

Level 1 / Level 2 GCSE (9 – 1)

MATHEMATICS

Paper 3 (Calculator)

Foundation Tier

Time : 1 hour 30 minutes

Paper : 1 MA1 / 3F

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a  $\pi$  button, take the value of  $\pi$  to be 3.142 unless the question instructs otherwise.



### Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. Change 5800 grams into kilograms.

$$5800\text{g} \div 1000 = 5.8\text{kg} \quad (1)$$

.....  
(Total for Question 1 is 1 mark)

2. Work out  $\frac{1}{7}$  of 91.

$$\frac{1}{7} \times 91 = 13 \quad (1)$$

.....  
(Total for Question 2 is 1 mark)

3. Write 65% as a fraction.

$$\text{for } \frac{65}{100} \text{ or any equivalent fraction} \quad (1)$$

.....  
(Total for Question 3 is 1 mark)

4. Work out  $4.8^2$

$$\text{for } 23.04 \text{ or equivalent} \quad (1)$$

.....  
(Total for Question 4 is 1 mark)

5. Here are four numbers

−8    −3    3    8

Write one of these numbers in each box to make a correct calculation

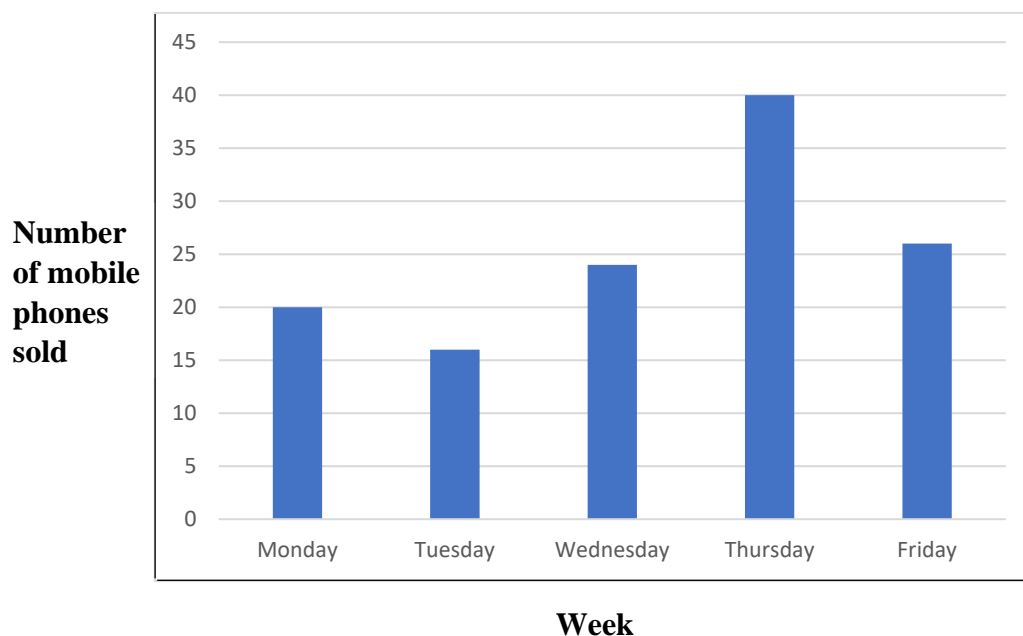
$$\square + \square = -5$$

$$\text{for } -8 \text{ and } 3 \text{ in each box} \quad (1)$$

.....  
(Total for Question 5 is 1 mark)



6. The bar chart shows information about the number of mobile phones sold in a shop on each of five days.



- a. On which day did the shop sell the greatest number of mobile phones?

Thursday (1)

.....  
(1)

- b. On which day did the shop sell 8 mobile phones more than the previous day?

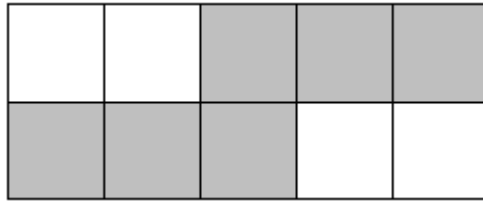
Wednesday (1)

.....  
(1)

**(Total for Question 6 is 2 marks)**



7.



a. What percentage of this shape is shaded?

$\frac{6}{10}$  squares are shaded.  
 $\frac{6}{10} \times 100\% = 60\%$

method to find percentage shaded (1)

correct answer only (1)

.....  
(2)

b. Write your answer to part (a) as a decimal.

