S1. Ans.(d)
Sol.
ATQ,
$\Rightarrow 3\text{cosec}^2\theta = 21 - 3\cot^2\theta$
$\Rightarrow 3(\text{cosec}^2\theta + \cot^2\theta) = 21$
$\Rightarrow \text{cosec}^2\theta + \cot^2\theta = 7$ ...(i)
And,
$\text{Cosec}^2\theta - \cot^2\theta = 1$ ...(ii)
Adding (i) & (ii) we get
$2\text{cosec}^2\theta = 8$
$\Rightarrow \text{cosec}^2\theta = 4$
$\Rightarrow \text{cosec}\theta = 2 \Rightarrow \theta = 30°$
$\therefore \sin 2\theta = \sin 60° = \frac{\sqrt{3}}{2}$

S2. Ans.(d)
Sol.
$$(\sin 4x + \sin 4y)\frac{[\tan(2x - 2y)]}{(\sin 4x - \sin 4y)}$$
$$\Rightarrow \frac{2\sin\left(\frac{4x+4y}{2}\right)\cos\left(\frac{4x-4y}{2}\right)}{2\cos\left(\frac{4x+4y}{2}\right)\sin\left(\frac{4x-4y}{2}\right)} \times \frac{\sin(2x-2y)}{\cos(2x-2y)}$$
$$\Rightarrow \frac{\sin(2x+2y)}{\cos(2x+2y)} \Rightarrow \tan(2x+2y)$$

S3. Ans.(d)
Sol. We know,
If (A + B) = 90°
⇒ SinA .SecB = 1
Now,
(sin41°. Sec49°). (sin42°. Sec48°)(sin43°. Sec47°). (sin44°. Sec46°)Cos45° =1/√2

S4. Ans.(c)
Sol.
$$\frac{32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1}{4\sin x\cos x\sin(60-x)\cos(60-x)\sin(60+x)\cos(60+x)}$$
As we know [$\sin x.\sin(60-x).\sin(60+x) = \frac{1}{4} \times \sin 3x$ *and* $\cos x.\cos(60-x).\cos(60+x) = \frac{1}{4}\cos 3x$]

$$\Rightarrow \frac{2(16\cos^6 x - 24\cos^4 x + 9\cos^2 x) - 1}{4 \times \frac{1}{4} \times \sin 3x \times \frac{1}{4}\cos 3x}$$

$$\Rightarrow \frac{2[(4\cos^3 x)\text{^}2 - (3\cos x)\text{^}2 - 2 \times 4 \times 3\cos^2 x \times \cos x)] - 1}{2 \times \frac{1}{2}\sin 3x \times \frac{1}{4}\cos 3x}$$

$$\Rightarrow \frac{2[(4\cos^3 x) - (3\cos x)]^2] - 1}{\frac{1}{8}\sin 6x}$$

$$\Rightarrow \frac{8 \times [2 \times \cos^2 3x - 1]}{\sin 6x}$$

$$\Rightarrow \frac{8\cos 6x}{\sin 6x}$$

$$\Rightarrow 8\cot 6x$$

S5. Ans.(a)

Sol.

ATQ,

$\text{Sin}\theta - \cos\theta = 0$

Put $\theta = 45°$

$\text{Sin}45° - \cos45° = 0$

$$\Rightarrow \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} = 0 \quad \text{(satisfies)}$$

$\therefore$ Put $\theta = 45°$ in $\frac{\text{Sin}(\theta+15°)}{\text{Sin}(\theta-15°)}$

$$= \frac{\text{Sin } 60°}{\text{Sin } 30°} = \frac{\sqrt{3}/2}{1/2} = \sqrt{3}$$

S6. Ans.(c)

Sol.

$$\frac{2\cot\left(\frac{(\pi - A)}{2}\right)}{\left[1 + \tan^2\left(\frac{(2\pi - A)}{2}\right)\right]}$$

$$\Rightarrow \frac{2\cot\left(90 - \frac{A}{2}\right)}{\left[1 + \tan^2\left(180 - \frac{A}{2}\right)\right]}$$

$$\Rightarrow \frac{2\tan\frac{A}{2}}{1 - \tan^2\frac{A}{2}} \Rightarrow \sin 2 \times \frac{A}{2} \Rightarrow \sin A$$

S7. Ans.(c)

Sol.

