Year 7 Mathematics

Learning Strategies

Mathematics is often the most challenging subject for students. Much of the trouble comes from the fact that mathematics is about logical thinking, not memorizing rules or remembering formulas. It requires a different style of thinking than other subjects. The students who seem to be "naturally" good at math just happen to adopt the correct strategies of thinking that math requires – often they don't even realise it. We have isolated several key learning strategies used by successful maths students and have made icons to represent them. These icons are distributed throughout the book in order to remind students to adopt these necessary learning strategies:

Talk Aloud Many students sit and try to do a problem in complete silence inside their heads. They think that solutions just pop into the heads of 'smart' people. You absolutely must learn to talk aloud and listen to yourself, literally to talk yourself through a problem. Successful students do this without realising. It helps to structure your thoughts while helping your tutor understand the way you think.

BackChecking This means that you will be doing every step of the question twice, as you work your way through the question to ensure no silly mistakes. For example with this question: $3 \times 2 - 5 \times 7$ you would do "3 times 2 is 5 ... let me check – no 3×2 is 6 ... minus 5 times 7 is minus 35 ... let me check ... minus 5×7 is minus 35. Initially, this may seem time-consuming, but once it is automatic, a great deal of time and marks will be saved.

Avoid Cosmetic Surgery Do not write over old answers since this often results in repeated mistakes or actually erasing the correct answer. When you make mistakes just put one line through the mistake rather than scribbling it out. This helps reduce silly mistakes and makes your work look cleaner and easier to backcheck.
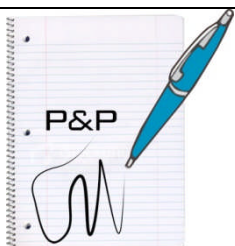
Pen to Paper It is always wise to write things down <u>as</u> you work your way through a problem, in order to keep track of good ideas and to see concepts on paper instead of in your head. This makes it easier to work out the next step in the problem. Harder maths problems cannot be solved in your head alone – put your ideas on paper as soon as you have them – always!
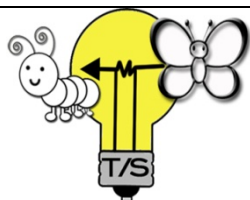
Transfer Skills This strategy is more advanced. It is the skill of making up a simpler question and then transferring those ideas to a more complex question with which you are having difficulty.

For example if you can't remember how to do long addition because you can't recall exactly how to carry the one: $\begin{array}{r} 5889 \\ + 4587 \\ \hline \end{array}$ then you may want to try adding numbers which you do know how to calculate that also involve carrying the one: $\begin{array}{r} 5 \\ + 9 \\ \hline \end{array}$

This skill is particularly useful when you can't remember a basic arithmetic or algebraic rule, most of the time you should be able to work it out by creating a simpler version of the question.

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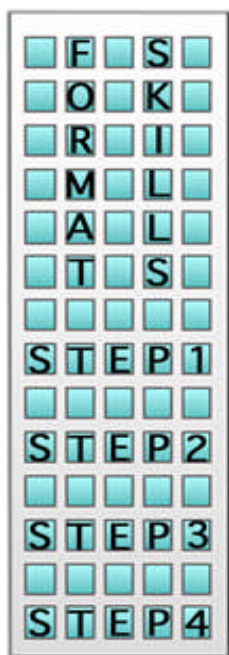
Format Skills These are the skills that keep a question together as an organized whole in terms of your working out on paper. An example of this is using the "=" sign correctly to keep a question lined up properly. In numerical calculations format skills help you to align the numbers correctly.

This skill is important because the correct working out will help you avoid careless mistakes. When your work is jumbled up all over the page it is hard for you to make sense of what belongs with what. Your "silly" mistakes would increase. Format skills also make it a lot easier for you to check over your work and to notice/correct any mistakes.

Every topic in math has a way of being written with correct formatting. You will be surprised how much smoother mathematics will be once you learn this skill. Whenever you are unsure you should always ask your tutor or teacher.
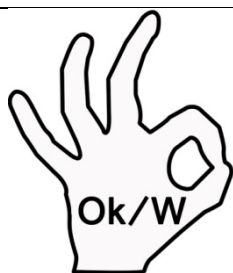
Its Ok To Be Wrong Mathematics is in many ways more of a skill than just knowledge. The main skill is problem solving and the only way this can be learned is by thinking hard and making mistakes on the way. As you gain confidence you will naturally worry less about making the mistakes and more about learning from them. Risk trying to solve problems that you are unsure of, this will improve your skill more than anything else. It's ok to be wrong – it is NOT ok to not try.
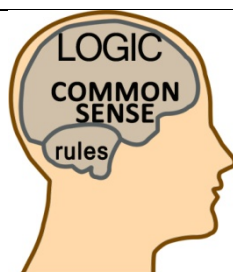
Avoid Rule Dependency Rules are secondary tools; common sense and logic are primary tools for problem solving and mathematics in general. Ultimately you must understand Why rules work the way they do. Without this you are likely to struggle with tricky problem solving and worded questions. Always rely on your logic and common sense first and on rules second, always ask Why?
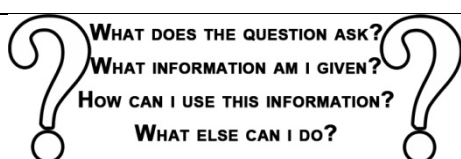
Self Questioning This is what strong problem solvers do naturally when they get stuck on a problem or don't know what to do. Ask yourself these questions. They will help to jolt your thinking process; consider just one question at a time and Talk Aloud while putting Pen To Paper.

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Number

Useful formulae and hints

To express a number as the product of its primes; write the number as a multiple of 2, repeat until division by 2 is not possible, then repeat the process for 3, 5, etc until a prime number remains

Write all the 2s 3s etc as products

Example: 840

$$840 = 2 \times 420$$

$$420 = 2 \times 210$$

$$210 = 2 \times 105$$

105 is not divisible by 2

$$105 = 3 \times 35$$

35 is not divisible by 3

$$35 = 5 \times 7$$

7 is a prime number

So, $840 = 2 \times 2 \times 2 \times 3 \times 5 \times 7$

To simplify surds, convert the number in the square root sign to a product, one of which is a square number.

$$\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$$

If b is a square number, say $\sqrt{b} = c$, then $\sqrt{a \times b} = c\sqrt{a}$

Example: $\sqrt{300} = \sqrt{3 \times 100} = \sqrt{3} \times \sqrt{100} = 10\sqrt{3}$

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Order of operation is

Brackets

Indices

Multiplication

Division

Addition

Subtraction

A number is divisible by 3 if its digits ad to a number that is a multiple of 3

Example: $825; 8 + 2 + 5 = 15$, which is a multiple of 3, so 825 is divisible by 3

Plus and minus signs indicate which direction to travel on a number line

A plus sign means go to the right

A minus sign means go to the left

An extra plus sign means keep going the same way

An extra minus sign means turn around

Examples

$6 + 2$: Start at 6 and move to the right 2 places (8)

$6 - 2$: Start at 6 and move to the left 2 places (4)

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$6 + (-2)$: Start at 6, ready to move right (+), but change direction (−)and move left (4)

$6 - (-2)$: Start at 6, ready to move left (−), but change direction and move right (8)

On a number line, the further to the left, the lower the number

Example $-10 < -7$

To convert a fraction to another, multiply or divide the numerator by the same factor necessary to change the denominator to the required fraction

Example: Change $\frac{24}{32}$ to quarters

To change the denominator to 4 (quarters) you must divide it by 8

Dividing the numerator by 8 also gives $\frac{3}{4}$

To change a mixed numeral to an improper fraction, convert the whole number to a fraction and add to the fraction part

Example: $2\frac{3}{8} = 2 + \frac{3}{8} = (2 \times 1) + \frac{3}{8} = \left(2 \times \frac{8}{8}\right) + \frac{3}{8} = \frac{19}{8}$

To change an improper fraction to a mixed numeral, divide the numerator by the denominator and leave the remainder as a fraction

Example: $15 \div 7 = 2$ with a remainder of 1, so $\frac{15}{7} = 2\frac{1}{7}$

To multiply fractions, multiply the numerators and multiply the denominators, then simplify the fraction if necessary

Example: $\frac{3}{5} \times \frac{1}{6} = \frac{3}{30} = \frac{1}{10}$

To convert fractions to decimals, divide the numerator by the denominator

To convert decimals to fractions, put the number(s) after the decimal point over 10, 100, or 1000 depending on how many there are, then simplify the fraction

Examples: $0.25 = \frac{25}{100} = \frac{1}{4}$

$$0.3 = \frac{3}{10}$$

$$0.444 = \frac{444}{1000} = \frac{111}{250}$$

To convert decimals to percentages, multiply by 100

Example: $0.46 = 0.46 \times 100\% = 46\%$

To convert percentages to decimals, divide by 100

Examples: $32\% = 32 \div 100 = 0.32$

$0.1\% = 0.1 \div 100 = 0.001$

$125\% = 125 \div 100 = 1.25$

To convert percentages to fractions, convert to a decimal then the decimal to a fraction as above

To convert fractions to percentages, convert to a decimal, then the decimal to a percentage as above

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To find a percentage of a number, change the percentage to a fraction, and multiply by the number

Example: $12\% \ of \ 80 = \frac{12}{100} \times 80 = \frac{960}{100} = 9.6$

To simplify ratios, divide each number by a common factor until they cannot be reduced further

Example: $24:100 = 12:50 = 6:25$

The sample space of an event is the list of all possible outcomes

Example: rolling a six sided die, the sample space is 1, 2, 3, 4, 5, and 6

The probability of an event is $\frac{Number \ of \ favorable \ events}{Sample \ space}$

Example: rolling a number less than 3 on a die, probability $= \frac{2}{6} = \frac{1}{3}$

Exercise 1

Number Groups & Families

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1) Express each number as a product of prime numbers

    a) 64

    b) 24

    c) 36

    d) 25

    e) 100

2) Express the following as a product of prime numbers

    a) 112

    b) 244

    c) 33

    d) 113

    e) 19

3) What do you notice about the answers to parts d & e above; what type of numbers are 113 and 19?

4) Express the following in simplified form. (e.g. $\sqrt{25} = 5$)

    a) $\sqrt{8}$

    b) $\sqrt{9}$

    c) $\sqrt{25}$

    d) $\sqrt{49}$

    e) $\sqrt{144}$

5) Express the following in simplified form

    a) $\sqrt{27}$

    b) $\sqrt{12}$

    c) $\sqrt{48}$

    d) $\sqrt{125}$

    e) $\sqrt{256}$

6) Express the following in number form

    a) $\sqrt{16}$

    b) $\sqrt{100}$

    c) $\sqrt[4]{16}$

    d) $\sqrt[3]{1}$

    e) $\sqrt[5]{32}$

7) Evaluate the following

    a) $240 \div 20$

    b) $(240 \div 10) \div 2$

c) 17×11

d) $(17 \times 10) + 17$

e) $660 \div 20$

f) $(660 \div 10) \div 2$

g) 33×11

h) $(33 \times 10) + 33$

i) $a \times 11$

j) $a \div 20$

8) Evaluate the following

a) 26×10

b) 26×5

c) 26×15

d) 82×10

e) 82×5

f) 82×15

g) 38×10

h) 38×5

i) 38×15

j) 66×10

k) 66×5

l) 66×15

m) $a \times 15 = (a \times 10) + (\quad)$

9) Determine if the following numbers can be divided by 3

a) 245

b) 771

c) 909
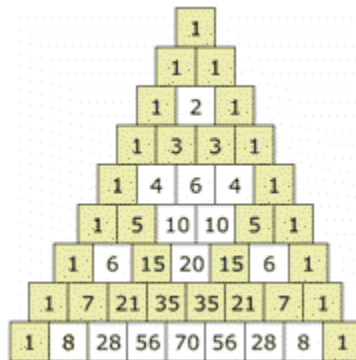
d) 427

e) 603

f) 717

g) 226

h) 998

i) 111

10) Identify what famous number pattern is shown in the following diagram

a) Describe a relationship between a number in any row and the two numbers above it

b) Use your answer to part a to write the next row of the triangle

c) The first diagonal from the top consists of all 1's. The next diagonal starting at row 2 consists of the numbers 1, 2, 3, 4, 5...... (the counting numbers); what set of numbers does the third diagonal produce?

d) Add each row; what set of numbers are produced?

e) Reading each of the top 5 rows as an actual number (e.g. 14641) what pattern is produced by listing the rows as numbers? (The pattern does continue after the row 14641, but it is slightly more complicated to show)

f) Add the following sets of numbers

   I.   1+4+10

  II.   1+6+21

 III.   1+3+6+10

Relate your answers to the triangle, use them to identify a pattern within the triangle, and use it to add the following numbers (without calculation)

1+3+6+10+15+21

Exercise 2

Directed Numbers

1) Draw a number line and place these numbers on it

a) 4

b) -2

c) 0

d) 10

e) -6

f) -1

2) Put the following numbers in order from smallest to largest

-10, 8, 0.5, -2, 0, 3, -9, -6, 6

3) Put the following numbers in order from largest to smallest

0, -3, 4, 6, -8, 2.5, -4, -2.5, 11

4) Calculate the following

a) $2 + (-3)$

b) $6 - (-5)$

c) $-2 - 7$

d) $-4 - 8$

e) $3 + 8$

f) $-8 - 3$

g) $2 - (-6)$

5) Calculate the following

a) $30 + (-10) - 9$

b) $-15 - (-10) + 7$

c) $-2 - (-8) - (-10)$

d) $4 + 5 + (-15) - (-6)$

6) Evaluate the following

a) $2 \times (-5)$

b) -2×5

c) $-2 \times (-5)$

d) -6×4

e) $6 \times (-4)$

f) -6×-4

7) Complete the following:

a) If you multiply a negative number by a negative number, the answer is always _____

b) If you multiply a negative number by a positive number, the answer is always _____

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8) Evaluate the following

    a) $-18 \div 6$

    b) $-18 \div (-6)$

    c) $18 \div (-6)$

    d) $60 \div (-10)$

    e) $-60 \div (-10)$

    f) $-60 \div (10)$

9) Complete the following:

    a) If one of the numbers in a division is negative and the other is positive, the result is always _____

    b) If both numbers in a division are negative, the result is always _____

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Exercise 3

Fractions

1) Convert the following fractions to quarters

   a) $\frac{1}{2}$

   b) $\frac{12}{16}$

   c) $\frac{3}{12}$

   d) $\frac{300}{400}$

2) Convert the following fractions to twelfths

   a) $\frac{3}{4}$

   b) $\frac{1}{2}$

   c) $\frac{2}{3}$

   d) $\frac{3}{9}$

   e) $\frac{3}{36}$

   f) $\frac{1}{6}$

3) Convert the following fractions to their simplest form

   a) $\frac{10}{24}$

   b) $\frac{6}{9}$

   c) $\frac{9}{45}$

   d) $\frac{4}{32}$

   e) $\frac{8}{36}$

   f) $\frac{5}{72}$

4) Convert the following mixed numbers to improper fractions

   a) $2\frac{1}{3}$

   b) $3\frac{1}{2}$

   c) $5\frac{2}{3}$

   d) $7\frac{3}{5}$

   e) $10\frac{1}{4}$

   f) $9\frac{4}{5}$

5) Convert the following improper fractions to mixed numbers

   a) $\frac{42}{4}$

   b) $\frac{15}{2}$

   c) $\frac{33}{8}$

   d) $\frac{22}{10}$

   e) $\frac{15}{5}$

   f) $\frac{37}{5}$

6) Calculate the following

    a) $\frac{1}{2} \times \frac{1}{4}$

    b) $\frac{1}{3} \times \frac{2}{5}$

    c) $\frac{3}{8} \times \frac{2}{3}$

    d) $\frac{3}{4} \times \frac{8}{9}$

    e) $\frac{1}{5} \times \frac{2}{5}$

    f) $\frac{1}{3} \times \frac{5}{6}$

    g) $\frac{3}{4} \times \frac{1}{9}$

7) Calculate the following

    a) $\frac{2}{3} \div \frac{4}{9}$

    b) $\frac{1}{5} \div \frac{7}{10}$

    c) $\frac{3}{7} \div \frac{9}{10}$

    d) $\frac{1}{2} \div \frac{3}{8}$

    e) $\frac{5}{6} \div \frac{15}{18}$

    f) $\frac{2}{5} \div \frac{4}{15}$

8) Two friends buy two pizzas. Tom eats a quarter of all the pieces, then David eats a half of what's left. What fraction of all the pieces remains? Check your answer by assuming there are 8 pieces in each pizza

9) Three men are rowing a boat back to shore. Peter rows half the distance, Alan rows one-third of the distance remaining, and Brian rows the rest of the way

    a) What fraction of the total distance did Brian row?

    b) If the distance in total was 1 and a half kilometres, how far did Alan row?

