

CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION  
General Certificate of Education Ordinary Level

CANDIDATE  
NAME

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CENTRE  
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INDEX  
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## MATHEMATICS

Paper 2

October/November 2022

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  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

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  $\frac{x}{7} + \frac{x-5}{3} = 1$ .

Answer  $x = \dots\dots\dots$  [2]

(b) Simplify  $\frac{6a^3b}{5} \div \frac{3a^2}{10b}$ .

Answer  $\dots\dots\dots$  [1]

(c) Solve the equation  $x^2 + 9x - 16 = 0$  by completing the square.  
Give your solutions correct to two decimal places.

Answer  $x = \dots\dots\dots$  or  $\dots\dots\dots$  [4]

(d) Simplify  $\frac{4x^2 - 8ax - 3x + 6a}{3x^2 - 12a^2}$ .

*Answer* ..... [3]



2 (a) Cheryl has some money to invest for 5 years.

Account A pays 1% per year simple interest.

Account B pays 1% per year compound interest.

Explain why Account B is the better choice for Cheryl's investment.

.....

..... [1]

(b) Marcus invests in an account that pays 1.8% per year simple interest.

He leaves the money in the account for 6 years.

At the end of 6 years there is \$1385 in the account.

Calculate the amount of money Marcus invested.

Answer \$ ..... [3]

(c) Tan invests in an account that pays 1.2% per year compound interest.

He leaves the money in the account for 4 years.

At the end of 4 years there is \$4719.92 in the account.

Calculate the total amount of interest Tan earned over the 4 years.

Answer \$ ..... [3]

- (d) Helen hires a car during a business trip in France.  
She drives a total of 745 km.  
The car uses fuel at an average rate of 5.8 litres/100 km.

She pays €134.50 for car hire and €1.52 per litre of fuel.

She pays using her credit card and is charged a fee of 1.5% for the currency conversion.

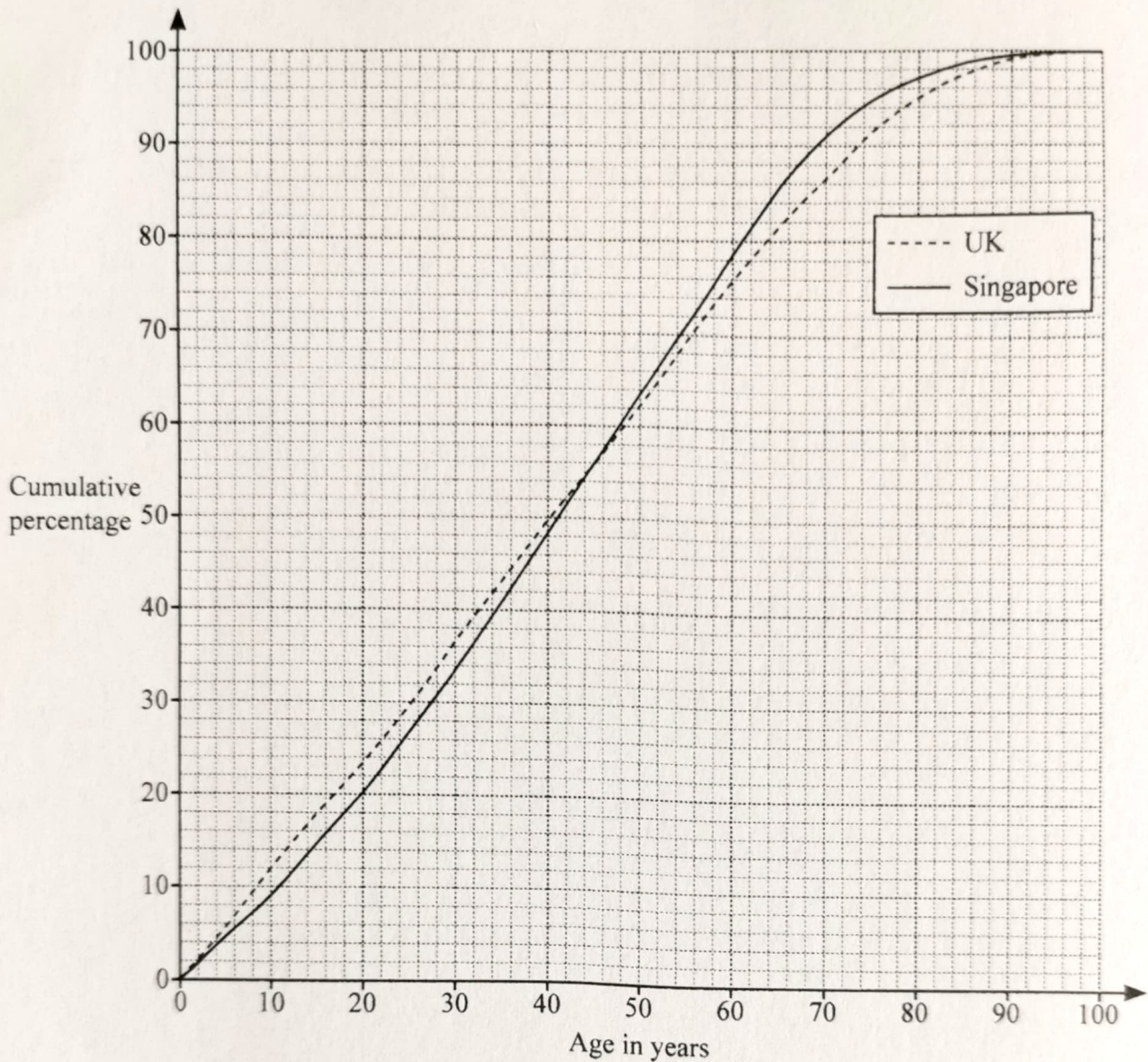
The exchange rate between Singapore dollars and euros is \$1 = €0.66 .