Put $a = 45°$

$$= \sqrt{(\text{Cosec}45° + \sin45°)(\text{Sec}45° + \cos45°)(\tan45° + \cot45°)}$$

$$= \sqrt{\left(\sqrt{2} + \frac{1}{\sqrt{2}}\right)\left(\sqrt{2} + \frac{1}{\sqrt{2}}\right)(1 + 1)}$$

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

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S8. Ans.(c)

Sol.

given

$\tan\theta + \sec\theta = \frac{x-2}{x+2}$ ...(i)

As we know $\sec^2\theta - \tan^2\theta = 1$

So,

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

So, put value from eq (i)

$\sec\theta - \tan\theta = \frac{x+2}{x-2}$ ...(ii)

Add eqn. (i) & (ii)

$2\sec\theta = \frac{(x+2)^2 + (x-2)^2}{x^2-4}$

$2\sec\theta = \frac{2(x^2+4)}{x^2-4}$

$\cos\theta = \frac{x^2-4}{x+4}$

S9. Ans.(a)

Sol.

ATQ,

$\Rightarrow \sin(\theta + 30°) = \frac{6}{\sqrt{48}} = \frac{2\times3}{2\times2\times\sqrt{3}} = \frac{\sqrt{3}}{2}$

$\Rightarrow \sin(\theta + 30°) = \sin 60°$

$\therefore \theta = 30°$

$\therefore (\tan 30)^2 = \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{1}{3}$

S10. Ans.(b)

Sol.

$$\frac{\cos 40° - \cos 140°}{\sin 80° + \sin 20°}$$

$$\Rightarrow \frac{-2\sin\left(\frac{40+140}{2}\right)\sin\frac{(40-140)}{2}}{2\sin\frac{(80+20)}{2}\cos\frac{(80-20)}{2}}$$

$$\Rightarrow \frac{-2\sin 90 \times -\sin 50}{2\sin 50 \times \cos 30} \Rightarrow \frac{1}{\frac{\sqrt{3}}{2}} = \frac{2}{\sqrt{3}}$$

S11. Ans.(b)

Sol.

3A = 6B = 9C = 18 (say)

A : B : C

6 : 3 : 2

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S12. Ans.(b)
Sol.
Ratio of initial investments = $\frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$.
Let their initial investments be 6x, 4x and 3x respectively.
A : B : C = (6x × 2 + 3x × 10) : (4x × 12) : (3x × 12) = 42 : 48 : 36 = 7 : 8 : 6.
∴ B's share = Rs $\left(378 \times \frac{8}{21}\right)$ = Rs. 144.

S13. Ans.(b)
Sol.
GIVEN RATIO

Selected : Unselected

19 : 17

Acc^{r} to Que^{n}

$\frac{36x-1200}{19x-800} = \frac{2}{1}$

36x – 1200 = 38x – 1600

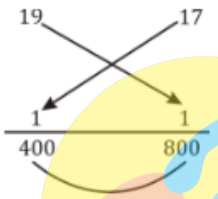
2x = 400

x = 200

Total applicant = 36 × 200

= 7200

ALTERNATE METHOD:-



(800 – 400) = $\frac{400}{(19-17)}$ = 200
Total = 36 × 200
= 7200

S14. Ans. (b)
Sol.
Let their initial investments be x, 3x and 5x respectively. Then,
A : B : C = $(x \times 4 + 2x \times 8) : \left(3x \times 4 + \frac{3x}{2} \times 8\right) : \left(5x \times 4 + \frac{5x}{2} \times 8\right)$
= 20x : 24x : 40x = 5 : 6 : 10.

