MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | S | | | | |

INDEX NUMBER | | | | |

MATHEMATICS

Paper 2

4048/02

October/November 2019

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 IN 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.

This document consists of **23** printed pages and **1** blank page.

1 **(a)** Simplify $\frac{4p^2r}{3} \div \frac{2r^3}{p}$.

Answer ..... [1]

(b) $a = \frac{3b+4c}{5-b}$

(i) Evaluate a when $b = 6$ and $c = -2$.

Answer $a =$ ..... [1]

(ii) Express b in terms of a and c.

Answer $b =$ ..... [2]

(c) **(i)** Express $9-7x+x^2$ in the form $p+(q+x)^2$.

Answer ..... [2]

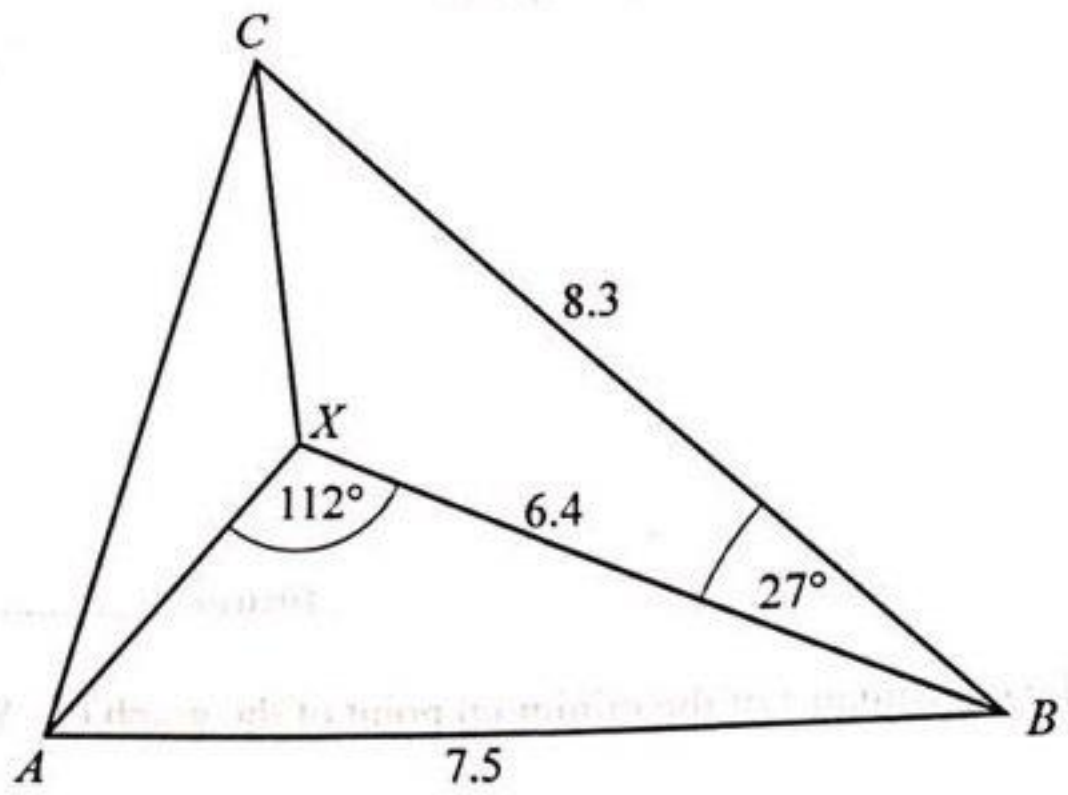
(ii) Write down the coordinates of the minimum point of the graph of $9-7x+x^2$.

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

(d) Solve $\frac{1}{x-3}+\frac{6}{x-1}=2$.

Answer $x =$ ..... or ..... [4]

2



X is a point inside triangle ABC.
$AB = 7.5$ cm, $BC = 8.3$ cm and $BX = 6.4$ cm.
Angle $AXB = 112°$ and angle $XBC = 27°$.

(a) Calculate CX.

Answer ..... cm [3]

(b) Calculate angle XAB.

