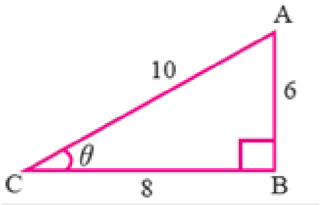
2. Trigonometry

Exercise 2.1

1 A. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

$\Rightarrow \sin\theta = \frac{AB}{AC} = \frac{6}{10}$

$\cos\theta = \frac{BC}{AC} = \frac{8}{10}$

$\tan\theta = \frac{AB}{BC} = \frac{6}{8}$

$\text{cosec}\,\theta = \frac{AC}{AB} = \frac{10}{6}$

$\sec\theta = \frac{AC}{BC} = \frac{10}{8}$

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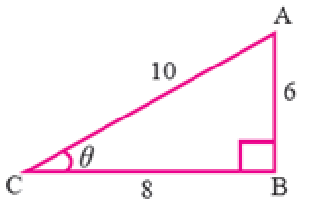
1 A. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
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$\Rightarrow \sin\theta = \frac{AB}{AC} = \frac{6}{10}$

$\cos\theta = \frac{BC}{AC} = \frac{8}{10}$

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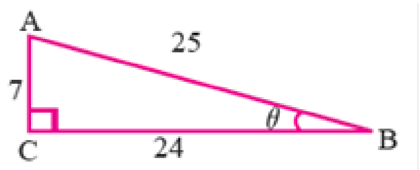
1 B. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

$\sin\theta = \frac{AC}{AB} = \frac{7}{25}$

$\cos\theta = \frac{BC}{AB} = \frac{24}{25}$

$\tan\theta = \frac{AC}{BC} = \frac{7}{24}$

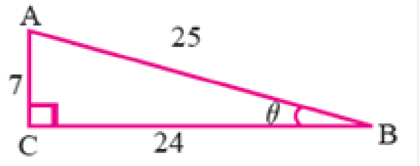
$\text{cosec}\,\theta = \frac{AB}{AC} = \frac{25}{7}$

$\sec\theta = \frac{AB}{BC} = \frac{25}{24}$

$\cot\theta = \frac{BC}{AC} = \frac{24}{7}$

1 B. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

$\sin\theta = \frac{AC}{AB} = \frac{7}{25}$

$\cos\theta = \frac{BC}{AB} = \frac{24}{25}$

$\tan\theta = \frac{AC}{BC} = \frac{7}{24}$

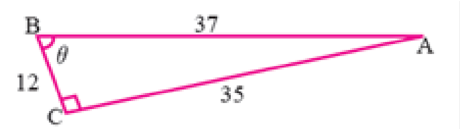
$\text{cosec}\,\theta = \frac{AB}{AC} = \frac{25}{7}$

$\sec\theta = \frac{AB}{BC} = \frac{25}{24}$

$\cot\theta = \frac{BC}{AC} = \frac{24}{7}$

1 C. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

$\sin\theta = \frac{AC}{AB} = \frac{35}{37}$

$\cos\theta = \frac{BC}{AB} = \frac{12}{37}$

$\tan\theta = \frac{AC}{BC} = \frac{35}{12}$

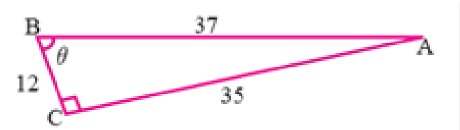
$\text{cosec}\,\theta = \frac{AB}{AC} = \frac{37}{35}$

$\sec\theta = \frac{AB}{BC} = \frac{37}{12}$

$\cot\theta = \frac{BC}{AC} = \frac{12}{35}$

1 C. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
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$\cos\theta = \frac{BC}{AB} = \frac{12}{37}$

$\tan\theta = \frac{AC}{BC} = \frac{35}{12}$

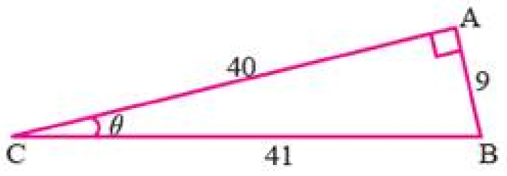
$\text{cosec}\,\theta = \frac{AB}{AC} = \frac{37}{35}$

$\sec\theta = \frac{AB}{BC} = \frac{37}{12}$

$\cot\theta = \frac{BC}{AC} = \frac{12}{35}$

1 D. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

$\sin\theta = \frac{AB}{BC} = \frac{9}{41}$

$\cos\theta = \frac{AC}{BC} = \frac{40}{41}$

$\tan\theta = \frac{AB}{AC} = \frac{9}{40}$

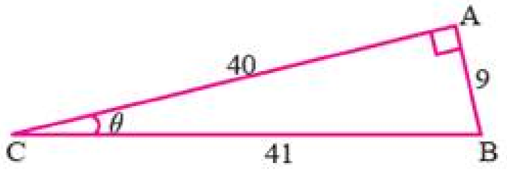
$\text{cosec}\,\theta = \frac{BC}{AB} = \frac{41}{9}$

$\sec\theta = \frac{BC}{AC} = \frac{41}{40}$

$\cot\theta = \frac{AC}{AB} = \frac{40}{9}$

1 D. Question

From the following diagrams, find the trigonometric ratios of the angle θ



Answer

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
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$\cos\theta = \frac{AC}{BC} = \frac{40}{41}$

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$\text{cosec}\ \theta = \frac{BC}{AB} = \frac{41}{9}$

$\sec\theta = \frac{BC}{AC} = \frac{41}{40}$

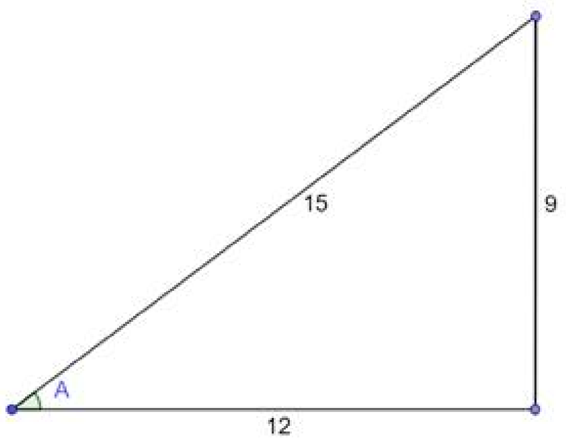
$\cot\theta = \frac{AC}{AB} = \frac{40}{9}$

2 A. Question

Find the other trigonometric ratios of the following

$$\sin A = \frac{9}{15}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 9^2 + p^2 = 15^2$

$\Rightarrow 81 + p^2 = 225$

$\Rightarrow p^2 = 144$

$\Rightarrow p = 12$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\cos A = \frac{12}{15}$

$\tan A = \frac{9}{12}$

$\text{cosec } A = \frac{15}{9}$

$\sec A = \frac{15}{12}$

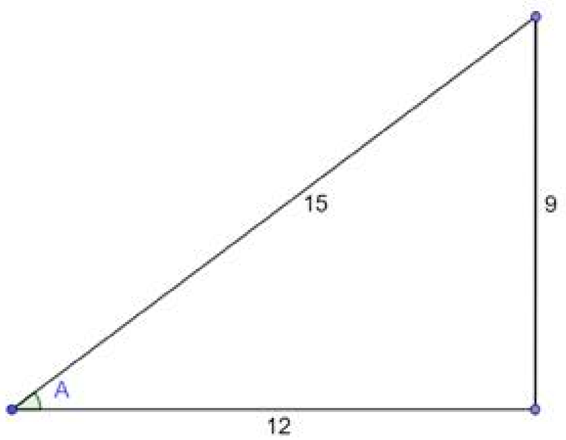
$\cot A = \frac{12}{9}$

2 A. Question

Find the other trigonometric ratios of the following

$$\sin A = \frac{9}{15}$$

Answer



Let the third side be p,

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$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
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$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

cos A = $\frac{12}{15}$

tan A = $\frac{9}{12}$

cosec A = $\frac{15}{9}$

sec A = $\frac{15}{12}$

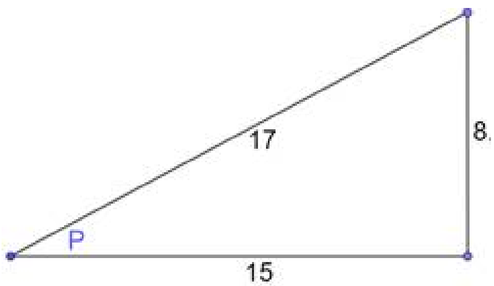
cot A = $\frac{12}{9}$

2 B. Question

Find the other trigonometric ratios of the following

$$\cos A = \frac{15}{17}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 15^2 + p^2 = 17^2$

$\Rightarrow 225 + p^2 = 289$

$\Rightarrow p^2 = 64$

$\Rightarrow p = 8$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin P = \frac{8}{17}$

$\tan P = \frac{8}{15}$

$\text{cosec } P = \frac{17}{8}$

$\sec P = \frac{17}{15}$

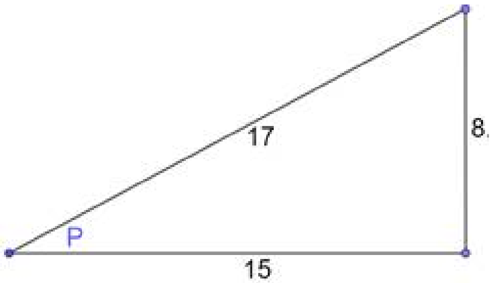
$\cot P = \frac{15}{8}$

2 B. Question

Find the other trigonometric ratios of the following

$$\cos A = \frac{15}{17}$$

Answer



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$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
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$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin P = \frac{8}{17}$

$\tan P = \frac{8}{15}$

$\text{cosec } P = \frac{17}{8}$

$\sec P = \frac{17}{15}$

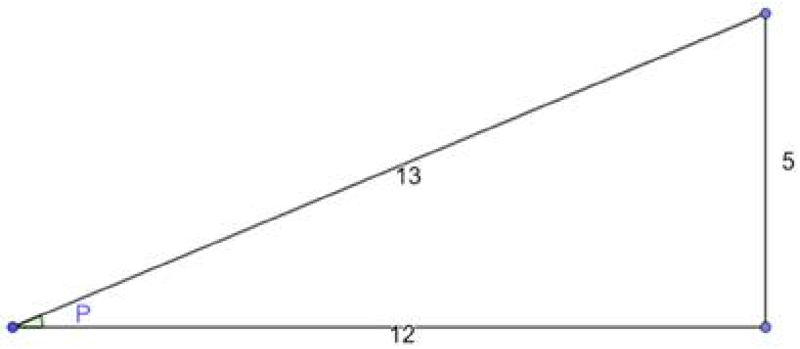
$\cot P = \frac{15}{8}$

2 C. Question

Find the other trigonometric ratios of the following

$$\tan P = \frac{5}{12}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 5^2 + 12^2 = P^2$

$\Rightarrow 25 + 144 = p^2$

$\Rightarrow p^2 = 169$

$\Rightarrow p = 13$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin P = \frac{5}{13}$

$\cos P = \frac{12}{13}$

$\text{cosec } P = \frac{13}{5}$

$\sec P = \frac{13}{12}$

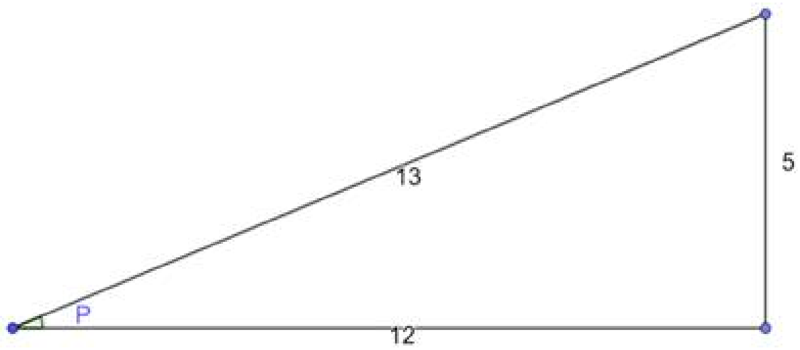
$\cot P = \frac{12}{5}$

2 C. Question

Find the other trigonometric ratios of the following

$$\tan P = \frac{5}{12}$$

Answer



Let the third side be p,

By Pythagoras theorem,

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$\Rightarrow 25 + 144 = p^2$

$\Rightarrow p^2 = 169$

$\Rightarrow$ p = 13

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

sin P = $\frac{5}{13}$

cos P = $\frac{12}{13}$

cosec P = $\frac{13}{5}$

sec P = $\frac{13}{12}$

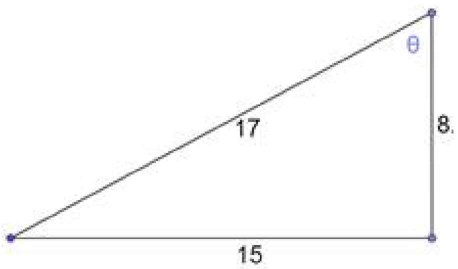
cot P = $\frac{12}{5}$

2 D. Question

Find the other trigonometric ratios of the following

$$\sec\theta = \frac{17}{8}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 15^2 + p^2 = 17^2$

$\Rightarrow 64 + p^2 = 289$

$\Rightarrow p^2 = 225$

$\Rightarrow$ p = 15

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{15}{17}$

$\cos\theta = \frac{8}{17}$

$\tan\theta = \frac{15}{8}$

$\text{cosec}\,\theta = \frac{17}{15}$

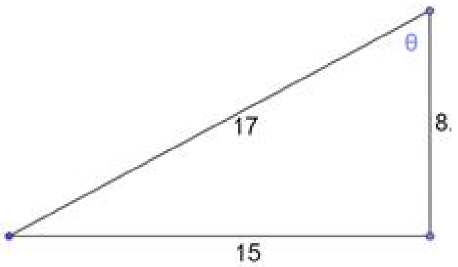
$\cot\theta = \frac{8}{15}$

2 D. Question

Find the other trigonometric ratios of the following

$$\sec\theta = \frac{17}{8}$$

Answer



Let the third side be p,

By Pythagoras theorem,

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$\Rightarrow p^2 = 225$

$\Rightarrow p = 15$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{15}{17}$

$\cos\theta = \frac{8}{17}$

$\tan\theta = \frac{15}{8}$

$\text{cosec}\ \theta = \frac{17}{15}$

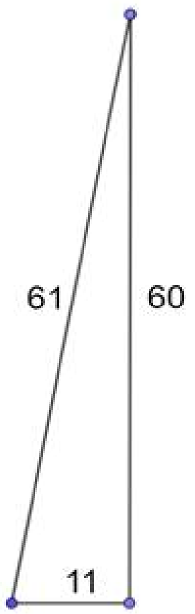
$\cot\theta = \frac{8}{15}$

2 E. Question

Find the other trigonometric ratios of the following

$$\text{cosec}\theta = \frac{61}{60}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 60^2 + p^2 = 61^2$

$\Rightarrow 3600 + p^2 = 3721$

$\Rightarrow p^2 = 121$

$\Rightarrow p = 11$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{60}{61}$

$\cos\theta = \frac{11}{61}$

$\tan\theta = \frac{60}{11}$

$\sec\theta = \frac{61}{11}$

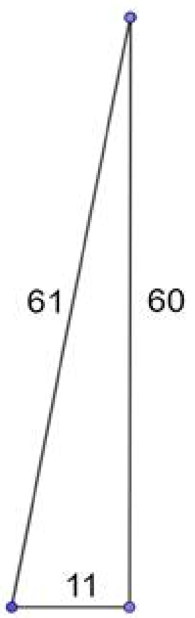
$\cot\theta = \frac{11}{60}$

2 E. Question

Find the other trigonometric ratios of the following

$$\text{cos ec}\theta = \frac{61}{60}$$

Answer



Let the third side be p,

By Pythagoras theorem,

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$\Rightarrow 3600 + p^2 = 3721$

$\Rightarrow p^2 = 121$

$\Rightarrow p = 11$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{60}{61}$

$\cos\theta = \frac{11}{61}$

$\tan\theta = \frac{60}{11}$

$\sec\theta = \frac{61}{11}$

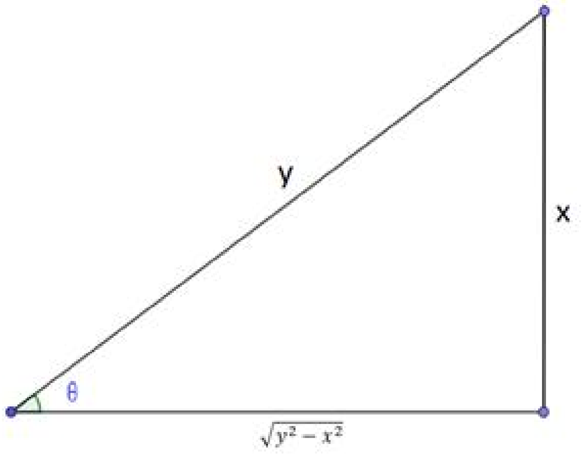
$\cot\theta = \frac{11}{60}$

2 F. Question

Find the other trigonometric ratios of the following

$$\sin\theta = \frac{x}{y}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow x^2 + p^2 = y^2$

$\Rightarrow p^2 = y^2 - x^2$

$\Rightarrow p = \sqrt{y^2 - x^2}$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\cos\theta = \frac{\sqrt{y^2 - x^2}}{y}$

$\tan\theta = \frac{x}{\sqrt{y^2 - x^2}}$

$\text{cosec}\,\theta = \frac{y}{x}$

$\sec\theta = \frac{y}{\sqrt{y^2 - x^2}}$

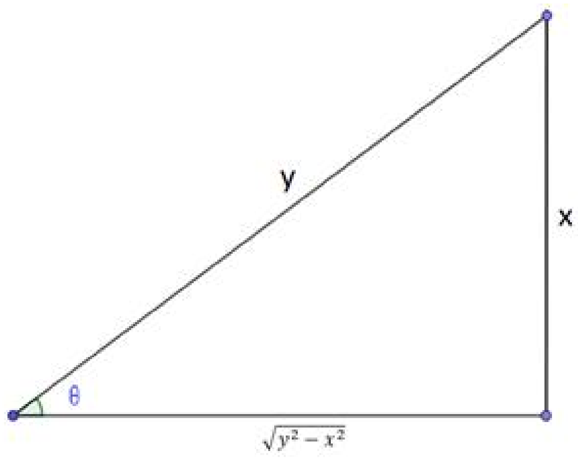
$\cot\theta = \frac{\sqrt{y^2 - x^2}}{x}$

2 F. Question

Find the other trigonometric ratios of the following

$$\sin\theta = \frac{x}{y}$$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow x^2 + p^2 = y^2$

$\Rightarrow p^2 = y^2 - x^2$

$\Rightarrow p = \sqrt{y^2 - x^2}$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\cos\theta = \frac{\sqrt{y^2 - x^2}}{y}$

$\tan\theta = \frac{x}{\sqrt{y^2 - x^2}}$

$\text{cosec}\ \theta = \frac{y}{x}$

$\sec\theta = \frac{y}{\sqrt{y^2 - x^2}}$

$\cot\theta = \frac{\sqrt{y^2 - x^2}}{x}$

3. Question

Find the value of θ, if

(i) $\sin\theta = \frac{1}{\sqrt{2}}$

(ii) $\sin\theta = 0$

(iii) $\tan\theta = \sqrt{3}$

(iv) $\cos\theta = \frac{\sqrt{3}}{2}$

Answer

ratio \ angle θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(i) $\sin\theta = \frac{1}{\sqrt{2}}$

$\sin\theta = \sin 45°$

$\theta = 45°$ (From the table)

(ii) $\sin\theta = 0$

$\sin\theta = \sin 0°$

$\theta = 0°$ (From the table)

(iii) $\tan\theta = \sqrt{3}$

$\tan\theta = \tan 60°$

$\theta = 60°$ (From the table)

(iv) $\cos\theta = \frac{\sqrt{3}}{2}$

$\cos\theta = \cos 30°$

$\theta = 30°$ (From the table)

3. Question

Find the value of θ, if

(i) $\sin\theta = \frac{1}{\sqrt{2}}$

(ii) $\sin\theta = 0$

(iii) $\tan\theta = \sqrt{3}$

(iv) $\cos\theta = \frac{\sqrt{3}}{2}$

Answer

ratio \ angle θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(i) $\sin\theta = \frac{1}{\sqrt{2}}$

$\theta = 45°$ (From the table)

(ii) $\sin\theta = 0$

$\theta = 0°$ (From the table)

(iii) $\tan\theta = \sqrt{3}$

$\theta = 60°$ (From the table)

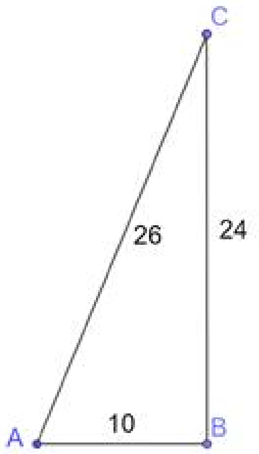
(iv) $\cos\theta = \frac{\sqrt{3}}{2}$

$\theta = 30°$ (From the table)

4. Question

In ΔABC, right angled at B, AB = 10 and AC = 26. Find the six trigonometric ratios of the angles A and C.

