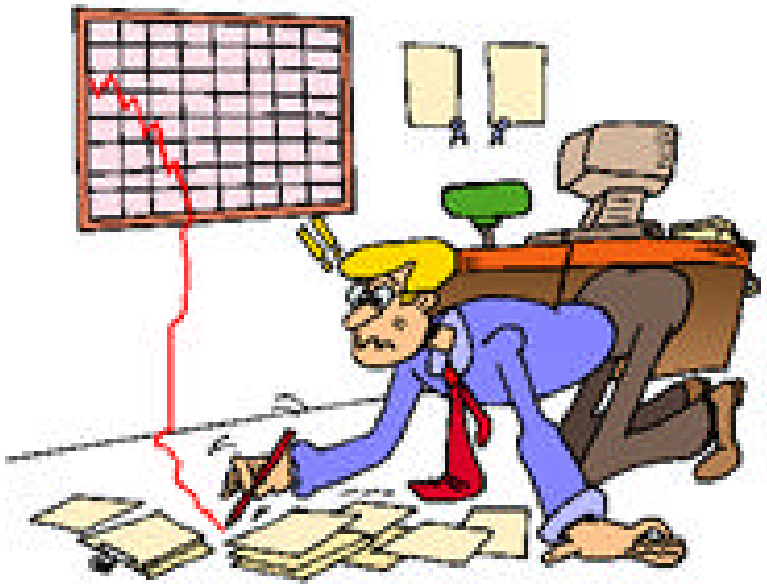
Numbers Up! 2 Baggin' The Dragon™

Mathematics Content Summary



Preface

The concepts and outcomes listed in this document form the basis for the structure of the Maths content in the game Numbers Up!2 Baggin' The Dragon ™.
These concepts and outcomes have been compiled from an extensive review of the concepts and outcomes listed in the following source documents:

Commonwealth of Australia National Numeracy Benchmarks
http://online.curriculum.edu.au/numbench/index.htm
NSW Board of Studies Mathematics K – 6, K-10
http://www.bosnsw-k6.nsw.edu.au/maths/maths_index.html
Northern Territory Board of Studies, Learning Area Statement; Mathematics; Transition to Year 10
http://www.education.nt.gov.au/
Queensland Studies Authority Years 1- 10 Mathematics Syllabus
http://www.qsa.qld.edu.au/yrs1_10/kla/mathematics/
South Australian Department of Education & Children's Services R – 7, 8 - 10 Mathematics Teaching Resources
http://www.sacsa.sa.edu.au/index_fsrc.asp?t=LA
Tasmanian Department of Education Outcomes and Standards
http://www.education.tas.gov.au/ocll/currcons/outcomes.pdf
Victorian Board of Studies Curriculum & Standards Framework, Mathematics
http://www.sofweb.vic.edu.au/curric/csfdesc.htm
Education Department of Western Australia, Outcomes & Standards, Mathematics
http://www.eddept.wa.edu.au/outcomes/

New Zealand Ministry of Education; Mathematics in the New Zealand Curriculum
http://www.minedu.govt.nz/index.cfm?layout=document&documentid=3526&indexid=1005&indexparentid=1004

United Kingdom Department for Education & Skills, National Numeracy Strategy, Framework for Teaching Mathematics: R to Year 6
http://www.standards.dfee.gov.uk/numeracy/
United Kingdom Department for Education & Skills, National Numeracy Strategy, Framework for Teaching Mathematics: Yrs 7, 8 and 9
http://www.standards.dfes.gov.uk/keystage3/strands/?strand=maths
Scottish Office Education Department National Guidelines Mathematics
http://www.ltscotland.org.uk/5to14/subjects/index.asp?bDisplayDetails=1&iSubjectID=1467377268
National Council of Teachers of Mathematics (North America) Standards
http://standards.nctm.org/document/
Ontario Ministry of Education & Training Mathematics Curriculum Grades 1 – 8
http://www.edu.gov.on.ca/eng/document/curricul/curr97ma/curr97m.html
Eire Primary School Mathematics Curriculum
http://www.ncca.ie/j/index2.php?name=bigriver
Curriculum Planning & Development Division, Ministry of Education, Singapore, Primary Mathematics Syllabus
Curriculum Planning & Development Division, Ministry of Education, Singapore, Lower Secondary Mathematics Syllabus
http://www1.moe.edu.sg/syllabuses/

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ORGANISING & INTERPRETING DATA, PROBABILITY

Organising and Interpreting Data - 1

1. Classify objects on the basis of one attribute such as colour, shape, texture, size or function.
2. Sort collections of objects.
3. Add similar objects to a clearly defined set.
4. Identify elements that are not part of a given set.
5. Match sets, equal and unequal.
6. Represent and interpret a set of simple mathematical data in two rows or columns using real objects, models and pictures.
7. Compare groups using pictorial representations.
8. Compare information on situations or objects using two categories. E.g.
    - How many children had either an apple or a pear for lunch?
    - How many objects are red and have wheels?
    - How many families have both a cat and a dog?
9. Can identify the numerical correspondence between a pictorial representation of data and the information displayed. E.g.
    - Reading from a pictorial representation to determine how many children had an apple for lunch.

Organising and Interpreting Data - 2

1. Make and organise a list such as
   - All the counting numbers between 14 and 23
   - All the days of the week
   - First names with six letters
2. Collect data quickly, make and organise a table.

Name	Cubes
Mary	8
James	7
Lisa	5
Mark	6

3. Answer questions such as
   - Who can hold the most cubes?
   - Who can hold one more cube than Mark?
   - How many more cubes can Mary hold than Lisa?
4. Represent information using pictures.
5. Compare groups using pictorial representations.
   - How many children were asked about their favourite ice cream?
   - Which ice cream was the most popular? How do you know?

Activities

1. Drag and drop objects onto a pictogram format
2. Given a pictogram of zoo animals: Are there more tigers than snakes?
3. Given a pictogram of different drinks sold at the shop: Which is the most popular drink?
4. Construct, then read from a pictogram: Children with lunch items, sort by drag and drop, then answer questions. Having Lunch : How many children had an apple/pear/piece of fruit for lunch?
5. Drag objects/words into different lists (sorting using 1 criterion) : days of the week, words with five letters, living things, things with wheels, etc
6. Click on all the first names with six letters: Abigail, Sheridan, Jaimie, Nathan, Halim, Aziz, Penny, Joshua, Pradeep
7. Read from a table: Who has 1 more marble than Marco? Who has the most marbles? How many more marbles does Sam have than Eric?
8. Read from a table: Do more families own a dog or a cat?
9. Read from a weather chart: Days of the week/ Sunny/rainy/cloudy. How many days were sunny?
10. Read from a block graph: Children's names/Number of people in the family; Whose family has 4 people? Whose family has the most people?

Organising and Interpreting Data – 3

1. Classify numbers and organise them into lists and simple tables. E.g.
   - Make a list of all the multiples of 10 between 0 and 100
   - Five different numbers that are more than 70
   - All the odd numbers from 15 to 35
2. Organise data into a simple table and use the table to answer questions. E.g.

3 letters	4 letters	5 letters	6 letters
Ann	Mark	Halim	Andrew
Sam	Tara	David	Sophie
Ali	Afra	Carey	Wilmot
	Jade		

What is the most common number of letters in a name?

How many names have more/fewer than 5 letters?

3. Organise information into a simple block graph and discuss questions relating to the information presented.
   E.g. What We Like To Drink, answering questions such as
   - What do most children like to drink?
   - How many children were asked?
4. Interpret pictograms where one symbol represents one unit. E.g. Our Bed Times
   - How many children are in bed by 7:30 pm?
   - Are more children in bed by 7:30 than after?
   - How many children altogether are in the class?

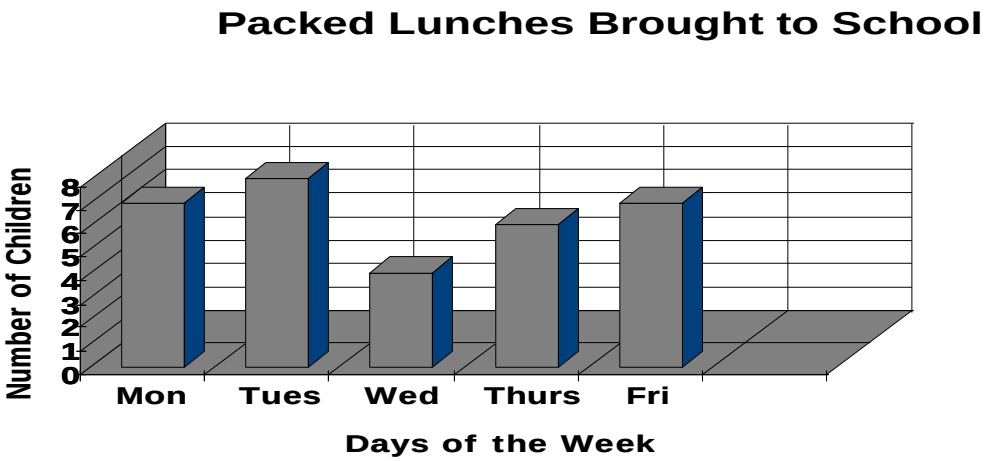
Organising and Interpreting Data – 4

1. Classify objects, numbers or shapes according to one criterion, progressing to two criteria, and display on a Carroll or Venn diagram.
    - E.g. Children who are 8 years old or not 8 years old
    - Shapes that are squares or not squares
2. Show data on a simple frequency table and respond to questions about the information displayed.

Favourite Colours	Votes
Blue	6
Green	4
Yellow	8
purple	7

- Which colour is most popular?
- Who voted for either blue or purple?
- Which colour had fewer than 5 votes?

3. Use a simple bar graph with the vertical axis labelled in ones, E.g.



Discuss questions such as:

- Which day had the most/least packed lunches?
- How many packed lunches in the whole week?

4. Read from a simple pictogram where each symbol represents two units:

E.g. Ways of Coming to School ● = 2 children

Discuss questions such as:

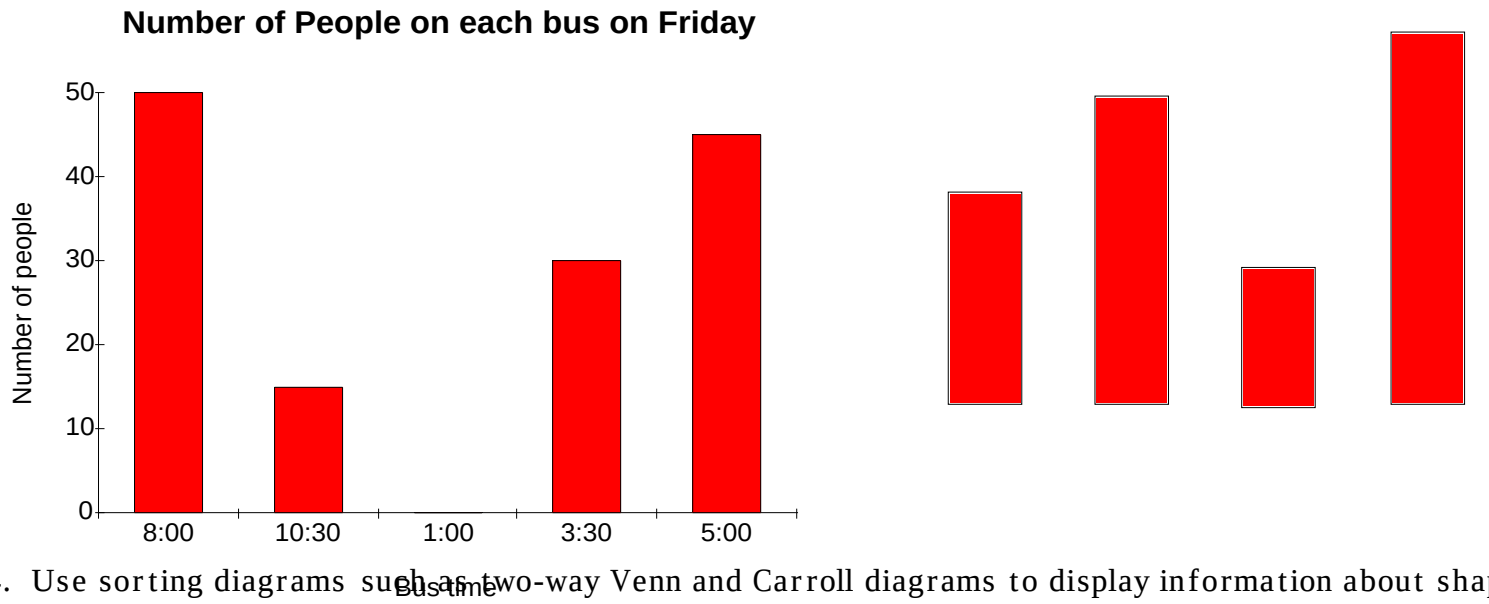
- Do most children walk to school?
- More children walk than come by bike. How many more?
- How many children altogether in the class?

Organising and Interpreting Data - 5

1. Record information on a tally chart and discuss the findings.
2. Read information from a pictogram where the symbol represents several units.
3. Answer a question or solve a problem by interpreting a bar chart with the vertical axis marked in multiples of 2, 5, 10 or 20, noting that a graph has a title, and that axes are labelled.

E.g.

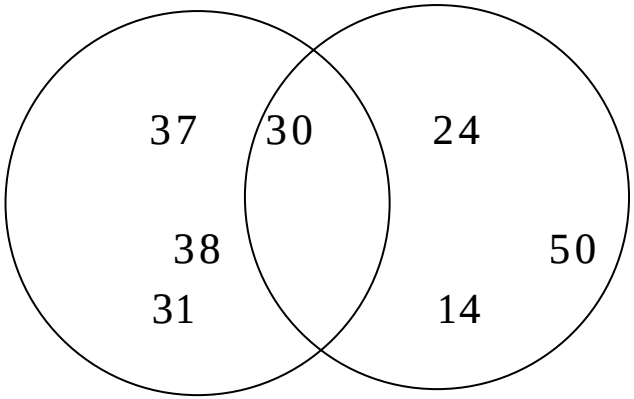
There were 25 people on the 1:00 bus. Put the correct bar in the graph.



4. Use sorting diagrams such as two-way Venn and Carroll diagrams to display information about shapes or numbers

E.g. This Venn diagram records how some number cards were sorted:

Numbers with 3 tens



Even numbers

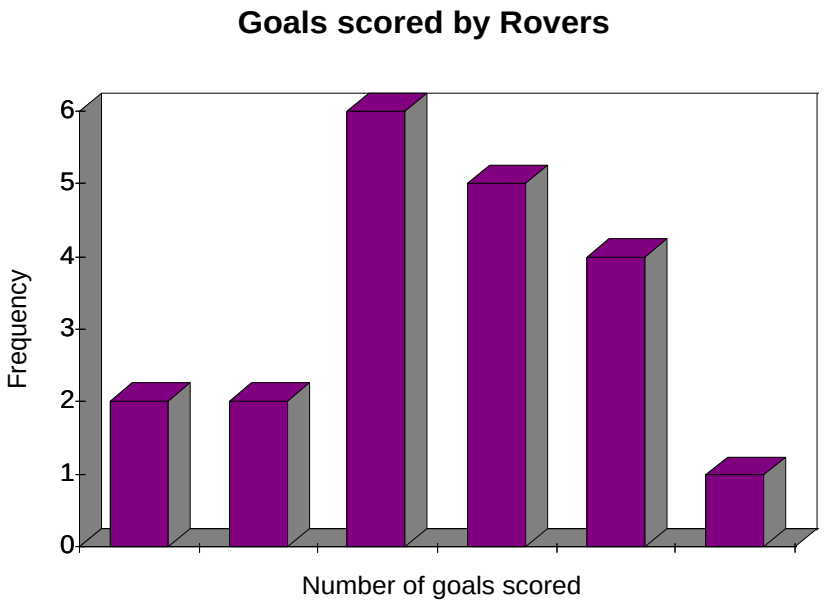
- Put these numbers on the diagram: 8, 36, 33, 41
- Make a Venn diagram with the circles Multiples of 3 and Multiples of 4. Put these numbers in their correct places:

  35, 42, 36, 28, 40, 12, 33, 15, 32, 27, 24, 34
- This Carroll diagram records how some of the whole numbers from 20 to 39 were sorted:
- Add these numbers to the diagram: 25, 34, 17, 18

Numbers with 3 tens	odd	not odd
	37 31	38 30
Numbers that don't have 3 tens	23 25	26 20

Organising and Interpreting Data - 6

1. Test a hypothesis by analysing a bar chart or bar line chart showing the frequency of an event. E.g. Hypothesis: The Rovers scored more than 3 goals in a quarter of their matches last season



- How many matches in total did the Rovers play?
- What was the maximum number of goals scored by the Rovers?
- In how many matches did the Rovers score more than 3 goals?
- What was the number of goals scored most commonly? (mode)

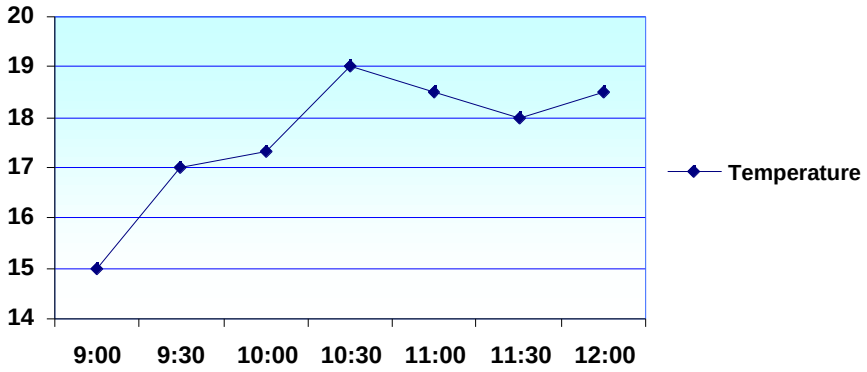
- If the Rovers play in the same league next season, are they likely to score 7 goals in a game?

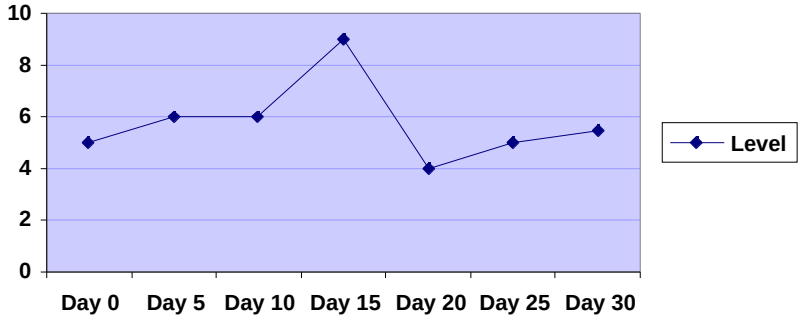
2. Develop understanding of the mode (most common item) and the range (difference between greatest and least values) of a set of data. E.g.

Name	Maths Score	Spelling Score
Danny	8	9
Elizabeth	10	7
Ana	7	9
Bailey	7	8
Devon	9	9
Alicia	7	10

- What was the most common score in the Maths test? In the Spelling test?
- What were the maximum and minimum scores in the Maths test? In the Spelling test?
- What was the difference between the maximum and minimum scores in the Maths test? (range) In the Spelling test?

3. Interpret a line graph. Understand that midpoints on the line may or may not have value, depending on the context. E.g. In a line graph showing Room Temperature/ Time, points are joined to show trends.

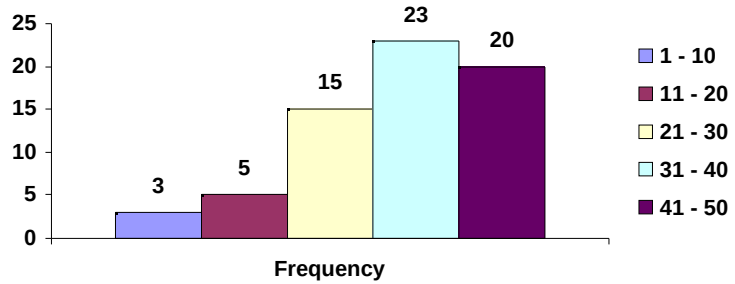




In a line graph showing the water level in a rain barrel during the month of April:

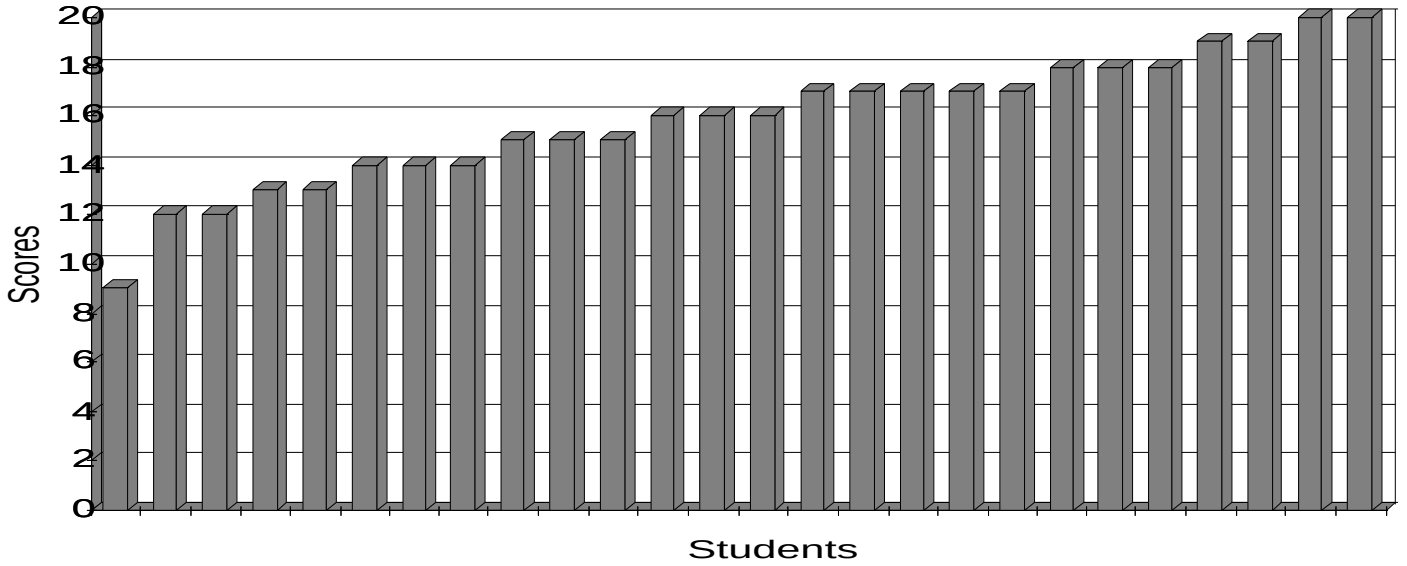
- What was the pattern of rainfall during the month?

1. Interpret a bar chart where discrete data are grouped. E.g. In a chart showing Marks in a Table Test, answer questions such as



- What was the most common score in the test?
- How many students took the test?
- What is the range of test scores?

2. Begin to interpret simple pie charts. E.g. Answer questions such as
    - What fraction/percentage of the village is aged 16 – 60? 16 and under? Over 60?
3. Working with a simple computer database, enter the results of a spelling test and use the database facilities to determine such questions as
    - Who scored more than 12?
    - How many people scored 12? 14? 16? 17? 20?
    - What was the most common score? (the mode value)
    - What was the difference between the highest and the lowest score? (the range of the values)
    - What was the middle score? (the median value)
    - What was the average score? (the mean value)
4. Begin to draw and interpret a line graph, in which the intermediate values have meaning. E.g. a conversion graph relating miles to kilometres, pounds to euros or yen or dollars, a "3 times" graph.



Organising and Interpreting Data – 8 to 11

1. Discuss a problem that can be addressed by statistical methods, and identify related questions to explore.
2. Decide which data to collect and identify possible sources.
3. Decide which data would be relevant to the enquiry and possible sources. E.g.
   - Surveying a sample of people
   - Conducting an experiment involving observation, counting or measuring
   - Consulting secondary sources such as tables, charts and graphs, from newspapers, reference books, websites, CD-ROMs, etc
4. Plan how to collect and organise the data and design suitable data collection sheets or questionnaires.
5. Construct frequency tables for sets of data, grouped where appropriate in equal class intervals.
6. Calculate statistics from data, using ICT as appropriate
7. Know that the mode is the only statistic appropriate for data based on non-numeric categories e.g. the most common way of travelling to school
8. Know that mean and average are interchangeable terms.
9. Know that the mode of a set of numbers is the most frequently occurring number.
   - For 1, 2, 3, 3, 4, 5, 6, 9 the mode is 3.
   - For 3, 4, 4, 4, 6, 7, 7, 8 the mode is 4.
   - For 2, 2, 3, 5, 6, 7, 9, 9 there are two modes, 2 and 9.

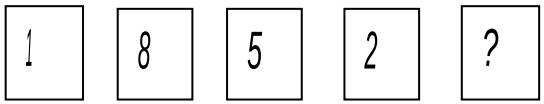
   In a grouped frequency distribution, the group that contains the most members is called the modal class or modal group.
10. Calculate the mean for a small set of discrete data, using a calculator for a larger number of items.
11. Find and use the range of a small set of discrete data.

- For 2, 3, 4, 7, 9, 10, 14, 15 the range is 15 – 2= 13

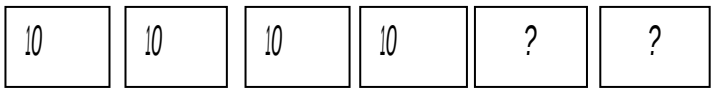
12. Find the median of a small set of discrete data.
    - The set 2, 5, 8, 3, 1, 7 becomes 1, 2, 3, 5, 6, 7, 8 and the median is 5
    - If the set has no single middle number, the mean of the two middle numbers is taken. The set 1, 5, 7, 8, 9, 10 has a median of (7 + 8) ÷ 2 = 7.5
13. Calculate statistics. E.g.
    - A competition has three different games. Jessie has played two of the games. To win, she needs a mean score of 60. How many points does she need to score in the last game?

	Game A	Game B	Game C
Score	62	53	

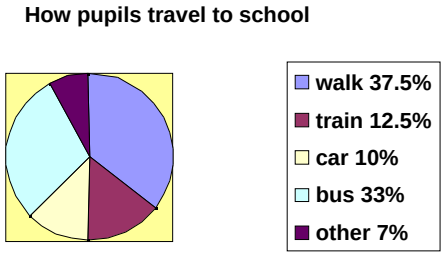
- Phil has these four cards. The mean is 4.
  Phil takes another card. The mean is still 4.
  What number is on his new card?
  If the new mean had been 5, what would be the number on the fifth card?



- Renita has six cards. The six cards have a mean of 10 and a range of 6. What are the numbers on the other two cards?

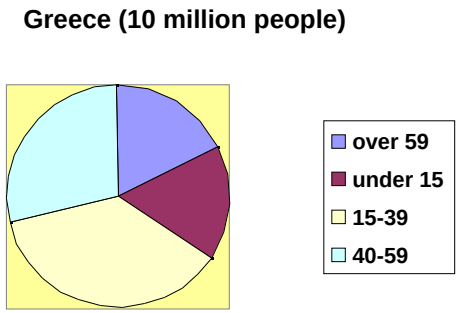


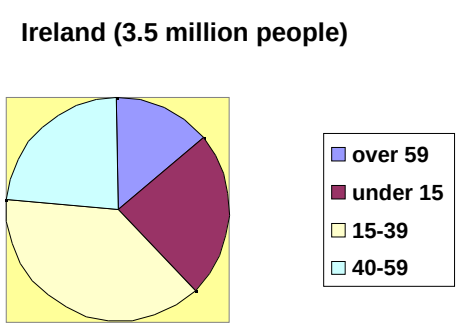
14. Identify the key features of different types of graphs. E.g. In a pie chart, know that the sizes of the sectors of the chart represent the proportions in each category. (Link to percentages)



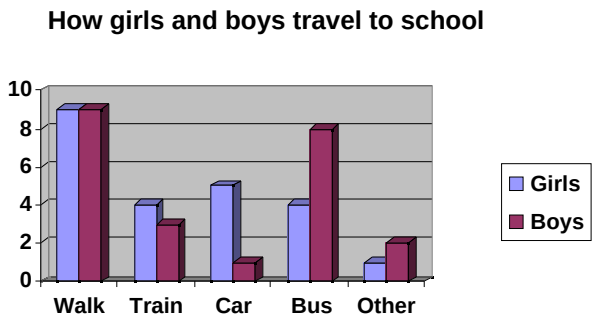
- In a school of 400 children, how many walk to school?

- There are more people under 15 in Ireland than in Greece. True or false?

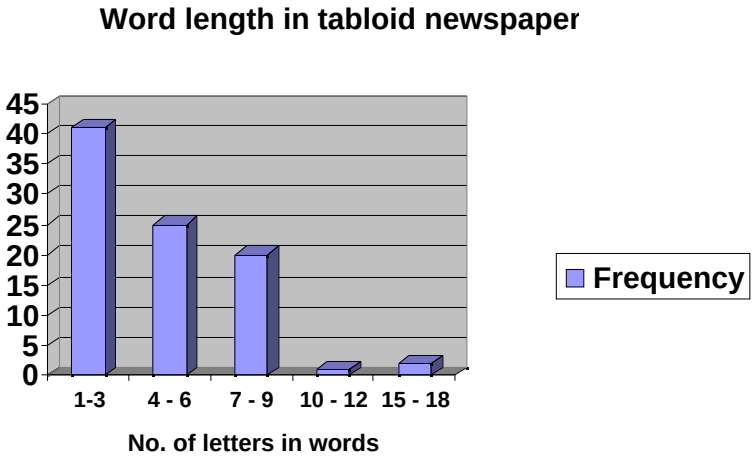


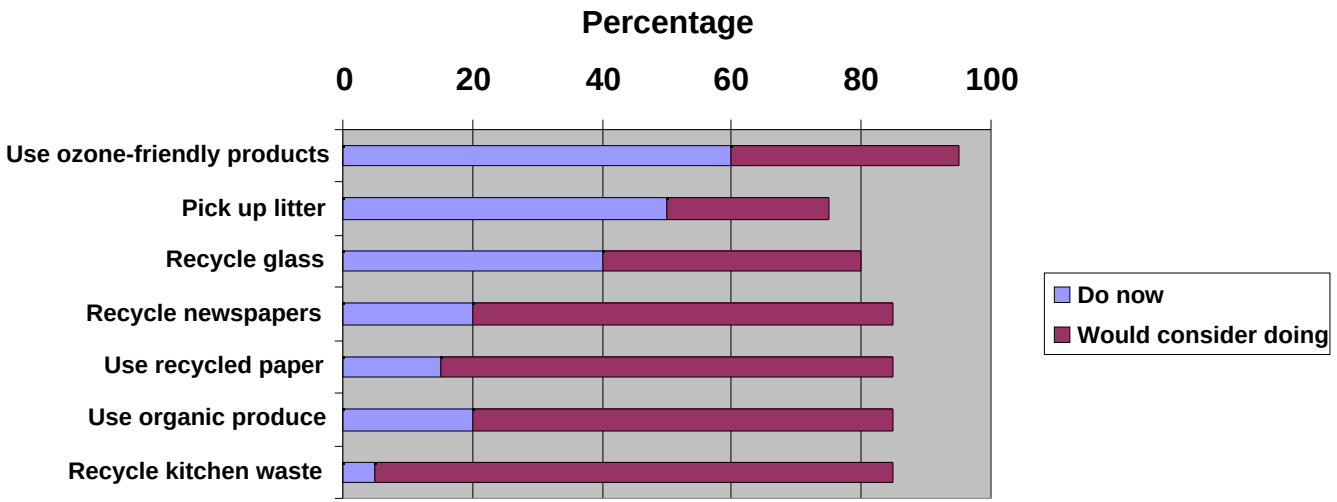


15. Read bar charts for categorical data.



16. Read bar charts for discrete (discontinuous) data.





17. Compare the distributions of two sets of data, and the relationships between them, using the range and one of the mode, mean or median.
18. Identify misleading graphs and statistics.

Probability – 6

1. Use vocabulary and ideas of probability, drawing on everyday experience. E.g.
   - Match each word to a statement: CERTAIN LIKELY UNLIKELY IMPOSSIBLE

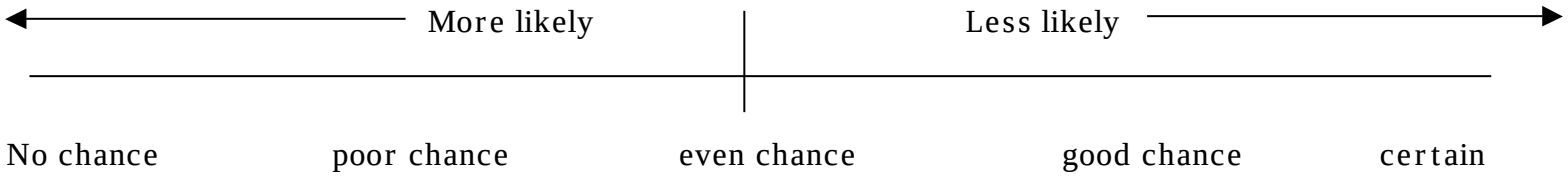
     It will get dark tonight.

     The sun will rise tomorrow in the east.

     I will see Queen Victoria on my way home today.

     It will snow before Christmas.

     I will grow taller than my mother.
   - Place the statements on a scale:



Probability – 7

1. Recognise that some events have two equally likely outcomes. E.g.
   - A piece of toast that falls is equally likely to land buttered side up or down.
   - A new baby is equally likely to be a boy or a girl. (Hmmmmm)
   - A coin is just as likely to land heads up or tails up.
   - A dice roll is just as likely to produce an even number as an odd number.

Probability – 8

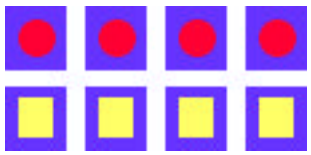
1. Use vocabulary and ideas of probability, drawing on everyday experience. E.g.
   - Match each word to a statement: CERTAIN LIKELY UNLIKELY IMPOSSIBLE

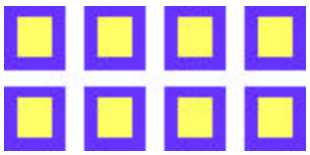
     I will eat a packet of crisps today.

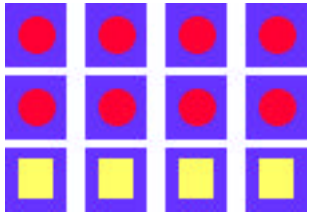
     Next year, there will be 54 Fridays.

     The sun will rise tomorrow in the east.

     I will see Ricky Ponting on my way home today.
   - A class is going to play three games. In each game, some cards are put into a bag. Each card has either a square or a circle on it. One card is taken out, then put back into the bag. If it is a circle, the girls get a point. If it is a square, the boys get a point. Here are the sets of cards for the three games:

Game 1 

Game 2 

Game 3 

- Which game are the girls more likely to win?
- Which game is impossible for the girls to win?
- Which game is it equally likely that the boys or girls could win?
- Are any of the games unfair? Which?

2. Understand and use the probability scale from 0 to 1. Find and justify probabilities based on equally likely outcomes in simple contexts. Recognise that, for a finite number of possible outcomes, probability is a way of measuring the chance or likelihood of a particular outcome on a scale from 0 to 1, with the lowest probability at zero (impossible) and the highest probability at 1 (certain).
   - What fraction would describe the chance of picking a red card at random from a pack of 52 cards?
   - What is the chance of picking a club?
3. Know that probability is related to proportion and can be represented by a fraction, a decimal or a percentage.
4. Know that if several equally likely outcomes are possible, the probability of a particular outcome chosen at random can be measured by $\frac{\text{Number of events favourable to the outcome}}{\text{Total number of possible events}}$
   - The letters in the word RABBIT are placed in a tub and one letter taken out at random. What is the probability of taking out a letter T? (one in 6 or 1/6)
     a letter B? (one in 3 or 1/3)
   - What is the probability of rolling a 2 on a fair dice? Rolling 5? Rolling an odd number? Zero? A prime number? A number between 0 and 7?
   - A newsagent delivers these papers, one to each house:

Sun	250	Times	120
Mirror	300	Mail	100
Telegraph	200	Express	80

What is the probability that a house picked at random has

The Times?

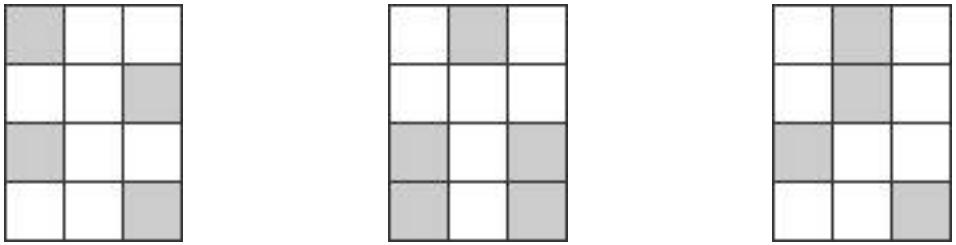
The Mail or the Express?

Neither the Sun nor the Mirror?

5. Identify all the possible outcomes of a single event. E.g.
    - How many possible outcomes are there when a fair coin is tossed? What is the probability of each outcome?
    - When a letter of the alphabet is chosen at random? Vowel or consonant? Probability of each outcome?
    - When a number is chosen at random from the set of numbers 1 – 30? Prime or not prime? Odd or even? Single digit/teen/twenty number?
6. Identify inaccuracies in statements related to probability. E.g.
    - The names of all the pupils, all the teachers and all the ancillary staff of a school are put into a box, and one name is taken out at random. Ravi says, “There are only three choices – it could be a pupil, a teacher or one of the other staff. The probability of its being a pupil is therefore one in three, or 1/3.” True or false?

Probability – 9

1. Use the vocabulary of probability when interpreting the results of an experiment, appreciating that random processes are unpredictable. E.g.
   - Three different scratch cards have some hidden shaded squares. You can scratch just one square, choosing at random. On which card are you most likely to reveal a shaded area?



