Question 1 (5 marks)

Question 1a (3 marks)

Identify the **three** expressions that simplify to $6x - 5$. Drag and drop the three expressions to the allocated space below.

Draggable expressions

$\frac{12x^2 - 10}{2x}$

$\frac{12x^2 - 10x}{2x}$

$2(3x + 4) - 13$

$6(x + 2) - 7$

$\sqrt{36x^2 - 25}$

$\frac{(3x)^2}{x} - \frac{6x + 10}{2}$

$6x - 5$

Expression 1

Expression 2

Expression 3

Question 1b (2 marks)

Identify the **two** expressions that simplify to $9x^2 - 4$. Drag and drop the two expressions to the allocated space below.

Draggable expressions

$(3x - 2)^2$

$(3x + 2)(3x - 2)$

$(x - 1)(9x + 4) + 5x$

$(9x + 4)(x - 1)$

$9x^2 - 4$

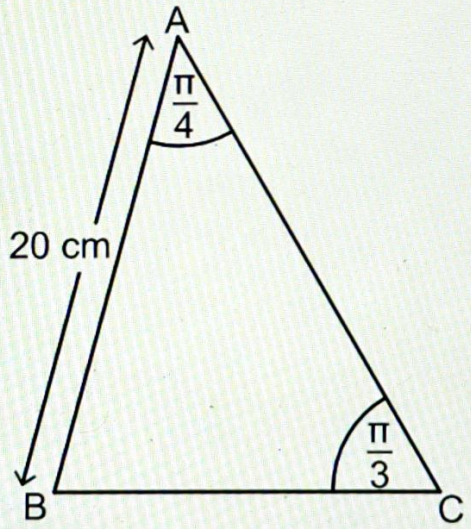
Expression 1

Expression 2

Question 2 (6 marks)

Question 2a (3 marks)

Given that BAC and ACB are angles in radians. **Show that** the length of side BC is 16.33 cm to the nearest two decimal places.



B I U x_2 x^2 Ω Σ Styles

Question 2b (1 mark)

Triangle ABC is reflected in the horizontal line BC as shown in **Diagram 1**. The shape in **Diagram 1** is reflected in the vertical line passing through point C.

Diagram 1

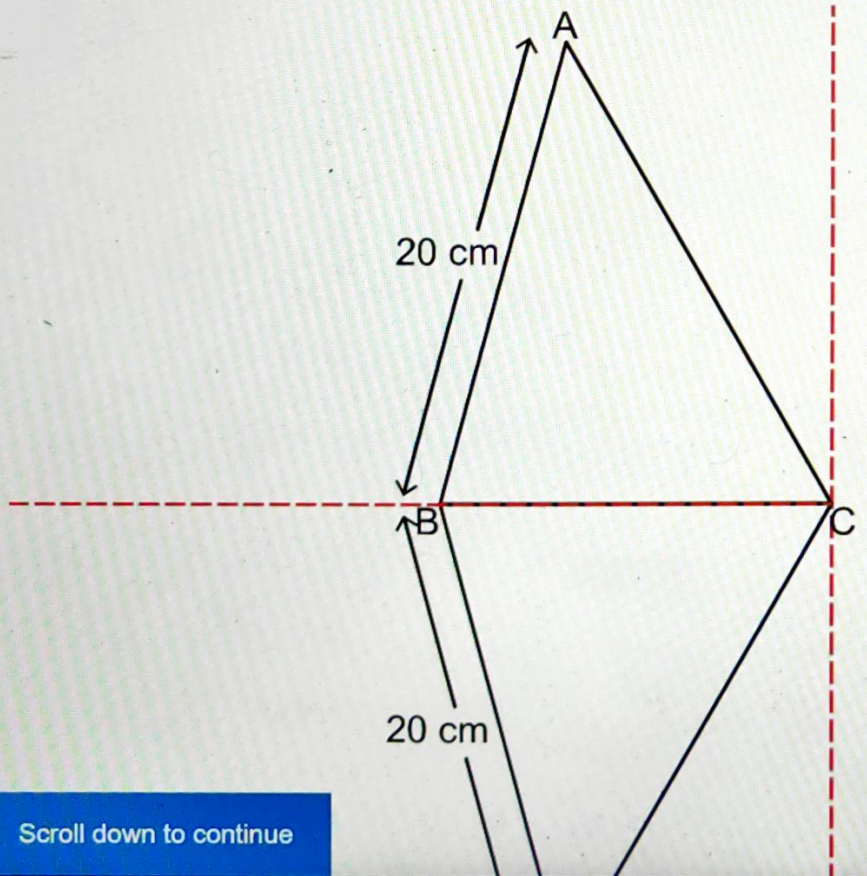
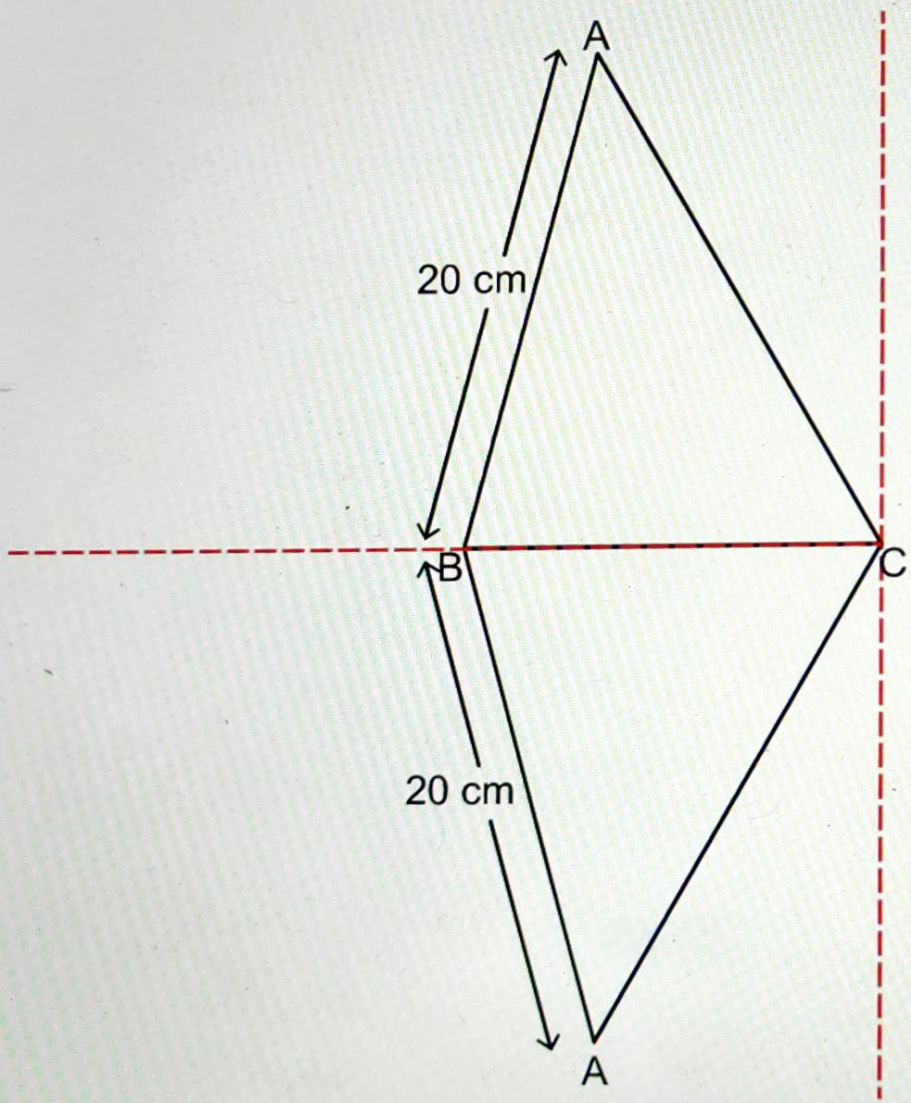


