

## Thursday 6 June 2019 – Morning

### GCSE (9–1) Mathematics

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

Time allowed: 1 hour 30 minutes



**You may use:**

- geometrical instruments
- tracing paper

**Do not use:**

- a calculator



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

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Candidate number

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First name(s)

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Last name

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### INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Answer **all** the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

### INFORMATION

- The total mark for this paper is **100**.
- The marks for each question are shown in brackets [ ].
- This document consists of **20** pages.



No calculator can be used for this paper

Answer **all** the questions.

1 Work out  $(2 \times 10^3) \times (4 \times 10^4)$ , giving your answer in standard form.



..... [2]

2 (a) Simplify fully.

$$\frac{3a^8 \times 2a^5}{a^2}$$



(a) ..... [3]

(b) Solve.

$$\frac{6x - 10}{5} = 1$$

(b)  $x =$  ..... [3]



3 Ed has a card shop.

(a) He buys a particular card for £1.20 and sells it for £1.68.

Calculate his percentage profit on this card.

(a) ..... % [3]

(b) Ed's profit on "Good Luck" cards in 2018 was £360.  
This was a decrease of 20% on his profit in 2017.

Work out Ed's profit on "Good Luck" cards in 2017.

(b) £ ..... [3]

4 (a) A sunflower grows at a rate of 4 cm each day.

How many days does it take to grow from a height of 80 cm to more than 1.06 m?



(a) ..... [3]

(b) If the sunflower grows at a faster rate, how would this affect your answer to part (a)?

..... [1]

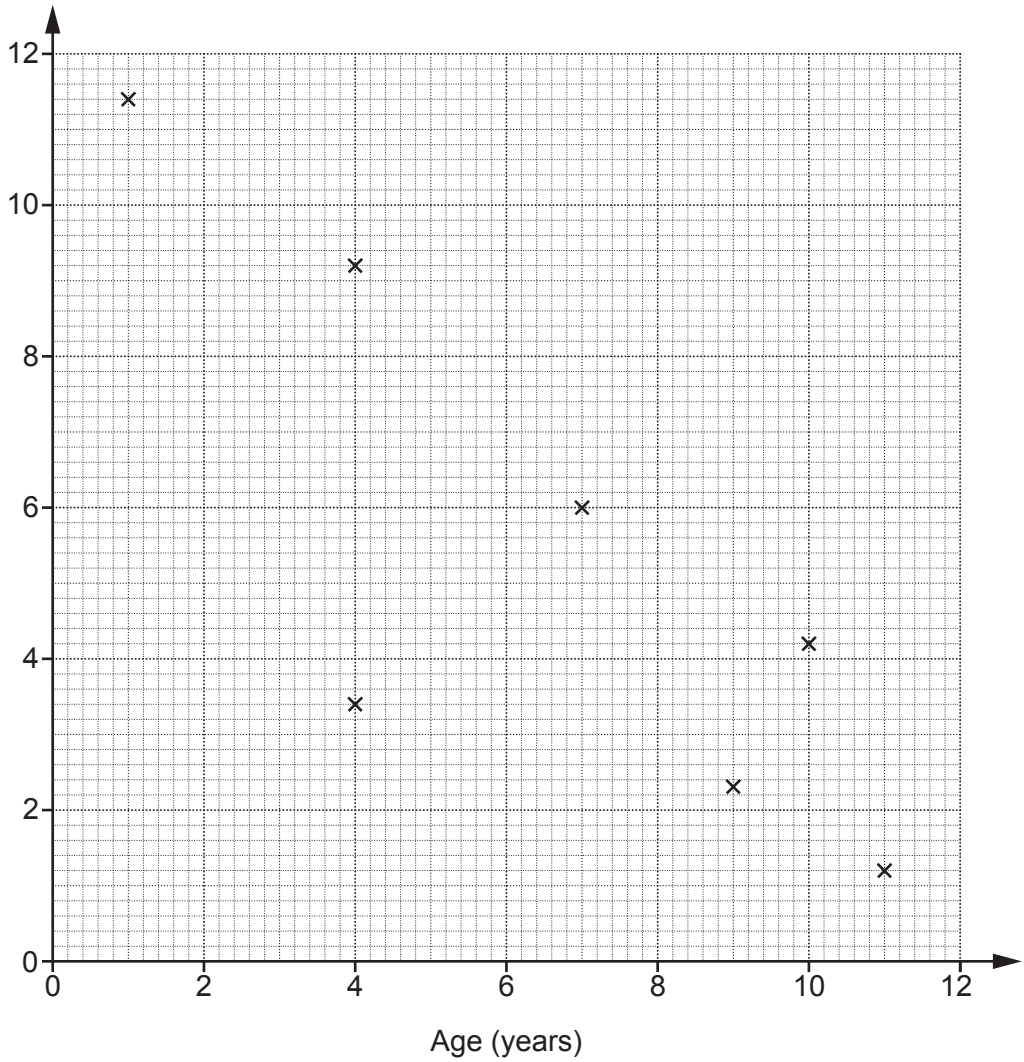
5 The table shows the ages and values of 11 cars of the same model.

