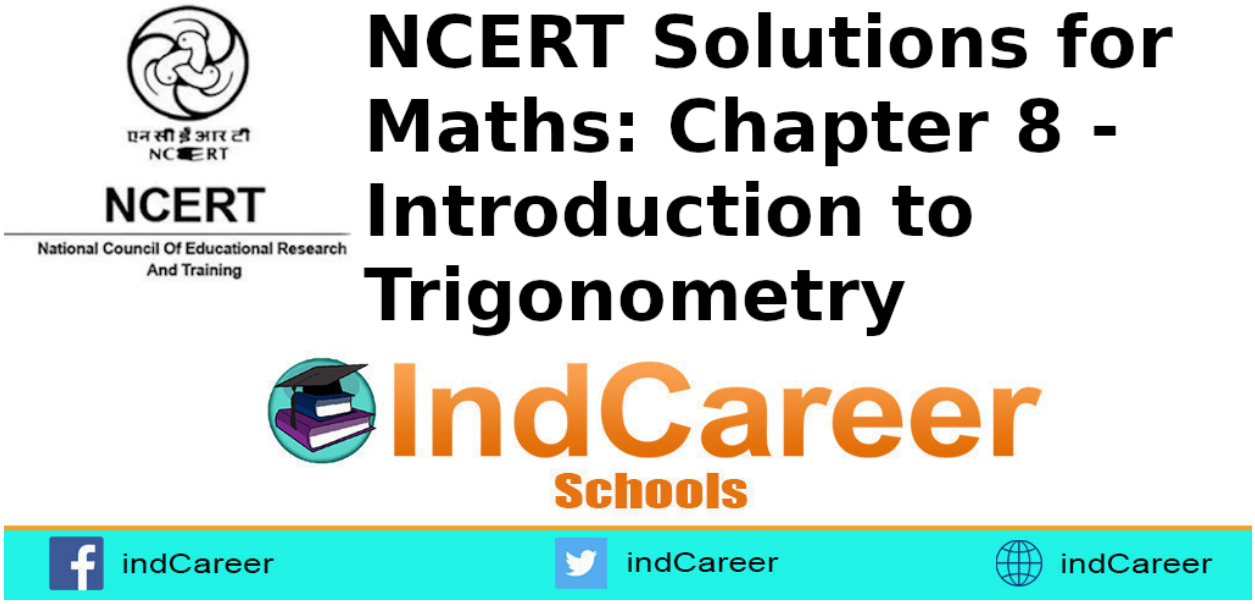

NCERT Solutions for Class 10 Maths Chapter 8 - Introduction to Trigonometry

Class 10: Maths Chapter 8 solutions. Complete Class 10 Maths Chapter 8 Notes.

NCERT Solutions for Class 10 Maths Chapter 8 - Introduction to Trigonometry

NCERT 10th Maths Chapter 8, class 10 Maths Chapter 8 solutions

Exercise 8.1

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1. In Δ ABC, right-angled at B, AB = 24 cm, BC = 7 cm. Determine :

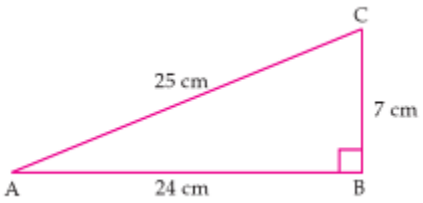
(i) sin A, cos A

(ii) sin C, cos C

Answer

In Δ ABC, ∠B = 90°

By Applying Pythagoras theorem , we get



$AC^2 = AB^2 + BC^2 = (24)^2 + 7^2 = (576+49)\ cm^2 = 625\ cm^2$

⇒ AC = 25

(i) sin A = BC/AC = 7/25 cos A = AB/AC = 24/25

(ii) sin C = AB/AC = 24/25

cos C = BC/AC = 7/25

2. In Fig. 8.13, find tan P – cot R.

Answer

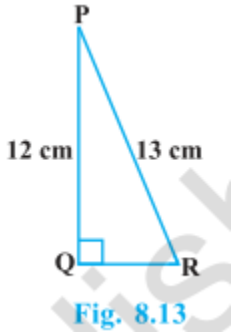


Fig. 8.13

By Applying Pythagoras theorem in ΔPQR , we get

$PR^2 = PQ^2 + QR^2 = (13)^2 = (12)^2 + QR^2 = 169 = 144 + QR^2$

$\Rightarrow QR^2 = 25 \Rightarrow QR = 5$ cm

Now,

tan P = QR/PQ = 5/12

cot R = QR/PQ = 5/12

A/q

tan P – cot R = 5/12 - 5/12 = 0

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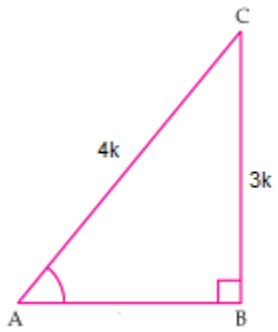
3. If sin A =3/4, calculate cos A and tan A.

