Trignometry Questions For SSC GD PDF

Instructions

For the following questions answer them individually

Question 1

If $\sec\theta + \tan\theta = 2$, then the value of $\sin\theta$ is:

A $\frac{4}{5}$

B $\frac{\sqrt{3}}{5}$

C $\frac{2}{5}$

D $\frac{3}{5}$

Answer: D

Explanation:

Given : $\sec\theta + \tan\theta = 2$ ----------(i)

Also, $sec^2\theta - tan^2\theta = 1$

=> $(sec\theta - tan\theta)(sec\theta + tan\theta) = 1$

=> $\sec\theta - \tan\theta = \frac{1}{2}$ ---------(ii)

Adding equations (i) and (ii), => $2sec\theta = 2 + \frac{1}{2} = \frac{5}{2}$

=> $sec\theta = \frac{5}{4}$

=> $cos\theta = \frac{4}{5}$

$\therefore sin\theta = \sqrt{1 - cos^2\theta}$

= $\sqrt{1 - (\frac{4}{5})^2} = \sqrt{1 - \frac{16}{25}}$

= $\sqrt{\frac{9}{25}} = \frac{3}{5}$

=> Ans - (D)

Question 2

If $\alpha + \theta$ = $\frac{7\pi}{12}$ and $\tan\theta = \sqrt{3}$, then the value of $\tan\theta$ is:

A $\sqrt{3}$

B 1

C 0

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

Answer: B

Question 3

If $\cos\theta + \sec\theta = \sqrt{3}$, then the value of $(\cos^3\theta + \sec^3\theta)$ is:

A 1

B $\frac{1}{\sqrt{2}}$

C 0

D $\sqrt{2}$

Answer: C

Explanation:

Given : $\cos\theta + \sec\theta = \sqrt{3}$ ---------(i)

Cubing both sides, we get :

=> $(\cos\theta + \sec\theta)^3 = (\sqrt{3})^3$

=> $cos^3\theta + sec^3\theta + 3(cos\theta)(sec\theta)(cos\theta + sec\theta) = 3\sqrt{3}$

=> $cos^3\theta + sec^3\theta + 3(cos\theta \times sec\theta)(\sqrt{3}) = 3\sqrt{3}$

$\because cos\theta \times sec\theta = 1$ and using equation (i),

=> $cos^3\theta + sec^3\theta = 3\sqrt{3} - 3\sqrt{3} = 0$

=> Ans - (C)

Question 4

The value of the following is: $\frac{\sin\theta\ \cos ec\theta\ \tan\theta\ \cot\theta}{\sin^2\theta+\cos^2\theta}$

A 1

B $\tan\theta$

C 0

D 2

Answer: A

Explanation:

Expression : $\frac{\sin\theta\ \cos ec\theta\ \tan\theta\ \cot\theta}{\sin^2\theta+\cos^2\theta}$

= $\frac{(sin\theta \times \frac{1}{sin\theta}) \times (tan\theta \times \frac{1}{tan\theta})}{1}$

= 1

=> Ans - (A)

Question 5

In a right angled triangle ABC and right angled at B, AB=BC, what is the value of sinA⋆cosC ?

A $\frac{1}{4}$

B $\frac{1}{2}$

C $\frac{1}{6}$

D $\frac{1}{5}$

Answer: B

Explanation:

Given is a right angled triangle at B.

Since it is a right angled triangle $AC^2 = AB^2 + BC^2$.

Given AB=BC.

$\therefore AC = \sqrt{2} \star BC$

sinA=$\frac{BC}{AC}$

cosC=$\frac{BC}{AC}$

sinA⋆cosC=$\frac{BC^2}{AC^2}$

Substituting AC=$\sqrt{2} \star BC$

sinA⋆cosC=$\frac{1}{2}$

Question 6

If $\sin\theta + \frac{1}{\sin\theta} = \frac{5}{2}$ and $\theta \in Q1$ then what is the value of $\tan\theta$?

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

B 1

C $\sqrt{3}$

D $\frac{1}{\sqrt{2}}$

Answer: A

Explanation:

Given $\sin\theta + \frac{1}{\sin\theta} = \frac{5}{2}$

$\sin^2\theta + 1 = (\frac{5}{2})\sin\theta$

$2\sin^2\theta - 5\sin\theta + 1 = 0$

$(\sin\theta - 2)(2\sin\theta - 1) = 0$

Therefore $\sin\theta = \frac{1}{2}$

$\therefore \theta = 30$

$\tan 30 = \frac{1}{2}$.

Question 7

The elevation of the top of a tower from a point on the ground is 45°. On travelling 60 m from the point towards the tower, the alevation of the top becomes 60°. The height of the tower, in metres, is

A 30

B 30(3- $\sqrt{3}$)

C 30(3 + $\sqrt{3}$)

D 30 $\sqrt{3}$

Answer: C

Explanation:

From $\triangle$ ACD,

tan $60^\circ = \frac{AD}{CD}$

$\Rightarrow AD = CD\sqrt{3}$

From $\triangle$ ABD,

tan $45^\circ = \frac{AD}{BD}$

$\Rightarrow$ AD = BD

$\Rightarrow$ AD = BC+CD

$\Rightarrow AD = 60 + \frac{AD}{\sqrt{3}}$

$\Rightarrow AD - \frac{AD}{\sqrt{3}} = 60$

$\Rightarrow \frac{\sqrt{3}AD - AD}{\sqrt{3}} = 60$

$AD(\sqrt{3} - 1) = 60\sqrt{3}$

$AD = \frac{60\sqrt{3}}{\sqrt{3}-1}$

Rationalising above equation

$AD = \frac{60\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$AD = \frac{60\sqrt{3}(\sqrt{3}+1)}{\sqrt{3}}$

$\therefore AD = 30(\sqrt{3}+3)$

Question 8

The expression $\sqrt{\frac{1+sin\,\theta}{1-sin\,\theta}} + \sqrt{\frac{1-sin\,\theta}{1+sin\,\theta}}$ is equal to

