



CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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4024/22

May/June 2021

2 hours 30 minutes

You will need: Geometrical instruments

- 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.

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [].

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

- 1 (a) The price of an electric drill is \$78.
In a sale, the price is reduced by 15%.

Calculate the sale price.

\$ [2]

- (b) The exchange rate between dollars (\$) and euros (€) is $\$1 = €0.85$.
Michael changes \$100 to euros.
He buys a clock costing €58.99.
He changes the remaining money back to dollars.

Calculate the amount, in dollars, he has left.

\$ [2]

(c)

ACE SIMPLE

Simple interest at
2.1% per year

COOL COMPOUND

Compound interest at
2% per year

Pietro invests \$3500 in the Ace Simple account for 4 years.

Eliana invests \$3500 in the Cool Compound account for 4 years.

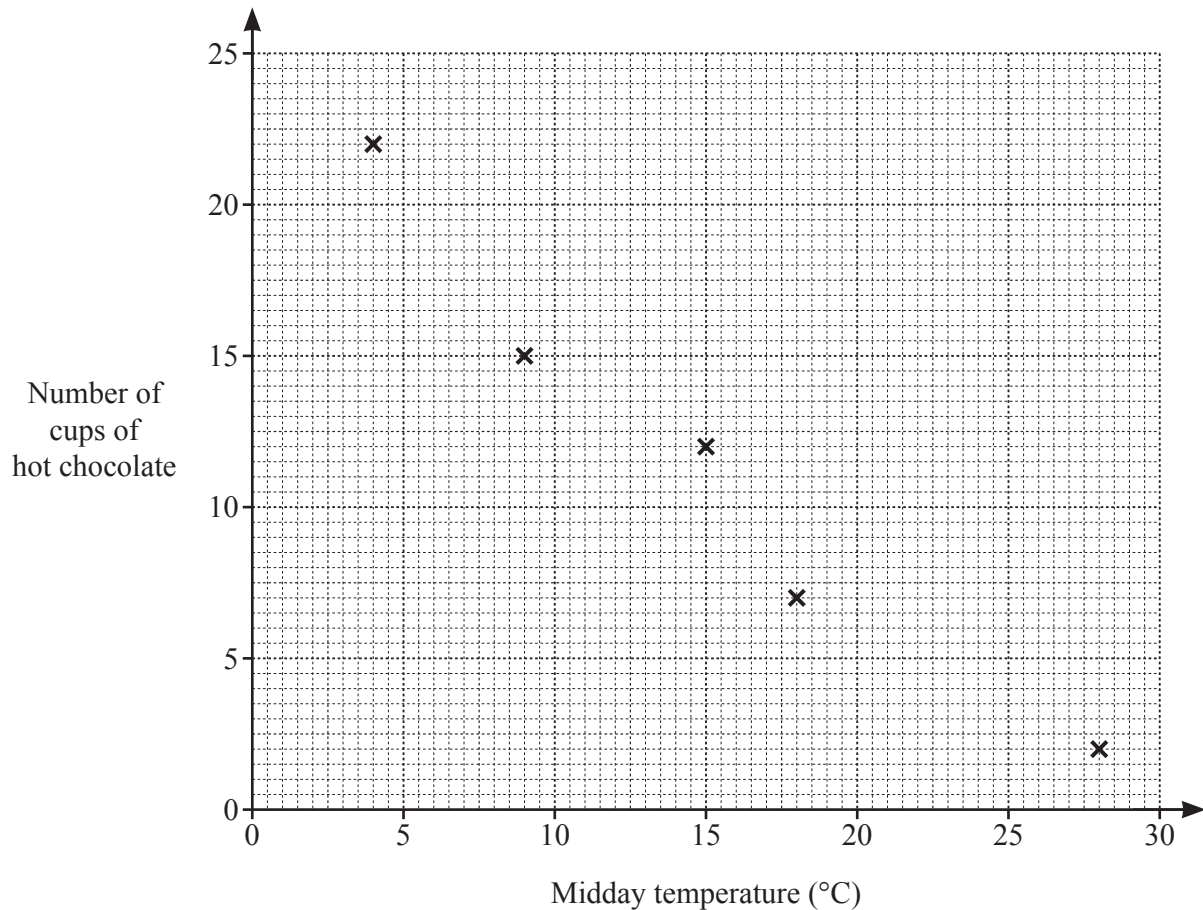
At the end of the 4 years, who has more money in their account and by how much?