0.6 (1)

.....  
(1)

**(Total for Question 7 is 3 marks)**

8. Barbie buys 96 macarons for her birthday party.

She buys macarons in packs of 12 macarons.  
 Each pack of 12 macarons costs £19.95.

Work out how much Barbie pays for the 96 macarons.

Number of packs needed:  $96 \div 12 = 8$

Total cost:  $8 \times £19.95 = £159.60$

Process to find the number of packs OR to find the cost of each macaron (1)

for complete process to find the total cost (1)

correct answer only (1)

.....  
(Total for Question 8 is 3 marks)



9. a. Find the value of  $(1.5 - 0.3)^2 + \sqrt{40.96}$

for either  $(1.5 - 0.3)^2 = 1.44$  or  $\sqrt{40.96} = 6.4$  (1)

for  $1.44 + 6.4 = 7.84$  (1)

.....

(2)

b. Write down the reciprocal of  $\frac{2}{5}$

for  $\frac{5}{2}$  or any equivalent fractions or 2.5 (1)

.....

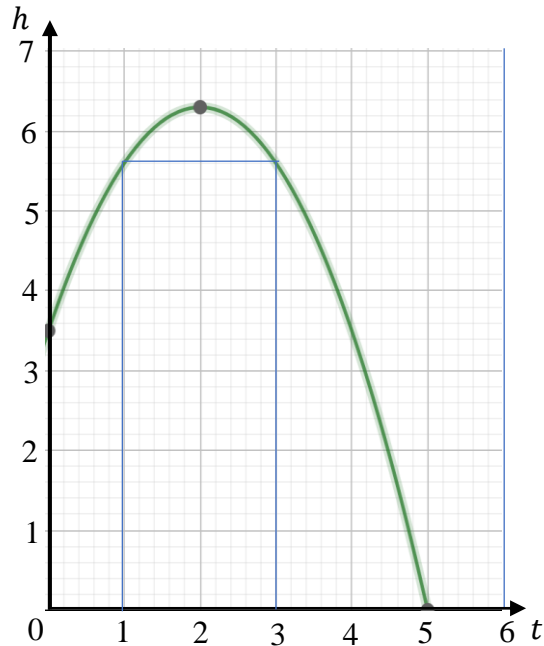
(1)

**(Total for Question 9 is 3 marks)**

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10. A ball is projected vertically upwards from the balcony of a house.  
 $t$  seconds after being projected, the height of the ball above the ground is  $h$  metres.  
 The diagram shows the graph of  $h$  against  $t$ , for  $h = 0.7(5 + 4t - t^2)$



Using the graph, find

- a. the height above the ground from which the ball was projected.

correct answer only  $h = 3.5$  (1)

.....  
(1)

- b. the maximum height of the ball

correct answer only  $h = 6.3$  (1)

.....  
(1)

- c. the total time for which the ball was at least 5.6 m above the ground.

for  $h = 5.6 \Rightarrow t = 1$  and  $3$  using blue lines on graph

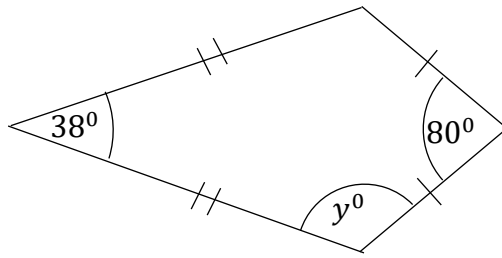
$3 - 1 = 2$  seconds (1)

.....  
(1)

(Total for Question 10 is 3 marks)



11.



The diagram shows a kite.  
Work out the value of  $y$ .

Angles in a kite add to  $360^\circ$  and they have one pair of opposite angles that are equal  
(1)

$$y = (360 - 80 - 38) \div 2 = 121 \quad (1)$$

correct answer only 121 (1)

.....  
(Total for Question 11 is 3 marks)

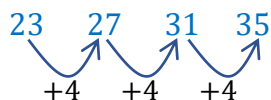
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12. Here are the first five terms of a number sequence.

