

GCSE MATHEMATICS

# Aiming for Grade 3

REVISION BOOKLET

Exam Dates:

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Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

## Contents

	<b>Page:</b>
<b>Number:</b>	
<a href="#">Highest common factor and lowest common multiple</a>	3
<a href="#">Laws of indices and reciprocals</a>	6
<a href="#">Order of operations</a>	8
<a href="#">Rounding (decimal places and significant figures)</a>	10
<b>Algebra:</b>	
<a href="#">Plotting linear graphs</a>	12
<a href="#">Calculating gradients of linear graphs</a>	17
<a href="#">Linear <math>n^{\text{th}}</math> term</a>	20
<a href="#">Expanding and factorising single brackets</a>	23
<a href="#">Substitution (harder)</a>	25
<a href="#">Solving linear equations (unknown on both sides)</a>	27
<a href="#">Deriving expressions and equations</a>	30
<a href="#">Rearranging simple formulae</a>	34
<a href="#">Inequalities on a number line</a>	37
<b>Shape, Space and Measure:</b>	
<a href="#">Angles around a point, on a line and in a triangle</a>	39
<a href="#">Angles in parallel lines</a>	43
<a href="#">Plans and elevations</a>	47
<a href="#">Unit conversions</a>	51
<a href="#">Map scales</a>	53
<a href="#">Drawing and measuring bearings</a>	55
<a href="#">Transformations</a>	58
<a href="#">Pythagoras' Theorem</a>	61
<a href="#">Area and perimeter of triangles, parallelograms, trapezia and compound shapes</a>	64
<a href="#">Volume and surface area of prisms and cylinders</a>	67
<b>Data Handling:</b>	
<a href="#">Stem and leaf diagrams</a>	70
<a href="#">Averages from frequency tables (ungrouped)</a>	74
<a href="#">Pie charts</a>	77
<b>Probability:</b>	
<a href="#">Relative frequency</a>	82
<a href="#">Sample space diagrams</a>	85
<a href="#">Frequency trees</a>	88
<b>Ratio and Proportion:</b>	
<a href="#">Applied ratio – best buys, recipes and exchange rates</a>	90
<a href="#">Fractions and ratios</a>	94
<a href="#">Fractions of amounts</a>	96
<a href="#">Fraction, decimal and percentage equivalence</a>	98
<a href="#">Calculating with fractions</a>	100
<a href="#">Increasing and decreasing by a percentage</a>	102

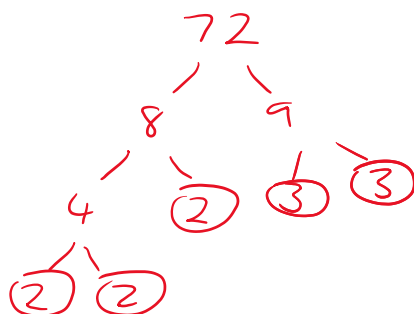
## Highest Common Factor and Lowest Common Multiple

### Things to remember:

- A factor is a whole number that divides exactly into another number
- A multiple is a number that may be divided by another a certain number of times without a remainder
- A prime number has exactly two factors – 1 and itself
- Start by expressing each number as a product of its prime factors
- The highest common factor is the product of the prime factors of both numbers
- The lowest common multiple is the product of all the prime factors of either number

### Questions:

1. a) Write 72 as a product of its prime factors.

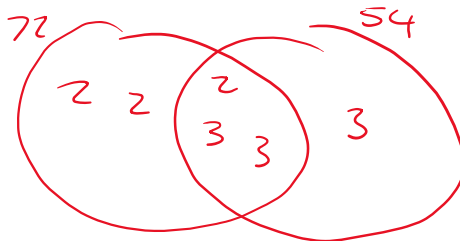
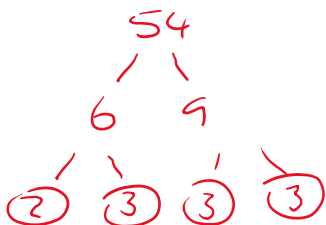


$$2^3 \times 3^2$$

.....

(2)

- b) Calculate the highest common factor of 72 and 54.



$$\text{HCF} = 2 \times 3 \times 3 = 18$$

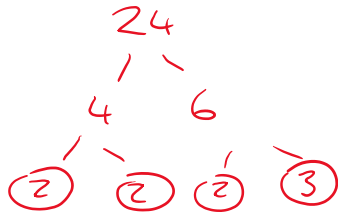
$$18$$

.....

(2)

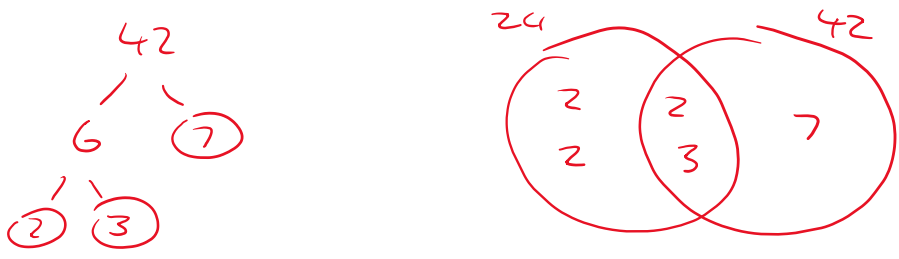
(Total 4 marks)

2. a) Write 24 as a product of its prime factors.



.....  $2^3 \times 3$  .....  
(2)

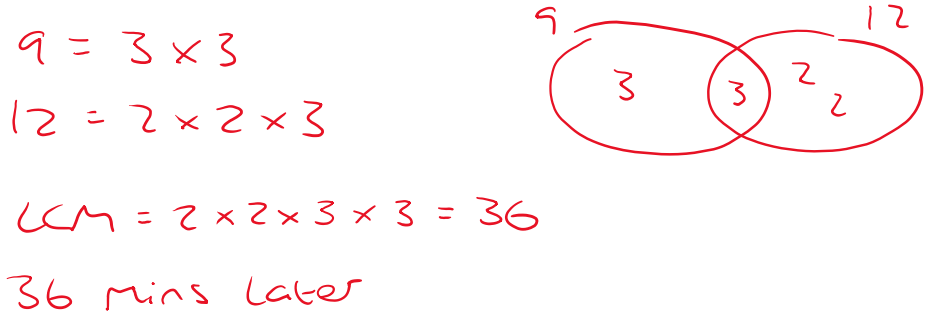
- b) Calculate the lowest common multiple of 24 and 42.



$LCM = 2 \times 2 \times 2 \times 3 \times 7 = 168$

.....  $168$  .....  
(2)  
(Total 4 marks)

3. Jess and Robert set the alarms on their phones to sound at 6.15 am  
Both alarms sound together at 6.15 am  
Jess' alarm then sounds every 9 minutes.  
Robert's alarm then sounds every 12 minutes.  
At what time will both alarms next sound together?



.....  $6:51 \text{ am}$  .....  
(Total 3 marks)

4. Catherine is making some table decorations.  
4



Each decoration is made from a candle and a holder.  
 Caroline buys some candles and some holders each in packs.  
 There are 30 candles in a pack of candles.  
 There are 18 holders in a pack of holders.  
 Catherine buys exactly the same number of candles and holders.

a) How many packs of candles and how many packs of holders does Catherine buy?

$30 = 2 \times 3 \times 5$   
 $18 = 2 \times 3 \times 3$   
 $LCM = 2 \times 3 \times 3 \times 5 = 90$   
 $90 \div 3 = 3$   
 $90 \div 18 = 5$

..... 3 ..... packs of candles  
 ..... 5 ..... packs of holders  
 (4)

Catherine uses all her candles and all her holders.

b) How many table decorations does Catherine make?

..... 90 ..... table decorations  
 (1)  
 (Total 5 marks)

5. Rhys buys some boxes of pencils and some packets of pens for people to use at a conference.

There are 40 pencils in a box.  
 There are 15 pens in a packet.  
 Rhys gives one pencil and one pen to each person at the conference.  
 How many boxes of pencils and how many packets of pens did Rhys buy?

$40 = 2 \times 2 \times 2 \times 5$   
 $15 = 3 \times 5$   
 $LCM = 2 \times 2 \times 2 \times 3 \times 5 = 120$   
 $120 \div 40 = 3$   
 $120 \div 15 = 8$

..... 3 ..... boxes of pencils  
 ..... 8 ..... packets of pens  
 (Total 3 marks)

## Laws of Indices and Reciprocals

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

### Things to remember:

- The exam question will use the word “simplify”
- If the exam question has the words “work out the value of”, or “evaluate” it means the answer is a number
- The reciprocal of a number the inverse of that number - if  $n$  is a real number, then its reciprocal will be  $\frac{1}{n}$

### Questions:

1. Evaluate:

a)  $2^3 \times 5^2$   $8 \times 25$

.....  
200  
..... (1)

b)  $4^5 \div 4^3$   $4^2$

.....  
16  
..... (1)

(Total 2 marks)

2. Write down the reciprocal of 3

.....  
 $\frac{1}{3}$   
..... (Total 1 mark)

3. Simplify:

a)  $x^3 \times x^4$

.....  
 $x^7$   
..... (1)

b)  $\frac{m^7}{m^5}$

.....  
 $m^2$   
..... (1)

(Total 2 marks)

4. Simplify:

a)  $\frac{p^4 \times p^2}{p^5}$   $\frac{p^6}{p^5}$

.....  
 $p$   
..... (2)

b)  $3d^2 \times 4d^5$

.....  
 $12d^7$   
..... (2)

(Total 2 marks)

5. Simplify:

a)  $x^2y^3 \times xy^4$

$x^3y^7$   
.....  
(2)

b)  $3a^3b^7 \times 2a^2b^{-4}$

$6a^5b^3$   
.....  
(2)

c)  $\frac{15m^6}{3m^3}$

$5m^3$   
.....  
(2)  
(Total 6 marks)

6. Write down the reciprocal of  $\frac{1}{2}$

$2$   
.....  
(Total 1 mark)

7. Write down the reciprocal of  $\frac{3}{4}$

$\frac{4}{3}$   
.....  
(Total 1 mark)

8.  $\frac{m^3 \times m^x}{m^2} = m^6$

Work out the value of  $x$

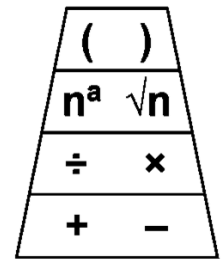
$3 + x - 2 = 6$

$x = 5$   
.....  
(Total 2 marks)

## Order of Operations

### Things to remember:

- As soon as you encounter a question with more than one operation, you need to ensure you do them in the right order
- Brackets, indices, division and multiplication (left to right), addition and subtraction (left to right)
- This is because indices are repeated multiplications and multiplications are repeated addition – it's not just made up!



### Questions:

1. Work out

i)  $2 \times 3 + 4$   
 $6 + 4$

(ii)  $10 - 2 \times 5$   
 $10 - 10$

(iii)  $16 \div (2 \times 4)$   
 $16 \div 8$

..... 10 .....

..... 0 .....

..... 2 .....

(Total 3 marks)

2. Alice says  $20 - 5 \times 3$  is 45  
Brian says  $20 - 5 \times 3$  is 5

a) Who is right?  
Give a reason for your answer.

..... Brian ..... is right because

..... multiplication comes before subtraction .....

b) Work out  $(12 + 9) \div 3$

$21 \div 3$

..... 7 .....

(1)

(Total 2 marks)

3. Work out

a)  $3 \times 3 - 5$   
 $9 - 5$

4

b)  $20 \div (12 - 2)$   
 $20 \div 10$

c)  $7 + (8 \div 4)$   
 $7 + 2$

2

9

(Total 3 marks)

4. a) Work out  $2 \times (11 + 9)$

$2 \times 20$

40

(1)

b) Work out  $(3 \times 5) + 4$   
 $15 + 4$

19

(1)

c) Work out  $20 - (5 \times 3)$   
 $20 - 15$

5

(1)

(Total 3 marks)

6. (a) Work out the value of  $(2 + 3) \times 4 + 5$

$(5 \times 4) + 5$   
 $20 + 5$

25

(1)

b) Add brackets ( ) to make each statement correct.  
You may use more than one pair of brackets in each statement.

i)  $2 + 3 \times (4 + 5) = 29$

ii)  $(2 + 3) \times (4 + 5) = 45$

(2)

(Total 3 marks)

## Rounding

### Things to remember:

- If the next number is less than 5, round down
- If the next number is 5 or more, round up
- The first decimal place is the first digit after the decimal point
- The first significant figure is the first non-zero digit, although every digit after this is significant

### Questions:

1. a) Write 376 to the nearest hundred.

400  
.....  
(1)

b) Write 5829 to the nearest thousand.

6000  
.....  
(1)  
(Total 2 marks)

2. a) Write 2.79 correct to 1 decimal place.

2.8  
.....  
(1)

b) Write 2437 to the nearest hundred.

2400  
.....  
(1)

c) Write 3.84761 correct to 1 decimal place.

3.8  
.....  
(1)  
(Total 3 marks)

3. Write 37.62 correct to one significant figure.

40  
.....  
(Total 1 mark)

4. Write 58.165 correct to one significant figure.

60  
.....  
(Total 1 mark)

5. Write 67480 correct to one significant figure.

70 000  
.....  
(Total 1 mark)

6. a) Write 18.1693 correct to 2 decimal places.

18.17

(1)

b) Write 0.4726 correct to two significant figures.

0.47

(1)

(Total 2 marks)

7. a) Write 5.4096 correct to 3 decimal places.

5.410

(1)

b) Write 4726.7 correct to three significant figures.

4730

(1)

(Total 2 marks)

8. a) Write 193.28 correct to one significant figure.

200

(1)

b) Write 90437 correct to two significant figures.

90 000

(1)

(Total 2 marks)

## Plotting Linear Graphs

### Things to remember:

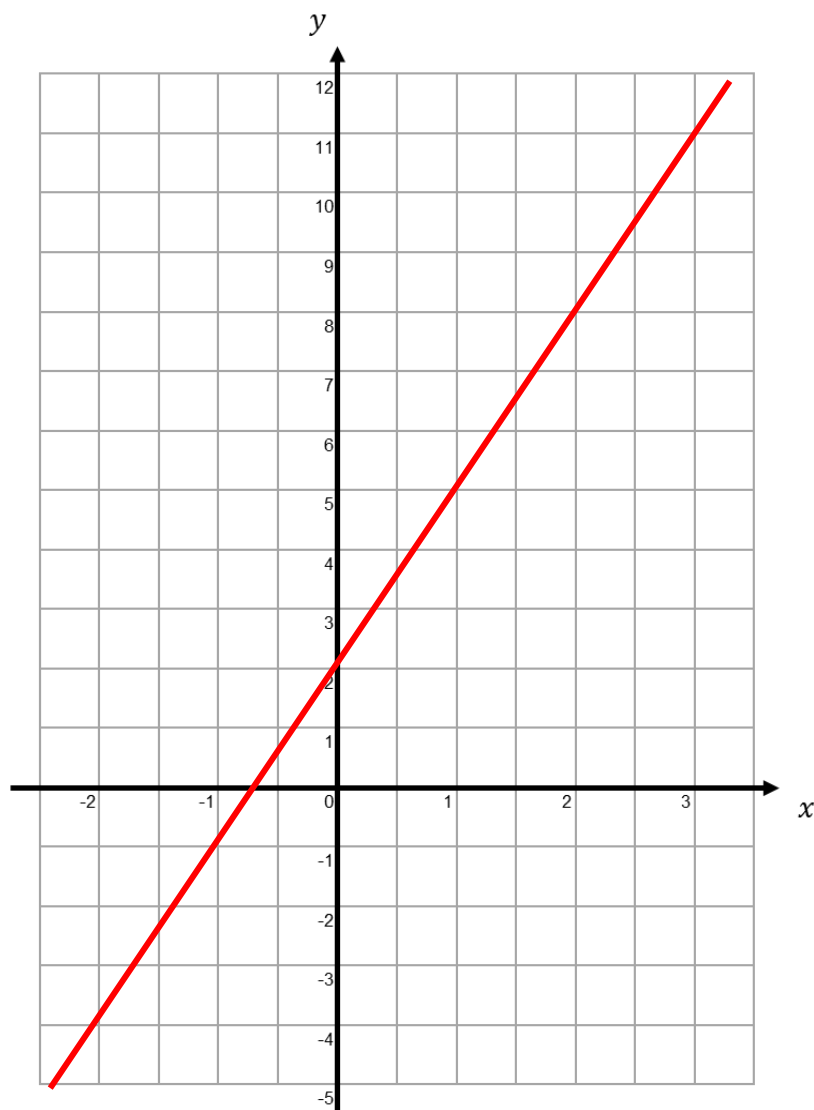
- Draw a table of values with  $x$  and  $y$
- Work out the values of  $y$  when  $x$  equals the given values
- Sometimes it might be easier to cover-up  $x$  and  $y$  in turn to work out corresponding values when  $x$  and  $y$  each equal 0
- Don't forget to connect the coordinates with a straight line using a ruler and pencil

### Questions:

1. a) Complete the table of values for  $y = 3x + 2$

$x$	-2	-1	0	1	2	3
$y$	-4	-1	2	5	8	11

- b) On the grid, draw the graph of  $y = 3x + 2$



(2)

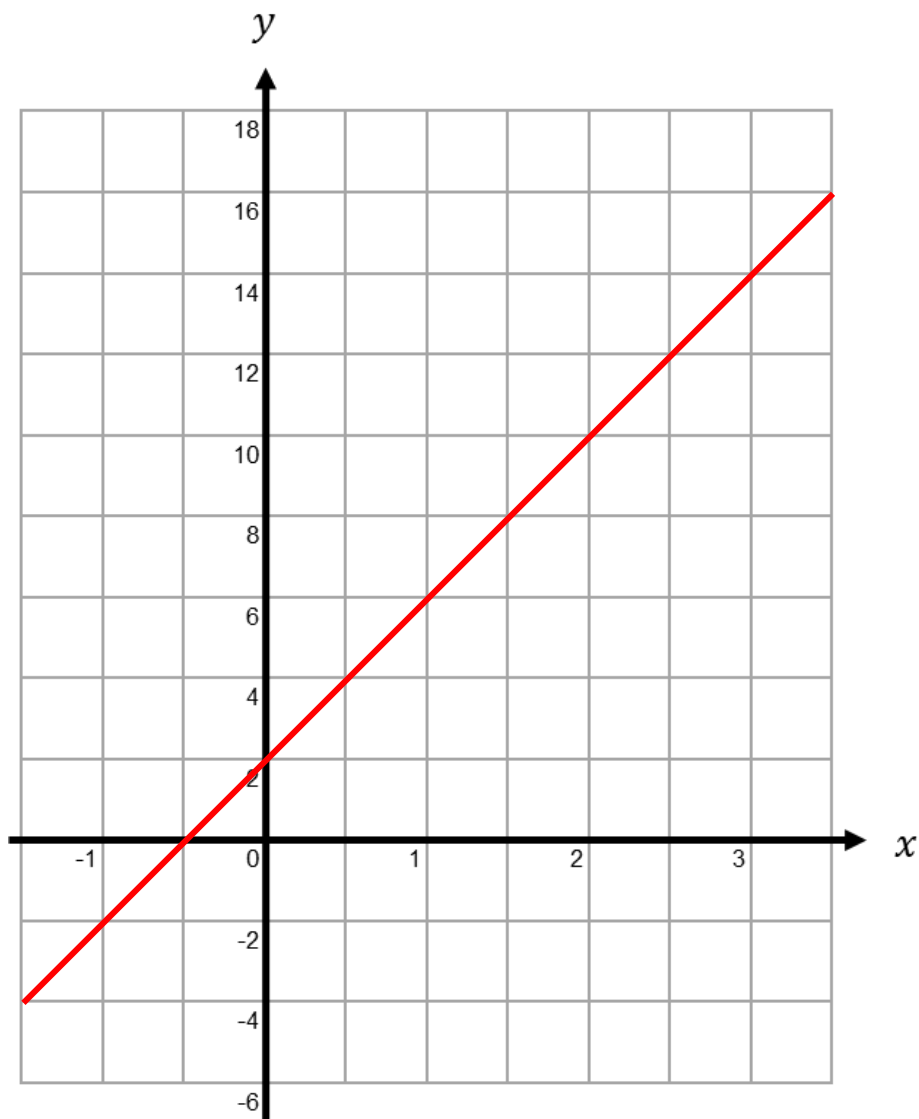
(2)

(Total 4 marks)



2. On the grid, draw the graph of  $y = 4x + 2$  from  $x = -1$  to  $x = 3$

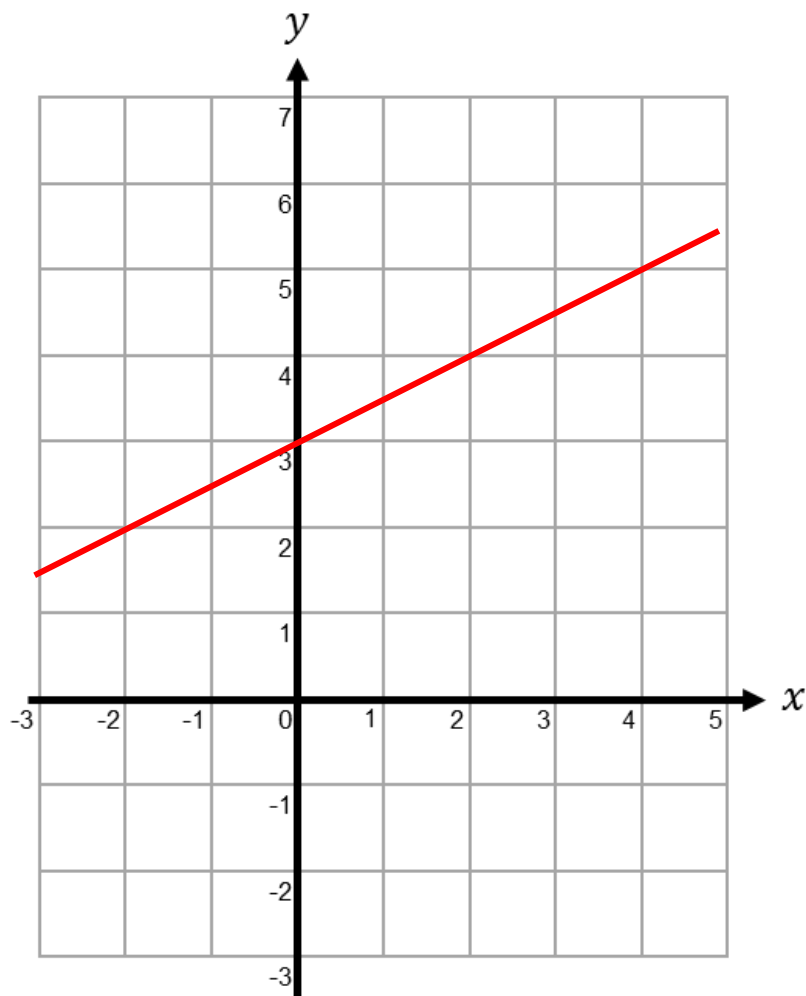
$x$	-1	0	1	2	3
$y$	-2	2	6	10	14



(Total 4 marks)