..... by \$ [4]

- 2 The table shows the midday temperature and the number of cups of hot chocolate Natcha sells on each of ten days.

Midday temperature ($^{\circ}\text{C}$)	18	9	4	28	15	21	6	5	12	23
Number of cups of hot chocolate	7	15	22	2	12	8	17	21	16	6

- (a) Complete the scatter diagram.
The first 5 points have been plotted for you.



[2]

- (b) Describe the relationship between the midday temperature and the number of cups of hot chocolate Natcha sells.

.....
 [1]

- (c) By drawing a line of best fit, estimate the number of cups of hot chocolate sold when the midday temperature is 17°C .

..... [2]

3 (a) Simplify $4a - b + 6b - 7a$.

..... [2]

(b) Solve $\frac{m}{2} - 4 = 5$.

$m =$ [2]

(c) Rearrange $u = \frac{t+4}{3}$ to make t the subject.

$t =$ [2]

(d) Expand $3y(2y^2 + 5)$.

..... [2]

- 4 100 adults in a town were surveyed about the number of emails they each received one day. The table shows the results.

Number of emails	1	2	3	4	5	6	7	8
Number of adults	8	10	22	28	15	9	5	3

- (a) Find the mode.

..... [1]

- (b) Calculate the mean.

..... [2]

- (c) One of these adults is chosen at random.

Find the probability that they received **fewer than** 4 emails that day.
Give your answer as a fraction in its simplest form.

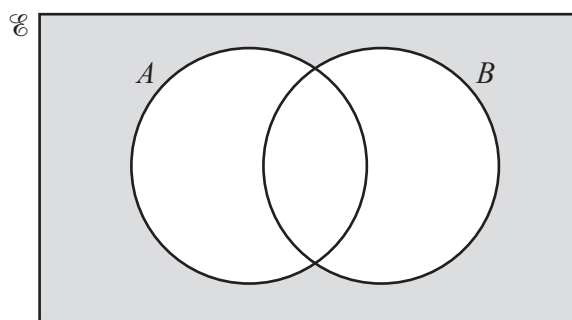
..... [2]

- (d) The town has 18 000 adults.

Use the survey results to estimate the number of adults in the town who received exactly 5 emails that day.

..... [2]

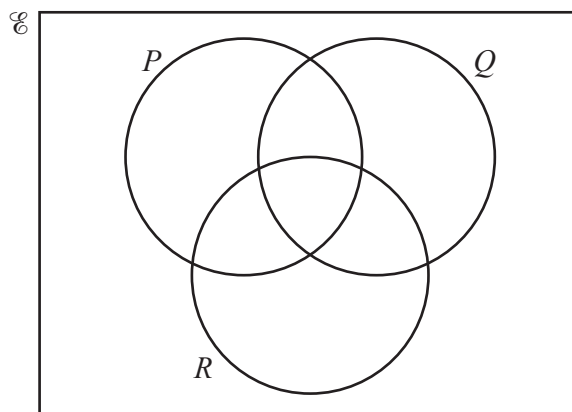
- 5 (a) Use set notation to describe the subset shaded in the Venn diagram.



..... [1]

- (b) $U = \{ 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 \}$
 $P = \{ x : x \text{ is a factor of } 36 \}$
 $Q = \{ x : x \text{ is a multiple of } 4 \}$
 $R = \{ x : 3 \leq x \leq 6 \}$

- (i) Complete the Venn diagram.



[3]

- (ii) List the elements of $P \cap (Q \cup R)'$.

..... [1]

- (iii) Find $n(P \cup Q)$.

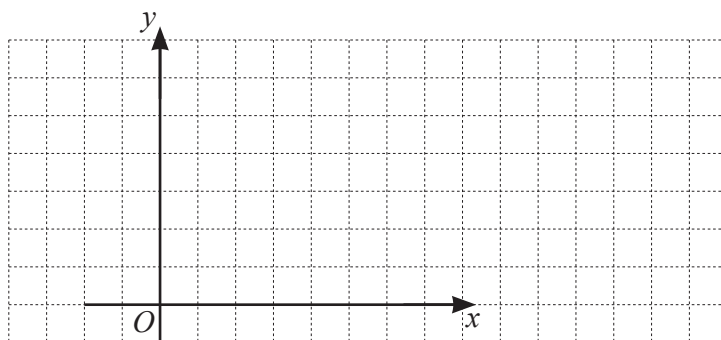
..... [1]

- (iv) Use set notation to complete the statement.