Answer



$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

For ∠A:

$\sin A = \frac{BC}{AC} = \frac{24}{26}$

$\cos A = \frac{AB}{AC} = \frac{10}{26}$

$\tan A = \frac{BC}{AB} = \frac{24}{10}$

$\text{cosec } A = \frac{AC}{BC} = \frac{26}{24}$

$\sec A = \frac{AC}{AB} = \frac{26}{10}$

cot A = $\frac{AB}{BC} = \frac{10}{24}$

For ∠C:

sin C = $\frac{AB}{AC} = \frac{10}{26}$

cos C = $\frac{BC}{AC} = \frac{24}{26}$

tan C = $\frac{AB}{BC} = \frac{10}{24}$

cosec C = $\frac{AC}{AB} = \frac{26}{10}$

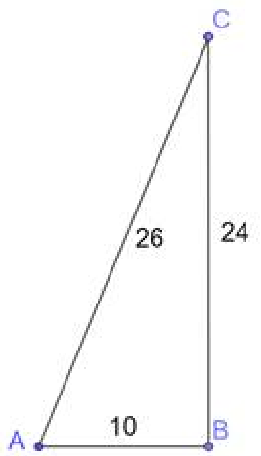
sec C = $\frac{AC}{BC} = \frac{26}{24}$

cot C = $\frac{BC}{AB} = \frac{24}{10}$

4. Question

In ΔABC, right angled at B, AB = 10 and AC = 26. Find the six trigonometric ratios of the angles A and C.

Answer



$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

For ∠A:

sin A = $\frac{BC}{AC} = \frac{24}{26}$

cos A = $\frac{AB}{AC} = \frac{10}{26}$

tan A = $\frac{BC}{AB} = \frac{24}{10}$

cosec A = $\frac{AC}{BC} = \frac{26}{24}$

sec A = $\frac{AC}{AB} = \frac{26}{10}$

cot A = $\frac{AB}{BC} = \frac{10}{24}$

For ∠C:

sin C = $\frac{AB}{AC} = \frac{10}{26}$

cos C = $\frac{BC}{AC} = \frac{24}{26}$

tan C = $\frac{AB}{BC} = \frac{10}{24}$

cosec C = $\frac{AC}{AB} = \frac{26}{10}$

sec C = $\frac{AC}{BC} = \frac{26}{24}$

cot C = $\frac{BC}{AB} = \frac{24}{10}$

5. Question

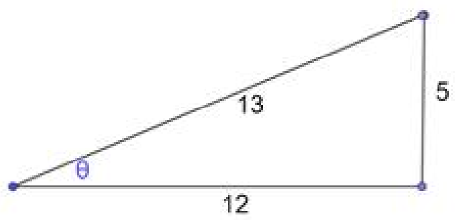
If 5cos θ – 12 sin θ = 0, find $\frac{\sin\theta + \cos\theta}{2\cos\theta - \sin\theta}$.

Answer

5cosθ –12sinθ = 0

⇒ 5cosθ = 12sinθ

⇒ tanθ = 5/12



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 5^2 + 12^2 = P^2$

$\Rightarrow 25 + 144 = p^2$

$\Rightarrow p^2 = 169$

$\Rightarrow p = 13$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{5}{13}$

$\cos\theta = \frac{12}{13}$

Putting values in the function as:

$\Rightarrow \frac{\sin\theta + \cos\theta}{2\cos\theta - \sin\theta}$

$\Rightarrow \frac{\frac{5}{13} + \frac{12}{13}}{2\times\frac{12}{13} - \frac{5}{13}}$

$\Rightarrow \frac{\frac{17}{13}}{\frac{19}{13}} = \frac{17}{19}$

5. Question

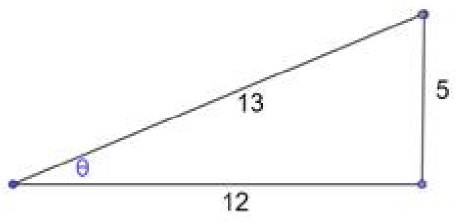
If 5cos θ – 12 sin θ = 0, find $\frac{\sin\theta + \cos\theta}{2\cos\theta - \sin\theta}$.

Answer

$5\cos\theta - 12\sin\theta = 0$

$\Rightarrow 5\cos\theta = 12\sin\theta$

$\Rightarrow \tan\theta = 5/12$



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 5^2 + 12^2 = P^2$

$\Rightarrow 25 + 144 = p^2$

$\Rightarrow p^2 = 169$

$\Rightarrow p = 13$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{5}{13}$

$\cos\theta = \frac{12}{13}$

Putting values in the function as:

$\Rightarrow \frac{\sin\theta + \cos\theta}{2\cos\theta - \sin\theta}$

$\Rightarrow \frac{\frac{5}{13} + \frac{12}{13}}{2\times\frac{12}{13} - \frac{5}{13}}$

$\Rightarrow \frac{\frac{17}{13}}{\frac{19}{13}} = \frac{17}{19}$

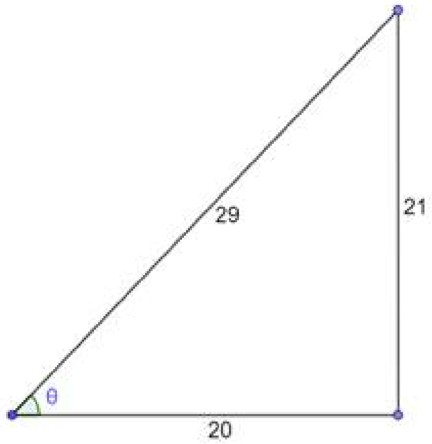
6. Question

If $29\cos\theta = 20$ find $\sec^2\theta - \tan^2\theta$.

Answer

$29\cos\theta = 20$

$\Rightarrow \cos\theta = 20/29$



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 20^2 + p^2 = 29^2$

$\Rightarrow 400 + p^2 = 841$

$\Rightarrow p^2 = 441$

$\Rightarrow p = 21$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sec\theta = \frac{29}{20}$

$\tan\theta = \frac{21}{20}$

Putting the values in function:

$\Rightarrow \sec^2\theta - \tan^2\theta$

$\Rightarrow \left(\frac{29}{20}\right)^2 - \left(\frac{21}{20}\right)^2$

$\Rightarrow \frac{841}{400} - \frac{441}{400}$

$\Rightarrow \frac{400}{400} = 1$

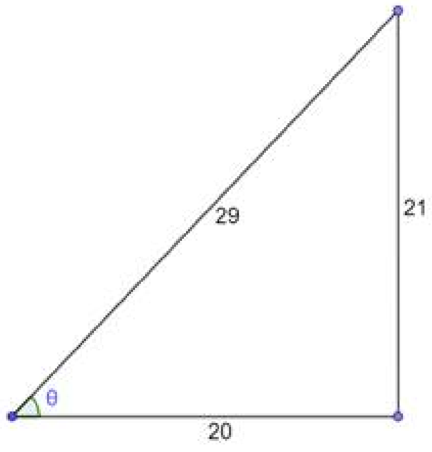
6. Question

If $29\cos\theta = 20$ find $\sec^2\theta - \tan^2\theta$.

Answer

$29\cos\theta = 20$

$\Rightarrow \cos\theta = 20/29$



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 20^2 + p^2 = 29^2$

$\Rightarrow 400 + p^2 = 841$

$\Rightarrow p^2 = 441$

$\Rightarrow p = 21$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sec\theta = \frac{29}{20}$

$\tan\theta = \frac{21}{20}$

Putting the values in function:

$\Rightarrow \sec^2\theta - \tan^2\theta$

$\Rightarrow \left(\frac{29}{20}\right)^2 - \left(\frac{21}{20}\right)^2$

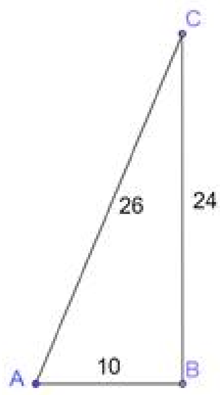
$\Rightarrow \frac{841}{400} - \frac{441}{400}$

$\Rightarrow \frac{400}{400} = 1$

7. Question

If $\sec\theta = \frac{26}{10}$, find $\frac{3\cos\theta + 4\sin\theta}{4\cos\theta - 2\sin\theta}$.

Answer



$\angle BAC = \theta$

Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 10^2 + p^2 = 26^2$

$\Rightarrow 100 + p^2 = 676$

$\Rightarrow p^2 = 576$

$\Rightarrow p = 24$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{24}{26}$

$\cos\theta = \frac{10}{26}$

Putting values in the function as:

$\Rightarrow \frac{3\cos\theta + 4\sin\theta}{4\cos\theta - 2\sin\theta}$

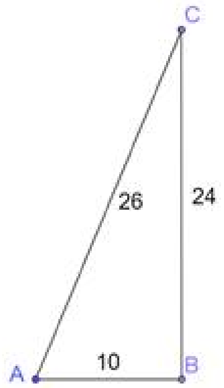
$$\Rightarrow \frac{3\times\frac{10}{26}+4\times\frac{24}{13}}{4\times\frac{10}{26}-2\times\frac{24}{26}}$$

$$\Rightarrow \frac{\frac{126}{26}}{\frac{-8}{26}} = \frac{-63}{4}$$

7. Question

If $\sec\theta = \frac{26}{10}$, find $\frac{3\cos\theta + 4\sin\theta}{4\cos\theta - 2\sin\theta}$.

Answer



$\angle BAC = \theta$

Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 10^2 + p^2 = 26^2$

$\Rightarrow 100 + p^2 = 676$

$\Rightarrow p^2 = 576$

$\Rightarrow p = 24$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{24}{26}$

$\cos\theta = \frac{10}{26}$

Putting values in the function as:

$$\Rightarrow \frac{3\cos\theta + 4\sin\theta}{4\cos\theta - 2\sin\theta}$$

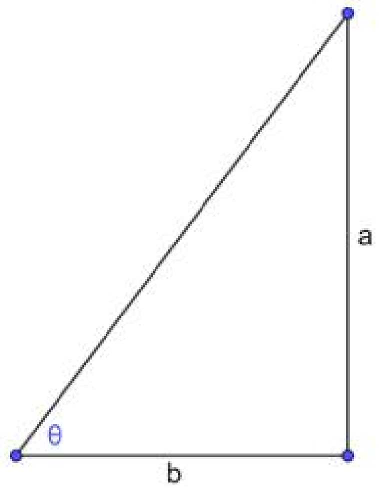
$$\Rightarrow \frac{3\times\frac{10}{26} + 4\times\frac{24}{13}}{4\times\frac{10}{26} - 2\times\frac{24}{26}}$$

$$\Rightarrow \frac{\frac{126}{26}}{\frac{-8}{26}} = \frac{-63}{4}$$

8. Question

If $\tan\theta = \frac{a}{b}$, find $\sin^2\theta + \cos^2\theta$.

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow a^2 + b^2 = p^2$

$\Rightarrow p = \sqrt{a^2 + b^2}$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{a}{\sqrt{a^2 + b^2}}$

$\cos\theta = \frac{b}{\sqrt{a^2 + b^2}}$

Putting the values in function:

$\Rightarrow \sin^2\theta + \cos^2\theta$

$\Rightarrow \left(\frac{a}{\sqrt{a^2 + b^2}}\right)^2 + \left(\frac{b}{\sqrt{a^2 + b^2}}\right)^2$

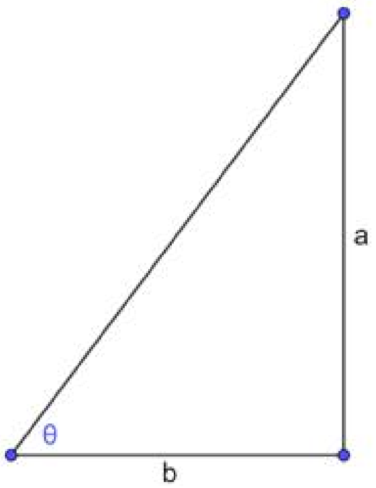
$\Rightarrow \frac{a^2}{a^2 + b^2} + \frac{b^2}{a^2 + b^2}$

$\Rightarrow \frac{a^2 + b^2}{a^2 + b^2} = 1$

8. Question

If $\tan\theta = \frac{a}{b}$, find $\sin^2\theta + \cos^2\theta$.

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow a^2 + b^2 = p^2$

$\Rightarrow p = \sqrt{a^2 + b^2}$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{a}{\sqrt{a^2+b^2}}$

$\cos\theta = \frac{b}{\sqrt{a^2+b^2}}$

Putting the values in function:

$\Rightarrow \sin^2\theta + \cos^2\theta$

$\Rightarrow \left(\frac{a}{\sqrt{a^2+b^2}}\right)^2 + \left(\frac{b}{\sqrt{a^2+b^2}}\right)^2$

$\Rightarrow \frac{a^2}{a^2+b^2} + \frac{b^2}{a^2+b^2}$

$\Rightarrow \frac{a^2+b^2}{a^2+b^2} = 1$

9. Question

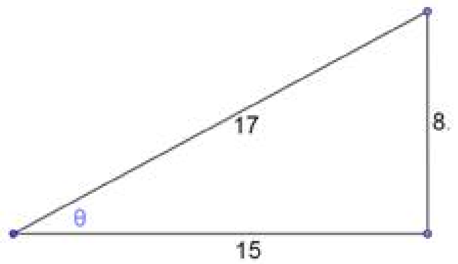
If $\cot\theta = \frac{15}{8}$, evaluate $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$.

Answer

Simplifying the function:

$\Rightarrow \frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$

$\Rightarrow \frac{(1-\sin^2\theta)}{(1-\cos^2\theta)}$



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 8^2 + 15^2 = P^2$

$\Rightarrow 64 + 225 = p^2$

$\Rightarrow p^2 = 289$

$\Rightarrow p = 17$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{8}{17}$

$\cos\theta = \frac{15}{17}$

Putting these values in the simplied function:$\Rightarrow \frac{(1-\sin^2\theta)}{(1-\cos^2\theta)}$

$$\Rightarrow \frac{\left(1-\left(\frac{8}{17}\right)^2\right)}{\left(1-\left(\frac{15}{17}\right)^2\right)}$$

$$\Rightarrow \frac{\left(1-\frac{64}{289}\right)}{\left(1-\frac{225}{289}\right)}$$

$$\Rightarrow \frac{\left(\frac{225}{289}\right)}{\left(\frac{64}{289}\right)} = \frac{225}{64}$$

9. Question

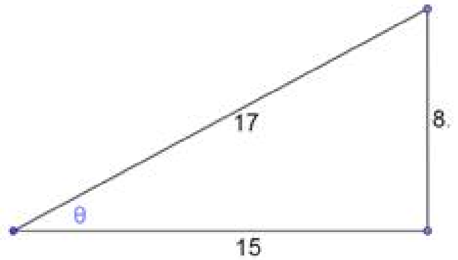
If $\cot\theta = \frac{15}{8}$, evaluate $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$.

Answer

Simplifying the function:

$$\Rightarrow \frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$$

$$\Rightarrow \frac{(1-\sin^2\theta)}{(1-\cos^2\theta)}$$



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 8^2 + 15^2 = P^2$

$\Rightarrow 64 + 225 = p^2$

$\Rightarrow p^2 = 289$

$\Rightarrow p = 17$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{8}{17}$

$\cos\theta = \frac{15}{17}$

Putting these values in the simplied function:$\Rightarrow \frac{(1-\sin^2\theta)}{(1-\cos^2\theta)}$

$$\Rightarrow \frac{\left(1-\left(\frac{8}{17}\right)^2\right)}{\left(1-\left(\frac{15}{17}\right)^2\right)}$$

$$\Rightarrow \frac{\left(1-\frac{64}{289}\right)}{\left(1-\frac{225}{289}\right)}$$

$$\Rightarrow \frac{\left(\frac{225}{289}\right)}{\left(\frac{64}{289}\right)} = \frac{225}{64}$$

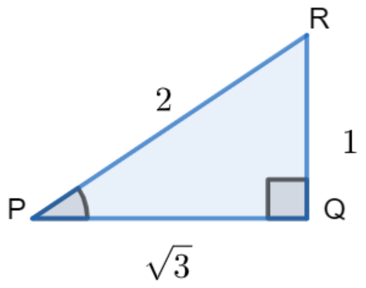
10. Question

In triangle PQR, right angled at Q, if tan $P = \frac{1}{\sqrt{3}}$ find the value of

(i) sin P cos R + cos P sin R

(ii) cos P cos R – sin P sin R.

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 1^2 + (\sqrt{3})^2 = P^2$

$\Rightarrow 1 + 3 = p^2$

$\Rightarrow p^2 = 4$

$\Rightarrow p = 2$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin P = \frac{1}{2}$

$\cos P = \frac{\sqrt{3}}{2}$

$\sin R = \frac{\sqrt{3}}{2}$

$\cos R = \frac{1}{2}$

(i) Putting the values in the expression:

sin P cos R + cos P sin R

$\Rightarrow \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{1}{4} + \frac{3}{4}$

$\Rightarrow 1$

(ii) Putting the values in the expression:

cos P cos R – sin P sin R.

$\Rightarrow \frac{\sqrt{3}}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow 0$

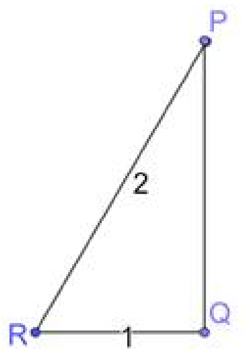
10. Question

In triangle PQR, right angled at Q, if tan $P = \frac{1}{\sqrt{3}}$ find the value of

(i) sin P cos R + cos P sin R

(ii) cos P cos R – sin P sin R.

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 1^2 + (\sqrt{3})^2 = P^2$

$\Rightarrow 1 + 3 = p^2$

$\Rightarrow p^2 = 4$

$\Rightarrow p = 2$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

sin P = $\frac{1}{2}$

cos P = $\frac{\sqrt{3}}{2}$

$\sin R = \frac{\sqrt{3}}{2}$

$\cos R = \frac{1}{2}$

(i) Putting the values in the expression:

sin P cos R + cos P sin R

$\Rightarrow \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{1}{4} + \frac{3}{4}$

$\Rightarrow 1$

(ii) Putting the values in the expression:

cos P cos R – sin P sin R.

