Section A

1) $\frac{17}{8} = \frac{17}{2^3}$

Any number whose denominator has only 2, only 5 or a combination of 2 and 5 as factors is terminating.

2) $kx(x-2)+6=0$

$kx^2 - 2kx + 6 = 0$

For a quadratic equation to have equal roots

$b^2 - 4ac = 0$

$(-2k)^2 - 4 \times k \times 6 = 0$

$4k^2 - 24k = 0$

$4k(k-6) = 0$

ie $4k = 0$, $k = 0$

and $k-6 = 0$, $k = 6$

$\therefore k = 0, 6$ Here we take $k=6$ only

3) __, 38, __, __, __, -22

$a_2 = a + d = 38$ — (1)

$a_6 = a + 5d = -22$ — (2)

(1) - (2) $-4d = 60$

$d = -15$

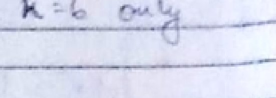
Substituting d in (1)

$a - 15 = 38$

$a = 38 + 15 = 53$

$\therefore$ AP is 53, 38, 23, 8, -7, -22

4) $PA = PB$



$\sqrt{(x-7)^2+(y-1)^2} = \sqrt{(x-3)^2+(y-5)^2}$

Squaring both sides

$x^2 - 14x + 49 + y^2 - 2y + 1 = x^2 - 6x + 9 + y^2 - 10y + 25$

$-8x + 8y + 16 = 0$

$x - y - 2 = 0$ or $x - y = 2$

5) $d = 3, \; a = 12, \; a_n = 99$

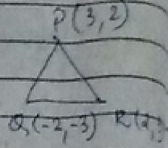
$a_n = a + (n-1)d$

$99 = 12 + (n-1)3$

$87 = 3n - 3$

$90 = 3n$

$n = 90/3 = \underline{\underline{30}}$



6) $PQ = \sqrt{(3+2)^2 + (2+3)^2}$

$= \sqrt{5^2 + 5^2}$

$= \sqrt{50}$ units

$QR = \sqrt{(-2-2)^2 + (-3-3)^2}$

$= \sqrt{(-4)^2 + (-6)^2}$

$= \sqrt{52}$ units

$PR = \sqrt{(3-2)^2 + (2-3)^2}$

$= \sqrt{1^2 + (-1)^2}$

$= \sqrt{2}$ units

$QR^2 = PQ^2 + PR^2$

ie $(\sqrt{52})^2 = (\sqrt{50})^2 + (\sqrt{2})^2$

$\therefore$ ~~ΔPQQ~~ ΔPQR is a right angled triangle.

7) HCF $\times$ LCM = product of numbers.

$6 \times LCM = 336 \times 54$

$LCM = \dfrac{336 \times \cancel{54}^{9}}{\cancel{6}} = \underline{\underline{3024}}$

8) $2x^2 - 4x + 3 = 0$

$b^2 - 4ac = (-4)^2 - 4 \times 2 \times 3$

$= 16 - 24$

$= -8$

ie the equation has no real roots

9) $\frac{1}{a}, \frac{3-a}{3a}, \frac{3-2a}{3a} \ldots (a \neq 0)$

$a_3 - a_2 = d.$

$\frac{3-2a}{3a} - \left[\frac{3-a}{3a}\right]$

$= \frac{\cancel{3}-2a-\cancel{3}+a}{3a}$

$= \frac{-a}{3a} = -\frac{1}{3} = d$

10) $\sin^2 60 + 2\tan 45 - \cos^2 30$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + 2\times 1 - \left(\frac{\sqrt{3}}{2}\right)^2$

$= \cancel{\frac{3}{4}} + 2 - \cancel{\frac{3}{4}}$

$= 2$

11) (A) $\sin A = \frac{3}{4}$, to find $\sec A$

$\sin^2 A + \cos^2 A = 1$

$\cos^2 A = 1 - \sin^2 A$

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

$= 1 - \frac{9}{16}$

$= \frac{7}{16}$

$\cos A = \sqrt{\frac{7}{16}} = \frac{\sqrt{7}}{4}$.

$\sec A = \frac{1}{\cos A} = \frac{4}{\sqrt{7}}$

11) (B) Any point on the x-axis has 0 as its y-coordinate.

PA = PB.

ie $\sqrt{(x+2)^2 + (0-0)^2} = \sqrt{(x-6)^2 + (0+0)^2}$

Squaring both sides

$\cancel{x^2} + 4x + 4 = \cancel{x^2} - 12x + 36$

$16x = 32$.