3. On the grid, draw the graph of  $y = \frac{1}{2}x + 3$  for values of  $x$  from  $-2$  to  $4$

$x$	-2	0	2	4
$y$	2	3	4	5

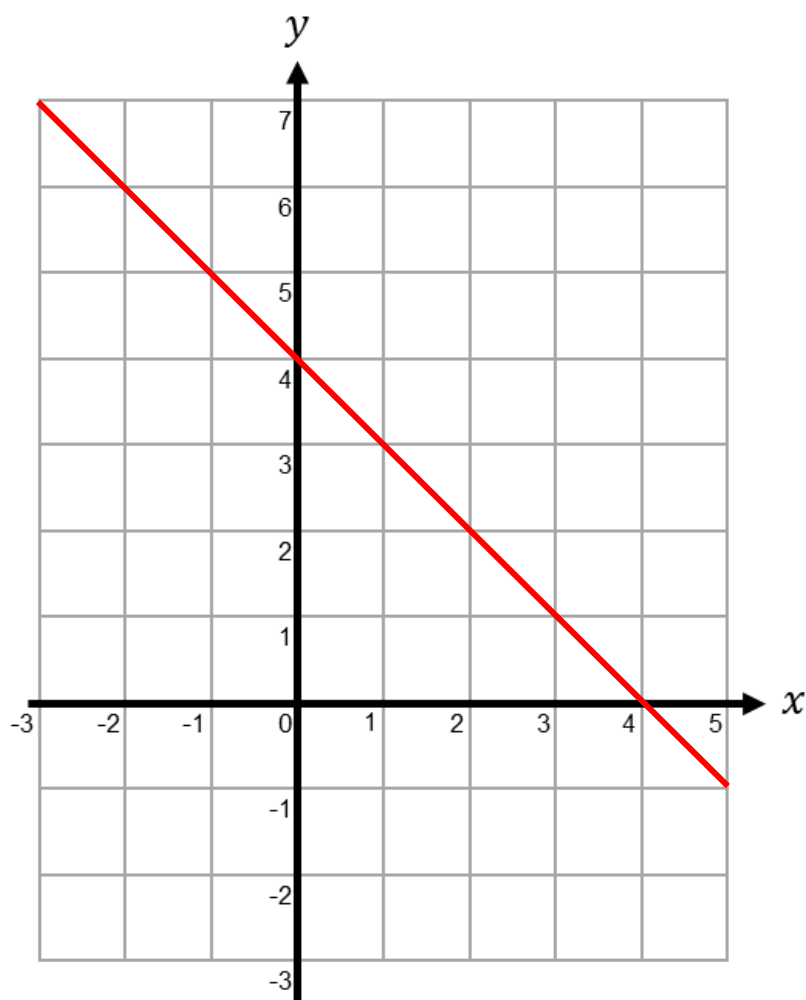


(Total 3 marks)

4. On the grid, draw the graph of  $x + y = 4$  for values of  $x$  from  $-2$  to  $4$

$$\text{If } x = 0, y = 4 \Rightarrow (0, 4)$$

$$\text{If } y = 0, x = 4 \Rightarrow (4, 0)$$

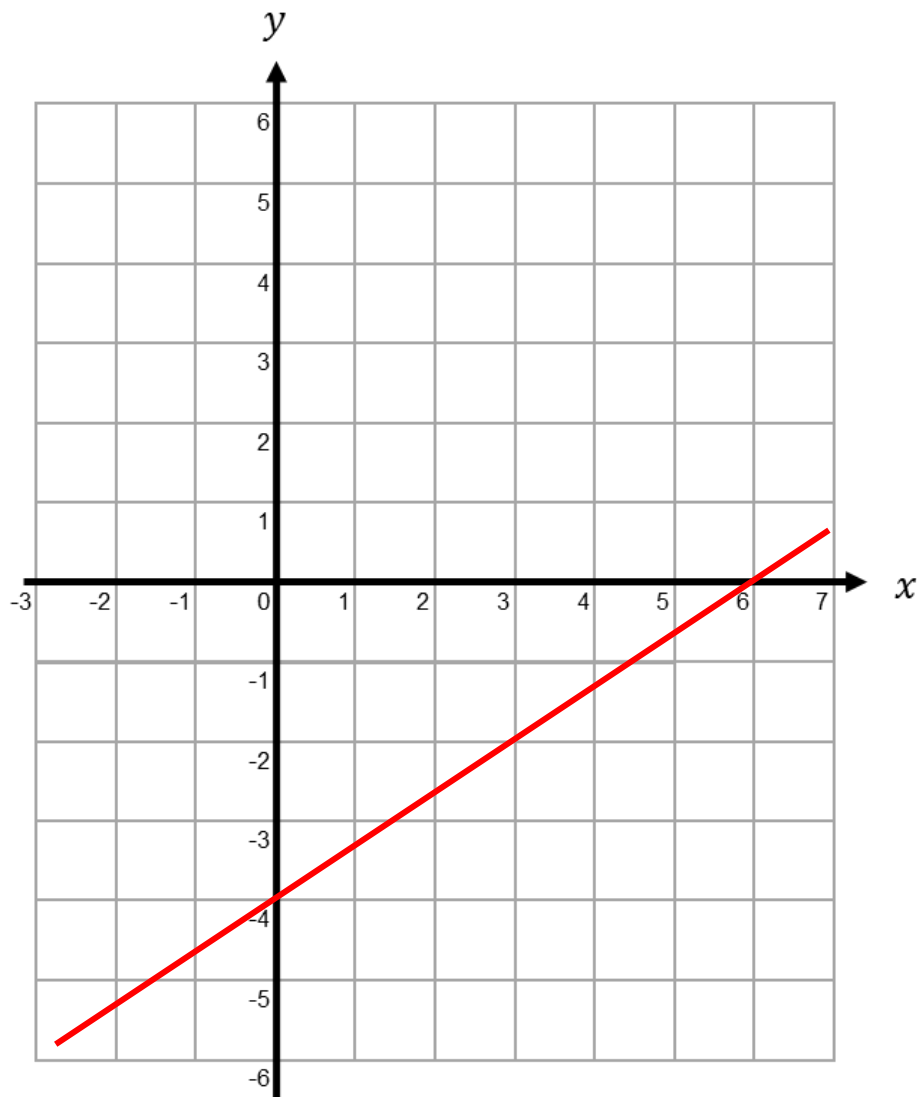


(Total 3 marks)

5. On the grid, draw the graph of  $2x - 3y = 12$  for values of  $x$  from  $-1$  to  $6$

$$\text{If } x=0, y=-4 \Rightarrow (0, -4)$$

$$\text{If } y=0, x=6 \Rightarrow (6, 0)$$

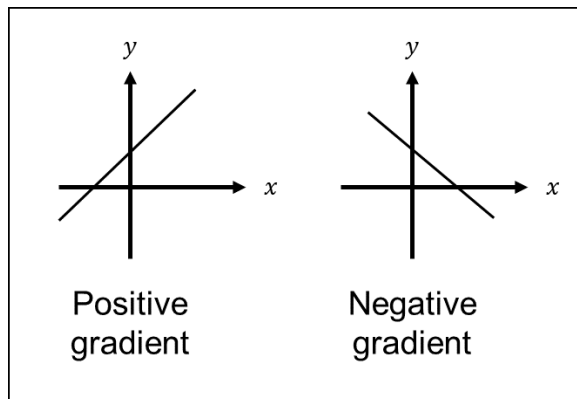


(Total 3 marks)

## Calculating Gradients of Linear Graphs

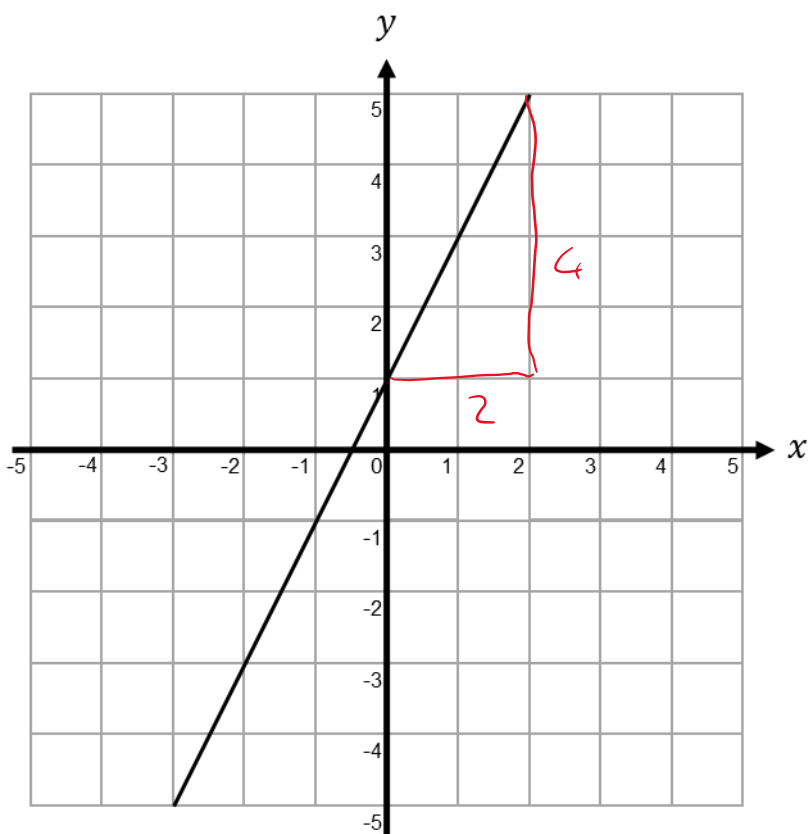
### Things to remember:

- To calculate the gradient of a straight line segment, use  $\frac{\text{rise}}{\text{run}}$
- You will also need to check whether the gradient is positive or negative
- If it's tricky, draw a piccy!



### Questions:

1. The line  $L$  is drawn on the grid below.



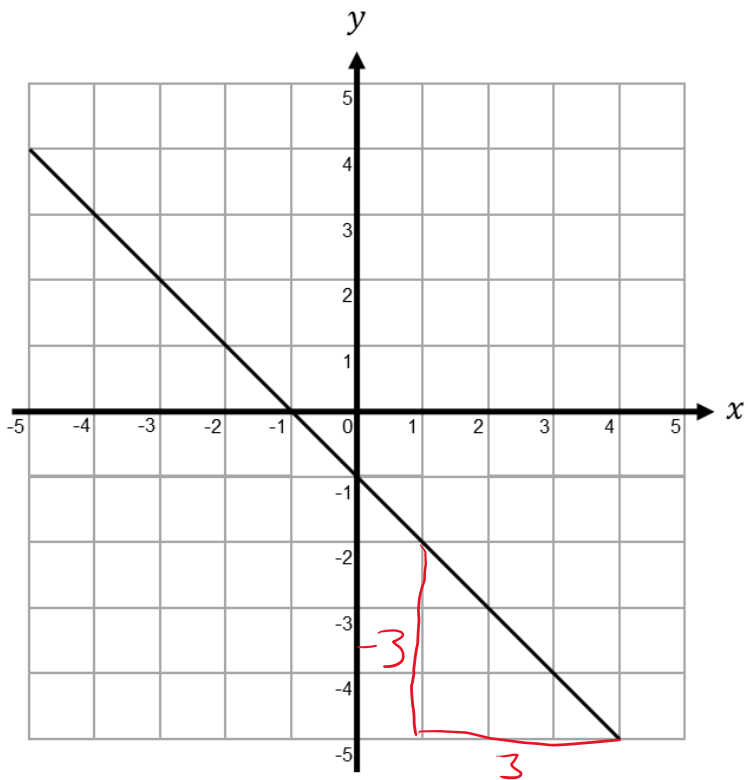
Find the gradient of the line.

$$\frac{\text{rise}}{\text{run}} = \frac{4}{2}$$

2

.....  
(Total 1 mark)

2. The line  $L$  is drawn on the grid below.

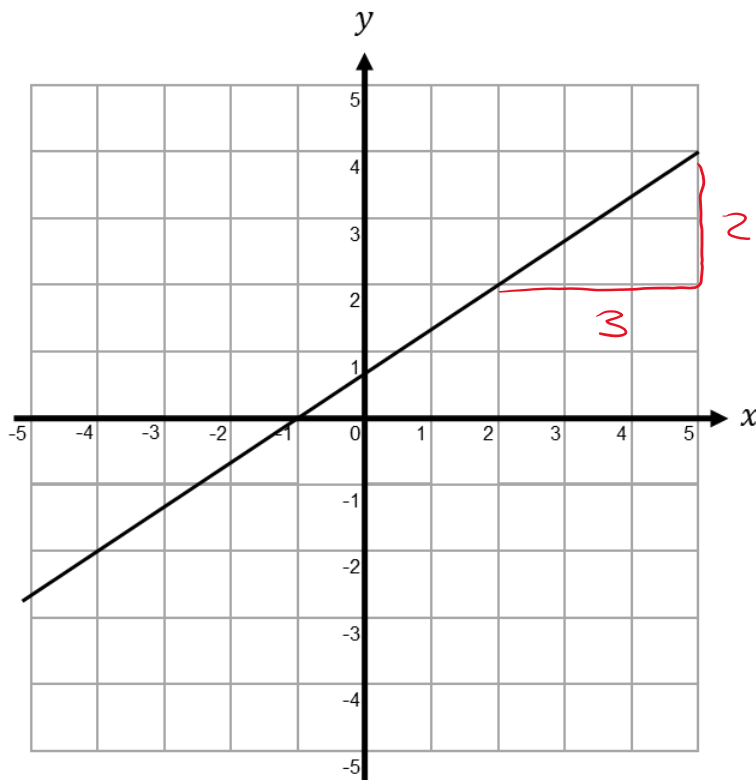


$$-\frac{3}{3}$$

Find the gradient of the line.

.....  $-1$  .....  
(Total 1 mark)

3. The line  $L$  is drawn on the grid below.

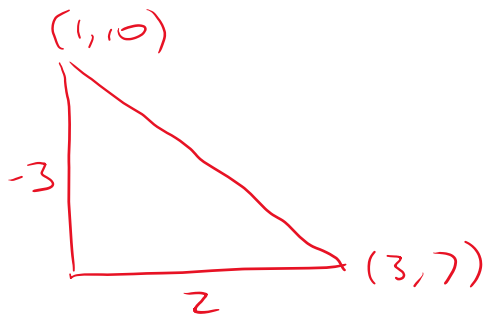


$$\frac{2}{3}$$

Find the gradient of the line.

.....  $\frac{2}{3}$  .....  
(Total 1 mark)

4. Find the gradient of the line that passes through (3, 7) and (1, 10).

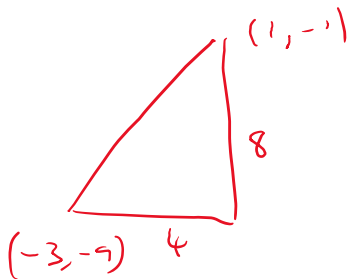


$$\frac{-3}{2}$$

$$-\frac{3}{2}$$

.....  
(Total 2 marks)

5. Find the gradient of the line that passes through (1, -1) and (-3, -9)

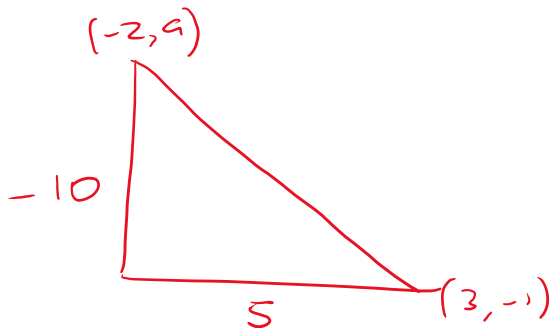


$$\frac{8}{4}$$

$$2$$

.....  
(Total 2 marks)

6. Find the gradient of the line that passes through (3, -1) and (-2, 9).



$$\frac{-10}{5}$$

$$-2$$

.....  
(Total 2 marks)

7. The line  $AB$  passes through the points  $A(-2, k)$  and  $(4, 8)$   
The gradient of  $AB$  is  $-2$   
Work out the value of  $k$

$$\frac{8 - k}{4 + 2} = -2$$

$$8 - k = -12$$

$$20$$

.....  
(Total 3 marks)

## Linear $n^{\text{th}}$ Term

### Things to remember:

- The gap between the numbers is the number that goes in front of  $n$  e.g.  $4n$
- Then add on the zero term
- If you're asked to write down terms of a sequence, use  $n = 1, n = 2, n = 3$  etc

### Questions:

1. Here are the first five terms of a sequence.

3    7    11    15    19

Write down the next two terms in the sequence.

..... 23, 27 .....

(Total 2 marks)

2. The  $n^{\text{th}}$  term of a sequence is  $2n + 3$

a) Find the first two terms of this sequence.

$$2 \times 1 + 3 = 5$$

$$2 \times 2 + 3 = 7$$

..... 5, 7 .....

(2)

b) Is 35 a term in this sequence?  
You must show how you get your answer.

.....  $2n + 3 = 35$     Yes - the 16<sup>th</sup> term .....

.....  $2n = 32$  .....

.....  $n = 16$  .....

(1)

(Total 3 marks)

3. Here are the first 5 terms of a sequence.

9    14    19    24    29

Find an expression, in terms of  $n$ , for the  $n^{\text{th}}$  term of this sequence.

$$5n: 5 \quad 10 \quad 15 \quad 20$$

.....  $5n + 4$  .....

(Total 2 marks)



4. Here are the first 5 terms of a sequence.

25    22    19    16    13

Find an expression, in terms of  $n$ , for the  $n^{\text{th}}$  term of this sequence.

$$-3n : -3 \quad -6 \quad -9 \quad -12$$

$$\frac{-3n + 28}{\dots\dots\dots}$$

(Total 2 marks)

5. Here are the first four terms of an arithmetic sequence.

4    11    18    25

Find an expression, in terms of  $n$ , for the  $n^{\text{th}}$  term of this sequence.

$$7n : 7 \quad 14 \quad 21 \quad 28$$

$$\frac{7n - 3}{\dots\dots\dots}$$

(Total 2 marks)

6. Here are the first four terms of an arithmetic sequence.

35    31    27    23

Find an expression, in terms of  $n$ , for the  $n^{\text{th}}$  term of this sequence.

$$-4n : -4 \quad -8 \quad -12 \quad -16$$

$$\frac{-4n + 39}{\dots\dots\dots}$$

(Total 2 marks)

7. Here are the first five terms of an arithmetic sequence.

-2    -7    -12    -17    -22

Find an expression, in terms of  $n$ , for the  $n^{\text{th}}$  term of this sequence.

$$-5n : -5 \quad -10 \quad -15 \quad -20$$

$$\frac{-5n + 3}{\dots\dots\dots}$$

(Total 2 marks)

8. A sequence of numbers is shown below.

1    5    9    13    17

a) Find an expression for the  $n$ th term of the sequence.

$$4n: \quad 4 \quad 8 \quad 12 \quad 16$$

$$4n - 3$$

(2)

b) Explain why 95 will not be a term in this sequence.

$$4n - 3 = 95$$

It is between the

$$4n = 98$$

24<sup>th</sup> and 25<sup>th</sup> terms.

$$n = 24.5$$

(2)

(Total 4 marks)

9. The  $n$ th term of a sequence is  $3n - 2$

a) Write down the first two terms of this sequence.

$$3 \times 1 - 2 = 1$$

$$3 \times 2 - 2 = 4$$

1, 4

(2)

b) Which term of the sequence is equal to 70?

$$3n - 2 = 70$$

$$3n = 72$$

$$n = 24$$

24<sup>th</sup> term

(2)

c) Explain why 101 is not a term in the sequence

$$3n - 2 = 101$$

It is between the 34<sup>th</sup>

$$3n = 103$$

and 35<sup>th</sup> term.

$$n = 34.\bar{3}$$

(2)

(Total 6 marks)

## Expanding and Factorising Single Brackets

### Things to remember:

- Expanding brackets means to multiply what is outside the bracket with everything inside the bracket
- Factorising is the opposite of expanding – put the HCF outside the brackets to factorise fully
- Use the grid method to make this easier!

