SSC MAINS (MATHS)-5 (SOLUTION)

1. (C) $\because (x-1)$ is factor of $x^3 - ax^2 + 14x + b$
So, $x = 1$
$\Rightarrow 1^3 - a \times 1^2 - 14 \times 1 + b = 0$
$\Rightarrow 1 - a + 14 + b = 0$
$\Rightarrow a - b = 15$ ..... (i)
$\because (x-2)$ is also factor of $x^3 - ax^2 + 14x + b$
So, $x = 2$
$\Rightarrow 2^3 - a \times 2^2 + 14 \times 2 + b = 0$
$\Rightarrow 8 - 4a + 28 + b = 0$
$\Rightarrow 4a - b = 36$ ..... (ii)
$a - b = 15$ ..... (i)
$- \quad + \quad -$
$3a = 21$
$a = 7, \quad b = -8$

2. (A) 1st term $\Rightarrow (b-a)x = (b-a)(b-c+a)$
$= (b-a)\{(b+a)-c\}$
$\Rightarrow (b-a)(b+a) - (b-a)c$
$= b^2 - a^2 - bc + ac$ ...(i)
2nd term $\Rightarrow (c-b)y = (c-b)(c-a+b)$
$= (c-b)\{(c+b)-a\}$
$\Rightarrow (c-b)(c+b) - (c-b)a$
$= c^2 - b^2 - ca + ab$ ...(ii)
3rd term $\Rightarrow (a-c)z = (a-c)(a-b+c)$
$= (a-c)\{(a+c)-b\}$
$\Rightarrow (a-c)(a+c) - (a-c)b$
$= a^2 - c^2 - ab + bc$ .....(iii)
From (i), (ii) and (iii)
$(b-a)x + (c-b)y + (a-c)z$
$= b^2 - a^2 + c^2 - b^2 + a^2 - c^2 - bc + ac - ca + ab - ab + bc$
$= 0$

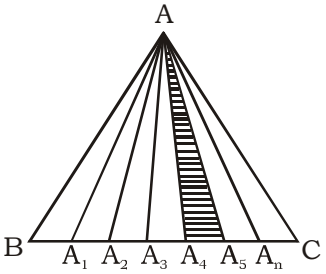
3. (B) We have, $x^3 - 27 = (x-3)(x^2 + 9 + 3x)$
$\therefore$ In 1 sec distance travelled by the wheel

$$x^2 + 9 + 3x \overline{)\, x^3 + 4x^2 + 12x + K \,(\, x + 1}$$
$$x^3 + 3x^2 + 9x$$
$$- \quad - \quad -$$
$$x^2 + 3x + K$$
$$x^2 + 3x + 9$$
$$- \quad - \quad -$$
$$K - 9$$

$\therefore$ Value of K = 9

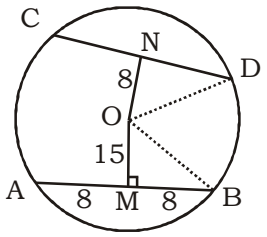
4. (C) Distance = 330 × 30 m
$$\text{speed} = \frac{330 \times 30}{11 \times 60 + 30} \text{ m/s}$$
$$= \frac{330 \times 30}{690}$$
$$= \frac{330}{23} \text{ m/s}$$

5. (D)



Total $(n+1)$ triangles will be formed Whose base are same and height are equal.
$\therefore$ Area of $\Delta ABC = (n+1) \times$ Area of ΔAA_4A_5
$= (n+1) \times K$ sq. cm

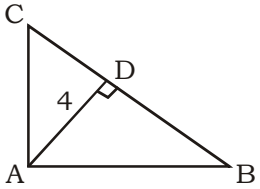
6. (C)



OB = $\sqrt{15^2 + 8^2}$
$= \sqrt{225 + 64}$
$= \sqrt{289}$
= 17 cm
$\because$ OB & OD are radius of circle.
DN= $\sqrt{17^2 - 8^2}$
$= \sqrt{289 - 64}$
$= \sqrt{225}$
= 15 cm
CD= CN + DN
= 15 + 15
= 30 cm

7. (A) From one hour 15 minutes to half past three, minute hand covers 2 hours 15 minutes or $2\frac{1}{4}$ rotations.
$\therefore$ If covers $2\frac{1}{4} \times 2\pi = (4.5)\pi$

8. (B)



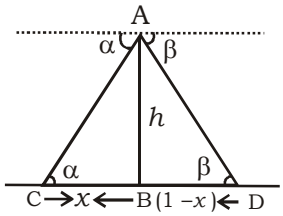
Cot B + Cot C

$\Rightarrow \frac{BD}{4} + \frac{CD}{4}$ [In ΔABD & ACD]

$\Rightarrow \frac{BD+CD}{4}$

$\Rightarrow \frac{12}{4} = 3$ cm

9. (C)



In right angled ΔABC,

$\Rightarrow \tan\alpha = \frac{AB}{BC} = \frac{h}{x}$

$\Rightarrow x\tan\alpha = h$ or $x = \frac{h}{\tan\alpha}$

In right angled ΔABD

$\Rightarrow \tan\beta = \frac{AB}{BD} = \frac{h}{1-x}$

$\Rightarrow h = \tan\beta - x\tan\beta$

$\Rightarrow h = \tan\beta - \frac{h}{\tan\alpha} \times \tan\beta$

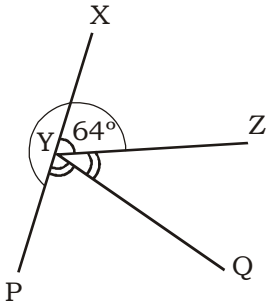
$\Rightarrow h = \frac{\tan\alpha\tan\beta - h\tan\beta}{\tan\alpha}$

