CLASS: XI: MATHEMATICS

TRIGONOMETRY FORMULAES

PRACTICE QUESTIONS ON COMPOUND ANGLES

FORMULA USED

1. $\sin(A+B)=\sin A\cos B+\cos A\sin B$
2. $\sin(A-B)=\sin A\cos B-\cos A\sin B$
3. $\cos(A+B)=\cos A\cos B-\sin A\sin B$
4. $\cos(A-B)=\cos A\cos B+\sin A\sin B$
5. $\tan(A+B)=\dfrac{\tan A+\tan B}{1-\tan A\tan B}$
6. $\tan(A-B)=\dfrac{\tan A-\tan B}{1+\tan A\tan B}$
7. $\cot(A+B)=\dfrac{\cot A\cot B-1}{\cot A+\cot B}$
8. $\cot(A-B)=\dfrac{\cot A\cot B+1}{\cot B-\cot A}$

Some Useful Results:

1. $\sin(A+B).\sin(A-B)=\sin^2 A-\sin^2 B=\cos^2 B-\cos^2 A$
2. $\cos(A+B).\cos(A-B)=\cos^2 A-\sin^2 B=\cos^2 B-\sin^2 A$

1. Evaluate: $(i)\cos 105^0$ $(ii)\tan 75^0+\cot 75^0$

2. Find the value of (i) $\cos 70^0\cos 10^0+\sin 70^0\sin 10^0$ (ii) $\cos 130^0\cos 40^0+\sin 130^0\sin 40^0$

3. Find the value of $\sin 780^0\sin 480^0+\cos 240^0\cos 300^0$

4. Show that: $\tan 70^0=2\tan 50^0+\tan 20^0$

5. Show that $\tan 75^0-\tan 30^0-\tan 75^0\tan 30^0=1$

6. Show that $2\tan 70^0=\tan 80^0-\tan 10^0$.

7. Prove that $\tan 3A\tan 2A\tan A=\tan 3A-\tan 2A-\tan A$.

8. Prove that : $\dfrac{\sec 8A-1}{\sec 4A-1}=\dfrac{\tan 8A}{\tan 2A}$

9. Prove that $\cot x\cot 2x-\cot 2x\cot 3x-\cot 3x\cot x=1$

10. Prove that: $\dfrac{\cos 8^0-\sin 8^0}{\cos 8^0+\sin 8^0}=\tan 37^0$

11. Prove that: $\tan 9^0=\dfrac{\cos 36^0-\sin 36^0}{\cos 36^0+\sin 36^0}$

12. Show that: $\dfrac{\sin(A-B)}{\sin(A+B)}=\dfrac{\tan A-\tan B}{\tan A+\tan B}$

13. Show that: $\frac{\sin(A-B)}{\cos A\cos B}+\frac{\sin(B-C)}{\cos B\cos C}+\frac{\sin(C-A)}{\cos C\cos A}=0$

14. Prove that: $\frac{1+\sin A-\cos A}{1+\sin A+\cos A}=\tan\frac{A}{2}$

15. Prove that: $\sin^2\left(\frac{\pi}{8}+\frac{A}{2}\right)-\sin^2\left(\frac{\pi}{8}-\frac{A}{2}\right)=\frac{1}{\sqrt{2}}\sin A$

16. Show that: $\frac{\cos 11^0+\sin 11^0}{\cos 11^0-\sin 11^0}=\tan 56^0$

17. If $\cos\alpha=-\frac{12}{13},\cot\beta=\frac{24}{7}$, α lies in II quadrant, β lies in III quadrant. Find (i) $\sin(\alpha+\beta)$ (ii) $\cos(\alpha+\beta)$ (iii) $\tan(\alpha+\beta)$

18. If $\tan x=\frac{3}{4},\pi<x<\frac{3\pi}{2}$, find the value of $\sin\frac{x}{2},\cos\frac{x}{2}$ *and* $\tan\frac{x}{2}$