Age (years)	4	7	11	1	9	10	4	3	7	8	12
Value (thousands of pounds)	9.2	6.0	1.2	11.4	2.3	4.2	3.4	8.0	5.6	5.0	0.4

The points for the first 7 cars are plotted on the scatter diagram.



Value  
(thousands of  
pounds)



(a) Plot the points for the remaining 4 cars. [2]

(b) Describe the type and strength of the correlation shown in the completed scatter diagram.

..... [2]

(c) One car lost its value more quickly than the other cars.

On the scatter diagram, draw a circle around the point representing this car. [1]

(d) By drawing a line of best fit, estimate the value of a car that is 6 years old.

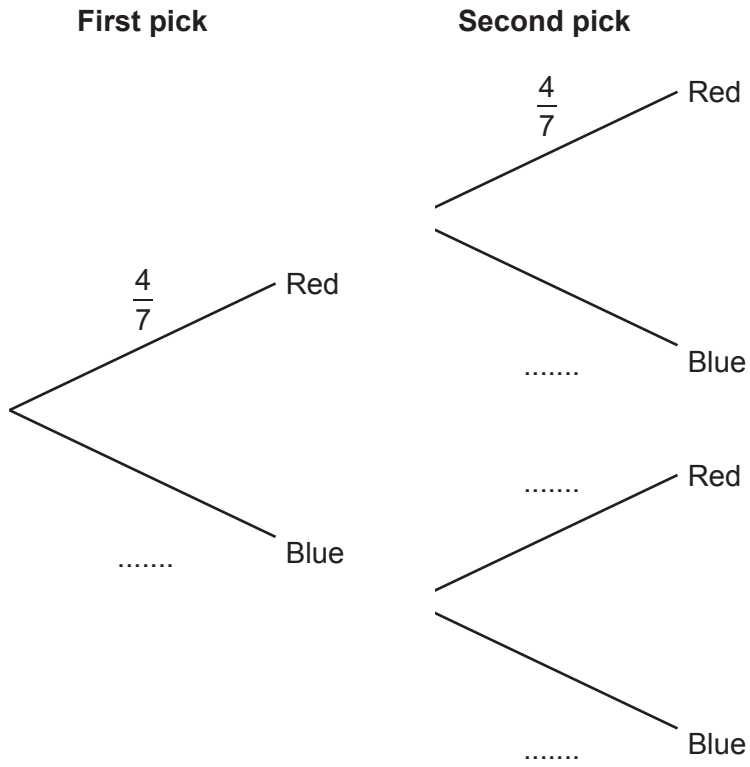
(d) £ ..... [2]

(e) Explain the limitations of using the equation of the line of best fit to estimate the value of a car that is 16 years old.

.....  
..... [1]

- 6 A bag contains 4 red counters and 3 blue counters only. Jack picks a counter at random and then replaces it. Jack then picks a second counter at random.

(a) Complete the tree diagram.



[2]

- (b) Work out the probability that Jack picks two red counters.

(b) ..... [2]

7 Adam buys some theatre tickets in a sale.

The normal prices are:

£80 for each adult

£40 for each child.

In the sale, the prices are reduced by 15%.

Adam buys 2 adult tickets and 1 child ticket at the sale price.

A 2% booking fee is then added to the total cost of the tickets.

Calculate the total amount that Adam must pay.



£ ..... [6]

8 Mrs Mills buys 4 packs of treats for her cats, Fluff and Tigger.

She gives Fluff  $\frac{1}{6}$  of a pack each day.

She gives Tigger  $\frac{1}{5}$  of a pack each day.

