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H

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.**

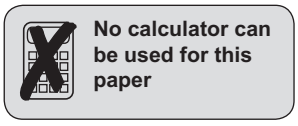
Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

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.



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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]**

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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]**

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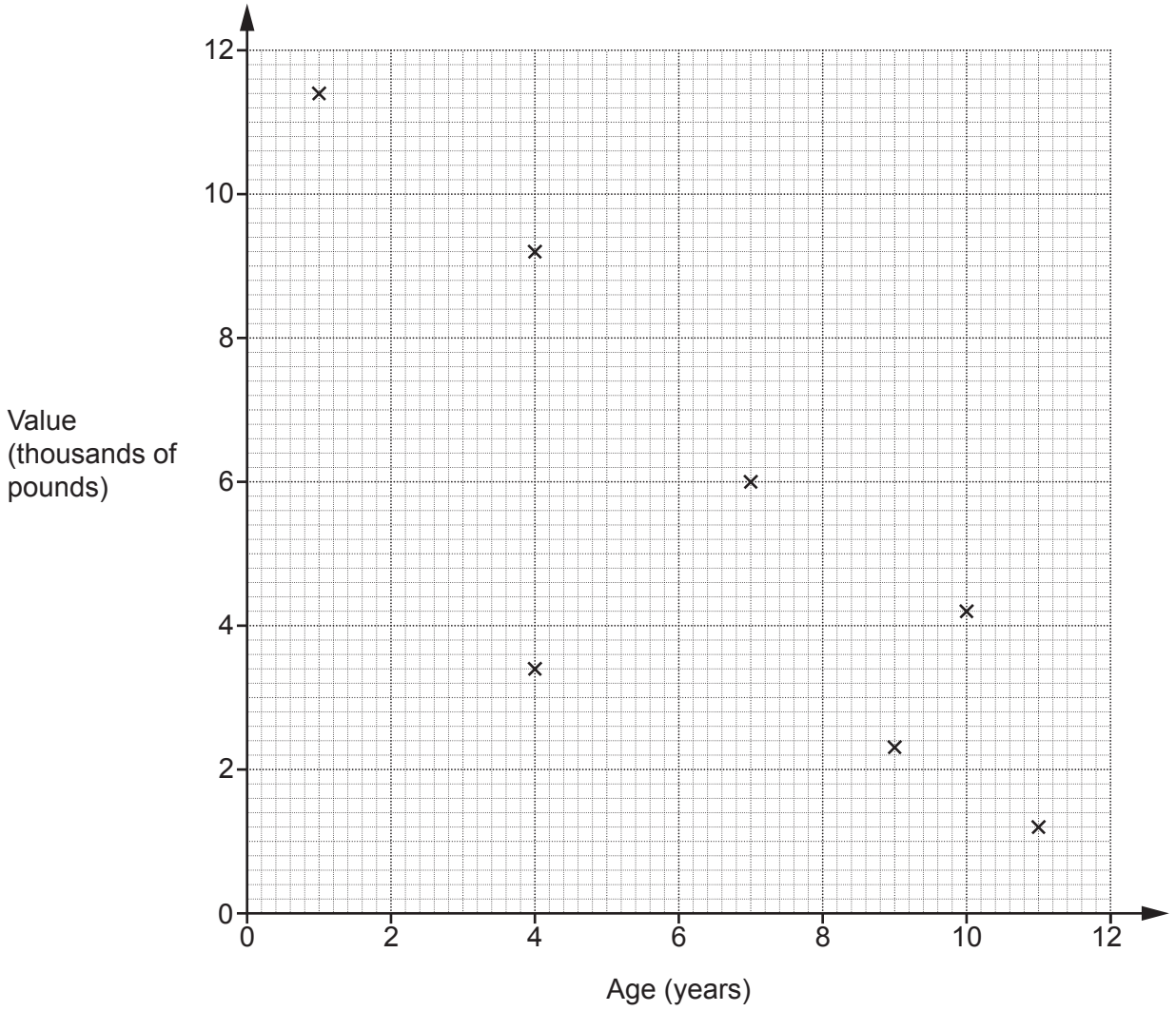
5 The table shows the ages and values of 11 cars of the same model.

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.