### Questions:

1. a) Expand  $2m(m + 3)$

$$\begin{array}{r|l} x & m \quad +3 \\ \hline 2m & 2m^2 + 6m \end{array}$$

$$\dots\dots\dots 2m^2 + 6m$$

(1)

- b) Factorise fully  $3xy^2 - 6xy$

$$\begin{array}{r|l} x & y \quad - 2 \\ \hline 3xy & 3xy^2 - 6xy \end{array}$$

$$\dots\dots\dots 3xy(y-2)$$

(2)  
(Total 3 marks)

2. a) Expand  $3(x + 4)$

$$\begin{array}{r|l} x & x \quad +4 \\ \hline 3 & 3x + 12 \end{array}$$

$$\dots\dots\dots 3x + 12$$

(1)

- b) Expand  $x(x^2 + 2)$

$$\begin{array}{r|l} x & x^2 \quad + 2 \\ \hline x & x^3 + 2x \end{array}$$

$$\dots\dots\dots x^3 + 2x$$

(2)

- c) Factorise  $x^2 - 6x$

$$\begin{array}{r|l} x & x \quad - 6 \\ \hline x & x^2 - 6x \end{array}$$

$$\dots\dots\dots x(x-6)$$

(1)  
(Total 4 marks)

3. a) Expand and simplify  $5(x + 7) + 3(x - 2)$

$$\begin{array}{r|l} x & x + 7 \\ \hline 5 & 5x + 35 \end{array} \quad \begin{array}{r|l} x & x - 2 \\ \hline 3 & 3x - 6 \end{array}$$

$$8x + 29$$

(2)

- b) Factorise completely  $3a^2b + 6ab^2$

$$\begin{array}{r|l} x & a + 2b \\ \hline 3ab & 3a^2b + 6ab^2 \end{array}$$

$$3ab(a + 2b)$$

(2)

(Total 4 marks)

4. (a) Expand  $3(2y - 5)$

$$\begin{array}{r|l} x & 2y - 5 \\ \hline 3 & 6y - 15 \end{array}$$

$$6y - 15$$

(1)

- b) Factorise completely  $8x^2 + 4xy$

$$\begin{array}{r|l} x & 2x + y \\ \hline 4x & 8x^2 + 4xy \end{array}$$

$$4x(2x + y)$$

(2)

(Total 3 marks)

5. a) Factorise  $3x + 6$

$$\begin{array}{r|l} x & x + 2 \\ \hline 3 & 3x + 6 \end{array}$$

$$3(x + 2)$$

(1)

- b) Expand and simplify  $5(y - 2) + 2(y - 3)$

$$\begin{array}{r|l} x & y - 2 \\ \hline 5 & 5y - 10 \end{array} \quad \begin{array}{r|l} x & y - 3 \\ \hline 2 & 2y - 6 \end{array}$$

$$7y - 16$$

(2)

(Total 3 marks)

## Substitution

### Things to remember:

- There is usually 1 mark just for just substituting into the expression without doing any working out
- Your answer must be a number – don't forget to finish the calculation
- The question will usually use the words "find the value of"
- Make sure you use the correct order of operations

### Questions:

1. Find the value of  $t^2 - 4t$  when  $t = -3$

$$(-3)^2 - 4(-3) = 9 + 12 = 21$$

..... 21 .....  
(Total 2 marks)

2.  $P = x^2 - 7x$   
Work out the value of  $P$  when  $x = -5$

$$(-5)^2 - 7(-5) = 25 + 35 = 60$$

$P =$  ..... 60 .....  
(Total 2 marks)

3.  $T$ ,  $x$  and  $y$  are connected by the formula  $T = 5x + 2y$   
 $x = -3$  and  $y = 4$

- a) Work out the value of  $T$

$$5(-3) + 2(4) = -15 + 8$$

$T =$  ..... -7 .....  
(2)

$$T = 16 \text{ and } x = 7$$

- b) Work out the value of  $y$

$$\begin{aligned} T &= 5x + 2y \\ 16 &= 5(7) + 2y \\ 16 &= 35 + 2y \\ -19 &= 2y \end{aligned}$$

$y =$  ..... -9.5 .....  
(3)  
(Total 5 marks)

4.  $P = 4k - 10$   
 $P = 50$

a) Work out the value of  $k$

$$\begin{aligned}50 &= 4k - 10 \\60 &= 4k \\15 &= k\end{aligned}$$

15

(2)

$y = 4n - 3d$   
 $n = 2$   
 $d = 5$

b) Work out the value of  $y$

$$4(2) - 3(5) = 8 - 15 = -7$$

-7

(2)

(Total 4 marks)

5.  $h = 5t^2 + 2$

a) Work out the value of  $h$  when  $t = -2$

$$5(-2)^2 + 2 = 5(4) + 2 = 22$$

22

(2)

b) Work out a value of  $t$  when  $h = 47$

$$\begin{aligned}47 &= 5t^2 + 2 \\45 &= 5t^2 \\9 &= t^2\end{aligned}$$

3 or -3

(2)

(Total 4 marks)

## Solving Linear Equations (Unknown on Both Sides)

### Things to remember:

- “Solve” means to find the value of the unknown
- The inverse of + is – and the inverse of  $\times$  is  $\div$
- Work one step at a time, keeping your = signs in line on each new row of working
- You may need to expand brackets before doing any solving!
- Start by eliminating the smallest unknown using inverse operations

### Questions:

1. a) Solve  $7p + 2 = 5p + 8$

$$\begin{array}{r} -5p \quad -5p \\ 2p + 2 = 8 \\ 2p = 6 \\ p = 3 \end{array}$$

$p = \dots\dots\dots 3 \dots\dots\dots$   
(2)

b) Solve  $7r + 2 = 5(r - 4)$

$$\begin{array}{r} 7r + 2 = (5r) - 20 \\ -5r \quad -5r \\ 2r + 2 = -20 \\ 2r = -22 \\ r = -11 \end{array}$$

$r = \dots\dots\dots -11 \dots\dots\dots$   
(3)

(Total 5 marks)

2. Solve  $4y + 1 = 2y + 8$

$$\begin{array}{r} -2y \quad -2y \\ 2y + 1 = 8 \\ 2y = 7 \\ y = 3.5 \end{array}$$

$y = \dots\dots\dots 3.5 \dots\dots\dots$   
(Total 2 marks)

3. Solve  $4m + 3 = 2m + 8$

$$\begin{array}{r} -2m \quad -2m \\ 4m + 3 = 2m + 8 \end{array}$$

$$2m + 3 = 8$$

$$2m = 5$$

$$m = 2.5$$

$m = \dots\dots\dots 2.5 \dots\dots\dots$   
(Total 2 marks)

4. Solve  $2(m - 10) = 10 + 7m$

$$\begin{array}{r} (2m) - 20 = 10 + 7m \\ -2m \quad \quad -2m \end{array}$$

$$\begin{array}{r} -20 = 10 + 5m \\ -30 = 5m \end{array}$$

$$-6 = m$$

$$-6 = m$$

$m = \dots\dots\dots -6 \dots\dots\dots$   
(Total 3 marks)

5. Solve  $2(5 - s) = s - 8$

$$\begin{array}{r} 10 - 2s = s - 8 \\ +2s \quad +2s \end{array}$$

$$10 = 3s - 8$$

$$18 = 3s - 8$$

$$18 = 3s$$

$$6 = s$$

$s = \dots\dots\dots 6 \dots\dots\dots$   
(Total 3 marks)

6. Solve  $6y + 11 = 3y + 5$

$$\begin{array}{r} -3y \quad -3y \\ 6y + 11 = 3y + 5 \end{array}$$

$$3y + 11 = 5$$

$$3y = -6$$

$$y = -2$$

$y = \dots\dots\dots -2 \dots\dots\dots$   
(Total 2 marks)



7. Solve  $7y + 18 = 2(y + 14)$

$$\begin{aligned}7y + 18 &= (2y) + 28 \\-2y &\quad -2y \\5y + 18 &= 28 \\5y &= 10 \\y &= 2\end{aligned}$$

$y = \dots\dots\dots 2 \dots\dots\dots$   
(Total 3 marks)

8. Solve  $2(x + 10) = 6(x - 2)$

$$\begin{aligned}(2x) + 20 &= 6x - 12 \\-2x &\quad -2x \\20 &= 4x - 12 \\32 &= 4x \\8 &= x\end{aligned}$$

$x = \dots\dots\dots 8 \dots\dots\dots$   
(Total 3 marks)

9. Solve  $3(x - 3) = x - 8$

$$\begin{aligned}3x - 9 &= (x) - 8 \\-x &\quad -x \\2x - 9 &= -8 \\2x &= 1 \\x &= 0.5\end{aligned}$$

$s = \dots\dots\dots 0.5 \dots\dots\dots$   
(Total 3 marks)

10. Solve  $10t - 19 = 7(t - 2)$

$$\begin{aligned}10t - 19 &= (7t) - 14 \\-7t &\quad -7t \\3t - 19 &= -14 \\3t &= 5 \\t &= \frac{5}{3}\end{aligned}$$

$t = \dots\dots\dots \frac{5}{3} \dots\dots\dots$   
(Total 3 marks)

## Deriving Expressions and Equations

### Things to remember:

- Use the letters given in the question
- Sometimes you will be given enough information to form and solve an equation, sometimes you will only be asked to write an expression
- You may need to use shape and angle facts to answer the question
- Think about words that mean add, subtract, multiply and divide and look out for these!

### Questions:

1. Pens cost  $p$  pence each.  
Quills cost  $q$  pence each.  
Write down an expression for the total cost, in pence, of 3 pens and 2 quills.

$3p + 2q$  ..... pence  
(Total 2 marks)

2. Alex is  $x$  years old.  
Bernard is 3 years younger than Alex.  
Connor is twice as old as Alex.
- a) Write an expression for Bernard's age.

$x - 3$  .....  
(1)

- b) Write an expression for Conner's age.

$2x$  .....  
(1)

- c) Write an expression for the sum of the three ages

$$x + x - 3 + 2x$$

$4x - 3$  .....  
(2)  
(Total 4 marks)

3. Adam has some marbles.  
Bradley has twice as many marbles as Adam.  
Chris has 5 more marbles than Bradley.  
In total they have 55 marbles.  
How many marbles does Chris have?

$$\begin{array}{l} \text{Adam: } x \\ \text{Bradley: } 2x \\ \text{Chris: } 2x + 5 \end{array} \qquad \begin{array}{l} x + 2x + 2x + 5 = 55 \\ 5x + 5 = 55 \\ 5x = 50 \\ x = 10 \end{array}$$

$$2x + 5 = 2(10) + 5 = 25$$

25

.....  
(Total 3 marks)

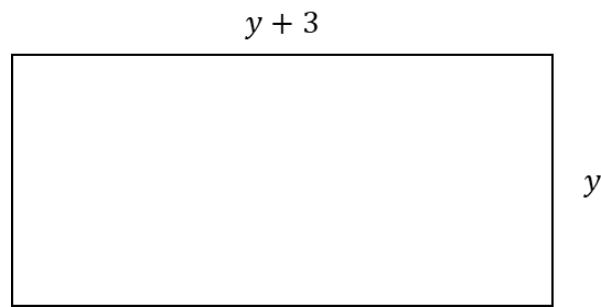
4. Lucy is three times as old as Ken.  
Lucy is 7 years older than Megan.  
The sum of their ages is 126.  
Find the ratio of Ken's age to Lucy's age to Megan's age.

$$\begin{array}{l} \text{Ken: } x \\ \text{Lucy: } 3x \\ \text{Megan: } 3x - 7 \end{array} \qquad \begin{array}{l} x + 3x + 3x - 7 = 126 \\ 7x - 7 = 126 \\ 7x = 133 \\ x = 19 \end{array}$$

19 : 57 : 50

.....  
(Total 4 marks)

5. The diagram shows a rectangle. All measurements are in centimetres.

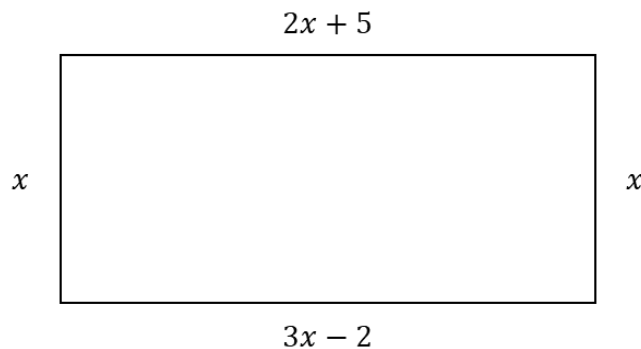


Write an expression, in terms of  $y$ , for the perimeter of the rectangle.

$$2(y + 3 + y)$$

.....  
 $4y + 6$   
(Total 2 marks)

6. The diagram shows a rectangle.



All measurements are in centimetres.  
Find the perimeter of the rectangle.

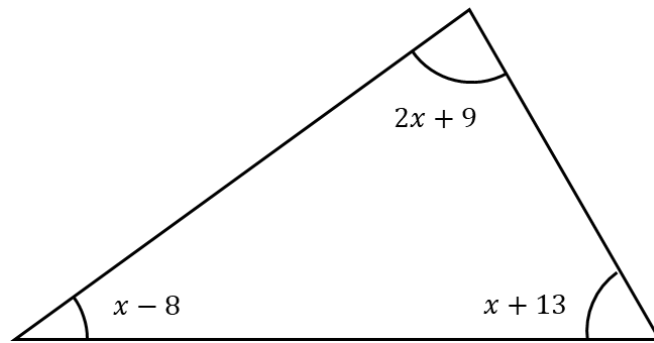
$$2x + 5 = 3x - 2$$

$$7 = x$$

$$\begin{aligned} 2x + 5 + x + 3x - 2 + x &= 7x + 3 \\ &= 7(7) + 3 \\ &= 52 \end{aligned}$$

.....  
 $52$   
(Total 3 marks)

7. The sizes of the angles, in degrees, of a triangle are  $2x + 9$ ,  $x + 13$  and  $x - 8$



Work out the value of  $x$ .

**Hint:** angles in a triangle sum to  $180^\circ$

$$2x + 9 + x + 13 + x - 8 = 180$$

$$4x + 14 = 180$$

$$4x = 166$$

$$x = 41.5$$

.....  
 $41.5$

(Total 3 marks)

## Rearranging Simple Formulae

### Things to remember:

- The same rules apply as in solving equations:
  - The inverse of + is - and the inverse of  $\times$  is  $\div$
  - Work one step at a time, keeping your = signs in line on each new row of working
  - You may need to expand brackets before doing any solving!
- Your answer will not be a number this time, but another formula instead

### Questions:

1.  $u = 4t - 7$   
Make  $t$  the subject of the formula.

$$\begin{aligned}u &= 4t - 7 \\u + 7 &= 4t \\ \frac{u + 7}{4} &= t\end{aligned}$$

$$t = \frac{u + 7}{4}$$

.....  
(Total 2 marks)

2.  $3x = 3y - 2$   
Make  $y$  the subject of the formula.

$$\begin{aligned}3x &= 3y - 2 \\3x + 2 &= 3y \\ \frac{3x + 2}{3} &= y\end{aligned}$$

$$y = \frac{3x + 2}{3}$$

.....  
(Total 2 marks)

3.  $m = 5n + 2p$   
Make  $p$  the subject of the formula.

$$\begin{aligned}m &= 5n + 2p \\m - 5n &= 2p \\ \frac{m - 5n}{2} &= p\end{aligned}$$

$$p = \frac{m - 5n}{2}$$

.....  
(Total 2 marks)

4. Make  $a$  the subject of  $v = u + at$

$$v - u = at$$

$$\frac{v - u}{t} = a$$

$$a = \frac{v - u}{t}$$

(Total 2 marks)

5. Make  $a$  the subject of  $v^2 = u^2 + 2as$

$$v^2 - u^2 = 2as$$

$$\frac{v^2 - u^2}{2s} = a$$

$$a = \frac{v^2 - u^2}{2s}$$

(Total 2 marks)

6. Make  $x$  the subject of  $y = \frac{1}{2}x + 6$

$$y - 6 = \frac{1}{2}x$$

$$2(y - 6) = x$$

$$x = 2(y - 6)$$

(Total 2 marks)

7. Make  $x$  the subject of  $y = \frac{2}{5}x - 12$

$$y + 12 = \frac{2}{5}x$$

$$\frac{5}{2}(y + 12) = x$$

$$x = \frac{5}{2}(y + 12)$$

(Total 2 marks)

8. Make  $x$  the subject of  $y = \frac{2x+3}{4}$

$$\begin{aligned}4y &= 2x + 3 \\4y - 3 &= 2x \\ \frac{4y - 3}{2} &= x\end{aligned}$$

$$x = \frac{4y - 3}{2}$$

.....  
(Total 2 marks)

9. Make  $a$  the subject of  $x = 3(a + 9)$

$$\begin{aligned}\frac{1}{3}x &= a + 9 \\ \frac{1}{3}x - 9 &= a\end{aligned}$$

$$a = \frac{1}{3}x - 9$$

.....  
(Total 2 marks)

10.  $d = \sqrt{\frac{4h}{3}}$   
Make  $h$  the subject of the formula.

$$\begin{aligned}d &= \sqrt{\frac{4h}{3}} \\ d^2 &= \frac{4h}{3} \\ 3d^2 &= 4h \\ \frac{3d^2}{4} &= h\end{aligned}$$

$$h = \frac{3d^2}{4}$$

.....  
(Total 2 marks)



## Inequalities on a Number Line

### Things to remember:

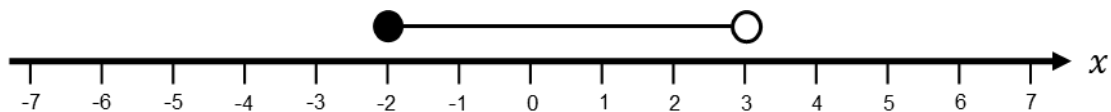
- $<$  means less than
- $>$  means greater than
- $\leq$  means less than or equal to
- $\geq$  means greater than or equal to
- An integer is a whole number
- On a number line, use a full circle to show a value can be equal, and an empty circle to show it cannot

### Questions:

1.  $n$  is an integer such that  $-3 \leq n < 1$   
Write down all the possible values of  $n$

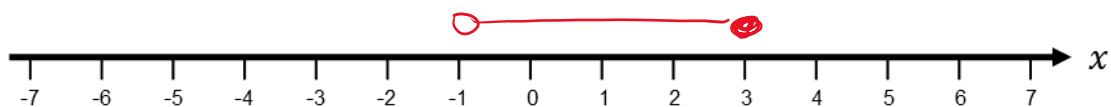
$-3, -2, -1, 0$   
.....  
(Total 2 marks)

2. Write down the inequality shown on the number line.



$-2 \leq x < 3$   
.....  
(Total 2 marks)

3. a) Show the inequality  $-1 < n \leq 3$  on the number line below.

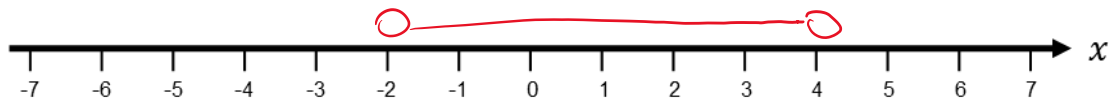


(2)

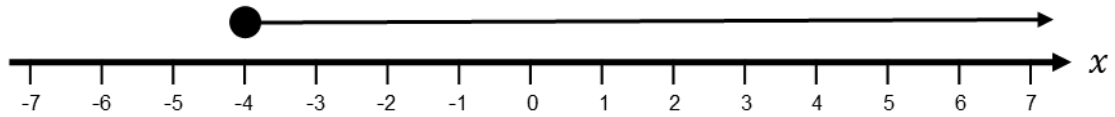
- b)  $n$  is an integer  
Write down all the possible values of  $n$

$0, 1, 2, 3$   
.....  
(2)  
(Total 4 marks)

4. a) On the number line below, show the inequality  $-2 < x < 4$



- b) Write down the inequality shown on the number line.



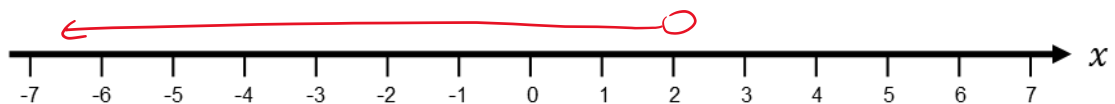
$x \geq -4$

(2)

(2)

(Total 4 marks)

5. a) On the number line below, show the inequality  $n < 2$



$4 \leq y < 8$  where  $y$  is an integer.

- b) Write down all the possible values of  $y$

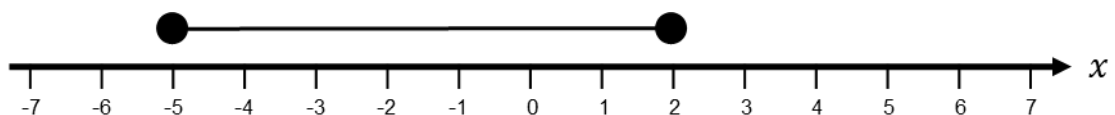
$4, 5, 6, 7$

(2)

(2)

(Total 4 marks)

6. Write down the inequality shown on the number line.



$-5 \leq x \leq 2$

(Total 2 marks)

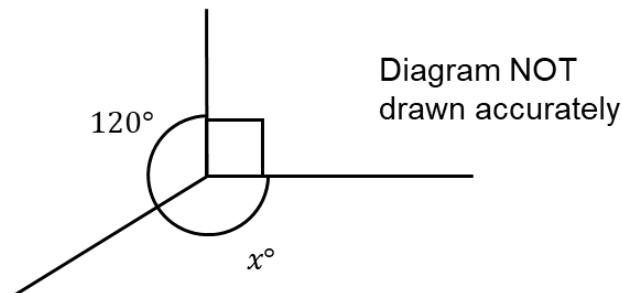
## Angles around a Point, on a Line and in a Triangle

### Things to remember:

- Remember the key points below and use this wording if you need to give reasons for your working:
  - Angles at a point sum to  $360^\circ$
  - Angles on a straight line sum to  $180^\circ$
  - Angles in a triangle sum to  $180^\circ$
  - Angles in a quadrilateral sum to  $360^\circ$
  - Vertically opposite angles are equal

### Questions:

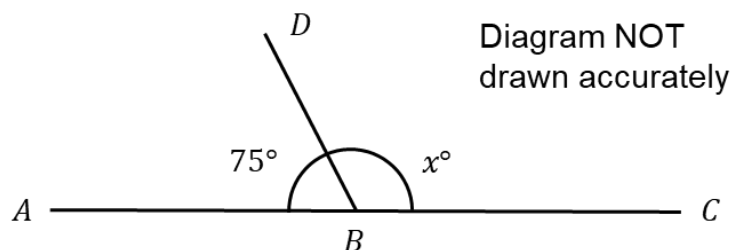
1. Work out the size of the angle marked  $x$



$$360 - (120 + 90) = 360 - 210 = 150$$

..... 150 .....  
(Total 2 marks)

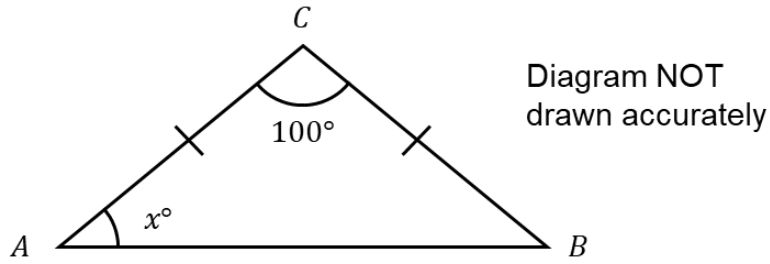
2.  $ABC$  is a straight line. Work out the size of the angle marked  $x$



$$180 - 75 = 105$$

..... 105 .....  
(Total 2 marks)

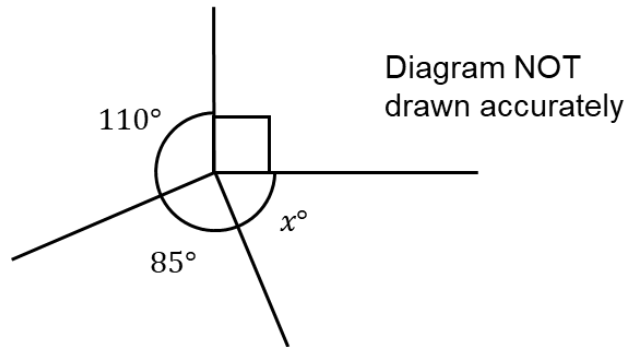
3.  $ABC$  is an isosceles triangle Work out the size of the angle marked  $x$



$$\frac{180 - 100}{2} = \frac{80}{2} = 40$$

.....<sup>40</sup>°  
(Total 2 marks)

4. a) Work out the size of the angle marked  $x$



$$360 - (110 + 85 + 90) = 360 - 285 = 75$$

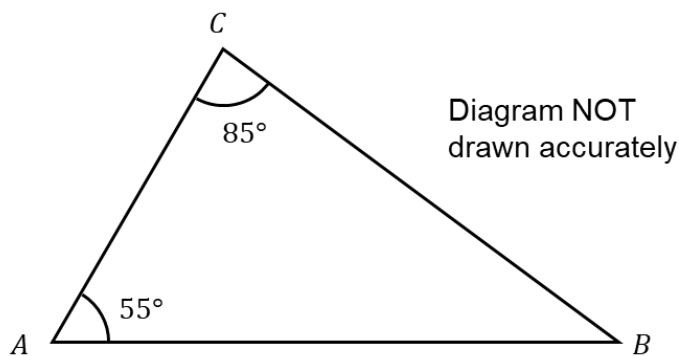
.....<sup>75</sup>°  
(2)

- b) Give a reason for your answer.

