**ANSWER KEY**

| | | | | |
|---|---|---|---|---|
| 1) d | 2) b | 3) c | 4) b | 5) d |
| 6) b | 7) a | 8) a | 9) b | 10) b |
| 11) b | 12) c | 13) b | 14) a | 15) d |
| 16) c | 17) b | 18) b | 19) a | 20) d |
| 21) c | 22) b | 23) d | 24) c | 25) c |
| 26) c | 27) c | 28) b | 29) c | 30) b |
| 31) b | 32) d | 33) c | 34) d | 35) b |
| 36) a | 37) a | 38) c | 39) c | 40) b |
| 41) a | 42) a | 43) c | 44) a | 45) d |
| 46) d | 47) c | 48) c | 49) b | 50) a |
| 51) c | 52) a | 53) c | 54) b | 55) d |
| 56) b | 57) a | 58) b | 59) b | 60) d |
| 61) b | 62) b | 63) c | 64) c | 65) c |
| 66) b | 67) b | 68) a | 69) c | 70) c |
| 71) a | 72) a | 73) c | 74) b | 75) a |
| 76) b | 77) d | 78) b | 79) c | 80) b |
| 81) d | 82) d | 83) c | 84) a | 85) c |
| 86) b | 87) c | 88) b | 89) b | 90) b |
| 91) d | 92) c | 93) c | 94) b | 95) c |
| 96) c | 97) b | 98) b | 99) a | 100) c |

**HINTS & SOLUTION**

**1.** *(d)* As, $y = qx + r$, so $0 \le r < x$.

**2.** *(b)* We know that, the product of a rational number and an irrational number is an irrational number.

**3.** *(c)* Given number is 2784936.
Sum of digits at odd places= 25 and sum of digits at even places = 14

$\therefore$ Difference = 25 − 14 = 11

So, number is divisible by 11. Also last three digits of 2784936 i.e. 936 is divisible by 8. Hence, 2784936 is divisible by both 8 and 11 i.e. 88.

**4.** *(b)* Clearly, both statements satisfies divisibility rule of 11.

**5.** *(d)* $d(d(d(12))) = d(d(6))$

[$\because$ positive integer divisor of 12 = 1, 2, 3, 4, 6, 12]

$d(d(6)) = d(4)$

[$\because$ positive integer divisor of 6 = 1, 2, 3, 6]

and $d(4) = 3$

[$\because$ positive integer divisor of 4 = 1, 2, 4]

**6.** *(b)* Because
$T_m = S_m - S_{m-1}$

$\Rightarrow 164 = 3(2m - 1) + 5.1$

$\Rightarrow 6m = 162$

$\therefore m = 27$

**7.** *(a)* The given sequence is arithmetic geometric series, where $r = \frac{1}{5}$ and $d = 1$

$$S_\infty = \frac{a}{1-r} + \frac{dr}{(1-r)^2}$$

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

$$= \frac{5}{4} + \frac{5}{16} = \frac{25}{16}$$

**8.** *(a)* LCM of 12, 15 and 20 = $2 \times 2 \times 3 \times 5$

$\therefore$ Required perfect square

$= 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 900$

**9.** *(b)* Since, $m = 2n + 1$ is an odd integer, so its factors may be 1 or 3 and $k = 9n + 4$ its factors may be 1, 2 and 4. Hence, HCF of $(m, k)$ is 1.

**10.** *(b)* $a^2b^4 + 2a^2b^2 = a^2b^2(b^2 + 2)$ ...(i)

and $(ab)^7 - 4a^2b^9 = a^7b^7 - 4a^2b^9$

$= a^2b^2(a^5b^5 - 4b^7)$... (ii)

From Eqs. (i) and (ii), we get

HCF $= a^2b^2$

**11.** *(b)*

$$\frac{[(0.5)^2]^2 - [(0.4)^2]^2}{(0.5)^2 + (0.4)^2}$$

$$[(a^2 - b^2) = (a+b)(a-b)]$$

$$= \frac{[(0.5)^2 - (0.4)^2]^2 - [(0.5)^2 + (0.4)^2]^2}{[(0.5)^2 + (0.4)^2]}$$

$= (0.5)^2 - (0.4)^2 = (0.5 - 0.4)(0.5 + 0.4)$

$= 0.1 \times 0.9 = 0.09$

**12.** *(c)* Required decimal fraction

$$= \frac{1}{60 \times 60}$$

$$= \frac{1}{3600} = 0.00027$$

**13.** *(b)* $\sqrt{0.0001} = 0.01$ which is a rational number.

**14.** *(a)* Given,

$$p^x = r^y = m \text{ and}$$
$$r^w = p^z = n$$

Now, $p^x = r^y$

On multiply power with $w$ on both sides, we get

$$(p^x)^w = (r^y)^w \Rightarrow p^{xw} = r^{yw}$$

$\Rightarrow$ $p^{xw} = (r^w)^y$ … (i)