Calculate the total amount, including credit card fee, Helen is charged for car hire and fuel.  
Give your answer in Singapore dollars correct to the nearest cent.

*Answer* \$ ..... [4]



- 3 The cumulative percentage curve shows the age distributions of the resident populations of Singapore and the UK in 2019.



(a) Use the curve to estimate

- (i) the median age for Singapore,

Answer ..... [1]

- (ii) the percentage of the UK population aged over 60,

Answer ..... % [1]

- (iii) the 80th percentile for Singapore.

Answer ..... [1]

(b) In 2019, the resident population of Singapore was 4.03 million.

Calculate an estimate of the number of people aged under 25 in Singapore in 2019.

*Answer* ..... [2]

(c) The range of ages for Singapore is the same as the range for the UK.

Make two more comparisons between the age distribution in Singapore and the UK.  
Use figures to support your answer.

1. ....

.....

2. ....

.....

[3]

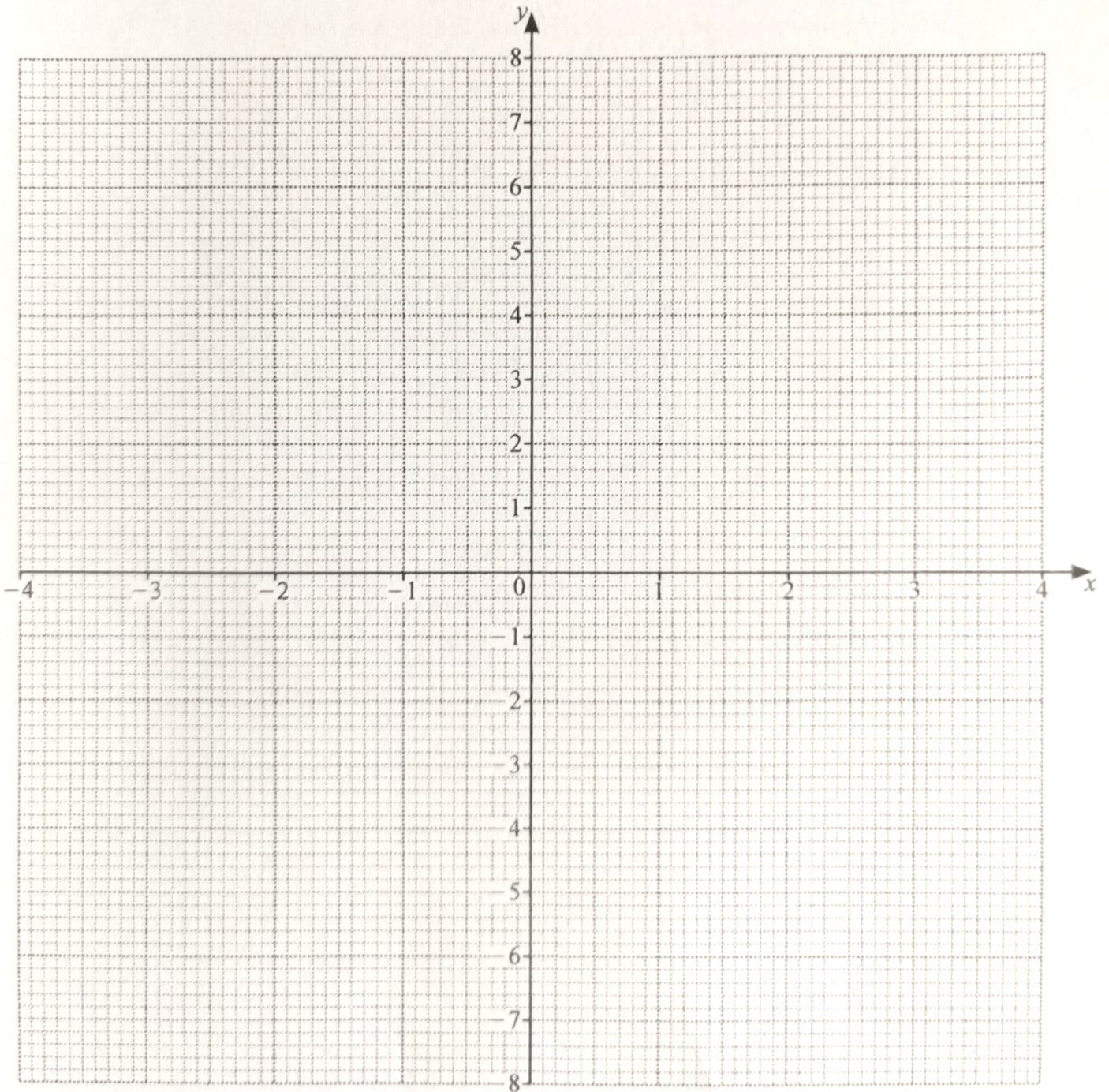


- 4 (a) Complete the table of values for  $y = \frac{x^3}{5} - 2x + 1$ .

$x$	-4	-3	-2	-1	0	1	2	3	4
$y$		1.6	3.4	2.8	1	-0.8	-1.4	0.4	5.8

[1]

- (b) On the grid, draw the graph of  $y = \frac{x^3}{5} - 2x + 1$  for  $-4 \leq x \leq 4$ .



[3]



(c) The equation  $\frac{x^3}{5} - 2x + 1 = k$  has two solutions.

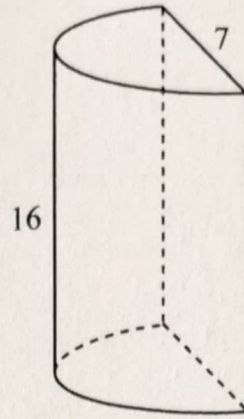
Use your graph to find the two possible values of  $k$ .

*Answer*  $k = \dots\dots\dots$  or  $\dots\dots\dots$  [2]

(d) By drawing a suitable straight line on the grid, solve the equation  $2x^3 - 25x + 20 = 0$ .

*Answer*  $\dots\dots\dots$  [4]

5 (a)



The diagram shows a solid in the shape of a half cylinder.  
The diameter is 7 cm and the height is 16 cm.

(i) Calculate the volume of the solid.