..... Angles at a point sum to 360°  
.....

(1)  
(Total 3 marks)

5. a) Work out the size of the angle ABC.



$$180 - (55 + 85) = 180 - 140 = 40$$

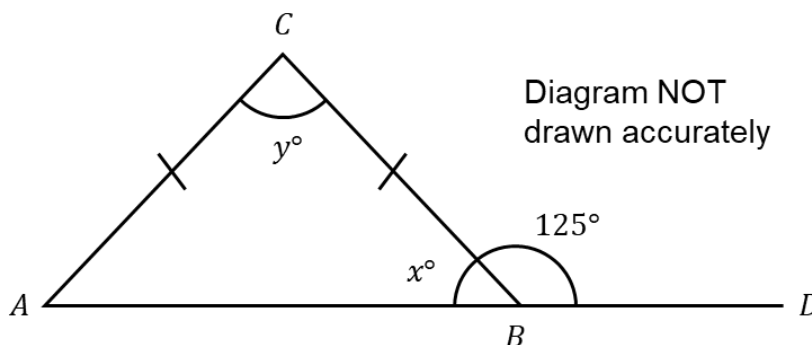
..... 40 .....<sup>o</sup>  
(2)

- b) Give a reason for your answer.

..... Angles in a triangle sum to 180° .....

.....  
(1)  
(Total 3 marks)

6. ABC is a triangle. ABD is a straight line.



- a) Work out the size of the angle marked  $x$

..... 55 .....<sup>o</sup>  
(2)

- b) i) Work out the size of the angle marked  $y$

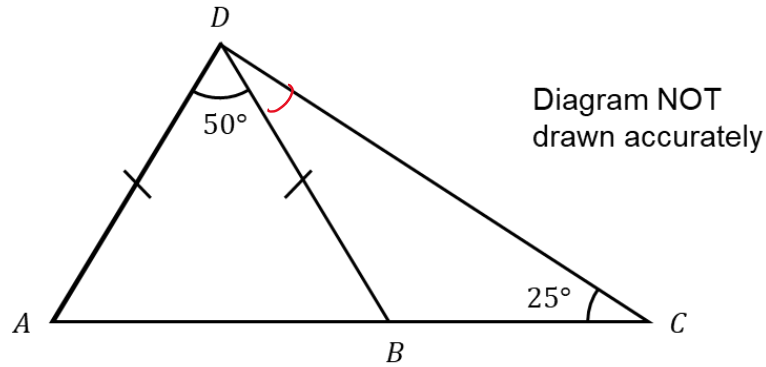
..... 70 .....<sup>o</sup>

- ii) Give a reason for your answer.

..... Angles in a triangle sum to 180° and base  
..... angles in an isosceles triangle are equal .....

(3)  
(Total 5 marks)

7.  $ABC$  is a straight line. Work out the size of the angle  $BDC$   
You must give reasons for your answers.



$\angle DAB = \angle DBA = 65^\circ$  because angles in a triangle sum to  $180^\circ$  and base angles in an isosceles triangle are equal.

$\angle DBC = 115^\circ$  because angles on a straight line sum to  $180^\circ$

$\angle BDC = 40^\circ$  because angles in a triangle sum to  $180^\circ$ .

.....<sup>o</sup>  
40  
(Total 5 marks)

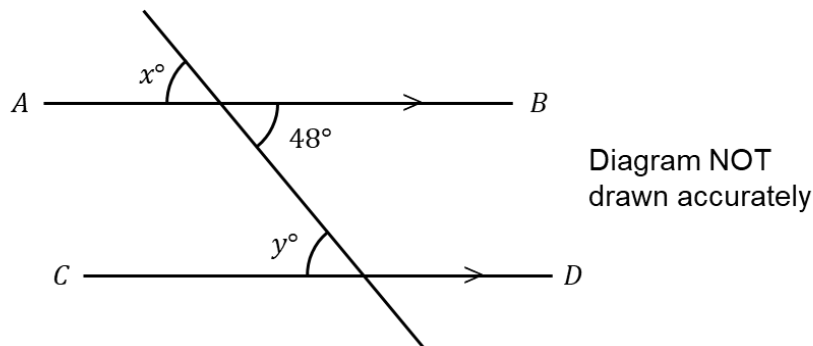
## Angles in Parallel Lines

### Things to remember:

- Remember the key points below and use this wording if you need to give reasons for your working:
  - Alternate angles are equal (Z-shaped)
  - Corresponding angles are equal (F-shaped)
  - Co-interior angles sum to  $180^\circ$  (C-shaped)

### Questions:

1.  $AB$  and  $CD$  are parallel lines.



- a) i) Write down the size of angle  $x$

..... 48 .....<sup>o</sup>

- ii) Give a reason for your answer.

..... Vertically opposite angles are equal. ....

.....  
(2)

- c) i) Write down the size of angle  $y$

..... 48 .....<sup>o</sup>

- ii) Give a reason for your answer

..... Alternate angles are equal. ....

.....  
(2)

(Total 4 marks)

2.  $AB$  and  $CD$  are parallel lines.

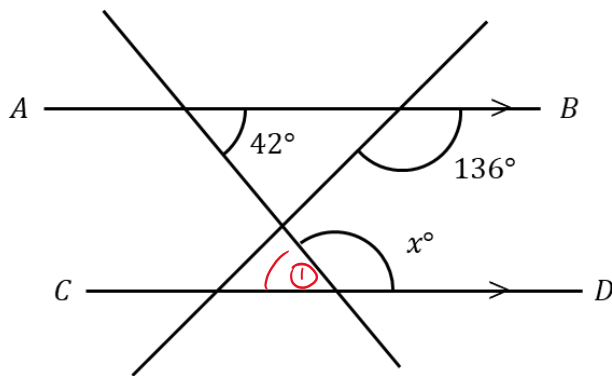


Diagram NOT  
drawn accurately

Find the size of angle  $x$   
Give reasons for each stage of your working.

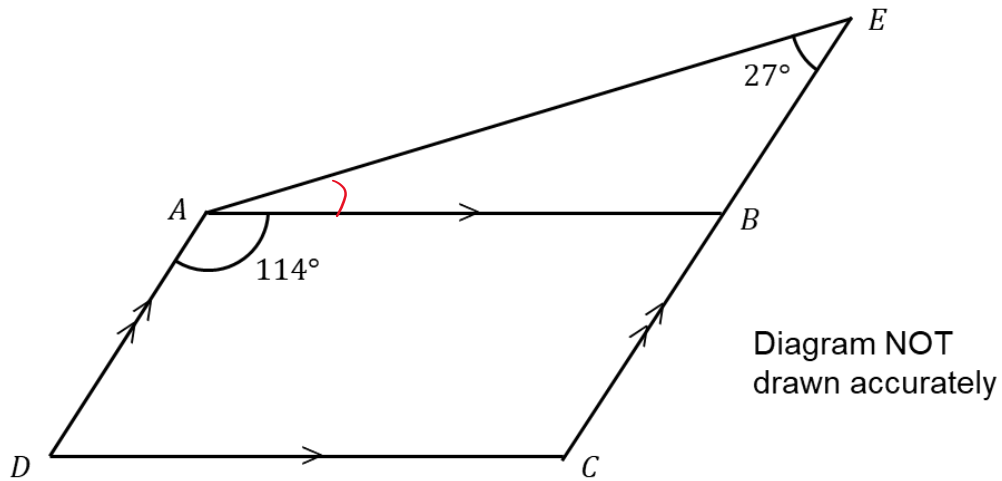
Angle ① is  $42^\circ$  because alternate angles  
are equal

$x = 138^\circ$  because angles on a straight line  
sum to  $180^\circ$ .

.....138.....<sup>°</sup>  
(Total 3 marks)



3.  $ABCD$  is a parallelogram.  
 $CBE$  is a straight line.



Find the size of angle  $BAE$   
Give a reason for each stage of your working.

$\angle ABE = 114^\circ$  because alternate angles are equal.

$\angle BAE = 39^\circ$  because angles in a triangle sum to  $180^\circ$ .

.....<sup>o</sup>  
39  
(Total 4 marks)

4.  $ABCD$  is a parallelogram.  
 Angle  $DAE = 63^\circ$   
 Angle  $BCD = 124^\circ$   
 Angle  $CBD = 25^\circ$

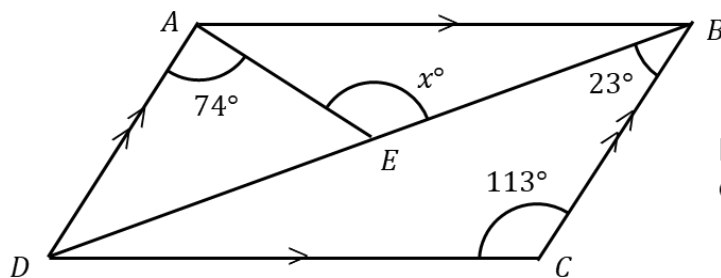


Diagram NOT  
drawn accurately

Calculate the size of angle  $x$   
 Give reasons for each stage of your answer

$\angle BAE = 39^\circ$  because opposite angles in a parallelogram are equal.

$\angle ABE = 44^\circ$  because co-interior angles sum to  $180^\circ$ .

$x = 97^\circ$  because angles in a triangle sum to  $180^\circ$ .

.....<sup>97</sup>°  
 (Total 4 marks)

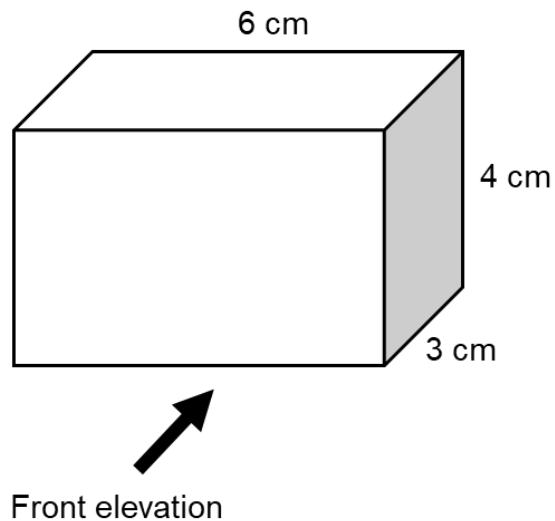
## Plans and Elevations

### Things to remember:

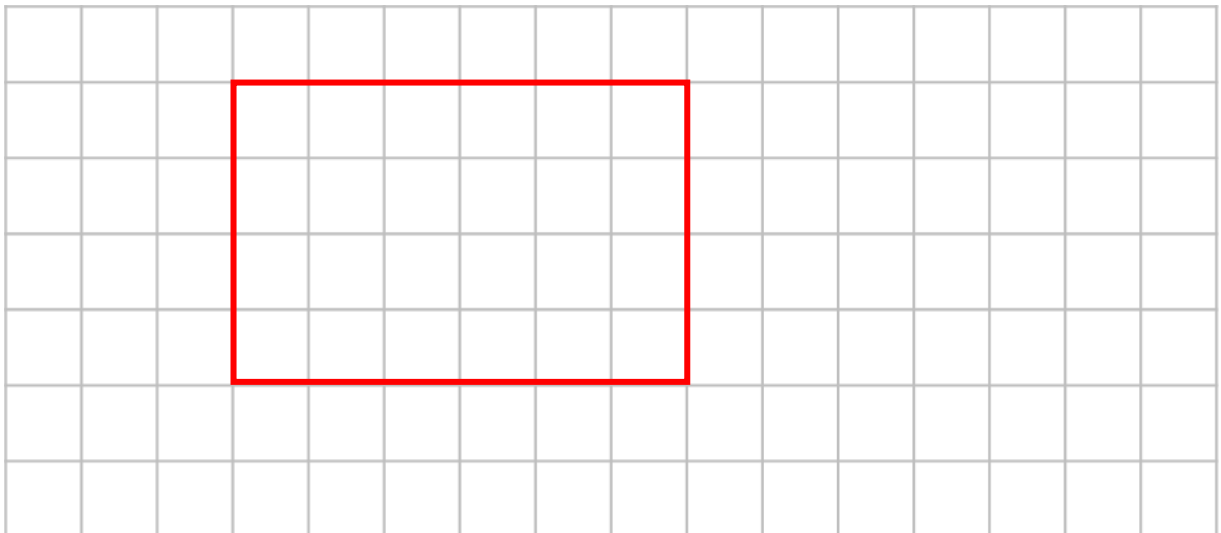
- Plans and elevations are 2D drawings of a 3D shape
- A plan is a scale drawing showing a 3D shape when it is looked at from above
- An elevation is the view of a 3D shape when it is looked at from the side or from the front

### Questions:

1. The diagram shows a cuboid.

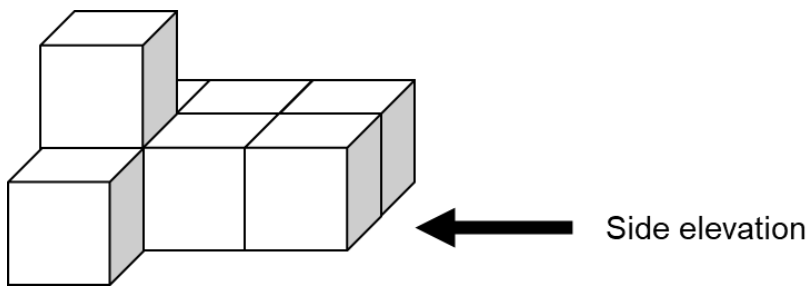


On the centimetre grid below, draw the front elevation of the prism.

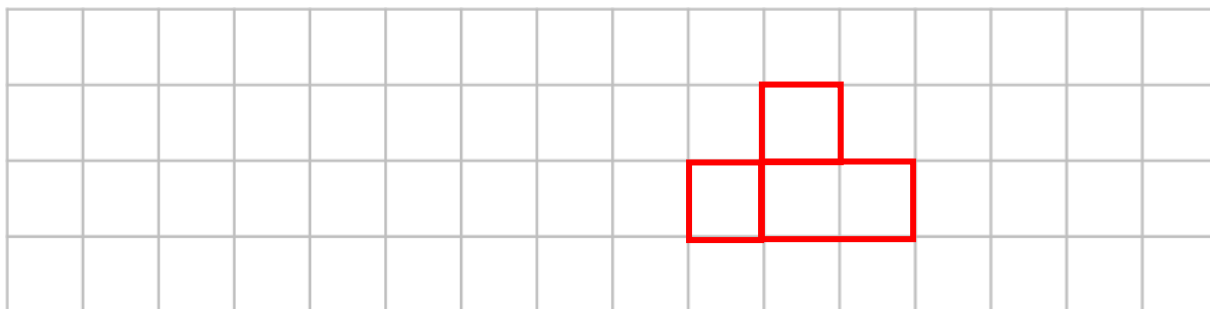


(Total 2 marks)

2. The diagram shows a solid made from centimetre cubes.

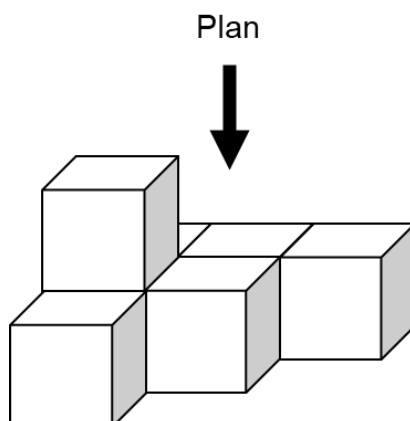


On the centimetre grid below draw the side elevation for the solid.

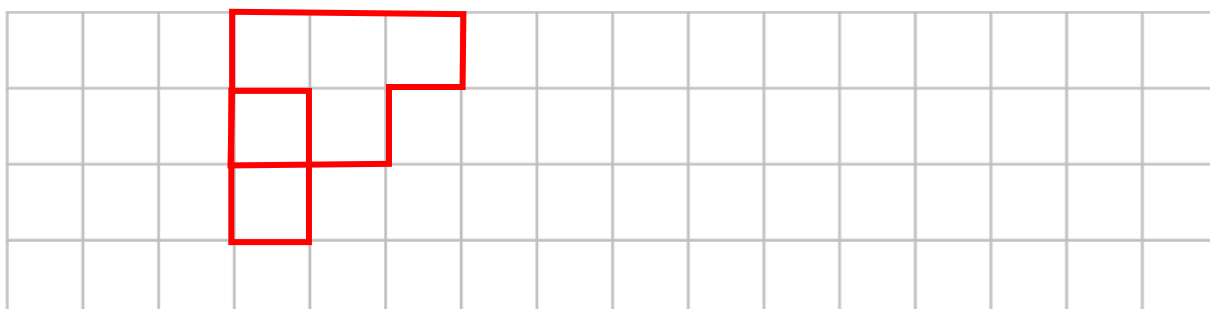


(Total 2 marks)

3. The diagram shows a solid made from centimetre cubes.

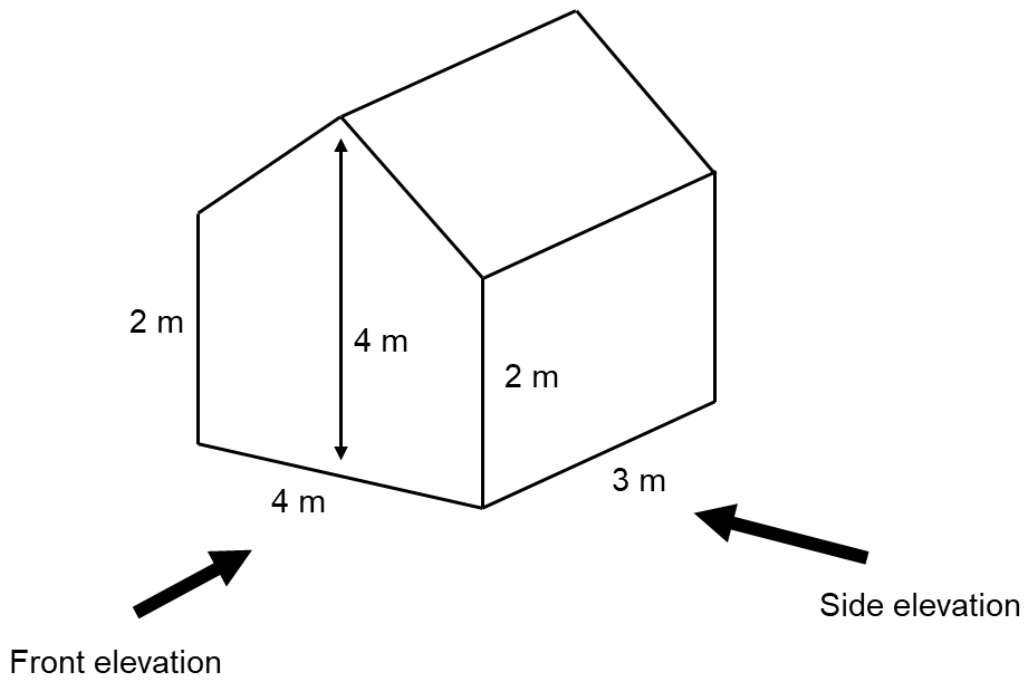


On the centimetre grid below draw the plan view for the solid.

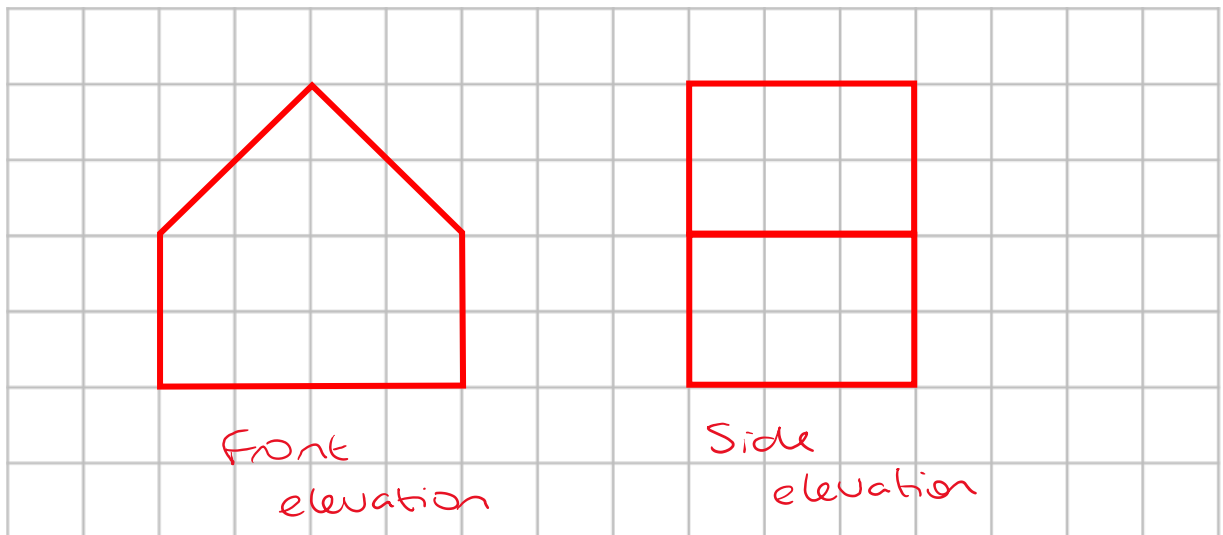


(Total 2 marks)

4. The diagram shows a prism.  
48

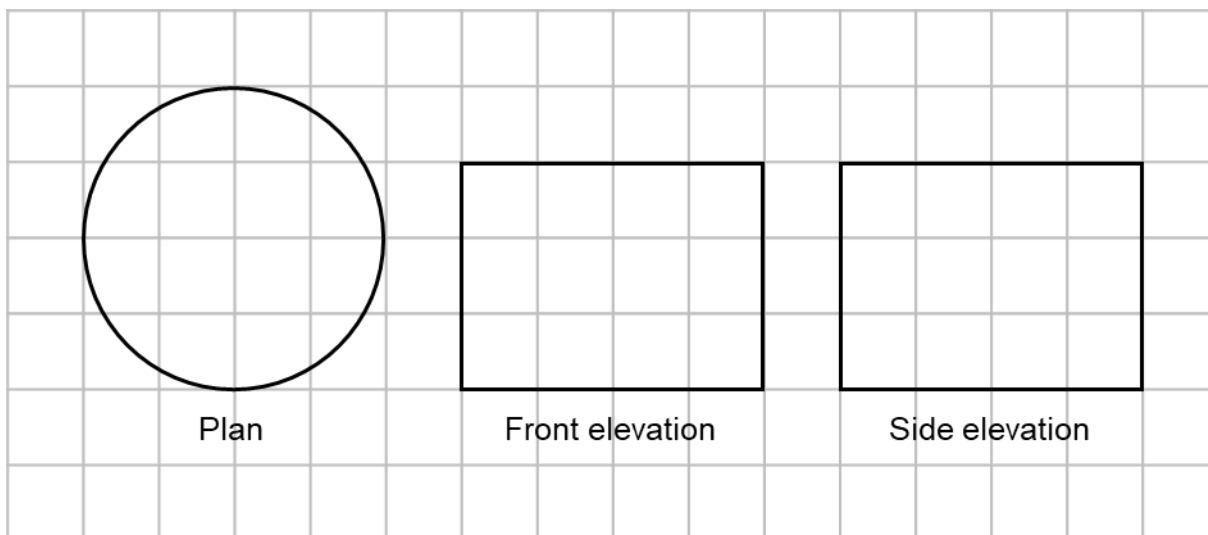


On the centimetre grid below, draw the front elevation and the side elevation of the prism. Use the scale 1 centimetre to 1 metre.

