OCR
Oxford Cambridge and RSA

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Thursday 4 November 2021 – Morning

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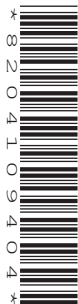
J560/05 Paper 5 (Higher Tier)

Time allowed: 1 hour 30 minutes

You can 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 can use an HB pencil, but only for graphs and diagrams.
• Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
• Answer **all** the questions.
• Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
• The total mark for this paper is **100**.
• The marks for each question are shown in brackets **[ ]**.
• This document has **20** pages.

ADVICE
• Read each question carefully before you start your answer.

Turn over

Answer **all** the questions.

1 Work out.

$$3\frac{4}{7} \times \frac{7}{10}$$

Give your answer as a mixed number in its simplest form.

.... **[3]**

2 **(a)** Azmi is given this question.

> Write 40 as a product of prime factors.
> Give your answer in index form.

Azmi's answer is $2 \times 2 \times 2 \times 5$.

Is Azmi correct?
Explain your answer.

....

.... **[1]**

(b) Find the value of *x*.

$$\frac{1}{16} = 2^x$$

(b) $x =$ .... **[1]**

3 A car mechanic has a tin containing 5 litres of engine oil.
Each week they use 450 millilitres of this oil for their vehicles.

The car mechanic says

After 9 weeks I will have used over 80% of the oil in this tin.
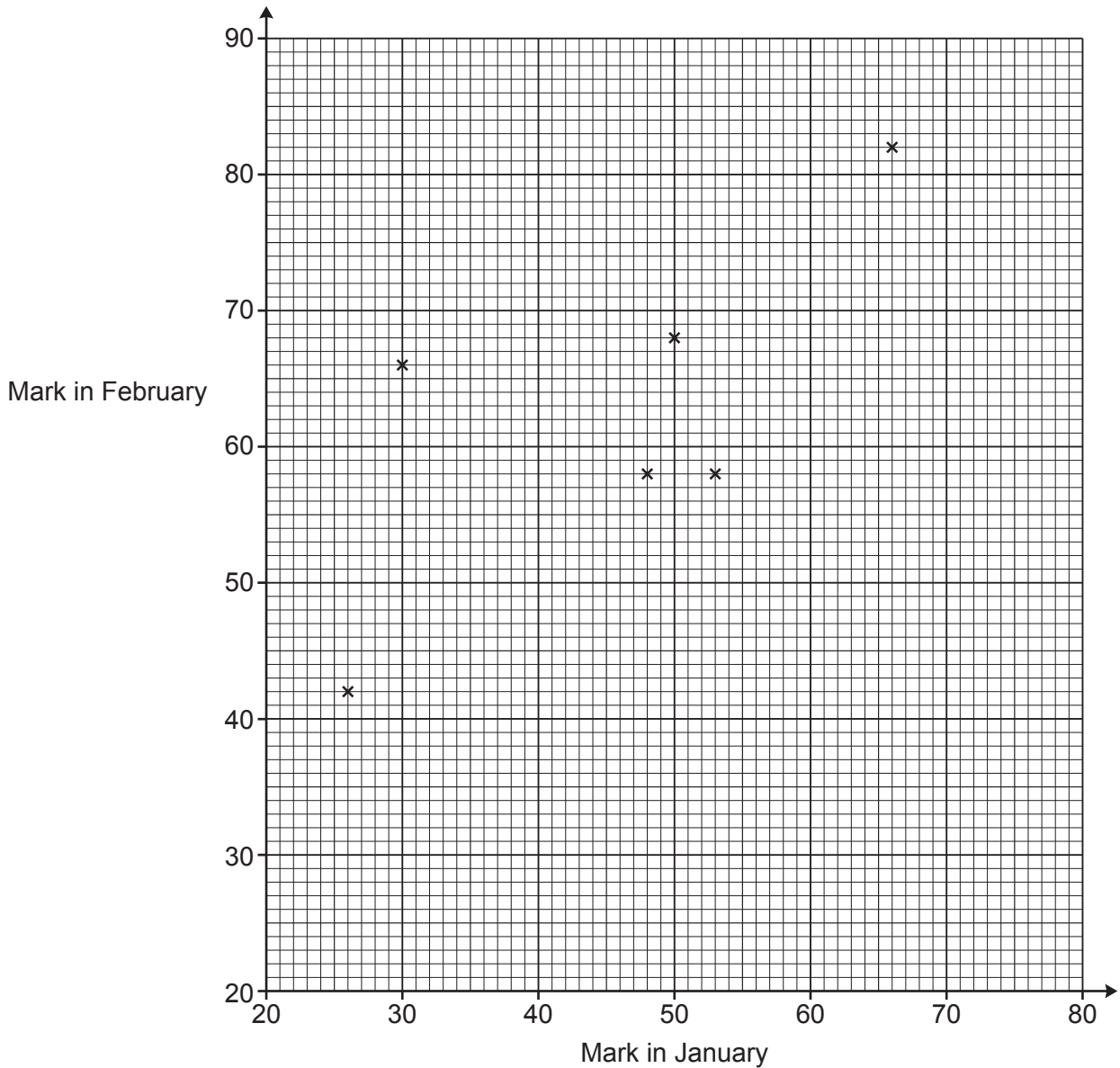
Are they correct?
Show how you decide.

