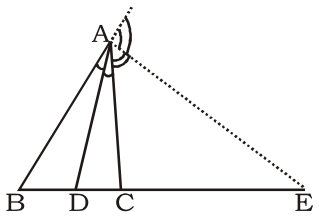
SSC MAINS - 22 (SOLUTION)

1. (B) In ΔABC, AD and AE are respectively the bisectors of the interior and exterior angles at A.



Since, AD is the internal bisector of $\angle A$ meeting BC at D.

$$\therefore \quad \frac{AB}{AC} = \frac{BD}{DC} \qquad \ldots (i)$$

Since AE is the external bisector of $\angle A$ meeting BC produced in E.

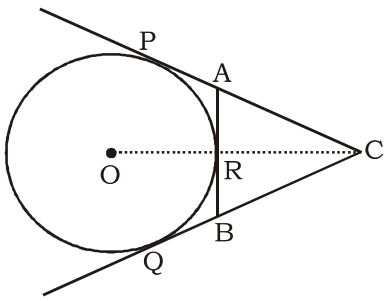
$$\therefore \quad \frac{AB}{AC} = \frac{BE}{CE} \qquad \ldots (ii)$$

From (i) and (ii), we get

$$\frac{BD}{DC} = \frac{BE}{CE}$$

$$\Rightarrow \quad \frac{BD}{BE} = \frac{CD}{CE}$$

2. (A)



[Hint: We have, CP = 11 cm]

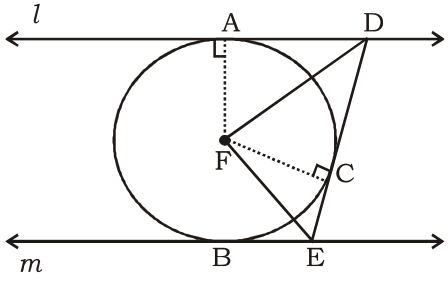
$\therefore$ CP = CQ $\Rightarrow$ CQ = 11 cm

Now, BR = BQ

$\Rightarrow$ BQ = 4 cm

$\therefore$ BC = CQ – BQ = (11 – 4) cm
= 7 cm

3. (C)



Since tangents drawn from an external point to a circle are equal.

Therefore, DA = DC.

Thus, in triangles ADF and DFC, we have

DA = DC

DF = DF [common]

AF = CF [Radii of the same circle]

So, by SSS-criterion of congruence, we have

$\Delta ADF \cong \Delta CDF$

$\Rightarrow \quad \angle ADF = \angle CDF \qquad \ldots. (i)$

$\Rightarrow \quad \angle ADC = 2\angle CDF$

Similarly, we can prove that

$\angle BEF = \angle CEF$

$\Rightarrow \quad \angle CEB = 2\angle CEF$

Now, $\angle ADC + \angle CEF = 180^\circ$

$\Rightarrow 2\angle CDF + 2\angle CEF = 180^\circ$ [sum of the interior

$\Rightarrow \angle CDF + \angle CEF = 90^\circ$ same of trans-

$\Rightarrow 180^\circ - \angle DFE = 90^\circ$ versal is 180°]

$\Rightarrow \angle DFE = 90^\circ$

4. (B) Required distance

$$= \sqrt{(12-0)^2 + (-9-0)^2}$$

$$= \sqrt{144+81} = \sqrt{225} = 15$$

5. (C) Volume of water flown in 15 min.
= Area of pipe × Rate of water flow

$$= \frac{13}{100\times 100}\text{m}^2 \times \left(9000 \times \frac{15}{60}\right)\text{m}$$

$$= \frac{13\times 9}{40}\text{m}^2$$

Rise in water level in 15 minutes in the tank

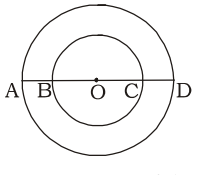
$$(h) = \frac{\text{Volume of water flown in 15 min.}}{\text{Length} \times \text{breadth}}$$

$$\Rightarrow \quad h = \frac{13\times 9}{40\times 45\times 26}$$

$\Rightarrow \quad h = 0.0025\text{m}$

Hence, the level of water will rise by 0.0025 m in the tank.

6. (C) Let ABCD be the given cylindrical ring -



Here, CD = W = thickness of ring
outer diameter D = AD = 10.75cm
inner diameter d = BC = 9.5 cm

$\Rightarrow$ thickness

$W = \frac{D-d}{2} = \frac{10.75-9.5}{2} = 0.625$

Using the formula for cylindrical ring surface area

$S = P_c l$

Where Pc = perimeter of cross section

$CD = \pi W = \pi \times 0.625$

l = length of ring = π (D – W)

$= \pi (10.75 - 0.625)$

Hence,

surface area

$= \pi \times 0.625 \times \pi (10.75 - 0.625) cm^2$

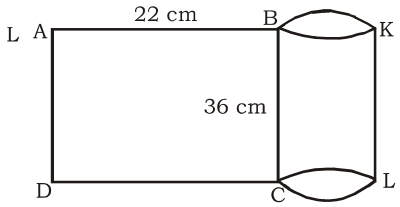
$= \pi^2 \times 0.625 \times 10.125\ cm^2$

$= 9.88 \times 0.625 \times 10.125\ cm^2$

$= 62.52\ cm^2$

7.(D) Let ABCD be the rectangular sheet whose length = AB = 36cm

breadth = BC = 22 cm



The sheet is rolled along its length AB to from the cylinder BCKL

So, heigth = h = BC = 36 cm

Circumference; $2\pi r$ = AB = 22 cm

$\Rightarrow r = 22 \times \frac{7}{2 \times 22} = \frac{7}{2}$ cm

Now, volume = $\pi r^2 h$

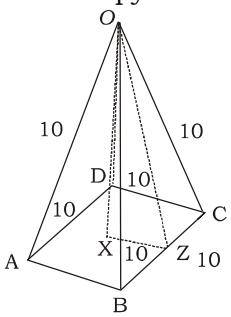
$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 36$

$= 1386\ cm^2$

Hence , the volume of the cylinder is 2268 cm^3

8.(A) Let OABCD be the given pyramid which has a square base (i.e. ABCD)

The four faces of the pyramid are



equilateral triangles.