23    27    31    35

a. i. Write down the next two terms of the sequence:



$$35 + 4 = 39$$

$$39 + 4 = 43$$

39, 43            (1)

.....  
(1)

A term of this sequence is 67.

ii. Which term?

$$67 - 23 = 44$$

$$44 \div 4 = 12 \text{ (1)}$$

.....  
(1)

c. Explain why 117 cannot be a term of the sequence.

for a process to find the  $n$ th term and a conclusion

$$\text{e.g. } 4n + 19 = 117 \Rightarrow n = 24.5, \text{ not a integer. (1)}$$

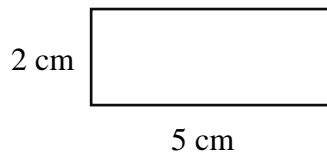
.....  
(1)

(Total for Question 12 is 3 marks)

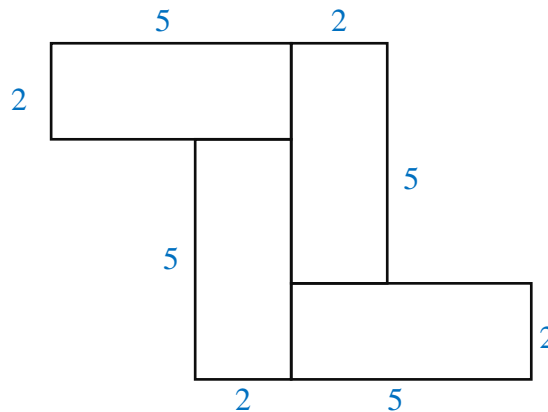




13. Here is a rectangle.



4 of these rectangles are used to make this 8-sided shape.



Work out the perimeter of this shape.

The two missing lengths are equal and are of length  $5 - 2 = 3$

Perimeter:  $(2 \times 4) + (5 \times 4) + (3 \times 2) = 34$

for a complete method to find the perimeter of the shape with the missing length as 3

(1)

correct answer only 34 (1)

.....  
**(Total for Question 13 is 2 marks)**

14. a. Simplify  $2a - 3b - a - b$

for method to collect terms e.g.  $a$  or  $-4b$  (1)

correct answer only e.g.  $a - 4b$  (1)

.....  
 (2)

b. Solve  $6p - 5 = 7$

$$\begin{array}{r}
 6p - 5 = 7 \\
 +5 \quad \swarrow \quad \searrow +5 \\
 6p = 12 \\
 \div 6 \quad \swarrow \quad \searrow \div 6 \\
 p = 2
 \end{array}$$

for adding 5 to both sides or dividing each term 6 as a first step (1)

correct answer only e.g. 2 (1)

.....  
 (2)  
**(Total for Question 14 is 4 marks)**



15. Here are the costs of the same type of toilet rolls in two supermarkets.

**A1 Supermarket**  
**toilet tissue 9 rolls**  
**for £4.95**

**B1 Supermarket**  
**toilet tissue 4 rolls**  
**for £2.25**

Sally needs to buy at least 24 toilet papers.

She must buy toilet papers in whole packs.

Sally wants to buy the toilet rolls as cheaply as possible from the same supermarket.

Which supermarket should she buy the toilet rolls from, A1 supermarket or

B1 supermarket?

You must show all your working.

Supermarket A1:

Number of packs needed:  $24 \div 9 = 2\frac{2}{3}$

She needs to buy 3 packs, which will cost  $3 \times £4.95 = £14.85$

Supermarket B1:

Number of packs needed:  $24 \div 4 = 6$

She needs to buy 6 packs, which will cost  $6 \times £2.25 = £13.50$

It will be cheaper to buy the toilet roll from supermarket B1

Start of process to find the number of toilet rolls needed from at least one

Supermarket (1)

Process to find cost of toilet rolls from at least one supermarket. (1)

Complete process to find the cost of toilet tissue rolls from both supermarkets, ensuring working shows the purchase is made in full packs (1)

for B1 supermarket (1)

.....  
**(Total for Question 15 is 4 marks)**

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16. There are 30 counters in a bag.
- a. 5 of the counters are blue.  
11 of the counters are red.  
The rest of the counters are yellow.

Frank takes at random a counter from the bag.  
Work out the probability that Frank takes a yellow counter.

