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5372399680

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2024**

2 hours 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 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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1 Dinari sells fruit and vegetables.

(a) One day the mass of fruit and vegetables he sells is in the ratio fruit : vegetables = 9 : 8.
He sells 48 kg of vegetables.

Find the mass of the fruit he sells.

..... kg [2]

(b) On another day he receives \$280 for the fruit and vegetables he sells.
The \$280 is in the ratio fruit : vegetables = $(c+3) : (c-1)$.

Find the amount he receives from selling the fruit.

\$ ..... [3]

(c) In one week Dinari buys fruit and vegetables for \$1620.
He sells the fruit and vegetables for \$1750.

Calculate his percentage profit.

..... % [2]

(d) In another week Dinari sells fruit and vegetables for \$1738.
He makes a profit of 10%.

Calculate the amount he paid for the fruit and vegetables in that week.

\$ ..... [2]

2 **(a)** A is the point $(3, 7)$ and B is the point $(-1, 5)$.

(i) Find the coordinates of the midpoint of the line AB.

(..... , ...) [2]

(ii) Write $\overrightarrow{AB}$ as a column vector.

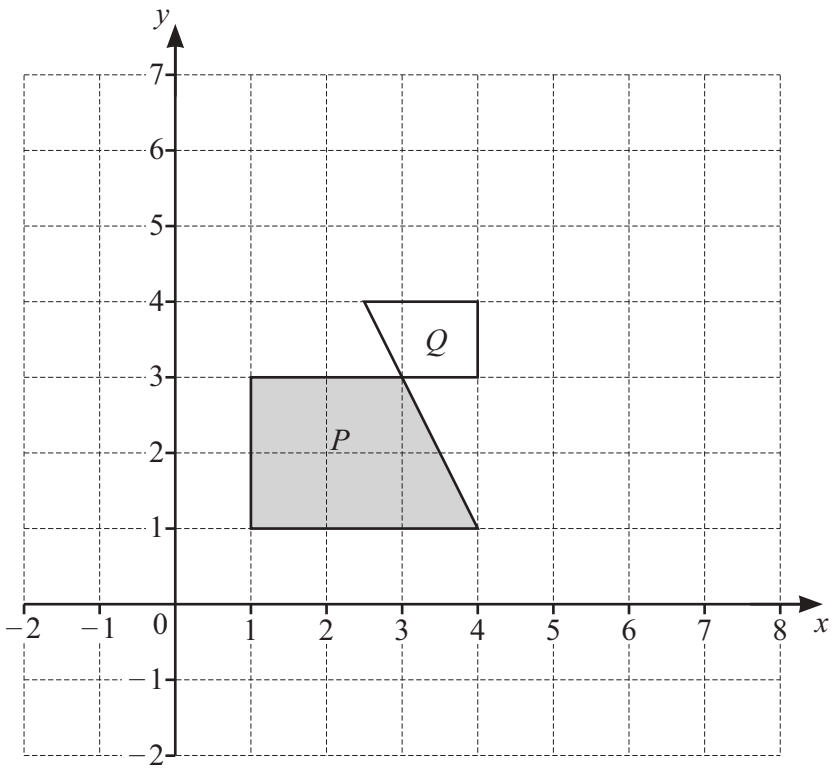
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) $\overrightarrow{AC} = 3\overrightarrow{BA}$

Find the coordinates of C.

(..... , ...) [2]

(b)



(i) Rotate shape P through 180° about the point $(4, 1)$. [2]

(ii) Reflect shape P in the line $y = x + 2$. [2]

(iii) Describe fully the **single** transformation that maps shape P onto shape Q.

.....

..... [3]

3 **(a)** Ed invests \$500 in an account paying r% per year simple interest.
At the end of 14 years the total amount in Ed's account is \$675.

Find the value of r.

$r =$ ..... [3]

(b) Eva invests \$400 at a rate of 2.2% per year compound interest.

Calculate the total interest earned at the end of 11 years.

\$ ..... [3]

(c) Erin invests \$700 at a rate of p% per **month** compound interest.
At the end of 21 years the value of Erin's investment is \$1074, correct to the nearest dollar.

Calculate the value of p.

$p =$ ..... [3]

4 **(a)** A box contains 50 cuboids.
Each cuboid has a mass of 135 g.
The total mass of the cuboids and the box is 7 kg.

Calculate the mass of the box.
Give your answer in grams.

