SSC CGL (Tier – II) Mathematics Practice Set

Answers with Explanation

1. (c) Suppose that

$$1+\frac{1}{10+\frac{1}{10}}=\frac{111}{101}=a$$

$$1-\frac{1}{10+\frac{1}{10}}=\frac{91}{101}=b$$

$$\therefore \frac{a^2-b^2}{a+b)}=\frac{(a+b)(a-b)}{(a+b)}=(a-b)$$

$$=\frac{111}{101}-\frac{91}{101}=\frac{20}{101}$$

2. (d) Check through options

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

$$=\frac{1}{3+\frac{1}{1+\frac{1}{\frac{8+1}{4}}}}=\frac{1}{3+\frac{1}{1+\frac{4}{9}}}$$

$$=\frac{1}{3+\frac{1}{\frac{9+4}{9}}}=\frac{1}{3+\frac{9}{13}}=\frac{1}{\frac{39+9}{13}}=\frac{13}{48}$$

3. (a) $\frac{1}{\sqrt{3.25}+\sqrt{2.25}}$

$$=\frac{1}{\sqrt{3.25}+\sqrt{2.25}}\times\frac{\sqrt{3.25}-\sqrt{2.25}}{\sqrt{3.25}-\sqrt{2.25}}$$

$$=\frac{\sqrt{3.25}-\sqrt{2.25}}{3.25-2.25}=\sqrt{3.25}-\sqrt{2.25}$$

Similarly,

$$\frac{1}{\sqrt{4.25}+\sqrt{3.25}}=\sqrt{4.25}-\sqrt{3.25}$$

$$\frac{1}{\sqrt{5.25}+\sqrt{4.25}}=\sqrt{5.25}-\sqrt{4.25}$$

$$\frac{1}{\sqrt{6.25}+\sqrt{5.25}}=\sqrt{6.25}-\sqrt{5.25}$$

$\therefore$ Expression

$=\sqrt{3.25}-\sqrt{2.25}+\sqrt{4.25}-\sqrt{3.25}+\sqrt{5.25}-\sqrt{4.25}+\sqrt{6.25}-\sqrt{5.25}$

$=\sqrt{6.25}-\sqrt{2.25}=2.5-1.5=1$

4. (c) $\frac{1}{\sqrt{3}+\sqrt{4}}$

$$=\frac{1}{\sqrt{3}+\sqrt{4}}\times\frac{\sqrt{4}-\sqrt{3}}{\sqrt{4}-\sqrt{3}}$$

$$=\frac{\sqrt{4}-\sqrt{3}}{4-3}=\sqrt{4}-\sqrt{3}$$

Similarly,

$$=\frac{1}{\sqrt{4}+\sqrt{5}}=\sqrt{5}-\sqrt{4}\ldots \text{so on}$$

$\therefore$ Expression

$=\sqrt{4}-\sqrt{3}+\sqrt{5}-\sqrt{4}+\sqrt{6}-\sqrt{5}+\sqrt{7}-\sqrt{6}+\sqrt{8}-\sqrt{7}+\sqrt{9}-\sqrt{8}$

$=\sqrt{9}-\sqrt{3}=3-\sqrt{3}$

5. (a) $\frac{x^3-y^3}{x^2+xy+y^2}=\frac{5}{1}$

$$\Rightarrow \frac{(x-y)\left(x^2+xy+y^2\right)}{x^2+xy+y^2}=5$$

$\Rightarrow x - y = 5$ ..... (i)

Again,

$$\frac{x^2-y^2}{x-y}=7$$

$$\Rightarrow \frac{(x+y)(x-y)}{x-y}=7$$

$\Rightarrow x + y = 7$ ..... (ii)

On adding equations (i) and (ii),

$2x = 12 \Rightarrow x = 6$

From equation (ii),
$x + y = 7 \Rightarrow y = 7 - 6 = 1$

$\therefore \frac{2x}{3y} = \frac{2\times6}{3\times1} = 4:1$

6. (d) Since 18% of the students neither play football nor cricket. It means 82% of the students either play football or cricket or both.
Using set theory
$\therefore n(A\cup B) = n(A) + n(B) - n(A\cap B)$
$\Rightarrow 82 = 40 + 50 - n(A\cap B)$
$\Rightarrow n(A\cap B) = 90 - 82 = 8$
$\therefore$ 8% students play both games.

7. (b) Using Rule 1,

Tricky Approach

If the cost price is ₹100, then selling price = ₹120 and gain = ₹20

Required gain % $= \frac{20}{120}\times100 = \frac{50}{3} = 16\frac{2}{3}\%$

8. (a) C.P. of 1 bucket = x
C.P. of 1 mug = y
$\therefore 8x + 5y = 92$ .....(i)
$5x + 8y = 77$ .....(ii)
By using equation (i) × 5 – equation (ii) × 8,
$40x + 25y - 40x - 64y$
$= 460 - 616$
$\Rightarrow -39y = -156$
$\Rightarrow y = 4$
From equation (i),
$8x + 20 = 92$
$\Rightarrow 8x = 92 - 20 = 72$
$\Rightarrow x = 9$
$\therefore$ C.P. of 2 mugs and 3 buckets
$= 2 \times 4 + 3 \times 9$
$= 8 + 27 =$ ₹35

9. (c) Principal + S.I. for $\frac{5}{2}$ years = ₹1012 ...(i)
Principal + S.I. for 4 years = ₹1067.20 ...(ii)
Subtracting equation (i) from (ii)

S.I. for $\frac{3}{2}$ years = ₹55.20

$\therefore$ S.I. for $\frac{5}{2}$ years $= 55.20\times\frac{2}{3}\times\frac{5}{2} =$ ₹92

$\therefore$ Principal = ₹(1012 – 92) = ₹920

$\therefore$ Rate $= \frac{92\times100}{920\times\frac{5}{2}} = \frac{92\times100}{920\times\frac{5}{2}}$

