SSC MAINS (MATHS) - 24 (SOLUTION)

1. (D) No number except 10080 is divisible by 7. Further, 80 is divisible by 4.
$1 + 0 + 0 + 8 + 0 = 9$ is divisible by 3 and 10080 is also divisible by 5.

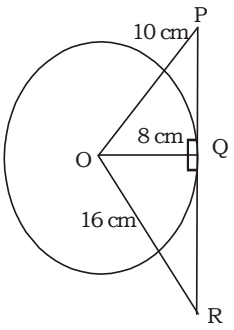
2. (B) Area of 64 squares = $64 \times 6.25 = 400$ cm^2.
Side of the chess board = $\sqrt{400} = 20$ cm
Length of the side of the board
$= 20 + 2 + 2 = 24$ cm

3. (A) Let the length & breadth be denoted by $4x$ and x yards respectively.
$\therefore$ area $= 4x \times x = 4x^2$ sq. yards.
Now, 1 acres = 4840 sq. yards.
$\therefore$ 2 acres 320 sq. yards $= 2 \times 4840 + 320$
$4x^2 = 10000 \Rightarrow x^2 = 2500 \Rightarrow x = 50$ yards
Length $= 4x = 4 \times 50 = 200$ yards

4. (C) Volume of the cubical block of ice
$= 50 \times 50 \times 50$ cm^3
$$= \frac{50 \times 50 \times 50}{100 \times 100 \times 100} \text{ m}^3 = \frac{1}{8} \text{ m}^3.$$
$$\text{Weight of the cube} = \frac{1}{8} \times 900 = 112.50 \text{ kg}$$

5. (D) $\left(x+1+\frac{1}{x}\right)\left(x+\frac{1}{x}-1\right)\left(x^2-1+\frac{1}{x^2}\right)$
$\left(x^4-1+\frac{1}{x^4}\right)$
$= \left(x+\frac{1}{x}+1\right) \quad \left(x+\frac{1}{x}-1\right) \quad \left(x^2+\frac{1}{x^2}-1\right)$
$\left(x^4+\frac{1}{x^4}-1\right)$
$= \left[\left(x+\frac{1}{x}\right)^2-1\right]\left(x^2+\frac{1}{x^2}-1\right)\left(x^4+\frac{1}{x^4}-1\right)$
$= \left(x^2+\frac{1}{x^2}+1\right)\left(x^2+\frac{1}{x^2}-1\right)\left(x^4+\frac{1}{x^4}-1\right)$
$= \left[\left(x^2+\frac{1}{x^2}\right)^2-(1)^2\right]\left(x^4+\frac{1}{x^4}-1\right)$
$= \left(x^4+\frac{1}{x^4}+1\right)\left(x^4+\frac{1}{x^4}-1\right) = \left(x^2+\frac{1}{x^4}\right)^2-(1)^2$
$= x^8 + \frac{1}{x^8} + 1$

6. (C)



Given
OP = 10 cm, Radius = 8 cm and OR = 16 cm
PR is the tangent then $\angle PQO = \angle RQO = 90°$
In ΔPQO,
$(PQ)^2 = (PO)^2 - (OQ)^2 = (10)^2 - (8)^2$
PQ = 6cm
In ΔOQR,
$OR^2 - OQ^2 = QR^2$
$16^2 - (8)^2 = OR^2$
$QR = 8\sqrt{3} = 13.84$ cm
PR = PQ + QR = 6 + 13.84
PR = 19.84 cm

7. (B) $\because \frac{p+19}{17-3y} = 4$
$\Rightarrow \frac{p+19}{17-3\times 4} = 4$
$\Rightarrow p + 19 = 20 \Rightarrow p = 1$
Again,
$\frac{p+19}{17-3y} = 1$
$\Rightarrow \frac{1+19}{17-3y} = 1$
$\Rightarrow 20 = 17 - 3y$
$-3y = 20 - 17$
$y = -1$

8. (D) $\because$ P(k, 3) lies on $5x + 4y = 14$
$\Rightarrow 5 \times k + 4 \times 3 = 14$
$\Rightarrow k = \frac{14-12}{5} = \frac{2}{5}$

9. (C) $\because$ LCM of A & B is B $\Rightarrow$ B is a multiple of both A & B
Again,
LCM of B & C is C $\Rightarrow$ C is a multiple of both B & C
$\therefore$ LCM of ABC = C

10. (B) $p^3(q-r)^3 + q^3(r-p)^3 + r^3(p-q)^3$.