Answer ..... [2]

(c) Calculate the area of triangle ABC.

Answer .....cm^2 [3]

3 (a) The price of a smartphone is $620 in Singapore.
The price of the same smartphone in the UK is £389.
The exchange rate between Singapore dollars ($) and UK pounds (£) is $1 = £0.58 .

Calculate how much cheaper the smartphone is in Singapore than in the UK.

Answer ..... [2]

(b) The price of a tablet is reduced by 6% in a sale.
The sale price of the tablet is $785.

Calculate the price of the tablet before the sale.
Give your answer correct to the nearest dollar.

Answer $ ..... [2]

(c) The table shows information about telecommunications in Singapore.

Year	2010	2015
Mobile phone subscriptions	7.29×10^6	8.21×10^6
SMS messages sent	2.77×10^{10}	1.14×10^{10}
Broadband subscriptions	7.85×10^6	1.20×10^7

(i) Calculate how many more mobile phone subscriptions there were in 2015 than in 2010.
Give your answer in standard form.

Answer ..... [1]

(ii) Calculate the percentage increase in the number of broadband subscriptions from 2010 to 2015.

Answer .....% [2]

(iii) The population of Singapore in 2015 was 5.54×10^6.

Calculate the mean number of SMS messages sent per person per day in 2015.

Answer ..... [3]

4 The variables x and y are connected by the equation $y = \frac{x^3}{5} - 2x + 1$.

Some corresponding values of x and y are given in the table below.

x	−4	−3	−2	−1	0	1	2	3	4
y	p	1.6	3.4	2.8	1	−0.8	−1.4	0.4	5.8

(a) Find the value of p.

Answer $p =$ ..... [1]

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

(c) Use your graph to write down an inequality in x to describe the range of values where $y > 4$.

Answer ..... [1]

(d) (i) On the same grid, draw the graph of $5y + x = 10$ for $-4 \leqslant x \leqslant 4$. [2]

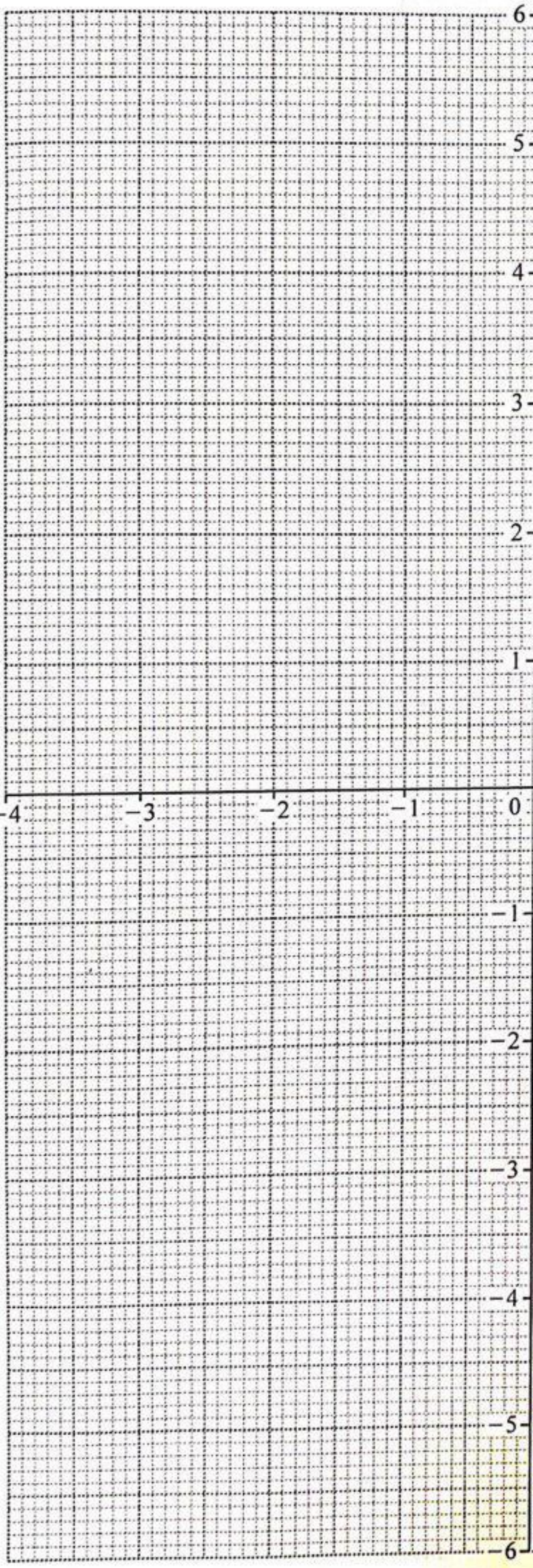
(ii) Show that the points of intersection of the line and the curve give the solutions of the equation $x^3 - 9x - 5 = 0$.

