# Introduction to Trigonometry: Exercise - 8.3

**Q.1 Evaluate :**

**(i)** $\frac{sin 18^0}{cos 72^0}$

**(ii)** $\frac{tan 26^0}{cot 64^0}$

**(iii) cos 48° – sin 42°**

**(iv) cosec 31° – sec 59°**

***Sol.*** **(i)** $\frac{sin 18^0}{cos 72^0} = \frac{sin\,(90^0 - 72^0)}{cos 72^0} = \frac{cos 72^0}{cos 72^0} = 1$

(As we know, sin (90–θ) = cosθ)

**(ii)** $\frac{tan 26^0}{cot 64^0} = \frac{tan\,(90^0 - 64^0)}{cot\ 64^0} = \frac{cot\ 64^0}{cot\ 64^0} = 1$

(As we know, tan (90–θ) = cot θ)

**(iii)** cos 48° – sin 42° = cos (90° – 42°) – sin 42°

= sin 42° – sin 42° = 0

(As we know, cos (90–θ) = sin θ)

**(iv)** cosec 31° – sec 59° = cosec (90° – 59°) – sec 59° = 0

= sec59° – sec59° = 0

(As we know, cosec (60–θ) = secθ)

**Q.2 Show that**

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

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

***Sol.*** **(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° (As we know, tan(90–θ) = cotθ]

$= \frac{1}{\tan 42^0} \cdot \frac{1}{\tan 67^0}$ . tan42°. tan67° = 1 (Since, $Cot\theta = \frac{1}{\tan\theta}$)

**(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 (As we know, cos (90° – θ) = sinθ)

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

***Sol.*** Given: tan 2A = cot (A – 18°).............. (i)

We can write as, tan 2A = cot (90° – 2A), (Since, cot (90° - θ) = tan θ)

put it in (i)

cot (90° – 2A) = cot (A – 18°)

From above, (90° – 2A) and (A – 18°) are both acute angle. So,

90° – 2A = A – 18°

⇒ – 2A – A = – 18° – 90°

⇒ – 3A = – 108°

⇒ A = 108°/3

⇒ A = 36°

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

***Sol.*** Given: tan A = cot B....................... (i)

To Prove: A + B = 90°.

Proof:

We can write, tan A = cot (90° – A), put it in (i)

cot (90° – A) = cot B (Since, cot (90° – θ) = tan θ]

Since, (90° – A) and B are both acute angles. So,

(90° – A) = B

⇒ A + B = 90°....................Hence Proved.

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

***Sol.*** Given: sec 4A = cosec (A – 20°)................. (i)

We can write sec 4A = cosec (90°– 4A), put it in (i)

cosec (90° – 4A) = cosec (A – 20°) (Since, cosec(90°–θ) = sec θ)

Since (90° – 4A) and (A – 20°) are both acute angles. So,

90° – 4A = A – 20°

⇒ – 4A – A = – 20° – 90°

⇒ – 5A = - 110°

⇒5A = 110°/5

⇒ A = 22°

**Q.6 If A, B and C are interior angles of a ΔABC, then show that**

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

***Sol.*** Given: A, B and C are the interior angles of a ΔABC.

Since, sum of the interior angles of a triangle is 180°.

So, A + B + C = 180° (Divide by 2 in both sides)

$$\Rightarrow \frac{A+B+C}{2} = 90^\circ$$

$$\Rightarrow \frac{B+C}{2} = 90^\circ - \frac{A}{2}$$, by taking sin both side

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

$$\sin\left(\frac{B+C}{2}\right) = \cos\frac{A}{2}$$ (Since, sin (90°–θ) = cos θ)

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

***Sol.*** Given: sin 67° + cos 75°

We can write the expression: sin (90° – 23) + cos (90° – 15°)

= cos 23° + sin 15°

Since, sin (90° – θ) = Cos θ and cos (90° – θ) = sin θ