

--

--	--	--	--	--

--	--	--	--

## 4024/22

May/June 2021

**2 hours 30 minutes**

You must answer on the question paper.

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  $\pi$ , 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.

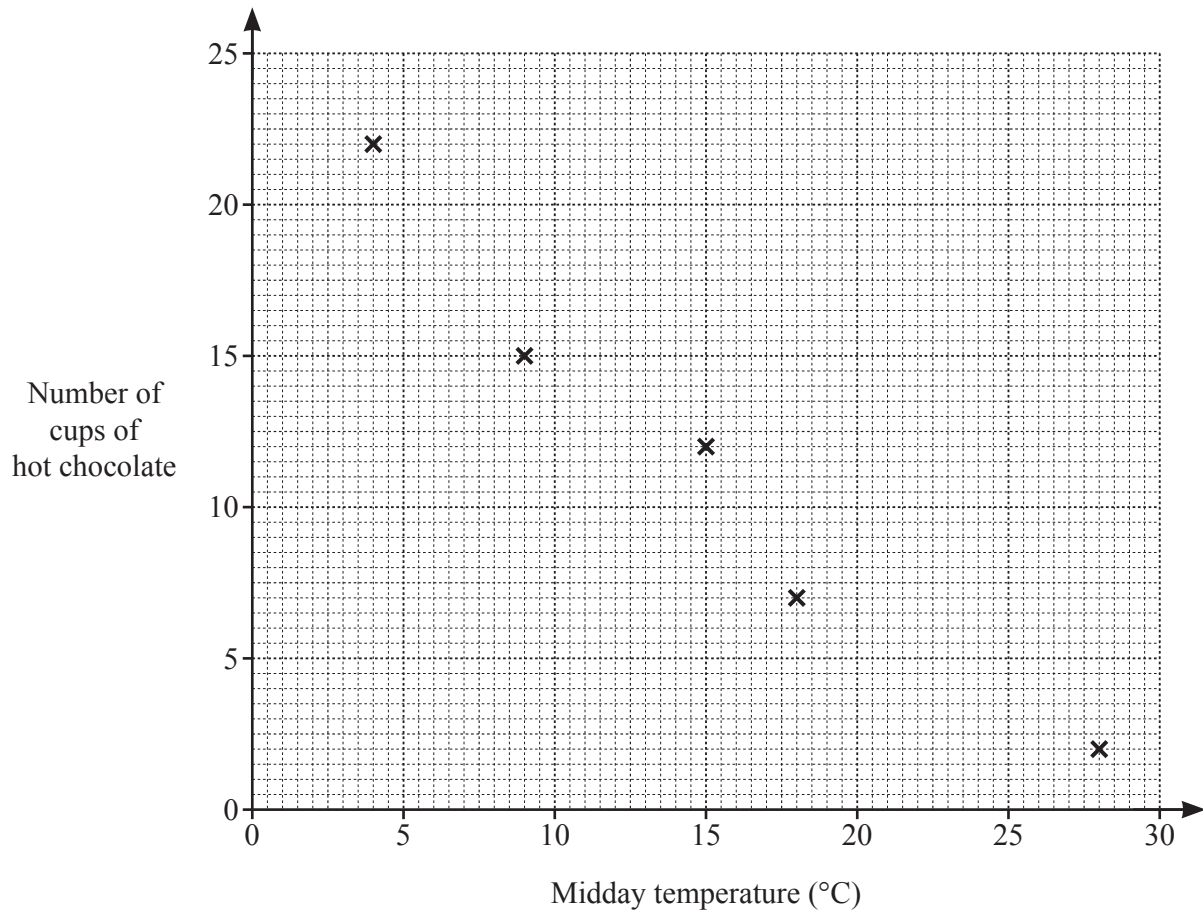
At the end of the 4 years, who has more money in their account and by how much?

..... 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  $17^{\circ}\text{C}$ .

..... [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.

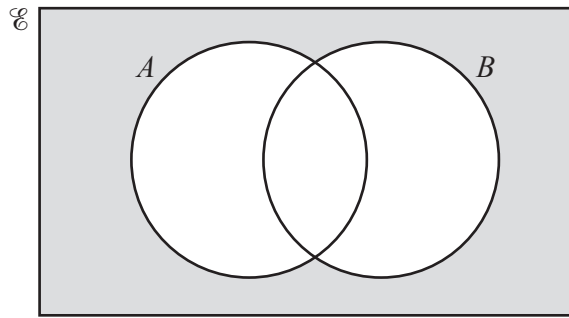
..... [2]

- (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]