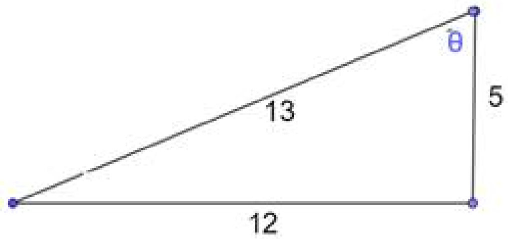
$\Rightarrow \frac{\sqrt{3}}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow 0$

11. Question

If $\sec\theta = \frac{13}{5}$, show that $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta} = 3$.

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 5^2 + p^2 = 13^2$

$\Rightarrow 25 + p^2 = 169$

$\Rightarrow p^2 = 144$

$\Rightarrow p = 12$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{12}{13}$

$\cos\theta = \frac{5}{13}$

Putting these values in the left hand side:$\Rightarrow \frac{2\times\frac{12}{13}-3\times\frac{5}{13}}{4\times\frac{12}{13}-9\times\frac{5}{13}}$

$\Rightarrow \frac{\frac{24}{13}-\frac{15}{13}}{\frac{48}{13}-\frac{45}{13}}$

$\Rightarrow \frac{\left(\frac{9}{13}\right)}{\left(\frac{3}{13}\right)}$

$\Rightarrow 3$

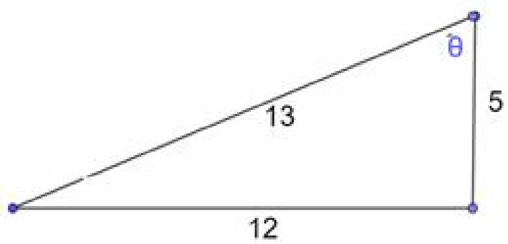
Which is equal to right hand side.

Hence proved.

11. Question

If $\sec\theta = \frac{13}{5}$, show that $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta} = 3.$

Answer



Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 5^2 + p^2 = 13^2$

$\Rightarrow 25 + p^2 = 169$

$\Rightarrow p^2 = 144$

$\Rightarrow p = 12$

$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Therefore, the other angles are:

$\sin\theta = \frac{12}{13}$

$\cos\theta = \frac{5}{13}$

Putting these values in the left hand side: $\Rightarrow \frac{2\times\frac{12}{13}-3\times\frac{5}{13}}{4\times\frac{12}{13}-9\times\frac{5}{13}}$

$\Rightarrow \frac{\frac{24}{13}-\frac{15}{13}}{\frac{48}{13}-\frac{45}{13}}$

$\Rightarrow \frac{\left(\frac{9}{13}\right)}{\left(\frac{3}{13}\right)}$

$\Rightarrow 3$

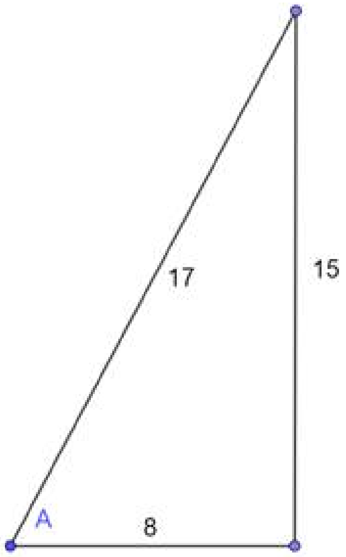
Which is equal to right hand side.

Hence proved.

12. Question

If $\sec A = \frac{17}{8}$, prove that $1-2\sin^2 A = 2\cos^2 A - 1$.

Answer



$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 8^2 + p^2 = 17^2$

$\Rightarrow 64 + p^2 = 289$

$\Rightarrow p^2 = 225$

$\Rightarrow p = 15$

Therefore, the other angles are:

$\sin\theta = \frac{15}{17}$

$\cos\theta = \frac{8}{17}$

Putting these values in the left hand side:$\Rightarrow 1-2\times\left(\frac{15}{17}\right)^2$

$\Rightarrow 1-2\times\frac{225}{289}$

$\Rightarrow 1-\frac{450}{289}$

$\Rightarrow \frac{-161}{289}$

Putting values in the right hand side:

$\Rightarrow 2\times\left(\frac{8}{17}\right)^2 - 1$

$\Rightarrow 2\times\frac{64}{289} - 1$

$\Rightarrow \frac{128}{289} - 1$

$\Rightarrow \frac{-161}{289}$

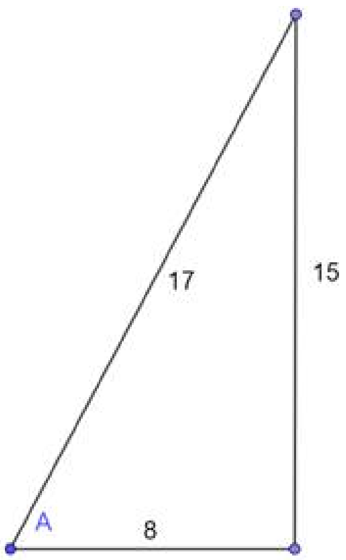
Therefore, Left hand side and right hand side are equal.

Hence proved.

12. Question

If $\sec A = \frac{17}{8}$, prove that $1-2\sin^2 A = 2\cos^2 A - 1$.

Answer



$\sin\theta = \frac{\text{perpendicular}}{\text{hypotenuse}}$	$\text{cosec}\theta = \frac{\text{hypotenuse}}{\text{perpendicular}}$
$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$	$\sec\theta = \frac{\text{hypotenuse}}{\text{base}}$
$\tan\theta = \frac{\text{perpendicular}}{\text{base}}$	$\cot\theta = \frac{\text{Base}}{\text{perpendicular}}$

Let the third side be p,

By Pythagoras theorem,

$\Rightarrow 8^2 + p^2 = 17^2$

$\Rightarrow 64 + p^2 = 289$

$\Rightarrow p^2 = 225$

$\Rightarrow$ p = 15

Therefore, the other angles are:

$\sin\theta = \frac{15}{17}$

$\cos\theta = \frac{8}{17}$

Putting these values in the left hand side:$\Rightarrow 1-2\times\left(\frac{15}{17}\right)^2$

$\Rightarrow 1-2\times\frac{225}{289}$

$\Rightarrow 1-\frac{450}{289}$

$\Rightarrow \frac{-161}{289}$

Putting values in the right hand side:

$\Rightarrow 2\times\left(\frac{8}{17}\right)^2 - 1$

$\Rightarrow 2\times\frac{64}{289} - 1$

$\Rightarrow \frac{128}{289} - 1$

$\Rightarrow \frac{-161}{289}$

Therefore, Left hand side and right hand side are equal.

Hence proved.

13. Question

Evaluate.

(i) sin 45° + cos 45°

(ii) sin 60° tan 30°

(iii) $\frac{\tan 45^\circ}{\tan 30^\circ + \tan 60^\circ}$

(iv) $\cos^2 60^\circ \sin^2 30^\circ + \tan^2 30^\circ \cot^2 60^\circ$

(v) $6\cos^2 90^\circ + 3\sin^2 90^\circ + 4\tan^2 45^\circ$

(vi) $\frac{4\cot^2 60^\circ + \sec^2 30^\circ - 2\sin^2 45^\circ}{\sin^2 60^\circ + \cos^2 45^\circ}$

(vii) $\dfrac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec}30^\circ + \sec 60^\circ - \cot^2 30^\circ}$

(viii) $4(\sin^4 30^\circ + \cos^4 60^\circ) - 3(\cos^2 45^\circ - \sin^2 90^\circ)$

Answer

angle θ / ratio	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(i) We know $\sin 45^\circ = (1/\sqrt{2})$ and $\cos 45^\circ = (1/\sqrt{2})$ (From the table)

$\Rightarrow \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}$

$\Rightarrow \frac{2}{\sqrt{2}} = \sqrt{2}$

(ii) We know $\sin 30^\circ = 1/2$ and $\tan 45^\circ = 1$ (From the table)

$\Rightarrow \frac{1}{2} \times 1 = \frac{1}{2}$

(iii) We know $\tan 30^\circ = (1/\sqrt{3})$ (From the table)

$\tan 45^\circ = 1$

$\tan 60^\circ = \sqrt{3}$

$\Rightarrow \dfrac{1}{\frac{1}{\sqrt{3}} + \sqrt{3}}$

$\Rightarrow \dfrac{1}{\frac{1+3}{\sqrt{3}}}$

$\Rightarrow \frac{\sqrt{3}}{4}$

(iv) We know $\sin 30^\circ = \cos 60^\circ = 1/2$ (From the table)

$\tan 30^\circ = \cot 60^\circ = 1/\sqrt{3}$

$\Rightarrow (\frac{1}{2})^2 \times (\frac{1}{2})^2 + (\frac{1}{\sqrt{3}})^2 \times (\frac{1}{\sqrt{3}})^2$

$\Rightarrow \frac{1}{4} \times \frac{1}{4} + \frac{1}{3} \times \frac{1}{3}$

$\Rightarrow \frac{1}{16} + \frac{1}{9}$

$\Rightarrow \frac{25}{144}$

(v) We know that cos 90° = 0 , sin 90° = 1 and tan 45° = 1 (From the table)

$\Rightarrow 6(0)^2 + 3(1)^2 + 4(1)^2$

⇒ 3 + 4

⇒ 7

(vi) We know cot 60° = (1/√3) (From the table)

sec 30° = 2/√3

sin 45° = 1/√2

sin 60° = √3/2

cos 45° = 1/√2

$$\Rightarrow \frac{4\times\left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{2}{\sqrt{3}}\right)^2 - 2\times\left(\frac{1}{\sqrt{2}}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2}$$

$$\Rightarrow \frac{4\times\frac{1}{3} + \frac{4}{3} - 2\times\frac{1}{2}}{\frac{3}{4} + \frac{1}{2}}$$

$$\Rightarrow \frac{\frac{5}{3}}{\frac{5}{4}}$$

$$\Rightarrow \frac{4}{3}$$

(vii) We know tan 60° = √3 (From the table)

cos 45° = 1/√2

sec 30° = 2/√3

cos 90° = 0

cosec 30° = 2

sec 60° = 2

cot 30° = √3

$\Rightarrow \dfrac{(\sqrt{3})^2 + 4\times\left(\frac{1}{\sqrt{2}}\right)^2 + 3\times\left(\frac{2}{\sqrt{3}}\right)^2 + 5\times(0)^2}{2+2-(\sqrt{3})^2}$

$\Rightarrow \dfrac{3 + 4\times\frac{1}{2} + 3\times\frac{4}{3} - 0}{4-3}$

$\Rightarrow 9$

(viii) We know

sin 30° = cos 60° = 1/2 (From the table)

cos 45° = 1/√2

sin 90° = 1

$\Rightarrow 4(\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^4) - 3(\left(\frac{1}{\sqrt{2}}\right)^2 - 1^2)$

$\Rightarrow 4(\frac{1}{16} + \frac{1}{16}) - 3(\frac{1}{2} - 1)$

$\Rightarrow 4(\frac{1}{8}) - 3(\frac{-1}{2})$

$\Rightarrow 2$

13. Question

Evaluate.

(i) sin 45° + cos 45°

(ii) sin 60° tan 30°

(iii) $\dfrac{\tan 45^\circ}{\tan 30^\circ + \tan 60^\circ}$

(iv) $\cos^2 60^\circ \sin^2 30^\circ + \tan^2 30^\circ \cot^2 60^\circ$

(v) $6\cos^2 90^\circ + 3\sin^2 90^\circ + 4\tan^2 45^\circ$

(vi) $\dfrac{4\cot^2 60^\circ + \sec^2 30^\circ - 2\sin^2 45^\circ}{\sin^2 60^\circ + \cos^2 45^\circ}$

(vii) $\dfrac{\tan^2 60^\circ + 4\cos^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\operatorname{cosec} 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$

(viii) $4(\sin^4 30^\circ + \cos^4 60^\circ) - 3(\cos^2 45^\circ - \sin^2 90^\circ)$

Answer

angle θ / ratio	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(i) We know sin 45° = (1/√2) and cos 45° = (1/√2) (From the table)

$\Rightarrow \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}$

$\Rightarrow \frac{2}{\sqrt{2}} = \sqrt{2}$

(ii) We know sin 30° = 1/2 and tan 45° = 1 (From the table)

$\Rightarrow \frac{1}{2} \times 1 = \frac{1}{2}$

(iii) We know tan 30° = (1/√3) (From the table)

tan 45° = 1

tan 60° = √3

$\Rightarrow \frac{1}{\frac{1}{\sqrt{3}} + \sqrt{3}}$

$\Rightarrow \frac{1}{\frac{1+3}{\sqrt{3}}}$

$\Rightarrow \frac{\sqrt{3}}{4}$

(iv) We know sin 30° = cos 60° = 1/2 (From the table)

tan 30° = cot 60° = 1/√3

$\Rightarrow (\frac{1}{2})^2 \times (\frac{1}{2})^2 + (\frac{1}{\sqrt{3}})^2 \times (\frac{1}{\sqrt{3}})^2$

$\Rightarrow \frac{1}{4} \times \frac{1}{4} + \frac{1}{3} \times \frac{1}{3}$

$\Rightarrow \frac{1}{16} + \frac{1}{9}$

$\Rightarrow \frac{25}{144}$

(v) We know that cos 90° = 0 , sin 90° = 1 and tan 45° = 1 (From the table)

$\Rightarrow 6(0)^2 + 3(1)^2 + 4(1)^2$

$\Rightarrow 3 + 4$

$\Rightarrow 7$

(vi) We know cot 60° = (1/√3) (From the table)

sec 30° = 2/√3

sin 45° = 1/√2

sin 60° = √3/2

cos 45° = 1/√2

$$\Rightarrow \frac{4\times\left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{2}{\sqrt{3}}\right)^2 - 2\times\left(\frac{1}{\sqrt{2}}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2}$$

$$\Rightarrow \frac{4\times\frac{1}{3} + \frac{4}{3} - 2\times\frac{1}{2}}{\frac{3}{4} + \frac{1}{2}}$$

$$\Rightarrow \frac{\frac{5}{3}}{\frac{5}{4}}$$

$$\Rightarrow \frac{4}{3}$$

(vii) We know tan 60° = √3 (From the table)

cos 45° = 1/√2

sec 30° = 2/√3

cos 90° = 0

cosec 30° = 2

sec 60° = 2

cot 30° = √3

$$\Rightarrow \frac{(\sqrt{3})^2 + 4\times\left(\frac{1}{\sqrt{2}}\right)^2 + 3\times\left(\frac{2}{\sqrt{3}}\right)^2 + 5\times(0)^2}{2 + 2 - (\sqrt{3})^2}$$

$$\Rightarrow \frac{3 + 4\times\frac{1}{2} + 3\times\frac{4}{3} - 0}{4 - 3}$$

$\Rightarrow 9$

(viii) We know

sin 30° = cos 60° = 1/2 (From the table)

cos 45° = $1/\sqrt{2}$

sin 90° = 1

$$\Rightarrow 4\left(\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^4\right) - 3\left(\left(\frac{1}{\sqrt{2}}\right)^2 - 1^2\right)$$

$$\Rightarrow 4\left(\frac{1}{16} + \frac{1}{16}\right) - 3\left(\frac{1}{2} - 1\right)$$

$$\Rightarrow 4\left(\frac{1}{8}\right) - 3\left(\frac{-1}{2}\right)$$

$\Rightarrow 2$

14. Question

Verify the following equalities.

(i) $\sin^2 30° + \cos^2 30° = 1$

(ii) $1 + \tan^2 45° = \sec^2 45°$

(iii) $\cos 60° = 1 - 2\sin^2 30° = 2\cos^2 30° - 1$

(iv) $\cos 90° = 1 - 2\sin^2 45° = 2\cos^2 45° - 1$

(v) $\dfrac{\cos 60^0}{1+\sin 60^0} = \dfrac{1}{\sec 60^0 + \tan 60^0}$

(vi) $\dfrac{1-\tan^2 60^0}{1+\tan^2 60^0} = 2\cos^2 60^0 - 1$

(vii) $\dfrac{\sec 30^0 + \tan 30^0}{\sec 30^0 - \tan 30^0} = \dfrac{1+\sin 30^0}{1-\sin 30^0}$

(viii) $\tan^2 60° - 2\tan^2 45° - \cot^2 30° + 2\sin^2 30^0 + \dfrac{3}{4}\operatorname{cosec}^2 45^0 = 0$

(ix) $4\cot^2 45° - \sec^2 60° + \sin^2 60° = 1$

(x) sin30° cos60° + cos30° sin60° = sin 90°

Answer

angle θ / ratio	$0°$	$30°$	$45°$	$60°$	$90°$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(i) We know sin 30° = (1/2) and cos 30° = (√3/2) (From the table)

Putting the values in the left hand side:

$\Rightarrow \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$\Rightarrow \frac{1}{4} + \frac{3}{4}$

⇒ 1

Which is equal to the right hand side.

Hence verified.

(ii) We know tan 45° = 1 and sec 45° = √2 (From the table)

Putting the values in the left hand side:

⇒ 1 + $(1)^2$

⇒ 1 + 1

⇒ 2

Putting the values in the right hand side:

⇒ $(\sqrt{2})^2$

⇒ 2

∴ LHS = RHS

Hence verified.

(iii) We know sin 30° = cos 60° = (1/2) and cos 30° = (√3/2) (From the table)

So the leftmost function = cos60° = (1/2)

Putting values in the middle function:⇒ 1 – 2× $\left(\frac{1}{2}\right)^2$

$\Rightarrow 1 - 2 \times \frac{1}{4}$

⇒ 1/2

Putting values in the rightmost function:⇒ 2× $\left(\frac{\sqrt{3}}{2}\right)^2 - 1$

$\Rightarrow 2 \times \frac{3}{4} - 1$

⇒ 1/2

Therefore, all simplify to 1/2 and are equal.

Hence verified.

(iv) We know sin 45° = cos 45° = (1/√ 2) and cos 90° = 0 (From the table)

So the leftmost function = cos90° = 0

Putting values in the middle function:⇒ 1 – 2× $\left(\frac{1}{\sqrt{2}}\right)^2$

$\Rightarrow 1 - 2 \times \frac{1}{2}$

⇒ 0

Putting values in the rightmost function:⇒ 2× $\left(\frac{1}{\sqrt{2}}\right)^2 - 1$

$\Rightarrow 2 \times \frac{1}{2} - 1$

⇒ 0

Therefore, all simplify to 0 and are equal.

Hence verified.

(v) We know sin 60° = (√3/2) (From the table)

cos 60° = (1/2)

tan 60° = √3

and sec 30° = 2

Putting values in the left hand side:⇒ $\frac{\frac{1}{2}}{1 + \frac{\sqrt{3}}{2}}$

$\Rightarrow \frac{\frac{1}{2}}{\frac{2+\sqrt{3}}{2}}$

$\Rightarrow \frac{1}{2+\sqrt{3}}$

Putting values in the right hand side:$\Rightarrow \frac{1}{2+\sqrt{3}}$

Therefore, left hand side and right hand side are equal.

Hence verified.

(vi) We know cos 60° = (1/2) (From the table)

tan 60° = √3

Putting values in the left hand side:$\Rightarrow \frac{1-(\sqrt{3})^2}{1+(\sqrt{3})^2}$

$\Rightarrow \frac{1-3}{1+3}$

$\Rightarrow \frac{-2}{4} = \frac{-1}{2}$

Putting values in the right hand side:$\Rightarrow 2 \times \left(\frac{1}{2}\right)^2 - 1$

$\Rightarrow 2 \times \frac{1}{4} - 1$

$\Rightarrow \frac{1}{2} - 1$

$\Rightarrow \frac{-1}{2}$

Therefore, left hand side and right hand side are equal.

Hence verified.

(vii) We know sec 60° = (2/√3) (From the table)

tan 30° = (1/√3)

sin 30° = (1/2)

Putting values in the left hand side:$\Rightarrow \frac{\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{3}}}{\frac{2}{\sqrt{3}}-\frac{1}{\sqrt{3}}}$

$\Rightarrow \frac{\frac{3}{\sqrt{3}}}{\frac{1}{\sqrt{3}}}$

$\Rightarrow 3$

Putting values in the right hand side:$\Rightarrow \frac{1+\frac{1}{2}}{1-\frac{1}{2}}$

$\Rightarrow \frac{\frac{3}{2}}{\frac{1}{2}}$

$\Rightarrow 3$

Therefore, left hand side and right hand side are equal.