....

.... **[5]**

4 The table shows the marks obtained by 10 students in spelling tests in January and February.

Mark in January	26	53	50	48	30	66	70	44	37	38
Mark in February	42	58	68	58	66	82	86	60	48	50

The marks for the first six students are plotted on the scatter diagram.

(a) Plot the marks for the remaining four students. **[2]**

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

.... **[1]**

(c) (i) On the scatter diagram, **circle** the student that made the greatest improvement in their marks from January to February. **[1]**

(ii) Work out the percentage change in this student's marks from January to February.

(c)(ii) .... % **[3]**

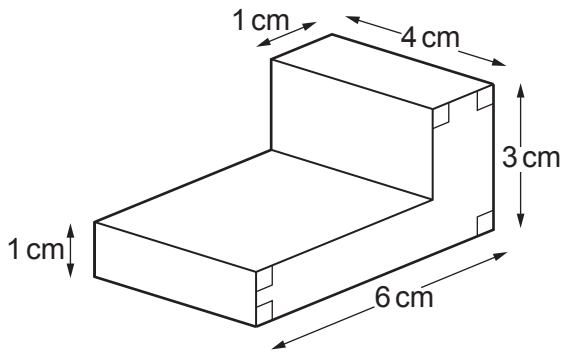**(d)** Another student, Kai, scored 79 marks in the test in January but was absent for the test in February.

Kai says

I could use a line of best fit on the scatter diagram to estimate the marks I may have achieved in the test in February.

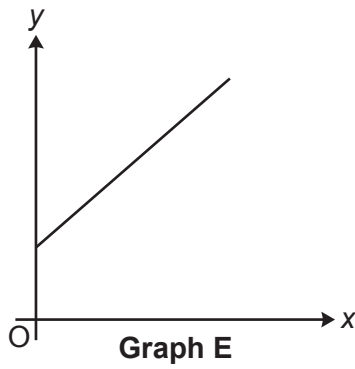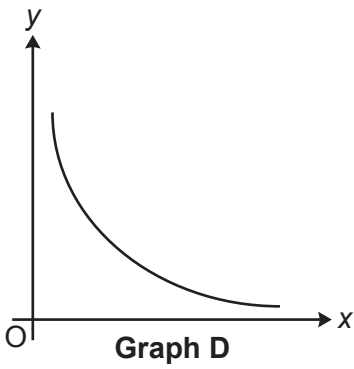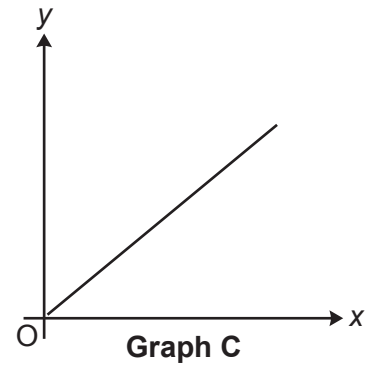Is Kai's method reliable?
Give a reason for your answer.

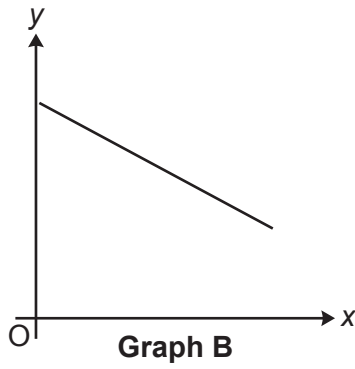..