..... = $\emptyset$ [1]

- 6 (a) PQR is an isosceles triangle with $PR = QR$.
 P is the point $(1, 5)$ and Q is the point $(5, 1)$.
 Angle PRQ is **not** a right angle.

Find the coordinates for one possible position of R .
 You may use the grid to help you.



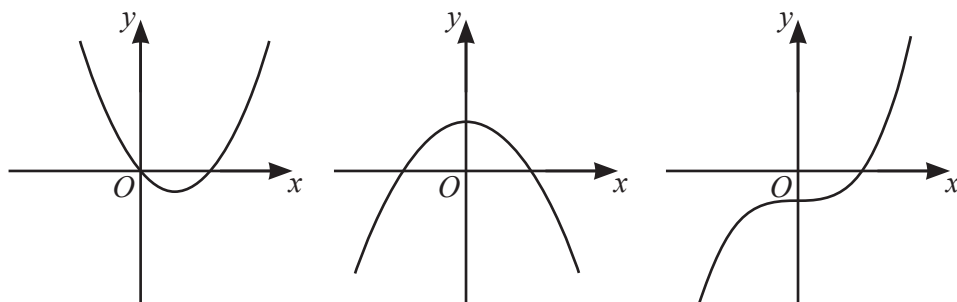
(..... ,) [2]

- (b) Here are the equations of five curves.

$$y = 2 - x^2 \quad y = x^3 - 2 \quad y = x^2 + 2x - 8 \quad y = x^3 - 3x \quad y = x^2 - 3x$$

Sketches of three of these curves are drawn below.

Write the correct equation underneath each sketch.



.....

.....

.....

[3]

- (c) A is the point $(-1, -5)$ and B is the point $(3, 3)$.

Find the equation of the line perpendicular to AB which passes through the midpoint of AB .

..... [5]

- 7 (a) A rectangular field measures 30 m by 45 m.

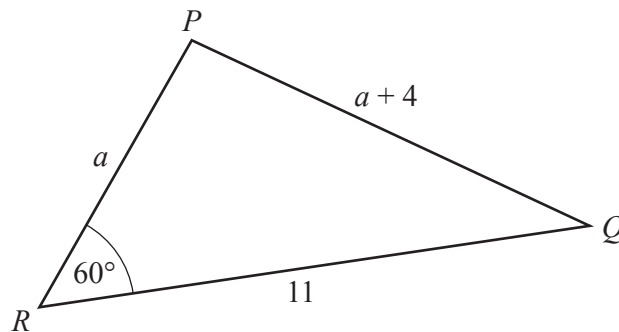
(i) Calculate the perimeter.

..... m [1]

(ii) Calculate the length of a diagonal.

..... m [2]

(b)



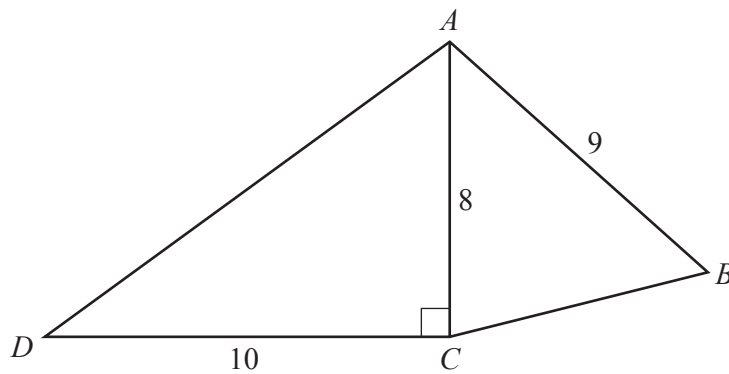
NOT TO
SCALE

The diagram shows a sketch of triangle PQR .
All lengths are given in centimetres.

Calculate the length a .

$a =$ cm [4]

- (c) The diagram shows a sketch of quadrilateral $ABCD$.
All lengths are given in centimetres.



NOT TO
SCALE

The area of quadrilateral $ABCD$ is 70 cm^2 .

Calculate $\hat{DAB}$.

$\hat{DAB} = \dots\dots\dots$ [6]

8 $f(x) = 3x - 5$ $g(x) = \frac{4x+4}{3}$

(a) Find $f(-2)$.

..... [1]

(b) Find the largest integer satisfying $f(x) > 3g(x)$.