$= \frac{2\times92\times100}{920\times5} = 4\%$

10. (b) P = ₹3000, A = ₹3993, n = 3 years

$A = P\left(1+\frac{r}{100}\right)^n$

$\therefore \left(1+\frac{r}{100}\right)^n = \frac{A}{P}$

$\left(1+\frac{r}{100}\right)^3 = \frac{3993}{3000} = \frac{1331}{1000}$

$\left(1+\frac{r}{100}\right)^3 = \left(\frac{11}{10}\right)^3$

$\Rightarrow 1+\frac{r}{100} = \frac{11}{10}$

$\Rightarrow \frac{r}{100} = \frac{11}{10} - 1$

$\Rightarrow \frac{r}{100} = \frac{1}{10} \Rightarrow r = \frac{100}{10}$

$\therefore r = 10\%$

11. (c) $x = \sqrt{\frac{\sqrt5+1}{\sqrt5-1}\times\frac{\sqrt5+1}{\sqrt5+1}} = \sqrt{\frac{\left(\sqrt5+1\right)^2}{5-1}}$

$= \sqrt{\frac{\left(\sqrt5+1\right)^2}{4}} = \frac{\sqrt5+1}{2}$

$\therefore 5x^2 - 5x - 1$

$= 5\left(\frac{\left(\sqrt5+1\right)}{2}\right)^2 - 5\frac{\left(\sqrt5+1\right)}{2} - 1$

$= 5\left(\frac{5+1+2\sqrt5}{4}\right) - \frac{5\sqrt5+5}{2} - 1$

$= 5\left(\frac{3+\sqrt5}{2}\right) - \frac{5\sqrt5+5}{2} - 1$

$= \frac{15+5\sqrt5-5\sqrt5-5-2}{2} = \frac{8}{2} = 4$

12. (c) $4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E = 47.2506$

$= 40 + 7 + \frac{2}{10} + \frac{5}{100} + \frac{6}{10000}$

$4A = 40 \Rightarrow A = 10$

$\frac{7}{B} = 7 \Rightarrow 7B = 7 \Rightarrow B = 1$

$2C = \frac{2}{10} \Rightarrow C = 0.1$

$\frac{5}{D} = \frac{5}{100} \Rightarrow D = 100$ অ্যাচিভার্স

$6E = \frac{6}{10000} \Rightarrow E = 0.0001$

$5A + 3B + 6C + D + 3E$
$= 5 \times 10 + 3 \times 1 + 6 \times 0.1 + 100 + 3 \times 0.0001$
$= 50 + 3 + 0.6 + 100 + 0.0003 = 153.6003$

13. (c) $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$

$\Rightarrow \frac{p^{2+} - 2p + 1}{2p} = 4$

$\Rightarrow \frac{p^2 - 2p + 1}{p} = 8$ অ্যাচিভার্স

$\Rightarrow \frac{p^2}{p} - \frac{2p}{p} + \frac{1}{p} = 8$

$\Rightarrow p + \frac{1}{p} = 8 + 2 = 10$

14. (c) $\frac{1}{\text{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ$

$- \frac{1}{\sin^2 51^\circ . \sec^2 39^\circ}$
$= \sin^2 51° + \sin^2 39° + \tan^2(90° - 39°) -$
$- \frac{1}{\sin^2(90^\circ - 39^\circ) . \sec^2 39^\circ}$
$= \cos^2 39° + \sin^2 39° + \cot^2 39° -$ অ্যাচিভার্স
$\frac{1}{\cos^2 39^\circ . \sec^2 39^\circ}$
$[\because \sin(90° - \theta) = \cos\theta$
$\tan(90° - \theta) = \cot\theta]$
$= 1 + \cot^2 39° - 1$
$= \text{cosec}^2 39° - 1 = x^2 - 1$

15. (c) $\frac{\frac{3}{2}}{\frac{1}{2}} \div \frac{4}{7}\left(\frac{4+3}{10}\right)$ of $\frac{3+2}{\frac{6}{3-2}}$

$= 3 \div \frac{4}{7}\left(\frac{7}{10}\right)$ of $\left(\frac{5}{6} \times 6\right)$

$= 3 \div \left(\frac{4}{7} \times \frac{7}{10} \times 5\right) = 3 \div 2 = \frac{3}{2}$

16. (b) Let $0.03 = x \Rightarrow 0.003 = \frac{x}{10}$ অ্যাচিভার্স

$0.21 = y \Rightarrow 0.021 = \frac{y}{10}$

and $0.065 = z \Rightarrow 0.0065 = \frac{z}{10}$

$\therefore$ Expression

$= \sqrt{\frac{x^2 + y^2 + z^2}{\left(\frac{x}{10}\right)^2 + \left(\frac{y}{10}\right)^2 + \left(\frac{z}{10}\right)^2}}$

$= \sqrt{100\frac{\left(x^2 + y^2 + z^2\right)}{\left(x^2 + y^2 + z^2\right)}} = \sqrt{100} = 10$

17. (a) $(64)^{\frac{-2}{3}} \times \left(\frac{1}{4}\right)^{-2}$ অ্যাচিভার্স

$= \frac{1}{(64)^{\frac{2}{3}}} \times (4)^2$

$= \frac{1}{(4)^{3 \times \frac{2}{3}}} \times 4^2 = \frac{1}{4^2} \times 4^2 = 1$

18. (c) $\left[\left(\sqrt[5]{x^{-3/5}}\right)^{\frac{-5}{3}}\right]^5$

$= \left(x^{-\frac{3}{5}}\right)^{\frac{1}{5} \times \frac{-5}{3} \times 5}$

$= x^{-\frac{3}{5} \times \frac{-5}{3}} = x$ অ্যাচিভার্স

19. (b) A : B = 5 : 4 = 45 : 36
B : C = 9 : 10 = 36 : 40
$\therefore$ A : B : C = 45 : 36 : 40
Sum of the terms of ratio
= 45 + 36 + 40 = 121

$\therefore$ C's share = ₹ $\left(\frac{40}{121} \times 2420\right)$ = ₹ 800

20. (a) Let numbers = 5x and 4x

$\therefore 5x \times \frac{40}{100} = 12$

$\Rightarrow$ 2x = 12 $\Rightarrow$ x = 6 and

Second number = 6 × 4 = 24

$\therefore$ 50% of 24 $= 24 \times \frac{50}{100} = 12$

21. (a) $(A + B) \times \frac{40}{100}$ অ্যাচিভার্স

$= (A - B) \times \frac{60}{100}$

$\Rightarrow 2(A + B) = 3 (A - B)$

$\Rightarrow 2A + 2B = 3A - 3B$

$\Rightarrow A = 5B$

$\therefore \frac{2A - 3B}{A + B} = \frac{10B - 3B}{5B + B} = \frac{7B}{6B} = \frac{7}{6}$