$\Rightarrow h\tan\alpha = \tan\alpha \times \tan\beta - h\tan\beta$

$\Rightarrow h(\tan\alpha + \tan\beta) = \tan\alpha.\tan\beta$

$\Rightarrow h = \frac{\tan\alpha \times \tan\beta}{\tan\alpha + \tan\beta}$ Km

10. (A)



$\angle XYZ + \angle ZYQ + \angle QYP = 180°$

or $64° + 2\angle ZYQ = 180$ [$\angle ZYQ = \angle QYP$]

$\therefore \angle ZYQ = 58°$

$\because \angle XYQ = \angle XYZ + \angle ZYQ$

$= 64° + 58°$

$= 122°$

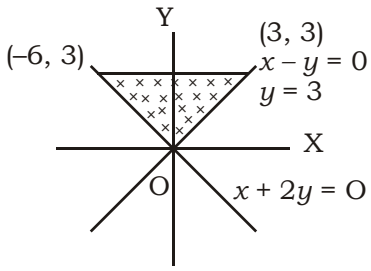
Now reflex,

$\angle QYP = \angle PYX + \angle XYQ$

$= 180° + 122°$

$= 302°$

11. (D)



Required area $= \frac{1}{2}|3 - (-6)| \times 3$

$= \frac{1}{2} \times 9 \times 3$

$= \frac{27}{2}$ sq. unit

$= 13.5$ sq. unit

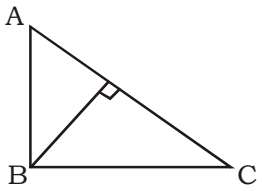
12. (C) Let the required side of triangle be x cm.

So, $\frac{x^2}{7^2} = \frac{256}{196}$

$\Rightarrow x^2 = \frac{256 \times 49}{196}$

$\Rightarrow x = 8$ cm

13. (A)



$\because$ Medians of right angled triangle meet at mid point of AC.

So, required ratio = $1 : \sqrt{2} : \sqrt{3}$

14. (D) $\sqrt{4a-9} + \sqrt{4x+9} = 5 + \sqrt{7}$

$\Rightarrow \left(\sqrt{4x-9}+\sqrt{4x+9}\right)\left(\sqrt{4x-9}-\sqrt{4x+9}\right)$

$= 4x - 9 - 4x - 9$

$\Rightarrow \left(5+\sqrt{7}\right)\left(\sqrt{4x-9}-\sqrt{4x+9}\right) = -18$

$\Rightarrow \sqrt{4x-9} - \sqrt{4x+9} = -\frac{18}{5+\sqrt{7}} \times \frac{5-\sqrt{7}}{5-\sqrt{7}}$

$\Rightarrow \sqrt{4x-9} - \sqrt{4x+9} = -\frac{18}{25-7}$

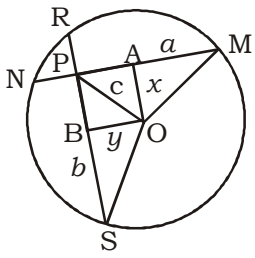
$\Rightarrow \sqrt{4x-9} - \sqrt{4x+9} = -\frac{18\left(5-\sqrt{7}\right)}{18}$

$\Rightarrow \sqrt{4x-9} - \sqrt{4x+9} = -\left(5-\sqrt{7}\right)$ ..... (i)

$\sqrt{4x-9} + \sqrt{4x+9} = (5+\sqrt{7})$ [Given]..... (ii)

$2\sqrt{4x-9} = 2\sqrt{7}$
$\Rightarrow \sqrt{4x-9} = \sqrt{7}$
$\Rightarrow 4x - 9 = 7$
$\Rightarrow 4x = 16$
$\Rightarrow x = 4$

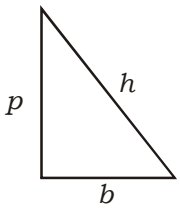
15. (B)



Let MN be $2a$ and RS be $2b$ unit, and OA be x and OB be y unit.
$\because$ AOBP is a square,
So, AO = PB ; OB = PA
In ΔOAM ; $a^2 + x^2 = OM^2$ .....(i)
In ΔOBS ; $b^2 + y^2 = OS^2$ ..... (ii)
$OM^2 + OS^2 = a^2 + x^2 + b^2 + y^2$ ..... (iii)
In ΔOPA ; $x^2 + y^2 = c^2$ ..... (iv)
$2\,OM^2 = c^2 + a^2 + b^2$

$OB = \sqrt{\frac{a^2+b^2+c^2}{2}}$

16. (C)



$\text{Cot}\,\theta = \frac{b}{p} = \frac{2xy}{x^2-y^2}$

In ΔABC
$\therefore h^2 = (x^2 - y^2)^2 + (2xy)^2$
$= (x^2 + y^2)^2$
$h = x^2 + y^2$

$\therefore \cos\theta = \frac{b}{h} = \frac{2xy}{x^2+y^2}$

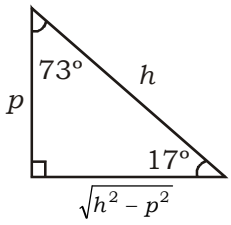
17. (C) $\frac{A}{B} = \frac{4}{5}$
(A+B)'s 1 day work = 9
(A+B)'s 7 day work = 63
As given in 3 days 37% of the work is completed
$\therefore$ Total work = 100
C's 3 day work = 37 – ((9 × 3) = 10
C's 1 day work = $\frac{10}{3}$

