

GCSE Revision: The Cosine Rule



GCSE Tier: Higher

ANSWERS

Target Grade: 6-7

1) Calculate AC.

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

$$AC^2 = 13^2 + 11^2 - 2 \times 13 \times 11 \cos 70$$

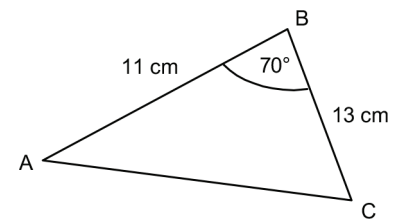
$$AC^2 = 169 + 121 - 286 \cos 70$$

$$AC^2 = 290 - 286 \cos 70$$

$$AC^2 = 192.182239009$$

$$AC = 13.862980885$$

$$AC = 14 \text{ cm}$$



2) Calculate the size of angle STU.

$$\text{Length } a = 430$$

$$\text{Length } b = 380$$

$$\text{Length } c = 510$$

$$A = \cos^{-1} \frac{b^2 + c^2 - a^2}{2bc}$$

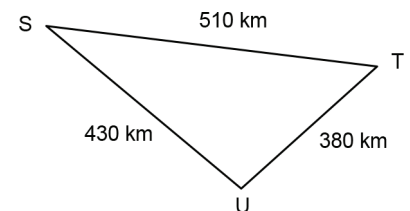
$$A = \cos^{-1} \frac{380^2 + 510^2 - 430^2}{2 \times 380 \times 510}$$

$$A = \cos^{-1} \frac{144400 + 260100 - 184900}{387600}$$

$$A = \cos^{-1} \frac{219600}{387600}$$

$$A = 55.489068132$$

$$A = 55^\circ$$



3) The hands on a clock are 8 cm and 11 cm long as shown. How far apart are the tips of the hands at 4 o'clock ?

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$c^2 = 11^2 + 8^2 - 2 \times 11 \times 8 \cos 120$$

$$c^2 = 121 + 64 - 176 \cos 120$$

$$c^2 = 185 + 88$$

$$c^2 = 273$$

$$c = \sqrt{273}$$

$$c = 16.5$$



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4) The diagram represents the positions of three towns P, Q and R.

Q is 27 km due north of P.

R is 73 km from P on a bearing of 153° .

Calculate the distance between Q and R.

Length a = ?

Length b = 27

Length c = 73

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

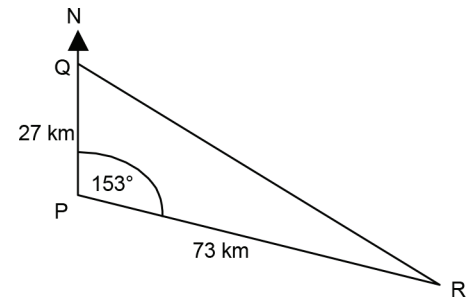
$$a^2 = 27^2 + 73^2 - 2 \times 27 \times 73 \times \cos 153$$

$$a^2 = 729 + 5329 - 3942 \cos 153$$

$$a^2 = 6058 - 3942 \cos 153$$

$$a = 97.828154$$

$$a = 98 \text{ km}$$



5) In the diagram ABCD is a kite.

AB = 5.7 cm, BC = 7.6 cm and AC = 10.7 cm.

Calculate angle ABC.

Length a = 10.7

Length b = 7.60

Length c = 5.70

$$A = \cos^{-1} \frac{b^2 + c^2 - a^2}{2bc}$$

$$A = \cos^{-1} \frac{7.6^2 + 5.7^2 - 10.7^2}{2 \times 7.6 \times 5.7}$$

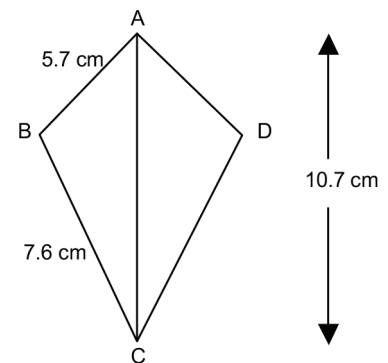
$$A = \cos^{-1} \frac{57.76 + 32.49 - 114.49}{86.64}$$

$$A = \cos^{-1} \frac{-24.24}{86.64}$$

$$A = \cos^{-1} -0.279778393$$

$$A = 106.246978981$$

$$A = 106^\circ$$



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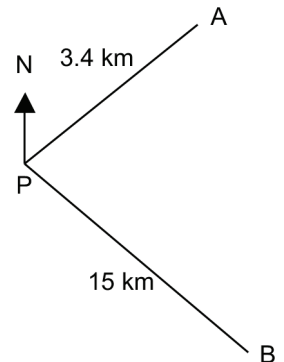