Since each edge = 10 m

So, AB = BC = DC = AD = 10 m

OA = OB = OC = OD = 10 m

Using the formula for pyramid

Volume V; = $\frac{1}{3} Ah$

Where A = 10 ×10

and h = OX = $\sqrt{OZ^2 - XZ^2}$

OZ = height of equilateral ΔOBC = $\frac{\sqrt{3}}{2} \times 10$

$= 5\sqrt{3}$

So, $h = \sqrt{(5\sqrt{3})^2 - 5^2} = 5\sqrt{2}$

$\Rightarrow V = \frac{1}{3} \times 100 \times 5\sqrt{2}$

$= 235.7\ m^3$

Hence, the volume of the pyramid is 235.7m^3

9.(D) $\therefore$ α, β, γ are zeroes of $f(x)$

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

$\alpha\beta + \beta\gamma + \alpha\gamma = \frac{c}{a}$

and $\alpha\beta\gamma = -\frac{d}{a}$

Now,

$\alpha^2 + \beta^2 + \gamma^2 + 2(\alpha\beta + \beta\gamma + \alpha\gamma) = (\alpha + \beta + \gamma)^2$

$\Rightarrow \alpha^2 + \beta^2 + \gamma^2 + 2 \times \frac{c}{a} = \left(\frac{-b}{a}\right)^2$

$\Rightarrow \alpha^2 + \beta^2 + \gamma^2 = \frac{b^2}{a^2} - \frac{2c}{a}$

$\Rightarrow \alpha^2 + \beta^2 + \gamma^2 = \frac{b^2 - 2ac}{a^2}$

10. (B) Given equations can be written as

$(a-b)x + (a+b)y = a^2 - 2ab - b^2$ ..... (1)

$(a+b)x + (a+b)y = a^2 + b^2$ ..... (2)

Subtracting (2) from (1), we have

$x(-2b) = -2ab - 2b^2$

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

Substituting the value of x in (2), we have

$(a+b)(a+b) + (a+b)y = a^2 + b^2$

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

$y = \frac{-2ab}{a+b}$

Hence $x = (a+b)$, $y = \frac{-2ab}{a+b}$

11. (A) If $x^2 + 1 = 0 \Rightarrow x^2 = -1$
Put value in given polynomial.
$x^4 + x^3 + 8x^2 + ax + b = 0$
$(-1)^2 + (-1)x + 8(-1) + ax + b = 0$
$1 - x - 8 + ax + b = 0$
$x(a - 1) + b - 7 = 0$
So, $a = 1$ and $b = 7$.

12. (D) Let the two digit number $= 10x + y$.
According to question:-
$10x + y = 4(x + y)$
$\Rightarrow 10x + y = 4x + 4y$
$\Rightarrow 6x - 3y = 0$
$\Rightarrow 2x - y = 0$ .... (i)
Again:-
$10x + y = 2xy$
$10x + 2x = 2 \times x \times 2x$
[from (i), $y = 2x$]
$\Rightarrow 12x = 4x^2$
$x = 3$
$\therefore y = 6$
$\therefore$ No. = 36

13. (A) $2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{1}{2}$

$\Rightarrow 1 - \sin^2\theta - \sin^2\theta = \frac{1}{2}$

$\Rightarrow 2\sin^2\theta = \frac{1}{2}$

$\Rightarrow \sin^2\theta = \frac{1}{4}$

$\Rightarrow \sin^2\theta = \pm\frac{1}{2}$

For acute angle θ

$\sin\theta = \frac{1}{2}$

$\Rightarrow \theta = 30^\circ$

14. (C) Here $2\sin^2\theta = 3\cos\theta$
$\Rightarrow 2 - 2\cos^2\theta = 3\cos\theta$
$\Rightarrow 2\cos^2\theta + 3\cos\theta - 2 = 0$

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \cos\theta = \cos 60^\circ \Rightarrow \theta = 60^\circ$

15. (B) $\cos^2 A - \sin^2 A = \tan^2 B$
$\Rightarrow \cos^2 A - \sin^2 A + 1 = \tan^2 B + 1$
$\Rightarrow 2\cos^2 A = \sec^2 B$

$\Rightarrow \frac{2}{\sec^2 A} = \frac{1}{\cos^2 B}$

$\Rightarrow 2\cos^2 B = \sec^2 A$
$\Rightarrow 2\cos^2 B - 1 = \sec^2 A - 1$
$\Rightarrow \cos^2 B - \sin^2 B = \tan^2 A$

16. (A) $\sin C [\sec A \operatorname{cosec} B - \tan A \cot B]$
In ΔABC, $\angle C = 90^\circ$
$\angle A + \angle B = 90^\circ$
$\Rightarrow \angle B = 90^\circ - \angle A$
Now, $\sin C [\sec A . \operatorname{cosec} B - \tan A . \cot B.]$
$= \sin 90^\circ [\sec A . \sec A - \tan A . \tan A]$
$= 1[\sec^2 A - \tan^2 A] = 1$
we get answer = 1

17. (C) $\because$ Roots of $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ are equal.
$\therefore$ Discriminant D = 0
$\Rightarrow (2mc)^2 - 4(1 + m^2)(c^2 - a^2) = 0$
$\Rightarrow m^2c^2 - (1 + m^2)(c^2 - a^2) = 0$
$\Rightarrow m^2c^2 - c^2 + a^2 - m^2c^2 + m^2a^2 = 0$
$\Rightarrow (m^2 + 1)a^2 = c^2$