10) Ben spends a quarter of his pocket money on drinks, one third of it on lollies and another third on bus fare.

    a) What fraction of his pocket money does he have left?

    b) If he received $24 pocket money how much does he have left?

    c) One third of the drinks he bought were for his brother, how much money did he spend on his brother?

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Exercise 4

Fractions, Decimals & Percentages

1) Convert the following fractions to decimals

    a) $\frac{1}{2}$

    b) $\frac{1}{4}$

    c) $\frac{1}{5}$

    d) $\frac{3}{10}$

    e) $\frac{3}{4}$

    f) $\frac{3}{5}$

    g) $\frac{23}{100}$

    h) $\frac{3}{100}$

2) Convert the following decimals to fractions

    a) 0.5

    b) 0.75

    c) 0.4

    d) 0.2

    e) 0.25

    f) 0.01

    g) 0.15

    h) 0.9

3) Convert the following decimals to percentage

    a) 0.3

    b) 0.03

    c) 0.25

    d) 0.12

    e) 0.001

    f) 0.99

    g) 0.125

    h) 1.00

4) Convert the following percentages to decimals

    a) 20%

    b) 30%

    c) 2%

    d) 4.5%

    e) 50%

    f) 100%

    g) 0.1%

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h) ½ %

5) Convert the following percentages to fractions

    a) 40%

    b) 50%

    c) 25%

    d) 12.5%

    e) 11%

    f) 0.1%

    g) 80%

    h) 37.5%

6) Convert the following fractions to percentages

    a) $\frac{3}{4}$

    b) $\frac{1}{2}$

    c) $\frac{3}{5}$

    d) $\frac{1}{10}$

    e) $\frac{11}{1000}$

    f) $\frac{1}{12}$

    g) $\frac{1}{8}$

    h) $\frac{8}{8}$

7) Calculate the following

    a) $10\% \ of \ 30$

    b) $20\% \ of \ 80$

    c) $25\% \ of \ 120$

    d) $12.5\% \ of \ 40$

    e) $1\% \ of \ 400$

    f) $5\% \ of \ 306$

    g) $100\% \ of \ 29735$

    h) $0\% \ of \ 2231324$

8) Ben splits his pocket money up

- 25% goes to entertainment

- 20% goes to bus fare

- 15% goes to food & drinks

- He saves the rest

a) What percentage of his pocket money does he save?

b) If he receives $25 pocket money, how much goes on bus fare?

c) If he receives $50 pocket money, how much would he spend on food and drinks?

d) If he receives $40 pocket money, how much would he save?

9) Peter spent 60% of his money on a new cricket bat

a) If he had $70, how much did the bat cost?

b) If he spent a further 10% of his original money on gloves, how much money will he have left?

c) If he spent a further 50% of the money he had left on a cricket ball, how much money does he now have?

10) An item was on sale for $60, but John did not have enough money to buy it. The shop assistant said he could reduce the price by 10%

a) How much was the shop assistant going to reduce the price by?

b) If John had only $48 could he afford the item after the price was reduced?

c) What percentage would the original price have to be reduced by for John to be able to buy it?

Exercise 5

Ratios

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1) Put the following ratios in their simplest form

    a) 5:10

    b) 75:100

    c) 10:40

    d) 9:99

    e) 6:10

    f) 2:5

    g) 2:100

    h) 10:140

    i) 9:135

2) A recipe to make 20 cup cakes calls for 250 g of sugar and 4 eggs. If you wanted to make 40 cup cakes how much sugar and how many eggs should you use?

3) A science experiment calls for two chemical: A and B, to be mixed in the ratio 3:5. If you put in 600 g of chemical A, how much of chemical B should you add/

4) Consider the following diagram of a right angled triangle.

A = 3   B = 6

30°
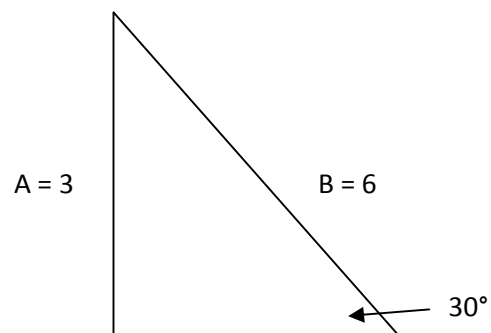
If the angle indicated is always 30°, the ratio of the lengths of sides A and B is always the same

    a) If the length of side A was 5, what would the length of side B be?

    b) If the length of side B was 12, what would the length of side A be?

    c) If you saw a diagram of a right angled triangle with the length of side A being 15 cm, and the length of side B being 30 cm, what could you say about the angle opposite side A?

5) The ratio of the number of stamps in John's collection to the number of stamps in Mark's collection is 7:4.

    a) If John has 49 stamps, how many does Mark have?

    b) If Mark has 56 stamps, how many does John have?

    c) If together they have 99 stamps, how many do they each have?

6) The ratio of blue jelly beans to white jelly beans in a packet is 2:5

    a) If there were 30 white jelly beans in a packet, how many blue ones would there be?

    b) If there were 20 blue jelly beans in a packet, how many white ones would there be?

    c) If there were originally 35 jelly beans in the packet, and 25 white ones were added, what would the new ratio be?

7) A recipe has the following ingredients to make 50 scones:

- 2 cups flour
- 500 g butter
- 100 g sugar
- 5 eggs
- 1 litre water

    a) How much butter would be needed to make 100 scones?

    b) How many cups of flour would be needed to make 125 scones?

    c) If 8 eggs were used, how much sugar would be needed?

    d) How many eggs would need to be used to make 75 scones?

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Exercise 6

Probability

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1) A card is chosen at random from a standard pack, and its suit is noted. List the sample space for this event

2) A coin is tossed and a dice is rolled. List the sample space for this event

3) Two dice are rolled, and their sum is noted. List the sample space for this event.

4) What is the probability of each of the following events occurring?

a) A coin is tossed and comes up heads

b) A card chosen from a standard pack is a diamond

c) A 5 is rolled on a die

d) A 7 is rolled on a die

e) A card chosen from a standard pack is either a red or a black card

5) There are 3 red socks, 2 blue socks and a white sock in a draw. What is the probability that a sock chosen at random is red?

6) John makes a pack of cards numbered from 1 to 20. What is the probability that a card chosen at random from this pack will be

a) The number 5

b) An even number

c) A number from 1 to 5

d) The number 21

7) There are 40 people in a room. Ten of them are under 20 years old, twenty of them are aged from 20 to 40, and the rest are over forty. What is the probability that a person chosen at random from this group is

a) Under 20 years old

b) Over 40 years old

c) Over 20 years old

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d) Under 200 years old

8) A fish tank contains 4 guppies, 6 koi and 10 goldfish. What is the probability that a fish chosen at random from the tank will be

a) A goldfish

b) Not a guppy

c) A koi

d) A rainbow fish

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Year 7 Mathematics

Algebra

Useful formulae and hints

Unknowns in a situation are denoted by the use of a variable, which can be anything, but is generally a lower case letter of the alphabet

Variables are used to model a real life situation, where the exact quantities are not known, or where a variety of situations can be predicted.

Example: if the number of black dots always equals twice the number of white dots plus one, then if the number of white dots are known, then so are the number of black dots

If there are 3 white dots, there are 7 black dots

Operations can be performed on variables like other numbers, but the variables must be the same

For example, $2x + 3x = 5x$, $4y \div 2y = 2$, but $2x + 3y$ cannot be simplified, since x and y are different variables

Tables show the relationship between variables given the rule that relates them

For example, if the rule states that $y = 2x$, then if $y = 3, x = 6$

When solving word problems, decide upon a variable, and what it represents. Make an algebraic sentence out of the information given, then solve the equation

Example: Fred's age is equal to twice Tom's age plus 4. If Tom is 22, how old is Fred?

We need to know Fred's age, so call it p. Call Tom' age r. Relate Fred's age to Tom's age from the information given

$$p = 2r + 4$$

If $r\ (Tom's\ age) = 22, then\ p = 2 \times 22 + 4 = 48$

Fred is 48

To graph a rule, construct a table of values and place a dot on a grid where the two values meet. Put the independent variable on the horizontal axis, and the dependent variable on the vertical axis. In the equation $y = 2x + 1, x,$ is the independent variable

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Exercise 1

Representing Variables

1) There are a certain number of lollies in a jar, but you don't know how many. If "a" represents the number of lollies in the jar, write an expression that represents:

   a) The number of lollies plus one

   b) Four less than the number of lollies

   c) Twice the number of lollies

   d) Half the number of lollies

   e) Twice the number of lollies plus one

   f) The number of lollies plus one, then this number doubled

2) If John's age is represented by the variable x, how would the ages of the rest of his family be represented?

   a) John's brother is three years older than him

   b) John's sister is half his age

   c) John's father is four times his age

   d) John's mother is three times his age plus five

   e) If you add two to John's age then multiply this number by five you get the age of John's grandfather

3) The number of people at a party at 8 o'clock is unknown but can be represented by a variable. For the next three hours 4 people per hour come to the party

   a) Represent the number of people at the party at nine o'clock, ten o'clock and eleven o'clock

   b) By midnight, there was only half the number of people at the party than at 11 o'clock. Represent this amount

   c) By one am there was only half the number of people at the party as there was at 8 o'clock. Represent this number

4) Mark and his friends agree to give money to a charity. Represent the contributions of each person in terms of the amount Mark contributes

   a) Peter says he will put in $2 more than mark

   b) Frank will put in $5 more than Mark

c) Alan will put in double whatever Frank puts in

d) Jeff will put in double whatever Peter puts in

5) Jack scored highest on the maths test. Represent the following scores in relation to Jack's score

   a) Karl scored five less than Jack

   b) Tom scored ten less than Jack

   c) Daniel scored half Jack's score

   d) Brian scored three less than Daniel

   e) Fred scored half Karl's score

6) In the first week of the basketball season a team scored a certain number of points. Each week they performed better than the previous week. Represent each week's scores in terms of their score of the first week.

   a) In week two they scored 5 points more than they did in week one

b) In week three they scored 6 points more than they did in week two

c) In week four they scored twice the number of points than they did in week one

d) In week five they scored double the number of points than they did in week three

e) What was the total number of points scored in the five weeks?

7) If y is the age of Peter, what is each of the following expressions describing

   a) $y + 1$

   b) $y - 2$

   c) $y + 5$

   d) $2y$

   e) $2y + 1$

   f) $2(y + 1)$

   g) $\frac{1}{2}y - 4$

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Exercise 2

Simplifying Expressions

1) Add the following:

    a) One bag of apples plus one bag of apples

    b) One bag of lollies plus one bag of lollies

    c) Two piles of bricks plus two piles of bricks

    d) Four eggs plus four eggs

    e) Four x plus four x

    f) $4x + 4x$

2) Let x represent the number of apples in a bag

    a) What is two bags of apples plus two bags of apples?

    b) What is $2x + 2x$?

    c) If there are ten apples in a bag, how many apples are there in part a?

    d) If $x = 10$, what is the answer to part b?

3) Let r represent the number of kilometeres a man walks every day

    a) How many kilometres would he walk in 3 days??

    b) What are 3 lots of r?

    c) If he walks 5 kilometres per day, how many kilometres would he walk in 3 days?

    d) If $r = 5$, what is the answer to part b?

4) How many lots of x are there in total in each of the following?

    a) $x + x$

    b) $x + x + x$

    c) $2x + x$

    d) $2x + 2x$

    e) $2x + 1 + 3x$

5) How many lots of x are there in each of the following?

    a) $3x - x$

    b) $3x - 2x$

    c) $4x - x$

    d) $5x - 3x$

    e) $3x - 3x$

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6) How many lots of r are there in each of the following?

     a) $4r + r - 2r$

     b) $3r - r - r$

     c) $2r + r - r$

     d) $\frac{1}{2}r + \frac{1}{2}r$

     e) $6r - 4r - 2r$

7) What is the value of $2x + 2x$ when:

     a) $x = 3$

     b) $x = 2$

     c) $x = 1$

     d) $x = \frac{1}{2}$

     e) $x = 0$

8) If x is the number of counters in a row, how many counters are there in 5 rows when $x =$:

     a) 2

     b) 4

     c) 1

     d) 10

e) 0

f) 20

Exercise 3

Geometric Patterns

1) Peter is making shapes with matches; he gets three matches and makes a triangle, which has three sides
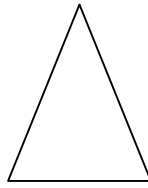
He adds another match to his shape and makes a quadrilateral, which has four sides
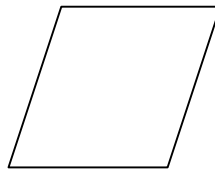
He adds another match to his shape and makes a pentagon, which has five sides
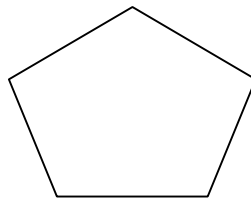
He notices a very simple pattern which he puts into a table

Number of matches used	Number of sides in the shape
3	3
4	4
5	5
6	
7	
8	
9	

a) Complete the table

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b) Complete this sentence: "The number of sides in the shape is equal to ...."

c) If his shape has 100 sides, how many matches has he used?

d) If he has used 200 matches, how many sides does his shape have?

