Name: _____ ( )	Class: _____

70

GREENDALE SECONDARY SCHOOL
Preliminary Examination 2023

Mathematics Syllabus A **4045/02**

Paper 2 15 August 2023

Secondary 4 Normal Academic **2 hours**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name in the spaces at the top of this page.
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.

Section A
Answer **all** the questions.

Section B
Answer **one** question.

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

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 total number of marks for this paper is 70.

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.

Qn	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9a,b	Q9c	Q10	Q11 a	Q11 b	Q12
Strand														
Marks														

Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

$$\text{Curve surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

Arc length = $r\theta$, where θ is in radians

Sector area = $\frac{1}{2}r^2\theta$, where θ is in radians

Trigonometry

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

Statistics

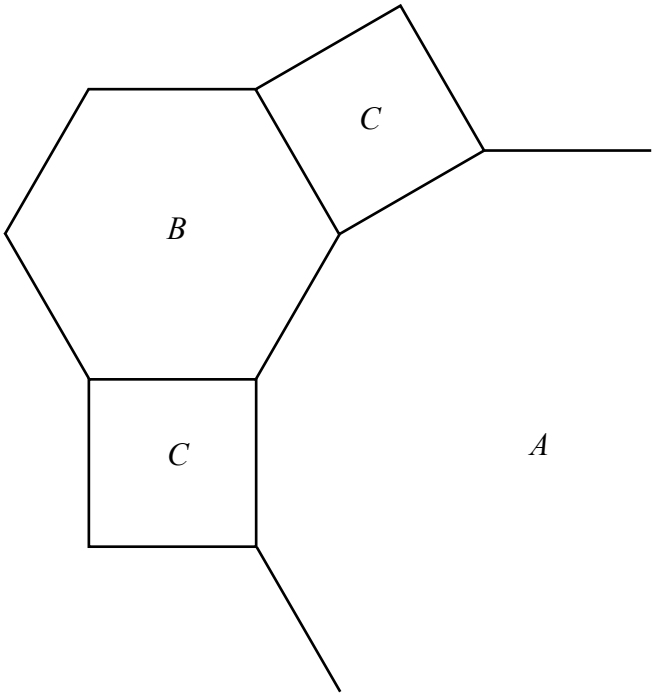
$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f}-\left(\frac{\sum fx}{\sum f}\right)^2}$$

Section A (62 marks)
Answer **all** questions in this section.

1 The diagram shows part of a n-sided regular polygon A.

B is a regular hexagon and C is a square.



Find n.

Answer n = ... [4]

2 The heights of a group of 14 students were measured.
The results are shown in the stem-and-leaf diagram.

15	6				
16	0	2	4	7	8
17	1	2	2	4	8
18	1	3			
19	0				

Key 16|2 means 162 cm

(a) Find the

(i) range of the heights,

Answer ……cm [1]

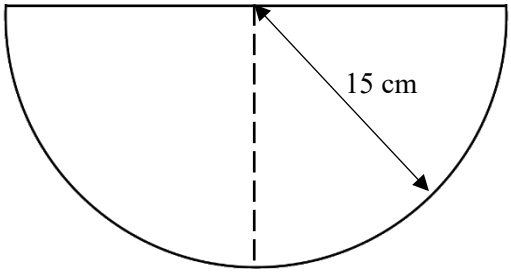
(ii) median height.

Answer ……cm [1]

(b) A new student, John, joined the group and his height was measured and added to the data.
As a result, his height would increase the range by 1 cm but decrease the median.
What is John's height?

Answer ……cm [1]

3



The diagram shows the cross-section of a hemispherical bowl of radius 15 cm with a divider in the middle. Water is poured into the left side of the bowl so that only half of the hemispherical bowl is completely filled with water.

Find the area of the water in contact with the bowl and the divider.

Answer …… cm^2 [4]

4 **(a)** Calculate $\sqrt{(-6)^2 + 4(-7)^2}$.