A will complete the work = $\frac{100}{4}$ = 25 days

B will complete the work = $\frac{100}{5}$ = 20 days

C will complete the work = $\frac{100}{\frac{10}{3}}$ = 30 days

18. (C)



$\sin 17° = \frac{p}{h}$
So, $b = \sqrt{h^2 - p^2}$
$\Rightarrow \sin 73° = \sin(90 - 17) = \cos 17°$
$= \frac{\sqrt{h^2-p^2}}{h}$
So, $\sec 17° - \sin 73°$
$\Rightarrow \frac{h}{h^2-p^2} - \frac{h^2-p^2}{h}$
$\Rightarrow \frac{h^2-h^2+p^2}{h\sqrt{h^2-p^2}}$
$\Rightarrow \frac{p^2}{h\sqrt{h^2-p^2}}$

19. (B) $\frac{\sin^6\theta - \cos^6\theta}{\sin^2\theta - \cos^2\theta} = \frac{(\sin^2\theta)^3 - (\cos^2\theta)^3}{\sin^2\theta - \cos^2\theta}$
$\Rightarrow \frac{(\sin^2\theta - \cos^2\theta)(\sin^4\theta + \cos^4\theta + \sin^2\theta.\cos^2\theta)}{\sin^2\theta - \cos^2\theta}$
$\Rightarrow \sin^4\theta + \cos^4\theta + 2\sin^2\theta.\cos^2\theta - \sin^2\theta.\cos^2\theta$
$= (\sin^2\theta + \cos^2\theta)^2 - \sin^2\theta.\cos^2\theta$
$= 1 - \sin^2\theta.\cos^2\theta$

20. (D) Let their shares be x, $8x$ and $6x$ respectively.
ATQ, $7x + 8x + 6x = 4200$
$x = 200$
Amount of Pinku, Rinku & Tinku are 1400, 1600 & 1200 respectively.
Required Ratio = (1400 + 200) : (1600 + 200) : (1200 + 200)
= 1600 : 1800 : 1400
= 8 : 9 : 7

21. (B) Let the speed of A be x Km/hrs and B be y km/hrs
$\Rightarrow \frac{60}{x-y} = 6$
$\Rightarrow x - y = 10$ .....(i)
ATQ,

$\frac{60}{\frac{2}{3}x - 2y} = 5$
$\Rightarrow \frac{2x-6y}{3} = 12$

$\Rightarrow 2x - 6y = 36$ ..... (ii)
$6x - 6y = 60$ ..... (iii)
$- \quad + \quad -$
$-4x = -24$
$x = 6$ km/hrs

22. (A) Required ratio $= \frac{3}{2} : \frac{4}{1} : \frac{2}{8}$
$= 24 : 64 : 4$
$= 6 : 16 : 1$

23. (C) Required average speed

$$= \frac{1}{\frac{1}{4\times10}+\frac{9}{20\times5}+\frac{3}{10\times15}}$$

$$= \frac{1}{\frac{1}{40}+\frac{9}{100}+\frac{3}{150}}$$

$$= \frac{200}{5+18+4}$$

$$= \frac{200}{27} \text{ km/hrs}$$

24. (A) Let the fraction be $\frac{x}{y}$

$$\frac{x+2}{y+1} = \frac{1}{2}$$

$\Rightarrow 2x - y = 3$ ..... (i)

$$\frac{x+1}{y-2} = \frac{3}{5}$$

$\Rightarrow 5x - 3y = 11$ ..... (ii)
$6x - 3y = -9$ ..... (iii)
$-x = -2$
$x = 2, \quad y = 7$

So, fraction $= \frac{2}{7}$

25. (B) Let principal for the first year be P_1 and that for two years be P_2.

$$\therefore 16224 = P_1\left(1+\frac{4}{100}\right)$$

$$\Rightarrow P_1 = \frac{16224\times25}{26}$$
$= ₹15600$

$$16224 = P_2\left(1+\frac{4}{100}\right)^2$$

$$\Rightarrow P_2 = \frac{16224\times25\times25}{26\times26}$$
$= ₹15000$

$\therefore$ Cash value of the scooter
$= ₹ (16224 + 15600 + 15000)$
$= ₹ 46824$

26. (D) HCF of 408 and 312 is 24.

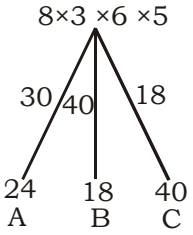
Total number of section $= \frac{408}{24} + \frac{312}{24}$
$= 17 + 13$
$= 30$

27. (A) Let the number of men of the beginning be x.
$m \times m \times m \times x = n \times n \times n \times m$

$$x = \frac{n^3\times m}{m^3}$$

$$x = \frac{n^3}{m^2}$$

28. (C)



A can complete it in $\frac{18\times4}{3} = 24$ days

B can complete it in $\frac{12\times3}{2} = 18$ days

C can complete it in $\frac{24\times5}{3} = 40$ days

A completed = 30 × 4 = 120 units
B completed = 40 × 6 = 240 units
C completed = 18 × 8 = 144 units

Total work completed = 504 units

Required percentage $= \frac{720-504}{720} \times 100$

$$= \frac{216}{720} \times 100$$
$= 30\%$

29. (B) Required days $= \frac{800\times6}{240}$
$= 20$ days

30. (D) Let the money be P.

$$\Rightarrow \frac{1}{3}\times P\times 7\% + \frac{1}{4}\times P\times 8\% + \left[1-\left(\frac{1}{3}+\frac{1}{4}\right)\right] \times P \times 10\%$$

$$\Rightarrow \frac{7P}{300} + \frac{8P}{400} + \frac{50P}{1200} = 510$$

$$P = \frac{510\times100\times6}{51}$$
$= ₹ 6000$

31. (C) Let x, y and z be the amounts invested in schemes P, Q and R respectively.