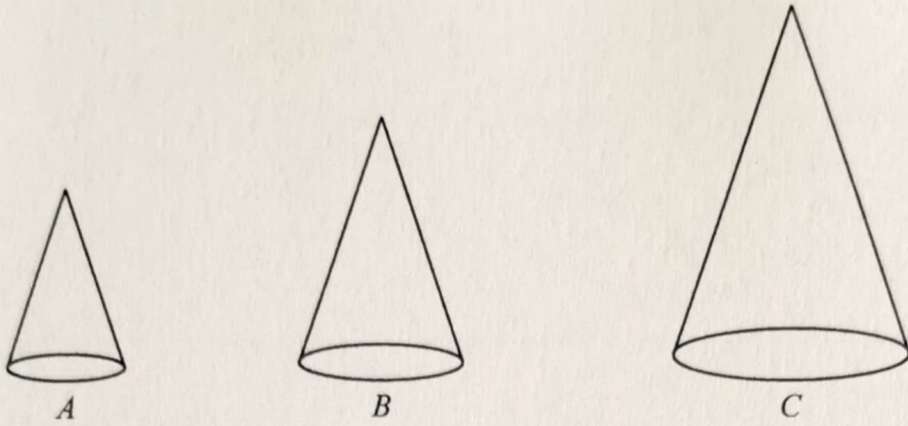
Answer .....  $\text{cm}^3$  [2]

(ii) Calculate the total surface area of the solid.

Answer .....  $\text{cm}^2$  [3]



(b)



$A$ ,  $B$  and  $C$  are similar cones.

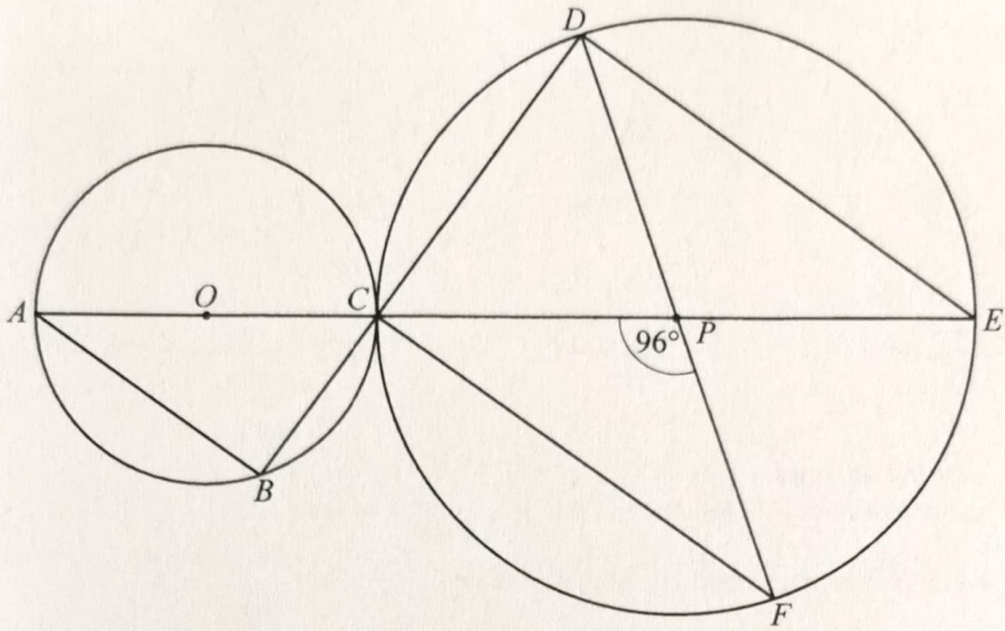
The ratio volume of cone  $A$  : volume of cone  $B$  : volume of cone  $C = 1 : 3 : 8$ .

(i) Find the ratio height of cone  $A$  : height of cone  $C$ .

*Answer* ..... : ..... [1]

(ii) Find the surface area of cone  $B$  as a percentage of the surface area of cone  $C$ .

*Answer* .....% [2]



The diagram shows two circles that touch at  $C$ .  
 $A, B$  and  $C$  are points on the smaller circle, centre  $O$ .  
 $C, D, E$  and  $F$  are points on the larger circle, centre  $P$ .  
 $AOCPE, BCD$  and  $DPF$  are straight lines.  
 Angle  $CPF = 96^\circ$ .

(a) Find angle  $DEP$ .

Answer ..... [2]

(b) Show that triangle  $ABC$  is similar to triangle  $FCD$ .  
 Give a reason for each statement you make.

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.....