2) Peter uses matches to tessellate triangles. He makes one triangle which uses 3 matches
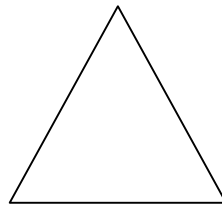
He adds enough matches so that two triangles are tessellated
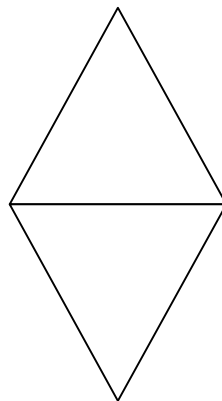
He tessellates another triangle

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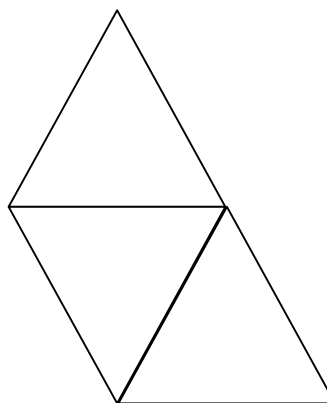
He notices a pattern which he puts into a table

Number of triangles	Number of matches
1	3
2	5
3	7
4	
5	

a) Complete the above table

b) Complete the table below

Number of triangles	Number of matches	
1	3	$(1 \times 2) + 1$
2	5	$(2 \times 2) + 1$
3	7	$(3 \times 2) + 1$
4		
5		

c) Use the table to help complete the sentence: "The number of matches equals the number of triangles. multiplied by ...., then add ....

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d) Use the rule to predict the number of matches used when 200 triangles are made

3) Peter next makes a pattern of squares
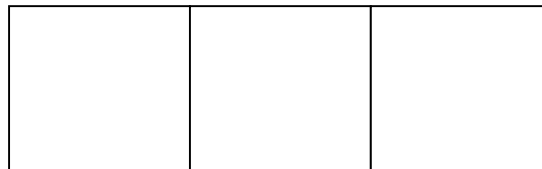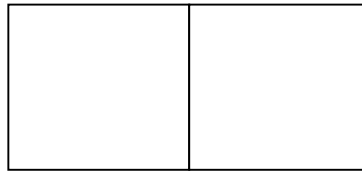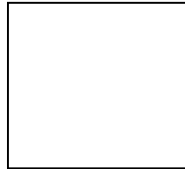
a) Complete the table

Number of squares	Number of matches
1	4
2	7
3	
4	
5	

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b) Complete the table

Number of squares	Number of matches	
1	4	$(1 \times 3) + 1$
2	7	$(2 \times 3) + 1$
3		
4		
5		

c) Use the table to help complete the sentence: "The number of matches equals .... multiplied by ....,. then add ....

d) Use the rule above to find the number of matches used to make 200 squares

4) Peter then cuts a circle into various pieces:
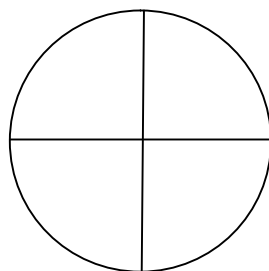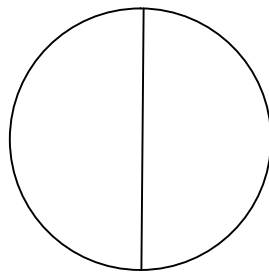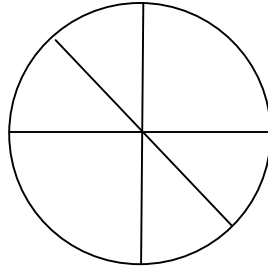
a) Complete the table

Number of cuts	Number of sections
1	2
2	4
3	
4	
5	

b) Complete the sentence: "The number of sections is equal to the number of cuts ...."

c) How many sections will be there be if there are 60 cuts made?

d) How many cuts are needed to make 180 sections?

5) Peter next builds a tower

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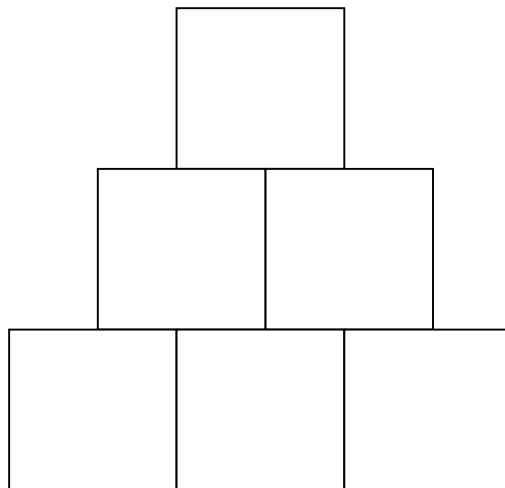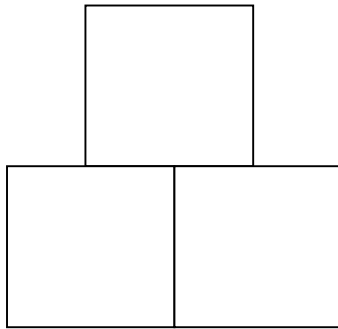
a) Complete the table

Number of rows	Number of blocks
1	1
2	3
3	6
4	
5	

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b) Describe what happens to the number of blocks added to the tower each time a row is added

c) How many blocks would be added to the tower in the 6th row?

d) How many blocks would be in the tower if it was 7 rows high?

6) Peter cuts a block across its length
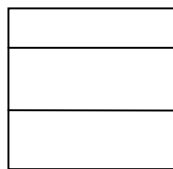
a) Complete the table

Number of cuts	Number of sections
1	2
2	3
3	
4	
5	

b) The number of sections increases by .... each time a cut is made

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c) Describe in words how to work out the number of sections if the number of cuts is known

d) Use this rule to calculate how many sections will be made from 95 cuts

e) How many cuts will have been made if there are 133 sections?

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Exercise 4

Number Patterns

1) Complete the table

x	1	2	3	4	5	6	7
$x + 2$	3	4	5				

2) Complete the table

x	1	2	3	4	5	6	7
$2x$	2	4	6				

3) Complete the table

x	1	2	3	4	5	6	7
$3x - 1$	2	5	8				

4) Complete the table, and describe the pattern that relates the numbers in the bottom row to the corresponding number in the top row

1	2	3	4	5	6	7
3	6	9				

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5) Complete the table, and describe the pattern that relates the numbers in the bottom row to the corresponding number in the top row

1	2	3	4	5	6	7
3	5	7				

6) Complete the table, and describe the pattern that relates the numbers in the bottom row to the corresponding number in the top row

x	1	2	3	4	5	6	7
????	5	6	7				

7) Mark's age is twice John's age. How old is Mark if John is

a) 10

b) 5

c) 15

d) 20

e) How old is John if Mark is 32?

8) Peter has twice the amount of money that Alan has plus 2 dollars. How much money does Peter have if Alan has

a) 8 dollars

b) 15 dollars

c) 20 dollars

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d) $15.50

e) How much money does Alan have if Peter has 12 dollars?

9) A large bus is allowed to carry three times the number of passengers of a small bus minus one.

a) Write this relationship using algebra

b) How many passengers can the large bus carry if the small bus can carry 12 passengers?

c) How many passengers can the large bus carry if the small bus can carry 20 passengers?

d) How many passengers can the small bus carry if the large bus can carry 44 passengers?

e) Does the rule work for all numbers of passengers? Explain why not with an example.

10) If you add one to the number of people who are at a soccer game, then double that number, you get the number of people who are at a basketball game

a) Write this relationship using algebra

b) If there are 40 people at the soccer game how many are there at the basketball game?

c) If there are 100 people at the soccer game, how many people are there at the basketball game?

d) If there are 62 people at the basketball game, how many people are there at the soccer game?

e) Can you always work out the number of people at the soccer game if you know the number of people at the basketball game? Explain your answer with an example

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Exercise 5

Graphing Patterns

1) Graph the following relationship

x	1	2	3	4	5	6	7
$x + 2$	3	4	5				

2) Graph the following relationship

x	1	2	3	4	5	6	7
$2x$	2	4	6				

3) Graph the following relationship

x	1	2	3	4	5	6	7
$3x - 1$	2	5	8				

4) Graph the following relationship

x	1	2	3	4	5	6	7
$2x + 1$	3	5	7				

5) Graph the following relationship

x	1	2	3	4	5	6	7
$x - 4$	-3	-2	-1				

6) An electrician charges $50 call out fee and $30 per hour for his services
Draw a table showing the amount charged for 1 to 7 hours and graph the
relationship using a suitable scale

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7) When baking scones the oven must be set at 150 degrees Celsius plus 2 degrees extra per scone

Draw a table that shows what temperature an oven must be on to cook 10, 20, 30, 40 and 50 scones and graph the relationship using appropriate scale

Can the points on the graph be joined up to form a line? Why or why not?

8) A river has a stepping stone every 1.5 metres. Draw a table showing the relationship between the number of stones and the distance travelled across the river. Draw a graph that shows the relationship. Explain why the points should not be joined to form a line

9) A boy places three lollies into a jar. Every minute he puts in another lolly.

a) Draw a table that shows how many lollies in the jar after each minute

b) Graph the relationship

c) Explain why the points should not be joined

10) Alan has 20 CDs in his collection. At the end of each month he buys a CD

a) Draw a table that shows how many CDs in his collection each month

b) Graph the relationship

c) Explain why the points should not be joined

Year 7 Mathematics

Data

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Useful formulae and hints

To calculate the area that each category takes up on a pie chart, divide the number applicable to that category by the total for all the categories and multiply the result by 360. This gives the number of degrees of the circle that the category takes up

Example: If 100 people are surveyed, and 20 of them prefer blue as their favourite colour, then the category blue takes up a sector with an angle of $\frac{20}{100} \times 360 = 72°$

Ensure that the sum of the angles is 360°

A conversion graph shows the relationship between two measures of the same phenomena, for example the Fahrenheit and Celsius measures of temperature

A divided bar graph shows a comparison between the relative sizes of items in the same category (e.g. populations of various cities). The areas of the bars are in scaled proportion to each other

A class graph shows all the items that belong in a certain group according to some criteria. For example, a class one might be in a certain range of lengths, a class two in another range, and so on.

A line graph shows the change in some variable over time (e.g. temperature)

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A travel graph shows the relationship between distance travelled and time. A straight line indicates a constant speed; a flat line indicates no movement, an upward sloping line indicates moving away from a start point, and a downward sloping line indicates travelling back toward the start point
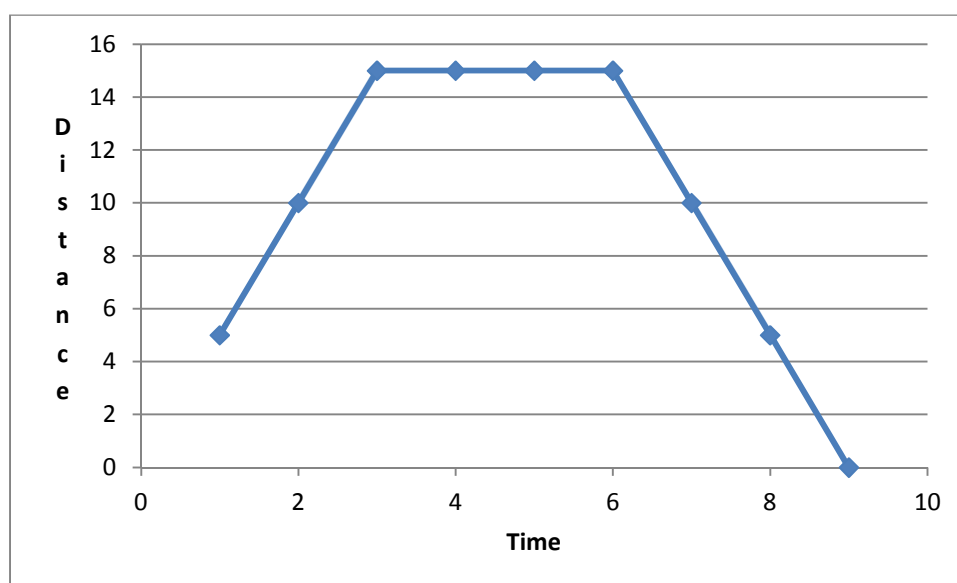
The mean of a set of data is equal to the sum of the data scores divided by the number of scores

The mean of 1, 2, 3, 6, and 8 is $= \frac{20}{5} = 4$

The mode of a set of data is the score that occurs most often. A set of data can have one, two or more modes, or no mode

The median of a set of data is the middle score of the set after the scores have been put into order.

The median of 1, 2, 3, 6, and 8 is 3 (the third score)

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If there is an even number of scores, the median is the number that is between the two middle scores

The data set 1, 2, 3, 6, 8, and 10 has an even number of scores; the two middle scores are 3 and 6. The number between them is 4.5; this is the median. Note the median of a data set does not have to be a number in the set

Exercise 1

Representing Data

1) Draw a sector (pie) graph that shows the following information

Type of car driven	Number of people
Holden	120
Ford	90
Toyota	60
Hyundai	60
Nissan	30

2) Draw a sector (pie) graph that shows the following information

Favourite sport	Number of people
AFL	16
Rugby	12
Soccer	8
Basketball	6
Tennis	4
Cricket	2

3) By measuring the appropriate angles in the following sector graph, construct a table that describes the information

720 people surveyed

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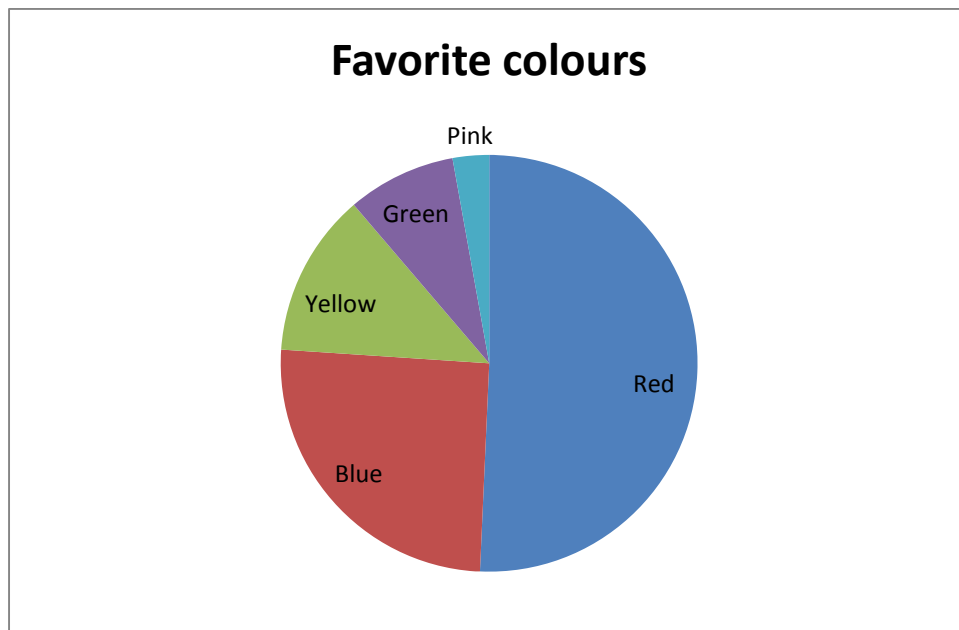
4) The following graph shows the conversion from Fahrenheit to Celsius temperature