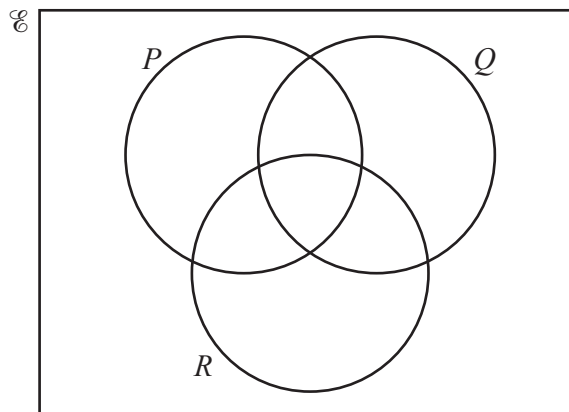
- 5 (a) Use set notation to describe the subset shaded in the Venn diagram.



..... [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  $n(P \cup Q)$ .

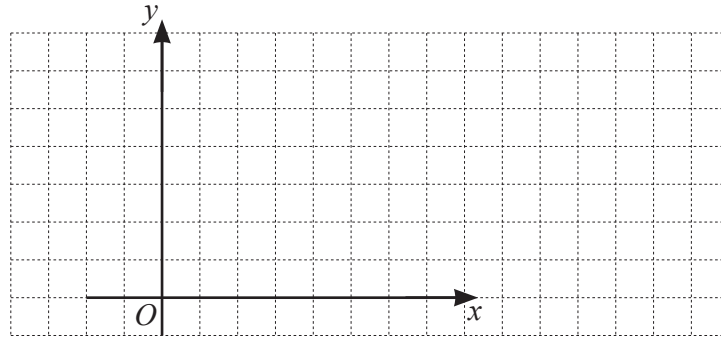
..... [1]

- (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.



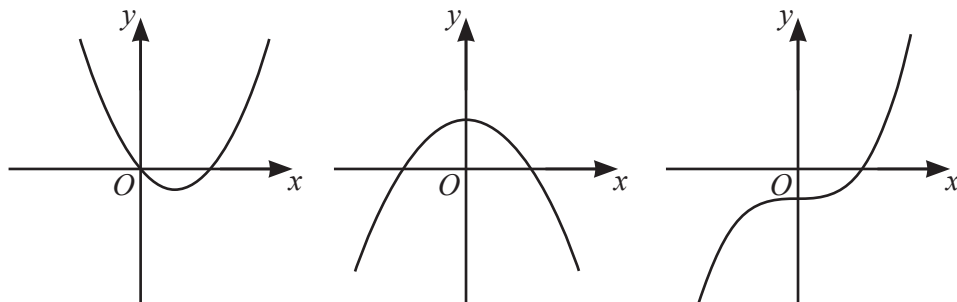
( ..... , ..... ) [2]

- (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.

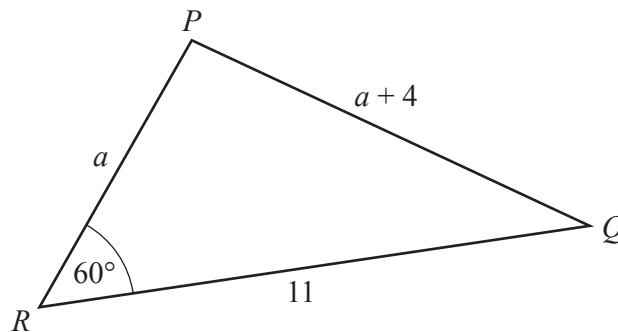
(i) Calculate the perimeter.

..... m [1]

(ii) Calculate the length of a diagonal.

..... m [2]

(b)



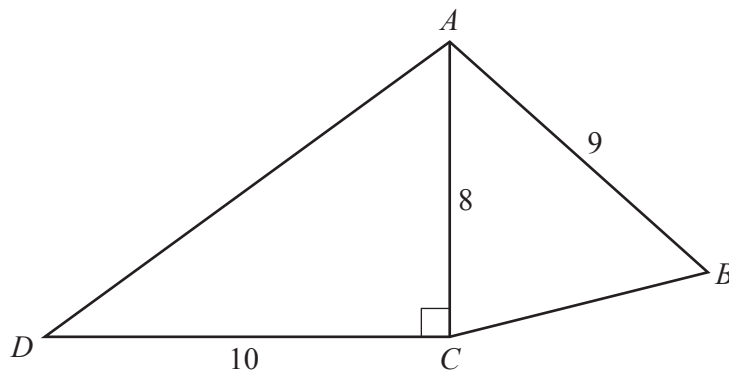
NOT TO  
SCALE

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  $70 \text{ cm}^2$ .

