

Quant Mega Quiz for SSC Tier-1 (Solutions)

S1. Ans.(b)

Sol.

$$\frac{\tan \theta + \cot \theta}{\tan \theta - \cot \theta} = \frac{2}{1}$$

Using Componendo and Dividendo,

$$\frac{\tan \theta + \cot \theta + \tan \theta - \cot \theta}{\tan \theta + \cot \theta - \tan \theta + \cot \theta} = \frac{2 + 1}{2 - 1}$$

$$\frac{\tan \theta}{\cot \theta} = \frac{3}{1}$$

$$\tan^2 \theta = 3$$

$$\tan \theta = \sqrt{3}$$

$$\theta = 60^\circ$$

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

S2. Ans.(a)

Sol.

$$\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$$

$$(\tan 1^\circ \times \tan 89^\circ) = 1$$

If  $A + B = 90^\circ$ , then

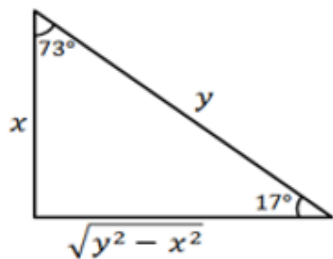
$$\tan A \times \tan B = 1$$

So the whole expression reduces to 1.

S3. Ans.(b)

Sol.

$$\sin 17^\circ = \frac{x}{y}, \text{ find } (\sec 17^\circ - \sin 73^\circ)$$



$$\begin{aligned} & \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y} \\ &= \frac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}} \\ &= \frac{x^2}{y\sqrt{y^2 - x^2}} \end{aligned}$$

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**S4. Ans.(b)****Sol.**

$$\begin{aligned}\sin(3x - 20^\circ) &= \cos(3y + 20^\circ) \\ \Rightarrow \cos(3y + 20^\circ) &= \sin(90^\circ - 3y - 20^\circ) \\ &= \sin(70^\circ - 3y)\end{aligned}$$

Now,

$$\begin{aligned}\sin(3x - 20^\circ) &= \sin(70^\circ - 3y) \\ = 3x - 20^\circ &= 70^\circ - 3y \\ = 3x + 3y &= 90^\circ \\ = 3(x + y) &= 90^\circ \\ \Rightarrow x + y &= 30^\circ\end{aligned}$$

**S5. Ans.(d)****Sol.**

$$\begin{aligned}\cos \theta \cdot \operatorname{cosec} 23^\circ &= 1 \\ \operatorname{cosec} 23^\circ &= \frac{1}{\cos \theta} \\ \operatorname{cosec} 23^\circ &= \sec \theta \\ \operatorname{cosec} 23^\circ &= \operatorname{cosec}(90^\circ - \theta) \\ \theta &= 90^\circ - 23^\circ \\ &= 67^\circ\end{aligned}$$

**S6. Ans.(a)****Sol.**  $\cos 90^\circ = 0$ **S7. Ans.(a)****Sol.**

$$\sec \theta + \tan \theta = \sqrt{3} \dots(i) \quad [\because \sec^2 \theta - \tan^2 \theta = 1]$$

$$\text{So, } \sec \theta - \tan \theta = \frac{1}{\sqrt{3}} \dots(ii)$$

Equation (i) - equation (ii)

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

$$2 \tan \theta = \frac{2}{\sqrt{3}}$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

$$\tan 3\theta = \text{undefined}$$

**S8. Ans.(c)****Sol.**

$$\operatorname{cosec} \theta - \cot \theta = \frac{7}{2} \dots(i)$$

$$\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

$$\Rightarrow (\operatorname{cosec} \theta + \cot \theta)(\operatorname{cosec} \theta - \cot \theta) = 1$$

$$\Rightarrow \operatorname{cosec} \theta + \cot \theta = \frac{2}{7} \dots(ii)$$



