

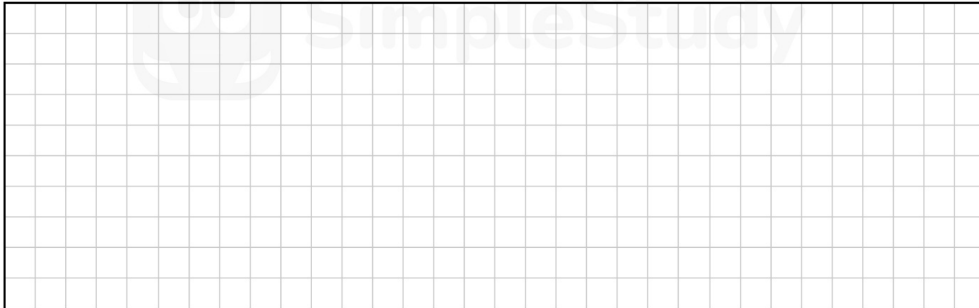
Question 1

Question 1

(30 marks)

(a) $A(4, 2)$ and $B(1, 8)$ are two points in the co-ordinate plane.

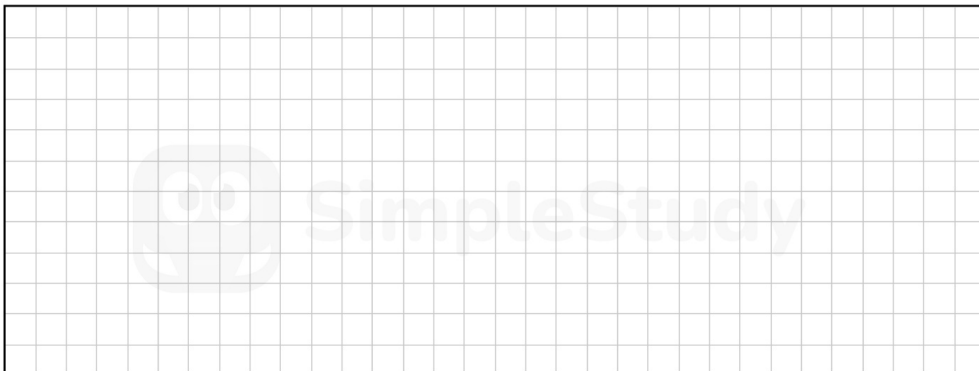
(i) Work out the slope of the line AB .



(ii) Work out the distance $|AB|$.

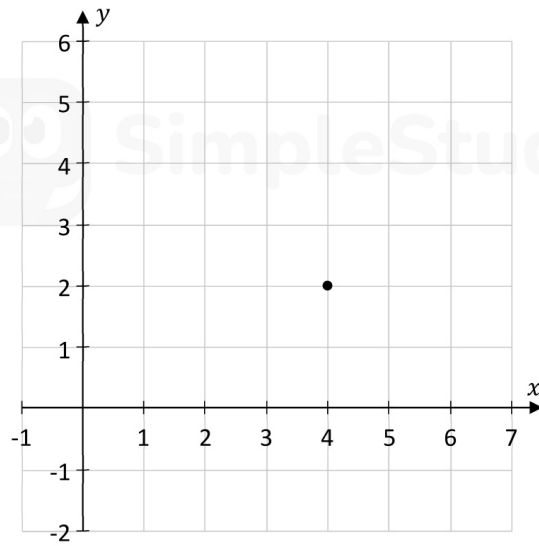


(b) Find the equation of the line through the point $(-2, 7)$ with a slope of $\frac{1}{3}$.
Give your answer in the form $ax + by + c = 0$, where $a, b, c \in \mathbb{Z}$.

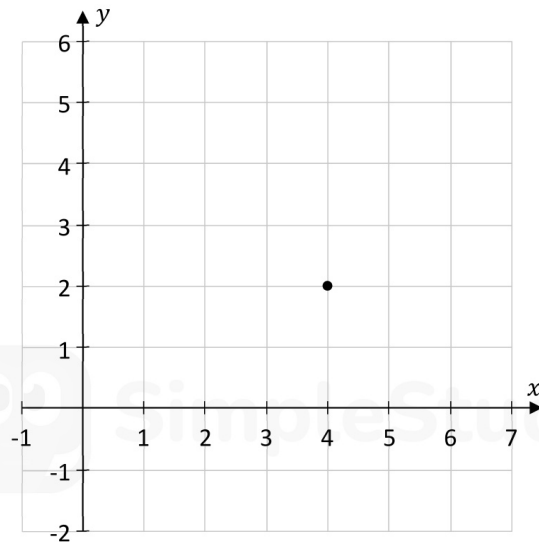


(c) The point $(4, 2)$ is shown in each of the two co-ordinate diagrams below.