.... **[1]**

Turn over

5 Work out the volume of this prism.

Not to scale

.... cm^3 **[4]**

6 Here are sketches of five graphs.

Graph A

Graph B

Graph C
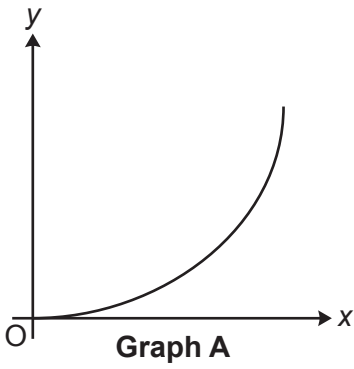
Graph D

Graph E

Write the letter of the graph that represents the following relationships.

(a) y is directly proportional to x.

(a) .... **[1]**

(b) y is inversely proportional to x.

(b) .... **[1]**

Turn over

7 **(a)** Solve the inequality.

$$4(x-3) < x$$

(a) .... **[3]**

(b) Show your answer to **part (a)** on the number line.

```
←——┬—┬—┬—┬—┬—┬—┬—┬—┬—┬—┬—┬—┬——→ x
    -6  -5  -4  -3  -2  -1  0   1   2   3   4   5   6
```
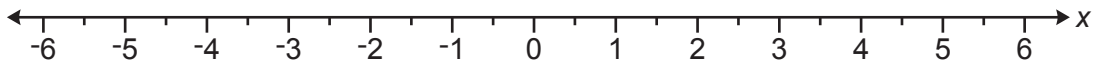
[2]

8 **(a)** Complete the table for $y = \dfrac{6}{x}$.

x	-6	-3	-2	-1	1	2	3	6
y	-1	-2		-6	6	3	2	1

[1]

(b) Draw the graph of $y = \dfrac{6}{x}$ for $^-6 \leqslant x \leqslant 6$, $x \neq 0$.

[3]

Turn over
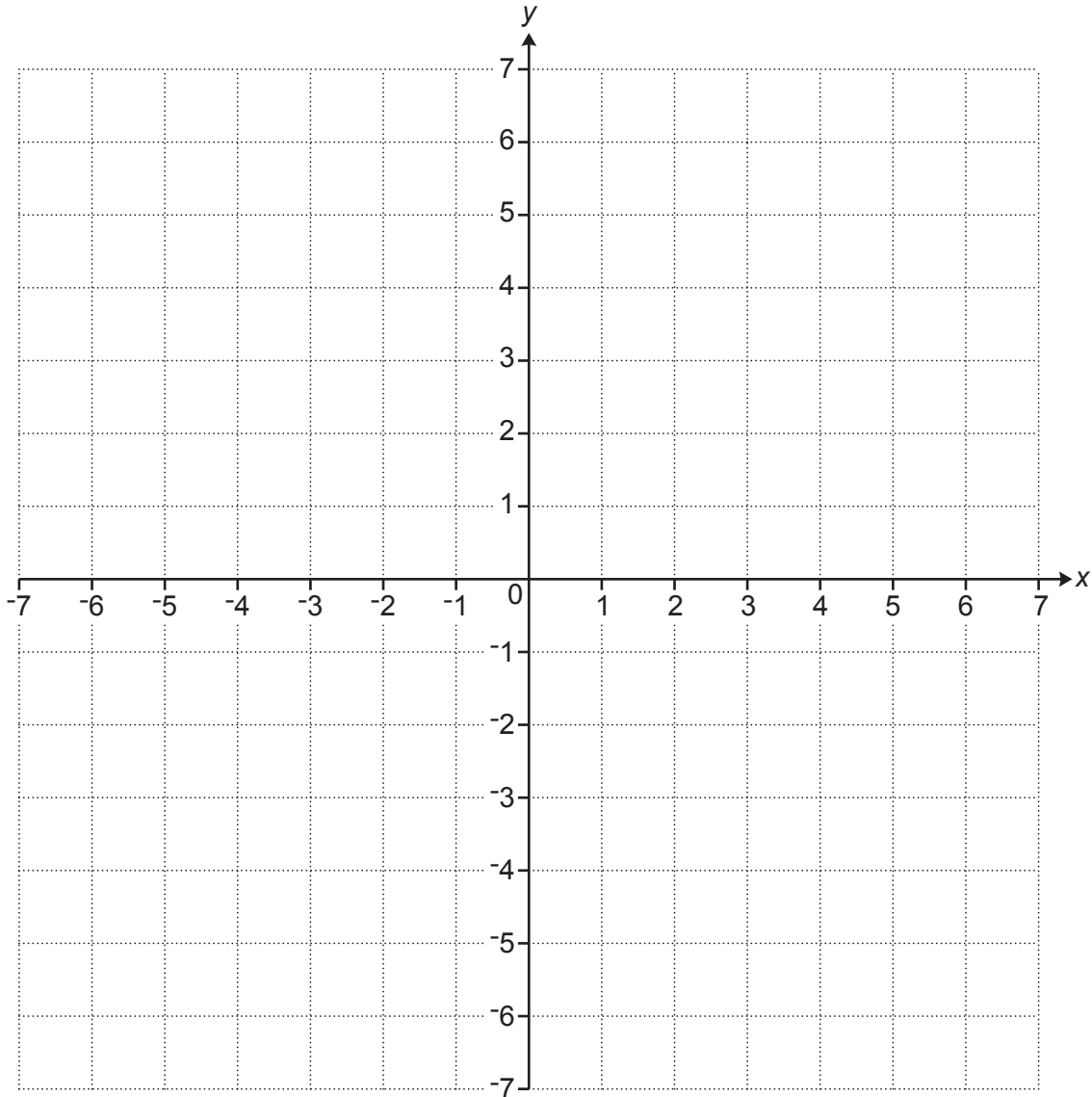
9 A worker received a 10% pay increase in 2017 and a further 10% pay increase in 2018.
The worker says

