Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

8382833755

MATHEMATICS (SYLLABUS D) **4024/21**

Paper 2 **October/November 2021**

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 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.

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1 **(a)** In October, Sara is charged \$84.25 for water.
A tax of 8% is added to this amount.

Calculate the total amount Sara is charged for water in October including tax.

\$ ..... [2]

(b) The table shows the rates that Sara is charged for her gas and electricity supply.
She is charged a fixed amount each day plus an amount for each unit used.

	Cost for one day	Cost for one unit
Gas	23 cents	4.3 cents
Electricity	28 cents	16 cents

(i) Sara uses a total of 960 units of gas in the 30 days of November.

Calculate the total amount, in dollars, Sara is charged for gas in November.

\$ ..... [2]

(ii) Sara is charged a total of \$30.80 for electricity in the 30 days of November.

Calculate the number of units of electricity she used.

..... units [3]

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(c) The amount of electricity generated is measured in Gigawatt hours (GWh).
The table shows information about the amount of electricity generated in different countries.

Country	Electricity generated in 2010 (GWh)	Electricity generated in 2016 (GWh)
Australia	2.37×10^5	2.43×10^5
Japan	1.09×10^6	1.03×10^6
Spain	2.91×10^5	2.64×10^5
Turkey	2.03×10^5	2.62×10^5

(i) Calculate how much more electricity was generated in Japan than in Australia in 2016.
Give your answer in standard form.

..... GWh [1]

(ii) Calculate the percentage increase in electricity generated in Turkey from 2010 to 2016.

..... % [2]

(iii) There was a 4% decrease in the amount of electricity generated in Spain from 2013 to 2016.

Calculate the amount of electricity generated in Spain in 2013.

..... GWh [2]

2 **(a)** The table shows the number of exercise classes attended in one week by each of 80 members of a gym.

Number of classes	0	1	2	3	4	5
Frequency	10	29	26	10	3	2

(i) Find the mode.

..... [1]

(ii) Find the median.

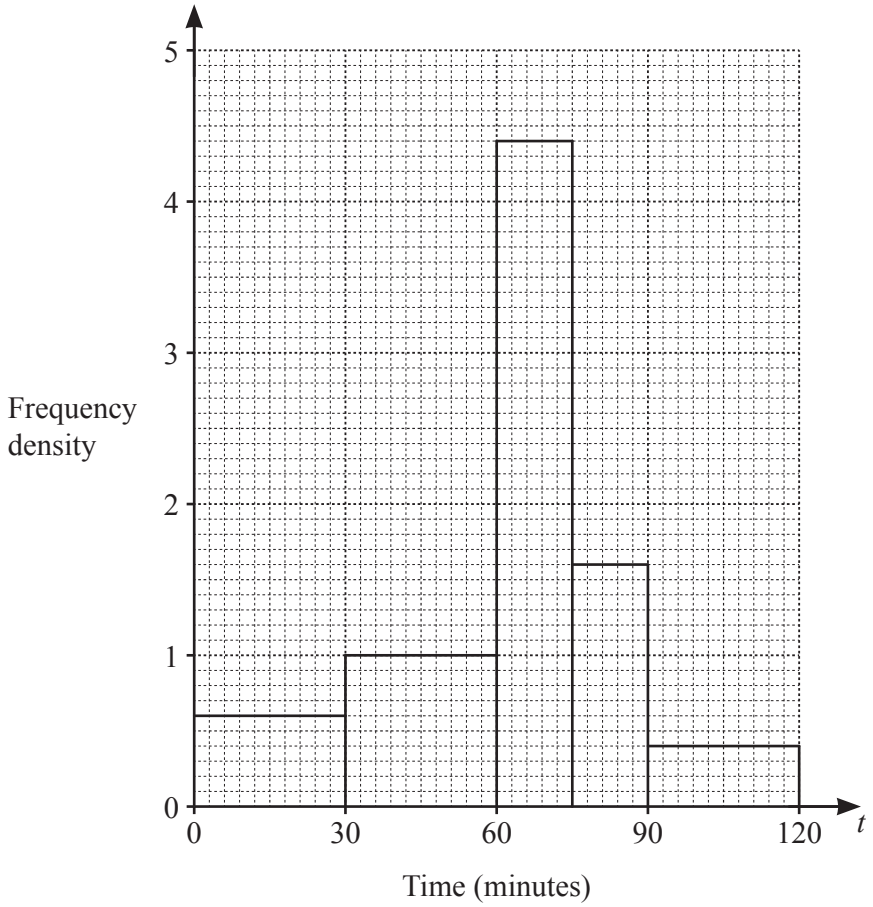
..... [1]

(iii) A pie chart is drawn to show this information.