   - Two boxes of sweets contain different numbers of hard- and soft-centred sweets.
     Box A has 8 hard-centred sweets and 10 soft-centred sweets.
     Box B has 6 hard-centred sweets and 12 soft-centred sweets.
     Kate only likes hard-centred sweets. She can pick one sweet at random from either box. Which box should she choose from?
     Kate is given a third box of sweets. Box C has 5 hard-centred sweets and 6 soft-centred sweets. Which box should Kate choose from now?
2. Know that if the probability of an event occurring is p, then the probability of its not occurring is 1 – p. Use this knowledge to solve problems. E.g.
   - Consider a pack of 52 playing cards (no jokers). What is the probability of drawing a club from the pack? (_)
     What is the probability of not drawing a club? (1 – _ or _)

- What is the probability that a card chosen at random will be
  (a) a red card?
  (b) a heart?
  (c) not a picture?
  (d) not an ace?
  (e) either a club or a diamond?
  (f) an even-numbered red card?
- There are 25 cars parked in a garage. Twelve are red, seven are blue, three are white and the rest are black. What is the probability that the next car to leave the garage will be
  (a) red?
  (b) not red?
  (c) black?
  (d) not black?
  (e) black or white?
- A set of snooker balls consists of 15 red balls and one each of the following colours: yellow, green, brown, blue, pink, black and white. One ball is picked at random. What is the probability of its being
  (a) red?
  (b) not red?
  (c) black?
  (d) not black?
  (e) black or white?
- Imran threw a dart at a dartboard 60 times, and hit the board with each throw. The maximum score for one dart is treble twenty. Imran scored treble twenty 12 times. Imran is about to throw the dart once more. What is the probability that he will score

(a) treble twenty?

(b) less than 60?

- 200 raffle tickets numbered from 1 to 200 have all been sold. One ticket will be drawn at random to win first prize.

  (a) Karen has number 125. What is the probability that she will win?

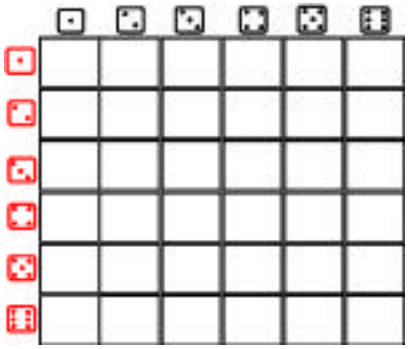
  (b) Andrew buys tickets numbered 81, 82, 83 and 84. Sue buys tickets numbered 30, 60, 90 and 120. Who has the better chance of winning?

  (c) Rob buys several tickets. He has a 5% chance of winning. How many tickets has he bought?

  (d) Three people have each lost a ticket and fail to return them for the draw. What is the chance that nobody will win on the first draw?

3. Find and record all possible outcomes for a single event and two successive events in a systematic way. E.g.

- One red and one black dice are numbered 1 to 6. Both dice are thrown and the numbers on the faces are added. Use a sample space to show all possible outcomes.



(a) Which outcome is the most likely?

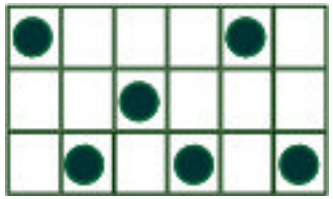
(b) What is the probability of getting the same number on both dice?

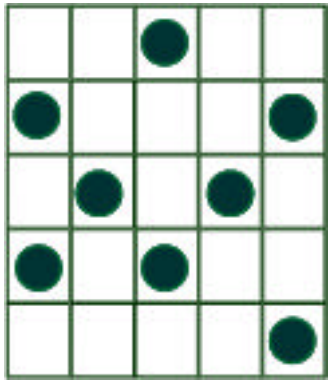
(c) What is the probability of the sum of the numbers being less than 4?

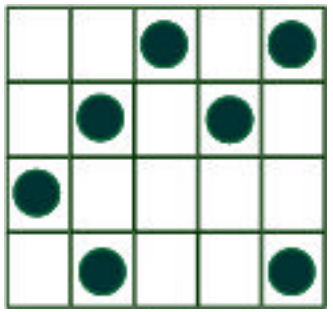
(d) What is the probability of the score on the red dice being double the score on the black dice?

Probability – 10&11

1. Use the vocabulary of probability in interpreting results involving uncertainty and prediction. E.g.
   - In the game Action Zone, different hazards are hidden on the game grid. When a player lands randomly on a square with a mine, he is out of the game. The circles indicate where the mines are hidden on three different levels of the game.







   - On which of the three grids is it hardest to survive?
   - On which of these grids is it hardest to survive (X) 10 mines on an 8 by 8 grid?
     (Y) 40 mines on a 16 by 16 grid?
     (Z) 99 mines on a 30 by 16 grid?

2. Know that the sum of probabilities of all mutually exclusive outcomes is 1. Use this to solve problems. E.g.
   - A bag contains a number of plastic discs. Most are marked with a number, either 1, 2, 3, 4 or 5. The rest are unmarked. The probabilities of drawing out a disc marked with each number are:

p1) = 0.15
p2) = 0.1
p3) = 0.05
p4) = 0.35
p5) = 0.2

(a) What is the probability of drawing out a disc marked 1, 2 or 3?

(b) What is the probability of drawing out a disc not marked with a number?

· In an arcade game only one of four possible symbols can be seen in the final window. The probability of each occurring is:

Symbol	Probability
Jackpot	1/16
Moon	1/4
Star	?
lose	1/2

(a) What is the probability of getting a star?

(b) What event is most likely to happen?

(c) What is the probability of not getting the jackpot?

(d) After many games, the jackpot had appeared 5 times. About how many games had been played?

3. Identify all the mutually exclusive outcomes of an experiment. E.g.

· A fair coin and a fair dice are thrown. One possible outcome is (T, 5). List all the other possible outcomes.

· A fruit machine has two 'windows'. In each window, one of three different fruits is likely to appear:

List all the possible outcomes.

What is the probability of getting:

(a) two identical fruits?

(b) at least one banana?

(c) no bananas?

- A game involves rolling 6 dice. If you get 6 sixes, you win a mountain bike. What is your chance of winning a mountain bike?
- The diagram shows the results of a two-question survey administered to 80 randomly selected students at Highcrest High School.

Do you play a musical instrument?

Do you play a sport?	YES	NO
YES	14	32
NO	20	14

- Based on the results of this sample, how many of the school's 1800 students might be expected to play a musical instrument?
- What is the probability that an arbitrary student at the school plays sport and plays a musical instrument?

- What is the probability that a student either plays sport or plays an instrument?
- What is the probability that a student plays neither a musical instrument nor a sport?
- There are six balls in a bag. The probability of taking a red ball out of the bag is 0.5. The first ball taken out of the bag is red. It is put to one side, not returned to the bag. What is the probability of taking out another red ball?
- All the balls in a bag are either black or red. The probability of taking out a red ball at random is 1/5. One ball is taken from the bag and placed on the table. The ball is red. What is the smallest number of black balls that could be in the bag?
- Another ball is taken from the bag and placed with the first ball. It is also red. What is the smallest number of black balls that could be in the bag?
- Two bags, A and B, contain coloured cubes. Each bag has the same number of cubes in it. The probability of taking a red cube at random from bag A is 0.5. The probability of taking a red cube at random from bag B is 0.2. All the cubes are now put into an empty new bag. What is the probability of taking a red cube at random from the new bag?
- What if bag A has twice the number of cubes as bag B?

2D & 3D SHAPE

2D & 3D Shape – 1

Vocabulary: shape. pattern, flat, curved, round, hollow, corner, face, side, edge,

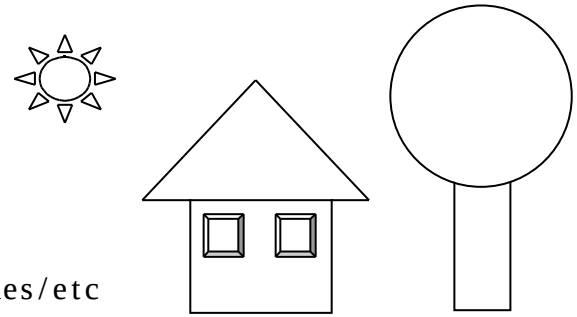
Shapes: circle, triangle, square, rectangle, cube, cone, sphere.

1. Can sort 2D/3D shapes according to given rules – things with 4 edges, things that could roll.
2. Can predict the movement of objects as a consequence of their shape. E.g. Will it roll? Will it slide? Will it slide or roll?
3. Can identify things that will stack or not stack.
4. Can click on the correct puzzle piece to fill an empty space in a puzzle.
5. Can describe 1D/2D/3D shapes. Click on the straight line/curved line/wavy line/zigzag line.
6. Can name some 2D/3D shapes – circle, square, rectangle, triangle, cube, sphere, cylinder.
7. Can identify non-examples of 2D/3D shapes E.g. a non-triangle (lines don't meet), non-circle (shape not uniform), etc.
8. Can match the shapes in a 'shape picture'.
9. Can find similar shapes on faces of objects. E.g.
    - Find 2 circles/triangles.
    - Match lids to jars or boxes.
    - Match a shape to a description: My shape has 3 corners and 3 sides.
      My shape is curved all the way around.
10. Can order 2D shapes according to size. E.g.
    - Make 'families' of the same shape in different sizes. (Russian nesting dolls, the 3 bears)
11. Can continue simple repeating or symmetrical patterns E.g. two circles, two squares, ... Etc
12. Can recognise things that are not squares, circles, triangles, cubes, etc

2D & 3D Shape – 2

Vocabulary: shape, pattern, flat, hollow, solid, side, edge, face, straight, curved, round, point, corner,
Shapes: circle, square, rectangle, triangle, cube, sphere, cylinder.

1. Can name some 2D/3D shapes – circle, square, rectangle, triangle, cube, sphere, cylinder.
2. Can identify solid shapes in everyday contexts E.g. a cuboid box, a cylindrical tin of baked beans
3. Use everyday language to describe features of familiar 2D and 3D shapes, referring to properties such as the shapes of flat faces, the number of faces, the number of corners, or the number and types of sides.
4. Can match and identify the shapes in a 'shape picture'. E.g.



   - Click on the circles/triangles/etc

5. Can find similar shapes on faces of objects. E.g.
   - Find 2 circles/triangles.
   - Match lids to jars or boxes.
   - Match a 2D or 3D shape to a description: Mystery Shapes: My shape has 3 corners and 3 sides.
   - My shape is curved all the way around.
   - My shape has four sides all of the same length.
6. Can describe 2D and 3D shapes. Can identify the faces, edges and corners of a 3D shape e.g. a cube.How many corners does this shape have? How many straight edges?

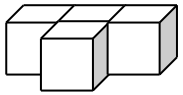
7. Can identify the correct piece to fill a space in a puzzle.
8. Use one or more shapes to continue repeating patterns.
9. Can identify non-examples of 2D/3D shapes E.g. a non-triangle (lines don't meet), non-circle (shape not uniform), etc.
10. Can order 2D shapes according to size. E.g.
    - Make 'families' of the same shape in different sizes. (Russian nesting dolls, the 3 bears)
11. Can identify how a 3D shape will move. Will it roll? Will it slide?

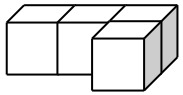
2D & 3D Shape – 3

Vocabulary: shape, pattern, flat, hollow, solid, side, edge, face, straight, curved, round, point, corner,
Shapes: circle, square, rectangle, triangle, cube, sphere, cylinder, pyramid, cylinder, pentagon, hexagon, octagon.

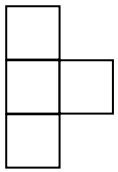
1. Use the mathematical names for common 2D and 3D shapes, including the pyramid, cylinder, pentagon, hexagon, octagon.
2. Make collections of cubes, cuboids, cylinders and spheres, and match them to their name labels.
3. Sort shapes and describe some of their features, such as the number of sides, corners, whether or not they are symmetrical (2D), shapes of faces, number of faces, edges, corners (3D shapes). E.g.
    - Click on the shapes with 6 faces.
    - Click on the shapes that have a triangular face.
4. Match shapes to their properties. E.g.
    - What am I? Find and name a shape with:
        a) one curved face and two flat circular faces
        b) eight corners and six square faces
        c) one square face and four triangular faces

5. 2D shapes:
   - Choose an example to match properties. E.g. find and name a shape
     a) with one curved edge
     b) with five corners and five sides
     c) with four straight equal edges
     d) with four square corners but sides that are not all equal
     e) that is not a rectangle
   - Sort shapes according to
     a) the number of sides
     b) the number of corners.
     c) the shapes with all straight sides
     d) the shapes with some curved sides
   - Shapes Get Together: Show picture of e.g. 2 triangles. Together they will make:- A selection of shapes including a rectangle.
6. Recognise 3D shapes from their pictures. E.g.
   - Match familiar solids to their pictures
   - Recognise, for example, shapes that are made from (4) cubes – single layer only, e.g.





   - Count the number of edges in a composite shape (4 tiles) e.g.

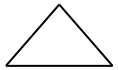


2D & 3D Shape – 4

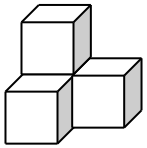
Vocabulary: shape, pattern, flat, hollow, solid, side, edge, face, straight, curved, round, point, corner, pentagonal, hexagonal, octagonal, right-angled, vertex, vertices,

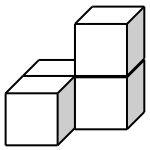
Shapes: circle, square, rectangle, triangle, cube, sphere, cylinder, pyramid, cylinder, pentagon, hexagon, octagon, prism, hemi-sphere, quadrilateral, semi-circle

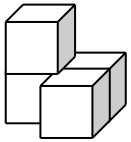
1. Classify and describe 2D and 3D shapes, including the hemisphere, prism, semi-circle, quadrilateral, referring to properties such as reflective symmetry (2D), the number and shapes of faces, the number of sides, edges and vertices, whether the sides/edges are the same length, whether or not the angles are right angles.
2. Know that a prism has the same cross-section along its length, and that the two end faces are identical.
3. Collect examples of prisms and cylinders and match them to name labels.
4. Sort 3D shapes in different ways according to properties such as
   - Whether or not they are prisms
   - The number and kind of faces, edges or vertices E.g. Click on all the solid shapes that have a face shaped like this.



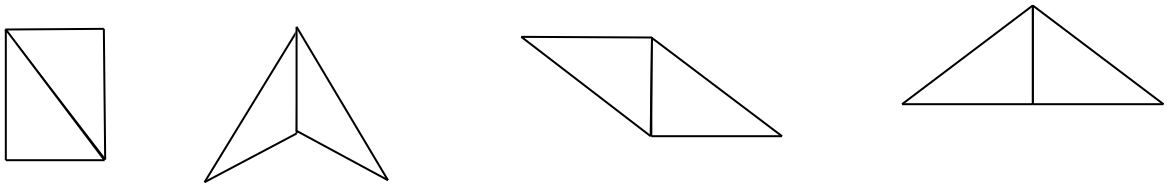
5. Recognise 3D shapes from descriptions of their properties. E.g
   - What am I? I am a 3D shape. I have two identical triangular faces at opposite ends, and all my other faces are rectangles.
   - I am a 3D shape. I have a flat circular face and one other face that is curved all around.
6. Relate 3D shapes to pictures of them. E.g.
   - Match familiar solids to their pictures.
   - Recognise, for example, shapes that are made from (4) cubes – double layered







7. Know that a quadrilateral is any flat shape with four straight sides.
8. Sort 2D shapes according to specific criteria such as
    - Whether the sides of the shape are all the same length
    - Whether at least one angle is a right angle
    - Whether the shapes have a line of symmetry
9. Recognise 2D shapes from descriptions of their properties.
    - Who am I? I am a 2D shape. I am half of a circle.
    - I am a 2D shape. I have 8 sides and 8 vertices.
    - I am a 2D shape. I have four right angles and my opposite sides are equal in length.
    - I am a 2D shape. I have five equal sides and two right angles.
10. Use 2D shapes to make and describe pictures and patterns. E.g.
    - Shapes Get Together (more complex): Show picture of e.g. 2 triangles. Together they will make:- A selection of shapes including a rectangle.



2D & 3D Shape – 5

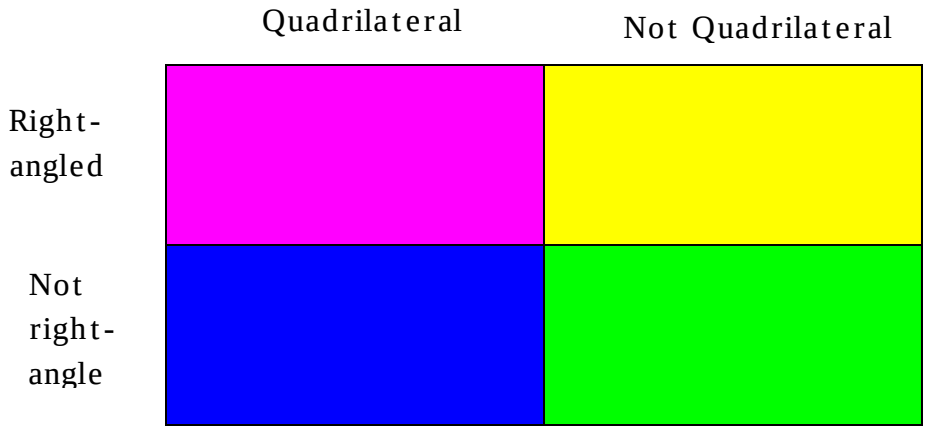
Vocabulary: pattern, shape, 2D, two-dimensional, 3D, three-dimensional, line, side, edge, face, surface, base, point, angle, vertex, vertices, centre, radius, diameter, net, regular, irregular, concave, convex, closed, open, circular, triangular, hexagonal, cylindrical, spherical, square-based, right-angled

Shapes: circle, semi-circle, triangle, equilateral triangle, isosceles triangle, quadrilateral, rectangle, oblong, square, pentagon, hexagon, heptagon, octagon, polygon, cube, cuboid, pyramid, sphere, hemi-sphere, cylinder, cone, prism, tetrahedron, polyhedron

1. Name, classify and describe 2D and 3D shapes, including the tetrahedron and the heptagon.
2. Know that in a polyhedron:
    - Each face is a flat surface and is a polygon.
    - An edge is the straight line where two faces meet.
    - A vertex is the point where three or more edges meet.
3. Know that a prism has two identical end faces and the same cross-section throughout its length. Collect, name and describe examples.
4. Know that a polygon is a closed, flat shape with three or more straight sides, and that regular polygons have all sides and all angles equal.
5. Name and classify polygons using such criteria as the number of right angles, whether or not they are regular, symmetry properties.
    - Know the angles and side properties of equilateral and isosceles triangles.
    - Know that all heptagons have seven sides
    - Know that a quadrilateral is any shape with four straight sides
    - Know that the square and the equilateral triangle are both regular polygons.
    - Know that an isosceles triangle is an irregular polygon.
    - Know that a polygon can be concave or convex.
    - Identify particular shapes from a mixed set. E.g. Which shapes are hexagons?

- What am I? I have seven equal sides and no right angles. I have 3 equal sides and 3 equal angles. My opposite sides are equal lengths, but I haven't got 4 equal sides. My angles are all right angles.

6. Sort 2D shapes. E.g. Put shapes into the right box.



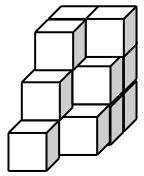
7. Count the number of faces and edges of 3D shapes. Recognise properties such as:
   - All pyramids have an even number of edges
   - The number of straight edges in a prism is a multiple of 3
   - The number of faces of a pyramid is one more than the number of edges of the base
   - The number of faces of a prism is two more than the number of edges of an end face.
8. Identify 3D shapes from 2D drawings. E.g.
   - Work out the least number of cubes needed to build these shapes:
9. Identify simple nets of solid shapes – cubes or cuboids.

2D & 3D Shape – 6

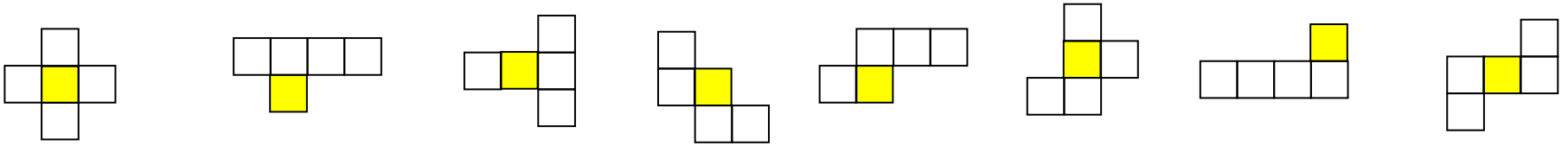
Vocabulary: pattern, shape, 2D, two-dimensional, 3D, three-dimensional, line, side, edge, face, surface, base, point, angle, vertex, vertices, centre, radius, diameter, net, regular, irregular, concave, convex, closed, open, circular, triangular, hexagonal, cylindrical, spherical, square-based, right-angled, congruent

Shapes: circle, semi-circle, triangle, equilateral triangle, isosceles triangle, scalene triangle, quadrilateral, rectangle, oblong, square, pentagon, hexagon, heptagon, octagon, polygon, cube, cuboid, pyramid, sphere, hemi-sphere, cylinder, cone, prism, tetrahedron, octahedron, polyhedron

1. Classify 3D shapes according to properties such as
    - The shapes of the faces
    - The number of faces, edges and vertices
    - Whether or not any face is right-angled
    - Whether the number of edges meeting at each vertex is the same or different
2. Recognise the properties of rectangles such as
    - All four angles are right angles
    - Opposite sides are equal and parallel
    - The diagonals bisect each other
3. Classify triangles (isosceles, equilateral, scalene), using criteria such as equal sides, equal angles, lines of symmetry. Know some of their properties such as
    - In an equilateral triangle all three sides are equal in length and all three angles are equal in size
    - An isosceles triangle has two equal sides and two equal angles
    - In a scalene triangle, no two sides or angles are equal
    - In a right-angled triangle, one of the angles is a right angle.
4. Visualise 3D shapes from 2D drawings. E.g.
    - Work out the least number of unit cubes needed to turn this shape into a cuboid.



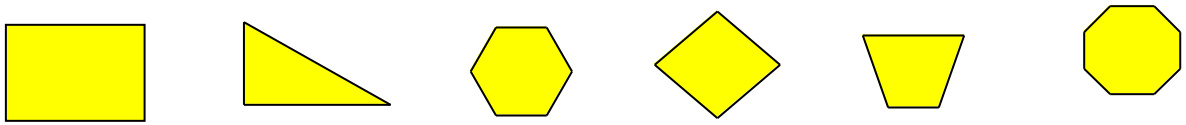
5. Identify the different nets for an open cube (five square faces)



6. Given a series of triangles drawn on a grid: Click on an isosceles triangle, a right-angled triangle, a scalene triangle, a triangle that is right-angled and isosceles, (Write the co-ordinates of point A)

7. Write the letter of the corresponding shape in the table:

Has parallel sides	
Has right angles	
Has acute angles	
Has obtuse angles	



2D & 3D Shape – 7

Vocabulary: pattern, shape, 2D, two-dimensional, 3D, three-dimensional, line, side, edge, face, surface, base, point, angle, vertex, vertices, centre, radius, diameter, net, regular, irregular, concave, convex, closed, open, circular, triangular, hexagonal, cylindrical, spherical, square-based, right-angled, congruent, concentric, circumference, tangram

Shapes: circle, semi-circle, triangle, equilateral triangle, isosceles triangle, scalene triangle, quadrilateral, rectangle, oblong, square, pentagon, hexagon, heptagon, octagon, polygon, cube, cuboid, pyramid, sphere, hemi-sphere, cylinder, cone, prism, tetrahedron, octahedron, polyhedron, parallelogram, rhombus, kite, trapezium, decahedron, dodecahedron

1. Describe and visualise properties of 3D shapes, such as parallel or perpendicular faces or edges.
2. Name and begin to classify quadrilaterals, using criteria such as parallel sides, equal angles, equal sides, lines of symmetry, etc. know that
    - A parallelogram has opposite sides equal and parallel
    - A rhombus is a parallelogram with four equal sides
    - A rectangle is a parallelogram with four right angles
    - A square is a rectangle with four equal sides.
    - A trapezium has one pair of opposite parallel sides.
    - A kite has two pairs of adjacent sides equal.

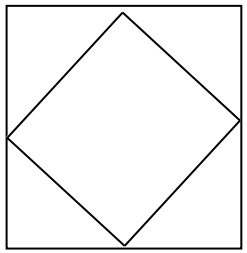
3. Sort quadrilaterals and place on a Carroll diagram:

	Parallel sides	Not parallel
Right-angled		
Not right-angled		

4. True or False? A rhombus is a special parallelogram.
   The angles of a quadrilateral add up to 1800.
   A trapezium has one pair of parallel sides.
   Opposite angles of a rhombus are equal.
   A parallelogram has two lines of symmetry.
5. Visualise 3D shapes from 2D drawings.
6. Identify different nets for a closed cube.

2D & 3D Shape – 8

1. Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes.
    - Know the labelling convention for triangles (angles A,B C; sides a, b, c opposite the corresponding angle)
    - Know the conventions for labelling equal or parallel sides)
    - Know that parallel lines are a constant distance apart, perpendicular lines intersect at right angles.
2. Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals.
3. Visualise 2D shapes in different orientations.
4. Know that the diagonals of any square, rhombus or kite intersect at right angles.
5. Know that the diagonals of any square, rectangle, rhombus or parallelogram bisect one another.
    - Imagine a square with its diagonals drawn in. Remove one of the triangles. What shape is left?
    - Imagine a rectangle with both diagonals drawn. Remove a triangle. What kind of triangle is it?
    - Imagine joining adjacent midpoints of the sides of a square. What shape is formed by the new lines?



6. Use 2D representations to visualise 3D shapes and deduce some of their properties. E.g.

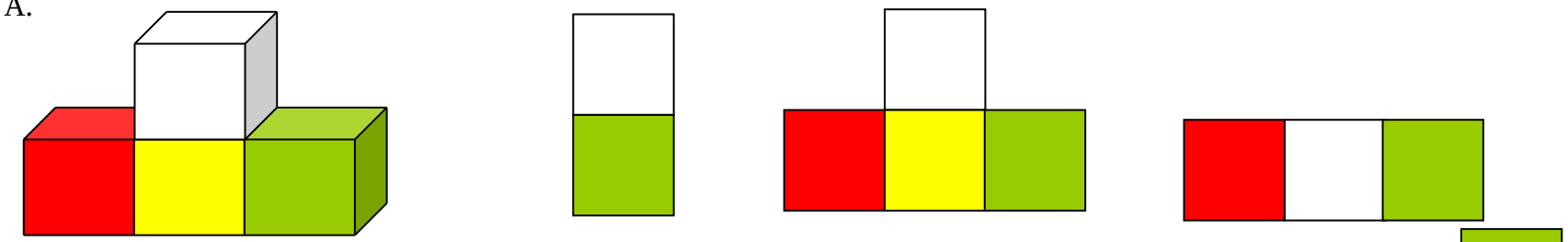
- These are the five Platonic solids. (Illustrate, with skeleton lines for unseen faces) Complete the table:

Name	Shape of faces	Number of faces
Tetrahedron		
Cube		
Octahedron		
Dodecahedron		
Icosahedron		

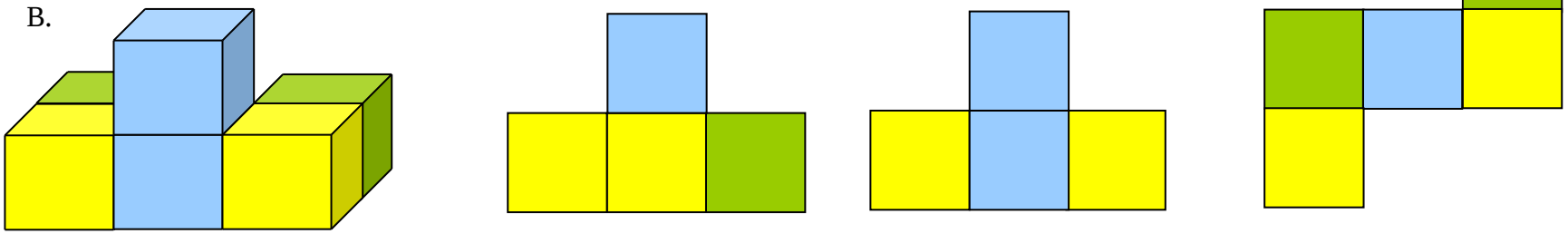
- Recognise shapes from different representations or combinations of representations E.g. plan view, side view, front view.

  E.g. Which model has this side view/front view/plan view? Click on the plan view/front view/side view.

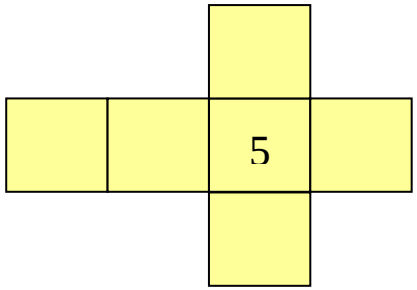
A.



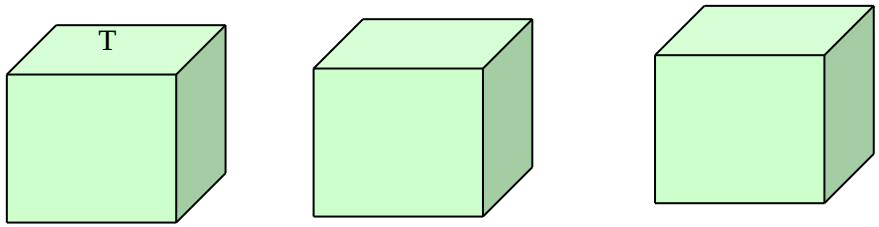
B.



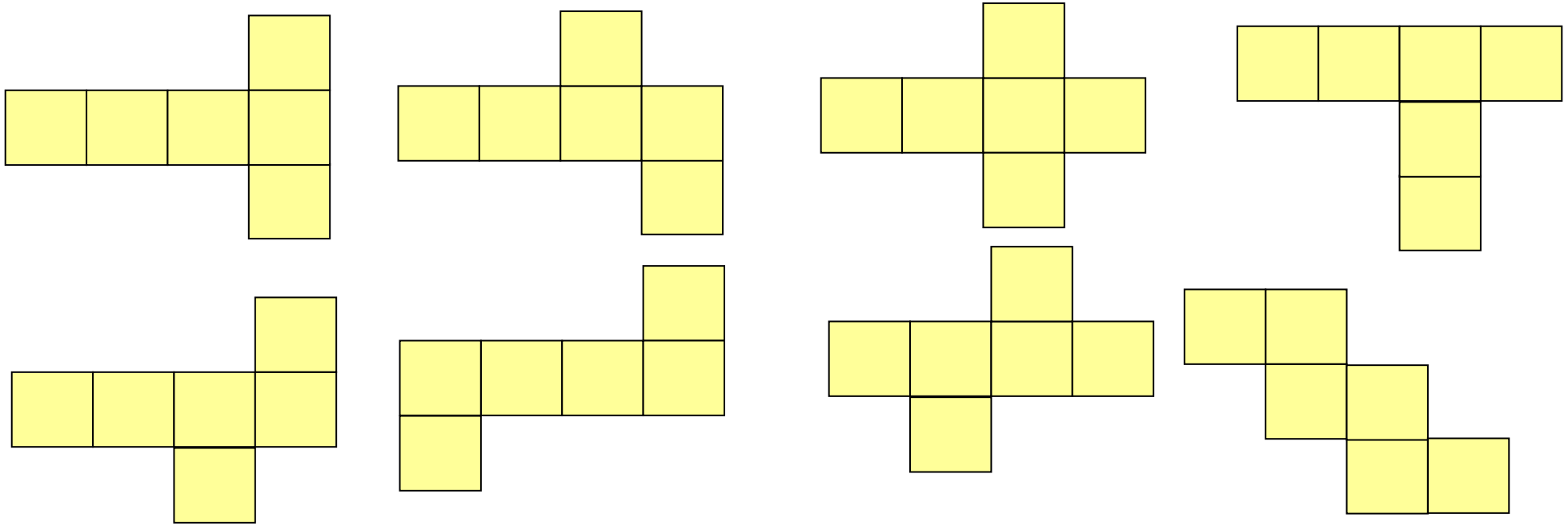
7. What am I? More complex.
8. Nets: Here is the net for a cube. Choose a face and write the number 5 on it. Now write numbers on the other faces so that when the cube is folded up, the opposite faces add up to 7.



9. Here are three views of the same cube. Which letters are opposite each other? OR Click the net with the correct arrangement of letters.

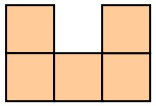


10. Click on the shapes that will fold to form a closed cube.

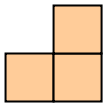


2D & 3D Shape – 9,10,11

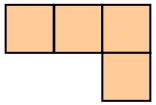
1. Know and use geometric properties of cuboids and shapes made from cuboids.
   - E.g. A cuboid with top and bottom painted red, ends painted yellow and sides painted blue. How many edges are there where blue meets red? Blue meets yellow? Yellow meets red? Blue meets blue? Yellow meets yellow? Red meets red? How many edges altogether? Faces? Vertices?
   - What is the relationship between the number of faces, edges and vertices? (F, E, V) (F + V = E + 2)
2. Begin to use plans and elevations. E.g. Click on the shape that shows a (sphere/hexagonal prism/square-based pyramid/etc) viewed from directly above. / Click on the solid shape that would look like this when viewed from directly above.
3. Identify shapes from front elevation, side elevation, plan view diagrams. E.g.



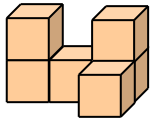
Front



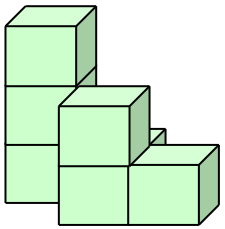
Sid

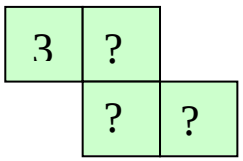


Plan view

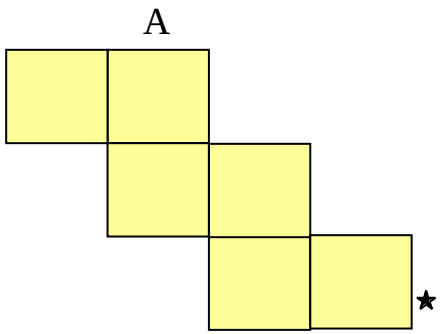


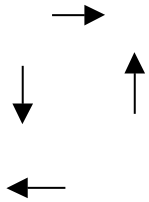
4. Given a picture of a structure and a plan view diagram, fill in the number of cubes on each base. E.g.





5. Archimedean solids
6. Nets
7. Answer questions such as: True or false? A pyramid is a prism.
   A cone is a polyhedron.
   A cube can only have a cross-section that is square.
   A cube can have a cross-section that is hexagonal.
   A prism has two bases that are identical in shape and size.





Look at this net of a cube. When it is folded, which edge will meet the edge marked A? Mark it with an arrow.

ANGLE & SPATIAL REASONING

Angle & Spatial Reasoning – 3

Vocabulary: slide, roll, turn, whole turn, half turn.

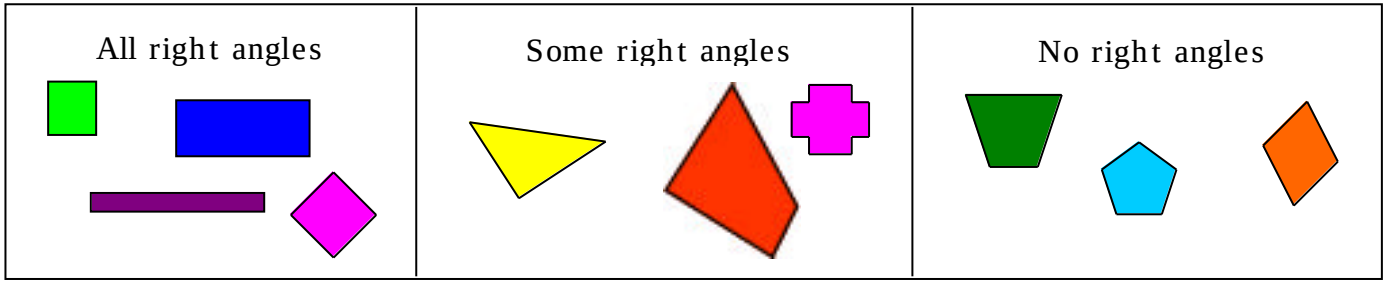
1. Describe movements in a straight line and turning, and understand angle as a measure of turn.
   - Recognise objects that turn about a point such as spinning wheels, clock hands, turnstile, windmill arms.
   - Recognise objects that turn about a line such as a door, the pages of a book, a hinged lid.
   - Recognise whole turns and half turns (on a clock, for example)

Angle & Spatial Reasoning – 4

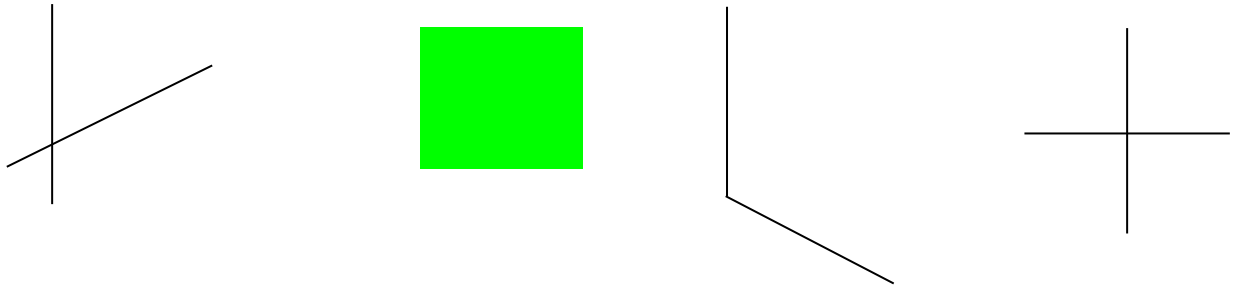
1. Identify parallel and non-parallel lines in the environment. (letters of the alphabet, lines in a room, lines in an everyday street scene)
2. Recognise the point where lines meet. Where does the wall meet the floor? The shop sign is parallel to the street. (T/F?)
3. Click on angles that are smaller or larger than a given angle.
4. Recognise whole turns, half turns and quarter turns.
5. Recognise that the corners of doors, books, tables, etc are right angles or square angles.