On putting $r^w = p^z$ in Eq. (i), we get

$$p^{xw} = (p^z)^y \Rightarrow p^{xw} = p^{zy}$$

On comparing both sides, we get

$\therefore$ $xw = zy$

**15.** *(d)* Here, the greatest six-digit number = 999999

| | 999 |
|---|---|
| 9 | $\overline{99}\ \overline{99}\ \overline{99}$ |
| | 81 |
| 189 | 1899 |
| ×9 | 1701 |
| 1989 | 19899 |
| ×9 | 17901 |
| | 1998 |

Here, the greatest number of six digit which is perfect square = 999999 − 1998 = 998001

**16.** *(c)*

$$\frac{1}{\sqrt{9}-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-\sqrt{4}}$$

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

[on rationalisation]

$$= \sqrt{9} + \sqrt{4} = 3 + 2 = 5$$

**17.** *(b)* Average speed $= \dfrac{2xy}{x+y}$

$$= \frac{2 \times 80 \times 20}{80 + 20} = 32 \ km/h$$

**18.** *(b)* Let the distance between $P$ and $Q$ be $x$ km and let the two trains meet $y$ h after 7 am.

Then, $T_1$ covers x km in 4h and $T_2$ covers x km in $3\frac{1}{2}$ h.

$\therefore$ Speed of train $T_1 = \dfrac{x}{4} \ km/h$

$\therefore$ and speed of train $T_2 = \dfrac{2x}{7} \ km/h$

According to the question,

$$\frac{x(y+2)}{4} + \frac{2xy}{7} = x$$

$$\Rightarrow \frac{(y+2)}{4} + \frac{2y}{7} = 1$$

$$\Rightarrow \frac{7(y+2) + 8y}{28} = 1$$

$$\Rightarrow 7y + 14 + 8y = 28$$

$$\therefore \quad y = \frac{14}{15} \ h = \frac{14}{15} \times 60 \ min$$

$= 56 \ min$

So, trains will meet at 7 : 56 am.

**19.** *(a)* This is the solution with explanation for

Here, $x = 10$ and $y = 12$

$\therefore$ Number of days taken by $A$ and $B$

$$= \frac{xy}{x+y} = \frac{12 \times 10}{12 + 10}$$

$$= 5\frac{5}{11} \ days$$

**20.** *(d)* 1 min work of first tap = $\frac{1}{5}$

1 min work of second tap = $\frac{1}{7}$

and 1 min work of third = $-\frac{1}{3}$

∴ 1 min work of all taps

$$= \frac{1}{5} + \frac{1}{7} - \frac{1}{3}$$

$$= \frac{21 + 15 - 35}{105} = \frac{1}{105}$$

Hence, tap will be filled in 105 min, if they work together.

**21.** *(c)* Given, $M_1 = 76,\ D_1 = 33$

Let number of ladies who did not report for the work = $x$

By given condition,

$M_2 = 76 - x$ and $D_2 = 44$

We know that,

$M_1 D_1 = M_2 D_2$

$\therefore\ 76 \times 33 = (76 - x) \times 44$

$\Rightarrow\ 76 - x = \frac{76 \times 3}{4} = 19 \times 3$

$\Rightarrow\ x = 19$

Hence, the number of ladies is 19.

**22.** *(b)* Given, 50% of $(x - y)$ = 40% of $(x + y)$

$$\frac{50}{100} \times (x - y) = \frac{40}{100} \times (x + y)$$

$\Rightarrow 5x - 5y = 4x + 4y$

$\Rightarrow x = 9y$ ...(i)

Let $r\%$ of $x = y \Rightarrow \frac{r}{100} \times x = y$

$\Rightarrow \frac{r}{100} \times 9y = y$ [from Eq. (i)

$\therefore\ r = \frac{100}{9} = 11\frac{1}{9}\%$

**23.** *(d)* Remaining percentage

$$= \left(1 - \frac{10}{100}\right)\left(1 - \frac{10}{100}\right)$$

$$= \frac{90}{100} \times \frac{90}{100} = 81\%$$

**24.** *(c)* Let salary of each of them be ₹ $x$. Jatin saves 22% of $x$ and his saving amount is ₹ 1540.

$\Rightarrow \frac{22}{100} x = 1540$

$\Rightarrow x = \frac{1540 \times 100}{22} =$ ₹ 7000

**25.** *(c)* For class-X, let the student passed in first class $= a\%$.

Then, by condition given in question,

$a\%$ of $30 = 24 \Rightarrow \frac{a \times 30}{100} = 24$

$\therefore\ a = 80\%$

Now, for class-Y let the student passed in first class = $b\%$.

According to the question,

$b\%$ of $35 = 28$

$\Rightarrow\ \frac{b}{100} \times 35 = 28$

$\therefore\ b = 80\%$

Hence, both classes have equal percentage of students getting first class.

**26.** *(c)* Simple Interest in 3 yr

= ₹ (1350 − 1260) = ₹ 90

∴ Simple interest for 2 yr

$= \frac{2}{3} \times 90 =$ ₹ 60

∵ Principal = ₹ (1260 – 60) = ₹ 1200

∴ Rate,

$$R = \frac{100 \times SI}{P \times T} = \frac{100 \times 60}{1200 \times 2} = \frac{60}{24} = \frac{5}{2}$$

$R = 2.5\%$

**27.** *(c)* For $A$ Let the amount be ₹ $x$.

Rate of interest = 5% and Time = 10 yr

Simple interest = $\frac{x \times 5 \times 10}{100} = \frac{x}{2}$

For B The amount be ₹ 2x.