Fahrenheit to Celsius conversion
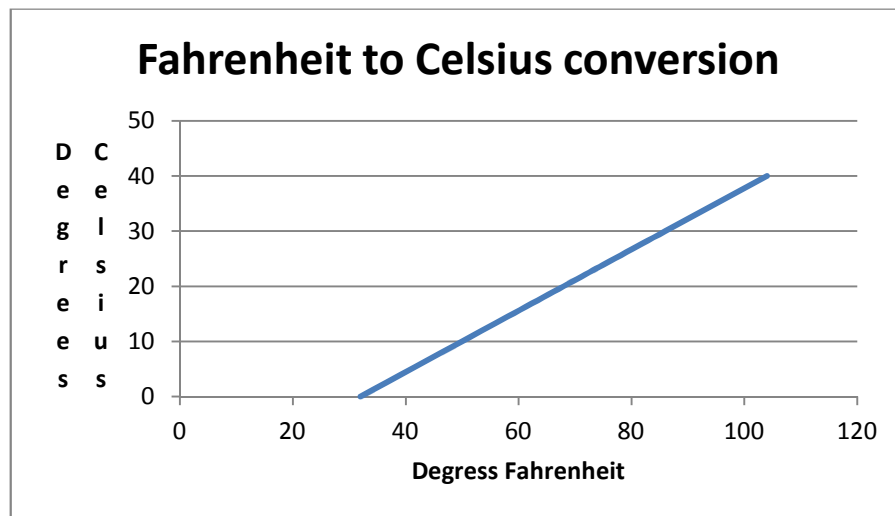
a) Approximately how many degrees Celsius is 100 degrees Fahrenheit?

b) Approximately how many degrees Fahrenheit is 10 degrees Celsius?

c) The freezing point of water is zero degrees Celsius. At approximately how many degrees Fahrenheit does water freeze?

d) Approximately how many degrees Fahrenheit increase by for every 10 degrees increase in Celsius?

5) The conversion graph shows the number of millilitres in different numbers of tablespoons of liquid

Tablespoons of liquid to millilitres
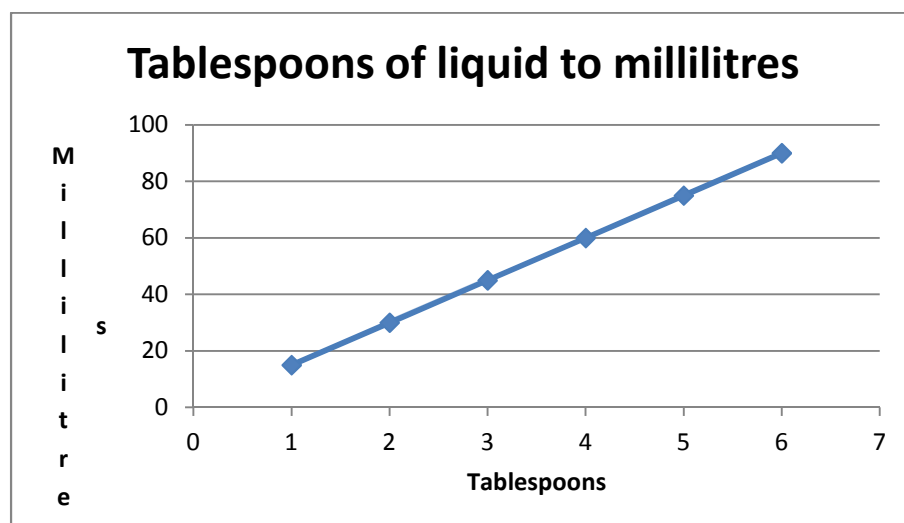
a) How many millilitres in 4 tablespoons?

b) How many tablespoons in 90 millilitres?

c) How many millilitres of liquid in each tablespoon?

6) The following divided bar graph shows the approximate comparison of the area of each state of Australia

WA

QLD

NT

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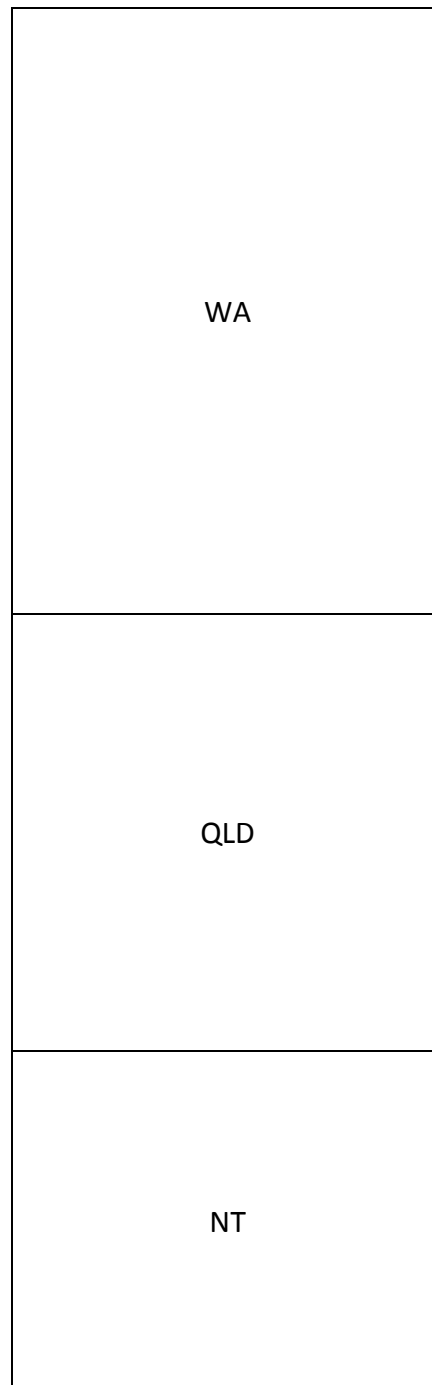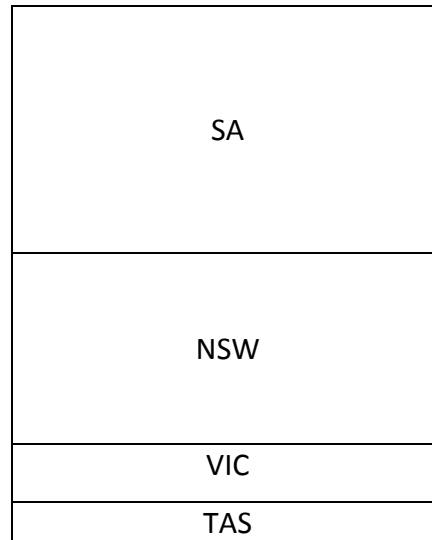
a) By measuring the relative sizes, how many times bigger in area is Victoria than Tasmania?

b) Which state has the larger area, NSW or SA?

c) The areas of which two states make up almost exactly 50% of the total area of Australia?

7) Fish are graded into classes according to their weight as shown in the graph below
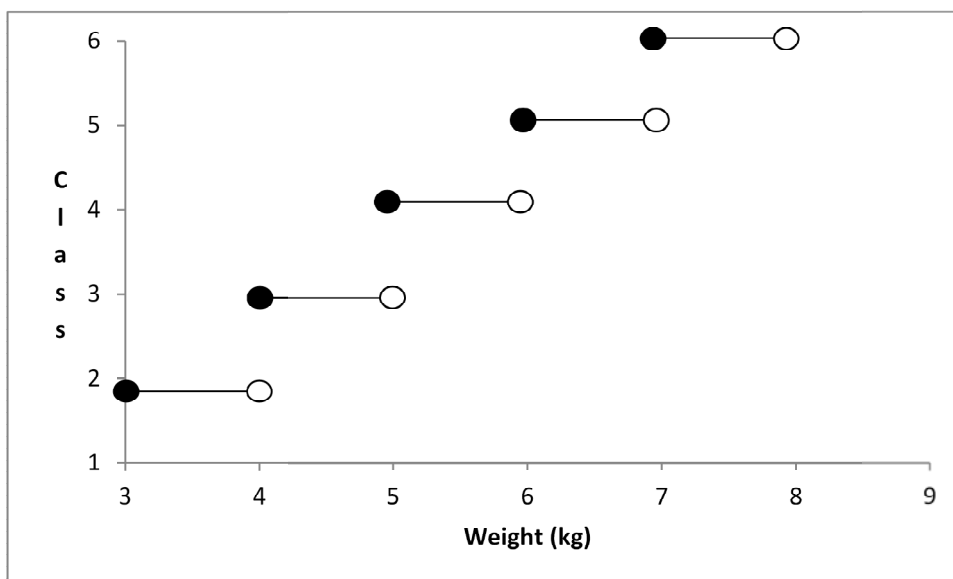
a) What class is a fish that weighs 4.5 kg?

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b) Between what weights must a fish be to be a class 5?

c) A fish weighs 7kg: what is its class?

8) Draw a graph that represents the following

For safety, use of the school oval for athletics is spread over the day

Years 1 and 2 start at 8 o'clock
Years 3 and 4 start at 9 o'clock
Years 5 and 6 start at 10 o'clock
Years 7 and 8 start at 11 o'clock
Years 9 and 10 start at noon
Years 11 and 12 start at 1 o'clock

No other year groups are allowed on the track at these times

9) The graph below shows the average monthly temperature for Perth over the past 50 years

Perth average monthly temperature

Average Temperature: Jan 30.5, Feb 30.7, Mar 28.4, Apr 25.2, May 20.9, June 18.2, July 17.4, Aug 18.3, Sept 20.0, Oct 22.0, Nov 25.7, Dec 28.3
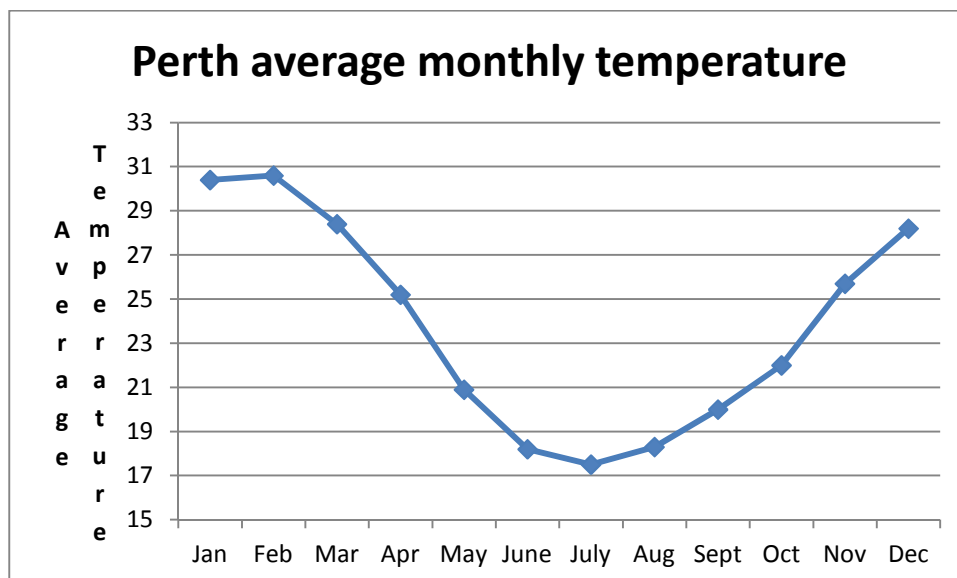
a) For what month is the average temperature highest?

b) For what month is the average temperature lowest?

c) Between which two months does the average temperature drop by the most?

d) For what month is the average temperature approximately 25 degrees?

e) What is the approximate average temperature for December?

10) Which type of graph of those studied in this exercise would be most suitable to display the following?

- Average monthly petrol prices over the past year
- Results of survey of peoples' favourite food
- Distribution of religions in a country
- Times for booking a hall
- The relationship between acres and square metres

Exercise 2

Travel Graphs

1) John took a walk. The following graph shows how far he had walked after each 5 minutes

John's walk
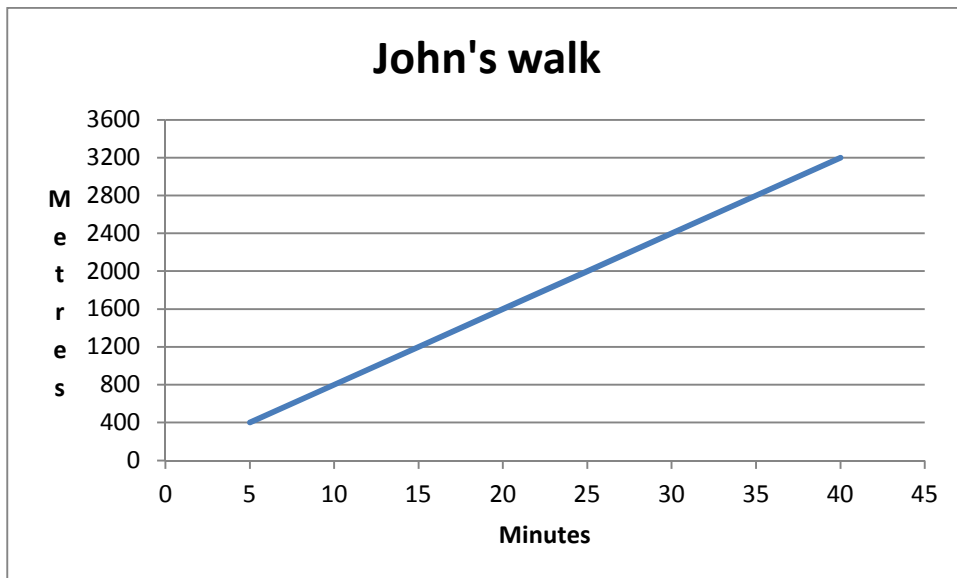
a) How far had John walked after 20 minutes?

b) How long did it take John to walk 1200 metres?

c) How many metres did John walk every 5 minutes

d) What was John's speed in metres per minute?

