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MATHEMATICS**0580/22**

Paper 2 (Extended)

October/November 2024**1 hour 30 minutes**

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages.



- 1 These are the first eight terms of a sequence.

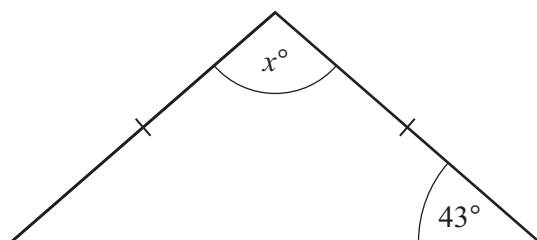
c -3 -9 -15 -21 -27 -33 k

Find the value of c and the value of k .

$c = \dots\dots\dots$

$k = \dots\dots\dots$ [2]

- 2 The diagram shows an isosceles triangle.



NOT TO
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Find the value of x .

$x = \dots\dots\dots$ [2]

- 3

0.25	3.142	$\sqrt{3}$	-3	24	-0.4	1.2	$-\frac{1}{4}$
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Complete each statement with a number from the list.

$\dots\dots\dots$ is a natural number.

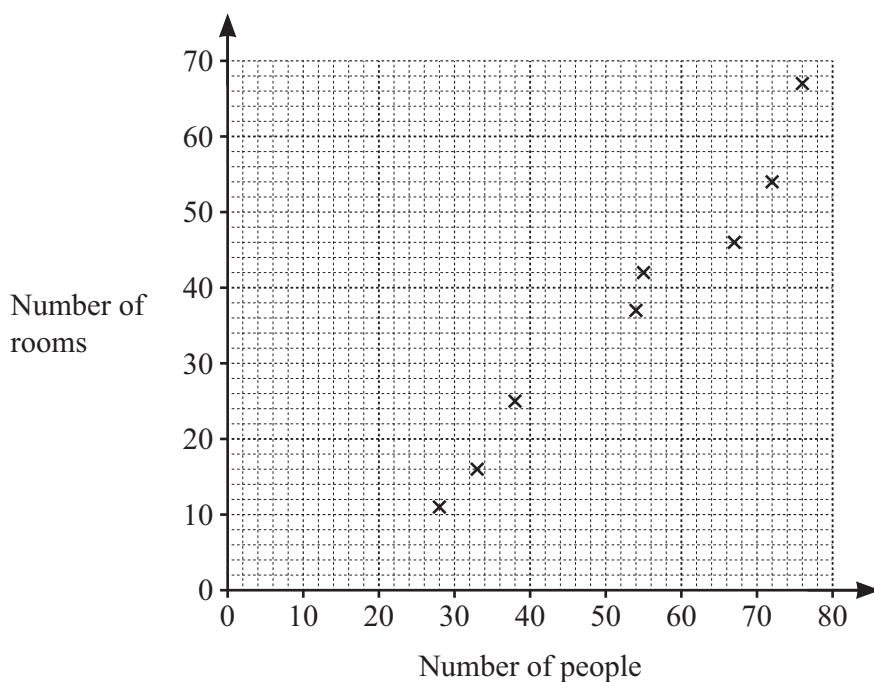
$\dots\dots\dots$ is an irrational number.

$\dots\dots\dots$ is the reciprocal of 4.

[3]



- 4 The scatter diagram shows the number of rooms and the number of people in each of eight buildings.



- (a) One of the buildings has 67 rooms.

Write down the number of people in this building.

..... [1]

- (b) In another building there are 42 people and 33 rooms.

On the scatter diagram, plot this point.

[1]

- (c) (i) On the scatter diagram, draw a line of best fit.

[1]

- (ii) There are 45 people in a different building.

Find an estimate for the number of rooms in this building.

..... [1]

- (d) What type of correlation is shown in the scatter diagram?

..... [1]

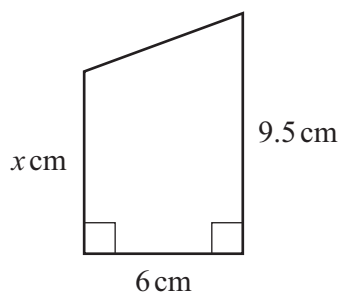




5 Convert 7.51 m^2 into cm^2 .

..... cm^2 [1]

6 The diagram shows a trapezium.



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The area of the trapezium is 42 cm^2 .

Calculate the value of x .