On adding both equations

$$\begin{aligned}2 \operatorname{cosec} \theta &= \frac{7}{2} + \frac{2}{7} \\&= \frac{49+4}{14} = \frac{53}{14} \\ \Rightarrow \operatorname{cosec} \theta &= \frac{53}{28}\end{aligned}$$

**S9. Ans.(c)**

**Sol.**

$$\begin{aligned}\cos^2 \theta &\leq 1 \\ \therefore \frac{(x+y)^2}{4xy} &\leq 1 \\ \Rightarrow (x+y)^2 - 4xy &\leq 0 \\ \Rightarrow (x-y)^2 &\leq 0 \\ \Rightarrow x &= y\end{aligned}$$

**S10. Ans.(c)**

**Sol.**

ATQ,

$$x = 2a \cos \theta + b \sin \theta \quad \dots(i)$$

$$y = 2a \sin \theta - b \cos \theta \quad \dots(ii)$$

on squaring and adding both the equations.

$$\begin{aligned}x^2 + y^2 &= (2a \cos \theta + b \sin \theta)^2 + (2a \sin \theta - b \cos \theta)^2 \\&= 4a^2 \cos^2 \theta + b^2 \sin^2 \theta + 4ab \cos \theta \cdot \sin \theta + 4a^2 \sin^2 \theta + b^2 \cos^2 \theta - 4ab \cos \theta \cdot \sin \theta \\&= 4a^2 (\cos^2 \theta + \sin^2 \theta) + b^2 (\sin^2 \theta + \cos^2 \theta) \\&= 4a^2 + b^2 \\ \therefore x^2 + y^2 &= 4a^2 + b^2\end{aligned}$$

**S11. Ans.(c)**

**Sol.**

$$\sec \alpha + \tan \alpha = 2$$

$$\frac{\sec \alpha + \tan \alpha = 2}{\sec \alpha + \tan \alpha = \frac{1}{2}} \quad \frac{2}{2}$$

$$\sec \alpha = \frac{5}{4}$$

$$\cos \alpha = \frac{4}{5}$$

$$\sin \alpha = \sqrt{1 - \frac{16}{25}}$$

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

$$= \frac{3}{5} \\ = 0.6$$

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**S12. Ans.(a)**

**Sol.**

$$3(\sec^2 \theta + \tan^2 \theta) = 5$$

$$\tan^2 \theta + \sec^2 \theta = \frac{5}{3}$$

$$\tan^2 \theta + \tan^2 \theta + 1 = \frac{5}{3}$$

$$2 \tan^2 \theta = \frac{2}{3}$$

$$\tan \theta = \frac{1}{\sqrt{3}}$$

$$\theta = 30^\circ$$

$$\cos 2\theta = \cos 60^\circ = 1/2$$

**S13. Ans.(c)**

**Sol.**

$$x^\circ + x^\circ + \frac{5\pi}{9} = \pi$$

$$2x^\circ = 4\pi/9$$

$$x^\circ = 2\pi/9$$

**S14. Ans.(b)**

**Sol.**

$$1 \text{ radian}$$

$$= \frac{180^\circ}{\pi}$$

$$= \frac{\pi}{180}$$

$$= \frac{22}{7}$$

$$= \frac{1260}{22}$$

$$= 57 \frac{6}{22}$$

$$= 57^\circ \frac{6}{22} \times 60$$

$$= 57^\circ 16' \frac{8}{22} \times 60$$

$$= 57^\circ 16' 22^\circ \text{ (approx.)}$$



**S15. Ans.(c)**

**Sol.**

$$\frac{3\pi}{5} \text{ radian}$$

$$= \frac{3}{5} \times 180^\circ$$

$$= 108^\circ$$

**S16. Ans.(b)****Sol.**

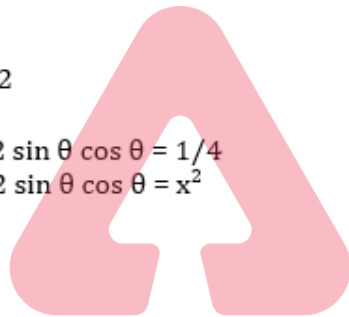
$$\begin{aligned}
 x + y &= 135^\circ \\
 x - y &= \frac{180^\circ}{12} = 15^\circ \\
 2x &= 150^\circ \\
 x &= 75^\circ \\
 y &= 60^\circ
 \end{aligned}$$