Diagram 1

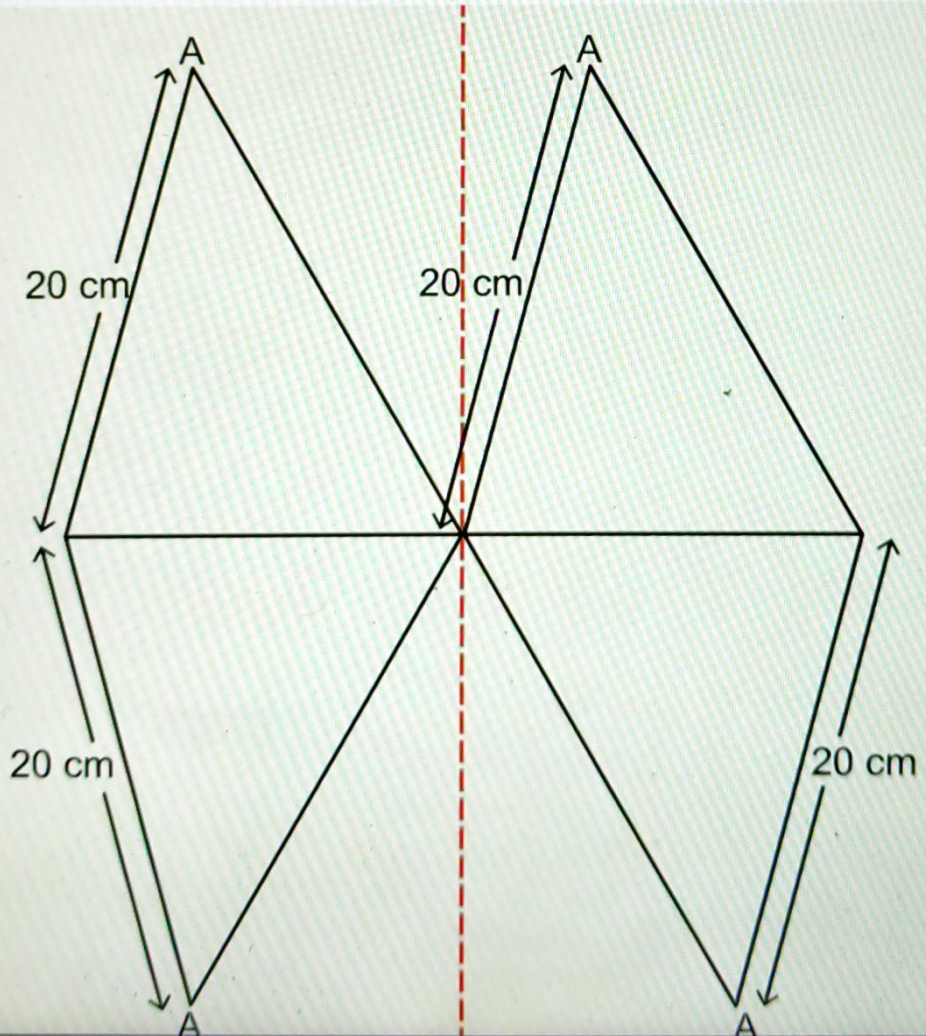


which shows the final shape after this reflection.

Select the figure which shows the final shape after this reflection.

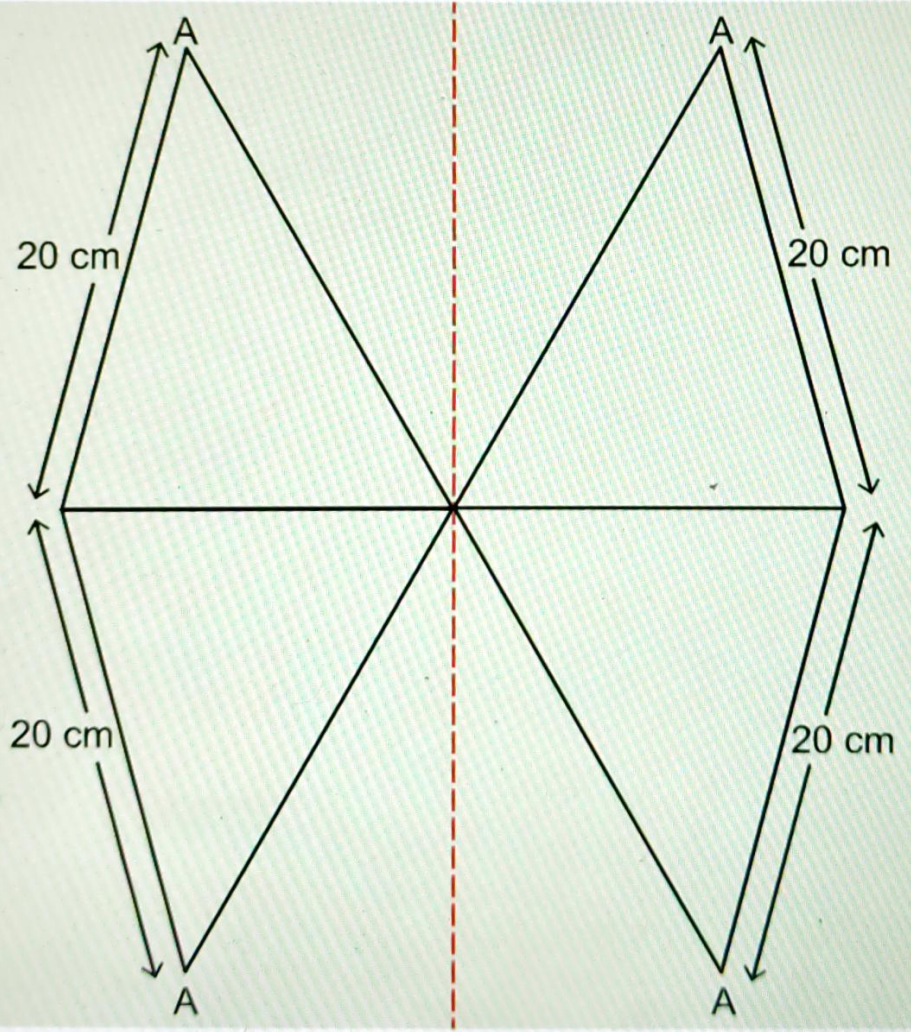
Select

Option A

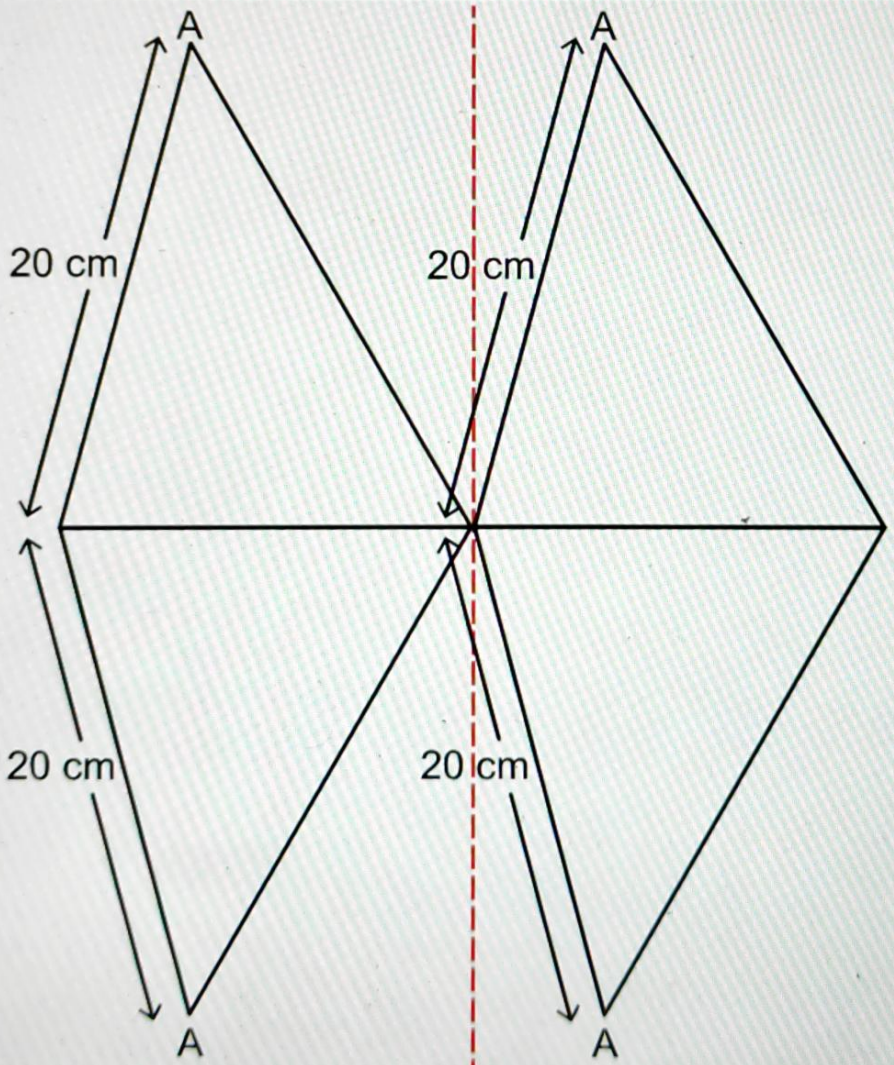


Scroll down to continue

Option B



Option C



Question 2c (2 marks)

Given that AC = 22.31 cm, **determine** the perimeter of the final shape formed after the reflections.

