

CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

CANDIDATE
NAME

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CENTRE
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MATHEMATICS

4048/02

Paper 2

October/November 2021

2 hours 30 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE ON ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [] at the end of each question or part question.

The total of the marks for this paper is 100.

1 (a) Solve the inequality $\frac{2x+5}{2} > 1-4x$.

Answer [2]

(b) It is given that $a = 2n(n-3k)$.

(i) Find a when $n = 0.5$ and $k = -1.2$.

Answer $a =$ [1]

(ii) Express k in terms of a and n .

Answer $k =$ [2]

(c) Solve the equation $\frac{3x}{x-4} + \frac{5}{2x+1} = 1$.

Give your solutions correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [5]

- 2 (a) The value of fuels and lubricants exported from Singapore in 2017 was \$90 182 million.

Write \$90 182 million in standard form correct to 3 significant figures.

Answer \$ [1]

- (b) The value of food exported from Singapore in 2012 was \$6230 million.
The value of food exported from Singapore in 2017 was \$8007 million.

Calculate the percentage increase in the value of food exported from 2012 to 2017.

Answer % [2]

- (c) The value of machinery and equipment exported from Singapore in 2012 was $\$2.3 \times 10^{11}$.
In 2017 this had increased by 9.3%.

Calculate the value of machinery and equipment exported in 2017.

Answer \$ [2]

- (d) From 2012 to 2017 the value of manufactured goods imported into Singapore decreased by 6.1%.
In 2017 the value was $\$1.8 \times 10^{10}$.

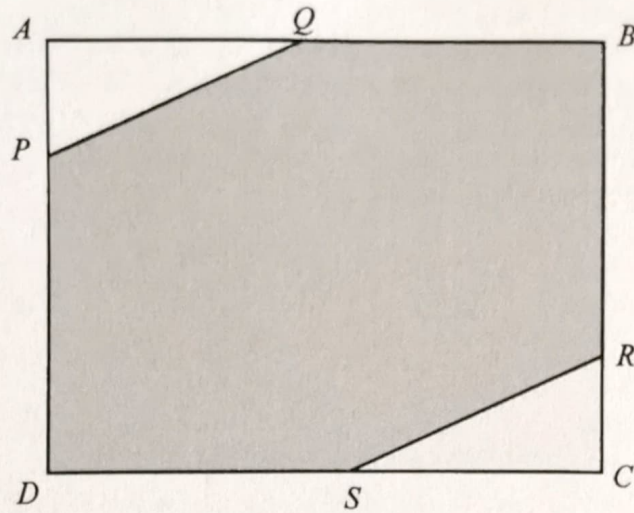
Calculate the value of manufactured goods imported in 2012.

Answer \$ [2]

- (e) Jiao buys a camera in Japan costing 155 000 Yen.
She pays GST at 7% on the cost of the camera when she returns to Singapore.
The exchange rate between Singapore dollars and Japanese Yen is \$1 = 80.4 Yen.

Calculate the amount, in dollars, Jiao spent on the camera including GST.
Give your answer correct to the nearest dollar.

Answer \$ [3]



$ABCD$ is a rectangle.

The area of the rectangle is 80 cm^2 .

Triangle PAQ and triangle RCS are removed from the rectangle.

$DP = QB = BR = SD = 4 \text{ cm}$.

$AD = x \text{ cm}$.

(a) Find an expression, in terms of x , for AQ .

Answer $AQ = \dots\dots\dots \text{ cm}$ [2]

(b) Show that the shaded area, $y \text{ cm}^2$, is given by $y = \frac{320}{x} + 4x - 16$.