Answer

Let ΔABC be a right-angled triangle, right-angled at B.

We know that sin A = BC/AC = 3/4

Let BC be 3k and AC will be 4k where k is a positive real number.



By Pythagoras theorem we get,

$AC^2 = AB^2 + BC^2$

$(4k)^2 = AB^2 + (3k)^2$

$16k^2 - 9k^2 = AB^2$

$AB^2 = 7k^2$

IndCareer

AB = √7 k

cos A = AB/AC = √7 k/4k = √7/4

tan A = BC/AB = 3k/√7 k = 3/√7

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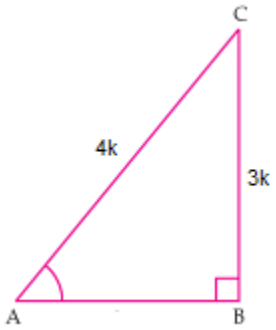
4. Given 15 cot A = 8, find sin A and sec A.

Answer



Let ΔABC be a right-angled triangle, right-angled at B.

We know that cot A = AB/BC = 8/15 (Given)

Let AB be 8k and BC will be 15k where k is a positive real number.

By Pythagoras theorem we get,

$AC^2 = AB^2 + BC^2$

$AC^2 = (8k)^2 + (15k)^2$

$AC^2 = 64k^2 + 225k^2$

$AC^2=289k^2$

AC = 17 k

sin A = BC/AC = 15k/17k = 15/17

sec A = AC/AB = 17k/8 k = 17/8

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5. Given sec θ = 13/12, calculate all other trigonometric ratios.

Answer

Let ΔABC be a right-angled triangle, right-angled at B.

We know that sec θ = OP/OM = 13/12 (Given)

Let OP be 13k and OM will be 12k where k is a positive real number.

By Pythagoras theorem we get,

$OP^2 = OM^2 + MP^2$

$(13k)^2 = (12k)^2 + MP^2$

$169k^2 - 144k^2 = MP^2$

$MP^2=25k^2$

MP = 5

Now,

sin θ = MP/OP = 5k/13k = 5/13

cos θ = OM/OP = 12k/13k = 12/13

tan θ = MP/OM = 5k/12k = 5/12

cot θ = OM/MP = 12k/5k = 12/5

cosec θ = OP/MP = 13k/5k = 13/5

NCERT Solutions for Class 10 Maths Chapter 8

6. If ∠A and ∠B are acute angles such that cos A = cos B, then show that ∠A = ∠B.

Answer

Let ΔABC in which CD ⊥ AB.

A/q,

cos A = cos B

⇒ AD/AC = BD/BC

⇒ AD/BD = AC/BC

Let AD/BD = AC/BC = k

⇒ AD = kBD .... (i)

⇒ AC = kBC .... (ii)

By applying Pythagoras theorem in ΔCAD and ΔCBD we get,

$CD^2 = AC^2 - AD^2$ …. (iii)

and also $CD^2 = BC^2 - BD^2$ …. (iv)

From equations (iii) and (iv) we get,

$AC^2 - AD^2 = BC^2 - BD^2$

⇒ $(kBC)^2 - (k\ BD)^2 = BC^2 - BD^2$

⇒ $k^2 (BC^2 - BD^2) = BC^2 - BD^2$

⇒ $k^2 = 1$

⇒ k = 1

Putting this value in equation (ii), we obtain

AC = BC

⇒ ∠A = ∠B (Angles opposite to equal sides of a triangle are equal-isosceles triangle)

7. If cot θ =7/8, evaluate :

(i)(1+sin θ)(1-sin θ)/(1+cos θ)(1-cos θ)

(ii) $\cot^2\theta$

Answer

Let ΔABC in which ∠B = 90° and ∠C = θ

A/q,

cot θ = BC/AB = 7/8

Let BC = 7k and AB = 8k, where k is a positive real number.

By Pythagoras theorem in ΔABC we get.

$AC^2 = AB^2 + BC^2$

$AC^2 = (8k)^2 + (7k)^2$

$AC^2 = 64k^2 + 49k^2$

$AC^2=113k^2$

AC = √113 k

sin θ = AB/AC = 8k/√113 k = 8/√113

and cos θ = BC/AC = 7k/√113 k = 7/√113

(i) $(1+\sin\theta)(1-\sin\theta)/(1+\cos\theta)(1-\cos\theta) = (1-\sin^2\theta)/(1-\cos^2\theta) = \{1 - (8/\sqrt{113})^2\}/\{1 - (7/\sqrt{113})^2\}$

$= \{1 - (64/113)\}/\{1 - (49/113)\} = \{(113 - 64)/113\}/\{(113 - 49)/113\} = 49/64$

(ii) $\cot^2\theta = (7/8)^2 = 49/64$

8. If 3cot A = 4/3 , check whether $(1-\tan^2A)/(1+\tan^2A) = \cos^2A - \sin^2A$ or not.

Answer

Let ΔABC in which ∠B = 90º,

A/q,

cot A = AB/BC = 4/3

Let AB = 4k and BC = 3k, where k is a positive real number.