Over these two years, my pay increased by 10% + 10% = 20%.

The worker is incorrect.

Work out the correct percentage increase.
You must show your working.

.... **[5]**

10 Force is measured in newtons (N).
A force of 198.5 N is applied to a rectangular surface of length 4.9 cm and width 4.1 cm.

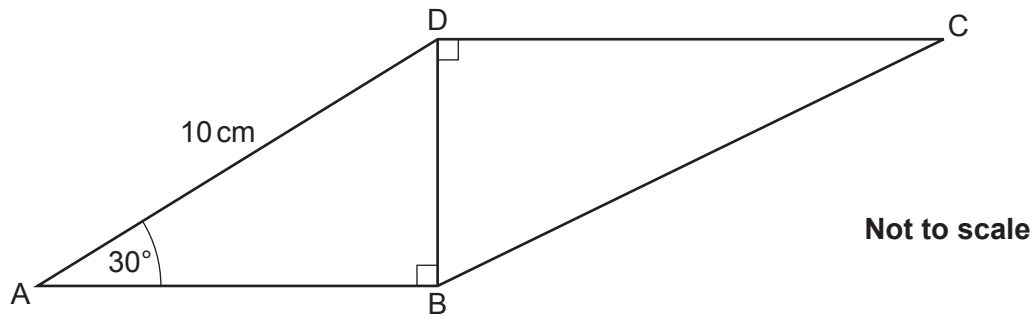Work out an **estimate** of the pressure, in N/cm², applied to this rectangular surface.

[The formula for pressure is: Pressure $= \dfrac{\text{Force}}{\text{Area}}$]

.... N/cm² **[4]**

11 The diagram shows a quadrilateral ABCD.

AD = 10 cm, angle BAD = 30° and angle ABD = angle BDC = 90°.

Not to scale

The ratio of length BD to length DC is 1 : 2.4 .

Work out length BC.
You must show your working.

.... cm **[7]**

Turn over

12 The box plot shows the distribution of the lengths, in cm, of 60 full-grown mice owned by a pet shop.
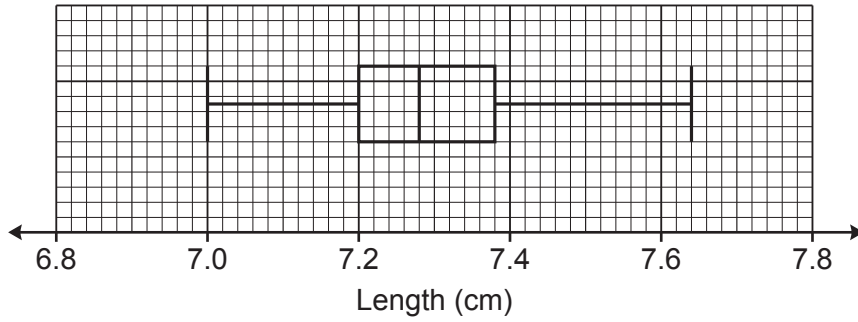
(a) Find the range.

(a) ....cm **[2]**

(b) Work out the number of these mice that have a length of at least 7.2 cm.

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

(c) Sam owns 5 full-grown mice.
Sam picks the third longest mouse and measures its length.
Sam then looks at the box plot.

