# GCSE (9 – 1) Mathematics

**J560/04** Paper 4 (Higher tier)


# Question Set 3

**1 (a)** Bob makes dry concrete by mixing cement, sand and stone in the ratio 1 : 2 : 3 by weight.
He buys the cement, sand and stone in bags as shown in this table.

| | Weight of bag (kg) | Cost per bag (£) |
|---|---|---|
| Cement | 25 | 5.50 |
| Sand | 20 | 2.00 |
| Stone | 15 | 3.90 |

He packs the dry concrete into 30 kg bags.

Bob buys just enough cement, sand and stone to make 50 bags of dry concrete.

(a) Show that Bob buys 500 kg of sand. [3]

1 : 2 : 3
1 + 2 + 3 = 6          50 × 30 = 1500 kg
1500 ÷ 6 = 250
250 × 2 = 500 kg

**(b)** Bob sells the 50 bags of dry concrete for a total of £396.

Calculate Bob's percentage profit.

sand
500 ÷ 20 = 25 bags
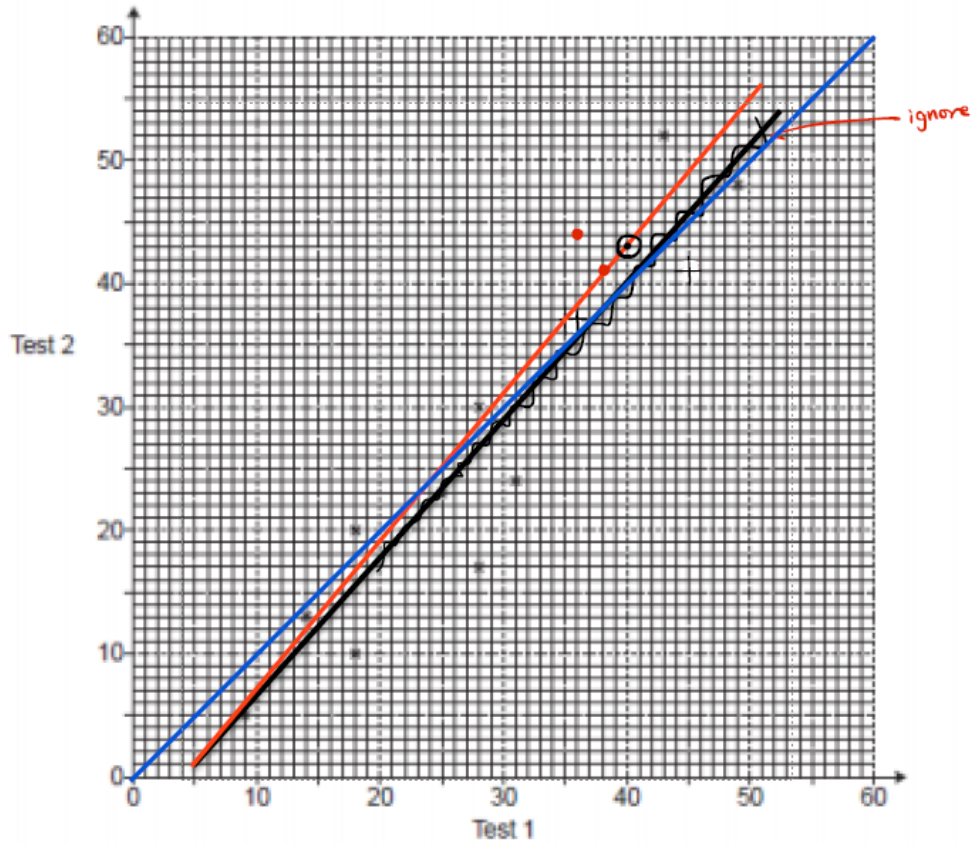25 × 2 = £50

cement
250 × 1 = 250
250 ÷ 25 = 10 bags
10 × 5.50 = £55

stone
250 × 3 = 750
750 ÷ 15 = 50 bags
50 × 3.90 £1.95

195 + 50 + 55 = £300 = total cost

$\left(\dfrac{396 - 300}{396}\right) \times 100\%$

= 24.24 %

(b) .............24.24............. % [5]

**2 (a)**

12 students take two tests.
Each test is out of 60.
The scatter diagram shows the results for 10 of the students.



Test 1

(a) The table shows the results for the other 2 students.

| Test 1 | 36 | 38 |
|--------|----|----|
| Test 2 | 44 | 41 |

Plot these results on the scatter diagram.                                    [1]

**b)**     Describe the type of correlation shown in the scatter diagram.

Strong positive correlation

(b) ........................................................... [1]

**(c)** **(i)**   Draw a line of best fit on the scatter diagram.                          [1]

**(ii)** Another student was absent for Test 2.
The student scored 40 marks on Test 1.

Use your line of best fit to estimate a result for this student on Test 2.