$\Rightarrow [p(q-r)]^3 + [q(r-p)]^2 + [r(p-q)]^3$

Now, $p(q-r) + q(r-p) + r(p-q) = 0$

$\therefore p^3(q-r)^3 + q^3(r-p)^3 + r^3(p-q)^3$

$= 3 \times p(q-r)q(r-p) \times r(p-q)$

$= 3pqr(p-q)(q-r)(r-p)$

11. (B) $$\frac{9^n \times (3^2)\left(3^{-\frac{n}{2}}\right)^{-2} - 27^n}{3^{3m}(2)^3} = \frac{1}{27}$$

$$\frac{(3)^{2n} \times 3^2 \times (3)^n - 3^{3n}}{3^{3m}(2)^3} = \frac{1}{27}$$

$$\frac{(3)^{3n+2} - 3^{3n}}{3^{3m} \times 8} = \frac{1}{27}$$

$$\frac{3^{3n}(9-1)}{3^{3m} \times 8} = \frac{1}{27}$$

$$3^{3(n-m)} = \frac{1}{27}$$

$$3^{-3(m-n)} = \frac{1}{27} = 3^{-3}.$$

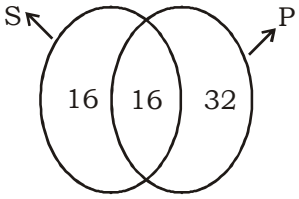
$-3(m-n) = -3$

So, $m - n - 1 = 0$

12. (D) Sociology (S) = 50% of 64 = 32

Political Science (P) = 75% of 65 = 48

Now,



Required students = 16

13. (A) 6 men = 7 women;

2 women = 3 boys;

4 boys = 5 girls;

Now earning of 1 girls per week = ₹ 16.

$\therefore$ Earning of 1 boy = $\frac{5}{4} \times 16 = ₹\ 20$.

$\therefore$ Earning of 1 women = $\frac{3}{2} \times 20 = ₹\ 30$.

$\therefore$ Earning of 1 man = $\frac{7}{6} \times 30 = ₹\ 35$.

14. (B) 8 arithmetic mean between 1 and 10

= 2, 3, 4, 5, 6, 7, 8, 9

Their mean = $\frac{2+3+4+5+6+7+8+9}{8}$

$= \frac{44}{8} = \frac{11}{2} = 5.5$

15. (D) $\frac{p+q+x}{p-q+x} = \frac{(p+q)^2}{(p-q)^2}$

Applying C & D we have

$$\frac{p+q+x+p-q+x}{p+q+x-(p-q+x)} = \frac{(p+q)^2+(p-q)^2}{(p+q)^2-(p-q)^2}$$

$$\Rightarrow \frac{2p+2x}{2q} = \frac{2(p^2+q^2)}{4pq}$$

$$\Rightarrow \frac{p+x}{q} = \frac{p^2+q^2}{2pq}$$

$$\Rightarrow p + x = \frac{p^2+q^2}{2p}$$

$$\Rightarrow x = \frac{p^2+q^2}{2p} - p = \frac{q^2-p^2}{2p}$$

16. (C) Let one of the parallel sides be x cm. and other be $(x + 6)$ cm.

Area of a trap.

$= \frac{1}{2} \times$ height(sum of parallel sides)

$180 = \frac{1}{2} \times 9(x + x + 6)$

$40 = 2x + 6$

$\Rightarrow x = 17$

Two parallel sides are 17 cm and 23 cm.

17. (A) Let the total marks be 100 and the passing marks be x, then

Marks obtained by A = 90% of $x = \frac{9}{10}x$

Marks obtained by B = $\left(1 - \frac{1}{9}\right)\%$ of $\frac{9}{10}x$

$= \frac{8}{9} \times \frac{9}{10}x = \frac{8}{10}x$

Marks obtained by C

$= \left(1 - \frac{7}{17}\right)\%$ of $\left(\frac{9}{10}x + \frac{8}{10}x\right)$

$= \frac{10}{17} \times \left(\frac{17}{10}x\right) = x$

Hence C passes the exam.

18. (C) Volume of the roof top

$= \frac{1}{2} \times$ Area of the surface ABCD $\times$ height CH

$= \frac{1}{2} \times 6 \times (9 + 5) \times 20 = 840\ \text{cm}^3$.

19. (C) Let MP of shirt be ₹ $2x$ and that of trouser be ₹ $3x$.
Let y% be the discount on the trouser

$$\frac{70}{100}\times 2x + \left(\frac{100-y}{100}\right)\times 3x = \frac{80}{100}\times(2x+3x)$$

$$\frac{7x}{5} + \frac{300x-3yx}{100} = \frac{80}{100}\times 5x$$

Dividing by x both side

$$\frac{7}{5} + \frac{300-3y}{100} = 4 \Rightarrow \frac{300-3y}{100} = \frac{13}{5}$$

$$y = 13\frac{1}{3}\%$$

20. (A) $\frac{KP}{PM} = \frac{4}{13} \Rightarrow \frac{PM}{KP} = \frac{13}{4}$

$$\frac{PM}{KP} + 1 = \frac{13}{4} + 1$$

$$\frac{PM+KP}{KP} = \frac{13+4}{4}$$

$$\frac{KM}{KP} = \frac{17}{4}$$

$\because \frac{KM}{KP} = \frac{KN}{KQ}$ (PQ || MN)

$$\frac{17}{4} = \frac{20.4}{KQ} \Rightarrow KQ = \frac{20.4\times 4}{17}\text{ cm}$$