$$\frac{x\times10\times1}{100} + \frac{y\times12\times1}{100} \times \frac{z\times15\times1}{100} = 3200$$

$\Rightarrow 10x + 12y + 15z = 32000$ .....(i)

Now, $z = 240\%$ of $y = \frac{12}{5}\ y$ .....(ii)

and $z = 150\%$ of $x = \frac{3}{2}\ x$

$\Rightarrow\ x = \frac{2}{3}\ z = \left(\frac{2}{3}\times\frac{12}{5}\right)\ y\ = \frac{8}{5}\ y$ ..... (iii)

From Eqs (i), (ii) and (iii), we have

$16\ y + 12y + 36y = 320000$

$y = 5000$

$\therefore$ Sum invested in scheme Q = ₹ 5000

32. (C) Percentage growth $= \left(\frac{1}{8}\times 100\right)\%$

$= 12.5\%$

Height after two years $= 64 \times \left(1+\frac{12.5}{100}\right)^2$

$= 64 \times \frac{9}{8} \times \frac{9}{8}$

$= 81$ cm

33. (A) Let the original price of mobile be 100% then, selling price = 80%

selling price of Apurv $= 80 \times \frac{140}{100}$

$= 112\%$

Profit percentage on original price

$= 112\% - 100\%$

$= 12\%$

34. (C) Case I : Percentage profit $\Rightarrow \frac{17\times 100}{36}$

$= 47.22\%$

Case II : Percentage profit $\Rightarrow \frac{24\times 100}{50}$

$= 48\%$

Case III : Percentage profit $\Rightarrow \frac{19\times 100}{40}$

$= 47.50\%$

Case IV : Percentage profit $\Rightarrow \frac{29\times 100}{60}$

$= 48.33\%$

Case IV is the best transaction.

35. (D) Given values are odd numbers.

then its common factor = (41+ 43)

= 84

36. (C) Required number = HCF of (260 – 7), (270–7) and (145 – 7)

= HCF of 253, 713 and 138

= 23

37. (B) Let , amount of equal instalment be x.

Ist instalment $(x) = P_1 \times \frac{87}{80}$

IInd instalment $(x) = P_2 \times \frac{87}{80}\times\frac{87}{80}$

So, $13{,}360 = \frac{80}{87}\ x\left(1+\frac{80}{87}\right)$

$\Rightarrow\ 13{,}360 = \frac{80}{87}\ x \times \frac{167}{87}$

$x = \frac{13360\times 87\times 87}{80\times 167}$

= ₹ 7569

38. (B) After two years, the simple interest

$= \frac{6000\times 5\times 2}{100}$

= ₹ 600

After two years, the compound interest

$= 5000\left(1+\frac{8}{100}\right)^2 - 5000$

$= 5000 \times \frac{27}{25} \times \frac{27}{25} - 5000$

= ₹ 5832 – 5000

= ₹ 832

Required difference = ₹ 832 – ₹ 600

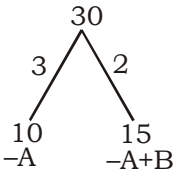
= ₹ 232

39. (B) $A = 250\left(1+\frac{4}{100}\right)\left(1+\frac{8}{100}\right)$

$= 250 \times \frac{26}{25} \times \frac{27}{25}$

= ₹ 280.80

40. (D)

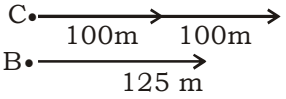


$B = \frac{30}{1}$ hours

$\therefore$ Capacity of tank = 30 × 60 × 4

$= 7200\ l$

41. (A)



So, A will meet B $= \frac{\text{Distance}}{\text{relative speed}}$

$= \frac{125}{250-125}$ min

$= \frac{125}{75}$ min

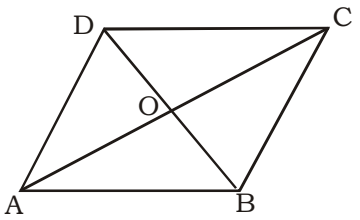
$= \frac{5}{3}$ min

A will meet C $= \frac{\text{Distance}}{\text{relative speed}}$

$= \frac{200}{200-100}$ min

= 2 min

42. (B)



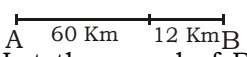
In right angle ΔAOB

$AB^2 = AO^2 + OB^2$

$= 5^2 + 12^2$

So, AB = 13 cm

43. (A)



Let the speed of Ravi the x Km/H, then speed of Ajay be $(x - 4)$ Km/H and their time of travelling be t hrs.

$t = \frac{48}{x-4}$ — (i)

$t = \frac{72}{x}$ — (ii)

$\Rightarrow \frac{48}{x-4} = \frac{72}{x}$

$\Rightarrow \frac{4}{x-4} = \frac{6}{x}$

$\Rightarrow 4x = 6x - 24$

$\Rightarrow 2x = 24$

$\Rightarrow x = 12$ km/hrs

44. (B) Distance = $\frac{330 \times 8}{352}$ m

speed = $\frac{330 \times 8}{352} \times \frac{18}{5}$ km/hrs

= 27 km/hrs

45. (B) I[st] Alloy ;

$Zn = \frac{1}{5} \times 10$

= 2 Kg

$\therefore$ Cu = 8 Kg

II[nd] Alloy ;

$Zn = \frac{3}{4} \times 16$

= 12 Kg

Cu = 4 Kg

Let x Kg pure copper melted.