..... [3]

(c) Solve $f(x) = g(3x - 5)$.

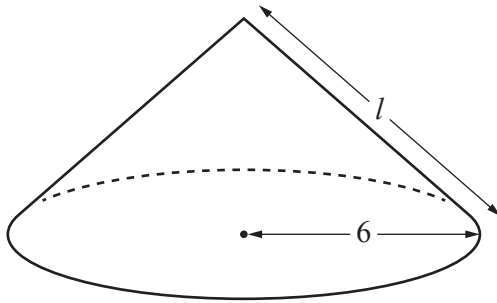
$x =$ [3]

(d) Solve $g^{-1}(x) = 5$.

$x =$ [1]

9 [Volume of a cone = $\frac{1}{3}\pi r^2 h$]

[Curved surface area of a cone = $\pi r l$]



A cone has radius 6 cm and slant height l cm.
The **total** surface area of the cone is $84\pi \text{ cm}^2$.

(a) Show that $l = 8$.

[2]

(b) Calculate the volume of the cone.

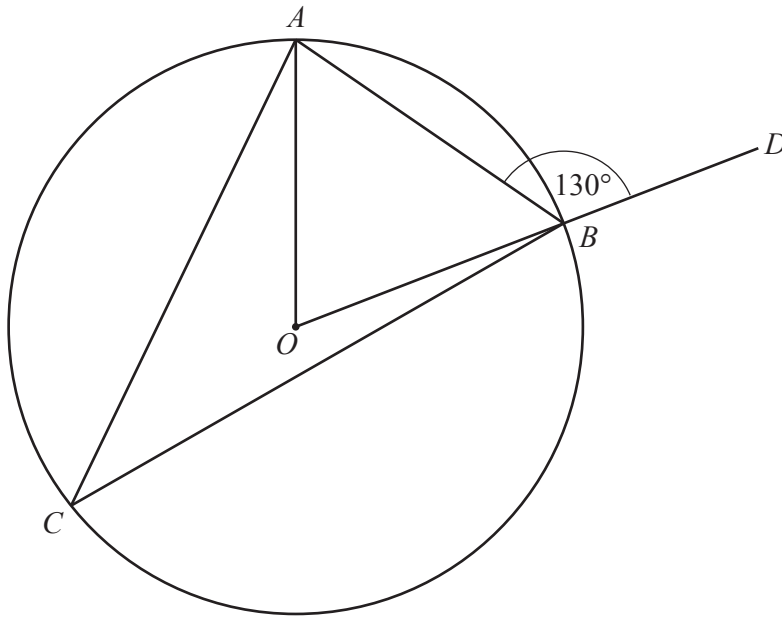
..... cm^3 [3]

(c) A similar cone has a **total** surface area of $47.25\pi \text{ cm}^2$.

Find the radius of this cone.

..... cm [2]

10 (a)

NOT TO
SCALE

A , B and C are points on the circumference of a circle, centre O .
 OBD is a straight line and angle $ABD = 130^\circ$.

Find angle ACB , giving a reason for each step of your working.

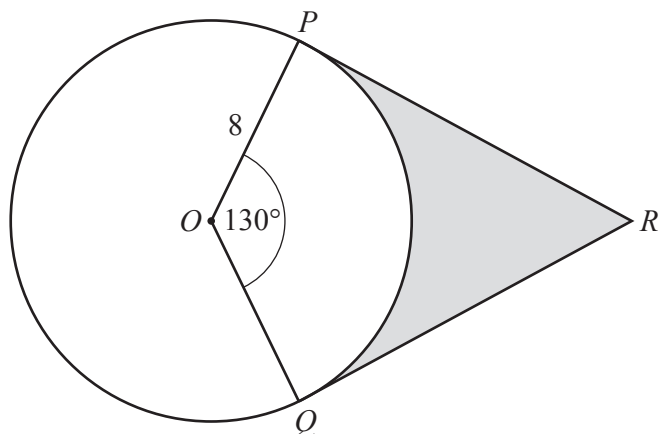
.....

.....

.....