By Pythagoras theorem in ΔABC we get.

$AC^2 = AB^2 + BC^2$

$AC^2 = (4k)^2 + (3k)^2$

$AC^2 = 16k^2 + 9k^2$

$AC^2=25k^2$

AC = 5k

tan A = BC/AB = 3/4

sin A = BC/AC = 3/5

cos A = AB/AC = 4/5

L.H.S. = $(1-\tan^2A)/(1+\tan^2A) = 1- (3/4)^2/1+ (3/4)^2 = (1- 9/16)/(1+ 9/16) = (16-9)/(16+9) = 7/25$

R.H.S. = $\cos^2A – \sin^2A = (4/5)^2 - (3/4)^2 =(16/25) - (9/25) = 7/25$

R.H.S. = L.H.S.

Hence, $(1-\tan^2A)/(1+\tan^2A) = \cos^2A – \sin^2A$

9. In triangle ABC, right-angled at B, if tan A =1/√3 find the value of:

(i) sin A cos C + cos A sin C

(ii) cos A cos C – sin A sin C

Answer

Let ΔABC in which ∠B = 90º,

A/q,

tan A = BC/AB = 1/√3

Let AB = √3 k and BC = k, where k is a positive real number.

By Pythagoras theorem in ΔABC we get.

$AC^2 = AB^2 + BC^2$

$AC^2 = (\sqrt{3}\ k)^2 + (k)^2$

$AC^2 = 3k^2 + k^2$

$AC^2=4k^2$

AC = 2k

sin A = BC/AC = 1/2 cos A = AB/AC = √3/2 ,

sin C = AB/AC = √3/2 cos A = BC/AC = 1/2

(i) sin A cos C + cos A sin C = (1/2×1/2) + (√3/2×√3/2) = 1/4+3/4 = 4/4 = 1

(ii) cos A cos C – sin A sin C = (√3/2×1/2) - (1/2×√3/2) = √3/4 - √3/4 = 0

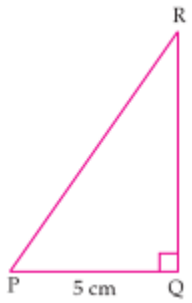
NCERT 10th Maths Chapter 8, class 10 Maths Chapter 8 solutions

10. In Δ PQR, right-angled at Q, PR + QR = 25 cm and PQ = 5 cm. Determine the values of sin P, cos P and tan P.

Answer

Given that, PR + QR = 25 , PQ = 5

Let PR be *x*. ∴ QR = 25 - *x*



By Pythagoras theorem ,

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

$x^2 = (5)^2 + (25 - x)^2$

$x^2 = 25 + 625 + x^2 - 50x$

$50x = 650$

$x = 13$

∴ PR = 13 cm

QR = (25 - 13) cm = 12 cm

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sin P = QR/PR = 12/13

cos P = PQ/PR = 5/13

tan P = QR/PQ = 12/5

11. State whether the following are true or false. Justify your answer.

(i) The value of tan A is always less than 1.

(ii) sec A = 12/5 for some value of angle A.

(iii) cos A is the abbreviation used for the cosecant of angle A.

(iv) cot A is the product of cot and A.

(v) sin θ = 4/3 for some angle θ.

Answer

(i) False.

In ΔABC in which ∠B = 90º,

AB = 3, BC = 4 and AC = 5

Value of tan A = 4/3 which is greater than.

The triangle can be formed with sides equal to 3, 4 and hypotenuse = 5 as

it will follow the Pythagoras theorem.

$AC^2 = AB^2 + BC^2$

$5^2 = 3^2 + 4^2$

25 = 9 + 16

25=25

(ii) True.

Let a ΔABC in which ∠B = 90º,AC be 12k and AB be 5k, where k is a positive real number.

By Pythagoras theorem we get,

$AC^2 = AB^2 + BC^2$

$(12k)^2 = (5k)^2 + BC^2$

$BC^2 + 25k^2 = 144k^2$

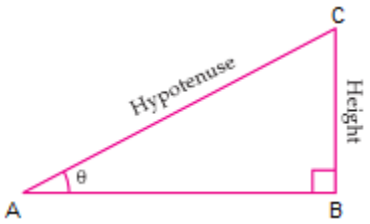
$BC^2 = 119k^2$

Such a triangle is possible as it will follow the Pythagoras theorem.