19. Show that $\sin^2(A+B)-\sin^2(A-B)=\sin 2A\sin 2B$

20. Prove that $\sin^2 A=\cos^2(A-B)+\cos^2 B-2\cos(A-B)\cos A\cos B$

21. If A, B, C and D are angles of a cyclic quadrilateral, prove that $\cos A+\cos B+\cos C+\cos D=0$

22. If $3\tan\theta\tan\phi=1$, prove that $2\cos(\theta+\phi)=\cos(\theta-\phi)$.

23. If $\cot\alpha.\cot\beta=2$, show that $\frac{\cos(\alpha+\beta)}{\cos(\alpha-\beta)}=2$

24. Show that $\cos^2\frac{\theta-\phi}{2}-\sin^2\frac{\theta+\phi}{2}=\cos\theta.\cos\phi$

25. If $\tan A=\frac{m}{m-1}$ and $\tan B=\frac{1}{2m-1}$, prove that $A-B=\frac{\pi}{4}$.

26. If $\tan\beta=\frac{n\sin\alpha.\cos\alpha}{1-n\sin^2\alpha}$, prove that $\tan(\alpha-\beta)=(1-n)\tan\alpha$.

27. If $\sin x+\sin y=a$ *and* $\cos x+\cos y=b$, show that $\cos(x-y)=\frac{1}{2}(a^2+b^2-2)$.

28. If $\tan\theta+\tan\phi=a$ *and* $\cot\theta+\cot\phi=b$, prove that $\cot(\theta+\phi)=\frac{1}{a}-\frac{1}{b}$.

29. If $\sin(\alpha+\beta)=1$ and $\sin(\alpha-\beta)=\frac{1}{2}$, where $0\le\alpha,\beta\le\frac{\pi}{2}$, find the values of $\tan(\alpha+2\beta)$ and $\tan(2\alpha+\beta)$.

30. If $\tan\frac{\alpha}{2}$ and $\tan\frac{\beta}{2}$ are the roots of the equation $8x^2-26x+15=0$, then find the value of $\cos(\alpha+\beta)$.

CLASS: XI: MATHEMATICS
TRIGONOMETRY FORMULAES
PRACTICE QUESTIONS ON TRANSFORMATION OF FORMULAE

FORMULA USED

Product to Sum or Difference Formulae

1. $2\sin A\cos B = \sin(A+B)+\sin(A-B)$

2. $2\cos A\sin B = \sin(A+B)-\sin(A-B)$

3. $2\cos A\cos B = \cos(A+B)+\cos(A-B)$

4. $2\sin A\sin B = \cos(A-B)-\cos(A+B)$

Sum or Difference to Product Formulae

5. $\sin C+\sin D = 2\sin\frac{C+D}{2}\cos\frac{C-D}{2}$

6. $\sin C-\sin D = 2\cos\frac{C+D}{2}\sin\frac{C-D}{2}$

7. $\cos C+\cos D = 2\cos\frac{C+D}{2}\cos\frac{C-D}{2}$

8. $\cos C-\cos D = 2\sin\frac{C+D}{2}\sin\frac{D-C}{2}$

1. Find the value of

$(i) 2\sin 15^0 \cos 75^0$

$(ii) 2\cos 45^0 \sin 15^0$

$(iii) 2\sin 75^0 \sin 15^0$

2. Find the value of $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13}+\cos\frac{3\pi}{13}+\cos\frac{5\pi}{13}$.

3. Find the value of $\sin\frac{5\pi}{12}\sin\frac{\pi}{12}$.

4. Prove that: $\sin 20^0 \sin 40^0 \sin 80^0 = \frac{\sqrt{3}}{8}$.

5. Prove that: $\tan(45^0+\theta)-\tan(45^0-\theta) = 2\tan 2\theta$

6. Prove that: $\tan 20^0 \tan 40^0 \tan 80^0 = \tan 60^0$

7. Prove that: $\sec\left(\frac{\pi}{4}+\theta\right).\sec\left(\frac{\pi}{4}-\theta\right) = 2\sec 2\theta$

8. Prove that $\frac{2\sin(\alpha-\gamma)\cos\gamma-\sin(\alpha-2\gamma)}{2\sin(\beta-\gamma)\cos\gamma-\sin(\beta-2\gamma)} = \frac{\sin\alpha}{\sin\beta}$.

