

10
ADV

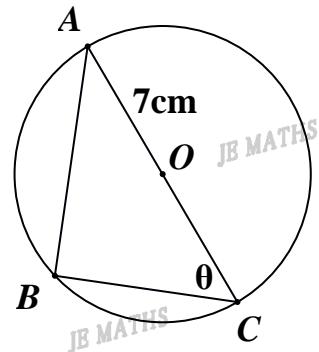
JE
MATHS

**33°
52'
37''S
151°
06'
04''E**

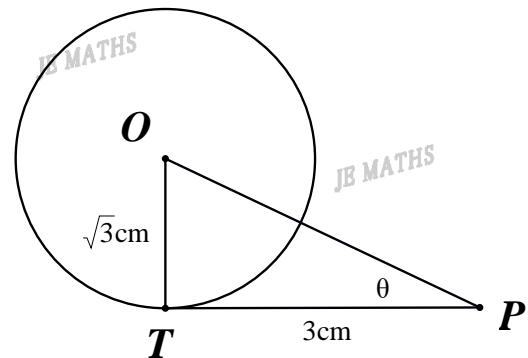


- Involving circle properties.

1. (a) Given that AC is the diameter of the circle O, which the radius is 7cm and BC = 8cm, find the missing θ to the nearest minute.

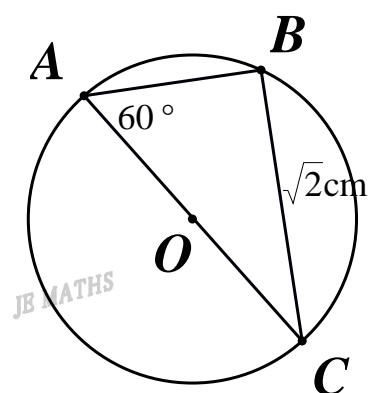


- (b) Given that TP is a tangent to the circle O, which the is radius $\sqrt{3}$ cm and TP = 3cm find the exact angle θ to the nearest minute.



2. Given that $\triangle ABC$ is inscribed inside a circle O with $\angle A = 60^\circ$ and $BC = \sqrt{2}$ cm.

- (a) Find the radius of $\triangle ABC$.



- (b) Find the area of this circle.

- (c) Find the area ratio of $\triangle ABC$ and the circle O .

-  3. A tangent PQ meets two extended lines from two radii of a circle O at point P , where T is the point of contact and $\angle POQ = 90^\circ$. Given that the radius of this circle is 1 unit, $TA \perp OP$, $TB \perp OQ$ and $\angle TOP = \theta$.

- (a) By using trig identities to find the length of the following sides in terms of θ .
- (i) TA .

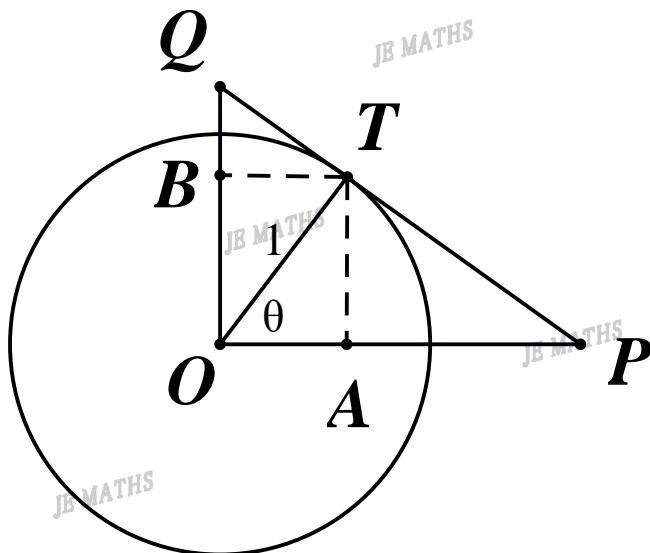
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(ii) TB .

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(iii) TP .