Rate of interest = 5% and Time = 5 yr

$$SI = \frac{2x \times 5 \times 5}{100} = \frac{x}{2}$$

So, $A$ and $B$ both will get the same amount as interest.

**28.** *(b)* Let initial amount be ₹ $P$, then

$A$ = ₹ 3P and

$T$ = 15 yr and 6 months = $\frac{31}{2}$ *yr*

$\because\ SI = A - P = 3P - P =$ ₹ $2P$

$$\Rightarrow P \times \frac{31}{2} \times \frac{R}{100} = 2P$$

$$\Rightarrow R = \frac{2 \times 2 \times 100}{31}\%$$

$$= \frac{400}{31}\%$$

Let amount doubled ne $t_1$ yr

Now, $SI = 2P - P =$ ₹ $P$

$$\therefore\ t_1 = \frac{SI \times 100}{P \times R}$$

$$\Rightarrow t_1 = \frac{P \times 100 \times 31}{P \times 400}$$

$$= \frac{31}{4} = 7 \text{ yr and 9 months}$$

**29.** *(c)* Given, $P$ = ₹ $x$, $R$ = 20% per annum, $n$ = 3 yr

and $A$ = ₹ $y$

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

$$\therefore\ y = x\left(1 + \frac{20}{100}\right)^3$$

$$\Rightarrow y = x\left(\frac{6}{5}\right)^3 \Rightarrow \frac{y}{x} = \frac{216}{125}$$

$\Rightarrow y : x = 216 : 125$

**30.** *(b)* Here, $P$ = ₹ 3200

$A$ = ₹ 3362

[ since, amount is payable quarterly]

$\therefore\ R = 10\%$ per annum $= \frac{10}{4}\%$ quarterly

and let time = $t$

$\Rightarrow n = 4t$

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

$$\Rightarrow 3362 = 3200\left(1 + \frac{10}{4 \times 100}\right)^n$$

$$\Rightarrow \frac{3362}{3200} = \left(\frac{410}{400}\right)^n \Rightarrow \left(\frac{41}{40}\right)^2 = \left(\frac{41}{40}\right)^n$$

$\Rightarrow n = 2 \Rightarrow 4t = 2$ *yr* $[\text{as } n = 4t]$

$$\therefore\ t = \frac{1}{2} \text{ yr}$$

**31.** *(d)* Data is insufficient as the rate of interest is not given to calculate further.

**32.** *(b)* Given, CP = ₹ 400, let selling price be ₹ $x$.

Then, 400 + 20% of $x = x$

$$\Rightarrow 400 + \frac{x}{5} = x \Rightarrow \frac{4x}{5} = 400$$

$$\Rightarrow x = \frac{400 \times 5}{4} \Rightarrow x = ₹\ 500$$

$\therefore$ Selling price = ₹ 500

**33.** *(c)* Let the price is = Rs. 100
After discount price

$$= 100 \times \frac{90}{100} \times \frac{80}{100} \times \frac{60}{100}$$

$= 43.2$
Difference = 100 – 43.2 = 56.8%
So, 56.8% is a single discount of percent of this series.

**34.** *(d)* Let the number of items be $x$.

Then, selling price of items = $60x$

Cost of material of items = $40x$
Overhead expenses = ₹ 3000

$\therefore\ 60x - (40x + 3000) = 1000$

$\Rightarrow\ 20x = 4000$

$\therefore\ x = \frac{4000}{20} = 200$

**35.** *(b)* Let CP = $x$

then SP = $\frac{110x}{100} = \frac{11x}{10}$

Now, CP = 96% of $x = \frac{96x}{100} = ₹\ \frac{24x}{25}$

According to the questions

$$SP = ₹ \left(\frac{11x}{10} + 6\right)$$

$$\therefore \left(\frac{11x}{10} + 6\right) = 118\frac{3}{4}\%\ of\ \frac{24x}{25}$$

$$\Rightarrow \frac{11x + 60}{10} = \frac{475}{400} \times \frac{24x}{25} = \frac{57x}{50}$$