$x = 2$

ie pt of x axis = (2,0)

SECTION B

12) LCM (306, 657) = 22338.

13) For three points to be collinear, area = 0.

ie $\frac{1}{2}\left[x(6-3) + (-4)(3-y) + (-2)(y-6)\right] = 0$

$3x - 12 + 4y - 2y + 12 = 0$

$3x + 2y = 0$

14) Area of a triangle $= \frac{1}{2}\left[x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)\right]$

$= \frac{1}{2}\left[1(6+5) - 4(-5+1) - 3(-1-6)\right]$

$= \frac{1}{2}(11+16+21)$

$= 24$ sq units

15) $2+5\sqrt{3} = \frac{a}{b}$ if it is rational

$5\sqrt{3} = \frac{a}{b} - 2$

$5\sqrt{3} = \frac{a-2b}{b}$

$\sqrt{3} = \frac{a-2b}{5b} = p/q$

But since $\sqrt{3}$ is irrational, it cannot be written in the form p/q.

$\therefore$ our assumption that $2+5\sqrt{3} = \frac{a}{b}$ is wrong.

ie $2+5\sqrt{3}$ is irrational.

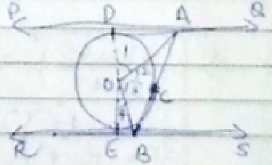
16) $2048 = 960 \times 2 + 128$

$960 = 128 \times 7 + 64$

$128 = 64 \times 2 + 0$

$\therefore$ HCF $(2048, 960) = 64$

17) PQ || RS



AD and AC are tangents to the circle from the external pt A

$\therefore \angle 1 = \angle 2$

Similarly $\angle 3 = \angle 4$

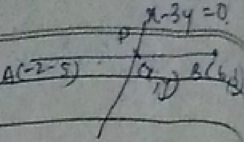
Since PQ || RS, ED is a diameter

$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 180^\circ$

$2\angle 2 + 2\angle 3 = 180$

$\angle 2 + \angle 3 = 90^\circ$ ie $\angle AOB = 90^\circ$

18) $x - 3y = 0$ or $x = 3y$ —— (1)



Pt. of intersection :

$$x = \frac{m_1x_2 + m_2x_1}{m_1 + m_2} \text{ or } \frac{kx_2 + x_1}{k+1} = \frac{6k-2}{k+1}$$

$$y = \frac{m_1y_2 + m_2y_1}{m_1+m_2}. \text{ or } \frac{ky_2 + y_1}{k+1} \quad \frac{3k-5}{k+1}$$

Subst x and y in (1).

$$\frac{6k-2}{\cancel{k+1}} = \frac{3(3k-5)}{\cancel{k+1}}$$

$$6k - 2 = 9k - 15$$

$$3k = 13$$

$$k = \frac{13}{3}.$$

$$\therefore P(x,y) = \left[\frac{6 \times \frac{13}{3} - 2}{\frac{13}{3}+1}, \frac{3 \times \frac{13}{3} - 5}{\frac{13}{3}+1}\right]$$

$$= \left(\frac{24 \times 3}{16}, \frac{8 \times 3}{16}\right)$$

$$= \left(\frac{9}{2}, \frac{3}{2}\right)$$

19) $$\left(\frac{3 \sin 43}{\cos 47}\right)^2 - \frac{\cos 37 \operatorname{cosec} 53}{\tan 5 \tan 25 \tan 45 \tan 65 \tan 85}$$

$$= \left[\frac{3 \sin 43}{\cos(90-43)}\right]^2 - \frac{\cos 37 \frac{1}{\sin 53}}{\tan 5 \tan 25 \times 1 \times \tan(90-25) \tan(90-5)}$$

$$= \left[\frac{3 \sin 43}{\sin 43.}\right]^2 - \frac{\cos 37 / \sin(90-37)}{\tan 5 \tan 25 \cot 25 \cot 5}$$

$$9 - \frac{\frac{\cos 37}{\cos 37}}{\tan 5 \tan 25 \frac{1}{\tan 25} \cdot \frac{1}{\tan 5}}$$

$$9 - 1$$

$$= 8$$

20) $f(x) = 3x^4 - 9x^3 + x^2 + 15x + k \div 3x^2 - 5$

$$\begin{array}{r} x^2 - 3x + 2 \\ 3x^2-5 \,\overline{)\, 3x^4 - 9x^3 + x^2 + 15x + k} \\ -3x^4 \quad\quad + 5x^2 \quad\quad\quad \\ \hline -9x^3 + 6x^2 + 15x + k \\ -9x^3 \quad\quad + 15x \quad \\ \hline 6x^2 \quad + k \\ 6x^2 - 10 \\ \hline k + 10 \end{array}$$