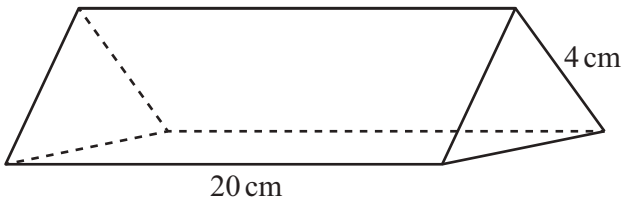
..... g [2]

(b) A solid cube of side 4 cm is fixed to the base inside an empty cube of side 6 cm.
Water is poured into the larger cube until it reaches the top of the smaller cube.

Calculate the amount of water poured into the larger cube.

..... cm^3 [2]

(c)



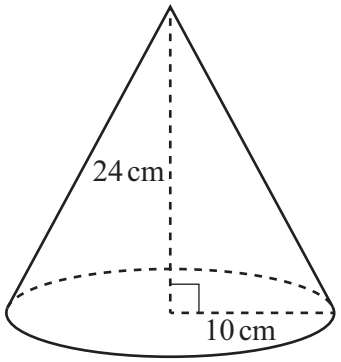
NOT TO SCALE

The diagram shows a solid triangular prism of length 20 cm.
The cross-section is an equilateral triangle with side length 4 cm.
The prism is made of wood with a density of 0.85 g/cm^3.

Calculate the mass of the prism.
[Density = mass ÷ volume]

..... g [4]

(d)



NOT TO SCALE

The diagram shows a solid cone with base radius 10 cm and height 24 cm.

(i) Show that the **total** surface area of the cone is 1131 cm^2, correct to the nearest cm^2.
[The curved surface area of a cone with base radius r and slant height l is $A = \pi rl$.]

[4]

(ii) The total surface area of the cone is painted.

(a) The cost to paint the cone is \$1.71 .

Calculate the cost to paint 1 cm^2 of the cone.
Give your answer in cents.

..... cents [1]

(b) One tin of paint has enough paint to cover 2.5 m^2.

Calculate the number of these cones that can be painted completely using one tin of paint.

..... [2]

5 **(a)** Naomi runs 100 m in 15 seconds.

Calculate Naomi's average speed in kilometres per hour.

..... km/h [2]

(b) Olav runs for 45 minutes at a speed of 9.5 km/h.
He then runs 8.1 km at a speed of 7.5 km/h.

Calculate Olav's average speed for the whole run.

..... km/h [3]

(c) A train has length p metres.
The train passes through a station of length q metres.
The speed of the train is v kilometres per hour.

Find an expression for the time the train takes to completely pass through the station.
Give your answer in seconds, in terms of p, q and v.

..... s [3]

6 **(a)** Simplify $\frac{24u}{5y} \times \frac{10}{3u}$.

..... [2]

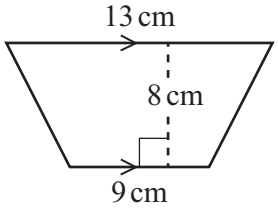
(b) Expand and simplify $(x-1)(x+2)(x+3)$.

..... [3]

(c) Solve the equation $2x^2 + x - 5 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

7 (a) (i)

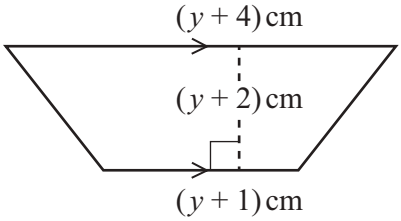


NOT TO SCALE

Calculate the area of the trapezium.

..... cm^2 [2]

(ii)



NOT TO SCALE

The area of this trapezium is 264 cm^2.

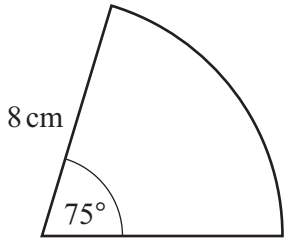
(a) Show that $2y^2 + 9y - 518 = 0$.

[3]

(b) Solve $2y^2 + 9y - 518 = 0$ by factorisation to find the value of y.

$y =$ ..... [3]

(b)



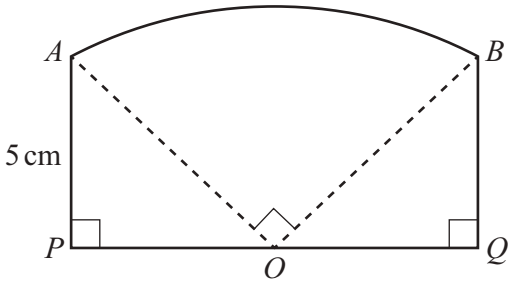
NOT TO SCALE

The diagram shows a sector of a circle with radius 8 cm and angle 75°.