Number of yellow counters:  $30 - (5 + 11) = 14$

$$P(\text{Yellow}) = \frac{14}{30}$$

for  $\frac{14}{m}$  where  $m > 14$  or  $\frac{n}{30}$  where  $n < 30$  (1)

for  $\frac{14}{30}$  or equivalent (1)

.....  
(2)

- b. The probability that Zakir scores a penalty is 0.85.  
Zakir is going to take 20 penalties in one season.  
Work out an estimate for the number of times Zakir will score.

$$20 \times 0.85 = 17$$

(1) (1)

.....  
(2)

(Total for Question 16 is 4 marks)



17.  $PQR$  is a triangle

$PR = 4.5$  cm and  $QR = 10.2$  cm

Use a ruler and compasses to construct the triangle  $PQR$  with  $PQ$  as its base.

You must show all construction lines.

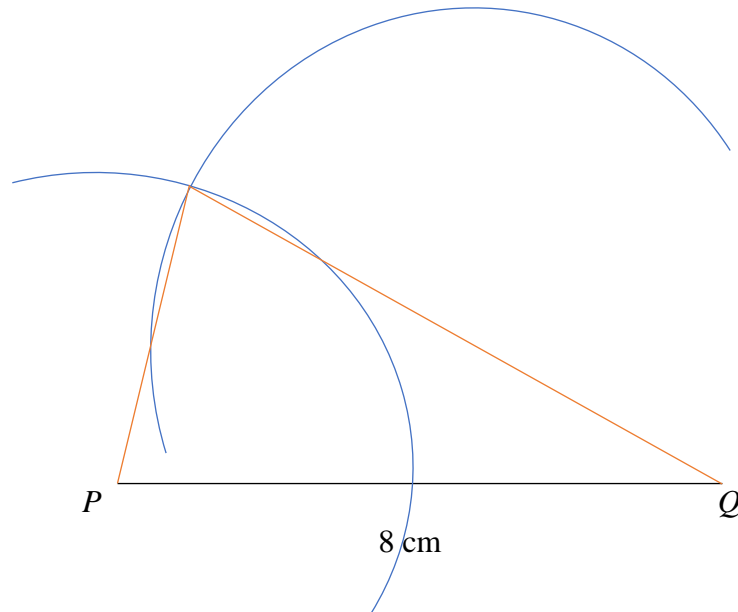


Diagram shown is not to scale.

Set compass to 4.5cm gap between point and pencil. Place the point on P and mark an arc of radius 4.5cm

Set compass to 10.2cm gap between point and pencil. Place the point on P and mark an arc of radius 10.2cm

The point at which the two arcs intersect is  $R$ . Connect the three corners of the triangle.

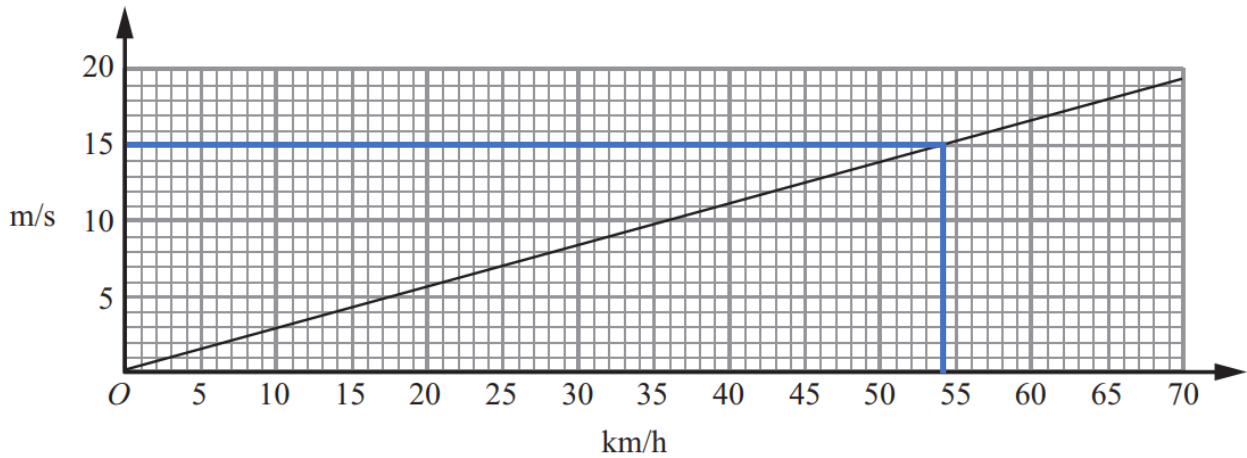
for drawing  $PR = 4.5$  cm or  $QR = 10.2$  cm (1)

for drawing  $PR = 4.5$  cm and  $QR = 10.2$  cm and correct triangle (1)

(Total for Question 17 is 2 marks)



18. The graph can be used to convert kilometres per hour (km/h) and metres per second (m/s).



a. Use your graph to convert 15 m/s to km/h.