KQ = 4.8 cm

21. (C) Ratio of their profit

$$= \frac{1}{8} : \frac{1}{3} : \left\{1-\left(\frac{1}{8}+\frac{1}{3}\right)\right\}$$

$$= \frac{1}{8} : \frac{1}{3} : \frac{13}{24}$$

= 3 : 8 : 13

Now, for A & C

A × 4 : C × 8 = 3 : 13

A × 4 : 1560 × 8 = 3 : 13

$$A = \frac{1560\times 8\times 3}{4\times 13} = ₹\,720$$

For B & C,

B × 6 : C × 8 = 8 : 13

B × 6 : 1560 × 8 = 8 : 13

$$B = \frac{1560\times 8\times 8}{6\times 13} = ₹\,1280$$

Contribution by A & B together

= 720 + 1280

= ₹ 2000

22. (B) Let the present age of my son = x yrs.
Then, the present age of mine = $3x$ yrs.

$$(3x+5) = 2\frac{1}{2}(x+5)$$

$(3x+5)\times 2 = 5(x+5)$

$6x + 10 = 5x + 25$

x = 15 yrs.

Father's age = 45 years

Son's age = 15 years

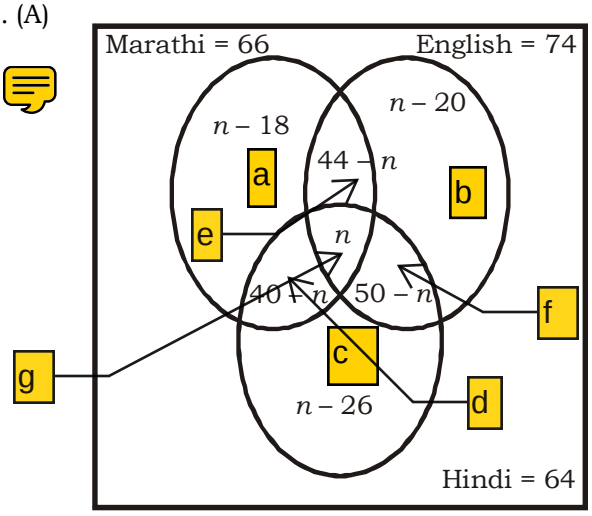
23. (B) Average area $= \frac{1^2+2^2+3^2+\ldots+n^2}{n}$

$$= \frac{n(n+1)(2n+1)}{6\times n}$$

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

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

24. (A)



104 – 38 = 66 Students speak Marathi
104 – 30 = 74 Students speak English
104 – 40 = 64 Students speak Hindi
By Venn diagram
$(n) + (44 - n + 50 - n + 40 - n)$
$+ (n - 18 + n - 20 + n - 26) = 104$
$n = 34$
No. of students who speak exactly two language= $40 - n + 44 - n + 50 - n$
$= 134 - 3n$
$= 134 - 3\times 34$
$= 134 - 102$
$= 32$

25. (C) Let the Ist part be ₹ x.
Then, 2nd part = ₹ $(4350 - x)$

$SI_1 = SI_2$

$$\frac{x \times 9 \times 1}{100} = \frac{(4350 - x) \times 10 \times 2}{100}$$

$9x + 20x = 4350 \times 20$

$$x = \frac{4350 \times 20}{29}$$

$= ₹\ 3000$

Ist part = ₹ 3000
2nd part = ₹ 1350

26. (B) $a = 1$

$\because\ ar^2 + ar^4 = 90$

$\Rightarrow ar^2(1 + r^2) = 90$

$\Rightarrow r^2(1 + r^2) = 90$

$\Rightarrow r^4 + r^2 - 90 = 0$

$\Rightarrow (r^2 + 10)(r^2 - 9) = 0$

$\Rightarrow r = \pm 3$

27. (B) P = ₹ 16000, R = 10% p.a. and n = 2 yrs.

$$\text{Amount after 2 years} = P\left[1 + \frac{R}{200}\right]^n$$

$$= 16000\left[1 + \frac{10}{200}\right]^{2\times 2}$$

$$= 16000 \times \left(\frac{21}{20}\right)^4$$

$= ₹\ 19448.10$

28. (C) Let the point (2, –2) lies on the curve $x^2 + 4y^2 = 10x$.

Then, $(2)^2 + 4(-2)^2 = 10 \times 2$

$4 + 4 \times 4 = 20$

$20 = 20$

Yes, (2, –2) lies on $x^2 + 4y^2 = 10x$.

29. (B) $$\text{Total debt} = ₹\ 6450 + \frac{6450 \times 5 \times 4}{100}$$

$= ₹\ 7740$

$$\text{Installment} = \frac{7740 \times 100}{4 \times 100 + (3 + 2 + 1) \times 5}$$

$= ₹1800$

30. (B) Let the length & breadth of the rectangular field be $3x$ & $2x$ cm.
Then area of rectangular field $= 3x \times 2x$
ATQ,

$3456 = 6x^2$

$x^2 = 576 = 24$

Length of the fence $= 2(l + b)$

$= 2(3x + 2x)$

$= 2 \times 5x$

$= 2 \times 5 \times 24$ cm

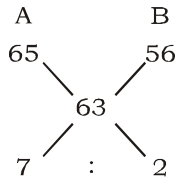
$= 240$ cm

Cost of fencing = ₹ 240 × 3.50

= ₹ 840

31. (C)

	Milk		Water		Milk		Water
A	5	:	2	$\}_{7\times 13}$	65	:	26
B	8	:	5	$\}_{13\times 7}$	56	:	35
Mixture	9	:	4	$\}_{13\times 7}$	63	:	28



Required ratio = 7 : 2

32. (A) Vol. of the wood
= [outer vol. – inner vol.]