$x =$ [2]



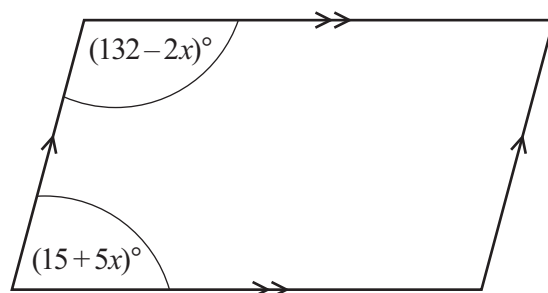


- 7 Without using a calculator, work out $\frac{2}{7} \div \frac{6}{11}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

- 8 The diagram shows a parallelogram.

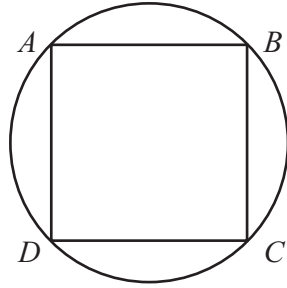


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Work out the size of the smallest interior angle of the parallelogram.

..... [4]





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Points A , B , C and D lie on a circle.
 $ABCD$ is a square with area 72 cm^2 .

Calculate the area of the circle.
Give your answer as a multiple of π .

..... cm^2 [3]

10 Calculate $\sqrt[3]{1 + 10.9 \times 0.4^2}$.

..... [1]





11 Factorise fully.

(a) $24x^2 - 9xy$

..... [2]

(b) $63x^2 - 28y^2$

..... [3]

12 y is directly proportional to the square root of $x + 1$.
 $y = 10.5$ when $x = 8$.

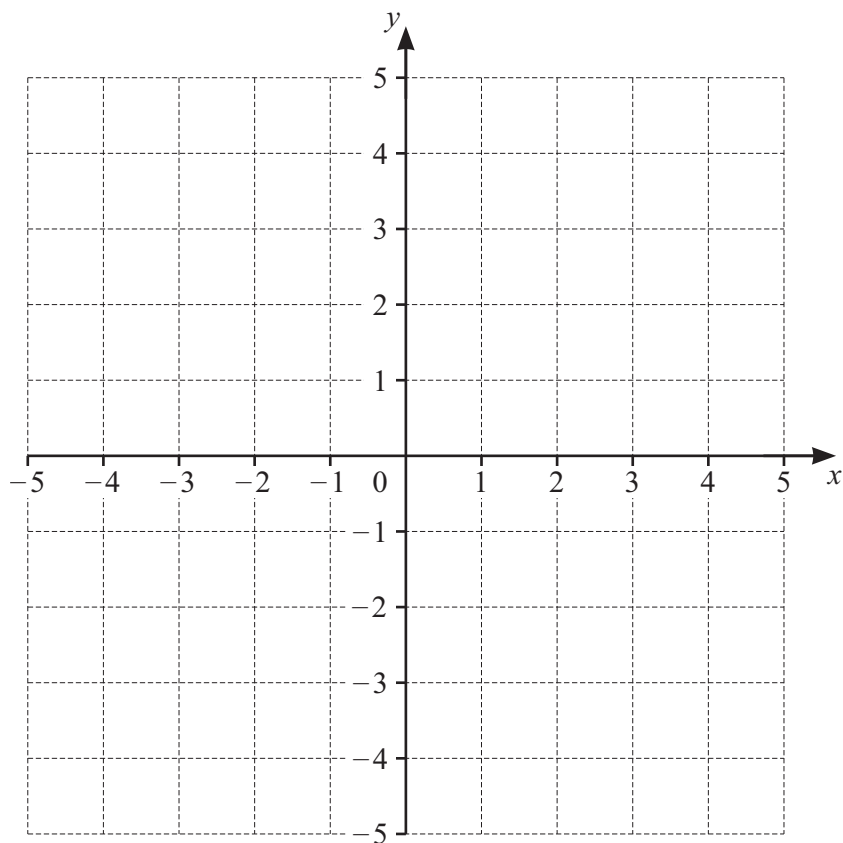
Find y when $x = 1.56$.

