

Section Check In – 1.05 Trigonometry

Questions

1. In the triangle ABC , $AB = 6$ cm and $BC = 9$ cm. Given that the area of the triangle is 18 cm², find the possible values of the angle B .
2. Find the exact value of $\tan 30^\circ(6\sin 135^\circ + 4\cos 210^\circ)$, giving your answer in the form $a + b\sqrt{6}$.
3. Prove that $\frac{\sin \theta(3\sin^2 \theta + 4\cos^2 \theta)}{\tan \theta} \equiv 3\cos \theta + \cos^3 \theta$.
4. Solve the equation $\sin \theta \tan \theta + \cos \theta = 3$ for $0^\circ < \theta < 360^\circ$.
5. A boat sails due north from a port. After going a distance of 3 km, the boat changes direction and sails for a further 5 km on a bearing of 040° .
 - (i) How far is the boat now from the port?
 - (ii) On what bearing should the boat now sail to return directly to the port?

Worked solutions

1. Using $\text{Area} = \frac{1}{2}ac \sin B$, $18 = \frac{1}{2} \times 9 \times 6 \times \sin B$ and therefore $\sin B = \frac{18}{27}$

Angle $B = 41.8^\circ$ or 138.2°

2. $\tan 30^\circ(6\sin 135^\circ + 4\cos 210^\circ) = \frac{1}{\sqrt{3}}(6 \times \frac{1}{\sqrt{2}} + 4 \times \frac{-\sqrt{3}}{2}) = \frac{6}{\sqrt{6}} - 2 = -2 + \sqrt{6}$

3. Left-hand side = $\frac{\sin \theta(3[\sin^2 \theta + \cos^2 \theta] + \cos^2 \theta)}{\tan \theta}$
 $= \frac{\sin \theta(3 \times 1 + \cos^2 \theta)}{\frac{\sin \theta}{\cos \theta}}$, using identities $\sin^2 \theta + \cos^2 \theta = 1$ and $\tan \theta = \frac{\sin \theta}{\cos \theta}$
 $= \sin \theta(3 + \cos^2 \theta) \times \frac{\cos \theta}{\sin \theta}$
 $= (3 + \cos^2 \theta)\cos \theta$, cancelling $\sin \theta$
 $= 3\cos \theta + \cos^3 \theta$

4. Equation is $\sin \theta \tan \theta + \cos \theta = 3$

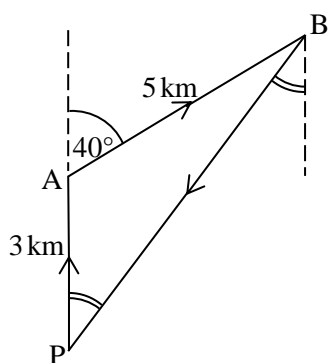
Using $\tan \theta = \frac{\sin \theta}{\cos \theta}$, $\sin \theta \times \frac{\sin \theta}{\cos \theta} + \cos \theta = 3$

Multiplying both sides by $\cos \theta$, $\sin^2 \theta + \cos^2 \theta = 3\cos \theta$

Using identity $\sin^2 \theta + \cos^2 \theta = 1$ for the left-hand side, $1 = 3\cos \theta$

Hence $\cos \theta = \frac{1}{3}$ giving solutions $\theta = 70.5^\circ, 289.5^\circ$

5.



(i) Using cosine rule, $PB^2 = 3^2 + 5^2 - 2 \times 3 \times 5 \times \cos 140^\circ = 56.98\dots$
 $PB = 7.548\dots$

Boat is 7.55 km from the port

(ii) Using sine rule, $\frac{\sin APB}{5} = \frac{\sin 140^\circ}{7.548\dots}$ giving $APB = 25.2^\circ$

Bearing to sail = $180^\circ + 25.2^\circ = 205.2^\circ$

AS LEVEL and STAGE 1 CONTENT
MATHEMATICS A
Section Check In

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