2) The next day John took another walk which is graphed below

John's second walk

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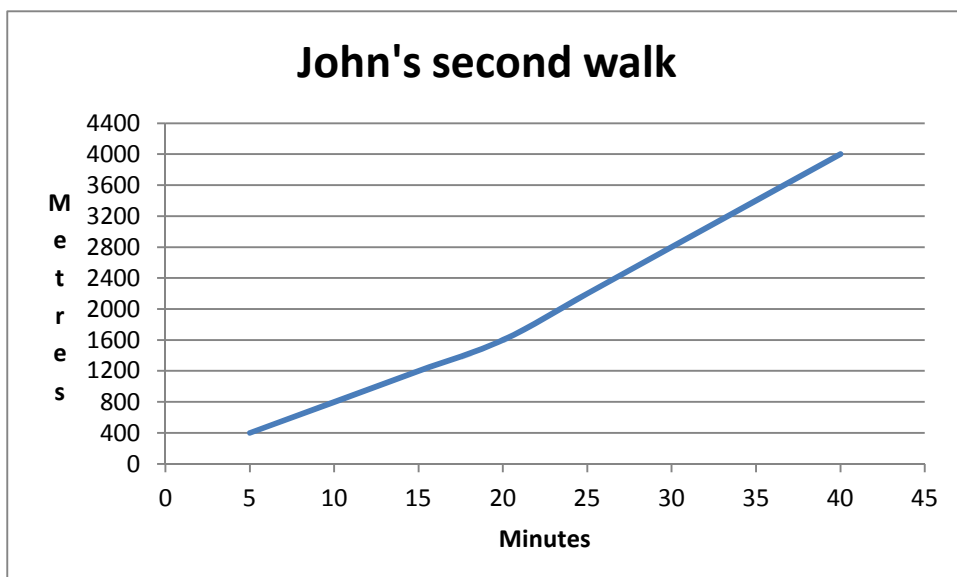
a) How far had John walked after 10 minutes?

b) How long did it take John to walk 3400 metres?

c) After how many minutes did John start walking faster?

d) After John started walking faster how many metres did he walk every 5 minutes?

e) What was John's speed for the faster part of his walk?

3) John went for a further walk the next day

John's third walk
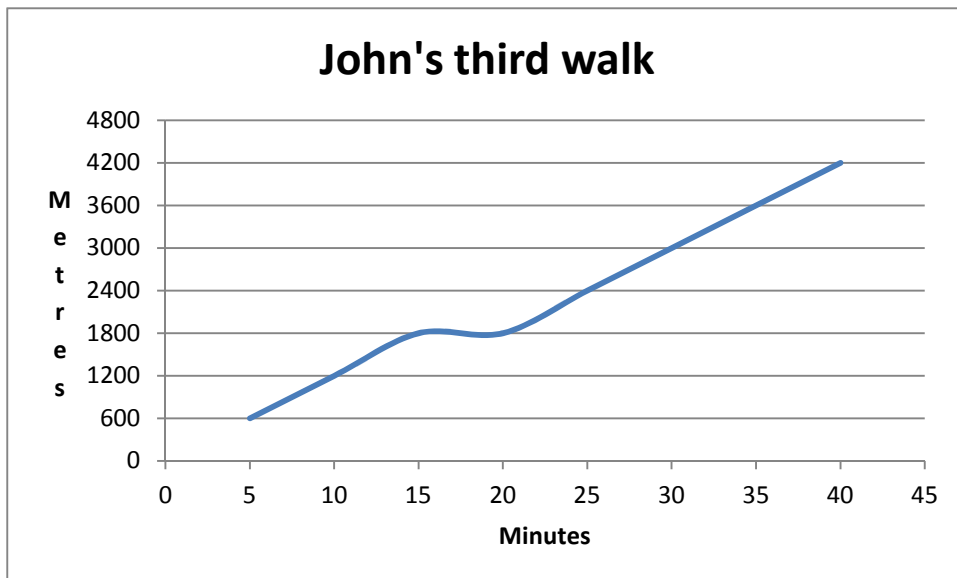
a) How far had John walked after 10 minutes?

b) How many minutes did it take John to walk 3600 metres?

c) After how many minutes of walking did John stop?

d) How long did he stop for?

4) Explain why the following walk is not possible
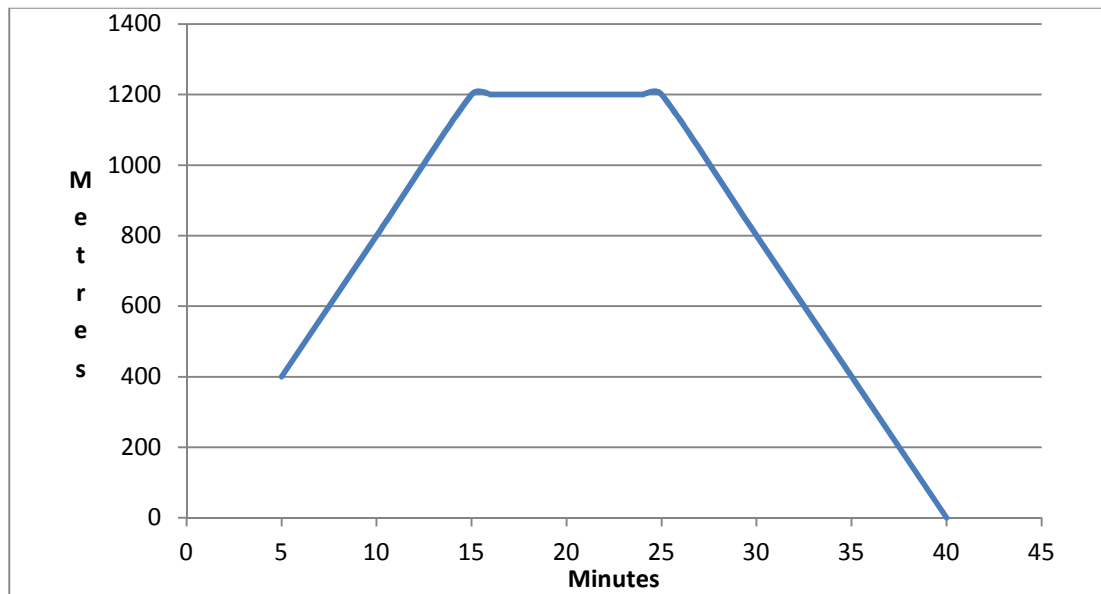
5) Draw a travel graph that shows the following journey

John walks for 4 minutes and goes 400 metres
He then stops for 2 minutes
He then walks for 4 minutes and goes 200 metres
He stops for a further 5 minutes
He runs for 2 minutes and goes 250 metres
He walks for 5 more minutes and goes 100 metres

6) Match the travel graph to the correct description

a) John walks at a constant speed of 6 km per hour for 20 minutes

b) John walks for 10 minutes and goes 1 km then stops for 10 minutes

c) John walks for 10 minutes at a speed of 3 km per hour, then walks for 10 minutes at 6 km per hour

d) John stands still for 10 minutes and then walks for 10 minutes and goes 1 km

I.
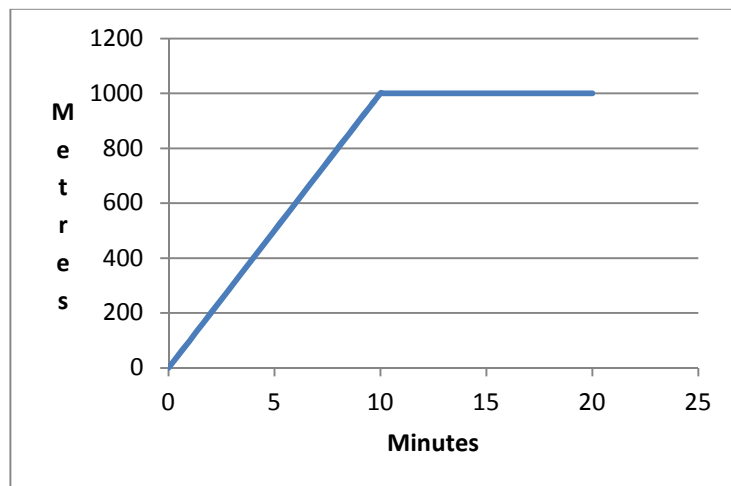
II.
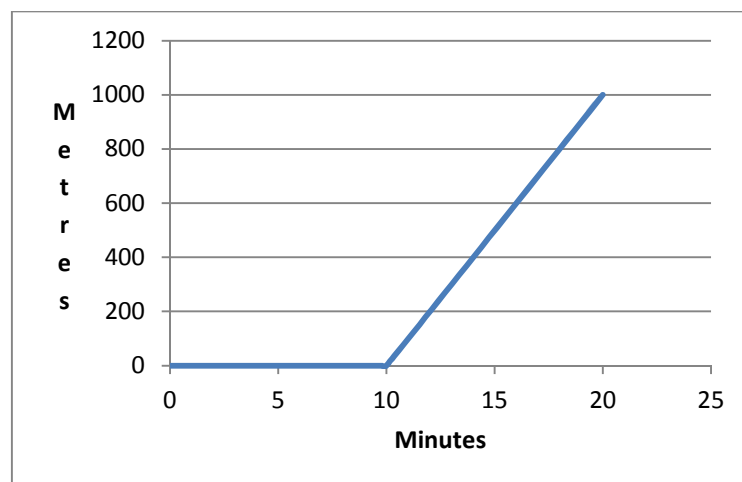
III.
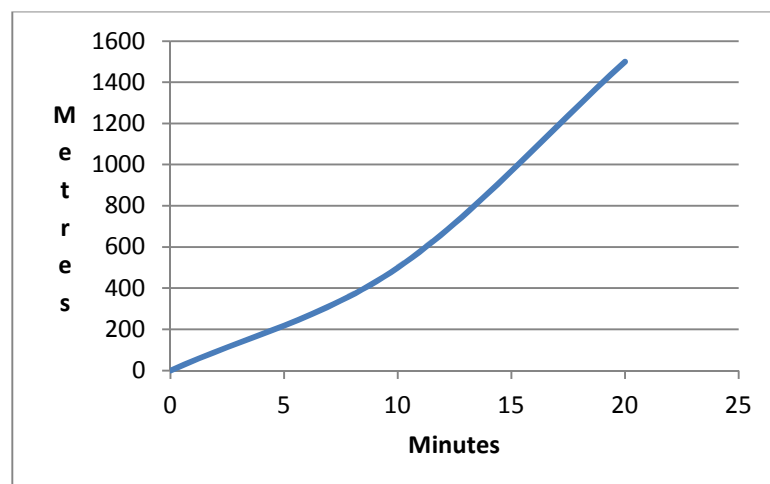
IV.
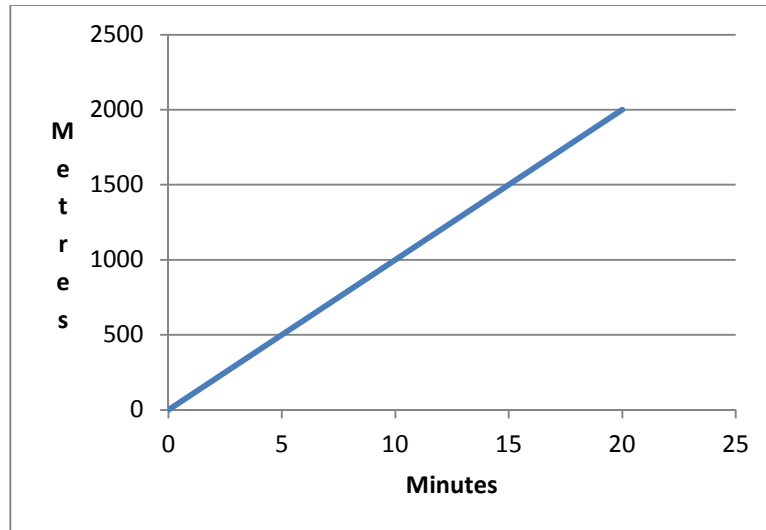
7) Car A travels for 30 minutes at 100 km per hour, stops for 30 minutes and then travels at 80 km per hour for 30 minutes

Car B travels for 20 minutes at 60 km per hour, and then stops for 10 minutes. It then travels at 70 km per hour for an hour.

Plot each car's journey on the same travel graph, and show which car travels further in the ninety minutes

Exercise 3

Mean, Mode & Median

1) Find the mean of the following data sets

    a) 1, 1, 1, 1,1

    b) 1, 2, 3, 4, 5

    c) 2, 4, 6, 8, 10

    d) 3, 3, 6, 6, 6, 6

2) What is the mode of the following data sets?

    a) 1, 1, 1, 1, 1

    b) 3, 3, 6, 6, 6, 6

    c) 2, 4, 6, 8, 10

    d) 2, 2, 4, 4, 6, 8, 10

    e) 1, 1, 2, 2, 3, 3, 4

3) Find the median of the following data sets

    a) 1, 1, 1, 1, 1,

    b) 1, 2, 3, 4, 5

    c) 2, 4, 6, 8, 10

    d) 4, 22, 32, 55, 100

    e) 23, 4, 5, 66, 9

    f) 3, 5, 17, 19, 22, 30

4)

    a) What is the mean of the following?

    1, 3, 5, 7, 9

    b) What is the mean of the following?

    1, 3, 5, 7, 9, 95

    c) What effect does adding a large number (an outlier) to a data set have on the value of the mean?

5)

    a) What is the mode of the following?

    2, 2, 2, 3, 4

    b) What is the mode of the following?

    2, 2, 2, 3, 4, 100

    c) What effect does adding a large number (an outlier) to a data set have on the value of the mode?

6)

    a) What is the median of the following?

    2, 4, 6, 8, 10

b) What is the median of the following?

2, 4, 6, 8, 10, 100

c) What effect does adding a large number (an outlier) have on the value of the median?

7) Three items on a menu have an average price of $20. If the price of the first item is $10 and the price of the second item is $35, what is the price of the third item?

8) The following data set has a mean of 6, a median of 6 and a mode of 8. Fill in the missing numbers

(The numbers are in order)

3, _____, _____, 8, _____

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Year 7 Mathematics

Measurement

Useful formulae and hints

The perimeter of a shape is the distance around the outside of it. For a circle, the perimeter (circumference) is equal to 2 x π x r, where r is the radius of the circle.