A $2\,sec\,\theta$

B $2\,tan\,\theta$

C $\frac{2\,(1-sin\,\theta)}{cos\,\theta}$

D $2\,sin\,\theta$

Answer: A

Explanation:

Expression : $\sqrt{\frac{1+sin\,\theta}{1-sin\,\theta}} + \sqrt{\frac{1-sin\,\theta}{1+sin\,\theta}}$

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

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

= $\frac{2}{cos\theta} = 2sec\theta$

=> Ans - (A)

Question 9

If $13sinA = 12$ then find out the value of $\frac{3sinA+4cosA}{3sinA-4cosA}$? Assume that $(0 \leq A \leq 90)$

A $\frac{7}{2}$

B $\frac{7}{4}$

C $\frac{7}{16}$

D $\frac{7}{8}$

Answer: A

Explanation:

It is given that $sinA = \frac{12}{13}$

$\Rightarrow \cos^2 A = \sqrt{1 - \sin^2 A}$

$\Rightarrow \cos^2 A = \sqrt{1 - (\frac{12}{13})^2}$

$\Rightarrow \cos^2 A = \frac{25}{169}$

$\Rightarrow cosA = \frac{5}{13}\ (0 \leq A \leq 90)$

We have to find out $\frac{3sinA+4cosA}{3sinA-4cosA}$

$\Rightarrow \frac{3\times\frac{12}{13}+4\times\frac{5}{13}}{3\times\frac{12}{13}-4\times\frac{5}{13}}$

$\Rightarrow \frac{36+20}{36-20}$

$\Rightarrow \frac{7}{2}$

Hence option A is the correct answer.

Question 10

What is the minimum and maximum value that the expression $12Sin\theta - 35cos\theta$ can take?

A $-23, 47$

B $-47, 23$

C $-47, 47$

D $-37, 37$

Answer: D

Explanation:

We know that the minimum and maximum values of the expression $ASin\theta + Bcos\theta$ is given by:

Minimum value =$-\sqrt{A^2 + B^2}$

Maximum value =$\sqrt{A^2 + B^2}$

So in the given question: (A=12, B=-35)

Minimum value =$-\sqrt{A^2 + B^2} = -\sqrt{(12)^2 + (-35)^2} = -37$

Maximum value =$\sqrt{A^2 + B^2} = \sqrt{(12)^2 + (-35)^2} = 37$

So, the minimum and maximum value of the expression will be -37 and 37.

Therefore, option D is the right answer.

Question 11

If $cos\theta_1 = \frac{35}{37}$, $sin\theta_2 = \frac{3}{5}$,then find out $\tan(\theta_2 - \theta_1)$? (Assume that $0 \leq \theta_1, \theta_2 \leq 90$)

A $\frac{49}{71}$

B $\frac{57}{76}$

C $\frac{75}{176}$

D $\frac{114}{352}$

Answer: D

Explanation:

It is given that $cos\theta_1 = \frac{35}{37}$

$\Rightarrow \sin^2\theta_1 = \sqrt{1 - \cos^2\theta_1}$

$\Rightarrow \sin^2\theta_1 = \sqrt{1 - (\frac{35}{37})^2}$

$\Rightarrow \sin^2\theta_1 = \frac{144}{1369}$

$\Rightarrow \sin\theta_1 = \frac{12}{37}\ (0 \leq \theta \leq 90)$

Also $\tan\theta_1 = \frac{\sin\theta_1}{cos\theta_1}$

$\Rightarrow \tan\theta_1 = \frac{\frac{12}{37}}{\frac{35}{37}}$

$\Rightarrow \tan\theta_1 = \frac{12}{35}$ ... (1)

Also $\cos^2\theta_2 = \sqrt{1 - \sin^2\theta_2}$

$\Rightarrow \cos^2\theta_2 = \sqrt{1 - (\frac{3}{5})^2}$

$\Rightarrow \cos\theta_2 = \frac{4}{5}$

Also $\tan\theta_2 = \frac{\sin\theta_1}{cos\theta_1} = \frac{3}{4}$ ...(2)

$\tan(\theta_2 - \theta 1)$ = $\frac{\tan\theta_2 - \tan\theta_1}{1+\tan\theta_2 * \tan\theta_1}$

$\Rightarrow \frac{\frac{3}{4} - \frac{12}{35}}{1+\frac{3}{4} * \frac{12}{35}}$

$\Rightarrow \frac{57}{176}$

Multiplying the numerator and denominator by 2

$\Rightarrow \frac{114}{352}$

Hence option D is the correct answer.

Question 12

If $tan\theta = \frac{11}{60}$ then find out $\frac{cos\theta - sin\theta}{cos\theta + sin\theta}$?

A $\frac{49}{71}$

B $\frac{55}{65}$

C $\frac{65}{55}$

D $\frac{71}{64}$

Answer: A

Explanation:

It is given that $tan\theta = \frac{11}{60}$ ... (1)

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

Dividing both numerator and denominator by $cos\theta$

$\Rightarrow \frac{1 - tan\theta}{1 + tan\theta}$

$\Rightarrow \frac{1-\frac{11}{60}}{1+\frac{11}{60}}$

$\Rightarrow \frac{\frac{60-11}{60}}{\frac{60+11}{60}}$

$\Rightarrow \frac{49}{71}$

Hence option A is the correct answer.

Question 13

If $tan\theta + cot\theta = x$, then what is the value of $tan^4\theta + cot^4\theta$?

