

- 1) (a) Find the next three terms in each of these sequences:  
 (i) 8, 11, 14, 17, 20, ...      (ii) 4, 7, 12, 19, 28, ...

..... 23, 26, 29 ..... [1] AI      ..... 39, 52, 67 ..... [1] AI

- (b) A sequence starts 1, 4, 9, 16, 25, .... Find the 20<sup>th</sup> number in this sequence.

$u_n = n^2$  M1 : correctly recognised sequence  
 $u_{20} = 20^2 = 400$

..... 400 ..... [2] AI

- (c) Find a formula for the  $n^{\text{th}}$  term of the sequence which starts 7, 9, 11, 13, 15, ....

AI      AI  
  
 $2n + 5$  ..... [2]

- (d) I have a sequence where each term is the sum of the two terms before it. I have forgotten the first three numbers in the sequence, but the fourth to eighth numbers are 4, 7, 11, 18, 29. Find:

- (i) the tenth number

$n$	1	2	3	4	5	6	7	8	9	10
$u_n$	2	1	3	4	7	11	18	29	47	76
			+2	+1	+3	+4	+7	+11	+18	+29

$\Rightarrow$  Fibonacci

..... 76 ..... [1] AI

- (ii) the first number

..... 2 ..... [1] AI

2) (a) Simplify:

(i)  $5x + 2x - 3x$

.....  $4x$      $A1$  [1]

(ii)  $3ab + 2a^2 + 4ba - 2a^2$

.....  $7ab$      $A2$  [2]

(iii)  $5x - (2x + 1)$

.....  $\begin{array}{c} A1 \quad A1 \\ \overline{3x} \quad \overline{-1} \end{array}$  [2]

(b) If  $p = 5, q = 2$  and  $r = -3$ , find:

(i)  $2p + q$

.....  $12$      $A1$  [1]

(ii)  $pq - r$

.....  $13$      $A1$  [1]

(iii)  $\frac{r^2+p}{q}$

$\frac{(-3)^2 + 5}{2}$      $M1$  correct substitution

.....  $7$      $A1$  [2]

(c) If  $a - b = 5$ , find the value of  $3a - 3b$ .

.....  $15$      $A1$  [1]

- (d) (i) Freddie has five times as many sweets as Marcus. If Marcus has  $x$  sweets, write down an expression for how many sweets Freddie has.

.....  $5x$  A1 [1]

- (ii) Freddie gives six sweets to Marcus. Write down expressions for the number of sweets each has now.

Freddie: .....  $5x - 6$  .....

Marcus: .....  $x + 6$  ..... [1]

} A1

- (iii) Freddie now has three times as many sweets as Marcus. Using your answers to part (ii), find how many sweets Marcus started with.

$$5x - 6 : x + 6 = 3 : 1$$

$$5x - 6 = 3(x + 6) \quad \text{M1 forming a correct equation}$$

$$5x - 6 = 3x + 18$$

$$2x = 24$$

$$x = 12$$

.....  $x = 12$  A1 [2]

- 3) (a) For the list of numbers: 8, 5, 6, 8, 6, 8, find:  
 (i) the mean

$$\frac{54}{8} = \frac{27}{4} = 6\frac{3}{4}$$

M1 for correct calculation,

6.75 or A1 [2]

- (ii) the range

allow  $\frac{8+5+6+8+9+6+4+8}{8}$

5 A1 [1]

- (b) Six boys and four girls take a test. The boys get a mean score of 71 and the girls get a mean score of 74. Find the mean of all ten children.

$$\frac{(6 \times 71) + (4 \times 74)}{10} \quad \text{M1}$$

$$= \frac{(3 \times 71) + (2 \times 74)}{5} = \frac{213 + 148}{5} = \frac{361}{5}$$

72.2 or A1 [2]

- (c) I think of four whole numbers.

The mode of the four numbers is 12.

$\Rightarrow$  12 is included more than once

The median of the four numbers is 10.

$\Rightarrow$  the average of the middle numbers is 10

The range of the four numbers is 5.

Find the four numbers.

$$\Rightarrow x + 5 = 12$$

$$x = 7$$

7, 8, 12, 12 A2 [2]

4) (a) Simplify the following:

(i)  $m^2 \times m^5$

$m^7$  A1 [1]

(ii)  $\frac{q^7}{q^4}$

$q^3$  A1 [1]

(iii)  $(x^4)^3$

$x^{12}$  A1 [1]

(b)  $16^3 = 4096$ . Use this fact and your answer to part (iii) to find  $\sqrt[12]{4096}$ .

$16^3 = (2^4)^3 = 4096$   
M1

2 A1 [2]

(c) Circle all the numbers below which are multiples of 12. There may be more than one answer.

$2^4 \times 3 \times 7^4 \times 11$  A2

$2 \times 3^5 \times 5^2 \times 7^4 \times 11^2$

$2^6 \times 5^3 \times 7^5 \times 11^3$

$2 \times 3^2 \times 5^4 \times 7^6 \times 11^3$

[2]

5) (a) Calculate the following:

(i)  $\frac{3}{4} - \frac{1}{5}$

$\frac{15}{20} - \frac{4}{20} = \frac{11}{20}$  M1 any correct method

.....  $\frac{11}{20}$  ..... A1 [2]

(ii)  $\frac{7}{13} \times \frac{3}{105}$

M1 any correct method

.....  $\frac{3}{5}$  ..... A1 [2]

(iii)  $2\frac{3}{4} + 1\frac{2}{3}$

$2\frac{9}{12} + 1\frac{8}{12}$  M1 any valid method

$3\frac{17}{12} = 4\frac{5}{12}$

.....  $4\frac{5}{12}$  ..... A1 [2]

(b) Show that  $1\frac{1}{4} \times \frac{4}{5} = 1$ .