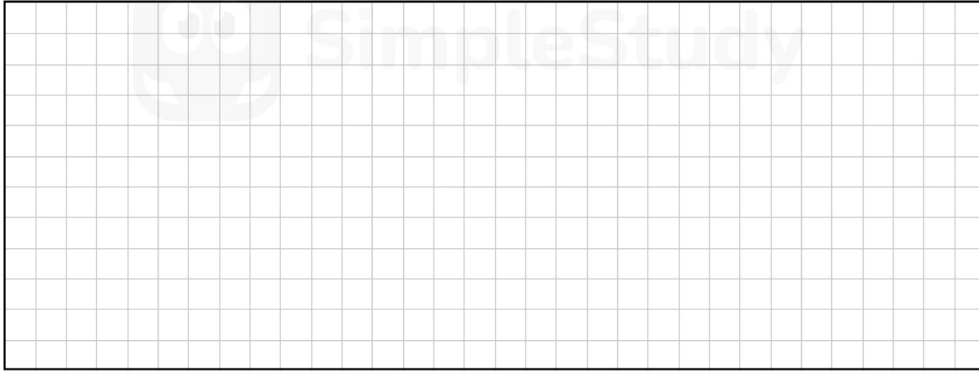
(i) Draw the line segment through the point $(4, 2)$ with a slope of 2 on the co-ordinate diagram below, with the range $-2 \leq y \leq 6$, $y \in \mathbb{R}$.



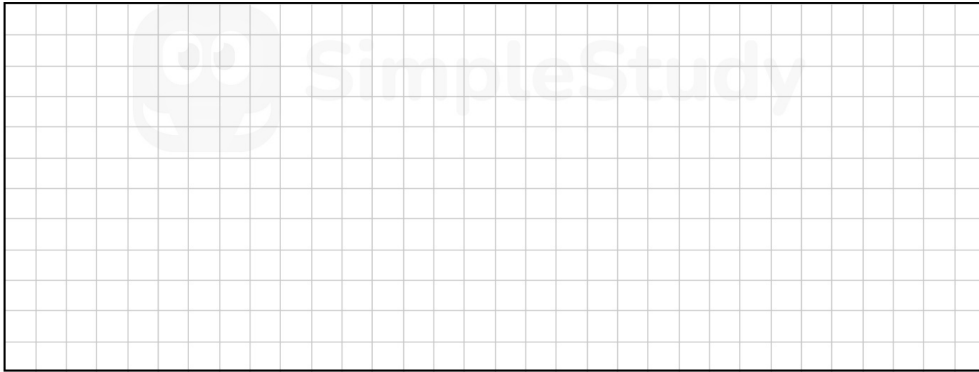
- (ii) Draw the line segment through the point (4, 2) with a slope of $-\frac{2}{3}$ on the co-ordinate diagram below, on the domain $-1 \leq x \leq 7$, $x \in \mathbb{R}$.



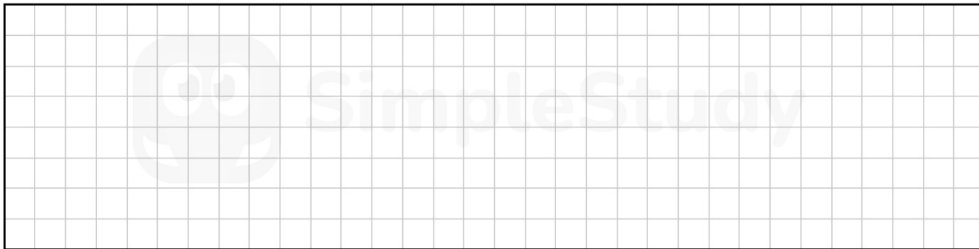
correct to the nearest percent.



- (d) Show that the radius of the circle k is 8.49 cm, correct to 2 decimal places.



- (e) Work out the circumference of the circle k , correct to 2 decimal places.



Question 3

Question 4

(30 marks)

Rohan plays basketball.

- (a) During a match, Rohan takes a number of free throws.
He scores 70% of his free throws, on average.

