

GCSE (9-1) Mathematics
J560/05 Paper 5 (Higher Tier)

Question Set 2

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

$$8 \times 10^{3+4} = \boxed{8 \times 10^7}$$

..... 8×10^7 [2]

2. 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.

$$\frac{1.68 - 1.20}{1.68} \times 100 = \frac{0.48}{1.68} \times 100 = \frac{2}{7} \times 100$$

$$= 28.571\dots$$

(a) 28.57 % [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.

$$\begin{array}{l} 2017 : £ x \\ 2018 : £ 360 \end{array} \quad \downarrow 20\%$$

$$360 = (1 - 0.2)x = 0.8x$$

$$x = \frac{360}{0.8} = \boxed{450}$$

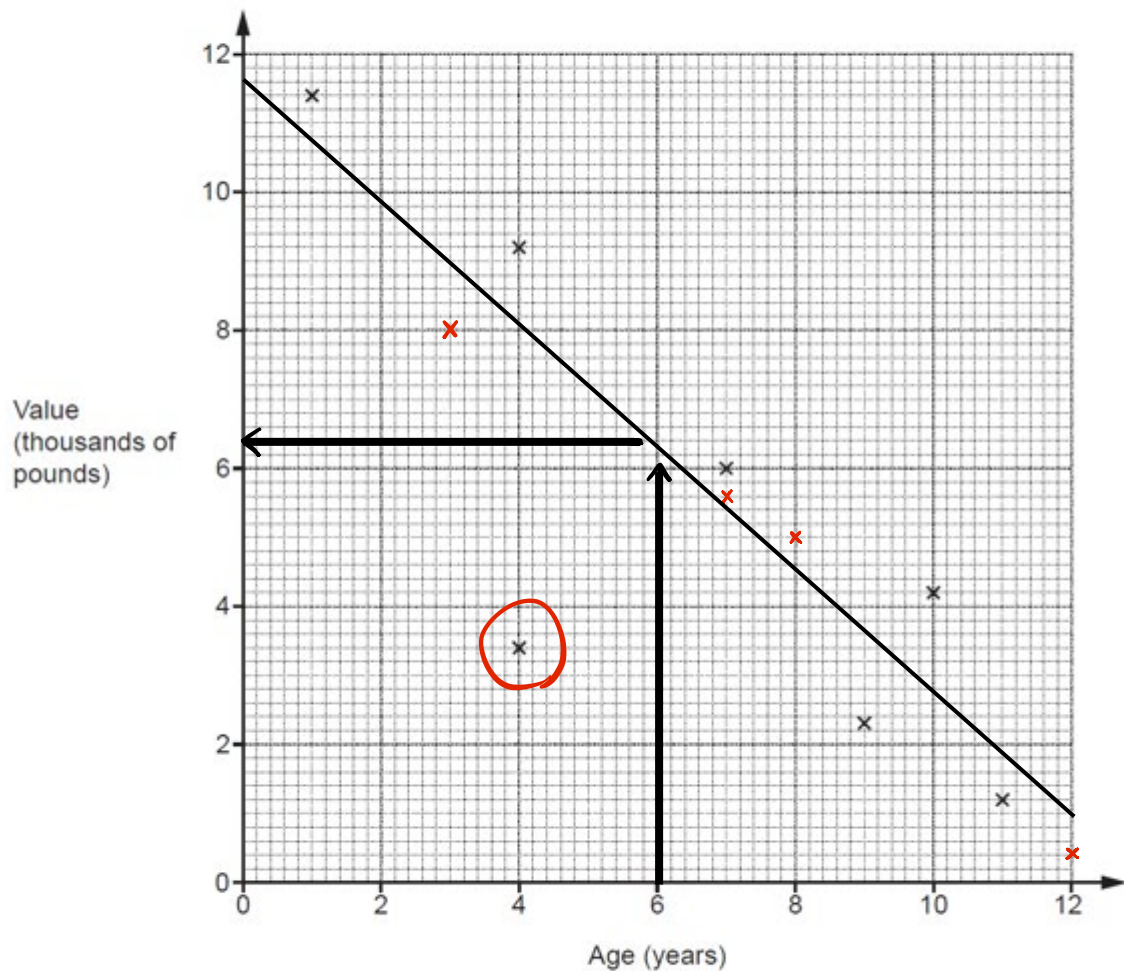
(b) £ 450 [3]

3.

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.

..... *Strong negative correlation* [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) £ 6400 [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.

The data which the line of best fit was based from only included cars from 0 to 12 years old thus we cannot assume the same trend can be applied for cars beyond 12 years old. Using this line of best fit to estimate the value of 16 years old car could be inaccurate. [1]

4.

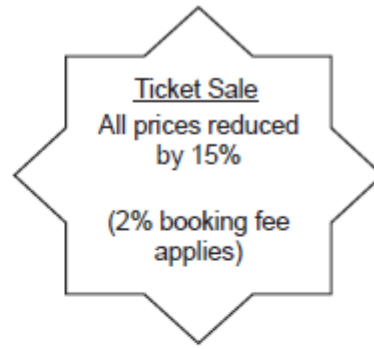
Adam buys some theatre tickets in a sale.