A $x^2(x^2-4)+6$

B $x^2(x^2-4)+2$

C $x^2(x^2-6)+2$

D $x^2(x^2-2)+2$

Answer: B

Explanation:
Given that $tan\theta + cot\theta = x$

Squaring on both sides

$\Rightarrow (tan\theta + cot\theta)^2 = x^2$

$\Rightarrow tan^2\theta + cot^2\theta + 2tan\theta \times cot\theta = x^2$

$\Rightarrow tan^2\theta + cot^2\theta = x^2 - 2$ (We know that $tan\theta \times cot\theta = 1$)

Squaring on both sides

$\Rightarrow (tan^2\theta + cot^2\theta)^2 = (x^2 - 2)^2$

$\Rightarrow tan^4\theta + cot^4\theta + 2tan^2\theta \times cot^2\theta = x^4 - 4x^2 + 4$

$\Rightarrow tan^4\theta + cot^4\theta + 2 = x^4 - 4x^2 + 4$ (We know that $tan\theta \times cot\theta = 1$)

$\Rightarrow tan^4\theta + cot^4\theta = x^2(x^2 - 4) + 4 - 2$

$\Rightarrow tan^4\theta + cot^4\theta = x^2(x^2 - 4) + 2.$

Therefore, option B is the right answer.

Question 14

If $sin^2\theta - cos^2\theta = \frac{16}{25}$, what is the value of $cos^4\theta - sin^4\theta$?

A $-\frac{4}{25}$

B $-\frac{16}{5}$

C $-\frac{16}{25}$

D $-\frac{4}{5}$

Answer: C

Explanation:

It is given that $sin^2\theta - cos^2\theta = \frac{16}{25}$ ... (1)

We know that $sin^2\theta + cos^2\theta = 1$ ... (2)

On multiplying both the equations, we get,

$(sin^2\theta - cos^2\theta) * (sin^2\theta + cos^2\theta) = \frac{16}{25} * 1$

$\Rightarrow sin^4\theta - cos^4\theta = \frac{16}{25}$

$\Rightarrow cos^4\theta - sin^4\theta = -\frac{16}{25}$

Therefore, option C is the right answer.

Question 15

If $cosec^2\theta + cot^2\theta = \frac{11}{5}$, what is the value of $cosec^4\theta - cot^4\theta$?

A $\frac{11}{5}$

B $\frac{121}{25}$

C $\frac{5}{11}$

D $\frac{11}{25}$

Answer: A

Explanation:

It is given that $cosec^2\theta + cot^2\theta = \frac{11}{5}$ ... (1)

We know that $cosec^2\theta - cot^2\theta = 1$ ... (2)

On multiplying both the equations, we get,

$\Rightarrow (cosec^2\theta + cot^2\theta) * (cosec^2\theta - cot^2\theta) = \frac{11}{5} * 1$

$\Rightarrow cosec^4\theta - cot^4\theta = \frac{11}{5}$

Therefore, option A is the right answer.

Question 16

If $tan^2\theta + sec^2\theta = \frac{9}{8}$, what is the value of $tan^4\theta - sec^4\theta$?

A $-\frac{81}{64}$

B $-\frac{9}{8}$

C $-\frac{81}{8}$

D $-\frac{9}{64}$

Answer: B

Explanation:

It is given that $tan^2\theta + sec^2\theta = \frac{9}{8}$ ... (1)

We know that $sec^2\theta - tan^2\theta = 1$ ... (2)

On multiplying both the equations , we get,

$(tan^2\theta + sec^2\theta) * (sec^2\theta - tan^2\theta) = \frac{9}{8} * 1$

$\Rightarrow sec^4\theta - tan^4\theta = \frac{9}{8}$

$\Rightarrow tan^4\theta - sec^4\theta = \frac{-9}{8}$

Therefore, option B is the right answer.

Question 17

If $cos\theta + sec\theta = a$, then what is the value of $cos^6\theta + sec^6\theta$?

A $a^6 + 6a^4 + 6a^2 + 2$

B $a^6 - 6a^4 + 18a^2 - 14$

C $a^6 - 6a^4 + 18a^2 + 2$

D $a^6 - 6a^4 + 6a^2 - 2$

Answer: D

Explanation:

Given that $cos\theta + sec\theta = a$

Squaring on both sides

$\Rightarrow (cos\theta + sec\theta)^2 = a^2$

$\Rightarrow cos^2\theta + sec^2\theta + 2cos\theta \times sec\theta = a^2$

$\Rightarrow cos^2\theta + sec^2\theta = a^2 - 2$ ... (1) (We know that $cos\theta \times sec\theta = 1$)

Taking cube on both sides

$\Rightarrow (cos^2\theta + sec^2\theta)^3 = (a^2 - 2)^3$

$\Rightarrow cos^6\theta + 3cos^4\theta \times sec^2\theta + 3cos^2\theta \times sec^4\theta + sec^6\theta = a^6 - 6a^4 + 12a^2 - 8$

$\Rightarrow cos^6\theta + sec^6\theta = a^6 - 6a^4 + 12a^2 - 8 - 3cos^2\theta \times sec^2\theta(cos^2\theta + sec^2\theta)$

$\Rightarrow cos^6\theta + sec^6\theta = a^6 - 6a^4 + 12a^2 - 8 - 3(a^2 - 2)$ (From equation 1)

$\Rightarrow cos^6\theta + sec^6\theta = a^6 - 6a^4 + 6a^2 - 2$

Therefore option D is the correct answer.

Question 18

Shadow of a tower is 60 m long and the towers's elevation angle is 60° then what is the height of the tower?

A 120 m

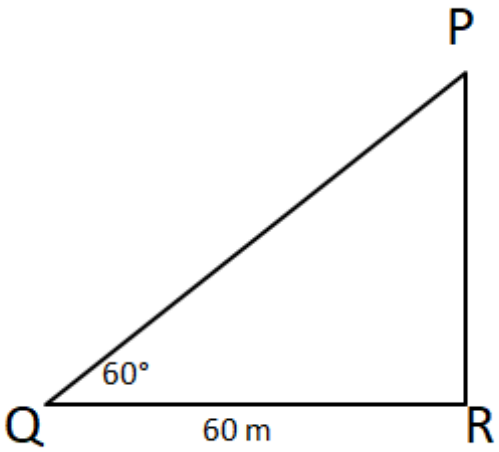
B $60\sqrt{3}$ m

C $\frac{60}{\sqrt{3}}$ m

D None of these

Answer: B

Explanation:



In the given diagram PR is the tower and RS is shadow.