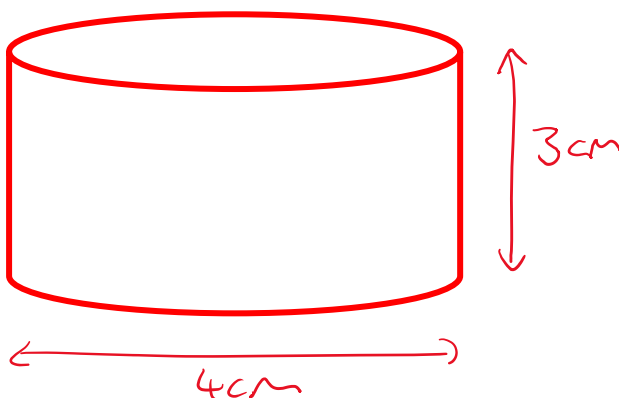


(Total 4 marks)

5. The diagram shows the plan, front elevation and side elevation of a solid shape, drawn on a centimetre grid.



In the space below, draw a sketch of the solid shape.  
Give the dimensions of the solid on your sketch.



(Total 2 marks)

## Unit Conversions

### Things to remember:

- The table shows some of the most common metric units and their equivalents. Make sure you know these conversions.

<b>Length</b>	1 km = 1000 m	1 m = 100 cm	1 cm = 10 mm
<b>Mass</b>	1 tonne = 1000 kg	1 kg = 1000 g	1g = 1000 mg
<b>Capacity</b>	1 L = 100 cl	1 cl = 10 ml	1 L = 1000 ml

- If you need to convert between metric and imperial units, you will be given the conversion to use.

### Questions:

1. Change 2580 grams to kilograms.

..... **2.58** ..... kilograms  
(Total 1 mark)

2. Change 520 millilitres to litres.

..... **0.52** ..... litres  
(Total 1 mark)

3. Change 0.87 kilograms to grams.

..... **870** ..... grams  
(Total 1 mark)

4. Change 640 cm to metres.

..... **6.4** ..... metres  
(Total 1 mark)

5. Change 1.6 kilometres to metres.

..... **1600** ..... metres  
(Total 1 mark)

6. Change 48 centimetres to millimetres.

..... 480 ..... mm  
(Total 1 mark)

7. Change 25 metres to centimetres.

..... 2500 ..... cm  
(Total 1 mark)

8. a) Jonny buys 1 gallon of orange juice.  
What is this in litres?  
Use the conversion 1 litre = 0.2 gallons

$$1 \div 0.2$$

..... 5 ..... litres  
(2)

b) Faith buys 10 litres of orange juice.  
What is this in gallons?

$$10 \times 0.2$$

..... 2 ..... gallons  
(2)  
(Total 4 mark)

9. Paul is about to drive to Paris from London.  
The distance from London to Paris is 460 km  
Paul's car can drive 45 miles using 1 gallon of petrol.  
Petrol costs £1.95 per litre  
4.5 litres = 1 gallon  
8 km = 5 miles  
Use the information above to calculate how much it will cost Paul to drive from London to Paris.

$$460 \text{ km} \div 8 \times 5 = 287.5 \text{ miles}$$

$$287.5 \div 45 = 6.388... \text{ gallons}$$
$$= 28.75 \text{ litres}$$

$$28.75 \times £1.95 = 56.0625$$

£ ..... 56.06 .....  
(Total 4 mark)



## Map Scales

### Things to remember:

- A map cannot be the same size as the area it represents. It needs to be scaled down to fit on a page or a screen
- Map scales can be written in two ways, a simple scale with units (1 centimetre represents 1 kilometre) or a ratio scale (1 : 200)

### Questions:

1. A map has the scale of 1 : 50000  
The distance between two points on the map is 7 cm  
Work out the real distance between the two points.  
Give your answer in kilometres.

$$\begin{aligned}7 \times 50\,000 &= 350\,000\text{ cm} \\ &= 3\,500\text{ m} \\ &= 3.5\text{ km}\end{aligned}$$

..... 3.5 ..... km  
(Total 3 marks)

2. A map has the scale of 1 : 75000  
The distance between two points on the map is 8.5 cm  
Work out the real distance between the two points.  
Give your answer in kilometres.

$$\begin{aligned}8.5 \times 75\,000 &= 637\,500\text{ cm} \\ &= 6\,375\text{ m} \\ &= 6.375\text{ km}\end{aligned}$$

..... 6.375 ..... km  
(Total 3 marks)

3. The accurate scale drawing shows three towns, Town *A*, Town *B* and Town *C*.  
The scale is 1 : 50000

× *A*

× *B*

× *C*

- a) Find the real distance between Town *A* and Town *B*, in kilometres.

$$\begin{aligned}7.7 \text{ cm} \times 50\,000 &= 385\,000 \text{ cm} \\ &= 3850 \text{ m} \\ &= 3.85 \text{ km}\end{aligned}$$

..... 3.85 ..... km  
(3)

- b) Find the real distance between Town *A* and Town *C*, in kilometres.

$$\begin{aligned}9.1 \text{ cm} \times 50\,000 &= 455\,000 \text{ cm} \\ &= 4550 \text{ m} \\ &= 4.55 \text{ km}\end{aligned}$$

..... 4.55 ..... km  
(3)  
(Total 6 marks)

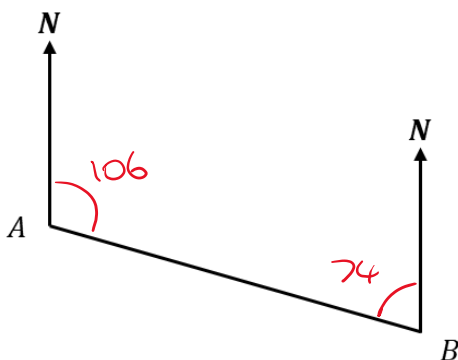
## Drawing and Measuring Bearings

### Things to remember:

- Always measure bearings clockwise from the North line and give your answer 3 digits
- If the diagram is drawn accurately, use the given scale
- If the diagram is not drawn accurately, use the fact that the North lines are all parallel

### Questions:

1.



a) Measure the bearing of *B* from *A*

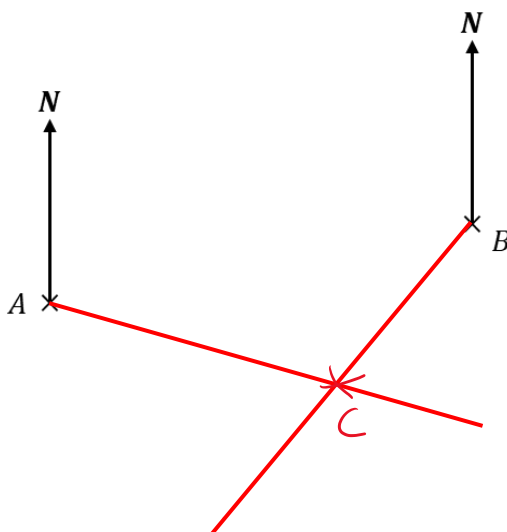
.....<sup>o</sup>  
106  
.....<sup>o</sup>  
(1)

b) Measure the bearing of *A* from *B*

.....<sup>o</sup>  
286  
.....<sup>o</sup>  
(1)

(Total 2 marks)

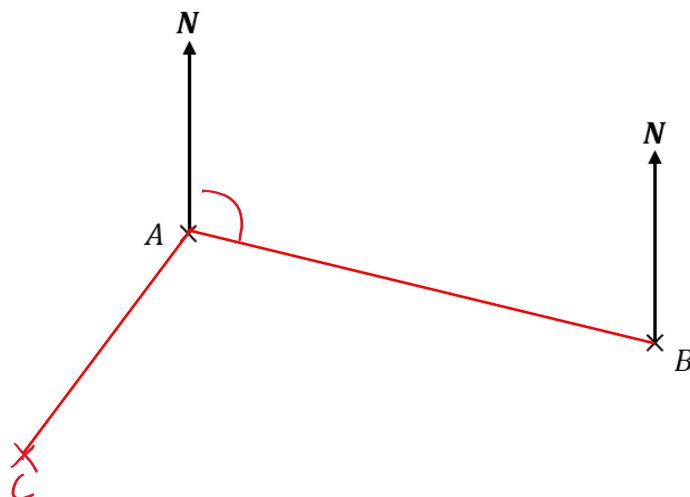
2. The accurate scale drawing shows the positions of boat *A* and boat *B*  
Boat *C* is on a bearing of  $105^\circ$  from *A*  
Boat *C* is on a bearing of  $220^\circ$  from *B*



On the diagram, mark with a cross (x) the position of boat *C* on the diagram.

(Total 3 marks)

3. The accurate scale drawing shows the positions of town *A* and town *B*  
 2 centimetres represents 1 kilometre



- a) Find the distance from *A* to *B*

$6.4 \text{ cm} = 3.2 \text{ km}$

..... 3.2 km  
 (1)

- b) Measure the bearing of *B* from *A*

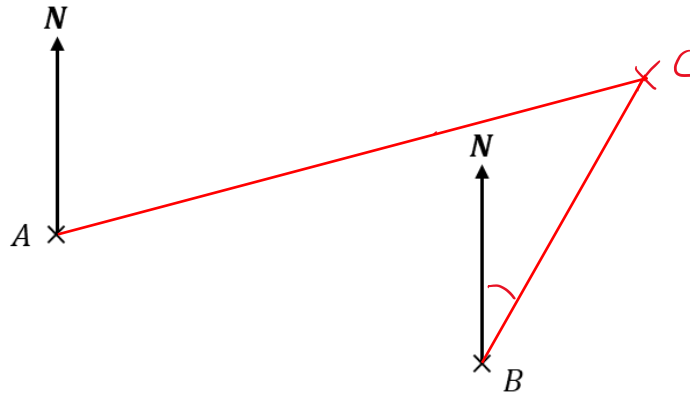
..... 103°  
 (1)

Another town *C* is 3.8 km from *A* on a bearing of 220°

- c) On the diagram, mark the position of town *C* with a cross (×)

(2)  
 (Total 4 marks)

4. The accurate scale drawing shows the positions of point  $A$  and point  $B$ . Point  $C$  is 8 cm from point  $A$  on a bearing of  $075^\circ$ .



- a) Find the distance from  $B$  to  $C$

.....  $4.4$  ..... cm  
(2)

- b) Find the bearing of  $C$  from  $B$

.....  $030$  .....  
(2)

(Total 4 marks)

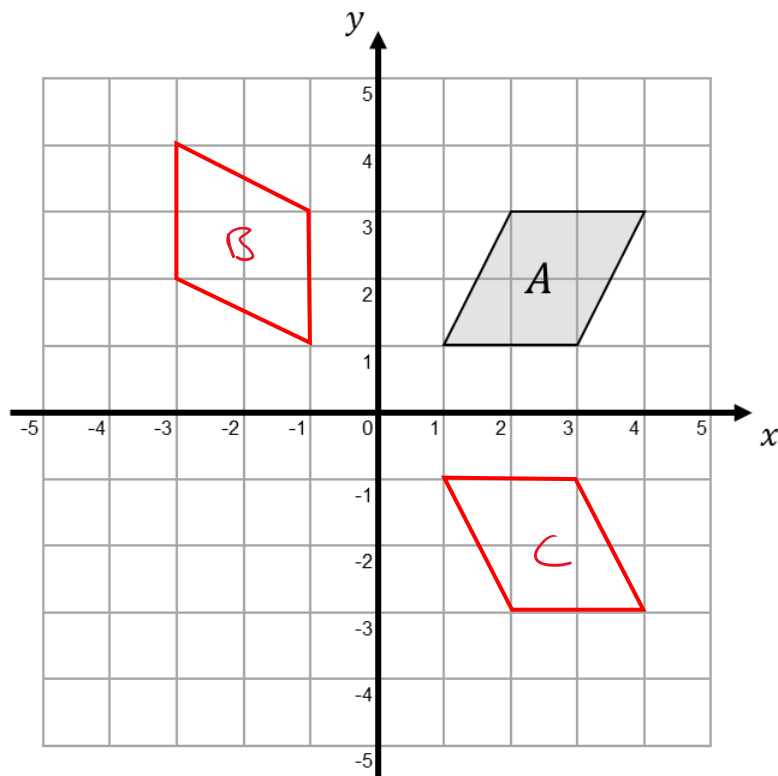
## Transformations

### Things to remember:

- Reflection – the shape is flipped in a mirror line
- Rotation – the shape is turned a number of degrees, around a centre, clockwise or anti-clockwise
- Translation – the shape is moved by a vector  $\begin{pmatrix} x \\ y \end{pmatrix}$
- Enlargement – the shape is made bigger or smaller by a scale factor from a centre

### Questions:

1.



a) On the grid, rotate the shaded shape  $A$   $90^\circ$  anticlockwise about  $O$   
Label the new shape  $B$

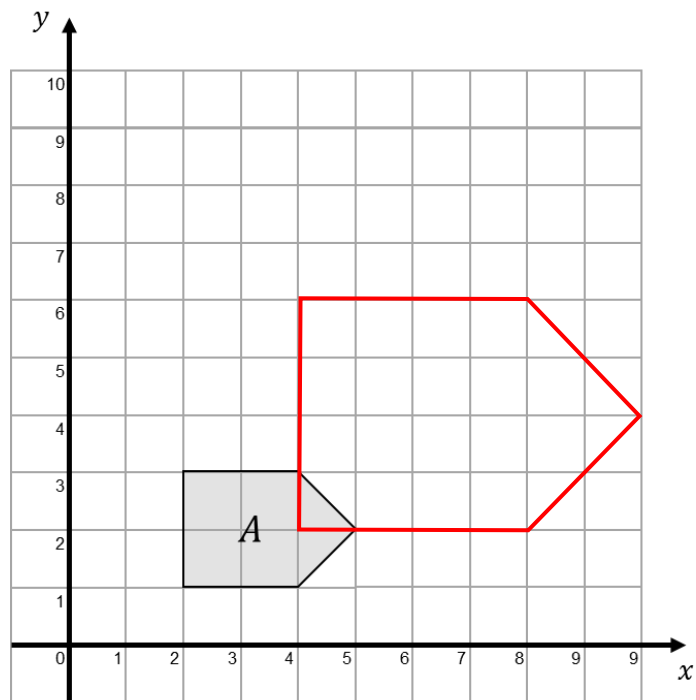
(2)

b) On the grid, reflect shape  $A$  in the  $x$ -axis.  
Label the new shape  $C$

(2)

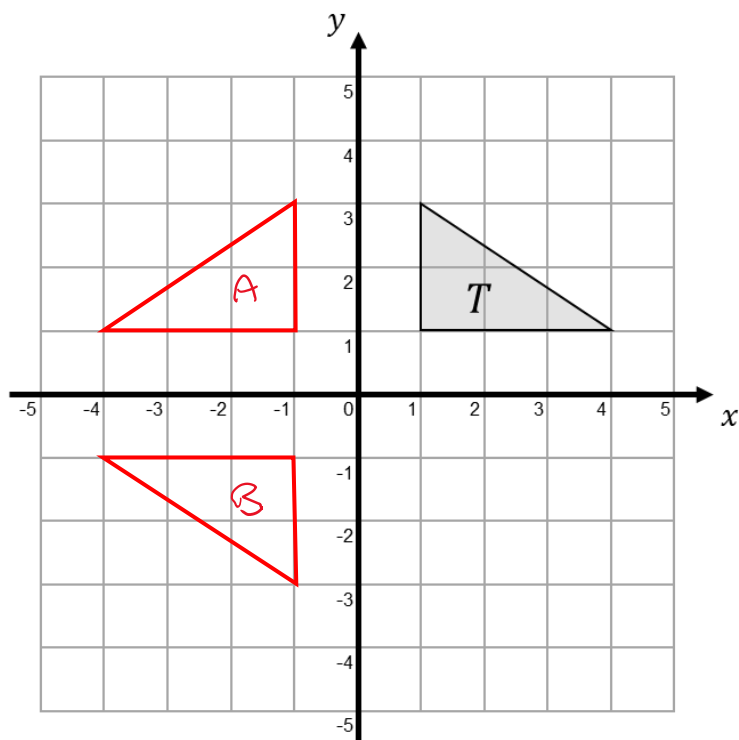
(Total 4 marks)

2. On the grid, enlarge shape *A* by scale factor 2 from centre *O*



(Total 2 marks)

- 3.



Triangle *T* has been drawn on the grid.

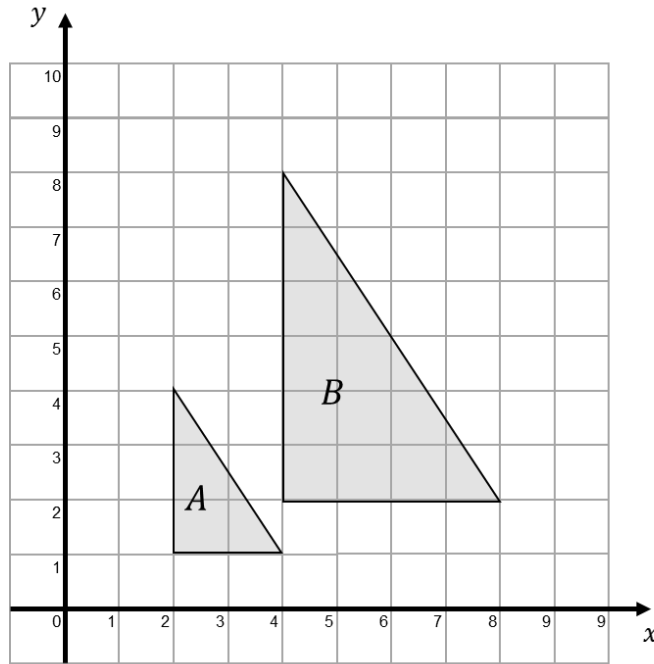
- Reflect triangle *T* in the *y*-axis.  
Label the new triangle *A*
- Rotate triangle *T* by a half turn, centre *O*  
Label the new triangle *B*

(2)

(2)

(Total 4 marks)

4.

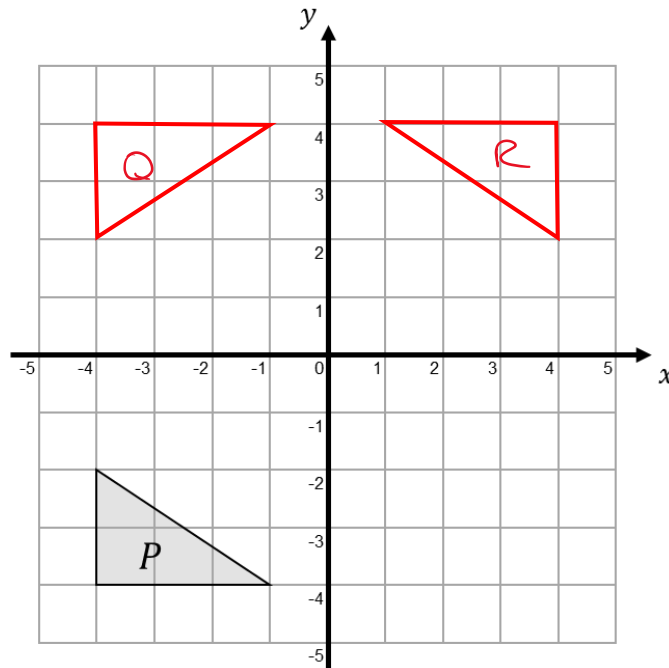


Describe fully the single transformation which maps triangle A onto triangle B

..... Enlargement of scale factor 2 .....  
 ..... centre (0,0) .....

(Total 2 marks)

5.



Triangle P is reflected in the  $x$ -axis to give triangle Q  
 Triangle Q is reflected in the  $y$ -axis to give triangle R  
 Describe the single transformation which maps triangle P onto triangle R

..... Rotated  $180^\circ$  about (0,0) .....

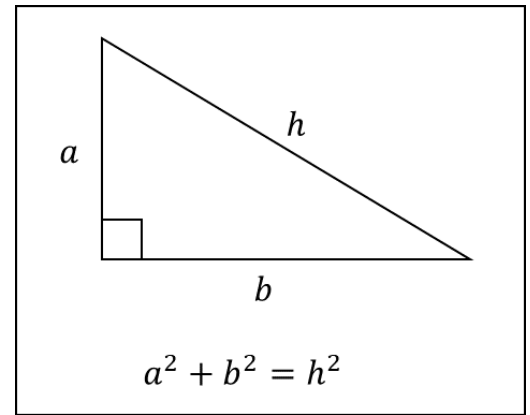
(Total 2 marks)



## Pythagoras' Theorem

### Things to remember:

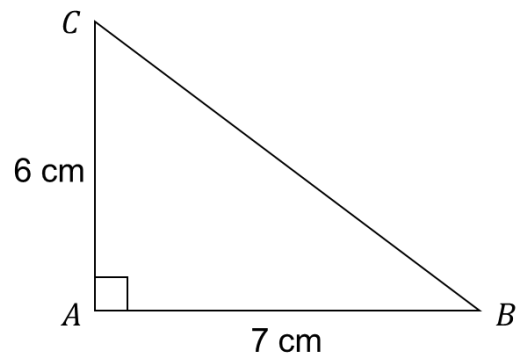
- In a right-angled triangle, the sum of the squares of the two shorter sides is equal to the square of the hypotenuse (longest side)
- Sometimes you will need to draw on extra lines – look for parallel lines that are the same length, or isosceles triangles that could be split in half



### Questions:

1.  $ABC$  is a right-angled triangle.  
Diagram NOT accurately drawn.  
Calculate the length of  $BC$   
Give your answer correct to 3 significant figures.