22. (c) After taking away respective balls,

Number of balls in the box

= 75 + 25 + 50 = 150

$\therefore$ Percentage of black balls

$= \frac{50}{150} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$ অ্যাচিভার্স

23. (c) C.P. of watch = Rs. x (let)

$\therefore$ S.P. $= \frac{120x}{100} = ₹ \frac{6x}{5}$

Cass II

C.P. $= ₹ \frac{9x}{10}$

S.P. $= ₹ \left(\frac{6x}{5} - 30\right)$

According to the question,

$\frac{6x}{5} - 30 = \frac{9x}{10} \times \frac{120}{100} = \frac{27x}{25}$

$\Rightarrow \frac{6x}{5} - \frac{27x}{25} = 30$ অ্যাচিভার্স

$\Rightarrow \frac{30x - 27x}{25} = 30$

$\Rightarrow 3x = 30 \times 25$

$\Rightarrow x = \frac{30 \times 25}{3} = ₹ 250$

24. (c) Let the C.P. of cycle be ₹ x.

Case I,

S.P. of cycle = $₹ \left(\frac{90x}{100}\right) = ₹ \frac{9x}{10}$

Case II,

106% of x $= \frac{9x}{10} + 200$

$\Rightarrow \frac{106x}{100} - \frac{9x}{10} = 200$

$\Rightarrow \frac{106x - 90x}{100} = 200$ অ্যাচিভার্স

$\Rightarrow \frac{16x}{100} = 200$

$\Rightarrow x = \frac{200 \times 100}{16} = ₹ 1250$

25. (b) Principal $= \frac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{1 \times 100}{\frac{1}{365} \times 5} = \frac{365 \times 100}{5}$

= ₹ 7300

26. (c) $\frac{1}{4} \times \frac{2}{6} \times \frac{3}{8} \times \frac{4}{10} \times \frac{5}{12} \ldots \times \frac{31}{64} = \frac{1}{2^x}$ অ্যাচিভার্স

$\Rightarrow \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times$ ... to 30 terms $\times \frac{1}{64} = \frac{1}{2^x}$

$\Rightarrow \frac{1}{2^{30}} \times \frac{1}{2^6} = \frac{1}{2^x}$

$\Rightarrow \frac{1}{2^{36}} = \frac{1}{2^x} \Rightarrow x = 36$

27. (a) $\frac{a}{2} = \frac{b}{3} = \frac{c}{5} = k$ (Let)

$\therefore$ a = 2k, b = 3k, c = 5k

$\therefore \frac{a + b + c}{c} = \frac{2k + 3k + 5k}{5k} = \frac{10k}{5k} = 2$

28. (b) $\frac{\sqrt{7} - 2}{\sqrt{7} + 2} = \frac{\sqrt{7} - 2}{\sqrt{7} + 2} \times \frac{\sqrt{7} - 2}{\sqrt{7} - 2}$ অ্যাচিভার্স

Rationalising the denominator)

$= \frac{\left(\sqrt{7} - 2\right)^2}{7 - 4} = \frac{7 + 4 - 4\sqrt{7}}{3}$

$= \frac{11}{3} - \frac{4\sqrt{7}}{3}$

$$\therefore \frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7}+b$$

$$\Rightarrow \frac{11}{3}-\frac{4}{3}\sqrt{7} = a\sqrt{7}+b$$

Clearly,

$$a = -\frac{4}{3} \text{ and } b = \frac{11}{3}$$

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29. (a) Let the rate of CI be R per cent per annum.

$$\therefore CI = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 5044 = 32000\left[\left(1+\frac{R}{400}\right)^3 - 1\right]$$

[$\because$ Interest is compounded quarterly]

$$\Rightarrow \frac{5044}{32000} = \left(1+\frac{R}{400}\right)^3 - 1$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 - 1 = \frac{1261}{8000}$$

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$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = 1+\frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = \frac{1261}{8000}\left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1+\frac{R}{400} = \frac{21}{20} \Rightarrow \frac{R}{400} = \frac{21}{20}-1 = \frac{1}{20}$$

$$\Rightarrow R = \frac{400}{20} = 20$$

30. (b) $\sin 17^\circ = \frac{x}{y}$

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$$\cos 17^\circ = \sqrt{1-\sin^2 17^\circ}$$

$$= \sqrt{1-\frac{x^2}{y^2}} = \sqrt{\frac{y^2-x^2}{y^2}}$$

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

$$\therefore \sec 17^\circ = \frac{y}{\sqrt{y^2-x^2}}$$

$\sin 73^\circ = \sin (90^\circ - 17^\circ)$

$= \cos 17^\circ$

$\therefore \sec 17^\circ - \sin 73^\circ$

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

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

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31. (c) Suppose the C.P. of each article is ₹ 1

Then C.P. of 10 articles = ₹ 10

S.P. of 10 articles = ₹ 15

$\therefore$ Profit = ₹ 5

$$\% \text{ profit } = \frac{5\times 100}{10} = 50\%$$

32. (d) C.P. of 100 oranges = ₹ 350

S.P. of 12 oranges = ₹ 48

$$\therefore \text{S.P. of 100 oranges } = \frac{48}{12}\times 100 = ₹\,400$$

Profit = ₹ (400 – 350) = ₹ 50

$$\therefore \text{Profit \% } = \frac{50}{350}\times 100 = \frac{100}{7} = 14\frac{2}{7}\%$$

33. (a) Expression

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$$= \sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}}$$

$$= \sqrt{5+\sqrt{11+\sqrt{19+6}}}$$

$$= \sqrt{5+\sqrt{11+5}}$$

$$= \sqrt{5+4} = \sqrt{9} = 3$$

34. (a) The orders of the given surds are 3, 2, 4 and 6.

Their LCM = 12

Now we convert each surd into a surd of order 12.

$$\sqrt[3]{9} = (9)^{\frac{1}{3}} = (9)^{\frac{4}{12}} = \left(9^4\right)^{\frac{1}{12}} = \sqrt[12]{6561}$$

Similarly,

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$$\sqrt{3} = \sqrt[12]{3^6} = \sqrt[12]{729}$$

$$\sqrt[4]{16} = \sqrt[12]{16^3} = \sqrt[12]{4096}$$

$$\sqrt[6]{80} = \sqrt[12]{80^2} = \sqrt[12]{6400}$$

Clearly,

$$\sqrt[12]{729} < \sqrt[12]{4096} < \sqrt[12]{6400} < \sqrt[12]{6561}$$

$\therefore \sqrt[3]{9}$ is the greatest number.