Hence verified.

(viii) We know sin 30° = (1/2) (From the table)

cot 30° = √3

cosec 45° = √2

tan 60° = √3

and tan 45° = 1

Putting the values in the left hand side:

$$\Rightarrow \left(\sqrt{3}\right)^2 - 2 \times (1)^2 - \left(\sqrt{3}\right)^2 + 2 \times \left(\frac{1}{2}\right)^2 + \frac{3}{4} \times \left(\sqrt{2}\right)^2$$

$$\Rightarrow 3 - 2 - 3 + 2 \times \frac{1}{4} + \frac{3}{4} \times 2$$

$\Rightarrow 0$

Which is equal to the right hand side.

Hence verified.

(ix) We know cos 60° = (1/2) (From the table)

sin 60° = (√3/2)

sec 60° = 2

and cot 45° = 1

Putting the values in the left hand side:

$$\Rightarrow 4 \times (1)^2 - (2)^2 + \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$$

$$\Rightarrow 4 - 4 + \frac{1}{4} + \frac{3}{4}$$

$\Rightarrow 1$

Which is equal to the right hand side.

Hence verified.

(x) We know sin 30° = cos 60° = (1/2) (From the table)

Cos 30° = sin 60° = (√3/2)

Sin 90° = 1

So the right hand side = sin 90° = 1

Putting the values in the left hand side:

$\Rightarrow \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{1}{4} + \frac{3}{4}$

⇒ 1

Which is equal to the right hand side.

Hence verified.

14. Question

Verify the following equalities.

(i) $\sin^2 30° + \cos^2 30° = 1$

(ii) $1 + \tan^2 45° = \sec^2 45°$

(iii) $\cos 60° = 1 - 2\sin^2 30° = 2\cos^2 30° - 1$

(iv) $\cos 90° = 1 - 2\sin^2 45° = 2\cos^2 45° - 1$

(v) $\frac{\cos 60^o}{1+\sin 60^o} = \frac{1}{\sec 60^o + \tan 60^o}$

(vi) $\frac{1-\tan^2 60^o}{1+\tan^2 60^o} = 2\cos^2 60^o - 1$

(vii) $\frac{\sec 30^o + \tan 30^o}{\sec 30^0 - \tan 30^o} = \frac{1+\sin 30^o}{1-\sin 30^o}$

(viii) $\tan^2 60° - 2\tan^2 45° - \cot^2 30° + 2\sin^2 30^o + \frac{3}{4}\operatorname{cosec}^2 45^o = 0$

(ix) $4\cot^2 45° - \sec^2 60° + \sin^2 60° = 1$

(x) sin30° cos60° + cos30° sin60° = sin 90°

Answer

angle θ / ratio	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	not defined
$\operatorname{cosec}\theta$	not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	not defined
$\cot\theta$	not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(i) We know sin 30° = (1/2) and cos 30° = (√3/2) (From the table)

Putting the values in the left hand side:

$\Rightarrow \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$\Rightarrow \frac{1}{4} + \frac{3}{4}$

⇒ 1

Which is equal to the right hand side.

Hence verified.

(ii) We know tan 45° = 1 and sec 45° = √2 (From the table)

Putting the values in the left hand side:

$\Rightarrow 1 + (1)^2$

⇒ 1 + 1

⇒ 2

Putting the values in the right hand side:

$\Rightarrow (\sqrt{2})^2$

⇒ 2

∴ LHS = RHS

Hence verified.

(iii) We know sin 30° = cos 60° = (1/2) and cos 30° = (√3/2) (From the table)

So the leftmost function = cos60° = (1/2)

Putting values in the middle function:⇒ 1 – 2× $\left(\frac{1}{2}\right)^2$

$\Rightarrow 1 - 2 \times \frac{1}{4}$

⇒ 1/2

Putting values in the rightmost function:⇒ 2× $\left(\frac{\sqrt{3}}{2}\right)^2 - 1$

$\Rightarrow 2 \times \frac{3}{4} - 1$

⇒ 1/2

Therefore, all simplify to 1/2 and are equal.

Hence verified.

(iv) We know sin 45° = cos 45° = (1/√ 2) and cos 90° = 0 (From the table)

So the leftmost function = cos90° = 0

Putting values in the middle function:⇒ 1 – 2× $\left(\frac{1}{\sqrt{2}}\right)^2$

$\Rightarrow 1 - 2 \times \frac{1}{2}$

⇒ 0

Putting values in the rightmost function:⇒ 2× $\left(\frac{1}{\sqrt{2}}\right)^2 - 1$

$\Rightarrow 2 \times \frac{1}{2} - 1$

⇒ 0

Therefore, all simplify to 0 and are equal.

Hence verified.

(v) We know sin 60° = (√3/2) (From the table)

cos 60° = (1/2)

tan 60° = √3

and sec 30° = 2

Putting values in the left hand side:⇒ $\frac{\frac{1}{2}}{1+\frac{\sqrt{3}}{2}}$

$\Rightarrow \frac{\frac{1}{2}}{\frac{2+\sqrt{3}}{2}}$

$\Rightarrow \frac{1}{2+\sqrt{3}}$

Putting values in the right hand side:$\Rightarrow \frac{1}{2+\sqrt{3}}$

Therefore, left hand side and right hand side are equal.

Hence verified.

(vi) We know cos 60° = (1/2) (From the table)

tan 60° = √3

Putting values in the left hand side:$\Rightarrow \frac{1-(\sqrt{3})^2}{1+(\sqrt{3})^2}$

$\Rightarrow \frac{1-3}{1+3}$

$\Rightarrow \frac{-2}{4} = \frac{-1}{2}$

Putting values in the right hand side:$\Rightarrow 2 \times \left(\frac{1}{2}\right)^2 - 1$

$\Rightarrow 2 \times \frac{1}{4} - 1$

$\Rightarrow \frac{1}{2} - 1$

$\Rightarrow \frac{-1}{2}$

Therefore, left hand side and right hand side are equal.

Hence verified.

(vii) We know sec 60° = (2/√3) (From the table)

tan 30° = (1/√3)

sin 30° = (1/2)

Putting values in the left hand side:$\Rightarrow \frac{\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{3}}}{\frac{2}{\sqrt{3}}-\frac{1}{\sqrt{3}}}$

$\Rightarrow \frac{\frac{3}{\sqrt{3}}}{\frac{1}{\sqrt{3}}}$

$\Rightarrow 3$

Putting values in the right hand side:$\Rightarrow \frac{1+\frac{1}{2}}{1-\frac{1}{2}}$

$\Rightarrow \frac{\frac{3}{2}}{\frac{1}{2}}$

$\Rightarrow 3$

Therefore, left hand side and right hand side are equal.

Hence verified.

(viii) We know sin 30° = (1/2) (From the table)

cot 30° = √3

cosec 45° = √2

tan 60° = √3

and tan 45° = 1

Putting the values in the left hand side:

$\Rightarrow \left(\sqrt{3}\right)^2 - 2 \times (1)^2 - \left(\sqrt{3}\right)^2 + 2 \times \left(\frac{1}{2}\right)^2 + \frac{3}{4} \times \left(\sqrt{2}\right)^2$

$\Rightarrow 3 - 2 - 3 + 2 \times \frac{1}{4} + \frac{3}{4} \times 2$

$\Rightarrow 0$

Which is equal to the right hand side.

Hence verified.

(ix) We know cos 60° = (1/2) (From the table)

sin 60° = (√3/2)

sec 60° = 2

and cot 45° = 1

Putting the values in the left hand side:

$\Rightarrow 4 \times (1)^2 - (2)^2 + \left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$\Rightarrow 4 - 4 + \frac{1}{4} + \frac{3}{4}$

$\Rightarrow 1$

Which is equal to the right hand side.

Hence verified.

(x) We know sin 30° = cos 60° = (1/2) (From the table)

Cos 30° = sin 60° = (√3/2)

Sin 90° = 1

So the right hand side = sin 90° = 1

Putting the values in the left hand side:

$\Rightarrow \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{1}{4} + \frac{3}{4}$

⇒ 1

Which is equal to the right hand side.

Hence verified.

Exercise 2.2

1 A. Question

Evaluate

$$\frac{\sin 36^{0}}{\cos 54^{0}}$$

Answer

$\Rightarrow \frac{\sin 36^{\circ}}{\cos 54^{\circ}}$

$\Rightarrow \frac{\sin 36^{\circ}}{\sin(90-54)^{\circ}}$

$\Rightarrow \frac{\sin 36^{\circ}}{\sin 36^{\circ}}$

⇒ 1

1 A. Question

Evaluate

$$\frac{\sin 36^{0}}{\cos 54^{0}}$$

Answer

$\Rightarrow \frac{\sin 36^{\circ}}{\cos 54^{\circ}}$

$\Rightarrow \frac{\sin 36^{\circ}}{\sin(90-54)^{\circ}}$

$$\Rightarrow \frac{\sin 36^\circ}{\sin 36^\circ}$$

$\Rightarrow 1$

1 B. Question

Evaluate

$$\frac{\operatorname{cosec} 10^0}{\sec 80^0}$$

Answer

$$\Rightarrow \frac{\operatorname{cosec} 10^\circ}{\sec 80^\circ}$$

$$\Rightarrow \frac{\operatorname{cosec} 10^\circ}{\operatorname{cosec}(90-80)^\circ}$$

$$\Rightarrow \frac{\operatorname{cosec} 10^\circ}{\operatorname{cosec} 10^\circ}$$

$\Rightarrow 1$

1 B. Question

Evaluate

$$\frac{\operatorname{cosec} 10^0}{\sec 80^0}$$

Answer

$$\Rightarrow \frac{\operatorname{cosec} 10^\circ}{\sec 80^\circ}$$

$$\Rightarrow \frac{\operatorname{cosec} 10^\circ}{\operatorname{cosec}(90-80)^\circ}$$

$$\Rightarrow \frac{\operatorname{cosec} 10^\circ}{\operatorname{cosec} 10^\circ}$$

$\Rightarrow 1$

1 C. Question

Evaluate

$\sin \theta \sec(90^\circ - \theta)$

Answer

$\Rightarrow \sin \theta \sec (90-\theta)$

$\Rightarrow \sin \theta \operatorname{cosec} \theta$

$\Rightarrow \sin\theta \times (1/\sin\theta)$

$\Rightarrow 1$

1 C. Question

Evaluate

$\sin\theta \sec(90° - \theta)$

Answer

$\Rightarrow \sin\theta \sec(90-\theta)$

$\Rightarrow \sin\theta \operatorname{cosec}\theta$

$\Rightarrow \sin\theta \times (1/\sin\theta)$

$\Rightarrow 1$

1 D. Question

Evaluate

$$\frac{\sec 20^0}{\operatorname{cosec} 70^0}$$

Answer

$\Rightarrow \frac{\sec 20^0}{\operatorname{cosec} 70^0}$

$\Rightarrow \frac{\operatorname{cosec}(90-20)^0}{\operatorname{cosec} 70^0}$

$\Rightarrow \frac{\operatorname{cosec} 70^0}{\operatorname{cosec} 70^0}$

$\Rightarrow 1$

1 D. Question

Evaluate

$$\frac{\sec 20^0}{\operatorname{cosec} 70^0}$$

Answer

$\Rightarrow \frac{\sec 20^0}{\operatorname{cosec} 70^0}$

$\Rightarrow \frac{\operatorname{cosec}(90-20)^0}{\operatorname{cosec} 70^0}$

$\Rightarrow \frac{\operatorname{cosec} 70^0}{\operatorname{cosec} 70^0}$

$\Rightarrow 1$

1 E. Question

Evaluate

$$\frac{\sin 17^{0}}{\cos 73^{0}}$$

Answer

$\Rightarrow \frac{\sin 17^{\circ}}{\cos 73^{\circ}}$

$\Rightarrow \frac{\sin 17^{\circ}}{\sin(90-73)^{\circ}}$

$\Rightarrow \frac{\sin 17^{\circ}}{\sin 17^{\circ}}$

$\Rightarrow 1$

1 E. Question

Evaluate

$$\frac{\sin 17^{0}}{\cos 73^{0}}$$

Answer

$\Rightarrow \frac{\sin 17^{\circ}}{\cos 73^{\circ}}$

$\Rightarrow \frac{\sin 17^{\circ}}{\sin(90-73)^{\circ}}$

$\Rightarrow \frac{\sin 17^{\circ}}{\sin 17^{\circ}}$

$\Rightarrow 1$

1 F. Question

Evaluate

$$\frac{\tan 46^{0}}{\cot 44^{0}}$$

Answer

$\Rightarrow \frac{\tan 46^{\circ}}{\cot 44^{\circ}}$

$\Rightarrow \frac{\tan 46^{\circ}}{\tan(90-44)^{\circ}}$

$\Rightarrow \frac{\tan 46^\circ}{\tan 46^\circ}$

$\Rightarrow 1$

1 F. Question

Evaluate

$$\frac{\tan 46^0}{\cot 44^0}$$

Answer

$\Rightarrow \frac{\tan 46^\circ}{\cot 44^\circ}$

$\Rightarrow \frac{\tan 46^\circ}{\tan(90-44)^\circ}$

$\Rightarrow \frac{\tan 46^\circ}{\tan 46^\circ}$

$\Rightarrow 1$

2 A. Question

Simplify

$\cos 38^\circ \cos 52^\circ - \sin 38^\circ \sin 52^\circ$

Answer

$\Rightarrow \cos 38^\circ \cos 52^\circ - \sin 38^\circ \sin 52^\circ$

$\Rightarrow \cos 38^\circ \sin (90-52)^\circ - \sin 38^\circ \cos (90-52)^\circ$

$\Rightarrow \cos 38^\circ \sin 38^\circ - \sin 38^\circ \cos 38^\circ$

$\Rightarrow 0$

2 A. Question

Simplify

$\cos 38^\circ \cos 52^\circ - \sin 38^\circ \sin 52^\circ$

Answer

$\Rightarrow \cos 38^\circ \cos 52^\circ - \sin 38^\circ \sin 52^\circ$

$\Rightarrow \cos 38^\circ \sin (90-52)^\circ - \sin 38^\circ \cos (90-52)^\circ$

$\Rightarrow \cos 38^\circ \sin 38^\circ - \sin 38^\circ \cos 38^\circ$

$\Rightarrow 0$

2 B. Question

Simplify

$$\frac{\cos 80^{o}}{\sin 10^{o}} + \cos 59^{o} \operatorname{cosec} 31^{o}$$

Answer

$$\Rightarrow \frac{\cos 80^{\circ}}{\cos(90-10)^{\circ}} + \cos 59^{\circ} \sec(90-31)^{\circ}$$

$$\Rightarrow \frac{\cos 80^{\circ}}{\cos(80)^{\circ}} + \cos 59^{\circ} \sec(59)^{\circ}$$

⇒ 1 + 1 = 2

2 B. Question

Simplify

$$\frac{\cos 80^{o}}{\sin 10^{o}} + \cos 59^{o} \operatorname{cosec} 31^{o}$$

Answer

$$\Rightarrow \frac{\cos 80^{\circ}}{\cos(90-10)^{\circ}} + \cos 59^{\circ} \sec(90-31)^{\circ}$$

$$\Rightarrow \frac{\cos 80^{\circ}}{\cos(80)^{\circ}} + \cos 59^{\circ} \sec(59)^{\circ}$$

⇒ 1 + 1 = 2

2 C. Question

Simplify

$$\frac{\sin 36^{o}}{\cos 54^{o}} - \frac{\tan 54^{o}}{\cot 36^{o}}$$

Answer

$$\Rightarrow \frac{\sin 36^{\circ}}{\sin(90-54)^{\circ}} - \frac{\tan 54^{\circ}}{\tan(90-36)^{\circ}}$$

$$\Rightarrow \frac{\sin 36^{\circ}}{\sin(36)^{\circ}} - \frac{\tan 54^{\circ}}{\tan(54)^{\circ}}$$

⇒ 1 – 1 = 0

2 C. Question

Simplify

$$\frac{\sin 36^{\circ}}{\cos 54^{\circ}} - \frac{\tan 54^{\circ}}{\cot 36^{\circ}}$$

Answer

$$\Rightarrow \frac{\sin 36^{\circ}}{\sin(90-54)^{\circ}} - \frac{\tan 54^{\circ}}{\tan(90-36)^{\circ}}$$

$$\Rightarrow \frac{\sin 36^{\circ}}{\sin(36)^{\circ}} - \frac{\tan 54^{\circ}}{\tan(54)^{\circ}}$$

$\Rightarrow 1 - 1 = 0$

2 D. Question

Simplify

$$3\frac{\tan 67^{\circ}}{\cot 23^{\circ}} + \frac{1}{2}\frac{\sin 42^{\circ}}{\cos 48^{\circ}} + \frac{5}{2}\frac{\operatorname{cosec} 61^{\circ}}{\sec 29^{\circ}}$$

Answer

$$\Rightarrow 3 \times \frac{\tan 67^{\circ}}{\tan(90-23)^{\circ}} + \frac{1}{2}\frac{\sin 42^{\circ}}{\sin(90-48)^{\circ}} + \frac{5}{2}\frac{\operatorname{cosec} 61^{\circ}}{\operatorname{cosec}(90-29)^{\circ}}$$

$$\Rightarrow 3 \times \frac{\tan 67^{\circ}}{\tan(67)^{\circ}} + \frac{1}{2}\frac{\sin 42^{\circ}}{\sin(42)^{\circ}} + \frac{5}{2}\frac{\operatorname{cosec} 61^{\circ}}{\operatorname{cosec}(61)^{\circ}}$$

$\Rightarrow (3\times1) + (1/2)\times1 + (5/2)\times1$

$\Rightarrow 3 + 3 = 6$

2 D. Question

Simplify

$$3\frac{\tan 67^{\circ}}{\cot 23^{\circ}} + \frac{1}{2}\frac{\sin 42^{\circ}}{\cos 48^{\circ}} + \frac{5}{2}\frac{\operatorname{cosec} 61^{\circ}}{\sec 29^{\circ}}$$

Answer

$$\Rightarrow 3 \times \frac{\tan 67^{\circ}}{\tan(90-23)^{\circ}} + \frac{1}{2}\frac{\sin 42^{\circ}}{\sin(90-48)^{\circ}} + \frac{5}{2}\frac{\operatorname{cosec} 61^{\circ}}{\operatorname{cosec}(90-29)^{\circ}}$$

$$\Rightarrow 3 \times \frac{\tan 67^{\circ}}{\tan(67)^{\circ}} + \frac{1}{2}\frac{\sin 42^{\circ}}{\sin(42)^{\circ}} + \frac{5}{2}\frac{\operatorname{cosec} 61^{\circ}}{\operatorname{cosec}(61)^{\circ}}$$

$\Rightarrow (3\times1) + (1/2)\times1 + (5/2)\times1$

$\Rightarrow 3 + 3 = 6$

2 E. Question

Simplify

$$\frac{\cos 37^{0}}{\sin 53^{0}} \times \frac{\sin 18^{0}}{\cos 72^{0}}$$

Answer

$$\Rightarrow \frac{\cos 37^{\circ}}{\cos(90-53)^{\circ}} \times \frac{\sin 18^{\circ}}{\sin(90-72)^{\circ}}$$

$$\Rightarrow \frac{\cos 37^{\circ}}{\cos(37)^{\circ}} \times \frac{\sin 18^{\circ}}{\sin(18)^{\circ}}$$