$= [\pi \times R_0^2 - \pi \times R_i^2] \times h$

$= \pi[14^2 - 12^2] \times 35$

$$= \frac{22}{7} \times 26 \times 2 \times 35$$

$= 5720\ cm^3$.

33. (A) 5 men + 3 boys can reap 23 hectares in 4 days
3 men + 2 boys can reap 7 hectares in 2 days
ATQ,
14(5 men + 3 boys) = 23(3 men + 2 boys)
70 men + 42 boys = 69 men + 46 boys.
1 man = 4 boys
Now,
5 men + 3 boys = 23 boys.

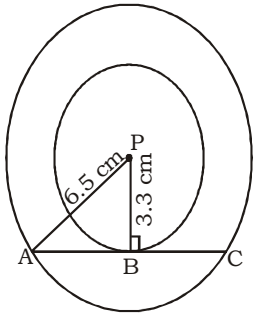
$$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$$

$$\frac{23 \times 4}{23} = \frac{M_2 \times 6}{45}$$

$M_2 = 30$

Also, 30 boys = 7 men + 2 boys
Hence, 2 boys must assist 7 men.

34. (B)



PB(r_i) = 3.3 cm
PA (r_0) = 6.5 cm

$$AB = \sqrt{AP^2 - PB^2} = \sqrt{6.5^2 - 3.3^2}$$

$= 5.6$ cm
AC = 2 × AB = 2 × 5.6
= 11.2 cm

35. (A) Time taken by A, B and C to complete a work are 6, 8 and 12 days respectively.

$$\text{Ratio of their efficiency} = \frac{1}{6} : \frac{1}{8} : \frac{1}{12}$$
$$= 4 : 3 : 2$$

$$\text{So, Share of B} = \frac{3}{9} \times 1350 = ₹\ 450$$

36. (*) For real and equal roots

$$\text{Discriminant} = 0$$
$$b^2 - 4ac = 0$$
$$p^2 - 4 \times 2 \times 8 = 0$$
$$p = 8$$

37. (D)

$$P_1\ (+)\quad 6 \overline{\diagdown 24} \quad 4$$
$$P_2\ (-)\quad 8 \overline{\diagup\ \ \ \ } \quad -3$$
$$1$$

$$\text{Total time required} = \frac{24}{1}$$
$$= 24 \text{ hours}$$

38. (D) $S = \{1, 2, 3, 4, 5, 6\}$

$$P(5 \text{ or } 6) = \frac{2}{6} = \frac{1}{3}$$

39. (B) $$\frac{\text{Speed of Man}_1}{\text{Speed of Man}_2} = \sqrt{\frac{\text{Time taken by Man}_2}{\text{Time taken by Man}_1}}$$

$$\frac{8}{\text{Speed of Man}_2} = \sqrt{\frac{4\frac{4}{5}}{3\frac{1}{3}}} = \sqrt{\frac{24}{5} \times \frac{3}{10}} = \sqrt{\frac{36}{25}}$$

$$\text{Speed of Man}_2 = \frac{5}{6} \times 8 = \frac{20}{3} \text{ km/hr}$$
$$= 6\frac{2}{3} \text{ km/hr}$$

40. (C) $$\tan\theta = \frac{p}{q} \quad \text{[given]}$$

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

$$= \frac{\frac{p}{q} \times \frac{p}{q} - 1}{\frac{p}{q} \times \frac{p}{q} + 1}$$

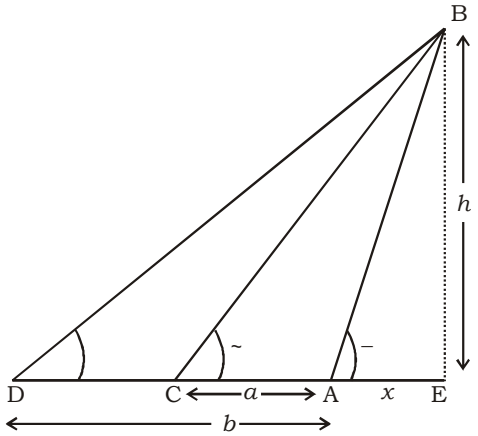
$$= \frac{p^2 - q^2}{p^2 + q^2}$$

41. (D) $$\frac{\text{Speed of Train}_1}{\text{Speed of Train}_2} = \sqrt{\frac{\text{Time taken by Train}_2}{\text{Time taken by Train}_1}}$$

$$\frac{x}{45} = \sqrt{\frac{288 \times 60}{60 \times 200}}$$

$$x = 45 \times \sqrt{\frac{36}{25}}$$
$$= 54 \text{ km/h}$$

42. (A)