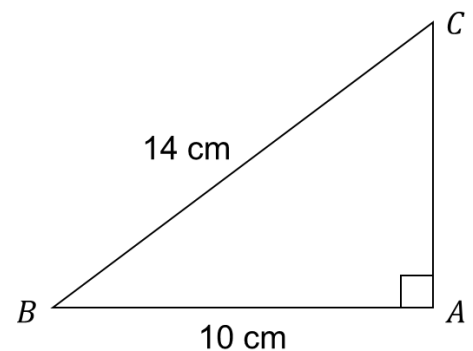
$$6^2 + 7^2 = 36 + 49 = 85$$
$$\sqrt{85} = 9.2195\dots$$



.....  $9.22$  ..... cm  
(Total 3 marks)

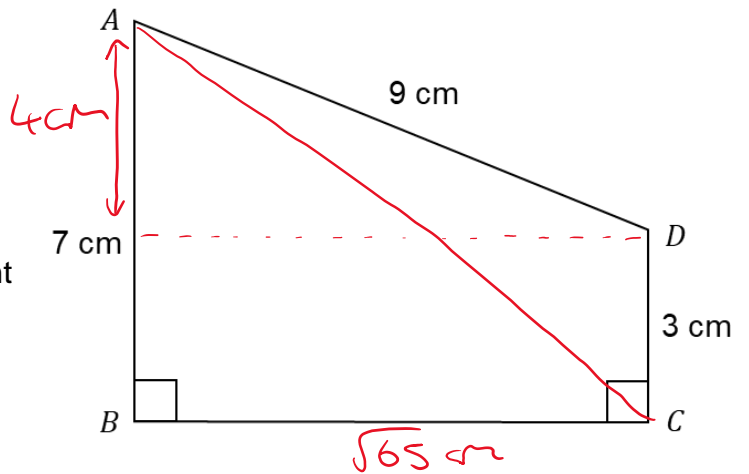
2.  $ABC$  is a right-angled triangle.  
Diagram NOT accurately drawn.  
Calculate the length of  $AC$   
Give your answer correct to 3 significant figures.

$$14^2 - 10^2 = 196 - 100 = 96$$
$$\sqrt{96} = 9.7979\dots$$



.....  $9.80$  ..... cm  
(Total 3 marks)

3.  $ABCD$  is a trapezium.  
 Diagram NOT accurately drawn  
 $AD = 9$  cm  
 $AB = 7$  cm  
 $DC = 3$  cm  
 Angle  $ABC = \text{angle } BCD = 90^\circ$   
 Calculate the length of  $AC$   
 Give your answer correct to 3 significant figures.

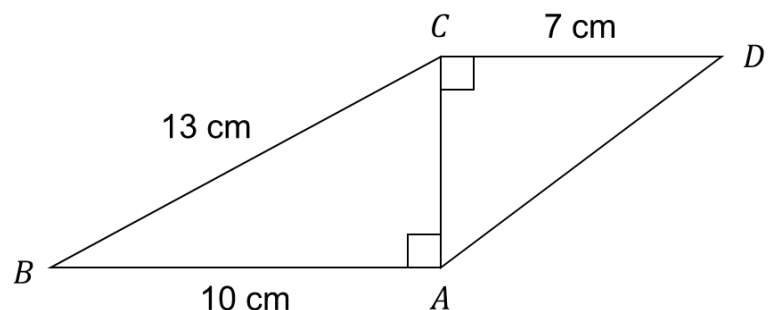


$$\sqrt{9^2 - 4^2} = \sqrt{65}$$

$$\sqrt{65^2 + 7^2} = \sqrt{114} = 10.6770\dots$$

..... 10.7 ..... cm  
 (Total 5 marks)

4. Calculate the length of  $AD$   
 Give your answer to 3 significant figures



$$\sqrt{13^2 - 10^2} = \sqrt{69}$$

$$\sqrt{69^2 + 7^2} = 118$$

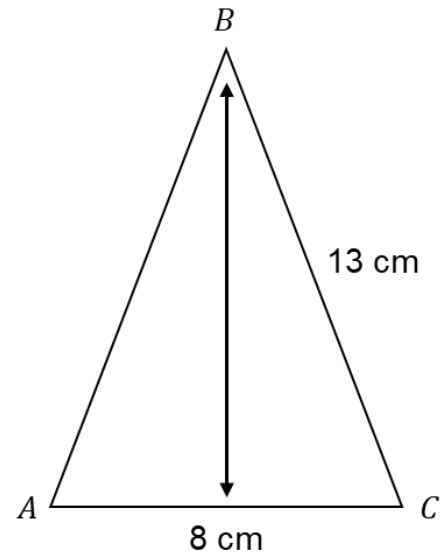
$$\sqrt{118} = 10.8627\dots$$

..... 10.9 ..... cm  
 (Total 4 marks)

5.  $ABC$  is an isosceles triangle.  
Calculate the perpendicular height of  $ABC$   
Give your answer correct to 3 significant figures.

$$13^2 - 4^2 = 169 - 16 = 153$$

$$\sqrt{153} = 12.3693\dots$$



..... 12.4 ..... cm  
(Total 3 marks)

6. Triangle  $ABC$  has perimeter 20 cm.  
 $AB = 7$  cm.  
 $BC = 4$  cm.  
By calculation, deduce whether triangle  $ABC$  is a right-angled triangle.  
You must show all of your working.

$$AC = 20 - (7 + 4) = 9 \text{ cm}$$

$$7^2 + 4^2 = 49 + 16 = 65$$

$$9^2 = 81$$

$$AB^2 + BC^2 \neq AC^2 \quad \therefore \text{Not a right-angled triangle}$$

(Total 4 marks)

## Area and Perimeter of Triangles, Parallelograms, Trapezia and Compound Shapes

### Things to remember:

- The area is the 2D space inside the shape and units are usually  $\text{cm}^2$ ,  $\text{m}^2$  or  $\text{mm}^2$
- Area of a rectangle = base  $\times$  height
- Area of a triangle =  $\frac{1}{2} \times$  base  $\times$  height
- Area of a parallelogram = base  $\times$  height
- Area of a trapezium =  $\frac{1}{2} \times (a + b) \times h$ , where  $a$  and  $b$  are the parallel sides and  $h$  is the height
- If the shape is not one listed above, try splitting it into recognisable shapes that you can calculate the area of separately
- The perimeter is the distance around the edge of the shape and units are usually cm, m or mm

### Questions:

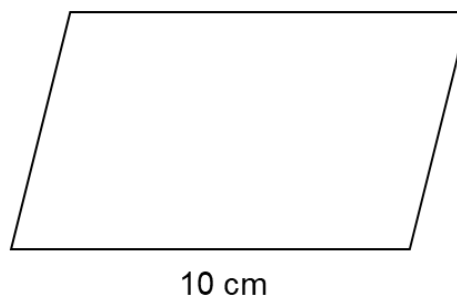
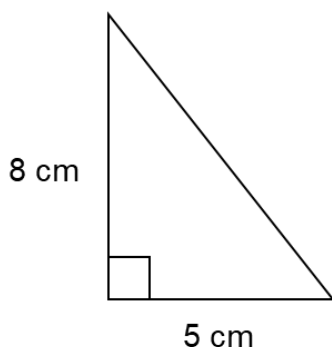
1. A square has a perimeter of 36 cm.  
Find the area of the square.

$$36 \div 4 = 9 \text{ cm}$$

$$9^2 = 81$$

..... 81 .....  $\text{cm}^2$   
(Total 2 marks)

2. The diagram shows a right-angled triangle and a parallelogram.  
The area of the parallelogram is four times the area of the triangle.  
The perpendicular height of the parallelogram is  $h$   
Find the value of  $h$



$$\text{Triangle: } \frac{1}{2} \times 5 \times 8 = 20 \text{ cm}^2$$

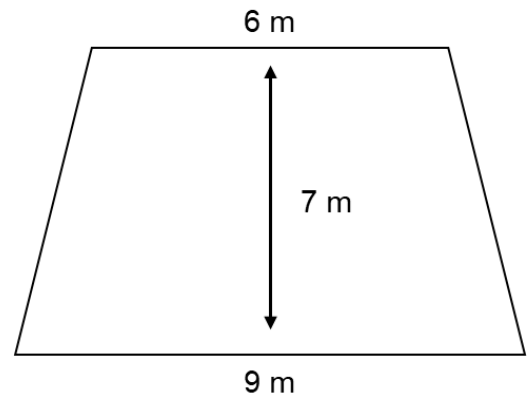
$$\text{Parallelogram: } 4 \times 20 = 80 \text{ cm}^2$$

$$80 \div 10 = 8$$

..... 8 ..... cm  
(Total 3 marks)

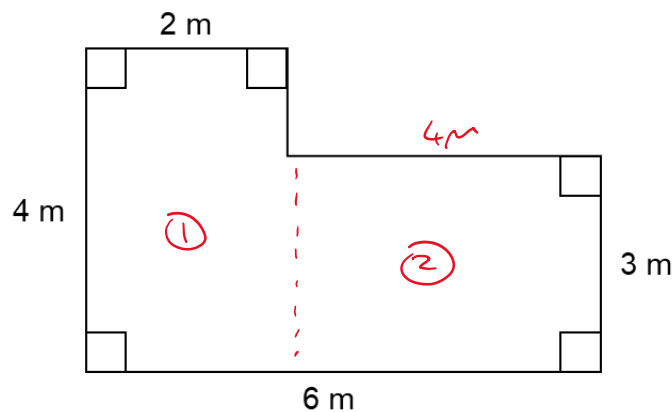
3. The diagram shows a garden in the shape of a trapezium.  
Find the area of the garden.

$$\frac{1}{2} (6+9) 7 = 52.5$$



..... 52.5 ..... m<sup>2</sup>  
(Total 3 marks)

4. The diagram shows the plan of Mrs Ravenscroft's living room.



Mrs Ravenscroft is going to cover the floor with floor boards.  
One pack of floor boards will cover 2.5 m<sup>2</sup>  
How many packs of floor boards does she need?  
You must show your working.

$$\begin{aligned} \textcircled{1} &: 2 \times 4 = 8 \text{ m}^2 \\ \textcircled{2} &: 4 \times 3 = 12 \text{ m}^2 \\ &\quad \underline{\quad\quad} \\ &20 \text{ m}^2 \end{aligned}$$

$$20 \div 2.5 = 8 \text{ packs}$$

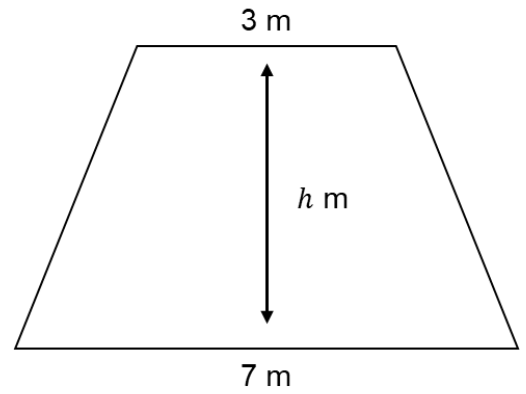
..... 8 .....  
(Total 4 marks)

5. The diagram shows a trapezium with an area of  $30 \text{ m}^2$  and a perpendicular height  $h \text{ m}$ . Find the value of  $h$

$$\frac{1}{2}(3+7)h = 30$$

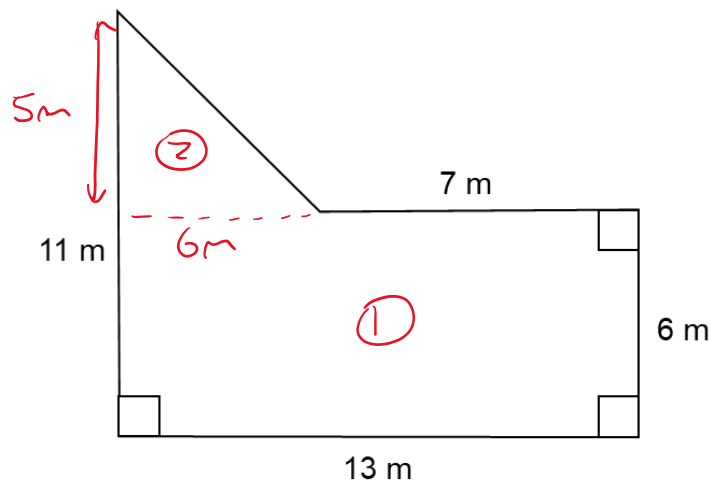
$$5h = 30$$

$$h = 6$$



..... 6 ..... m  
(Total 3 marks)

6. Work out the area of the shape.



$$\textcircled{1} : 13 \times 6 = 78 \text{ m}^2$$

$$\textcircled{2} : \frac{1}{2} \times 5 \times 6 = 15 \text{ m}^2$$

$$\underline{\quad\quad\quad}$$

$$93 \text{ m}^2$$

..... 93 .....  $\text{m}^2$   
(Total 4 marks)

## Volume and Surface Area of Prisms and Cylinders

### Things to remember:

- Volume is the 3D space inside a space
- The volume of a prism is given by area of cross section  $\times$  length
- Volume of a cylinder =  $\pi r^2 h$ , where  $r$  is the radius and  $h$  is the height
- The surface area is the area of the surface
- To work out the surface area, calculate the area of each face then add them all together

### Questions:

1. The total surface area of a cube is  $150 \text{ cm}^2$   
Work out the volume of the cube.

$$150 \div 6 = 25 \text{ cm}^2$$

$$\sqrt{25} = 5 \text{ cm}$$

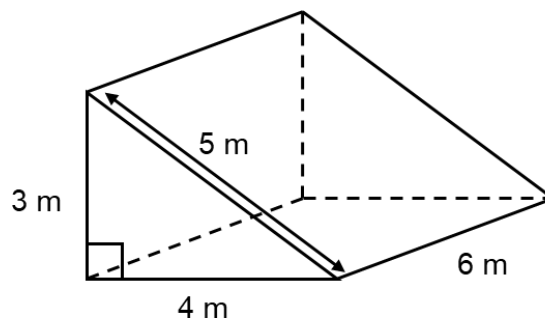
$$5^3 = 125 \text{ cm}^3$$

.....  $125$  .....  $\text{cm}^3$   
(Total 4 marks)

2. The diagram shows a triangular prism.  
The cross-section of the prism is a right angled triangle

- a) Work out the volume of the triangular prism.

$$\frac{1}{2} \times 3 \times 4 \times 6 = 36$$



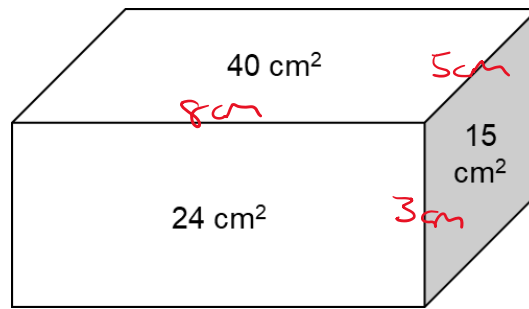
.....  $36$  .....  $\text{m}^3$   
(3)

- b) Work out the total surface area of the triangular prism.

$$\begin{aligned} \text{Front: } & \frac{1}{2} \times 3 \times 4 = 6 \text{ m}^2 \\ \text{Back: } & \frac{1}{2} \times 3 \times 4 = 6 \text{ m}^2 \\ \text{Bottom: } & 4 \times 6 = 24 \text{ m}^2 \\ \text{Left: } & 3 \times 6 = 18 \text{ m}^2 \\ \text{Right: } & 5 \times 6 = 30 \text{ m}^2 + \\ & \underline{\hspace{1.5cm}} \\ & 84 \text{ m}^2 \end{aligned}$$

.....  $84$  .....  $\text{m}^2$   
(3)  
(Total 6 marks)

3. The diagram shows the area of each of three faces of a cuboid.  
The length of each edge of the cuboid is a whole number of centimetres.  
Work out the volume of the cuboid.

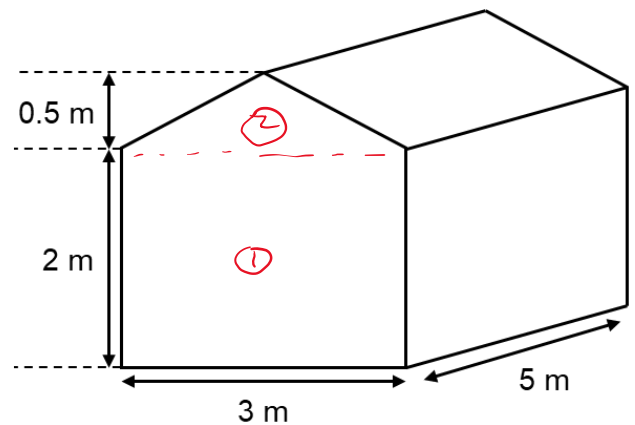


HCF of 40 and 24 = 8

$8 \times 3 \times 5 = 120 \text{ cm}^3$

..... 120 .....  $\text{cm}^3$   
(Total 4 marks)

4. The diagram represents a shed.  
The shed is in the shape of a prism.  
The cross section of the prism is a pentagon.  
The pentagon has one line of symmetry.  
The walls of the shed are vertical.  
Calculate the volume of the shed.



①:  $2 \times 3 = 6 \text{ m}^2$

②:  $\frac{1}{2} \times 3 \times 0.5 = 0.75 \text{ m}^2$  +  
 $6.75 \text{ m}^2$

$6.75 \times 5 = 33.75 \text{ m}^3$

..... 33.75 .....  $\text{m}^3$   
(Total 4 marks)

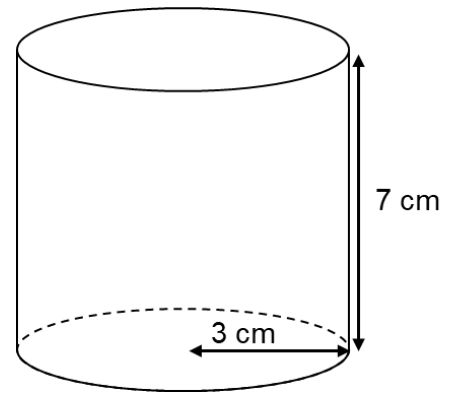


5. A cylinder has a radius of 3 cm and a height of 7 cm.

- a) Work out the volume of the cylinder.  
Give your answer correct to 3 significant figures.

$$\pi \times 3^2 \times 7$$

$$= 197.920 \dots$$



..... 198 ..... cm<sup>3</sup>  
(3)

- b) Work out the total surface area of the cylinder.  
Give your answer correct to 3 significant figures.

$$\text{Top: } \pi \times 3^2 = 9\pi$$

$$\text{Bottom: } \pi \times 3^2 = 9\pi$$

$$\text{Curved: } \pi \times 6 \times 7 = 42\pi$$

$$60\pi = 188.495 \dots$$

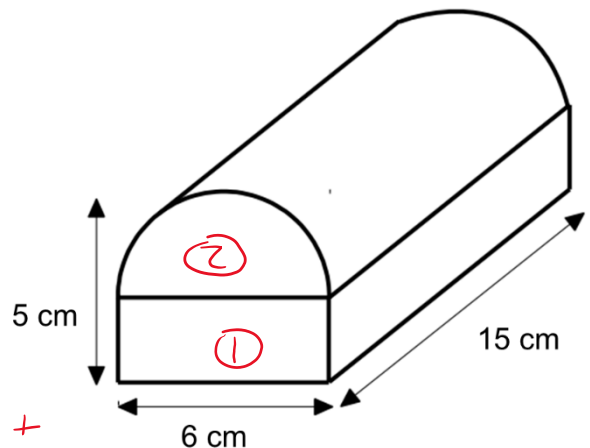
..... 188 ..... cm<sup>2</sup>  
(3)  
(Total 6 marks)

6. A solid is formed by placing a half cylinder on a rectangular prism.  
The solid has a width of 6 cm, a total height of 5 cm and a length of 15 cm.  
Work out the volume of the solid.  
Give your answer correct to 3 significant figures.

$$\textcircled{1} : 6 \times 2 \times 15 = 180 \text{ cm}^3$$

$$\textcircled{2} : \frac{\pi \times 3^2 \times 15}{2} = 212.057 \dots$$

$$+ \quad \quad \quad 392.057 \dots$$



..... 392 ..... cm<sup>3</sup>  
(Total 4 marks)

## Stem and Leaf Diagrams

### Things to remember:

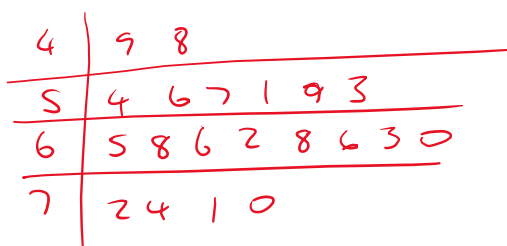
- A stem and leaf diagram is drawn by splitting the tens and units column. The tens column becomes the 'stem' and the units become the 'leaf'.
- Stem and leaf diagrams must be in order to read them properly
- Every stem and leaf diagram needs a key
- The 'leaf' should only ever contain single digits. Therefore, to put the number 124 in a stem and leaf diagram, the 'stem' would be 12 and the 'leaf' would be 4. To put the number 78.9 into a stem and leaf diagram, the 'stem' would be 78 and the 'leaf' would be 9. In this case, the key would indicate that the split between stem and leaf is a decimal.

### Questions:

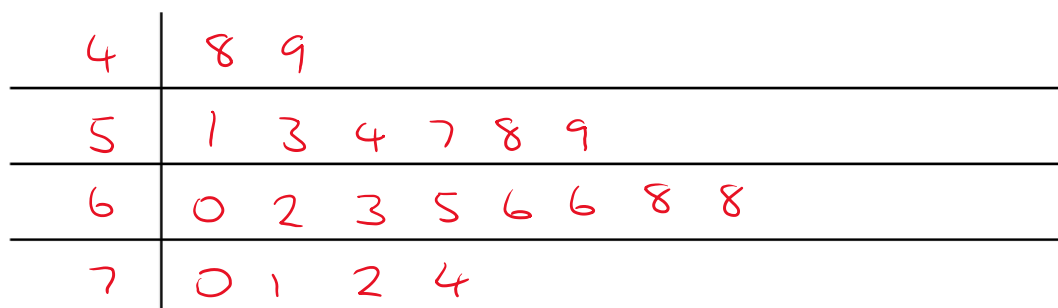
1. Here are the times, in seconds, it took 20 people to run a race.