Abbreviation used for cosecant of angle A is cosec A.cos A is the abbreviation used for cosine of angle A.

(iv) False.

cot A is not the product of cot and A. It is the cotangent of ∠A.



sin θ = Height/Hypotenuse

We know that in a right angled triangle, Hypotenuse is the longest side.

∴ sin θ will always less than 1 and it can never be 4/3 for any value of θ.

Excercise 8.2

NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.2

1. Evaluate the following :

(i) sin 60° cos 30° + sin 30° cos 60° (ii) $2\tan^2 45° + \cos^2 30° – \sin^2 60°$

(iii) cos 45°/(sec 30° + cosec 30°) (iv) (sin 30° + tan 45° – cosec 60°)/(sec 30° + cos 60° + cot 45°)

(v) $(5\cos^2 60° + 4\sec^2 30° - \tan^2 45°)/(\sin^2 30° + \cos^2 30°)$

Answer

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(i) $\sin 60° \cos 30° + \sin 30° \cos 60°$

$= (\sqrt{3}/2 \times \sqrt{3}/2) + (1/2 \times 1/2) = 3/4 + 1/4 = 4/4 = 1$

(ii) $2 \tan^2 45° + \cos^2 30° – \sin^2 60°$

$= 2 \times (1)^2 + (\sqrt{3}/2)^2 - (\sqrt{3}/2)^2 = 2$

(iii) $\cos 45°/(\sec 30° + \text{cosec } 30°)$

$= 1/\sqrt{2}/(2/\sqrt{3} + 2) = 1/\sqrt{2}/\{(2+2\sqrt{3})/\sqrt{3})$

$= \sqrt{3}/\sqrt{2} \times (2+2\sqrt{3}) = \sqrt{3}/(2\sqrt{2}+2\sqrt{6})$

$= \sqrt{3}(2\sqrt{6}-2\sqrt{2})/(2\sqrt{6}+2\sqrt{2})(2\sqrt{6}-2\sqrt{2})$

$= 2\sqrt{3}(\sqrt{6}-\sqrt{2})/(2\sqrt{6})^2-(2\sqrt{2})^2$

$= 2\sqrt{3}(\sqrt{6}-\sqrt{2})/(24-8) = 2\sqrt{3}(\sqrt{6}-\sqrt{2})/16$

$= \sqrt{3}(\sqrt{6}-\sqrt{2})/8 = (\sqrt{18}-\sqrt{6})/8 = (3\sqrt{2}-\sqrt{6})/8$

(iv) $(\sin 30° + \tan 45° – \text{cosec } 60°)/(\sec 30° + \cos 60° + \cot 45°)$

$= (1/2+1-2/\sqrt{3})/(2/\sqrt{3}+1/2+1)$

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

$= (3\sqrt{3}-4/2\sqrt{3})/(3\sqrt{3}+4/2\sqrt{3})$

$= (3\sqrt{3}-4)/(3\sqrt{3}+4)$

$= (3\sqrt{3}-4)(3\sqrt{3}-4)/(3\sqrt{3}+4)(3\sqrt{3}-4)$

$= (3\sqrt{3}-4)^2/(3\sqrt{3})^2-(4)^2$

$= (27+16-24\sqrt{3})/(27-16)$

$= (43-24\sqrt{3})/11]$

(v) $(5\cos^2 60° + 4\sec^2 30° - \tan^2 45°)/(\sin^2 30° + \cos^2 30°)$

$= 5(1/2)^2+4(2/\sqrt{3})^2-1^2/(1/2)^2+(\sqrt{3}/2)^2$

$= (5/4+16/3-1)/(1/4+3/4)$

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= (15+64-12)/12/(4/4)

= 67/12

2. Choose the correct option and justify your choice :

(i) $2\tan 30°/1+\tan^2 30°$ =

(A) sin 60° (B) cos 60° (C) tan 60° (D) sin 30°

(ii) $1-\tan^2 45°/1+\tan^2 45°$ =

(A) tan 90° (B) 1 (C) sin 45° (D) 0

(iii) sin 2A = 2 sin A is true when A =

(A) 0° (B) 30° (C) 45° (D) 60°

(iv) $2\tan 30°/1-\tan^2 30°$ =

(A) cos 60° (B) sin 60° (C) tan 60° (D) sin 30°

Answer

(i) (A) is correct.