(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]**

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(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]**

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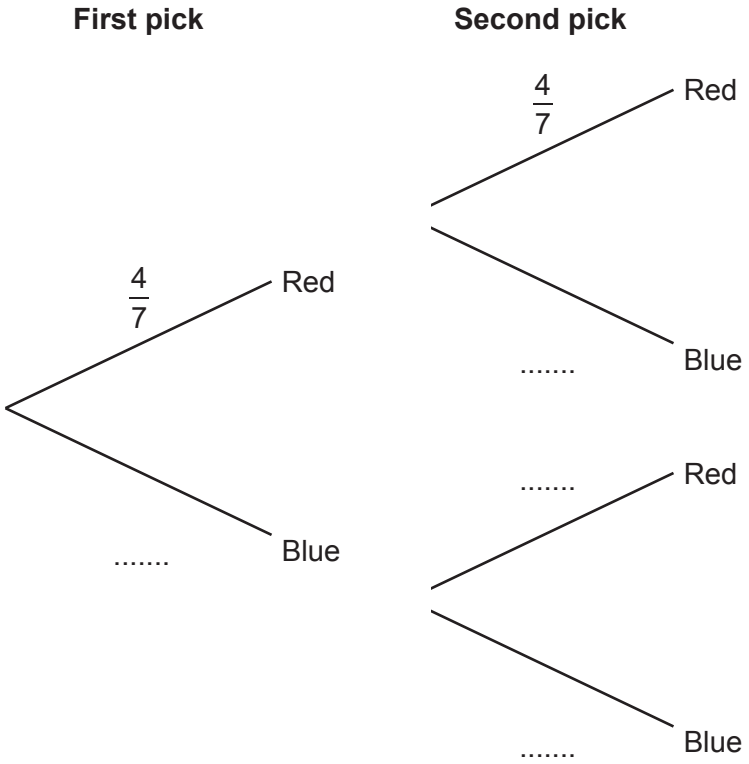
6 A bag contains 4 red counters and 3 blue counters only.
Jack picks a counter at random and then replaces it.
Jack then picks a second counter at random.

(a) Complete the tree diagram.



[2]

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

(b) ..... **[2]**

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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]**

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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]**

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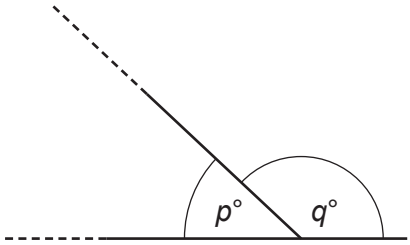
9 An interior angle of an isosceles triangle is $p°$ and an exterior angle is $q°$.



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: .....°, ...°, ...°

Triangle 2: .....°, ...°, ...°

[4]

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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 $0.1\dot{5}$.

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]**

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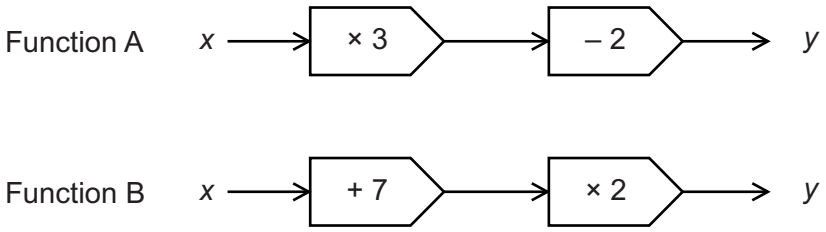
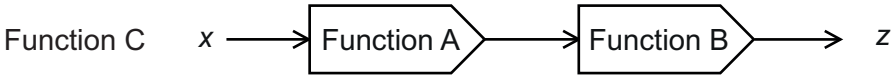
12 Here are two functions.



(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]**

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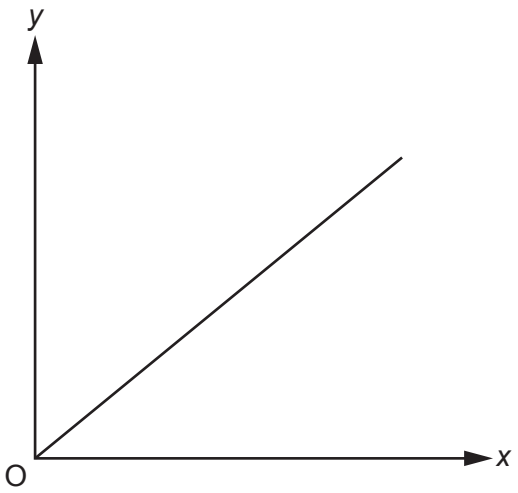
13 Shirley is asked to sketch a graph of $y = 5^x$ for $x \geqslant 0$.
She produces the following.