Angle & Spatial Reasoning – 5

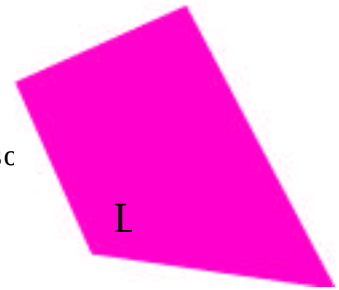
1. Recognise whole turns, half turns and quarter turns.
2. Recognise square angles or right angles in the everyday environment.
3. Sort 2D shapes according to whether they have all, some, or no right angles. E.g.



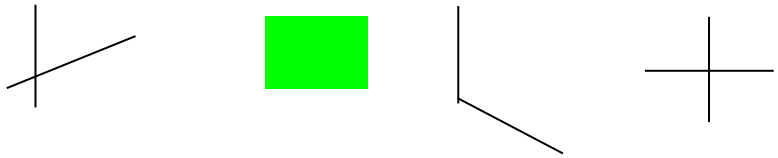
4. Use a template to measure right angles. Decide which angles are right angles, which angles are smaller/larger than right angles.



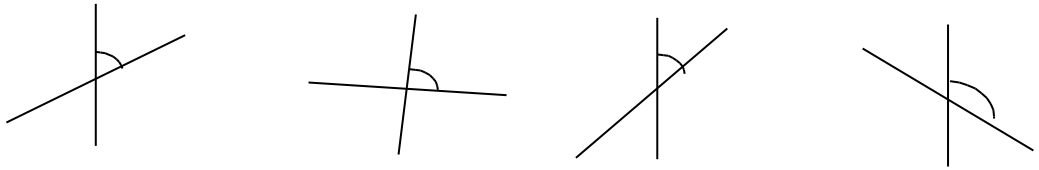
5. In a shape, mark:
   - The smallest angle with the letter S
   - The largest angle with the letter L



1. Know that angles are measured in degrees and that
   One whole turn is 360^0
   A quarter turn is 90^0 or a right angle
   Half a right angle is 45^0.
2. Use a template to measure right angles. Decide which angles are right angles, which angles are smaller/larger than right angles.

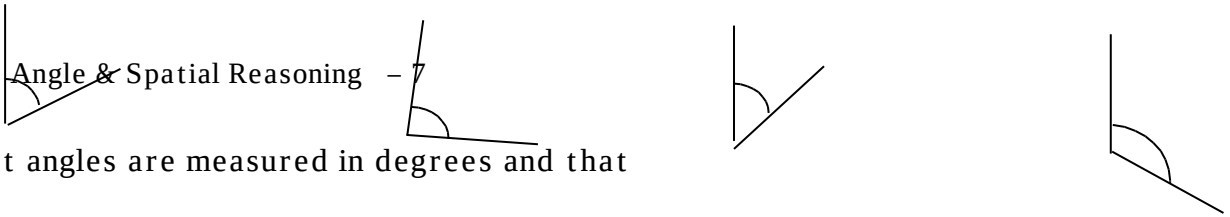


3. Recognise which of two angles is greater. Link descriptors of acute, obtuse and about 90^0 to pictures of angles. E.g. Put the correct describing word on each angle.



About 90^0 Obtuse Acute

4. Place in order of size a set of angles, each less than 180^0.



5. Know that angles are measured in degrees and that

One whole turn is 360^0

A quarter turn is 90^0 or a right angle

Half a right angle is 45^0.

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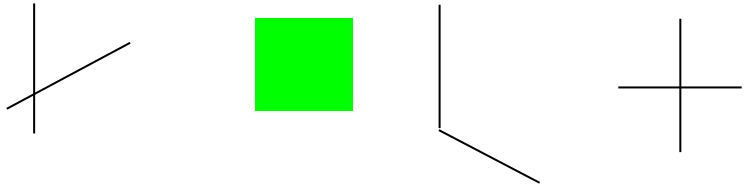
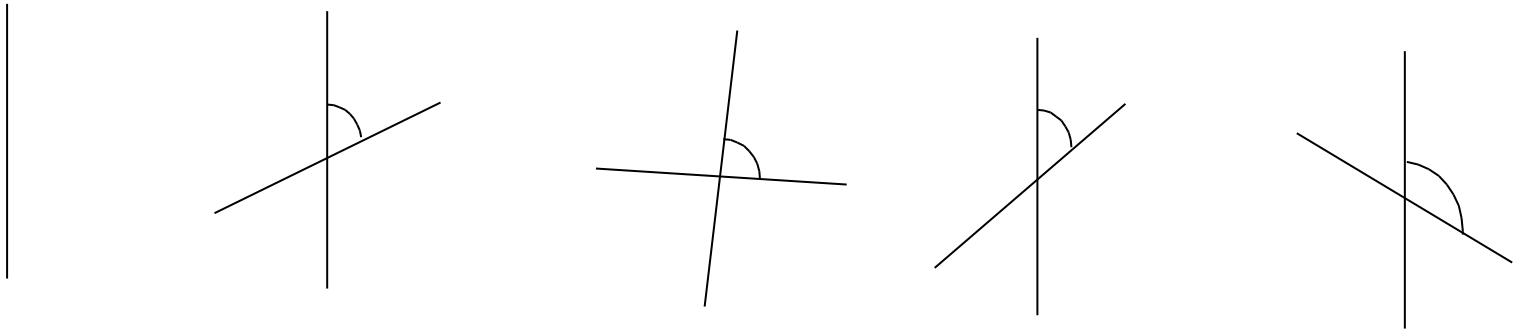


7. Recognise which of two angles is greater. Link descriptors of acute, obtuse, about 90^0 and straight angle to pictures of angles. E.g.
   - Put the correct describing word on each angle.



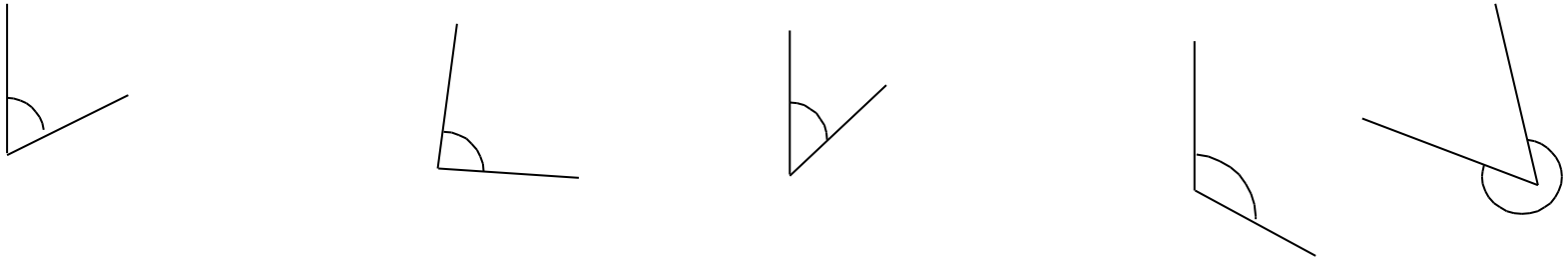
About 90^0 Obtuse

Acute Straight Angle

   - Angle ID Parade. Click on the angle that matches the suspect's description.

45^0	A	B	C

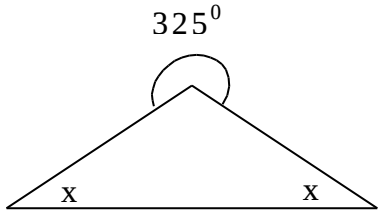
8. Place in order of size a set of angles of any size.



9. Identify angles of turn or direction in everyday contexts. E.g. Turning a corner in traffic, the change in wind direction from N to E, the angle the minute hand turns between ten past and half past the hour.

Angle & Spatial Reasoning – 8

1. Identify acute, obtuse, straight and reflex angles.
2. Calculate angles in a straight line, knowing that angles in a straight line total 180^0.
3. Calculate angles at a point, knowing that angles at a point total 360^0.
4. Know that the angle sum of a triangle is 180^0.
5. Know that two straight lines in a plane (on a flat surface) can either cross once or are parallel.
6. Know that lines that cross, cross at a point called an intersection.
7. Know that parallel lines are always equidistant.
8. Know that perpendicular lines are lines that intersect at right angles.
9. Know the conventions for naming lines, angles, polygons, indicating parallel lines,
10. Given sufficient information, calculate
    - angles in a straight line or at a point
    - the third angle of a triangle
    - the base angles of an isosceles triangle E.g. Calculate the size of angle x.



1. Identify acute, obtuse, straight and reflex angles.
2. Calculate angles in a straight line, knowing that angles in a straight line total 180^0.
3. Calculate angles at a point, knowing that angles at a point total 360^0.
4. Know that the angle sum of a triangle is 180^0 and the angle sum of a quadrilateral is 360^0.
5. Know that two straight lines in a plane (on a flat surface) can either cross once or are parallel.
6. Know that lines that cross, cross at a point called an intersection.
7. Know that parallel lines are always equidistant.
8. Know that perpendicular lines are lines that intersect at right angles.
9. Know the conventions for naming lines, angles, polygons, indicating parallel lines,
10. Given sufficient information, calculate
    - angles in a straight line or at a point
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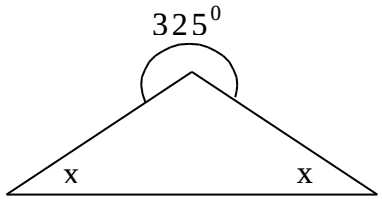
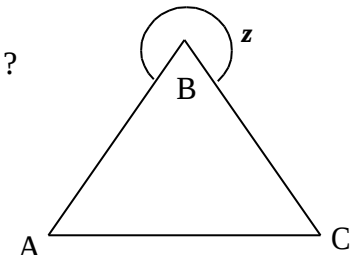
    - the base angles of an isosceles triangle E.g. Calculate the size of angle x.

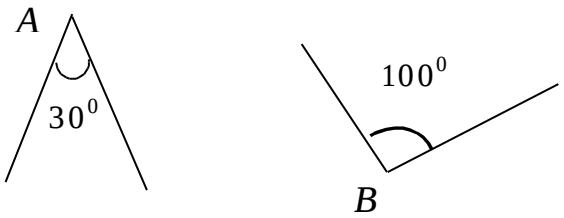


    - the exterior angle of an equilateral triangle

      E.g. ABC is an equilateral triangle. What is the size of angle z?

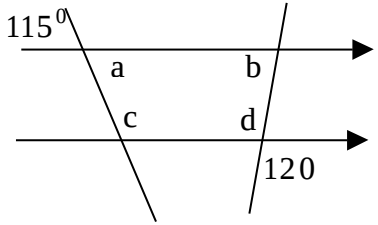


11. Understand that supplementary angles total 180^0 and complementary angles total 90^0. E.g. Angle A and Angle B are supplementary angles. True/False ?

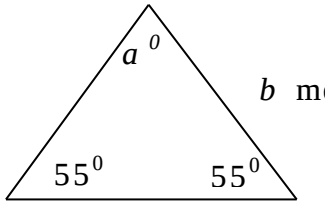


12. Understand conditions for congruency of triangles: 3 equality statements - one of SAS, ASA, SSS, RHS.
    - Answer questions such as
      Which congruence conditions do these two triangles meet?
      Understand that if ΔABC _ _DEF and ΔDEF _ _XYZ (for different reasons), then ΔABC _ _XYZ
13. Understand that when two lines intersect, vertically opposite angles are equal.
14. Understand that when parallel lines are intersected by a transversal, then
    - Corresponding angles are equal
    - Alternate angles are equal and
    - Co-interior angles are supplementary

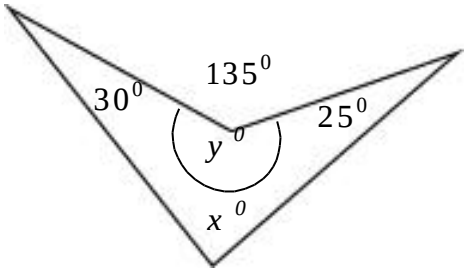
14. Answer questions such as:
    - Find the angle sizes of a, b, c and d



· Find the values of a and b



· What are the values of x and y?



Angle & Spatial Reasoning – 10

1. Identify Acute
   Obtuse
   Right
   Reflex and
   Straight angles.
2. Identify complementary, supplementary and adjacent angles.
3. Know that the sum of the angles at a point is 360^0.
4. Know that the sum of the angles in a straight line is 180^0.
5. Know that where two lines intersect, vertically opposite angles are equal.
6. Know the parallel line theorems:
   a) corresponding angles are equal

b) alternate angles are equal

c) co-interior angles are supplementary

7. Know the triangle theorems:

a) the sum of the angles is 180^0.

b) The exterior angle is equal in size to the sum of the two interior opposite angles

c) The angles opposite equal sides of an isosceles triangle are equal

d) Equilateral triangles have all sides and all angles equal, and all angles are equal to 60^0.

8. Know the quadrilateral theorems:

a) The sum of the angles is 360^0.

b) A parallelogram has opposite sides and opposite angles equal.

c) The diagonals of a rhombus bisect each other at right angles.

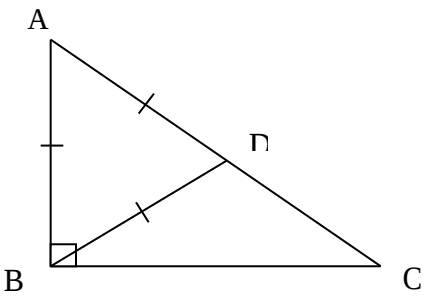
d) The four interior angles of a rectangle are right angles.

e) A square has all sides equal, all interior angles equal to 90^0, diagonals bisecting each other at right angles.

9. Answer questions such as:

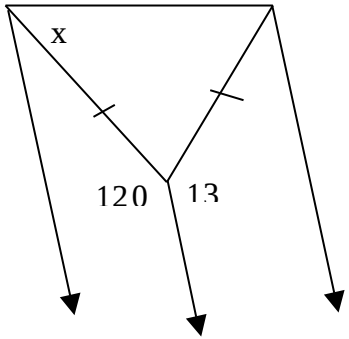
· What is the size of angle DCB?

· D is the midpoint of the line AC. True or false?

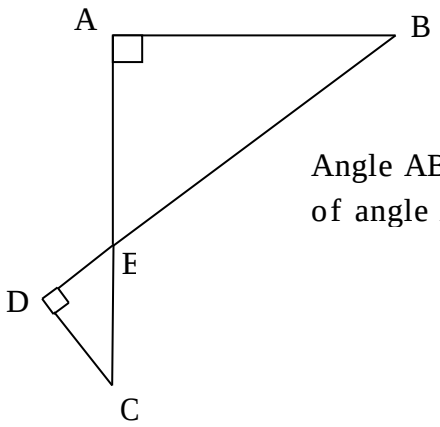


· Name the angle that is equal in size to angle ABE.

to angle AEB.



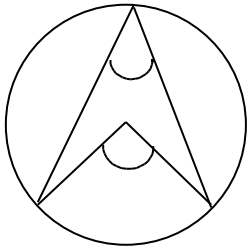
What is the size of angle *x*?

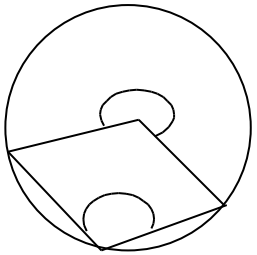


Angle ABC is 55^0. What is the value of angle ACD?

Angle & Spatial Reasoning – 11

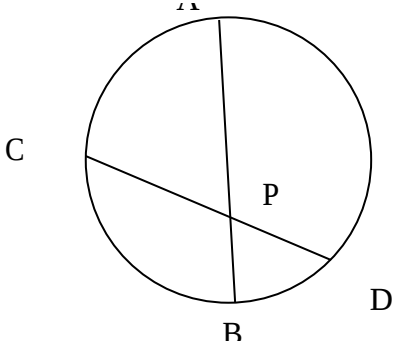
1. As in 9 – Angles at a point
   Angles in a straight line
   Parallel line theorems
   Angles of a triangle
   Angles of a quadrilateral
2. Know and identify the different parts of a circle: centre, radius, diameter, circumference, chord, arc, segment, sector, tangent, semicircle, quadrant
3. Know the theorems relating to angles in a circle:
   a) The angle at the centre of the circle (whether acute, obtuse or reflex) is twice the angle at the circumference suspended by the same arc.



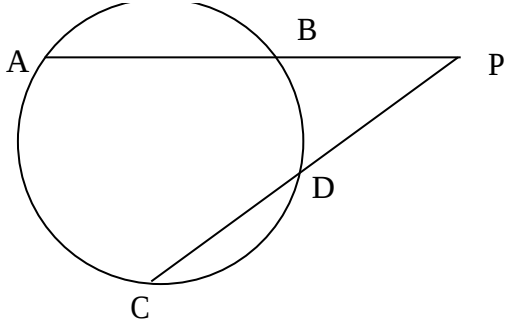


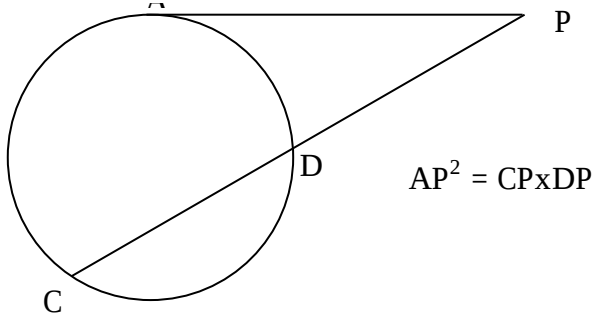
b) The angle in a semicircle is 90^0.
c) Angles at the circumference of a circle suspended by the same arc are equal.
d) The opposite angles of a cyclic quadrilateral total 180^0.
e) If the opposite angles of a quadrilateral are supplementary, then the four vertices of the quadrilateral are concyclic.

4. Know the theorems relating to chords in a circle:
   a) The line from the centre of a circle to the midpoint of a chord is perpendicular to the chord.
   b) The perpendicular line from the centre of the circle to the chord bisects the chord.
   c) The bisector of the chord passes through the centre of the circle.
   d) Chords that are equal in length are the same perpendicular distance from the centre and subtend equal angles.
   e) The products of intercepts of intersecting chords are equal (whether the point of intersection is internal or external)

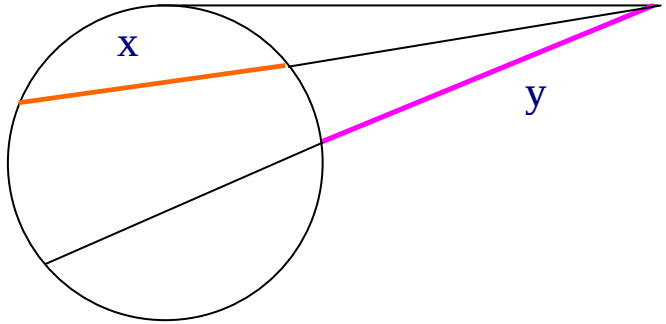


APxBP =
CPxDP





$AP^2 = CPxDP$



5. Know the theorems relating to tangents of a circle:
    a) The tangent to a circle is perpendicular to the radius at the point of contact.
    b) Two tangents to the same circle drawn from the same external point are equal in length.
    c) The line from this external point to the centre of the circle is the axis of symmetry.
    d) When two circles intersect, the line joining the two centres bisects the common chord at right angles.

POSITION & CO-ORDINATE GEOMETRY

Position – 1

1. Can use the vocabulary of position – over, under, up, down, on, beside, in, above, below, near, far E.g.
    - Given a tropical ocean scenario – click on the creature under the rock, beside the starfish, below the seaweed, in the shell, above the shark, nearest to the Dory fish, etc
2. Can describe the position of an object in relation to another object or objects.
3. Can understand simple moving and turning directions. E.g. Move the dog forward 3. Move the bone 2 places to the right.
4. Can describe the order of places passed on a journey.
5. Can follow short paths connecting two drawn objects e.g. Which path will take the dog to his kennel/bone?

Position – 2

1. Can use the vocabulary of position to describe the position of an object in a picture relative to another object. E.g.
    - Where's Wendy? Put the same character into different pictures. Click on the right answer: Wendy is beside the pond. Wendy is below the tree. Wendy is to the right of the swing.
2. Can describe the order of places passed on a journey.
3. Can interpret simple movement instructions. E.g.
    - Where am I? Move forward 3 squares. Turn right. Move forward 2 squares. Where are you? Click on the correct shape.
    - Begin at the triangle. Move forward 4. What colour is the square IN FRONT OF YOU? BEHIND you?
    - Begin at the circle. Which path will take you to the closest red square? Forward 6/ Forward 4, Turn Right, Forward 1.
4. Can identify paths connecting two drawn objects.

Position – 3

1. Can use the vocabulary of position to describe the position of an object in a picture relative to another object. E.g.
    - Where's Wendy? Put the same character into different pictures. Click on the right answer: Wendy is beside the pond. Wendy is below the tree. Wendy is to the right of the swing.
2. Can describe the order of places passed on a journey.
3. Can interpret simple movement instructions, including left and right. E.g. True or false The clock is on the left of this picture.
    - Where am I? Move forward 3 squares. Turn right. Move forward 2 squares. Where are you? Click on the correct shape.
    - Begin at the triangle. Move forward 4. What colour is the square IN FRONT OF YOU? BEHIND you?
    - Begin at the circle. Which path will take you to the closest red square? Forward 6/ Forward 4, Turn Right, Forward 1.
    - Treasure map with different routes and locations.
    - A plan view "live gameboard" – E.g. a farmyard with different animals in stalls, etc
4. Can identify paths connecting two drawn objects.

Position – 4

1. Can interpret simple movement instructions, including left and right. E.g. True or false The clock is on the left of this picture.
    - Where am I? Move forward 3 squares. Turn right. Move forward 2 squares. Where are you? Click on the correct shape.
    - Begin at the triangle. Move forward 4. What colour is the square IN FRONT OF YOU? BEHIND you?

- Begin at the circle. Which path will take you to the closest red square? Forward 6/ Forward 4, Turn Right, Forward 1.
- Treasure map with different routes and locations.
- A plan view "live gameboard" – E.g. a farmyard with different animals in stalls, etc

2. Can identify paths connecting two drawn objects.
3. Can identify the position of an object on an informal grid E.g. ice cube in an iceblock tray, book on a bookshelf
4. Can identify the position of a square on a grid of squares with rows and columns labelled. E.g. What shape is at (A,3)? Click on the square (B,2).
5. Can place a Nought or a Cross in a specified square in a game of Tic-Tac-Toe.
6. Can find features or locations on simple maps or plans drawn on squared paper (Letter, Number format)
7. Can identify the four basic compass directions N, S, E, W. On a map, identify a position e.g. 2 squares east or 2 squares south of a given position

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Position – 5

1. Describe and find the position of a point on a grid of squares with the lines numbered. E.g. Click on the animals at (1,4) and (4,1) on grid.
2. Understand the language of horizontal and vertical. E.g. Click on the horizontal/vertical edge.
3. Begin to relate compass positions and direction of movement to grid locations. (N,S,E,W only) E.g. Move the tiger from (1,4) to (1,2). What direction did it move?
4. Identify the new position on a grid after a specified movement. Start at (1, 2). Move horizontally for 3 units. What is the new position?
5. Find locations on simple maps or plans with a grid overlay. (Treasure map, street map, theatre seating plan, etc)

Position – 6

1. Describe and find the position of a point on a grid of squares with the lines numbered. E.g. Click on the animals at (1,4) and (4,1) on grid.
2. Understand the language of horizontal and vertical. E.g. Click on the horizontal/vertical edge. Move the bear horizontally and put it in a blue square. Move the apple vertically and put it in a purple square.
3. Begin to relate compass positions and direction of movement to grid locations. (N,S,E,W only) E.g. Move the tiger from (1,4) to (1,2). What direction did it move? (N,S,E,W – multiple choice)
4. Identify the new position on a grid after a specified movement. Start at (1, 2). Move horizontally for 3 units. What is the new position?
5. Solve-a-word – Find and put together letters from specific locations on a letter-grid in order to make a word.

A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J

6. Beetle Beat. All movement on a grid must be along a line, either horizontal or vertical (across or up). Move the beetle and count the total number of units moved in the journey:from (0,0) to (0,5); to (4,1); to (3,2); to (2,3); to (1,4), to (5,0).

7. Find locations on simple maps or plans with a grid overlay. (Treasure map, street map, theatre seating plan, etc)

Position & Co-ordinate Geometry - 7

1. Use vocabulary: co-ordinates, grid, quadrant, parallel, perpendicular, horizontal, vertical, diagonal.
2. Describe and find the position of a point on a grid of squares with the lines numbered. E.g. Click on the animals at (1,4) and (4,1) on grid.
3. Understand the language of horizontal, vertical and diagonal. E.g.
   - Click on the horizontal/vertical edge.
   - Move the bear horizontally and put it in a blue square.
   - Move the apple vertically and put it in a purple square.
   - Click on the parallel/perpendicular lines.
   - The blue line is perpendicular to the black line. True or false?
   - The purple line is one diagonal of the square. True or false?

4. Begin to relate compass positions and direction of movement to grid locations. (N,S,E,W and intermediate points NE, NW, SE, SW) E.g. Using a map – click on
5. Identify the new position on a grid after a specified movement.
   - Start at the point (1, 2). Move horizontally/vertically for 3 units. What is the new position?

- Start at the point (0, 1). Move diagonally across 3 squares. What is the new position?

6. Beetle Beat. All the beetle's movement on the grid must be along a line, either horizontal or vertical (across or up). Move the beetle and count the total number of units moved in the journey:from (0,0) to (0,5); to (4,1); to (3,2); to (2,3); to (1,4), to (5,0).
7. Beetle Beat (2) Same rules. Two beetles (Alfie Beetle and Bart Beetle) start from two different points (x,y) and (x_1,y_1) at the same time. They are both headed for a third point (x_2,y_2). Both beetles move at the same speed. Which beetle will arrive at the destination first?


8. Solve-a-word – Find and put together letters from specific locations on a letter-grid in order to make a word.

A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J

9. Find locations on simple topography maps or plans with a grid overlay. (Treasure map, street map, topography map, theatre seating plan, etc).
10. Find locations on simple topography maps or street maps using compass directions. E.g. What land feature is 30 km south-west of Mount Pleasant? What direction is the Post Office from the airport?
11. Answer questions such as:
    - These points are the vertices of a shape. What is the shape?
    - Three of the vertices of a square are: (2,1), (2,4) and (5,4). Put the circles on each of these coordinates. What will be the co-ordinates of the fourth vertex?
    - Three of the vertices of a rectangle are (x,y) (x,y) and (x,y)). Put the circles on each of these coordinates. What will be the coordinates of the fourth vertex?

Position & Co-ordinate Geometry - 8

1. Use vocabulary: co-ordinates, grid, quadrant, parallel, perpendicular, horizontal, vertical, diagonal.
2. Describe and find the position of a point on a grid of squares with the lines numbered. E.g. Click on the animals at (1,4) and (4,1) on grid. (first quadrant only)
3. Begin to relate compass positions and direction of movement to grid locations. (N,S,E,W and intermediate points NE, NW, SE, SW) E.g. Using a map – click on
4. Identify the new position on a grid after a specified movement.
    - Start at the point (1, 2). Move horizontally/vertically for 3 units. What is the new position?
    - Start at the point (0, 1). Move diagonally across 3 squares. What is the new position?
5. Beetle Beat. All the beetle's movement on the grid must be along a line, either horizontal or vertical (across or up). Move the beetle and count the total number of units moved in the journey:from (0,0) to (0,5); to (4,1); to (3,2); to (2,3); to (1,4), to (5,0).

6. Beetle Beat (2) Same rules. Two beetles (Alfie Beetle and Bart Beetle) start from two different points (x,y) and (x_1,y_1) at the same time. They are both headed for a third point (x_2,y_2). Both beetles move at the same speed. Which beetle will arrive at the destination first?

7. Solve-a-word – Find and put together letters from specific locations on a letter-grid in order to make a word.

A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J

8. Find locations on simple topography maps or plans with a grid overlay. (Treasure map, street map, topography map, theatre seating plan, etc).
9. Find locations on simple topography maps or street maps using compass directions. E.g. What land feature is 30 km south-west of Mount Pleasant? What direction is the Post Office from the airport?

10. Answer questions such as:

- These points are the vertices of a shape. What is the shape?
    - Three of the vertices of a square are: (2,1), (2,4) and (5,4). Put the circles on each of these coordinates. What will be the co-ordinates of the fourth vertex?
    - Three of the vertices of a rectangle are (x,y) (x,y) and (x,y)). Put the circles on each of these coordinates. What will be the coordinates of the fourth vertex?

1. Find locations on simple topography maps or plans with a grid overlay. (Treasure map, street map, topography map, theatre seating plan, etc).
2. Find locations on simple topography maps or street maps using compass directions. E.g. What land feature is 30 km south-west of Mount Pleasant? What direction is the Post Office from the airport?
3. Use scale to estimate the distance between 2 points on a map.
4. Use vocabulary of grid, x-axis, y-axis, coordinates, quadrants, plane, intersecting, intersection.
5. Read and plot points in first and second quadrants. E.g. Put the blue cross on the point (-2, 4) and the black cross on the point (4, 2)
6. Respond to questions such as:
    - The points (-1,1), (2,5) and (6,2) are three of the four vertices of a square. What are the coordinates of the fourth vertex?
    - Plot 3 points (1,3), (-2,2), (-1,4). What fourth point will make a parallelogram?
    - Alf Beetle begins a journey at point A whose coordinates are (-1,3). He moves 3 units back and 4 units down to point B. What are the coordinates of point B?
7. Begin to understand that a line segment joining 2 given points on the number plane passes through an infinite number of other points. E.g.

- Plot the points (1,1) and (–2, -2): Will a line passing through these two points also pass through the point (0,0)? (-1,2)? (4,4)?

8. Understand locus as a set of points that satisfy a given set of conditions or constraints. E.g.
   - Imagine a robot moving so that it is always the same distance from a fixed point. What shape is the path the robot makes? (a circle)
   - Imagine two trees. Imagine walking so that you are always the same distance from each tree. Describe the shape of the path you would walk. (perp. bisector of the line segment joining the two trees)
   - Place a red counter on the table. Place white counters so that their centres are all the same distance from the red counter. What shape do the white counters make? (circle)

Position & Co-ordinate Geometry – 10

1. Read and plot points in all quadrants. E.g. Put the blue cross on the point (-2, 4) and the black cross on the point (4, 2)
2. Respond to questions such as:
   - The points (-1,1), (2,5) and (6,2) are three of the four vertices of a square. What are the coordinates of the fourth vertex?
   - Plot 3 points (1,3), (-2,2), (-1,4). What fourth point will make a parallelogram?
   - A triangle has vertices A, B and C all lying in the first quadrant. This shape is reflected in the y-axis. The vertices of new shape are A', B' and C' (the reflections of A, B and C in the y-axis). What are the coordinates of point B'? What would the new coordinates be if point B were reflected in the x-axis?
   - Plot the vertices of a triangle with the coordinates (-3,0), (3,4) and (5,0). What is its area?
   - Plot the vertices of a triangle with the coordinates A(5,1), B(5,5) and C(2,1). What kind of triangle is ABC? What is the length of BC?
   - Plot the points (1,1) and (–2, -2): Will a line passing through these two points also pass through the point (0,0)? (-1,2)?

- These are the co-ordinates of some of the points on the line AB. Fill in the missing coordinate values:

x	-8	-4	-2	0	2	6	8		16
Y	-4			0	1			5	

3. Understand locus as a set of points that satisfy a given set of conditions or constraints. E.g.
   - A spider is dangling motionless on a single thread. I move a finger so that its tip is always 10cm from the centre of the spider's body. What is the locus of my fingertip? (the surface of a sphere).
4. Find locations on simple topography maps or plans with a grid overlay. (Treasure map, street map, topography map, theatre seating plan, etc).
5. Find locations on simple topography maps or street maps using compass directions. E.g. What land feature is 30 km south-west of Mount Pleasant? What direction is the Post Office from the airport?
6. Identify turns using compass directions. E.g. Nick was facing due west. He turned 45^0 in a clockwise direction. What direction is he facing now?
7. Use scale to estimate the distance between 2 points on a map.

Position & Co-ordinate Geometry - 11

1. Read and plot points in all quadrants. E.g. Put the blue cross on the point (-2, 4) and the black cross on the point (4, 2)
2. Respond to questions such as:
   - The points (-1,1), (2,5) and (6,2) are three of the four vertices of a square. What are the coordinates of the fourth vertex?
   - Plot 3 points (1,3), (-2,2), (-1,4). What fourth point will make a parallelogram?
   - A triangle has vertices A, B and C all lying in the first quadrant. This shape is reflected in the y-axis. The vertices of new shape are A', B' and C' (the reflections of A, B and C in the y-axis). What are the coordinates of point B'? What would the new coordinates be if point B were reflected in the x-axis?
   - Plot the vertices of a triangle with the coordinates (-3,0), (3,4) and (5,0). What is its area?
   - Plot the vertices of a triangle with the coordinates A(5,1), B(5,5) and C(2,1). What kind of triangle is ABC? What is the length of BC?
   - Plot the points (1,1) and (–2, -2): Will a line passing through these two points also pass through the point (0,0)? (-1,2)?
   - These are the coordinates of some of the points on the line AB. Fill in the missing coordinate values:

x	-8	-4	-2	0	2	6	8		16
Y	-4			0	1			5	

· These are some points on a line PQ:

x	0	1	2
Y	3	2	1

These are some of the points on a line AB:

x	0	1	2
Y	0	2	4

· What are the coordinates of the point where AB and PQ intersect?
· Is the point (-1, 4) on the line AB or PQ?
· Will the line AB pass through the point (50, 100)?
· These points are all on the line SM:

x	0	1	2
Y	3	3	3

· Point P on this line has (12) as its x-coordinate. What will its y-coordinate be?

3. Understand locus as a set of points that satisfy a given set of conditions or constraints. E.g.
    - A spider is dangling motionless on a single thread. I move a finger so that its tip is always 10cm from the centre of the spider's body. What is the locus of my fingertip? (the surface of a sphere).
4. Find locations on simple topography maps or plans with a grid overlay. (Treasure map, street map, topography map, theatre seating plan, etc).
5. Find locations on simple topography maps or street maps using compass directions. E.g. What land feature is 30 km south-west of Mount Pleasant? What direction is the Post Office from the airport?
6. Identify turns using compass directions. E.g. Nick was facing due west. He turned 45^0 in a clockwise direction. He walked for 50 metres. He turned 135^0 in a clockwise direction. Then he walked for 30 metres. What direction is he facing now? What direction is he from his original position? How far is he from his original position?
7. Use scale to estimate the distance between 2 points on a map.

TRANSFORMATION/SYMMETRY

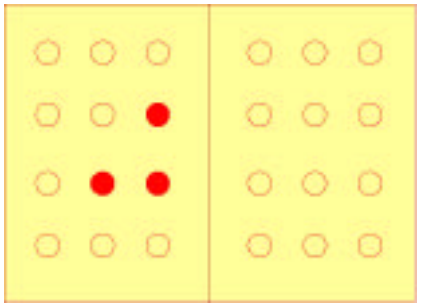
Transformation & Symmetry – 2

1. Shows awareness of symmetry – recognises symmetry in the environment. E.g. Answer questions such as
    - Can "Find the Other Half" E.g. of the butterfly, of the Christmas tree, of the flag.
2. Can use shape and orientation to fit several of the same shapes onto a template showing internal lines.
3. Can complete simple shape jigsaws. Which piece fits?
4. Can put shapes in order of size.
5. Can put identical shapes of different dimensions into "families".
6. Can continue repeating patterns E.g. 1 cone, 2 pyramids, 1 cone. E.g.
    - Put in the next shape.
    - Click on the missing piece.
7. Identify things that turn (clock hands, wheels, a key in a lock, screws and screwdrivers, nuts and bolts)
8. Identify objects that will slide (boxes, books, blocks, pyramid), roll (marble, wheel, mandarin, ball), both slide and roll (can of baked beans, coin, drum, cone, cotton reel)

Transformation & Symmetry – 3

1. Shows awareness of symmetry – recognises symmetry in the environment. E.g.
    - Can "Find the Other Half" E.g. of the butterfly, of the Christmas tree, of the flag.
2. Can relate the appearance of an object to the same object once it has been turned.
3. Can use shape and orientation to fit several of the same shapes onto a template showing internal lines.
4. Can complete simple shape jigsaws. Which piece fits?
5. Can put shapes in order of size.
6. Can put identical shapes of different dimensions into "families".

7. Can continue repeating patterns E.g. 1 cone, 2 pyramids, 1 cone. E.g.
    - Put in the next shape.
    - Click on the missing piece.
8. Identify objects that will slide (boxes, books, blocks), roll (marble, wheel, mandarin, ball), both slide and roll (can of baked beans, coin, drum, cone)
9. "Mirror, Mirror - Make the Other Half" – Put the circles into a simulated "pegboard" to complete a simple symmetrical pattern.