9. Prove that $\cos(120^0+\alpha).\cos(120^0-\alpha) = \frac{2\cos 2\alpha-1}{4}$

10. Prove that $\tan 20^0 \tan 40^0 \tan 60^0 \tan 80^0 = 3$.

11. Prove that: $\sin 10^0 \sin 30^0 \sin 50^0 \sin 70^0 = \frac{1}{16}$.

12. Prove that $\cos^2 A + \cos^2 B - 2\cos A \cos B \cos(A+B) = \sin^2(A+B)$

13. Prove that $\sin^2 A + \sin^2(A-B) - 2\sin A \cos B \sin(A-B) = \sin^2 B$

14. Prove that $\tan(A+30^0) + \cot(A-30^0) = \frac{1}{\sin 2A - \sin 60^0}$

15. Prove that $4\cos 20^0 \cos 40^0 \cos 60^0 \cos 80^0 = \frac{1}{4}$

16. Prove that $4\cos A \cos(60^0 - A)\cos(60^0 + A) = \cos 3A$

17. Prove that $\sin A \sin(B-C) + \sin B \sin(C-A) + \sin C \sin(A-B) = 0$

18. Prove that $\sin(60^0 + A)\sin(420^0 - A) = \frac{1+2\cos 2A}{4}$

19. Prove that: $\left(\cos\alpha + \cos\beta\right)^2 + \left(\sin\alpha + \sin\beta\right)^2 = 4\cos^2\left(\frac{\alpha-\beta}{2}\right)$

20. If $\cos A + \cos B = \frac{1}{3}$ and $\sin A + \sin B = \frac{1}{4}$, then prove that $\tan\frac{A+B}{2} = \frac{3}{4}$

21. Find the value of (i) $\sin 75^0 + \sin 15^0$ (ii) $\cos 75^0 + \sin 15^0$ (iii) $\cos\frac{4\pi}{5} + \cos\frac{\pi}{5}$

(iv) $\sin 50^0 - \cos 80^0$

22. Find the value of $\frac{\cos 20^0 - \cos 70^0}{\sin 70^0 - \sin 20^0}$.

23. Find the value of $\frac{\sin 75^0 - \sin 15^0}{\cos 75^0 - \cos 15^0}$.

24. Show that: $\sin\left(\frac{\pi}{4} + \theta\right) + \sin\left(\frac{\pi}{4} - \theta\right) = \sqrt{2}\cos\theta$

25. Show that $\cos\left(\frac{2\pi}{3} + \theta\right) + \cos\left(\frac{2\pi}{3} - \theta\right) = \sqrt{3}\cos\theta$

26. Prove that $\cos 15^0 - \sin 15^0 = \frac{1}{\sqrt{2}}$

27. Prove that $\frac{\tan 5\theta + \tan 3\theta}{\tan 5\theta - \tan 3\theta} = 4\cos 2\theta \cos 4\theta$

28. Prove that $\frac{\cos\theta + \cos 2\theta + \cos 3\theta + \cos 4\theta}{\sin\theta + \sin 2\theta + \sin 3\theta + \sin 4\theta} = \cot\frac{5\theta}{2}$

29. Prove that $\frac{\cos 3\theta + 2\cos 5\theta + \cos 7\theta}{\cos\theta + 2\cos 3\theta + \cos 5\theta} = \cos 2\theta - \sin 2\theta \tan 3\theta$

30. If $x\cos\theta = y\cos\left(\theta + \frac{2\pi}{3}\right) = z\cos\left(\theta + \frac{4\pi}{3}\right)$, then show that $xy + yz + zx = 0$.