In ΔABE,

$$\frac{AE}{BE} = \cot\theta \Rightarrow \frac{x}{h} = \cot\theta$$

$$x = h\cot\theta \quad \ldots. \text{(i)}$$

In ΔCBE,

$$\frac{CE}{BE} = \cot\alpha \Rightarrow \frac{x+a}{h} = \cot\alpha$$
$$x = h\cot\alpha - a \quad \ldots. \text{(ii)}$$

In ΔDBE,

$$\frac{DE}{BE} = \cot\beta \Rightarrow \frac{x+b}{h} = \cot\beta$$

$$h = \frac{x+b}{\cot\beta}$$

$$x = h\cot\beta - b \quad \ldots. \text{(iii)}$$

From (i) & (ii)

$$h\cot\theta = h\cot\alpha - a$$

$$h = \frac{a}{\cot\alpha - \cot\theta}$$

From (i) & (iii)

$$h\cot\theta = h\cot\beta - b$$

$$h = \frac{b}{\cot\beta - \cot\theta}$$

$$\therefore \frac{a}{\cot\alpha - \cot\theta} = \frac{b}{\cot\beta - \cot\theta}$$

$$\cot\theta = \frac{b\cot\alpha - a\cot\beta}{b - a}$$

43. (B) Speed of boat in still water = x km/h (say) and that of stream = y km/h

Then,

$$x + y = \frac{1}{\frac{7.5}{60}} = \frac{1 \times 600}{75} = 8$$

$x + y = 8$ and $x - y = 5$

So, Speed of boat $= \frac{1}{2}(8 + 5)$

$= 6.5$ km/h

44. (A) Area of isosceles triangle $= \frac{b}{4}\sqrt{4a^2 - b^2}$

So,

$$60 = \frac{b}{4}\sqrt{4 \times 13^2 - b^2}$$

$$240 = b(\sqrt{4 \times 169 - b^2})$$

$240^2 = b^2(676 - b^2)$

$b^4 - 676b^2 + 57600 = 0$

$(b^2 - 100)(b^2 - 576) = 0$

$b = 10$ cm or 24 cm

As options are given, correct answer will be 10 cm.

45. (C) Distance run by A $= 5 \times \frac{15}{4} = \frac{75}{4}$ km

Distance run by B $= 5\frac{1}{7} \times \frac{15}{4} = \frac{135}{7}$ km

Distance run by C $= \frac{16}{3} \times \frac{15}{4} = 20$ km

Greatest length of the race course

$= \text{HCF of } \frac{75}{4}, \frac{135}{7}, \frac{20}{1}$

$= \frac{5}{28}$ km

46. (C) Area of the base $= \frac{\sqrt{3}}{4} \times \text{side}^2$

$$16\sqrt{3} = \frac{\sqrt{3}}{4}x^2$$

$$x = \sqrt{64} = 8 \text{ cm}$$

Lateral Surface Area

$= 3 \times$ area of 1 lateral surface

$= 3 \times \frac{8}{4}\sqrt{4 \times 5^2 - 8^2}$

$= 6 \times \sqrt{100 - 64}$

$= 6 \times 6 = 36$ cm^2.

47. (A) LCM of 5, 6, 8 & 12 = 120

Required no is of the form $120k + 1$ which divisible by 13.

$\therefore$ for $k = 1$ $120 \times 1 + 1 = 120 \neq$ divisible by 13

$k = 2$ $120 \times 2 + 1 = 241 \neq$ divisible by 13

$k = 3$ $360 + 1 = 361 \neq$ divisible by 13

$k = 4$ $120 \times 4 + 1 = 481$ is divisible by 13.

No. of shrubs = 481.

48. (B) Perpendicular distance of $3x - 4y - 15 = 0$ from (0, 0) is d.

$$d = \left|\frac{Ax_1 + By_1 + C}{\sqrt{A^2 + B^2}}\right|$$

$$d = \left|\frac{3 \times 0 + (-4) \times 0 - 15}{\sqrt{3^2 + 4^2}}\right|$$

$$d = \left|0 + \frac{0 - 15}{5}\right| = 3 \text{ unit}$$

49. (A) $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = k$ (say)

$a = bk$, $c = dk$ & $e = fk$

In option (A)

L.H.S.

$$\sqrt{\frac{a + c + e}{b + d + f}} = \sqrt{\frac{k(b + d + f)}{b + d + f}} = \sqrt{k}$$

R.H.S.

$$\frac{a^2 + c^2 + e^2}{b^2 + d^2 + f^2} = \frac{k^2b^2 + k^2d^2 + k^2f^2}{b^2 + d^2 + f^2} = k^2$$

Hence (i) is not true.

50. (D) Let one angle of the cyclic quadrilateral be x°, the its opposite angle $= 2x^\circ$

Now, $x^\circ + 2x^\circ = 180^\circ$

(opp. angles of a cyclic quad. are supplementary)

$x^\circ = 60^\circ$

$\therefore$ larger angle $= 2 \times 60^\circ = 120^\circ$.

51. (A) Let the population of the town in the beginning of 2008 be x.