18. (B) Let the usual speed of the aeroplane $= x$ km/h

usual time $= \frac{1250}{x} h$

New speed $= (x + 250)$ km/h

New time $= \frac{1250}{x + 250}$

ATQ,

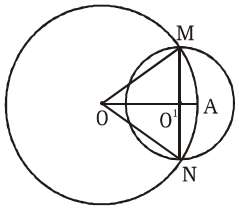
$\frac{1250}{x} - \frac{1250}{x + 250} = \frac{50}{60}$

$\Rightarrow 1250\left[\frac{x + 250 - x}{x^2 + 250x}\right] = \frac{5}{6}$

$\Rightarrow x^2 + 250x = \frac{1250 \times 250 \times 6}{5}$

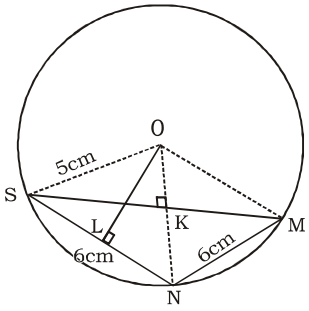
$= 1250 \times 50 \times 6$
$\Rightarrow x^2 + 250x - 375000 = 0$
$\Rightarrow x^2 + 750x - 500x - 375000 = 0$
$\Rightarrow (x + 750)(x - 500) = 0$
$\therefore x = 500$ km/h

19. (A)



The line joining centres is perpendicular to the radius of the smaller circle and then that common chord is the diameter of the smaller circle.
$\because$ $00' = 4$ cm
OA = 5 cm
$MO^2 = OM^2 - 00'^2$
$MO' = 3$ cm
$MN = 2 \times MO = 6$ cm

20.(C).



S, N, M referred for Sangeeta, Namrata & Mandip

Let OK= x m

$\Rightarrow$ KN = $5 - x$ m

In ΔOSK

$SK^2 = OS^2 - OK^2$

$= 5^2 - x^2$ ..... (1)

In ΔSNK

$SK^2 = 6^2 - (5 - x)^2$ ..... (2)

$\therefore$ From (1) & (2)

$5^2 - x^2 = 6^2 - (5 - x)^2$

$\Rightarrow 25 - x^2 = 36 - 25 + 10x - x^2$

$\Rightarrow 25 - 11 = 10x$

$\Rightarrow x = \frac{14}{10} = \frac{7}{5}$

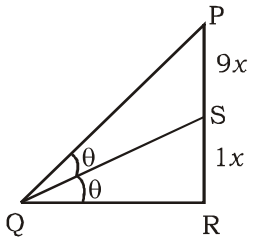
$\therefore SK = \sqrt{25 - \frac{49}{25}}$

$= \sqrt{\frac{625 - 49}{25}} = \frac{24}{5}$ m = 4.8 m

so, distance between Sangita and Mandip

= 4.8 × 2 = 9.6 m

21. (B)



Since $\angle PQS = \angle SQR = \theta$

$\Rightarrow$ Q divides $\angle PQR$ in two equal parts

$\Rightarrow \frac{SR}{SP} = \frac{QR}{QP}$

$\Rightarrow \frac{x}{9x} = \frac{15}{QP}$

$\Rightarrow$ QP = 135 m

In right ΔPQR,

$PR = \sqrt{PQ^2 - QR^2}$

$= \sqrt{(135)^2 - (15)^2}$

$= 60\sqrt{5} = 134$ m

22. (B) $\cos x = \sin 200°$

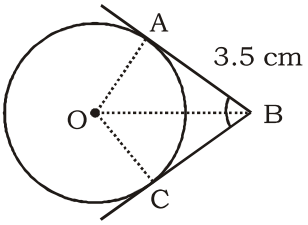
$\Rightarrow x = \sin(90° \pm x) = \sin 200°$

$\Rightarrow x = 200° - 90°$ or $90° - 200°$

$\Rightarrow x = 110°$ or $-110°$

$\Rightarrow x = 110°$ or $(360° - 110°) = 250°$

23. (A)

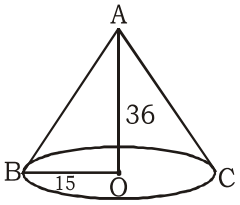


Area of circle $= \pi r^2$

$= \frac{22}{7} \times 3.5 \times 3.5$

$= 38.5$ cm^2.

24. (C)



Clearly, the soild generated by turning round on 36 cm side will be a cone

Whose h = 36 cm, r = 15 cm

So, $l = \sqrt{36^2 + 15^2}$ = 39 cm

Curved Surface Area of the solid formed

$= \pi rl$

= 3.14 × 15 × 39

= 1836.9 cm^2.

25. (A) The given equation is $px^2 + qx + m = 0$

Now, Sum of the root = sin A + cos A = $-\frac{q}{p}$

Product of the roots = sin A cos A = $\frac{m}{p}$

Now, $\sin^2 A + \cos^2 A = 1$

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

$\Rightarrow q^2 - 2mp = p^2$

$\Rightarrow q^2 + m^2 = p^2 + 2mp + m^2$

[adding m^2 to both sides]

$\Rightarrow q^2 + m^2 = (p + m)^2$

26. (C) Since $(a-3)$ is a factor of $f(a) = a^3 - ba^2 + 4b - 12$.

So, $f(3) = 0$

$\Rightarrow \quad 3^3 - b \times 3^2 + 4 \times b - 12 = 0$

$\Rightarrow \quad 3b^2 - 4b - 15 = 0$

$\Rightarrow \quad b = 3$

So, $f(a) = a^3 - 3a^2 + 12 - 12$

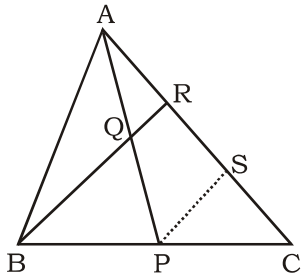
$= a^3 - 3a^2$

$f(-3) = (-3)^3 - 3(-3)^2$

$= -27 - 27$

$= -54$

27. (A)



Draw PS||BR, meeting AC at S.