The graph has two errors.

How should they be corrected?

1 .....

.....

2 .....

..... **[2]**

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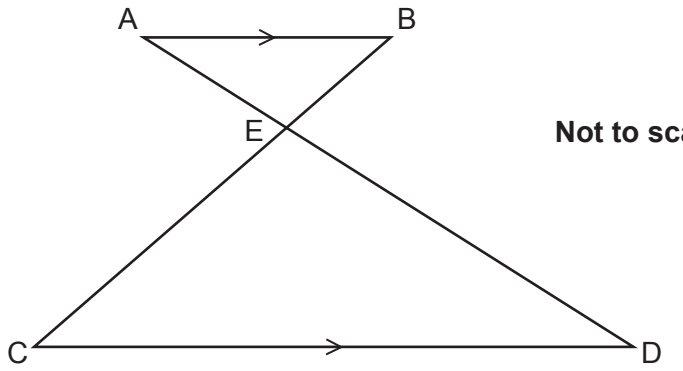
14 In the diagram AB is parallel to CD.
AED and BEC are straight lines.



Not to scale

Prove that triangle ABE is similar to triangle CDE.

.....

.....

.....

..... **[3]**

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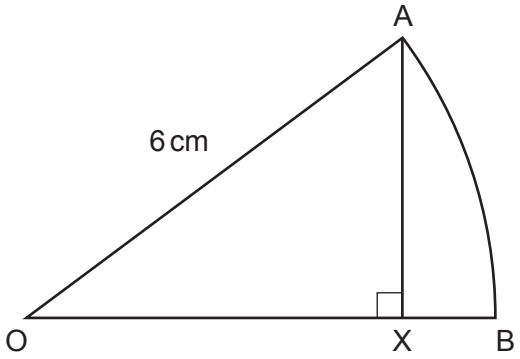
15 OAB is a sector of a circle, centre O.
OA = 6 cm and AX is perpendicular to OB.



Not to scale

The area of sector OAB is 6π cm^2.

Show that $AX = 3\sqrt{3}$ cm. **[6]**

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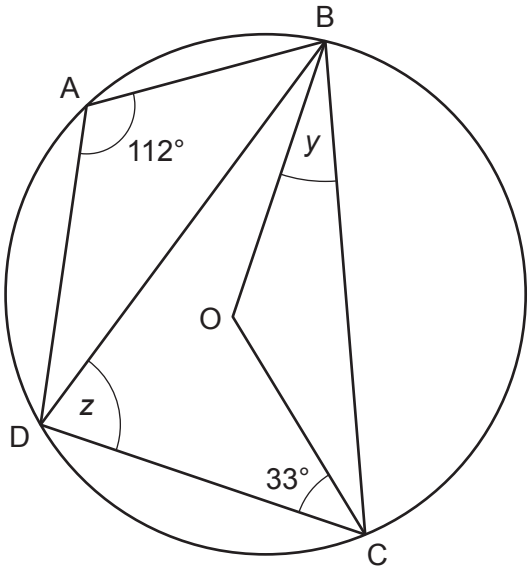
16 A, B, C and D are points on the circumference of a circle, centre O.

Angle BAD = 112° and angle DCO = 33°.



Not to scale

(a) Show that angle $y = 35°$.
Give reasons for each stage of your working. **[4]**

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

Angle z = ... ° because .....

.....

..... **[3]**

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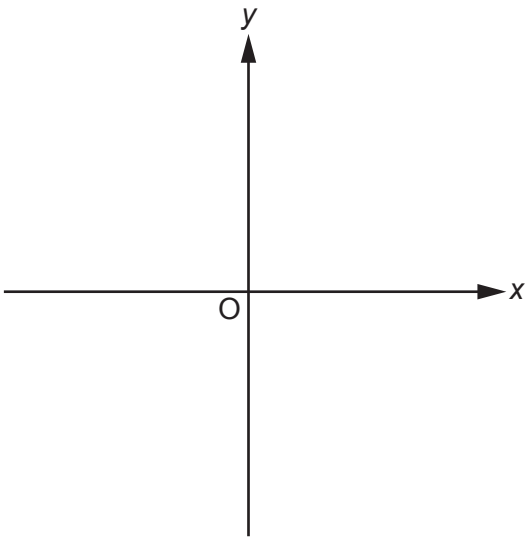
17 **(a)** Write $x^2 + 8x + 3$ in the form $(x + a)^2 - b$.