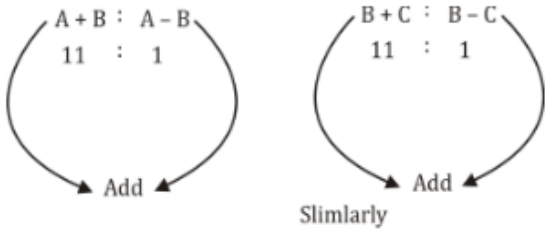
S15. Ans.(d)
Sol. Given,

a	b	c
10	20	?

$b^2 = ac = 400 = 10XC$
C = 40

S16. Ans.(b)
Sol. Total amount= 120/100[80*6.75 +120*8]=1800
Now, required value= 1800/200= 9 Rs/kg

S17. Ans.(b)
Sol.



Slimlarly

2a = 12 : B = 6, C = 5
a = 6
then b = 5
ratio of

A	:	B	:	C
6	:	5		
		6	:	5

36 :30 :25

Hence B's salary = $\frac{30}{91} \times 182000$
= 60000 Rs.

S18. Ans.(b)
Sol.
In 20 litres of cocktail mixture,
Alcohol = $\frac{20 \times 20}{100}$ = 4 litres
Water = 20 - 4 = 16 litres
On adding 4 litres of water,
Quantity of water = 16 + 4 = 20 litres
Quantity of mixture = 24 litres
Required per cent
$= \frac{4}{24} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$

S19. Ans.(b)
Sol.

	Old		New
Price →	8	:	11
Tickets	→ 23	:	21

184 : 231
IF 184 →36800
THEN 231 → 231 × 200
= 46200
↑es in revenue = [46200 – 36800]
= 9400 Rs.

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S20. Ans.(a)

Sol.

GIVEN

Present age of father = 11x + 2y

ACCORDING TO QUESTION

$\frac{11x+2y}{10x+2y}=\frac{19}{18}$ → 198x + 36y = 190x + 38y

$\frac{x}{y}=\frac{1}{4}$

RATIO of present age is

$\frac{11x+y}{10x+y}=\frac{11+4}{10+4}=\frac{15}{14}$

S21. Ans.(b)

Sol.

Given eqⁿ,

$x^2 + 2x + 5 = 0$

→ comparing it with $ax^2 + bx + c = 0$

a = 1, b = 2, c = −15

⇒ We know that,

$\alpha + \beta = -\frac{b}{a} = -2$

$\alpha\beta = \frac{c}{a} = -15$

$\therefore \frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta}$

$=\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$

$=\frac{(-2)^2-2\times-15}{-15}$

$=\frac{4+30}{-15}=-\frac{34}{15}$

S22. Ans.(b)

Sol.

$\Rightarrow \frac{12x^2-27x+27+1}{4x^2-9x+9}=\frac{16}{5}$

$\Rightarrow 3+\frac{1}{4x^2-9x+9}=\frac{16}{5}$

$\Rightarrow 4x^2 - 9x + 9 = 5$

$\Rightarrow x+\frac{1}{x}=\frac{9}{4}$

$\Rightarrow x^2+\frac{1}{x^2}=\frac{81}{16}-2$

$\Rightarrow \sqrt{x^2+\frac{1}{x^2}}=\frac{7}{4}$

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S23. Ans.(b)

Sol.

$(x - 2)$ is a factor of polynomial $f(x) = x^3 + x^2 - 5x + \tau$

$\therefore f(2) = 0$

$\Rightarrow 2^3 + 2^2 - 5 \times 2 + \tau = 0$

$\Rightarrow 12 - 10 + \tau = 0$

$\Rightarrow \tau = -2$

S24. Ans.(a)

Sol.

