WORKSHEET 1

CHAPTER 8 – TRIGONOMETRIC RATIOS

1. If $\sin A = \frac{1}{3}$, evaluate $\cos A \operatorname{cosec} A + \tan A \sec A$.

2. If $\operatorname{cosec} A = 2$, find the value of $\frac{1}{\tan A} + \frac{\sin A}{1 + \cos A}$.

3. Evaluate each of the following in the simplest form:

   (*i*) $\operatorname{cosec} 30° + \cot 45°$ (*ii*) $\cos 30° \cos 45° - \sin 30° \sin 45°$

   (*iii*) $\tan 30° \sec 45° + \tan 60° \sec 30°$ (*iv*) $\sin 30° \cos 45° + \cos 30° \sin 45°$

4. If θ is an acute angle and $\sin \theta = \cos \theta$, find the value of $2 \tan^2 \theta + \sin^2 \theta - 1$.

5. ABC is a right triangle, right angled at C. If $\angle A = 30°$ and AB = 40 units, find the remaining two sides and $\angle B$ of ΔABC.

6. If $\tan A = \sqrt{3}$, find other trigonometric ratios of $\angle A$.

7. If $\sec \theta = \frac{25}{7}$, find all trigonometric ratios of θ.

8. If $\sec \theta = \frac{5}{4}$, show that $\frac{2 \cos \theta - \sin \theta}{\cot \theta - \tan \theta} = \frac{12}{7}$.

9. If $\sin \alpha = \frac{1}{2}$, show that $(3 \cos \alpha - 4 \cos^3 \alpha) = 0$

10. In right ΔABC, $\angle B = 90°$, AB = 3 cm and AC = 6 cm. Find $\angle C$ and $\angle A$.

11. Verify each of the following:

   (*i*) $\sin 60° \cos 30° - \cos 60° \sin 30° = \sin 30°$ (*ii*) $\cos 60° \cos 30° + \sin 60° \sin 30° = \cos 30°$

   (*iii*) $2 \sin 30° \cos 30° = \sin 60°$ (*iv*) $2 \sin 45° \cos 45° = \sin 90°$

12. Taking $\theta = 30°$, verify each of the following:

   (*i*) $\sin 2\theta = 2 \sin \theta \cos \theta$ (*ii*) $\cos 2\theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$

   (*iii*) $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$ (*iv*) $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$

   (*v*) $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$

13. Find the value of x in each of the following:

   (*i*) $\tan 3x = \sin 45° \cos 45° + \sin 30°$ (*ii*) $\cos x = \cos 60° \cos 30° + \sin 60° \sin 30°$

   (*iii*) $\sin 2x = \sin 60° \cos 30° - \cos 60° \sin 30°$

14. Solve each of the following equations when $0° < \theta < 90°$.

   (*i*) $2 \cos \theta = 1$ (*ii*) $2 \cos^2 \theta = \frac{1}{2}$ (*iii*) $2 \sin^2 \theta = \frac{1}{2}$ (*iv*) $3 \tan^2 \theta - 1 = 0$

15. If A and B are acute angles such that $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$ and $\tan (A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$, find A + B.

16. If $\sin (A + B) = 1$ and $\cos (A - B) = \frac{\sqrt{3}}{2}$, $0° < A + B, \leq 90°$, $A > B$, then find A and B.

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17. Show that:

(*i*) $2(\cos^2 45° + \tan^2 60°) - 6(\sin^2 45° - \tan^2 30°) = 6$

(*ii*) $2(\cos^4 60° + \sin^4 30°) - (\tan^2 60° + \cot^2 45°) + 3\sec^2 30° = \frac{1}{4}$

18. Evaluate each of the following:

(*i*) $2\cos^2 60° + 3\sin^2 45° - 3\sin^2 30° + 2\cos^2 90°$

(*ii*) $(\sin^2 30° + 4\cot^2 45° - \sec^2 60°)(\operatorname{cosec}^2 45° \sec^2 30°)$

(*iii*) $\frac{4}{\cot^2 30°} + \frac{1}{\sin^2 30°} - 2\cos^2 45° - \sin^2 0°$

(*iv*) $\frac{\sin 30°}{\cos 45°} + \frac{\cot 45°}{\sec 60°} - \frac{\sin 60°}{\tan 45°} - \frac{\cos 30°}{\sin 90°}$

19. Show that:

(*i*) $\frac{1 - \sin 60°}{\cos 60°} = \frac{\tan 60° - 1}{\tan 60° + 1}$

(*ii*) $\frac{\cos 30° + \sin 60°}{1 + \sin 30° + \cos 60°} = \cos 30°$

20. Show that:

(*i*) If $\tan\theta = \frac{4}{3}$, then $\sin\theta + \cos\theta = \frac{7}{5}$

(*ii*) If $\operatorname{cosec}\theta = 2$, then $\left(\cot\theta + \frac{\sin\theta}{1 + \cos\theta}\right) = 2$

(*iii*) If $\sec\theta = \frac{17}{8}$, then $\frac{3 - 4\sin^2\theta}{4\cos^2\theta - 3} = \frac{3 - \tan^2\theta}{1 - 3\tan^2\theta}$

(*iv*) If $\tan\theta = \frac{a}{b}$, then $\left(\frac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta}\right) = \frac{a^2 - b^2}{a^2 + b^2}$

ANSWERS

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1. $\frac{16\sqrt{2}+3}{8}$

2. 2.

3. (*i*) 3 (*ii*) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ (*iii*) $\frac{\sqrt{2}+2\sqrt{3}}{\sqrt{3}}$ (*iv*) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

4. $\frac{3}{2}$

5. $\angle B = 60°$, $AC = 20\sqrt{3}$ units, $BC = 20$ units

6. $\sin A = \frac{\sqrt{3}}{2}$, $\cos A = \frac{1}{2}$, $\tan A = \sqrt{3}$, $\text{cosec } A = \frac{2}{\sqrt{3}}$, $\sec A = 2$, $\cot A = \frac{1}{\sqrt{3}}$

7. $\sin \theta = \frac{24}{25}$, $\cos \theta = \frac{7}{25}$, $\tan \theta = \frac{24}{7}$, $\text{cosec } \theta = \frac{25}{24}$, $\sec \theta = \frac{25}{7}$, $\cot \theta = \frac{7}{24}$

10. $\angle C = 30°$ and $\angle A = 60°$

13. (*i*) $x = 15°$ (*ii*) $x = 30°$ (*iii*) $x = 15°$

14. (*i*) $\theta = 60°$ (*ii*) $\theta = 60°$ (*iii*) $\theta = 60°$ (*iv*) $\theta = 30°$

15. 45°

16. $A = 60°$ and $B = 30°$

18. (*i*) $\frac{5}{4}$ (*ii*) $\frac{2}{3}$ (*iii*) $\frac{13}{3}$ (*iv*) $\frac{(\sqrt{2}+1-2\sqrt{3})}{2}$