Find the perimeter of the sector.

..... cm [3]

(c)



NOT TO SCALE

The diagram shows a shape $ABQP$ made from three straight lines and an arc of a sector of a circle.
The sector has centre O and angle 90°.
POQ is a straight line and $AP = PO = OQ = QB = 5$ cm.

Find the area of $ABQP$.
Give your answer in the form $a + k\pi$.

..... cm^2 [4]

8 Guillaume measures the speed of each of 100 cars.
The results are shown in the table.

Speed (v km/h)	$30 < v \leqslant 40$	$40 < v \leqslant 45$	$45 < v \leqslant 50$	$50 < v \leqslant 70$
Frequency	15	20	35	30

(a) Guillaume draws a pie chart for this data.

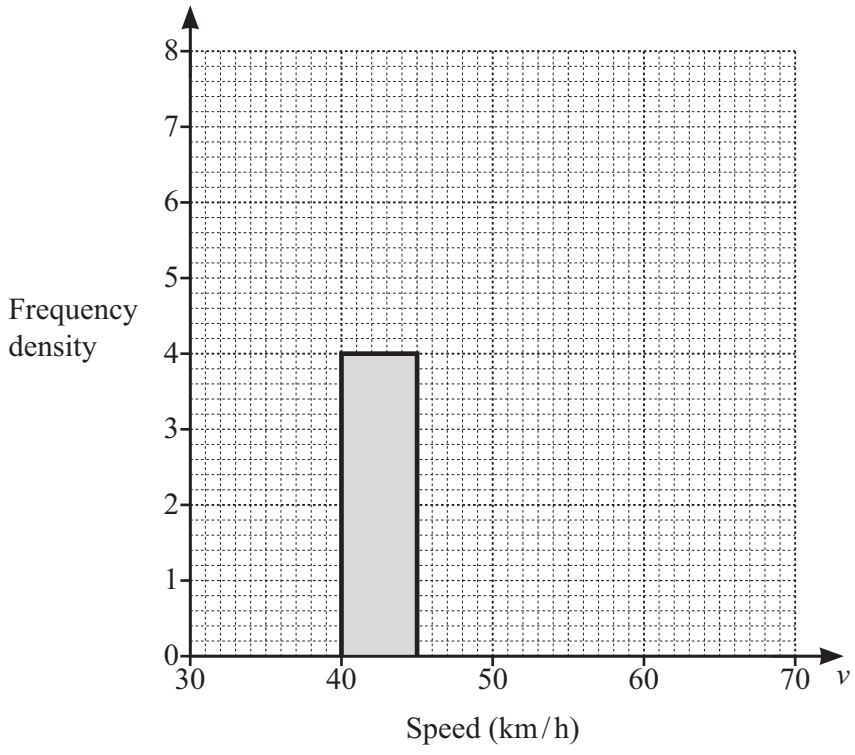
Calculate the angle for the interval $45 < v \leqslant 50$.

..... [2]

(b) Calculate an estimate of the mean speed.

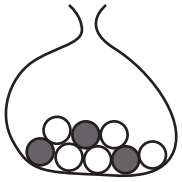
..... km/h [4]

(c) Complete the histogram to show the data in the table.



[3]

9



A bag contains 5 white balls and 3 black balls.

(a) (i) Marwan picks a ball from the bag at random and then replaces it.

Find the probability that the ball is white.

..... [1]

(ii) Naomi picks a ball from the bag at random and then replaces it.
She repeats this 120 times.

Find the number of times the ball is expected to be white.

..... [1]

(b) Oscar picks a ball from the bag at random.
He replaces it and then picks a second ball from the bag at random.

(i) Find the probability that the balls are the same colour.

..... [3]

(ii) Find the probability that the balls are not the same colour.