**S17. Ans.(d)****Sol.**

$$\begin{aligned}
 \cos \theta + \sin \theta &= \sqrt{2} \cos \theta \\
 \cos \theta - \sin \theta &= x \\
 \cos^2 \theta + \sin^2 \theta + 2 \sin \theta \cos \theta &= 2 \cos^2 \theta \\
 \cos^2 \theta + \sin^2 \theta - 2 \sin \theta \cos \theta &= x^2 \\
 2 &= 2 \cos^2 \theta + x^2 \\
 x^2 &= 2(1 - \cos^2 \theta) \\
 x &= \sqrt{2} \sin \theta
 \end{aligned}$$

**S18. Ans.(c)****Sol.**

$$\begin{aligned}
 \sin \theta - \cos \theta &= 1/2 \\
 \sin \theta + \cos \theta &= x \\
 \sin^2 \theta + \cos^2 \theta - 2 \sin \theta \cos \theta &= 1/4 \\
 \sin^2 \theta + \cos^2 \theta + 2 \sin \theta \cos \theta &= x^2 \\
 2 &= \frac{1}{4} + x^2 \\
 x^2 &= \frac{7}{4} \\
 x &= \frac{\sqrt{7}}{2}
 \end{aligned}$$

**S19. Ans.(a)****Sol.**

$$\begin{aligned}
 \cos^2 \theta - \sin^2 \theta &= 1/3 \\
 \cos^2 \theta - 1 + \cos^2 \theta &= 1/3 \\
 2 \cos^2 \theta &= 4/3 \\
 \cos \theta &= \sqrt{\frac{2}{3}} \\
 \sin \theta &= \sqrt{1 - \frac{2}{3}} \\
 &= \frac{1}{\sqrt{3}} \\
 \cos^4 \theta - \sin^4 \theta &= \frac{4}{9} - \frac{1}{9} \\
 &= \frac{3}{9} = \frac{1}{3}
 \end{aligned}$$

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**S20. Ans.(a)**

**Sol.**

$$3 \sin \theta + 5 \cos \theta = 5$$

$$5 \sin \theta - 3 \cos \theta = x$$

$$9 \sin^2 \theta + 25 \cos^2 \theta + 30 \sin \theta \cos \theta = 25$$

$$25 \sin^2 \theta + 9 \cos^2 \theta - 30 \sin \theta \cos \theta = x^2$$

$$9 (\sin^2 \theta + \cos^2 \theta) + 25 (\sin^2 \theta + \cos^2 \theta) \\ = 25 + x^2$$

$$x = \pm 3$$

**S21. Ans.(b)**

**Sol.**

	Milk	Water	
Mixture I	14	13	× 13
	182	169	
Mixture II	13	15	× 14
	<u>182</u>	<u>210</u>	

$$\text{Quantity of Water added} = 210x - 169x = 41x$$

$$41x = 82 \text{ litre}$$

$$x = 2 \text{ litre}$$

$$\text{Initial quantity of Milk} = 182 \times 2 + 54 \times \frac{14}{27}$$

$$= 364 + 28$$

$$= 392 \text{ litre.}$$

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**S22. Ans.(a)**

**Sol.**

	Water	Spirit	
Vessel I	3	9	] × 13
	39	117	
Vessel II	7	6	] × 12
	<u>84</u>	<u>72</u>	
	123	189	

$$\text{Required ratio} = 41 : 63$$

**S23. Ans.(b)**

**Sol.**

ATQ,

$$\frac{x}{10} + \frac{y}{4} = 46$$

$$\Rightarrow 2x + 5y = 920$$

$$\text{Also } x + y = 250$$

$$\text{On solving, } x = 110, y = 140$$

S24. Ans.(a)