$\Rightarrow 1 \times 1 = 1$

2 E. Question

Simplify

$$\frac{\cos 37^{0}}{\sin 53^{0}} \times \frac{\sin 18^{0}}{\cos 72^{0}}$$

Answer

$$\Rightarrow \frac{\cos 37^{\circ}}{\cos(90-53)^{\circ}} \times \frac{\sin 18^{\circ}}{\sin(90-72)^{\circ}}$$

$$\Rightarrow \frac{\cos 37^{\circ}}{\cos(37)^{\circ}} \times \frac{\sin 18^{\circ}}{\sin(18)^{\circ}}$$

$\Rightarrow 1 \times 1 = 1$

2 F. Question

Simplify

$$2\frac{\sec(90^{0}-\theta)}{\operatorname{cos\,ec}\theta} + 7\frac{\cos(90^{0}-\theta)}{\sin\theta}$$

Answer

$$\Rightarrow 2 \times \frac{\operatorname{cosec}\theta}{\operatorname{cosec}\vartheta} + 7 \times \frac{\sin\vartheta}{\sin\vartheta}$$

$\Rightarrow 2 \times 1 + 7 \times 1$

$\Rightarrow 2 + 7 = 9$

2 F. Question

Simplify

$$2\frac{\sec(90^{0}-\theta)}{\operatorname{cos\,ec}\theta} + 7\frac{\cos(90^{0}-\theta)}{\sin\theta}$$

Answer

$\Rightarrow 2 \times \frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta} + 7 \times \frac{\sin\theta}{\sin\theta}$

$\Rightarrow 2 \times 1 + 7 \times 1$

$\Rightarrow 2 + 7 = 9$

2 G. Question

Simplify

$$\frac{\sec(90^{\circ} - \theta)}{\sin(90^{\circ} - \theta)} \times \frac{\cos\theta}{\tan(90^{\circ} - \theta)} - \sec\theta$$

Answer

$\Rightarrow \frac{\operatorname{cosec}\theta}{\cos\theta} \times \frac{\cos\theta}{\cot\theta} - \sec\theta$

$\Rightarrow \frac{\operatorname{cosec}\theta}{\cot\theta} - \sec\theta$

$\Rightarrow \frac{1}{\sin\theta} \times \frac{\sin\theta}{\cos\theta} - \sec\theta$

$\Rightarrow \frac{1}{\cos\theta} - \sec\theta$

$\Rightarrow \sec\theta - \sec\theta$

$\Rightarrow 0$

2 G. Question

Simplify

$$\frac{\sec(90^{\circ} - \theta)}{\sin(90^{\circ} - \theta)} \times \frac{\cos\theta}{\tan(90^{\circ} - \theta)} - \sec\theta$$

Answer

$\Rightarrow \frac{\operatorname{cosec}\theta}{\cos\theta} \times \frac{\cos\theta}{\cot\theta} - \sec\theta$

$\Rightarrow \frac{\operatorname{cosec}\theta}{\cot\theta} - \sec\theta$

$\Rightarrow \frac{1}{\sin\theta} \times \frac{\sin\theta}{\cos\theta} - \sec\theta$

$\Rightarrow \frac{1}{\cos\theta} - \sec\theta$

$\Rightarrow \sec\theta - \sec\theta$

$\Rightarrow 0$

2 H. Question

Simplify

$$\frac{\sin 35^\circ}{\cos 55^\circ}+\frac{\cos 55^\circ}{\sin 35^\circ}-2\cos^2 60^\circ$$

Answer

$$\Rightarrow \frac{\sin 35^\circ}{\sin(90-55)^\circ}+\frac{\cos 55^\circ}{\cos(90-35)^\circ}-2\left(\frac{1}{2}\right)^2$$

$$\Rightarrow \frac{\sin 35^\circ}{\sin(35)^\circ}+\frac{\cos 55^\circ}{\cos(55)^\circ}-2\times\frac{1}{4}$$

⇒ 1 + 1 –(1/2)

⇒ 3/2

2 H. Question

Simplify

$$\frac{\sin 35^\circ}{\cos 55^\circ}+\frac{\cos 55^\circ}{\sin 35^\circ}-2\cos^2 60^\circ$$

Answer

$$\Rightarrow \frac{\sin 35^\circ}{\sin(90-55)^\circ}+\frac{\cos 55^\circ}{\cos(90-35)^\circ}-2\left(\frac{1}{2}\right)^2$$

$$\Rightarrow \frac{\sin 35^\circ}{\sin(35)^\circ}+\frac{\cos 55^\circ}{\cos(55)^\circ}-2\times\frac{1}{4}$$

⇒ 1 + 1 –(1/2)

⇒ 3/2

2 I. Question

Simplify

cot12° cot38° cot52° cot60° cot78°.

Answer

⇒ cot 12° cot 38° tan (90–52)° tan (90–78)°

⇒ cot 12° cot 38° tan (38)° tan (12)°

⇒ cot 12° × 1 × tan (12)°

⇒ 1

2 I. Question

Simplify

cot12° cot38° cot52° cot60° cot78°.

Answer

⇒ cot 12° cot 38° tan (90–52)° tan (90–78)°

⇒ cot 12° cot 38° tan (38)° tan (12)°

⇒ cot 12° × 1 × tan (12)°

⇒ 1

3. Question

Find A if

(i) sin A = cos 30°

(ii) tan49° = cot A

(iii) tan A tan 35° = 1

(iv) sec 35° = cosec A

(v) cosec A cos 43° = 1

(vi) sin 20° tan A sec 70° = √3

Answer

(i) sin A = sin (90–30)°

⇒ sin A = sin 60°

⇒ A = 60

(ii) cot(90–49) = cot A

⇒ cot 41 = cot A

⇒ A = 41

(iii) tan A = 1/ tan35°

⇒ tan A = cot 35°

⇒ tan A = tan (90–35)

⇒ tan A = tan 55

⇒ A = 55

(iv)cosec(90–35) = cosec A

⇒ cosec 55 = cosec A

⇒ A = 55

(v) cosec A = 1/ cos 43°

⇒ cosec A = sec 43°

⇒ cosec A = cosec (90–43)

⇒ cosec A = cosec 47

⇒ A = 47

(vi) sin 20° tan A cosec(90–70) = √3

⇒ sin 20° tan A cosec 20° = √3

⇒ tan A = √3

⇒ tan A = tan 60°

⇒ A = 60°

3. Question

Find A if

(i) sin A = cos 30°

(ii) tan49° = cot A

(iii) tan A tan 35° = 1

(iv) sec 35° = cosec A

(v) cosec A cos 43° = 1

(vi) sin 20° tan A sec 70° = √3

Answer

(i) sin A = sin (90–30)°

⇒ sin A = sin 60°

⇒ A = 60

(ii) cot(90–49) = cot A

⇒ cot 41 = cot A

⇒ A = 41

(iii) tan A = 1/ tan35°

⇒ tan A = cot 35°

⇒ tan A = tan (90–35)

$\Rightarrow$ tan A = tan 55

$\Rightarrow$ A = 55

(iv)cosec(90–35) = cosec A

$\Rightarrow$ cosec 55 = cosec A

$\Rightarrow$ A = 55

(v) cosec A = 1/ cos 43°

$\Rightarrow$ cosec A = sec 43°

$\Rightarrow$ cosec A = cosec (90–43)

$\Rightarrow$ cosec A = cosec 47

$\Rightarrow$ A = 47

(vi) sin 20° tan A cosec(90–70) = $\sqrt{3}$

$\Rightarrow$ sin 20° tan A cosec 20° = $\sqrt{3}$

$\Rightarrow$ tan A = $\sqrt{3}$

$\Rightarrow$ tan A = tan 60°

$\Rightarrow$ A = 60°

4 A. Question

Show that

cos 48° – sin 42° = 0

Answer

Simplifying the left hand side:

$\Rightarrow$ cos 48° – cos(90–42)

$\Rightarrow$ cos 48° – cos(48)°

$\Rightarrow$ 0

Which is equal to right hand side.

Hence proved.

4 A. Question

Show that

cos 48° – sin 42° = 0

Answer

Simplifying the left hand side:

⇒ cos 48° – cos(90–42)

⇒ cos 48° – cos(48)°

⇒ 0

Which is equal to right hand side.

Hence proved.

4 B. Question

Show that

cos 20° cos 70° – sin 70° sin 20° = 0

Answer

Simplifying the left hand side:

⇒ cos 20° cos 70° – cos(90–70)° cos (90–20)°

⇒ cos 20° cos 70° – cos 20° cos 70°

⇒ 0

Which is equal to right hand side.

Hence proved.

4 B. Question

Show that

cos 20° cos 70° – sin 70° sin 20° = 0

Answer

Simplifying the left hand side:

⇒ cos 20° cos 70° – cos(90–70)° cos (90–20)°

⇒ cos 20° cos 70° – cos 20° cos 70°

⇒ 0

Which is equal to right hand side.

Hence proved.

4 C. Question

Show that

sin (90° – θ)tan θ = sin θ

Answer

Simplifying the left hand side:

⇒ cos θ tan θ

⇒ cos θ (sin θ/cos θ)

⇒ sin θ

Which is equal to right hand side.

Hence proved.

4 C. Question

Show that

sin (90° – θ)tan θ = sin θ

Answer

Simplifying the left hand side:

⇒ cos θ tan θ

⇒ cos θ (sin θ/cos θ)

⇒ sin θ

Which is equal to right hand side.

Hence proved.

4 D. Question

Show that

$$\frac{\cos(90^\circ - \theta)\tan(90^\circ - \theta)}{\cos\theta} = 1$$

Answer

Simplifying the left hand side:

$\Rightarrow \frac{\sin\theta \cot\theta}{\cos\theta}$

$\Rightarrow \frac{\sin\theta}{\cos\theta} \times \frac{\cos\theta}{\sin\theta}$

⇒ 1

Which is equal to right hand side.

Hence proved.

4 D. Question

Show that

$$\frac{\cos(90^\circ - \theta)\tan(90^\circ - \theta)}{\cos\theta} = 1$$

Answer

Simplifying the left hand side:

$$\Rightarrow \frac{\sin\theta \cot\theta}{\cos\theta}$$

$$\Rightarrow \frac{\sin\theta}{\cos\theta} \times \frac{\cos\theta}{\sin\theta}$$

$\Rightarrow 1$

Which is equal to right hand side.

Hence proved.

Exercise 2.3

1 A. Question

Find the value of the following.

sin 26^o

Answer

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
26°	**0.43837**										

From the table,

We have sin 26° = 0.43837 ≈ 0.4384

1 A. Question

Find the value of the following.

sin 26^o

Answer

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
26°	**0.43837**										

From the table,

We have sin 26° = 0.43837 ≈ 0.4384

1 B. Question

Find the value of the following.

cos 72°

Answer

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
72°	**0.3090**										

From the table,

We have cos 72° = 0.3090

1 B. Question

Find the value of the following.

cos 72°

Answer

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
72°	**0.3090**										

From the table,

We have cos 72° = 0.3090

1 C. Question

Find the value of the following.

tan35°

Answer

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
35°	**0.7002**										

From the table, we have

We have tan 35° = 0.7002

1 C. Question

Find the value of the following.

tan35$^{\text{o}}$

Answer

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
35°	**0.7002**										

From the table, we have

We have tan 35° = 0.7002

1 D. Question

Find the value of the following.

sin 75$^{\text{o}}$ 15’

Answer

We write sin 75° 15’ = sin 75° 12’ + 3’.

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
75°			**0.9668**								**2**

From the table, we have

Sin 75° 12’ = 0.9668

Mean difference for 3’ = 0.0002

<u>We know that mean difference is to be added in the case of sine.</u>

∴ sin75° 15’ = 0.9668 + 0.0002 = 0.9670

1 D. Question

Find the value of the following.

sin 75^{o} 15’

Answer

We write sin 75° 15’ = sin 75° 12’ + 3’.

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
75°			**0.9668**								**2**

From the table, we have

Sin 75° 12’ = 0.9668

Mean difference for 3’ = 0.0002

<u>We know that mean difference is to be added in the case of sine.</u>

∴ sin75° 15’ = 0.9668 + 0.0002 = 0.9670

1 E. Question

Find the value of the following.

sin 12° 12’

Answer

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
12°			**0.2113**								

From the table, we have

Sin 12° 12’ = 0.2113

1 E. Question

Find the value of the following.

sin 12° 12’

Answer

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
12°			**0.2113**								

From the table, we have

Sin 12° 12’ = 0.2113

1 F. Question

Find the value of the following.

cos 12^{o} 35’

Answer

We write cos 12° 35’ = cos 12° 30’ + 5’.

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
12°						**0.9763**					**3**

From the table, we have

cos 12° 30’ = 0.9763

Mean difference for 5’ = 0.0003

<u>We know that mean difference is to be subtracted in the case of cosine.</u>

∴ cos 12° 35’ = 0.9763 - 0.0003 = 0.9760

1 F. Question

Find the value of the following.

cos 12^{o} 35’

Answer

We write cos 12° 35’ = cos 12° 30’ + 5’.

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
12°						**0.9763**					**3**

From the table, we have

cos 12° 30’ = 0.9763

Mean difference for 5’ = 0.0003

<u>We know that mean difference is to be subtracted in the case of cosine.</u>

∴ cos 12° 35’ = 0.9763 - 0.0003 = 0.9760

1 G. Question

Find the value of the following.

cos 40° 20’

Answer

We write cos 40° 20’ = cos 40° 18’ + 2’.

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
40°				**0.7627**							**4**

From the table, we have

cos 40° 18’ = 0.7627

Mean difference for 2’ = 0.0004

<u>We know that mean difference is to be subtracted in the case of cosine.</u>

∴ cos 40° 20’ = 0.7627 - 0.0004 = 0.7623

1 G. Question

Find the value of the following.

cos 40° 20’

Answer

We write cos 40° 20’ = cos 40° 18’ + 2’.

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
40°				**0.7627**							**4**

From the table, we have

cos 40° 18’ = 0.7627

Mean difference for 2’ = 0.0004

<u>We know that mean difference is to be subtracted in the case of cosine.</u>

∴ cos 40° 20’ = 0.7627 - 0.0004 = 0.7623

1 H. Question

Find the value of the following.

tan 10° 26’

Answer

We write tan 10° 26’ = tan 10° 24’ + 2’.

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
10°					**0.1835**						**6**

From the table, we have

tan 10° 24’ = 0.1835

Mean difference for 2’ = 0.0006

<u>We know that mean difference is to be added in the case of tangent.</u>

∴ tan 10° 26’ = 0.1835 + 0.0006 = 0.1841

1 H. Question

Find the value of the following.

tan 10^{o} 26’

Answer

We write tan 10° 26’ = tan 10° 24’ + 2’.

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
10°					**0.1835**						**6**

From the table, we have

tan 10° 24’ = 0.1835

Mean difference for 2’ = 0.0006

<u>We know that mean difference is to be added in the case of tangent.</u>

∴ tan 10° 26’ = 0.1835 + 0.0006 = 0.1841

1 I. Question

Find the value of the following.

cot 20^{o}

Answer

The relevant part of the cotangent table is given below.

	0′	10′	20′	30′	40′	50′	60′
20°	**2.7475**						

From the table, we have

cot 20° = 2.7475

1 I. Question

Find the value of the following.

cot 20^{o}

Answer

The relevant part of the cotangent table is given below.

	0′	10′	20′	30′	40′	50′	60′
20°	**2.7475**						

From the table, we have

cot 20° = 2.7475

1 J. Question

Find the value of the following.

cot 40^{0} 20’

Answer

The relevant part of the cotangent table is given below.

	0′	10′	20′	30′	40′	50′	60′
40°			**1.17777**				

From the table, we have

cot 40° 20’ = 1.17777 ≈ 1.1778

1 J. Question

Find the value of the following.

cot 40^{0} 20’

Answer

The relevant part of the cotangent table is given below.

	0′	10′	20′	30′	40′	50′	60′
40°			**1.17777**				

From the table, we have

cot 40° 20’ = 1.17777 ≈ 1.1778

2. Question

Find the value of θ, if

(i) sinθ= 0.7009

(ii) cos θ = 0.9664

(iii) tan θ = 0.3679

(iv) cotθ = 0.2334

(v) tanθ = 63.6567

Answer

(i) From the sine table, we find 0.7009 is corresponding to sin 44° 30’.

⇒ sin 44° 30’ = 0.7009

∴ θ = 44° 30’

(ii) From the cosine table, we find 0.9664 is corresponding to cos 14° 54’.

⇒ cos 14° 54’ = 0.9664

∴ θ = 14° 54’

(iii) From the tangent table, we find 0.3679 is corresponding to tan 20° 12’.

⇒ tan 20° 12’ = 0.3679

∴ θ = 20° 12’

(iv) From the cotangent table, we find 0.2334 is corresponding to cot 76° 30’.

⇒ cot 76° 30’ = 0.2334

∴ θ = 76° 30’

(v) From the tangent table, we find 63.6567 is corresponding to tan 89° 6’.

⇒ tan 89° 6’ = 63.6567

∴ θ = 89° 6’

2. Question

Find the value of θ, if

(i) sinθ= 0.7009

(ii) cos θ = 0.9664

(iii) tan θ = 0.3679

(iv) cotθ = 0.2334

(v) tanθ = 63.6567

Answer

(i) From the sine table, we find 0.7009 is corresponding to sin 44° 30'.

⇒ sin 44° 30' = 0.7009

∴ θ = 44° 30'

(ii) From the cosine table, we find 0.9664 is corresponding to cos 14° 54'.

⇒ cos 14° 54' = 0.9664

∴ θ = 14° 54'

(iii) From the tangent table, we find 0.3679 is corresponding to tan 20° 12'.

⇒ tan 20° 12' = 0.3679

∴ θ = 20° 12'

(iv) From the cotangent table, we find 0.2334 is corresponding to cot 76° 30'.

⇒ cot 76° 30' = 0.2334

∴ θ = 76° 30'

(v) From the tangent table, we find 63.6567 is corresponding to tan 89° 6'.

⇒ tan 89° 6' = 63.6567

∴ θ = 89° 6'

3 A. Question

Simplify, using trigonometric tables

sin 30°30'+cos 40°20'

Answer

First consider sin 30° 30',

The relevant part of the sine table is given below.

	0'	6'	12'	18'	24'	30'	36'	42'	48'	54'	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
30°						**0.5075**					

From the table, we have

Sin 30° 30' = 0.5075

Then consider cos 40° 20',

We write cos 40° 20’ = cos 40° 18’ + 2’.

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
40°				**0.7627**							**4**

From the table, we have

cos 40° 18’ = 0.7627

Mean difference for 2’ = 0.0004

<u>We know that mean difference is to be subtracted in the case of cosine.</u>

∴ cos 40° 20’ = 0.7627 - 0.0004 = 0.7623

∴ sin 30° 30’ + cos 40° 20’ = 0.5075 + 0.7623 = 1.2698

3 A. Question

Simplify, using trigonometric tables

sin 30°30’+cos 40°20’

Answer

First consider sin 30° 30’,

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
30°						**0.5075**					

From the table, we have

Sin 30° 30’ = 0.5075

Then consider cos 40° 20’,

We write cos 40° 20’ = cos 40° 18’ + 2’.

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
40°				**0.7627**							**4**

From the table, we have

cos 40° 18’ = 0.7627

Mean difference for 2’ = 0.0004

We know that mean difference is to be subtracted in the case of cosine.

∴ cos 40° 20’ = 0.7627 - 0.0004 = 0.7623

∴ sin 30° 30’ + cos 40° 20’ = 0.5075 + 0.7623 = 1.2698

3 B. Question

Simplify, using trigonometric tables

tan 45° 27’ + sin 20°

Answer

First we consider tan 45° 27’.

We write tan 45° 27’ = tan 45° 24’ + 3’.

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
45°					**1.0141**						**18**

From the table, we have

tan 45° 24’ = 1.0141

Mean difference for 3’ = 0.0018

We know that mean difference is to be added in the case of tangent.

∴ tan 45° 27’ = 1.0141 + 0.0018 = 1.0159

Then, consider sin 20°,

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
20°	**0.3420**										

From the table, we have

Sin 20° = 0.3420

∴ tan 45° 27’ + sin 20° = 1.0159 + 0.3240 = 1.3399

3 B. Question

Simplify, using trigonometric tables

tan 45° 27’ + sin 20°

Answer

First we consider tan 45° 27’.

