Oxford Cambridge and RSA

# GCSE (9-1) Mathematics

**J560/05** Paper 5 (Higher Tier)

## Question Set 6

**1.** Write 75 as a product of its prime factors.

$$\begin{array}{r|l} 5 & 75 \\ \hline 5 & 15 \\ \hline & 3 \end{array}$$

$3 \times 5^2$ ..... [2]

2, **(a)** The ratio 45 minutes to 3 hours 45 minutes can be written in the form 1 : *n*.

Find the value of *n*.

3 hrs 45 min = 3 × 60 + 45

= 180 + 45

= 225

45 : 225

(÷ 45)

1 : 5

(a) *n* = 5 [2]

**(b)** Reece and Sarah share some money in the ratio 9 : 16.

Reece says that Sarah gets more than 60% of this money.

Show that Reece is correct.

Total = 16 + 9 = 25

$\frac{16}{25} \times 100^{4} = 64\%$

64% > 60%

[3]

**3.** Charlie and Jasmine share cartons of apple juice.

Charlie drinks $\frac{1}{3}$ of a carton every day.

Jasmine drinks $\frac{2}{5}$ of a carton every day.

Any apple juice left in a carton at the end of the day is used the following day.

The cost of a carton is 70p.
Charlie and Jasmine buy just enough cartons to last them for 10 days.

How much do they spend in total for these cartons?
Give your answer in £.
Show your working.

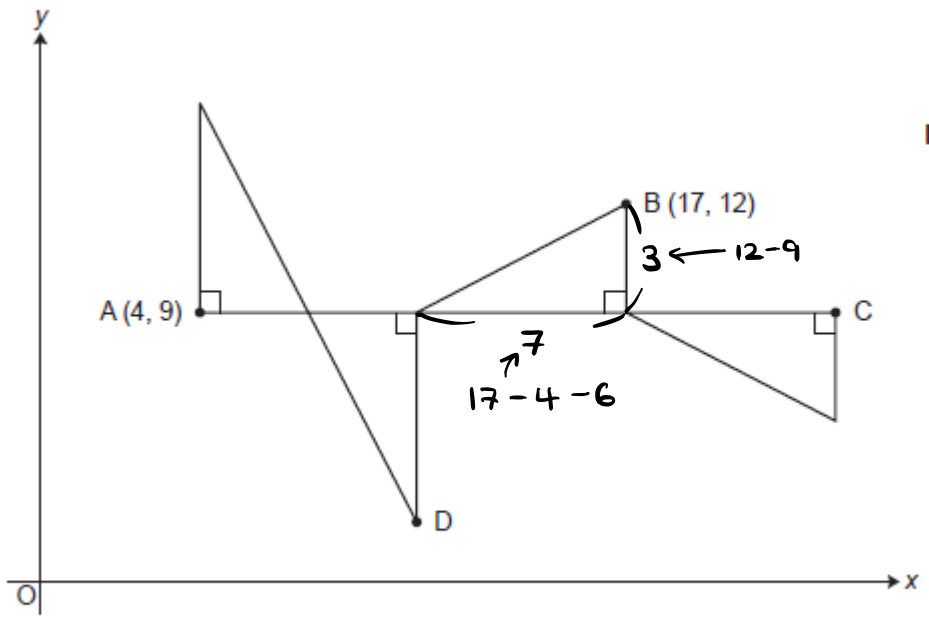
$\frac{1}{3} \times 10 + \frac{2}{5} \times \cancel{10}^{2} = \frac{10}{3} + 4 = 3\frac{1}{3} + 4 = 7\frac{1}{3}$.

Thus need 8 cartons $\rightarrow$ $8 \times 0.7 =$ 5.60

70p = £0.7

£ 5.60 [6]

**4.** A pattern is made from four congruent right-angled triangles.




Not to scale

The line AC is parallel to the *x*-axis.
The point A has coordinates (4, 9) and the point B has coordinates (17, 12).

Work out the coordinates of point C and point D.

C : $x = 17 + 7 = 24$ $y = 9$ (24, 9)

D : $x = 4 + 6 = 10$ $y = 9 - 7 = 2$ (10, 2)

C ( 24 , 9 )

D ( 10 , 2 ) **[5]**

**5.** Each day, Eve records how long it takes her to complete a puzzle.

On Friday, she took 50% less time than on Thursday.
On Saturday, she took 20% less time than on Friday.
On Saturday, she takes 36 minutes to complete the puzzle.

How many minutes did she take to complete the puzzle on Thursday?
Show your working.