Calculate the angle representing 5 classes attended.

..... [2]

(b) Some members of the gym were surveyed about how much time they spent at the gym.
The histogram shows the times, t minutes, they spent on their last visit.



(i) Thirty members spent between 30 and 60 minutes at the gym.

Calculate the number of members surveyed.

..... [3]

(ii) Rohit says:

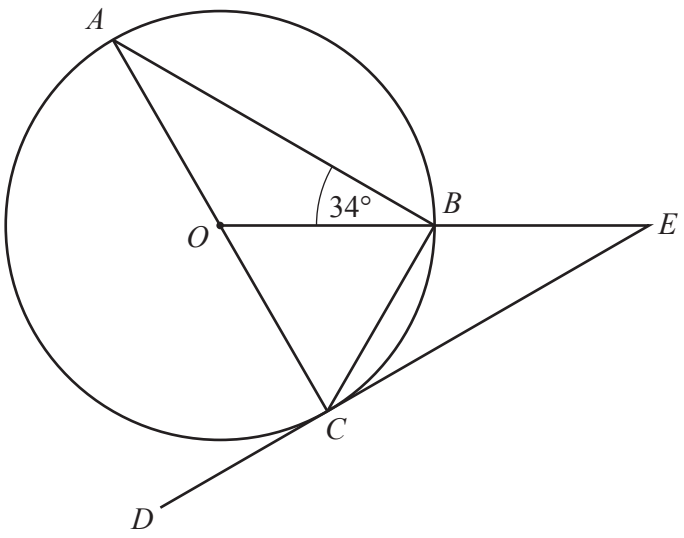
One tenth of these members spent longer than $1\frac{1}{2}$ hours at the gym on their last visit.

Is he correct?
Justify your answer.

.....

..... [2]

3 **(a)**



NOT TO SCALE

Points A, B and C are on the circle, centre O.
AOC and OBE are straight lines.
DE is a tangent to the circle at C.
$A\hat{B}O = 34°$.

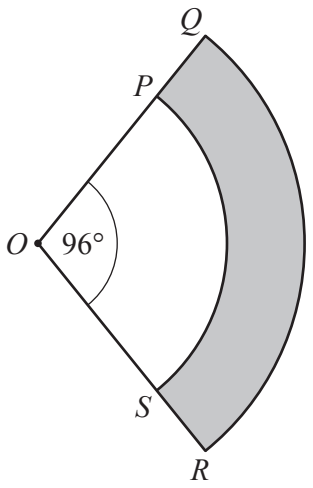
(i) Explain why triangle AOB is isosceles.

..... [1]

(ii) Find $B\hat{E}C$.

$B\hat{E}C =$ ..... [3]

(b)