Transformation & Symmetry – 4

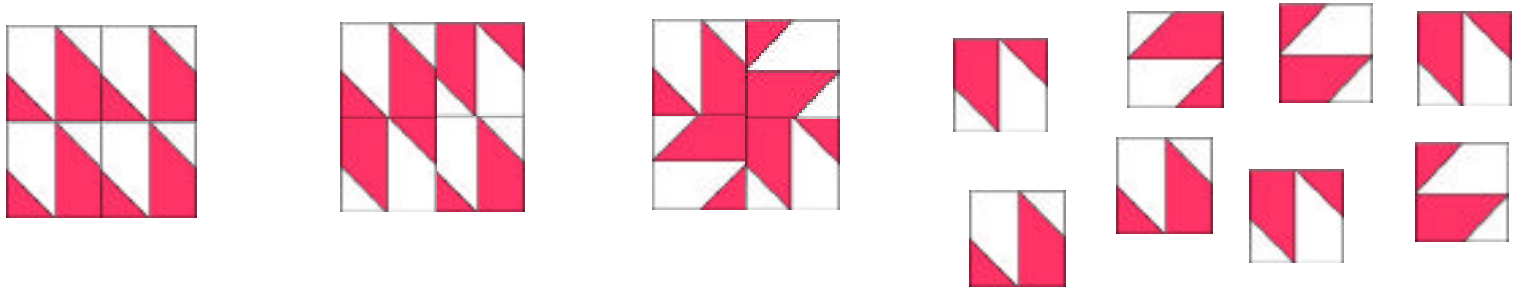
1. Recognise symmetry in the environment E.g.
    - Can "Find the Other Half" E.g. of the butterfly, of the Christmas tree, of the flag.
    - Can differentiate between shapes that have symmetry and shapes that do not.
    - Can click on a line of symmetry.
2. Can relate the appearance of an object to the same object once it has been turned.
3. Can begin to identify full turns and half turns. E.g. Clock – the minute hand has made (half a turn)(a whole turn)
4. Can use shape and orientation to fit several of the same shapes onto a template showing internal lines.

5. Can complete simple shape jigsaws.
6. Can put shapes in order of size.
7. Can put identical shapes of different dimensions into “families”.
8. Can continue repeating patterns E.g. 1 cone, 2 pyramids, 1 cone. E.g.
    - Put in the next shape.
    - Click on the missing piece.
9. Can put shapes together to copy a simple model.
10. Flip! Slide! Turn! Have three different operating tools – (Flip, Slide and Turn). Shape (Operating Tool) – Click on new shape.
11. “Mirror, Mirror - Make the Other Half” – Put the circles into a simulated “pegboard” to complete a more complex symmetrical pattern.

Transformation & Symmetry – 5

1. Recognise symmetry in the environment E.g.
    - Can “Find the Other Half” E.g. of the butterfly, of the Christmas tree, of the flag.
    - Can differentiate between shapes that have symmetry and shapes that do not. E.g. Which letters of the alphabet are symmetrical and which are not?
    - Can click on a line of symmetry.
2. Can begin to identify full turns, half turns and quarter turns. E.g. Clock – the minute hand has made (half a turn)(a whole turn)(a quarter turn)
3. Can recognise whether a shape or pattern has been turned. E.g. Two pictures – some unchanged, some with quarter turns or half turns.
4. Can put shapes in order of size.

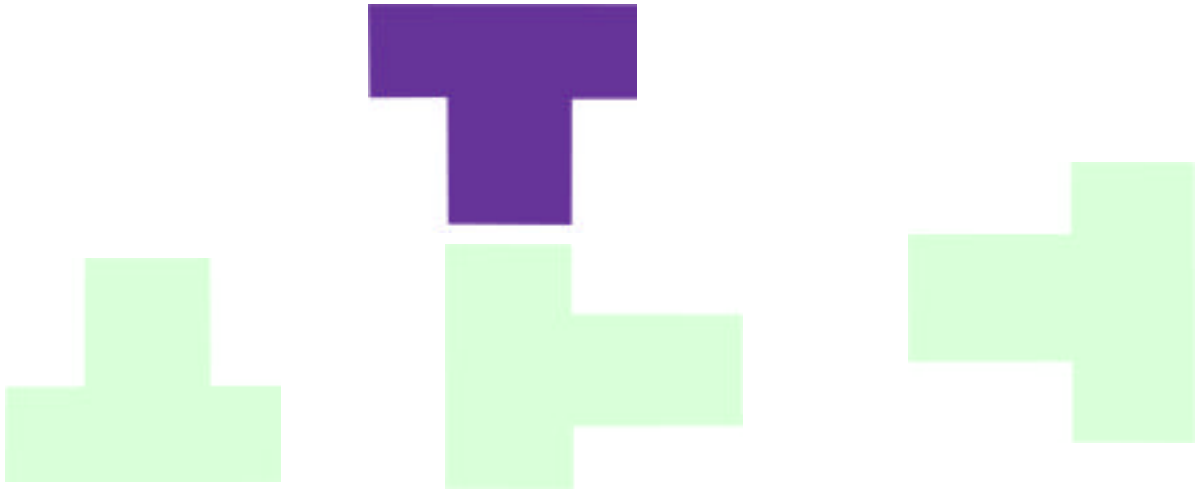
5. Can put identical shapes of different dimensions into “families”.
6. Can continue repeating patterns E.g. 1 cone, 2 pyramids, 1 cone. E.g.
    - Put in the next shape.
    - Click on the missing piece.
7. Flip! Slide! Turn! Have three different operating tools – (Flip! Slide! Turn!)). Pattern (Operating Tool) – Click on new shape.



8. “Mirror, Mirror!” - Make the Other Half – Put the circles into a simulated “pegboard” to complete a more complex symmetrical pattern.
9. Can put shapes and patterns together to match a simple given model.

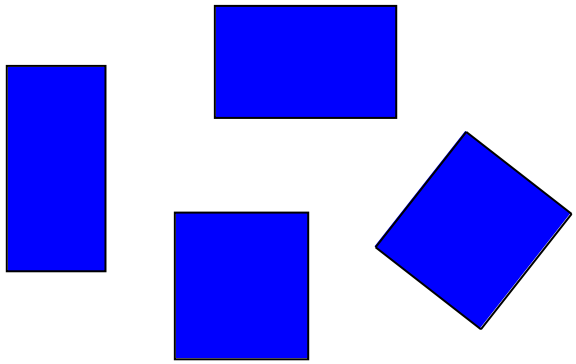
Transformation & Symmetry – 6

1. Identify the reflection of a simple shape in a mirror line parallel to one side (all sides parallel or perpendicular to the mirror line). E.g.
   - Move one of the blue shapes to make a reflection of the purple shape.



   - Name this shape.

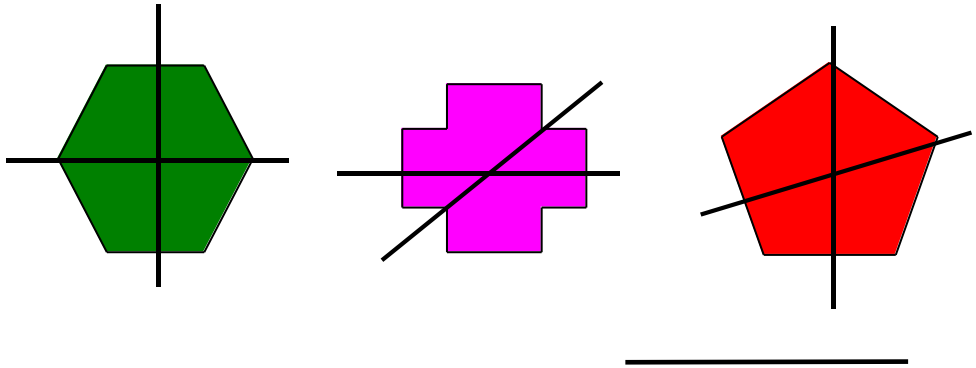
   - If this shape is turned, it would look like this: (Put a shape in the box)



· Tile Pairs. These tile pairs are made using the same basic tile.

Click on a design made using two tiles and turning one of them around (a rotation pattern).
Click on a design made using a mirror to reflect the tile (a reflection pattern).

2. Blots Get Together. Put each Blot with its mirror pair.
3. Shapes With Symmetry. Put lines of symmetry on 2-D shapes.
4. Classify 2-D shapes according to their lines of symmetry.

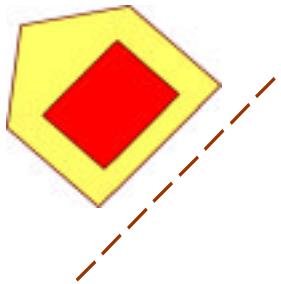


Transformation & Symmetry – 7

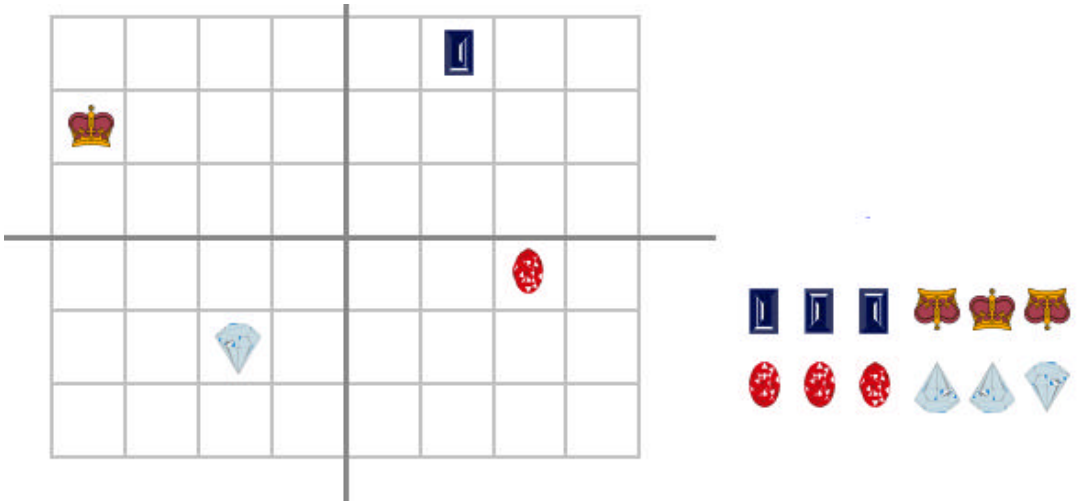
1. Investigate the lines of symmetry in regular polygons. Recognise that the number of lines of symmetry in a regular polygon is equal to the number of sides. E.g. Complete a table such as

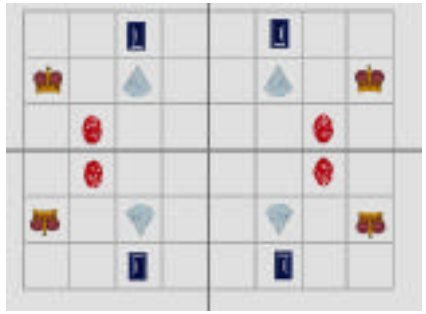
Shape	No. of Sides	No. of lines of symmetry
	3	3
		
		

2. Sketch the reflection of a simple shape in a mirror line parallel to one of its edges, where the edges of the shape are not all parallel or perpendicular to the mirror line. E.g.



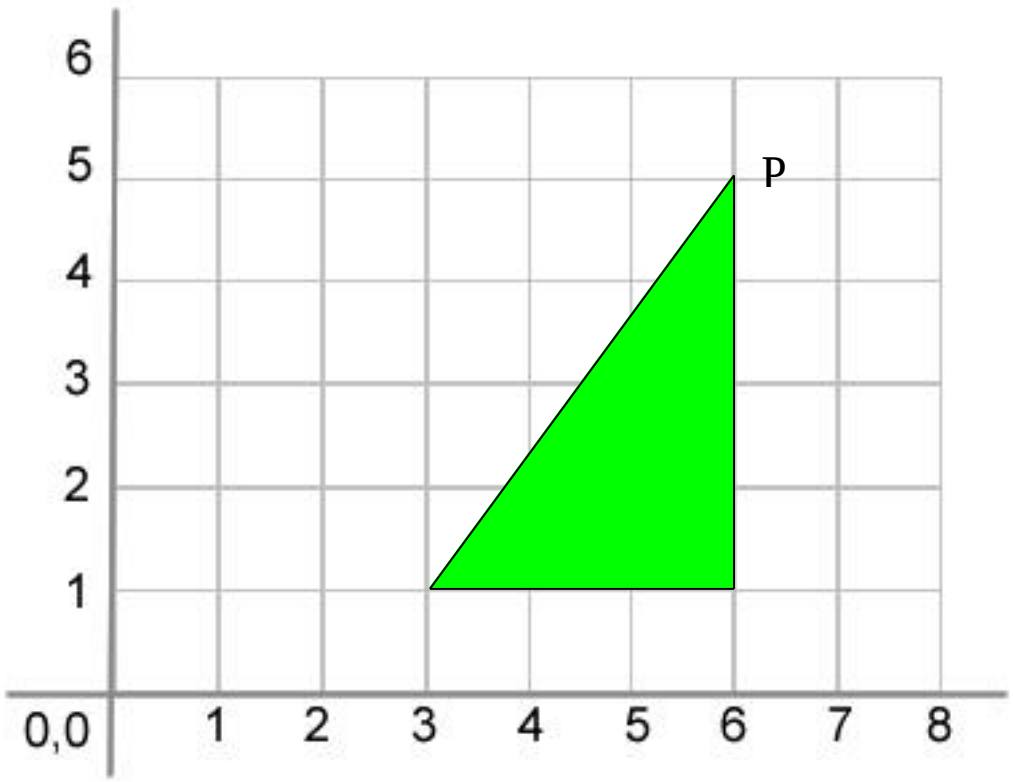
Complete symmetrical patterns on squared paper with two lines of symmetry at right angles. E.g.
Use the extra shapes to complete this pattern.





(Solution)

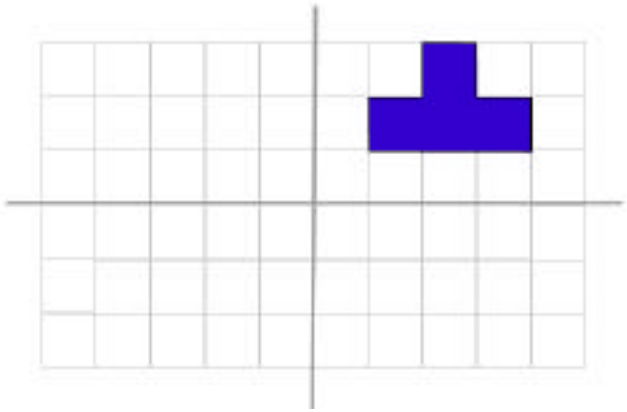
3. On a grid with coordinates, translate shapes by a specified amount and give coordinates of the new position. E.g.
   - What is the name of this shape?
   - Move this shape 2 units to the left. What are the new coordinates of P?


6
5
4
3
2
1
0,0
1
2
3
4
5
6
7
8
P

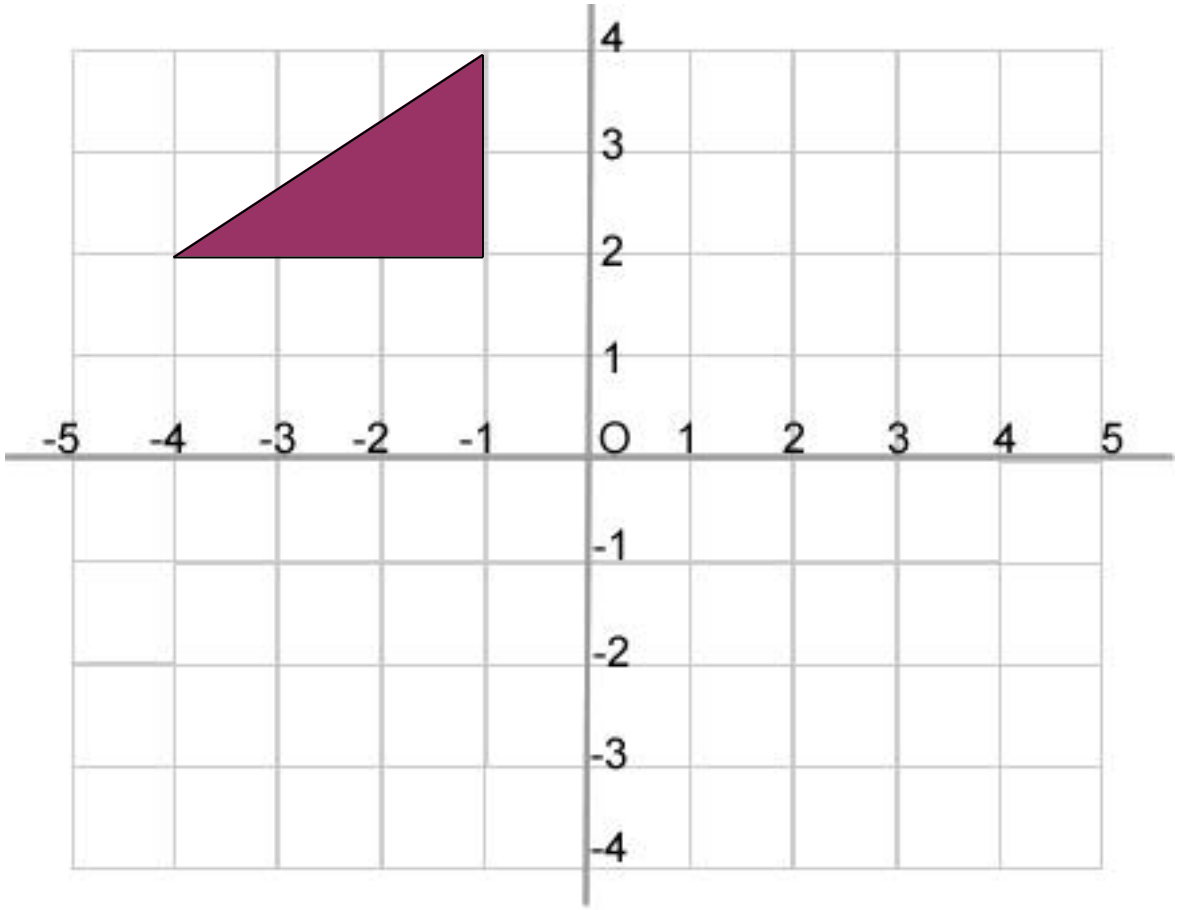
Transformation & Symmetry – 8

1. Sketch the reflection of a simple shape in a mirror line which touches the shape at one point, where the edges of the shape are not necessarily perpendicular or parallel to the mirror line. E.g.

2. Sketch the reflection of a simple shape in two mirror lines at right angles, where the sides of the shape are perpendicular to the mirror lines. E.g.



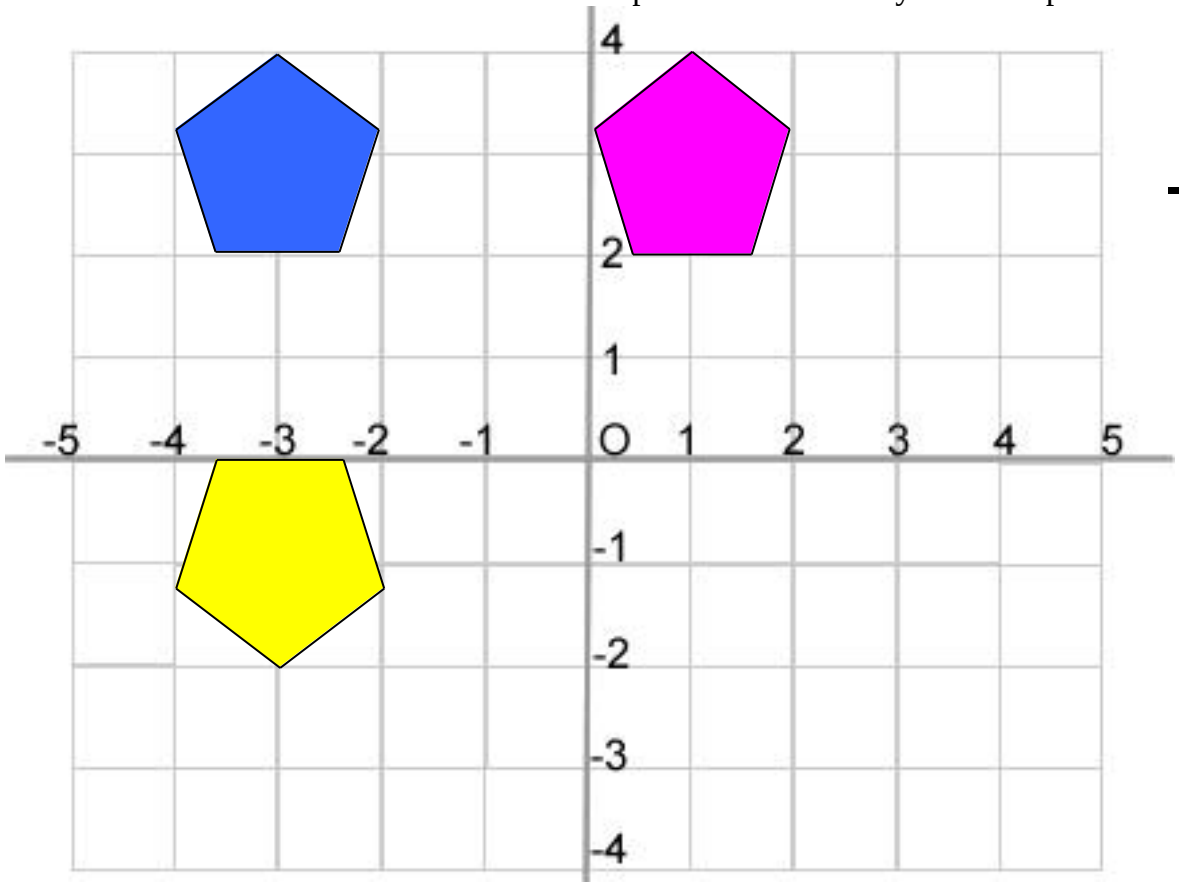
3. Translate a simple shape with reference to both axes E.g. Shift the triangle two units to the right and three units down.



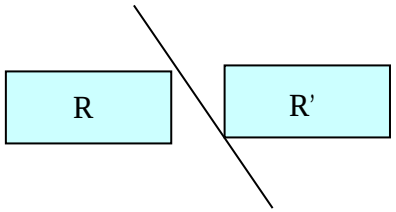
Transformation & Symmetry – 9

1. Recognise and visualise transformations and symmetries of shapes.
2. Understand that reflections in two dimensions map points to images in a mirror line or axis of reflections, so that
   a) the mirror line or axis of reflection is the perpendicular bisector of the line joining point A to its image A'
   b) The image is the same distance behind the mirror line as the object is in front of the line.
   c) Points on the mirror line do not change their position.
   d) Reflection is self-inversive. Point A reflects to Point A'. Point A' reflects to Point A.

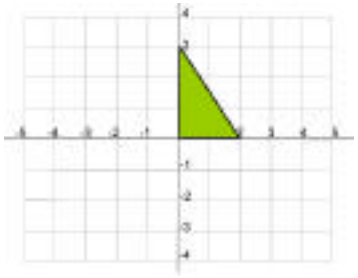
   E.g. Place the black mirror line in the correct place so that the yellow shape reflects the blue shape.

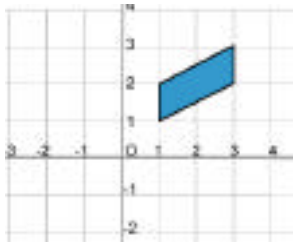


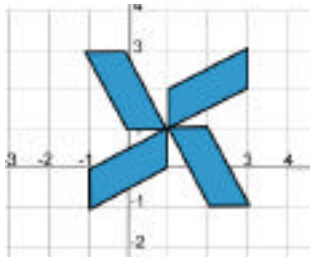
- Place the red mirror line in the correct place so that the blue shape reflects the pink shape.
- When rectangle R is reflected in the line L, it makes the reflection R'. True or false?

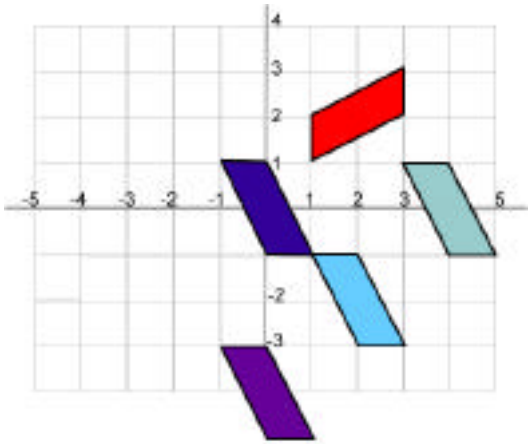


3. Understand that rotation is specified by a centre of rotation about which the shape turns and an (anticlockwise) angle of rotation.
4. Understand that the centre of rotation remains fixed throughout the rotation and can be inside or outside the shape.
5. Understand that the inverse of any rotation is either an equal rotation about the same point in the opposite direction or a rotation in the same direction such that the two rotations total 360^0.
6. Rotate shapes anticlockwise about the centre of rotation (0,0) through right angles and simple fraction of a whole turn.
7. Rotate shapes about points other than (0,0)









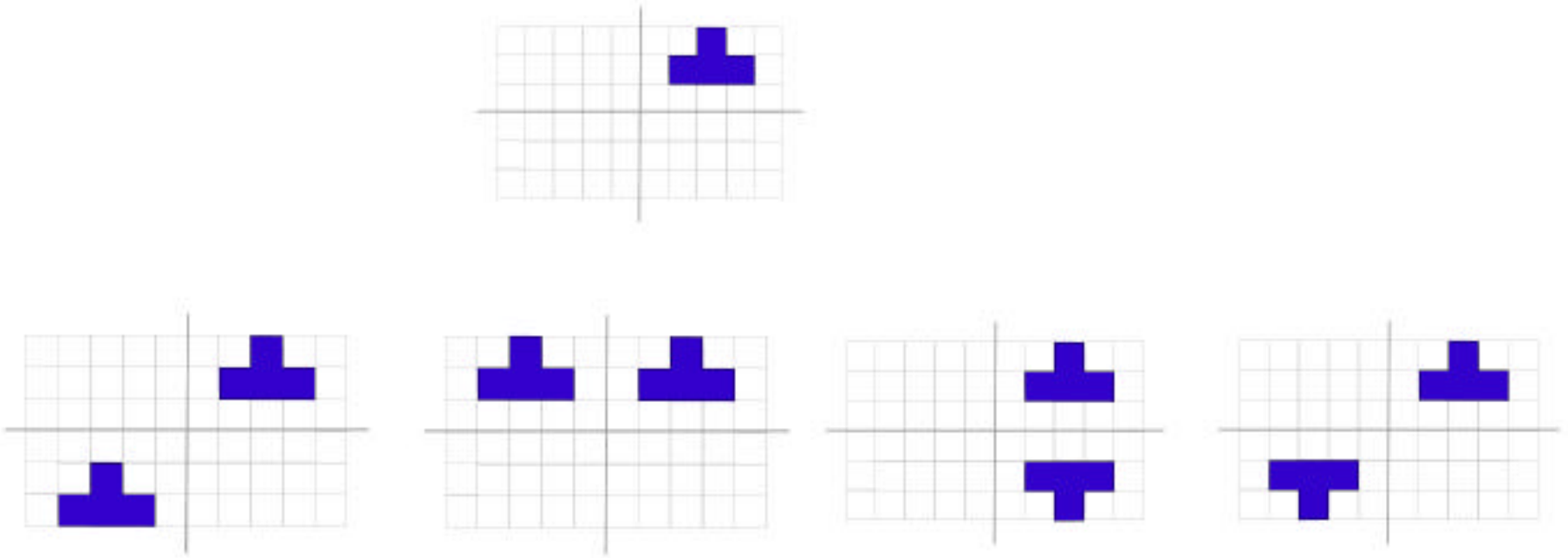
Rotate about (0,0)

Rotate about (1,1)

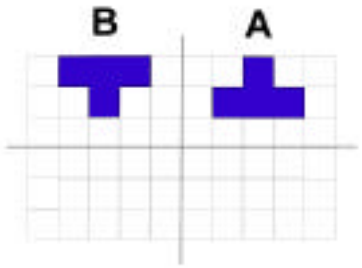
Rotate about different centres of rotation. E.g. Work out the centre of rotation and put the correct coordinates on each shape.

Transformation & Symmetry – 10&11

1. Transform 2D shapes by repeated reflections. Explore the effect of repeated reflections in parallel or perpendicular lines.
   E.g. What would this shape look like after being reflected first in the x-axis and then in the y-axis?

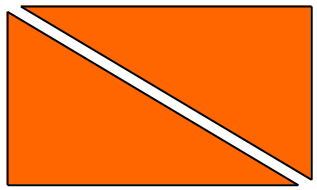


· Which two transformations would change the blue shape from A to B? (Multiple choice)

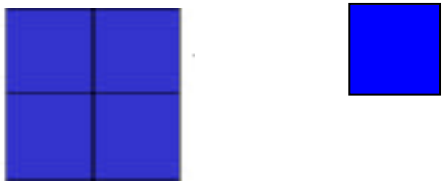


2. Transform 2D shapes by combining translations, rotations and reflections.
3. Know that reflections, rotations and translations preserve length and angle, and thus map objects onto congruent images.
   E.g.
   - Say what shape the combined object and image or images form when:

     a) a right-angled triangle is reflected along its hypotenuse.

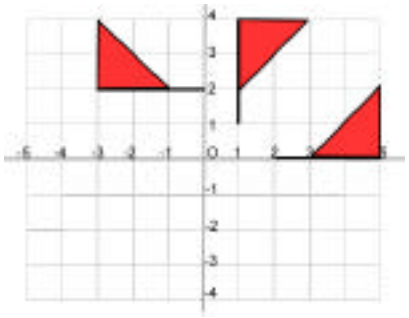


     b) a square is rotated three times through a quarter turn about a corner.

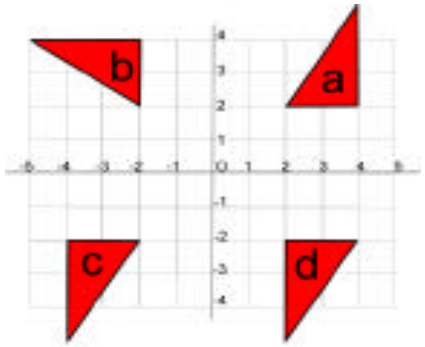


c) A scalene triangle is rotated through 180^0 about the midpoint of one of its sides.

d) What combination of transformations could move the flag from position A to position C?



4. Understand that
   - Reflection in 2 parallel lines is equivalent to a translation.
   - Reflection in 2 perpendicular lines is equivalent to a rotation of 180^0.
   - Two rotations about the same centre are equivalent to a single rotation.
   - Two translations are equivalent to a single translation.
5. Answer questions such as:
   - What single transformation would map a onto c ?



- What single transformation would map c onto d?
- Pick 2 transformations that would map b onto c?
  c onto d?

6. Recognise order of rotation symmetry (the number of ways the shape will map onto itself in a rotation of 360^0. E.g.
   - How many times would this shape map onto itself during a rotation of 360^0?

MASS

Mass – 1

Vocabulary: weigh, weight, heavy, light, about the same as..

1. Compare objects according to mass, using language of heavier, lighter.
2. Order up to three objects according to mass.
3. Can relate standard measuring devices to their purpose. E.g. Scale to How heavy?
4. Predict the action of an equal arm balance when objects of different mass are placed in the pans.
5. Compare an object with a collection of objects according to mass.
6. Compare a collection of objects with another collection of objects according to mass.
7. Can use appropriate language of approximation to describe mass. E.g
    - Click on the things that weigh about the same.
    - What is about the same weight as the car?

Mass – 2

Vocabulary: weigh, weight, heavy, light, about the same as..

1. Compare objects according to mass, using language of heavier, lighter.
2. Order up to three objects according to mass.
3. Can relate standard measuring devices to their purpose. E.g. Scale to How heavy?
4. Predict the action of an equal arm balance when objects of different mass are placed in the pans.
5. Compare an object with a collection of objects according to mass.
6. Compare a collection of objects with another collection of objects according to mass.
7. Can use appropriate language of approximation to describe mass. E.g
    - Click on the things that weigh about the same.

- What is about the same weight as the car?

8. Suggest suitable units to estimate or measure mass. E.g.
    - 4 cubes balance an apple.
      5 cubes balance a pear.
      The apple and the pear are together on the scale.
      How many cubes will balance them?
    - How many cubes balance 2 apples?
    - Will the apple balance the pear?
    - Which is heavier?

Mass – 3

Vocabulary: weigh, weight, heavy, light, about the same as, balances..

1. Begin to use standard units of measurement for mass. E.g.
    - Click on the objects lighter/heavier than 1 kilogram.
    - How many 1-kilogram weights will balance a 5kg bag of potatoes?
    - Click on objects whose mass would be measured in kilograms/grams.
    - Click on the object that weighs the most/the least. (different sizes, not correlated to mass)
2. Read different types of simple scales to the nearest labelled division.

Mass – 4

Vocabulary: weigh, weight, heavy, light, about the same as, balances..

1. Begin to use standard units of measurement for mass. E.g.
    - Click on the objects lighter/heavier than 1 kilogram.
    - How many 1-kilogram weights will balance a 5kg bag of potatoes?
    - Click on objects whose mass would be measured in kilograms/grams.
    - Click on the object that weighs the most/the least. (different sizes, not correlated to mass)
2. Read different types of simple scales to the nearest labelled division, in both kilograms and grams.
3. Know that 1 kilogram = 1 000 grams.
4. Begin to solve problems in a variety of contexts, using standard units such as kilograms, half-kilograms, units of 100g. E.g.
    - Place packets/tins of food in order of weight
    - What is the total weight in kilograms of Vita-Bites and Mini-Snax?
5. Suggest suitable units to estimate mass. E.g. Would a new-born baby weigh closer to 3g, 3kg or 30kg?

Mass – 5

Vocabulary: unit, standard unit, kilogram, gram, roughly, nearly, about, approximately..

1. Know that 1 kilogram = 1 000 grams.
2. Know and use relationships between familiar units.
    - Know the equivalent in grams of one-half, one-quarter and three-quarters of one kilogram.
3. Begin to write weights in equivalent units. E.g. 4kg = 4 000g
4. Read different types of simple scales to the nearest labelled division, in both kilograms and grams.
5. Record weights as either grams, kilograms or in mixed units. E.g. Write 4 125g in kilograms and grams.

6. Round weights to the nearest 100g. E.g. Smudge the rabbit weighs 4 690g. Write Smudge's weight to the nearest 100 grams.
7. Begin to solve problems in a variety of contexts, using standard units such as kilograms, half-kilograms, units of 100g. E.g.
    - Place packets/tins of food in order of weight
    - What is the total weight in kilograms of Vita-Bites and Mini-Snax?
8. Suggest suitable units to estimate mass. E.g. Would a large potato weigh closer to 20g, 200g or 2kg?
    - What unit of mass would be used to measure the weight of a paper clip? An egg? A bag of potatoes? A child? A van?

Vocabulary: unit, standard unit, kilogram, gram, roughly, nearly, about, approximately..

1. Know that 1 kilogram = 1 000 grams.
2. Know and use relationships between familiar units.
    - Know the equivalent in grams of one-half, one-quarter, three-quarters, one-tenth and one-hundredth of one kilogram.
3. Begin to write weights in equivalent units. E.g. 4.5kg = 4 500g
4. Use correctly the abbreviations kg and g.
5. Read different types of simple scales between labelled divisions, in both kilograms and grams. E.g.
    - Kitchen scale showing a weight between 3kg and 4kg (scale divided into 0.1kg increments). 300 grams of flour are taken off the scale. How much flour is left?
6. Record weights as either grams, kilograms or in mixed units. E.g. Write 4 125g in kilograms and grams.
7. Round weights to the nearest whole unit. E.g. Smudge the rabbit weighs 4 690g. Write Smudge's weight to the nearest kilogram.

8. Begin to solve problems in a variety of contexts, using standard units such as kilograms, half-kilograms, units of 100g. E.g.
    - Place packets/tins of food in order of weight
    - What is the total weight in grams and kilograms of Vita-Bites and Mini-Snax?
9. Suggest suitable units to estimate mass. E.g. Would a pear weigh closer to 500g, 250g or 100g?
    - What unit of mass would be used to measure the weight of a paper clip? An egg? A bag of potatoes? A child? A van?

Mass – 7

Vocabulary: unit, standard unit, kilogram, gram, roughly, nearly, about, approximately..

1. Know that 1 kilogram = 1 000 grams.
   1 tonne = 1 000 kilograms
2. Know and use relationships between familiar units.
    - Know the equivalent in grams of one-half, one-quarter, three-quarters, one-tenth, one-hundredth and one-thousandth of one kilogram.
3. Use correctly the abbreviations kg and g.
4. Write weights in equivalent units. E.g.
    - Convert a larger metric unit to a smaller: Write 4.25kg in grams.
    - Begin to convert a smaller unit to a larger: Write 750g in kilograms
5. Record measurements involving halves, quarters and tenths of kilograms in decimal form. E.g. Given the weight of some adults shown on a number line, write their weights as decimal numbers.
6. Read different types of simple scales between labelled divisions, in both kilograms and grams. E.g.

- Kitchen scale showing a weight between 3kg and 4kg (scale divided into 0.1kg increments). 300 grams of flour are taken off the scale. How much flour is left?
- Kitchen scale shows weights in divisions of 0.1kg. How many grams of flour are on the scale?

7. Record weights as either grams, kilograms or in mixed units. E.g.
   - Write 4 125g in kilograms as a decimal number.
   - How many grams of sugar must be added to 1.38kg to make 2kg of sugar altogether?
   - Two pumpkins weigh 9.36kg altogether. If the heavier pumpkin is twice the weight of the lighter one, how much does the heavier one weigh?
   - Bags of Father's Finest Flour weigh 4.75kg. How many bags of flour must a baker buy to get 30kg of flour?
   - Two prize-winning potatoes at the Harvest Festival weigh 1.32kg and 976g. What is the difference in their weights?
8. Round weights to the nearest whole unit or tenth of a unit. E.g. Smudge the rabbit weighs 4 690g. Write Smudge's weight to the nearest tenth of a kilogram. (4.7kg) Write his weight to the nearest kilogram. (5kg)
9. Begin to solve problems in a variety of contexts, using standard units.