**43**

(c)(ii) ........................................ [1]

dots that are
above the blue line

**(d)** Work out the percentage of **the 12 students** whose result on Test 1 is **lower** than their result on Test 2.

out of the 12, 5 of them have a
lower test 1 than test 2.

$$\left(\frac{5}{12}\right) \times 100\% = 41 \cdot 6$$

**41.67**

(d) ........................................ % [4]

**3** The diagrams show the price paid by two groups of people visiting a funfair.

| 5 adults | £ |
| 4 children | £ |
| | |
| Total £ | 78 |

| 3 adults | £ |
| 6 children | £ |
| | |
| Total £ | 63 |

Assume each adult pays the same price and each child pays the same price.

Find the price for an adult and the price for a child.

① $\quad 5a + 4c = 78$

② $\quad 3a + 6c = 63$

③ = ① × 1.5 = $7.5a + 6c = 117$

③ - ② = $4.5a = 54$

$\qquad a = 12$

$(3 \times 12) + 6c = 63$

$\qquad 6c = 27$

$\qquad c = 4.5$

Adult price = £ ........... 12 ...........

Child price = £ ........ 4.50 ........

[5]

**4 (a)**

The value of a house, £H, is given by the formula

$$H = 165\,000 \times 1.03^t$$

where $t$ is the number of years after 1st January 2010.

(a) Write down the value of the house on 1st January 2010.

$$165\,000 \times 1.03^0$$

(a) £ 165 000 ......... [1]

**(b)**

Write down the annual percentage increase in the value of the house.

$$0.03 \times 100\% = 3$$

$165000 \times 1.03 = 169950$     $169950 - 16500 = 4950$

$\dfrac{4950}{165000} \times 100 = 3\%$     (b) ........ 3 ........ % [1]

**(c)**

Show that the value of the house is over £200 000 on 1st January 2017.   [2]

$$165\,000 \times 1.03^7 = 202929.19$$

£202929 ≈ £200 000

**5 (a)**

A transport lorry consists of a cab and a trailer.
The trailer has a volume of 90 m³.
Alfie makes a model of this lorry using a scale of 1 : 72.

Work out the volume of the trailer in Alfie's model, giving your answer in cm³.

$$1.25 \times \left( \begin{array}{c} 1 : 72 \\ 1.25 : 90 \end{array} \right) 1.25 \times$$

$$1.25 \ m^3 \implies 1250000$$

$$1 m^3 = 1000000 \ cm^3$$
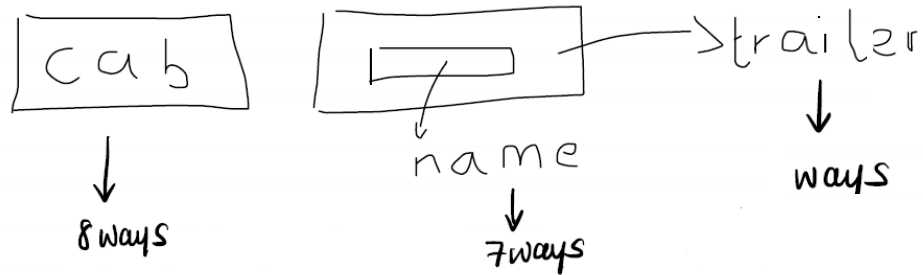
(a) ........1250000........ cm³ **[3]**

**(b)**

Alfie paints his model lorry.
He has eight colours available.

He decides to paint the cab in one colour and the trailer in a different colour.

He then wants to paint his name on the trailer.
The name must be in a different colour to the trailer.

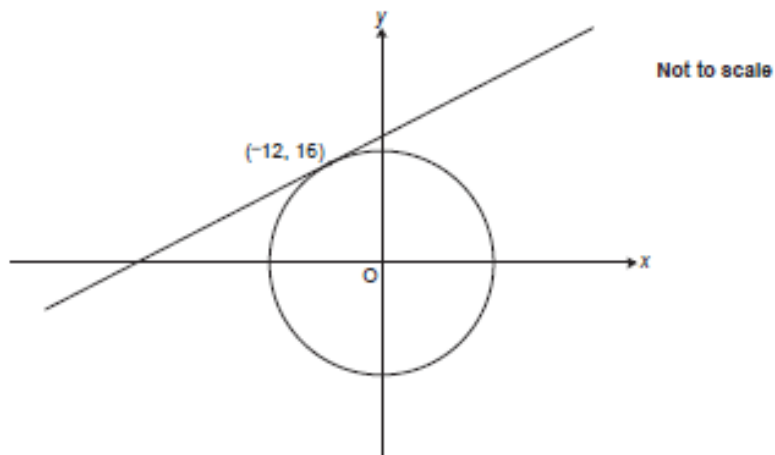In how many different ways can Alfie paint his model lorry?

cab → 8 ways

name → 7 ways

→ trailer → ways

$$8 \times 7 \times 7 = 392$$

(b) ........392 ways........ **[3]**

**6** The diagram shows a circle with centre (0, 0) and a tangent at the point (−12, 16).



Not to scale

The tangent crosses the y-axis at the point (0, p).