..... [3]



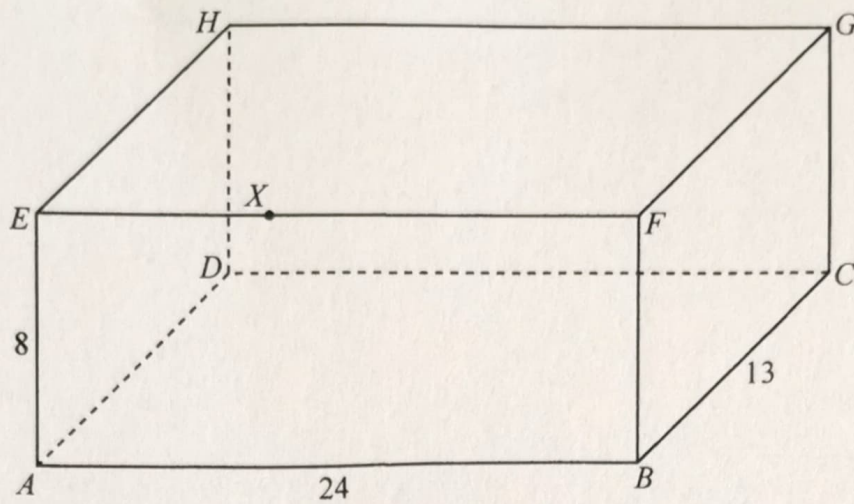
(c)  $DE = 7.21$  cm,  $DF = 9.70$  cm and  $BD = 9.10$  cm and angle  $CPF = 96^\circ$ .

(i) Calculate  $AB$ .

*Answer* ..... cm [4]

(ii) Calculate the length of the minor arc  $AB$ .

*Answer* ..... cm [3]



The diagram shows a cuboid  $ABCDEFGH$ .  
 $AB = 24$  cm,  $BC = 13$  cm and  $AE = 8$  cm.  
 $X$  is a point on  $EF$  such that  $EX : XF = 3 : 5$ .

(a) Calculate the area of trapezium  $ABXE$ .

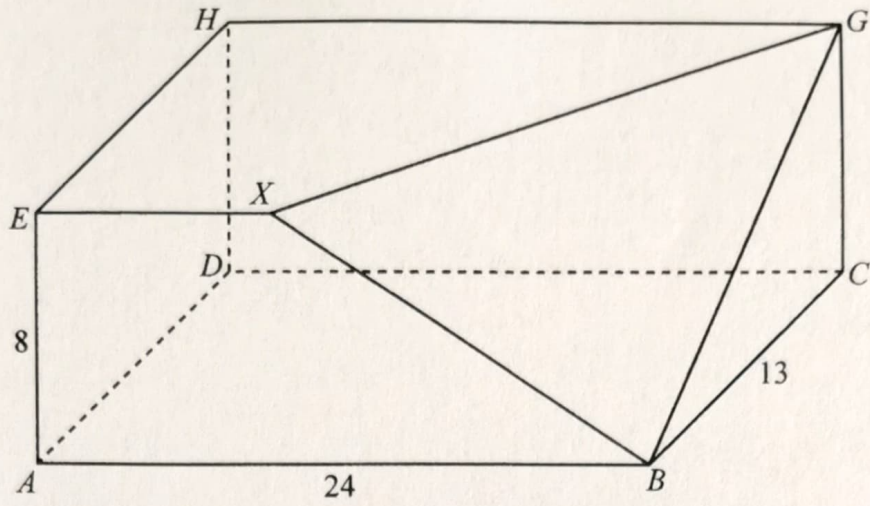
Answer .....  $\text{cm}^2$  [3]

(b) Calculate  $XG$ .

Answer ..... cm [2]



(c)



A pyramid is cut from the cuboid as shown.  
The base of the pyramid is triangle  $BGX$ .

Calculate the area of triangle  $BGX$ .

Answer .....  $\text{cm}^2$  [5]

8 (a)  $P$  is the point  $(-3, 5)$  and  $Q$  is the point  $(2, 11)$ .

$$\overrightarrow{PR} = \begin{pmatrix} 8 \\ -2 \end{pmatrix}.$$

(i) Calculate the length of the line  $PQ$ .

*Answer* ..... [2]

(ii) Find the coordinates of point  $R$ .