We write tan 45° 27’ = tan 45° 24’ + 3’.

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
45°					**1.0141**						**18**

From the table, we have

tan 45° 24’ = 1.0141

Mean difference for 3’ = 0.0018

<u>We know that mean difference is to be added in the case of tangent.</u>

∴ tan 45° 27’ = 1.0141 + 0.0018 = 1.0159

Then, consider sin 20°,

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
20°	**0.3420**										

From the table, we have

Sin 20° = 0.3420

∴ tan 45° 27’ + sin 20° = 1.0159 + 0.3240 = 1.3399

3 C. Question

Simplify, using trigonometric tables

tan 63°12’ – cos 12°42’

Answer

First we consider tan 63° 12’,

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
63°			**1.9797**								

From the table, we have

tan 63° 12’ = 1.9797

Then consider cos 12° 42’,

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
12°								**0.9755**			

From the table, we have

cos 12° 42’ = 0.9755

∴ tan 63° 12’ – cos 12° 42’ = 1.9797 – 0.9755 = 1.0042

3 C. Question

Simplify, using trigonometric tables

tan 63°12’ – cos 12°42’

Answer

First we consider tan 63° 12’,

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
63°			**1.9797**								

From the table, we have

tan 63° 12’ = 1.9797

Then consider cos 12° 42’,

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
12°								**0.9755**			

From the table, we have

cos 12° 42’ = 0.9755

∴ tan 63° 12’ – cos 12° 42’ = 1.9797 – 0.9755 = 1.0042

3 D. Question

Simplify, using trigonometric tables

sin 50° 26’ + cos 18° + tan 70° 12’

Answer

First, we consider sin 50° 26’,

We write sin 50° 26’ = sin 50° 24’ + 2’.

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference				
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1	2	3	4	5
50°					**0.7705**							**4**			

From the table, we have

Sin 50° 24’ = 0.7705

Mean difference for 2’ = 0.0004

<u>We know that mean difference is to be added in the case of sine.</u>

∴ sin50° 26’ = 0.7705 + 0.0004 = 0.7709

Now consider cos 18°,

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
18°	**0.9511**										

From the table, we have

cos 18° = 0.9511

Then consider tan 70° 12’,

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
70°			**2.7776**								

From the table, we have

tan 70° 12’ = 2.7776

∴ sin 50° 26’ + cos 18° + tan 70° 12’ = 0.7709 + 0.9511 + 2.7776 = 4.4996

3 D. Question

Simplify, using trigonometric tables

sin 50° 26’ + cos 18° + tan 70° 12’

Answer

First, we consider sin 50° 26’,

We write sin 50° 26’ = sin 50° 24’ + 2’.

The relevant part of the sine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
50°					**0.7705**						**4**

From the table, we have

Sin 50° 24’ = 0.7705

Mean difference for 2’ = 0.0004

<u>We know that mean difference is to be added in the case of sine.</u>

∴ sin50° 26’ = 0.7705 + 0.0004 = 0.7709

Now consider cos 18°,

The relevant part of the cosine table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
18°	**0.9511**										

From the table, we have

cos 18° = 0.9511

Then consider tan 70° 12’,

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
70°			**2.7776**								

From the table, we have

tan 70° 12’ = 2.7776

∴ sin 50° 26’ + cos 18° + tan 70° 12’ = 0.7709 + 0.9511 + 2.7776 = 4.4996

3 E. Question

Simplify, using trigonometric tables

tan 72° + cot 30°

Answer

First we consider tan 72°,

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
72°	**3.0777**										

From the table, we have

tan 72° = 3.0777

Then consider cot 30°,

The relevant part of the cotangent table is given below.

	0′	10′	20′	30′	40′	50′	60′
30°	**1.73205**						

From the table, we have

cot 30° = 1.73205

∴ tan 72° + cot 30° = 3.0777 + 1.73205 = 4.80975 ≈ 4.8098

3 E. Question

Simplify, using trigonometric tables

tan 72° + cot 30°

Answer

First we consider tan 72°,

The relevant part of the tangent table is given below.

	0′	6′	12′	18′	24′	30′	36′	42′	48′	54′	Mean Difference
	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°	1 2 3 4 5
72°	**3.0777**										

From the table, we have

tan 72° = 3.0777

Then consider cot 30°,

The relevant part of the cotangent table is given below.

	0′	10′	20′	30′	40′	50′	60′
30°	**1.73205**						

From the table, we have

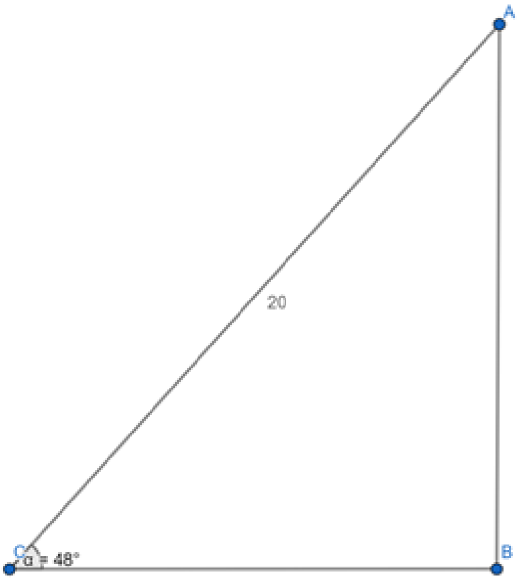
cot 30° = 1.73205

∴ tan 72° + cot 30° = 3.0777 + 1.73205 = 4.80975 ≈ 4.8098

4. Question

Find the area of the right triangle with hypotenuse 20cm and one of the acute angle is 48°

Answer



From the above figure,

$\Rightarrow \sin\theta = \frac{AB}{AC}$

$\Rightarrow \sin 48° = \frac{AB}{20}$

From the sine table, sin 48° = 0.7431.

$\therefore 0.7431 = \frac{AB}{20}$

∴ AB = 0.7431 × 20 = 14.862 cm

Then $\cos\theta = \frac{BC}{AC}$

$\Rightarrow \cos 48° = \frac{BC}{20}$

From the cosine table, cos 48° = 0.6691

$\therefore 0.6691 = \frac{BC}{20}$

∴ BC = 0.6691 × 20 = 13.382 cm

<u>We know that Area of right angled triangle = 1/2 bh.</u>

∴ Area of ΔABC = 1/2 × 13.382 × 14.862

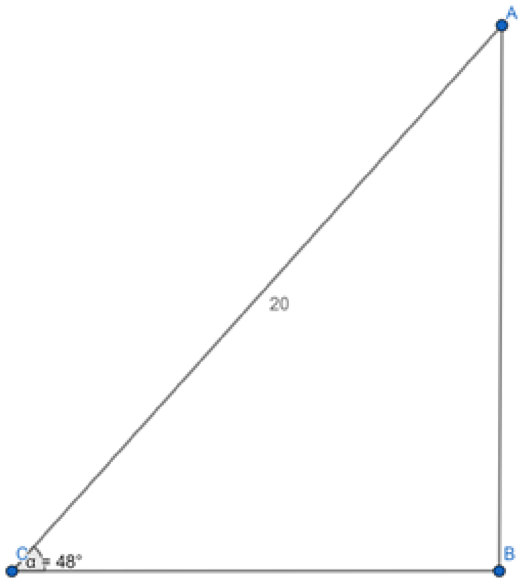
= 99.441642

∴ Area of the triangle is 99.441 cm^2.

4. Question

Find the area of the right triangle with hypotenuse 20cm and one of the acute angle is 48°

Answer



From the above figure,

$\Rightarrow \sin\theta = \frac{AB}{AC}$

$\Rightarrow \sin 48° = \frac{AB}{20}$

From the sine table, sin 48° = 0.7431.

$\therefore 0.7431 = \frac{AB}{20}$

∴ AB = 0.7431 × 20 = 14.862 cm

Then $\cos\theta = \frac{BC}{AC}$

$\Rightarrow \cos 48° = \frac{BC}{20}$

From the cosine table, cos 48° = 0.6691

$\therefore 0.6691 = \frac{BC}{20}$

∴ BC = 0.6691 × 20 = 13.382 cm

<u>We know that Area of right angled triangle = 1/2 bh.</u>

∴ Area of ΔABC = 1/2 × 13.382 × 14.862

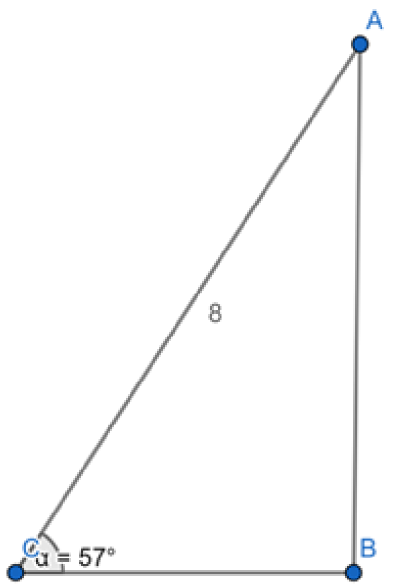
= 99.441642

∴ Area of the triangle is 99.441 cm^2.

5. Question

Find the area of the triangle with hypotenuse 8cm and one of the acute angle is 57°

Answer



From the above figure,

$\Rightarrow \sin\theta = \frac{AB}{AC}$

$\Rightarrow \sin 57° = \frac{AB}{8}$

From the sine table, sin 57° = 0.8387.

$\therefore 0.8387 = \frac{AB}{8}$

∴ AB = 0.8387 × 8 = 6.7096 cm

Then $\cos\theta = \frac{BC}{AC}$

$\Rightarrow \cos 57° = \frac{BC}{8}$

From the cosine table, cos 57° = 0.5446

$\therefore 0.5446 = \frac{BC}{8}$

∴ BC = 0.5446 × 8 = 4.3568 cm

We know that Area of right angled triangle = 1/2 bh.

∴ Area of ΔABC = 1/2 × 4.3568 × 6.7096

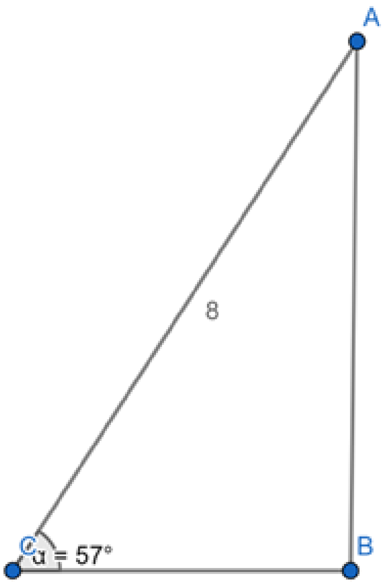
= 14.616192

∴ Area of the triangle is 14.62 cm^2 (Approximately).

5. Question

Find the area of the triangle with hypotenuse 8cm and one of the acute angle is 57°

Answer



From the above figure,

$\Rightarrow \sin\theta = \frac{AB}{AC}$

$\Rightarrow \sin 57° = \frac{AB}{8}$

From the sine table, sin 57° = 0.8387.

$\therefore 0.8387 = \frac{AB}{8}$

∴ AB = 0.8387 × 8 = 6.7096 cm

Then $\cos\theta = \frac{BC}{AC}$

$\Rightarrow \cos 57° = \frac{BC}{8}$

From the cosine table, cos 57° = 0.5446

$\therefore 0.5446 = \frac{BC}{8}$

∴ BC = 0.5446 × 8 = 4.3568 cm

We know that Area of right angled triangle = 1/2 bh.

∴ Area of ΔABC = 1/2 × 4.3568 × 6.7096

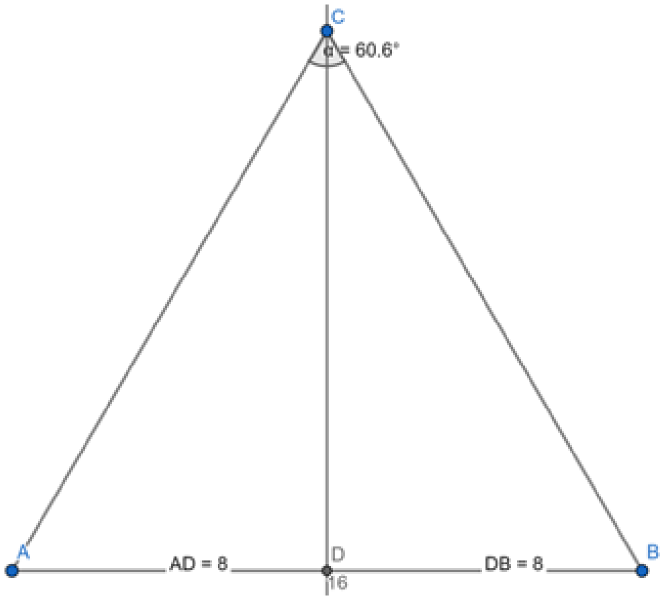
= 14.616192

∴ Area of the triangle is 14.62 cm^2 (Approximately).

6. Question

Find the area of isosceles triangle with base 16cm and vertical angle 60° 40’

Answer



Draw CD perpendicular to AB.

∴ D is the midpoint of AB and ∠ACB = 60° 40’

Then ∠ACD = $\frac{60°40'}{2}$ = 30° 20’ = ∠BCD

In right angled triangle ACD,

⇒ tan 30° 20’ = $\frac{AD}{CD}$

⇒ tan 30° 20’ = $\frac{8}{CD}$

From tangent table, tan 30° 18’ = 0.5844 and Mean difference of 2’ = 0.0008.

∴ tan 30° 20’ = 0.5844 + 0.0008 = 0.5852

⇒ CD = 8 ÷ 0.5852 = 13.672 cm

<u>We know that Area of right angled triangle = 1/2 bh.</u>

⇒ Area of ΔACD = 1/2 × 8 × 13.672 = 54.688 cm^2

Since ΔABC is isosceles, area of ΔACD = area of ΔBCD = 54.688 cm^2.

∴ Area of ΔABC = Area of (ΔACD + ΔBCD)

= 54.688 + 54.688

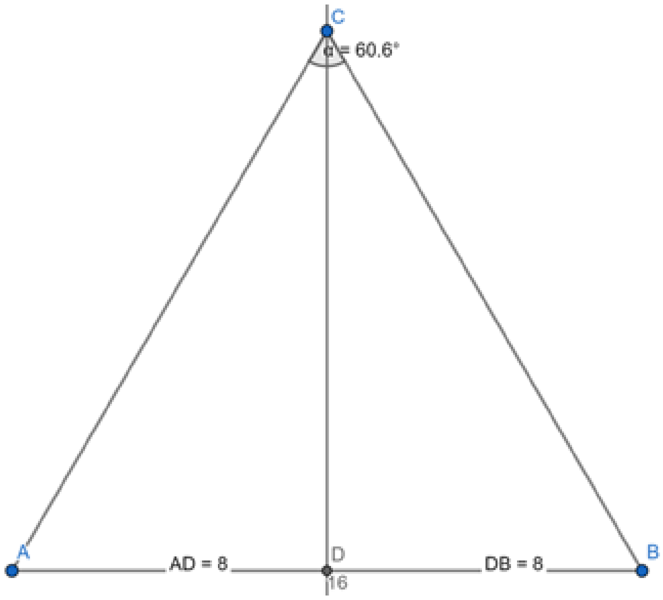
= 109.376 cm^2

∴ The area of given isosceles triangle = 109.376 cm^2.

6. Question

Find the area of isosceles triangle with base 16cm and vertical angle 60° 40’

Answer



Draw CD perpendicular to AB.

∴ D is the midpoint of AB and ∠ACB = 60° 40’

Then ∠ACD = $\frac{60°40'}{2}$ = 30° 20’ = ∠BCD

In right angled triangle ACD,

⇒ tan 30° 20’ = $\frac{AD}{CD}$

⇒ tan 30° 20’ = $\frac{8}{CD}$

From tangent table, tan 30° 18’ = 0.5844 and Mean difference of 2’ = 0.0008.

∴ tan 30° 20’ = 0.5844 + 0.0008 = 0.5852

⇒ CD = 8 ÷ 0.5852 = 13.672 cm

We know that Area of right angled triangle = 1/2 bh.

⇒ Area of ΔACD = 1/2 × 8 × 13.672 = 54.688 cm^2

Since ΔABC is isosceles, area of ΔACD = area of ΔBCD = 54.688 cm^2.

∴ Area of ΔABC = Area of (ΔACD + ΔBCD)

= 54.688 + 54.688

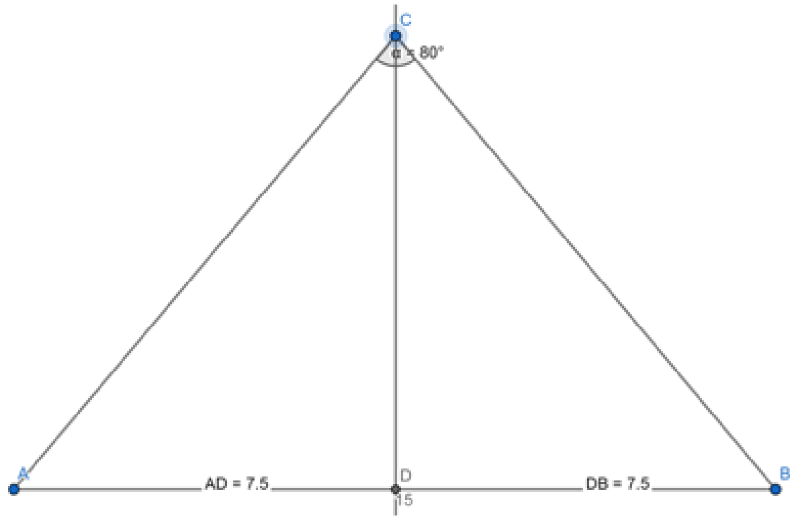
= 109.376 cm^2

∴ The area of given isosceles triangle = 109.376 cm^2.

7. Question

Find the area of isosceles triangle with base 15cm and vertical angle 80°

Answer



Draw CD perpendicular to AB.

∴ D is the midpoint of AB and ∠ACB = 80°

Then ∠ACD = $\frac{80°}{2}$ = 40° = ∠BCD

In right angled triangle ACD,

⇒ tan 40° = $\frac{AD}{CD}$

⇒ tan 40° = $\frac{7.5}{CD}$

From tangent table, tan 40° = 0.8391.

⇒ CD = 7.5 ÷ 0.8391 = 8.938 cm

<u>We know that Area of right angled triangle = 1/2 bh.</u>

⇒ Area of ΔACD = 1/2 × 7.5 × 8.938 = 33.5175 cm^2

Since ΔABC is isosceles, area of ΔACD = area of ΔBCD = 33.5175 cm^2.

∴ Area of ΔABC = Area of (ΔACD + ΔBCD)

= 33.5175 + 33.5715

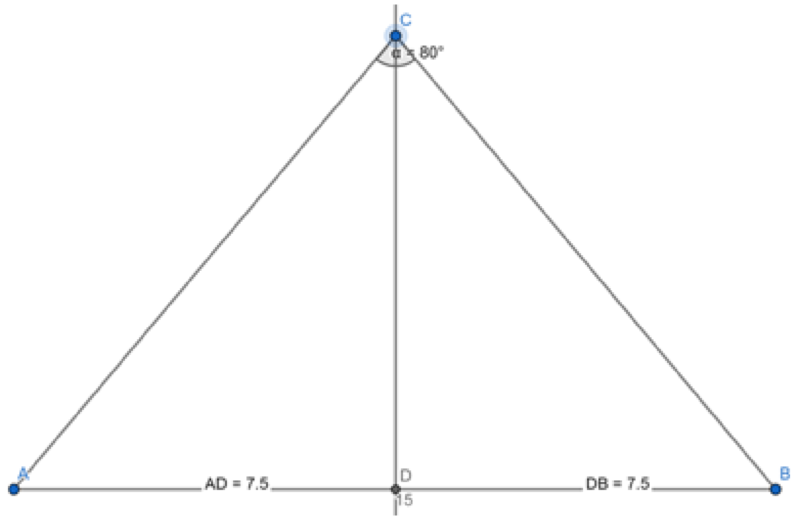
= 67.035 cm^2

∴ The area of given isosceles triangle = 67.035 cm^2.