31. Prove that $\cos\alpha + \cos\beta + \cos\gamma + \cos(\alpha+\beta+\gamma) = 4\cos\frac{\alpha+\beta}{2}\cos\frac{\beta+\gamma}{2}\cos\frac{\gamma+\alpha}{2}$.

32. Prove that $\sin\alpha + \sin\beta + \sin\gamma - \sin(\alpha+\beta+\gamma) = 4\sin\frac{\alpha+\beta}{2}\sin\frac{\beta+\gamma}{2}\sin\frac{\gamma+\alpha}{2}$.

33. Prove that $\frac{\cos 2A\cos 3A - \cos 2A\cos 7A + \cos A\cos 10A}{\sin 4A\sin 3A - \sin 2A\sin 5A + \sin 4A\sin 7A} = \cot 6A\cot 5A$

34. Prove that $\frac{\cos\left(\frac{\pi}{4}+\theta\right) - \cos\left(\frac{\pi}{4}-\theta\right)}{\sin\left(\frac{2\pi}{3}+\theta\right) - \sin\left(\frac{2\pi}{3}-\theta\right)} = \sqrt{2}$

35. Prove that $\frac{\sin(4A-2B)+\sin(4B-2A)}{\cos(4A-2B)+\cos(4B-2A)} = \tan(A+B)$

36. If $A+B+C=\pi$, prove that $\frac{\cos A}{\sin B\sin C} + \frac{\cos B}{\sin C\sin A} + \frac{\cos C}{\sin A\sin B} = 2$

37. Prove that $\sin(y+z-x)+\sin(z+x-y)+\sin(x+y-z)-\sin(x+y+z) = 4\sin x\sin y\sin z$

38. If $b\sin\beta = a\sin(2\alpha+\beta)$, prove that $(b+a)\cot(\alpha+\beta) = (b-a)\cot\alpha$

39. If $\sin A + \sin B = a$ *and* $\cos A + \cos B = b$, then prove that $(i)\tan\frac{A+B}{2}$ and $(ii)\tan\frac{A-B}{2}$.

40. If $\sin\theta = n\sin(\theta+2\alpha)$, prove that $\tan(\theta+\alpha) = \frac{1+n}{1-n}\tan\alpha$.

CLASS: XI: MATHEMATICS
TRIGONOMETRY FORMULAES
PRACTICE QUESTIONS ON MULTIPLES AND SUBMULTIPLES

FORMULA USED

Multiples Formulaes

$$\sin 2A = 2\sin A\cos A = \frac{2\tan A}{1+\tan^2 A}$$

$$\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A = \frac{1-\tan^2 A}{1+\tan^2 A}$$

$$\tan 2A = \frac{2\tan A}{1-\tan^2 A}$$

$$\sin^2 A = \frac{1-\cos 2A}{2}, \quad \cos^2 A = \frac{1+\cos 2A}{2} \text{ and } \tan^2 A = \frac{1-\cos 2A}{1+\cos 2A}$$

$$\sin 3A = 3\sin A - 4\sin^3 A$$

$$\cos 3A = 4\cos^3 A - 3\cos A$$

$$\tan 3A = \frac{3\tan A - \tan^3 A}{1-3\tan^2 A}$$

Sub- Multiples Formulaes

$$\sin A = 2\sin\frac{A}{2}\sin\frac{A}{2} = \frac{2\tan\frac{A}{2}}{1+\tan^2\frac{A}{2}}$$

$$\cos A = \cos^2\frac{A}{2} - \sin^2\frac{A}{2} = 1 - 2\sin^2\frac{A}{2} = 2\cos^2\frac{A}{2} - 1 = \frac{1-\tan^2\frac{A}{2}}{1+\tan^2\frac{A}{2}}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2}, \quad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \text{ and } \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\tan A = \frac{2\tan\frac{A}{2}}{1-\tan^2\frac{A}{2}}$$

1. Find the value of (i) $\sin 15^0$ (ii) $\sin 7\frac{1}{2}^0$ (iii) $\cos 22\frac{1}{2}^0$ (iv) $\sin 22\frac{1}{2}^0$ (v) $\tan 142\frac{1}{2}^0$ (vi) $\cot 7\frac{1}{2}^0$ (vii) $\tan 11\frac{1}{4}^0$

2. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ *and* $\tan\frac{x}{2}$ (i) if $\sin x = \frac{1}{4}$, x in II quadrant (ii) if $\cos x = -\frac{1}{3}$, x in III quadrant.