Answer

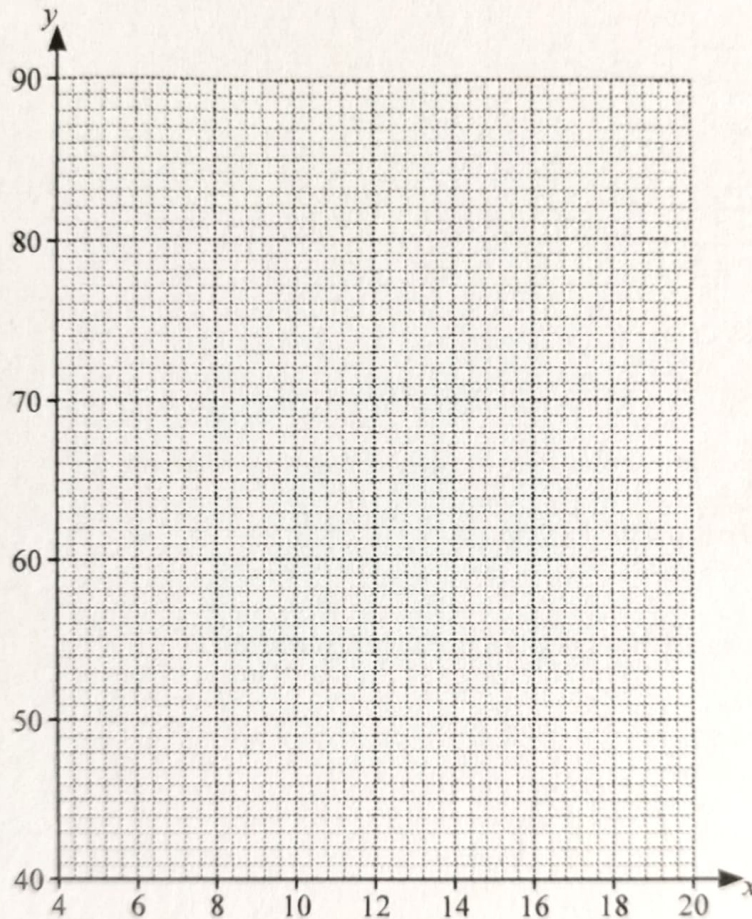
(c) Complete the table of values for $y = \frac{320}{x} + 4x - 16$.

Values are given to 1 decimal place where appropriate.

x	4	6	8	10	12	14	16	18	20
y	80	61.3	56	56	58.7	62.9	68		80

[1]

(d) On the grid, draw the graph of $y = \frac{320}{x} + 4x - 16$ for $4 \leq x \leq 20$.



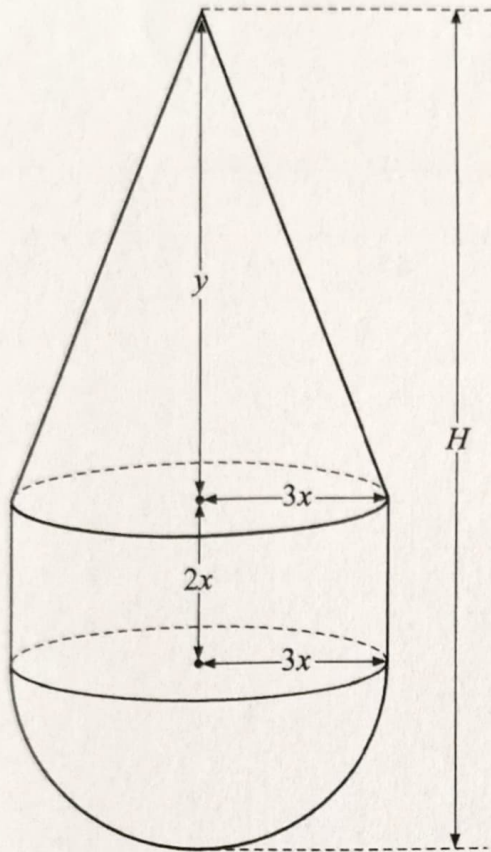
[3]

(e) Use your graph to find the greatest value of x when the shaded area is equal to 60 cm^2 .

Answer [1]

(f) Explain how the graph shows that the shaded area cannot be equal to 50 cm^2 .

.....
 [1]



The diagram shows a solid formed from a cone, a cylinder and a hemisphere.
The cone has base radius $3x$ cm and height y cm.
The cylinder has radius $3x$ cm and height $2x$ cm.
The hemisphere has radius $3x$ cm.

- (a) The volume of the cone is twice the volume of the hemisphere.

Show that $y = 12x$.

Answer

(b) The total surface area of the solid is 300 cm^2 .

Calculate the total height, H , of the solid.

Answer cm [6]

5 The coordinates of point A are $(5, 5)$.

Line p passes through point A and has gradient $-\frac{2}{9}$.

(a) Show that the equation of line p is $9y + 2x = 55$.

Answer

[2]

(b) The equation of line q is $3y = 4x - 26$.

Find the coordinates of the point of intersection of line p and line q .