$\Rightarrow$ tan60° = $\frac{PR}{QR}$

$\Rightarrow \sqrt{3} = \frac{PR}{60}$

$\Rightarrow PR = 60\sqrt{3}$ m

Therefore the height of the tower is $60\sqrt{3}$ m. Hence we can say that option B is the correct answer.

Question 19

If $tanA - cotA = 0$ then find out the value of ($tan^4 A + cot^4 A$) ?

A 2

B 4

C 0

D None of these

Answer: A

Explanation:

Given that

$\Rightarrow tanA - cotA = 0$

Squaring on both sides

$\Rightarrow (tanA - cotA)^2 = 0$

$\Rightarrow tan^2 A + cot^2 A - 2tanA * cotA = 0$ (We know that $\tan\theta \times \cot\theta = 1$)

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

Now squaring again on both the sides

$\Rightarrow (tan^2 A + cot^2 A)^2 = 2^2$

$\Rightarrow tan^4 A + cot^4 A + 2tan^2 A \times cot^2 A = 4$

$\Rightarrow tan^4 A + cot^4 A + 2(tanA \times cotA)^2 = 4$ (We know that $\tan\theta \times \cot\theta = 1$)

$\Rightarrow tan^4 A + cot^4 A = 4 - 2$

$\Rightarrow tan^4 A + cot^4 A = 2$

Therefore option A is the correct answer.

Question 20

If $5tanA = 12$ then find out the value of $\frac{12sinA+5cosA}{12sinA-5cosA}$?

A $\frac{129}{179}$

B $\frac{179}{129}$

C $\frac{119}{169}$

D $\frac{169}{119}$

Answer: D

Explanation:

Given that

$5tanA = 12$

$tanA = \frac{12}{5}$

We have to find out the value of $\frac{12sinA+5cosA}{12sinA-5cosA}$

$\Rightarrow \frac{12sinA+5cosA}{12sinA-5cosA}$

Dividing numerator and denominator by cosA

$\Rightarrow \frac{12(\frac{sinA}{cosA})+5(\frac{cosA}{cosA})}{12(\frac{sinA}{cosA})-5(\frac{cosA}{cosA})}$

$\Rightarrow \frac{12tanA+5}{12tanA-5}$

$\Rightarrow \frac{12(\frac{12}{5})+5}{12(\frac{12}{5})-5}$

$\Rightarrow \frac{\frac{144+25}{5}}{\frac{144-25}{5}}$

$\Rightarrow \frac{169}{119}$

Hence option D is the correct answer.

Question 21

It is given that sinA = $\frac{-\sqrt{3}}{2}$, cosB = $\frac{\sqrt{3}}{2}$ then what is the value of (A+B) ?
(Assume that 180° $\leq$ A, B $\leq$ 360°)

A 600°

B 630°

C 570°

D More than one of the above

Answer: D

Explanation:
Given that

sinA = $\frac{-\sqrt{3}}{2}$

Therefore A = (180°+ 60°) or (360° - 60°)

$\Rightarrow$ A = 240° or 300°

Similarly cosB = $\frac{\sqrt{3}}{2}$

Therefore B = 330°

Hence A+B = 240°+330° or 300°+330°

$\Rightarrow$ (A+B) = 570° or 630°

Hence option D is correct answer.

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Question 22

It is given that cosA = $-\frac{1}{\sqrt{2}}$, cosB = $-\frac{1}{2}$, then what is the value of (A+B) ?
(Assume that 180° $\leq$ A, B $\leq$ 270°)

A 465°

B 435°

C 150°

D More than one of the above

Answer: A

Explanation:
Given that

cosA = $-\frac{1}{\sqrt{2}}$

Therefore A = 180°+ 45° = 225°

Similarly cosB = $-\frac{1}{2}$

Therefore B = 180° + 60° = 240°

Hence A+B = 225°+240 = 465°

Hence option A is correct answer.

Question 23

It is given that sinA = $\frac{\sqrt{3}}{2}$, cosB = $\frac{1}{2}$ then what is the value of (A+B) ?
(Assume that 0° $\leq$ A, B $\leq$ 180°)

A 120°

B 90°

C 150°

D More than one of the above

Answer: A

Explanation:
Given that

sinA = $\frac{\sqrt{3}}{2}$

Therefore A = 60° or 120°

Similarly cosB = $\frac{1}{2}$

Therefore B = 60°

Hence A+B = 60°+60° or 120°+60°

$\Rightarrow$ (A+B) = 120° or 180°

Hence option A is correct answer.

Question 24

If $\cos\theta_1 = \frac{\sqrt{3}}{2}, \cos\theta_2 = \frac{24}{25}$ then find out the value of $\tan(\theta_1 - \theta_2)$? (Assume that $0 \leq \theta_1, \theta_2 \leq 90$)

A $\frac{7+24\sqrt{3}}{7-24\sqrt{3}}$

B $\frac{7-24\sqrt{3}}{7+24\sqrt{3}}$

C $\frac{24-7\sqrt{3}}{24\sqrt{3}+7}$

D $\frac{24+7\sqrt{3}}{24\sqrt{3}-7}$

Answer: C

Explanation:

Given that $\cos\theta_1 = \frac{\sqrt{3}}{2}$

We know that $\sin\theta = \sqrt{1-\cos^2\theta}$

Therefore $\sin\theta_1 = \sqrt{1-\cos^2\theta_1}$

$\Rightarrow \sin\theta_1 = \sqrt{1-(\frac{\sqrt{3}}{2})^2}$

$\Rightarrow \sin\theta_1 = \frac{1}{2}$

Therefore $\tan\theta_1 = \frac{\sin\theta_1}{\cos\theta_1}$

$\Rightarrow \tan\theta_1 = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$