B I U x_2 x^2 Ω Σ Styles

Question 3 (10 marks)

Question 3a (2 marks)

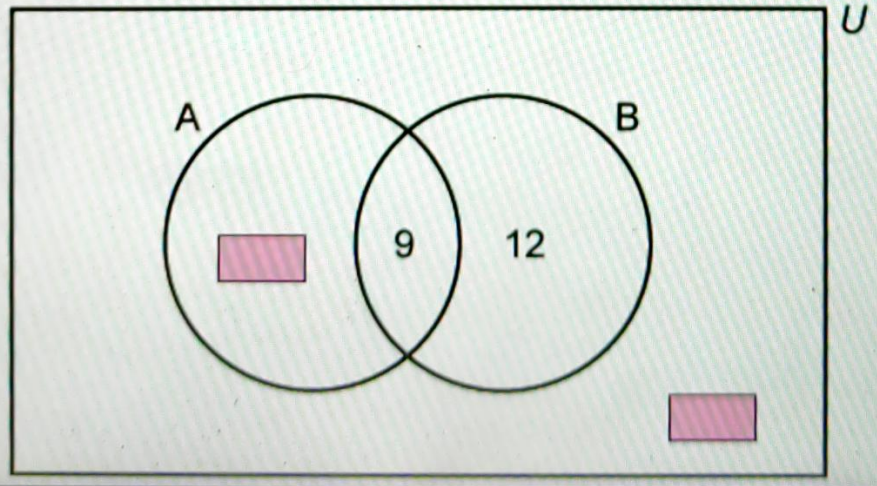
In a group of 60 students:

34 study Extended mathematics or Physics

In the Venn diagram below

Set A represents the number of students who study Extended mathematics
Set B represents the number of students who study Physics.

Determine the missing values and complete the Venn diagram below.

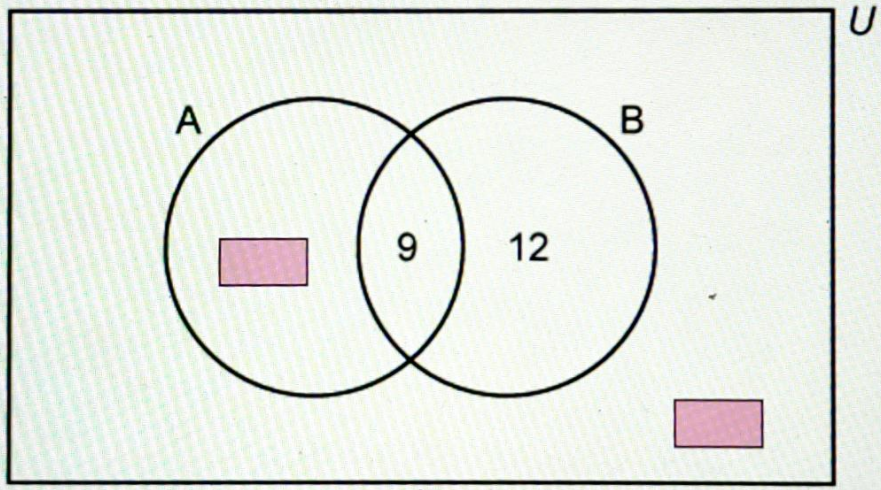


Scroll down to continue

In the Venn diagram below

Set A represents the number of students who study Extended mathematics
Set B represents the number of students who study Physics.

Determine the missing values and complete the Venn diagram below.



Question 3b (1 mark)

Describe the region $A \cap B'$ in context.

B I U x_2 x^2 Ω Σ Styles

The school decides to participate in a competition. The participants must be studying **both** Extended mathematics and Physics.

The school decides to participate in a competition. The participants must be studying **both** Extended mathematics and Physics.

Question 3c (2 marks)

One student is selected at random from the group. Given that the student studies Physics, **determine** the probability that the student can participate in the competition.

B I U x_2 x^2 Ω Σ Styles

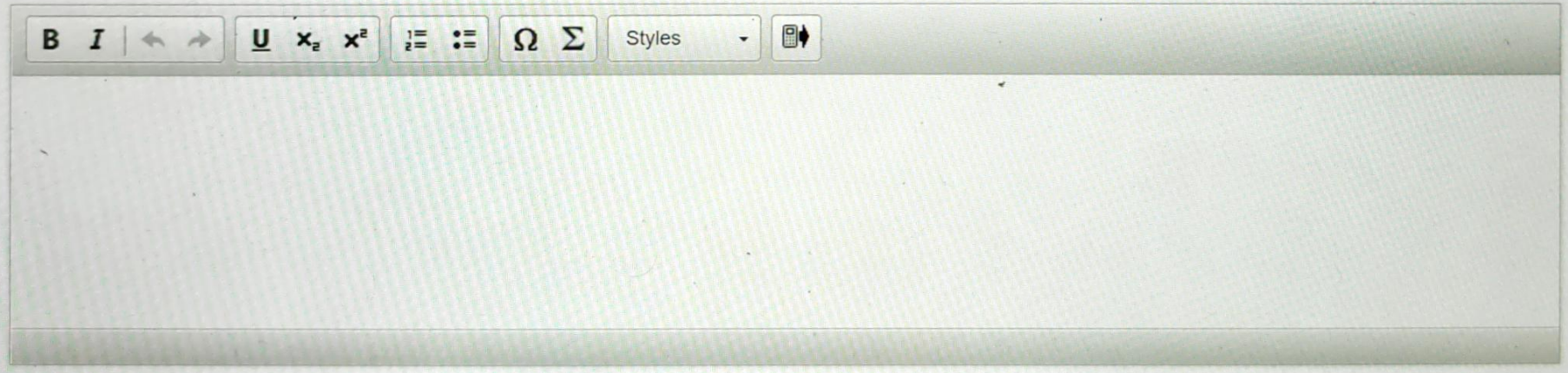
Question 3d (3 marks)

Three students are selected at random from the group. **Find** the probability that they can participate in the competition.

B I U x_2 x^2 Ω Σ Styles

Question 3e (2 marks)

Comment on the practicality of selecting students for the competition randomly.



Question 4 (6 marks)

Scroll down to continue

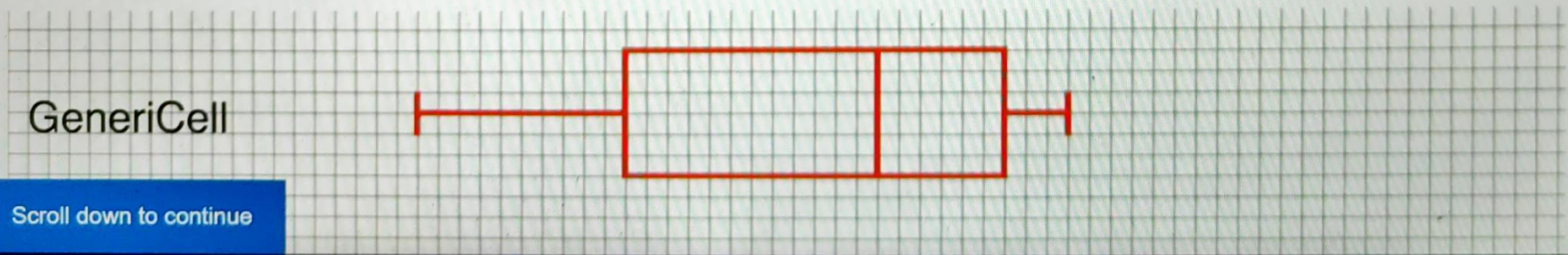
The students have conducted an experiment in their maths class to test the claims of the advertisements. In the experiment, students have tested nine batteries from GeneriCell and measured the lifetime of the batteries. The results are shown in **Table 1** to the nearest minute. A higher number indicates that the battery has a longer lifetime.

Table 1

Lifetime (in minutes) of the nine batteries from GeneriCell								
478	478	498	500	500	501	505	507	509

Below is a box-and-whisker plot representing the data found in **Table 1**. You can hover over the box-and-whisker plot to reveal the values.

Box-and-whisker plot to show "Lifetime (in minutes) for the nine batteries from GeneriCell"



Box-and-whisker plot to show "Lifetime (in minutes) for the nine batteries from GeneriCell"

Question 4a (1 mark)

Using the box-and-whisker plot, **write down** the percentage of batteries with a lifetime between 488 and 506 minutes from GeneriCell.