35. (a) Third number = 100
First number = 70
Second number = 63
∴ Required percentage
$= \frac{7}{70} \times 100 = 10$

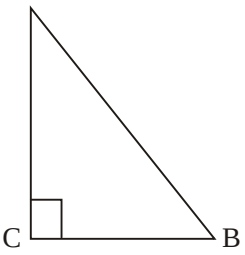
36. (a) $\text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$
$= \frac{280 \times 100}{400 \times 10}$ = 7% per annum

37. (b) $4^{4x+1} = \frac{1}{64} = \frac{1}{4^3}$
$\Rightarrow 4^{4x+1} = 4^{-3}$
$\Rightarrow 4x + 1 = -3$
$\Rightarrow 4x = -4$
$\Rightarrow x = -1$

38. (b) $\sqrt{1 - \frac{x^3}{100}} = \frac{3}{5}$
Squaring both sides,
$1 - \frac{x^3}{100} = \frac{9}{25}$
$\Rightarrow \frac{x^3}{100} = 1 - \frac{9}{25} = \frac{25-9}{25} = \frac{16}{25}$
$\Rightarrow x^3 = \frac{16}{25} \times 100 = 64$
$\therefore x = \sqrt[3]{64} = \sqrt[3]{4 \times 4 \times 4} = 4$

39. (c) $x = \left(\sqrt{2}+1\right)^{-\frac{1}{3}}$
$\Rightarrow x^{-3} = \sqrt{2}+1$
$\Rightarrow \frac{1}{x^3} = \sqrt{2}+1$
and $x^3 = \frac{1}{\sqrt{2}+1} = \frac{1\left(\sqrt{2}-1\right)}{\left(\sqrt{2}+1\right)\left(\sqrt{2}-1\right)} = \sqrt{2}-1$
$\therefore x^3 - \frac{1}{x^3}$
$= \sqrt{2} - 1 - \sqrt{2} - 1 = 2$

40. (b) $\tan\theta = \frac{3}{4}$
$\therefore \cot\theta = \frac{4}{3}$
$\because \text{cosec}^2\theta - \cot^2\theta = 1$
$\Rightarrow \text{cosec}\,\theta = \sqrt{1+\cot^2\theta}$
$= \sqrt{1+\left(\frac{4}{3}\right)^2} = \sqrt{1+\frac{16}{9}} = \sqrt{\frac{25}{9}} = \frac{5}{3}$

41. (c) A

C B
AC = BC = 5 cm
$\therefore AB = \sqrt{AC^2 + BC^2}$
$= \sqrt{5^2+5^2} = \sqrt{50} = 5\sqrt{2}$ cm

42. (d) Expression
$= \sqrt{3\frac{33}{64}} \div \sqrt{9\frac{1}{7}} \times 2\sqrt{3\frac{1}{9}}$
$= \sqrt{\frac{225}{64}} \div \sqrt{\frac{64}{7}} \times 2\sqrt{\frac{28}{9}}$
$= \sqrt{\frac{225}{64} \times \frac{7}{64} \times \frac{28}{9}} \times 2$
$= \frac{5 \times 7}{8 \times 4} \times 2 = \frac{35}{16} = 2\frac{3}{16}$

43. (b) $\sqrt[3]{9} - \sqrt[3]{3} + 1 = (3)^{\frac{2}{3}} - (3)^{\frac{1}{3}} + (1)^{\frac{2}{3}}$
$\therefore \left(\sqrt[3]{3}+1\right)\left(\sqrt[3]{9} - \sqrt[3]{3} + 1\right) = (3^{\frac{1}{3}})^3 + 1$
= 3 + 1 = 4
$\therefore a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$
$\therefore$ Rationalising factor = $\sqrt[3]{3}+1$

44. (a) Let man's salary be *x*.
∴ His expenditure on items of daily use
$= \frac{25}{2}\%$ of x
$= \frac{25 \times x}{200} = \frac{x}{8}$
So, remaining amount

$= x - \frac{x}{8} = ₹\frac{7x}{8}$

Expenditure on house rent

$= 30\%$ of $₹\frac{7x}{8}$

$= \frac{30}{100} \times \frac{7x}{8} = ₹\frac{21x}{80}$ অ্যাচিভার্স

Now, remaining amount

$= \frac{7x}{8} - \frac{21x}{80}$

$= \frac{70x - 21x}{80} = ₹\frac{49x}{80}$

According to the question,

$\therefore \frac{49x}{80} = 2940$

$\Rightarrow x = \frac{2940 \times 80}{49} = ₹4800$

45. (b) C.P. of each article $= \frac{2400}{80} = ₹30$ অ্যাচিভার্স

Profit = 16%

$\therefore$ S.P. of each article

$= ₹\left(\frac{30 \times 116}{100}\right) = ₹34.80$

46. (a) Using Rule 1,

Let the cost price = 5x and the selling price = 6x.

Gain % $= \frac{6x - 5x}{5x} \times 100 = 20\%$

47. (d) Using Rule 1,

Let P be the principal and R% rate of interest.

$\therefore$ S.I. $= \frac{PR \times 10}{100} = \frac{PR}{10}$

According to the question অ্যাচিভার্স

$\frac{PR}{10} = \left(P + \frac{PR}{10}\right) \times \frac{2}{5}$

$\Rightarrow \frac{R}{10} = \left(1 + \frac{R}{10}\right) \times \frac{2}{5}$

$\Rightarrow \frac{R}{10} = \frac{2}{5} + \frac{R}{25}$

$\Rightarrow \frac{R}{10} - \frac{R}{25} = \frac{2}{5}$

$\Rightarrow \frac{5R - 2R}{50} = \frac{2}{5}$

$\Rightarrow \frac{3R}{50} = \frac{2}{5}$

$\Rightarrow R = \frac{50 \times 2}{3 \times 5} = \frac{20}{3} = 6\frac{2}{3}\%$

48. (c) Using Rule 1, অ্যাচিভার্স

Principal (P) = Rs. S

Rate (R) = 2r% per annum

$\therefore$ Amount $= P\left(1 + \frac{R}{100}\right)^T$

$= S\left(1 + \frac{2r}{100}\right)^3 = S\left(1 + \frac{r}{50}\right)^3$

49. (b) Given $x = \frac{\sqrt{3}}{2}$

Given expression

$= \frac{\sqrt{1+x}}{1+\sqrt{1+x}} + \frac{\sqrt{1-x}}{1-\sqrt{1-x}}$ অ্যাচিভার্স