Its population in the beginng of 2010

$$= x\left(1 - \frac{12}{100}\right)\left(1 + \frac{15}{100}\right) = x \times \frac{88}{100} \times \frac{115}{100}$$

$= 1.0120\,x$

Percentage of effect on the population

$$= \frac{1.0120x - x}{x} \times 100 = \frac{0.0120x}{x} \times 100$$

$= 1.2\%$ increase

52. (B) Let x books are purchased initially.
ATQ,

$$\frac{80}{x+4} = \frac{80}{x} - 1$$

$$80x = (x+4)(80-x)$$

$$80x = 80x - x^2 + 320 - 4x$$

$$x^2 + 4x - 320 = 0$$

$$(x+20)(x-16) = 0$$

$$x = 16$$

53. (A) Actual price = 98% of 95% of ₹ 4800
= ₹ 4468.80

54. (A) $a = 128, r = \frac{-96}{128} = \frac{-3}{4}$

$$S_{20} = a\left[\frac{1-r^{20}}{1-r}\right]$$

$$= 128\left[\frac{1-\left(-\frac{3}{4}\right)^{20}}{1-\left(-\frac{3}{4}\right)}\right]$$

$$= 128 \times \frac{4}{7}\left[1-\left(\frac{3}{4}\right)^{20}\right]$$

$$= 128 \times \frac{4}{7}\frac{[4^{20}-3^{20}]}{4^{20}}$$

$$= \frac{4^{20}-3^{20}}{2^{31}\times 7}$$

55. (C) Let x % marks is scored in the second paper.
30% of 180 + x % of 150
= 50% of (180 + 150)

$$x = \frac{50\times 330 - 30\times 180}{150}$$

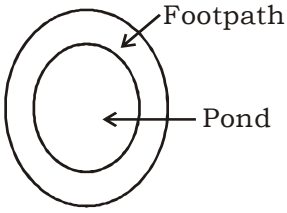
$$= \frac{16500-5400}{150} = \frac{11100}{150}$$

= 74%

56. (D) Length of median of equilateral triangle
= 3 × radius incircle
= 3 × 3
= 9 cm

57. (D) The sum be $= \frac{412.50\times 100}{\left(\frac{9}{2}-\frac{7}{2}\right)\times 11}$
= ₹ 3750

58. (C)



Circumference of the pond = $2\pi r$
ATQ,

$$2\pi r = 66 \times 400$$

$$2r = 66 \times 400 \times \frac{7}{22} = 8400 \text{ cm}$$

$\therefore$ Diameter of the pond = 8400 cm.

59. (A) Let the sum be = ₹ x
ATQ,

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

$$2x = x\left(1+\frac{r}{100}\right)^{15}$$

$$2 = \left(1+\frac{r}{100}\right)^{15}$$

Again A = $8x$

$$8x = x\left(1+\frac{r}{100}\right)^n$$

$$\left[\left(1+\frac{r}{100}\right)^{15}\right]^3 = \left[1+\frac{r}{100}\right]^n$$

$$\Rightarrow \quad n = 15 \times 3$$

= 45 years

60. (A) Speed of flowing water = $\frac{10\times 100}{60}$ cm/s

$$= \frac{50}{3} \text{ cm/s}$$

Radius(r) = $\frac{5}{2}$ mm = $\frac{5}{20}$ cm = $\frac{1}{4}$ cm

$$\text{Required time} = \frac{\text{Volume of cone}}{\text{Volume of water flow}}$$

$$= \frac{\frac{1}{3}\pi\times 20\times 20\times 24}{\pi\times\frac{1}{4}\times\frac{1}{4}\times\frac{50}{3}}$$

$$= \frac{20\times 20\times 24\times 4\times 4}{50}$$

$$= 51\frac{1}{5} \text{ min or } 51 \text{ min } 12 \text{ sec}$$

61. (B) R = 16% p.a. = $\frac{16}{4}$ % quartely.

The amount of ₹ 17576, paid at the end of first quarter has its principal equal to

$$= 17576 \times \left(\frac{25}{26}\right)^1 = ₹\ 16900$$

Similarly, the principle at the end of 2nd quarter $= 17576 \times \left(\frac{25}{26}\right)^2 = ₹16250$

and at the end of 3rd quarter

$$= 17576 \times \left(\frac{25}{26}\right)^3 = ₹\ 15625$$

Net principal = ₹(16900 + 16250 +15625)
= ₹ 48775

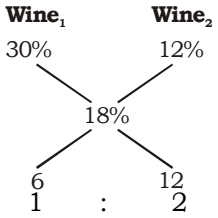
62. (B) Let $^{-}$ =10° 6' 32''

90° – $^{-}$° = 79° 53' 28''

sin (90 – $^{-}$) + tan $^{-}$ = cos $^{-}$ + tan $^{-}$

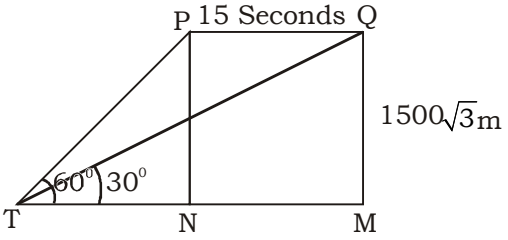
$$= a + \frac{\sqrt{1-a^2}}{a} = \frac{a^2+\sqrt{1-a^2}}{a}$$

63. (B)



It means $\frac{1}{3}$ part of the butt of sherry was left so $\frac{2}{3}$ part of the butt of sheery stolen.