Find the value of p.

$$(-12, 16) \rightarrow (0, 0$$

$$m = \frac{(16-0)}{(-12-0)} = -\frac{4}{3}$$

$$m \text{ of tangent} = \frac{3}{4}$$

$$y = \frac{3}{4}x + c$$

$$16 = \left(\frac{3}{4} \times -12\right) + c \qquad c = 25$$

p = ....25................................ [5]

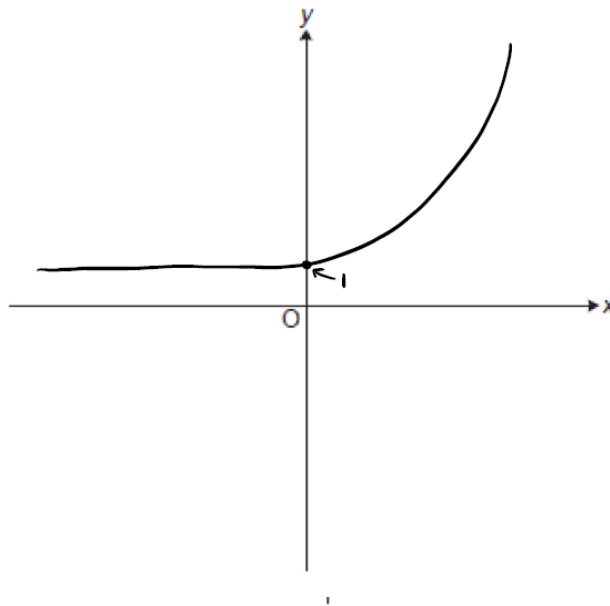**7** Show that $\dfrac{x+9}{x^2-1} + \dfrac{4}{x+1}$ can be written in the form $\dfrac{a}{x-1}$, where $a$ is an integer. **[4]**

$$\frac{x+9}{(x+1)(x-1)} + \frac{4}{x+1}$$

$$= \frac{x+9 + 4(x-1)}{(x+1)(x-1)}$$

$$= \frac{x+9+4x-4}{(x+1)(x-1)}$$

$$= \frac{5x+5}{(x+1)(x-1)}$$

$$= \frac{5(x+1)}{(x+1)(x-1)}$$

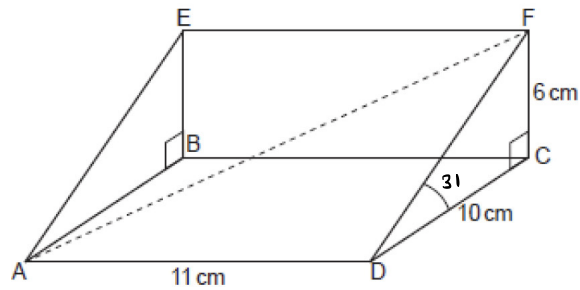$$= \frac{5}{x-1} \qquad \boxed{a = 5}$$

**8** Sketch the graph of $y = 3^x$.
Give the value of the $y$-intercept.



**[2]**

**9 (a)** The diagram shows a right-angled triangular prism ABCDEF.



Length AD = 11 cm, length CD = 10 cm and length CF = 6 cm.

**(a)** Calculate the volume of the prism.

$$11 \times 10 \times \cancel{6}^{3} \times \frac{1}{\cancel{2}} = 330$$

(a) ..............330.............. cm³ **[2]**

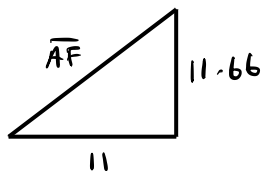**(b)** Use trigonometry to show that angle FDC = 31°, correct to the nearest degree. **[2]**



$$\tan x = \frac{6}{10}$$

$$x = 30.9637... \approx 31°$$

**(c)** Calculate the exact length of AF.

$$\overline{DF}^2 = 6^2 + 10^2 = 136$$

$$\overline{DF} = 11.66$$



$$\overline{AF}^2 = 11^2 + 11.66^2$$

$$= 257$$

$$\overline{AF} = 16.03...$$

(c) ..............16.03.............. cm **[4]**

## Total Marks for Question Set 3 : 50