$= \frac{\sqrt{1+x}}{1+\sqrt{1+x}} \times \frac{1-\sqrt{1+x}}{1-\sqrt{1+x}} + \frac{\sqrt{1-x}}{1-\sqrt{1-x}} \times \frac{1+\sqrt{1-x}}{1+\sqrt{1-x}}$

$= \frac{\sqrt{1+x} - 1 - x}{1 - 1 - x} + \frac{\sqrt{1-x} + 1 - x}{1 - 1 + x}$

$= \frac{\sqrt{1-x} + 1 - x}{x} - \frac{\sqrt{1+x} - 1 - x}{x}$

$= \frac{\sqrt{1-x} + 1 - x - \sqrt{1+x} + 1 + x}{x}$

$= \frac{2 + \sqrt{1-x} - \sqrt{1+x}}{x}$

$= \frac{2 + \sqrt{1 - \frac{\sqrt{3}}{2}} - \sqrt{1 + \frac{\sqrt{3}}{2}}}{\frac{\sqrt{3}}{2}}$ অ্যাচিভার্স

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

$$= \frac{2+\frac{\sqrt{4-2\sqrt{3}}}{2}-\frac{\sqrt{4+2\sqrt{3}}}{2}}{\frac{\sqrt{3}}{2}}$$

$$\left[\because \sqrt{4-2\sqrt{3}} = \sqrt{3+1-2\sqrt{3}} = \sqrt{\left(\sqrt{3}-1\right)^2} = \sqrt{3}-2\right]$$

and

$$\left[\sqrt{4+2\sqrt{3}} = \sqrt{3+1+2\sqrt{3}}\right.$$

$$\left. = \sqrt{(\sqrt{3}+1)^2} = \sqrt{3}+1\right]$$

$$= \frac{4+\sqrt{3}-1-\sqrt{3}-1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$$

50. (a) Third proportional of a and b $= \frac{b^2}{a}$

$$= \frac{\left(\sqrt{x^2+y^2}\right)^2}{\frac{x}{y}+\frac{y}{x}} = \frac{x^2+y^2}{\frac{x^2+y^2}{xy}} = xy$$

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51. (d) $\frac{x}{a} = \frac{1}{a} - \frac{1}{x}$

$$\Rightarrow \frac{x}{a} = \frac{x-a}{ax}$$

$$\Rightarrow x^2 = x - a$$

$$\Rightarrow x - x^2 = a$$

52. (c) $\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} = \frac{5}{4}$

$$\Rightarrow \frac{\cos\theta\left(\frac{\sin\theta}{\cos\theta}+1\right)}{\cos\theta\left(\frac{\sin\theta}{\cos\theta}-1\right)} = \frac{5}{4}$$

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$$\Rightarrow \frac{\tan\theta+1}{\tan\theta-1} = \frac{5}{4}$$

$$\Rightarrow 4\tan\theta + 4 = 5\tan\theta - 5$$

$$\Rightarrow \tan\theta = 9$$

$$\Rightarrow \frac{2\tan\theta}{2} = \frac{5+4}{5-4}$$

(By componendo and dividendo)

$$\therefore \frac{\tan^2\theta+1}{\tan^2-1} = \frac{(9)^2+1}{(9)^2-1} = \frac{81+1}{81-1}$$

$$= \frac{82}{80} = \frac{41}{40}$$

53. (a) a = 64 and b = 289

$$\therefore \sqrt{a} = \sqrt{64} = 8 \text{ and } \sqrt{b} = \sqrt{289} = 17$$

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$$\therefore \left(\sqrt{\sqrt{a}+\sqrt{b}} - \sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{8+17} - \sqrt{17-8}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{25} - \sqrt{9}\right)^{\frac{1}{2}}$$

$$= (5-3)^{\frac{1}{2}} = (2)^{\frac{1}{2}}$$

54. (b) $\left[\sqrt[3]{\sqrt[6]{5^9}}\right]^4 \left[\sqrt[6]{\sqrt[3]{5^9}}\right]^4$

$$= \left[5^{9\times\frac{1}{6}\times\frac{1}{3}}\right]^4 \left[5^{9\times\frac{1}{6}\times\frac{1}{3}}\right]^4$$

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$$= \left[5^{\frac{1}{2}\times4}\right]\left[5^{\frac{1}{2}\times4}\right] = 5^2 \times 5^2 = 5^4$$

55. (b) Number of brown socks = x
Price of brown socks = ₹y per pair
Price of black socks = ₹2y per pair
₹ 4y + x × 2y

$$= \frac{150}{100}(4\times2y + xy)$$

$$\Rightarrow 4 + 2x = \frac{3}{2}(8+x)$$

$\Rightarrow$ 8 + 4x = 24 + 3x
$\Rightarrow$ x = 24 – 8 = 16
$\therefore$ Required ratio = 4 : 16 = 1 : 4

56. (d) Salary of clerk in 1974

$$= \frac{3600\times100}{100+20} = ₹3050$$

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57. (b) Average price of blended tea

$$= \frac{280\times7 + 240\times9}{16}$$

$$= \frac{1960+2160}{16}$$

$= \frac{4120}{16} = ₹257.50$ kg

58. (b) Required percent

$= \left(35 - 20 - \frac{35 \times 20}{100}\right)\% = 8\%$

59. (b) Rate = R% per annum

$\therefore$ Time $= \frac{R}{2}$ Years

$\therefore$ Rate $= \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$\Rightarrow R = \frac{8}{25} \times \frac{100}{\frac{R}{2}}$