In ΔBCR, P is the mid-point of BC and PS||BR.

$\therefore$ S is the mid-point of CR.

$\Rightarrow$ CS = SR ... (i)

In ΔAPS, Q is the mid-point of AP and QR||PS.

$\therefore$ R is the mid-point of AS.

$\Rightarrow$ AR = RS

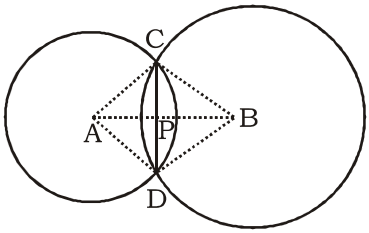
From (i) and (ii), we get

AR = RS = SC

$\Rightarrow$ AC = AR + RS + SC = 3AR

$\Rightarrow \text{AR} = \frac{1}{3}\text{AC} \Rightarrow \frac{AR}{CA} = \frac{1}{3}$

28. (D)



Since tangent at a point to a circle is perpendicular to the radius through the point of contact. Therefore, $\angle$ACB = 90°.

In ΔACB, we have

$\text{AB}^2 = \text{AC}^2 + \text{BC}^2$

$\Rightarrow \quad \text{AB}^2 = 3^2 + 4^2 = 9 + 16 = 25$

$\Rightarrow \quad \text{AB} = 5$ cm

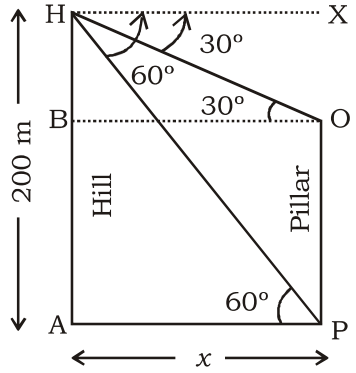
$5 \times \text{CP} = 3 \times 4$

$$\text{CP} = \frac{12}{5} = 2.4$$

Hence, CD = 2CP = 4.8 cm

29. (A) Let AH be the hill.

$\Rightarrow$ Height of the bill = AH = 200 m



Let OP be the pillar

and OP = h m

and distance of the pillar from hill = x m.

Now in ΔHPA

$$\tan 60^\circ = \frac{AH}{AP} = \frac{200}{x}$$

$$\Rightarrow \quad x = 200 \cot 60^\circ = \frac{200}{\sqrt{3}}$$

Similarly, in right ΔHBO

$$\tan 30^\circ = \frac{BH}{BO} = \frac{AH - AB}{BO} = \frac{200 - OP}{AP}$$

$$\Rightarrow \quad \tan 30^\circ = \frac{200 - h}{x}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{200 - h}{\frac{200}{\sqrt{3}}} \quad \left[\text{Since } x = \frac{200}{\sqrt{3}}\right]$$

$$\Rightarrow \quad 200 - h = \frac{200}{\sqrt{3}} \times \frac{1}{\sqrt{3}}$$

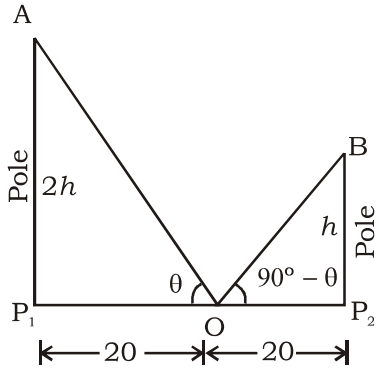
$$h = 200 - \frac{200}{3}$$

$$h = 133.33,$$

Hence, the height of the pillar

= 133.33 m.

30. (C)



Let AP_1 and BP_2 be two poles.

Then, if $BP_2 = h$ meter (say)
$AP_1 = 2h$ meter (say)
The distance between the two poles,
$P_1P_2 = 40$ m
Let O be the middle point of P_1P_2, so,
$OP_1 = OP_2 = 20$ m
and $\angle P_1OA = \theta$, $\angle P_2OB = 90° - \theta$, because angular elevations are complementary (given)
In right ΔAP_1O

$$\tan\theta = \frac{2h}{20} \Rightarrow 2h = 20\tan\theta \quad \text{... (i)}$$

In right ΔBP_2O,

$$\tan\theta\,(90° - \theta) = \frac{h}{20}$$

$$\Rightarrow h = 20\tan(90° - \theta) \quad \text{... (ii)}$$

Multiplying (i) and (ii),
$2h^2 = 20^2$ [Since $\tan\theta.\cot\theta = 1$]

$$\Rightarrow h = 10\sqrt{2} \text{ metre/}$$

Therefore, the height of the poles are 14.14 m and 28.28 m respectively.

31. (B) $\left|\frac{3}{5}\times\frac{-5}{10}\right| = \left|\frac{3}{5}\right| \times \left|\frac{-5}{10}\right| = \left|\frac{3}{5}\right| \times \frac{1}{2} = \left|\frac{3}{5}\right| \times \frac{4}{8}$

32. (A) Numbers 264 , 396, 792 and 6336 are divisible by 132.

33. (A) Let any proper fraction be $\frac{1}{2}$.

$$\text{New fraction} = \frac{1+2}{2+2} = \frac{3}{4}$$

Now, $\frac{3}{4} > \frac{1}{2}$.

34. (D) As we know when m is odd $(x^m + a^m)$ is divisible by $(x + a)$.
$\therefore$ Each one is divisible by (41 + 43).
$\therefore$ Highest common factor = (41 + 43)

35. (D) Since $4A = 333^{555} + 555^{333}$ is a very larger number so, taking a similar smallest exponents (here the exponent is odd which is 1)
$4A = 333^1 + 555^1$
$4A = 888$
$A = 222$ which is divisible by 2, 3 and 37

Hence, $\frac{333^{555}+555^{333}}{4}$ is also divisible by 2, 3 and 37.
So, option (D) is correct.