$\Rightarrow 570x = 550x + 3000$

$$\Rightarrow x = \frac{3000}{20} = 150$$

$\therefore\ CP = ₹\ 150$

$$\therefore\ SP = \frac{11}{10} \times 150 = ₹\ 165$$

**36.** *(a)* The sub duplicate ratio of
$16x^4 : 625y^6$ is

$$\frac{\sqrt{16x^4}}{\sqrt{625\,y^6}} = \frac{4x^2}{25y^3} = 4x^2 : 25y^3$$

**37.** *(a)* Mean proportional between
$(2+\sqrt{3})$ and $(8-\sqrt{48})$

$$= \sqrt{(2+\sqrt{3})(8-\sqrt{48})}$$

$$= \sqrt{(2+\sqrt{3})\,4(2-\sqrt{3})}$$

$$= 2\sqrt{(2+\sqrt{3})(2-\sqrt{3})}$$

$$= 2\sqrt{(4-3)} = 2 \times 1 = 2$$

$[\because (a-b)(a+b) = a^2 - b^2]$

**38.** *(c)* According to the question,

$p\%$ of $x = t\,(q\%\ of\ y)$

$$\Rightarrow \frac{xp}{100} = \frac{yq}{100} \times t$$

$\therefore\ x : y = qt : p$

**39.** *(c)* Let the three parts be $A$, $B$ and $C$.
By given condition,

$$\frac{1}{2}A = \frac{1}{3}B = \frac{1}{6}C = x \quad \text{[say]}$$

$$\therefore \frac{1}{2}A = x \Rightarrow A = 2x$$

$$\frac{1}{3}B = x \Rightarrow B = 3x$$

$$\frac{1}{6}C = x \Rightarrow C = 6x$$

As, $A + B + C = 1870$

$\therefore\ 2x + 3x + 6x = 1870$

$\Rightarrow\ 11x = 1870$

$\therefore\ x = \frac{1870}{11} = 170$

$\therefore$ Third part i.e. $C = 6 \times 170 = 1020$

**40.** *(a)* Let Q join for $x$ months.

$\therefore$ Ratio of capital

$= 2525 \times 12 : 1200 \times x$

$= 2525 : 100x = 101 : 4x$

$\therefore\ P's$ profit $= \frac{101}{101 + 4x} \times 1644$

$\Rightarrow 1212 = \frac{101 \times 1644}{101 + 4x}$

$\Rightarrow \frac{1}{137} = \frac{1}{101 + 4x}$

$\Rightarrow 4x = 36 \quad \Rightarrow x = 9$

Hence, $Q$ joined for 9 months i.e., he joined after 3 months.

**41.** *(a)* $\log_3 x = -2$

$\log_3 x = -2$

$\Rightarrow x = 3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

**42.** *(a)* The given expression is

$$= \frac{1}{\log_x(yz) + \log_x x} + \frac{1}{\log_y(xz) + \log_y y} + \frac{1}{\log_z(xy) + \log_z z}$$

$$= \frac{1}{\log_x xyz} + \frac{1}{\log_y xyz} + \frac{1}{\log_z xyz}$$

$= \log_{xyz} x + \log_{xyz} y + \log_{xyz} z$

$= \log_{xyz} xyz = 1$

**43.** *(c)* Let first integer be $a$.

Then, $b = a + 1$ and $c = a + 2$

$\therefore\ ac + 1 = a(a + 2) + 1$

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

$ac + 1 = b^2$

So, $\log(ac + 1) = \log b^2 = 2\log b$

**44.** *(a)* Given, $\log(x + y) = \log x + \log y$

$\Rightarrow \log(x + y) = \log xy$

$\Rightarrow\ x + y = xy$

$\Rightarrow y = \frac{x}{x - 1} = \frac{1.1568}{1.1568 - 1} = \frac{1.1568}{0.1568}$

$= 7.37755 = 7.3776$

**45.** *(d)* $6\sqrt{3}x^2 - 47x + 5\sqrt{3}$

$= 6\sqrt{3}x^2 - 45x - 2x + 5\sqrt{3}$

$= 3\sqrt{3}x\left(2x - 5\sqrt{3}\right) - 1\left(2x - 5\sqrt{3}\right)$

$= \left(2x - 5\sqrt{3}\right)\left(3\sqrt{3}x - 1\right)$

**46.** *(d)* Given, $a + b + c = 0$

$\Rightarrow a^3 + b^3 + c^3 = 3abc$

On dividing both sides by $abc$, we get

$\Rightarrow \frac{a^3}{abc} + \frac{b^3}{abc} + \frac{c^3}{abc} = 3$

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

**47.** *(c)* Given, $(u)^3 + (-2v)^3 + (-2w)^3$

$= 3 \times (-2)(-3)\ uvw$

$\therefore\ u + (-2v) + (-3w) = 0$

$\left[\because\ a^3 + b^3 + c^3 = 3abc, \text{ then } a + b + c = 0\right]$

$\Rightarrow u-2v-3w=0$

$\therefore \quad u-2v=3w$

**48.** *(c)* I. $(a+b)(b+c)(c+a)$

$= (1-c)(1-a)(1-b)$

$[\because a+b+c=1]$

$(1-c)[1-b-a+ab]$

$= 1-b-a+ab-c+bc+ac-abc$

$= 1-(a+b+c)+ab+bc+ac-abc$

$= ab+bc+ac-abc$

II. $a^2+b^2-c^2+2ab$

$= a^2+b^2+2ab-c^2$

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

$= (a+b+c)(a+b-c) = a+b-c$

$[\because a+b=c=1]$

So, both statements are correct.