~~54~~   ~~65~~   ~~68~~   ~~49~~   ~~72~~   ~~74~~   ~~56~~   ~~57~~   ~~66~~   ~~82~~  
~~68~~   ~~48~~   ~~51~~   ~~59~~   ~~66~~   ~~71~~   ~~63~~   ~~60~~   ~~53~~   ~~70~~

Draw an ordered stem and leaf diagram to show this information.  
 You must include a key.



key  
 $4|8 = 48 \text{ seconds}$



(Total 3 marks)

2. Here is a stem and leaf diagram showing the mass, in grams, of some bananas.

15	<del>6</del>	<del>6</del>	<del>7</del>	<del>9</del>	
16	<del>1</del>	<del>3</del>	<del>4</del>	<del>5</del>	8
17	<del>0</del>	<del>0</del>	<del>2</del>	<del>3</del>	<del>7</del>
18	<del>0</del>	<del>4</del>	<del>5</del>		

Key: 15 | 6 = 156 grams

Work out the median mass.

.....168..... grams  
(Total 2 marks)

3. Here is a stem and leaf diagram showing the ages of some footballers.

1	7	<del>9</del>						
2	<del>0</del>	<del>2</del>	<del>2</del>	<del>3</del>	5	7	<del>7</del>	<del>8</del>
3	<del>0</del>	<del>1</del>	<del>3</del>	3				

Key: 1 | 7 = 17 years old

a) Work out the range.

33 - 17

.....16.....  
(1)

b) Work out the median age.

.....26.....  
(2)  
(Total 3 marks)

4. Here are the speeds, in mph, of 20 cars.

~~55~~ ~~70~~ ~~67~~ ~~58~~ ~~69~~ ~~51~~ ~~43~~ ~~63~~ ~~49~~ ~~48~~  
~~65~~ ~~52~~ ~~45~~ ~~42~~ ~~47~~ ~~50~~ ~~47~~ ~~64~~ ~~63~~ ~~58~~

a) Draw an ordered stem and leaf diagram to show this information. You must include a key.

4	3 9 8 5 2 7 7
5	5 8 1 2 0 8
6	7 9 3 5 4 3
7	0

key  
 4 | 3 = 43 mph

4	<u>2</u> <u>3</u> <u>5</u> <u>7</u> <u>7</u> <u>8</u> <u>9</u>
5	<u>0</u> <u>1</u> <u>2</u> <u>5</u> <u>8</u> <u>8</u>
6	<u>3</u> <u>3</u> <u>4</u> <u>5</u> <u>7</u> <u>9</u>
7	<u>0</u>

(3)

b) Work out the median speed.

..... 53.5 ..... mph  
 (2)  
 (Total 5 marks)

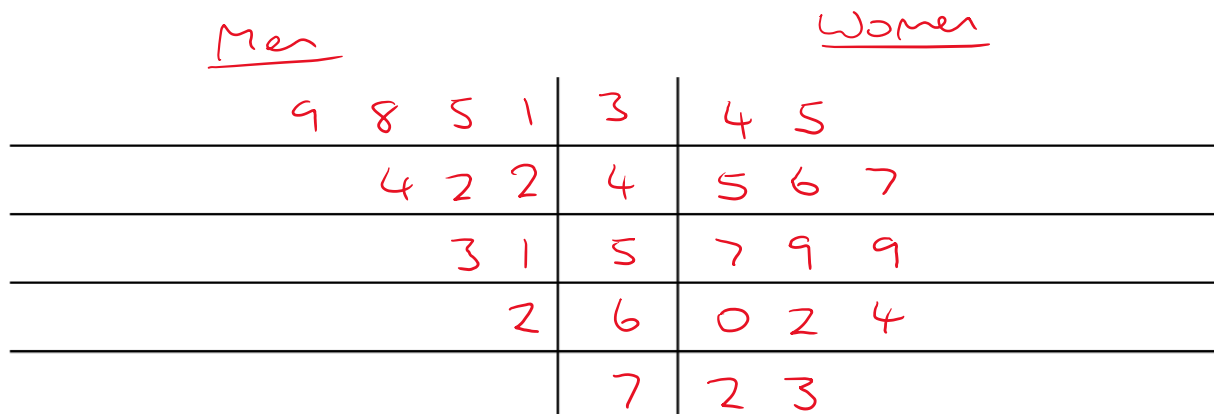
5. The ages of men and women at a bowling club were recorded, and the results are shown below.

Men: ~~42~~ ~~38~~ ~~62~~ ~~35~~ ~~53~~ ~~39~~ ~~44~~ ~~51~~ ~~31~~ ~~42~~  
 Women: ~~57~~ ~~45~~ ~~73~~ ~~35~~ ~~64~~ ~~34~~ ~~46~~ ~~59~~ ~~62~~ ~~59~~ ~~47~~  
~~60~~ ~~72~~

Draw an ordered **back-to-back** stem and leaf diagram to show this information. You must include a key.



key  
3 | 4 = 34 years



(Total 5 marks)

## Averages from Frequency Tables

### Things to remember:

- The modal value is the value that occurs most. From a table, this means the modal value is the one with the highest frequency
- The median value is the middle value when all items are in order. To find the value that is the median for a set of  $n$  items of data, add 1 to  $n$  and then divide by 2
- The mean is found by adding up all the numbers and dividing by how many numbers there are. To calculate this from a table, you need to divide the total number of items by the given frequency, ie.  $\frac{\Sigma fx}{\Sigma f}$

### Questions:

1. Shakir asked 24 of his friends how many pets they have. The results are shown in the table below.

Number of pets	Number of students	$fx$
0	8	0
1	11	11
2	4	8
3	0	0
4	1	4

- a) Write down the modal number of pets.

..... 1 .....  
(1)

- b) Work out the median number of pets.

$$\frac{24+1}{2} = 12.5^{\text{th}}$$

..... 1 .....  
(2)

- c) Calculate the mean number of pets.

$$\frac{\Sigma fx}{\Sigma f} = \frac{23}{24} = 0.958 \dots$$

..... 0.96 .....  
(3)

(Total 6 marks)

2. Jesse did a survey of the number of cups of coffee some teachers in his school had drunk yesterday.

The frequency table shows his results.

Number of cups of coffee	Frequency	$fx$
2	1	2
3	3	9
4	5	20
5	8	40
6	5	30

- a) Work out the number of teachers that Jesse asked

..... 22 ..... (1)

- b) Work out the mean number of cups of coffee drunk.

$$\frac{\sum fx}{\sum f} = \frac{101}{22} = 4,5909\dots$$

..... 4.6 ..... (3)

(Total 4 marks)

3. The table shows information about the number of goals scored in a game by a football team.

The team scored a total of 30 goals.

Find the value of  $x$

Number of goals scored	Frequency	
0	6	0
1	8	8
2	$x$	$2x$
3	2	6
4 or more	0	0

$$2x + 14 = 30$$

$$2x = 16$$

$$x = 8$$

..... 8 ..... (Total 3 marks)

4. Andrew plays 50 games in an arcade. The table shows how many tickets he won in each game.

Tickets won	Frequency
0	4
1	3
2	5
3	$x$
4	11
5	6
6	10
7	2
8	3

0  
3  
10  
18  
44  
30  
60  
14  
24

$$44 + x$$

- a) Work out the missing frequency.

.....6.....  
(3)

- b) Work out the total number of tickets won.

.....203.....  
(1)

- c) Work out the mean number of tickets won per game.

$$\frac{\sum fx}{\sum f} = \frac{203}{50} = 4.06$$

.....4.06.....  
(2)

Andrew wants to exchange his ticket for a prize that costs 800 tickets.

- d) How many more games do you expect Andrew would have to play?

$$\frac{800 - 203}{4.06} = 147.044\dots$$

.....147 or 148.....  
(2)

(Total 8 marks)



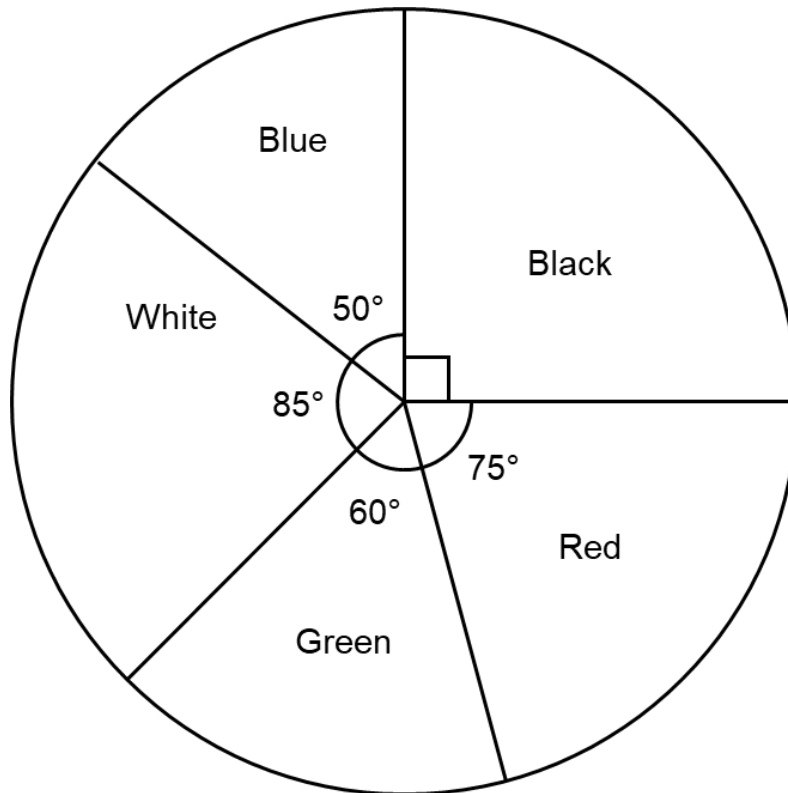
# Pie Charts

## Things to remember:

- A pie chart is a chart represented by a circle. It shows the proportion of each group
- There are  $360^\circ$  in a circle so each group in the pie chart will be a proportion of  $360^\circ$
- The first step for drawing or reading a pie chart is to work out how many degrees represents a frequency of 1
- You may need to use a protractor to measure or draw accurate angles
- When comparing pie charts, you can only compare proportions, not exact numbers

## Questions:

1. The pie chart shows the colours of front doors on a street.



a) What is the most common colour of door?

..... *Black* .....  
(1)

b) What is the least common colour of door?

..... *Blue* .....  
(1)

18 houses have a black front door.

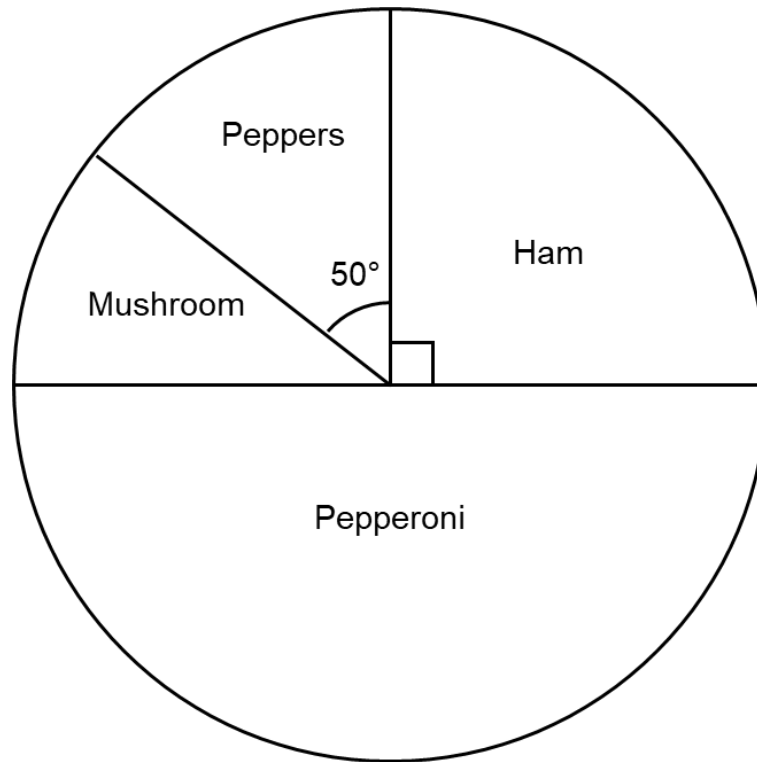
c) How many houses are on the street altogether?

*18 x 4*

..... *72* .....  
(2)

(Total 4 marks)

2. The pie chart shows information about the favourite pizza toppings of a group of students. Diagram NOT drawn accurately.



Use the pie chart to complete the table.

Topping	Frequency	Angle of sector
Ham	18	90°
Pepperoni	36	180°
Mushroom	8	40°
Peppers	10	50°

(Total 4 marks)

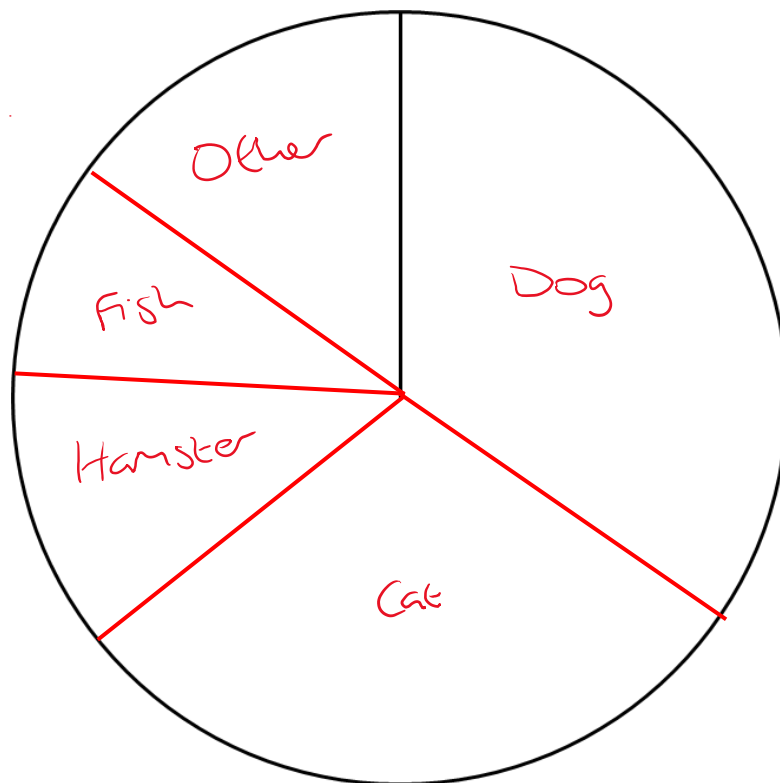
$$\div 5$$

3. The table shows the different types of pets that a class have.

Pet	Frequency	Angle
Dog	21	$126^\circ$
Cat	18	$108^\circ$
Hamster	7	$42^\circ$
Fish	5	$30^\circ$
Other	9	$54^\circ$

60  $\times 6 \rightarrow$

Draw an accurate pie chart to show this information.



(Total 4 marks)

4. A group of 36 football fans were asked which team they supported. The accurate pie chart and table show information about who they support.



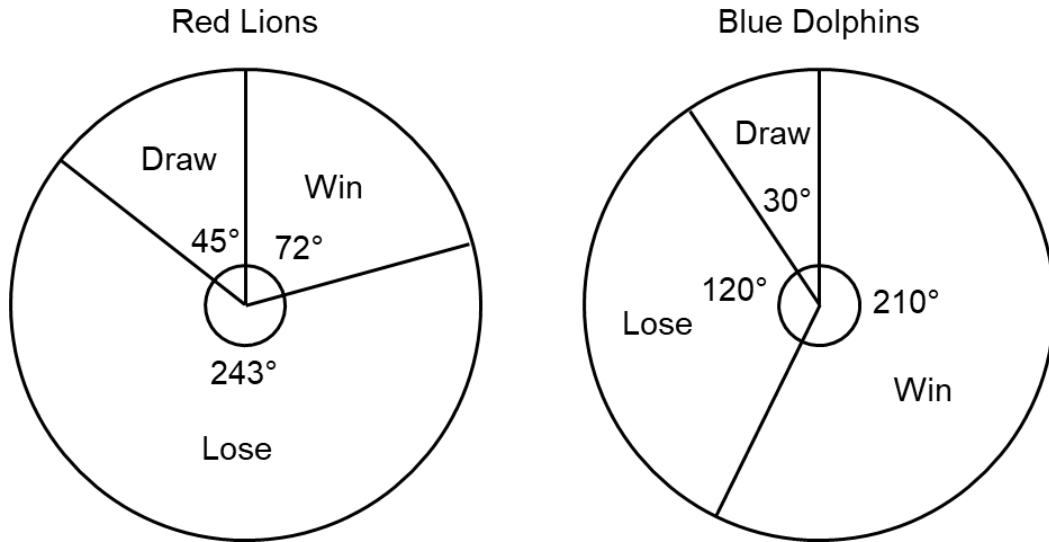
Use the pie chart to complete the table.

Team	Frequency	Angle of sector
Manchester City	11	110°
Arsenal	15	150°
Chelsea	4	40°
Liverpool	6	60°

↪  
÷10

(Total 4 marks)

5. The pie charts show information about the results of netball matches that two teams have played in over the course of a season.



Red Lions drew 5 matches.

- a) How many matches did Red Lions win?

$$45 \div 5 = 9$$

$$72 \div 9 = 8$$

8

(2)

Celia says “the pie charts show that Blue Dolphins won more matches than Red Lions.”

- b) Is Celia correct?  
You must explain your answer.

Not enough information - we cannot know how many matches Blue Dolphins won.

(1)

(Total 3 marks)

## Relative Frequency

### Things to remember:

- The probabilities of all possible outcomes of an event will add up to 1 (exhaustive)
- To calculate relative frequency, multiply the number of trials by the expected probability

### Questions:

1. Hettie throws a biased dice 200 times.  
The table shows information about her results.

Score	Frequency
1	72
2	31
3	29
4	30
5	26
6	12

Luna throws the dice 450 times.

Work out an estimate for the total number of times that Luna will get a score of 6

$$\frac{12}{200} \times 450$$

.....  
27

(Total 3 marks)

2. The probability that a carrot plant will grow from a seed is 86%  
Adam plants 800 seeds.  
Work out an estimate for the number of seeds that will grow into carrot plants.

$$0.86 \times 800$$

.....  
688

(Total 2 marks)

3. Miranda plays a game.  
 The probability that she will lose the game is 0.18  
 The probability that she will draw the game is 0.34  
 Miranda is going to play the game 200 times.  
 Work out an estimate for the number of times Miranda will win the game.

$$1 - (0.18 + 0.34) = 0.48$$

$$0.48 \times 200 = 96$$

96

.....  
 (Total 3 marks)

4. Parker wants to raise money for charity.  
 He designs a game for people to play.  
 Parker uses a fair 15-sided dice for the game.  
 The dice is numbered from 1 to 15  
 Each person will roll the dice once. A person wins the game if the dice lands on a multiple of 4  
 Ellie plays the game once.

- a) Work out the probability that Ellie will win the game.

4 8 12

$$\frac{3}{15} = \frac{1}{5}$$

.....  
 (2)

Each person pays 50p to play the game once.  
 The prize for a win is £2  
 Parker thinks that the game will be played 100 times.

- b) Work out an estimate for how much money Parker will raise for charity.

$$100 \times 0.5 = £50$$

$$\frac{1}{5} \text{ of } 100 = 20$$

$$20 \times £2 = £40$$

$$£50 - £40 = £10$$

£10

.....  
 (3)  
 (Total 5 marks)

5. A biased spinner can land on red, blue, yellow and green.  
The table shows the probabilities that the spinner will land on red, blue and yellow.

Colour	Red	Blue	Yellow	Green
Probability	0.25	0.3	0.1	0.35

- a) Complete the table.

(2)

Yasmin is going to spin the spinner 80 times.

- b) Work out an estimate for the number of times the spinner will land on red.

$$0.25 \times 80 = 20$$

20

(2)

(Total 4 marks)

6. In a bag there are only red counters, blue counters and yellow counters.  
A counter is taken at random from the bag.  
The table shows the probability of getting a red counter.  
The probability of getting a blue counter is the same as the probability of getting a yellow counter.

Colour	Red	Blue	Yellow
Probability	0.4	0.3	0.3

- a) Complete the table.

(2)

There are 12 red counters in the bag.

- b) Work out the total number of counters in the bag.

$$12 \div 0.4 = 30$$

30

(2)

(Total 4 marks)



## Sample Space Diagrams

### Things to remember:

- 'Sample space' is a term used to mean all possible outcomes
- We can show all possible outcomes in a sample space diagram

### Questions:

1. Two fair six sided dice are rolled.  
The numbers on the two dice are multiplied together to give a score.

		Dice 1					
		1	2	3	4	5	6
Dice 2	1	1	2	3	4	5	6
	2	2	4	6	8	10	12
	3	3	6	9	12	15	18
	4	4	8	12	16	20	24
	5	5	10	15	20	25	30
	6	6	12	18	24	30	36

- a) Complete the table to show all possible scores.

(2)

- b) Find the probability of a score of 12

$$\frac{4}{36} = \frac{1}{9}$$

(1)

- c) Find the probability of a score of 8 or less

$$\frac{16}{36} = \frac{4}{9}$$

(2)

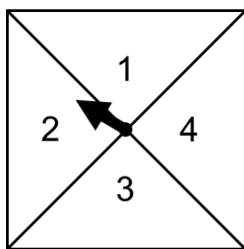
- d) Find the probability of an odd number

$$\frac{9}{36} = \frac{1}{4}$$

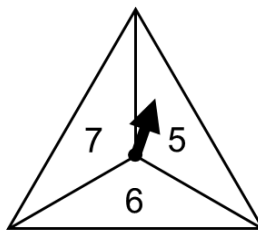
(2)

(Total 7 marks)

2. Two fair spinners are spun.  
 Spinner 1 has four equal sections labelled 1, 2, 3 and 4.  
 Spinner 2 has three equal sections labelled 5, 6 and 7.



Spinner 1



Spinner 2

Each spinner is spun once.  
 The numbers are multiplied together to get a score.

		Spinner 1				
		×	1	2	3	4
Spinner 2	5	5	10	15	20	
	6	6	12	18	24	
	7	7	14	21	28	

- a) Complete the table to show all possible scores. (2)
- b) Find the probability of scoring a 12 (1)

$$\frac{1}{12}$$

- c) Find the probability of scoring an even number (1)

$$\frac{8}{12} = \frac{2}{3}$$

(2)  
 (Total 5 marks)

3. Two bags, A and B, each contain three counters that are equal size. In bag A, the counters are labelled 1, 2 and 3. In bag B, the counters are labelled 3, 4 and 5.



