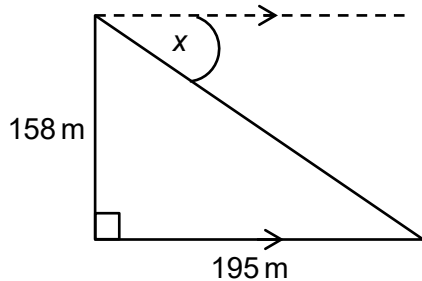
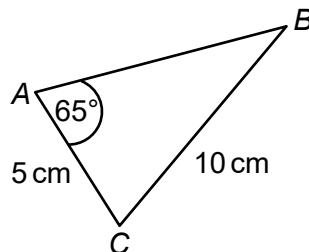


Higher Check In - 10.05 Triangle mensuration

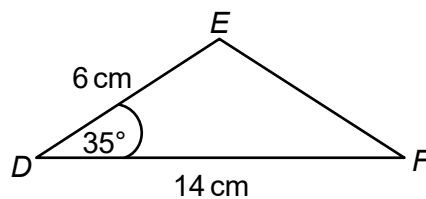
1. Calculate angle x , giving your answer to 3 significant figures.



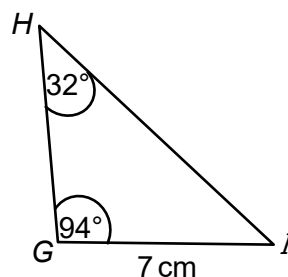
2. Calculate angle B , giving your answer to 3 significant figures.



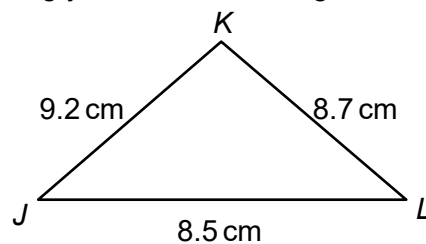
3. Calculate length EF , giving your answer to 1 decimal place.



4. Calculate length GH , giving your answer to 3 significant figures.



5. Calculate angle K , giving your answer to 3 significant figures.

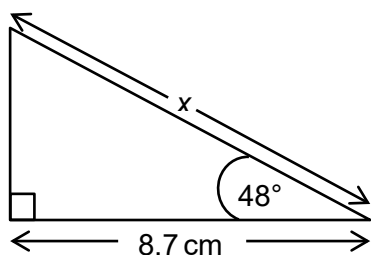


6. Rakesh thinks that $\sin 30^\circ + \sin 60^\circ = \sin 90^\circ$. Show that he is incorrect.

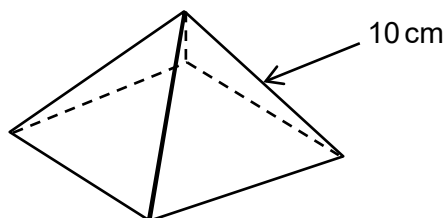


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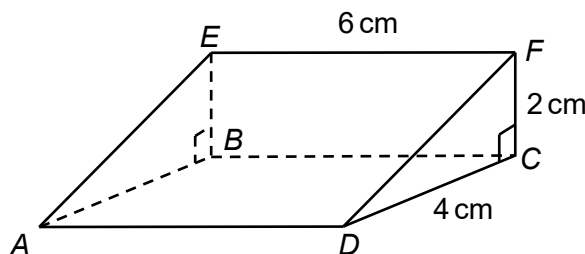
7. Mary says that you can calculate x using the cosine ratio, but Shah says that you can use the sine rule. Explain why both Mary and Shah are correct.



8. A square-based pyramid has its vertex vertically above the centre of the square (so it is called a right pyramid). If **all** the edges of the pyramid are 10 cm long, show that the angle between each face of the pyramid and the square base is 54.7° , correct to 1 decimal place.



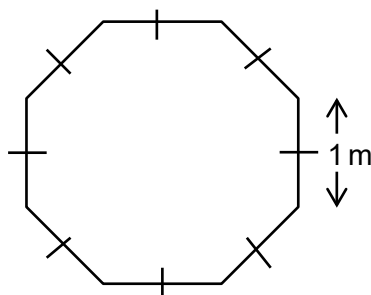
9. Find the angle between the lines BD and DF . Give your answer correct to 1 decimal place.