Answer

[2]

(iii) Use your graphs to solve the equation $x^3 - 9x - 5 = 0$.

Answer $x =$ ..... or ..... or ..... [2]



5 (a) The diagram shows part of a number grid.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33			

A rectangular column outlining four numbers, as shown, can be placed anywhere on the grid.

(i) If t represents the number in the top of the rectangle, find an expression, in terms of t, for the product of the top number and the bottom number in the column.

Answer ..... [1]

(ii) Explain why the difference between the product of the middle two numbers and the product of the top and bottom numbers is always 72.

Answer .....

.....

.....

.....

..... [2]

(iii) The rectangular column is placed on the grid such that the sum of the four numbers outlined is 360.

Find the value of the largest number in the column.

Answer ..... [3]

(b) In a sequence, S, the difference between consecutive terms is constant.
The third term of this sequence is 36.
The sixth term of this sequence is 60.

(i) Find an expression, in terms of n, for the nth term of this sequence.

Answer ..... [2]

(ii) Explain why the terms of the sequence are all multiples of 4.

Answer .....

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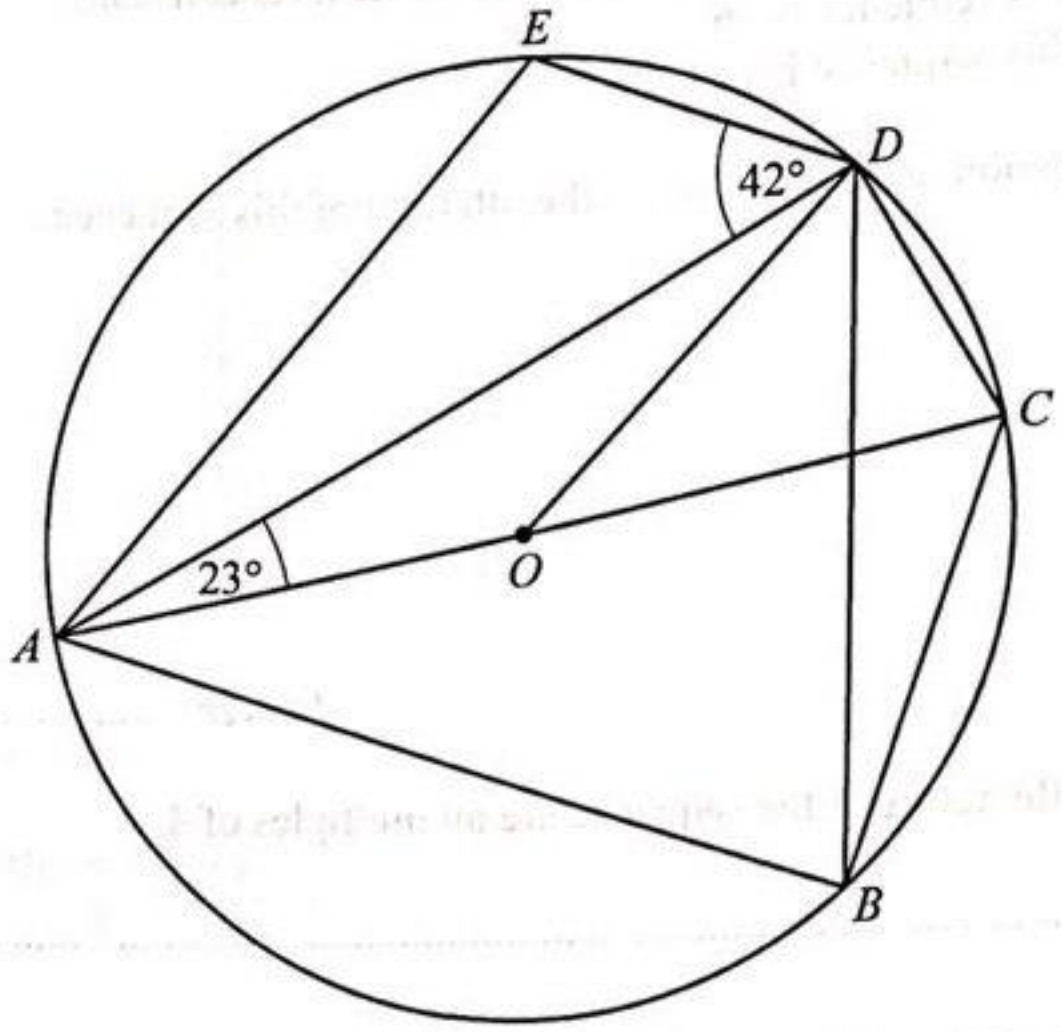
..... [1]