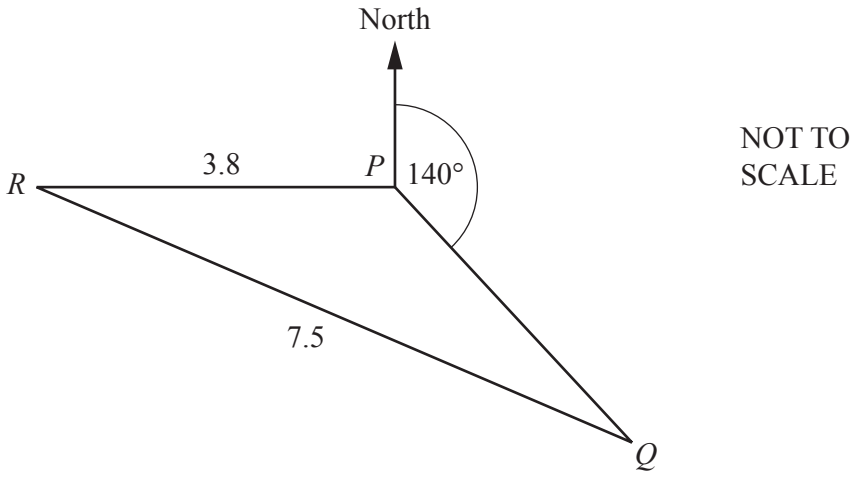
NOT TO SCALE

OPS and *OQR* are sectors of circles each with centre *O*.
OPQ and *OSR* are straight lines.
$OP = 7.4\,\text{cm}$, $PQ = 1.2\,\text{cm}$ and $Q\hat{O}R = 96°$.

Calculate the shaded area.

..... cm^2 [3]

4 **(a)**



The diagram shows the positions of three villages, P, Q and R.
R is due west of P and Q is on a bearing of 140° from P.
$PR = 3.8$ km and $QR = 7.5$ km.

(i) Calculate angle PRQ.

Angle PRQ = ... [4]

(ii) Work out the bearing of R from Q.

..... [2]

(b) The distance by road from village *P* to village *T* is 16.5 km.

Kwesi leaves village *P* at 10 30 and drives to village *T* at an average speed of 45 km/h.
He stops in village *T* for 15 minutes.
He then drives back to village *P* and arrives there at 11 35.

Calculate Kwesi's average speed, in km/h, for the journey back from village *T* to village *P*.

..... km/h [4]

5 **(a)**

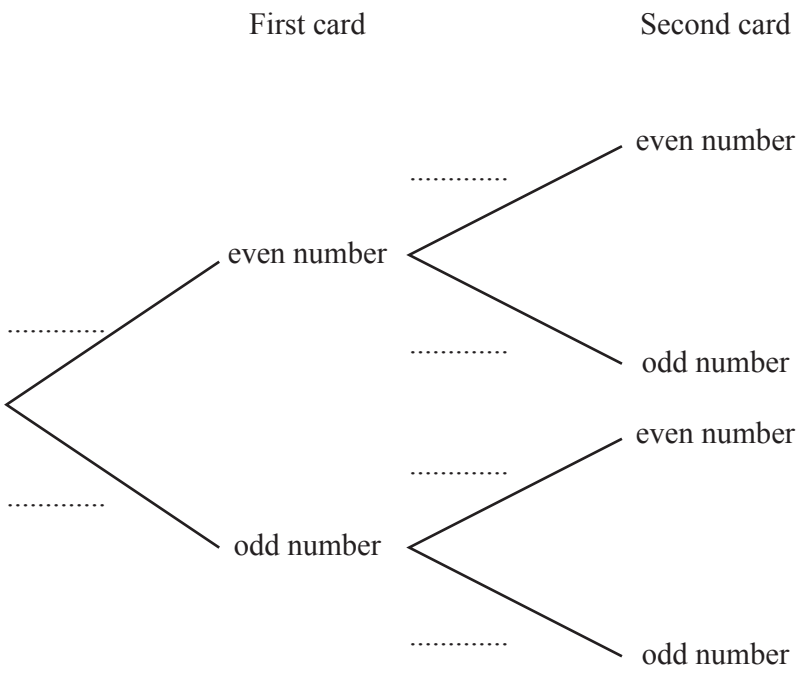
2	2	2	3	4	5	5	6	8	9

Khalid has these 10 number cards.
He takes a card at random, notes the number and replaces it.
He then takes a second card.

(i) Find the probability that the first card Khalid takes shows an even number.

..... [1]

(ii) Complete the tree diagram.



[2]

(iii) Work out the probability that Khalid takes one odd number and one even number.