$k + 10 = 0$

$\underline{\underline{k = -10}}$

21) $7y^2 - \frac{11}{3}y - \frac{2}{3}$

$= \frac{21y^2 - 11y - 2}{3}$

$= \frac{1}{3}\left[21y^2 - 11y - 2\right]$

$= \frac{1}{3}\left[21y^2 - 14y + 3y - 2\right]$

$= \frac{1}{3}\left[7y(3y-2) + (3y-2)\right]$

$= \frac{1}{3}(7y+1)(3y-2)$

Zeroes are $-\frac{1}{7}, \frac{2}{3}$

Verification

$\frac{-b}{a} = \alpha + \beta$

$\alpha + \beta = \frac{2}{3} - \frac{1}{7}$

$= \frac{11}{21}$

$-\frac{b}{a} = \frac{11}{3 \times 7} = \frac{11}{21}$

ie $\frac{-b}{a} = \alpha + \beta$.

$\frac{c}{a} = \alpha\beta$

$\alpha\beta = \frac{2}{3} \times \frac{-1}{7}$

$= \frac{-2}{21}$

$\frac{c}{a} = \frac{-2}{3 \times 7} \times \cancel{7}$

$= \underline{\underline{\frac{-2}{21}}}$

22) $6^n = (2\times3)^n$

For a number to end with zero, its factors should be in the form $2^m \times 5^n$, where m & n are integers. $\therefore$ 6 also has 3 as a factor $\therefore$ 6^n will not end with the digit 0.

23) $5-\sqrt{3}$

Assume $\sqrt{3}$ is rational.

ie $\sqrt{3} = p/q$ where p & q are integers, p and q are co-prime and $q \neq 0$.

$\sqrt{3}q = p$.

Squaring both sides

$3q^2 = p^2$ —— (1).

Since p^2 is divisible by 3, p is also divisible by 3.

Let $p = 3r$.

Substituting in (1)

$3q^2 = 9r^2$

or $q^2 = 3r^2$.

Since q^2 is divisible by 3, q is also divisible by 3.

ie p and q have a common factor 3. This contradicts our assumption that p and q are coprime.

So our assumption at $\sqrt{3}$ is rational is incorrect.

Let $5-\sqrt{3}$ be rational

ie $5-\sqrt{3} = \dfrac{a}{b}$

$-\sqrt{3} = \dfrac{a}{5b}$ $\quad -\sqrt{3} = \dfrac{a}{b} - 5$

or $\sqrt{3} = -\dfrac{a}{5b}$ $\quad \sqrt{3} = \dfrac{5b-a}{b} = \dfrac{c}{d}$.

But $\sqrt{3}$ is irrational and cannot be in the for $4d$. $\therefore$ our assumption is incorrect and $\therefore 5-\sqrt{3}$ is irrational.

24) $10, 7, 4, \ldots -62$

Let -62 be the first term and 10 be the last.

$-62, \ldots 4, 7, 10$

$a = -62 \quad d = 3$.

$a_{11} = a + 10d$.

$= -62 + 10 \times 3$

$= -62 + 30$

$= \underline{-32}$

25) Let the two APs be $a_1, a_2, a_3 \ldots$ & $A_1, A_2, A_3 \ldots$

$a_2 - a_1 = d = A_2 - A_1$

$a_{100} - A_{100} = 100$ (given)

ie $a + 99d - (A + 99d) = 100$

$a + \cancel{99d} - A - \cancel{99d} = 100$

$a - A = 100$.

$a_{1000} - A_{1000}$

$= a + 999d - (A + 999d)$

$= a + \cancel{999d} - A - \cancel{999d}$

$= a - A$

$= \underline{100}$.