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

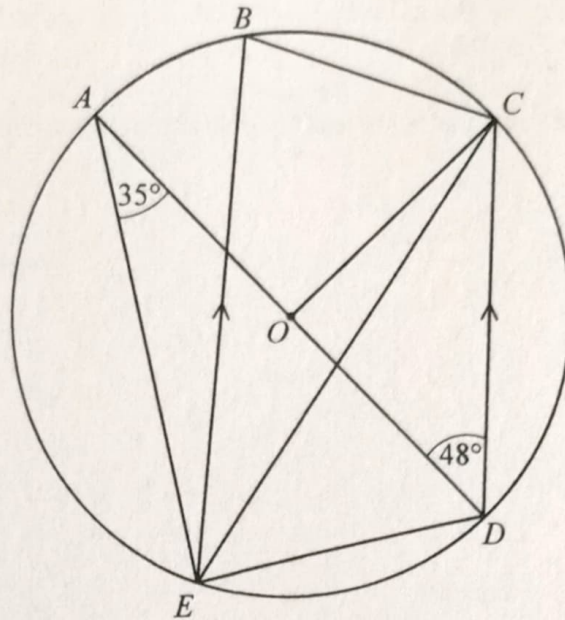
(c) Line p intersects the y -axis at point B and line q intersects the y -axis at point C .
Line q intersects the line $x = 5$ at point D .

(i) Explain why $ABCD$ is a trapezium and state the distance between the parallel sides.

.....
.....
..... [2]

(ii) Calculate the area of trapezium $ABCD$.

Answer units² [4]



The diagram shows a circle $ABCDE$, centre O .

BE is parallel to CD .

Angle $EAD = 35^\circ$ and angle $ADC = 48^\circ$.

- (a) Find angle BED .
Give a reason for each step of your working.

Answer Angle $BED = \dots\dots\dots$ [3]

- (b) Find angle BCE .
Give a reason for each step of your working.

Answer Angle $BCE = \dots\dots\dots$ [3]

(c) The radius of the circle is 5 cm.

Calculate the area of the major sector $OAEDC$.

Answer cm^2 [3]

7 Here are the first four terms of a sequence.

$$\frac{1}{2} \quad \frac{5}{4} \quad \frac{9}{6} \quad \frac{13}{8}$$

(a) Find the fifth term of the sequence.

Answer [1]

(b) T_n is the n th term of the sequence.

Find an expression, in terms of n , for T_n .

Answer $T_n =$ [3]

(c) The difference, D , between two consecutive terms of the sequence is $T_{n+1} - T_n$.

Show that $D = \frac{3}{2n(n+1)}$.

Answer

[3]

(d) Explain why the difference between two consecutive terms of the sequence is always less than 1.

Answer

.....

..... [1]

8 (a) The position vector of point R is $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$.

The position vector of point S is $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$.

(i) (a) Find the vector that represents the translation from R to S .

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

(b) Find the magnitude of \overrightarrow{RS} .

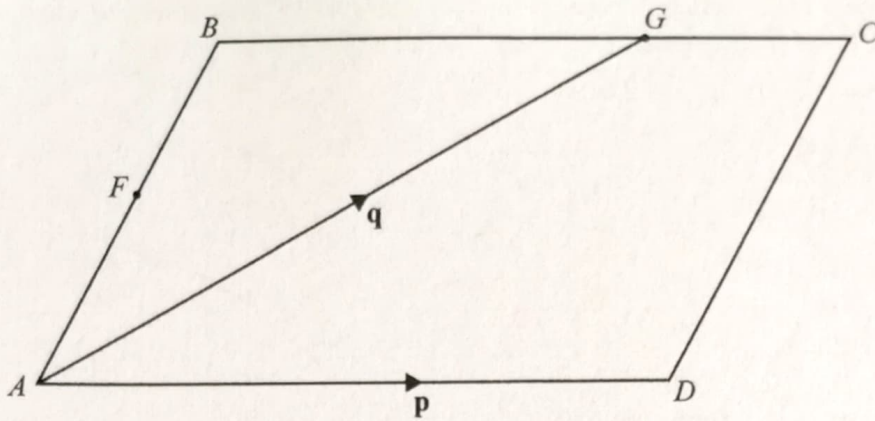
Answer [2]

(ii) The position vector of T is $\begin{pmatrix} k \\ 7 \end{pmatrix}$ and $|\overrightarrow{ST}| = 10$.

Find the two possible values of k .

Answer $k = \dots$ or \dots [3]

(b)



$ABCD$ is a parallelogram.

F is the point on AB such that $AF:AB = 1:2$.

G is the point on BC such that $BG:GC = 3:1$.

$\vec{AD} = \mathbf{p}$ and $\vec{AG} = \mathbf{q}$.

(i) Express \vec{CD} , as simply as possible, in terms of \mathbf{p} and \mathbf{q} .