64. (A)



In ΔQMT

$$\frac{TM}{QM} = \cot 30° \Rightarrow TM = \sqrt{3} \times 1500\sqrt{3}$$

$$TM = 4500m$$

In ΔPNT

$$\frac{TN}{PN} = \cot 60° \Rightarrow TN = \frac{1}{\sqrt{3}} \times 1500\sqrt{3}$$

$$TN = 1500\ m$$

Speed of the jet plane $= \frac{PQ}{15} = \frac{4500-1500}{15}$

$= 200$ m/s

65. (D) Let total work = 240 units

Time taken by (A + B) to complete work = 40 days

Work done by (A + B) in 10 days

$$= \frac{240}{40} \times 10 = 60$$

Remaining work = 240 – 60 = 180 units

Work done by (A + B + C) in a day = $\frac{180}{20}$ = 9 units

Work done by C in a day = 9 – 6 = 3 units

Work done by B in a day = $\frac{3\times 2}{3}$ = 2 units

So,

Work done by A in a day = 6 – 2 = 4 units

Time taken A to complete work = $\frac{240}{4}$ days = 60 days

66. (A) Remainder = $p(-2)=2(-2)^4-6(-2)^3+2(-2)^2-(-2)+2$
= 32 + 48 + 8 + 2 + 2
= 92

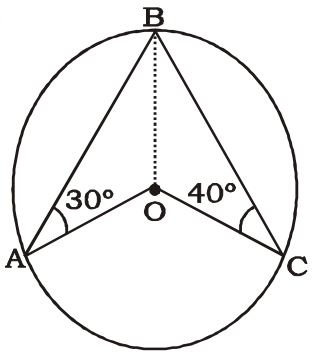
67. (B) Relative Speed = (11.44 – 10.56) km/h
= 0.88 km/h

$$=0.88 \times \frac{5}{18} \text{ m/s}$$

$$\text{Reqd time} = \frac{176}{\frac{0.88\times 5}{18}} \text{ sec}$$

= 720 sec or 12 min

68. (B)



$\angle AOC = 2[\angle OBA + \angle OBC]$
$= 2[\angle OAB + \angle OCB]$
$= 2[30^0 + 40^0] = 140^0$

69. (B) Let the required distance be x km.

ATQ,

$$\frac{x}{7.2} + \frac{x}{4.8} = 1$$

$$2x + 3x = 14.4$$

$$x = 2.88 \text{ km}$$

70. (C) Let the n^{th} term is $\frac{1}{128}$

ATQ,

$$\frac{1}{128} = 2\left(\frac{1}{2}\right)^{n-1}$$

$$\frac{1}{128} = \frac{1}{2^{n-1-1}}$$

$$\frac{1}{2^7} = \frac{1}{2^{n-2}}$$

$\Rightarrow \quad n = 9$

71. (A) Amount $= ₹\left(400 + \frac{400 \times 5 \times 2}{100}\right)$

$= ₹\ 440$

Amount returned by Ramu to Arun

$= 2\%$ of 440

$= \frac{2}{100} \times 440$

$= ₹\ 8.8$

72. (C) Radius of the semicircle AQC

$= \frac{1}{2}\sqrt{14^2 + 14^2}$

$= 7\sqrt{2}$ cm

Area of the shaded region

= Area of semi-circle AQC

+ Area of triangle ABC

– Area of Quarter circle APCB

$= \frac{1}{2} \times \frac{22}{7} \times 7\sqrt{2} \times 7\sqrt{2} + \frac{1}{2} \times 14 \times 14$

$- \frac{1}{4} \times \frac{22}{7} \times 14 \times 14$

$= 154 + 98 - 154$

$= 98\ cm^2$

73. (C) $\frac{x}{a+x} + \frac{y}{b+y} + \frac{z}{c+z}$

$= \frac{a.x}{a^2 + ax} + \frac{b.y}{b^2 + by} + \frac{c.z}{c^2 + cz}$

$= \frac{ax}{by + cz + ax} + \frac{by}{cz + ax + by} + \frac{cz}{ax + by + cz}$

$= \frac{ax + by + cz}{ax + by + cz}$

$= 1$

74. (A) h = 45 cm, r_1 = 28 cm and r_2 = 7 cm

Volume of the bunket

$= \frac{1}{3}\pi (r_1^2 + r_1 r_2 + r_2^2) \times h$

$= \frac{1}{3} \times \frac{22}{7} (28^2 + 28 \times 7 + 7^2) \times 45$

$= \frac{1}{3} \times \frac{22}{7} (784 + 196 + 49) \times 45$

$= \frac{1}{3} \times \frac{22}{7} \times 1029 \times 45$

$= 48510\ cm^3$

75. (D) Total change $= 25 + 10 + \frac{25 \times 10}{100} = 37.5\%$

So, revenue increased by 37.5%.