Angle $ACB =$ [3]

(b)

NOT TO
SCALE

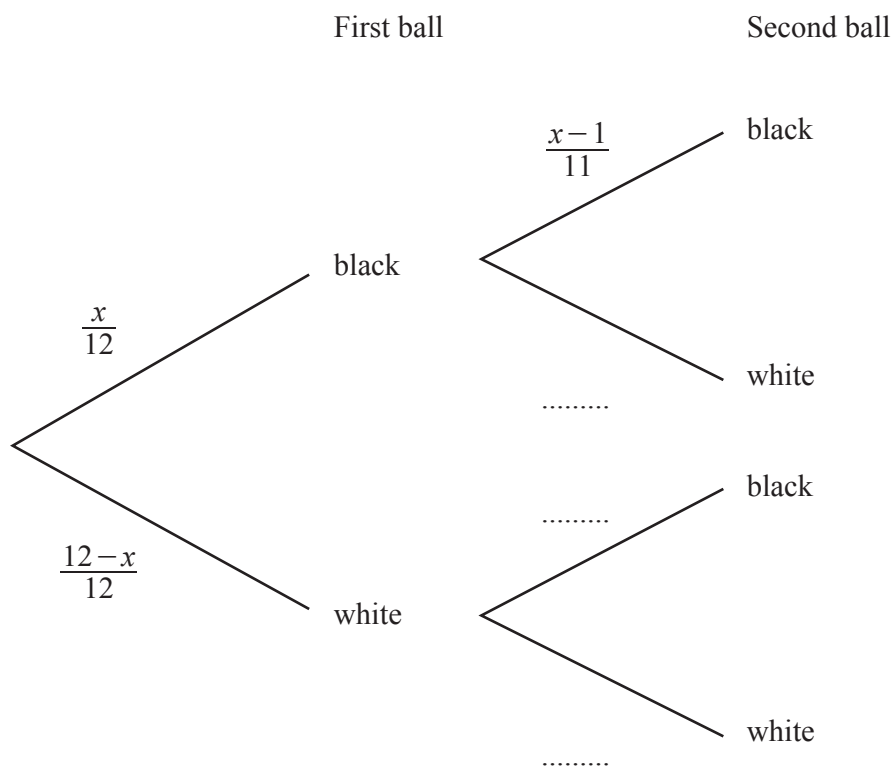
P and Q are points on the circumference of a different circle, centre O .
 PR and QR are tangents to the circle at P and Q respectively.
 $OP = 8$ cm and $\angle POQ = 130^\circ$.

(i) Find PR . $PR = \dots\dots\dots$ cm [2](ii) Calculate the percentage of quadrilateral $OPRQ$ that is shaded. $\dots\dots\dots$ % [4]

- 11** A bag contains 12 balls.
There are x black balls in the bag and the other balls are white.

Two balls are taken at random from the bag without replacement.

- (a) Complete the tree diagram.



[2]

- (b)** Find an expression for the probability of taking one ball of each colour. Write your answer as a single fraction in terms of x .

..... [3]

- (c) The probability that both balls are black is $\frac{14}{33}$.

Form an equation in x and solve it to find the number of black balls in the bag.
Show your working.

..... [4]

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

(i) Find $\overrightarrow{AB}$.

$$\overrightarrow{AB} = \begin{pmatrix} \\ \end{pmatrix} \quad [2]$$

(ii) $\overrightarrow{BC} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$

Find the coordinates of C .

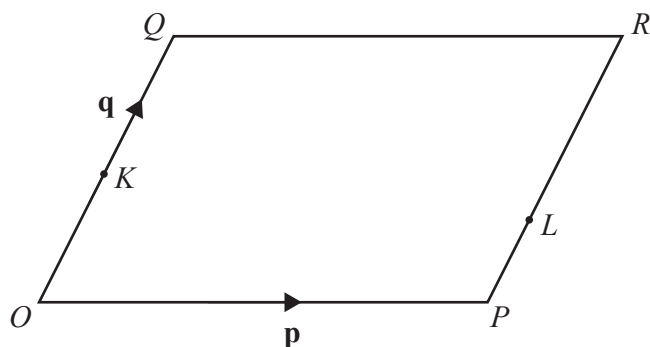
(..... ,) [1]

(iii) $|\overrightarrow{AD}| = \sqrt{74}$ and $D = (-3, n)$.

Find the possible values of n .

$n = \dots\dots\dots$ or $n = \dots\dots\dots$ [3]

(b)

NOT TO
SCALE

$OQRP$ is a parallelogram.

$\vec{OP} = \mathbf{p}$ and $\vec{OQ} = \mathbf{q}$.

K is the midpoint of OQ and L is a point on PR .

$$\vec{KL} = \mathbf{p} - \frac{1}{10}\mathbf{q}.$$

Find $PL : LR$.

..... : [3]

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