Answer …… [1]

(b) Write the following numbers in order of size, largest first.

$$-3.\dot{2}, \quad \frac{22}{7}, \quad -\pi, \quad 3.142$$

Answer …… , …… , …… , …… [2]
largest *smallest*

(c) The Mariana ocean trench, the world's deepest ocean trench, has an approximate depth of 10 994 m, while the Hikurangi ocean trench has an approximate depth of 3 750 m.

(i) Write 10 994 in standard form.

Answer …… [1]

(ii) Find the difference in depth between the two ocean trenches.
Give your answer in standard form.

Answer …… m [2]

5 **(a)** Map *A* is drawn to a scale of $1:200\ 000$.

(i) The length of a cycling path measures 3.5 km.

Calculate the length of the cycling path on the map in centimetres.

Answer …… cm [2]

(ii) The area of a forest measures 8 cm^2 on the map.

Calculate the actual area of the forest in square kilometres.

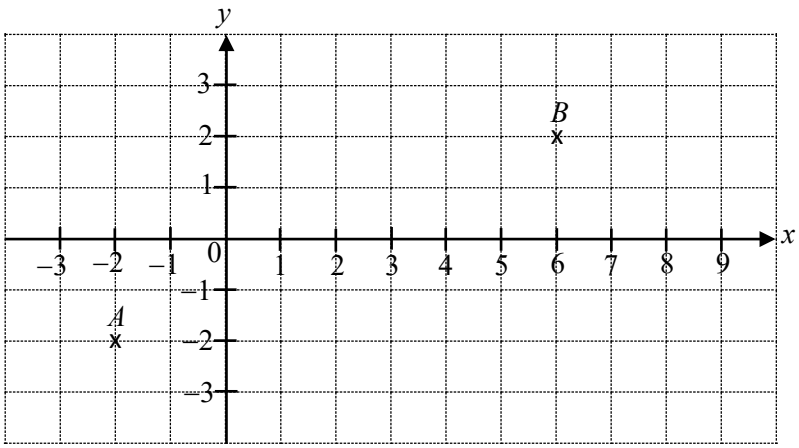
Answer …… km^2 [3]

(b) The actual distance representing a length on the map is 20% shorter on Map *B*.

State the map scale of Map *B* in terms 1 : *n.*

Answer 1: …… [1]

6 A is the point $(-2, -2)$ and B is the point $(6, 2)$.



(a) Find the equation of the line AB.

Answer …… [1]

(b) Draw the line $y = 3$. [1]

(c) X is the point of intersection of the line AB and $y = 3$.

(i) Write down the coordinates of X.

Answer (……, ……) [1]

(ii) Calculate the length of AX.

Answer AX = …… units [1]

(d) C is the point $(8, -2)$.

$ABCD$ is a rectangle.