$\Rightarrow \tan\theta_1 = \frac{1}{\sqrt{3}}$

Also $\sin\theta_2 = \sqrt{1-\cos^2\theta_2}$

$\Rightarrow \sin\theta_2 = \sqrt{1-(\frac{24}{25})^2}$

$\Rightarrow \sin\theta_2 = \frac{7}{25}$

$\tan\theta_2 = \frac{\sin\theta_2}{\cos\theta_2}$

$\Rightarrow \tan\theta_2 = \frac{\frac{7}{25}}{\frac{24}{25}}$

$\Rightarrow \tan\theta_2 = \frac{7}{24}$

We have to find out the value of $\tan(\theta_1 - \theta_2)$

$\Rightarrow \frac{\tan\theta_1 - \tan\theta_2}{1+\tan\theta_1 \times \tan\theta_2}$

$\Rightarrow \frac{\frac{1}{\sqrt{3}} - \frac{7}{24}}{1+\frac{1}{\sqrt{3}} \times \frac{7}{24}}$

$\Rightarrow \frac{\frac{24-7\sqrt{3}}{24\sqrt{3}}}{\frac{24\sqrt{3}+7}{24\sqrt{3}}}$

$\Rightarrow \frac{24-7\sqrt{3}}{24\sqrt{3}+7}$

Hence option C is the correct answer.

Question 25

If $\cos\theta_1 = \frac{1}{\sqrt{2}}, \cos\theta_2 = \frac{40}{41}$ then find out the value of $\cos(\theta_1 - \theta_2)$? (Assume that $0 \leq \theta_1, \theta_2 \leq 90$)

A $\frac{49\sqrt{2}}{82}$

B $\frac{49}{82\sqrt{2}}$

C $\frac{41\sqrt{2}}{98}$

D $\frac{41\sqrt{2}}{49}$

Answer: A

Explanation:

Given that $\cos\theta_1 = \frac{1}{\sqrt{2}}$

We know that $\sin\theta = \sqrt{1-\cos^2\theta}$

Therefore $\sin\theta_1 = \sqrt{1-\cos^2\theta_1}$

$\Rightarrow \sin\theta_1 = \sqrt{1-(\frac{1}{\sqrt{2}})^2}$

$\Rightarrow \sin\theta_1 = \frac{1}{\sqrt{2}}$

Also $\sin\theta_2 = \sqrt{1-\cos^2\theta_2}$

$\Rightarrow \sin\theta_2 = \sqrt{1-(\frac{40}{41})^2}$

$\Rightarrow \sin\theta_2 = \frac{9}{41}$

We have to find out the value of $\cos(\theta_1 - \theta_2)$

$\Rightarrow \cos\theta_1\cos\theta_2 + \sin\theta_1\sin\theta_2$

$\Rightarrow \frac{1}{\sqrt{2}} \times \frac{40}{41} + \frac{1}{\sqrt{2}} \times \frac{9}{41}$

$\Rightarrow \frac{40+9}{41\sqrt{2}}$

$\Rightarrow \frac{49\sqrt{2}}{82}$

Hence option A is the correct answer.

Question 26

If $\sin\theta_1 = \frac{3}{5}, \cos\theta_2 = \frac{7}{25}$ **then find out the value of** $\sin(\theta_1+\theta_2)$ **? (Assume that** $0 \leq \theta_1, \theta_2 \leq 90$**)**

A $\frac{99}{125}$

B $\frac{117}{125}$

C $\frac{96}{125}$

D $\frac{107}{125}$

Answer: B

Explanation:

Given that $\sin\theta_1 = \frac{3}{5}$

We know that $\cos\theta = \sqrt{1-\sin^2\theta}$

Therefore $\cos\theta_1 = \sqrt{1-\sin^2\theta_1}$

$\Rightarrow \cos\theta_1 = \sqrt{1-(\frac{3}{5})^2}$

$\Rightarrow \cos\theta_1 = \frac{4}{5}$

Also $\sin\theta = \sqrt{1-\cos^2\theta}$

Therefore $\sin\theta_2 = \sqrt{1-\cos^2\theta_2}$

$\Rightarrow \sin\theta_2 = \sqrt{1-(\frac{7}{25})^2}$

$\Rightarrow \sin\theta_2 = \frac{24}{25}$

We have to find out the value of $\sin(\theta_1+\theta_2)$

$\Rightarrow \sin\theta_1\cos\theta_2 + \cos\theta_1\sin\theta_2$

$\Rightarrow \frac{3}{5}\times\frac{7}{25} + \frac{4}{5}\times\frac{24}{25}$

$\Rightarrow \frac{21+96}{125}$

$\Rightarrow \frac{117}{125}$

Hence option B is the correct answer.

Question 27

$\frac{\sin x}{1+\cos x} + \frac{1+cosx}{\sin x} = 4$ **for 0° < x < 90°**

What is the value of $\cot x$

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

B $\sqrt{3}$

C 1

D 0

Answer: B

Explanation:

$\frac{\sin x}{1+\cos x} + \frac{1+cosx}{\sin x} = 4$

=>$\frac{\sin^2 x+(1+\cos x)^2}{\sin x(1+\cos x)} = 4$

=>$\frac{\sin^2 x+1+\cos^2 x+2\cos x}{\sin x(1+\cos x)} = 4$

=>$\frac{2+2\cos x}{\sin x(1+\cos x)} = 4$

=>$\frac{2+2\cos x}{\sin x(1+\cos x)} = 4$

=>$\frac{2(1+\cos x)}{\sin x(1+\cos x)} = 4$

=>$2\,\mathrm{cosec}\, x = 4$

=>$\mathrm{cosec}\, x = 2$

=>$\sin x = \frac{1}{2}$

=> $x = 30°$

so, $\cot x = \cot 30°$ = $\sqrt{3}$

Hence, option B is the correct answer.