26) The x coordinate of all pts on the y-axis $= 0$

ie $0 = \dfrac{m_1 x_2 + m_2 x_1}{m_1 + m_2}$. $\quad A(5, -6)$ $\quad B(-1, -4)$

$0 = \dfrac{-m_1 + 5m_2}{m_1 + m_2}$

$0 = -m_1 + 5m_2$

$m_1 = 5m_2$

$\dfrac{m_1}{m_2} = \dfrac{5}{1}$

$P(x, y)$ is the pt. of intersection.

$$y = \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}$$

$$= \frac{5 \times -4 + 1 \times -6}{5+1}$$

$$= \frac{-20-6}{6}$$

$$= \frac{-26}{6} = \frac{-13}{3}.$$

$\therefore P(x, y) = P\left(0, \frac{-13}{3}\right)$

SECTION C

27) HCF (12576, 4052)

$12576 = 4052 \times 3 + 420$

$4052 = 420 \times 9 + 272$

$420 = 272 \times 1 + 148$

$272 = 148 \times 1 + 124$

$148 = 124 \times 1 + 24$

$124 = 24 \times 5 + 4$

$24 = 4 \times 6 + 0.$

HCF (12576, 4052) = 4

28) $3x^2 - 2\sqrt{6}x + 2 = 0$

sum $= -2\sqrt{6}$

product $= 6$

$3x^2 - \sqrt{6}x - \sqrt{6}x + 2.$

$\sqrt{3}x(\sqrt{3}x - \sqrt{2}) - \sqrt{2}(\sqrt{3}x - \sqrt{2})$

$(\sqrt{3}x - \sqrt{2})^2 = 0$

$\sqrt{3}x - \sqrt{2} = 0$

$\sqrt{3}x = \sqrt{2}$

$x = \frac{\sqrt{2}}{\sqrt{3}}$ $\therefore$ roots are $\sqrt{\frac{2}{3}}, \sqrt{\frac{2}{3}}$

29) Let speed of the train be x km/hr.

Time taken $= \frac{480}{x}$.

When the speed is reduced $s = x - 8$.

new time taken $= \frac{480}{x} + 3$.

ie $\frac{480}{x-8} = \frac{480}{x} + 3$

$\frac{480}{x-8} - \frac{480}{x} = 3$

$480\left[\frac{1}{x-8} - \frac{1}{x}\right] = 3$

$480\left[\frac{x - x + 8}{x(x-8)}\right] = 3$

$480 \times 8 = 3x(x-8)$

$3840 = 3x^2 - 24x$.

$x^2 - 8x - 1280 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= (8 \pm \sqrt{64 + 5120})/2$

$= (8 \pm \sqrt{5184})/2$

$= (8 \pm 72)/2$

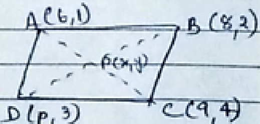
$= 4 \pm 36$

$= -32, 40$

Since speed cannot be -ive.

$x = 40$ km/hr.

30) Diagonals of a parallelogram bisect each other.



ie midpt of AC = midpt of BD

$x = \frac{p+8}{2} = \frac{6+9}{2}$

$\frac{p+8}{2} = \frac{15}{2}$.

$p + 8 = 15$

$\underline{p = 7}$

31) For three pts to be collinear ar = 0.

$$\frac{1}{2}\left(x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right] = 0$$

$$\frac{1}{2}\left[2(k+3)+4(-3-3)+6(3-k)\right] = 0$$

$$2k+6-24+18-6k = 0$$

$$-4k = 0$$

$$\underline{\underline{k = 0}}$$

32) $A+B+C = 180$

$$B+C = 180 - A$$

$$\frac{B+C}{2} = 90 - \frac{A}{2}.$$

$$\sin\left(\frac{B+C}{2}\right) = \sin\left(90-\frac{A}{2}\right)$$

$$= \cos\frac{A}{2} \qquad \left[\sin(90-\theta) = \cos\theta\right]$$

33) $\frac{1+\sec A}{\sec A} = \frac{\sin^2 A}{1-\cos A}$

LHS $\frac{1+\sec A}{\sec A}$

$$= \frac{1}{\sec A} + \frac{\sec A}{\sec A}$$

$$= \cos A + 1$$

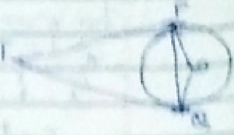
RHS $= \frac{\sin^2 A}{1-\cos A}.$

$$\frac{\cancel{(1-\cos A)}(1+\cos A)}{\cancel{1-\cos A}}$$

$$= 1+\cos A$$

$\therefore$ LHS = RHS.

34) $\angle T + \angle O = 180$
Let $\angle T = x$,
$x + \angle O = 180$
$\angle O = 180 - x$.