36. (A) Given,
HCF = 4, LCM = 27720
$n = 5$
According to the formula,
Required product $= (\text{HCF})^{n-1} \times \text{LCM}$
$= (4)^{5-1} \times 27720$
$= (4)^4 \times 27720$
$= 256 \times 27720$
$= 7096320$

ANOTHER METHOD:-
Let the numbers be ma, mb, mc, md and me. where HCF = m = 4, (a, b, c, d and e are relatively prime numbers)
$\Rightarrow$ LCM $= abcde.m$
$\Rightarrow$ $27720 = abcde \times 4$

37. (B) $\sqrt[3]{3^x} = 5^{1/4}$

$$\Rightarrow 3^{x/3} = 5^{1/4} \quad \text{(i)}$$

and $\left(3^{\frac{x}{3}}\right)^y = \left(5^{\frac{1}{4}}\right)^y$

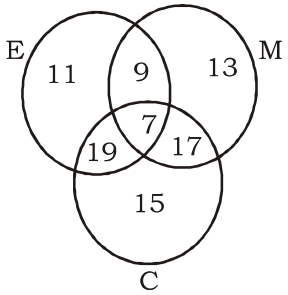
$$3^{\frac{xy}{3}} = 3^{\frac{1}{2}}$$

$$xy = \frac{3}{2}$$

$$\Rightarrow 2xy = 3$$

38. (A)

39. (C) The Venn diagram represents the number of students who passed in the respective subjects.
Number of students who passed in one or more subjects.
= 11 + 9 + 13 + 17 + 15 + 19 + 7 = 91



Number of students who failed in all the subjects = 100 – 91
= 9

40. (C) nth term from the end of G.P. $= \frac{G_n}{r^{n-1}}$.

So, 6th term from the end of G.P.

$$\frac{\frac{1}{1024}}{\left(\frac{1}{2}\right)^{6-1}} = \frac{1}{1024} \times 2^5 = \frac{1}{2^5} = \frac{1}{32}$$

41. (C) Let intial collection = ₹ 100
Collection after change

$$= 100 \times \frac{75}{100} \times \frac{130}{100}$$

$$= ₹\, 97.50$$

% decrease in collection

$$= \frac{(100 - 97.50)}{100} = 2.5\%$$

42. (B) Let the number be x.
$x - 60 = 20\%$ of x

$$x - 60 = \frac{x}{5} \Rightarrow x - \frac{x}{5} = 60$$

$$\frac{4x}{5} = 60 \Rightarrow x = 75$$

$$\therefore \frac{2}{3} \text{ of } 75 = 50$$

43. (A) $\sqrt{10\% \text{ of } 20} + \sqrt{40\% \text{ of } 20} - \sqrt{90\% \text{ of } 20}$

$$= \sqrt{2} + \sqrt{8} - \sqrt{18} = \sqrt{2} + 2\sqrt{2} - 3\sqrt{2}$$

= 0

44.(A) Let the quality of rice be x quintal
C.P. = ₹ $150x$
Spoiled rice = 10% of $x = x/10$
Rice to be sold = $9x/10$ quintals
% Profit = 20%

$$\text{S.P.} = 150x \times \frac{120}{100} = ₹\, 180x$$

$$\text{Rate} = \frac{180x}{\frac{9x}{10}} = ₹\, 200/\text{quintal}$$

45. (B) Let the cost price of the goods be ₹ x
ATQ,
125% of 120% of $x = 225$

$$\frac{125}{100} \times \frac{120}{100} \times x = 225$$

$$x = \frac{225 \times 100 \times 100}{125 \times 120} = ₹150$$

46. (C) S.P. = ₹ 270
C.P. = ₹ x (Say)
Loss = $x - 270 = 10\%$ of x
$x - 270 = x/10$
$10x - 2700 = x$
$9x = 2700$
$x =$ ₹ 300

47. (B) Let the Cost Price of of each cycle = ₹ x
84% of 725 = 105 % of x
$(84/100) \times 725 = 105x/100$

$$x = \frac{84 \times 725}{105} = ₹\, 580$$

48. (D) Suppose the dealer weights x gm less for a kg
then on $(1000 - x)$ gm he earns x gm.

on 1 gm he earns $\frac{x}{1000 - x}$

on 100 he earns $\frac{x}{1000 - x} \times 100 = \frac{100}{9}$

$9x = 1000 - x$
$x = 100$ gm

49. (A) M.P. = ₹ 100
S.P. = 80

$$\text{C.P.} = \frac{80 \times 100}{90} = \frac{800}{9}$$

$$\text{Profit} = 95 - \frac{800}{9}$$

$$\frac{855 - 800}{9}$$

$$\% \text{ Profit } \frac{95 - \frac{800}{9}}{\frac{800}{9}} \times 100\%$$

$$= \frac{\frac{55}{9}}{\frac{800}{9}} \times 100 = \frac{55}{8}\% = 6.9\%$$

50.(D) $\frac{(x-1)(x+1)}{(x+2)(x-1)} = \frac{9}{10}$

$10x + 10 = 9x + 18$
$x = 8$

51. (D) SI = $\frac{2}{5} \times$ (P + SI)

$$\frac{5SI}{2} = P + SI$$

$\frac{3}{2} \times SI = P$

SI=(2/3)P

$R = \frac{\frac{2P}{3}\times 100}{P\times 5} = \frac{40}{3}\%$

52.(D) $CI - SI = P\left[\frac{r^3}{100^3} + \frac{3r^2}{100^2}\right]$

$11.40 = P\left[\frac{125}{1000000} + \frac{3\times 25}{10000}\right]$

$11.40 = P\left[\frac{125+7500}{1000000}\right]$

$P = \frac{11.40\times 1000000}{7625}$

= ₹ 1495.08 = ₹ 1495 (apprx.)