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

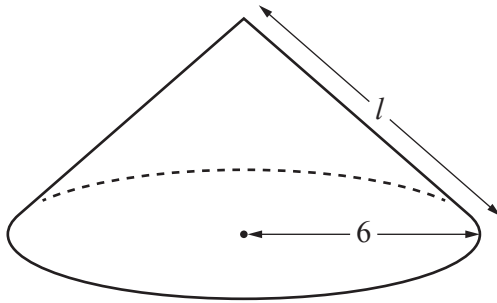
$x =$  ..... [3]

(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.

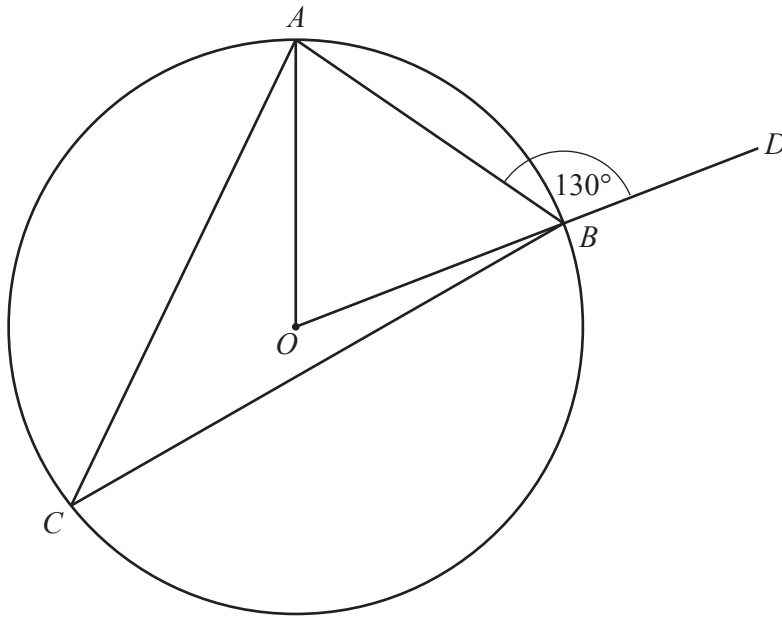
.....  $\text{cm}^3$  [3]

(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.

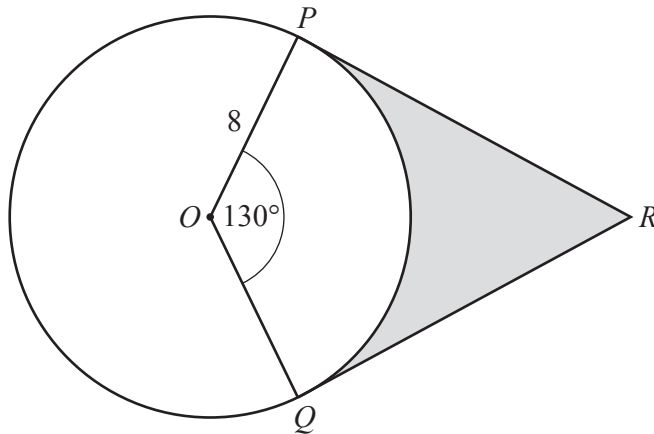
.....

.....

.....

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]





- (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  $\overrightarrow{AB}$ .

$$\overrightarrow{AB} = \begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix} \quad [2]$$

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

Find the coordinates of  $C$ .

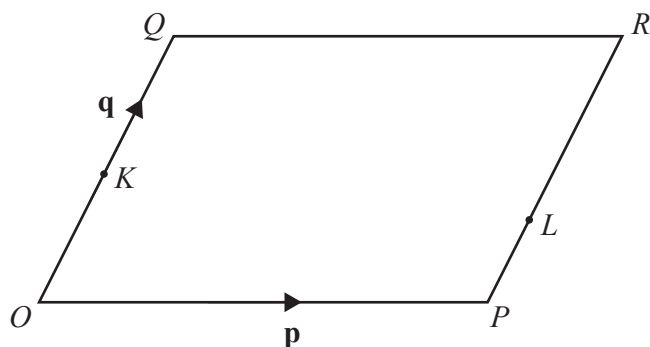
$$(\dots\dots\dots, \dots\dots\dots) \quad [1]$$

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

Find the possible values of  $n$ .

$$n = \dots\dots\dots \text{ or } n = \dots\dots\dots \quad [3]$$

(b)

NOT TO  
SCALE

$OQRP$  is a parallelogram.

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

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

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

Find  $PL : LR$ .

..... : ..... [3]

**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.