6 (a)



A, B, C, D and E are points on the circle, centre O.
AC is a diameter of the circle.
Angle $OAD = 23°$ and angle $ADE = 42°$.

Find, giving reasons for each answer,

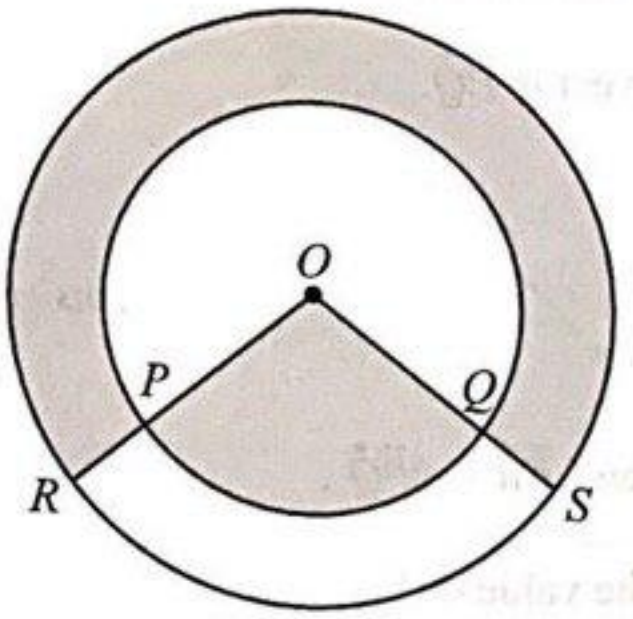
(i) angle ABD,

Answer ..... [3]

(ii) angle EAD.

Answer ..... [3]

(b)



P and Q are points on the circle centre O with radius 4 cm.
R and S are points on the circle centre O with radius 6 cm.
OPR and OQS are straight lines.
The perimeter of the minor sector OPQ is 15.2 cm.

(i) Calculate angle POQ in radians.

Answer .....radians [2]

(ii) Calculate the total shaded area.

Answer .....cm^2 [3]

7 (a) P is the point (4, –3), Q is the point (–5, 1).

(i) Write down the column vector $\overrightarrow{PQ}$.