$x(x + 1) + 1 = 6(x + 1)$

$\Rightarrow (x - 1)(x^2 + x + 1) = (6x + 6)(x - 1)$

$\Rightarrow (x^3 - 1) = 6x^2 - 6$

$\Rightarrow x^3 - 6x^2 = -5$

Required $= 5x^4 (x - 6)^2 + 14$

$\Rightarrow 5(x^3 - 6x^2)^2 + 14$

$\Rightarrow 125 + 14 = 139$

S25. Ans.(d)

Sol.

Always do these types of question with the help of put. $a = b = c = 1$

$3(1^2 + 1^2 + 1^2) = (1 + 1 + 1)^2$

$\Rightarrow 9 = 9$ (satisfied)

$\Rightarrow$ So, this is answer $\longrightarrow a = b = c$

S26. Ans.(a)

Sol.

L.C.M. $= (x^2 + 6x + 8)(x + 1)$

$= (x + 1)(x + 2)(x + 4)$

H.C.F. $= (x + 1)$

First expression $= x^2 + 3x + 2$

$= (x + 1)(x + 2)$

ATQ,

(second expression) $\times (x + 1)(x + 2)$

$= (x + 1)(x + 1)(x + 2)(x + 4)$

Second expression $= (x + 1)(x + 4)$

$= x^2 + 5x + 4$

S27. Ans.(b)

Sol.

$x^2 + 11x - 5x - 55 = 1$

$(x + 11)(x - 5) = 1$

$(x - 5) = \frac{1}{(x + 11)}$

$(x + 11) - 16 = \frac{1}{x + 11}$

$(x + 11) - \frac{1}{(x + 11)} = 16$

$(x + 11) + \frac{1}{x + 11} = \sqrt{16^2 + 4} = 2\sqrt{65}$

Required $= (x + 11)^2 - \frac{1}{(x+11)^2} = 16 \times 2\sqrt{65} = 32\sqrt{65}$

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S28. Ans.(a)

Sol.

Given

$(a^2 - b^2)^3 + (b^2 - c^2)^3 + (c^2 - a^2)^3$

Let,

$(a^2 - b^2) = A$

$(b^2 - c^2) = B$

$(c^2 - a^2) = C$

Now,

$A + B + C = a^2 - b^2 + b^2 - c^2 + c^2 - a^2 = 0$

We know,

$A^3 + B^3 + C^3 - 3ABC$

$= \frac{1}{2}(A + B + C)\{(A - B)^2 + (B - C)^2 + (C - A)^2\}$

$= 0$

$\Rightarrow$

$A^3 + B^3 + C^3 = 3ABC$

$\therefore A^3 + B^3 + C^3 = 3 \times (a^2 - b^2)(b^2 - c^2)(c^2 - a^2)$

Hence,

$(a + b)(a - b)$ is a factor

S29. Ans.(d)

Sol.

Given $(x - 8) = \frac{-1}{x}$

$x + \frac{1}{x} = 8$ then $x - \frac{1}{x} = \sqrt{60}$

$\Rightarrow x^3 - \frac{1}{x^3} = 60\sqrt{60} + 3\sqrt{60}$

$= 63\sqrt{60}$

$\Rightarrow x^3 - 63\sqrt{60} = \frac{1}{x^3}$

$\Rightarrow x^3 (x^3 - 63\sqrt{60}) = 1$

$K = 63\sqrt{60}$

S30. Ans.(b)

Sol.

Given, $(x + y) = 5$

$\Rightarrow$ Take cube on both sides

$(x + y)^3 = 125$

$\Rightarrow x^3 + y^3 + 3xy(x + y) = 125$

$\Rightarrow 35 + 3xy(5) = 125 \{\because x^3 + y^3 = 35\}$

$\Rightarrow 15xy = 90$

$\Rightarrow xy = 6$

$\therefore \frac{1}{x} + \frac{1}{y} = \frac{x + y}{xy} = \frac{5}{6}$