$2\tan 30°/1+\tan^2 30° = 2(1/\sqrt{3})/1+(1/\sqrt{3})^2$

$= (2/\sqrt{3})/(1+1/3) = (2/\sqrt{3})/(4/3)$

$= 6/4\sqrt{3} = \sqrt{3}/2 = \sin 60°$

$1-\tan^2 45°/1+\tan^2 45° = (1-1^2)/(1+1^2)$

= 0/2 = 0

sin 2A = 2 sin A is true when A =

= As sin 2A = sin 0° = 0

2 sin A = 2sin 0° = 2×0 = 0

or,

sin 2A = 2sin A cos A

⇒2sin A cos A = 2 sin A

⇒ 2cos A = 2 ⇒ cos A = 1

⇒ A = 0°

$2\tan 30°/1-\tan^2 30° = 2(1/\sqrt{3})/1-(1/\sqrt{3})^2$

$= (2/\sqrt{3})/(1-1/3) = (2/\sqrt{3})/(2/3) = \sqrt{3} = \tan 60°$

3. If tan (A + B) = √3 and tan (A – B) = 1/√3; 0° < A + B ≤ 90°; A > B, find A and B.

Answer

tan (A + B) = √3

⇒ tan (A + B) = tan 60°

⇒ (A + B) = 60° ... (i)

tan (A – B) = 1/√3

⇒ tan (A - B) = tan 30°

⇒ (A - B) = 30° ... (ii)

Adding (i) and (ii), we get

A + B + A - B = 60° + 30°

2A = 90°

A= 45°

Putting the value of A in equation (i)

45° + B = 60°

⇒ B = 60° - 45°

⇒ B = 15°

Thus, A = 45° and B = 15°

4. State whether the following are true or false. Justify your answer.

(i) sin (A + B) = sin A + sin B.

(ii) The value of sin θ increases as θ increases.

(iii) The value of cos θ increases as θ increases.

(iv) sin θ = cos θ for all values of θ.

(v) cot A is not defined for A = 0°.

Answer

(i) False.

Let A = 30° and B = 60°, then

sin (A + B) = sin (30° + 60°) = sin 90° = 1 and,

sin A + sin B = sin 30° + sin 60°

= 1/2 + √3/2 = 1+√3/2

sin 0° = 0

sin 30° = 1/2

sin 45° = 1/√2

sin 60° = √3/2

sin 90° = 1

Thus the value of sin θ increases as θ increases.

cos 0° = 1

cos 30° = √3/2

cos 45° = 1/√2

cos 60° = 1/2

cos 90° = 0

Thus the value of cos θ decreases as θ increases.

cot A = cos A/sin A

cot 0° = cos 0°/sin 0° = 1/0 = undefined.

Excercise 8.3

NCERT 10th Maths Chapter 8, class 10 Maths Chapter 8 solutions

1. Evaluate :

(i) sin 18°/cos 72°

(ii) tan 26°/cot 64°

(iii) cos 48° – sin 42°

(iv) cosec 31° – sec 59°

Answer

(i) sin 18°/cos 72°

= sin (90° - 18°) /cos 72°

= cos 72° /cos 72° = 1

= tan (90° - 36°)/cot 64°

= cot 64°/cot 64° = 1

= cos (90° - 42°) - sin 42°

= sin 42° - sin 42° = 0

= cosec (90° - 59°) - sec 59°

= sec 59° - sec 59° = 0

2. Show that :

(i) tan 48° tan 23° tan 42° tan 67° = 1

(ii) cos 38° cos 52° – sin 38° sin 52° = 0

Answer

(i) tan 48° tan 23° tan 42° tan 67°

= tan (90° - 42°) tan (90° - 67°) tan 42° tan 67°

= cot 42° cot 67° tan 42° tan 67°

= (cot 42° tan 42°) (cot 67° tan 67°) = 1×1 = 1

(ii) cos 38° cos 52° - sin 38° sin 52°

= cos (90° - 52°) cos (90°-38°) - sin 38° sin 52°

= sin 52° sin 38° - sin 38° sin 52° = 0

3. If tan 2A = cot (A – 18°), where 2A is an acute angle, find the value of A.

Answer

A/q,

tan 2A = cot (A- 18°)

⇒ cot (90° - 2A) = cot (A -18°)

Equating angles,

⇒ 90° - 2A = A- 18° ⇒ 108° = 3A

⇒ A = 36°

4. If tan A = cot B, prove that A + B = 90°.

Answer

A/q,

tan A = cot B

⇒ tan A = tan (90° - B)

⇒ A = 90° - B

⇒ A + B = 90°

5. If sec 4A = cosec (A – 20°), where 4A is an acute angle, find the value of A.

Answer

A/q,

sec 4A = cosec (A - 20°)

⇒ cosec (90° - 4A) = cosec (A - 20°)