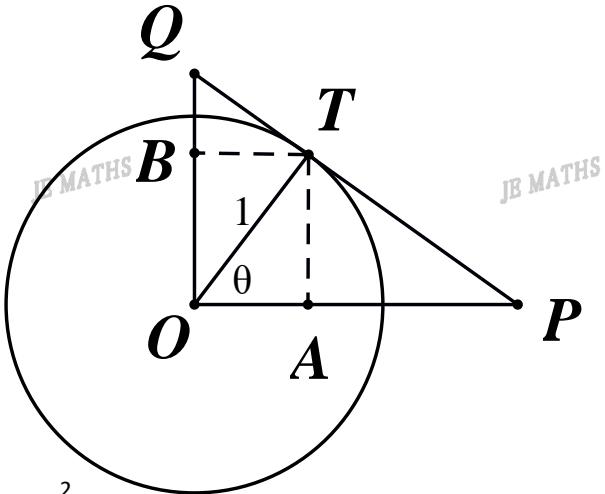
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(iv) OP .

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(v) QO .

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(vi) QT



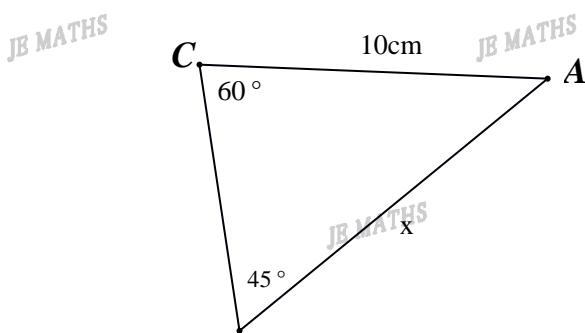
- (b) Hence, put all 6 trig ratios on the sides of the given graph by using 6 different colours.



- Involving sine rule and the area formula: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ and $A = \frac{1}{2}ab \sin C$

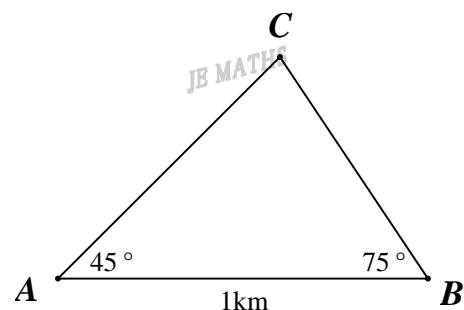
4. Given that ΔABC .

(a) Find the exact missing side x .

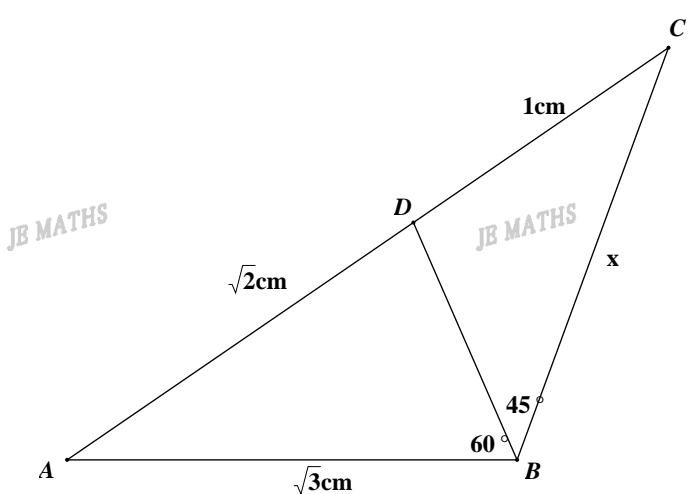


(b) Hence, find the area of ΔABC . (2dps)

5. From the end of a straight horizontal road, AB of 1 km long, a balloon directly above the road is observed to have angles of elevation of 45° and 75° respectively. How far is the balloon from B measuring along the line of sight, in the exact value?



6. Find the exact value of x by using trig identities.



-  7. The **golden triangle** is uniquely identified as the only triangle to have three angles in the ratio 1: 2: 2.