3. Evaluate: $8\cos^3\frac{\pi}{9}-6\cos\frac{\pi}{9}$

4. If $\sin A=\frac{3}{5}$ and A is in I quadrant, find sin2A, cos2A and tan2A.

5. Prove that: $\cos 5A=16\cos^5 A-20\cos^3 A+5\cos A$

6. Prove that: $16\sin^5\theta-20\sin^3\theta+5\sin\theta=\sin 5\theta$

7. Prove that: $\frac{1+\sin A-\cos A}{1+\sin A-\cos A}=\tan\frac{A}{2}$

8. Prove that: $\frac{\cos A}{1-\sin A}=\tan\left(45^0+\frac{A}{2}\right)$

9. Prove that: $\sqrt{2+\sqrt{2(1+\cos 4A)}}=2\cos A$

10. Prove that: $\cos^3 x\sin^2 x=\frac{1}{16}(2\cos x-\cos 3x-\cos 5x)$

11. If $\tan x=\frac{1}{7}$ and $\tan y=\frac{1}{3}$, prove that $\cos 2x=\sin 4y$

12. Prove that: $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 3A}}}=2\cos A$

13. Prove that: $4(\cos^3 20^0+\cos^3 40^0)=3(\cos 20^0+\cos 40^0)$

14. Prove that: $\tan A+2\tan 2A+4\tan 4A+8\cot 8A=\cot A$

15. Prove that: $\sin A.\sin(60^0-A).\sin(60^0+A)=\frac{1}{4}\sin 3A$

16. Prove that: $\cos A.\cos(60^0-A).\cos(60^0+A)=\frac{1}{4}\cos 3A$

17. Prove that: $\cos A.\cos 2A.\cos 4A.........\cos 2^{n-1}A=\frac{\sin(2^n A)}{2^n(\sin A)}$.

18. If $\tan\frac{A}{2}=\sqrt{\frac{1-x}{1+x}}\tan\frac{B}{2}$, prove that $\cos B=\frac{\cos A-x}{1-x\cos A}$

19. If $\cos A=\frac{a\cos B+b}{a+b\cos B}$, prove that $\tan\frac{A}{2}=\sqrt{\frac{a-b}{a+b}}\tan\frac{B}{2}$

20. If $2\cos A=x+\frac{1}{x}$, prove that $2\cos 3A=x^3+\frac{1}{x^3}$

21. Prove that: $\cos^3 A+\cos^3(120^0+A)+\cos^3(240^0+A)=\frac{3}{4}\cos 3A$

22. Prove that: $\cot A+\cot(60^0+A)+\cot(120^0+A)=3\cot 3A$

23. Prove that: $\sin^2\frac{\pi}{8}+\sin^2\frac{3\pi}{8}+\sin^2\frac{5\pi}{8}+\sin^2\frac{7\pi}{8}=\frac{3}{2}$

24. Prove that: $\cos^2\frac{\pi}{8}+\cos^2\frac{3\pi}{8}+\cos^2\frac{5\pi}{8}+\cos^2\frac{7\pi}{8}=2$

25. Prove that: $\cos^2\frac{\pi}{10}+\cos^2\frac{2\pi}{5}+\cos^2\frac{3\pi}{5}+\cos^2\frac{9\pi}{10}=2$.

26. If $m\tan(\theta-30^0)=n\tan(\theta+120^0)$, prove that $\cos 2\theta=\frac{m+n}{2(m-n)}$.

27. If $\sin\alpha=\lambda\sin(\theta-\alpha)$, prove that $\tan\left(\alpha-\frac{\theta}{2}\right)=\frac{\lambda-1}{\lambda+1}\tan\frac{\theta}{2}$.