B I U x_2 x^2 Ω Σ Styles

Question 4b (3 marks)

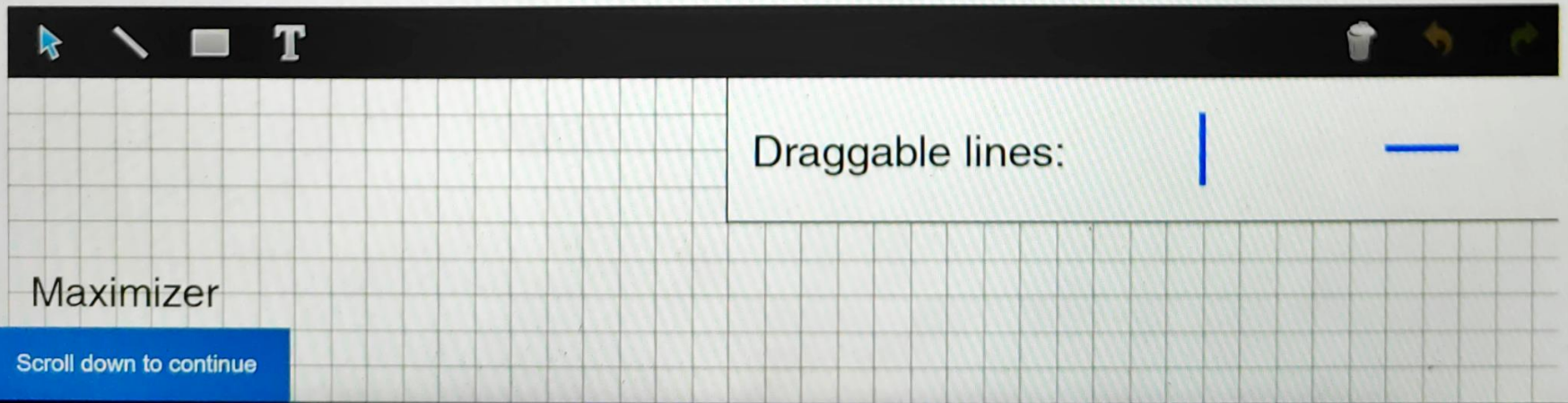
The experiment is repeated for the Maximizer brand. The times are recorded in **Table 2** to the nearest minute.

Table 2

Lifetime (in minutes) of the nine batteries from Maximizer								
478	491	497	498	502	502	502	504	509

On the canvas provided, **draw** a box-and-whisker plot to summarize the data given in **Table 2** for Maximizer. The draggable lines can be resized as required.

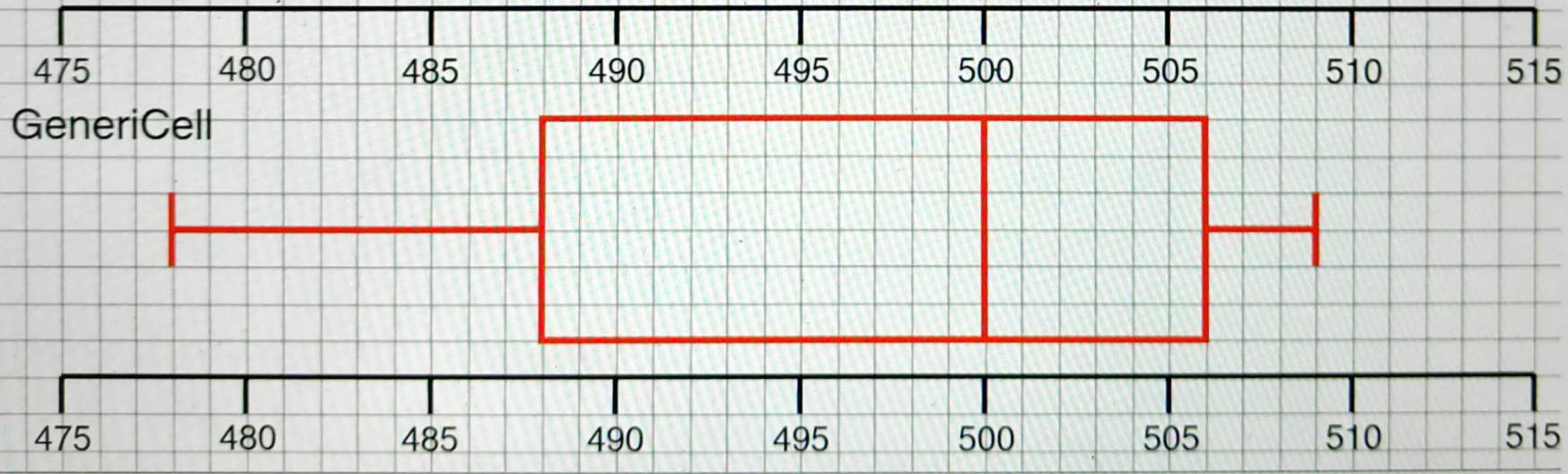
Lifetime (in minutes) of the nine batteries from both brands



Scroll down to continue

Draggable lines:

Maximizer



Question 4c (2 marks)

Using your box-and-whisker plots:

Identify one reason that supports GeneriCell in their advertisement claim and **one** reason that supports Maximizer in their advertisement claim.

GeneriCell

Maximizer

Question 5 (7 marks)

Question 5a (3 marks)

The equation, $x + \frac{1}{2}x = 5^2 - x$ can be described in words as

"The sum of a number and its half is the same as the difference between the square of five and the number."

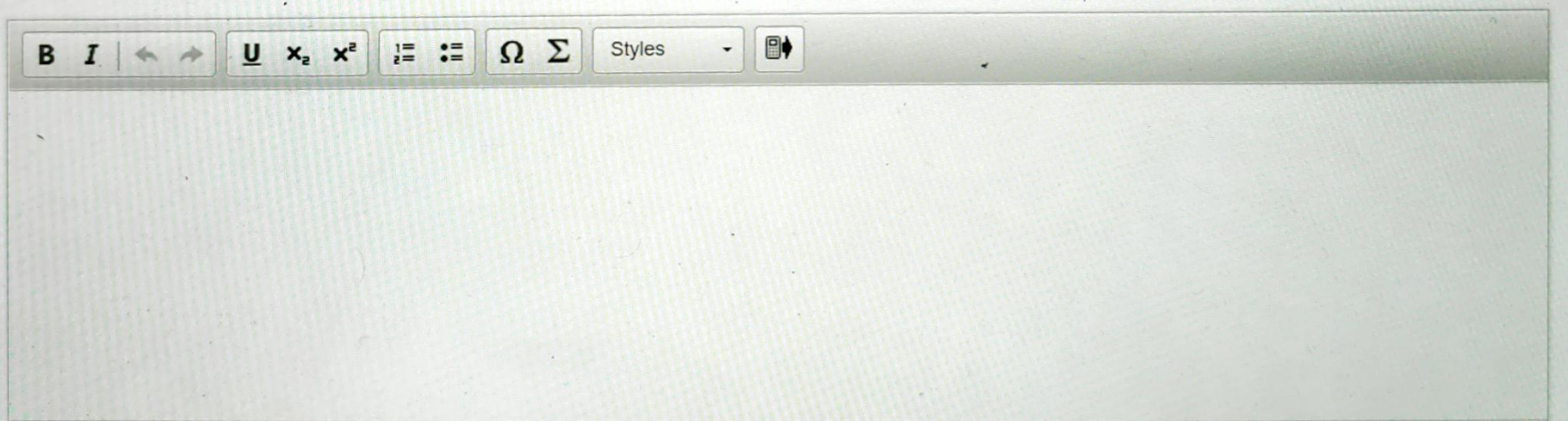
Calculate the value of the number.

Question 5b (4 marks)

In another case,

"The sum of half a number and its square is the same as 14".

Find all possible values of the number.



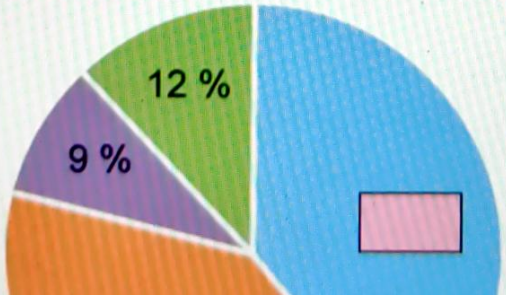
Question 6 (14 marks)

In this question, you will make calculations for changes that individuals can make to save water on a daily basis.

Question 6a (1 mark)

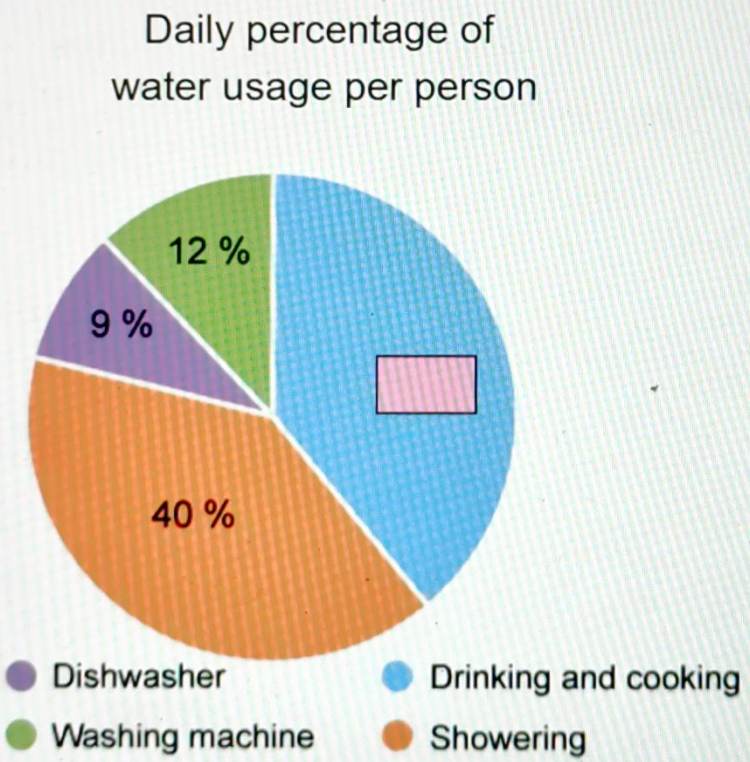
Write down the missing percentage for drinking and cooking on the pie chart.