7. Question

Find the area of isosceles triangle with base 15cm and vertical angle 80°

Answer



Draw CD perpendicular to AB.

∴ D is the midpoint of AB and ∠ACB = 80°

Then $\angle ACD = \frac{80^\circ}{2} = 40^\circ = \angle BCD$

In right angled triangle ACD,

$\Rightarrow \tan 40^\circ = \frac{AD}{CD}$

$\Rightarrow \tan 40^\circ = \frac{7.5}{CD}$

From tangent table, tan 40° = 0.8391.

⇒ CD = 7.5 ÷ 0.8391 = 8.938 cm

<u>We know that Area of right angled triangle = 1/2 bh.</u>

⇒ Area of ΔACD = 1/2 × 7.5 × 8.938 = 33.5175 cm^2

Since ΔABC is isosceles, area of ΔACD = area of ΔBCD = 33.5175 cm^2.

∴ Area of ΔABC = Area of (ΔACD + ΔBCD)

= 33.5175 + 33.5715

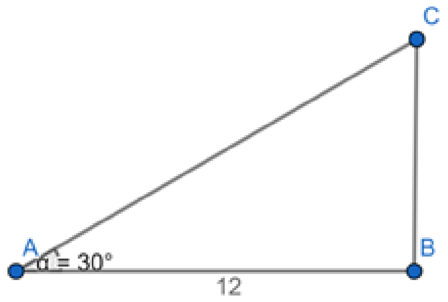
= 67.035 cm^2

∴ The area of given isosceles triangle = 67.035 cm^2.

8. Question

A ladder makes an angle 30° with the floor and its lower end is 12m away from the wall. Find the length of the ladder.

Answer



Let AC be the length of the ladder.

AB is the distance between the foot of the ladder and the wall = 12m

In ΔABC,

$\Rightarrow \cos 30° = \frac{AB}{AC}$

$\Rightarrow \cos 30° = \frac{12}{AC}$

From cosine table, cos 30° = 0.8660

$\Rightarrow 0.8660 = \frac{12}{AC}$

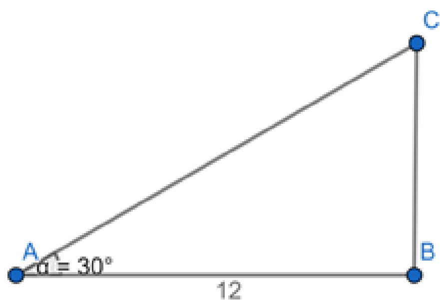
$\Rightarrow AC = \frac{12}{0.8660} = 13.856$ m

∴ The length of the ladder is 13.856 m.

8. Question

A ladder makes an angle 30° with the floor and its lower end is 12m away from the wall. Find the length of the ladder.

Answer



Let AC be the length of the ladder.

AB is the distance between the foot of the ladder and the wall = 12m

In ΔABC,

$\Rightarrow \cos 30° = \frac{AB}{AC}$

$\Rightarrow \cos 30° = \frac{12}{AC}$

From cosine table, cos 30° = 0.8660

$\Rightarrow 0.8660 = \frac{12}{AC}$

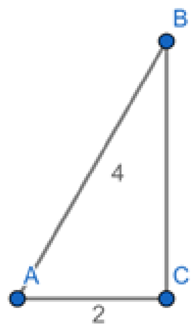
$\Rightarrow AC = \frac{12}{0.8660} = 13.856$ m

∴ The length of the ladder is 13.856 m.

9. Question

Find the angle made by a ladder of length 4m with the ground if its one end is 2m away from the wall and the other end is on the wall.

Answer



Let θ be the angle made by the ladder with the ground.

AB is the length of the ladder = 4m

AC is the distance between end of ladder and the wall = 2m

In ΔABC,

$\Rightarrow \cos\theta = \frac{AC}{AB}$

$\Rightarrow \cos\theta = \frac{2}{4} = 1/2 = 0.5$

From cosine table, we find 0.5 is corresponding to cos 60°.

$\Rightarrow \cos\theta = \cos 60°$

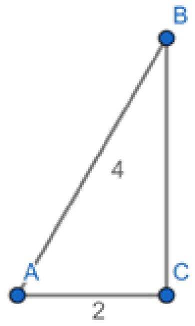
∴ θ = 60°

∴ The angle made by the ladder with the ground is 60°.

9. Question

Find the angle made by a ladder of length 4m with the ground if its one end is 2m away from the wall and the other end is on the wall.

Answer



Let θ be the angle made by the ladder with the ground.

AB is the length of the ladder = 4m

AC is the distance between end of ladder and the wall = 2m

In ΔABC,

$\Rightarrow \cos\theta = \frac{AC}{AB}$

$\Rightarrow \cos\theta = \frac{2}{4} = 1/2 = 0.5$

From cosine table, we find 0.5 is corresponding to cos 60°.

$\Rightarrow \cos\theta = \cos 60°$

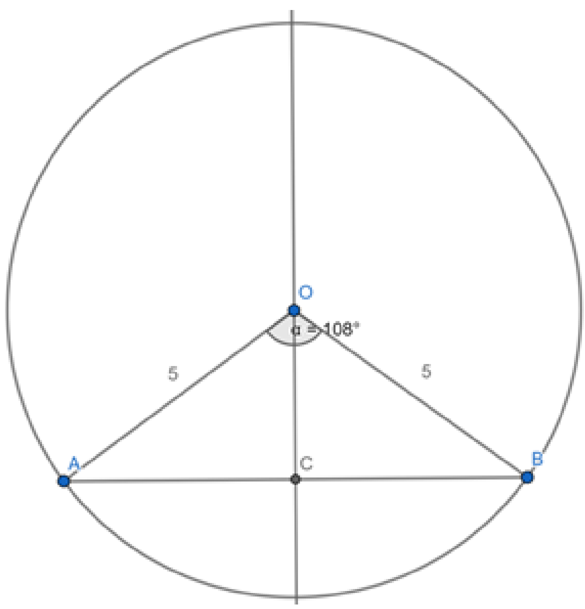
$\therefore \theta = 60°$

∴ The angle made by the ladder with the ground is 60°.

10. Question

Find the length of the chord of a circle of radius 5cm subtending an angle of 108° at the centre.

Answer



Let AB be the chord of a circle of radius 5 cm with O as centre.

Draw OC perpendicular to AB.

∴ C is the midpoint of AB and ∠AOB = 108°

Then ∠AOC = $\frac{108°}{2}$ = 54°

In right angled triangle OCA,

⇒ sin 54° = $\frac{AC}{OA}$

⇒ sin 54° = $\frac{AC}{5}$

⇒ AC = sin 54° × 5

= 0.8090 × 5

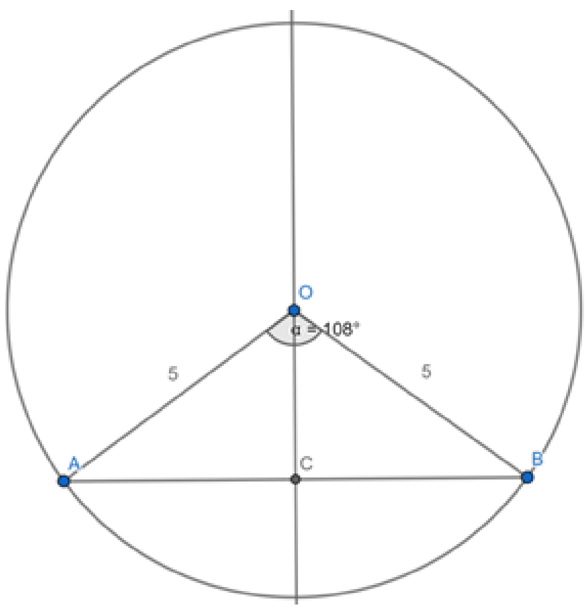
= 4.045 cm

∴ Length of the chord AB = AC × 2 = 4.045 × 2 = 8.90 cm

10. Question

Find the length of the chord of a circle of radius 5cm subtending an angle of 108° at the centre.

Answer



Let AB be the chord of a circle of radius 5 cm with O as centre.

Draw OC perpendicular to AB.

∴ C is the midpoint of AB and ∠AOB = 108°

Then ∠AOC = $\frac{108°}{2}$ = 54°

In right angled triangle OCA,

$\Rightarrow \sin 54° = \frac{AC}{OA}$

$\Rightarrow \sin 54° = \frac{AC}{5}$

$\Rightarrow AC = \sin 54° \times 5$

$= 0.8090 \times 5$

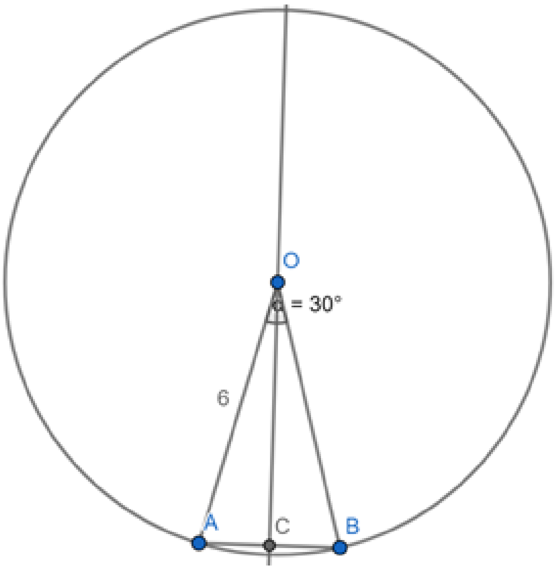
$= 4.045$ cm

$\therefore$ Length of the chord AB = AC × 2 = 4.045 × 2 = 8.90 cm

11. Question

Find the length of the side of regular polygon of 12 sides inscribed in a circle of radius 6cm.

Answer



Let AB be a side of the regular polygon with 12 sides in the circle of radius 6 cm.

If O is a centre of the circle, then $\angle AOB = \frac{360°}{12} = 30°$

Draw OC perpendicular to AB.

Then $\angle AOC = \frac{30°}{2} = 15°$

$\Rightarrow \sin 15° = \frac{AC}{OA} = \frac{AC}{6}$

$\Rightarrow 0.2588 = \frac{AC}{6}$

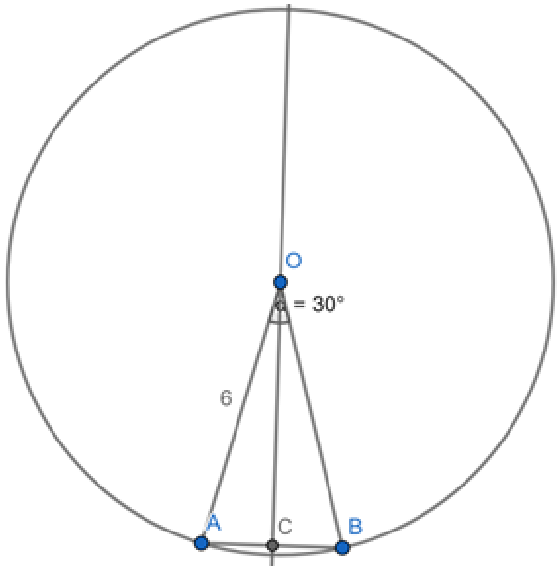
$\Rightarrow AC = 0.2588 \times 6 = 1.5528$

$\therefore$ Length of the side AB = 2 × AC = 2 × 1.5528 = 3.1056 cm

11. Question

Find the length of the side of regular polygon of 12 sides inscribed in a circle of radius 6cm.

Answer



Let AB be a side of the regular polygon with 12 sides in the circle of radius 6 cm.

If O is a centre of the circle, then $\angle AOB = \frac{360^\circ}{12} = 30^\circ$

Draw OC perpendicular to AB.

Then $\angle AOC = \frac{30^\circ}{2} = 15^\circ$

$\Rightarrow \sin 15^\circ = \frac{AC}{OA} = \frac{AC}{6}$

$\Rightarrow 0.2588 = \frac{AC}{6}$

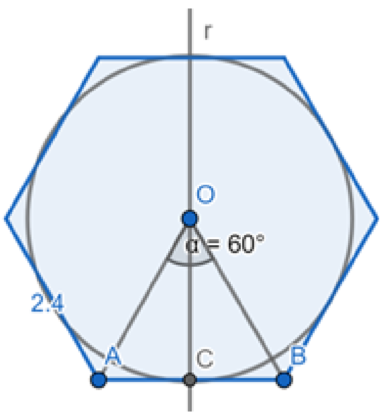
$\Rightarrow AC = 0.2588 \times 6 = 1.5528$

∴ Length of the side AB = 2 × AC = 2 × 1.5528 = 3.1056 cm

12. Question

Find the radius of the incircle of a regular hexagon of side 24cm.

Answer



Let AB be the side of the regular hexagon and let O be the centre of the incircle.

Draw OC perpendicular to AB.

If r is the radius of the circle, then OC = r.

We know that total sum of angles of a regular polygon = 360°

So, $\angle AOB = \frac{360°}{6} = 60°$

$\therefore \angle AOC = \frac{60°}{2} = 30°$

$\Rightarrow \tan 30° = \frac{AC}{r}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{12}{r}$

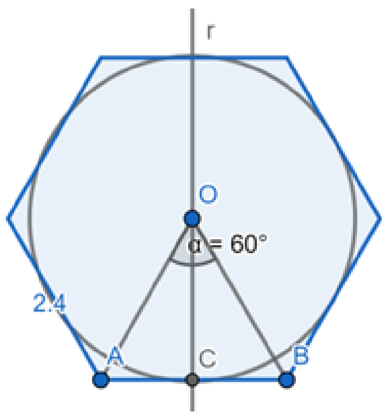
$\Rightarrow r = 12 \times 1.732 = 20.784$ cm

Hence, radius of incircle is 20.784 cm.

12. Question

Find the radius of the incircle of a regular hexagon of side 24cm.

Answer



Let AB be the side of the regular hexagon and let O be the centre of the incircle.

Draw OC perpendicular to AB.

If r is the radius of the circle, then OC = r.

We know that total sum of angles of a regular polygon = 360°

So, $\angle AOB = \frac{360°}{6} = 60°$

$\therefore \angle AOC = \frac{60°}{2} = 30°$

$\Rightarrow \tan 30° = \frac{AC}{r}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{12}{r}$

$\Rightarrow$ r = 12 × 1.732 = 20.784 cm

Hence, radius of incircle is 20.784 cm.

Exercise 2.4

1. Question

The value of $\sin^2 60° + \cos^2 60°$ is equal to

A. $\sin^2 45° + \cos^2 45°$

B. $\tan^2 45° + \cot^2 45°$

C. $\sec^2 90°$

D. 0

Answer

We know,

$$\sin 60^0 = \frac{\sqrt{3}}{2}$$

$$\cos 60° = \frac{1}{2}$$

$$\therefore \sin^2 60° + \cos^2 60° = \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2$$

$$= \frac{3}{4} + \frac{1}{4}$$

$$= \frac{3 + 1}{4}$$

$$\Rightarrow \sin^2 60° + \cos^2 60° = 1.$$

Comparing the above result with the given options, we find that

A. is the correct option because,

$$\sin^2 45° + \cos^2 45° = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} + \frac{1}{2}$$

$$\Rightarrow \sin^2 45° + \cos^2 45° = 1 = \sin^2 60° + \cos^2 60°$$

B. is incorrect because,

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

$\Rightarrow \tan^2 45° + \cot^2 45° = 2 \neq \sin^2 60° + \cos^2 60°$

C. is incorrect because,

$\sec^2 90°$ is not defined.

$\Rightarrow \sec^2 90° \neq \sin^2 60° + \cos^2 60°$

D. is incorrect because, $0 \neq \sin^2 60° + \cos^2 60°$

1. Question

The value of $\sin^2 60° + \cos^2 60°$ is equal to

A. $\sin^2 45° + \cos^2 45°$

B. $\tan^2 45° + \cot^2 45°$

C. $\sec^2 90°$

D. 0

Answer

We know,

$$\sin 60^0 = \frac{\sqrt{3}}{2}$$

$$\cos 60° = \frac{1}{2}$$

$$\therefore \sin^2 60° + \cos^2 60° = \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2$$

$$= \frac{3}{4} + \frac{1}{4}$$

$$= \frac{3 + 1}{4}$$

$\Rightarrow \sin^2 60° + \cos^2 60° = 1.$

Comparing the above result with the given options, we find that

A. is the correct option because,

$$\sin^2 45° + \cos^2 45° = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} + \frac{1}{2}$$

$\Rightarrow \sin^2 45° + \cos^2 45° = 1 = \sin^2 60° + \cos^2 60°$

B. is incorrect because,

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

$\Rightarrow \tan^2 45° + \cot^2 45° = 2 \neq \sin^2 60° + \cos^2 60°$

C. is incorrect because,

$\sec^2 90°$ is not defined.