Mass – 8

1. Know that 1 kilogram = 1 000 grams.
   1 tonne = 1 000 kilograms
2. Know and use relationships between familiar units.
   - Know the equivalent in grams of one-half, one-quarter, three-quarters, one-tenth, one-hundredth and one-thousandth of one kilogram and one tonne.
3. Use units of measurement to measure, estimate, calculate and solve problems in a range of contexts.
4. Convert between metric units. (UK Know rough metric equivalents of common imperial measures.) E.g
   - Convert a larger unit to a smaller one: 0.89 tonnes into kilograms

- Convert a smaller unit to a larger one: 250g into kilograms

5. Read and interpret scales on a range of measuring instruments E.g. with horizontal or circular scales
6. Round measurements to an appropriate degree of accuracy.
7. Solve problems involving mass in everyday contexts. E.g.
    - A number of bars of soap are packed in a box that weighs 850g. Each bar of soap weighs 54g. When it is full, the total weight of the box and the soap is 7.6kg. How many bars of soap are in the box?
    - The maximum load in a small service lift is 50kg. 60 tins, each weighing 840g, are to be sent up in the lift. How many loads are required to transport the tins?
    - Mrs. Green sells Blushing Beauty apples for 30 cents each. Mr. White sells apples of the same size and variety for $2.45 per kilo. Each apple weighs an average of 125g. Which greengrocer has the cheaper price?
    - How many grams of carrots must be added to 2.76kg to make 5kg of carrots altogether?

Mass – 9

1. Know that 1 kilogram = 1 000 grams.
   1 tonne = 1 000 kilograms
2. Know and use relationships between familiar units.
   - Know the equivalent in grams of one-half, one-quarter, three-quarters, one-tenth, one-hundredth and one-thousandth of one kilogram and one tonne.
3. Use units of measurement to measure, estimate, calculate and solve problems in a range of contexts.
4. Convert between metric units. (UK Know rough metric equivalents of common imperial measures.) E.g
   - Convert a larger unit to a smaller one: 0.89 tonnes into kilograms
   - Convert a smaller unit to a larger one: 250g into kilograms
5. Read and interpret scales on a range of measuring instruments E.g. with horizontal or circular scales
6. Round measurements to an appropriate degree of accuracy.
7. Solve problems involving mass in everyday contexts. E.g.
   - Sausages are priced at $2.50 per kilogram. How much will 600 grams of sausages cost?
   - Which is the best buy – 475g of hazelnut spread for $2.38 or 750g of hazelnut spread for $3.75?
   - A carton contains 24 cans of baked beans each with a mass of440g. What is the total mass of the tins? Give your answer in kilograms.
   - At the supermarket Phyllis buys a loaf of bread (680g), a jar of honey (500g), a tin of baby food (225g) and a dozen eggs (700g). What is the total mass of her groceries?
8. Know that one litre of water weighs one kilogram, and use this knowledge to solve problems in everyday contexts. E.g.
   - A fish tank in the shape of a rectangular prism has a base 50cm long and 40cm wide. It contains water to a depth of 20cm. What is the weight of water in the fish tank?
9. Continue to use units of measurement from previous years and extend to compound measures. E.g

- Density (mass per unit of volume)
- Pressure (force per unit of area)

10. Convert between metric units. E.g. Change 150 000 kilograms into tonnes.
11. Convert one rate to another. E.g. Convert 30kg/m^2 into grams/cm^2
12. Round measurements of mass to an appropriate degree of accuracy. E.g. Round 3.54kg to the nearest tenth of a kilogram/ to the nearest kilogram/Write 3.54kg in grams.
13. Solve problems involving mass, rounding measurements to an appropriate degree of accuracy.

LENGTH

Length – 1

Vocabulary: long, short, tall, high, low, wide, narrow, near, far, nearer, further

1. Compare objects according to length, width, height, thickness, size.
    - Click on the long curved line/short straight line/short thick line/long thin line
    - Sort lines into categories long and short.
2. Order objects according to length, width, height, thickness, size.
    - Is Imran taller than Chloe? Is Sondra shorter than Sam?
    - The yellow pencil is longer/shorter than the blue pencil.
3. Compare an object with a collection of other objects according to length, width, height, thickness, size.
    - Will this teddy fit on this bed? (Yes/No/Teddy is too tall/Teddy is too small)
    - Pick a ribbon from the Ribbon Shop that is wider/narrower/longer/shorter than this one.
    - Pick the bed that is just right for Goldilocks.
    - Pick the tallest/shortest child.
    - Pick the Pattern. Add the matching line/object to a collection using attributes of length, width, height, thickness, size.
4. Compare a collection of objects with another collection of objects according to length, width, height, thickness, size.
5. Use appropriate language of approximation to describe length, width, height, thickness, size. E.g.
    - Can select objects that are “about the same” length, width, height, thickness, size as another object or other objects.
6. Describe distances using informal language of near and far.
    - Joe is near the windmill. He is far from the church.
7. Compare distances using informal language of nearer and further.
    - The striped ball is nearer to Danielle than the blue ball. Which is further away from Asa, the fence or the tree?

Length – 2

Vocabulary: long, short, tall, high, low, wide, narrow, deep, shallow, thick, thin, far, near, close, closer, further…

1. Make direct comparisons (side by side) of two items of different length, width, height, thickness, size.
    - Complete complementary statements such as Xavier is taller than Kent. Kent is shorter than Xavier. The pencil is shorter than the ruler. The ruler is longer than the pencil.
    - Click on the boxes where the two lines are the same length. (Vary colour, thickness, relative position)
    - Click on the long curved line/short straight line/short thick line/long thin line
    - Which person is taller/shorter?
    - Which is higher – the top of the door or the top of the table?
    - Which book is wider? Which book is thicker?
    - Which is the longest/shortest scarf?
    - Which is the tallest/shortest sunflower?
    - Pick the Pattern. Add the matching line/object to a collection using attributes of length, width, height, thickness, size. E.g. Fishing: Match the longest fish to the longest string and the longest stick/ the largest balloon to the longest string
2. Use uniform non-standard units. E.g. 7 rulers fit across the table. 10 rulers fit across the door. Which is wider, the table or the door? How much wider is it?
3. Estimate length, width, height, thickness, size, using non-uniform units. E.g.
    - How many cubes would fit across the book?
    - How many of Rebecca's shoes would fit beside one of David's shoes?
    - How many toy cars would fit across the desk?
    - How many paper clips would be the same width as a page?
    - How many matchsticks would be the same length as a playing card?

- How many suricates (meerkats) would be as tall as a giraffe?
- Which (non-straight) line is longer?

4. Use appropriate language of approximation to describe length, width, height, thickness, size. E.g.
    - Select objects that are “about the same” length, width, height, thickness, size as another object or other objects.
5. Describe distances using informal language of near and far.
6. Compare distances using informal language of nearer and further.
7. Order the distances between three objects, on a map or a diagram.
    - The post office is nearer to the school than the railway station.

Length – 3

Vocabulary: long, short, tall, high, low, wide, narrow, deep, shallow, thick, thin, far, near, close, closer, further…

1. Compare length, width, height, thickness, size of objects using metres and centimetres. E.g
    - A picture frame is 1 metre long. A window is 2 metres long. Click on the one that is longer.
    - A brush is 20 centimetres long. A purse is 50 centimetres long. Click on the one that is shorter.
    - The brush is 5 centimetres wide. The purse is 20 centimetres wide. Click on the one that is wider.
    - A cricket bat is 12 centimetres wide. A baseball bat is 8 centimetres wide. Click on the one that is narrower.
    - A swimming pool has one end that is 1 metre deep and one end that is 3 metres deep. Click on the end with the shallower water.
2. Compare length, width, height, thickness, size of objects in relation to 1 metre. Click on all the things that are longer/shorter than 1 metre. Show a straight piece of string and a curved piece of string, both labelled 1 metre. Which is longer?
3. Begin to recognise when metres or centimetres are appropriate units of measurement. E.g.

- Would you measure the length of a paper clip in metres or centimetres? The height of the ceiling? A hand span? The length of a football field? The length of a pencil? The height of a flower? The height of an oak tree?
- Click on an object about 1cm/10cm/100cm long/tall/wide/deep?

4. Read a simple scale to the nearest labelled division. E.g.
   - In a picture showing a table and a metre rule – what is the height of the table?
5. Use a ruler to measure lines in centimetres.
   - (Measuring Snakes)
   - (How far apart are the stars?)

Length – 4

Vocabulary: long, short, tall, high, low, wide, narrow, deep, shallow, thick, thin, far, near, close, closer, further, distance…

1. Know that 1 metre = 100cm
   1 kilometre = 1 000m
2. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – centimetres, metres and kilometres. E.g.
   - Mr Gee's house is 10 kilometres from the school. How far does he travel to and from school each day? In five days?
   - Karla's skipping rope is 2 metres long. The hall is 4 metres long. How many of the same skipping ropes would fit along the hall?
   - Nerida's lunch box is 15 centimetres wide. A small fruit juice pack is 7 centimetres wide. How many will fit across the lunch box?
3. Begin to recognise when metres or centimetres are appropriate units of measurement. E.g.
   - Would you measure the length of a paper clip in metres or centimetres? The height of the ceiling? A hand span? The length of a football field? The length of a pencil? The height of a flower? The height of an oak tree?

- Click on an object about 1cm/10cm/100cm long/tall/wide/deep?
- Would you expect a front door to be 1, 2 or 5 metres tall?
  A hand span to be 5, 15 or 50 centimetres wide?
  A cat to be 4, 40 or 400 centimetres tall?

4. Read a simple scale to the nearest labelled division. E.g.
   - In a picture showing a table and a metre rule – what is the height of the table?
   - In a picture of a ruler marked 0, 10, 20 cm, and 1cm increments shown, with 2 arrows indicating a portion of the ruler: what length is shown?
5. Use a ruler to measure lines in centimetres.
   - (Measuring Lizards)
   - (How far apart are the stars?)
6. Choose an appropriate measuring tool to measure a given length. E.g.a tape measure, a trundle wheel, callipers, a ruler, a metre rule

Length – 5

Vocabulary: long, short, tall, high, low, wide, narrow, deep, shallow, thick, thin, far, near, close, closer, further, distance, edge, perimeter…

1. Know that 10mm = 1 cm
   100cm = 1 metre
   1 000m = 1 kilometre
2. Use correctly the abbreviations mm, cm, m, km.
3. Know the equivalent of one-half, one quarter, three-quarters and one-tenth of 1 metre in centimetres and of 1 kilometre in metres.
4. Make sensible estimates of measurements of length. E.g.

- Would you expect a low-set house to be about 3 metres, about 6 metres or about 12 metres tall?

5. Recognise appropriate units of measurement for different objects. E.g.
   - Would you expect these measurements to be in millimetres, centimetres, metres or kilometres? The wingspan of an insect? The length of a skateboard? The height of a telegraph pole? The distance from Paris to Heidelburg?
6. Choose an appropriate measuring tool to measure a given length. E.g.a tape measure, a trundle wheel, callipers, a ruler, a metre rule., to measure (a) the length of the classroom
   (b) the school fence
   (c) the width of an atlas
   (d) the thickness of a CD case
6. Read a simple scale to the nearest labelled division. E.g.
   - In a picture showing a table and a metre rule – what is the height of the table?
   - In a picture of a ruler marked in metres and centimetres, with 2 arrows indicating a portion of the ruler: what length is shown? Write the answer as a decimal number i.e. 3.5 metres, 1.35 metres
7. Round measurements of length to the nearest ten or hundred units. E.g.
   - Leila is 157cm tall. What is her height to the nearest 10 centimetres?
   - The classroom is 4.86 metres across. What is the width to the nearest 10 centimetres? To the nearest metre?
8. Measure and calculate perimeters of simple shapes. Answer questions such as
   - How far is it around the edge of a square 5cm x 5cm?
   - How long is the perimeter of a 4cm x 7cm rectangle?
     a triangle with sides 10m, 20m and 24m?
   - The perimeter of a square is 28cm. How long is each side?
7. Use a ruler to measure lines in centimetres or millimetres. E.g.
   - In a flea-hopping competition, measure how many millimetres each flea jumped.

9. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – millimetres, centimetres, metres and kilometres. E.g.
    - I think of a length, double it, then subtract 25cm. The new length is 95cm. What was the length I first thought of?
    - Given a garden plan – How far is it from the tree to the shed? From the front door to the waterfall? (Use the paths – don't walk across the lawn or the flower beds.)

Length – 6

Vocabulary: as previously

1. Know that 10mm = 1 cm
   100cm = 1 metre
   1 000m = 1 kilometre
2. Use correctly the abbreviations mm, cm, m, km.
3. Know the equivalent of one-half, one quarter, three-quarters and one-tenth of 1 metre in millimetres and centimetres and of 1 kilometre in metres.
4. Recognise lengths written as decimal numbers. E.g. Write 1.6m in centimetres.
5. Make sensible estimates of measurements of length. E.g.
    - Is the classroom 3 metres, 6 metres or 12 metres high?
    - Is the crayon 5mm, 55mm or 550mm long?
6. Recognise appropriate units of measurement for different objects. E.g.
    - Would you expect these measurements to be in millimetres, centimetres, metres or kilometres? The width of a shoelace? The width of a dinner plate? The height of an advertising billboard? The distance from Cairns to the Daintree River?

7. Choose an appropriate measuring tool to measure a given length. E.g.a tape measure, a trundle wheel, callipers, a ruler, a metre rule., to measure (a) the length of the classroom
   (b) the school fence
   (c) the width of an atlas
   (d) the thickness of a CD case
8. Read a simple scale to the nearest labelled division, and convert to equivalent units. E.g.
   - In a picture showing a table and a metre rule – what is the height of the table?
   - In a picture of a ruler marked in metres and centimetres, with 2 arrows indicating a portion of the ruler: what length is shown? Write the answer as a decimal number i.e. 3.5 metres, 1.35 metres
   - With the scale reading in centimetres: What is the distance between the two arrows in millimetres? In metres?
9. Round measurements of length to the nearest ten or hundred units. E.g.
   - Leila is 157cm tall. What is her height to the nearest 10 centimetres?
   - The classroom is 4.86 metres across. What is the width to the nearest 10 centimetres? To the nearest metre?
10. Record halves, quarters and tenths of kilometres in decimal form. E.g. 600m = 0.6 km
11. Measure lines to the nearest millimetre.
12. Measure and calculate perimeters of simple shapes.
13. Use the formula for calculating the perimeter of a rectangle, in words and letters. Respond to questions such as
   - The perimeter of a rectangle is 36cm. The shortest sides are 6cm long. How long is each of the other sides?
14. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – millimetres, centimetres, metres and kilometres.

Vocabulary: as previously

1. Know that 10mm = 1 cm
   100cm = 1 metre
   1 000m = 1 kilometre
2. Use correctly the abbreviations mm, cm, m, km.
3. Know the equivalent of one-half, one quarter, three-quarters and one-tenth of 1 metre in millimetres and centimetres and of 1 kilometre in metres.
4. Recognise lengths written as decimal numbers. E.g. Write 1.6m in centimetres.
5. Make sensible estimates of measurements of length. E.g.
   - Is the classroom 3 metres, 6 metres or 12 metres high?
   - Is the crayon 5mm, 55mm or 550mm long?
7. Recognise appropriate units of measurement for different objects. E.g.
   - Would you expect these measurements to be in millimetres, centimetres, metres or kilometres? The width of a shoelace? The width of a dinner plate? The height of an advertising billboard? The distance from Cairns to the Daintree River?
8. Choose an appropriate measuring tool to measure a given length. E.g.a tape measure, a trundle wheel, callipers, a ruler, a metre rule, to measure (a) the length of the classroom
   (b) the school fence
   (c) the width of an atlas
   (d) the thickness of a CD case
9. Read a simple scale to the nearest labelled division, and convert to equivalent units. E.g.
   - In a picture showing a table and a metre rule – what is the height of the table?
   - In a picture of a ruler marked in metres and centimetres, with 2 arrows indicating a portion of the ruler: what length is shown? Write the answer as a decimal number i.e. 3.5 metres, 1.35 metres
10. With the scale reading in centimetres: What is the distance between the two arrows in millimetres? In metres?

11. Round measurements of length to the nearest whole unit or tenth of a unit. E.g.
    - Leila is 157cm tall. What is her height to the nearest tenth of a metre?
    - The classroom is 4.86 metres across. What is the width to the nearest tenth of a metre? To the nearest metre?
12. Record halves, quarters and tenths of kilometres in decimal form. E.g. 600m = 0.6 km
13. Measure lines to the nearest millimetre.
14. Measure and calculate perimeters of simple shapes.
15. Calculate perimeters of compound shapes where the components are rectangles.
16. Use the formula for calculating the perimeter of a rectangle, in words and letters. Respond to questions such as
    - The perimeter of a rectangle is 36cm. The shortest sides are 6cm long. How long is each of the other sides?
17. Begin to link calculations of perimeter and area. E.g.
    - The area of a square is $36cm^2$. What is its perimeter?
18. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – millimetres, centimetres, metres and kilometres.

Length – 8

1. Convert between one metric unit and another. E.g.
   - Larger to smaller: Write 36cm in millimetres.
   - Smaller to larger: Write 750m in kilometres.
     Write 4mm in centimetres.
2. Convert between millimetres, centimetres, metres and kilometres to compare length, width, height, thickness, size of objects in a variety of contexts.
3. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – millimetres, centimetres, metres and kilometres. E.g.
   - Interpret and calculate from the dimensions of a house floor plan. What is the length of the living room?
     What is the width of the hall?
     How much wider is Bedroom 1 than Bedroom 2?
   - A painting measuring 90cm by 60cm is to be framed. The picture framer mounts the picture on thick cardboard leaving a 10cm border between the picture and the timber frame. The frame is made from timber 5cm in width. What is the length and width of the picture and the frame?
4. Round measurements of length to the nearest whole unit or tenth of a unit.
5. Calculate compound measurements involving length E.g. speed = distance/time and solve problems involving rates of change. E.g.
   - The distance from Lowell to Forthbridge is 180km. An express train travels the distance in 2_ hours. What is its average speed?
   - A cyclist travels 133km in 8 hours, including a one-hour rest break. What was her average cycling speed?
   - The next day, she cycled for 3 hours on the flat at 20km/h and 1_ hours uphill at 12km/h. What was the total distance travelled during this time?

- On the third day, she cycled 160km at an average speed of 24km/h. How long did her journey take?
- A lorry 20m long and travelling at a speed of 72km/h passes through a tunnel 80m long. How long will it take from the time the lorry enters the tunnel until the entire lorry is out of the tunnel? (5 seconds)

6. Use the formula for calculating the perimeter of rectangles. E.g.
   - An area of flower beds and lawn is $25m^2$. It is bordered by a path one metre wide. What is the outside perimeter of the path?
7. Investigate relationships between perimeters and areas of different rectangles and triangles. E.g.
   - A rectangle has a fixed area of $36m^2$. What is the smallest perimeter that it could have?
   - Cyrus's Circus encloses an area outside the Big Top to conduct spectacular crowd-drawing activities such as clowns eating fire and poodles walking on tightropes. The enclosure is built out of one-metre portable fencing sections. There are 50 sections of fencing. What length and width should the fence be to enclose the largest possible area?

7. Know and use the formula for calculating the circumference of circles, knowing that different approximations of π are 3, 22/7 and 3.14 (correct to 2 d.p.) E.g.
   - The diameter of King Arthur's Round Table is 5.5m. Legend claims that 50 knights used to sit around the table. Assume each knight in armour needs seating space of 45cm round the circumference. Could 50 knights sit around the table?
   - A ferris wheel has a diameter of 42m. Use the approximation that $\pi = 22/7$ to calculate how many metres each passenger travels in one revolution of the wheel.
   - The large wheel on Tanya's wheelchair has a diameter of 56cm. Tanya moves her wheelchair forward 880cm. How many times does the large wheel go round? (Use the approximation that $\pi = 22/7$)
   - A touring cycle has wheels of diameter 70cm. How many rotations does each wheel make during a journey of 11km? (Use the approximation that $\pi = 22/7$)
8. Calculate perimeters of compound shapes where the components are rectangles, squares and triangles.

Length – 9

1. Convert between one metric unit and another. E.g.
   - Larger to smaller: Write 36cm in millimetres.
   - Smaller to larger: Write 750m in kilometres.
     Write 4mm in centimetres.
2. Convert between millimetres, centimetres, metres and kilometres to compare length, width, height, thickness, size of objects in a variety of contexts.
3. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – millimetres, centimetres, metres and kilometres. E.g.
   - Interpret and calculate from the dimensions of a house floor plan. What is the length of the living room?
     What is the width of the hall?
     How much wider is Bedroom 1 than Bedroom 2?
   - A painting measuring 90cm by 60cm is to be framed. The picture framer mounts the picture on thick cardboard leaving a 10cm border between the picture and the timber frame. The frame is made from timber 5cm in width. What is the length and width of the picture and the frame?
4. Round measurements of length to the nearest whole unit or tenth of a unit.
5. Calculate compound measurements involving length E.g. speed = distance/time and solve problems involving rates of change. E.g.
   - The distance from Lowell to Forthbridge is 180km. An express train travels the distance in 2_ hours. What is its average speed?
   - A cyclist travels 133km in 8 hours, including a one-hour rest break. What was her average cycling speed?
   - The next day, she cycled for 3 hours on the flat at 20km/h and 1_ hours uphill at 12km/h. What was the total distance travelled during this time?

- On the third day, she cycled 160km at an average speed of 24km/h. How long did her journey take?
- A lorry 20m long and travelling at a speed of 72km/h passes through a tunnel 80m long. How long will it take from the time the lorry enters the tunnel until the entire lorry is out of the tunnel? (5 seconds)
- Sara travelled 34.24km by car, 2.7km by bus and 1 000m on foot. How many kilometres did she travel altogether? How many metres?

6. Use the formula for calculating the perimeter of rectangles. E.g.
   - An area of flower beds and lawn is $25m^2$. It is bordered by a path one metre wide. What is the outside perimeter of the path?
7. Calculate perimeters of compound shapes where the components are rectangles, squares and triangles.
8. Investigate relationships between perimeters and areas of different rectangles and triangles. E.g.
   - A rectangle has a fixed area of $36m^2$. What is the smallest perimeter that it could have?
   - Cyrus's Circus encloses an area outside the Big Top to conduct spectacular crowd-drawing activities such as clowns eating fire and poodles walking on tightropes. The enclosure is built out of one-metre portable fencing sections. There are 50 sections of fencing. What length and width should the fence be to enclose the largest possible area?
9. Know and use the formula for calculating the circumference of circles, knowing that different approximations of π are 3, 22/7 and 3.14 (correct to 2 d.p.) E.g.
   - The diameter of King Arthur's Round Table is 5.5m. Legend claims that 50 knights used to sit around the table. Assume each knight in armour needs seating space of 55cm round the circumference. Could 50 knights sit around the table?
   - A ferris wheel has a diameter of 42m. Use the approximation that $\pi = 22/7$ to calculate how many metres each passenger travels in one revolution of the wheel.
   - The large wheel on Tanya's wheelchair has a diameter of 56cm. Tanya moves her wheelchair forward 880cm. How many times does the large wheel go round? (Use the approximation that $\pi = 22/7$)

- A touring cycle has wheels of diameter 70cm. How many rotations does each wheel make during a journey of 11km? (Use the approximation that π = 22/7)

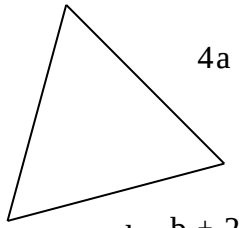
10. Know that the length of an arc of a circle is directly proportional to the angle _ between the two bounding radii (arc length = 2πr x _/360).

Length – 10

1. Convert between one metric unit and another. E.g.
   - Larger to smaller: Write 36cm in millimetres.
   - Smaller to larger: Write 750m in kilometres.
     Write 4mm in centimetres.
2. Convert between millimetres, centimetres, metres and kilometres to compare length, width, height, thickness, size of objects in a variety of contexts.
3. Convert between less common units of length measurement e.g. micrometres to millimetres, millimetres to nanometres (Excel 9-10 Int pp 90-91)
4. Solve problems involving length, width, height, thickness, size of objects in a variety of contexts, using standard units of length – millimetres, centimetres, metres and kilometres. E.g.
   - Interpret and calculate from the dimensions of a house floor plan. What is the length of the living room?
     What is the width of the hall?
     How much wider is Bedroom 1 than Bedroom 2?
   - A painting measuring 90cm by 60cm is to be framed. The picture framer mounts the picture on thick cardboard leaving a 10cm border between the picture and the timber frame. The frame is made from timber 5cm in width. What is the length and width of the picture and the frame?

- A streamer is made by joining together strips of paper that are 30cm long. Each join has an overlap of 5cm. How long is a streamer made from 2 strips? From 3 strips?

5. Round measurements of length to the nearest whole unit or tenth of a unit.
6. Calculate compound measurements involving length E.g. speed = distance/time and solve problems involving rates of change. E.g.
   - The distance from Lowell to Forthbridge is 180km. An express train travels the distance in 2_ hours. What is its average speed?
   - A cyclist travels 133km in 8 hours, including a one-hour rest break. What was her average cycling speed?
   - The next day, she cycled for 3 hours on the flat at 20km/h and 1_ hours uphill at 12km/h. What was the total distance travelled during this time?
   - On the third day, she cycled 160km at an average speed of 24km/h. How long did her journey take?
   - A lorry 20m long and travelling at a speed of 72km/h passes through a tunnel 80m long. How long will it take from the time the lorry enters the tunnel until the entire lorry is out of the tunnel? (5 seconds)
7. Use the formula for calculating the perimeter of rectangles and triangles. E.g.
   - An area of flower beds and lawn is $25m^2$. It is bordered by a path one metre wide. What is the outside perimeter of the path?
   - The diagram shows the lengths of the sides of a triangle in centimetres. The triangle is equilateral. What is its perimeter in centimetres?



8. Calculate perimeters of compound shapes where the components are rectangles, squares and triangles.
9. Investigate relationships between perimeters and areas of different rectangles and triangles. E.g.

- A rectangle has a fixed area of $36m^2$. What is the smallest perimeter that it could have?
- The length of a rectangle is 4cm more than its width. Its area is $96cm^2$. What is its perimeter?
- A T-shape is made from 5 square tiles. The length of a side of a tile is t cm. Write an expression for the area of the t-shape. If the area of the T-shape is $720cm^2$, what is the length of its perimeter?
- Cyrus's Circus encloses an area outside the Big Top to conduct spectacular crowd-drawing activities such as clowns eating fire and poodles walking on tightropes. The enclosure is built out of one-metre portable fencing sections. There are 50 sections of fencing. What length and width should the fence be to enclose the largest possible area?

10. Know and use the formula for calculating the circumference of circles, knowing that different approximations of π are 3, 22/7 and 3.14 (correct to 2 d.p.) E.g.
    - A letter B is made out of a single piece of wire. It has a straight edge and two equal semicircles, each with a 15cm diameter. What is the total length of the wire used? (use the approximation $\pi = 3.1$)

10. Know that the length of an arc of a circle is directly proportional to the angle _ between the two bounding radii (arc length = $2\pi r$ x _/360)

AREA

Area – 3

Vocabulary: area, covers, surface

1. Recognise surface as an attribute. E.g. Click on the object with a flat/curved/rough/smooth/hot/cold/shiny surface.
    - E.g. tree trunks, bricks, ball, bench top, carpet, glass, paper, plastic
2. Cover a shape with another shape or shapes. E.g.
    - Click on the shape that will cover the top of the box.
    - How many blue shapes will cover the black shape?
3. Cover spaces with a shape or shapes.
    - Which shape will cover this space?
    - How many blue shapes will cover this space?
4. Recognise open and closed lines. Know that closed lines make a shape.
    - Click on lines that join up and make a shape.
    - Click on the inside and outside of shapes. E.g. Some of these shapes have space inside them. Click on the inside spaces.
5. Compare two shapes that are obviously different in area. Which is the bigger/smaller?

Area – 4

Vocabulary: area, covers, surface

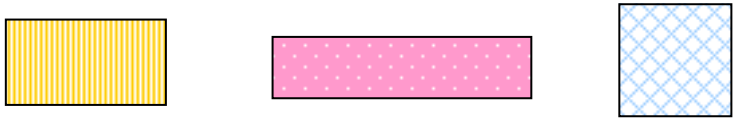
1. Recognise surface as an attribute. E.g. Click on the object with a flat/curved/rough/smooth/hot/cold/shiny surface.
    - E.g. tree trunks, bricks, ball, bench top, carpet, glass, paper, plastic
2. Cover a shape with another shape or shapes. E.g.
    - Click on the shape that will cover the top of the box.

- How many blue shapes will cover the black shape?

3. Cover spaces with a shape or shapes.
    - Which shape will cover this space?
    - How many blue shapes will cover this space?
4. Recognise open and closed lines. Know that closed lines make a shape.
    - Click on lines that join up and make a shape.
    - Click on the inside and outside of shapes. E.g. Some of these shapes have space inside them. Click on app the inside spaces.
5. Count how many shapes of a uniform size will cover a larger shape.
    - Have a defined space e.g. square or rectangle. Have a number of uniformly sized, shaped and coloured 'pieces' (squares, rectangles, triangles). How many blue pieces does it take to completely cover the pink shape? Drag & drop, write answer.
6. Five Squares. Make a shape which has exactly the same number of squares as another shape.
7. Does the yellow shape have exactly as many squares as the pink shape?
8. Click on all the shapes which have exactly as many squares as the pink shape.
9. Compare and order three shapes that are different in area. Which is the bigger/smaller? (Integrate with 2D Geometry.) Click on the largest circle/the triangle with the smallest area/the hexagon that is bigger than the circle but smaller than the square.
    - Which is the biggest envelope? Postcard? Magazine? Towel? Glove?

Area - 5

1. Count how many shapes of a uniform size will cover a larger shape.
    - Have a defined space e.g. square or rectangle. Have a number of uniformly sized, shaped and coloured 'pieces' (squares, rectangles, triangles). How many blue pieces does it take to completely cover the pink shape? Drag & drop, write answer.
2. Five Squares. Make a shape that has exactly the same number of squares as another shape.
3. Does the yellow shape have exactly as many squares as the pink shape?
4. Click on all the shapes that have exactly as many squares as the pink shape.
5. Compare and order three shapes that are different in area. Which is the bigger/smaller? (Integrate with 2D Geometry - Click on the largest circle/the triangle with the smallest area/the hexagon that is bigger than the circle but smaller than the square.)
6. Which is the biggest envelope? Postcard? Magazine? Towel? Glove?
7. Integrate with fractions. Click on all the grids that are divided into halves.
8. This is one square centimetre. Click on the things that are about the same size.
9. Repeat for 2/4/5/10cm^2.
10. Find areas of regular and irregular shapes (eg a simple sail boat or house) by counting square centimetres.
11. Estimate approximate areas of rectangles with a transparent grid overlaid. E.g. 2.8cm x 6.1cm
12. Use a transparent grid to order the areas of shapes where it is difficult to tell which area is larger or smaller. E.g.



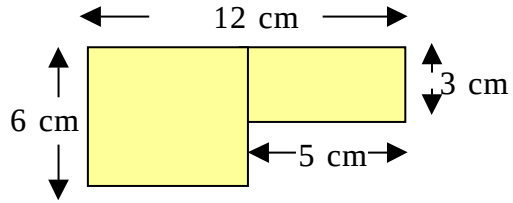
13. Recognise areas that would be suitable to measure in square centimetres. A page of a book? A football field? A matchbox? The classroom floor? A foot/hand print?

Area – 6

1. Know that $1m^2 = 1m \times 1m = 100cm \times 100cm = 10\ 000cm^2$
2. Make sensible estimates of different areas. E.g.
   - Would you expect the area of a paperback book to be: $100cm^2$, $600cm^2$ or $6m^2$?
   - Would you expect the area of a bedroom floor to be: $10m^2$ or $100m^2$?
   - Would you expect the area of a playing card to be: $5cm^2$, $50cm^2$ or $100cm^2$?
3. Choose a suitable unit to estimate the area of: a sheet of newspaper; the top of your desk; a postage stamp; a leaf; the floor of the gym; the surface of the swimming pool; a dinner plate.
4. Triangles: Begin to relate the area of triangles to being half the area of corresponding rectangles. E.g. Given a number of different rectangles, cover each with its matching "pair" of triangles. Find the areas of each rectangle using a transparent grid overlay.
5. Begin to recognise that finding the area of a rectangle is a multiplicative operation. E.g. Sum It Up –type calculations. Which calculation/expression will give the number of square centimetres in this rectangle?

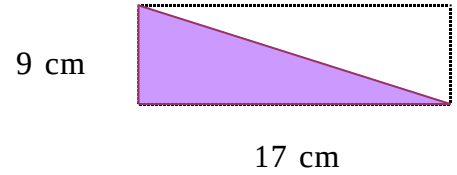
Area – 7

1. Know that $1m^2 = 1m \times 1m = 100cm \times 100cm = 10\ 000cm^2$
2. Know that $1cm^2 = 10mm \times 10mm = 100mm^2$.
3. Know the formula for finding the area of a rectangle.
4. Begin to find the area of compound shapes that can be split into rectangles. E.g.

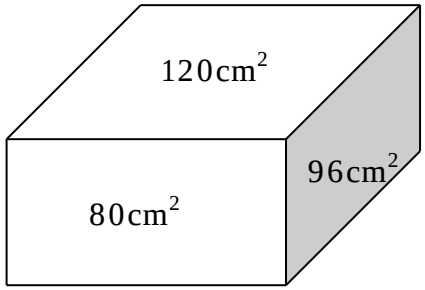


(Use plan views of buildings, rooms, etc)

5. Find the area of right-angled triangles by considering them as half of a rectangle. E.g.



6. Find the surface area of simple solid shapes e.g. cubes and rectangular prisms.
7. Respond to questions linking measurements of length and area E.g. Find the length, breadth and height of this box. Find the total surface area of the box.

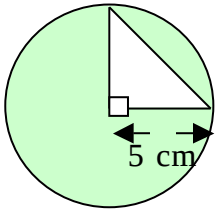


Area – 8

1. Know that $1m^2 = 1m \times 1m = 100cm \times 100cm = 10\ 000cm^2$
2. Know that $1cm^2 = 10mm \times 10mm = 100mm^2$.
3. Know that $1km^2 = 1\ 000m \times 1\ 000m = 1\ 000\ 000m^2$
4. Know that 1 hectare $= 100m \times 100m = 10\ 000m^2$
5. Convert between mm^2, cm^2, m^2, hectares, km^2.
6. Know the formula for finding the area of a rectangle. Use the formula to determine areas from linear measurements and linear measurements from area.
7. Recognise that squares are "special-case" rectangles, and find their areas.
8. Find the areas of right-angled triangles by considering them as half of rectangles.
9. Derive the formula for finding the area of a triangle. Use the formula to determine areas from linear measurements and linear measurements from area.
10. Recognise the equivalence between the areas of rectangles and parallelograms with the same base and height. E.g. Click on the shapes which have the same area.
11. Find the areas of compound shapes that can be split into rectangles.
12. Relate the surface area of simple cuboids to the shape of their nets.
13. Respond to questions linking measurements of length and area.

Area – 9

1. Know that $1m^2 = 1m \times 1m = 100cm \times 100cm = 10\ 000cm^2$
2. Know that $1cm^2 = 10mm \times 10mm = 100mm^2$.
3. Know that $1km^2 = 1\ 000m \times 1\ 000m = 1\ 000\ 000m^2$
4. Know that 1 hectare $= 100m \times 100m = 10\ 000m^2$
5. Convert between mm^2, cm^2, m^2, hectares, km^2.
6. Know the formula for finding the area of a rectangle. Use the formula to determine areas from linear measurements and linear measurements from area.
7. Know the formula for finding the area of a triangle. Use the formula to determine areas from linear measurements and linear measurements from area.
8. Recognise the equivalence between the areas of rectangles and parallelograms with the same base and height. E.g. Click on the shapes which have the same area.
9. Find the areas of compound shapes that can be split into rectangles and triangles. E.g. A right-angled triangle lies inside a circle. The circle has a radius of 5cm. Calculate the area of the triangle.



10. Know the formula for finding the area of a circle. Use the formula to determine areas from linear measurements and linear measurements from area.
11. Know that the value of π is about 3 or 3.14 or 22/7.

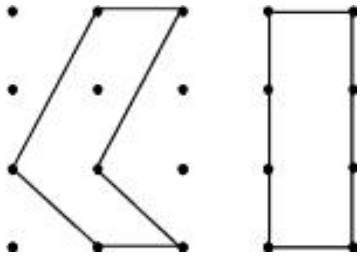
12. Understand the relationships between perimeter and area. E.g.

- A rectangle has a fixed area of $36cm^2$. Complete a table showing possible dimensions. Drag & drop corresponding shapes. What shape gives the smallest possible perimeter?

Area	Length	Width	Perimeter
$36cm^2$	36cm	1cm	(37x2) cm
$36cm^2$	18cm	2cm	(20x2) cm
$36cm^2$	12cm	3cm	(15x2) cm
$36cm^2$	9cm	4cm	(13x2) cm
$36cm^2$	6cm	6cm	(12x2) cm

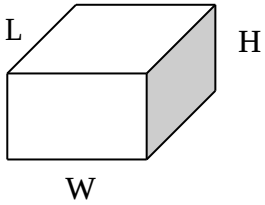
- A rectangle has a fixed perimeter of 20cm. Complete a table showing possible dimensions. Drag & drop corresponding shapes. What shape encloses the largest possible area? Click on the graph that shows the relationship between length/width and area.

Perimeter	Length	Width	Area
20cm	9cm	1cm	$9cm^2$
20cm	8cm	2cm	$16cm^2$
20cm	7cm	3cm	$21cm^2$
20cm	6cm	4cm	$24cm^2$
20cm	5cm	5cm	$25cm^2$



- Do these shapes have
  a. the same area?
  b. the same perimeter?