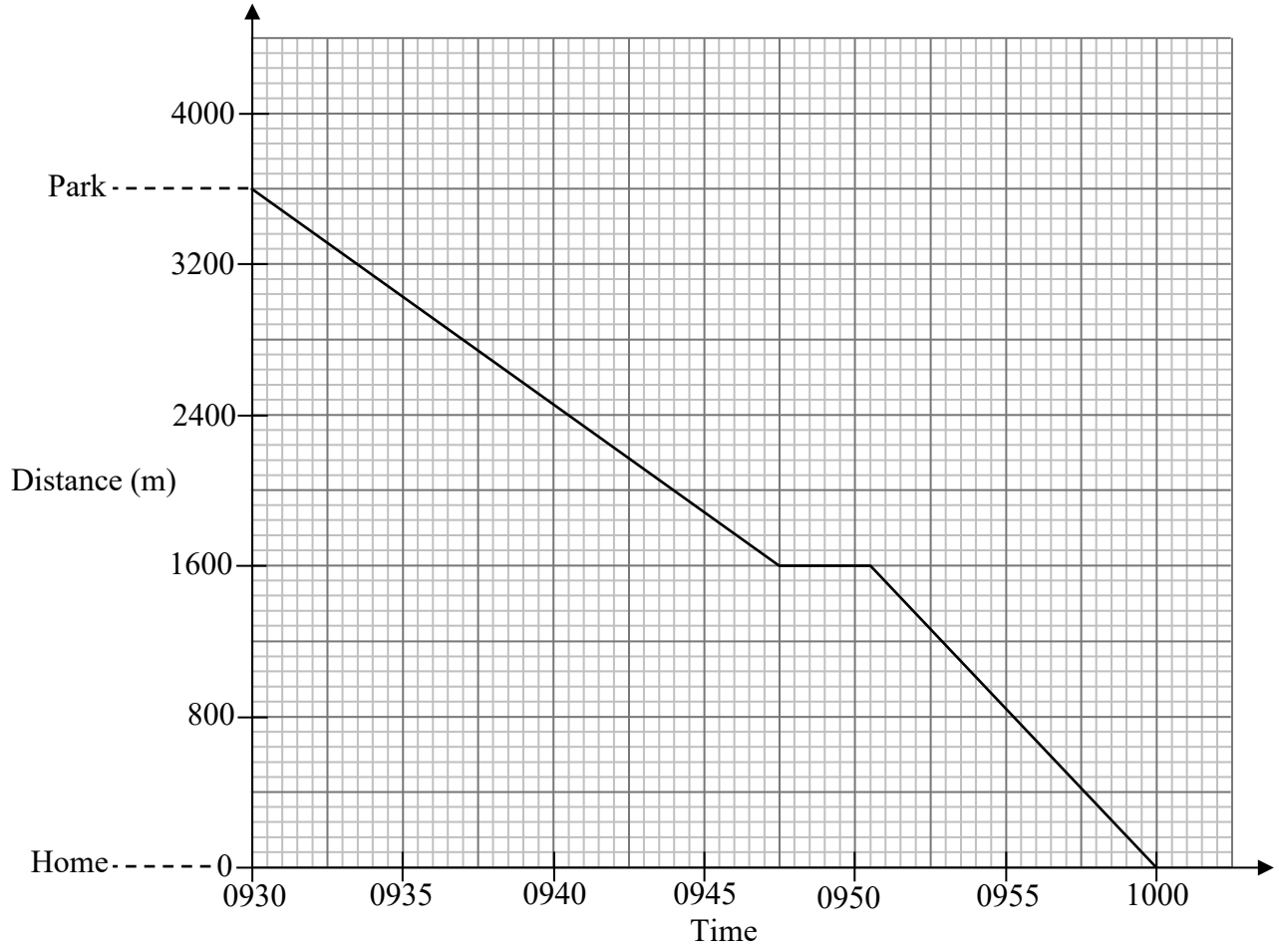
(i) Find the coordinates of D.

Answer (……, ……) [1]

(ii) Calculate the area of $ABCD$.

Answer …… square units [1]

7 Lim runs from the park back home.
The distance-time graph shows his journey.



He met a friend on his way home and stopped to talk.

(a) Find the number of minutes he stopped for.

Answer …… minutes [1]

(b) Find the average speed of Lim for his whole journey in km/h.

Answer …… km/h [3]

(c) Lim's brother, Mark, leaves home at 0934 and runs at a constant speed to the park.
He takes 25 minutes to reach the park.

Complete the grid to show Mark's journey. [1]

(d) Find the distance Mark is away **from the park** when he passes Lim.