For reading the correct reading from the graph. e.g. 54 (1)

.....km/h

(1)

Ben travels from London to Brighton at an average speed of 90 km/h.

b. Work out the average speed in m/s that Ben travelled from London to Brighton.

$$\frac{90 \times 1000}{3600} = 25$$

(1) (1)

.....m/s

(2)

(Total for Question 18 is 2 or 3 marks)



19. Here are the types of nut trees Caterina counted one day.

| Nut trees |    |
|-----------|----|
| Cashew    |    |
| Walnut    | 21 |
| Almond    |    |
| Pistachio | 16 |



21 walnut and 16 pistachio nut trees were counted.

The ratio of number of almond nut trees to the number of walnut nut trees is 5 : 7

a. Work out the number of almond nut trees.

$$21 \div 7 = 3 \quad (1)$$

$$3 \times 5 = 15 \quad (1)$$

.....

(2)

The number of cashew trees was 75% of the number of pistachio trees.

b. Work out the number of cashew trees.

$$\frac{75}{100} \times 16 = 12$$

(1)      (1)

.....

(2)

**(Total for Question 19 is 4 marks)**



- 20.** Three tins  $P$ ,  $Q$  and  $R$  each have buttons.  
Tin  $P$  contains  $x$  buttons.  
Tin  $Q$  contains 72 buttons.  
Tin  $R$  contains 7 fewer buttons than tin  $P$ .

The mean number of buttons in the three tins is 39.  
Work out the number of buttons in tin  $R$ .

Tin  $R$  contains  $x - 7$  buttons.

The mean is given by:

$$\frac{x + 72 + x - 7}{3} = 39 \quad (1)$$

$$2x = 52 \Rightarrow x = 26 \quad (1)$$

Tin  $R$  contains  $26 - 7 = 19$  buttons (1)

for a setting up an equation in terms of  $x$  (1)

for attempting to find a value of  $x$  (1)

correct answer only (1)

.....  
**(Total for Question 20 is 3 marks)**

- 21.** Andy tests a coin by spinning it 10 times and gets 7 tails.  
a. Explain why he thinks the coin might be biased.

Experimental probability is  $\frac{7}{10}$  which is higher than the theoretical probability of  $\frac{1}{2}$  (1)  
(1)

He spins the same coin 200 times and gets 104 tails.

- b. Explain why he now thinks the coin is fair.

The experimental probability is  $\frac{104}{200}$ , which is close to the theoretical probability of  $\frac{1}{2}$  (1)  
(1)

- c. Which is his most accurate estimate of the experimental probability of getting a tail?  
Explain.

His second estimate is more accurate as more trials give a more accurate result. (1)  
(1)

**(Total for Question 21 is 3 marks)**







23. a. Simplify  $2p \times 3q$

correct answer only  $6pq$  (1)

.....  
(1)

b. Simplify  $\frac{2a^2b}{8ab^3}$

for partial simplification e.g.  $\frac{1}{4}$  or  $a$  or  $\frac{1}{b^2}$  or  $b^{-2}$  (1)

for  $\frac{a}{4b^2}$  or  $\frac{ab^{-2}}{4}$  (1)

.....  
(2)

c. Solve  $2y + 7 < 2$

for  $2y < -5$  or  $2y = -5$  or critical value  $-\frac{5}{2}$  (1)

$y < -\frac{5}{2}$  or  $y < -2\frac{1}{2}$  or  $y < -2.5$  (1)

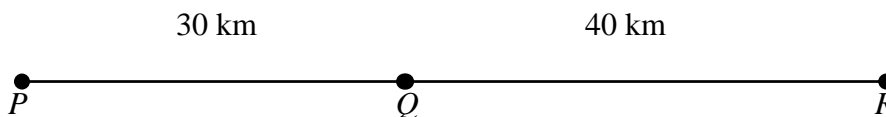
.....  
(2)

**(Total for Question 23 is 5 marks)**

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24.



$P$ ,  $Q$  and  $R$  are 3 service stations on a motorway.

$$PQ = 30 \text{ km}$$

$$QR = 40 \text{ km}$$

Ben drives along the motorway from  $P$  to  $R$ .