ATQ,

$\frac{8+4+x}{2+12} = \frac{3}{2}$

$\Rightarrow \frac{12+x}{14} = \frac{3}{2}$

$\Rightarrow 12 + x = 21$

$\Rightarrow x = 9$ Kg

So, Total weight of alloy

= 10 + 16 + 9

= 35 Kg

46. (A) Let the sum be ₹ P.

$SI = \frac{Pr \times 3}{100} = \frac{3Pr}{100}$

$CI = P\left[\left(1+\frac{r}{100}\right)^3 - 1\right]$

$= P\left[1+\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}-1\right]$

$= P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}\right]$

$\Rightarrow$ CI-SI $= P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}\right] - \frac{3Pr}{100}$

$x = P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}\right]$

$= P\left(\frac{r^2}{100^3}\right)(r + 300)$

$P = \frac{r(100)^3}{r^2(r+300)}$

Here, x ₹ 608 (given) and r 4% per annum

$P = \frac{608 \times 100 \times 100 \times 100}{4 \times 4 \times (4+300)}$

P = ₹ 1,25,000

47. (D) Capacity of cask

$= \frac{6}{1-\left(\frac{121}{144}\right)^{1/2}}$

$= \frac{6}{1-\left(\frac{11}{12}\right)^{2\times\frac{1}{2}}}$

$= \frac{6}{1-\frac{11}{12}}$

$= \frac{6}{\frac{1}{12}}$

= 72 litres

48. (A) Ratio of profit = 125000 : 85000

= 25 : 17

Let the total profit be ₹ x

Share of first partner

$= 40\%$ of $x\left(\frac{25}{25+17}\right)$

= 40% of $x\left(\frac{25}{42}\right)$

$= \frac{40x}{100} \times \frac{25}{42}$

$= \frac{5x}{21}$

Share of second partner

= 40% of $x\left(\frac{17}{42}\right)$

$= \frac{17x}{105}$

ATQ,

$\frac{5x}{21} - \frac{17x}{105} = 300$

$\Rightarrow \frac{25x-17x}{105} = 300$

$\Rightarrow \frac{8x}{105} = 300$

$\Rightarrow x = \frac{300\times105}{8}$

x = ₹ 3937.50

49. (B) Let the distance D Km and speed be x Km/hrs.

$\Rightarrow \frac{50}{x} + \frac{(D-50)4}{3x} = \frac{D}{x} + \frac{25}{60}$

$\Rightarrow \frac{150+4D-200}{3x} = \frac{60D+25x}{60x}$

$\Rightarrow 4D - 50 = 3D + \frac{5}{4}x$

$\Rightarrow 4D - 5x = 50 \times 4$

$4D - 5x = 200$ ..... (i)

$\Rightarrow \frac{50-24}{x} + \frac{(D-26)\times4}{3x} = \frac{D}{x} + \frac{35}{60}$

$\Rightarrow 4D - 7x = 104$ ..... (ii)

From equation (i) and (ii)

D = 110 kms

50. (A) Let up stream speed be x km/hrs and down stream speed y km/hrs.

$\Rightarrow \frac{30}{x} + \frac{44}{y} = 10$ ..... (i)

$\Rightarrow \frac{40}{x} + \frac{55}{y} = 13$ ..... (ii)

From equation (i) and (ii)

x = 5, km/hrs

and y = 11 km/hrs

Speed of current = $\frac{11-5}{2}$

= 3 km/hrs

Speed of man = $\frac{11+5}{2}$

= 8 km/hrs

51. (A) Let the required time be T years.

$\frac{M\times22}{W} = \frac{T(50M+45F+17C)}{W}$

$4 \times 22 = T(50\times4+45\times3+17\times1)$

$T = \frac{88}{200+135+17}$

$= \frac{88}{352}$

$= \frac{1}{4}$ Years or 3 months

52. (B) $\frac{P}{Q} = \frac{5}{8}$

$Q = \frac{8P}{5}$

Q – (P + 9) = 6

Q – P – 9 = 6

Q – P = 15

Q = p + 15 ..... (i)

$\frac{8P}{5} = P + 15$

8P = 5P + 75

3P = 75

P = 25

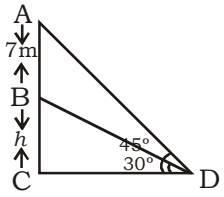
Q = 25 + 15 = 40

Total age = 25 + 40 = 65 years.

53. (C) Sum of the ratios must divide 12.

Since 3 +2 = 5 doesn't divide 12,

54. (A)



Let the height of tower be h m.

total height of tower and

flagstaff = $\frac{7}{\left(1-\frac{\tan30^\circ}{\tan45^\circ}\right)}$

$= \frac{7}{\left(1-\frac{1}{\sqrt{3}\times1}\right)}$

$= \frac{7\sqrt{3}}{\sqrt{3}-1}$

Height of tower

$$h = \frac{7\sqrt{3}}{\sqrt{3}-1} - 7$$

$$= 7\left(\frac{\sqrt{3}-\sqrt{3}+1}{\sqrt{3}-1}\right) \text{ m}$$

$$= \frac{7}{\sqrt{3}-1} \text{ m}$$

55. (A) 20 pieces $\rightarrow$ $(3 + x)$ min.
60 pieces $\rightarrow$ $(8 - 3 - x)$ min.

$$\frac{20}{3+x} + \frac{60}{5-x} = 20$$

$5 - x + 9 + 3x = 15 - 3x + 5x - x^2$
$\Rightarrow \quad 14 + 2x = 15 + 2x - x^2$
$\Rightarrow \quad x^2 = 1$
$\Rightarrow \quad x = 1$
20 pieces $\rightarrow$ 4 min
160 pieces $\rightarrow$ 32 min