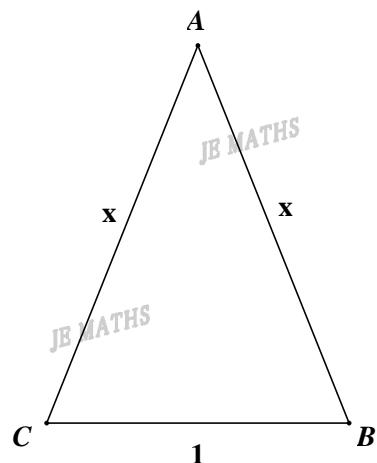
(a) Find each interior angle of a golden triangle.

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(b) Let the base side of the golden triangle ΔABC be 1 unit.

(i) Find the missing letter x as the golden ratio, in 2 dps.

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(ii) Given that $\sin 72^\circ = \frac{\sqrt{10+2\sqrt{5}}}{4}$ and $\sin 36^\circ = \frac{\sqrt{10-2\sqrt{5}}}{4}$,

show that the exact value of x is $\frac{1+\sqrt{5}}{2}$.

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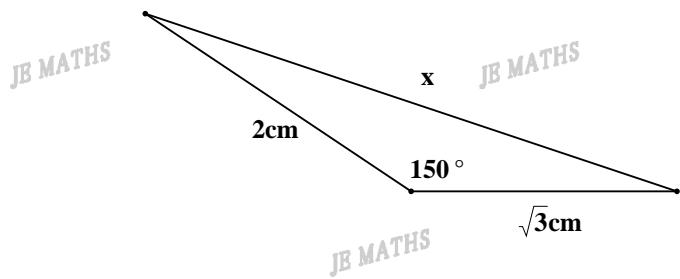
(iii) Hence, show that the exact area of this golden triangle is $A = \frac{\sqrt{5+2\sqrt{5}}}{4}$.

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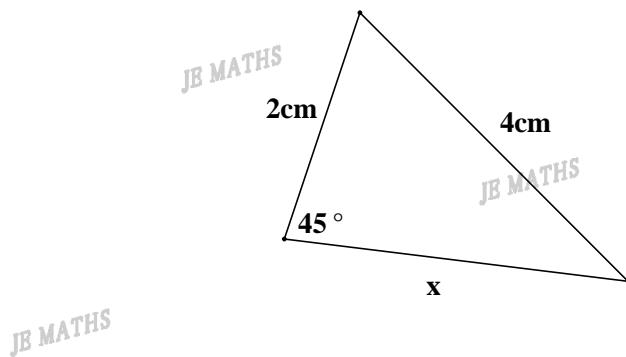
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- **Involving cosine rule:** $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$.

8. Find the exact value of x .

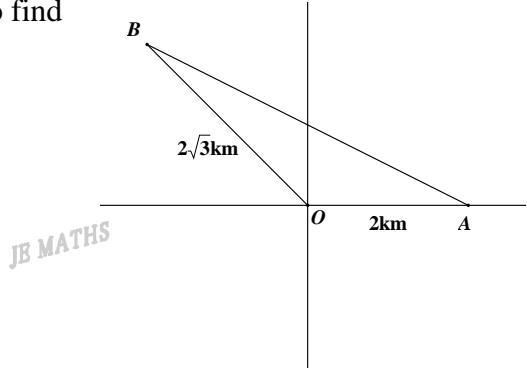


9. Find the exact value of x .

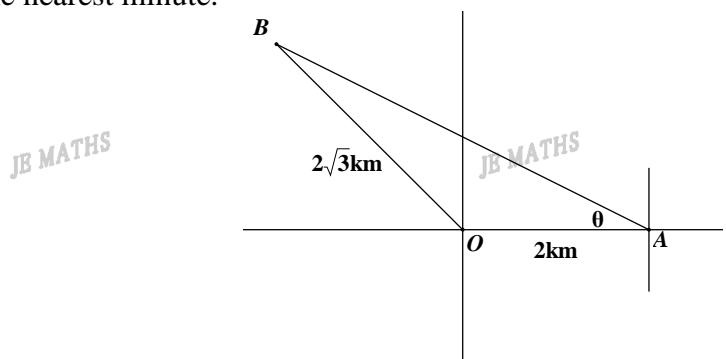


10. A ship sails 2 km due East from the harbour O to A , and a second boat sails $2\sqrt{3}$ km from O to B on a bearing of 300° . Use the cosine rule to find