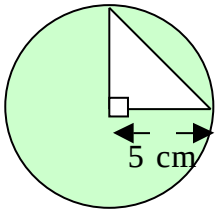
13. Derive a formula for the surface area of a cuboid with dimensions L, W and H. (S = 2(L xW) + 2(L x H) + 2 (W x H))



Area – 10

1. 1. Know that $1m^2 = 1m \times 1m = 100cm \times 100cm = 10\ 000cm^2$
2. Know that $1cm^2 = 10mm \times 10mm = 100mm^2$.
3. Know that $1km^2 = 1\ 000m \times 1\ 000m = 1\ 000\ 000m^2$
4. Know that 1 hectare = $100m \times 100m = 10\ 000m^2$
5. Convert between mm^2, cm^2, m^2, hectares, km^2.
6. Know the formula for finding the area of a rectangle. Use the formula to determine areas from linear measurements and linear measurements from area.
7. Know the formula for finding the area of a triangle. Use the formula to determine areas from linear measurements and linear measurements from area.

8. Recognise the equivalence between the areas of rectangles and parallelograms with the same base and height. E.g. Click on the shapes which have the same area.
9. Use knowledge about areas of rectangles and triangles to derive a formula for areas of trapeziums (1/2 [sum of parallel sides] x h)
10. Find the areas of compound shapes that can be split into rectangles and triangles. E.g. A right-angled triangle lies inside a circle. The circle has a radius of 5cm. Calculate the area of the triangle.



11. Know the formula for finding the area of a circle. Use the formula to determine areas from linear measurements and linear measurements from area.
12. Find areas of sectors of circles, knowing that the area of a sector is directly proportional to the size of the angle _ between the two bounding radii. (sector area = πr^2 x _/360) E.g. A pizza has a surface area of 480cm^2. Adam eats a wedge whose sides make an angle of 120^0. How many square centimetres of pizza did Adam eat?
13. Know that the value of π is about 3 or 3.14 or 22/7.
14. Relate the surface area of cuboids to the shape of their net. Calculate surface areas from the formula S= 2LW+2WH+2LH. E.g. Click on the correct net for this cuboid. What is the surface area of the cuboid?

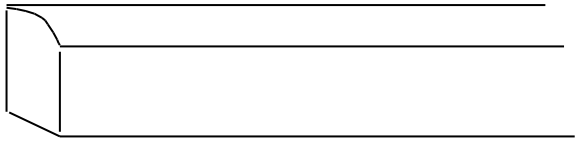
Area – 11

1. Know that $1m^2 = 1m \times 1m = 100cm \times 100cm = 10\ 000cm^2$
2. Know that $1cm^2 = 10mm \times 10mm = 100mm^2$.
3. Know that $1km^2 = 1\ 000m \times 1\ 000m = 1\ 000\ 000m^2$
4. Know that 1 hectare $= 100m \times 100m = 10\ 000m^2$
5. Convert between mm^2, cm^2, m^2, hectares, km^2.
6. Know the formula for finding the area of a rectangle. Use the formula to determine areas from linear measurements and linear measurements from area.
7. Know the basic formula for finding the area of a triangle. Use the formula to determine areas from linear measurements and linear measurements from area.
8. Begin to use Heron's Formula for finding the area of a triangle given the length of each side: $A = \sqrt{[s(s-a)(s-b)(s-c)]}$ where

$$s = (a + b + c) \div 2$$

9. Find areas of triangles given the length of 2 sides and the size of the angle between them using the sine ratio. (A = _ab sin C)
10. Recognise the equivalence between the areas of rectangles and parallelograms with the same base and height.
11. Know the formula for areas of trapeziums; (1/2 [sum of parallel sides] x h)
12. Know the formula for finding the area of rhombii and kites. (A = _(product of diagonals))
13. Know the formula for finding the surface area of a sphere $(A = 4\pi r^2)$
14. Know that the surface area of a cylinder = the circumference of the circular face x the height of the cylinder. $(A = 2\pi rh)$
15. Find the areas of compound shapes that can be split into rectangles, triangles and circles. E.g.

- The cross-section of a skirting board is in the shape of a rectangle, with a quadrant or quarter-circle on top. The skirting board is 1.5cm thick and 6.5cm high. What is the area of the cross-section?

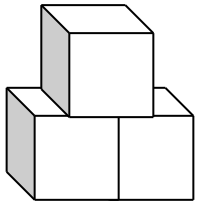


16. Know the formula for finding the area of a circle. Use the formula to determine areas from linear measurements and linear measurements from area.
17. Find areas of sectors of circles, knowing that the area of a sector is directly proportional to the size of the angle _ between the two bounding radii. (sector area = πr^2 x _/360)
18. Know that the value of π is about 3 or 3.14 or 22/7.
19. Relate the surface area of 3-D shapes including cuboids, triangular prisms and cylinders to the shape of their net. Calculate surface areas. E.g. Click on the correct net for this 3-D shape. What is the surface area of the shape?

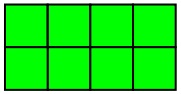
20. Investigate relationships between surface area and volume. E.g. for a fixed volume of $24cm^3$:

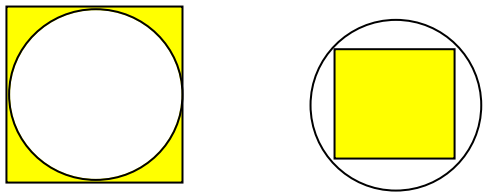
Volume	Length	Width	Height	Surface Area
$24cm^3$	24cm	1cm	1cm	$98cm^2$
$24cm^3$	12cm	2cm	1cm	$76cm^2$
$24cm^3$	8cm	3cm	1cm	$70cm^2$
$24cm^3$	6cm	4cm	1cm	$68cm^2$
$24cm^3$	6cm	2cm	2cm	$56cm^2$
$24cm^3$	4cm	3cm	2cm	$52cm^2$

- Click on the shape that corresponds to each of these cuboids.
- 12 cubes with 1-cm edges are each covered with sticky paper. How much paper is needed?
- The 12 cubes are covered with a single piece of clear sticky paper. Which arrangement of the cubes would need the least paper?
- This shape is made from three identical cubes. The top cube is placed centrally over the other ones. The total shape is to be covered with sticky paper, one piece of paper for each face of the shape. What shapes are the pieces of paper needed for the six faces?



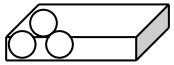
- A rectangle is 2cm wide and 4cm long. What is the area of the smallest circle into which the rectangle will fit? (Use the approximation $\pi = 3$)

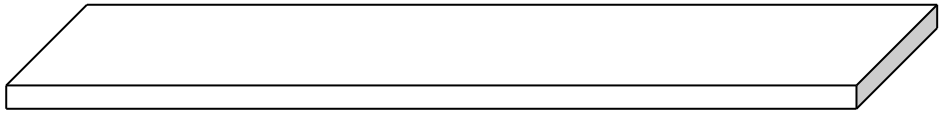




- These two circles have the same radius. What is the ratio of the area of the larger yellow square to the area of the smaller yellow square?

· Boxes of bubblegum measure 2.5cm by 4.5cm by 6.2cm. A shopkeeper puts them in a display tray measuring 9cm in width and 31cm in length, with a depth of 2.5cm. What is the largest number of boxes that can lie flat in the tray?





VOLUME & CAPACITY

Volume & Capacity – 1

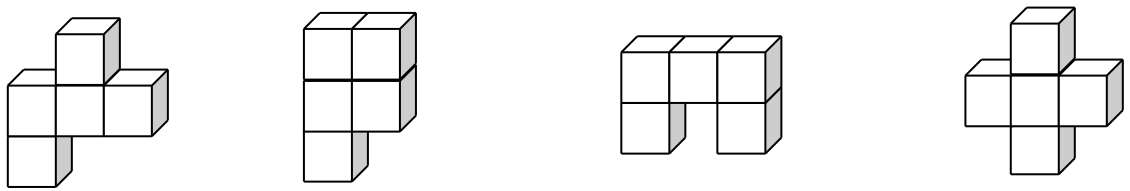
1. Understand and uses vocabulary of full, nearly full, empty, nearly empty.
2. Compare and order three or four containers of obviously different capacity. Uses vocabulary of holds more/less than/holds as much as. E.g. Click on the bucket that holds more that this one. Click on the vase that has more water in it than this one.
3. Compare and order three objects of similar shape in order of volume. Which one takes up the most/least space? E.g. three balls of different sizes, three slices of bread of different thickness, three saucepans, three stacking dolls.
4. Find objects that take up more or less space than a given object.
5. Begin to recognise that objects of the same volume may be different shapes. E.g. Click on the shapes that are made from (6) blocks.
6. Find the pairs. In a large array of containers of different sizes and shapes, group the "pairs" that have the same capacity.
7. Can identify whether objects will or will not fit a defined space (packing). Will the car fit in the garage? Will the bus? Will 10 more people fit on the bus? Will 2 more people? Will my drink bottle fit in my lunch box?
8. Can identify whether a certain volume of liquid in one container will or will not fit into a different container (filling).
9. Can identify which containers are suitable for holding different substances. E.g. a sieve will hold marbles but not water, a colander will hold peas but not rice.

Volume & Capacity – 2

1. Understand and use vocabulary of full, nearly full, empty, nearly empty, most, more, least, less, exactly the same, different, difference, amount, quantity, measure, estimate, actual, unit
2. Compare and order three or four containers of obviously different capacity. Uses vocabulary of holds more/less than/holds as much as. E.g. Click on the bucket that holds more that this one. Click on the vase that has more water in it than this one.
3. Compare and order three objects of similar shape in order of volume. Which one takes up the most/least space? E.g. three balls of different sizes, three slices of bread of different thickness, three saucepans, three stacking dolls.
4. Find objects that take up more or less space than a given object.
5. Begin to recognise that objects of the same volume may be different shapes. E.g. Click on the shapes that are made from (6) blocks.
6. Find the pairs. In a large array of containers of different sizes and shapes, group the "pairs" that have the same capacity.
7. Can identify whether objects will or will not fit a defined space (packing). Will the car fit in the garage? Will the bus? Will 10 more people fit on the bus? Will 2 more people? Will my drink bottle fit in my lunch box?
8. Can identify whether a certain volume of liquid in one container will or will not fit into a different container (filling).
9. Can record and interpret information recorded graphically from experiments measuring the capacity of different containers using informal units. E.g. a pictogram shows how many cups of sand/water/rice fitted into different containers. Which container is the largest/smallest? Does the pink container hold more/less than the blue container?

Volume & Capacity – 3

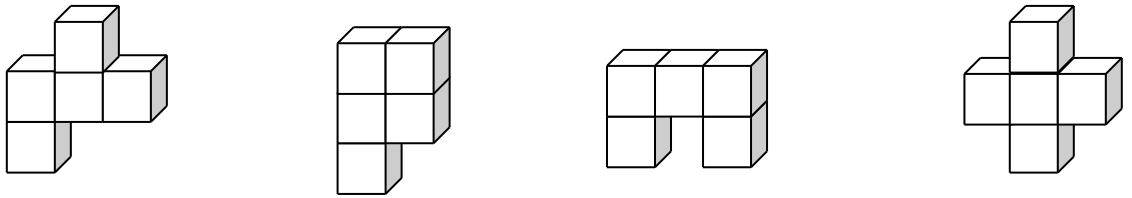
1. Understand and uses vocabulary of full, nearly full, empty, nearly empty, most, more, least, less, exactly the same, different, difference, amount, quantity, measure, estimate, actual, unit
2. Compare and order three or four containers of obviously different capacity. Uses vocabulary of holds more/less than/holds as much as. E.g. Click on the bucket that holds more that this one. Click on the vase that has more water in it than this one.
3. Compare and order three objects of similar shape in order of volume. Which one takes up the most/least space? E.g. three balls of different sizes, three slices of bread of different thickness, three saucepans, three stacking dolls.
4. Find objects that take up more or less space than a given object.
5. Find the pairs. In a large array of containers of different sizes and shapes, group the "pairs" that have the same capacity.
6. Can identify whether objects will or will not fit a defined space (packing). Will the car fit in the garage? Will the bus? Will 10 more people fit on the bus? Will 2 more people? Will my drink bottle fit in my lunch box?
7. Can identify whether a certain volume of liquid in one container will or will not fit into a different container (filling).
8. Can record and interpret information recorded graphically from experiments measuring the capacity of different containers using informal units. E.g. a pictogram shows how many cups of sand/water/rice fitted into different containers. Which container is the largest/smallest? Does the pink container hold more/less than the blue container?
9. Recognise that volume is conserved in objects made from small numbers of identical components. E.g. Same or Different? Click on the models that are made from the same number of cubes.



10. Begin to relate capacity of different containers to the standard measurement of one litre. E.g. Click on the containers that will hold more/less than 1 litre.
11. Begin to recognise everyday substances that are measured in litres i.e. liquids as opposed to solids. Click on the things that are measured in litres: milk? Flour? Bread? Fruit juice? How tall I am? The length of my ruler? Petrol for the car?
12. Read and interpret measurements of volume to the nearest litre. E.g. How much juice is in the jug? Water in the bucket?

Volume & Capacity – 4

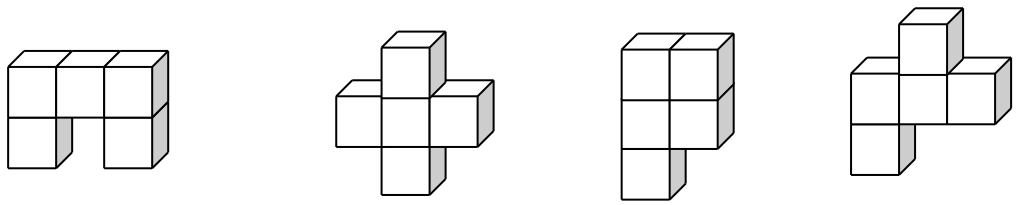
1. Compare and order three or four objects of similar shape in order of volume. Which one takes up the most/least space? E.g. three balls of different sizes, three slices of bread of different thickness, three saucepans, three stacking dolls.
2. Find the pairs. In a large array of containers of different sizes and shapes, group the "pairs" that have the same capacity.
3. Can record and interpret information recorded graphically from experiments measuring the capacity of different containers using informal units. E.g. a pictogram shows how many cups of sand/water/rice fitted into different containers. Which container is the largest/smallest? Does the pink container hold more/less than the blue container?
4. Recognise that volume is conserved in objects made from small numbers of identical components. E.g. Same or Different? Click on the models that are made from the same number of cubes.



5. Relate capacity of different containers to the standard measurement of one litre. E.g. Click on the containers that will hold more/less than 1 litre.
6. Recognise everyday substances that are measured in litres i.e. liquids as opposed to solids.
    - Click on the things that are measured in litres: milk? Flour? Bread? Fruit juice? How tall I am? The length of my ruler? Petrol for the car?
    - Responds to questions such as: Would you expect that a teapot would hold close to 1 litre, 10 litres or 100 litres?
7. Know that 1 litre = 1 000 millilitres and _ litre = 500mL.
8. Read and interpret measurements of volume to the nearest litre and the nearest 100mL E.g.
    - How much juice is in the jug? Water in the bucket?
9. Order containers smaller than 1 litre by interpreting capacities expressed in millilitres. E.g. fruit juice containers, measuring cups and spoons, medicine glass, perfume bottles, small bottles of soft drink.

Volume & Capacity – 5

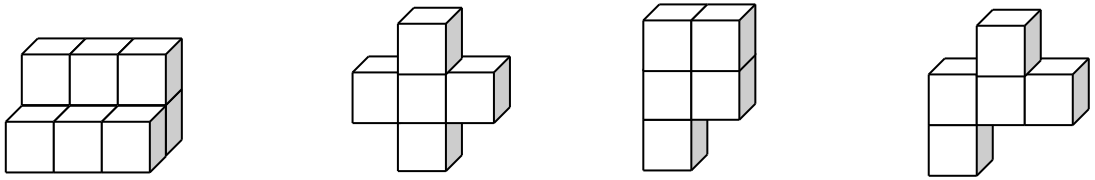
1. Compare and order three or four objects of similar shape in order of volume. Which one takes up the most/least space? E.g. three balls of different sizes, three slices of bread of different thickness, three saucepans, three stacking dolls.
2. Can record and interpret information recorded graphically from experiments measuring the capacity of different containers using formal and informal units. E.g. a pictogram shows how many cups/litres of sand/water/rice fitted into different containers. Which container is the largest/smallest? Does the pink container hold more/less than the blue container?
3. Recognise that volume is conserved in objects made from small numbers of identical components. E.g. Same or Different? Click on the models that are made from the same number of cubes.



4. Relate capacity of different containers to the standard measurement of one litre. E.g. Click on the containers that will hold more/less than 1 litre, reading volume measurements that are recorded on the containers displayed.
5. Recognise everyday substances that are measured in litres i.e. liquids as opposed to solids.
    - Click on the things you would expect to be measured in litres/millilitres: a spoonful of medicine? Fruit juice for the whole class? Petrol for the car? The amount of milk in a cake?
    - Responds to questions such as: Would you expect that a teapot would hold close to 1 litre, 10 litres or 100 litres? Would you expect a small bottle of lemonade to hold about 250mL or about 1 250mL?
6. Know that 1 litre = 1 000 millilitres and _ litre = 500mL and _ litre = 250mL.
7. Read and interpret measurements of volume to the nearest litre, the nearest 100mL and to the millilitre on a measuring device calibrated in mL E.g.
    - How much juice is in the jug? Water in the bucket? Water in the measuring cylinder? Medicine in the medicine glass?
8. Recognise and write volume measurements using half- and quarter-litres written as decimal numbers E.g. 1.25L
9. Order containers smaller than 1 litre by interpreting capacities expressed in millilitres. E.g. fruit juice containers, measuring cups and spoons, medicine glass, perfume bottles, small bottles of soft drink.
10. Solve problems relating to capacity in everyday contexts. E.g. How much is left in a one-litre container of juice after three 200mL glasses are poured?

Volume & Capacity – 6

1. Can identify how many uniform units make up a regular or simple irregular 3-D shape.



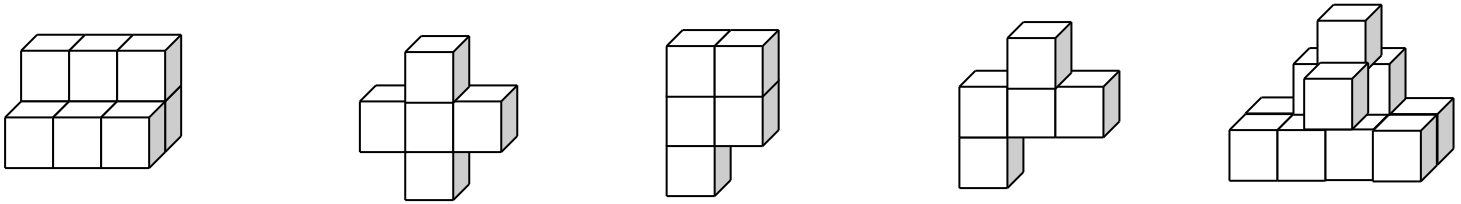
2. Relate capacity of different containers to the standard measurement of one litre. E.g. Click on the containers that will hold more/less than 1 litre, reading volume measurements that are recorded on the containers displayed.
3. Recognise everyday substances that are measured in litres i.e. liquids as opposed to solids.
    - Click on the things you would expect to be measured in litres/millilitres: a spoonful of medicine? Fruit juice for the whole class? Petrol for the car? The amount of milk in a cake?
    - Responds to questions such as: Would you expect that a teapot would hold close to 1 litre, 10 litres or 100 litres? Would you expect a small bottle of lemonade to hold about 250mL or about 1 250mL?
4. Know that 1 litre = 1 000 millilitres and _ litre = 500mL and _ litre = 250mL and 1/10 litre = 100mL
5. Read and interpret measurements of volume to the nearest litre, the nearest 100mL and to the millilitre on a measuring device calibrated in mL E.g.
    - How much juice is in the jug? Water in the bucket? Water in the measuring cylinder? Medicine in the medicine glass?
6. Recognise and writes volume measurements using half-, tenth- and quarter-litres written as decimal numbers E.g. 1.25L, 1.5L, 4.1L
7. Begin to convert between litres and millilitres. E.g. Write 1.5L in millilitres. Write 1 500mL in litres.

8. Begin to round decimal measurements to the nearest whole unit. E.g. A saucepan holds 4 250mL. How much does it hold to the nearest litre?
9. Order containers smaller than 1 litre by interpreting capacities expressed in millilitres. E.g. fruit juice containers, measuring cups and spoons, medicine glass, perfume bottles, small bottles of soft drink.
10. Solve problems relating to capacity in everyday contexts. E.g. How much is left in a one-litre container of juice after three 200mL glasses are poured?
    - How many 1.25L bottles of lemonade would be needed to fill a 10L container?
    - Which juice is cheaper – Calypso Citrus (200mL costs 90 cents) or Troppo Treat (500mL costs $2.30)?

Volume & Capacity – 7

1. Relate capacity of different containers to the standard measurement of one litre. E.g. Click on the containers that will hold more/less than 1 litre, reading volume measurements that are recorded on the containers displayed.
2. Recognise everyday substances that are measured in litres i.e. liquids as opposed to solids.
    - Click on the things you would expect to be measured in litres/millilitres: a spoonful of medicine? Fruit juice for the whole class? Petrol for the car? The amount of milk in a cake?
    - Responds to questions such as: Would you expect that a teapot would hold close to 1 litre, 10 litres or 100 litres? Would you expect a small bottle of lemonade to hold about 250mL or about 1 250mL?
3. Know that 1 litre = 1 000 millilitres and _ litre = 500mL and _ litre = 250mL and 1/10 litre = 100mL
4. Recognise that 1 cubic centimetre is the space occupied by a cube whose edges are all 1cm long. (E.g. Click on the one-centimetre cube.) Know the abbreviation for one cubic centimetre is $1cm^3$.

5. Can identify how many uniform units (e.g. cubic centimetres) make up a regular or simple irregular 3-D shape.



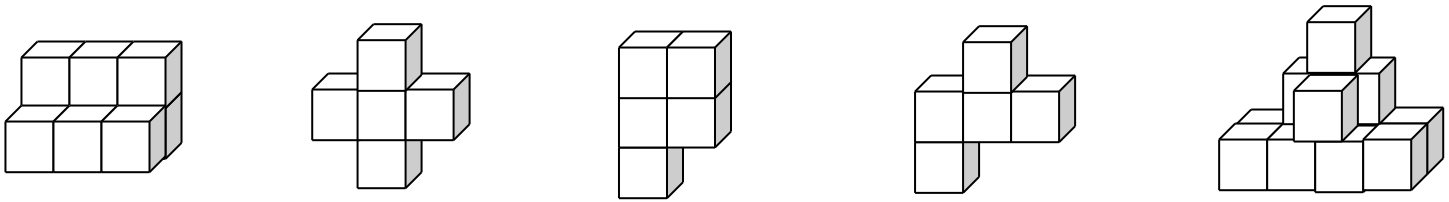
Read and interpret measurements of volume to the nearest litre, the nearest 100mL and to the millilitre on a measuring device calibrated in mL. E.g.

- How much juice is in the jug? Water in the bucket? Water in the measuring cylinder? Medicine in the medicine glass?

6. Recognise and write volume measurements using half-, tenth- and quarter-litres written as decimal numbers E.g. 1.25L, 1.5L, 4.1L
7. Begin to convert between litres and millilitres. E.g. Write 1.5L in millilitres. Write 1 500mL in litres.
8. Begin to round decimal measurements to the nearest whole unit. E.g. A saucepan holds 4 250mL. How much does it hold to the nearest litre?
9. Order containers smaller than 1 litre by interpreting capacities expressed in millilitres. E.g. fruit juice containers, measuring cups and spoons, medicine glass, perfume bottles, small bottles of soft drink.
10. Solve problems relating to capacity in everyday contexts. E.g. How much is left in a one-litre container of juice after three 200mL glasses are poured?
    - How many 1.25L bottles of lemonade would be needed to fill a 10L container?
    - A swimming pool has a capacity of 43 000L. Forty thousand litres have already flowed into the pool and water is flowing in at a rate of 10 litres per minute. How many hours longer will it take to fill the pool?
    - A full bucket holds 5_L. A full jug holds _L. How many jugs full of water will be needed to fill the bucket?

Volume & Capacity – 8

1. Relate capacity of different containers to the standard measurement of one litre. E.g. Click on the containers that will hold more/less than 1 litre, reading volume measurements that are recorded on the containers displayed.
2. Recognise everyday substances that are measured in litres i.e. liquids as opposed to solids.
   - Click on the things you would expect to be measured in litres/millilitres: a spoonful of medicine? Fruit juice for the whole class? Petrol for the car? The amount of milk in a cake?
   - Responds to questions such as: Would you expect that a teapot would hold close to 1 litre, 10 litres or 100 litres? Would you expect a small bottle of lemonade to hold about 250mL or about 1 250mL?
3. Know that 1 litre = 1 000 millilitres and _ litre = 500mL and _ litre = 250mL and 1/10 litre = 100mL
4. Know that 1 cubic centimetre is the space occupied by a cube whose edges are all 1cm long. Know the abbreviation for one cubic centimetre is $1cm^3$.
5. Can identify how many uniform units (e.g. cubic centimetres) make up a regular or simple irregular 3-D shape.



6. Recognise how many cubic centimetres will be needed to fill rectangular containers with simple dimensions marked in grids. E.g. How many cubic centimetres would fit in this box?

7. Begin to relate measurements of volume and capacity.
   Know that 1cm^3 is equivalent to 1 millilitre.
   Know that 1cm^3 =1 000mm^3
   1L = 1 000mL = 1 000cm^3
   1m^3 = 1 000 000cm^3 = 1 000L = 1 kL
   Convert between different units. E.g.
   - A milk container has a volume of 1 500 cm^3. How many litres of milk does it hold when full?
   - A swimming pool is 25m long, 10m wide and 1m deep. How many kilolitres of water does it contain?
8. Read and interpret measurements of volume to the nearest litre, the nearest 100mL and to the millilitre on a measuring device calibrated in mL. E.g.
   - How much juice is in the jug? Water in the bucket? Water in the measuring cylinder? Medicine in the medicine glass?
9. Round decimal measurements to the nearest whole unit. E.g. A reservoir holds 4 250kL. How much does it hold to the nearest kilolitre?
10. Order containers by interpreting capacities expressed in mixed units of litres and millilitres. E.g. fruit juice containers, measuring cups and spoons, medicine glass, perfume bottles, large and small bottles of drink.
11. Solve problems relating to capacity in everyday contexts. E.g. How much is left in a two-litre container of juice after three 200mL glasses are poured?
    - How many 1.25L bottles of lemonade would be needed to fill a 10L container?
    - A swimming pool has a capacity of 43 000L. Forty thousand litres have already flowed into the pool and water is flowing in at a rate of 10 litres per minute. How many hours longer will it take to fill the pool?
    - The football club has 400L of soup for the fans. One cup of soup is 250mL. How many fans can have one cup of soup?

- Mum's car holds 40L of petrol. Dad's van holds two and a half times as much. How much petrol does Dad's van hold?
- There is 300mL of oil in a small bottle. The larger size contains six and one quarter times as much. How much oil is in the larger bottle?
- Sean has some small cubes. The edge of each cube measures 1.5cm. He uses these cubes to make a larger cube. The volume of the larger cube is 216cm^3. How many small cubes did Sean use?

Volume & Capacity – 9

1. Know that 1cm^3 =1 000mm^3
   1L = 1 000mL = 1 000cm^3
   1m^3 = 1 000 000cm^3 = 1 000L = 1 kL and 1 litre of water has a mass of 1kg. (1mL = 1g)
2. Recognise the difference between units of volume and units of capacity, and convert between units of volume and capacity. E.g.
   - Write 23kL in litres.
   - A container has a volume of 125cm^3. How many millilitres of juice will it hold?
   - Write 14 500L in kilolitres.
3. Answer questions such as: A swimming pool is being filled at the rate of 20 litres per minute. What is that rate in kilolitres per hour?
4. Find the volume of regular prisms using the appropriate formulae:
   - V = A x H where A = area of prism cross-section
     and H = height
5. Solve problems related to volume and capacity in real-life situations including volumes of composite shapes. E.g.
   - A carton of juice measures 10cm by 20cm by 5cm. What is the volume of the carton?

- What is its capacity in litres?
- Find the volume of a house brick. What is the volume of a wall x metres long, y metres wide and 2 bricks deep?
- The volume of a cube is 512cm^3. How many centimetres long is each side?
- The volume of a cylinder is 1 420cm^3. What is its capacity in litres?
- A cubic concrete block of side 50cm has a circular hole of diameter 20cm drilled out of the block. Calculate the volume of concrete remaining to the nearest cubic centimetre.
- Two watering troughs are made by cutting a cylindrical drum in halves. The drum was 5m long, and the diameter of its base was 1.5m. What is the volume of each watering trough? If each trough is filled to the brim, what is the capacity of the trough in kilolitres? During the day 35% of the water either evaporates or is drunk by the cattle. How many litres of water are needed to refill each trough at night?
- A mailbox is constructed by placing half a cylinder on top of a square prism. The square face of the prism has a side 24cm in length. The mail box is 35cm deep. What is its total volume?

  (Give m/choice answers related to multiplication of π rather than calculating out the sum OR use 3 as an approximation of π and give an estimate of the answer)

6. Know that 1cm^3 =1 000mm^3

   1L = 1 000mL = 1 000cm^3

   1m^3 = 1 000 000cm^3 = 1 000L = 1 kL and 1 litre of water has a mass of 1kg. (1mL = 1g)
7. Recognise the difference between units of volume and units of capacity, and convert between units of volume and capacity. E.g.
   - Write 23kL in litres.

- A container has a volume of 125cm^3. How many millilitres of juice will it hold?
- Write 14 500L in kilolitres.

8. Answer questions such as: A swimming pool is being filled at the rate of 20 litres per minute. What is that rate in kilolitres per hour?
9. Find the volume of regular prisms/cylinders using the appropriate formulae:
   - V = A x H where A = area of prism cross-section
     and H = height
10. Find the volumes of cones and conic sections using the formula
    - V (cone) = 1/3 (volume of corresponding cylinder)
      = 1/3 ($\pi r^2 h$)
11. Solve problems related to volume and capacity in real-life situations including volumes of composite shapes. E.g.
    - A carton of juice measures 10cm by 20cm by 5cm. What is the volume of the carton?
    - What is its capacity in litres?
    - Find the volume of a house brick. What is the volume of a wall x metres long, y metres wide and 2 bricks deep?
    - The volume of a cube is 512cm^3. How many centimetres long is each side?
    - The volume of a cylinder is 1420cm^3. What is its capacity in litres?
    - A cubic concrete block of side 50cm has a circular hole of diameter 20cm drilled out of the block. Calculate the volume of concrete remaining to the nearest cubic centimetre.
    - Two watering troughs are made by cutting a cylindrical drum in halves. The drum was 5m long, and the diameter of its base was 1.5m. What is the volume of each watering trough? If each trough is filled to the brim, what is the capacity of the trough in kilolitres? During the day 35% of the water either evaporates or is drunk by the cattle. How many litres of water are needed to refill each trough at night?
    - A mailbox is constructed by placing half a cylinder on top of a square prism. The square face of the prism has a side 24cm in length. The mail box is 35cm deep. What is its total volume?

(Give m/choice answers related to multiplication of π rather than calculating out the sum OR use 3 as an approximation of π and give an estimate of the answer)

Volume & Capacity – 11

1. Know that $1cm^3 = 1\,000mm^3$
   $1L = 1\,000mL = 1\,000cm^3$
   $1m^3 = 1\,000\,000cm^3 = 1\,000L = 1\,kL$ and 1 litre of water has a mass of 1kg. (1mL = 1g)
2. Recognise the difference between units of volume and units of capacity, and convert between units of volume and capacity. E.g.
   - Write 23kL in litres.
   - A container has a volume of $125cm^3$. How many millilitres of juice will it hold?
   - Write 14 500L in kilolitres.
3. Answer questions such as: A swimming pool is being filled at the rate of 20 litres per minute. What is that rate in kilolitres per hour?
4. Find the volume of regular prisms/cylinders using the appropriate formulae:
   - $V = A \times H$ where A = area of prism cross-section
     and H = height
5. Find the volumes of cones and conic sections using the formula
   - V (cone) = 1/3 (volume of corresponding cylinder)
     $= 1/3\ (\pi r^2 h)$
6. Find the volume of pyramids using the formula
   - V (pyramid) = 1/3 (volume of corresponding rectangular prism)
     $= 1/3\ A \times H$

7. Find the volume of spheres using the formula
    - V (sphere) = $4/3\pi r^3$
8. Solve problems related to volume and capacity in real-life situations including volumes of composite shapes. E.g.
    - A children's play pool is hexagonal in shape. Each side of the hexagon is 1m in length. The area of the base is 2.6m2. The sides of the pool are 60cm deep. What is the volume of the pool?
    - The manufacturer's safety guidelines recommend that the pool be filled to no more than two-thirds of its total capacity. What is the maximum amount of water that should be put in the pool?
    - One cubic centimetre of steel has a mass of 6.8g. What is the total mass of a solid steel hemispherical paper-weight with a diameter of 5cm?
    - What is the capacity, in litres, of a basketball whose inner diameter is 25cm?
    - The volume of a cylinder is 1 420cm^3. What is its capacity in litres?
    - A cubic concrete block of side 50cm has a circular hole of diameter 20cm drilled out of the block. Calculate the volume of concrete remaining to the nearest cubic centimetre.
    - A swimming pool is in the shape of a trapezoidal prism. What is the volume of the pool in cubic metres?
    - A mailbox is constructed by placing half a cylinder on top of a square prism. The square face of the prism has a side 24cm in length. The mail box is 35cm deep. What is its total volume?

        (Give m/choice answers related to multiplication of π rather than calculating out the sum OR use 3 as an approximation of π and give an estimate of the answer)

TIME

Time – 1

Vocabulary: night, day, morning, afternoon, today, tomorrow, yesterday, all day, a long time, a short time, lunchtime, bedtime, before, after.

1. Can order pictures of familiar daily events in correct time sequence.
2. Can sequence events in familiar stories and rhymes.
3. Can compare duration of familiar daily events.
4. Knows and can order the days of the week.
5. Knows the names and order of the seasons.
6. Can sequence pictures representing stages of development. E.g. stages of growth from baby to child to adult.
7. Can identify errors in a sequence e.g. egg to frog to tadpole
8. Can recognise different devices for measuring time – clock (analogue & digital), calendar, stopwatch, sundial

Time – 2

Vocabulary: night, day, morning, afternoon, today, tomorrow, yesterday, all day, a long time, a short time, lunchtime, bedtime, before, after, hour, day, week, month, year, season, weekend, midnight, fast, slow, late, early, soon, now, how long, how often, sometimes, always, never, usually, once, twice…

1. Can order pictures of familiar daily events in correct time sequence.
2. Can sequence events in familiar stories and rhymes.
3. Can compare duration of familiar daily events.
4. Knows and can order the days of the week.
5. Knows the names and order of the seasons.
6. Can sequence pictures representing stages of development. E.g. stages of growth from baby to child to adult.

7. Can identify errors in a sequence e.g. egg to frog to tadpole
8. Can recognise different devices for measuring time – clock (analogue & digital), calendar, stopwatch, sundial
9. Can read time to the hour on an analogue clock.

Time – 3

Vocabulary: : night, day, morning, afternoon, today, tomorrow, yesterday, all day, a long time, a short time, lunchtime, bedtime, before, after, second, minute, hour, day, week, fortnight, month, year, season, weekend, midnight, fast, slow, late, early, soon, now, how long, how often, sometimes, always, never, usually, once, twice …

1. Knows that 1 week = 7 days
   1 hour = 60 minutes
1. Knows in order the months of the year.
2. Knows in order the seasons of the year.
3. Knows in order the days of the week.
4. Reads the time to the hour and half hour on an analogue or a digital clock.
5. Makes sensible estimates about duration of familiar events. E.g. things that take 10 minutes, 1 hour, 1 day, 1 week, 1 year….

Time – 4

Vocabulary: : night, day, morning, afternoon, today, tomorrow, yesterday, all day, a long time, a short time, lunchtime, bedtime, before, after, second, minute, hour, day, week, fortnight, month, year, century, calendar, date, a.m. and p.m., season, weekend, midnight, fast, slow, late, early, soon, now, how long, how often, sometimes, always, never, usually, once, twice ...

1. Know that 1 minute = 60 seconds
   1 hour = 60 minutes
   1 day = 24 hours
   1 week = 7 days
   1 year = 365 days
2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to the hour, half hour and quarter hour on an analogue or a digital clock. E.g.
   - Match a digital display with an analogue display.
   - Click on the clock faces that show three o'clock.
   - Write what time it will be in half an hour. 7:30 / 8:15 / 6:45
   - Write the time shown on this clock.
6. Suggest suitable units to measure: the time until the end of the month, the time to boil an egg, the length of a school day, the time to blink 3 times.
7. Recognise duration of familiar events: E.g. What takes about 30 minutes? About 3 hours? About 4 weeks?
8. Order familiar events on a time line. E.g. Given a day's activities, place the times next to each event. (digital or analogue)

Time – 5

Vocabulary: : night, day, morning, afternoon, today, tomorrow, yesterday, all day, a long time, a short time, lunchtime, bedtime, before, after, second, minute, hour, day, week, fortnight, month, year, century, calendar, date, a.m. and p.m., season, weekend, midnight, fast, slow, late, early, soon, now, how long, how often, sometimes, always, never, usually, once, twice ...