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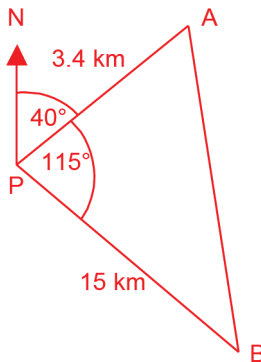
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- 6) Ship A is 3.4 km from port P on a bearing of 040° .
Ship B is 15 km from P on a bearing of 155° .
Calculate the distance between the two ships.
Give your answer to an appropriate degree of accuracy.



$$\text{Angle APB} = 155 - 40 = 115^\circ$$



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

$$a^2 = 3.4^2 + 15^2 - 2 \times 3.4 \times 15 \cos 115$$

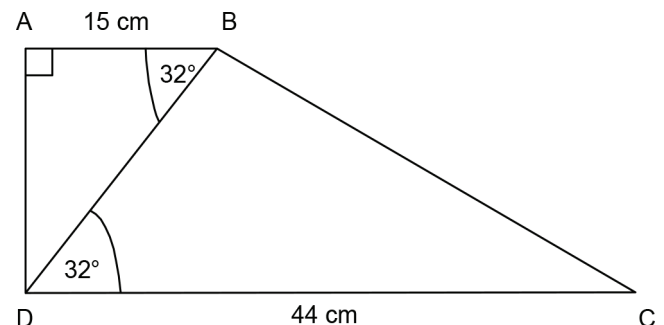
$$a^2 = 11.56 + 225 - 102 \cos 115$$

$$a^2 = 279.667063$$

$$a = 16.723249$$

$$a = 17 \text{ km}$$

- 7) ABCD is a trapezium.
Angle $BAD = 90^\circ$.
Angle $BDC = \text{angle } ABD = 32^\circ$.
 $AB = 15 \text{ cm}$ and $DC = 44 \text{ cm}$.
Calculate the length of BC.
Give your answer to a suitable degree of accuracy.



$$\cos 32 = \frac{15}{BD}$$

$$BD = \frac{15}{\cos 32}$$

$$BD = 17.68767605$$

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

$$a^2 = 44^2 + 17.69^2 - 2 \times 44 \times 17.69 \times \cos 32$$

$$a = 30.47560775$$

$$a = 30 \text{ cm}$$

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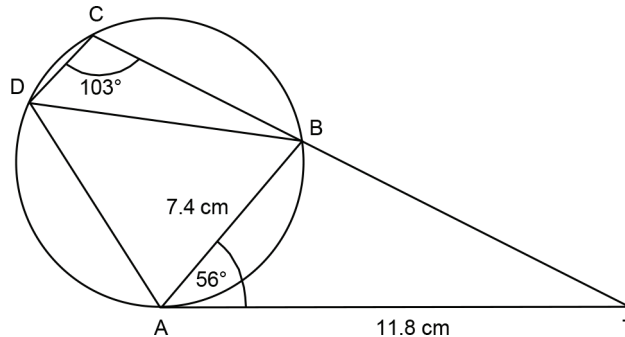


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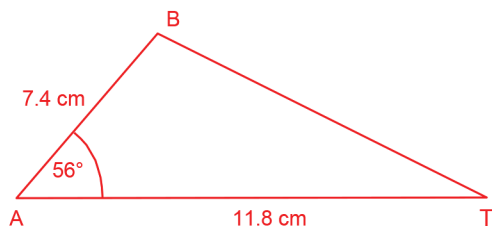
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- 8) In the diagram, ABCD is a cyclic quadrilateral and AT is the tangent at A.
Angle $BAT = 56^\circ$, angle $DCB = 103^\circ$, length $AB = 7.4$ cm and length $AT = 11.8$ cm.



Calculate the length of BT.



Length a = ?
Length b = 11.8
Length t = 7.40

$$\begin{aligned}a^2 &= b^2 + c^2 - 2bc \cos A \\a^2 &= 11.8^2 + 7.4^2 - 2 \times 11.8 \times 7.4 \times \cos 56 \\a^2 &= 139.2 + 54.76 - 174.64 \cos 56 \\a^2 &= 96.342551338 \\a &= \sqrt{96.342551338} \\a &= 9.815424155 \\a &= 9.8 \text{ cm}\end{aligned}$$