Thursday = $x$ minutes

Friday = $0.5x$

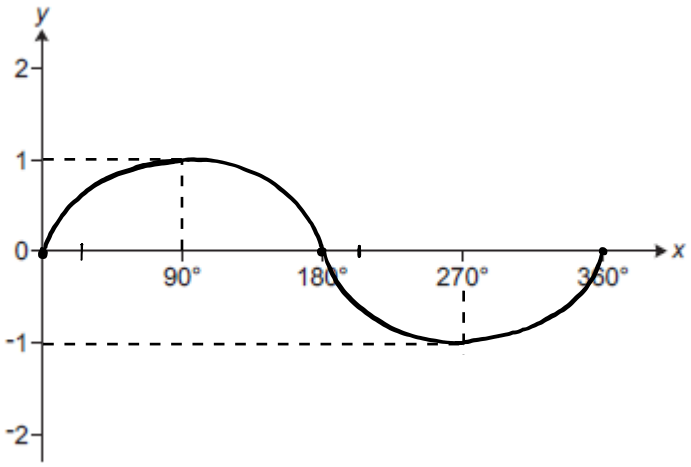
Saturday = $(100-0.2) \times 0.5x = 0.8 \times 0.5x = 0.4x$

$0.4x = 36$ minutes

$x = 90$

90 ..... minutes **[5]**

**6.** **(a)** Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.




**[2]**

**(b)** The graph of $y = \cos(x - 30)$ for $0° \leqslant x \leqslant 360°$ crosses the $x$-axis in two places.

Write down the values of $x$ where this occurs.

$y = \cos x$ graph shifts to the right by 30°

$y = \cos x$ crosses $x$-axis at 90° and 270°

↓

$y = \cos(x - 30)$ crosses $x$-axis at $90° + 30°, 270° + 30°$

$= 120°, 300°$

$x =$ 120° and 300° **[2]**

**7.** Solve.

$\frac{x}{x+6} = 5$ $\quad x(x+6)$

$x = 5(x+6)$

$x = 5x + 30$

$4x = -30$

$x = -\frac{30}{4}^{15}_{2}$

$x = -\frac{15}{2}$

$x =$ $-\frac{15}{2}$ **[3]**

**8.**

(a) The masses, $m$kg, of some parcels are shown below.

4 15 14 11 12 3 1 18 13 2 16 10

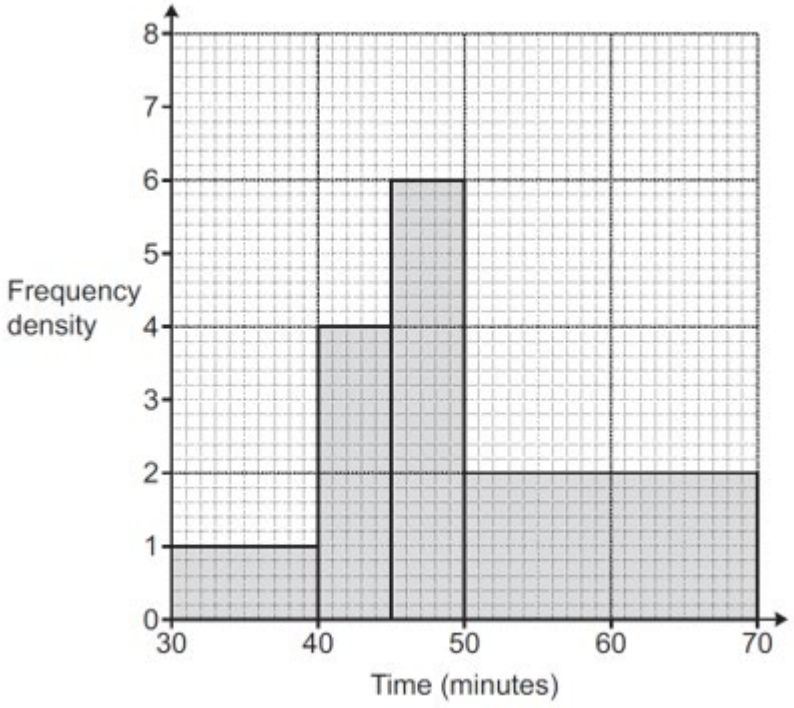
Jack constructs this grouped frequency table to record the masses.

| Mass ($m$kg) | Tally | Frequency |
|---|---|---|
| $0 \leqslant m \leqslant 5$ | IIII | 4 |
| $5 \leqslant m \leqslant 10$ | I | 1 |
| $10 \leqslant m \leqslant 15$ | ~~IIII~~ I | 6 |
| $15 \leqslant m \leqslant 20$ | II | 2 |

Explain why Jack's table is unsuitable to record the masses.

Every group has an overlap with other groups on the lower and upper boundaries thus the number on the boundary would be counted twice (e.g. 10) [1]

(b) The histogram summarises the times taken, in minutes, by some students to complete a race.