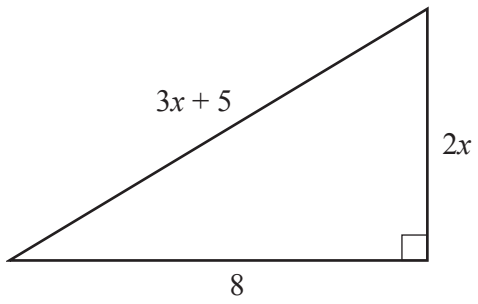
..... [2]

(b) Basma has a bag containing 5 yellow counters, 3 pink counters and 4 black counters.
She takes two counters from the bag at random, without replacement.

Find the probability that she takes one yellow counter and one pink counter.
Give your answer as a fraction in its simplest form.

..... [3]

6 **(a)**



NOT TO SCALE

The diagram shows a right-angled triangle, with dimensions given in centimetres.

(i) Show that $5x^2 + 30x - 39 = 0$.

[3]

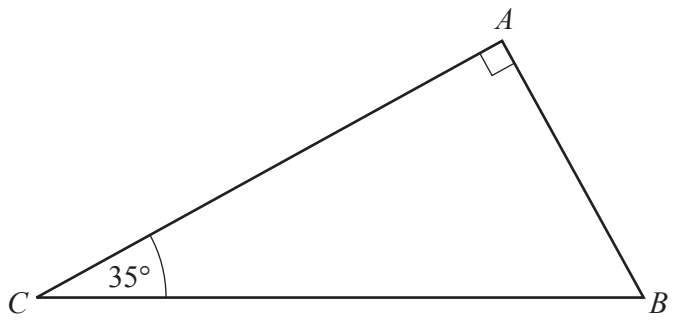
(ii) Solve the equation $5x^2 + 30x - 39 = 0$.
Show your working and give your answers correct to 2 decimal places.

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

(iii) Calculate the area of the triangle.

..... cm^2 [2]

(b)



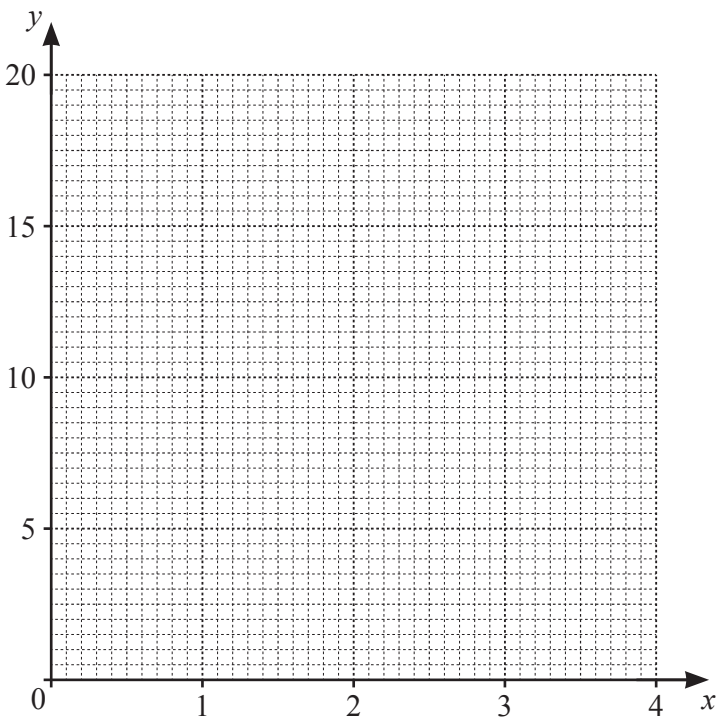
NOT TO SCALE

The diagram shows a different right-angled triangle.
The length of the hypotenuse is 12 cm.

Calculate the shortest distance from A to BC.