Assume that scoring his free throws are independent events.

- (i) Find the probability that he scores his first 3 free throws.

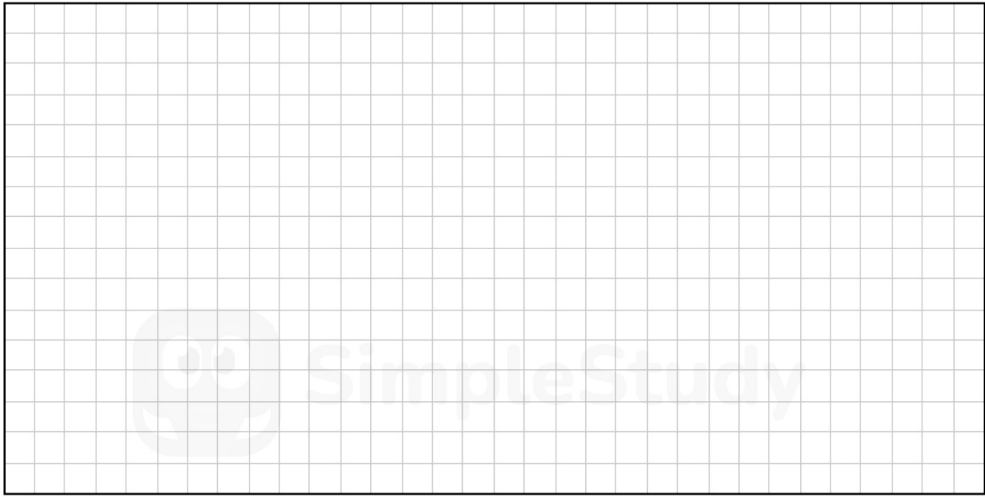
- (ii) Find the probability that he scores exactly 2 of his first 3 free throws.

- (iii) Give one reason why scoring his free throws might **not** be independent events.

- (b) The table below shows the number of games in which Rohan scored each of the given number of points. For example, Rohan scored 12 points in 3 games.

Number of points	0	6	8	10	12	16
Number of games	4	5	4	2	3	1

Work out Rohan's mean number of points per game, based on the values in the table.
Give your answer correct to 2 decimal places.

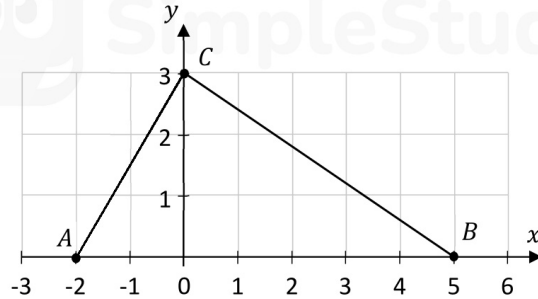


Question 4

Question 1

(30 marks)

Parts of the lines AC and BC are shown in the co-ordinate diagram below (not to scale).



- (a) (i) Find the slope of AC .

SimpleStudy

- (ii) By using slopes, investigate if AC is perpendicular to BC . Justify your answer.

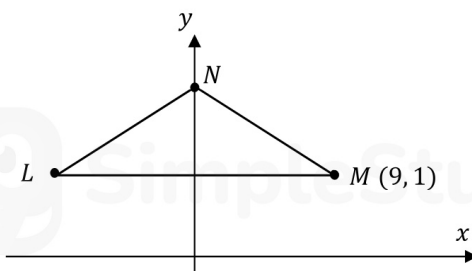
Answer:
(Tick (✓) **one** box only)

AC is perpendicular
to BC

AC is **not** perpendicular
to BC

SimpleStudy

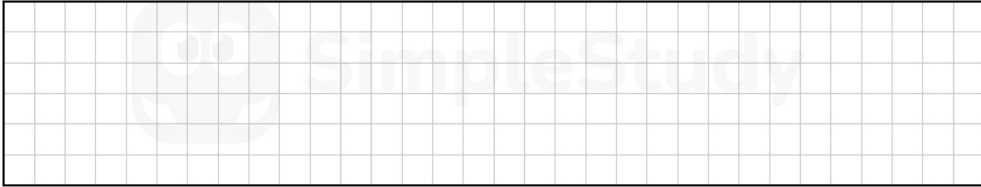
- (b) The triangle LMN is shown on the co-ordinate diagram below (not to scale).
The point M has co-ordinates $(9, 1)$.
The triangle LMN is symmetrical about the y -axis.