$y =$ [3]





13



The region R satisfies these inequalities.

$$-3 < y \leq 2 \qquad y \leq x - 1$$

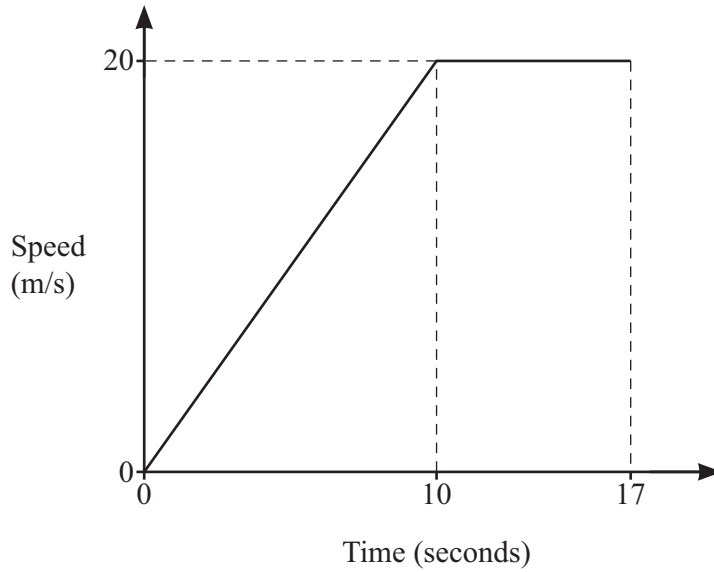
By drawing suitable straight lines and shading **unwanted** regions, find and label the region R .

[4]





14



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The diagram shows the speed–time graph for 17 seconds of a car journey.

(a) Find the acceleration of the car during the first 10 seconds.

..... m/s^2 [1]

(b) Calculate the total distance travelled by the car during the 17 seconds.

..... m [3]



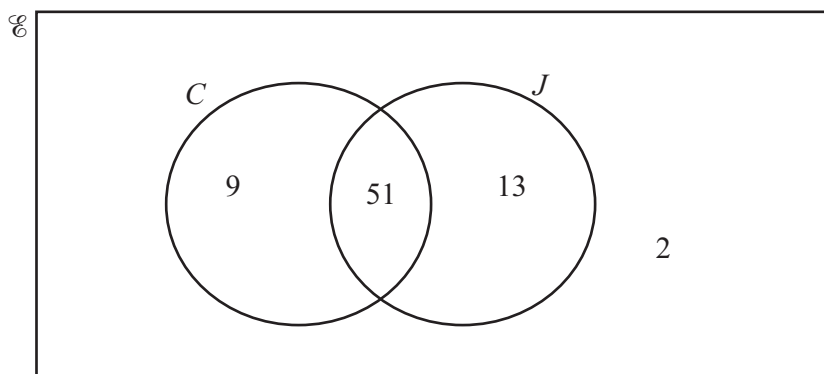


- 15 At the start of an experiment there are 40 000 bacteria.
The number of bacteria increases at a rate of 15% per hour.

Calculate the number of bacteria after 3 hours.

..... [2]

- 16 75 people are asked if they have a car, C , and if they have a job, J .
The Venn diagram shows the results.



A person is chosen at random from those who have a car.

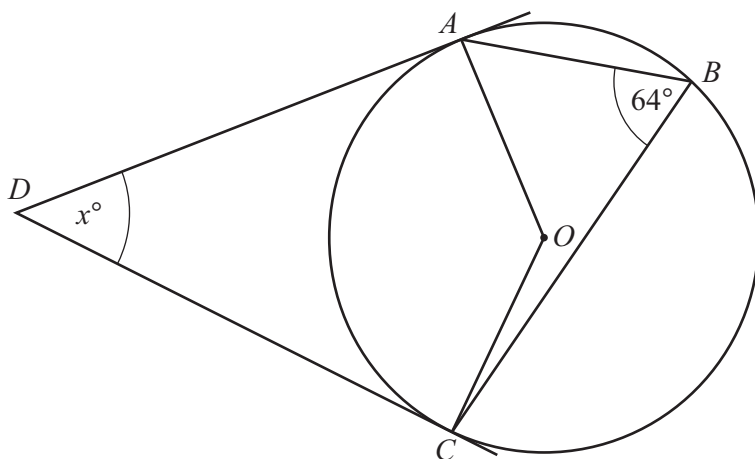
Find the probability that this person also has a job.

..... [1]





17



NOT TO
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A , B and C are points on the circumference of a circle with centre O .
 DA and DC are tangents to the circle.
 Angle $ABC = 64^\circ$.

Work out the value of x .