56. (A) Let the polynomial be $p(x)$ then by remainder theorem $p(2) = 1$ and $p(3) = 2$
$\because x^2 - 5x + 6 = 0$
$\Rightarrow x^2 - 3x - 2x + 6 = 0$
$\Rightarrow (x-3)(x-2) = 0$
Let $p(x) = h(x)(x-2)(x-2) + ax + b$
$\therefore p(2) = 0 + 2a + b$
$\Rightarrow \quad 1 = 0 + 2a + b$
or $1 = 2a + b$ ..... (i)
$p(3) = 0 + 3a + b$
$\Rightarrow 2 = 3a + b$ .....(ii)
Subtracting (i) from (ii)
$a = 1, \quad b = -1$
Hence, required remainder $ax + b = x - 1$

57. (A) Let the CP of book be x and pen be y,
$x + y = 13{,}800$ ..... (i)

$$\left(x \times \frac{117}{100} + y \times \frac{113}{100}\right) - \left(x \times \frac{113}{100} + y \times \frac{117}{100}\right) = 40$$

$$x \times \frac{4}{100} - y \times \frac{4}{100} = 40$$

$x - y = 1000$ ..... (ii)
$\underline{x + y = 13{,}800}$ ..... (i)

$$x = \frac{14800}{2}$$

$= ₹\ 7{,}400$
$y = ₹\ 6{,}400$

58. (A) Total CP of 13 dozen bottles

$$= 12 \times 12 \times 117 \times \frac{3}{4}$$

$= ₹\ 12636$
Total bottles purchased $= 13 \times 12$
$= 156$

Lowest price of one bottles $= \frac{12636}{156}$
$= ₹\ 81$

59. (B) Let the CP of article = 100%
SP of article = 120%
ATQ,

$$120\% - 100 = (100\% - 100)\ \frac{124}{100}$$

$4\% = 24$

$$100\% = \frac{24}{4} \times 100$$

C P = ₹ 600

60. (D) Let milkman purchased x litre.
ATQ, $50x + 2000 = 60x - 1500$
$10x = 3500$ litre ;
$x = 350$ litres

61. (C) Let the CP of first article be 100%

	CP	SP
I[st] article	100%	80%
II[nd] article	$\frac{100}{125} \times 100 = 80\%$	100%
	180%	180%

$\because$ CP of two article is equal to SP.
So, shopkeeper has neither profit nor loss.

62. (B)

	CP	SP
I[st]	$\frac{180}{80} = \frac{5}{4} \Rightarrow 4\times6 = 24$	$5\times6 = 30$
II[nd]	$\frac{120}{100} = \frac{6}{5} \Rightarrow 5\times5 = 25$	$6\times5 = 30$

$30 \xrightarrow{\times 60} 1800$
difference $\Rightarrow 25 - 24 = 1$
$1 \xrightarrow{\times 60} ₹\ 60$

63. (C) Maximum value of $\sin^6\theta + \cos^6\theta = 1$

64. (B) Let the speed of A be $4x$ m/sec and B be $3x$ m/sec
Speed of A is more than B
$= 4x - 3x$
$= x$ m/sec

$$t = \frac{500}{x} \text{ sec.}$$

$\because$ Time taken by A to run

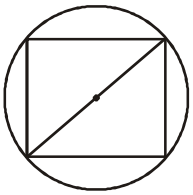
7 Km $= \frac{7000}{4x}$ seconds

$$\therefore \text{ Number of rounds} = \frac{7000}{4x} \div \frac{500}{x}$$

$= 3.5$
So, A crosses B 3 times.

65. (A) $\sqrt{(x-1)^2} + \sqrt{(x-3)^2}$
$\Rightarrow x - 1 + x - 3$
$\Rightarrow 2x - 4$
$\because 1 < x < 2$

66. (B)



Let side of cube = a
radius of sphere = r
diagonal of cube = diameter of sphere

$$a\sqrt{3} = 2r$$

$$a = \frac{2r}{\sqrt{3}}$$

Volume of cube = $a^3 = \left(\frac{2r}{\sqrt{3}}\right)^3 = \left(\frac{2}{\sqrt{3}}\right)^3 . r^3$

67. (C) Let the CP of the article be ₹100 and its SP be x.

$$\Rightarrow \frac{100-x}{100} \times 100 = \frac{2x-100}{100} \times 100$$

$$\Rightarrow 100 - x = 2x - 100$$

$$\Rightarrow 3x = 200$$

$$\Rightarrow x = \frac{200}{3}$$

$$\therefore \text{Loss\%} = 100 - \frac{200}{3}$$

$$= \frac{100}{3}$$

$$= 33\frac{1}{3}\%$$

68. (D) Let the marked price be x.

$$\therefore \text{CP} = \frac{13}{15}x$$

$$\text{SP} = \frac{112}{100}x$$

$$\therefore \text{Profit} = \frac{112x}{100} - \frac{13x}{15}$$

$$= \frac{336x - 260x}{300}$$

$$= \frac{76}{300}x$$

$$\therefore \text{Profit \%} = \frac{76x}{300} \times \frac{15}{13x} \times 100$$

$$= \frac{380}{13}\%$$

$$= 29\frac{3}{13}\%$$

69. (B) Gain = X × $\frac{25}{100}$

$$= ₹ \frac{X}{4}$$

$$\text{Taxes} = \frac{X}{4} \times \frac{50}{100}$$

$$= \frac{X}{8}$$

70. (B) CP of the article = $\frac{700 \times 100}{140}$

$$= ₹ 500$$

$$\therefore \text{New selling price} = \frac{500 \times 110}{100}$$

$$= ₹ 550$$

71. (B) Investment ratio in terms of one month or of their equivalent capitals,

$$\text{A : B : C} = \left\{(50{,}000 \times 4) + \left(\frac{50{,}000}{2} \times 8\right)\right\} :$$

$$\left\{(45{,}000 \times 8) + \left(\frac{45{,}000}{2} \times 4\right)\right\} : (70{,}000 \times 4)$$