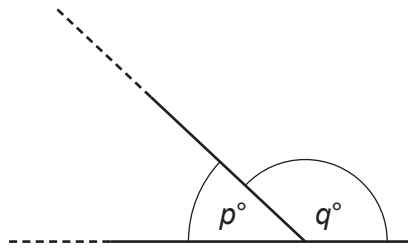
For how many complete days will the 4 packs of treats last?



..... [5]



- 9 An interior angle of an isosceles triangle is  $p^\circ$  and an exterior angle is  $q^\circ$ .



Not to scale



It is given that  $q = 5p$ .

- (a) Write the ratio  $p : q$  in its simplest form.

(a) ..... : ..... [2]

- (b) Work out the two different possible sets of angles for the isosceles triangle.

(b) Triangle 1: ..... $^\circ$ , ..... $^\circ$ , ..... $^\circ$

Triangle 2: ..... $^\circ$ , ..... $^\circ$ , ..... $^\circ$

[4]

10 (a) Write  $\frac{1}{6}$  as a recurring decimal.



(a) ..... [2]

(b) Elsa divides a two-digit number by another two-digit number. She gets the answer 0.15.

She says that there is only one possible pair of numbers that will give this answer. Is she correct? Show how you decide.

..... [4]

11 (a) Simplify fully.

$$\sqrt{200}$$



(a) ..... [2]

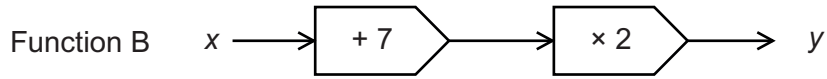
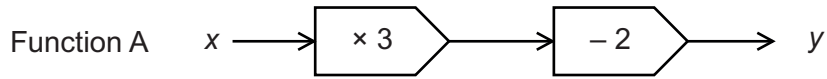
(b) Evaluate.

$$8^{\frac{1}{3}}$$

(b) ..... [1]



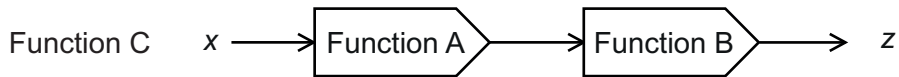
12 Here are two functions.



(a) Find an algebraic expression for the output of the **inverse** of function A when the input is  $x$ .

(a) ..... [2]

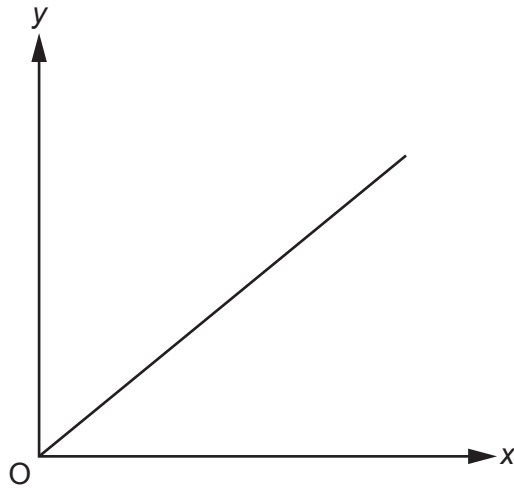
(b) Here is a composite function C.



Find the value  $x$  when  $z = 4x$ .

(b)  $x =$  ..... [5]

- 13 Shirley is asked to sketch a graph of  $y = 5^x$  for  $x \geq 0$ . She produces the following.



The graph has two errors.

How should they be corrected?

1 .....

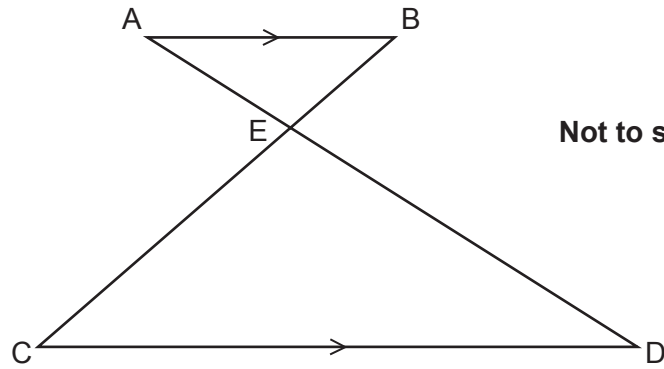
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2 .....

..... [2]



- 14 In the diagram AB is parallel to CD.  
AED and BEC are straight lines.



Not to scale

Prove that triangle ABE is similar to triangle CDE.