1. Know that 1 minute = 60 seconds
   1 hour = 60 minutes
   1 day = 24 hours
   1 week = 7 days
   1 year = 365 days
   1 leap year = 366 days, with the extra day being February 29
   1 year = 12 months
   1 year = 52 weeks and 1 day
2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to five minutes on an analogue or a digital clock. E.g.
   - Match a digital display with an analogue display.
   - Click on the clock faces that show three o'clock.
   - Write what time it will be in one hour/half an hour/a quarter of an hour: 7:30 / 8:15 / 6:45
   - Write the time shown on this clock.
   - Know that 8:35 is the same as “35 minutes past 8” and “25 minutes to 9”
   - Use a.m. and p.m. E.g. Our school lunch time begins at 12:30 (a.m./p.m.)? I go to bed at 7:30 (a.m./p.m.)?

6. Suggest suitable units to measure: the time it takes to eat lunch, to watch a movie, how long till the end of the year.
7. Recognise duration of familiar events: E.g. What takes about 30 minutes? About 3 hours? About 4 weeks?
    - Hanni will be 10 years old in one week's time. Has she lived more or less than 500 weeks?
8. What measuring instrument would be used to time a 100m race? How long a cake is cooked?
9. Begin to solve simple problems from the context of everyday life involving time. E.g.
    - Tim's train left Groveleigh Station at 8:10am and arrived at Central Station at 8:55am. How long did the journey take?
    - Greta set the video to begin recording at 7:25pm and finish at 9:40pm. How long was it recording?
    - Jamie put a cake into the oven at 12:05. He set the timer for 45 minutes. At what time will the timer bell ring?
    - Pradeep arrived at school at 8:15. His journey had taken half an hour. At what time did he leave home?
    - Ian got in the pool at 3:30pm. He swam for 40 minutes. At what time did he get out?
    - Lunch takes 50 minutes. It ends at 1:35pm. What time does it start?

Time – 6

Vocabulary: : night, day, morning, afternoon, today, tomorrow, yesterday, all day, a long time, a short time, lunchtime, bedtime, before, after, second, minute, hour, day, week, fortnight, month, year, century, calendar, date, a.m. and p.m., season, weekend, midnight, fast, slow, late, early, soon, now, how long, how often, sometimes, always, never, usually, once, twice ...

1. Know that
    1 minute = 60 seconds
    1 hour = 60 minutes
    1 day = 24 hours
    1 week = 7 days
    1 year = 365 days

1 leap year = 366 days, with the extra day being February 29
1 year = 12 months
1 year = 52 weeks and 1 day
1 decade = 10 years
1 century = 100 years
1 millenium = 1 000 years

2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to one minute on an analogue or a digital clock. E.g.
    - Match a digital display with an analogue display.
    - Click on the clock faces that show three o'clock, twenty past four, eleven thirty, five to one, a quarter to five
    - Write what time it will be in half an hour. 7:30 / 8:15 / 6:45
    - Write what time it will be in 15 minutes/5 minutes/10 minutes/1 hour.
    - Write the time shown on this clock.
    - Know that 8:35 is the same as "35 minutes past 8" and "25 minutes to 9"
    - Use a.m. and p.m. E.g. Our school lunch time begins at 12:30 (a.m./p.m.)? I go to bed at 7:30 (a.m./p.m.)?
6. Suggest suitable units to measure: the time it takes to eat lunch, to watch a movie, how long till the end of the year.
7. Recognise duration of familiar events: E.g. What takes about 30 minutes? About 3 hours? About 4 weeks?
    - Hanni will be 10 years old in one week's time. Has she lived more or less than 500 weeks?
    - Jack is 11 years and 6 months old. Has he lived for 100 000 hours yet? Has he lived for 4 000 days?

- What units of time would be used to measure: a) The age of an old redwood tree b) How long it takes a ball to fall to the ground c) How long it takes a seed to come up after it has been planted d) How long you are asleep in a week e) How long a cake takes to bake

8. Begin to read and interpret timetables. E.g.
   - This table show the times for buses going to Worthmoor:

8:00 am	10:30am	1:00pm	3:30pm	5:00pm

   - Courtney arrives at the bus stop at 2:50pm. How long will she have to wait for the next bus?
   - The 10:30am bus is 35 minutes late. What time does it arrive?
   - How long is it between the first bus and the last bus of the day?
9. Solve problems relating to everyday life involving time. E.g.
   - A bus takes 20 minutes to travel between each stop. Complete the timetable:

High Street	11:05		1:45
Church Street			
Post Office		1:05	
University			

   - Liz and Holly work in the same office block. Liz's bus leaves at 7:55am. Holly's train leaves at 8:06am. Liz's bus takes 27 minutes to travel to the bus stop directly outside the office. Holly's train takes 15 minutes to reach the closest station, and she walks for five minutes to get to the office. Which girl reaches the

office building first? (Liz arrives 4 minutes before Holly, Holly arrives 1 minute before Liz, Holly arrives 2 minutes after Liz. They arrive at exactly the same time.)

- The sun rose at 4:45am and set at 6:15pm. How many hours of sunshine were there? If the sun rose again next day at 4:42am, how many hours and minutes of darkness were there?

Time – 7

1. Know that
   1 minute = 60 seconds
   1 hour = 60 minutes
   1 day = 24 hours
   1 week = 7 days
   1 year = 365 days
   1 leap year = 366 days, with the extra day being February 29
   1 year = 12 months
   1 year = 52 weeks and 1 day
   1 decade = 10 years
   1 century = 100 years
   1 millenium = 1000 years
2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to one minute on an analogue or a digital clock. E.g.
   - Match a digital display with an analogue display.
   - Click on the clock faces that show three thirteen, twenty-six minutes past four, eleven thirty-seven, eight minutes to one, nineteen minutes to five

- Write what time it will be in half an hour, in fifteen minutes, in six minutes, in seventeen minutes, in thirty-four minutes. 7:30 / 8:15 / 6:45
- Write the time shown on this clock.
- Know that 8:35 is the same as “35 minutes past 8” and “25 minutes to 9”
- Use a.m. and p.m. E.g. Our school lunch time begins at 12:30 (a.m./p.m.)? I go to bed at 7:30 (a.m./p.m.)?

6. Read and understand 24-hour time. Convert between 12-hour and 24-hour times. E.g
   - A train departing at 07:55 arrived at its destination at 17:00. How long did the journey take?
   - A car race began at 08:45 and finished at 14:35. How long did the race last?
   - Fill in the gaps in this timetable:

Seven o'clock in the morning	19:00h	7:00pm
A quarter to ten in the morning		
	14:20h	
	22:15h	
Midnight		
17 minutes past four in the afternoon		

7. Suggest suitable units to measure: the time it takes to eat lunch, to watch a movie, how long till the end of the year.
8. Recognise duration of familiar events: E.g. What takes about 30 minutes? About 3 hours? About 4 weeks?
   - Hanni will be 10 years old in one week's time. Has she lived more or less than 500 weeks?
   - Jack is 11 years and 6 months old. Has he lived for 100 000 hours yet? Has he lived for 4 000 days?

- What units of time would be used to measure: a) The age of an old redwood tree b) How long it takes a ball to fall to the ground c) How long it takes a seed to come up after it has been planted d) How long you are asleep in a week e) How long a cake takes to bake

9. Read and interpret timetables: E.g.

Birmingham New Street	09:40	10:05	11:05	12:35
Birmingham International	09:50	10:15	11:15	12:45
Coventry	10:10	10:30	11:30	13:00
Leamington Spa	10:25	....	11:45	13:15
Banbury	10:45	....	12:05	....
Oxford	11:05	11:20	12:25	13:55
Reading	11:30	11:55	12:50	14:25

- What time does the 09:40 from Birmingham New Street arrive at Reading?
- Which train makes the fastest journey from Birmingham New Street to Reading?
- At how many stations does the 10:15 from Birmingham International stop before it reaches Reading?
- How long does it take the 13:55 from Oxford to reach Reading?
- Celia needs to arrive in Oxford at 2:00pm . Which train should she catch from Coventry?
- James gets to Leamington at 09:30. How long must he wait for a train to Reading?

10. Solve problems relating to everyday life involving time.

Time – 8

1. Know that 1 minute = 60 seconds
   1 hour = 60 minutes
   1 day = 24 hours
   1 week = 7 days
   1 year = 365 days
   1 leap year = 366 days, with the extra day being February 29
   1 year = 12 months
   1 year = 52 weeks and 1 day
   1 decade = 10 years
   1 century = 100 years
   1 millenium = 1 000 years
2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to one minute on an analogue or a digital clock.
6. Read and understand 24-hour time. Convert between 12-hour and 24-hour times.
7. Interpret a world time chart and answer questions such as: It is 12 noon Australian Eastern Summer Time in Sydney. What time is it in London? It is 12 noon in London. What time is it in New York?
8. Suggest suitable units to measure: the time it takes to eat lunch, to watch a movie, how long till the end of the year.
9. Recognise duration of familiar events.
10. Solve problems relating to everyday life involving time.

· Answer questions such as: If 24 June falls on Monday, what day of the week is 1 July?

Time – 9

1. Know that 1 minute = 60 seconds
   1 hour = 60 minutes
   1 day = 24 hours
   1 week = 7 days
   1 year = 365 days
   1 leap year = 366 days, with the extra day being February 29
   1 year = 12 months
   1 year = 52 weeks and 1 day
   1 decade = 10 years
   1 century = 100 years
   1 millenium = 1 000 years
2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to one minute on an analogue or a digital clock.
6. Read and understand 24-hour time. Convert between 12-hour and 24-hour times.
7. Interpret a world time chart and answer questions such as: It is 12 noon Australian Eastern Summer Time in Sydney. What time is it in London? It is 12 noon in London. What time is it in New York?
8. Suggest suitable units to measure: the time it takes to eat lunch, to watch a movie, how long till the end of the year.
9. Recognise duration of familiar events.
   - Solve problems relating to everyday life involving time.

Time – 10&11

1. Know that 1 minute = 60 seconds
   1 hour = 60 minutes
   1 day = 24 hours
   1 week = 7 days
   1 year = 365 days
   1 leap year = 366 days, with the extra day being February 29
   1 year = 12 months
   1 year = 52 weeks and 1 day
   1 decade = 10 years
   1 century = 100 years
   1 millenium = 1 000 years
2. Know in order the months of the year.
3. Know in order the seasons of the year.
4. Know in order the days of the week.
5. Read the time to one minute on an analogue or a digital clock.
6. Interpret a world time chart.
7. Suggest suitable units to measure: the time it takes to eat lunch, to watch a movie, how long till the end of the year.
8. Recognise duration of familiar events.
9. Solve problems relating to everyday life involving time.
10. Perform additions, subtractions, multiplications and divisions involving minutes, seconds and hours to solve problems related to everyday life.

PATTERNS, RELATIONSHIPS & REASONING

Patterns, Relationships & Reasoning – 1

1. Can identify patterns in colour, shape, size and number. E.g. Can click on the patterns that are the same (or put blue counters (or frogs) on these patterns and yellow counters (or dogs) on those patterns).
2. Can copy patterns in colour, shape, size and number. E.g. Can arrange a set of objects to match another given set.
   - Can choose the 'missing link' from a number of options.
3. Can extend patterns in colour, shape, size and number. E.g.
   - Can put the next elements on the end of a pattern. E.g 5 red cubes, then 4 red and 1 yellow, then 3 red and 2 yellow. Make the next set in the pattern.
   - A pattern with the counting numbers underneath. What shape will the number 10 be?
4. Can identify process: Given a simple counting pattern E.g. 5, 4, 3, 2, How do we make the next number? (Add 1) (Add 2) (Take 1) (Take 2) Can count in ones up to and down from 20, can count in twos up to and down from 10.
5. Can recognise inconsistencies in a pattern. E.g. One of these things is not like the others. Which number does not belong?
6. Can order new objects to make a set like a given one. E.g. Can choose from a selection of objects the elements needed to match a given pattern. (given 6 things, can select the 4 needed to match the pattern, and can arrange them in the correct order).
7. Can sort sets of objects (balls, flowers, animals, etc)
8. Can classify sets of objects.
   - Put all the red shapes in the box with the elephant. Put all the blue shapes in the box with the tiger.
   - Click on all the shapes that are round.
   - Click on all the shapes that are not round.
9. Can order sets of objects (largest to smallest, number order)

10. Can recognise equivalence in patterns. E.g. Put a star on the patterns that match. (Blue shape, blue shape, red shape) (Elephant, elephant, tiger) (egg, egg, spoon) (square, square, triangle)
11. Can recognise equivalence in number. E.g. Click on the groups that show the same number. (10) (2 groups of 5) (2 groups of 4 and 2 singles) (3 groups of 3 and 1 more).

Patterns, Relationships & Reasoning – 2

1. Can identify patterns in colour, shape, size and number. E.g. Can click on the patterns that are the same (or put blue counters (or frogs) on these patterns and yellow counters (or dogs) on those patterns).
2. Can copy patterns in colour, shape, size and number. E.g. Can arrange a set of objects to match another given set.
    - Can choose the 'missing link' from a number of options.
3. Can extend patterns in colour, shape, size and number. E.g.
    - Can put the next elements on the end of a pattern. E.g 5 red cubes, then 4 red and 1 yellow, then 3 red and 2 yellow. Make the next set in the pattern.
    - A pattern with the counting numbers underneath. What shape will the number 14 be?
4. Can identify process: Given a simple counting pattern E.g 10, 9, 8, 7, How do we make the next number? (Add 1) (Add 2) (Take 1) (Take 2) - Can count in twos up to and down from 20.
5. Can recognise inconsistencies in a pattern. E.g. One of these things is not like the others. Which number does not belong?
6. Can order new objects to make a set like a given one. E.g. Can choose from a selection of objects the elements needed to match a given pattern. (given 6 things, can select the 4 needed to match the pattern, and can arrange them in the correct order).
7. Can sort sets of objects (balls, flowers, animals, etc)
8. Can classify sets of objects.

- Put all the red shapes in the box with the elephant. Put all the blue shapes in the box with the tiger.
- Click on all the shapes that are round.
- Click on all the shapes that are not round.

9. Can order sets of objects (largest to smallest, number order, days of the week, months of the year)
10. Can recognise equivalence in patterns. E.g. Put a star on the patterns that match. (Blue shape, blue shape, red shape) (Elephant, elephant, tiger) (egg, egg, spoon) (square, square, triangle)
11. Can recognise equivalence in number. E.g.
    - Click on the groups that show the same number. (15) (3 groups of 5) (3 groups of 4 and 3 singles) (a ten group and a five group) (a ten group and five singles)
    - Click on groupings of objects that show the same number. E.g. click on the boxes where there are 5 pets. (3 cats and 2 dogs) (4 budgies and 1 rabbit) (5 clownfish in a fish tank)
12. Counting patterns. Make a 30-grid. Put (stars, buttons, balls, whatever) on every (second, third, fourth, fifth) number.

Patterns, Relationships & Reasoning – 3

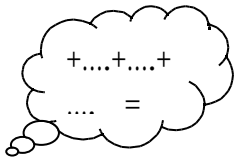
1. Can identify patterns in colour, shape, size and number. E.g.
    - Click on the patterns that are the same
    - Put blue counters (or frogs) on these patterns and yellow counters (or dogs) on those patterns.
2. Can copy patterns in colour, shape, size and number. E.g.
    - Arrange a set of objects to match another given set.
    - Choose the 'missing link' from a number of options.
3. Can extend patterns in colour, shape, size and number. E.g.
    - Put the next elements on the end of a pattern. E.g 5 red cubes, then 4 red and 1 yellow, then 3 red and 2 yellow. Make the next set in the pattern.

- A pattern with the counting numbers underneath. What shape will the number 14 be?

4. Can identify process: Given a simple counting pattern E.g 10, 9, 8, 7, How do we make the next number? (Add 0) (Add 1) (Add 2) (Take 1) (Take 2) - Can count in twos up to and down from 50.
5. Can recognise inconsistencies in a pattern. E.g. One of these things is not like the others. Which number does not belong?
6. Can order new objects to make a set like a given one. E.g. Can choose from a selection of objects the elements needed to match a given pattern. (given 6 things, can select the 4 needed to match the pattern, and can arrange them in the correct order).
7. Can sort sets of objects (balls, flowers, animals, etc)
8. Can classify sets of objects.
    - Put all the red shapes in the box with the elephant. Put all the blue shapes in the box with the tiger.
    - Click on all the shapes that are round.
    - Click on all the shapes that are not round.
9. Can order sets of objects (largest to smallest, number order, days of the week, months of the year, hours, seasons)
10. Can recognise equivalence in patterns. E.g. Put a star on the patterns that match. (Blue shape, blue shape, red shape) (Elephant, elephant, tiger) (egg, egg, spoon) (square, square, triangle)
11. Can recognise equivalence in number. E.g.
    - Click on the groups that show the same number. (30) (3 groups of 10) (6 groups of 5) (2 ten groups and 2 five groups) (a ten group and 4 groups of five)
    - Click on groupings of objects that show the same number. E.g. click on the boxes where there are 5 pets. (3 cats and 2 dogs) (4 budgies and 1 rabbit) (5 clownfish in a fish tank)
    - Click on expressions that are equivalent in value to a given expression. E.g. Click on all the expressions that could go on the other side of the equals sign. 7 + 7 = (14) (10 + 4) (7 + 3 + 4) (7 + 5 + 2)
12. Can identify and continue counting patterns.

- Make a 50-grid. Put (stars, buttons, balls, opaque red box?) on every (second, third, fourth, fifth, tenth) number.
- Show part of a number track. Put the number 42 in the right box.
- Describe this pattern. Choose the box that describes the number pattern. (Add 1) (Add 2) (Add 2, then Take 1) (odd numbers) (even numbers)
- Counting Circles. Pictures of children in a circle formation, 20, 30, 40, 50, Who will say 90? Also 82, 72, 62, Who will say 32?
- What odd number comes next after 13? After 7?
- On a grid or part of a grid – put stars on all the odd/even numbers.
- Show displays of numbers using centicubes or similar. Click on the numbers that will divide into 2 equal groups.

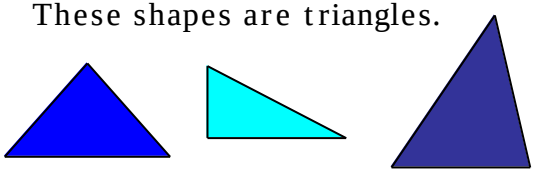
13. Can reason about number operations and find unknown numbers or quantities in everyday contexts. E.g.
    - There were 11 cakes on the tray. I ate ☐ of them. There were 9 cakes left.
    - Ana is 2 years older than Dominic. Next year Dominic will turn 6. How old is Ana?
    - Which operation sign is missing? 24 ❀ 2 = 26 63 ❀ 8 = 71 94 ❀ 5 = 89
    - Click on three odd numbers that total 11. (Random selection of numbers – some odd, some even. Big bubble saying "=11)



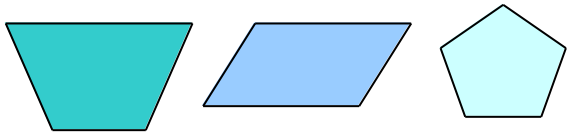
- Make a correct number sentence using these signs and numbers. 2,9,11,+,-, =.
- I think of a number, then add 2. The answer is 7. What was the first number?
- Marty rolled two dice. He got a score of 8. The same number was on both dice. What was the number?
- Half the apples in the bag have been eaten. There are 3 left. How many apples were there at first?
- William thinks of a number. Half his number is 8. What is his number?

- There are 6 people on a bus. 8 more get on and 3 get off. How many are on the bus now?
- Keiran is 140cm tall. Alex is 5cm taller. How tall is Alex?

14. Can recognise the accuracy of a general statement. E.g.
    - These shapes are triangles.



    - These shapes are not triangles.



Click on the sentence that is true: All triangles have 3 points All blue shapes are triangles.

Patterns, Relationships & Reasoning – 4

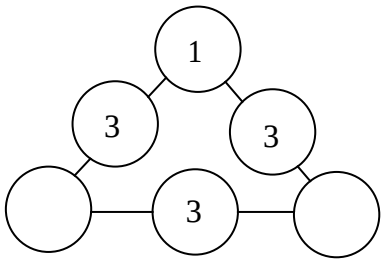
1. Can identify patterns in colour, shape, size and number. E.g.
    - Click on the patterns that are the same
    - Put blue counters (or frogs) on these patterns and yellow counters (or dogs) on those patterns.
2. Can copy patterns in colour, shape, size and number. E.g.
    - Arrange a set of objects to match another given set.
    - Choose the 'missing link' from a number of options.
3. Can extend patterns in colour, shape, size and number. E.g.

- Put the next elements on the end of a pattern. E.g 5 red cubes, then 4 red and 1 yellow, then 3 red and 2 yellow. Make the next set in the pattern.
- A pattern with the counting numbers underneath. What shape will the number 14 be?

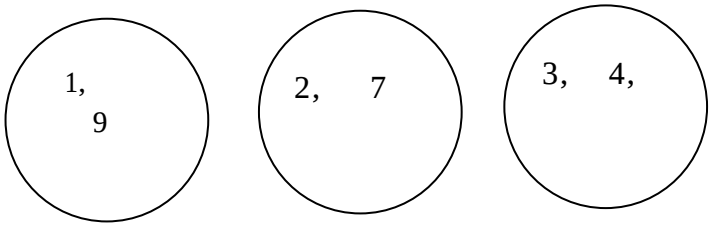
4. Can identify process: Given a simple counting pattern E.g 10, 9, 8, 7, How do we make the next number? (Add 0) (Add 1) (Add 2) (Take 1) (Take 2) - Can count in twos up to and down from 50.
5. Can recognise inconsistencies in a pattern. E.g. One of these things is not like the others. Which number does not belong?
6. Can order new objects to make a set like a given one. E.g. Can choose from a selection of objects the elements needed to match a given pattern. (given 6 things, can select the 4 needed to match the pattern, and can arrange them in the correct order).
7. Can sort sets of objects (balls, flowers, animals, etc)
8. Can classify sets of objects.
    - Put all the red shapes in the box with the elephant. Put all the blue shapes in the box with the tiger.
    - Click on all the shapes that are round.
    - Click on all the shapes that are not round.
9. Can order sets of objects (largest to smallest, number order, days of the week, months of the year, hours, seasons)
10. Can recognise equivalence in patterns. E.g. Put a star on the patterns that match. (Blue shape, blue shape, red shape) (Elephant, elephant, tiger) (egg, egg, spoon) (square, square, triangle)
11. Can recognise equivalence in number. E.g.
    - Click on the groups that show the same number. (30) (3 groups of 10) (6 groups of 5) (2 ten groups and 2 five groups) (a ten group and 4 groups of five)
    - Click on groupings of objects that show the same number. E.g. click on the boxes where there are 5 pets. (3 cats and 2 dogs) (4 budgies and 1 rabbit) (5 clownfish in a fish tank)

- Click on expressions that are equivalent in value to a given expression. E.g. Click on all the expressions that could go on the other side of the equals sign. 7 + 7 = (14) (10 + 4) (7 + 3 + 4) (7 + 5 + 2)

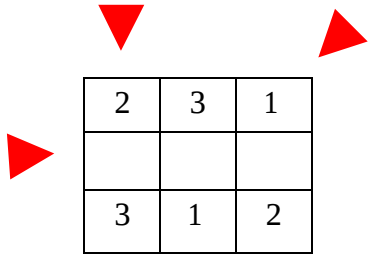
12. Can identify and continue counting patterns.
    - Make a 100-grid. Put (stars, buttons, balls, opaque red box?) on every (second, third, fourth, fifth, sixth, eighth, ninth, tenth) number.
    - Show part of a number track. Put the number 58 in the right box.
    - Describe this pattern. Choose the box that describes the number pattern. (Add 1) (Add 2) (Add 2, then Take 1) (odd numbers) (even numbers)
    - Counting Circles. Pictures of children in a circle formation, 20, 30, 40, 50, Who will say 90? Also 82, 72, 62, Who will say 32?
    - What odd number comes next after 13? After 7?
    - On a grid or part of a grid – put stars on all the odd/even numbers.
    - Show displays of numbers using centicubes or similar. Click on the numbers that will divide into 2 equal groups.
13. Can reason about number operations and find unknown numbers or quantities in everyday contexts. E.g.
    - There were ☐ cakes on the tray. I ate 4 of them. There were 18 cakes left.
    - Ana is 2 years older than Dominic. Next year Dominic will turn 6. How old is Ana?
    - Which operation sign is missing? 60 ❀ 4 = 56 63 ❀ 28 = 91 95 ❀ 5 = 100
    - Which number is missing? 60 - ❀ = 40
    - Make Five - Put the numbers 1, 2 or 3 in each blank space so that each side totals (5)(6).



- Use the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9. Each circle must have three numbers. Each circle must total 15.



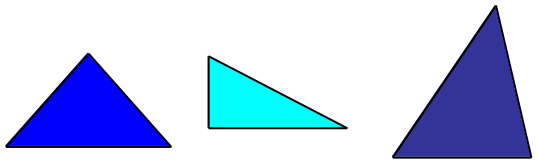
- Put the numbers 1,2 5, and 3 in the boxes so that each row, column and 6, 8 diagonal has the same total.



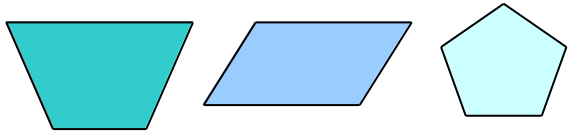
- Make 24 by adding 3 numbers. E.g. ☐ + ☐ + ☐ = 24 Choose from random selection of numbers to fill blank boxes.
- I think of a number, then add 2. The answer is 50. What was the first number?
- Half the chocolates in the box have been eaten. There are 20 left. How many chocolates were there at first?
- William thinks of a number. Half his number is 50. What is his number?
- There are 30 people on a bus. 10 more get on and 5 get off. How many are on the bus now?
- Mrs Waite cut a piece of ribbon into 5 lengths. Each length was 10cm. How long was the piece of ribbon at first?

14. Can recognise the accuracy of a general statement. E.g.

- These shapes are triangles.



- These shapes are not triangles.



Click on the sentence that is true: All triangles have 3 points All blue shapes are triangles.

15. Can relate a general statement to a number pattern. E.g. Guess My Rule. Here is a pattern: 70, 60, 50, 40…. What is the rule?

Patterns, Relationships & Reasoning – 5

1. Can identify and continue patterns formed by shapes or colours.
2. Can identify and continue number patterns.
   - Make a 100-grid. Put (stars, buttons, balls, opaque red box?) on every (second, third, fourth, fifth, seventh, sixth, eighth, ninth, tenth) number.
   - Make patterns by counting forwards or backwards in 1's, 2's, 3's, 4's, 5's, 10's, 100's, in the number range 0 to 1 000.
   - Show part of a number track (up to 1000). Put the number (598) in the right box.
   - Describe this pattern. Choose the box that describes the number pattern. (Add 1) (Add 2) (Add 2, then Take 1) (odd numbers) (even numbers)
   - What odd number comes next after 133? After 701?
3. Can identify process: Given a more complex counting pattern E.g How do we make the next two numbers? (Add 0, then add 1) (Add 2) (Take 1) (Take 2)
4. Can recognise inconsistencies in a pattern. E.g. One of these things is not like the others. Which number/shape/pattern does not belong?

5. Can recognise that the equals sign indicates equivalence in number relationships, not that an operation is to be performed. E.g.
   - Same or Different? True or False? 4 + 6 = 5 x 2
   - Number Quest. Click on all the expressions that COULD go in the blue box (i.e. on the other side of the = sign) (include simple x and ÷)
6. Can reason about number operations and find unknown numbers or quantities in everyday contexts. E.g.
   - There were 36 cakes on the tray. I ate ☐ of them. There were 18 cakes left.
   - There were 45 stickers in the box. After Tanya gave some away, there were 30 left. How many did she give away?
   - Which operation sign is missing? 60 ❀ 2 = 30 63 ❀ 3 = 189 95 ❀ 5 = 90
   - Which number is missing? 440 - ❀ = 40
   - I think of a number, then subtract 18. The answer is 26. What was the first number?
   - I think of a number, add 2, then multiply by 3. The answer is 15. What was the first number?
   - Find 3 consecutive numbers that add up to (39)(21)(36).
   - What pair of numbers has a sum of 11 and a product of 24?
     A sum of 4 and a product of 4?
     A sum of 15 and a product of 54.
   - Choose 3 digits from this set: 1, 3, 4, 8. Replace each ❀ to make this statement true:
     ❀❀ - ❀ = 38
   - Gillian sold 2 raffle tickets each to her neighbours Mr James, Mrs Carter and Mrs Finch. How many were left in her book of 20 tickets?
7. Can find examples that match a general statement. E.g. Click on the number sentence that matches the statement: The sum of three odd numbers is odd. 3 + 5 + 7 = 15 The product of an even number and an odd number is even. 4 x 103 = 412.

8. Can match a general statement to a given set of numbers. E.g. Guess My Rule: Here is a pattern: 1, 4, 7, 10, 13. What is the rule for the pattern?
9. Can match a number statement that uses a symbol for an unknown quantity to a simple "story problem". E.g. Which number statement matches this story?

    There were 10 in the bed and the middle one said, "Roll over!" So they all rolled over and one fell out.

    10 – 1 = ❀

    I think of a number. I add 2. The answer is 20.

    ❀ + 2 = 20

    There were 12 children at the birthday party. After some went home, there were 9 left.

    12 - ❀ = 9

Patterns, Relationships & Reasoning – 6

1. Can identify and continue number patterns.
    - Make patterns by counting forwards or backwards in 1's, 2's, 3's, 4's, 5's, 10's, 100's, in the number range 0 to 10 000.
    - Describe this pattern. Choose the box that describes the number pattern. (More complex e.g. (Add 1 Then Double) (Add 2, then Take 1)
2. Can recognise inconsistencies in a pattern. E.g. One of these things is not like the others. Which number/shape/pattern does not belong?
3. Can recognise that the equals sign indicates equivalence in number relationships, not that an operation is to be performed. E.g.
    - Same or Different? True or False?

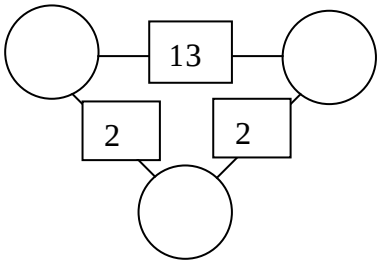
- Number Quest. Click on all the expressions that COULD go in the blue box (i.e. on the other side of the = sign) (include simple x and ÷)

4. Can reason about number operations and find unknown numbers or quantities in everyday contexts. E.g.
   - 36 students, parents and teachers went on a school excursion. There were 27 children and 6 parents. How many teachers went?
   - 192 eggs fit in 16 identical boxes. How many eggs are in each box?
   - A bus seats 48 people, and no passengers are allowed to stand. 17 people got off a full bus. How many passengers were left on board? How many buses would be needed for 227 passengers? How many people can sit on 3 buses?
   - Abby has read 132 pages of her book. There are 515 pages altogether in the book. How many more pages must she read to be at the middle page?
   - Which operation sign is missing? 500 ❀ 20 = 480 63 ❀ 3 = 21 95 ❀ 5 = 475
   - Which number is missing? 44 040 - ❀ = 40 40 400 ÷ 4 = ❀ ❀ + 40 = 44 400
   - I think of a number, then subtract 180. The answer is 26. What was the first number?
   - Henrietta thinks of a number. She subtracts 17. Then she divides by 6. The answer is 10. What was the number she first thought of?
   - On Thursday Bryce began reading his new book, called The Dragonmaster. The first page of the book was numbered 3. On Friday he read 10 more pages than he did on Thursday, and got to page 63. How many pages did he read on Thursday?
   - Gareth bought a packet of 30 biscuits. He ate one-fifth of the packet on Saturday night. He ate one-eighth of the rest on Sunday. How many were left?
   - I think of a number, add 3, then multiply by 10. The answer is 430. What was the first number?
   - Find 2 consecutive numbers with a product of 182.
   - Find 3 consecutive numbers with a sum of 333.
   - What pair of numbers has a sum of 22 and a product of 40?

A sum of 40 and a product of 400?

A sum of 60 and a product of 800?

- Put a number in each circle so that the number in each square box equals the sum of the two numbers on either side.



13, 12, 11, 10, 9,
8, 7, 6, 5,
4, 3, 2, 1

5. Can find examples that match a general statement. E.g. The product of two consecutive numbers is an even number.
   Two numbers can be multiplied in any order, but they can't be divided in any order.
6. Can formulate a general statement or rule about a mathematical operation. E.g.
   - Find the number of months in any number of years.
   - The pattern is 1, 4, 9, 16, 25…. What is the rule?

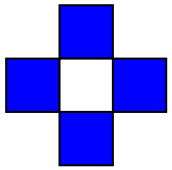
1. Can solve word problems and investigate in a number of contexts. E.g.
   - I think of a number, add 3.7, then multiply by 5. The answer is 22.5. What was the first number?
   - Use each of the digits 1, 2, 3, 4, 5 and 8 once to make this sum correct.
     □□ + □□ = □□
   - Use only the digits 2, 3, 7 or 8. Each can be used more than once.

     □□ + □□ = 54 □□ + □□ = 69 □□ + □□ = 155 □□ + □□ = 105
     □□ + □□ = 99 □□ + □□ = 110
   - Two prime numbers are added. The answer is 45. What are the two numbers?
   - Find two consecutive numbers with a product of 702. (26, 27)
   - A function machine changes the number ✂ to the new number 3✂ + 1 . What will the machine do to this number? (2, 5, 9, 21. 0)

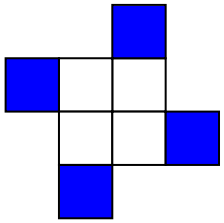
     What number must be input to get the number 10? (37, 10)
   - Here is a sequence of five numbers.

     2 □ □ □ 18

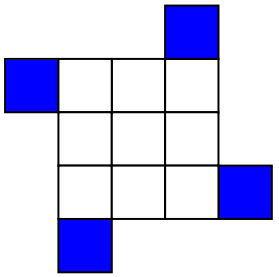
     The rule is: Start with 2. Add the same number each time. Write in the numbers missing from the sequence.
   - This is a series of patterns with white and blue tiles.



Pattern No. 1



Pattern No. 2



Pattern No. 3

- Complete this table:

Pattern No.	1	2	3	4	5	6	7	8
White tiles	1	4						
Blue tiles	4	4						

Answer questions such as:

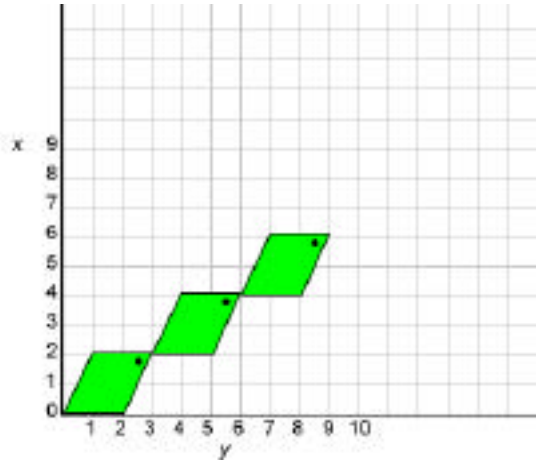
- How many blue tiles will there be in Pattern No. 8? In Pattern No. 58?
- How many white tiles will there be in Pattern No. 9? In Pattern No. 100?
- How many tiles altogether will there be in Pattern No. 50?
- Will one of the patterns have 100 white tiles?

- A line drawn on a grid passes through these points:

X	0	2	5	3	6
y	-5	-3	0	-2	1

Does this line pass through the point (10, 10)?

- Lucy has some green tiles, each with a marked corner. She sets out the tiles like this.



- What will be the coordinates of the next marked corner?
- What is the rule for finding the next set of coordinates?
- Will there be a corner that has an x-coordinate of 16?
- Lucy says, “One of the marked corners will be at the point (21, 17). Is she correct?

- This formula calculates how tall a boy is likely to grow.

> **Add the father's height and the mother's height.**
> **Divide by 2.**
> **Add 7cm to the result.**
> **A boy is likely to be this height, plus or minus 10cm.**

Marc's mother is 168cm tall and his father is 194cm tall.
What is the greatest height that Marc is likely to grow?

- Francis has 4 turns at the Lucky Dip at the Kelly Plains School Fete. She pays with a $2 coin and is given change. The cost of each Lucky Dip is c cents. Which number statement will calculate her change in cents?

  4c –2 4c – 200 2 – 4c 200 – 4c

2. Begin to understand the use of letters to stand for unknown numbers in number sentences.
   - Use letter symbols to write expressions in meaningful contexts. E.g. Make matching pairs.

Add 7 to a number	n + 7
Subtract 4 from a number	n – 4
4 minus a number	4 – n
a number multiplied by 2	n x 2
a number multiplied by 2 and then 5 added	(n x 2) + 5 or 2n + 5
a number divided by 2	n ÷ 2 or n/2
a number plus 7 and then multiplied by 10	(n + 7) x 10 or 10(n + 7)
a number multiplied by itself	n x n or n^2

   - Understand the difference between expressions such as: 2n and n + 2

$n^2 + 2n$

$3(c + 5)$ and $3c + 5$

$2n^2$ and $(2n)^2$

3. Know that algebraic expressions follow the same conventions and order as arithmetic conventions. E.g.

In the expression $2 + 5a$, the multiplication is to be performed first.

4. Know that the same commutative and associative laws apply to algebraic expressions as they do to arithmetic progressions.

True or False? $a + b = b + a$

$a \times b = b \times a$

$ab = ba$

$a + (b + c) = a + b + c = (a + b) + c$

$a \times (b \times c) = (a \times b) \times c = a \times b \times c$

$abc = a(bc) = (ab)c = ac(b) = acb = cab$ etc….

Truth Quest: Is it true that

If	$a + b = 5$	then $b + a = 5$	and $5 - b = a$	and $5 - a = b$
If	$ab = 24$	then $ba = 24$	and $24/b = a$	and $24/a = b$

Back Track: I think of a number, multiply by 6 and add on 4. What was the original number?