= 400000 : 450000 : 280000
= 40 : 45 : 28

72. (D) Effective discount = $25 + 15 - \frac{25 \times 15}{100}$

= (40 – 3.75)%
= 36.25%

$\therefore$ CP of buyer = (100 – 36.25)% of 800

$$= \frac{63.75}{100} \times 800$$

$$= \frac{63.75 \times 800}{100}$$

$$= ₹ 510$$

$\therefore$ To gain 20%

$$\text{SP} = ₹ \left(\frac{120 \times 510}{100}\right)$$

$$= ₹ 612$$

Let the list price be ₹ x.
$\therefore$ 90% of x = ₹ 612

$$\Rightarrow \frac{90 \times x}{100} = 612$$

$$\Rightarrow x = \frac{612 \times 100}{90}$$

$$= ₹ 680$$

73. (B) Let the CP be ₹ 100, the SP = ₹ 120
Let the marked price be x.
Then 90% of x = ₹ 120

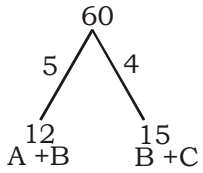
$$x = \frac{120 \times 100}{90}$$

$= \frac{400}{3}\%$

$= 133\frac{1}{3}\%$

So, it is $33\frac{1}{3}\%$ higher then the CP.

74. (C)



$A + 2B + C = \frac{60}{9}$ days

$A = 2C$ [given]

$2C + 2B + C = 9$ unit

$C = (9 - 8)$ unit work

$= 1$ unit

$B = \frac{60}{4-1}$

$= \frac{60}{3}$ days

$= 20$ days

75. (D) $10 \times \left[\frac{2M+3W+4C}{10}\right] = D\left[\frac{6M+4W+7C}{16}\right]$

$\Rightarrow [2 \times 5 + 3 \times 4 + 4 \times 2]$

$= D\left[\frac{6\times5+4\times4+7\times2}{16}\right]$

$\Rightarrow [10 + 12 + 8] = D\left[\frac{30+16+14}{16}\right]$

$D = \frac{30\times16}{60} = 8$ days

76. (B) P can complete the whole work = 40 days

Q can complete the whole work $= \frac{15\times5}{2}$ days

R can complete the whole work = 39 days

S can complete the whole work = 42 days

So, Q will complete it first

77. (C) A ⟵ 330Km ⟶ B

Distance travelled till 9 am = 60 Km

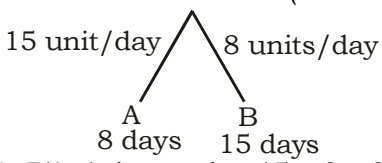
Required time = 9 am + $\frac{270}{60+75}$ hrs

= 9 am + $\frac{270}{135}$ hrs

= 9 am + 2 hours

= 11 am

78. (D) Total work = 120 units (LCM of 8 and 15)



(A+B)'s 1 day work = 15 + 8 = 23 units

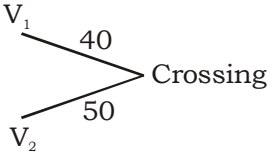
(A+B)'s 3 days work = 23 × 3 = 69 units

Remaining work = 120 – 69 = 51 units

Number of days taken by A to complete the remaining work $= \frac{51}{15} = 3\frac{6}{15} + 3\frac{2}{5}$

Total number of days $= 3\frac{2}{5} + 3 = 6\frac{2}{5}$ days

79. (B)

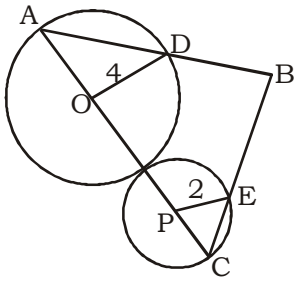


Let the time taken be equal

$\frac{40}{V_1} = \frac{50}{V_2}$, then they will collide i.e. cars will reach at the same time

$\therefore \frac{V_1}{V_2} \neq \frac{40}{50} = \frac{4}{5}$

80. (A)



$\angle OAD = \angle ODA = 45°$

$\angle PCE = \angle PEC = 45°$

$\angle ABC = 180° - (45 + 45)$

$= 90°$

$AB = CB$

In ΔABC,

$\Rightarrow 12^2 = \sqrt{AB^2 + CB^2}$

$\Rightarrow 144 = \sqrt{AB^2 + AB^2}$

$\Rightarrow AB = \frac{\sqrt{144}}{\sqrt{2}}$ cm

$= \frac{12}{\sqrt{2}}$ cm

Area of $\Delta ABC = \frac{1}{2} \times \frac{12}{\sqrt{2}} \times \frac{12}{\sqrt{2}}$

$= 36$ sq cm

81. (A) x^2 – (Sum of roots) x + (product of roots) = 0

$\Rightarrow 3x^2 + 4x + 2 = 0$

$\Rightarrow x^2 + \frac{4}{3}x + \frac{2}{3} = 0$

sum of roots = $\frac{4}{3}$

product of roots = $\frac{2}{3}$

So, X does not have any real roots.