There are 10 mm in one cm

There are 100 cm in one metre

There are 100 metres in one km

Pythagoras' Theorem relates the lengths of the three sides of a right angled triangle $a^2 + b^2 = c^2$, where c is the hypotenuse (the side opposite the right angle)

The surface area of a prism is equal to the sum of the areas of all its faces

The volume of a prism is equal to the area of its base times its height. The base is usually a shape, the area of which can be calculated using known formulae

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Exercise 1

Perimeter & Circumference

1) Find the perimeter of the following

a)

3 cm

5 cm

b)

2 cm

5 cm

c)

6 cm

2 cm   2 cm

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d)

5 cm

2 cm
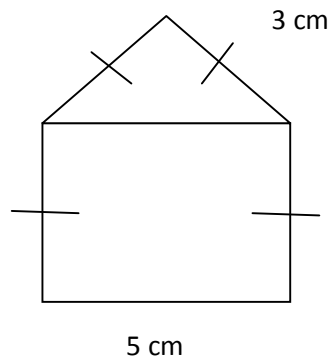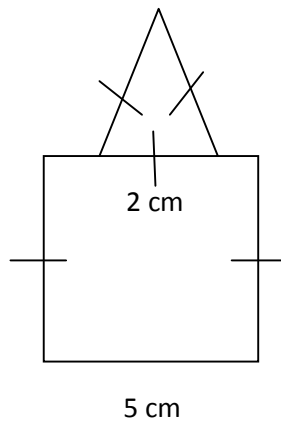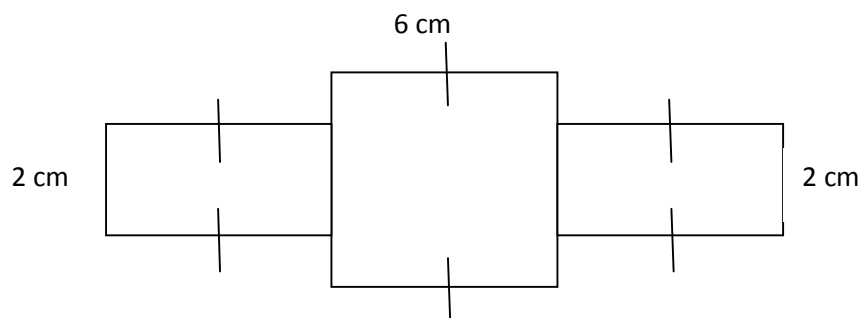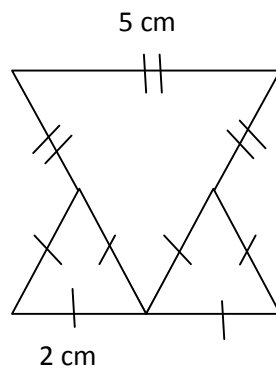
2) Find the circumference of the following correct to 2 decimal places

a)

4 cm

b)

3 cm

c)

10 cm

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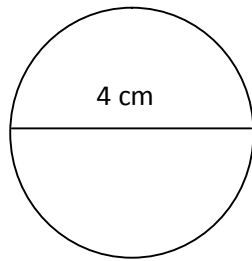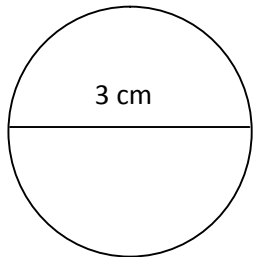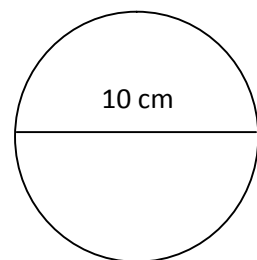
d)
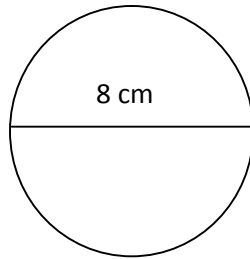
e)
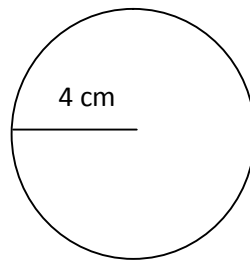
3) John walks around a circular running track, whilst Peter walks directly across the middle of it from one side to the other. If Peter walked 300 metres, how far did John walk? (To 2 decimal places)

4) The Earth has a circumference of approximately 40,000 km. If you were to drill a hole from the surface to the centre of the Earth, how far would you have to drill? (To 2 decimal places)

5) A piece of string is cut so it fits exactly across a circle, going through its centre. If the cut piece of string measures 1 metre, what is the distance around the outside of the circle? (to 2 decimal places)

6) An equilateral triangle sits exactly on the top of a square. If the side length of the square is 20 cm, what is the distance around the whole shape?

7) A rectangle of side lengths 3 cm and 4 cm is cut across its diagonal to form a triangle. What is the perimeter of this triangle?

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8) A circular athletics field has a circumference of 400 metres. If a javelin thrower can hurl the javelin a maximum of 80 metres, is it safe to throw javelins in the field without being a danger to runners? Allow 10 metres for a javelin thrower to run up

9) As part of its act, a lion runs directly across the middle of a circus ring, around it 5 times, then back across the middle of the ring to its cage. If the distance across the ring is 3 metres, how far does the lion run in its act?

Exercise 2

Units of Measurement

1) How many metres in

a) 1 mm

b) 1 cm

c) 1 km

d) 1000 mm

e) 100 cm

f) 0.001 km

2) Convert the following to cm

a) 10 mm

b) 100 mm

c) 1000 mm

d) 1 m

e) 10 m

f) 15 m

3) Convert the following to m

a) 1000 mm

b) 1000 cm

c) 10,000 cm

d) 10 km

e) 100 km

4) Which unit of measurement (mm, cm, m, Km) would be most appropriate to measure the length of the following?

a) Soccer pitch

b) Pencil

c) Person

d) Tower

e) Staple

f) TV screen

g) River

h) Bead

5) Estimate the length of the following, using the appropriate unit of measurement

a) Giraffe

b) Lap top

c) Cricket bat

d) Shoe

e) TV remote control

f) Butter knife

84

Exercise 3

Pythagoras' Theorem

1) Identify which side of the following triangles is the hypotenuse

a)

c > b and c > a

b)

c)

d)

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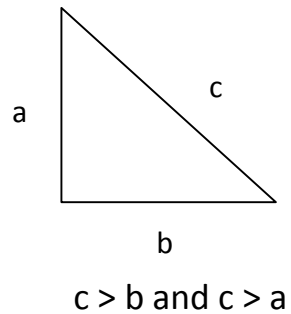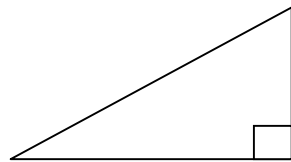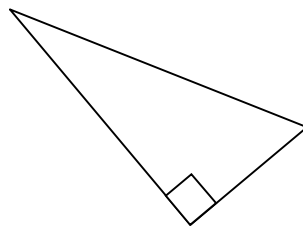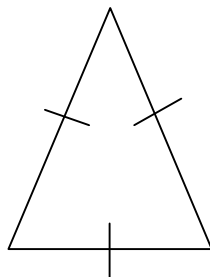
2) Calculate the length of the hypotenuse in the following triangles

a)

4cm

3cm

b)

6cm

8cm

c)

5cm

12cm

d)

4cm

2cm

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e)

2cm
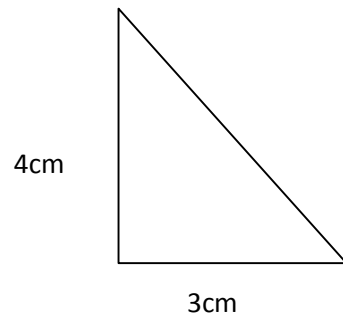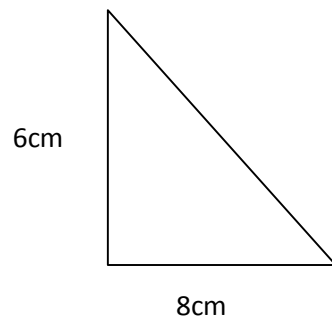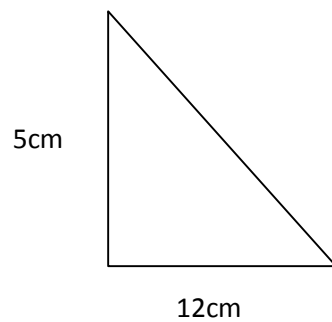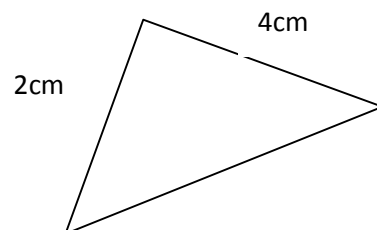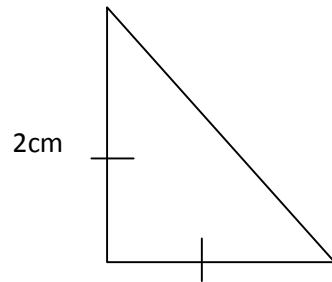
3) Explain why an equilateral triangle cannot be right-angled

4) Calculate the missing side length in the following triangles

a)

5cm

4cm

b)

10cm

8cm

c)

13cm

12cm

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d)

4cm

8cm

e)

7cm

3cm
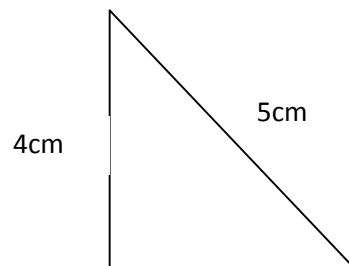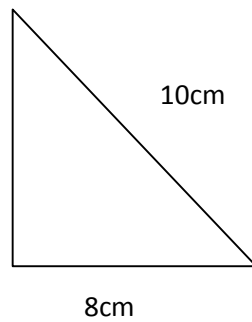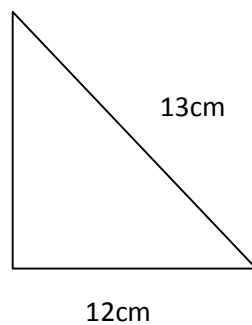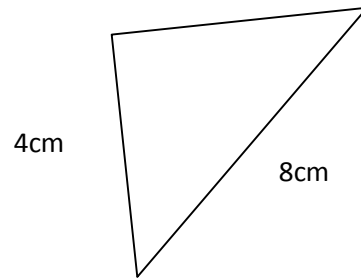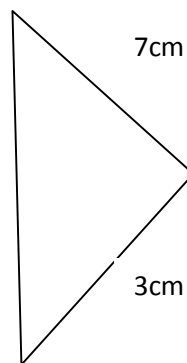
5) What is the area of the following triangle? (Use Pythagoras' to find required length)

5cm

4cm
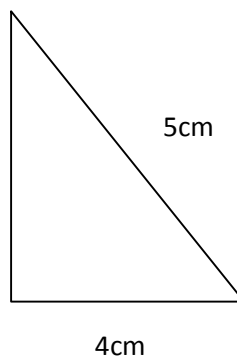
6) To get from point A to point C, a motorist must drive via point B. The distance from A to B is 15km. The distance from B to C is 20km. If the government wishes to build a bridge directly from A to C, how much distance will be taken off the trip?

A

B

C

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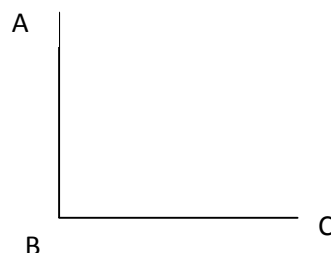
7) A slide is 3 metres long. If it is 2 metres high, how far is the bottom of the slide from the base of the ladder?

8) A square room is 3 metres long. How far is it from corner to corner?

9) A computer screen is 80 cm long by 40 cm wide. What is the distance from corner to corner?

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Exercise 4

Surface Area & Volume of Prisms

1) Calculate the surface area of the following prisms

a)

4cm

3cm

8cm

b)

3cm

c)

12 cm

B

8 cm   6 cm

A   10 cm   C

d)

9 cm

12 cm

18 cm

e)

5cm

12cm

6cm
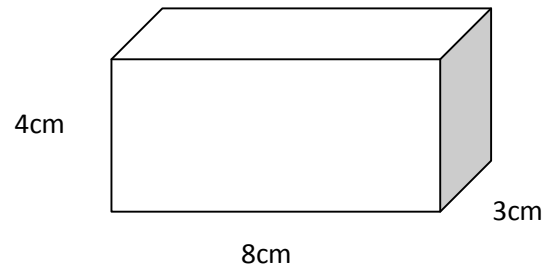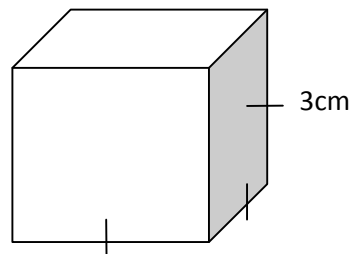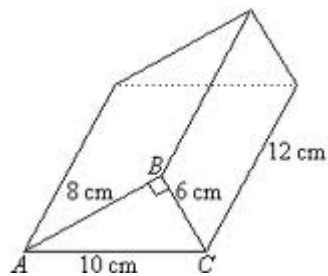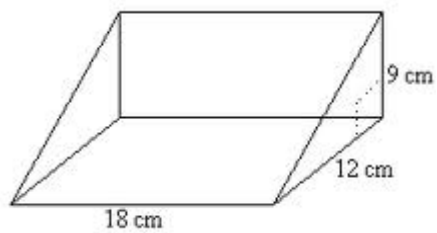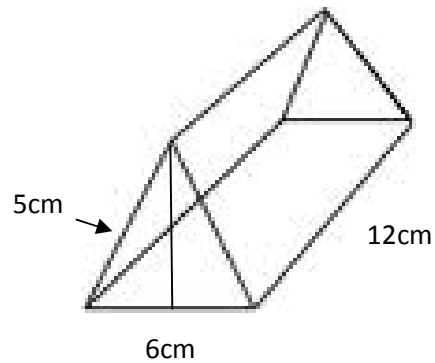
2) The surface area of a cube is 54 cm^2. What is its side length?

3) The following shapes are put together to make a prism. What is its surface area?

4cm

4cm

10cm
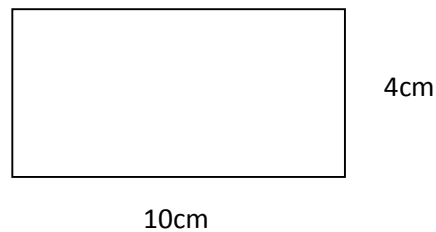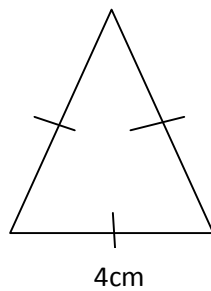
4) Calculate the volume of the following prisms

a)
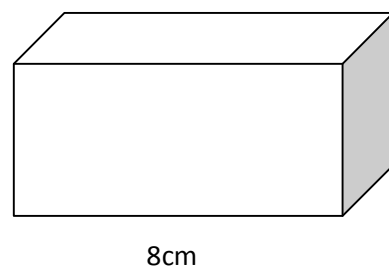
Area of shaded region = 20cm^2

8cm

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b)

3cm

c)

12 cm

B

8 cm   6 cm

A   10 cm   C

d)

9 cm

12 cm

18 cm
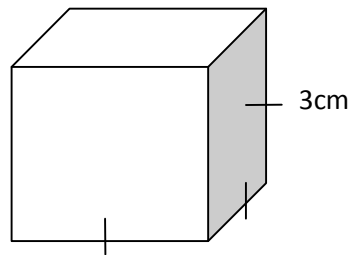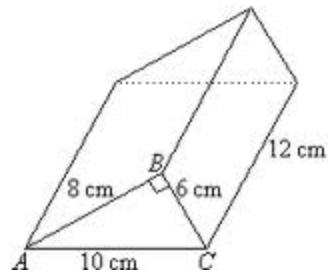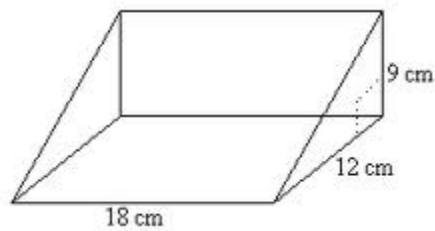
5) In each part below there is a cross section of a prism that has a length of 12cm. What are their volumes?

a)

4cm

6cm

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b)

5cm

c)

10cm

8cm

d) A

10cm

8cm
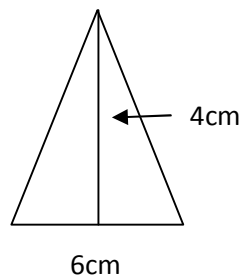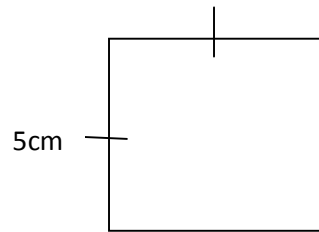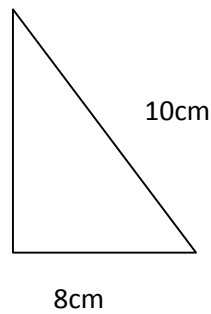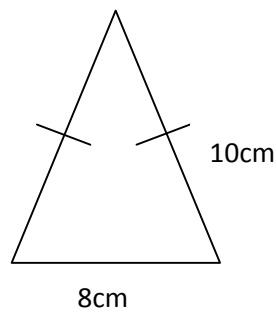
6) Convert the following to litres

    a) 1000 cm^3

    b) 2000 cm^3

    c) 4500 cm^3

    d) 750 cm^3

    e) 4125 cm^3

7) Convert the following to m^3

    a) 1000 litres

    b) 3 Kilolitres

    c) 8000 litres

    d) 0.5 Kilolitres

    e) 600 litres

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8) A piece of wood which measures 200 cm x 100 cm x 1 cm thick is placed on the ground. A further 9 identical pieces are placed on top of it. What is the volume of the stack of wood? If the structure was hollowed out, how much liquid would the structure hold?