(i) Find the length $|LM|$.

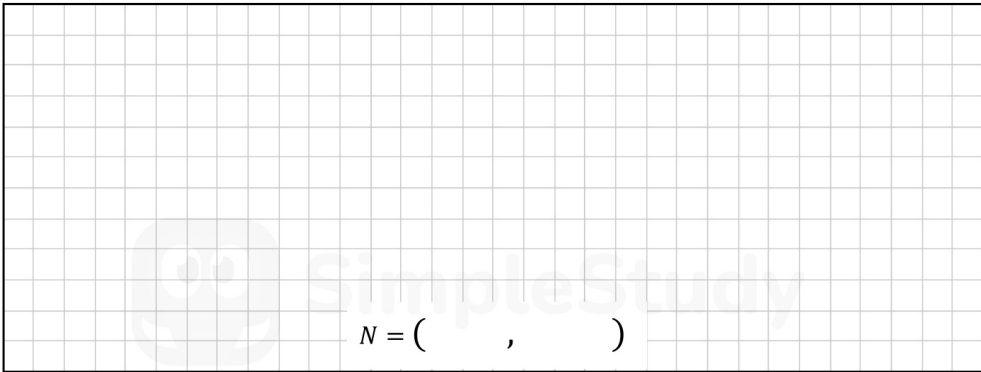


(ii) Write down the equation of the horizontal line LM .



(iii) The line NM has equation $x + 4y - 13 = 0$, where $x, y \in \mathbb{R}$.

Use this equation to find the co-ordinates of the point N .

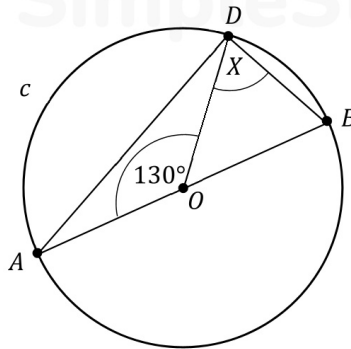


Question 5

Question 6

(30 marks)

- (a) The circle c is shown in the diagram below (not to scale). Its centre is at the point O . The points A , B , and D lie on the circle, and $[AB]$ is a diameter of the circle.



- (i) Write down $|\angle ADB|$, the size of the total angle at the point D .

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- (ii) $|\angle AOD| = 130^\circ$. Work out the size of the angle marked X in the diagram.

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- (iii) The radius of the circle is 18 cm. Find the length of the arc AD .
Give your answer in cm, in terms of π .

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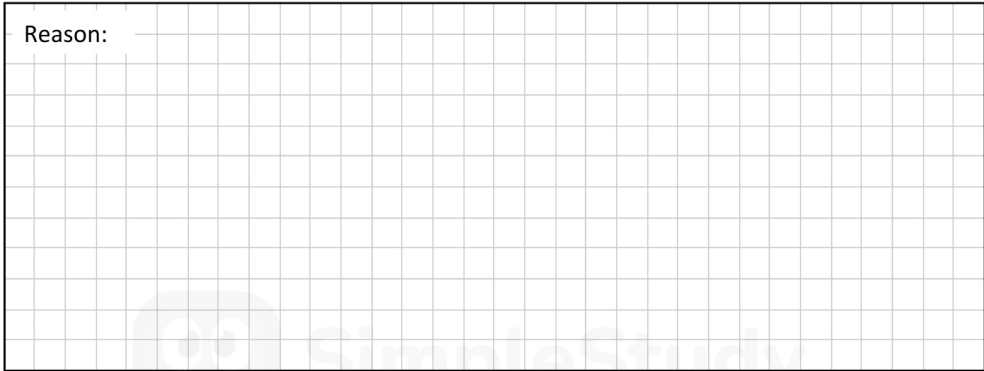
- (b) Two statements, **A** and **B**, are shown below.

For each statement, put a tick (\checkmark) in the correct box to show if it is true or false.
Give a reason for your answer in each case.

- (i) **Statement A:** If two triangles are similar, then they **must** be congruent.