53. (C) S.I. for 10 years on 416

$= \frac{416\times 10\times 8}{100}$

= 332.8

Let C principle for C.I. = P

Then,

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

$332.8 = P \times \left[\left(\frac{27}{25}\right)^2 - 1\right]$

$P = \frac{332.8\times 625}{104}$

Principal = ₹ 2000

54. (A) x = principle (Say)

Time = n = 1 yrs.

r = Rate of interest (annually)

ATQ,

$px = x\left[1+\frac{r}{100}\right]^1 \Rightarrow p = 1+\frac{r}{100}$

$qx = x\left[1+\frac{r}{100}\right]^n \Rightarrow q = \left(1+\frac{r}{100}\right)^n$

$\Rightarrow q = p^n$

$\Rightarrow \log_p q = n$

$\Rightarrow n = \frac{\log q}{\log p}$

55. (B) Since the base of the rectangular solid is square shaped, so

$l = b$

It is given that $h = 2l$

Using the formula

Volume $V = lbh$

$\Rightarrow$ $16000 = l \cdot l \cdot 2l$

$\Rightarrow$ $l^3 = 8000$

$\Rightarrow$ $l = 20$ m

Now, surface area = $2(lb + bh + hl)$

$\Rightarrow$ $S = 2(l^2 + 2l^2 + 2l^2)$

$\Rightarrow$ $S = 10l^2$

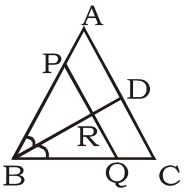
$\Rightarrow$ $S = 10 \times 20^2 = 4000$ m^2

Hence, the area of its surface is 4000 m^2.

56. (D) $\frac{V}{S} = \frac{A}{p_c} = \frac{r}{2}$

$\Rightarrow \frac{800}{S} = \frac{12}{2} \Rightarrow S = \frac{800}{6} = 133.2$ cm^2.

57. (A)



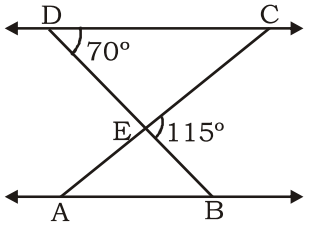
In ΔABC, we have [Given]

$PQ \| AC$

$\Rightarrow$ $\frac{AB}{AP} = \frac{CB}{CQ}$ [By Thale's Theorem]

$\Rightarrow$ $AB \times CQ = BC.AP$

58. (D)



$\because \angle BEF = \angle CDE + \angle DCE$

[Ext. angles properly]

$115° = 70° + \angle DCE$

$\angle DCE = 45°$

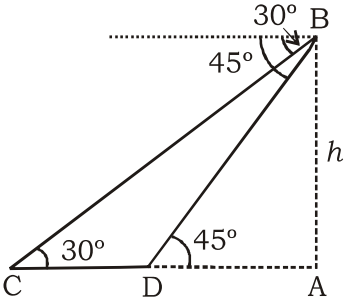
Again,

$\angle AEB + \angle BEC = 180°$

$\angle AEB + 115° = 180°$

$\angle AEB = 65°$

59. (A)



$\frac{AC}{AB} = \cot 30°$

$AC = \sqrt{3}h$

$\frac{AD}{AB} = \cot 45°$

$AD = h$

$(\sqrt{3}h - h)$ units travelled in = 12 minutes

h units travelled in $= \frac{12 \times h}{(\sqrt{3}h - h)}$

$= \frac{12}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= 6(\sqrt{3}-1)$

= 16.39 minutes

or

= 16 minutes 23 seconds

60. (A) Let h = rise in water surface,
Then,

$$h \times 49 \times \frac{44}{3} = \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$$

$h = 2$ cm

61. (A) Let the side of longer square = a unit
Side of smaller square = m unit
ATQ,

$4a - 4m = 100$

$a - m = 25$ .... (i)

Again from question:-

$a^2 - 3m^2 = 325$ .... (ii)

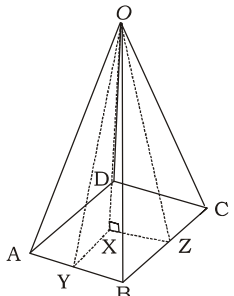
From (i) and (ii):-

m = 30, –5

(side cannot be negative)

$\therefore$ m = 30

62. (B) Let OABCD be the right pyramid on a rectangular base ABCD



AB = CD = 32 cm
BC = AD = 10cm
Since it is a right pyramind,
$\angle OXZ = 90°$ and
OX = h = 12cm
X is the midpoint of the base.
Now, in ΔOXZ, $\angle OXZ = 90°$

$OZ = \sqrt{OX^2 + XZ^2}$

$= \sqrt{12^2 + 16^2}$

(since $XZ = \frac{1}{2}DC = 16$)

= 20cm

In ΔOXY, $\angle OXY = 90°$

$OY = \sqrt{OX^2 + XY^2}$

$= \sqrt{12^2 + 5^2}$ $\left(XY = \frac{1}{2}BC = 4\right)$

= 13 cm

Now, since the base is a rectangle,

$\Delta OBC = \Delta OAD$ and $\Delta OAB = \Delta ODC$

$\Delta OBC = \frac{1}{2} \times BC \times OZ = \frac{1}{2} \times 10 \times 20 = 100 cm^2$

$\Delta OAB = \frac{1}{2}AB \times OY = \frac{1}{2} \times 32 \times 13 = 208 cm^2$

Slant surface of pyramid

$= 2(\Delta OBC + \Delta OAB)$

$= 2(100 + 208) = 616 cm^2$

whole surface of pyramid

= Slant surface + Base area

$= 616 + (32 \times 10) = 936 cm^2$

63. (C) Let A $= (x_1, y_1) = (t, t-2)$

B $= (x_2, y_2) = (t+2, t+2)$

C $= (x_3, y_3) = (t+3, t)$

The vertices of the vertices of the given triangle.

$\therefore$ Area of $\Delta ABC = \frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}|\{t(t+2-t) + (t+2)(t-t+2) + (t+3)(t-2-t-2)\}|$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2}[\{2t+2t+4-4t-12)\}]$

$= |-4| = 4$ sq. units

Clearly, area of ΔABC is independent of t.