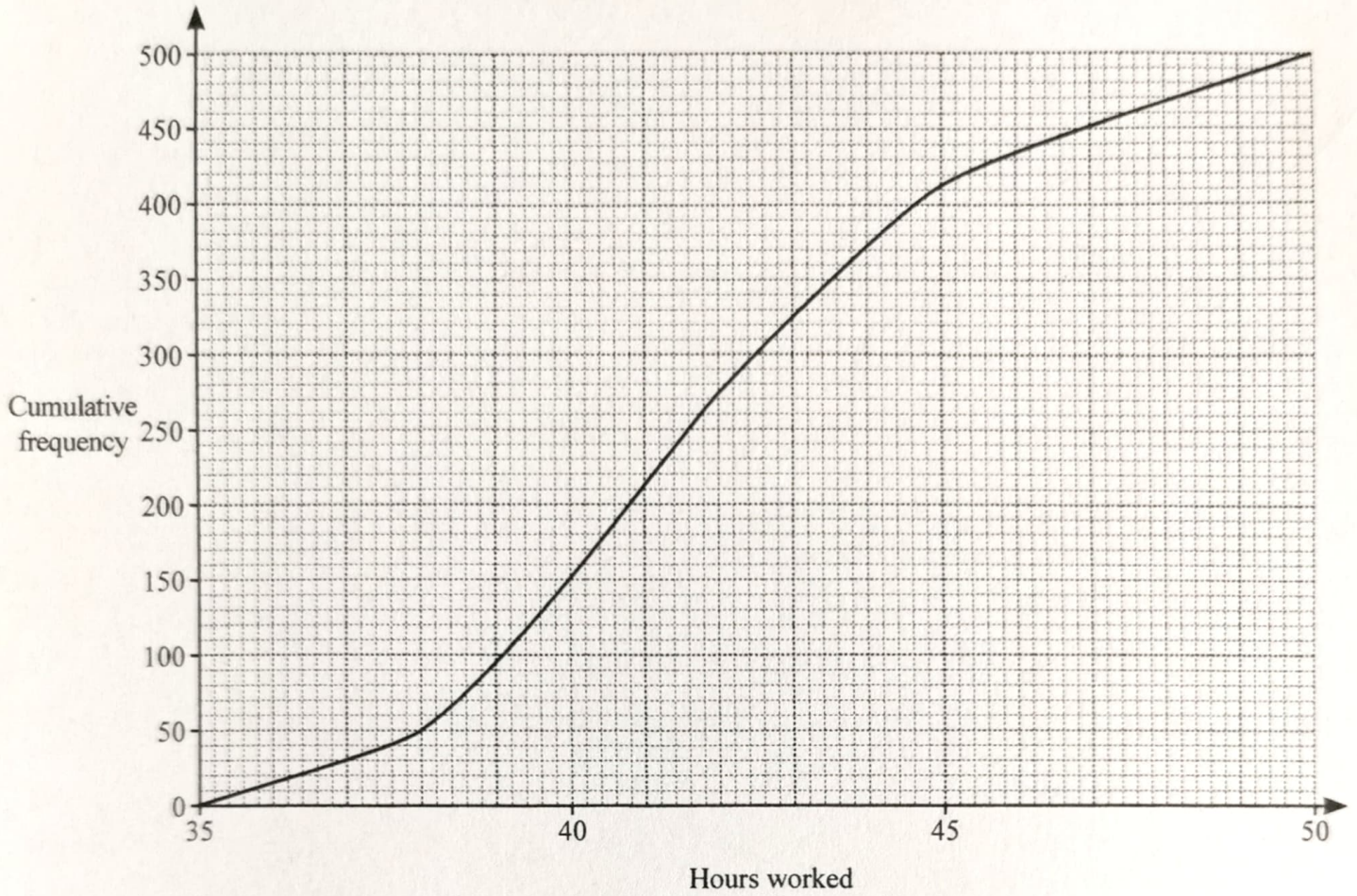
Answer $\vec{CD} = \dots\dots\dots$ [2]

(ii) H is the point such that $\vec{DH} = \vec{GF}$.

Express \vec{AH} , as simply as possible, in terms of \mathbf{p} and \mathbf{q} .

Answer $\vec{AH} = \dots\dots\dots$ [4]

- 9 (a) A company recorded the number of hours worked in one week by each of its 500 employees. The cumulative frequency curve shows the distribution of the results.



(i) Use the curve to estimate

(a) the median hours worked,

Answer hours [1]

(b) the interquartile range of the number of hours worked.