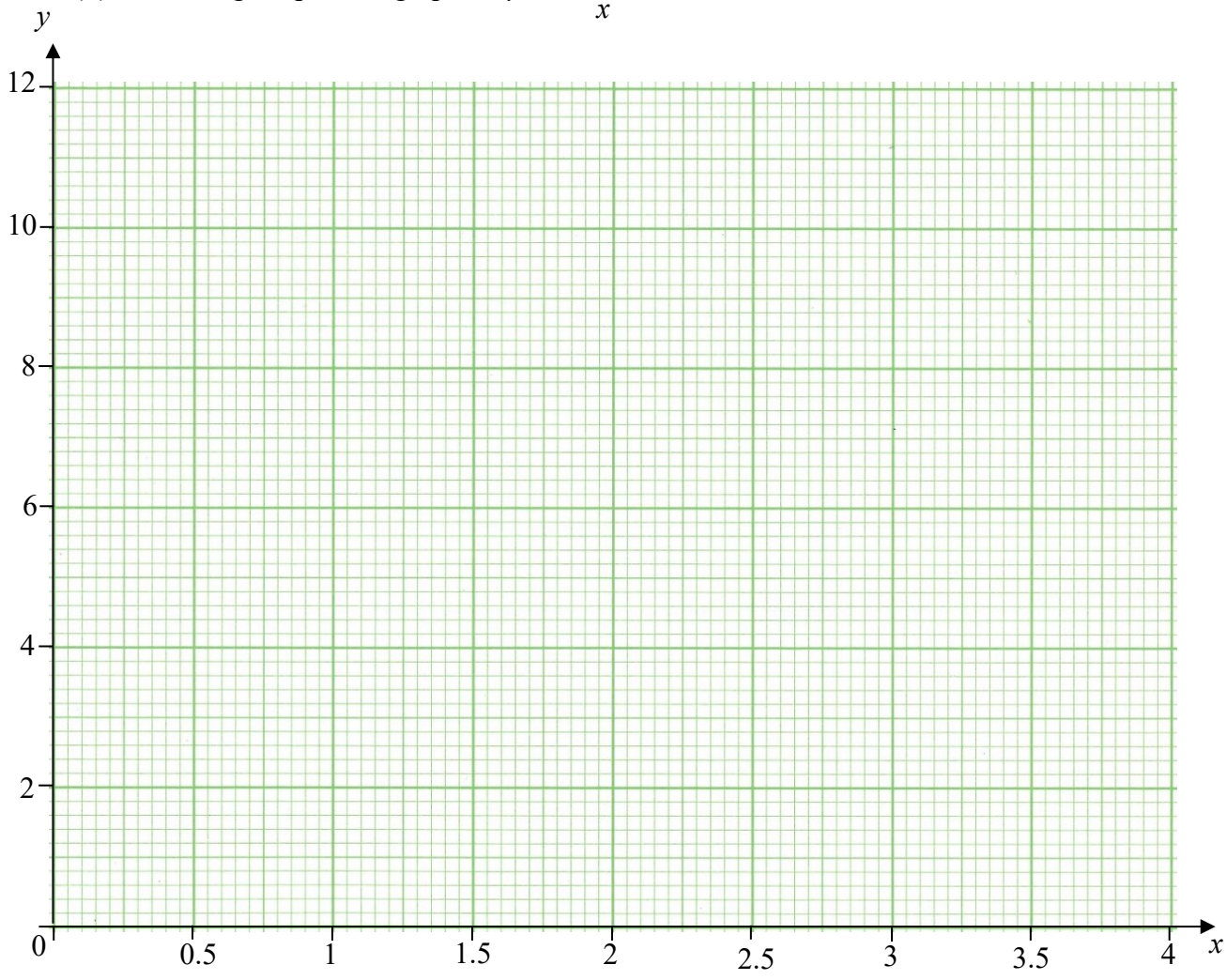
Answer …… m [1]

8 **(a)** Complete the table of values of $y = 3 + \frac{2}{x}$.

x	0.5	1	1.5	2	2.5	3	3.5	4
y	7	5	4.3	4		3.7	3.6	

[2]

(b) On the grid, plot the graph of $y = 3 + \frac{2}{x}$ for $0.5 \le x \le 4$.



[3]

(c) Use the graph to find the value of x when $y = 5.6$.

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

(d) Draw the tangent to the curve at $x = 1$ to find the gradient of the curve at that point.

Answer …… [2]

(e) Explain why the graph $y = 3 + \frac{2}{x}$ has no y-intercept.

Answer

[1]

9 **(a)** It is given $h = \frac{2a}{m+n^2}$.

Find the value of h when $a = 0.5,\ m = -0.238,\ n = -1.1$.

Answer $h =$ …… [2]

(b) Rearrange $h = \frac{2a}{m+n^2}$ to make n the subject.

Answer $n =$ …… [3]

(c) Solve $x(2x+1) = 5$.

Answer …… [4]

10 Every household in Singapore was given a free home recycling box, known as a Bloobox as shown in Figure 1, in April this year. The initiative by the National Environment Agency (NEA) aims to encourage every household to set up a home recycling corner and start the habit of recycling at home.