Which equation will calculate the number? $nx6 + 4 = 34$ so $n = (34 - 4) \div 6$

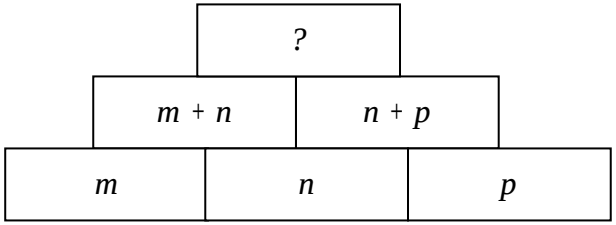
There are 26 biscuits altogether on 2 plates. The second plate has 8 fewer biscuits than the first plate. How many biscuits are on each plate?

Find the size of the angle a in a triangle with angles a, $a + 10$ and $a + 20$.

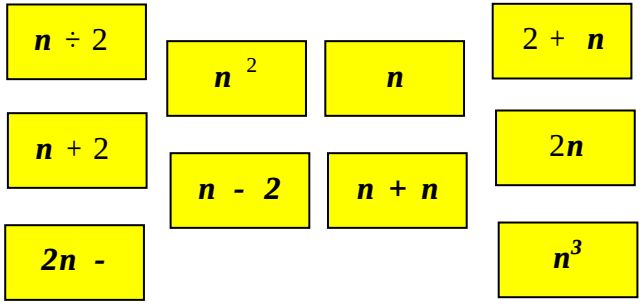
5. Simplify linear expressions by collecting like terms. E.g. Fill in the missing numbers:

- $a + a + a = \square a$ $3n + 2n = \square n$ $b + 2b + b = \square b$
- $x + 6 + 2x = 3x + \square$ $3(n + 2) = 3n + \square$

- a/a = ☐ 2a/a = ☐ 4a/2 = ☐ 6a/2a = ☐
- The number in each cell is the result of adding the numbers in the two cells beneath it. Fill in the missing terms:



- Algebra Cards



Click on the card that will always give the same answer as n x n.
Two of the cards will always give the same answer as 2 x n. Click on the cards.
When the expressions on three of the cards are added together they will always have the same answer as 5n.
Click on the three cards.

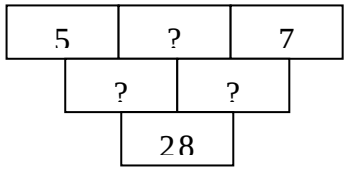
- The answer is 2a + 5b. Click on the question.

6. Construct and solve simple linear equations with integer coefficients, the unknown on one side only.

- Given a simple linear equation e.g. n – 7 = 16 , choose and put in place the next line in the calculation.

  n = 16 + 7

  50d = 1 200 d = 1 200 ÷ 50 etc
- Algebra Trees: First put the correct expression into each box. Then calculate the value of n.



n

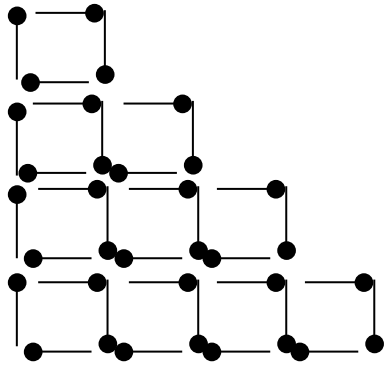
n + 7

n + 5

- Solve these equations: a + 5 = 12

  7h – 3 = 24 7 = 5 + 2z 3m = 18 2c + 3 = 19
- If n is any number, which of these expressions will always be an odd number? n, n + 1, 2n, 2n + 1, 2n – 1
- What will be the next odd number after the number 2n + 1? 2n – 1?
- These expressions represent a set of five consecutive odd numbers: 2n + 1, 2n + 3, 2n + 5, 2n + 7, 2n + 9. What value of n would produce the set 21, 23, 25, 27, 29?
- For a row of squares made with matches, complete this table:

No. of squares	1	2	3	4	5
No. of matches	4	7			



Which expression gives the number of matches needed to makea row of n squares?

How many matches would be needed to make 11 squares?

- Which expression tells how to convert centimetres into metres? (M = c ÷ 100) Litres into millilitres? (mL = L x 1000) Metres into millimetres? (mm = M x 1000)
- Bronson has p pencils. Ravi has twice as many pencils as Bronson. How many pencils does Ravi have?
- Bronson gives 2 pencils to Hamish. How many pencils does Bronson have now?
- Ravi shares his pencils equally among himself and 4 other friends. How many pencils does each person receive?
- Mr Snags plants petunias, asters, sweet peas and marigolds. n is the number of petunia plants that Mr Snags puts in his garden.

  He plants the same number of asters as petunias. How many asters does he plant?

  There are twice as many sweet peas as petunias. How many sweet peas are there?

  There are 24 more marigold plants than asters. How many marigolds are there?

  What is the simplest expression for the total number of plants Mr Snags has planted?

7. Generate a sequence given a rule for finding each term from its position in the sequence. E.g.

   The nth term of a sequence is n + 3. Write the first 5 terms. (5 separate text inputs)

   (n + 7) (105 – 5n)(2n – 0.5) (4n)

ALGEBRA

Algebra – 8

1. Know that an algebraic expression is formed from letters, symbols and numbers combined with operations signs.
   - Express relationships between abstract variables. E.g.

$y = r + w$ $w = y - 2r$

$r = (y - w) \div 2$

   - Back Track: Think of a number, divide it by 4, then subtract 7.
     - How do you get back to the first number? (Add 7 then multiply by 4)
     - Click on any expression that describes the relationship between the first and last numbers. (m/4 – 7 = n, m = 4 (n + 7))
2. Know that algebraic operations follow the same conventions and order as arithmetic operations.
3. Use index notation and the index laws for small positive index powers. E.g.
   - Understand the difference in meaning between expressions such as 2n and n^2.
   - Simplify expressions such as $2x^2 + 3x^2$ $n^2 \times n^3$ $p^3 \div p^2$
4. Simplify or transform linear expressions by collecting like terms. E.g.
   - 3a + 2b + 2a – b
   - 4x + 7 + 3x - 3 – x
   - 3 (x + 5)
   - 12 – (n – 3)
   - m (n + p)
   - 4 (a + 2b) – 2(2a + b)
   - This magic square has been built from an algebraic formula:

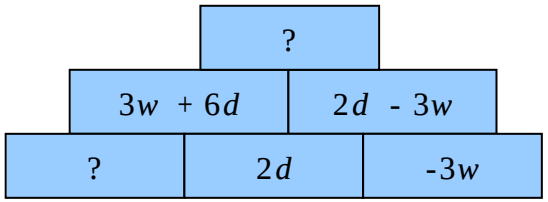
$m - p$	$m + p - q$	$m + q$
$m + p + q$	m	$m - p - q$
$m - q$	$m - p + q$	$m + p$

Given the values
$m = 8$
$p = 4$
$q = 3$
Fill in the missing

4		
	8	
		12

- Fill in the missing expressions:

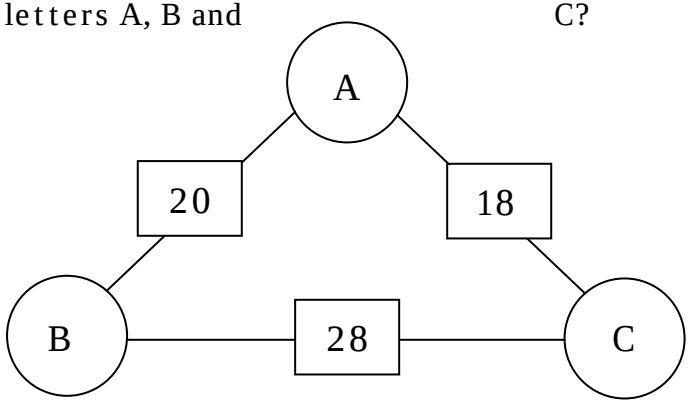
Write each expression in its simplest form



5. Consolidate forming and solving linear equations with an unknown on one side only. E.g.
   - Harold is collecting stones for his dry-stone wall. He has put 376 stones in three piles. The second pile has 24 more stones than the first pile. The third pile has twice as many stones as the second. How many stones are there in each pile? (Multiple Choice)

Pile 1	Pile 2	Pile 3
x stones	?	?

- In this triangular arithmagon, the number in each square is the sum of the numbers in the two circles on each side of it. What numbers are represented by the letters A, B and C?



Click on the expressions that are true.

B = 20 – A
C = 18 – A
B + C = 28
(20 – A) + (18 – A) = 28
(20 + 18) – A – A = 28
(20 + 18) – 2A = 28
38 – 2A = 28
38 – 28 = 2A
2A = 10

- On Phillip's next birthday he will be one-third as old as his father and twice as old as his sister. Phillip is P years old now. How old will Phillip be next year? How old will Phillip's father be next year? How old will Phillip's sister be next year?
- Solve these equations:
  - 5x = 7
  - 2(p + 5) = 24
  - 4(b - 1) + 5(b + 1) = 100

6. Explore alternative ways of solving simple equations. E.g.
   - Equation Detour: Given a simple linear equation, identify different ways to proceed.

     2(a – 7) = 48

     Which routes could you take? Several expressions could be the next step in this calculation. Put all the correct alternatives into the blue box.

     (2a – 14 = 48 a – 7 = 24)

- Dr Algebra's Operating Room: Given a simple true mathematical statement, identify a related equation where the same operation has been performed on both sides. E.g.

  $54 - 8 = 43 + 3$

  Which expression shows the same equation after the same operation has been done on both sides?

  $(54 = 43 + 3 + 8)$ $(54 - 8 - 3 = 43)$
- Same method again using pronumerals. E.g.

  $y = x + 5$

  Which expression shows the same equation after the same operation has been done on both sides?

  $(y + 4 = x + 9)$ $(2y = 2x + 10)$ $(2(y + 3) = 2(x + 8))$ $(2(y + 3) - c = 2(x + 8) - c)$

7. Substitute positive and negative numbers into linear expression and positive integers into simple expressions involving powers.
   - Find the value of these expressions when $x = (4)(-7)(10)(2.5)$

     $4x + 3$ $100 - 3x$ $7(x + 1)$
   - Find the value of these expressions when $d = (4)(7)(-2)$

     $4d^2 + 7$ $2d^3$ $4d^2 - 1$
   - The number of diagonals in a polygon with n sides is given by the expression. How many diagonals are there in a polygon with 21 sides?
8. In simple cases, find an unknown quantity where it is not the subject of the formula, and where an equation must be solved. E.g.
   - The formula for the perimeter P of a rectangle is: $P = 2(L + B)$. If $P = 20$ metres and $L = 6$ metres, what is the value of B?
   - The formula for calculating the amount of change (C) received from \$100 after the purchase of s identical CDs. each costing \$9 is:

     $C(\$) = \$(100 - 9s)$

Jon received $73. How many CDs did he buy?

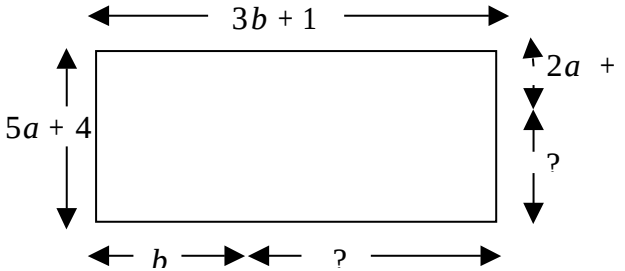
9. Derive algebraic expressions and formulas.
   - Amanda bought a apples and some bananas. She bought 3 times as many bananas as apples.
     Write an expression for the number of bananas Amanda bought.
     She used 3 bananas to make a banana cake. How many bananas did she have left?
     Amanda's grandmother used half the apples to make a pie. Then Amanda took one for her lunch. How many apples were left? (Multiple choice)
   - Ken has x sheep and Doug has y sheep. Write expressions for each of these statements:
     Ken and Doug have a total of 2000 sheep.
     Doug has four times as many sheep as Ken.
     If Doug gave away 400 sheep, he would then have three times as many sheep as Ken.
     If Doug gave 600 sheep to Ken, they would both have the same number of sheep.
     Half of Ken's total number of sheep is the same as two-fifths of Doug's total number.
   - Which equation would you use to find the number n halfway between the numbers n_1 and n_2? (MCh)

Algebra – 9 to 11

1. Can use letter symbols and distinguish their different roles in algebra.
2. Can interpret equalities in equations with expressions on each side. E.g.
   - True/False: $2(n + 3b) = 2n + 6b = 6b + 2n$

     $2(n + 3b) = 18$ $2n + 6b = 18$ $n + 3b = 9$ $n = 9 – 3b$ $3b = 9 – n$ etc..
3. Know that algebraic operations follow the same conventions and order as arithmetic operations. Use simple instances of the index laws for multiplication and division of small integer powers. E.g.
   - $n^2 \times n^3 = n^{2+3} = n^5$
   - $p^3 \div p^2 = p^{3-2} = p^5$
   - $(p^3)^2 = p^{3 \times 2} = p^6$
   - Simplify e.g. $24x^2 \div x$
   - $3a^2 \times 4a^4 \times \_\ a^3$
   - $(b^3)^2$
   - $(a^2c^4)^3$
4. Continue to transform linear expressions by collecting like terms. E.g. Simplify these expressions:
   - $7t + 5t + t - 8t$
   - $8ab – 3ba + 2ab$
   - $5x^2 – 3x – 2x^2 + 8x$
   - $3cd + 5c^2 + 4dc$
5. Continue to use the distibutive law to multiply a single term over a bracket. E.g. Write these expressions in expanded form (without the brackets):
   - $(3d + 8)\ 5$
   - $5(2x + 3b)$

6. Simplify or transform algebraic expressions by taking out single-term common factors.
   - $4a + 6 = (2a + 3)$ $10x + x^2 = (10 + x)$
   - $mn - m = (n - 1)$
   - Write expressions for the missing lengths in this rectangle:



7. Add simple algebraic fractions.
8. Square a linear expression, and expand and simplify the product of two linear expressions of the form $x \pm n$. E.g.
   - Apply the distributive law to claculations such as:

$43 \times 37 = (40 + 3)(30 + 7)$
$= (40 \times 30) + (40 \times 7) + (3 \times 30) + (3 \times 7)$
$= 1200 + 280 + 90 + 21$
$= 1480 + 111$
$= 1591$

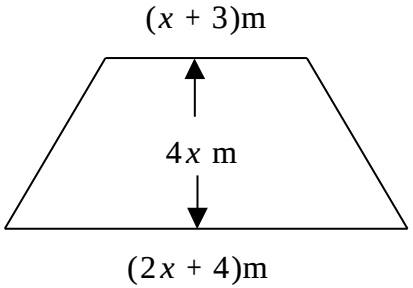
$62 \times 29 = (60 + 2)(30 - 1)$
$= (60 \times 30) - (60 \times 1) + (2 \times 30) - (2 \times 1)$
$= 1800 - 60 + 60 - 2$
$= 1800 - 2$
$= 1798$

   - Extend to finding the product of two linear expressions of the form $(a + b)(c + d)$;

$(a + b)(c + d) = ac + ad + bc + bd$
$(a + b)(a + b) = a^2 + ab + ab + b^2$
$(a + b)(c - d) = ac - ad + bc - bd$

$(a + b)(a – b) = a^2 – ab - ba – b^2 = a^2 – b^2$

- E.g. Find the simplest expression for finding the area of this trapezoid:



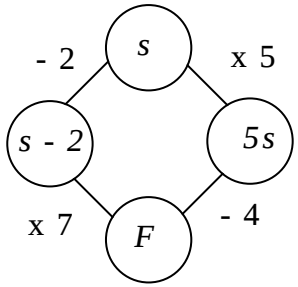
- Click on the expression that is equivalent to $(n + 1)^2$;$(n - 1)^2$; $(n + 1)(n - 1)$

$(n^2 + 2n + 1)$ $(n^2 - 2n + 1)$ $(n^2 - 1)$

Use this expression to calculate the value of $(41^2)(592)(21 \times 19)$

9. Formulate algebraic expressions to express relationships between unknown numbers. E.g.
   - S boys play soccer, C boys play cricket and B boys play both.
     How many boys altogether play these sports?
     How many boys play soccer but not cricket?
     How many boys play cricket but not soccer?
   - B boys and G girls take a spelling test. The boys score an average of m marks and the girls and average of n marks. What is the average mark for the whole group?
   - Clarissa completes 7 maths investigations during the year. Her average score is A %. For her last investigation she receives a mark of 14 out of 20. What percentage is her new average score? (Sum It Up)
10. Construct and solve linear equations with negative signs anywhere in the equation, or a negative solution.
11. Solve linear equations using inverse operations, by transforming both sides in the same way, or by other methods. E.g.
   - Jacky, Mac and Salty are sailors. They were marooned on a desert island with a monkey and a crate of 86 bananas. Jacky ate 5 more bananas than Salty. Mac ate 3 more bananas than Salty. The monkey ate 6 bananas. How many bananas did Jacky eat? (Salty)(Mac)
   - The length of a rectangle is three times its width. The perimeter is 24 metres. How many square metres is the area?
12. Form linear equations with unknowns on both sides and solve them by transforming both sides E.g.

- In the two-way flow diagram, find the starting number s that has to be entered so that the same finishing number F is reached whichever route is followed.



- Solve equations such as: $3x + 2 = 2x + 5$ $5z - 7 = 13 - 3z$ $4(n + 3) = 6 (n - 1)$
- I think of a number, multiply it by 2, then add 5. The answer is the same as subtracting that number from 23. What is the number?
- Paddy gave Mick 50 pigs. Mick now has 4 times as many pigs as Paddy. Paddy and Mick have 250 pigs between them. How many pigs does Mick have?

13. Solve a pair of simultaneous linear equations by eliminating one variable. Know that simultaneous equations can be solved in a variety of ways. E.g.
    - Substitute from one equation into another:
      $5p - q = 30$ and $q = 3p$
      - Write the equation again, substituting the second value into the first equation.
    - Extend the substitution method to examples where one equation must be rearranged before the substitution can be made. E.g.
      $x - 3y = 6$ and $x + 6y = 24$
      - Rearrange the first equation to write an expression for x.

- Now write the second equation, substituting the new expression for x.

- Add or subtract equations.

$4x + y = 44$

$x + y = 20$

- Subtract the lower equation from the upper equation and write an expression that has a value for x only.

$5x + y = 17$

$5x - y = 3$

- Add these two equations and write an expression that has a value for x only.
- Here are two equations: $2x + y = 17$

$3x + 2y = 28$

Operate

Operate on the first equation so that when the second equation is subtracted, the expression that is left has a value in x only.

14. Solve linear inequalitites in one variable and represent the solution set on a number line. E.g.

- N is an integer. List (in ascending numerical order) the integers that satisfy the conditions

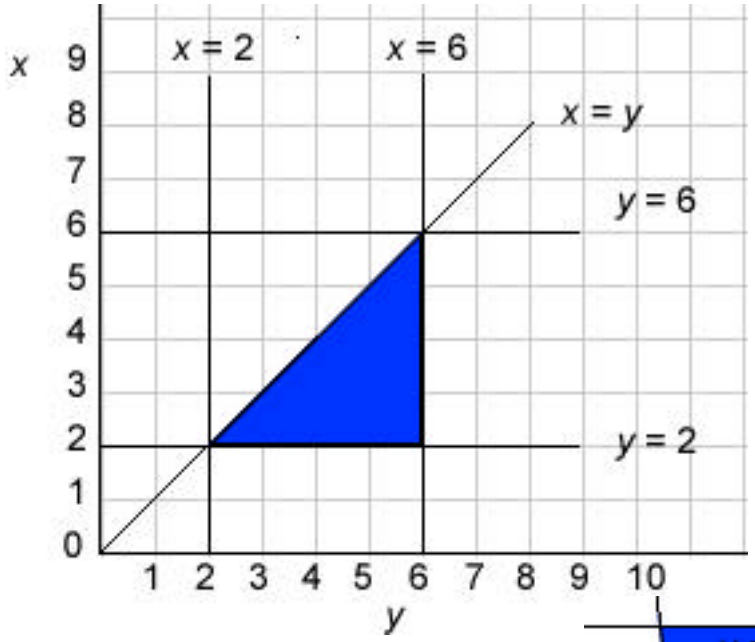
$2N < 17$ and $3N > 9$

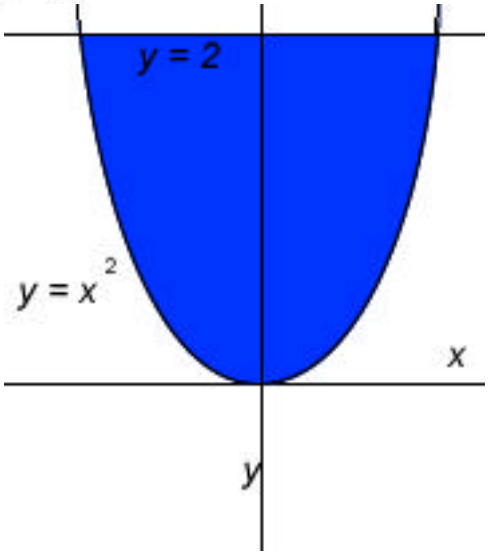
- Solve the inequality $3n - 4 < 17$

and $n > 2$.

Click on the two integers that are the bounds of the inequality.

- Three straight-line graphs enclose the blue area. Click on the three inequalities that together fully describe this area.



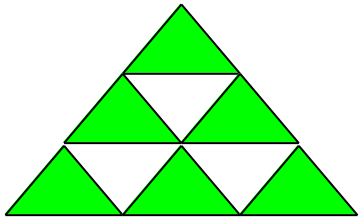


· Click on the two inequalities that describe the blue area.

$y < x^2$	$x \leq 0$
$y \leq 2$	$y < 2$
$y < 0$	$y \geq x^2$
$x > 0$	$y > 2$
$y \geq 0$	

15. Use algebraic methods to solve simple non-linear equations. E.g.
    - Give both solutions to each of these equations:
      $c^2 + 24 = 60$ $y^2 - 5 = 139$
16. Substitute positive and negative numbers into linear expressions and expressions involving powers. E.g.
    - Find the value of these expressions when x = (-5)(0.2)
      $4x^2 + 3$ $3x^3 - 2x$

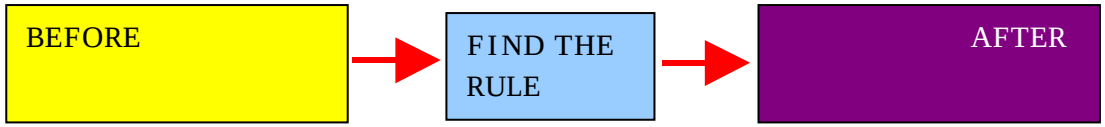
    - A pattern of triangular shapes is made like this:
      The number of triangles in each row is given by the formula
      $R^2 - (R - 1)^2$
      How many triangles will there be in the 20^{th} row of the pattern?



17. Change the subject of simple formulae using inverse operations. E.g.
    - If A = _ bh click on the correct expression for b.
      (V = lbh $V = \pi r^2 h$ $A = 4\pi r^2$)
18. Derive more complex algebraic expressions and formulae. E.g.
    - The instructions for roasting a whole chicken in Sally's new oven read as follows: Preheat the oven to 190 degrees C. Allow 20 minutes per _ kg of chicken and 20 minutes extra.
      - Write a formula for the number of minutes (m) to cook a chicken weighing x kg.
      - Sally bought a chicken weighing 1.5kg. She put the chicken in the preheated oven at 4:30pm. At what time should the chicken be cooked?
19. Find the nth term of some simple linear sequences, knowing that the nth term is of the form T(n) = an + b, where a is the constant difference between successive terms and b is a constant number related to the starting point of the sequence. E.g.
    - Write an expression for the nth term of this sequence: (2, 11, 20, 29, ...) (-1, -5, -9, -13, ...)

FUNCTIONS & GRAPHS

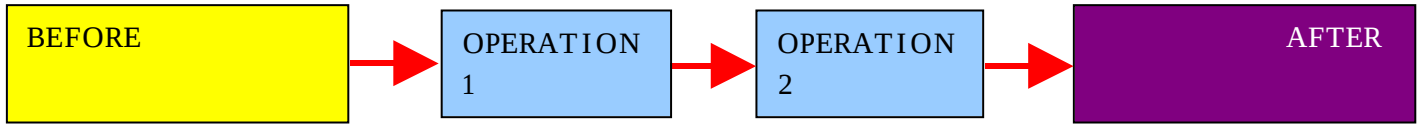
Functions & Graphs – 8



1. Given inputs and outputs, find the function.
   E.g.

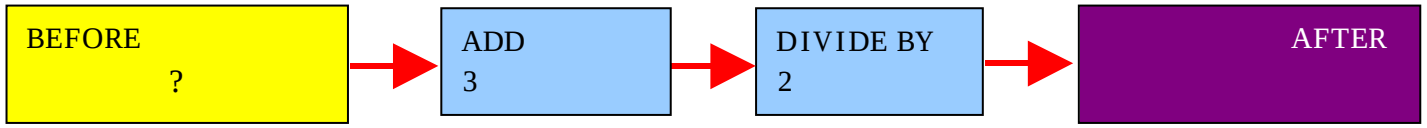
   Single Operation
   (Multiple choice)

   Double Operation
   (M/C – Put Function Cards in order)

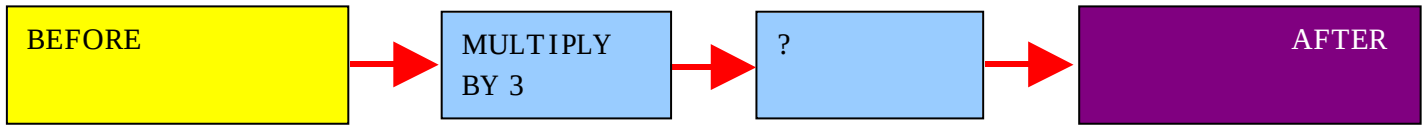


2. Explore inverse operations, to find the input, given the output and the function.

   Given the output, find the input.



Given one of the two functions, define the other.



3. Complete a table of values to satisfy a given rule. E.g.

x	-10	-4	1	3	5	10
y = x + 4						

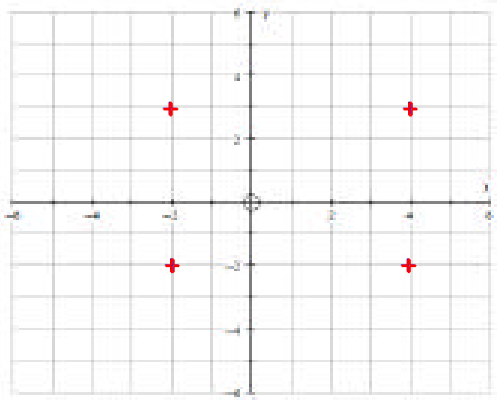
- Click on the line that includes all these points.
- Is the point (0, 5) on this line? The point (0.5, 4.5)?

4. Begin to consider the features of graphs of simple linear functions where y is given explicitly in terms of x. E.g.
   - On a single diagram display the graphs of y = _ x, y = x, y = 2x, y = 3x, y = 5x
     Which line has the steepest slope?
     The lines all pass through one common point. What are the coordinates of that point?
     Which line would the point (20, 20) be? (20, 10) (10,20) (20, 100)

5. Recognise that equations of the form y = c , where c is a constant, are straight-line graphs parallel to the x-axis, and equations of the form x = c, where x is a constant, are straight-line graphs parallel to the y-axis. E.g.
   - Click on the line that represents the equation (y = 2) (x = 0.5)
   - Click on the correct equation for this (black)(orange)(purple) line.

- Given a grid and 4 markers, plot given points e.g. (4,-2) (-2,-2)(-2,3)(4,3). If these points were joined, what shape would the lines form? How many grid squares is the area?

Same exercise for other sets of points: e.g.
(0,3) (-4,0) (0,1)
(-1,2) (-1,-2) (3,-2) (3,2)



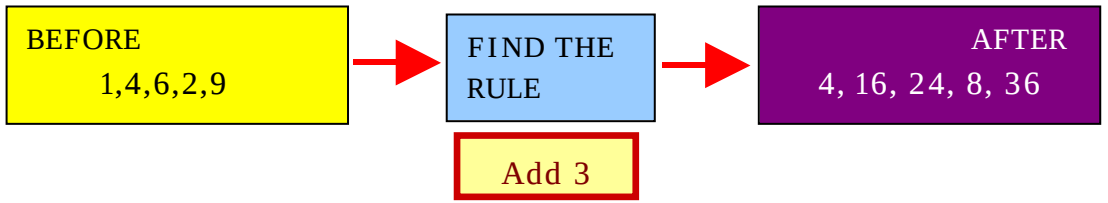
6. Consider the features of graphs such as $y = x - 1$ and $y = 10 – x$. Answer questions such as:
   - When $y = 3$, what is the value of x?
   - When $x = 2$, what is the value of y ?
7. Consider the intersection of the graphs of two linear expressions, one of which is of the form $y = c$ or $x = c$. E.g.
   - This diagram shows two straight-line graphs. Click on the colour matching the line with the equation ($y = 2x$) ($x = 2$).
   - Which expression will give the value of the x-coordinate of the point where these two lines intersect?

$y = 2x$	$x = y$
$y = 2$	$2x = 2$
$x = 2$	

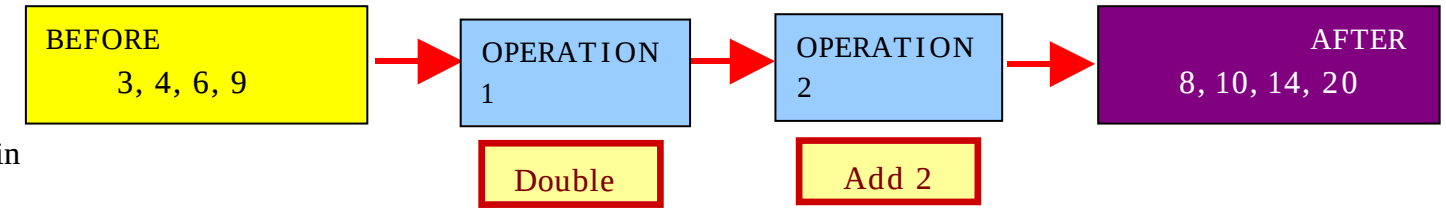
8. Interpret graphs of functions arising from real-life situations e.g. a conversion graph converting from miles to kilometres, degrees Fahrenheit to degrees Celsius.
   - Read values from a graph.
   - Say whether intermediate points have any significance.
   - Say how the variables relate e.g. the longer the time you travel, the greater the distance from the starting point; the higher the temperature, the fewer the number of drinks left in the canteen refrigerator.
   - Discuss and interpret straight-line graphs from science or geography.

7. Generate sets of values for simple functions using a functions machine.

Single Operation
(Multiple choice)

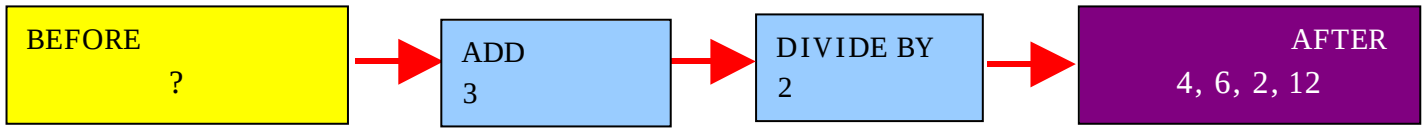


Double Operation
(M/C – Put Function Cards in order)

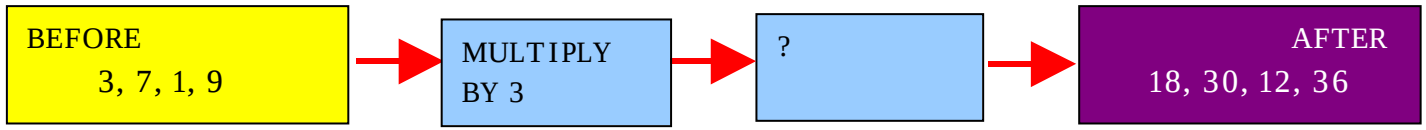


6. Explore inverse operations, to find the input, given the output and the function.

Given the output, find the input.



Given one of the two functions, define the other.

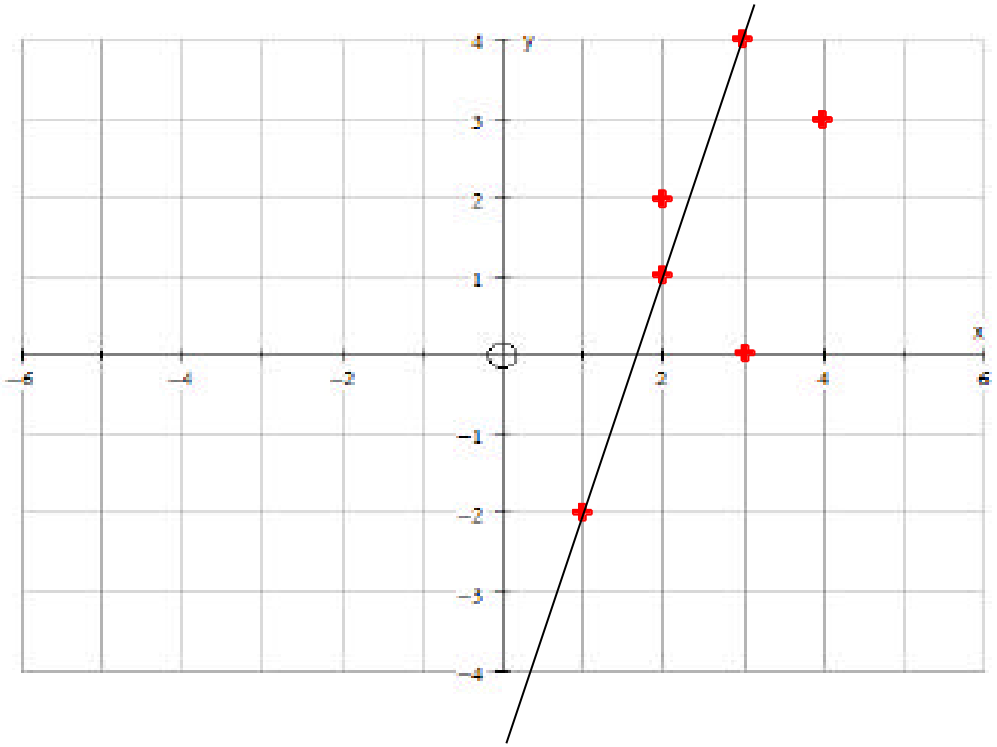


6. Generate coordinate pairs in all four quadrants. E.g.
   - Given a linear expression e.g. y = 2x – 3, generate coordinate pairs of points on the corresponding line. Fill in the missing numbers: (-3, _), (-2, _), (_, -5), (0, _)

1. Recognise the features of a graph of the form y = mx + c. E.g.
   - Corresponds to a straight line. (E.g. Choosing from a selection of straight and curved graphs, click on any line that satisfies the equation y = mx + c.)
   - The values of the coordinates at any point on the line satisfy the equation represented by the graph.
   - Any coordinate pair which represents a point not on the graph does not satisfy the equation.
   - The value of m determines the slope of the line. E.g. Given the diagram of the graph of y = 2x – 2: Click on the lines that will have the same slope. (y = 2x , y = 2x + 1, y = 2x - 5)

- The value of c determines the coordinates of the y-intercept. E.g.
  - This line has the equation y = 2x + 1. When y = 0, the line crosses the y-axis. Write the coordinates of this point.
  - Given a diagram of several graphs (e.g. y = x + 4, y = _ x + 4, y = 4 – x) what are the coordinates of the point where all these lines intersect?
  - Click on the lines that will pass through the point (0, 4). (y = 2x + 4, y = 4 – _ x , etc)
  - These two lines cross the y-axis at the same point. What are the coordinates of that point? (y = 3 – x) (y = x + 3)
  - Use the markers to plot these points: (2,2) (2,1) (3,0) (3,4) (1, -2) and (4,3)

The line joining three of these points has a slope of 3.
What are the coordinates of the point where it crosses the *y*-axis?



9. Understand that the point of intersection of two lines is the point whose coordinates satisfy both equations. E.g.
   - Without plotting the graphs, work out the coordinates of the point where these pairs of lines intersect.

$y = 2x$	$y = x + 1$	$y = 3x - 1$
$y = x + 3$	$y = 2x - 1$	$y = 4x - 2$

10. Interpret graphs of functions arising from real-life situations e.g. a conversion graph converting from miles to kilometres, degrees Fahrenheit to degrees Celsius.
    - Read values from a graph.
    - Say whether intermediate points have any significance.
    - Say how the variables relate e.g. the longer the time you travel, the greater the distance from the starting point; the higher the temperature, the fewer the number of drinks left in the canteen refrigerator.
    - Discuss and interpret straight-line graphs from science or geography. E.g.

      Students poured different volumes of water onto a piece of towelling cloth. Each time the water was completely absorbed by the cloth and the new mass was measured. Which would be the most likely shape for a graph of these measurements?

1. Generate coordinate pairs in all four quadrants. E.g.
   - Given a linear expression e.g. $y = 2x - 3$, generate coordinate pairs of points on the corresponding line.
     Fill in the missing numbers: (-3, _), (-2, _), (_, -5), (0, _)
   - A line interval is drawn between the points (4,-6) and (0, 8). Find the coordinates of the line's midpoint. [(-9,3) and (1,1); (4,-4) and (-2,6)]
2. Recognise the features of a graph of the form $y = mx + c$. E.g.

- Corresponds to a straight line. (E.g. Choosing from a selection of straight and curved graphs, click on any line that satisfies the equation $y = mx + c$.)
- The values of the coordinates at any point on the line satisfy the equation represented by the graph. E.g.
  A line has a gradient of 4 and passes through the point (-3,5). Click on the correct equation for this line.
- Any coordinate pair which represents a point not on the graph does not satisfy the equation.
- The value of m determines the slope of the line. E.g. Given the diagram of the graph of $y = 2x – 2$: Click on the lines that will have the same slope. ($y = 2x$, $y = 2x + 1$, $y = 2x - 5$)
- The value of c determines the coordinates of the y-intercept. E.g.
  - This line has the equation $y = 2x + 1$. When $y = 0$, the line crosses the y-axis. Write the coordinates of this point.