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

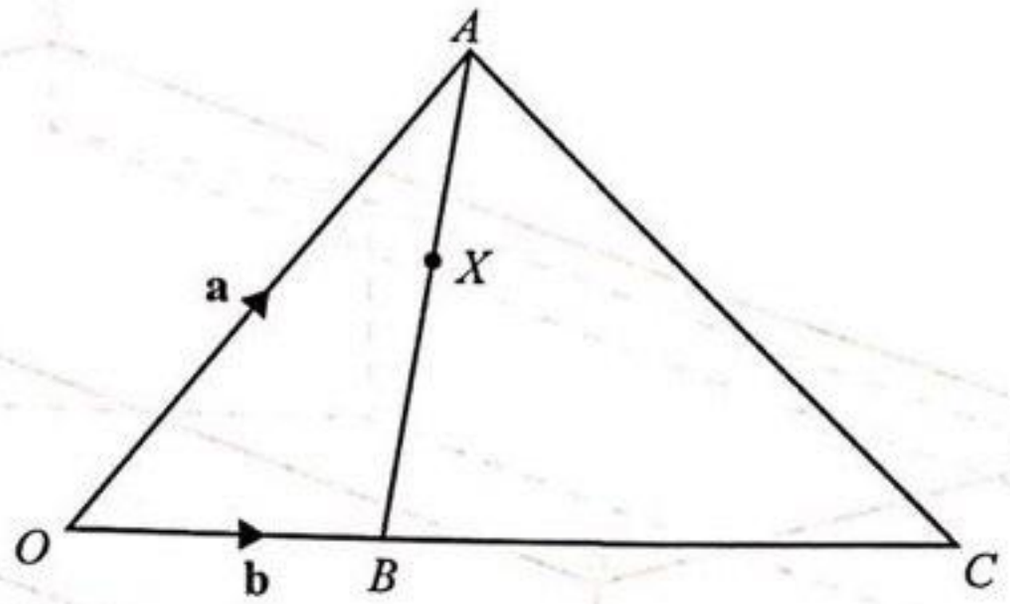
(ii) R has coordinates (h, 3) and $\overrightarrow{PR} = k\overrightarrow{PQ}$.

Find the value of h and the value of k.

Answer $h =$ .....

$k =$ ..... [2]

(b)



OAC is a triangle and B is a point on OC.
$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $OB:BC = 2:3$.
X is the point on AB such that $AX:XB = 1:2$.

(i) Express $\overrightarrow{AC}$ in terms of **a** and **b**, as simply as possible.

Answer ..... [2]

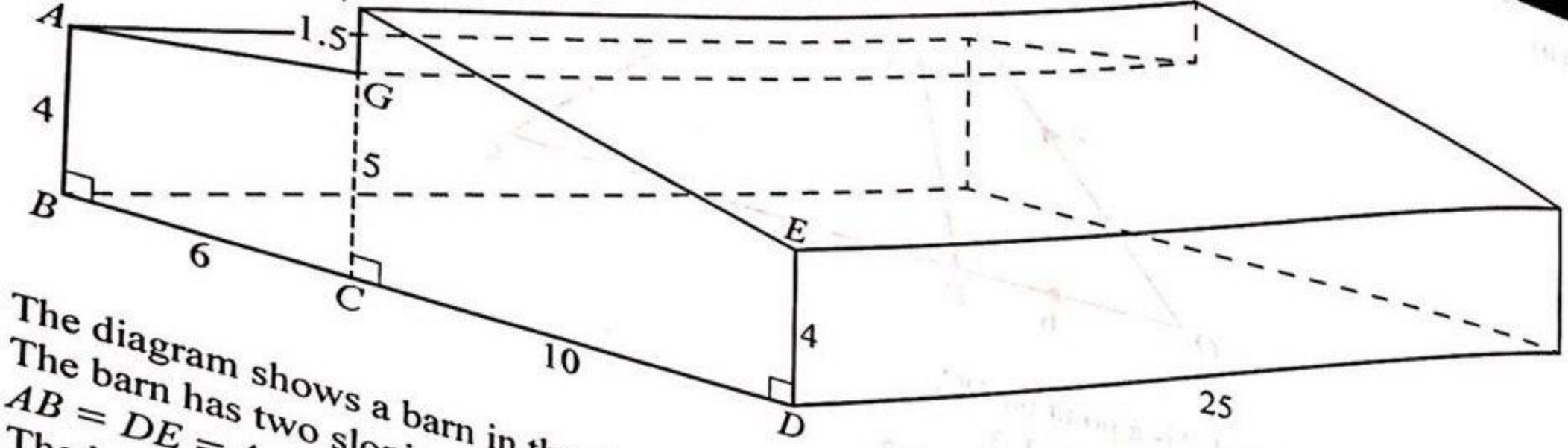
(ii) Express $\overrightarrow{XB}$ in terms of **a** and **b**, as simply as possible.