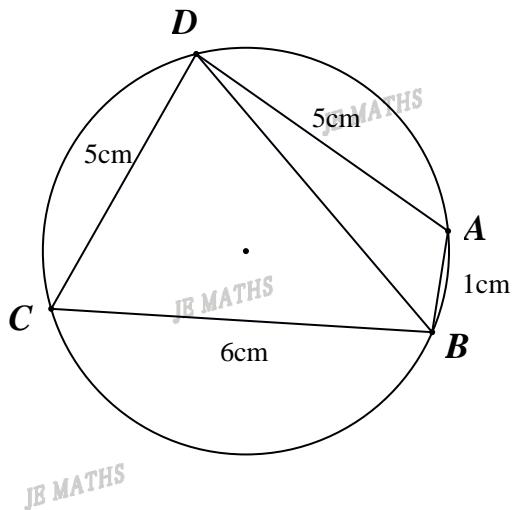
- (a) AB .



- (b) the bearing of B from A , correct to the nearest minute.



11. In the inscribed cyclic quadrilateral $ABCD$, $AD=DC=5\text{cm}$, $BC = 6\text{cm}$ and $AB = 1\text{cm}$, find:
- the exact value of BD by using the cosine rule and trig identities.

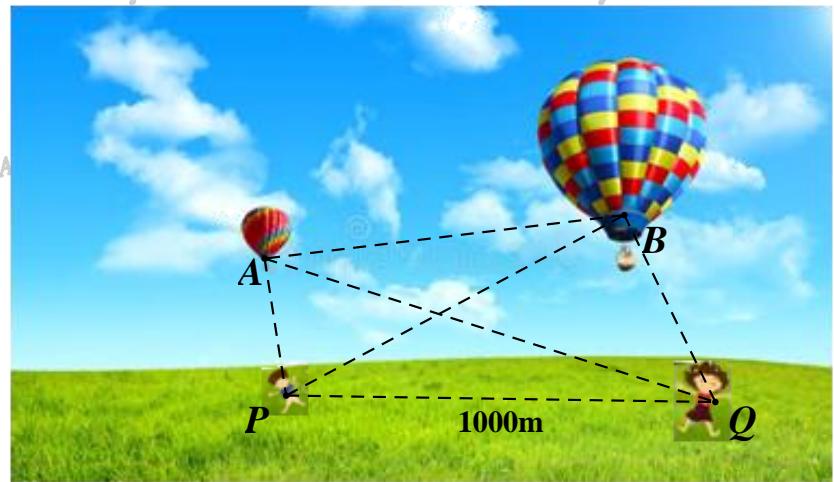


- the exact value of $\angle C$.

- the exact value of the area of cyclic quadrilateral $ABCD$.

12. In the figure, two **hot air balloons** at Position A and B are directly above two children, Peter (*P*) and Queenie (*Q*) 1000m apart, where *A*, *B*, *Q* and *P* are on the same vertical plane. Given that the angles of elevation of the hot air balloons at Position A and B from *Peter* are 100° and 60° respectively and the angles of elevation of the hot air balloons at Position A and B from *Queenie* are 40° and 75° respectively.

- (a) Find the line of the sight of Peter to the hot air balloon at position A (ie, the length of AP).