Daily percentage of
water usage per person



Question 6a (1 mark)

Write down the missing percentage for drinking and cooking on the pie chart.

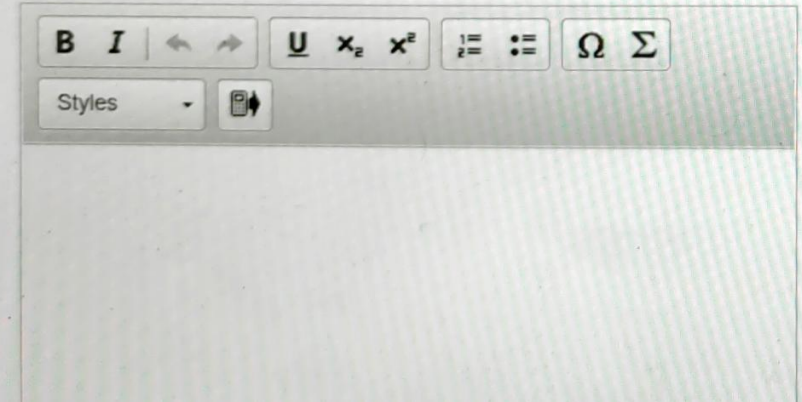


Question 6b (4 marks)

It is estimated that the daily water usage per person is 120 litres.

A regular shower has a flow rate of 8 Litres (L) per minute.

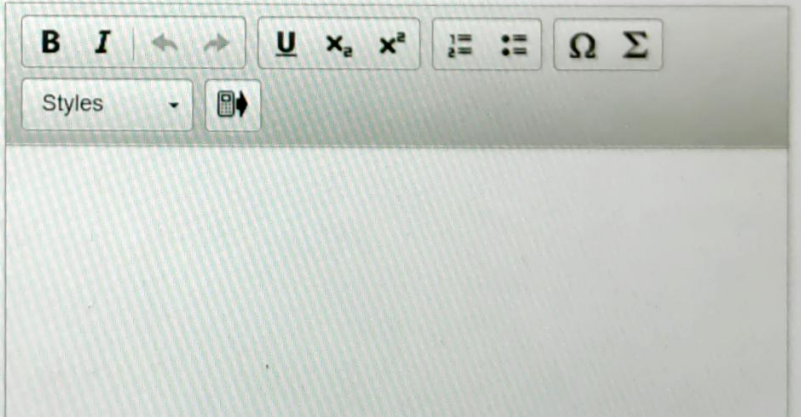
Determine the duration of a regular shower.



Question 6c (2 marks)

In a water-saving condition the flow rate of a shower can be reduced to be 5 L per minute. Given that the duration of the shower does not change:

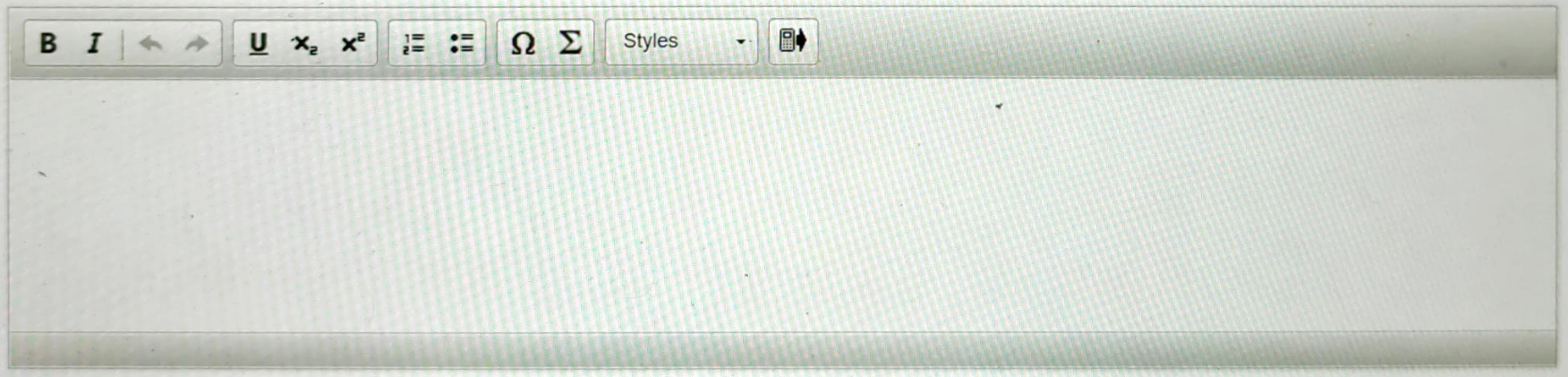
Determine the amount of water used for showering in a water-saving condition.



Question 6d (3 marks)

The amount of water used by the washing machine is 14.4 L. The eco-setting for washing machines reduces water by 5 %.

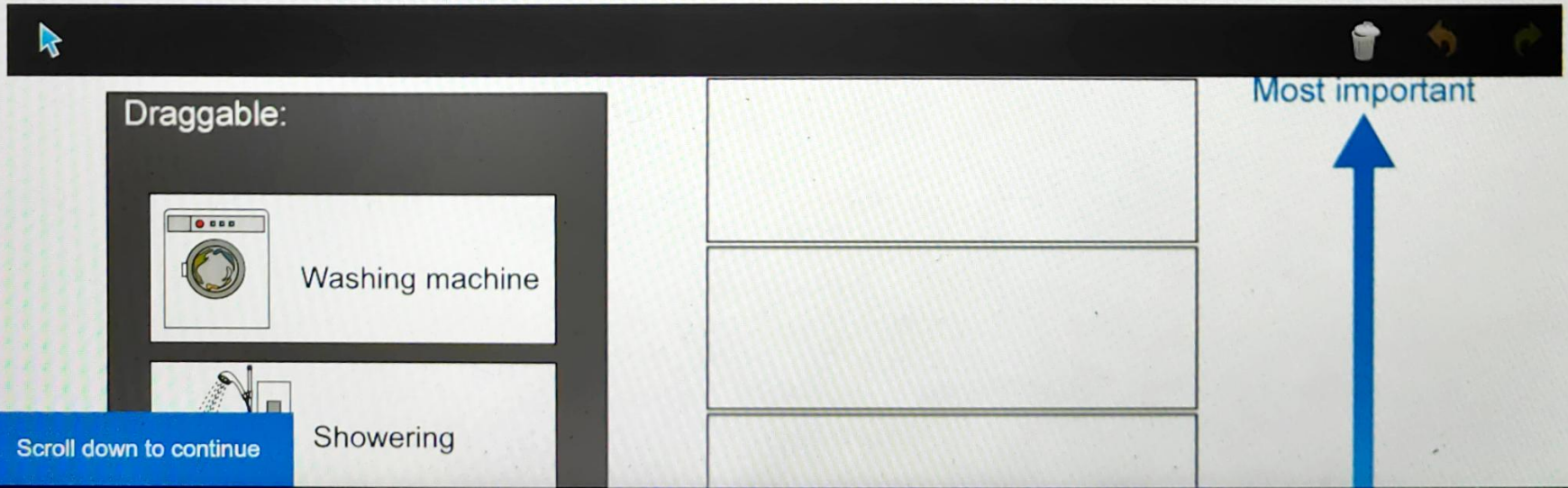
Calculate the amount of water used by the washing machine in the eco-setting.



Question 6e (1 mark)

Water activity	Water-saving condition
Drinking and cooking	No change
Dishwasher	Eco setting: saves 5 % of water
Washing machine	Eco setting: saves 5 % of water
Showering	Flow rate: 5 litres of water per minute

Suggest the order of activities in which it is most important to save water. Drag and drop the activities in the appropriate order.



Suggest the order of activities in which it is most important to save water. Drag and drop the activities in the appropriate order.