This statement is: true false
(tick **one** box only)

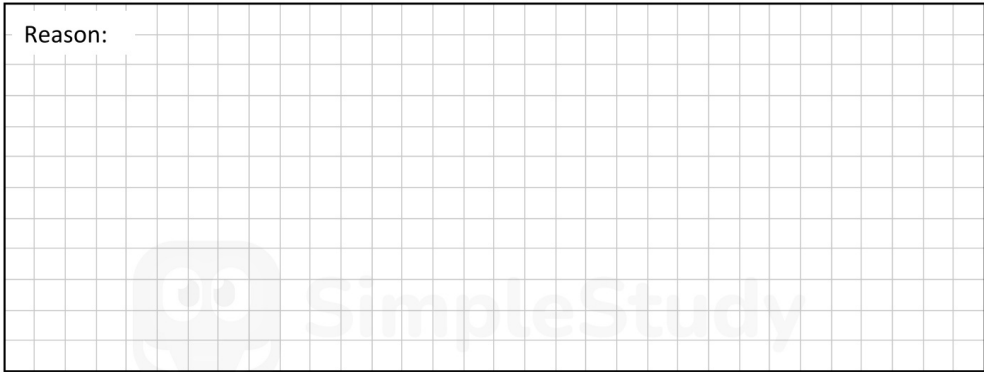
Reason:

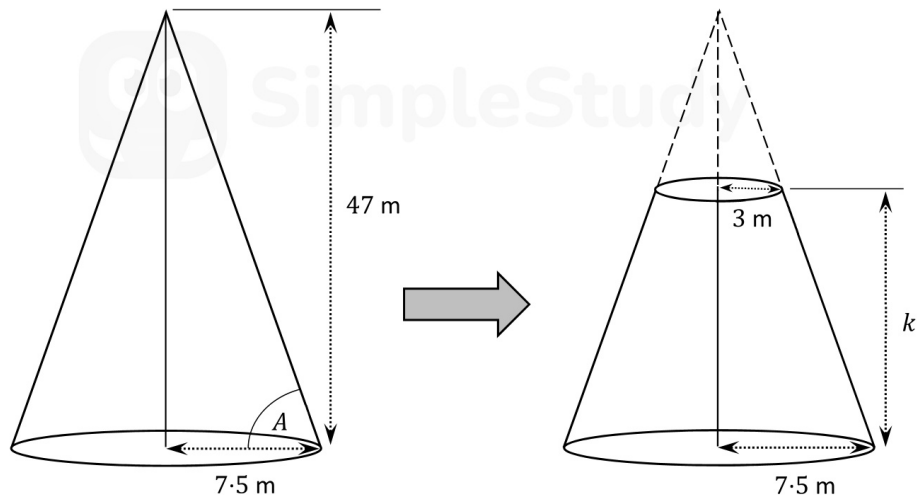


(ii) **Statement B:** If two triangles are congruent, then they **must** be similar.

This statement is: true false
(tick **one** box only)

Reason:





- (i) The height of the cone **before** the top part is removed is 47 m.
 Work out the size of the angle at the base of the cone, marked A in the diagram above.
 Give your answer correct to the nearest degree.

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- (ii) Find the distance marked k on the diagram, the height **after** the top part is removed.

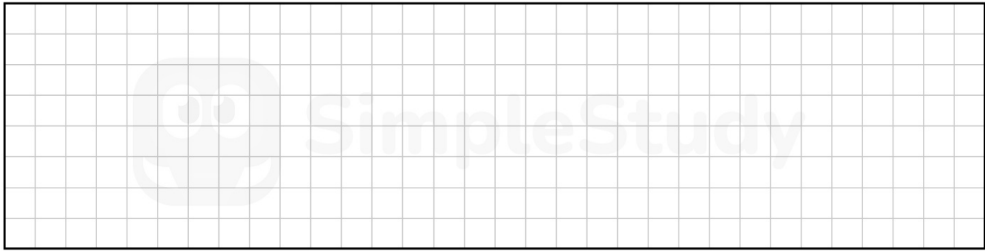
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- (c) Assume that the Fastnet lighthouse can be seen from anywhere within a circle of radius 50 km.

- (i) Work out the area of the circle within which the Fastnet lighthouse can be seen.
 Give your answer correct to the nearest km^2 .

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- (ii) $50 \text{ km} = 27 \text{ nautical miles}$.
 Use this to work out how many km are in 1 nautical mile.
 Give your answer correct to 4 significant figures.



Question 7

Question 7

(50 marks)

- (a) The following table shows the age profiles of all of the people in Ireland, aged between 15 and 65, who subscribed to an online streaming platform.