In ΔOPQ,
$OP = OQ$ (radii)
$\therefore \angle OPQ = \angle OQP$
$\angle O + \angle OPQ + \angle OQP = 180$
$\angle O + 2\angle OPQ = 180$
$2\angle OPQ = 180 - 180 + x$
$2\angle OPQ = x$
$2\angle OPQ = \angle PTQ$

35) Area of minor sector $= \frac{\theta}{360} \cdot \pi r^2$

$= \frac{30}{360} \times 3.14 \times 4 \times 4$
$= 4.186\ cm^2$

Area of major sector $= \pi r^2 - \frac{\theta}{360} \pi r^2$
$= 3.14 \times 4 \times 4 - 4.186$
$= 50.24 - 4.186$
$= 46.054\ cm^2$

36) $x^2 + px + 16 = 0$
For equal roots $b^2 - 4ac = 0$
$p^2 - 64 = 0$
$p^2 = 64$
$p = \pm 8$

For $p = 8$:
$x^2 + 8x + 16 = 0$
$(x+4)^2 = 0$
$x + 4 = 0 \quad x = -4$

For $p = -8$

$x^2 - 8x + 16 = 0$

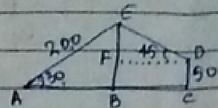
$(x-4)^2 = 0$

$x - 4 = 0$

$x = 4.$

SECTION D

37) $\sin 30 = \dfrac{BE}{AE}$



$\dfrac{1}{2} = \dfrac{BE}{200}$

$BE = 100\,m.$

$EF = BE - BF$

$= 100 - 50$

$= 50\,m.$

$\sin 45 = \dfrac{EF}{DE}$

$\dfrac{1}{\sqrt{2}} = \dfrac{50}{DE}$

$DE = 50\sqrt{2}\ m.$

38) $\dfrac{\tan\theta}{1-\cot\theta} + \dfrac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\,\text{cosec}\,\theta.$

$\dfrac{\frac{\sin\theta}{\cos\theta}}{1-\frac{\cos\theta}{\sin\theta}} + \dfrac{\frac{\cos\theta}{\sin\theta}}{1-\frac{\sin\theta}{\cos\theta}}$

$= \dfrac{\sin^2\theta}{\cos\theta(\sin\theta-\cos\theta)} + \dfrac{\cos^2\theta}{\sin\theta(\cos\theta-\sin\theta)}$

$= \dfrac{\sin^3\theta - \cos^3\theta}{\sin\theta\cos\theta(\sin\theta-\cos\theta)}$

$$= \frac{(\sin\theta - \cos\theta)(\sin^2\theta + \cos^2\theta + \sin\theta\cos\theta)}{\sin\theta\cos\theta(\sin\theta - \cos\theta)}$$

$$= \frac{1 + \sin\theta\cos\theta}{\sin\theta\cos\theta}$$

$$= \underline{\underline{\csc\theta\sec\theta + 1}} = \text{RHS}$$

39) $\frac{\sin\theta}{\cot\theta + \csc\theta} = 2 + \frac{\sin\theta}{\cot\theta - \csc\theta}$

$$\frac{\sin\theta}{\cot\theta + \csc\theta} - \frac{\sin\theta}{\cot\theta - \csc\theta} = 2$$

$$\sin\theta\left[\frac{1}{\cot\theta + \csc\theta} - \frac{1}{\cot\theta - \csc\theta}\right]$$

$$\sin\theta\left[\frac{\cot\theta - \csc\theta - \cot\theta - \csc\theta}{(\cot\theta + \csc\theta)(\cot\theta - \csc\theta)}\right]$$

$$\frac{\sin\theta \times -2\csc\theta}{\cot^2\theta - \csc^2\theta}$$

$$= \frac{+\sin\theta \times \frac{2}{\sin\theta}}{+1} = 2 = \underline{\underline{\text{RHS}}}$$

40) Time taken by smaller pipe to fill the tank = x hr.
Time taken by larger pipe = $(x-10)$ hr

$$\frac{1}{x} + \frac{1}{x-10} = \frac{8}{75}$$

$$\frac{x - 10 + x}{x(x-10)} = \frac{8}{75}$$

$$75(2x - 10) = 8(x^2 - 10x)$$

$$150x - 750 = 8x^2 - 80x$$

$$8x^2 - 80x - 150x + 750 = 0$$

$$8x^2 - 230x + 750 = 0$$

$$8x^2 - 200x - 30x + 750 = 0$$

$$8x(x - 25) - 30(x - 25) = 0$$

$$(8x - 30)(x - 25) = 0$$

$$x = 25, \frac{30}{8} = 25, 3.75$$

Here $x = 25$

ie time taken by smaller pipe $= 25$ hrs

" " " larger pipe $= 15$ hrs

41) Let the speed of the stream be x km/hr.