**49.** *(b)* Factor theorem is a special case of remainder theorem.

**50.** *(a)* Here, HCF of 22 and 36 is 2

Now, $x(x+1)^2 = x(x+1)(x+1)$

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

Common factors of $x(x+1)^2$

and $x^2(2x^2+3x+1)$ are $x(x+1)$

Hence, required HCF = $2x(x+1)$

**51.** *(c)* Here, LCM = $36x^2(x+a)(x^3-a^3)$ and HCF = $x^2(x-a)$

$p(x) = 4x^2(x^2-a^2)$

But $p(x)\times q(x)$ = HCF × LCM

$q(x) = \frac{\text{HCF} \times \text{LCM}}{p(x)}$

$= \frac{x^2(x-a)\,36x^3(x+a)(x^3-a^3)}{4x^2(x^2-a^2)}$

$= 9x^3(x^3-a^3)$

**52.** *(a)* $A = p^2+8p+12 = (p+2)(p+6)$

$B = p^2+2p-24 = (p-4)(p+6)$

$C = p^2+15p+54 = (p+9)(p+6)$

I. LCM of *A, B*

and

$C = (p+2)(p+6)(p-4)(p+9)$

Thus, I is correct.

II. HCF of *A, B* and *C = (p + 6)*

Hence, II is incorrect.

**53.** *(c)* Here, $(x-3)$ is GCD, so is a factor of both of them.

$\therefore$ Putting $x = 3$, in both makes each polynomial zero.

$3^3-2(3)^2+p(3)+6=0 \Rightarrow p=-5$

$3^2-5(3)+q=0 \Rightarrow q=6$

$\therefore 5q+6p = 5(6)+(-5)(6)$

$= 30-30 = 0$

**54.** *(b)* Here,

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

$[\because x^2-1=(x+1)(x-1)]$

$= \frac{x-2x+2}{x(x-1)} = \frac{-(x-2)}{x(x-1)}$

**55.** *(d)* Let the number be *x*.

According to the question,

$\frac{3x}{4}-x=-130 \Rightarrow \frac{3x-4x}{4}=-130$

$\Rightarrow \frac{-x}{4}=-130 \Rightarrow x=520$

Hence, the. number is 520.

**56.** *(b)* As this is the case of unique solution $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so the graph of the equations will intersect at one point.

**57.** *(a)* Given, $3x - 5y = -10$
At *Y-axis*, $x = 0$

$$\Rightarrow 0 = 5y = -10 \Rightarrow y = \frac{10}{5} = 2$$

So, the point on Y-axis is (0, 2).

**58.** *(b)* Since, the equation $kx - y = 2$ and $6x - 2y = 3$ have a unique solution

$$\therefore \frac{k}{6} \neq \frac{1}{2} \Rightarrow k \neq 3$$

**59.** *(b)* An equation of n degree has n roots. So, quadratic equation has two roots.

**60.** *(d)* Here, $\alpha + \beta = -\frac{b}{a}$ and $\alpha\beta = \frac{c}{a}$

Now, roots of required equation are $\frac{1}{\alpha}, \frac{1}{\beta}$.

$$\Rightarrow S = \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-\frac{b}{a}}{\frac{c}{a}} = \frac{-b}{c}$$

$$P = \frac{1}{\alpha} \cdot \frac{1}{\beta} = \frac{1}{\frac{c}{a}} = \frac{a}{c}$$

$\therefore$ Required quadratic equation is

$$x^2 - Sx + P = 0$$

$$\Rightarrow x^2 - \left(\frac{-b}{c}\right)x + \frac{a}{c} = 0$$

$$\Rightarrow cx^2 + bx + a = 0$$

**61.** *(b)* Given equation is

$$x^{2/3} + x^{1/3} - 2 = 0$$

$$\Rightarrow \left(x^{1/3}\right)^2 + x^{1/3} - 2 = 0$$

Let $x^{1/3} = x$

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

It is a quadratic equation in $x$.

$\therefore$ Discriminant of $x^2 + x - 2 = 0$ is

$$\therefore B^2 - 4AC = 1^2 - 4(1)(-2)$$
$$= 9 > 0$$

Hence, two real values of $x$ satisfy the given equation.

**62.** *(b)* Let the roots of the equation $kx^2 - 5x + 6 = 0$ be $\alpha$ and $\beta$

$$\therefore \alpha + \beta = \frac{5}{k} \text{ and } \alpha\beta = \frac{6}{k}$$

Given, $\frac{\alpha}{\beta} = \frac{2}{3} \Rightarrow \alpha = \frac{2}{3}\beta$

$$\therefore \frac{2}{3}\beta + \beta = \frac{5}{k} \text{ and } \frac{2}{3}\beta^2 = \frac{6}{k}$$

$$\Rightarrow \frac{5}{3}\beta = \frac{5}{k} \text{ and } \beta^2 = \frac{9}{k}$$

$$\beta = \frac{3}{k} \text{ and } \beta^2 = \frac{9}{k} \Rightarrow \frac{9}{k^2} = \frac{9}{k}$$

$$\Rightarrow k = 1 \text{ and } k \neq 0$$

$[\because$ leading coefficient is never zero$]$

**63.** *(c)* Number of elements in $A = 4$

$\therefore$ Total number of non-empty

Proper subsets of $A = 2^n - 2$

$$= 2^4 - 2 = 14$$

**64.** *(c)* $A - (A - B) = A - (A \cap B')$

$$= A \cap (A \cap B')' = A \cap (A' \cup B)$$
$$= (A \cap A') \cup (A \cap B)$$
$$= \phi \cup (A \cap B) = A \cap B$$