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Year 7 Mathematics

Space

Useful formulae and hints

A polyhedron is a many faced shape (plural polyhedral)

Cross sections can be taken of polyhedral by cutting across them. Here we look at two cuts; parallel with the base and perpendicular to the base, and the 2D shapes they produce

A net is the representation of a 3D shape that has been unfolded.

Here is the net of a cube
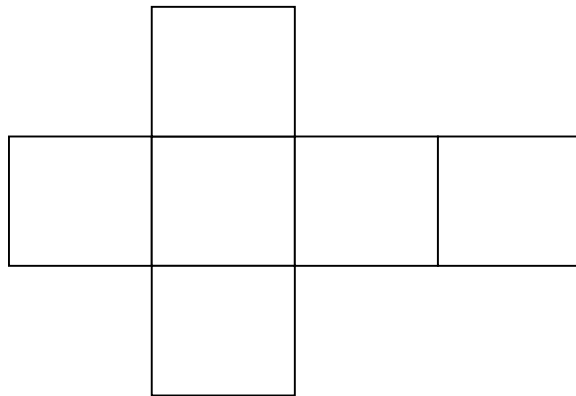
An isometric representation is a method for the visual representation of three-dimensional objects in two dimensions. Depth is shown by the use of scale

Two lines form to make an angle, the point where the lines meet is called a point or vertex

When a line intersects parallel lines, a number of angle pairs are formed. These have special names and relationships

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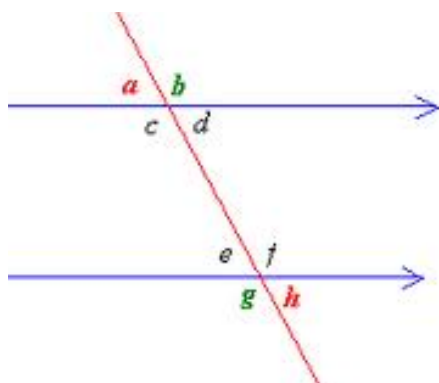
a and h are alternate exterior angles, and are equal

c and f are alternate interior angles, and are equal

c and e are co-interior angles, and add to 180°

e and g are complementary angles, and add to 180°

d and h are corresponding angles, and are equal

a and d are vertically opposite angles, and are equal

Supplementary angles are those that add to 90°

There are 4 main types of triangles

- Equilateral: all sides are equal, as are all angles
- Isosceles: two sides are equal in length, as are the angles opposite the equal sides
- Scalene: all sides are unequal, as are all angles
- Right angled: has a right angle (90°), which is opposite the longest side (the hypotenuse)

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A right angled triangle can be scalene or isosceles, but never equilateral

The sum of the internal angles of a triangle is 180°; this also means that all the angles of an equilateral triangle are 60°

Congruent shapes are those that have all sides and all angles equal

Similar shapes are a scaled version of a each other; the length of each side of one shape is a multiple of the length of the corresponding side on the other shape. For two shapes to be similar these scales must apply to each set of corresponding sides

The necessary conditions to prove similarity are

AA

SAS

SSS

ASA

HS

Where A represents a pair of angles, S represents a pair of sides, and H represents a pair of hypotenuse

For example if it can be shown that two sets of corresponding angles are the same, the triangles are similar

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Exercise 1

3 Dimensional Shapes

1) .Complete the following table (not all spaces may be able to be filled in)

	Number of faces	Shape of faces	Number and type of congruent faces	Vertices	Edges
Triangular Prism					
Rectangular Prism					
Cylinder					
Square Pyramid					
Triangular Pyramid					
Cone					
Sphere					

2) Draw two cross sections of each of the following solids. Draw one parallel to the base and the other perpendicular to the base

    a) Cylinder

    b) Triangular prism

    c) Cone

    d) Square pyramid

    e) Triangular Pyramid

    f) Rectangular prism

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3) Identify the solid from the given net

a)

b)

c)

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d)

Net

e)

f)

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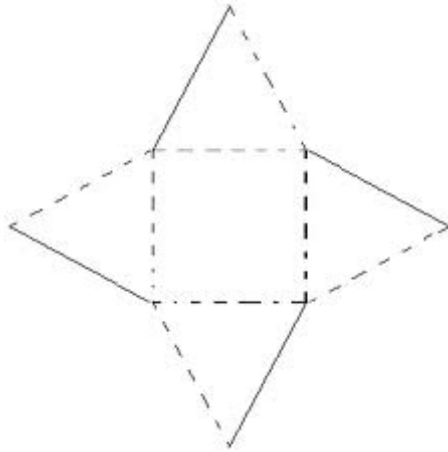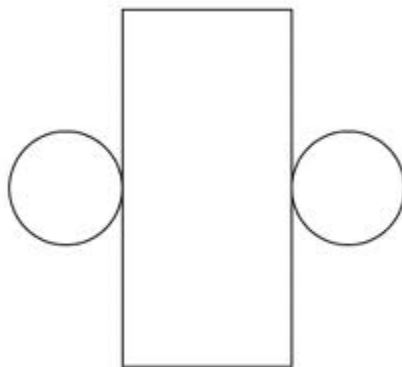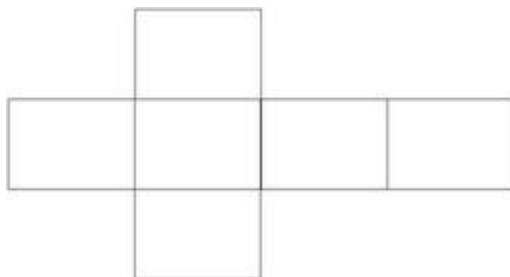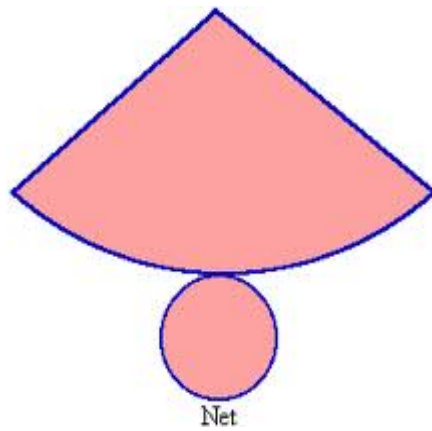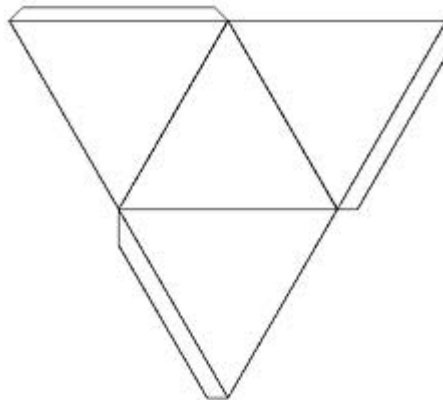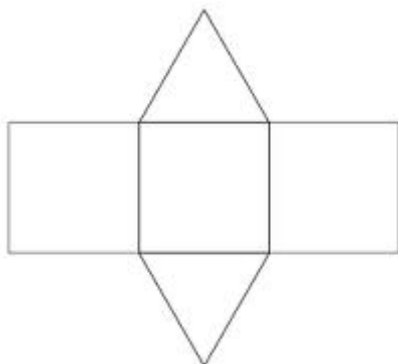
4) Which of the following solids are polyhedra?

Triangular prism, cone, triangular pyramid, rectangular prism, square pyramid, cylinder, sphere

5) Draw isometric representations of the following shapes built with cubes

Row 1	Row 2	Row 3
3 cubes x 1 cube	3 cubes x 2 cubes	3 cubes x 3 cubes
3 cubes x 1 cube	3 cubes by 3 cubes	3 cubes by 5 cubes
4 cubes x 2 cubes	5 cubes x 2 cubes	5 cubes x 3 cubes
2 cubes x 2 cubes	4 cubes x 4 cubes	6 cubes x 6 cubes
3 cubes x 3 cubes	3 cubes x 3 cubes	3 cubes x 6 cubes

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Exercise 2

Labelling Lines, Angles & Shapes

1) In the diagram identify and name the following

- A point
- A line
- An angle
- A right angle
- A pair of equal angles
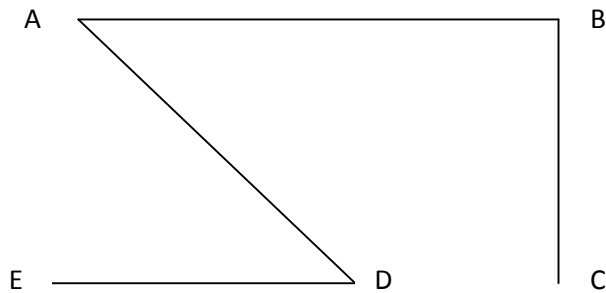
2) In the diagram identify and name the following

- A pair of adjacent angles
- A pair of vertically opposite angles
- A pair of complementary angles
- A pair of supplementary angles

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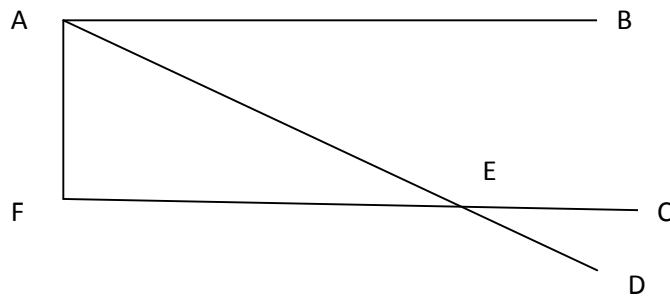
3) In the diagram identify and name the following

- A pair of co-interior angles
- A pair of alternate angles
- A pair of corresponding angles
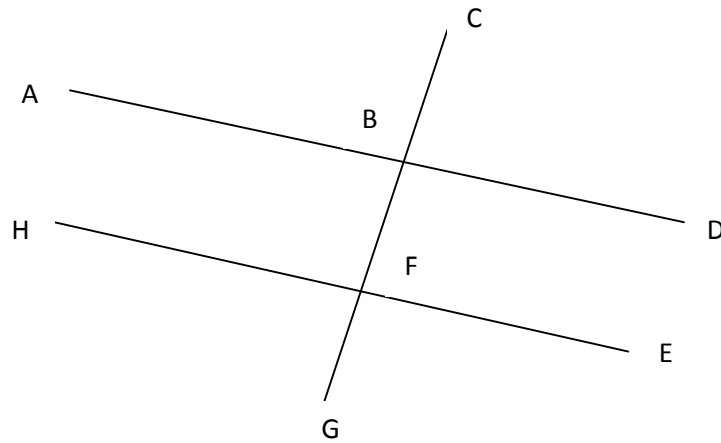
4) Name the following shapes using the correct notation

a)

b)

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c)

d)

e)

f)

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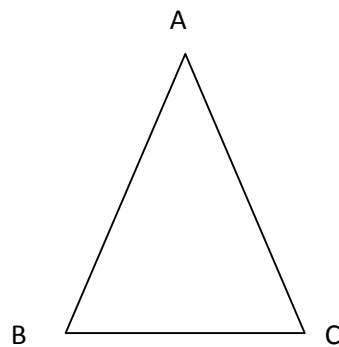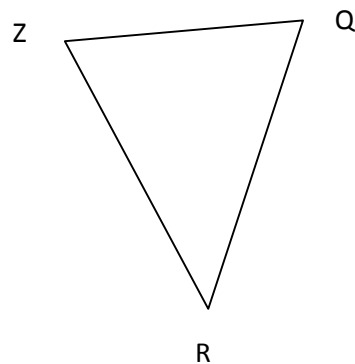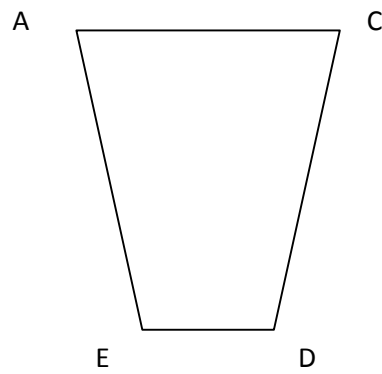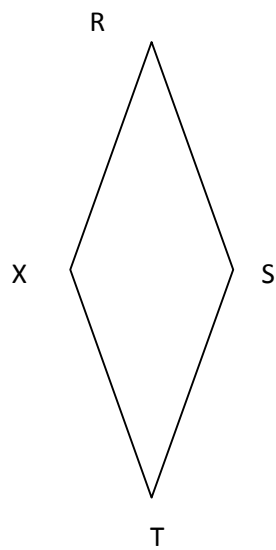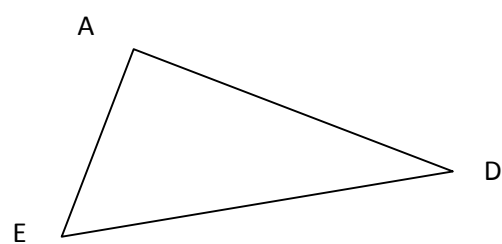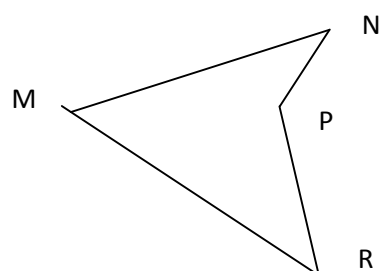
5) Name the following types of triangles, and indicate if the triangle is acute or obtuse angled if appropriate

a)

b)