$1\frac{1}{4} = \frac{5}{4}$  M1  $\frac{5}{4} \times \frac{4}{5} = \frac{20}{20} = 1$  A1: Show that the fractions cancel to 1

..... [2]

(c) The price of a diamond ring is increased by 25%. The following week it is reduced back to its previous price. By what percentage was it reduced?

..... 20% ..... A1 [1]

(d) Write down the value of  $\frac{7}{8} \times \frac{6}{7} \times \frac{5}{6} \times \frac{4}{5} \times \frac{3}{4} \times \frac{2}{3} \times \frac{1}{2}$ .

.....  $\frac{1}{8}$  ..... AI [1]

(e) Tim and Alanna have to mark some exam papers. If Tim worked alone it would take him 12 hours to mark them all. If Alanna marked them all it would take her 6 hours to mark them all. How long will it take them to mark all the exams if they do the marking together?

Let  $x$  be the total number of papers.

MI some correct working seen

Then Tim's rate of marking is  $\frac{x}{12}$  papers/hour

Alanna's rate of marking is  $\frac{x}{6}$  papers/hour

Working together, they mark  $\frac{x}{12} + \frac{x}{6}$  papers/hours

Let  $k$  be the number of hours they take to mark all the papers, working together.

..... 4 hours ..... AI [2]

$$\text{Then } x = k \left( \frac{x}{12} + \frac{x}{6} \right)$$

$$x = \frac{3kx}{12}$$

$$k = \frac{12}{3} = 4$$

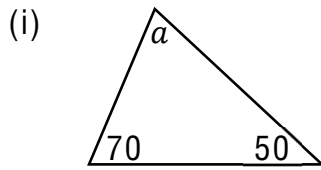
Alternatively: Alanna marks papers twice as fast as Tim.

Therefore, Alanna will mark  $\frac{2}{3}$  of the papers, and Tim will mark  $\frac{1}{3}$ .

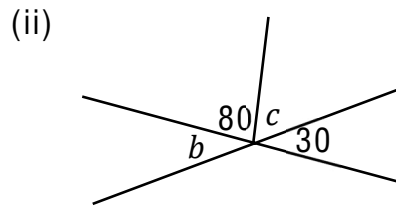
The time it takes Alanna to mark  $\frac{2}{3}$  of the papers is

$$\frac{2}{3} \times 6 = 4 \text{ hours}$$

6) (a) Find the size of each of the angles marked with letters. The diagrams are not drawn to scale so you cannot measure them with a protractor:

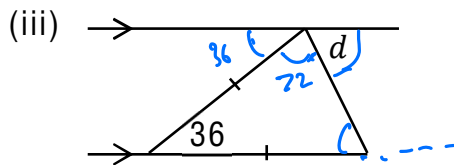


$a = \dots 60^\circ \text{ A1} \dots [1]$



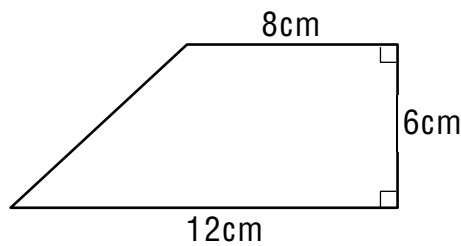
$b = \dots 30^\circ \text{ A1} \dots [1]$

$c = \dots 70^\circ \text{ A1} \dots [1]$



$d = \dots 72^\circ \text{ A1} \dots [1]$

(b) Find the area of this trapezium.

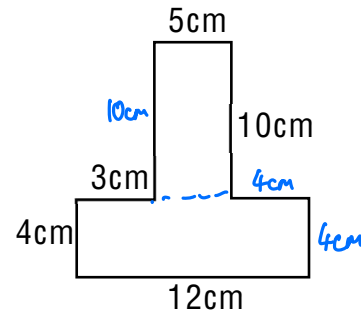


$\left(\frac{8+12}{2}\right) \times 6 \text{ M1 (also M1 for attempt to solve by compound shapes)}$   
 $= 60\text{cm}^2$

Area =  $\dots 60\text{cm}^2 \text{ A1} \dots [2]$



(c) Find the perimeter and area of the shape shown.

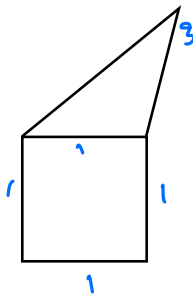


M1 evidence of attempt to find area by compound shapes

M1 for evidence of correct method (incl. if one missed length)

Perimeter =  $52\text{cm}$  A1 [2]      Area =  $98\text{cm}^2$  A1 [2]

(d) In this question, the square and the triangle have the same perimeter. Find the ratio of the perimeter of the irregular pentagon to the perimeter of the square.



$6 : 4$  M1 for correct ratio (or expression)  
 $= 3 : 2$  for the perimeter of the pentagon and the square.

$3 : 2$  A1 [2]

End of test. Now go back and check your work.