Equating angles,

90° - 4A= A- 20°

⇒ 110° = 5A

⇒ A = 22°

6. If A, B and C are interior angles of a triangle ABC, then show that

sin (B+C/2) = cos A/2

Answer

In a triangle, sum of all the interior angles

A + B + C = 180°

⇒ B + C = 180° - A

⇒ (B+C)/2 = (180°-A)/2

⇒ (B+C)/2 = (90°-A/2)

⇒ sin (B+C)/2 = sin (90°-A/2)

7. Express sin 67° + cos 75° in terms of trigonometric ratios of angles between 0° and 45°.

Answer

sin 67° + cos 75°

= sin (90° - 23°) + cos (90° - 15°)

= cos 23° + sin 15°

Excercise 8.4

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NCERT Solutions for Class 10 Maths Chapter 8 Exercise 8.4

1. Express the trigonometric ratios sin A, sec A and tan A in terms of cot A.

Answer

$\text{cosec}^2A - \cot^2A = 1$

$\Rightarrow \text{cosec}^2A = 1 + \cot^2A$

$\Rightarrow 1/\sin^2A = 1 + \cot^2A$

$\Rightarrow \sin^2A = 1/(1+\cot^2A)$

Now,

$\sin^2A = 1/(1+\cot^2A)$

$\Rightarrow 1 - \cos^2A = 1/(1+\cot^2A)$

$\Rightarrow \cos^2A = 1 - 1/(1+\cot^2A)$

$\Rightarrow \cos^2A = (1-1+\cot^2A)/(1+\cot^2A)$

$\Rightarrow 1/\sec^2A = \cot^2A/(1+\cot^2A)$

$\Rightarrow \sec A = (1+\cot^2A)/\cot^2A$

also,

tan A = sin A/cos A and cot A = cos A/sin A

$\Rightarrow$ tan A = 1/cot A

2. Write all the other trigonometric ratios of $\angle A$ in terms of sec A.

Answer

We know that,

sec A = 1/cos A

⇒ cos A = 1/sec A

also,

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

⇒ $\sin^2 A = 1 - \cos^2 A$

⇒ $\sin^2 A = 1 - (1/\sec^2 A)$

⇒ $\sin^2 A = (\sec^2 A - 1)/\sec^2 A$

$$\Rightarrow \sin A = \frac{\pm\sqrt{sec^2 A - 1}}{sec\, A}$$

also,

sin A = 1/cosec A

⇒cosec A = 1/sin A

Now,

$\sec^2 A - \tan^2 A = 1$

⇒ $\tan^2 A = \sec^2 A + 1$

also,

tan A = 1/cot A

⇒ cot A = 1/tan A

3. Evaluate :

(i) $(\sin^2 63° + \sin^2 27°)/(\cos^2 17° + \cos^2 73°)$

(ii) sin 25° cos 65° + cos 25° sin 65°

Answer

(i) $(\sin^2 63° + \sin^2 27°)/(\cos^2 17° + \cos^2 73°)$

= [$\sin^2(90°-27°) + \sin^2 27°$]/[$\cos^2(90°-73°) + \cos^2 73°$)]

= ($\cos^2 27° + \sin^2 27°$)/($\sin^2 27° + \cos^2 73°$)

= 1/1 =1 ($\because \sin^2 A + \cos^2 A = 1$)

(ii) sin 25° cos 65° + cos 25° sin 65°

= sin(90°-25°) cos 65° + cos(90°-65°) sin 65°

= cos 65° cos 65° + sin 65° sin 65°

= $\cos^2 65° + \sin^2 65° = 1$

4. Choose the correct option. Justify your choice.

(i) 9 $\sec^2 A$ - 9 $\tan^2 A$ =

(A) 1 (B) 9 (C) 8 (D) 0

(ii) (1 + tan θ + sec θ) (1 + cot θ - cosec θ)

(A) 0 (B) 1 (C) 2 (D) - 1

(iii) (secA + tanA) (1 - sinA) =

(A) secA (B) sinA (C) cosecA (D) cosA

(iv) 1+$\tan^2 A$/1+$\cot^2 A$ =

(A) $\sec^2 A$ (B) -1 (C) $\cot^2 A$ (D) $\tan^2 A$

Answer

(i) (B) is correct.