Draggable:

Washing machine

Showering

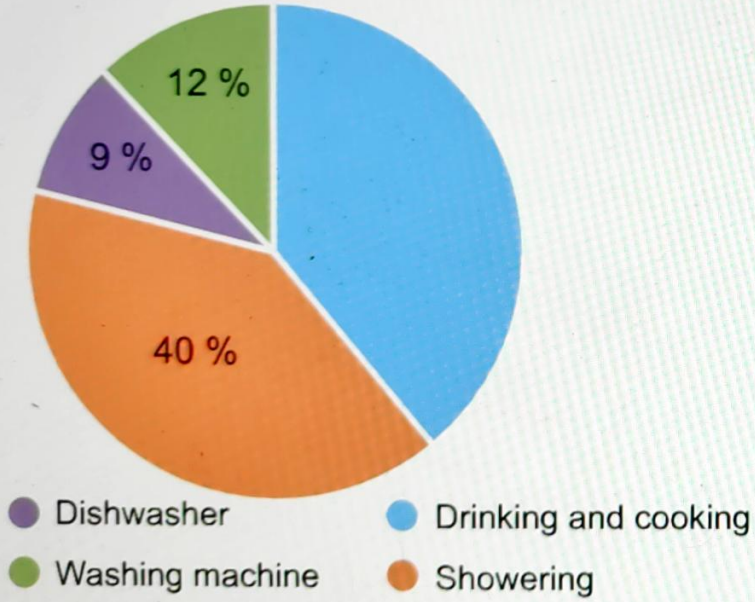
Dishwasher

Most important

Drinking and cooking

Least important

Question 6f (3 marks)



Justify your chosen order in part (e). You should refer to your answers from previous parts.

B I U x_2 x^2 Ω Σ

Styles

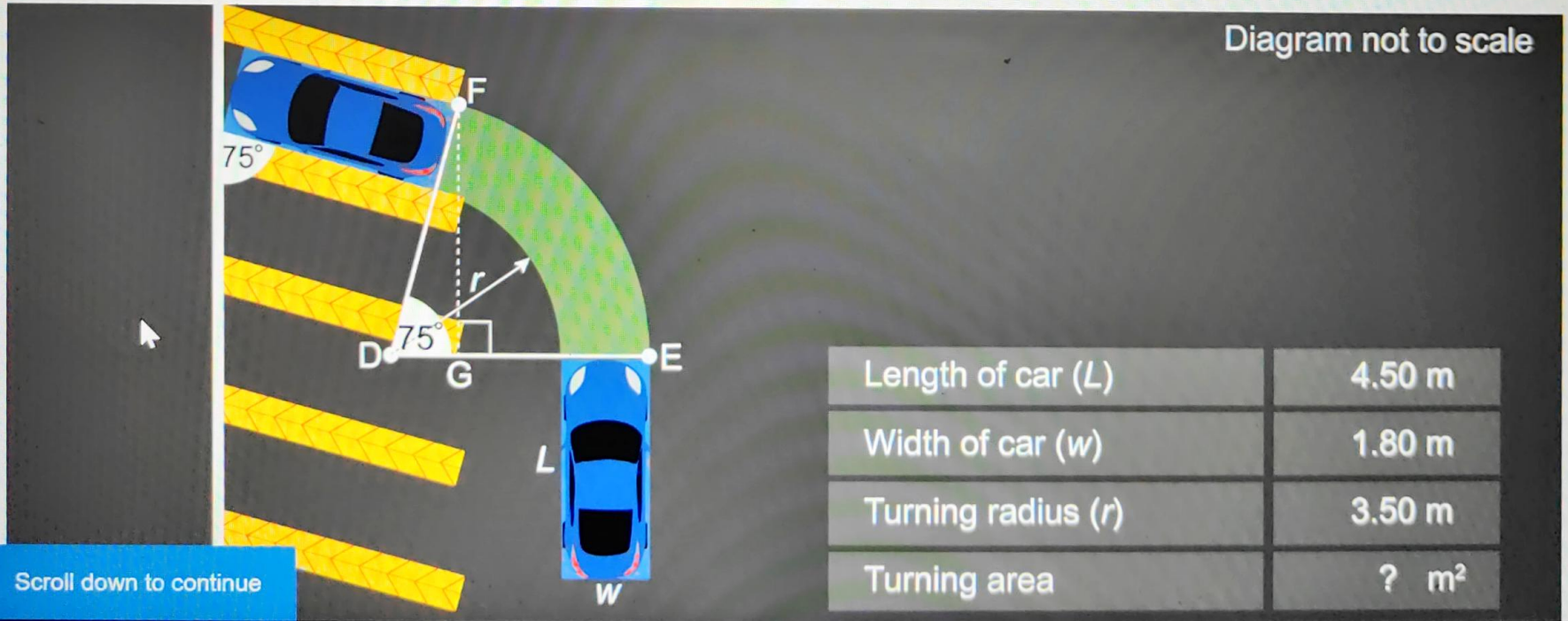
Angled parking scenario

The car park is designed to fit cars with maximum dimensions as shown in the table. DE and DF are equal. FG is perpendicular to DE.

The angled parking scenario is modelled in **Diagram 1**.

Given that DE is 5.3 m.

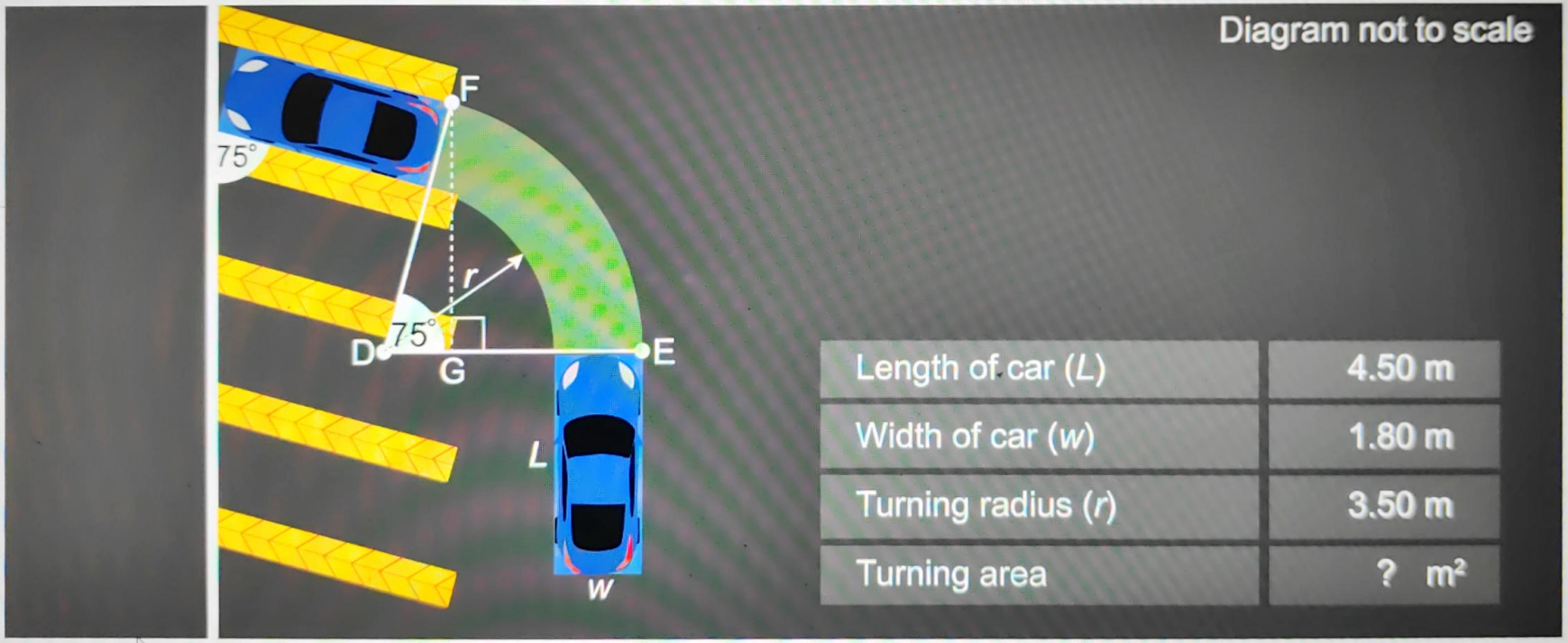
Diagram 1



Length of car (L)	4.50 m
Width of car (w)	1.80 m
Turning radius (r)	3.50 m
Turning area	? m^2

Given that DE is 5.3 m.

Diagram 1



©

Question 7a (4 marks)

Calculate the value of the turning area shaded in green.

B I U x_2 x^2 Ω Σ

Styles

Question 7b (5 marks)

Find the value of the minimum lane width EG to the nearest one decimal place.

B I U x_2 x^2 Ω Σ

Styles

Question 7c (10 marks)

You are the designer in a planning department, below is your brief for a car park design.