Figure 1

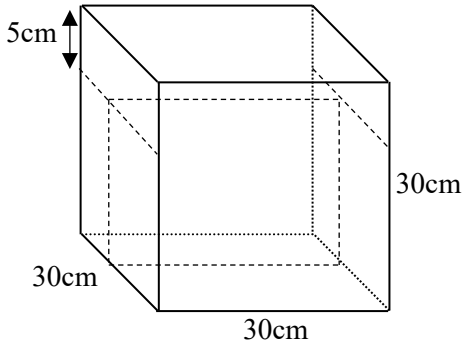


Figure 2

Credits:https://sg.news.yahoo.com/singapore-household-free-bloobox-recycling-041953957.html

The Bloobox can be modelled after a cube with 30 cm side shown in Figure 2. There is a divider that separates the box into two compartments so that user can further sort their recyclables.

(a) **(i)** Calculate the total volume of one Bloobox.

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

(ii) Assuming that the thickness of the plastic is negligible, calculate the total area of plastic needed to manufacture one Bloobox including the divider that separates the box.

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

Bloobins are placed around the estate for households to deposit their recyclables. There are two types of Bloobins available for John, the block manager, to decide which type is more suitable for his block.

There are 16 storeys in his block and a total of 6 units in each storey.

Some assumptions made:

1. Every household recycles once every day.
2. Bloobox is filled to the brim at the end of the day.

The dimensions of the two types of Bloobins are given below.

	Type A	**Type B**
		
Dimension (m)	$1.2 \times 0.5 \times 1.2$	$1.2 \times 1.2 \times 2.0$
Remarks	Filled up to 100% of its capacity	Filled up to 95% of its capacity
	Bins will be emptied every day	

Credits: https://mothership.sg/2021/11/big-blue-recycling-bin-singapore/

(b) Should John request for two Type *A* Bloobin or one Type *B* Bloobin for his block?

Show all your calculations.

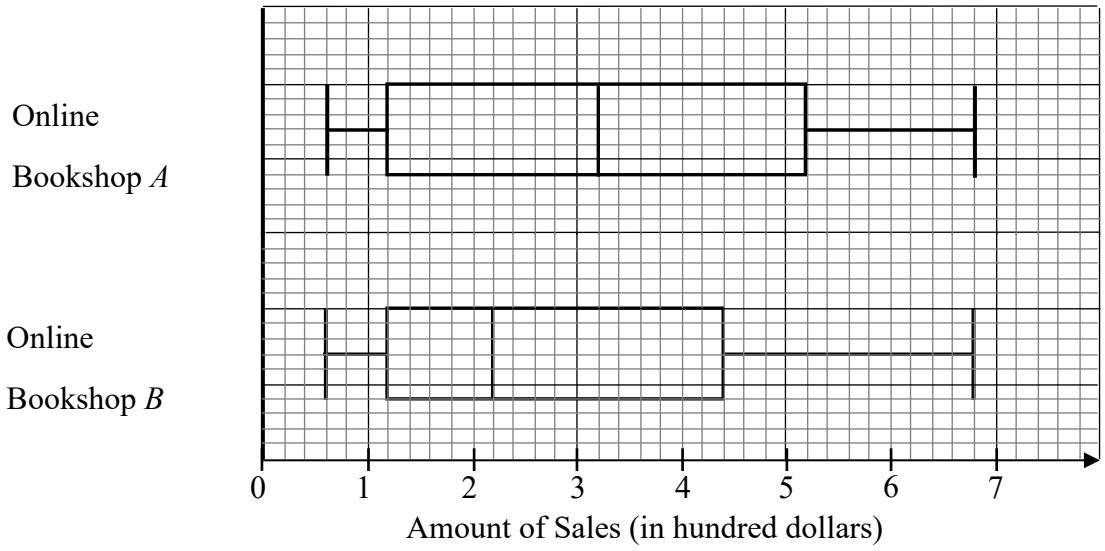
Answer

[5]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

11 **(a)** An author of an electronic book (e-book) wants to test the sales of an e-book at two different online bookshops, *A* and *B*.
The results are summarised in the box-and-whisker plots below



(i) Find the median sales at online bookshop *A*.