Ben drives at an average speed of 72 km/h from  $P$  to  $Q$ .

Ben drives at an average speed of 75 km/h from  $Q$  to  $R$ .

Work out the difference in the time ben takes to drive from  $P$  to  $Q$  and the time Ben takes to drive from  $Q$  to  $R$ .

$$\text{Time between } PQ: 30 \div 72 = \frac{5}{12} \text{ hour} = 25 \text{ min}$$

$$\text{Time between } QR: 40 \div 75 = \frac{8}{15} \text{ hour} = 32 \text{ min} \quad (1)$$

Difference of the times:

$$32 - 25 = 7 \text{ mins} \quad (1)$$

$$\text{correct answer only } 7 \text{ mins} \quad (1)$$

..... mins

**(Total for Question 24 is 3 marks)**

25. A number,  $y$ , is 11 when rounded to 2 significant figures.

Write down the error interval.

$$\text{for } 10.5 \text{ or } 11.5 \quad (1)$$

$$\text{for } 10.5 \leq y < 11.5 \quad (1)$$

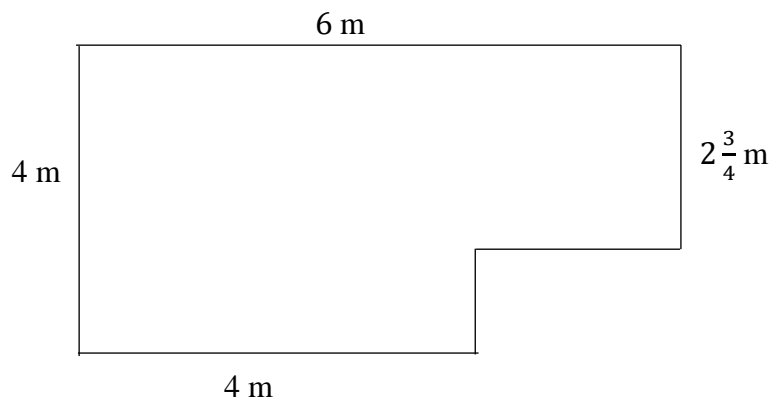
.....

(2)

**(Total for Question 25 is 2 marks)**



26. This is a plan of Rose's bedroom.



She wants to tile the floor.

The tiles are 50 cm by 50 cm.

There are 30 tiles in each box.

How many boxes will she need to cover her floor?

Area of bedroom:  $4 \times 4 + 2 \times 2\frac{3}{4} = 21.5m^2$  (1)

Number of tiles needed:

$$21.5m^2 \div (0.5m \times 0.5m) = 86 \text{ tiles} \quad (1)$$

Number of boxes needed:  $86 \div 30 = 2.866$  (1)

She will need 3 boxes (1)

.....  
(Total for Question 26 is 4 marks)



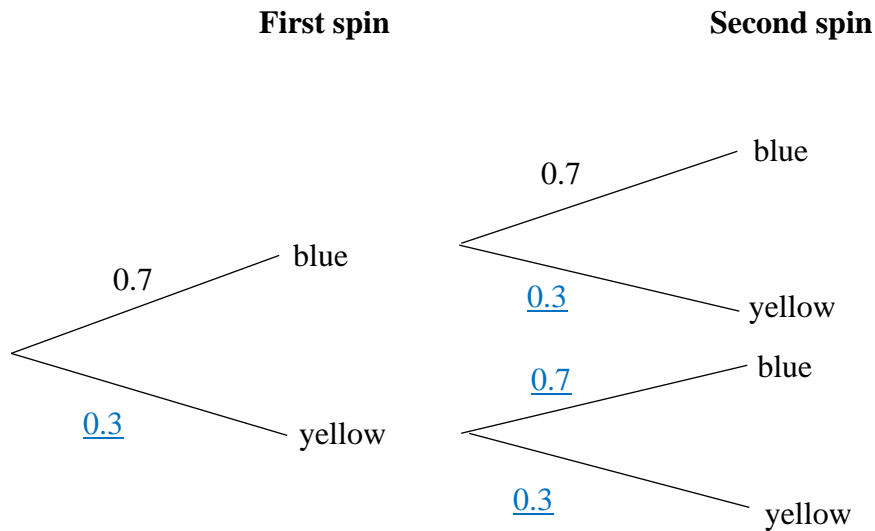
27. Jerry makes a spinner.