Age Group	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Percentage (%) of Subscribers	24	27	25	16	8

Note: 25 – 35 means 25 years and over but less than 35 years.

Source: <https://www.statista.com>

- (i) Draw a **Histogram** to represent the data.



- (ii) In a survey of 1000 subscribers, aged between 15 and 65, how many people would you expect to be between 25 years and 55 years?

- (iii) Use the table or the histogram to write down the age group which contains the median age.

Age Group: _____

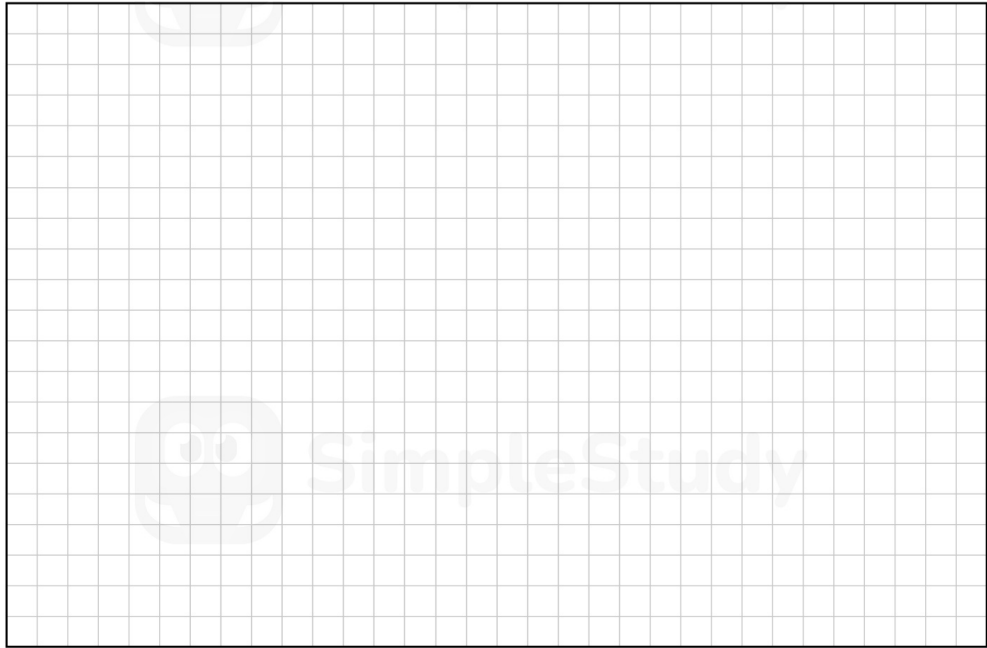
- (iv) Use the mid-interval values of the groups in the table to estimate the mean age of the subscribers. Give your answer correct to one decimal place.

- (b) Prior to the COVID-19 pandemic, *Netflix* held the largest share of the online streaming market with 65% of all streaming subscribers in the 15 to 65 age group. Aiden thought that this percentage might have changed during the pandemic and surveyed a sample of subscribers in this age group to get data. He then carried out a Hypothesis Test to test his theory.

- (i) If 540 people responded to his survey, calculate the margin of error of his survey. Give your answer as a percentage, correct to one decimal place.

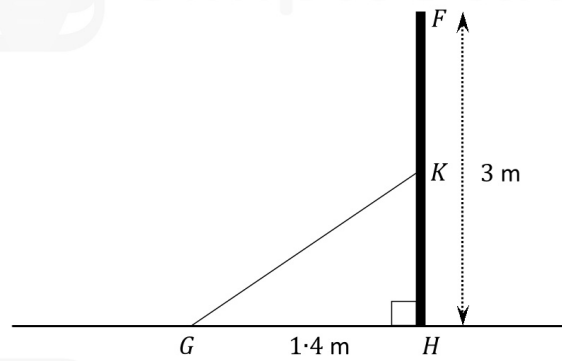
- (ii) His survey revealed that 372 of the responders said they now have a *Netflix* account. Use your answer to **Part (b)(i)** above to create a 95% confidence interval for the percentage of the population that have a *Netflix* account.

- (iii) Use your answer to **Part (b)(ii)** above to conduct the Hypothesis Test, at the 5% level of significance to test Aiden's claim that the percentage of subscribers to *Netflix* had changed. State clearly your null hypothesis, your alternative hypothesis and give your conclusion in the context of the question.



sign $[FH]$.