$\Rightarrow \sec^2 90° \neq \sin^2 60° + \cos^2 60°$

D. is incorrect because, $0 \neq \sin^2 60° + \cos^2 60°$

2. Question

If x = $\frac{2\tan 30^0}{1-\tan^2 30^0}$, then the value of x is

A. tan 45°

B. tan 30°

C. tan 60°

D. tan 90°

Answer

Using $\tan 30° = \frac{1}{\sqrt{3}}$ in the given expression,

$$\frac{2\tan 30°}{1-\tan^2 30°} = \frac{2 \times \frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}}$$

$$\Rightarrow \frac{2\tan 30°}{1-\tan^2 30°} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}} = \frac{2}{\sqrt{3}} \times \frac{3}{2} = \sqrt{3}$$

Comparing the above results with the given options, we find that

A. is incorrect because, $\tan 45° = 1$

B. is incorrect because, $\tan 30° = \frac{1}{\sqrt{3}}$

C. is the correct option because, $\tan 60° = \sqrt{3}$

D. is incorrect because, $\tan 90° = \text{not defined}$

2. Question

If x = $\frac{2\tan 30^0}{1-\tan^2 30^0}$, then the value of x is

A. tan 45°

B. tan 30°

C. tan 60°

D. tan 90°

Answer

Using $\tan 30° = \frac{1}{\sqrt{3}}$ in the given expression,

$$\frac{2\tan 30°}{1-\tan^2 30°} = \frac{2\times\frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}}$$

$$\Rightarrow \frac{2\tan 30°}{1-\tan^2 30°} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}} = \frac{2}{\sqrt{3}}\times\frac{3}{2} = \sqrt{3}$$

Comparing the above results with the given options, we find that

A. is incorrect because, $\tan 45° = 1$

B. is incorrect because, $\tan 30° = \frac{1}{\sqrt{3}}$

C. is the correct option because, $\tan 60° = \sqrt{3}$

D. is incorrect because, $\tan 90° = \text{not defined}$

3. Question

The value of $\sec^2 45° - \tan^2 45°$ is equal to

A. $\sin^2 60° - \cos^2 60°$

B. $\sin^2 45° + \cos^2 60$

C. $\sec^2 60° - \tan^2 60°$

D. 0

Answer

We know, $\sec 45° = \sqrt{2}$, $\tan 45° = 1$

$$\therefore \sec^2 45° - \tan^2 45° = \left(\sqrt{2}\right)^2 - (1)^2 = 2 - 1$$

$$\Rightarrow \sec^2 45° - \tan^2 45° = 1.$$

Comparing the above result with the given options, we find that

A. is incorrect because,

$$\sin^2 60° - \cos^2 60° = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{3}{4} - \frac{1}{4}$$

$$\Rightarrow \sin^2 60° - \cos^2 60° = \frac{1}{2} \neq \sec^2 45° - \tan^2 45°$$

B. is incorrect because,

$$\sin^2 45° + \cos^2 60° = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{1}{2} + \frac{1}{4}$$

$$\Rightarrow \sin^2 45° - \cos^2 60° = \frac{3}{4} \neq \sec^2 45° - \tan^2 45°$$

C. is the correct option because,

$$\sec^2 60° - \tan^2 60° = (2)^2 - \left(\sqrt{3}\right)^2 = 4 - 3$$

$$\Rightarrow \sec^2 60° - \tan^2 60° = 1 = \sec^2 45° - \tan^2 45°$$

D. is incorrect because,

$$0 \neq \sec^2 45° - \tan^2 45^c$$

3. Question

The value of $\sec^2 45° – \tan^2 45°$ is equal to

A. $\sin^2 60° – \cos^2 60°$

B. $\sin^2 45° + \cos^2 60$

C. $\sec^2 60° - \tan^2 60°$

D. 0

Answer

We know, $\sec 45° = \sqrt{2}, \tan 45° = 1$

$$\therefore \sec^2 45° - \tan^2 45° = \left(\sqrt{2}\right)^2 - (1)^2 = 2 - 1$$

$$\Rightarrow \sec^2 45° - \tan^2 45° = 1.$$

Comparing the above result with the given options, we find that

A. is incorrect because,

$$\sin^2 60° - \cos^2 60° = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{3}{4} - \frac{1}{4}$$

$\Rightarrow \sin^2 60° - \cos^2 60° = \frac{1}{2} \neq \sec^2 45° - \tan^2 45°$

B. is incorrect because,

$$\sin^2 45° + \cos^2 60° = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{1}{2} + \frac{1}{4}$$

$\Rightarrow \sin^2 45° - \cos^2 60° = \frac{3}{4} \neq \sec^2 45° - \tan^2 45°$

C. is the correct option because,

$$\sec^2 60° - \tan^2 60° = (2)^2 - \left(\sqrt{3}\right)^2 = 4 - 3$$

$\Rightarrow \sec^2 60° - \tan^2 60° = 1 = \sec^2 45° - \tan^2 45°$

D. is incorrect because,

$0 \neq \sec^2 45° - \tan^2 45^c$

4. Question

The value of 2sin30° cos30° is equal to

A. tan 30°

B. cos 60°

C. sin 60°

D. cot 60°

Answer

We know, $\sin 30° = \frac{1}{2}, \cos 30° = \frac{\sqrt{3}}{2}$

$\therefore 2 \sin 30° \cos 30° = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow 2 \sin 30° \cos 30° = \frac{\sqrt{3}}{2}$

Comparing the above result with the given options, we find that

A. is incorrect because, $\tan 30° = \frac{1}{\sqrt{3}} \neq 2 \sin 30° \cos 30°$

B. is incorrect because, $\cos 60° = \frac{1}{2} \neq 2 \sin 30° \cos 30°$

C. is the correct option because, $\sin 60° = \frac{\sqrt{3}}{2} = 2 \sin 30° \cos 30°$

D. is incorrect because, $\cot 60° = \frac{1}{\sqrt{3}} \neq 2 \sin 30° \cos 30°$

4. Question

The value of 2sin30° cos30° is equal to

A. tan 30°

B. cos 60°

C. sin 60°

D. cot 60°

Answer

We know, $\sin 30° = \frac{1}{2}$, $\cos 30° = \frac{\sqrt{3}}{2}$

$\therefore 2\sin 30° \cos 30° = 2 \times \frac{1}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow 2\sin 30° \cos 30° = \frac{\sqrt{3}}{2}$

Comparing the above result with the given options, we find that

A. is incorrect because, $\tan 30° = \frac{1}{\sqrt{3}} \neq 2\sin 30° \cos 30°$

B. is incorrect because, $\cos 60° = \frac{1}{2} \neq 2\sin 30° \cos 30°$

C. is the correct option because, $\sin 60° = \frac{\sqrt{3}}{2} = 2\sin 30° \cos 30°$

D. is incorrect because, $\cot 60° = \frac{1}{\sqrt{3}} \neq 2\sin 30° \cos 30°$

5. Question

The value of $\text{cosec}^2\ 60° - 1$ is equal to

A. $\cos^2 60°$

B. $\cot^2 60°$

C. $\sec^2 60°$

D. $\tan^2 60°$

Answer

We know, $\text{cosec}\ 60° = \frac{2}{\sqrt{3}}$

$\therefore \text{cosec}^2 60° - 1 = \left(\frac{2}{\sqrt{3}}\right)^2 - 1 = \frac{4}{3} - 1$

$\Rightarrow \text{cosec}^2 60° - 1 = \frac{1}{3}$

Comparing the above result with the given options, we find that

A. is incorrect because, $\cos^2 60° = \left(\frac{1}{2}\right)^2 = \frac{1}{4} \neq \text{cosec}^2 60° - 1$

B. is the correct option because, $\cot^2 60° = \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{1}{3} = \text{cosec}^2 60° - 1$

C. is incorrect because, $\sec^2 60° = (2)^2 = 4 \neq \text{cosec}^2 60° - 1$

D. is incorrect because, $\tan^2 60° = \left(\sqrt{3}\right)^2 = 3 \neq \text{cosec}^2 60° - 1$

5. Question

The value of $\text{cosec}^2 60° - 1$ is equal to

A. $\cos^2 60°$

B. $\cot^2 60°$

C. $\sec^2 60°$

D. $\tan^2 60°$

Answer

We know, $\text{cosec}\ 60° = \frac{2}{\sqrt{3}}$

$\therefore \text{cosec}^2 60° - 1 = \left(\frac{2}{\sqrt{3}}\right)^2 - 1 = \frac{4}{3} - 1$

$\Rightarrow \text{cosec}^2 60° - 1 = \frac{1}{3}$

Comparing the above result with the given options, we find that

A. is incorrect because, $\cos^2 60° = \left(\frac{1}{2}\right)^2 = \frac{1}{4} \neq \text{cosec}^2 60° - 1$

B. is the correct option because, $\cot^2 60° = \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{1}{3} = \text{cosec}^2 60° - 1$

C. is incorrect because, $\sec^2 60° = (2)^2 = 4 \neq \text{cosec}^2 60° - 1$

D. is incorrect because, $\tan^2 60° = \left(\sqrt{3}\right)^2 = 3 \neq \text{cosec}^2 60° - 1$

6. Question

$\cos 60° \cos 30° - \sin 60° \sin 30°$ is equal to

A. $\cos 90°$

B. $\text{cosec}\ 90°$

C. $\sin 30° + \cos 30°$

D. tan 90°

Answer

We know, $\cos 30° = \frac{\sqrt{3}}{2}, \cos 60° = \frac{1}{2}$ and $\sin 30° = \frac{1}{2}, \sin 60° = \frac{\sqrt{3}}{2}$

$\therefore \cos 60° \cos 30° - \sin 60° \sin 30° = \frac{1}{2} \times \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4}$

$\Rightarrow \cos 60° \cos 30° - \sin 60° \sin 30° = 0.$

Comparing the above result with the given options, we find that

A. is the correct because, $\cos 90° = 0 = \cos 60° \cos 30° - \sin 60° \sin 30°$

B. is incorrect because, $\operatorname{cosec} 90° = 1 \neq \cos 60° \cos 30° - \sin 60° \sin 30°$

C. is incorrect because,

$$\sin 30° + \cos 30° = \frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{1 + \sqrt{3}}{2} \neq \cos 60° \cos 30° - \sin 60° \sin 30°$$

D. is incorrect because, $\tan 90° =$ not defined

6. Question

cos60° cos30° – sin60° sin30° is equal to

A. cos 90°

B. cosec 90°

C. sin 30° + cos 30°

D. tan 90°

Answer

We know, $\cos 30° = \frac{\sqrt{3}}{2}, \cos 60° = \frac{1}{2}$ and $\sin 30° = \frac{1}{2}, \sin 60° = \frac{\sqrt{3}}{2}$

$\therefore \cos 60° \cos 30° - \sin 60° \sin 30° = \frac{1}{2} \times \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \times \frac{1}{2} = \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4}$

$\Rightarrow \cos 60° \cos 30° - \sin 60° \sin 30° = 0.$

Comparing the above result with the given options, we find that

A. is the correct because, $\cos 90° = 0 = \cos 60° \cos 30° - \sin 60° \sin 30°$

B. is incorrect because, $\operatorname{cosec} 90° = 1 \neq \cos 60° \cos 30° - \sin 60° \sin 30°$

C. is incorrect because,

$\sin 30° + \cos 30° = \frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{1 + \sqrt{3}}{2} \neq \cos 60° \cos 30° - \sin 60° \sin 30°$

D. is incorrect because, $\tan 90° = \text{not defined}$

7. Question

The value of $\frac{\sin 27^0}{\cos 63^0}$ is

A.0

B. 1

C. tan 27°

D. cot 63°

Answer

We know, $\sin\theta = \cos(90° - \theta)$

$\therefore \frac{\sin 27°}{\cos 63°} = \frac{\cos(90° - 27°)}{\cos 63°} = \frac{\sin 63°}{\cos 63°}$

$\Rightarrow \frac{\sin 27°}{\cos 63°} = 1$

Hence option B is correct.

Note: Alternatively, the identity $\cos\theta = \sin(90° - \theta)$ could also have been used.

7. Question

The value of $\frac{\sin 27^0}{\cos 63^0}$ is

A.0

B. 1

C. tan 27°

D. cot 63°

Answer

We know, $\sin\theta = \cos(90° - \theta)$

$\therefore \frac{\sin 27°}{\cos 63°} = \frac{\cos(90° - 27°)}{\cos 63°} = \frac{\sin 63°}{\cos 63°}$

$\Rightarrow \frac{\sin 27°}{\cos 63°} = 1$

Hence option B is correct.

Note: Alternatively, the identity $\cos\theta = \sin(90° - \theta)$ could also have been used.

8. Question

If cos x = sin 43°, then the value of x is

A. 57°

B. 43°

C. 47°

D. 90°

Answer

We know, $\sin\theta = \cos(90° - \theta)$

$\sin 43° = \cos(90° - 43°)$

$\sin 43° = \cos 47°$

$\therefore x = 47°$

So, C is the correct option.

8. Question

If cos x = sin 43°, then the value of x is

A. 57°

B. 43°

C. 47°

D. 90°

Answer

We know, $\sin\theta = \cos(90° - \theta)$

$\sin 43° = \cos(90° - 43°)$

$\sin 43° = \cos 47°$

$\therefore x = 47°$

So, C is the correct option.

9. Question

The value of sec 29° – cosec 61° is

A. 1

B. 0

C. sec 60°

D. cosec 29°

Answer

We know, $\operatorname{cosec}\theta = \sec(90° - \theta)$

$\therefore \operatorname{cosec} 61° = \sec(90° - 61°)$

$\Rightarrow \operatorname{cosec} 61° = \sec 29°$

Using the above result, $\sec 29° - \operatorname{cosec} 61° = \sec 29° - \sec 29° = 0.$

So, B is the correct option.

Note: Alternatively, the identity $\sec\theta = \operatorname{cosec}(90° - \theta)$ could also have been used.

9. Question

The value of sec 29° – cosec 61° is

A. 1

B. 0

C. sec 60°

D. cosec 29°

Answer

We know, $\operatorname{cosec}\theta = \sec(90° - \theta)$

$\therefore \operatorname{cosec} 61° = \sec(90° - 61°)$

$\Rightarrow \operatorname{cosec} 61° = \sec 29°$

Using the above result, $\sec 29° - \operatorname{cosec} 61° = \sec 29° - \sec 29° = 0.$

So, B is the correct option.

Note: Alternatively, the identity $\sec\theta = \operatorname{cosec}(90° - \theta)$ could also have been used.

10. Question

If 3x cosec 36° = sec 54°, then the value of x is

A. 0

B. 1

C. $\frac{1}{3}$

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

Answer

It is given that, $3x\text{cosec } 36° = \sec 54°$

Using $\text{cosec}\,\theta = \sec(90° - \theta)$

$\therefore \text{cosec}\,36° = \sec(90° - 36°)$

$\Rightarrow \text{cosec } 36° = \sec 54°$

And so, $3x\text{cosec } 36° = \sec 54°$ can be rewritten as

$3x\sec 54° = \sec 54°$

i.e $3x = 1$

$\therefore x = \frac{1}{3}$

So, C is the correct option.

Note: Alternatively, the identity $\sec\theta = \text{cosec}(90° - \theta)$ could also have been used.

10. Question

If 3x cosec 36° = sec 54°, then the value of x is

A. 0

B. 1

C. $\frac{1}{3}$

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

Answer

It is given that, $3x\text{cosec } 36° = \sec 54°$

Using $\text{cosec}\,\theta = \sec(90° - \theta)$

$\therefore \operatorname{cosec} 36^\circ = \sec(90^\circ - 36^\circ)$

$\Rightarrow \operatorname{cosec} 36^\circ = \sec 54^\circ$

And so, $3x\operatorname{cosec} 36^\circ = \sec 54^\circ$ can be rewritten as

$3x\sec 54^\circ = \sec 54^\circ$

i.e $3x = 1$

$\therefore x = \frac{1}{3}$

So, C is the correct option.

Note: Alternatively, the identity $\sec\theta = \operatorname{cosec}(90^\circ - \theta)$ could also have been used.

11. Question

The value of sin60° cos30° + cos60° sin30° is equal to

A. sec 90°

B. tan 90°

C. cos 60°

D. sin 90°

Answer

We know, $\cos 30^\circ = \frac{\sqrt{3}}{2}$, $\cos 60^\circ = \frac{1}{2}$ and $\sin 30^\circ = \frac{1}{2}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$

$\therefore \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ = \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4}$

$\Rightarrow \cos 60^\circ \cos 30^\circ - \sin 60^\circ \sin 30^\circ = 1.$

Comparing the above result with the given options, we find that

A. is incorrect because, $\sec 90^\circ =$ not defined

B. is incorrect because, $\tan 90^\circ = 1 \neq \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

C. is incorrect because, $\cos 60^\circ = \frac{1}{2} \neq \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

D. is the correct because, $\sin 90^\circ = 1 = \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

11. Question

The value of sin60° cos30° + cos60° sin30° is equal to

A. sec 90°

B. tan 90°

C. cos 60°

D. sin 90°

Answer

We know, $\cos 30^\circ = \frac{\sqrt{3}}{2}$, $\cos 60^\circ = \frac{1}{2}$ and $\sin 30^\circ = \frac{1}{2}$, $\sin 60^\circ = \frac{\sqrt{3}}{2}$

$\therefore \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ = \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{3}{4} + \frac{1}{4}$

$\Rightarrow \cos 60^\circ \cos 30^\circ - \sin 60^\circ \sin 30^\circ = 1.$

Comparing the above result with the given options, we find that

A. is incorrect because, $\sec 90^\circ = \text{not defined}$

B. is incorrect because, $\tan 90^\circ = 1 \neq \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

C. is incorrect because, $\cos 60^\circ = \frac{1}{2} \neq \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

D. is the correct because, $\sin 90^\circ = 1 = \sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

12. Question

If $\cos A \cos 30^0 = \frac{\sqrt{3}}{4}$,then the measure of A is

A. 90°

B. 60°

C. 45°

D. 30°

Answer

We know, $\cos 30^\circ = \frac{\sqrt{3}}{2}$ and $\cos 60^\circ = \frac{1}{2}$

Given $\cos A \times \cos 30^\circ = \frac{\sqrt{3}}{4}$

So, $\cos A \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$

$\Rightarrow \cos A = \frac{1}{2}$

$\Rightarrow A = 60^\circ$

So, B is the correct option.

12. Question

If $\cos A \cos 30^0 = \frac{\sqrt{3}}{4}$,then the measure of A is

A. 90°

B. 60°

C. 45°

D. 30°

Answer

We know, $\cos 30° = \frac{\sqrt{3}}{2}$ and $\cos 60° = \frac{1}{2}$

Given $\cos A \times \cos 30° = \frac{\sqrt{3}}{4}$

So, $\cos A \times \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$

$\Rightarrow \cos A = \frac{1}{2}$

$\Rightarrow A = 60°$

So, B is the correct option.

13. Question

The value of $\frac{\tan 26°}{\cot 64°}$ is

A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

C. 0

D. 1

Answer

We know, $\tan \theta = \cot(90° - \theta)$

$\tan 26° = \cot(90° - 26°)$

$\tan 26° = \cot 64°$

Using the above result, $\frac{\tan 26°}{\cot 64°} = \frac{\cot 64°}{\cot 64°} = 1$

So, D is the correct option.

Note: Alternatively, the identity $\cot\theta = \tan(90° - \theta)$ could also have been used.

13. Question

The value of $\frac{\tan 26°}{\cot 64°}$ is

A. $\frac{1}{2}$

B. $\frac{\sqrt{3}}{2}$

C. 0

D. 1

Answer

We know, $\tan\theta = \cot(90° - \theta)$

$\tan 26° = \cot(90° - 26°)$

$\tan 26° = \cot 64°$

Using the above result, $\frac{\tan 26°}{\cot 64°} = \frac{\cot 64°}{\cot 64°} = 1$

So, D is the correct option.

Note: Alternatively, the identity $\cot\theta = \tan(90° - \theta)$ could also have been used.

14. Question

The value of sin 60° – cos 30° is

A. 0

B. $\frac{1}{\sqrt{2}}$

C. $\frac{\sqrt{3}}{2}$

D. 1

Answer

We know, $\sin 60° = \cos 30° = \frac{\sqrt{3}}{2}$

So, $\sin 60° - \cos 30° = \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} = 0$

So, A is the correct option.

14. Question

The value of sin 60° – cos 30° is

A. 0

B. $\frac{1}{\sqrt{2}}$

C. $\frac{\sqrt{3}}{2}$

D. 1

Answer

We know, $\sin 60° = \cos 30° = \frac{\sqrt{3}}{2}$

So, $\sin 60° - \cos 30° = \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} = 0$

So, A is the correct option.

15. Question

The value of $\cos^2 30° - \sin^2 30°$ is

A. cos 60°

B. sin 60°

C. 0

D. 1

Answer

We know, $\sin 30° = \frac{1}{2}$ and $\cos 30° = \frac{\sqrt{3}}{2}$

So, $\cos^2 30° - \sin^2 30° = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{3}{4} - \frac{1}{4}$

$\Rightarrow \cos^2 30° - \sin^2 30° = \frac{1}{2}$

Comparing the above result with the given options, we find that

A. is the correct option because, $\cos 60° = \frac{1}{2} = \cos^2 30° - \sin^2 30°$

B. is incorrect because, $\sin 60° = \frac{\sqrt{3}}{2} \neq \cos^2 30° - \sin^2 30°$

C. is incorrect because, $0 \neq \cos^2 30° - \sin^2 30°$

D. is incorrect because, $1 \neq \cos^2 30° - \sin^2 30°$

15. Question

The value of $\cos^2 30° - \sin^2 30°$ is

A. cos 60°

B. sin 60°

C. 0

D. 1

Answer

We know, $\sin 30° = \frac{1}{2}$ and $\cos 30° = \frac{\sqrt{3}}{2}$

So, $\cos^2 30° - \sin^2 30° = \left(\frac{\sqrt{3}}{2}\right)^2 - \left(\frac{1}{2}\right)^2 = \frac{3}{4} - \frac{1}{4}$

$\Rightarrow \cos^2 30° - \sin^2 30° = \frac{1}{2}$

Comparing the above result with the given options, we find that

A. is the correct option because, $\cos 60° = \frac{1}{2} = \cos^2 30° - \sin^2 30°$

B. is incorrect because, $\sin 60° = \frac{\sqrt{3}}{2} \neq \cos^2 30° - \sin^2 30°$

C. is incorrect because, $0 \neq \cos^2 30° - \sin^2 30°$

D. is incorrect because, $1 \neq \cos^2 30° - \sin^2 30°$