(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]

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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]**

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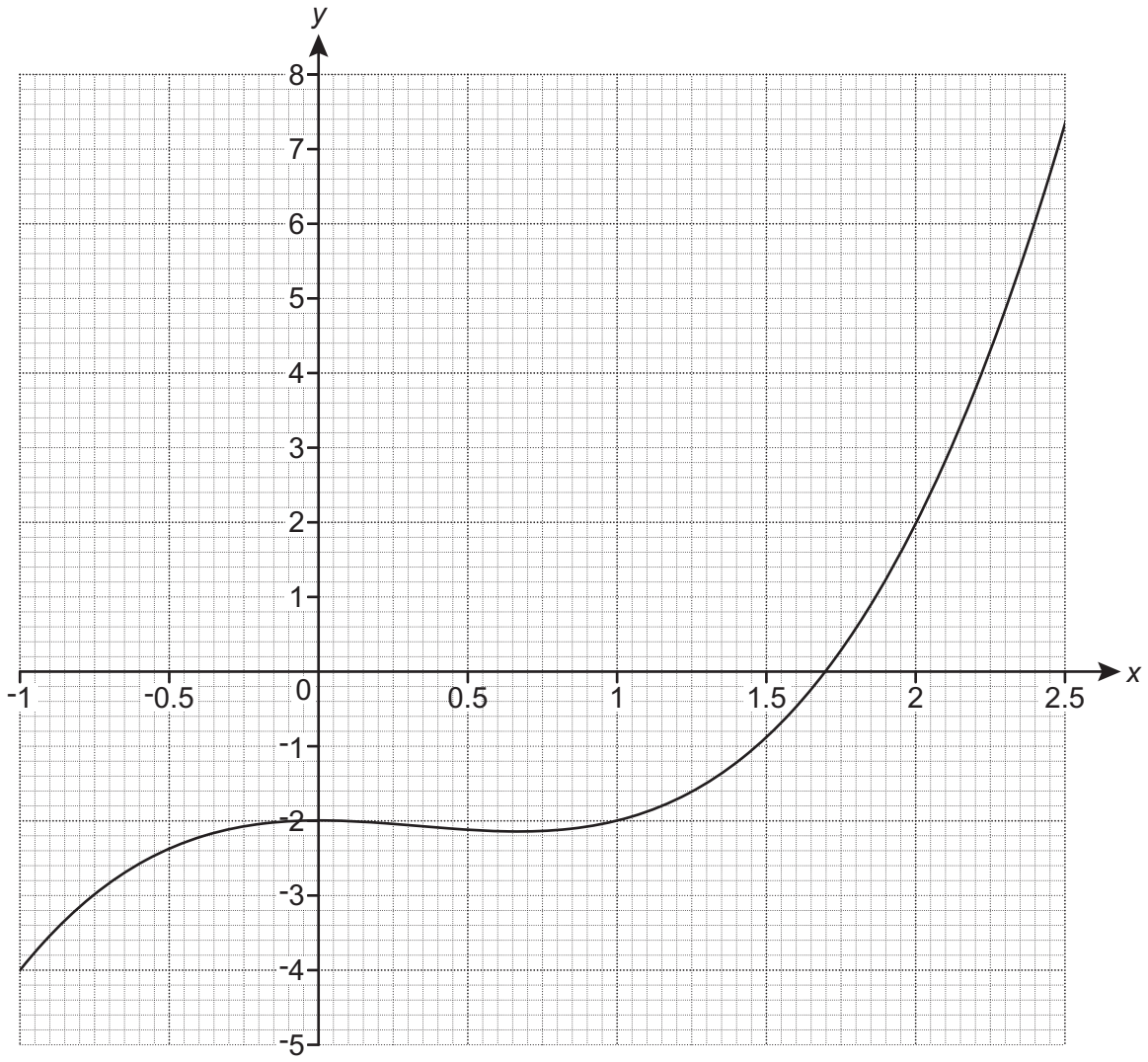
19 The graph of $y = x^3 - x^2 - 2$ is drawn on the grid.



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

$x =$ ..... **[1]**

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(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) $a =$ .....

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

END OF QUESTION PAPER

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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).

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