$\Rightarrow R^2 = \frac{8 \times 200}{25} = 64$

$\Rightarrow R = \sqrt{64} = 8\%$ per annum

60. (c) $m + \frac{1}{m-2} = 4$

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

$\Rightarrow (m-2) + \frac{1}{(m-2)} = 4 - 2 = 2$

On squaring both sides,

$(m-2)^2 + \frac{1}{(m-2)^2} + 2(m-2)\left(\frac{1}{m-2}\right) = 4$

$\Rightarrow (m-2)^2 + \frac{1}{(m-2)^2} = 4 - 2 = 2$

61. (a) $\frac{x}{b+c} = \frac{y}{c+a}$

$= \frac{x-y}{b+c-c-a} = \frac{x-y}{b-a}; \quad \frac{y}{c+a} = \frac{z}{a+b}$

$= \frac{y-z}{c+a-a-b} = \frac{y-z}{c-b}; \quad \frac{z}{a+b} = \frac{x}{b+c}$

$= \frac{z-x}{a+b-b-c} = \frac{z-x}{a-c}$

$\therefore \frac{x-y}{b-a} = \frac{y-z}{c-b} = \frac{z-x}{a-c}$

62. (a) $x^2 + y^2 - z^2 + 2xy$
$= x^2 + y^2 + 2xy - z^2$
$= (x+y)^2 - z^2 = (x + y + z)(x + y - z)$
$= (b + c - 2a + c + a - 2b + a + b - 2c)$
$(x + y - z) = 0$

63. (d) Check through options.
If x = y = z, then

$\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{3}{x^2}$ and $\frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx}$

$= \frac{1}{x^2} + \frac{1}{x^2} + \frac{1}{x^2} = \frac{3}{x^2}$

64. (a) $\frac{2\sin\theta - \cos\theta}{\cos\theta + \sin\theta} = 1$

Dividing numerator and denominator by $\sin\theta$,

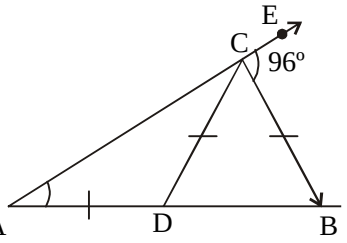
$\frac{2 - \cot\theta}{\cot\theta + 1} = 1$

$\Rightarrow 2 - \cot\theta = \cot\theta + 1$

$\Rightarrow 2\cot\theta = 1$

$\Rightarrow \cot\theta = \frac{1}{2}$

65. (c)



Let $\angle ACD = a = \angle DAC$
$\therefore \angle CDB = 2a = \angle CBD$
The angles of the base of an isosceles triangle are equal.
$\therefore \angle ACB = 180° - 96° = 84°$
$\Rightarrow \angle ACD + \angle DCB = 84°$
$\Rightarrow a + 180° - 4a = 84°$
$\Rightarrow 180° - 3a = 84°$
$\Rightarrow 3a = 180° - 84° = 96°$

$\Rightarrow a = \frac{96}{3} = 32°$

$\Rightarrow \angle DBC = 2a = 64°$

66. (c) We know that
$a^3 + b^3 + c^3 - 3abc$
$= (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$= \frac{1}{2}(a + b + c)[(a - b)2 + (b - c)2 + (c - a)^2]$

$$\therefore \sqrt[3]{(333)^3+(333)^3+(334)^3-3\times 333\times 333\times 334}$$

$$\Rightarrow \sqrt[3]{\frac{1}{2}(333+333+334)[(333-333)^2+(333-334)^2+(334-333)^2]}$$

$$=\sqrt[3]{\frac{1}{2}\times 1000\times 2}=\sqrt[3]{1000}$$

$$=\sqrt[3]{10\times 10\times 10}=10$$

67. (b) $a=\sqrt{2}+1$

$$\therefore a+1=\sqrt{2}+2$$

Again, $b=\sqrt{2}-1$

$$\therefore b+1=\sqrt{2}-1+1=\sqrt{2}$$

$$\therefore \frac{1}{a+1}+\frac{1}{b+1}$$

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

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

68. (c) $\frac{x}{y}=\frac{4}{5}$ (Given)

$$\text{Expression}=\frac{4}{7}+\frac{2y-x}{2y+x}$$

$$=\frac{4}{7}+\frac{\frac{2y}{y}-\frac{x}{y}}{\frac{2y}{y}+\frac{x}{y}}$$

$$=\frac{4}{7}+\frac{2-\frac{x}{y}}{2+\frac{x}{y}}=\frac{4}{7}+\frac{2-\frac{4}{5}}{2+\frac{4}{5}}$$

$$=\frac{4}{7}+\frac{\frac{10-4}{5}}{\frac{10+4}{5}}=\frac{4}{7}+\frac{6}{14}$$

$$=\frac{4}{7}+\frac{3}{7}=\frac{7}{7}=1$$

69. (c) $2x=\sqrt{a}+\frac{1}{\sqrt{a}}$

On squaring both sides,

$$4x^2=a+\frac{1}{a}+2$$

$$\Rightarrow 4x^2-4=a+\frac{1}{a}+2-4$$

$$=a+\frac{1}{a}-2$$

$$\therefore \sqrt{4x^2-4}=\sqrt{\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)^2}$$

$$=\sqrt{a}-\frac{1}{\sqrt{a}}$$

$$\therefore \sqrt{x^2-1}=\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)$$

$$\therefore \text{Expression}=\frac{\sqrt{x^2-1}}{x-\sqrt{x^2-1}}$$

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

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

$$=\frac{1}{2}(a-1)$$

70. (d) $a+\frac{1}{b}=b+\frac{1}{c}=c+\frac{1}{a}$

$$\Rightarrow \frac{abc+c}{bc}=\frac{abc+a}{ac}=\frac{abc+b}{ab}$$

$$\Rightarrow \frac{c}{bc}=\frac{a}{ac}=\frac{b}{ab}$$

$$\Rightarrow \frac{1}{b}=\frac{1}{c}=\frac{1}{a}$$

$\Rightarrow a = b = c = 1$

$\therefore a^2\ b^2\ c^2 = 1$

71. (d) Expression

$$= \sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$$ অ্যাচিভার্স

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

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

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

$$= \frac{1+\sin\theta}{\cos\theta} + \frac{1-\sin\theta}{\cos\theta}$$

$$= \frac{1+\sin\theta+1-\sin\theta}{\cos\theta} = \frac{2}{\cos\theta}$$ অ্যাচিভার্স

$$= 2\sec\theta$$

72. (c) Let A and B have ₹2x and ₹x initially.
$\therefore$ 2x–2 = x + 2
$\Rightarrow$ x = 4
$\therefore$ Initial amount with A = ₹8
$\therefore$ Initial amount with B = ₹4.