**65.** *(c)* Clearly, both I and II are true.

**66.** *(b)* Here, $r = 60$ cm, $l = 16.5$ cm

$$\therefore \theta = \frac{l}{r} = \left(\frac{16.5}{60}\right)^c$$

$$= \left(\frac{16.5}{60} \times \frac{180}{\pi}\right)^\circ = \left(\frac{16.5}{60} \times \frac{180}{22} \times 7\right)^\circ$$

$= \left(\frac{63}{4}\right)^\circ = 15^\circ 45'$

**67.** *(b)* Let the hands of a clock coincides after '*t*' min.

Angle traced by hour hand in

$t$ min $= \frac{1}{2}t$

Angle traced by minute hand in

$t$ min $= 6t$

Angle between hour hand and minute

hand at 5 pm $= 5\times 30 = 150^\circ$

$\therefore\ 6t - \frac{1}{2}t = 150^\circ \Rightarrow t = \frac{150\times 2}{11} = \frac{300}{11}$

$= 27 + \frac{3}{11} = 27$ min 16 sec

Therefore, required time = 5:27:16 pm

**68.** *(a)* In $\Delta\ ABC,\ A + B + C = 180^\circ$

$\therefore\ A + B = 180^\circ - C$

$\Rightarrow \tan(A+B) = \tan(180^\circ - C)$

$\Rightarrow \frac{\tan A + \tan B}{1 - \tan A \tan B} = -\tan C$

$\Rightarrow \tan A + \tan B$

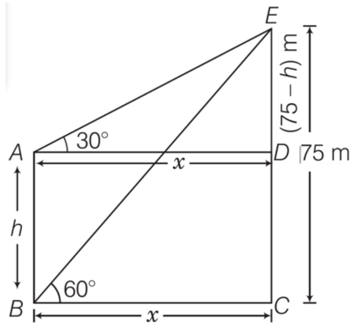
$= -\tan C + \tan A \tan B \tan C$

$\Rightarrow \tan A + \tan B + \tan C$

$= \tan A \tan B \tan C$

**69.** *(c)* Let height of the building be $h$ m and terrace and distance between building and tower be $x$ m.

$\therefore\ AB = h$ m and $BC = x$ m




In right angled $\Delta\ ADE$,

$\tan 30^\circ = \frac{ED}{AD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{75 - h}{x}$

$\Rightarrow x = 75\sqrt{3} - h\sqrt{3}$ …(i)

and in right angled $\Delta\ BCE$,

$\tan 60^\circ = \frac{CE}{BC} \Rightarrow \sqrt{3} = \frac{75}{x}$

$\Rightarrow\ x\sqrt{3} = 75$

$\Rightarrow (75\sqrt{3} - h\sqrt{3})\sqrt{3} = 75$ …(i)

$\Rightarrow 75 \times 3 - 3h = 75$

$\Rightarrow 3h = 75 \times 3 - 75 \Rightarrow h = \frac{75\times 2}{3}$

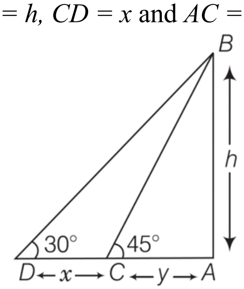
$\therefore\ h = 50\ m$

Hence, the height of the building is 50.

**70.** *(c)* Let $AB$ be the tower and $C, D$ be the two positions of the car.

Then, $\angle ACB = 45^\circ,\ \angle ADB = 30^\circ$

Let $AB = h,\ CD = x$ and $AC = y$.




In right angled $\Delta\ ABC$, we get

$$\frac{AB}{AC} = \tan 45^\circ = 1 \Rightarrow \frac{h}{y} = 1$$

$$\Rightarrow \quad y = h \quad \dots (\text{i})$$

In right angled $\Delta\, ABD$, we get

$$\frac{AB}{AD} = \tan 30^\circ = \frac{1}{\sqrt{3}} \Rightarrow \frac{h}{x+y} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \quad x + y = \sqrt{3}h \quad \dots (\text{ii})$$

$$\therefore\ x = \sqrt{3}\,h - h = h\left(\sqrt{3} - 1\right)$$

[by Eqs. (i) and (ii) ]

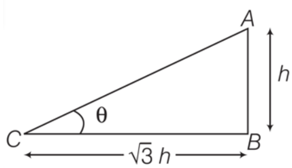
Now, $h\left(\sqrt{3} - 1\right)$ is covered in 12 min.

So, $h$ will be covered in

$$\left[\frac{12}{h\left(\sqrt{3}-1\right)} \times h\right] = \frac{12}{\left(\sqrt{3}-1\right)} \text{ min}$$

$$= \left(\frac{1200}{73}\right) \text{min} \approx 16 \text{ min } 23 \text{ s}$$

**71.** *(a)* Let $\theta$ be the angle of elevation of Sun and height of the pole be $h$ m.




In right angled $\Delta\, ABC$,

$$\tan\theta = \frac{AB}{BC} \Rightarrow \tan\theta = \frac{h}{\sqrt{3}h}$$

$$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} = \tan 30^\circ$$

$$\therefore\ \theta = 30^\circ$$

Hence, the angle of elevation of Sun is $30^\circ$

**72.** *(a)* Let angle be $x$ and its supplementary

$$= 180^\circ - x$$

Then, $\quad x = 2\,(180^\circ - x)$

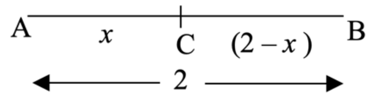
$$\Rightarrow \quad 3x = 360^\circ$$

$$\Rightarrow \quad x = 120^\circ$$

**73.** *(a)* When two lines are parallel intersected by a transversal then corresponding as well as alternate interior angles are equal. Hence, the statement II and IV are correct.