Question 28

If $\cos 4x = \sin x$ **where,** $0 < x < 90$**, what is the value of** $\sin 5x$**?**

A 1

B 0

C 0.5

D 0.33

Answer: A

Explanation:

$\cos 4x = \sin x$

=>$\cos 4x = \cos(90° - x)$

=>$4x = 90° - x$

=>$x = 18°$

So, $\sin 5x = \sin 90° = 1$

Hence, option A is the correct answer.

Question 29

$2a + a^2 \tan 2x = \tan 2x$

What is the value of $\sec^2 x$**?**

A a^2

B $1 + a^2$

C $a^2 - 1$

D $2a^2 + 1$

Answer: B

Explanation:

$2a + a^2 \tan 2x = \tan 2x$

=>$2a = \tan 2x - a^2 \tan 2x$

=>$\tan 2x = \frac{2a}{1-a^2}$

we know that $\tan 2x = \frac{2 \tan x}{1-\tan^2 x}$

On comparing we get $\tan x = a$

$\sec^2 x = 1 + \tan^2 x = 1 + a^2$

Hence, option B is the correct answer.

Question 30

If $\cos \theta = \frac{3}{5}$ **then find out the value of** $\frac{\tan \theta - \cot \theta}{\tan \theta + \cot \theta}$ **? (Assume that** $0 \leq \theta \leq 90$**)**

A $\frac{16}{25}$

B $\frac{18}{25}$

C $\frac{7}{25}$

D $\frac{9}{25}$

Answer: C

Explanation:

We are given that $\cos\theta = \frac{3}{5}$

$\Rightarrow \sin^2\theta = \sqrt{1 - \cos^2\theta}$

$\Rightarrow \sin^2\theta = \sqrt{1 - (\frac{3}{5})^2}$

$\Rightarrow \sin^2\theta = \frac{16}{25}$

$\Rightarrow \sin\theta = \frac{4}{5}\ (0 \leq \theta \leq 90)$

Therefore $\tan\theta = \frac{\sin\theta}{cos\theta}$

$\Rightarrow \tan\theta = \frac{\frac{4}{5}}{\frac{3}{5}}$

$\Rightarrow \tan\theta = \frac{4}{3}$ ... (1)

We can easily start $\cot\theta = \frac{3}{4}$ ... (2)

We have to find out, $\frac{\frac{4}{3} - \frac{3}{4}}{\frac{4}{3} + \frac{3}{4}}$

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

$\Rightarrow \frac{7}{25}$

Hence option C is the correct answer.

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Question 31

If $\frac{\tan^2\theta+3}{\tan^2\theta-3} = 2$, what is the value of $\frac{\sec^2\theta+\cot^2\theta}{\sec^2\theta-\cot^2\theta}$?(Assume θ is in 1st quadrant)

A $\frac{89}{91}$

B $\frac{114}{71}$

C $\frac{6}{5}$

D $\frac{91}{89}$

Answer: D

Explanation:

Given that $\frac{\tan^2\theta+3}{\tan^2\theta-3} = 2$.

Assuming $\tan^2\theta = t$, we get,

$\frac{t+3}{t-3} = 2$

$\Rightarrow t = 9$

$\Rightarrow \tan^2\theta = 9$

$\Rightarrow \tan\theta = 3$ (θ is in 1st quadrant)

We know that $\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow \sec^2\theta = 1 + \tan^2\theta$

Also $\cot^2\theta = \frac{1}{\tan^2\theta}$

We have to find out $\frac{\sec^2\theta+\cot^2\theta}{\sec^2\theta-\cot^2\theta}$

$\Rightarrow \frac{1+\tan^2\theta+\frac{1}{\tan^2\theta}}{1+\tan^2\theta-\frac{1}{\tan^2\theta}}$

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

$\Rightarrow \frac{91}{89}$

Hence option D is the correct answer.

Question 32

If $\cos\theta = \frac{\sqrt{2+\sqrt{3}}}{2}$, then what is the value of $cos\theta + sec\theta$? (Assume that $0 \leq \theta \leq 90$)

A $\frac{6+\sqrt{3}}{2\sqrt{2+\sqrt{3}}}$

B $\frac{3+\sqrt{3}}{\sqrt{2+\sqrt{3}}}$

C $\frac{3+\sqrt{6}}{\sqrt{2+\sqrt{6}}}$

D $\frac{6+\sqrt{6}}{\sqrt{3+\sqrt{6}}}$

Answer: A

Explanation:

Given that $cos\theta = \frac{\sqrt{2+\sqrt{3}}}{2}$

Then,

$\Rightarrow cos\theta + sec\theta$

$\Rightarrow cos\theta + \frac{1}{cos\theta}$

$\Rightarrow \frac{cos^2\theta+1}{cos\theta}$

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

$\Rightarrow \frac{\frac{2+\sqrt{3}}{4}+1}{\frac{\sqrt{2+\sqrt{3}}}{2}}$

$\Rightarrow \frac{6+\sqrt{3}}{2\sqrt{2+\sqrt{3}}}$

Question 33

If $\frac{\sec^2\theta+1}{\sec^2\theta-1} = \frac{37}{35}$, what is the value of $\frac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta}$?(Assume θ is in 1st quadrant)

A $\frac{5}{7}$

B $\frac{7}{5}$

C $\frac{7}{6}$

D $\frac{6}{7}$

Answer: B

Explanation:

Given that $\frac{\sec^2\theta+1}{\sec^2\theta-1} = \frac{37}{35}$.

Assuming $\sec^2\theta = t$, we get,

$\frac{t+1}{t-1} = \frac{37}{35}$

$\Rightarrow t = 36$

$\Rightarrow \sec^2\theta = 36$

$\Rightarrow \sec\theta = 6$ (θ is in 1st quadrant)

We have to find out value of $\frac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta}$.

$\frac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta}$ = $\frac{\sec\theta+1}{\sec\theta-1}$ (Dividing numerator and denominator by $\sin\theta$)

$\Rightarrow \frac{6+1}{6-1}$

$\Rightarrow \frac{7}{5}$.