73. (d) Using Rule 9,
Required increase percent

$$= \frac{40}{100-40} \times 100$$

$$= \frac{40}{60} \times 100 = \frac{200}{3} = 66\frac{2}{3}\%$$

74. (c) Let the C.P. of article be ₹x, then

$$\frac{120x}{100} - \frac{115x}{100} = 27$$

$$\Rightarrow \frac{5x}{100} = 27$$ অ্যাচিভার্স

$$\Rightarrow x = \frac{27 \times 100}{5} = ₹\,540$$

75. (b) Amount after 10 years

$$= P\left(1+\frac{RT}{100}\right) = P\left(1+\frac{R\times 10}{100}\right)$$

$$= ₹P\left(1+\frac{R}{10}\right)$$

$$\therefore \text{Interest} = ₹\,P\left(1+\frac{R}{10}\right)\times\frac{2}{5}$$

$$\therefore \text{Rate} = \frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$\Rightarrow R = \frac{P\left(1+\frac{R}{10}\right)\times\frac{2}{5}\times 100}{P\times 10}$$ অ্যাচিভার্স

$$\Rightarrow R = 4\left(1+\frac{R}{10}\right)$$

$$\Rightarrow \frac{R}{4} = 1+\frac{R}{10}$$

$$\Rightarrow \frac{R}{4} - \frac{R}{10} = 1$$

$$\Rightarrow \frac{5R-2R}{20} = 1$$

$$\Rightarrow 3R = 20$$

$$\Rightarrow R = \frac{20}{3} = 6\frac{2}{3}\%$$

76. (d) Principal = P (let) অ্যাচিভার্স

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 510 = P\left[\left(1+\frac{25}{200}\right)^2 - 1\right]$$

$$\Rightarrow 510 = P\left[\left(1+\frac{1}{8}\right)^2 - 1\right]$$

$$\Rightarrow 510 = P\left[\left(\frac{9}{8}\right)^2 - 1\right]$$

$$\Rightarrow 510 = P\left(\frac{81}{64} - 1\right)$$

$$\Rightarrow 510 = P\left(\frac{81-64}{64}\right)$$ অ্যাচিভার্স

$$\Rightarrow 510 = \frac{17P}{64}$$

$$\Rightarrow P = \frac{510\times 64}{17} = ₹1920$$

$$\therefore \text{S.I.} = \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$= \frac{1920\times 2\times 25}{100\times 2} = ₹\,480$$

77. (b) $\frac{3a+4b}{3c+4d}=\frac{3a-4b}{3c-4d}$

$\Rightarrow \frac{3a+4b}{3a-4b}=\frac{3c+4d}{3c-4d}$

By Componendo and Dvividendo

$\frac{3a+4b+3a-4b}{3a+4b-3a+4b}$

$=\frac{3c+4d+3c-4d}{3c+4d-3c+4d}$

$\Rightarrow \frac{6a}{8b}=\frac{6c}{8d}$

$\Rightarrow \frac{a}{b}=\frac{c}{d}$

$\Rightarrow ad = bc$

78. (a) $2x-\frac{1}{2x}=5$

On dividing by 2,

$x-\frac{1}{4x}=\frac{5}{2}$

On squaring both sides

$\left(x-\frac{1}{4x}\right)^2=\left(\frac{5}{2}\right)^2=\frac{25}{4}$

$\Rightarrow x^2+\frac{1}{16x^2}-2\times x\times\frac{1}{4x}=\frac{25}{4}$

$\Rightarrow x^2+\frac{1}{16x^2}=\frac{25}{4}+\frac{1}{2}$

$=\frac{25+2}{4}=\frac{27}{4}$

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

$=\frac{27}{4}-2=\frac{27-8}{4}=\frac{19}{4}$

79. (c) $p^2+\frac{1}{p^2}=47$

$\Rightarrow \left(p+\frac{1}{p}\right)^2-2=47$

$\Rightarrow \left(p+\frac{1}{p}\right)^2=47+2=49$

$\Rightarrow p+\frac{1}{p}=\sqrt{49}=7$

80. (b) Using Rule 8,

$2p+\frac{1}{p}=4$

$\Rightarrow p+\frac{1}{2p}=2$

$\therefore \left(p+\frac{1}{2p}\right)^3$

$=p^3+\frac{1}{8p^3}+3.p.\frac{1}{2p}\left(p+\frac{1}{2p}\right)$

$\Rightarrow 8=p^3+\frac{1}{8p^3}+\frac{3}{2}\times 2$

$\Rightarrow p^3+\frac{1}{8p^3}=8-3=5$

81. (b) Successful boys in English or Maths or both = 80 + 85 – 75 = 90%

Unsuccessful boys = 10%

∴ Total number of boys

$=\frac{100}{10}\times 45=450$

82. (c) Let the C.P. of bucket be ₹x.

According to the question,

$\frac{108x}{100}-\frac{92x}{100}=28$

$\Rightarrow \frac{16x}{100}=28$

$\Rightarrow x=\frac{28\times 100}{16}=₹175$

83. (d) Required ratio $=5:\frac{2}{5}=25:2$

$\frac{\text{loan amount}}{\text{Interest amount}}=\frac{5}{2}$

$\Rightarrow$ Interest rate $=\frac{2}{5}$

$\left[\because \frac{P+I}{I}=\frac{5}{2}\Rightarrow \frac{P}{I}+I=\frac{5}{2}\right.$

$\Rightarrow \frac{P}{I} = \frac{3}{2}$, then $I = \frac{2}{5}$]

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$\frac{\text{loan amount}}{\text{Interest rate}} = \frac{5}{2/5} = \frac{25}{2}$ or $25:2$

84. (c) Using Rule 6,

$\text{Time} = \frac{3}{2} \times 2 = 3$ half years

$\text{Rate} = \frac{10}{2} = 5\%$ per half years

[$\because$ when r $\rightarrow$ r/2, then t $\rightarrow$ 2t]

Difference

$= P\left(\frac{r^3}{1000000} + \frac{3r^2}{10000}\right)$

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$\Rightarrow 244 = P\left(\frac{125}{1000000} + \frac{75}{10000}\right)$

$\Rightarrow 244 = P\left(\frac{7625}{1000000}\right)$

$\Rightarrow P = \frac{244 \times 1000000}{7625} = ₹32000$

85. (b) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x \Rightarrow x^2 - 2x + 1 = 0$