9 $\sec^2 A$ - 9 $\tan^2 A$

= 9 ($\sec^2 A - \tan^2 A$)

= 9×1 = 9 ($\because$ sec2 A - tan2 A = 1)

(1 + tan θ + sec θ) (1 + cot θ - cosec θ)

= (1 + sin θ/cos θ + 1/cos θ) (1 + cos θ/sin θ - 1/sin θ)

= (cos θ+sin θ+1)/cos θ × (sin θ+cos θ-1)/sin θ

= $(\cos \theta+\sin \theta)^2-1^2/(\cos \theta \sin \theta)$

= $(\cos^2\theta + \sin^2\theta + 2\cos \theta \sin \theta -1)/(\cos \theta \sin \theta)$

= (1+ 2cos θ sin θ -1)/(cos θ sin θ)

= (2cos θ sin θ)/(cos θ sin θ) = 2

(secA + tanA) (1 - sinA)

= (1/cos A + sin A/cos A) (1 - sinA)

= (1+sin A/cos A) (1 - sinA)

= $(1 - \sin^2A)/\cos A$

= $\cos^2A/\cos A = \cos A$

$1+\tan^2A/1+\cot^2A$

= $(1+1/\cot^2A)/1+\cot^2A$

= $(\cot^2A+1/\cot^2A)\times(1/1+\cot^2A)$

= $1/\cot^2A = \tan^2A$

5. Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(i) $(\text{cosec } \theta - \cot \theta)^2 = (1-\cos \theta)/(1+\cos \theta)$

(ii) cos A/(1+sin A) + (1+sin A)/cos A = 2 sec A

(iii) tan θ/(1-cot θ) + cot θ/(1-tan θ) = 1 + sec θ cosec θ

[Hint : Write the expression in terms of sin θ and cos θ]

(iv) (1 + sec A)/sec A = $\sin^2A/(1-\cos A)$

[Hint : Simplify LHS and RHS separately]

(v) (cos A–sin A+1)/(cos A+sin A–1) = cosec A + cot A,using the identity $\text{cosec}^2A = 1+\cot^2A$.

(vi) $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$

(vii) $(\sin \theta - 2\sin^3\theta)/(2\cos^3\theta - \cos \theta) = \tan \theta$

(viii) $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2 = 7+\tan^2 A+\cot^2 A$

(ix) $(\text{cosec } A - \sin A)(\sec A - \cos A) = 1/(\tan A+\cot A)$

[Hint : Simplify LHS and RHS separately]

(x) $(1+\tan^2 A/1+\cot^2 A) = (1-\tan A/1-\cot A)^2 = \tan^2 A$

Answer

(i) $(\text{cosec } \theta - \cot \theta)^2 = (1-\cos \theta)/(1+\cos \theta)$

L.H.S. = $(\text{cosec } \theta - \cot \theta)^2$

$= (\text{cosec}^2\theta + \cot^2\theta - 2\text{cosec } \theta \cot \theta)$

$= (1/\sin^2\theta + \cos^2\theta/\sin^2\theta - 2\cos \theta/\sin^2\theta)$

$= (1 + \cos^2\theta - 2\cos \theta)/(1 - \cos^2\theta)$

$= (1-\cos \theta)^2/(1 - \cos\theta)(1+\cos \theta)$

$= (1-\cos \theta)/(1+\cos \theta)$ = R.H.S.

(ii) $\cos A/(1+\sin A) + (1+\sin A)/\cos A = 2 \sec A$

L.H.S. = $\cos A/(1+\sin A) + (1+\sin A)/\cos A$

$= [\cos^2 A + (1+\sin A)^2]/(1+\sin A)\cos A$

$= (\cos^2 A + \sin^2 A + 1 + 2\sin A)/(1+\sin A)\cos A$

$= (1 + 1 + 2\sin A)/(1+\sin A)\cos A$

$= (2+ 2\sin A)/(1+\sin A)\cos A$

$= 2(1+\sin A)/(1+\sin A)\cos A$

$= 2/\cos A = 2 \sec A$ = R.H.S.

(iii) $\tan\theta/(1-\cot\theta) + \cot\theta/(1-\tan\theta) = 1 + \sec\theta \operatorname{cosec}\theta$

L.H.S. $= \tan\theta/(1-\cot\theta) + \cot\theta/(1-\tan\theta)$

$= [(\sin\theta/\cos\theta)/1-(\cos\theta/\sin\theta)] + [(\cos\theta/\sin\theta)/1-(\sin\theta/\cos\theta)]$

$= [(\sin\theta/\cos\theta)/(\sin\theta-\cos\theta)/\sin\theta] + [(\cos\theta/\sin\theta)/(\cos\theta-\sin\theta)/\cos\theta]$

$= \sin^2\theta/[\cos\theta(\sin\theta-\cos\theta)] + \cos^2\theta/[\sin\theta(\cos\theta-\sin\theta)]$

$= \sin^2\theta/[\cos\theta(\sin\theta-\cos\theta)] - \cos^2\theta/[\sin\theta(\sin\theta-\cos\theta)]$

$= 1/(\sin\theta-\cos\theta)\,[(\sin^2\theta/\cos\theta) - (\cos^2\theta/\sin\theta)]$

$= 1/(\sin\theta-\cos\theta) \times [(\sin^3\theta - \cos^3\theta)/\sin\theta\cos\theta]$

$= [(\sin\theta-\cos\theta)(\sin^2\theta+\cos^2\theta+\sin\theta\cos\theta)]/[(\sin\theta-\cos\theta)\sin\theta\cos\theta]$

$= (1 + \sin\theta\cos\theta)/\sin\theta\cos\theta$

$= 1/\sin\theta\cos\theta + 1$

$= 1 + \sec\theta\operatorname{cosec}\theta$ = R.H.S.