Sol.

$$\text{Initially, } \frac{\text{Water}}{\text{Mixture}} = \frac{5}{9}$$

$$\text{Final, } \frac{\text{Water}}{\text{Mixture}} = \frac{3}{5}$$

$$\text{Final} - \text{Initial} = \frac{3}{5} - \frac{5}{9} = \frac{2}{45}$$

S25. Ans.(c)

Sol.

Let total person be  $12x$

No. of males =  $6x$

No. of Females =  $6x$

Males who dance =  $\frac{2}{3} \times 6x = 4x$

No. Of people who dance =  $6x$

Required ratio =  $\frac{2x}{4x} = 1 : 2$

S26. Ans.(b)

Sol.

A : B + C

2 3

⇒ Total investment = 5 units

A's investment = 2 units.

A's 4% profit = 420

1% profit = 105

100% profit = 10500 = A's Investment

So, 2 unit → Rs 10500

3 unit → Rs 15750



S27. Ans.(b)

Sol.

Profit ratios P : Q : R

= 8 : 3 : 3

Investment × time = Profit

$$\frac{P \times 6}{R \times 6} = \frac{8}{3}$$

$$\frac{P \times 6}{2400 \times 6} = \frac{8}{3}$$

P = Rs 6400

Also,

$$\frac{Q \times 5}{2400 \times 6} = \frac{3}{3}$$

Q = 2880

P + Q = 6400 + 2880 = 9280

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S28. Ans.(d)

Sol.

Let total work =  $16x$

No. of days to do total work = 20 days

Done Work =  $12x \times \frac{3}{4} = 9x$

Remaining Work =  $16x - 9x = 7x$

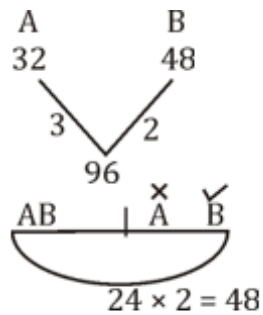
$$\frac{M_1 D_1}{W_1} = \frac{M_2 D_2}{W_2}$$

$$\frac{36 \times 20}{16x} = \frac{30 \times D_2}{7x}$$

$$D_2 = \frac{21}{2} = 10\frac{1}{2} \text{ days}$$

S29. Ans.(b)

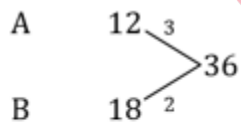
Sol.



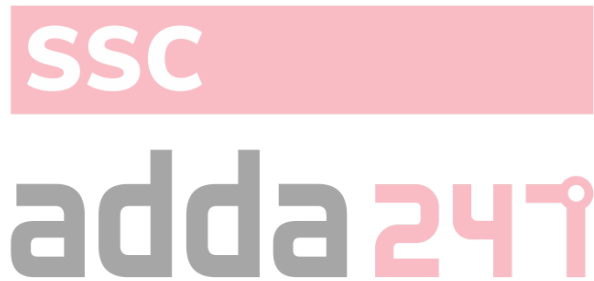
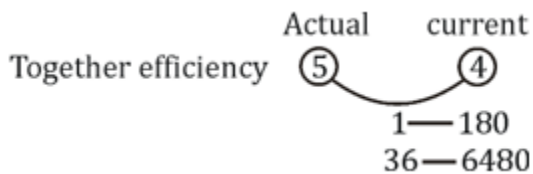
Remaining work =  $96 - 48 = \frac{48}{3} = 16$  days.

S30. Ans.(c)

Sol.



$$\frac{36}{9} = 4$$



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