Mairéad says that the size of the new angle $\angle KGH$ is half the size of the angle $\angle FGH$.



Is Mairéad correct?

Use calculations to support your answer.

Answer:

(Tick (✓) **one** box only)

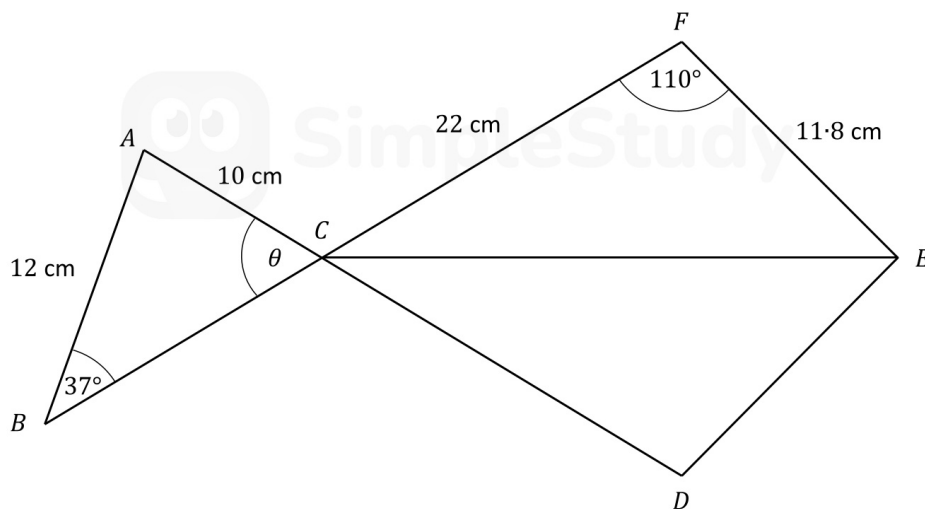
Yes

No

Calculations:

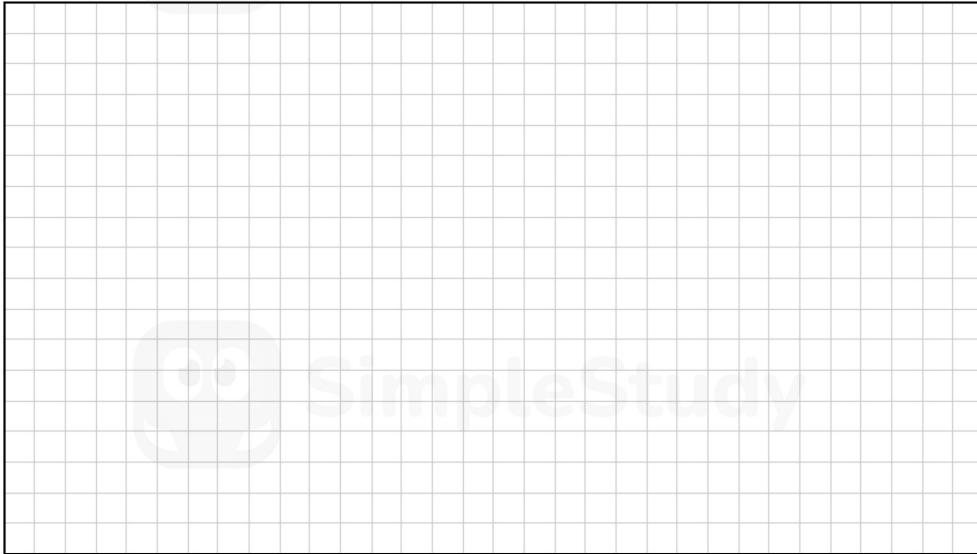
This question continues on the next page.

- (b) The fish shop has a logo with some measurements as shown in the diagram below (not to scale).



- (i) $|AB| = 12$ cm, $|AC| = 10$ cm, and $|\angle ABC| = 37^\circ$.

Work out the size of the angle θ , where θ is the angle $\angle BCA$.
Give your answer correct to the nearest degree.



- (ii) $|CF| = 22$ cm, $|EF| = 11.8$ cm, and $|\angle EFC| = 110^\circ$.

Use the cosine rule to work out the distance $|CE|$.
Give your answer correct to 1 decimal place.



- (iii) $CDEF$ is symmetrical about $[CE]$.

Work out the **total** area of $CDEF$.

Give your answer correct to the nearest cm^2 .