(iv) $(1 + \sec A)/\sec A = \sin^2 A/(1-\cos A)$

L.H.S. $= (1 + \sec A)/\sec A$

$= (1 + 1/\cos A)/1/\cos A$

$= (\cos A + 1)/\cos A/1/\cos A$

$= \cos A + 1$

R.H.S. $= \sin^2 A/(1-\cos A)$

$= (1 - \cos^2 A)/(1-\cos A)$

$= (1-\cos A)(1+\cos A)/(1-\cos A)$

$= \cos A + 1$

L.H.S. = R.H.S.

(v) $(\cos A–\sin A+1)/(\cos A+\sin A–1) = \operatorname{cosec} A + \cot A$, using the identity $\operatorname{cosec}^2 A = 1+\cot^2 A$.

L.H.S. = (cos A–sin A+1)/(cos A+sin A–1)

Dividing Numerator and Denominator by sin A,

= (cos A–sin A+1)/sin A/(cos A+sin A–1)/sin A

= (cot A - 1 + cosec A)/(cot A+ 1 – cosec A)

= (cot A - $cosec^2A$ + cot^2A + cosec A)/(cot A+ 1 – cosec A) (using $cosec^2A - cot^2A = 1$)

= [(cot A + cosec A) - ($cosec^2A$ - cot^2A)]/(cot A+ 1 – cosec A)

= [(cot A + cosec A) - (cosec A + cot A)(cosec A - cot A)]/(1 – cosec A + cot A)

= (cot A + cosec A)(1 – cosec A + cot A)/(1 – cosec A + cot A)

= cot A + cosec A = R.H.S.

Dividing Numerator and Denominator of L.H.S. by cos A,

= sec A + tan A = R.H.S.

(vii) $(\sin\theta - 2\sin^3\theta)/(2\cos^3\theta - \cos\theta) = \tan\theta$

L.H.S. = $(\sin\theta - 2\sin^3\theta)/(2\cos^3\theta - \cos\theta)$

= $[\sin\theta(1 - 2\sin^2\theta)]/[\cos\theta(2\cos^2\theta - 1)]$

= $\sin\theta[1 - 2(1-\cos^2\theta)]/[\cos\theta(2\cos^2\theta - 1)]$

= $[\sin\theta(2\cos^2\theta - 1)]/[\cos\theta(2\cos^2\theta - 1)]$

= $\tan\theta$ = R.H.S.

(viii) $(\sin A + cosec\ A)^2 + (\cos A + \sec A)^2 = 7+\tan^2A+\cot^2A$

L.H.S. = $(\sin A + cosec\ A)^2 + (\cos A + \sec A)^2$

= ($\sin^2A$ + $cosec^2A$ + 2 sin A cosec A) + ($\cos^2A$ + $\sec^2A$ + 2 cos A sec A)

= ($\sin^2A$ + $\cos^2A$) + 2 sin A(1/sin A) + 2 cos A(1/cos A) + 1 + $\tan^2A$ + 1 + $\cot^2A$

= 1 + 2 + 2 + 2 + $\tan^2 A + \cot^2 A$

= 7+$\tan^2 A+\cot^2 A$ = R.H.S.

(ix) (cosec A – sin A)(sec A – cos A) = 1/(tan A+cotA)

L.H.S. = (cosec A – sin A)(sec A – cos A)

= (1/sin A - sin A)(1/cos A - cos A)

= [(1-$\sin^2 A$)/sin A][(1-$\cos^2 A$)/cos A]

= ($\cos^2 A$/sin A)×($\sin^2 A$/cos A)

= cos A sin A

R.H.S. = 1/(tan A+cotA)

= 1/(sin A/cos A +cos A/sin A)

= 1/[($\sin^2 A+\cos^2 A$)/sin A cos A]

= cos A sin A

L.H.S. = R.H.S.

(x) (1+$\tan^2 A$/1+$\cot^2 A$) = (1-tan A/1-cot A)^2 =$\tan^2 A$

L.H.S. = (1+$\tan^2 A$/1+$\cot^2 A$)

= (1+$\tan^2 A$/1+1/$\tan^2 A$)

= 1+$\tan^2 A$/[(1+$\tan^2 A$)/$\tan^2 A$]

= $\tan^2 A$

NCERT 10th Maths Chapter 8, class 10 Maths Chapter 8 solutions

Chapterwise NCERT Solutions for Class 10 Maths:

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