28. Prove that: $\cos^3\left(x-\frac{2\pi}{3}\right)+\cos^3 x+\cos^3\left(x+\frac{2\pi}{3}\right)=\frac{3}{4}\cos 3x$

29. If $\theta=\frac{\pi}{2^n+1}$, prove that $2^n\cos\theta\cos 2\theta\cos 4\theta.............\cos 2^{n-1}\theta=1$.

30. If $\sec(\phi+\alpha),\sec\phi$ *and* $\sec(\phi-\alpha)$ are in A.P., prove that $\cos\phi=\pm\sqrt{2}\cos\frac{\alpha}{2}$.

31. Find the value of (i) $\sin 18^0$ (ii) $\cos 18^0$ (iii) $\sin 36^0$ (iv) $\cos 36^0$

32. Prove that: $\sin^2 72^0-\sin^2 60^0=\frac{\sqrt{5}-1}{8}$

33. Prove that: $\sin\frac{\pi}{5}\sin\frac{2\pi}{5}\sin\frac{3\pi}{5}\sin\frac{4\pi}{5}=\frac{5}{16}$

34. Prove that: $\sin 6^0\sin 42^0\sin 66^0\sin 78^0=\frac{1}{16}$

35. Prove that: $\cos 36^0\cos 72^0\cos 108^0\cos 144^0=\frac{1}{16}$

36. Prove that: $\tan 6^0\tan 42^0\tan 66^0\tan 78^0=1$

37. Prove that: $\cos\frac{\pi}{15}\cos\frac{2\pi}{15}\cos\frac{3\pi}{15}\cos\frac{4\pi}{15}\cos\frac{5\pi}{15}\cos\frac{6\pi}{15}\cos\frac{7\pi}{15}=\frac{1}{128}$

38. Prove that: $\left(1+\cos\frac{\pi}{10}\right)\left(1+\cos\frac{3\pi}{10}\right)\left(1+\cos\frac{7\pi}{10}\right)\left(1+\cos\frac{9\pi}{10}\right)=\frac{1}{16}$

39. If $13\alpha=\pi$, prove that $\cos\alpha\cos 2\alpha\cos 3\alpha\cos 4\alpha\cos 5\alpha\cos 6\alpha=\frac{1}{64}$.

40. If $15\alpha=\pi$, prove that $\cos 2\alpha\cos 4\alpha\cos 8\alpha\cos 14\alpha=\frac{1}{16}$.

CLASS: XI: MATHEMATICS
TRIGONOMETRY FORMULAES
PRACTICE QUESTIONS ON SOLUTION OF TRIANGLES

FORMULA USED

Sine Formula

1. $\dfrac{a}{\sin A}=\dfrac{b}{\sin B}=\dfrac{c}{\sin C}$

Cosine Formula

2. $a^2=b^2+c^2-2bc\cos A$, $b^2=c^2+a^2-2ca\cos B$ and $c^2=a^2+b^2-2ab\cos C$

or

$\cos A=\dfrac{b^2+c^2-a^2}{2bc}$, $\cos B=\dfrac{c^2+a^2-b^2}{2ca}$, $\cos C=\dfrac{a^2+b^2-c^2}{2ab}$

Tangent Formula

3. $\tan\left(\dfrac{A-B}{2}\right)=\left(\dfrac{a-b}{a+b}\right)\cot\dfrac{C}{2}$, $\tan\left(\dfrac{B-C}{2}\right)=\left(\dfrac{b-c}{b+c}\right)\cot\dfrac{A}{2}$ and

$\tan\left(\dfrac{C-A}{2}\right)=\left(\dfrac{c-a}{c+a}\right)\cot\dfrac{B}{2}$

Projection Formulaes

4. $a=b\cos C+c\cos B$

$b=a\cos C+c\cos A$

$c=a\cos B+b\cos A$

Area of triangle Formulaes

5. $\Delta=\dfrac{1}{2}bc\sin A$, $\Delta=\dfrac{1}{2}ca\sin B$ and $\Delta=\dfrac{1}{2}ab\sin C$