**74.** *(b)* Given, $AC^2 = AB \times CB$

$$\Rightarrow x^2 = 2 \times (2 - x)$$




$$\Rightarrow \quad x^2 = 4 - 2x$$

$$\Rightarrow \quad x^2 + 2x - 4 = 0$$

$$\Rightarrow \quad x = \frac{-2 \pm \sqrt{4+16}}{2 \times 1}$$

$$\Rightarrow \quad x = -1 \pm \sqrt{5}$$

Now,

$$BC = 2 - \left(-1 \pm \sqrt{5}\right) = 3 - \sqrt{5}$$

(neglect $3 + \sqrt{5} \because 3 + \sqrt{5} > 2$ )

**75.** *(a)* Let the ratio of their corresponding height be $h_1 : h_2$

But the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding heights.

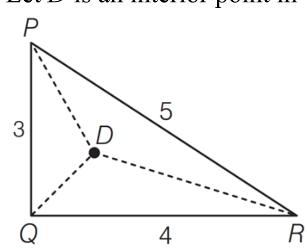
$$\therefore\ \frac{h_1^{\,2}}{h_2^{\,2}} = \frac{81}{49} \Rightarrow h_1 : h_2 = 9 : 7$$

**76.** *(b)* Given, $PQ = 3$ cm, $QR = 4$ cm and $RP = 5$ cm

Here, $RP^2 = PQ^2 + QR^2$

So, $PQR$ is a right-angled triangle.

Let $D$ is an interior point in $\Delta\, PQR$



In $\Delta\ DPQ$, $DP + DQ > 3$ … (i)

similarly, $DQ + DR > 4$ … (ii)

and $DP + DR > 5$ … (iii)

adding (i), (ii) and (iii), we get

$$2(DP + DQ + DR) > 12$$

$$\Rightarrow DP + DQ + DR > 6$$

Hence, both statements I and II are individually true and statement II is not correct explanation of statement I.

**77.** *(d)* Two parallelograms on the same base and between the same parallels are equal in area. So, the ratio of their areas is 1:1.

**78.** *(b)* Here, $n = 6$

Sum of interior angles of a hexagon

$= (n - 2)180° = (6 - 2) \times 180°$

$= 4 \times 180° = 720°$

Number of angles = 6

$\therefore$ Each angle of a regular hexagon

$$= \frac{720°}{6} = 120°$$

**79.** *(c)* If a parallelogram and a rectangle stand on the same base and on the same side of the base with the same height, then perimeter of parallelogram is greater than perimeter of rectangle.

$$\therefore l_1 > l_2$$

**80.** *(b)* Clearly, the point of concurrency of the perpendicular bisectors of the sides of a triangle is known as circumcentre.

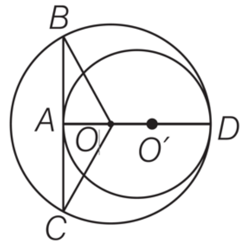
**81.** *(d)* Here, $OB = OD = 3$ cm and

$O'D = O'A = 2$ cm

$OO' = OD - O'D = 3 - 2 = 1$ cm

$\therefore OA = O'A - OO' = 2 - 1 = 1$ cm

In $\Delta\ OAB$,




$AB = \sqrt{OB^2 - OA^2}$

[ by pythagoras theorem]

$= \sqrt{3^2 - 1^2} = \sqrt{9 - 1}$

$= \sqrt{8}$ cm

$\therefore$ Required length $= BC = 2AB$

$= 2\sqrt{8} = 4\sqrt{2}$ cm

**82.** *(d)* I. It is true that the opposite angles of a cyclic quadrilateral are supplementary.

II. It is also true that the angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.

Hence, both statements are individually true, but neither statements implies to each other.

**83.** *(c)* Let length of rectangle be $x$ cm.

and breadth of rectangle = $(x - 2)$ cm

$\because$ Perimeter of rectangle = $2(l + b)$

So, $2\left[x + (x - 2)\right] = 48$

$\Rightarrow 4x - 4 = 48$

$$\Rightarrow x = \frac{52}{4} = 13$$

$\therefore$ Length = 13 cm and breadth = 11cm

Hence, area of rectangle

$= l \times b = 13 \times 11$

$= 143\ \text{cm}^2$

**84.** *(a)* Let each equal side = $a$ = 13 cm and base $b$ = 24 cm

$\therefore$ Area of the isosceles triangle
$= \frac{1}{4}b \cdot \sqrt{4a^2 - b^2}$

$= \left[\frac{1}{4} \times 24 \times \sqrt{4 \times 169 - 24 \times 24}\right]$

$= 60 \text{ cm}^2$

**85.** *(c)* $\because$ From statement I

length = $2 \times$ width

$\therefore$ Area of rectangle $= 2 \times \text{width} \times \text{width}$

$= 2(\text{width})^2$

From statement II,

$\therefore$ Area of rectangle $= 2 \times$ perimeter

$= 2 \times 2(\text{length} + \text{width})$

$= 4(\text{length} + \text{width})$

From I and II,

$2(\text{width})^2 = 4(2\text{ width} + \text{width})$

$2(\text{width})^2 = 12 \text{ width}$

$\Rightarrow \text{width} = 6$ units

So, both statements together are sufficient.