64. (C) $\because \frac{a^{n+1} + b^{n+1}}{a^{\frac{n}{2}} + b^{\frac{n}{2}}}$ is the AM between a & b.

$\therefore \frac{a+b}{2} = \frac{a^{n+1} + b^{n+1}}{a^{\frac{n}{2}} + b^{\frac{n}{2}}}$

for $n = 0$

LHS = RHS

Hence, $n = 0$

65. (D) Cannot be determined.

66. (D) Cannot be determined.

67. (B)

During 1993-1994	
Agriculture = 30% × 1.2 = 36%	18 × 150% = 27
Traction = 2% × 1.2 = 2.4%	13 × 150% = 19.5
Other = 4% × 1.2 = 4.8%	4 × 150% = 6
Domestic = 11% × 1.2 = 13.2%	11 × 150% = 16.5
Commercial = 13% × 1.2 = 15.6%	6 × 150% = 9
Industrial = 40% × 1.2 = 48%	48 × 150% = 72

Only agriculture and commercial increases by more than 50% during the same period.

68. (B) Electricity consumption in traction in

1980-81 $= \frac{13}{100} \times 100 = 13$

Electricity consumption in traction in

1993-94 $= \frac{2}{100} \times 1300 = 26$

% increase $= \frac{26-13}{13} \times 100 = 100\%$

69. (B) Industrial + Agriculture will be more will be more than 50%.

70. (A) 20%.

71. (C) In 600 m race, ratio of distances

A : B
600 : 540
10 : 9

In 500 m race, ratio of distances

B : C
500 : 475
20 : 19

$\therefore$ A : B : C = (10 × 20) : (9 × 20) : (19 × 9)
= 200 : 180 : 171

So, when A runs 200 m $\rightarrow$ C runs 171 m

When A runs 1 m $\rightarrow$ C runs $\frac{171}{200}$ m

When A runs 400 m $\rightarrow$ C runs $\frac{71 \times 400}{200}$ = 342m

A can beat C by 400 – 342 = 58 m

72. (D) A : B : C
3 : 4 : 4
3 : 3 : 4
9 : 12 : 16

$\therefore$ A's share $= \frac{9}{37} \times 370 = ₹ 90$

73. (C) Required profit = $(100 + 65) \times \frac{100}{120} \times \frac{100}{125} - 100$
= 110 – 100 = 10%

74. (C) Let the price of shirt = ₹ x

A.T.Q, $\frac{x+500}{12} = \frac{x+350}{10}$

$\Rightarrow 10x + 5000 = 12x + 4200$

$\Rightarrow x = \frac{800}{2} = ₹ 400$

Hence, the price of shirt = ₹ 400

75. (D) Required profit percentage

$= \frac{\left(\frac{11}{10} - \frac{10}{11}\right)}{\frac{10}{11}} \times 100$

$= \frac{121-100}{100} \times 100 = 21\%$

76. (B) Let total number of men = x
and total number of women = y

$\therefore$ Number of married men $= \frac{45x}{100}$

and number of married women $= \frac{25y}{100}$

A.T.Q,

$\frac{45x}{100} = \frac{25y}{100} \Rightarrow y = \frac{9x}{5}$ _____(i)

also,

Total number of married adults $= \frac{45x}{100} + \frac{25y}{100}$

$= \frac{9x}{20} + \frac{9x}{20}$ [from eq._____(i)]

$= \frac{9x}{10}$

and total population in city = $x + y$

$= x + \frac{9x}{5}$ [from eq._____(ii)]

$= \frac{14x}{5}$

$\therefore$ Required percentage $= \frac{\frac{9x}{100}}{\frac{14x}{5}} \times 100 = 32.14\%$

77. (A) Let the individual ration be x
According to the question,

$72 \times 54 \times x = 90 \times D_2 \times x \times \frac{90}{100}$

$\Rightarrow D_2 = \frac{72 \times 54 \times 100}{90 \times 90} = 48$

Hence the required number of days = 48

78. (A) Let the total number of candidates = x
Number of candidates who answered all the

5 questions $= \frac{5x}{100}$

Also, Number of candidates who answered not a single question $= \frac{5x}{100}$

$\therefore$ Remaining students $= x - \left(\frac{5x}{100} + \frac{5x}{100}\right) = \frac{9x}{10}$

$\Rightarrow$ Number of candidates who answered only one question $= \frac{9x}{10} \times \frac{25}{100} = \frac{9x}{40}$

Number of candidates who answered four questions

$$= \frac{9x}{10} \times \frac{20}{100} = \frac{9x}{50}$$

Gvien, number of candidates who answered either two questions or three questions = 396

$$\Rightarrow x - \left(\frac{5x}{100} + \frac{5x}{100} + \frac{9x}{40} + \frac{9x}{50}\right) = 396$$

$$\Rightarrow x - \left(\frac{10 + 10 + 45 + 36}{200}\right) x = 396$$

$$\Rightarrow x\left(\frac{200 - 101}{200}\right) = 396$$

$$\Rightarrow x = \frac{396 \times 200}{99} = 800$$

79.(D) B's marks = C's marks + 5% of 400
= 300 +20 = 320
Now, A's marks = B's marks + 10% of 400
= 320 + 40 = 360

80.(A) Let the length of the train be x m.
According to the question,

$\frac{x}{9}$ = speed _____(i)

and $\frac{x+150}{15}$ = speed _____(ii)

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

$$\frac{x}{9} = \frac{x+150}{15}$$

$\Rightarrow 5x = 3x + 450$

$\therefore x = 225$m

81.(A) Distance between Arun and Bhaskar at 7 : 30 am $= 8 \times 1\frac{1}{2} = 12$ km

Time taken by Bhaskar to cover a distance of 12 km $= \frac{12}{(12-8)} = 3$ hours

$\therefore$ Required time = 10:30 am

82.(C)

83.(B) Ratio of total capital of A and B
= 20000 ×12 : 35000 × 12
= 240000 : 420000

Now C gives 220000 to both to make the capital equal.