- (b) Find the line of the sight of Peter to the balloon at position B (ie, length of PB). (2dps)

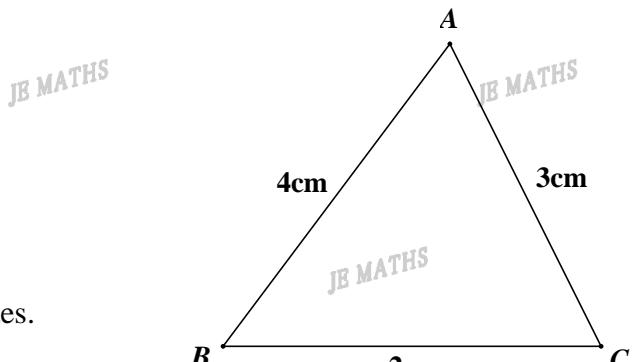
- (c) Hence, find the distance between these two hot air balloons in the sky (ie, the length of AB).
(1dp)

- 3D trig application:

13. Given that $\triangle ABC$.

- (a) show that $\angle A = \cos^{-1} \frac{7}{8}$.

- (b) Hence, find $\angle B$ to the nearest minutes.



14. Given that a square prism is shown as below.

- (a) Find the exact value of:

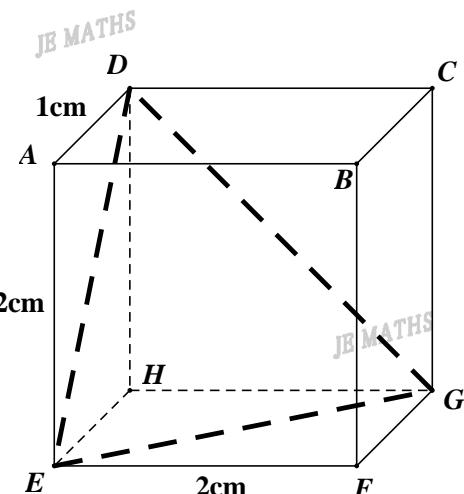
(i) EG.

(ii) ED.

(iii) DG.

- (b) Find $\angle EDG$ by using the cosine rule, to the nearest minutes.

- (c) Find $\angle DEG$, to the nearest minutes.



- (d) Hence, find the shortest distance from D to EG. (1dp)

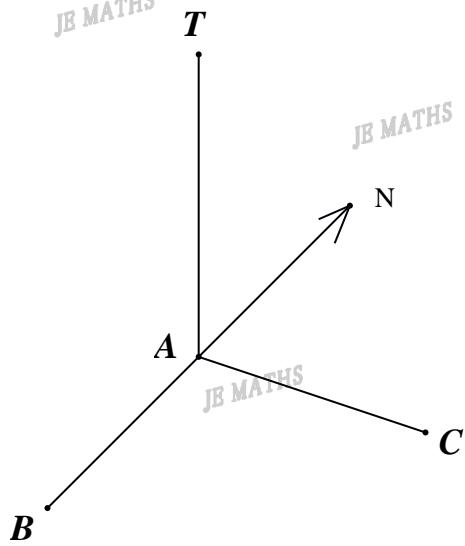
15. A, B and C are three points on the level ground. B is due south of A and the bearing of C from A is 085° . A vertical mast AT of h meter stands at A. The angle of elevation of T from B is 44° , the angle of elevation of T from C is 28° and $BC = 11\text{m}$. Show that: (2dps)

(a) the exact length of AB is $h \cot 44^\circ$.

(b) the exact length of AC is $h \cot 28^\circ$.

(c) Hence, use the cosine rule to show that

$$h^2 = \frac{121}{\cot^2 44^\circ + \cot^2 28^\circ - 2 \cot 44^\circ \cot 28^\circ \cos 95^\circ}.$$



- (d) Hence, find the height of this mast AT to two decimal places.

- (e) the bearing of C from B . (1dp)

- (f) If a man walks from B to C ,

(i) find the *shortest distance from BC to the base of the mast (A)*. (1dp)

(ii) Hence, find the *greatest angle of elevation* of the top of the mast from any point along BC . (0dp) (**Hint:** the greatest angle of elevation appears at the point on BC when it is at the shortest distance to point A.)

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Avg:

Week _____

HSC

A

A

JE
MATHS

Want to
learn?
We will
help u.

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Don't
want to
learn?
We will
change u.