2cm   14cm

6cm

c)

d)

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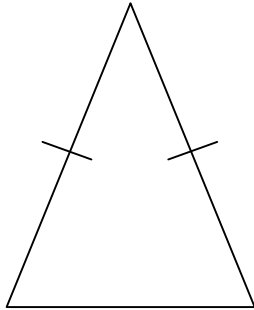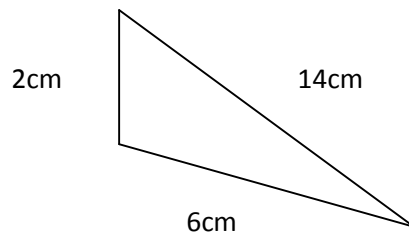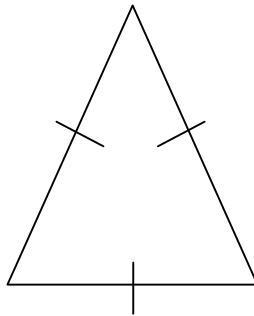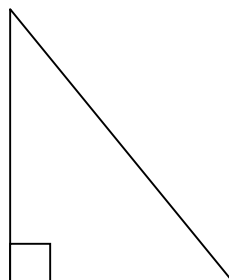
6) Calculate the size of the missing angle(s) in each diagram

a)

40°

60°

b)

70°

80°

c)

80°

d)

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e)

f)

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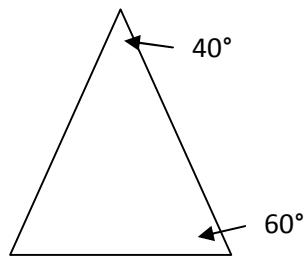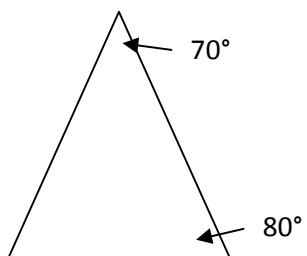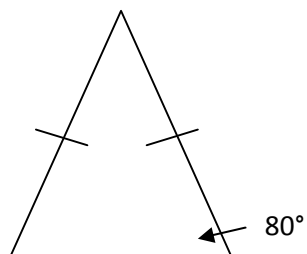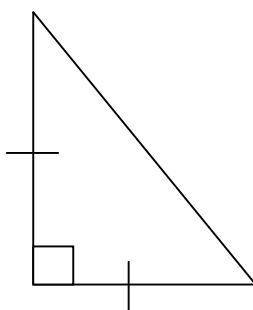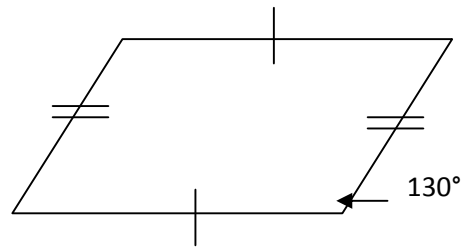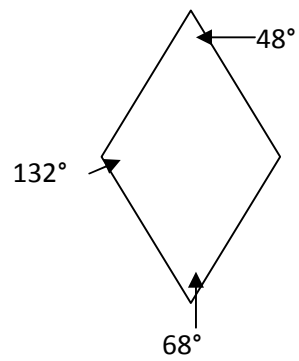
Exercise 3

Congruence & Similarity

1) Identify which of the following pairs of shapes are congruent, and match the sides and angles when making the congruence statement

a)
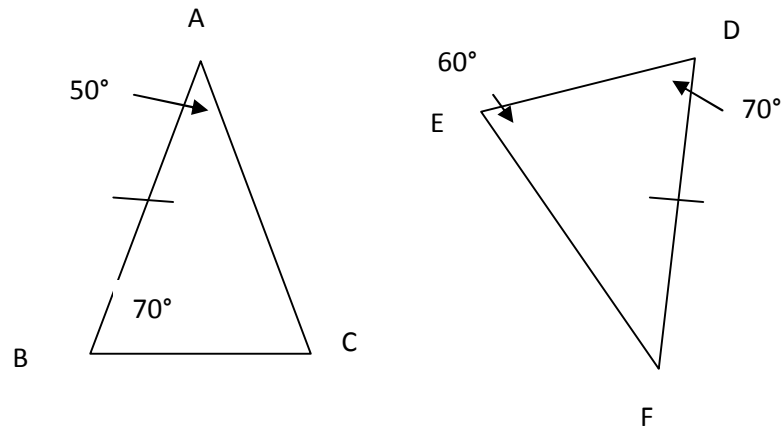
b)
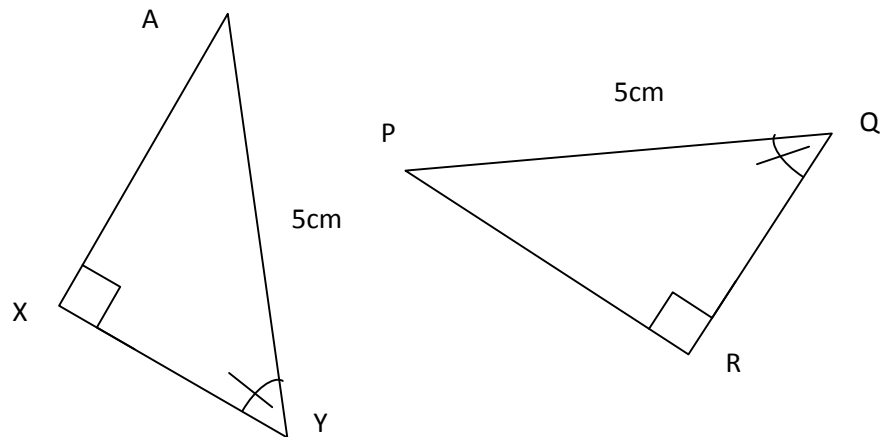
c)
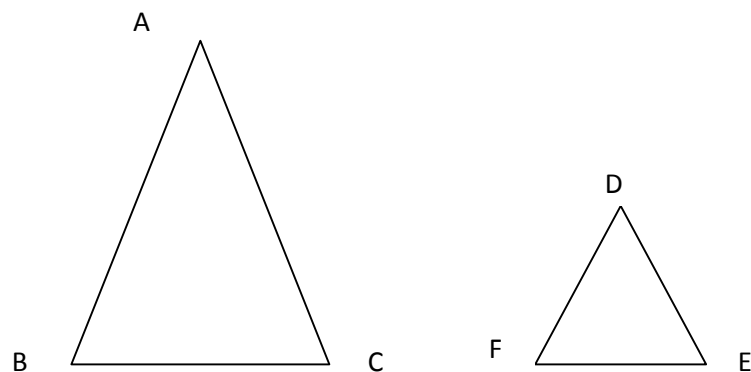
d)
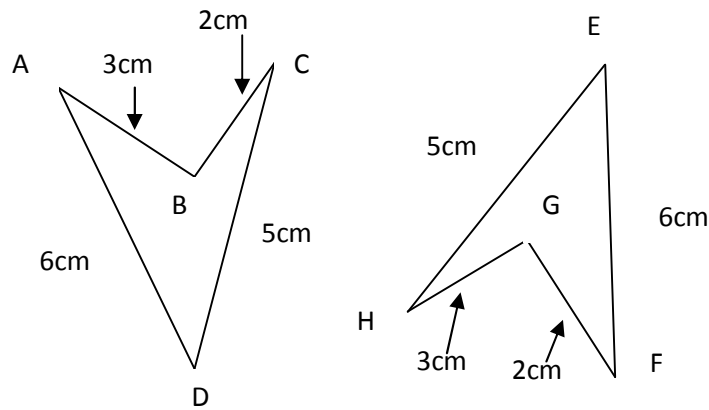
e)
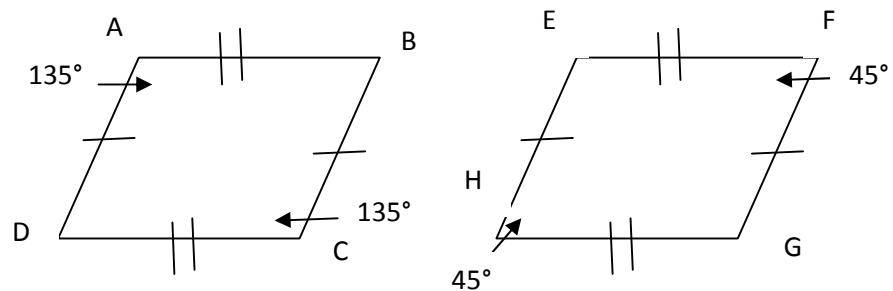
2)

a) Two rectangles are similar. The first is 4 cm. wide and 15 cm. long. The second is 9 cm. wide. Find the length of the second rectangle

b) Two rectangles are similar. One is 5 cm by 12 cm. The longer side of the second rectangle is 8 cm greater than twice the shorter side. Find its length and width.

c) A tree casts a 7.5 m shadow, whilst a man 2 m tall casts a 1.5 m shadow at the same time. How tall is the tree?

3) For each of the following pairs of similar figures, calculate the scale factor, and the value of x
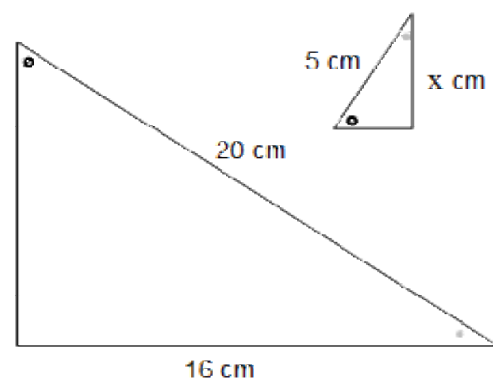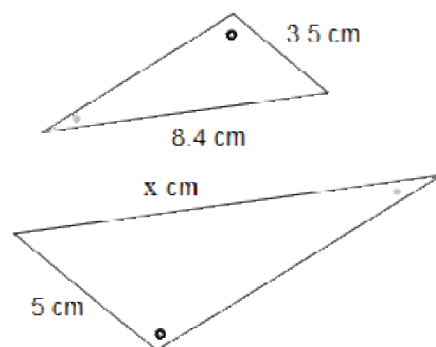
a)

b)

c)

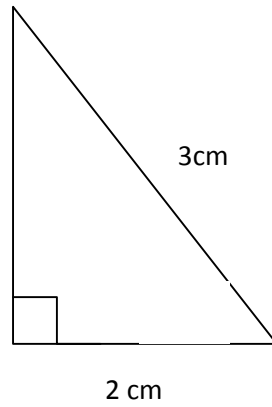www.ezymathtutoring.com.au

d)

e)

f)

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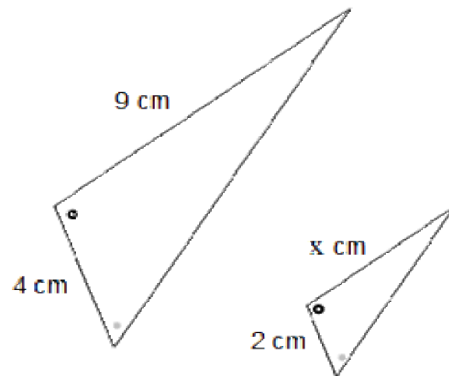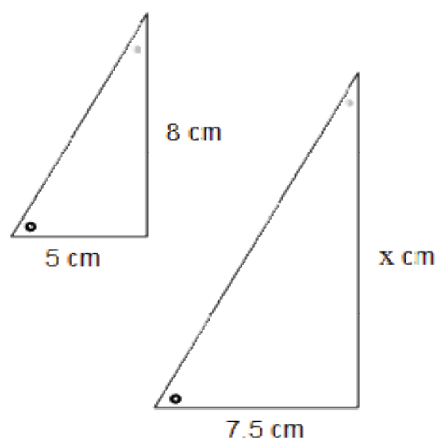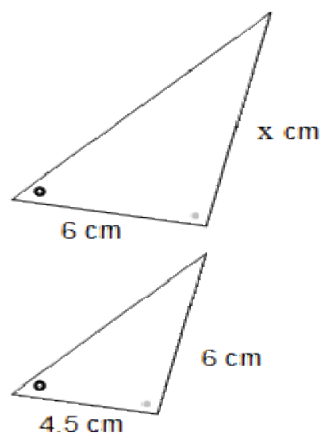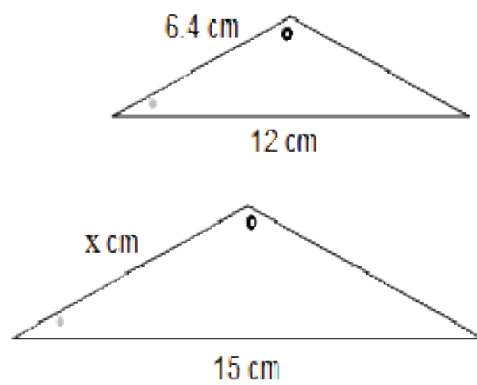
4) Enlarge the following shapes by a scale factor of 2.5.

a)

b)

c)

d)

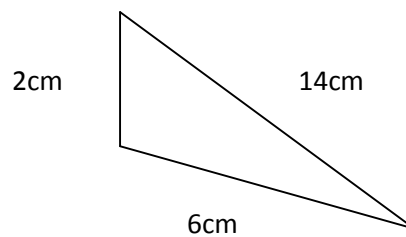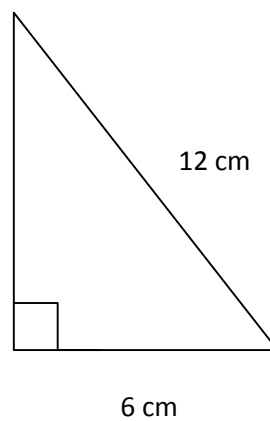www.ezymathtutoring.com.au
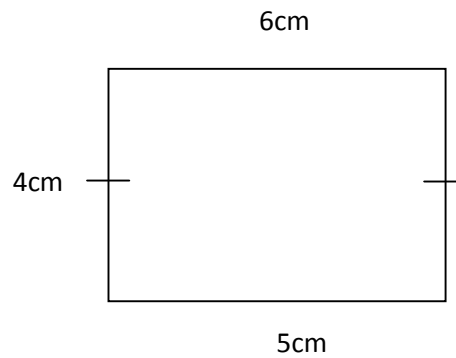
5) The Eiffel Tower is approximately 300 metres tall and sits on a square base of approximately 100 m in length. If a man makes an exact scale model in the ratio 1:25, what are the dimensions of the model?

6) A building is to be constructed from a blueprint. Firstly a prototype model is built, and then the full size building is constructed. The dimensions on the blueprint are 150cm x 200cm x 500cm. The prototype is built using a scale factor of 4, and then the actual building is made by scaling the model by a factor of 10. What are the dimensions of the actual building, and what is the scale factor between it and the blueprint?

7) A rectangular prism has dimensions of 2cm x 3cm x 5cm. If each dimension is scaled by a factor of 4.5, what are the dimensions of the new prism? By what scale factor does the volume of the original prism increase by?

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