Therefore, option B is the right answer.

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Question 34

From the top of 600 m high tower, the angles of depression of the top and bottom of a flag are observed to be 30° and 45° respectively. What is the height of the flag?

A $200(\sqrt{3}-1)$

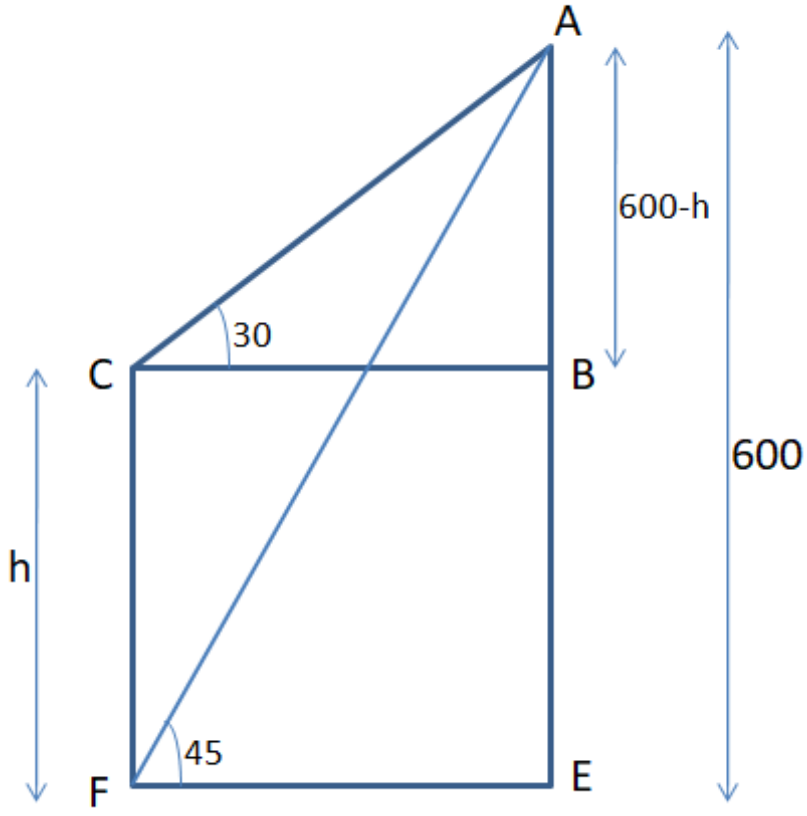
B $200(\sqrt{3}-\sqrt{2})$

C $200\sqrt{3}(\sqrt{3}-1)$

D None of the above

Answer: C

Explanation:
Let us assume that height of flag is h meters.



In triangle AEF,
tan(45) = $\frac{AE}{EF}$ = 1
AE =EF =600 m
We can see that BC = EF
Hence BC = 600m ... (1)

In triangle ABC,
tan(30) = $\frac{AB}{BC}$ = $\frac{1}{\sqrt{3}}$
tan(30) = $\frac{600-h}{BC}$ = $\frac{1}{\sqrt{3}}$

$\Rightarrow \frac{600-h}{600} = \frac{1}{\sqrt{3}}$
$\Rightarrow h = 600 - 200\sqrt{3}$
$\Rightarrow h = 200\sqrt{3}(\sqrt{3} - 1)$
Hence, option C is the right choice.

Question 35

If $cos\theta - sec\theta = 7$, what is the value of $cos^2\theta + sec^2\theta$?

A 51

B 36

C 49

D None of the above

Answer: A

Explanation:
Given that $\cos\theta - \sec\theta = 7$
Squaring on both sides
$\Rightarrow (\cos\theta - \sec\theta)^2 = 7^2$
$\Rightarrow \cos^2\theta - 2 \times \cos\theta \sec\theta + \sec^2\theta = 49$ (We know that $\cos\theta \sec\theta = 1$)
$\Rightarrow \cos^2\theta - 2 \times 1 + \sec^2\theta = 49$
$\Rightarrow \cos^2\theta + \sec^2\theta = 49 + 2$
$\Rightarrow \cos^2\theta + \sec^2\theta = 51$
Therefore, option A is the right answer.

Question 36

If $\sin\theta + \text{cosec}\,\theta = 2$ then find out the value of $\text{cosec}^{32}\theta + \sin^{32}\theta$?

A 32

B 16

C 64

D None of the above

Answer: D

Explanation:
Given that $\sin\theta + \text{cosec}\,\theta = 2$ (We know that $\text{cosec}\,\theta = \frac{1}{\sin\theta}$)
$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$
$\Rightarrow \sin^2\theta - 2 \times \sin\theta + 1 = 0$
$\Rightarrow (\sin\theta - 1)^2 = 0$
$\therefore \sin\theta = +1 or -1$
Since $\sin\theta = +1 or -1$, $\text{cosec}\,\theta$ is also equal to $-1 or +1$.
Hence, the value of $\text{cosec}^{32}\,\theta + \sin^{32}\,\theta$ = 1 + 1 = 2.
Therefore, option D is the right answer.

Question 37

If $\sec\theta = \frac{15}{9}$ **then find out the value of** $\frac{\cot\theta + \text{cosec}\,\theta}{\cot\theta - \text{cosec}\,\theta}$ **? (Assume that** $0 \leq \theta \leq 90$**)**

A 3

B -3

C -4

D 4

Answer: C

Explanation:

Given that $\sec\theta = \frac{15}{9}$

$\cos\theta = \frac{9}{15}$

$\Rightarrow \sin\theta = \sqrt{1-\cos^2\theta}$

$\Rightarrow \sin\theta = \sqrt{1-(\frac{9}{15})^2}$

$\Rightarrow \sin\theta = \frac{12}{15}$

$\Rightarrow \operatorname{cosec}\theta = \frac{15}{12}$ (Inverse of $\sin\theta$)

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

$\Rightarrow \cot\theta = \frac{\frac{9}{15}}{\frac{12}{15}}$

$\Rightarrow \cot\theta = \frac{9}{12}$

We have to find

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

$\Rightarrow \frac{\frac{9}{12}+\frac{15}{12}}{\frac{9}{12}-\frac{15}{12}}$

$\Rightarrow \frac{9+15}{9-15}$

$\Rightarrow -4$

Therefore, option C is the right answer.