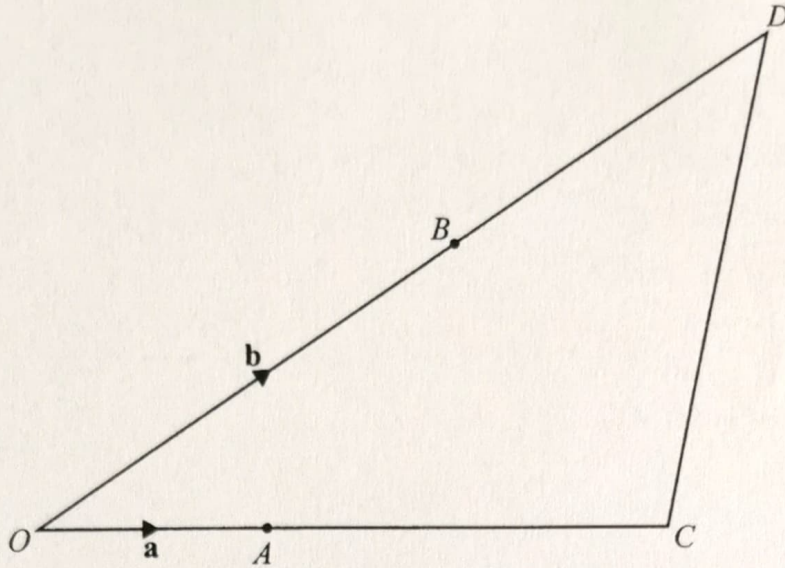
*Answer* ( ..... , ..... ) [1]

(iii) Find the equation of the line  $QR$ .

*Answer* ..... [3]



(b)



$OCD$  is a triangle.

$A$  is a point on  $OC$  and  $B$  is a point on  $OD$ .

$\vec{OA} = \mathbf{a}$  and  $\vec{OB} = \mathbf{b}$ .

$OA = \frac{1}{3}OC$  and  $OB : BD = 3 : 2$ .

$X$  is a point on  $OC$  such that  $BX$  is parallel to  $DC$ .

Find  $\vec{XD}$ .

Give your answer as simply as possible in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

Answer  $\vec{XD} = \dots\dots\dots$  [5]

- 9 (a)  $\mathcal{E} = \{\text{integers } x : 1 \leq x \leq 15\}$   
 $A = \{\text{prime numbers}\}$   
 $B = \{\text{factors of } 30\}$   
 $C = \{\text{multiples of } 3\}$

(i) List the elements in  $A'$ .

Answer ..... [1]

(ii) List the elements in  $(A \cup B)'$ .

Answer ..... [1]

(iii) A number,  $p$ , is chosen at random from the set  $(B \cup C)$ .

Find the probability that  $p \notin C$ .

Answer ..... [2]



(b) The table shows the languages studied by a group of 30 students.

	French	Not French
Spanish	8	12
Not Spanish	7	3

(i) One of the students who studies French is chosen at random.

Find the probability that this student also studies Spanish.

*Answer* ..... [1]

(ii) Two of the students who study Spanish are chosen at random.

Find the probability that both students study Spanish but not French.

*Answer* ..... [2]

(iii) Three students are chosen at random from the whole group.

Find the probability that only one of them studies Spanish.

*Answer* ..... [2]

10 A small business makes jewellery.

Workers are paid a basic hourly rate with an additional payment for each item they make.

Basic rate	\$9.80 per hour
Earrings	\$2.50 per pair
Necklace	\$1.65 each
Bracelet	\$1.45 each
Brooch	\$0.85 each

These are the employment guidelines provided for the workers.

Total of 40 hours per week over 5 days
18 days annual holiday paid at basic hourly rate
Expected annual income at least \$48 000

(a) Abid makes 7 pairs of earrings in one hour.

Calculate the time he takes to make one pair of earrings.

Give your answer correct to the nearest 10 seconds.

*Answer* ..... [1]

(b) Mei makes bracelets.

One day she works for 9 hours and earns a total of \$231.75 .

Show that Mei made an average of 11 bracelets per hour.

*Answer*



- (c) In one day, a total of 132 necklaces are made.  
Chen and Zhu make these necklaces.  
Zhu takes 80 seconds less than Chen does to make each necklace.  
They each work for 8 hours a day.

Can Chen and Zhu each expect to earn the advertised minimum annual income?  
Justify your decision and show your method clearly.

*Answer*