Purpose:

Design a car park to maximize the number of parking spaces in order to make the best use of the land as a resource.

Conditions:

Use **either** perpendicular parking **or** angled parking **but not both.**

Use 5.5 m as minimum lane width for the perpendicular parking

Use 4.0 m as minimum lane width for the angled parking

Design a layout for the car park with the dimensions provided in the diagram.

In your answer, you should:

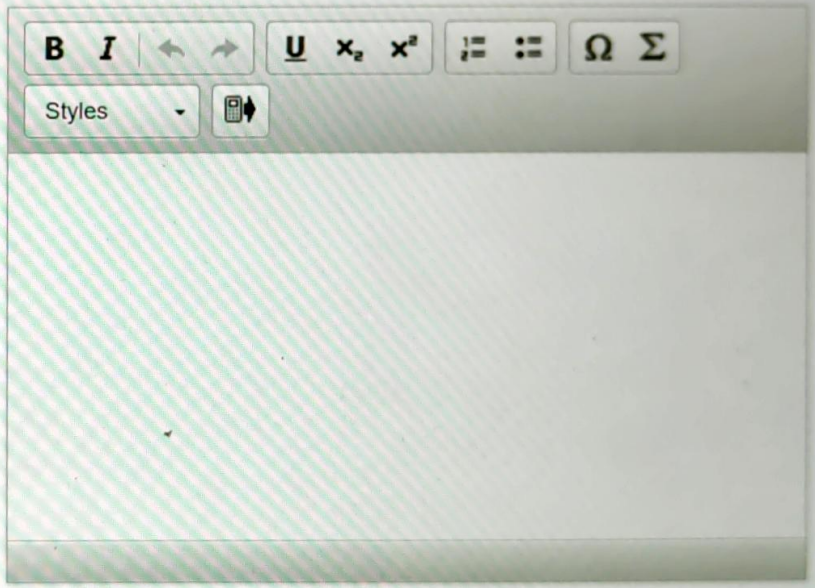
B I U x_2 x^2 Ω Σ

Styles

Design a layout for the car park with the dimensions provided in the diagram.

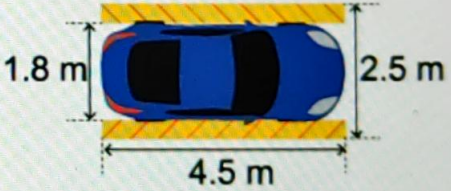
In your answer, you should:

- identify the relevant factors you considered in your design
- justify with calculations that your design is making the best use of the available width of the car park
- justify the degree of accuracy of your design
- illustrate the design on **one** of the diagrams below.



Key:

Perpendicular parking

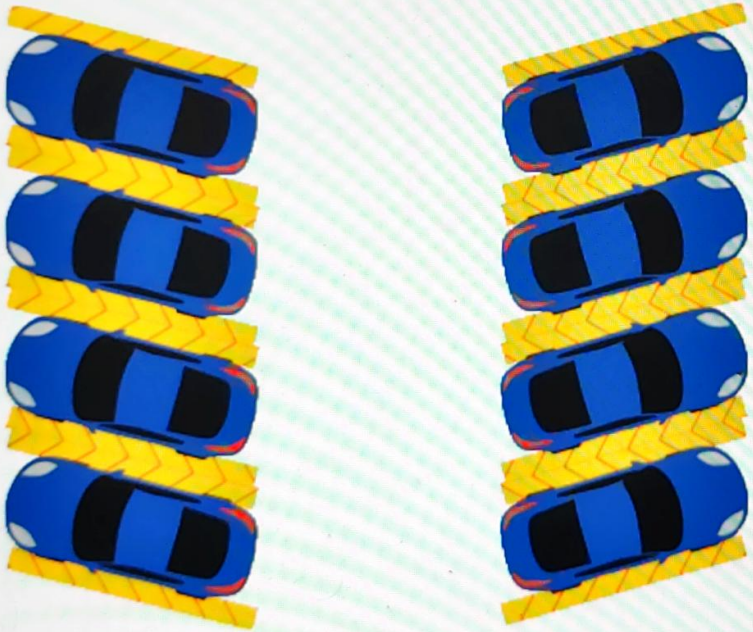


Draggable:

Scale

5 m

Draggable:



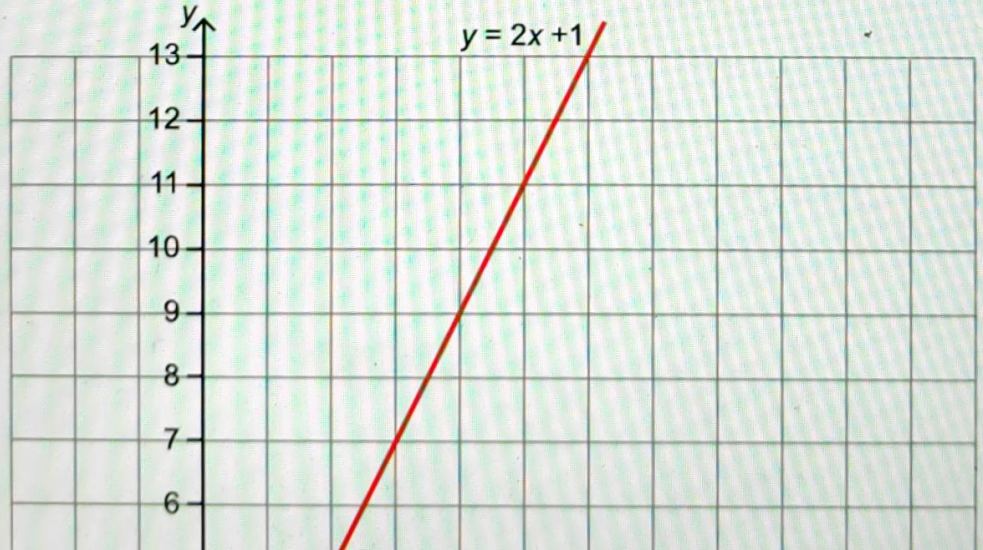
Key:

Question 8 (33 marks)

The line $y = 2x + 1$ is drawn. Vertical line segments are added between the line and the x axis. They are one unit apart horizontally. In this question, you will investigate areas of different trapeziums formed.

Drag the stage slider to see how trapeziums can be formed.

This media is interactive



Stage control

Stage:

Stage (n)	Area of trapezium (T)

This media is interactive

Stage control

Stage:

Stage (n)	Area of trapezium (T)