Answer $…….. [1]

(ii) Which online bookshop has a greater amount of sales?
Give a reason for your answer.
Answer

[1]

(iii) Find the interquartile range of the amount of sales for online bookshop *A*.

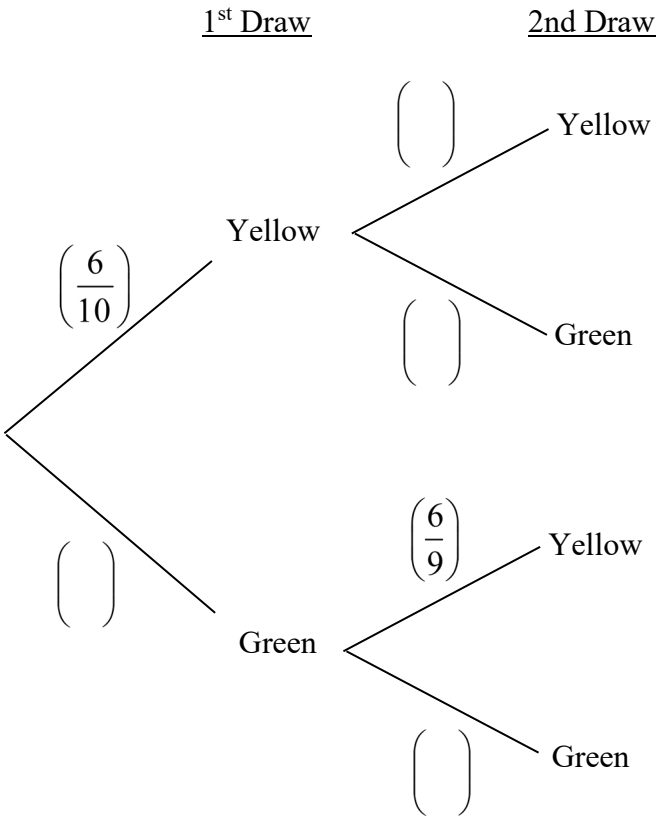
Answer $…….. [1]

(iv) Which online bookshop has a more consistent amount of sales?
Give a reason for your answer.
Answer

[1]

(b) Andy buys 10 capsicums from the market to make pizzas. 6 of them are yellow and the remaining 4 are green.
Two capsicums are to be chosen at random, one after the other.

(i) Complete the probability tree diagram.

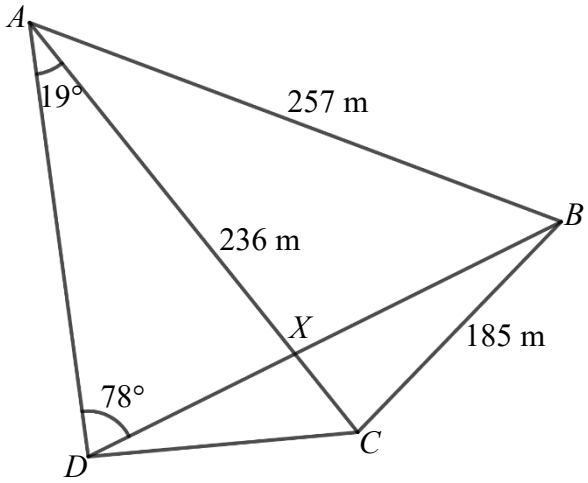


[2]

(ii) Find the probability that at least one capsicum is green.

Answer …….. [2]

12 *ABCD* is a piece of land.



AB = 257 m, *BC* = 185 m and *AC* = 236 m.

Angle *DAC* = 19° and angle *ADB* = 78°.

X is the point of intersection of *AC* and *BD*, where *XC* is $\frac{1}{4}$ of *AC*.

(a) Calculate the angle *ABC*.

Answer ……° [3]

(b) Calculate *DX*.

Answer …… m [2]

(c) The bearing of B from D is 056°.

Find the bearing of C from A.

Answer ……° [3]

END OF PAPER