Answer hours [2]

(ii) In 2017, the average number of paid hours worked in a week in Singapore was 45.1 hours.

Calculate the percentage of the company's employees who worked more than this average.

Answer % [2]

(iii) The company wants to reduce the working hours of each of its employees by 3 hours per week.

Describe the effect this change would have on the cumulative frequency curve.

.....
..... [1]

(b) A small business has 16 employees.

One of the 16 employees is selected at random.

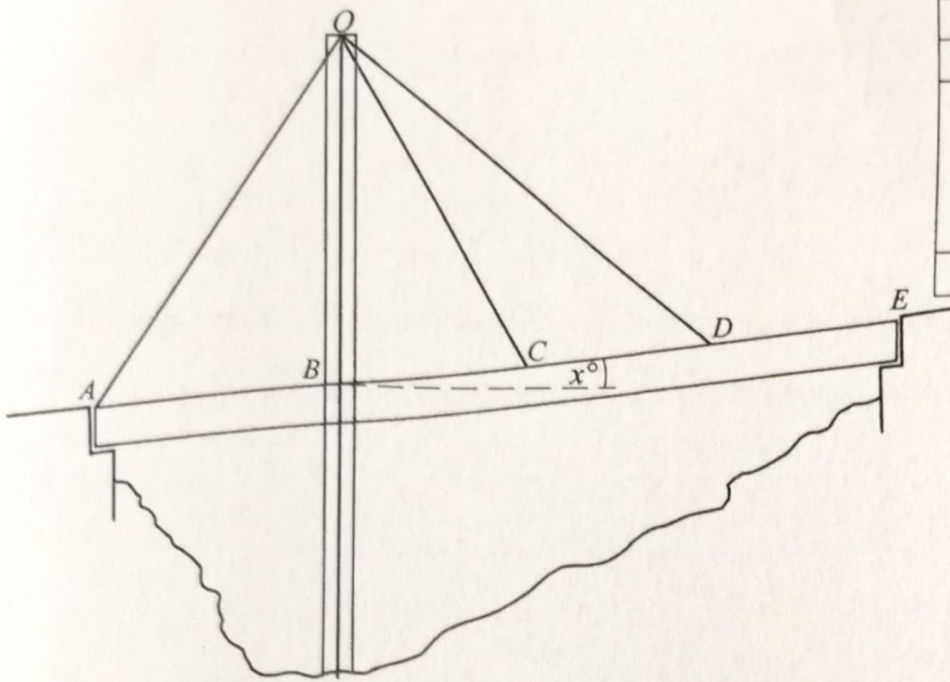
The probability that it is a man working part time is $\frac{1}{8}$.

Two of the 16 employees are selected at random.

The probability that they are both women working full time is $\frac{1}{8}$.

Complete the table of information about the 16 employees of the business.

	Part-time workers	Full-time workers
Men		5
Women		



Key dimensions		
Part		Length (m)
Mast	<i>OB</i>	35.0
	<i>AB</i>	30.0
Deck	<i>BC</i>	20.0
	<i>CD</i>	20.0
	<i>DE</i>	20.0
Cable	<i>OA</i>	48.3

The diagram represents a cable-stayed footbridge.
 The deck *ABCDE* is supported by three cables, *OA*, *OC* and *OD*.
 The cables are suspended from the vertical mast *OB*.
 The deck is at an angle of x° to the horizontal.

Cable *OA* has diameter 64 mm.
 Cable *OC* and *OD* both have diameter 44 mm.

Information about cables used in bridge building is shown in the table below.

Product code	Diameter (mm)	Design load (kN)	Unit mass (kg/m)
FLC 32	32	615	5.7
FLC 36	36	779	7.2
FLC 40	40	973	9.0
FLC 44	44	1179	10.8
FLC 48	48	1403	12.9
FLC 52	52	1667	15.3
FLC 56	56	1933	17.8
FLC 60	60	2218	20.4
FLC 64	64	2524	23.2
FLC 68	68	2848	26.2

(a) The gradient of the bridge deck is such that the ratio vertical distance : horizontal distance is 1 : 10.

Use the ratio to show that $x = 5.7$, correct to 1 decimal place.

Answer

(b) Show that $OC = 38.5$ m, correct to 1 decimal place.

Answer

[3]

(c) The bridge engineer has specified a maximum of 2.1 tonnes for the total mass of the three cables.
1 tonne is equal to 1000 kg.

Do the cables meet the engineer's specification?
Justify your decision.

Answer

.....
..... [6]