

C.E.M.TUITION

Student Name : _____

Review Topic : Trigonometric Ratios

(Preliminary - Paper 2)

Year 11 - 2 Unit

1. (a) Write an exact expression for:

(i) $\cos^2 60^\circ - \sin^2 60^\circ$

(ii) $\tan 30^\circ \cos 30^\circ \sin 30^\circ$

(b) If θ lies between 0° and 360° , find all values of θ given that:

(i) $\cos \theta = \frac{\sqrt{3}}{2}$

(ii) $2 \cos \theta = -\sqrt{3}$

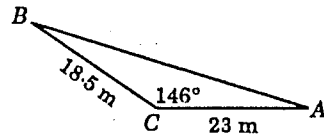
2. (a) Simplify to a surd with rational denominator $\frac{2 \tan 30^\circ}{1 - \tan^2 30^\circ}$.

(b) Find all values of θ , $0^\circ \leq \theta \leq 360^\circ$ when:

(i) $\sec \theta = 2$ (ii) $\sin^2 \theta = \frac{1}{2}$

-
3. (a) Express $\sin 30^\circ \cos 45^\circ + \cos 30^\circ \sin 45^\circ$ as a fraction with rational denominator.
- (b) Find all values of ϕ , $0^\circ \leq \phi^\circ \leq 360^\circ$, where:
- (i) $\tan \phi = -1$ (ii) $\sin \phi = -\cos \phi$
-

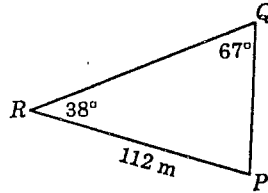
4. Use the Cosine Rule to calculate the length of the side AB (correct to one decimal place).

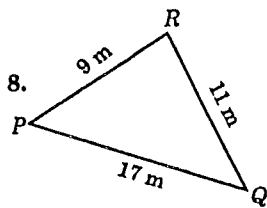


5. If $\cos x^\circ = \frac{3}{5}$, and $0^\circ < x^\circ < 90^\circ$, calculate the value of $\tan x^\circ$.

-
6. Given that $\sin \alpha = \frac{5}{13}$, and α is acute, find the value of $\cos \alpha$.

7. Use the Sine Rule to calculate the length of the fence PQ of this triangular paddock. Answer correct to the nearest metre.






Use the Cosine Rule to calculate the largest angle in the triangle PQR with the sides as shown in the diagram. Answer correct to the nearest minute.

1. (a) (i) $\left(\frac{1}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2$
 $= \frac{1}{4} - \frac{3}{4} = -\frac{2}{4} = -\frac{1}{2}$

(ii) $\frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{1}{4}$

(b) (i) $\cos \theta = \frac{\sqrt{3}}{2}$ 
 $\theta = 30^\circ$ and $(360 - 30)^\circ$
 $= 30^\circ$ and 330°

(ii) $\cos \theta = -\frac{\sqrt{3}}{2}$
 Acute angle is 30°
 cos negative in 2nd, 3rd quadrants.
 $\theta = (180 - 30)^\circ, (180 + 30)^\circ$
 $= 150^\circ, 210^\circ$

2. (a) $\frac{2 \times \frac{1}{\sqrt{3}}}{1 - \left(\frac{1}{\sqrt{3}}\right)^2}$ $\tan 30^\circ = \frac{1}{\sqrt{3}}$
 $= \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}} = \frac{2}{\sqrt{3}} \times \frac{3}{2} = \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{3}}{3} = \sqrt{3}$

(b) (i) $\sec \theta = 2$ (take reciprocal)
 or $\cos \theta = \frac{1}{2}$
 $\therefore \theta = 60^\circ$ or $(360 - 60)^\circ$
 $\theta = 60^\circ$ or 300°

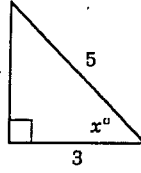
(ii) $\sin^2 \theta = \frac{1}{2}$
 $\therefore \sin \theta = \pm \frac{1}{\sqrt{2}}$
 $\therefore \theta = 45^\circ, (180 - 45)^\circ, (180 + 45)^\circ, (360 - 45)^\circ$
 $\theta = 45^\circ, 135^\circ, 225^\circ$ or 315° .

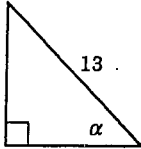
3. (a) $\frac{1}{2} \times \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2}$
 $= \frac{1 + \sqrt{3}}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ (rationalise)
 $= \frac{\sqrt{2} + \sqrt{6}}{4}$

(b) (i) $\tan \phi = -1$
 Acute angle is 45° .
 Tan ϕ is negative in 2nd and 4th quadrants.
 $\therefore \phi = (180 - 45)^\circ, (360 - 45)^\circ = 135^\circ$ or 315° .

+ both sides by cos ϕ . (ii) $\sin \phi = -\cos \phi$
 $\frac{\sin \phi}{\cos \phi} = -\frac{\cos \phi}{\cos \phi}$
 $\therefore \tan \phi = -1$
 from (i),
 $\phi = 135^\circ$ or 315° .

4. $AB^2 = 18 \cdot 5^2 + 23^2 - 2(18 \cdot 5)(23) \cos 146^\circ$
 $= 1576 \cdot 761$ (Cosine Rule)
 $\therefore AB = \sqrt{1576 \cdot 761} = 39 \cdot 70845 \approx 39 \cdot 7$ (1 dec. pl.)
 $\therefore AB$ is 39.7 metres.

5. $\cos x^\circ = \frac{3}{5}$
Using Pythagoras, other side is 4. 
 $\therefore \tan x^\circ = \frac{4}{3}$

6. $\sin \alpha = \frac{5}{13}$
 By Pythagoras, $4^2 + x^2 = 13^2$
 $x^2 = 13^2 - 5^2 = 144$
 $x = 12$ Other side is 12.
 $\therefore \cos \alpha = \frac{12}{13}$ $\frac{x}{13}$ 

7. Let $PQ = x$ m, then using Sine Rule,

$$\frac{x}{\sin 38^\circ} = \frac{112}{\sin 67^\circ}$$

$$\therefore x = \frac{112 \sin 38^\circ}{\sin 67^\circ} = 74 \cdot 908986 \approx 75 \text{ (nearest metre)}$$

Length of fence PQ is 75 m.

8. Largest angle is opposite the longest side, that is, $\angle PRQ$. Using the Cosine Rule,

$$\cos \hat{P}RQ = \frac{9^2 + 11^2 - 17^2}{2 \times 9 \times 11} = -\frac{87}{198}$$

$$= -0 \cdot 4393939$$

$$\therefore \hat{P}RQ = 116^\circ 4'$$