$\therefore$ A's captial : B's capital
= 240000 : 420000
– 220000 : 220000
20000 : 200000

$\therefore$ Required ratio of divided amount = 1 : 10

84.(D)

A	20	60	3
B	30		2
			5

Work done by A in 4 days = 3 × 4 = 12
Work done by B in 8 days = 2 × 18 = 36
Remaining work = 60 – (12 + 36) = 12
Work done by C in 18 days = 12
Time required by C to complete work

$$= \frac{18}{12} \times 60 = 90 \text{ days}$$

85.(D)

P_1 (+)	12		+5
P_2 (+)	15	12	+4
P (–)	6		–10
			–1

Cistern fill in first 5 minutes
= (+5+4)× 5 = 45
Time required to empty the cistern

$$= \frac{45}{1} = 45 \text{ minutes}$$

86.(C)

A + B	24	96	4
A	32		3
B			1

Work done by (A + B) in 8 days = 4 × 8 = 32
Remaining work = 96 – 32 = 64
Time taken by B to complete remaining work $= \frac{64}{1} = 64$ minutes

87.(B) Let extra hours per day are x.

By $\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$

$$\frac{x(6+4)}{1} = \frac{x(6+6+x)}{1\frac{1}{2}}$$

$$\Rightarrow \frac{3}{2} \times 10 = 12 + x$$

$$\Rightarrow 15 = 12 + x$$

$$\Rightarrow x = 15 - 12 = 3$$

$\Rightarrow$ Extra hours of work per day is 3 hrs.

88.(D) $m : n$

$70 \searrow \swarrow 91$

80

$\swarrow \searrow$

$11 : 10$

$\therefore \quad \frac{n}{m} = \frac{10}{11}$

89.(B) Let the total number of workers = x

According to the question,

$60x = 12 \times 400 + 56\,(x - 12)$

$\Rightarrow \quad 60x - 56x = 4800 - 672$

$\Rightarrow \quad 4x = 4128$

$\therefore \quad x = 1032$

90.(C) Let the nos. are x and y.

ATQ, $\frac{x+y}{x-y} = \frac{7}{1}$

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

$$\Rightarrow \frac{x+y+x-y}{x+y-x+y} = \frac{7+1}{7-1}$$

$$\Rightarrow \frac{x}{y} = \frac{4}{3} \Rightarrow x : y = 4 : 3$$

91.(C) ratio of the ages of three boys = 4 : 5 : 7

So, Let their ages be $4x$, $5x$ and $7x$ years

So, ATQ,

$$\frac{4x+5x+7x}{3} = 16$$

or, $16x = 48$

$\Rightarrow \quad x = 3$

So, Age of the youngest boy

$= 4x = 4 \times 3 = 12$ yrs.

92.(C) Ratio of ages of Rita & her mother = 3 :11

So, the ages of Rita & her mother = $3x$ and $11x$ years

$\because$ Difference between their ages = 24 years.

$\Rightarrow 11x - 3x = 24$ years.

or, $8x = 24$ years $\Rightarrow \quad x = 3$ years.

$\Rightarrow$ Present ages of Rita and her mother = 9 yrs. and 33 yrs.

$\Rightarrow$ Their ages after 3 years = 12 yrs, 36 yrs.

$\Rightarrow$ Ratio of the ages of Rita and her mother after 3 years. = 1 : 3

93.(C) A : B : C

$$= \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$$

$$= 15 : 12 : 10$$

(on multiplying each term by the L.C.M. of 4.5 and 6 = 60)

$$\Rightarrow \text{Amount got by A} = \frac{15}{15+12+10} \times 370$$

$$= ₹\,150$$

94. (B)

		Time	Original Time
S_1	4	5	+ 5
	20		
S_2	5	4	− 4
		1 hrs	9 min

$\downarrow$

(60 minutes)

If diff is 60 minutes than distance

= 20 km

If diff is 9 minutes than distance

$$= \frac{20}{60} \times 9$$

= 3 km

95. (A) Required average speed

$$= \frac{4200}{t_1 + t_2 + t_3}$$

$$= \frac{4200}{\frac{2500}{500} + \frac{1200}{400} + \frac{500}{250}}$$

$$= \frac{4200}{5+3+2}$$

$$= \frac{42000}{10}$$

= 420 km/h

96. (D) Distance between AB

$$= \sqrt{(0+1)^2 + (-3-1)^2} = \sqrt{17}$$

Distance between BC

$$= \sqrt{(5-0)^2 + (2+3)^2} = 5\sqrt{2}$$

Distance between CD

$$= \sqrt{(5-4)^2 + (2-6)^2} = \sqrt{17}$$

Distance between AD

$$= \sqrt{(4+1)^2 + (6-1)^2} = 5\sqrt{2}$$

Distance between AC

$$= \sqrt{(5+1)^2 + (2-1)^2} = \sqrt{37}$$

Distance between BD

$$= \sqrt{(0-4)^2 + (-3-6)^2} = \sqrt{97}$$

Hence, given co-ordinates are the vertices of a parallogram.

97.(B) Average distribution of loan

$$= \frac{87+104+113+120}{4} = \frac{424}{4} = 106 \text{ crores.}$$

It is clear from the table that the distribution of loan in 2008 is nearest to the average distribution.

98.(B) % increse of disbursement of loans by all banks from 2009 to 2010

$$= \frac{120-113}{113} \times 100 = \frac{700}{113} = 6\frac{22}{113}\%$$

99.(D) Total disbursement of loans by (in crores)

	2007	2008	2009	2010
A & B	45	56	63	71
C & D	42	48	50	49

disbursement of loans by A & B is never equal to the disbursement of loans by C & D in any year.

100.(B) It is clear from the table that the bank B distributes more than 30% of the total laons by all banks in 2010.

SSC MAINS - 22 (ANSWER KEY)

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