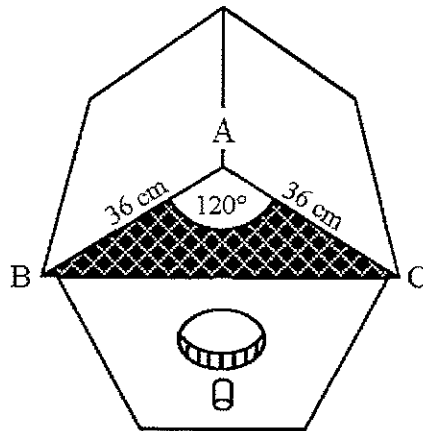


Geometry and Trigonometry

Question 21 E6.G.2

2 marks

A community group is building bird houses.



A) State the type of triangle that is shaded in the diagram. (1 mark)

Sample answers:

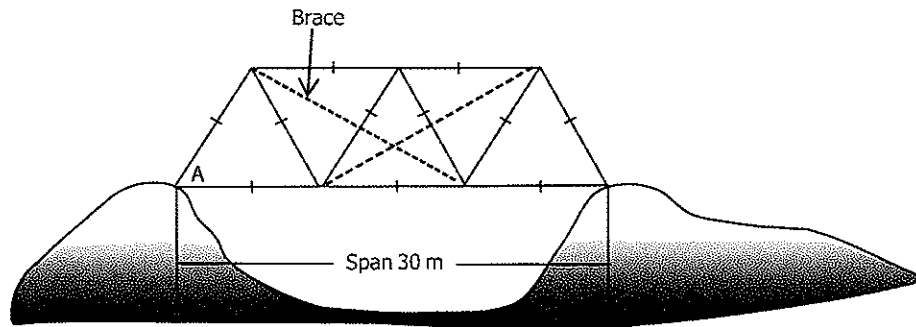
- isosceles
- obtuse

B) State the measure of $\angle C$ in triangle ABC. (1 mark)

Answer:

$$\begin{aligned}\angle C &= \frac{180^\circ - 120^\circ}{2} \\ &= 30^\circ \quad \leftarrow 1 \text{ mark}\end{aligned}$$

Bartholomew is solving a math problem involving a truss bridge. The 30 metre bridge is made of 5 equilateral triangles of the same size and has 2 braces as shown in the diagram.



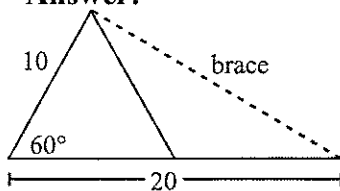
A) State the measure of angle A. (1 mark)

Answer:

$$\begin{aligned} \angle A &= \frac{180^\circ}{3} \\ &= 60^\circ \leftarrow 1 \text{ mark} \end{aligned}$$

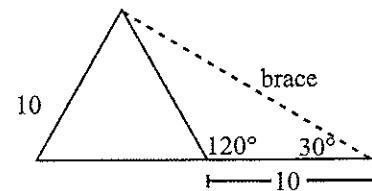
B) Calculate the length of the brace. (2 marks)

Answer:



OR

Answer:



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

$$a^2 = 10^2 + 20^2 - (2(10)(20) \cos 60^\circ)$$

$$\begin{aligned} \cancel{a^2} &= \cancel{100} + \cancel{400} - (\cancel{400} \cos 60^\circ) \\ a^2 &= 300 \end{aligned}$$

$$a = \sqrt{300}$$

$$a = 17.32 \text{ m}$$

$\leftarrow 1 \text{ mark for process} \rightarrow$

$$\begin{cases} \frac{\text{brace}}{\sin 120^\circ} = \frac{10}{\sin 30^\circ} \\ \text{brace} = \frac{10(\sin 120^\circ)}{\sin 30^\circ} \end{cases}$$

$\leftarrow 1 \text{ mark} \rightarrow$

$$\text{brace} = 17.32 \text{ m}$$

Note to marker: Accept equivalent solutions.

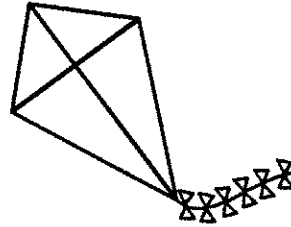
Question 23

E6.G.2

1 mark

Identify which of the following is a property of a kite:

- A) the lengths of the opposite sides are congruent
- B) opposite angles are congruent
- C) diagonals are congruent
- D) diagonals intersect at 90°



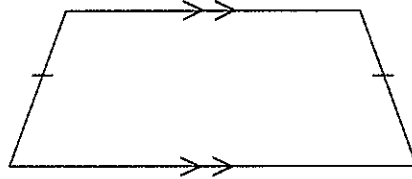
Answer: D)

Identify which of the following diagrams best illustrates an isosceles trapezoid.