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.

$$(80 \times 2 + 40) \times \frac{100-15}{100}$$

$$= 200 \times \frac{85}{100}$$

$$= 170$$

$$170 \times \frac{100+2}{100} = 173.4$$

£ 173.40 [6]

5. (a) Simplify fully.

$$\sqrt{200} = \sqrt{2 \times 10^2} = \boxed{10\sqrt{2}}$$

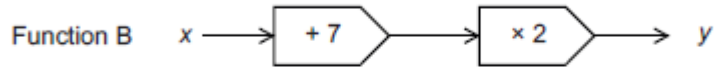
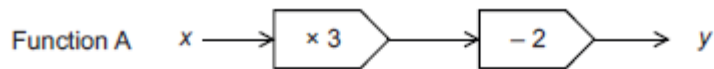
(a) $10\sqrt{2}$ [2]

(b) Evaluate.

$$8^{\frac{1}{3}} = \sqrt[3]{8} = \sqrt[3]{2^3} = \boxed{2}$$

(b) 2 [1]

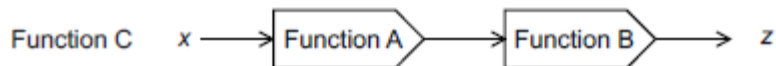
6. Here are two functions.



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

(a) $3(x-2)$ [2]

(b) Here is a composite function C.



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

$$3x - 2 = \text{Function A}$$

$$\{(3x - 2) + 7\} \times 2 = \text{Function B}$$

$$\{(3x - 2) + 7\} \times 2 = z = 4x$$

$$(3x + 5) \times 2 = 4x$$

$$6x + 10 = 4x$$

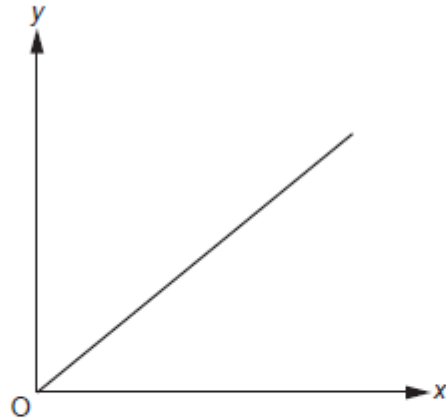
$$6x - 4x = -10$$

$$\frac{2x}{2} = \frac{-10}{2}$$

$$x = -5$$

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

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



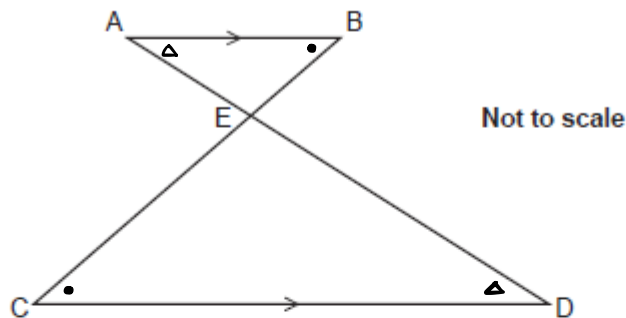
The graph has two errors.

How should they be corrected?

- 1 The graph must be increasing exponentially as a curve going upwards
- 2 The graph must start at $y=1$ when $x=0$ not at origin

[2]

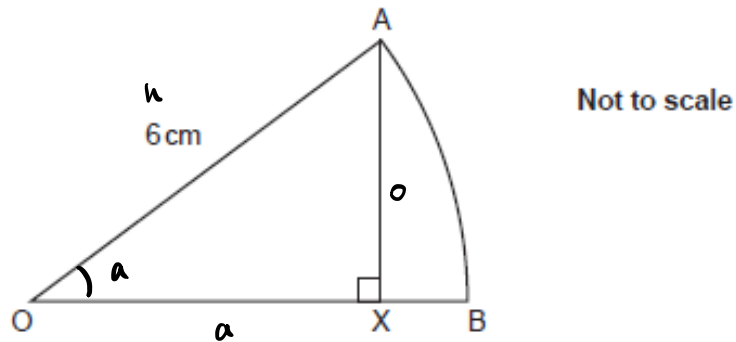
8. In the diagram AB is parallel to CD . AED and BEC are straight lines.



Prove that triangle ABE is similar to triangle CDE .

According to Z rule, $\angle ABC = \angle BCD$ and $\angle BAD = \angle ADC$. The last remaining angles $\angle AEB$ and $\angle CED$ are equal to each other because they both are calculated by subtracting same two angles ($\bullet + \blacktriangle$) from 180° . [3]