$\Rightarrow (x-1)^2 = 0$

$\Rightarrow x = 1$

$\therefore x^2 + \frac{1}{x^3} = 1 + 1 = 2$

86. (b) $(a^2 + b^2)^3 = (a^3 + b^3)^2$ অ্যাচিভার্স

$\Rightarrow a^6 + b^6 + 3a^2b^2(a^2 + b^2)$

$= a^6 + b^6 + 2a^3b^3$

$\Rightarrow 3(a^2 + b^2) = 2ab$

$\Rightarrow \frac{a^2 + b^2}{ab} = \frac{2}{3}$

$\Rightarrow \frac{a}{b} + \frac{b}{a} = \frac{2}{3}$

87. (c) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 - 2x + 1 = 0$

$\Rightarrow (x-1)^2 = 0 \Rightarrow x = 1$

$\therefore x^{17} + \frac{1}{x^{19}} = 1 + 1 = 2$

88. (b) $3x + \frac{3}{x} = 1$

$\Rightarrow x + \frac{1}{x} = \frac{1}{3}$ অ্যাচিভার্স

On cubing both sides,

$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \frac{1}{27}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times \frac{1}{3} = \frac{1}{27}$

$\Rightarrow x^3 + \frac{1}{x^3} + 1 = \frac{1}{27}$

89. (c) Let the C.P. of A be ₹x, then

$\frac{x \times 125}{100} \times \frac{90}{100} = 675$

$\Rightarrow x = \frac{675 \times 100 \times 100}{125 \times 90} = ₹600$ অ্যাচিভার্স

90. (d) $A = P\left(1 + \frac{R}{100}\right)^T$

$\Rightarrow 1.44 = P\left(1 + \frac{R}{100}\right)^2$

$\Rightarrow (1.2)^2 = \left(1 + \frac{R}{100}\right)^2$

$\Rightarrow 1 + \frac{R}{100} = 1.2$

$\Rightarrow R = 0.2 \times 100 = 20\%$

91. (d) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x$ অ্যাচিভার্স

$\Rightarrow x^2 - 2x + 1 = 0$

$\Rightarrow (x-1)^2 = 0 \Rightarrow x = 1$

$\therefore x^{2013} + \frac{2}{x^{2014}} = 1 + 1 = 2$

92. (c) Expression

$= \frac{\frac{3}{15}a^5b^6c^3 \times \frac{5}{9}ab^5c^4}{\frac{10}{27}a^2bc^3}$

$= \left(\frac{3}{15} \times \frac{5}{9} \times \frac{27}{10}\right)\left(\frac{a^6b^{11}c^7}{a^2bc^3}\right)$

$= \frac{3}{10}a^{6-2}b^{11-1}c^{7-3}$

$= \frac{3}{10}a^4b^{10}c^4 \quad \left[\because a^m \times a^n = a^{m+n}, \; a^m \div a^n = a^{m-n}\right]$

93. (c) $\frac{x^3+3y^2x+y^3+3x^2y}{x^3+3y^2x-y^3-3x^2y}$

$= \frac{35+19}{35-19} = \frac{54}{16}$

$\Rightarrow \frac{(x+y)^3}{(x-y)^3} = \frac{27}{8} = \left(\frac{3}{2}\right)^3$

$\Rightarrow \frac{x+y}{x-y} = \frac{3}{2}$

By componendo and dividendo again

$\frac{x+y+x-y}{x+y-x+y} = \frac{3+2}{3-2} \Rightarrow \frac{x}{y} = 5$

94. (b) Total profit in sales

$= ₹\left(\frac{750\times6}{100} - \frac{750\times4}{100}\right)$

= Rs. (45 – 30) = Rs. 15

$\left[\text{or, Profit} = (6-4)\% \text{ of } 750 = \frac{750\times2}{100} = ₹15\right]$

$\therefore$ Profit per cent $= \frac{15}{1500}\times100 = 1\%$

95. (c) Putting x = 2 in the equation
2x + y = 6,
2 × 2 + y = 6
$\Rightarrow$ y = 6 – 4 = 2
$\therefore$ Required point = (2, 2)

96. (c) On putting y = –x in the equation
5y + 7x = 24,
–5x + 7x = 24
$\Rightarrow$ 2x = 24 $\Rightarrow$ x = 12
& y = –12
$\therefore$ m = x = 12, n = y = –12
$\Rightarrow$ m + n = 12 – 12 = 0

97. (a) a : b = 7 : 9
b : c = 3 : 5 = 9 : 15
$\therefore$ a : b : c = 7 : 9 : 15

98. (c) $\frac{x}{y} = \frac{3}{4}$ (Given)

$\therefore \frac{5x-2y}{7x+2y} = \frac{5\frac{x}{y}-2}{7\frac{x}{y}+2}$

$= \frac{5\times\frac{3}{4}-2}{7\times\frac{3}{4}+2} = \frac{\frac{15-8}{4}}{\frac{21+8}{4}} = \frac{7}{29}$

99. (c) $x = \sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}$

Cubing both sides,

$x^3 = \left(\sqrt[3]{a+\sqrt{a^2+b^3}}\right)^3 + \left(\sqrt[3]{a-\sqrt{a^2+b^3}}\right)^3$

$+3\left(\sqrt[3]{a+\sqrt{a^2+b^3}}\right)$

$\left(\sqrt[3]{a-\sqrt{a^2+b^3}}\right)\left(\sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}\right)$

$= a+\sqrt{a^2+b^3} + a-\sqrt{a^2+b^3}$

$+3\left(\left(a+\sqrt{a^2+b^3}\right)\times\left(a-\sqrt{a^2+b^3}\right)\right)^{\frac{1}{3}} x$

$= 2a + 3\left(a^2-b^3\right)^{\frac{1}{3}} x$

$= 2a + (-3bx)$

$\therefore x^3 + 3bx = 2a$

100. (a) Let the income of A, B and C be ₹3x, ₹7x and ₹4x respectively and their expenses be ₹4y, ₹3y and ₹5y respectively.
$\therefore$ 3x = 2400
$\Rightarrow$ x = 800
$\therefore$ 4y = 2400 – 300 = 2100
$\Rightarrow$ y = 525
$\therefore$ B's saving = (7x – 3y)
= ₹(7 × 800 – 3 × 525)
= ₹(5600 – 1575) = ₹4025
and C's savings = ₹(4x – 5y)
= (3200 – 2625) = ₹575

★★★