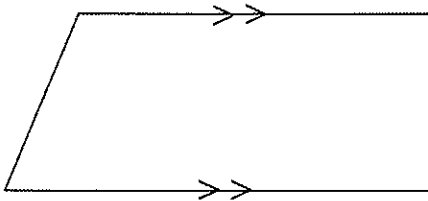
A)



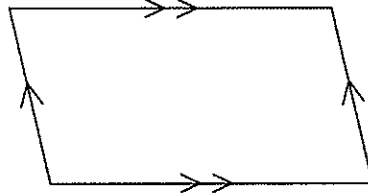
B)



C)



D)



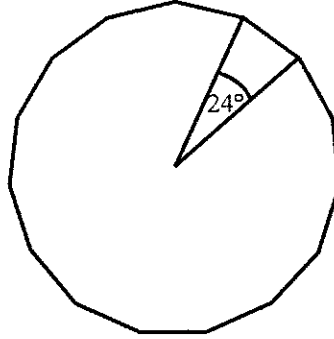
Answer: B)

Question 26

E6.G.2

1 mark

An engineer is designing a building in the form of a regular polygon that has a central angle of 24° .



She is using the formula $S = \frac{64\,800}{C} - 360^\circ$, where S is the sum of the interior angles of a polygon and C is the central angle of the regular polygon.

State the sum of the interior angles of the polygon.

Answer:

$$\begin{aligned} S &= \frac{64\,800}{C} - 360^\circ \\ &= \frac{64\,800}{24^\circ} - 360^\circ \\ &= 2700^\circ - 360^\circ \\ &= 2340^\circ \end{aligned}$$

← 1 mark

OR**Answer:**

$$\begin{aligned} C &= \frac{360^\circ}{n} \\ 24^\circ &= \frac{360^\circ}{n} \\ n &= 15 \end{aligned}$$

$$S = 180^\circ(n - 2)$$

$$S = 2340^\circ$$

← 1 mark

Question 21 E6.G.2

2 marks

A standard soccer ball is made up of different shapes including hexagons sewn together to form a ball.

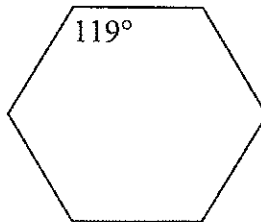
A) State the sum of the interior angles of a regular hexagon. (1 mark)

Answer:

$$180^\circ(6 - 2)$$

$$= 720^\circ \quad \leftarrow 1 \text{ mark}$$

B) Paulo has the following piece of material that he is using to make a soccer ball.



Justify whether the piece of material shown above is a regular polygon. (1 mark)

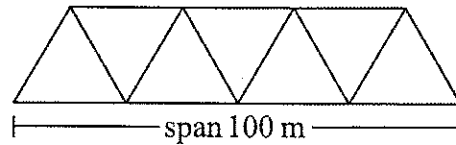
Answer:

This is not a regular polygon because all of the angles are not 120° .

Question 23 E6.G.2

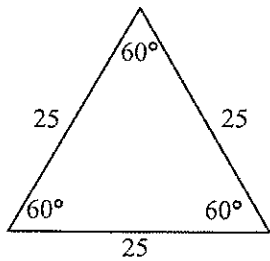
2 marks

A student is solving a math question involving a 100 metre truss bridge. The bridge is made of 7 equilateral triangles as shown in the diagram below.



Sketch 1 of the bridge's triangles and state all side and angle measurements.

Answer 1:

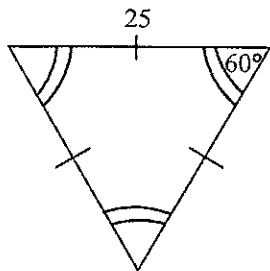


1 mark for three 25 m sides

1 mark for three 60° angles

OR

Answer 2:

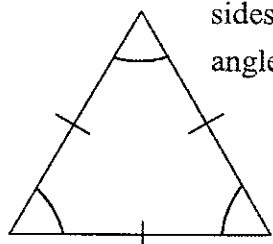


1 mark for three 25 m sides

1 mark for three 60° angles

OR

Answer 3:



sides: 25 m

angles: 60°

1 mark for three 25 m sides

1 mark for three 60° angles

Question 24 E6.G.2

2 marks

The sum of the interior angles of a regular polygon is 2160° .

Calculate the number of sides of this regular polygon.