Answer ..... [2]

(iii) Y is the point on OC such that $AXYC$ is a trapezium.

Find, in terms of **a** and **b**, $\overrightarrow{XY}$.

Answer ..... [2]



The diagram shows a barn in the shape of a prism of length 25 m with a rectangular base.
The barn has two sloping rectangular roofs.
$AB = DE = 4$ m, $BC = 6$ m, $CD = 10$ m, $CG = 5$ m and $FG = 1.5$ m.
The barn is positioned on horizontal ground and the walls are vertical.

(a) Calculate the volume of the barn.

Answer .....m^3 [3]

(b) Calculate the total area of the two sloping roofs of the barn.

Answer .....m^2 [4]

(c) Calculate the angle of elevation of P from D.

Answer ..... [4]

9 **(a)** Two groups of students entered a science competition.
Their scores are shown in the stem-and-leaf diagram.

Group A									Group B								
					9	8	3	5	0	1	5	7					
	8	7	6	5	4	2	0	6	2	2	6						
9	7	7	6	5	2	1	1	7	1	3	4	5	5	7	8	9	
					8	8	7	2	8	0	6	7					
							5	0	9	1	3						

Key: 3 | 5 | 0 means a score of 53 in group A and a score of 50 in group B

(i) Find the median score for group A.

Answer ..... [1]

(ii) Find the range of scores for group B.

Answer ..... [1]

(iii) Calculate the percentage of students in group A who scored more than 70.

Answer .....% [1]

(iv) Students who scored more than 70 were awarded a merit.
Students who scored more than 85 were awarded a distinction.

Use this information to make two comments comparing the performance of the students in the two groups.

1 .....

.....

2 .....

.....

..... [2]

(b) A bag contains 16 red counters and 9 blue counters.
Two counters are taken from the bag at random without replacement.

(i) Shen says the probability that both counters are blue is $\frac{81}{625}$.

Explain what he has done wrong.

Answer .....

.....

..... [1]

(ii) Draw a tree diagram to show the probabilities of the possible outcomes.

Answer

[2]

(iii) Find, as a fraction in its simplest form, the probability that only one of the counters is red.

Answer ..... [2]

10 Leila lives in Kuala Lumpur and drives a small family car.

The tables below give information that Leila can use to work out her driving costs.

	Amount of fuel used (litres/100 km)			
	Type of car			
Type of driving	Supermini	Small family	Large family	SUV
City	5.5	6.3	7.8	7.6
Out of city	3.9	4.2	4.6	5.0
Combined	4.5	5.0	5.8	6.0

Speed limits	
City roads	60 km/h
Out of city	
Federal roads	90 km/h
Expressway	110 km/h

Fuel prices per litre	
Regular	$2.07
Premium	$2.11
Diesel	$1.45
5% discount with loyalty card	

(a) One week, Leila drives a total distance of 92 km in the city.
Leila estimates that she uses 5.8 litres of fuel.

Show that Leila is correct.

Answer

[1]

(b) Leila drives for 45 minutes on the expressway at an average speed of 85 km/h.

Calculate an estimate of the amount of fuel she uses.

Answer ..... litres [2]

(c) Leila and Hamid go on a journey together in Leila's car.
They drive from the city of Kuala Lumpur to a town outside of Kuala Lumpur.

Leila drives the first stage of the journey at an average speed of 60 km/h.
The second stage of the journey is 25 km shorter than the first stage.
Leila drives the second stage at an average speed of 75 km/h.
The journey takes a total of 3 hours 15 minutes.

Hamid offers to pay half of the cost of the fuel used for the journey.
Leila's car uses regular fuel and she has a loyalty card.

Suggest a suitable amount for Leila to ask Hamid to pay.
Justify the decision you make and show your calculations clearly.

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.....[7]