Formulaes for $\sin\dfrac{A}{2},\sin\dfrac{B}{2},\sin\dfrac{C}{2}$

6. $\sin\dfrac{A}{2}=\sqrt{\dfrac{(s-b)(s-c)}{bc}}$, $\sin\dfrac{B}{2}=\sqrt{\dfrac{(s-c)(s-a)}{ca}}$, $\sin\dfrac{C}{2}=\sqrt{\dfrac{(s-a)(s-b)}{ab}}$

Formulaes for $\cos\dfrac{A}{2},\cos\dfrac{B}{2},\cos\dfrac{C}{2}$

7. $\cos\dfrac{A}{2}=\sqrt{\dfrac{s(s-a)}{bc}}$, $\cos\dfrac{B}{2}=\sqrt{\dfrac{s(s-b)}{ca}}$, $\cos\dfrac{C}{2}=\sqrt{\dfrac{s(s-c)}{ab}}$

Formulaes for $\tan\dfrac{A}{2},\tan\dfrac{B}{2},\tan\dfrac{C}{2}$

8. $\tan\dfrac{A}{2}=\sqrt{\dfrac{(s-b)(s-c)}{s(s-a)}}$, $\tan\dfrac{B}{2}=\sqrt{\dfrac{(s-c)(s-a)}{s(s-b)}}$, $\tan\dfrac{C}{2}=\sqrt{\dfrac{(s-a)(s-b)}{s(s-c)}}$

1. In a ΔABC, if a = 2, b = 3 and sinA = $\dfrac{2}{3}$, find $\angle$B.

2. In a ΔABC, if a = 18, b = 24 and c = 30, find sinA, sinB and sinC.

3. For any triangle ABC, prove that $\dfrac{\sin(B-C)}{\sin(B+C)}=\dfrac{b^2-c^2}{a^2}$.

4. In a triangle ABC, if acosA = bcosB, show that the triangle is either isosceles or right triangle.

Prove that the following:

5. $(b+c)\cos\frac{B+C}{2} = a\cos\frac{B-C}{2}$

6. $\frac{c}{a+b} = \frac{1-\tan\frac{A}{2}\tan\frac{B}{2}}{1+\tan\frac{A}{2}\tan\frac{B}{2}}$

7. $\frac{c}{a-b} = \frac{\tan\frac{A}{2}+\tan\frac{B}{2}}{\tan\frac{A}{2}-\tan\frac{B}{2}}$

8. $a\cos A + b\cos B + c\cos C = 2b\sin A\sin C = 2c\sin A.\sin B$

9. $(b-c)\cot\frac{A}{2} + (c-a)\cot\frac{B}{2} + (a-b)\cot\frac{C}{2} = 0$

10. $\frac{a^2\sin(B-C)}{\sin B+\sin C} + \frac{b^2\sin(C-A)}{\sin C+\sin A} + \frac{c^2\sin(A-B)}{\sin A+\sin B} = 0$

11. $\frac{b^2-c^2}{\cos B+\cos C} + \frac{c^2-a^2}{\cos C+\cos A} + \frac{a^2-b^2}{\cos A+\cos B} = 0$

12. $\frac{a\sin(B-C)}{b^2-c^2} = \frac{b\sin(C-A)}{c^2-a^2} = \frac{c\sin(A-B)}{a^2-b^2}$

13. $a\sin(B-C) + b\sin(C-A) + c\sin(A-B) = 0$

14. $\frac{1+\cos(A-B)\cos C}{1+\cos(A-C)\cos B} = \frac{a^2+b^2}{a^2+c^2}$

15. $2(bc\cos A + ca\cos B + ab\cos C) = a^2+b^2+c^2$

16. $a(b\cos C - c\cos B) = b^2 - c^2$

17. $(b^2-c^2)\cot A + (c^2-a^2)\cot B + (a^2-b^2)\cot C = 0$

18. $\frac{b^2-c^2}{a^2}\sin 2A + \frac{c^2-a^2}{b^2}\sin 2B + \frac{a^2-b^2}{c^2}\sin 2C = 0$