Answer 1:

$$\left. \begin{array}{l} S = 180^\circ(n - 2) \\ 2160^\circ = 180^\circ(n - 2) \\ \frac{2160^\circ}{180^\circ} = n - 2 \\ 12 = n - 2 \\ n = 14 \end{array} \right\} \begin{array}{l} \leftarrow 1 \text{ mark for substitution/process} \\ \\ \\ \\ \leftarrow 1 \text{ mark} \end{array}$$

OR**Answer 2:**

Number of sides	Sum of interior angles
3	180°
4	360°
5	540°
\vdots	\vdots
<u>14</u>	2160°

← 1 mark for substitution/process

1 mark

OR**Answer 3:**

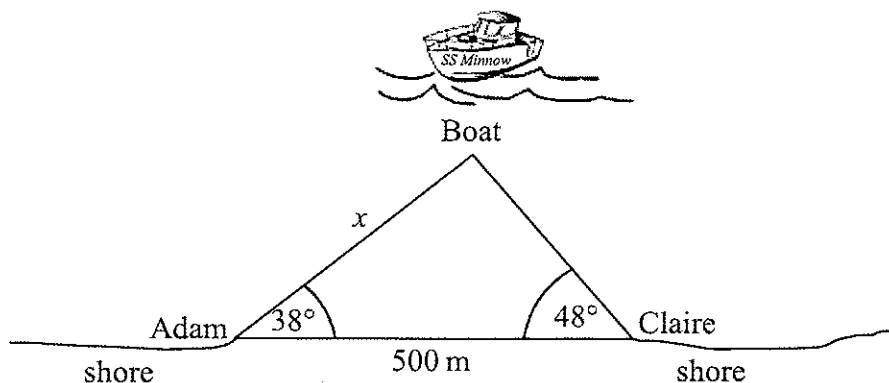
$$\left. \begin{array}{l} S = 180^\circ(n - 2) \\ 2160^\circ = 180^\circ(n - 2) \\ 2160^\circ = 180^\circ n - 360^\circ \\ 2520^\circ = 180^\circ n \\ \frac{2520^\circ}{180^\circ} = n \\ n = 14 \end{array} \right\} \begin{array}{l} \leftarrow 1 \text{ mark for substitution/process} \\ \\ \\ \\ \leftarrow 1 \text{ mark} \end{array}$$

Question 22 E6.G.1

4 marks

A boat has drifted away from the shore. Adam and Claire are 500 m apart on the shore. The angle between the boat, Adam, and Claire is 38° , while the angle between the boat, Claire, and Adam is 48° .

Calculate the distance (x) Adam must swim to reach the boat.

**Answer:**

$$\angle ABC = 180^\circ - (38^\circ + 48^\circ)$$

$$= 94^\circ$$

← 1 mark for identification of third angle

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

$$\frac{\sin 94^\circ}{500} = \frac{\sin 48^\circ}{x}$$

$$x = \frac{500(\sin 48^\circ)}{\sin 94^\circ}$$

← 1 mark for identification of sine law

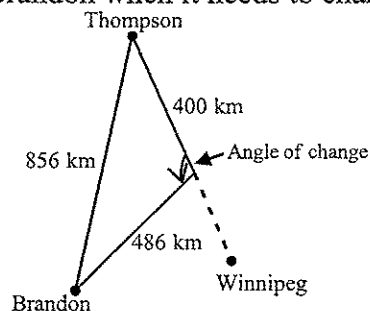
← 1 mark for substitution/process

$$x = 372.48 \text{ metres}$$

← 1 mark

An air ambulance is flying from Thompson to Winnipeg. After travelling 400 km, the plane is re-routed to Brandon.

Calculate the angle of change if the plane is 486 km from Brandon when it needs to change its direction.



Answer 1:

$$a^2 = b^2 + c^2 - (2bc \cos A) \quad \leftarrow 1 \text{ mark for identification of cosine law}$$

$$856^2 = 400^2 + 486^2 - (2(400)(486) \cos A)$$

$$732\,736 = 396\,196 - (388\,800 \cos A)$$

$$336\,540 = -388\,800 \cos A$$

$$\cos A = -0.8655\dots$$

$$A = \cos^{-1}(-0.8655\dots)$$

$$A = 149.9497$$

$$A = 149.95^\circ \quad \leftarrow 1 \text{ mark}$$

} ← 1 mark for substitution/process

OR

Answer 2:

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \quad \leftarrow 1 \text{ mark for identification of cosine law}$$

$$\cos A = \frac{486^2 + 400^2 - 856^2}{2(486)(400)}$$

$$\cos A = \frac{236\,196 + 160\,000 - 732\,736}{388\,800}$$

$$\cos A = \frac{-336\,540}{388\,800}$$

$$\cos A = -0.865\,586\,419$$

$$A = 149.95^\circ \quad \leftarrow 1 \text{ mark}$$

} ← 1 mark for substitution/process