$x = \dots\dots\dots$ [2]

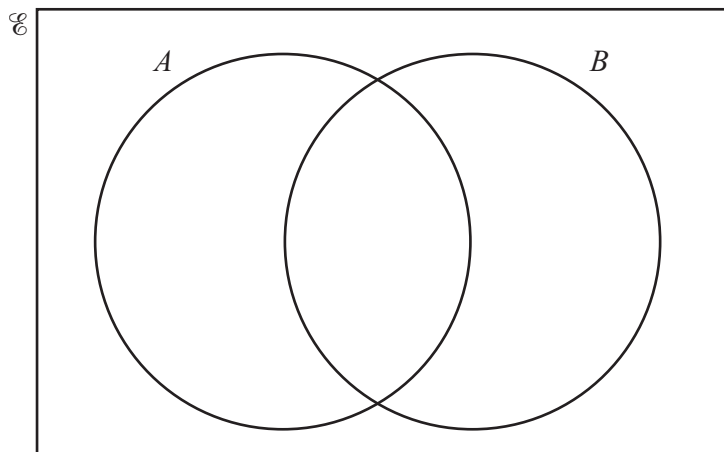




18 (a) $\mathcal{E} = \{8 \times 10^{-1}, 0.\dot{8}, 8\%, \sqrt{0.08}\}$

$$A = \{a: 0.08 < a \leq 0.8\}$$

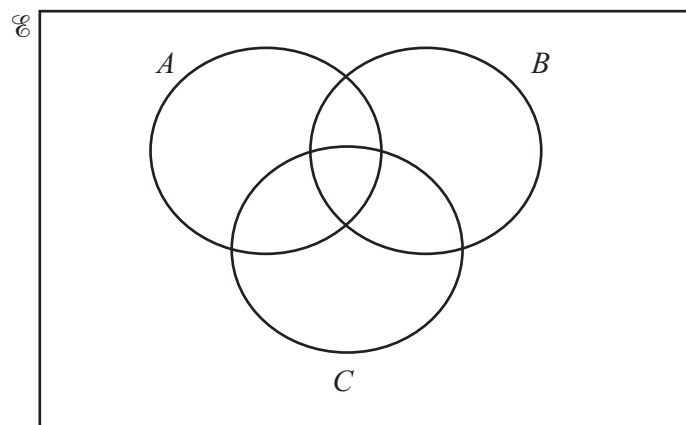
$$B = \{b: b \geq 0.8\}$$



Complete the Venn diagram.

[3]

(b) Shade the region $(A \cup C) \cap B'$ in the Venn diagram.

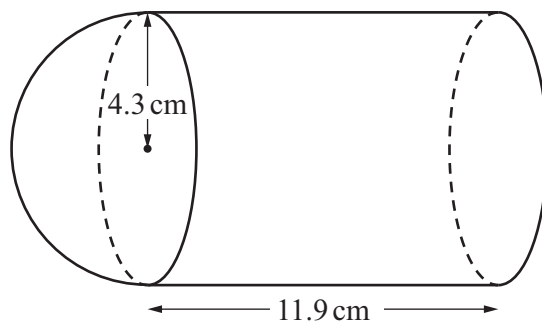


[1]





19

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A solid is made from a cylinder and a hemisphere, both of radius 4.3 cm.
The cylinder has length 11.9 cm.

- (a) Calculate the volume of the solid.
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm^3 [3]

- (b) Calculate the total surface area of the solid.
[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

..... cm^2 [4]





20 Find an expression for the n th term of this sequence.

$$\frac{1}{7}, \quad 1, \quad 7, \quad 49, \quad 343, \quad 2401, \quad \dots$$

..... [2]

21 Expand and simplify.

$$(x+3)(x+5)(2x+1)$$

..... [3]





22 A is the point $(17, 9)$ and B is the point $(23, 39)$.

Find the equation of the perpendicular bisector of line AB .
Give your answer in the form $y = mx + c$.

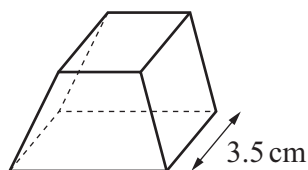
$y = \dots\dots\dots$ [5]

Question 23 is printed on the next page.

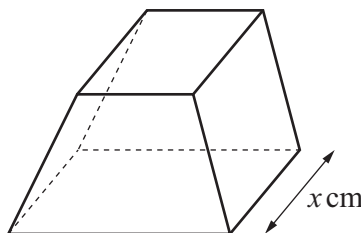




23



Small box



Large box

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The small box is mathematically similar to the large box.
The volume of the large box is 72.8% greater than the volume of the small box.
The small box has length 3.5 cm and the large box has length x cm.

Calculate the value of x .

$x = \dots\dots\dots$ [3]

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