19. $(c^2-a^2+b^2)\tan A = (a^2-b^2+c^2)\tan B = (b^2-c^2+a^2)\tan C$

20. $a^3\cos(B-C) + b^3\cos(C-A) + c^3\cos(A-B) = 3abc$

21. $2\left(b\cos^2\frac{C}{2} + c\cos^2\frac{B}{2}\right) = a+b+c$

22. $2\left(a\sin^2\frac{C}{2} + c\sin^2\frac{A}{2}\right) = a+c-b$

23. $\dfrac{\cos A}{b\cos C+c\cos B}+\dfrac{\cos B}{c\cos A+a\cos C}+\dfrac{\cos C}{a\cos B+b\cos A}=\dfrac{a^2+b^2+c^2}{2abc}$

24. If in a triangle ABC, $\dfrac{2\cos A}{a}+\dfrac{\cos B}{b}+\dfrac{2\cos C}{c}=\dfrac{a}{bc}+\dfrac{b}{ca}$, then prove that the triangle is right angled.

25. In a triangle ABC, if $\cos B=\dfrac{\sin B}{2\sin C}$, show that the triangle is isosceles.

26. In any triangle ABC, if C=60^0, prove that $\dfrac{1}{a+c}+\dfrac{1}{b+c}=\dfrac{3}{a+b+c}$.

27. In a triangle ABC, if $\dfrac{b+c}{11}=\dfrac{c+a}{12}=\dfrac{a+b}{13}$ then prove that $\dfrac{\cos A}{7}=\dfrac{\cos B}{19}=\dfrac{\cos C}{25}$.

28. In a triangle ABC, if B=60^0, prove that $(a+b+c)(a-b+c)=3ca$.

29. The sides of a triangle are a = 4, b = 6 and c = 8, show that 8cosA + 16cosB + 4cosC = 17.

30. In any triangle ABC, if A = 30^0, b = 3 and c = $3\sqrt{3}$, then find $\angle$B and $\angle$C.

31. In any triangle ABC, prove that $4\Delta(\cot A+\cot B+\cot C)=a^2+b^2+c^2$

32. In any triangle ABC, prove that $a\cos A+b\cos B+c\cos C=2a\sin B\sin C=\dfrac{8\Delta^2}{abc}$

33. In any triangle ABC, prove that $\dfrac{a^2-b^2}{2}.\dfrac{\sin A\sin B}{\sin(A-B)}=\Delta$

34. In any triangle ABC, prove that $4\Delta\cot A=b^2+c^2-a^2$

35. In a triangle ABC, a = 3, b = 5, c = 6. Calculate (i) $\sin\dfrac{A}{2}$ (ii) $\cos\dfrac{A}{2}$ (iii) area of triangle.

36. In a triangle ABC, if a = 18, b = 24 and c = 30, find $\tan\dfrac{A}{2},\tan\dfrac{B}{2},\tan\dfrac{C}{2}$.

37. In a triangle ABC, prove that $\dfrac{(a+b+c)^2}{a^2+b^2+c^2}=\dfrac{\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}}{\cot A+\cot B+\cot C}$

38. In a triangle ABC, prove that $\cot\dfrac{A}{2}+\cot\dfrac{B}{2}+\cot\dfrac{C}{2}=\dfrac{a+b+c}{a+b-c}\cot\dfrac{C}{2}$

39. In a triangle ABC, prove that $(b+c-a)\left(\cot\dfrac{B}{2}+\cot\dfrac{C}{2}\right)=2a\cot\dfrac{A}{2}$

40. In a triangle ABC, prove that $(a+b+c)\left(\tan\dfrac{A}{2}+\tan\dfrac{B}{2}\right)=2c\cot\dfrac{C}{2}$