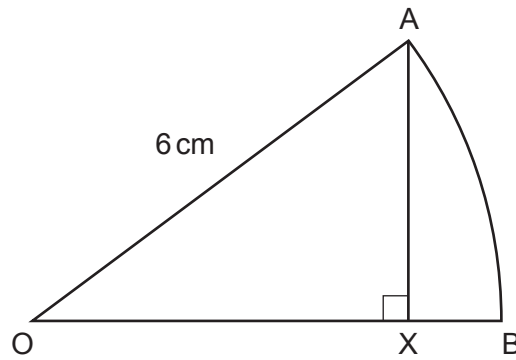
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.....

.....

..... [3]

- 15 OAB is a sector of a circle, centre O.  
OA = 6 cm and AX is perpendicular to OB.



Not to scale

The area of sector OAB is  $6\pi \text{ cm}^2$ .

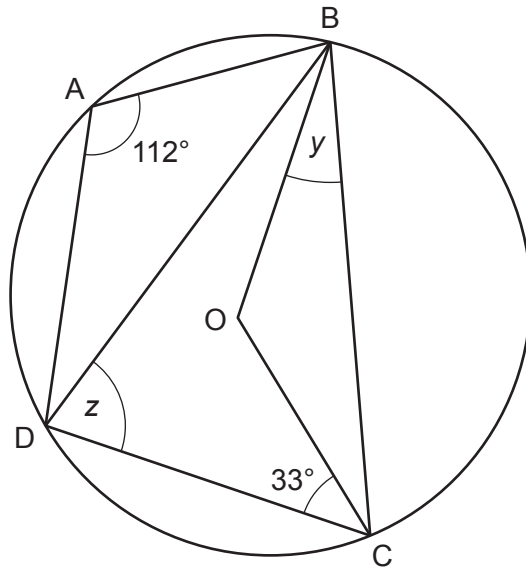
Show that  $AX = 3\sqrt{3} \text{ cm}$ .

[6]



16 A, B, C and D are points on the circumference of a circle, centre O.

Angle BAD =  $112^\circ$  and angle DCO =  $33^\circ$ .



Not to scale

(a) Show that angle  $y = 35^\circ$ .  
Give reasons for each stage of your working.

[4]

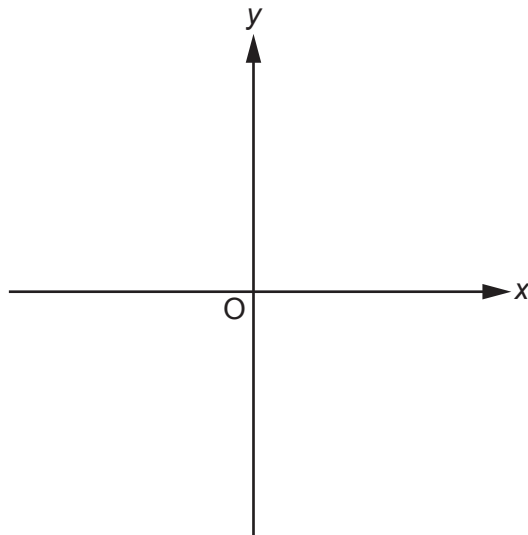
(b) Work out angle  $z$ .  
Give reasons for your answer.

Angle  $z = \dots\dots\dots^\circ$  because  $\dots\dots\dots$   
 $\dots\dots\dots$   
 $\dots\dots\dots$  [3]

17 (a) Write  $x^2 + 8x + 3$  in the form  $(x + a)^2 - b$ .

(a) ..... [3]

(b) Sketch the graph of  $y = x^2 + 8x + 3$ .  
Show clearly the coordinates of any turning points and the y-intercept.



[4]





18 21 people travelled to a meeting.