Question 38

If sec θ = 25/24, then what is the value of cot θ? (Assume that $0 \leq \theta \leq 90$)

A $\frac{7}{24}$

B $\frac{25}{7}$

C $\frac{24}{7}$

D $\frac{7}{25}$

Answer: C

Explanation:

Given that: $sec\theta = \frac{25}{24}$

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

Using, $sin^2\theta + cos^2\theta = 1$

$\Rightarrow sin^2\theta = 1 - (\frac{24}{25})^2 = \frac{625-576}{625}$

$\Rightarrow sin^2\theta = \frac{49}{625}$

$\Rightarrow sin\theta = \frac{7}{25}$

We know that $cot\theta = \frac{cos\theta}{sin\theta}$

$\Rightarrow cot\theta = \frac{\frac{24}{25}}{\frac{7}{25}}$

$\Rightarrow cot\theta = \frac{24}{7}.$

Therefore, option C is the right answer.

Question 39

If cos θ + sec θ = a, then what is the value of $cos^4\theta + sec^4\theta$?

A $a^2(a^2 - 4) + 2$

B $a(a - 4) + 2$

C $(a^3 - 3)^2 + 2$

D $(a^4 - 2a) + 4$

Answer: A

Explanation:

Given that cos θ + sec θ = a

Squaring both sides,

$\Rightarrow (cos\theta + sec\theta)^2 = (a)^2$

$\Rightarrow cos^2\theta + sec^2\theta + 2(cos\theta)(sec\theta) = a^2$

$\Rightarrow cos^2\theta + sec^2\theta + 2 = a^2$ [$\because cos\theta sec\theta = 1$]

$\Rightarrow cos^2\theta + sec^2\theta = a^2 - 2$

Again squaring both sides, we get :

$\Rightarrow (cos^2\theta + sec^2\theta)^2 = (a^2 - 2)^2$

$\Rightarrow cos^4\theta + sec^4\theta + 2(cos^2\theta)(sec^2\theta) = a^4 - 4a^2 + 4$

$\Rightarrow cos^4\theta + sec^4\theta + 2 = a^4 - 4a^2 + 4$

$\Rightarrow cos^4\theta + sec^4\theta = a^2(a^2 - 4) + 4 - 2$

$\Rightarrow cos^4\theta + sec^4\theta = a^2(a^2 - 4) + 2.$

Therefore, option A is the right answer.

Question 40

If $x + y = z$ and $tanz = 20$, $m = tanx + tany$ and $n = tanx * tany$, what is the value of $\frac{m}{1-n}$? (Assume that $0 \leq x, y, z \leq 90$)

A 40

B 20

C 10

D 5

Answer: B

Explanation:

$x + y = z$

$tanz = tan(x + y)$ = $\frac{tanx+tany}{1-tanx*tany}$

$\Rightarrow tanz = \frac{m}{1-n}$

$\Rightarrow \frac{m}{1-n}$ = 20

Hence, option B is correct.

Instructions

The Politics of Aristotle is the second part of a treatise of which the Ethics is the first part. For Aristotle did not separate the spheres of the statesman and the moralist. In the Ethics he has described the character necessary for the good life, but that life is for him essentially to be lived in society, and when in the last chapters of the Ethics he comes to the practical application of his inquiries, that finds expression not in moral exhortations but in a description of the legislative opportunities of the statesman. It is the legislator's task to frame a society which shall make the good life possible. We are accustomed since the growth of the historical method to the belief that states are "not made but grow," and are apt to be impatient with the belief which Aristotle and Plato show in the powers of the lawgiver. But however true the maxim may be of the modern nation state, it was not true of the much smaller and more self-conscious Greek city. When Aristotle talks of the legislator, he is not talking in the air. Students of the Academy had been actually called on to give new constitutions to Greek states. For the Greeks the constitution was not merely as it is so often with us, a matter of political machinery. It was regarded as a way of life. Further,

the constitution within the framework of which the ordinary process of administration and passing of decrees went on, was always regarded as the work of a special man or body of men, the lawgivers. All Greek states, except those perversions which Aristotle criticizes as being "above law," worked under rigid constitutions, and the constitution was only changed when the whole people gave a commission to a lawgiver to draw up a new one. The lawgiver was not an ordinary politician. He was a state doctor, called in to prescribe for an ailing constitution. When the people of Cyrene asked the oracle of Delphi to help them in their dissensions, the oracle told them to go to Mantinea, and the Mantineans lent them Demonax, who acted as a "setter straight" and drew up a new constitution for Cyrene. So again the Athenians, when they were founding their model new colony at Thurii, employed Hippodamus of Miletus as the best expert in town-planning, to plan the streets of the city, and Protagoras as the best expert in law-making, to give the city its laws. The Greeks thought administration should be democratic and law-making the work of experts. We think more naturally of law-making as the special right of the people and administration as necessarily confined to experts.

Question 41

Why, according to the paragraph, did Aristotle not separate the spheres of the statesman and the moralist?

A Aristotle attached no importance to the role of the moralist as he believed that Ethics applied to a society and not to an individual

B Aristotle believed the practical application of morals was the duty of the statesman and not the moralist

C Aristotle believed that the roles of the statesman and moralist were interrelated as it was the job of the moralist to describe the characteristics of the good life and that of the statesman to make the good life possible

D Aristotle believed that mere exhortations of morals for an individual was pointless unless the society acted on the morals as a whole

Answer: C

Explanation:
The first paragraph clearly states that Aristotle viewed the two spheres of Ethics and Politics as interrelated. Option C follows directly from the first paragraph.