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



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

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

[6]

$$\pi r^2 \times \frac{a}{360} = 6\pi \quad r=6$$

$$\sin a = \frac{o}{h}$$

$$36\pi \times \frac{a}{360} = 6\pi$$

$$\sin 60 = \frac{o}{6} \quad (\times 6)$$

$$\frac{a}{10} = 6 \quad (\times 10)$$

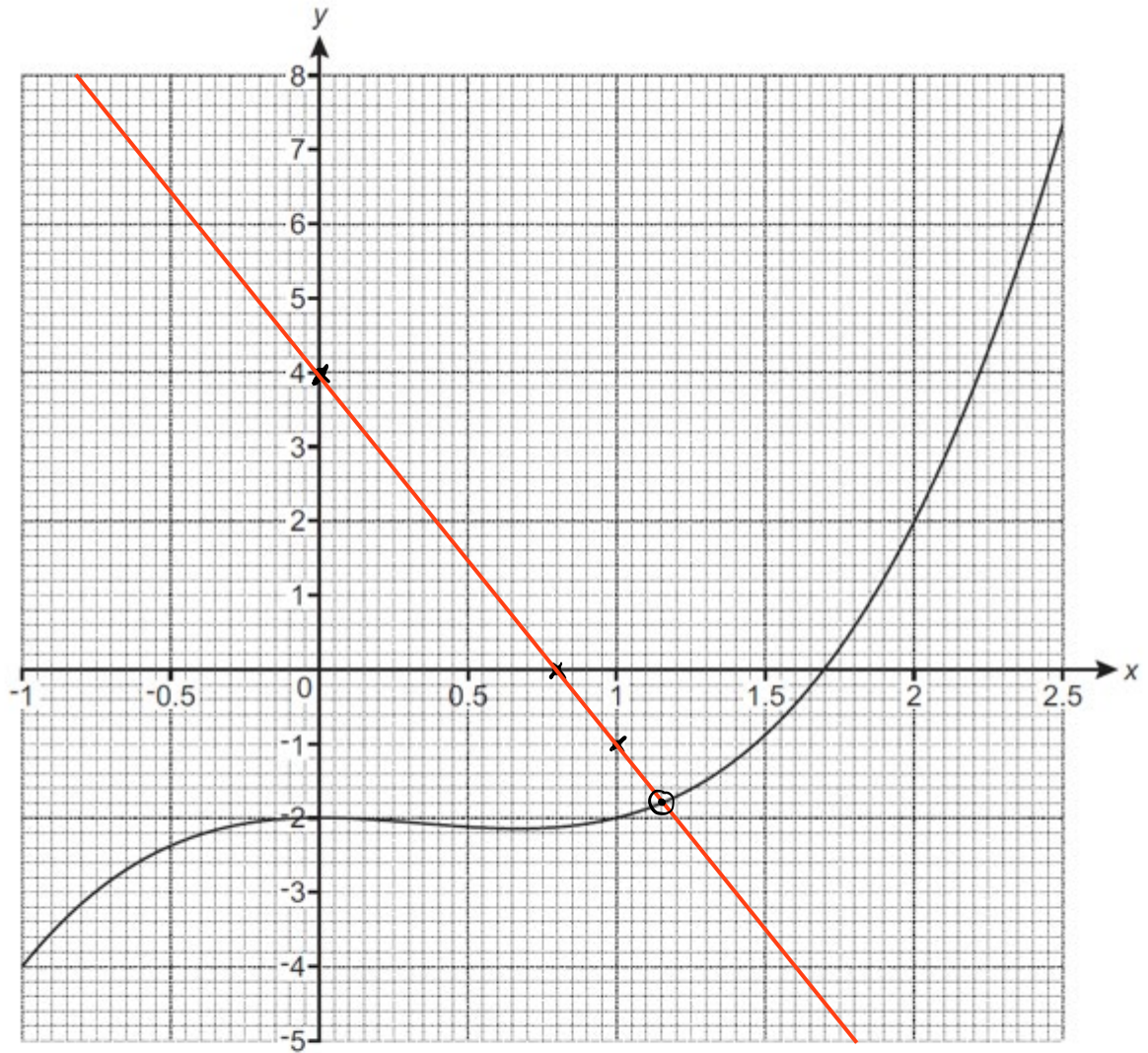
$$6 \times \sin 60 = o$$

$$3\sqrt{3} = o = \overline{AX}$$

$$\underline{\underline{a = 60^\circ}}$$

$$\therefore \overline{AX} = 3\sqrt{3} \text{ cm}$$

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.

$x = \dots\dots\dots 1.7 \dots\dots\dots$ [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 .

$$\begin{aligned}
 x^3 - x^2 - 2 &= ax + b \\
 \cancel{x^3} - \cancel{x^2} - 2 - ax - b &= 0 = \cancel{x^3} - \cancel{x^2} + 5x - 6 \\
 \underbrace{-2 - b}_{5x} &= -6 \\
 -2 - b &= -6 \\
 6 - 2 = b & \quad \boxed{b = 4} \\
 -ax = 5x & \quad \boxed{a = -5}
 \end{aligned}$$

(b)(i) $a = \frac{-5}{1}$
 $b = 4$ [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.

$$\begin{aligned}
 y &= -5x + 4 & \text{intersection point: } x &= 1.15 \\
 y = 0 \quad -5x + 4 &= 0 & & \\
 5x &= 4 \quad x &= \frac{4}{5} & \\
 x = 1 \quad y &= -5 + 4 = -1 & & \\
 \text{(ii) } x &= 1.2 & & \text{ [3]}
 \end{aligned}$$

Total Marks for Question Set 2: 49

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