**86.** *(b)* Given, diameter of the base of the cylinder = 21cm

$\therefore$ Radius $= \frac{21}{2}$ cm

As, curved surface area $= 2\pi rh = 1320$

$\Rightarrow 2 \times \frac{22}{7} \times \frac{21}{2} \times h = 1320$

$\therefore \quad h = \frac{1320}{22 \times 3} = 20$ cm

**87.** *(c)* Volume of spherical lead shot

$= \frac{4}{3}\pi(1^3) = \frac{4}{3}\pi \text{ cm}^3$

I. Volume of 8 shots

$= \frac{4}{3}\pi(0.5)^3 \times 8$

$= \frac{4}{3}\pi \text{ cm}^3$

II. Volume of both sides

$= \frac{4}{3}\pi(0.75)^3 + \frac{4}{3}\pi(0.8)^3$

$= \frac{4}{3}\pi\left[\left(\frac{3}{4}\right)^3 + \left(\frac{4}{5}\right)^3\right]$

$= \frac{4}{3}\pi\left(\frac{27}{64} + \frac{64}{125}\right)$

$= \frac{4}{3}\pi\left(\frac{3375 + 4096}{8000}\right)$

$= \frac{4}{3}\pi\left(\frac{7471}{8000}\right) = \frac{4}{3}\pi(0.93) \text{ cm}^3$

Hence, statement I, II are true.

**88.** *(b)* Total sum of items

$= 2 \times 12 + 3 \times 12 + 5 \times 12$

$= 24 + 36 + 60 = 120$

Total sum of items of first two group

$= (2 + 3) \times 3 = 15$

Total sum of 5 items of group third

$= 120 - 15 = 105$

$\therefore$ Mean of third group $= \frac{105}{5} = 21$

Hence, the mean of third group is 21.

**89.** *(b)* A discrete frequency distribution is such a distribution in which data are presented in a way that exact measurements of the units are clearly shown. Clearly weights of a set of a students is continuous, while other three are discrete.

**90.** *(b)* Number of cellphones sold by

$$\text{Motorola} = \frac{3}{16} \times 45664$$

Centre angle of Motorola

$$= \left( \frac{\frac{3}{16} \times 45664}{45664} \times 360° \right) = \left( \frac{3}{16} \times 360° \right)$$

$$= 67.5°$$

**91.** *(d)* Clearly, all the statements are true about median.

**92.** *(c)* Given, mean = 8.9 and median = 9

$\because$ Mode = $(3 \times \text{Median}) - (2 \times \text{Mean})$

$$= (3 \times 9 - 2 \times 8.9) = 27 - 17.8 = 9.2$$

**93.** *(c)* Ratio of surface area

$$= \frac{4\pi r^2}{4\pi R^2} = \left(\frac{4}{25}\right) = \left(\frac{2}{5}\right)^2$$

$$\Rightarrow \frac{r}{R} = \frac{2}{5}$$

Now, ratio of volumes

$$= \frac{\frac{4}{3}\pi r^2}{\frac{4}{3}\pi R^3} = \left(\frac{r}{R}\right)^3 = \left(\frac{2}{5}\right)^3 = \frac{8}{125}$$

$$= 8 : 125$$

**94.** *(b)* Let side of a cube be a unit.

$\therefore$ Volume of cube, $V = a^3$

and total surface area of cube, $S = 6(a)^2$

$$S^3 = 6^3(a^6) = 216\, V^2$$

**95.** *(c)* Let side of square be $x$

$\therefore$ Radius of sphere = $x$

Surface area of sphere, $A = 4\pi x^2$

Since, square revolves round a side to generate a cylinder whose height and radius are $x$ and $x$, respectively.

$\therefore S = 2\pi x(x + x) = 4\pi x^2$

So, it is clear that, $A = S$.

**96.** *(c)* Given, length of string = Radius of circle = 28 m

Area over which the horse can graze

$$= \pi r^2 = \frac{22}{7} \times 28 \times 28 = 2464 \text{ m}^2$$

**97.** *(b)* Area of shaded region = Area of horizontal rectangle + Area of vertical rectangle

$$= 5 \times 1 + (8 - 1) \times 1 = 5 + 7 = 12 \text{ m}^2$$

**98.** *(b)* Clearly, the locus of the centre of circles which passes through two given point is perpendicular bisector of the line joining the given points.

**99.** *(a)* Since, the direct common tangents of two circles divides the line joining their centres externally in the ratio of their radii. Here, both the circles being of equal radii. Hence, their ratio is 1 : 1.

**100.** *(c)* The locus of a point is the circumference of the circle with AB as diameter.