82. (C) Value of $\cos\theta - \sin\theta = \sqrt{2 - m^2}$

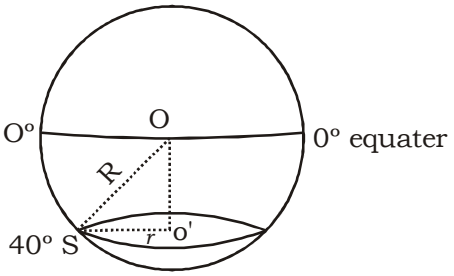
83. (B) HCF of 120 and 105 = 15

Number of tiles = $\frac{120 \times 105}{15}$

= 8 × 7

= 56

84. (B)



Let radius of that circle be r.

$\cos 40^\circ = \frac{r}{R}$

$\therefore\ r = R \cos 40^\circ$

85. (B) As given 3M = 5 W ... (i)

2W = 3C

$\therefore 2 \times \frac{3}{5}$ M = 3 C [from eq. (i)

$\Rightarrow$ 2M = 5C

Now, $M_1 D_1 W_2 = M_2 D_2 W_1$

(20 M + 30 W + 75 C) × 60 × $\frac{3}{4}$

= [(20 + x) M + 25 C] × 85 × $\frac{1}{4}$

$\Rightarrow$ (20 M + 18 W + 75 C) × 60 × $\frac{3}{4}$

= [(20 + x) M + 10 M] × 85 × $\frac{1}{4}$

$\Rightarrow$ 68 M × 45 = (30 + x) M × 85 × $\frac{1}{4}$

$\Rightarrow$ (30 + x) = 144

$\Rightarrow$ x = 114

86. (C) Let radius of hemisphere = height of cylinder = r units.

$\therefore \frac{\text{Volume of hemisphere}}{\text{Volume of cylinder}} = 1$

$\Rightarrow \frac{\frac{2}{3}\pi r^3}{\pi r_1^2 r} = 1$

$\Rightarrow \frac{r^2}{r_1^2} = \frac{3}{2}$

$\Rightarrow r : r_1 = \sqrt{3} : \sqrt{2}$

87. (D) ATQ, $\pi m^2 H = \frac{1}{3}\pi r^2 h$

$\Rightarrow H = \frac{1}{3}\frac{\pi r^2 h}{\pi m^2} = \frac{hr^2}{3m^2}$

88. (C) Let radius of circle be x cm, side of square be y cm and side of equilateral triangle be z cm

ATQ,

$2\pi x = 4y = 3z$

$\Rightarrow x = \frac{4y}{2\pi} = \frac{2y}{\pi}$

$z = \frac{4y}{3}$

Area of circle 'C' = $\pi x^2 = \pi \times \frac{4}{\pi^2} y^2$

$= \frac{4}{\pi} y^2 > y^2$

Area of square 'S' = y^2

Area of triangle 'T' = $\frac{\sqrt{3}}{4} z^2$

$= \frac{\sqrt{3}}{4} \times \frac{4 \times 4}{3 \times 3} y^2$

$= \frac{4}{3\sqrt{3}} y^2$

or, $\frac{4}{3\sqrt{3}} < y^2$

$\therefore$ T < S < C

89. (D) Distance covered = 66 × $\frac{5}{2}$

$2\pi r$ = 165 metre

$r = \frac{165 \times 7}{2 \times 22}$

= 26.25 metres

90. (C) Let number of revolutions of rear wheel be m.

Distance covered by front wheel in 1 revolution = π × diameter

= $2\pi x$ cm

Distance covered by rear wheel in 1 revolution = $2\pi y$ cm

$\therefore 2\pi x \times n = 2\pi y \times m$

$m = \frac{nx}{y}$

91. (C) Total number of boys in school

$$T = 1250 \times \frac{60}{100}$$
$$= 750$$

92. (C) Required number of boys

$$= \frac{2500 \times \frac{60}{100} + 3000 \times \frac{55}{100}}{2}$$
$$= \frac{1500 + 1650}{2}$$
$$= \frac{3150}{2}$$
$$= 1575$$

93. (C) Required ratio $= 2500 \times \frac{40}{100} : 3000 \times \frac{45}{100}$
$= 1000 : 1350$
$= 20 : 27$

94. (A) Required average

$$= \frac{2500 + 3000 + 2000 + 2250 + 1250 + 1000}{6}$$
$$= \frac{12000}{6} = 2000$$

95. (D) Total girl students in all schools.

$$= 2500 \times \frac{40}{100} + 3000 \times \frac{45}{100} + 2000 \times \frac{27.5}{100}$$
$$+ 2250 \times \frac{32.5}{100} + 1250 \times \frac{40}{100} + 1000 \times \frac{12.5}{100}$$
$= 1000 + 1350 + 540 + 675 + 500 + 125$

Required percentage $= \frac{4190}{12000} \times 100$
$= 34.90\%$

96. (D) Average profit $= \frac{25 + 35 + 22.5 + 30 + 35.5}{5}$
$= \frac{148}{5}$
$=$ 29.6 or 30 Lacs

97. (B) Required income = 37.5 + 28
= 65.5 Lacs

98. (D) Required percentage $= \frac{30 - 22.5}{22.5} \times 100$
$= \frac{7.5}{22.5} \times 100$
$= 33.33\%$

99. (C) Required ratio = 25 : 37.5
= 250 : 375
= 2 : 3

100. (B) Expenditure = 45 – 22.5
= 22.5 Lacs
= ₹ 22,50,000

SSC MAINS (MATHS)-5 (ANSWER KEY)

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