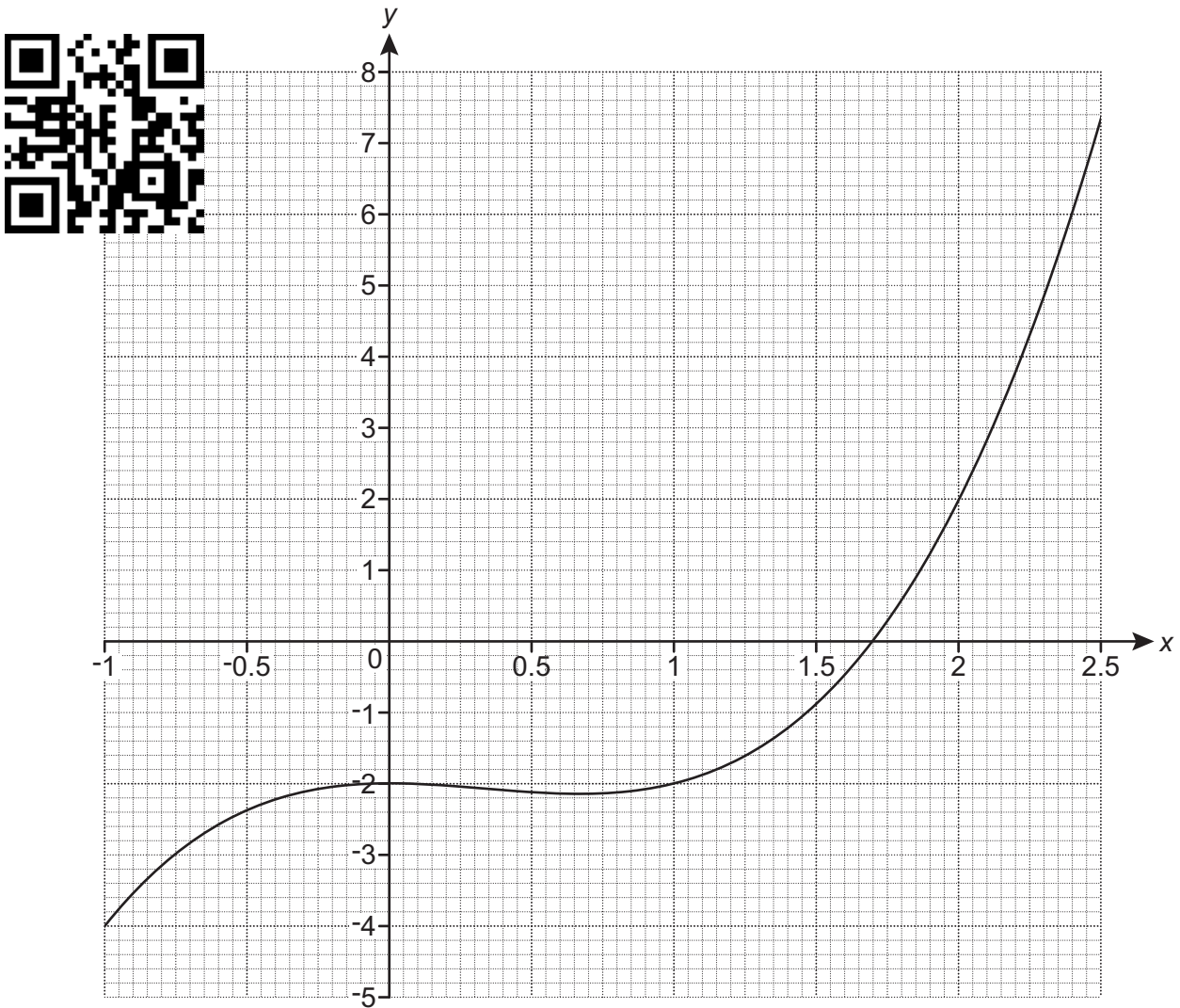
- 12 used a train.
- 6 used a car.
- 7 did not use a train or a car.
- Some used a train and a car.

Two people are chosen at random from those who used a train.

Find the probability that both these people also used a car.

..... [6]

19 The graph of  $y = x^3 - x^2 - 2$  is drawn on the grid.



- (a) Use the graph to solve  $x^3 - x^2 - 2 = 0$ .  
Give your answer correct to 1 decimal place.

$x = \dots\dots\dots$  [1]

(b) The equation  $x^3 - x^2 + 5x - 6 = 0$  can be solved by finding the intersection of the graph of  $y = x^3 - x^2 - 2$  and the line  $y = ax + b$ .

(i) Find the value of  $a$  and the value of  $b$ .

(b)(i)  $a = \dots\dots\dots$

$b = \dots\dots\dots$  [2]

(ii) Hence, **use the graph** to solve the equation  $x^3 - x^2 + 5x - 6 = 0$ .  
Give your answer correct to 1 decimal place.

(ii)  $x = \dots\dots\dots$  [3]

**END OF QUESTION PAPER**

**ADDITIONAL ANSWER SPACE**

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large rectangular area with a solid vertical line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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