Speed of boat upstream $= (18 - x)$ km/h

" " " downstream $= (18+x)$ km/h.

$$\frac{24}{18-x} - \frac{24}{18+x} = 1$$

$$24\left[\frac{18+x-18+x}{(18+x)(18-x)}\right] = 1$$

$$48x = 324 - x^2$$

$$x^2 + 48x - 324 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-48 \pm \sqrt{48^2 + 4 \times 324}}{2}$$

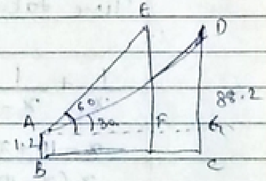
$$= \frac{-48 \pm \sqrt{3600}}{2} = \frac{-48 \pm 60}{2}$$

$$= -54, 6$$

Here x is the speed of the stream

$= 6$ km/h.

42) From $\triangle AGD$



$$\tan 30 = \frac{DG}{AG} = \frac{87}{AG}$$

$$\frac{1}{\sqrt{3}} = \frac{87}{AG}$$

$$AG = 87\sqrt{3}$$

From $\triangle AFE$

$$\tan 60 = \frac{EF}{AF} = \frac{87}{AF}$$

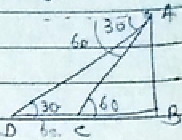
$$\sqrt{3} = \frac{87}{AF}$$

$$AF = \frac{87}{\sqrt{3}} = \frac{87\sqrt{3}}{3} = 29\sqrt{3}$$

$FG = AG - AF$

$= 87\sqrt{3} - 29\sqrt{3}$

$= \underline{\underline{58\sqrt{3}\ m}} \rightarrow$ Distance travelled by the balloon.



43) $\tan 30 = \frac{AB}{DB}$

$\frac{1}{\sqrt{3}} = \frac{AB}{DC + CB}$

$AB = \frac{DC + CB}{\sqrt{3}}$ —— (1)

$\tan 60 = \frac{AB}{CB}$

$\sqrt{3} = \frac{AB}{CB}$

$AB = CB\sqrt{3}$. —— (2)

Equating (1) and (2)

$CB\sqrt{3} = \frac{DC + CB}{\sqrt{3}}$

$3CB = DC + CB$

$2CB = DC$

$2CB = 6$

$CB = 3$ seconds.

44) $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{cosec} A + \cot A$ (using $\operatorname{cosec}^2 A = 1 + \cot^2 A$)

LHS. Dividing numerator & denominator by $\sin A$.

$= \frac{\cot A - 1 + \operatorname{cosec} A}{\cot A + 1 - \operatorname{cosec} A}$.

$= \frac{[\cot A - (1 - \operatorname{cosec} A)][\cot A - (1 - \operatorname{cosec} A)]}{[\cot A + (1 - \operatorname{cosec} A)][\cot A - (1 - \operatorname{cosec} A)]}$

$$= \frac{[\cot A - (1 - \operatorname{cosec} A)]^2}{\cot^2 A - (1 - \operatorname{cosec} A)^2}$$

$$= \frac{\cot^2 A + 1 + \operatorname{cosec}^2 A - 2\cot A - 2\operatorname{cosec} A + 2\cot A \operatorname{cosec} A}{\cot^2 A - 1 + 2\operatorname{cosec} A - \operatorname{cosec}^2 A}$$

$$= \frac{2\operatorname{cosec}^2 A - 2\cot A - 2\operatorname{cosec} A + 2\cot A \operatorname{cosec} A}{-2 + 2\operatorname{cosec} A}$$

$$= \frac{\operatorname{cosec}^2 A - \cot A - \operatorname{cosec} A + \cot A \operatorname{cosec} A}{\operatorname{cosec} A - 1}$$

$$= \frac{\operatorname{cosec} A(\operatorname{cosec} A + \cot A) - (\operatorname{cosec} A + \cot A)}{\operatorname{cosec} A - 1}$$

$$= \frac{\cancel{(\operatorname{cosec} A - 1)}(\operatorname{cosec} A + \cot A)}{\cancel{(\operatorname{cosec} A - 1)}}$$

$= RHS$.