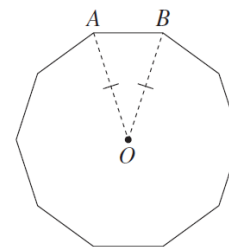




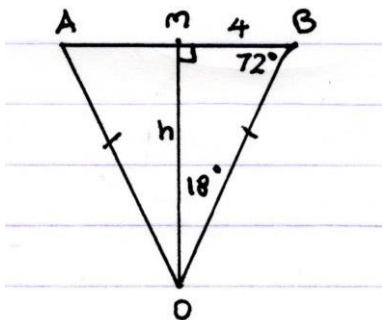
- 20 MA** **22** The diagram shows a regular decagon (ten-sided shape with all sides equal and all interior angles equal). The decagon has centre O . The perimeter of the shape is 80 cm. By considering triangle OAB , calculate the area of the ten-sided shape. Give your answer in square centimetres, correct to one decimal place.



4

As $80 \div 10 = 8$, then $AB = 8$ cm. ✓

As $360 \div 10 = 36$, angle $AOB = 36^\circ$.



As $\triangle AOB$ is isosceles, then OM is perpendicular to AB and BM is 4 cm.

As $\angle AOB = 36^\circ$, then $\angle BOM = 18^\circ$, and hence $\angle OBM = 72^\circ$. Also, let $OM = h$.

$$\frac{h}{4} = \tan 72^\circ$$

$$h = 4 \tan 72^\circ \quad \checkmark$$

$$\text{Area } \triangle OAB = \frac{1}{2} \times AB \times h$$

$$= \frac{1}{2} \times 8 \times 4 \tan 72^\circ$$

$$= 20 \tan 72^\circ \quad \checkmark$$

$$\text{Area of decagon} = 10 \times 16 \tan 72^\circ$$

$$= 492.4293659\dots$$

$$= 492.4 \text{ (1 dec pl)}$$

\therefore the area is 492.4 cm². ✓

State Mean:
2.67/4

HSC Marking Feedback

Students should:

- determine the length of one side of a regular decagon given the perimeter
- use the sine rule to calculate the side length of a triangle
- find the area of a triangle using the sine rule
- find the area of the decagon using multiple steps.

In better responses, students were able to:

- calculate the internal angles of the triangle
- find the perpendicular height of one triangle correctly
- use the sine rule to find the length of the triangle.

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Areas for students to improve include:

- recognising that the triangles are isosceles
- rounding to one decimal place
- distinguishing between the perpendicular height and slant height of a triangle
- using correct substitutions into the sine rule.

* These solutions have been provided by [projectmaths](http://projectmaths.com.au) and are not supplied or endorsed by NESA.