Sam says

This mouse is 7.35 cm long.
Therefore, the mice I own are longer than the full-grown mice owned by the pet shop.

(i) Give a mathematical reason to support Sam's conclusion.

....

.... **[1]**

(ii) Give a mathematical reason why Sam's conclusion may be unreliable.

....

.... **[1]**

13 **(a)** Write $\dfrac{3}{11}$ as a recurring decimal.

(a) .... **[2]**

(b) Write $0.4\dot{8}$ as a fraction in its simplest form.

(b) .... **[3]**

14 Two solid ornaments are mathematically similar.
The larger ornament is twice as tall as the smaller ornament.

The smaller ornament has a volume of $50\,\text{cm}^3$.

Work out the volume of the larger ornament.

.... cm^3 **[2]**

15 Write $\sqrt{20} + \sqrt{45}$ in the form $k\sqrt{5}$.

.... **[3]**

16 In a group of 60 students, 40 own a smartphone, 27 own a tablet and 8 own neither.

A student is chosen at random from those that own a tablet.

Find the probability that they also own a smartphone.
You must show your working.

.... **[5]**

Turn over

17 Simplify fully.

$$\frac{2x^2 - 50}{x^2 + 7x + 10}$$

.... **[5]**

18   A, B, C and D are points on the circumference of a circle.

EF is the tangent to the circle at D.

Angle BDF = 70°.

Not to scale
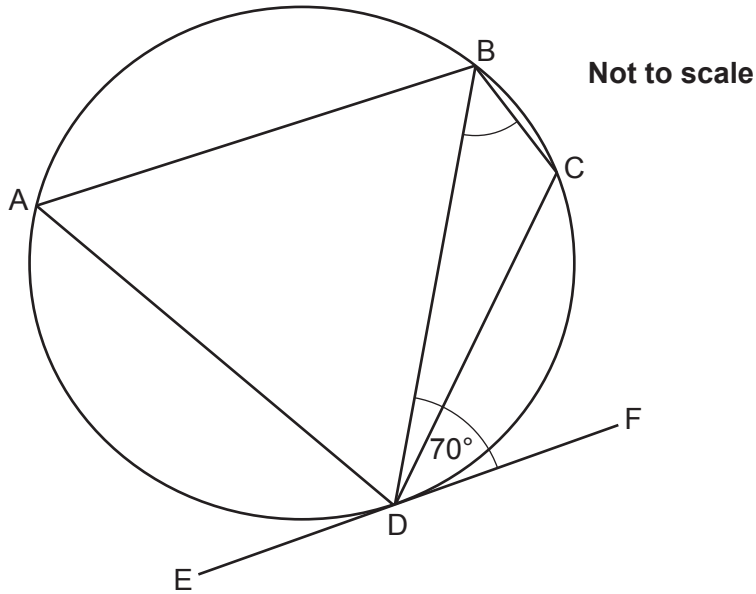
The ratio angle BCD : angle CBD is 5 : 2.

Work out angle CBD.
You must show your working.

....° **[5]**

Turn over

19 The point $\left(5, 7\sqrt{2}\right)$ lies on the circumference of a circle, centre (0, 0).

Find the equation of the circle.

.... **[4]**

20 $x^2 - 2y = 5$ and $4y + z = 7$.

Write z in terms of x.
Give your answer in its simplest form.

.... **[4]**

21 AOB is a sector of a circle, centre O and radius 10 cm.

A

O   10 cm   B
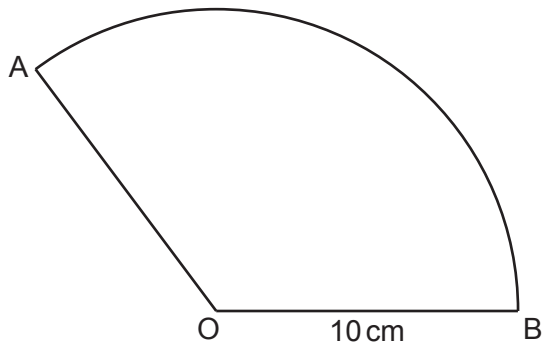
Not to scale

The area of the sector is 40π cm^2.

Work out the perimeter of the sector.
Give your answer in the form $a + b\pi$, where a and b are integers.
You must show your working.

.... cm **[6]**

Turn over for Question 22

Turn over

22 *n* is a positive integer.

Prove that $(2n+1)(n-3)(n+2)+3n(n+7)$ is always even.

.... **[6]**

END OF QUESTION PAPER