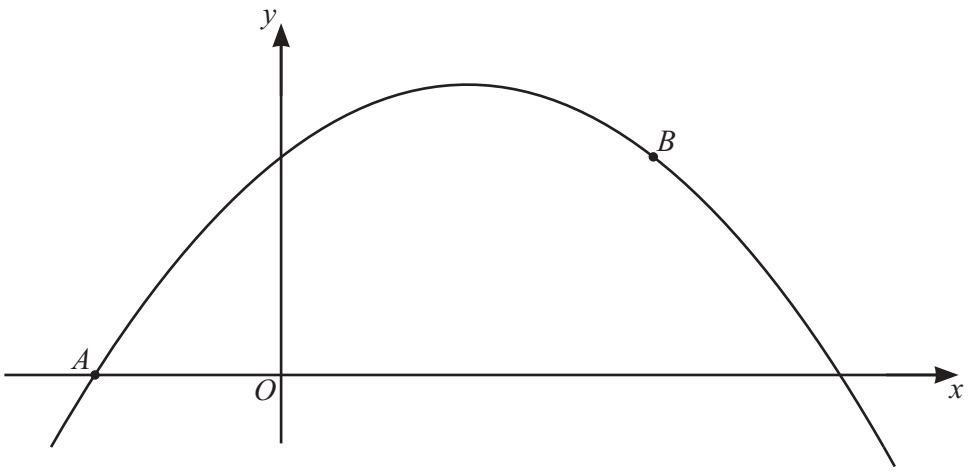
..... [1]

(c) Priya picks 3 of the 8 balls from the bag at random without replacement.

Find the probability that she picks two white balls and one black ball.

..... [3]

10



NOT TO SCALE

The diagram shows a sketch of the graph of $y = 3 + 2x - x^2$.
A is the point $(-1, 0)$ and B is the point $(2, 3)$.

(a) Find the derivative of $3 + 2x - x^2$.

..... [2]

(b) (i) Show that the equation of the tangent at A is $y = 4x + 4$.

[3]

(ii) The line L is perpendicular to the line $y = 4x + 4$.
The line L passes through the point B.

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

$y =$ ..... [3]

(c) Find the coordinates of the maximum point on the graph of $y = 3 + 2x - x^2$.

(..... , ...) [3]

11 $f(x) = 2x + 5$ $g(x) = 1 - 2x$ $h(x) = \frac{1}{x+1}, x \neq -1$ $j(x) = 2^x$

(a) Find $g(-3)$.

..... [1]

(b) Find $f(x)g(x) + fg(x) + 1$.
Give your answer in its simplest form.

..... [4]

(c) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(d) Find $hh(1)$.

..... [2]

(e) Simplify $\frac{1}{\mathrm{f}(x)} - \mathrm{h}(x)$.

Give your answer as a single fraction in its simplest form.

..... [3]

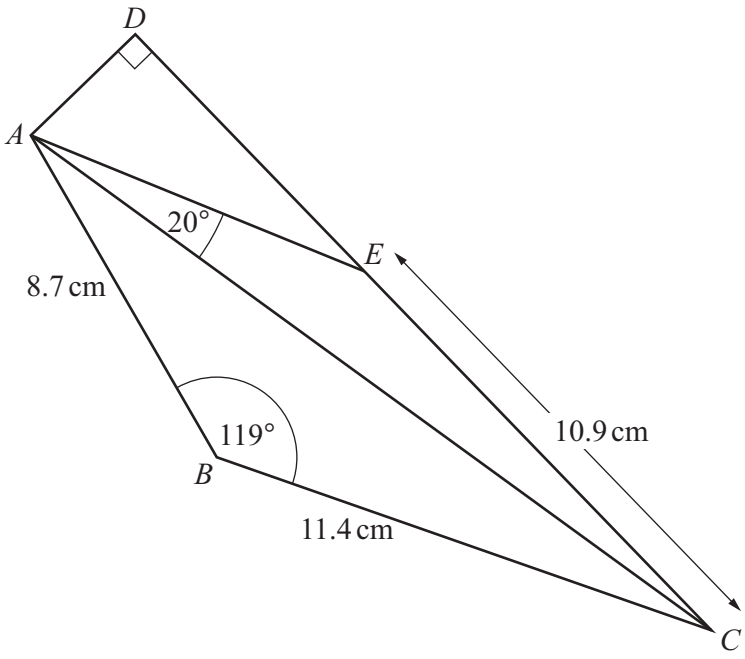
(f) Find x when $\mathrm{j}(x) = \frac{1}{32}$.

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

(g) Find x when $\mathrm{j}^{-1}(x) = 0$.

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

12



NOT TO SCALE

ABCD is a quadrilateral and *E* is a point on *CD*.
AB = 8.7 cm, *BC* = 11.4 cm and *CE* = 10.9 cm.
Angle *ADE* = 90°, angle *ABC* = 119° and angle *CAE* = 20°.

(a) Show that *AC* = 17.37 cm, correct to 2 decimal places.

[3]

(b) Angle AEC is obtuse.

Calculate angle ACE.

Angle ACE = ... [4]

(c) Calculate the perimeter of quadrilateral $ABCD$.

..... cm [3]