(i) Show that 70 students took between 45 and 70 minutes to complete the race. [2]

frequency density = $\frac{\text{frequency}}{\text{class width}}$ $6 \times 5 + 2 \times 20 = 30 + 40 =$ 70 students

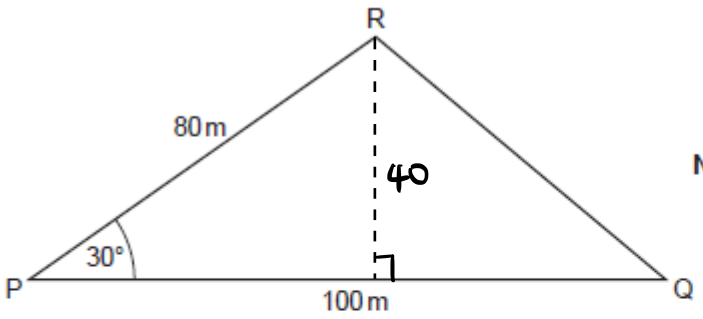
(ii) Calculate an estimate of the mean time taken to complete the race.
Show your working.

(b)(ii) 50.25 min [5]

$$\bar{x} = \frac{10 \times 35 + 20 \times 42.5 + 30 \times 47.5 + 40 \times 60}{1 \times 10 + 4 \times 5 + 70}$$

$$= \frac{5025}{100} = 50.25 \text{ minutes}$$

**9.** The diagram shows a triangular field PQR which is used to grow organic carrots.




Not to scale

PQ = 100 m, PR = 80 m and angle RPQ = 30°.

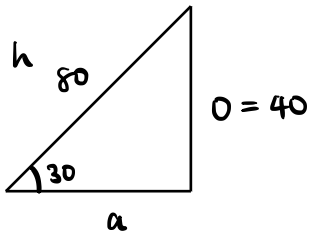
In recent years, an average of 2.5 kg of carrots has been harvested from each square metre of the field.

**(a)** Use this information to work out the total mass of carrots that might have been harvested from the field in 2019.

2.5kg per $1m^2$

Area of $\triangle PQR = 100 \times \cancel{40}^{20} \times \frac{1}{\cancel{2}}$

$= 2000\ m^2$




$2.5\ kg \times 2000$

$= 5000\ kg$

$\sin 30 = \frac{O}{80}$

$O = 80 \times \sin 30$

$O = 40$

**(a)** 5000 kg **[4]**

**(b)** Why might the answer to part **(a)** be unreliable?

Because 2.5kg is an average value based from past years, the average value for 2019 could be different **[1]**

**10.** **(a)** Write $x^2 - 10x + 22$ in the form $(x-a)^2 - b$.

$(x-a)^2 = x^2 - 2ax + a^2$

$x^2 - 2 \times 5x + 22 \qquad a = 5$

$= x^2 - 2 \times 5x + 5^2 - 5^2 + 22$

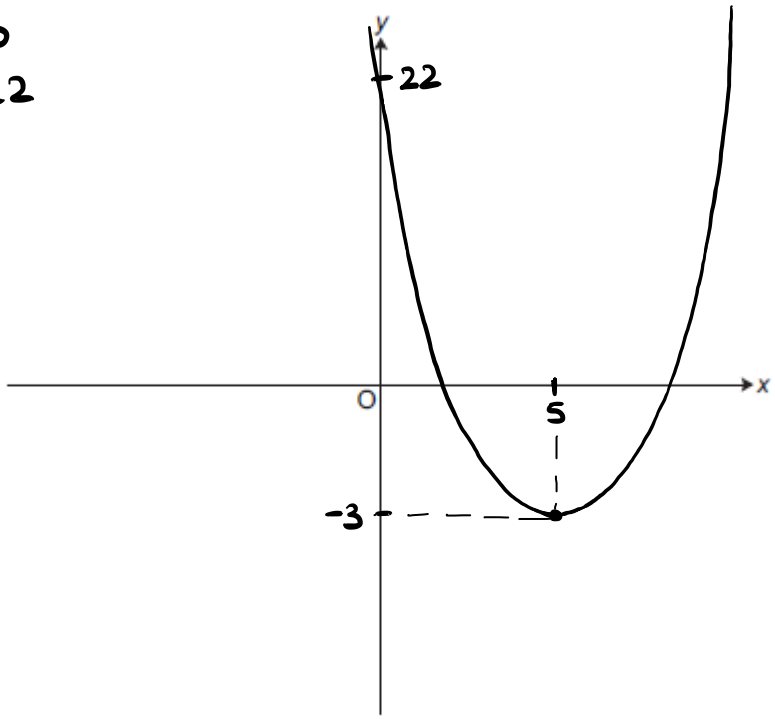
$= (x-5)^2 - 25 + 22$

$= (x-5)^2 - 3$

(a) $(x-5)^2 - 3$ **[3]**

**(b)** Sketch the graph of $y = x^2 - 10x + 22$.
Show clearly the coordinates of any turning points and the value of the $y$-intercept.

$x = 0$
$y = 22$




**[4]**

**Total Marks for Question Set 6: 50**