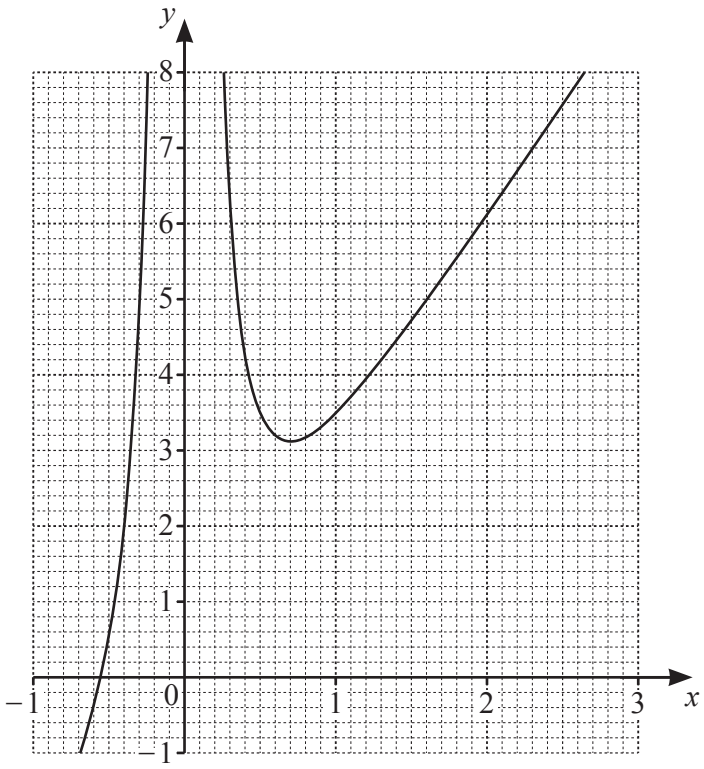
..... cm [4]

7 **(a)** On the grid below, draw the graph of $y = 2^x$ for $0 \leqslant x \leqslant 4$.



[4]

(b)



The diagram shows the graph of $y = \frac{1}{2x^2} + 3x$ for $-1 \leqslant x \leqslant 3$.

(i) By drawing a tangent, estimate the gradient of the curve at $x = 0.5$.

..... [2]

(ii) Use the graph to estimate the solution of the equation $\frac{1}{2x^2} + 3x = 2$.

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

(iii) By drawing a suitable line on the grid, estimate the solutions of the equation $\frac{1}{2x^2} = 7 - 4x$.

$x =$ ..... , $x =$ ..... , $x =$ ..... [4]

8 A is the point $(-2, 3)$ and B is the point $(4, 5)$.

(a) Find the coordinates of the midpoint of AB.

(..... , ...) [1]

(b) Show that the equation of line AB is $3y = x + 11$.

[3]

(c) Find the equation of the perpendicular bisector of line AB.

..... [3]

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9 **(a)** Solve $3x - 8 = 7$.

$x =$ ..... [2]

(b) Solve the inequality $7x < 3(2 - x)$.

..... [2]

(c) Solve $\dfrac{3}{x-2} + \dfrac{x}{x+5} = 1$.

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

(d) Simplify $\dfrac{2x^2 + 3x + 4xy + 6y}{2x^2 + 11x + 12}$.

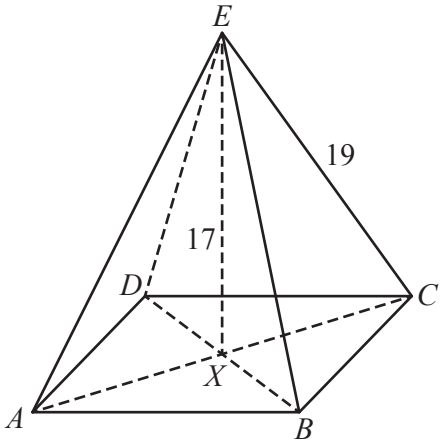
..... [4]

10 **(a)** A cuboid measures 6.2 cm by 4.8 cm by 2.5 cm.
Each measurement is given correct to the nearest millimetre.

Calculate the upper bound of the surface area of the cuboid.

..... cm^2 [3]

(b) **[Volume of a pyramid = $\frac{1}{3}$ × base area × height]**



The diagram shows a square-based pyramid *ABCDE*.
Vertex *E* is vertically above *X*, the centre of the square base.
The height of the pyramid, *EX*, is 17 cm.
EC = 19 cm.

(i) Show that the length of the base is 12 cm.

[4]

(ii) Calculate the volume of the pyramid.

..... cm^3 [2]

(iii) Calculate angle *CBE*.

Angle *CBE* = ... [3]

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