10. A ship sails on a bearing of 052° for 60 km, then changes direction and sails on a bearing of 155° for another 80 km. How far is the ship now from its starting point? Give your answer correct to 3 significant figures. (Hint: first draw a diagram.)

Extension

Each side of the regular octagon below measures 1 m. Work out the area of the octagon. Give your answer correct to 3 significant figures.



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Answers

- 39.0°
- 26.9°
- 9.7 cm
- 10.7 cm
- 56.6°
- $\sin 30^\circ = \frac{1}{2}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$ so $\sin 30^\circ + \sin 60^\circ = \frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{1+\sqrt{3}}{2}$
But $\sin 90^\circ = 1$ so $\sin 30^\circ + \sin 60^\circ \neq \sin 90^\circ$

- As the triangle has a right angle you can use the cosine ratio
This gives $x = \frac{8.7}{\cos 48^\circ} = 13.0$ cm (3 sf)

You can also use the sine rule $\frac{a}{\sin A} = \frac{b}{\sin B}$

where angle $A = 90^\circ$, angle $B = 180 - (90^\circ + 48^\circ)$ and side $b = 8.7$ cm

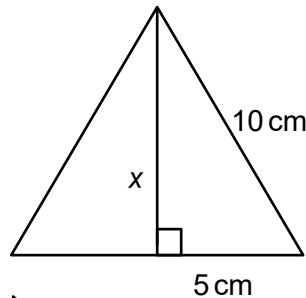
This gives $\frac{x}{\sin 90^\circ} = \frac{8.7}{\sin 42^\circ}$ so $x = \frac{8.7 \times \sin 90^\circ}{\sin 42^\circ} = 13.0$ cm (3 sf)

- First, work out the distance x from the apex of the pyramid to the midpoint of each face.

Using Pythagoras' theorem

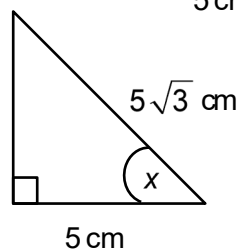
$$x^2 = 10^2 - 5^2$$

$$x = \sqrt{75} = 5\sqrt{3}$$



$$\text{Then } \cos x = \frac{5}{5\sqrt{3}} = \frac{1}{\sqrt{3}}$$

And $x = 54.7^\circ$ (to 1 dp)



- 60.3° (1 dp)
- 88.5 km (3 sf)



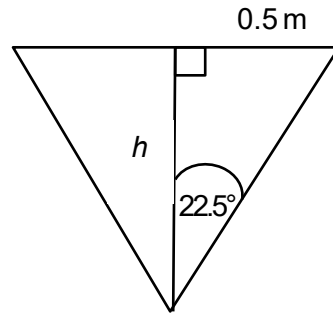
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Extension

Divide the octagon into 8 isosceles triangles.

The angle at the centre of each triangle is $360^\circ \div 8 = 45^\circ$.

Divide each isosceles triangle into two congruent right-angled triangles.



$$\tan 22.5^\circ = \frac{0.5}{h} \text{ so } h = \frac{0.5}{\tan 22.5^\circ} = 1.207106781 \text{ m.}$$

The area of each isosceles triangle is given by $\frac{1}{2}$ base \times height

$$\text{Therefore the area of each isosceles triangle} = \frac{1}{2} \times 0.5 \times 1.207106781 = 0.301776695 \text{ m}^2$$

$$\text{The total area of the octagon} = 8 \times 0.301776695 = 2.41421356 \text{ m}^2 \text{ (3 sf)}$$



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Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Use trigonometry to find an angle			
AO1	2	Find an angle using the sine rule			
AO1	3	Find a length using the cosine rule			
AO1	4	Find a length using the sine rule			
AO1	5	Find an angle using the cosine rule			
AO2	6	Use exact value of trigonometric functions to prove a result			
AO2	7	Explain different methods of using trigonometry			
AO2	8	Use trigonometry in 3D to prove a result			
AO3	9	Use Pythagoras' theorem in 3D			
AO3	10	Solve a real-life word problem involving bearings using the cosine rule			

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