The spinner can land on blue or on yellow.

The probability that the spinner will land on blue is 0.7

Jerry spins the spinner twice.

a. Complete the probability tree diagram.



(2)

at least 2 correct probabilities (1)

four fully correct probabilities (1)

b. Work out the probability that the spinner lands on one of each colour.

The spinner can land on Blue, Yellow or Yellow, Blue (1)

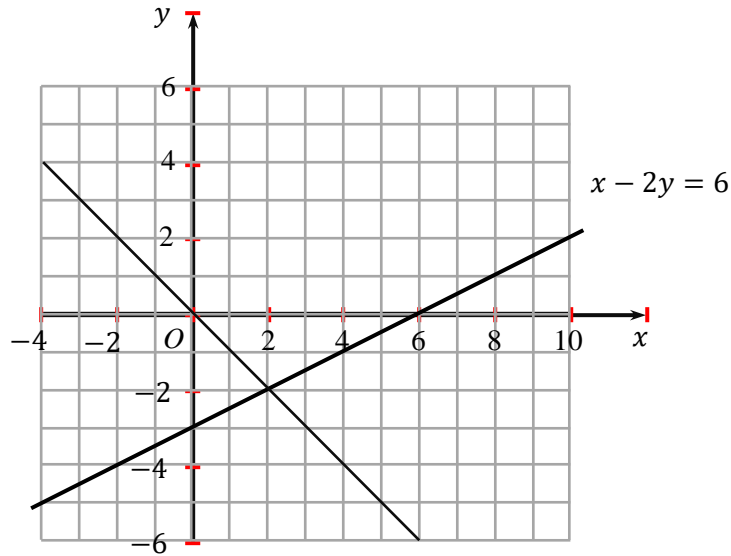
$$\begin{aligned}
 &= P(B, Y) + P(Y, B) \\
 &= (0.7 \times 0.3) + (0.3 \times 0.7) \\
 &= 0.42 \text{ (1)}
 \end{aligned}$$

.....  
(2)

(Total for Question 27 is 4 marks)



28.



The graph of the straight line  $x - 2y = 6$  is shown on the grid.

a. On the grid draw  $y = -x$

for plotting correct points

e.g.  $(-4,4), (-3,3), (-2,2), (-1,1), (0,0), (1,-1), (2,-2), (3,-3), (4,-4)$  (1)

for joining the points to draw the line  $y = -x$  (1)

(2)

b. Use your graphs to solve the simultaneous equations

$$x - 2y = 6$$

$$y = -x$$

The graphs intersect at  $(2, -2)$ , so  $x = 2, y = -2$  (1)

$x = \dots\dots\dots$

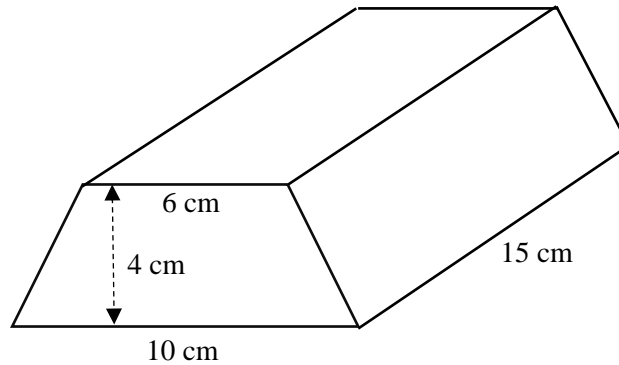
$y = \dots\dots\dots$

(1)

**(Total for Question 28 is 3 marks)**



29.



The diagram shows a solid prism made from wood.  
 The cross-section of the prism is a trapezium.  
 The parallel sides of the trapezium are 6 cm and 10 cm.  
 The height of the trapezium is 4 cm.  
 The length of the prism is 15 cm.

The density of the wood is  $0.8 \text{ g/cm}^3$   
 Calculate the mass of the prism.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Volume: } \left( \frac{6+10}{2} \times 4 \right) \times 15 = 480 \quad (1)$$

$$\text{Mass: } \left( \frac{6+10}{2} \times 4 \right) \times 15 \times 0.8 = 384 \quad (1)$$

$$\text{correct answer only } 384 \quad (1)$$

..... g

**(Total for Question 29 is 3 marks)**

**TOTAL FOR PAPER IS 80 MARKS**