Bag A



Bag B

A counter is drawn at random from bag A and a counter is drawn at random from bag B. The two numbers are added together to give a score.

		Bag A			
		+	1	2	3
Bag B	3		4	5	6
	4		5	6	7
	5		6	7	8

- a) Complete the table to show all possible scores.

(1)

- b) Find the probability of scoring a 6

$$\frac{3}{9} = \frac{1}{3}$$

(1)

- c) Find the probability of scoring 5 or more

$$\frac{8}{9}$$

(2)

(Total 5 marks)

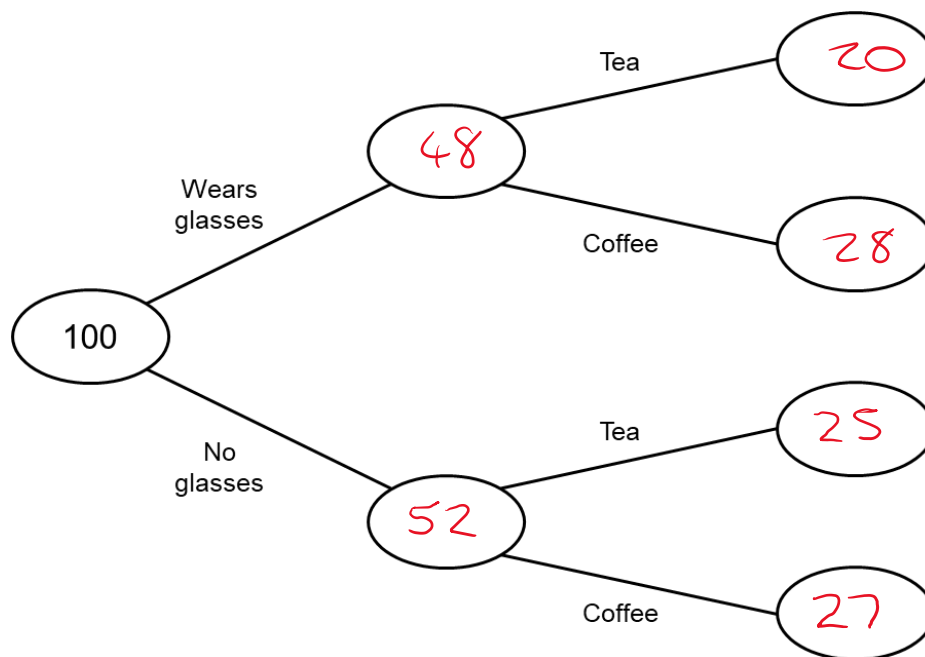
## Frequency Trees

### Things to remember:

- A frequency tree can be used to record and organise information given as frequencies
- We can use a frequency tree to calculate probabilities

### Questions:

1. 100 people were asked if they prefer tea or coffee.  
48 of the people wore glasses.  
25 of the people that didn't wear glasses preferred tea.  
55 of the people preferred coffee.



a) Use this information to complete the frequency tree.

(3)

One of the 100 people is chosen at random.

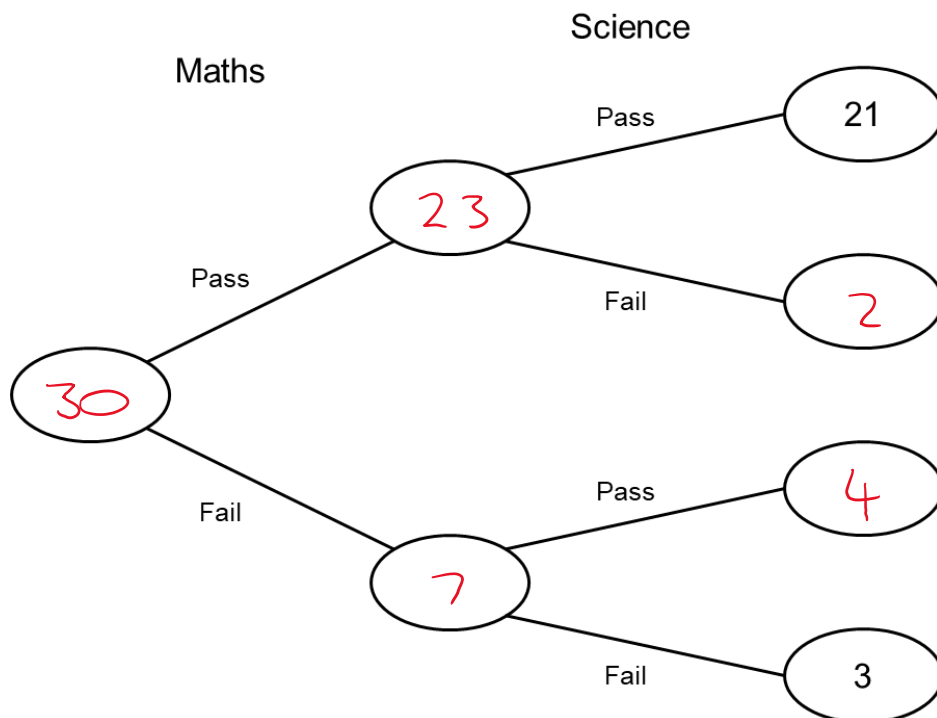
b) Write down the probability that this person wears glasses and preferred tea.

$$\frac{20}{100} = \frac{1}{5}$$

(1)

(Total 4 marks)

2. 30 students took a maths test and a science test.  
23 of the students passed the maths test.



a) Use this information to complete the frequency tree.

(3)

b) Write down the number of students that passed the science test.

$$21 + 4$$

25

(1)

(Total 4 marks)

## Applied Ratio

### Things to remember:

- To calculate the best value product, you need to compare like-for-like, for example the price of one millilitre or one gram
- To scale up a recipe, work out the required scale factor and multiply all the ingredients by that scale factor
- To convert from British pounds to a foreign currency, you multiply by the exchange rate. To go back the other way, you divide by the exchange rate

### Questions:

1. Best Waves Shampoo is available in two different bottles.

900 ml for £5.50

400 ml for £2.50

Work out which bottle offers the best value for money.  
You must show your working.

$$100\text{ml} = 61.111\dots\text{p} \quad 100\text{ml} = 62.5\text{p}$$

900ml bottle is better value for money

(Total 3 marks)

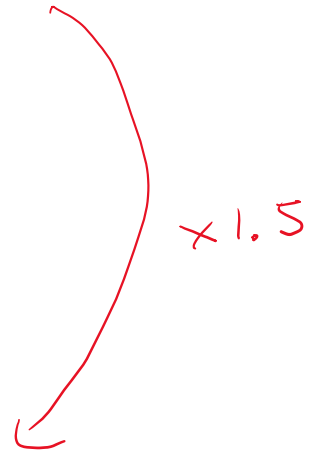
2. Leia is on holiday in Turkey.  
She changes £250 to Turkish lira.  
The exchange rate is £1 = 21 Turkish lira.  
Calculate how many Turkish lira Leia receives.

$$250 \times 21$$

.....5250..... lira  
(Total 2 marks)

3. Here are the ingredients needed to make 16 gingerbread men.

Ingredients	
to make 16 gingerbread men	
180 g	flour
40 g	ginger
110 g	butter
30 g	sugar



Seb wants to make 24 gingerbread men.  
Work out how much of each of the ingredients he needs.

$$180 \times 1.5$$

$$40 \times 1.5$$

$$110 \times 1.5$$

$$30 \times 1.5$$

..... 270 .....	g flour
..... 60 .....	g ginger
..... 165 .....	g butter
..... 45 .....	g sugar

(Total 3 marks)

4. A pair of trainers cost 3400 rupees in India.  
The same pair of trainers cost £68 in the UK.  
The exchange rate is £1 = 95 rupees.  
Work out the difference between the cost of the trainers in India and in the UK.  
Give your answer in pounds (£).

$$3400 \div 95 = £35.79$$

$$£68 - £35.79 = £32.21$$

£ ..... 32.21 .....

(Total 3 marks)

5. Here are the ingredients needed to make 12 shortcakes.

<p>Shortcakes</p> <p>Makes 12 shortcakes</p> <p>50 g of sugar 200 g of butter 200 g of flour 10 ml of milk</p>
--

Ruth makes some shortcakes.  
She uses 25 ml of milk.

- a) How many shortcakes does Ruth make?

$$12 \times 2.5 = 30$$

30

---

(2)

Mason has 500 g of sugar  
1000 g of butter  
1000 g of flour  
500 ml of milk

- b) Work out the greatest number of shortcakes Mason can make.

$$\text{Sugar} : 500 \div 50 \times 12 = 120$$

$$\text{Butter} : 1000 \div 200 \times 12 = 60$$

$$\text{Flour} : 1000 \div 200 \times 12 = 60$$

$$\text{Milk} : 500 \div 10 \times 12 = 600$$

60

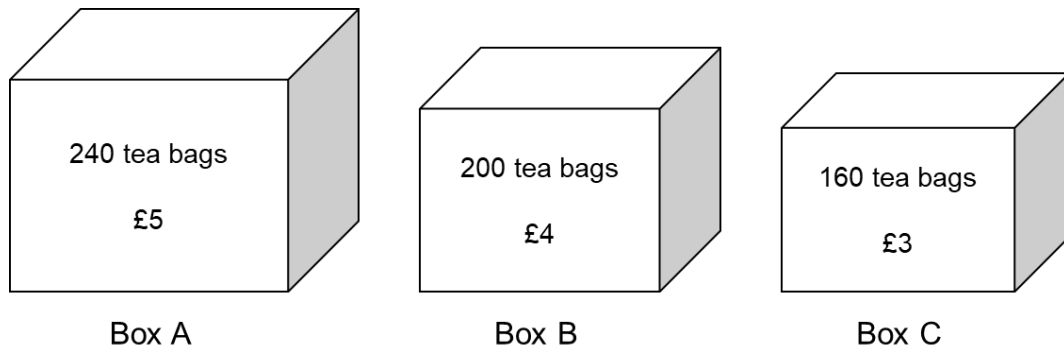
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(2)

(Total 4 marks)



6. Three boxes of tea bags are available in the supermarket



Which box offers the best value for money

$$\begin{aligned} & \pounds 5 \div 240 \\ & = 2.083\text{-}p \end{aligned}$$

$$\begin{aligned} & \pounds 4 \div 200 \\ & = 2p \end{aligned}$$

$$\begin{aligned} & \pounds 3 \div 160 \\ & = 1.875p \end{aligned}$$

Box C is best value.

(Total 4 marks)

7. Amin is travelling from the USA to Germany.  
Amin wants to book flights which cost \$1260 and a hotel which costs €80 per night for 12 nights.  
The exchange rates are as follows:

$$\begin{aligned} \pounds 1 & = \text{€}1.18 \\ \$1 & = \text{€}0.98 \end{aligned}$$

Amin can spend no more than £2000  
Work out if Amin is able to book the flights and the hotel.

$$\begin{aligned} & \$ 1260 \times 0.98 = \text{€} 1234.8 \\ & \text{€} 80 \times 12 = \text{€} 960 \\ & \text{€} 1234.8 + 960 = \text{€} 2194.8 \\ & \text{€} 2194.8 \div 1.18 = \pounds 1860 \end{aligned}$$

Yes Amin is able to book the flights  
and the hotel.

(Total 4 marks)

## Fractions and Ratios

### Things to remember:

- For any ratio  $a : b$ ,  $a$  represents  $\frac{a}{a+b}$  as a fraction
- Drawing a bar model might help with these questions

### Questions:

1. In a bag there are blue sweets and red sweets.  
The ratio of blue sweets to red sweets is 4 : 9  
What fraction of the sweets are blue?

$$\frac{4}{13}$$

.....  
(Total 2 marks)

2. In a bag there are blue sweets, red sweets and green sweets.  
The ratio of blue sweets to red sweets to green sweets is 5 : 3 : 2  
What fraction of the sweets are green?

$$\frac{2}{10} = \frac{1}{5}$$

.....  
(Total 2 marks)

3. In a bag there are blue sweets, red sweets and green sweets.  
The ratio of blue sweets to red sweets to green sweets is 2 : 4 : 5  
What fraction of the sweets are red?

$$\frac{2}{11}$$

.....  
(Total 2 marks)

4. In a bag there are only red sweets and yellow sweets.  
 $\frac{3}{5}$  of the sweets are red.  
Write down the ratio of red sweets to yellow sweets?

$$3 : 2$$

.....  
(Total 2 marks)

5. In a bag there are only blue sweets and green sweets.  
 $\frac{5}{6}$  of the sweets are green.  
Write down the ratio of blue sweets to green sweets?

$$1:5$$

(Total 2 marks)

6. In a cinema the ratio of adults to children is 3 : 1  
The children are all either boys or girls.  
The ratio of boys to girls is 3 : 2  
What fraction of all the people in the cinema are girls?

$$\frac{2}{5} \times \frac{1}{4} = \frac{2}{20}$$

$$\frac{2}{20} = \frac{1}{10}$$

(Total 3 marks)

7. In a company the ratio of men to women is 2 : 3  
30% of the women are under the age of 30.  
What fraction of all the people in the company are women under the age of 30?

$$\frac{3}{10} \times \frac{3}{5} = \frac{9}{50}$$

$$\frac{9}{50}$$

(Total 3 marks)

## Fractions of Amounts

### Things to remember:

- The denominator tells us how many equal parts the amount is divided into
- The numerator tells us how many of these parts we are interested in
- To calculate a fraction of an amount, divide the amount by the denominator, then multiply by the numerator

### Questions:

1. Work out  $\frac{1}{8}$  of 48

$$48 \div 8$$

6

(Total 1 mark)

2. Work out  $\frac{1}{11}$  of 77

$$77 \div 11$$

7

(Total 1 mark)

3. Work out  $\frac{2}{5}$  of 35

$$35 \div 5 \times 2$$

14

(Total 2 marks)

4. Work out  $\frac{3}{8}$  of 72

$$72 \div 8 \times 3$$

27

(Total 2 marks)

5. Work out  $\frac{5}{7}$  of 63

$$63 \div 7 \times 5$$

45

(Total 2 marks)

6. Henry has 50 sweets.  
He gives  $\frac{1}{5}$  of the sweets to Sandy.  
He gives  $\frac{3}{10}$  of the sweets to Leo.  
Henry keeps the rest of the sweets for himself.  
Work out how many sweets Henry keeps

$$\text{Sandy: } 50 \div 5 = 10$$

$$\text{Leo: } 50 \div 10 \times 3 = 15$$

$$50 - (10 + 15) = 25$$

25

(Total 3 marks)

7. Damon has an income of £2500 a month.  
He spends  $\frac{2}{5}$  of his income on rent.  
He spends  $\frac{1}{4}$  of his income on bills.  
He spends  $\frac{1}{10}$  of his income on food.  
Damon saves the rest of his income.  
Work out how much Damon saves each month.

$$\text{Rent: } 2500 \div 5 \times 2 = £1000$$

$$\text{Bills: } 2500 \div 4 = £625$$

$$\text{Food: } 2500 \div 10 = £250$$

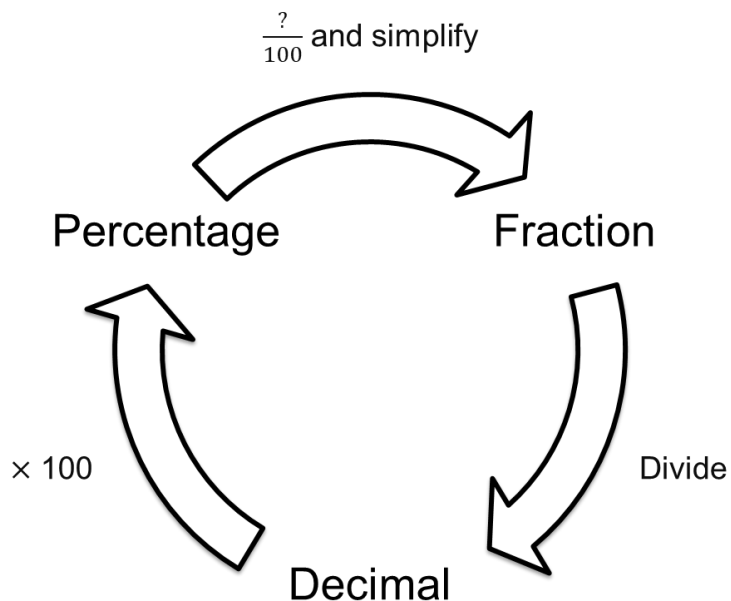
$$2500 - (1000 + 625 + 250)$$

£625

(Total 3 marks)

## Fractions, Decimals and Percentages Equivalence

Things to remember:



Questions:

1. Write 0.3 as a fraction

$$\frac{3}{10}$$

.....  
(Total 1 mark)

2. Write  $\frac{2}{5}$  as a percentage

$$40\%$$

.....  
(Total 1 mark)

3. Write  $\frac{1}{8}$  as a decimal

$$0.125$$

.....  
(Total 1 mark)

4. Write 45% as a fraction

$$\frac{9}{20}$$

.....  
(Total 1 mark)

5. Write 0.85 as a percentage

$$85\%$$

.....  
(Total 1 mark)

6. Write 37.5% as a decimal

$0.375$   
.....  
(Total 1 mark)

7. Write 0.06 as a fraction

$\frac{3}{50}$   
.....  
(Total 1 mark)

8. Stephan says that 13% is greater than 0.1  
Is Stephan correct?  
Give a reason for your answer.

$No \rightarrow 0.1 = 10\%$ , which is less than 13%.  
.....  
.....  
(Total 1 mark)

9. Write the following numbers in order of size.  
Start with the smallest number.

$\frac{2}{5}$       43%      0.04       $\frac{1}{3}$        $\frac{7}{20}$   
 $0.4$        $0.43$        $0.04$        $0.333\dots$        $0.35$

$0.04, \frac{1}{3}, \frac{7}{20}, \frac{2}{5}, 43\%$   
.....  
(Total 2 marks)

10. Write the following numbers in order of size.  
Start with the smallest number.

0.6       $\frac{2}{3}$       65%      0.66       $\frac{5}{8}$   
 $0.6$        $0.666\dots$        $0.65$        $0.66$        $0.625$

$0.6, \frac{5}{8}, 65\%, 0.66, \frac{2}{3}$   
.....  
(Total 2 marks)

## Calculating with Fractions

### Things to remember:

- To multiply fractions, just multiply the numerators together and multiply the denominators together
- To divide fractions, multiply the first fraction by the reciprocal of the second fraction (keep, change, flip)
- To add or subtract fractions, start by finding equivalent fractions with a common denominator
- If you need to calculate with mixed numbers, start by converting them to improper fractions

### Questions:

1. Work out  $\frac{3}{4} \times \frac{5}{6}$   
Give your answer as a fraction in its simplest form.

$$\frac{3}{4} \times \frac{5}{6} = \frac{15}{24} = \frac{5}{8}$$

$$\frac{5}{8}$$

.....  
(Total 2 marks)

2. a) Work out  $\frac{1}{3} \div \frac{2}{5}$

$$\frac{1}{3} \times \frac{5}{2} = \frac{5}{6}$$

$$\frac{5}{6}$$

.....  
(2)

- b) Work out  $\frac{2}{5} + \frac{1}{7}$   
Give your answer as a fraction in its simplest form.

$$\frac{14}{35} + \frac{5}{35} = \frac{19}{35}$$

$$\frac{19}{35}$$

.....  
(2)  
(Total 4 marks)



3. a) Work out  $\frac{5}{6} - \frac{1}{4}$   
Give your answer as a fraction in its simplest form.

$$\frac{10}{12} - \frac{3}{12} = \frac{7}{12}$$

$$\frac{7}{12}$$

(2)

- b) Work out  $1\frac{3}{4} \times 1\frac{1}{2}$   
Give your answer as a mixed number in its simplest form.

$$\frac{7}{4} \times \frac{3}{2} = \frac{21}{8} = 2\frac{5}{8}$$

$$2\frac{5}{8}$$

(2)

(Total 4 marks)

4. Work out  $3\frac{1}{4} - 1\frac{7}{9}$   
Give your answer as a mixed number in its simplest form.

$$\frac{13}{4} - \frac{16}{9}$$

$$\frac{117}{36} - \frac{64}{36} = \frac{53}{36}$$

$$1\frac{17}{36}$$

(Total 2 marks)

5. Work out  $1\frac{1}{6} \div \frac{2}{3}$   
Give your answer as a mixed number in its simplest form.

$$\frac{7}{6} \times \frac{3}{2} = \frac{21}{12} = \frac{7}{4} = 1\frac{3}{4}$$

$$1\frac{3}{4}$$

(Total 2 marks)

## Increasing and Decreasing by a Percentage

### Things to remember:

- “Per cent” means “out of 100”
- Increase means the value will go up, decrease means the value will go down
- If you don’t have a calculator, work out the percentage of the amount then add it on to increase or subtract it to decrease
- If you do have a calculator, you can multiply the original amount by the multiplier (the equivalent decimal to the percentage)

### Questions:

1. Jeremy is paid £34000 per year.  
He is going to get a 3% increase in the amount of money he is paid.  
Work out how much money Jeremy will be paid per year after the increase.

$$34000 \times 1.03$$

£ ..... 35020 .....  
(Total 2 marks)

2. Sophie buys a bag in a “20% off” sale.  
The price on the tag is £40.  
What is the sale price of the bag?

$$0.8 \times 40$$

£ ..... 32 .....  
(Total 2 marks)

3. A new TV is priced at £720  
In a sale it is reduced by 45%  
Calculate the sale price.

$$720 \times 0.55$$

£ ..... 396 .....  
(Total 2 marks)

4. A carton of orange juice contains 700 ml  
A special offer carton contains an extra 30%  
How many millilitres of orange juice are in the special offer carton?

$$700 \times 1.3$$

..... 910 ..... millilitres  
(Total 2 marks)

5. A vintage car was bought for £19,500  
Since then the value of the car has increased by 45%  
Calculate the value of the car

$$19\,500 \times 1.45$$

£ ..... 28\,275 .....  
(Total 2 marks)

6. Bonnie needs to buy petrol for her car.  
Her car can hold 70 litres of petrol.  
There are already 20 litres of petrol in the tank.  
Bonnie is going to fill up the petrol tank.  
The price of petrol is 195.9p per litre  
Bonnie has a voucher that gives her 5% off the price of petrol.  
How much does Bonnie have to pay for the petrol?

50 Litres needed

$$50 \times £1.959 = £97.95$$

$$0.95 \times £97.95 = £93.05$$

£ ..... 93.05 .....  
(Total 5 marks)

# **Useful websites:**

**www.piximaths.co.uk**

**www.mathswatchvle.com**

**www.corbettmaths.com**

**www.mymaths.co.uk**

**www.dr frost.com**

**www.bbc.co.uk/schools/gcsebitesize  
/maths**

**Remember: Do your best;  
it is all you can do 😊**