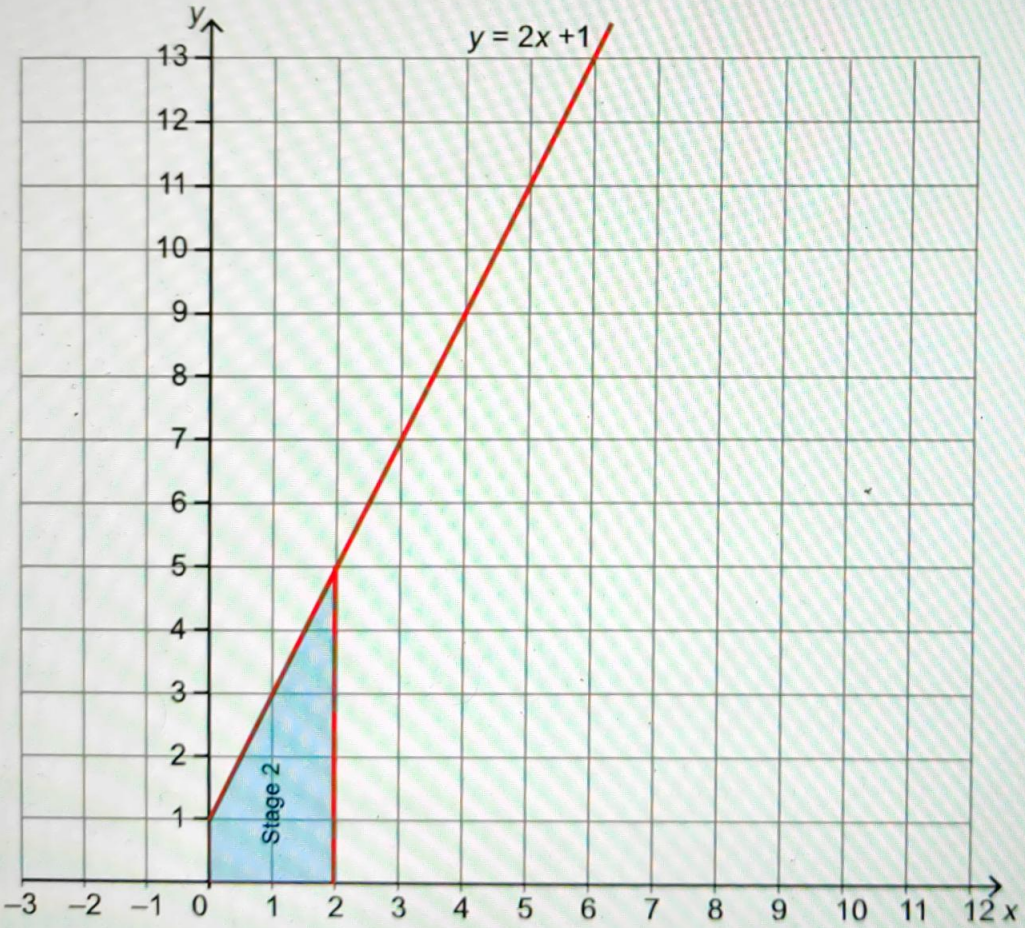
This media is interactive

Stage control

Stage: 1

Stage (n)	Area of trapezium (T)
1	2

This media is interactive



Stage control

Stage: 2

Stage (n)	Area of trapezium (T)
1	2
2	6

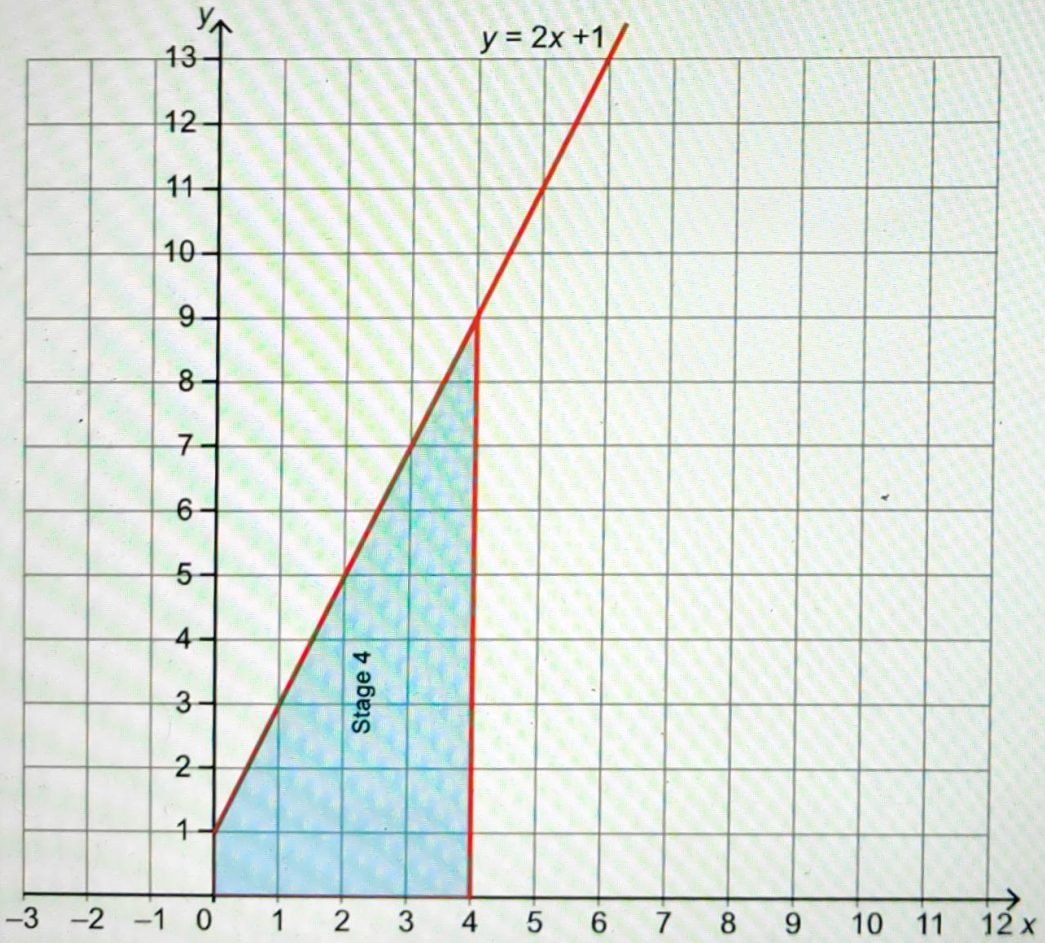
This media is interactive

Stage control

Stage: 3

Stage (n)	Area of trapezium (T)
1	2
2	6
3	12

This media is interactive



Stage control

Stage: 4

Stage (n)	Area of trapezium (T)
1	2
2	6
3	12
4	20

This media is interactive

Stage control

Stage: 5

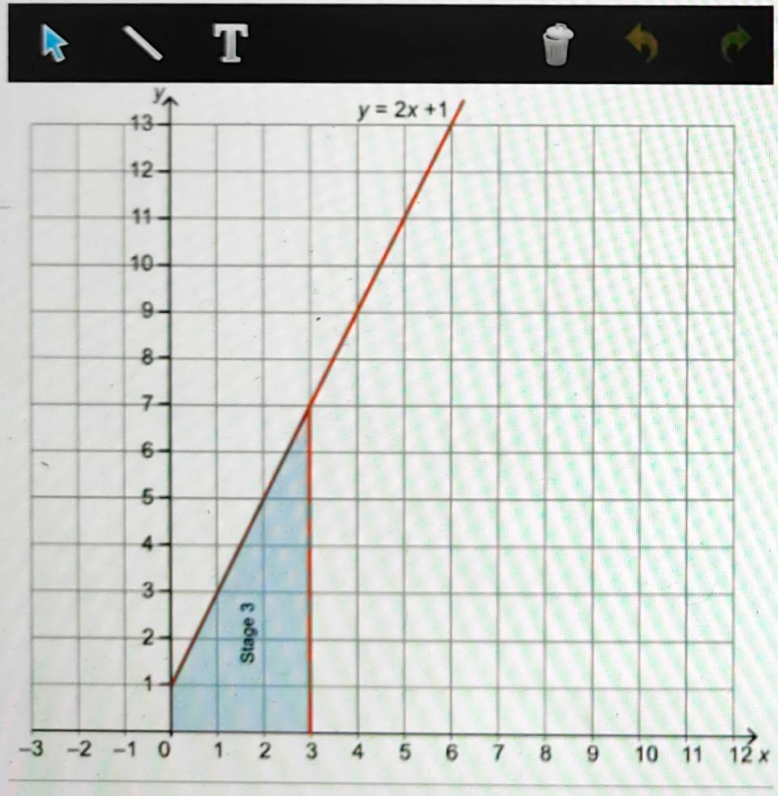
Stage (n)	Area of trapezium (T)
1	2
2	6
3	12
4	20
5	?

Stage control

Stage: 6

Stage (n)	Area of trapezium (T)
1	2
2	6
3	12
4	20
5	?
6	?

Question 8a (2 marks)



For stage 3, **show that** the area of the trapezium is 12 units squared.

B I U x_2 x^2 Ω Σ

Styles

Question 8b (1 mark)

Write down the missing values in the table up to stage 6.

Stage (n)	Area of trapezium (A)
1	2
2	6
3	12
4	20
5	
6	

Reset

Question 8c (2 marks)

Describe in words **two** patterns you see in the table for A.

B I U x_2 x^2 Ω Σ

Styles

Question 8b (1 mark)

Write down the missing values in the table up to stage 6.

Stage (n)	Area of trapezium (A)
1	2
2	6
3	12
4	20
5	
6	

Reset

Question 8d (2 marks)

Write down a general rule for A in terms of n.

B I U x_2 x^2 Ω Σ

Styles

Question 8b (1 mark)

Write down the missing values in the table up to stage 6.

Stage (n)	Area of trapezium (A)
1	2
2	6
3	12
4	20
5	
6	

Reset

Question 8e (3 marks)

Verify your general rule for A.

B I U x_2 x^2 Ω Σ

Styles

Question 8f (23 marks)

The lines $y = 2x + 1$ and $y = -2x - 2$ are drawn. Vertical line segments are added between the lines. They are one unit apart horizontally, you will now look at how different trapeziums are formed.

Drag the Stage slider to see how these different trapeziums can be formed

Legend:

A denotes area of trapeziums above the x-axis
B denotes area of trapeziums below the x-axis
T denotes area of the whole trapezium

Investigate to find a relationship for T in terms of n. In your answer, you should:

- predict more values and record these in the table
- describe in words **two** patterns for column T
- find a general rule for T in terms of n
- test your general rule for T
- prove or verify and justify your general rule for T
- ensure that you communicate all your working appropriately.

- prove or verify and justify your general rule for T
- ensure that you communicate all your working appropriately.

Stage (n)	Area of trapezium (A)	Area of trapezium (B)	Area of trapezium (T)
1	2	3	5
2	6	8	14
3	12	15	27
4	20	24	44
5			
6			
7			

Reset