76. (B) $2x^2 + x - 1 = 0$

So, $2x^2 = 1 - x$

$f(x) = 4x^4 - 2x^3 - 6x^2 + x - 5$

$= (2x)^2 - x(2x^2) - 3(2x^2) + x - 5$

$= 1 + x^2 - 2x - x + x^2 - 3 + 3x + x - 5$

$= 2x^2 + x - 7$

$= 1 - x + x - 7$

$= -6$

77. (D)

	Quantity		
C.P.	9	———	$16 \times 11 = 176$
		99	
S.P.	11	———	$20 \times 9 = 180$

Percentage profit $= \frac{180 - 176}{176} \times 100$

$= \frac{25}{11}\%$

78. (D) $3\sin\theta + 4\cos\theta = 5$

$\Rightarrow 4\sqrt{(1 - \sin^2\theta)} = 5 - 3\sin\theta$

$16(1 - \sin^2\theta) = 25 + 9\sin^2\theta - 30\sin\theta$

$\Rightarrow 25\sin^2\theta - 30\sin\theta + 9 = 0$

$\Rightarrow (5\sin\theta - 3)^2$

$\Rightarrow \sin\theta = \frac{3}{5}$

$\Rightarrow \text{cosec}\ \theta = \frac{5}{3}$

79. (C) Investment of A = 2000 × 12 = ₹ 24,000

Investment of B = 3000 ×4 + 4000 × 8

= ₹ 44,000

Investment of C = 4000 × 9 + 3000 × 3

= ₹ 45,000

A : B : C = 24 : 44 : 45

A's Share = $\frac{24}{113} \times 8475 = ₹\ 1800$

80. (C) $\frac{(0.22)^3 + (0.11)^3 + (0.32)^3}{(0.66)^3 + (0.96)^3 + (0.33)^3} + \frac{(0.32)^3 + (0.45)^3 + (0.77)^3}{81(0.32)(0.45)(0.77)}$

$= \frac{(0.22)^3 + (0.11)^3 + (0.32)^3}{(3 \times 0.22)^3 + (3 \times 0.32)^3 + (3 \times 0.33)^3} + \frac{(0.32)^3 + (0.45)^3 + (-0.77)^3}{81(0.32)(0.45)(0.77)}$

$= \frac{1}{27} \times 1 + \frac{3(0.32) \times 0.45 \times (-0.77)}{81(0.32)(0.45)(0.77)}$

$= \frac{1}{27} - \frac{1}{27}$

$= 0$

81. (B) Suppose the distance b/w x & y be K km.

Then, it takes hours $\frac{\frac{3}{4}K}{B}$ hours to conver $\frac{3}{4}K$ km.

& It takes $\frac{\frac{1}{4}K}{S}$ hrs to cover $\frac{1}{4}$ K km

Average Speed

$= \frac{\frac{3}{4}K + \frac{1}{4}K}{\frac{\frac{3}{4}K}{B} + \frac{\frac{1}{4}K}{S}} = \frac{K(BS)}{\frac{3}{4}KS + \frac{1}{4}KB}$

$= \frac{4BS}{3S + B}$ km/hr

82.(B) The minute hand gains 60 over the hour hand in $\frac{60 \times 60}{55} = 65\frac{5}{11}$ minutes.

Therefore the hands of a correct clock coincide every $65\frac{5}{11}$ minutes.

But the hands of the clock mentioned in the question coincide every 65 minutes.

Hence in 65 minutes the clock gains $\frac{5}{11}$ minutes.

$\therefore$ in 60 × 24 minutes or in 24 hours it gains $\frac{5}{11} \times \frac{1}{65} \times 60 \times 24$ minutes $= 10\frac{10}{143}$ minutes.

83.(D) Price of the car after 3 years

$= 360000\left(1 - \frac{10}{100}\right)\left(1 - \frac{10}{100}\right)\left(1 - \frac{20}{80}\right)$

= ₹ 233280

84.(C) $\frac{\sec 37^\circ}{\text{cosec } 53^\circ} + \frac{\sec 42^\circ}{\cos 48^\circ}$

$= \frac{\sec (90^\circ - 53^\circ)}{\text{cosec } 53^\circ} + \frac{\sin (90^\circ - 48^\circ)}{\cos 48^\circ}$

$= \frac{\text{cosec } 53^\circ}{\text{cosec } 53^\circ} + \frac{\cos 48^\circ}{\cos 48^\circ}$

$= 1 + 1 = 2$

85.(C) Installment $= \frac{6000 \times 100}{100 \times 5 + (4 + 3 + 2 + 1) \times 10}$

$= \frac{6000 \times 100}{600}$

= ₹ 1000

86. (C) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$36 = a^2 + b^2 + c^2 + 2 \times 11$

$14 = a^2 + b^2 + c^2$

Now $a^3 + b^3 + c^3 - 3abc$

$= (a + b + c)[a^2 + b^2 + c^2 - ab - bc - ca]$

$6[14 - 11] = 6 \times 3$

$= 18$

87. (A) Quantity of milk = $\frac{7}{9} \times 729 = 567$

Quantity of water = $\frac{2}{9} \times 729 = 162$

ATQ,

$\frac{567}{162 + x} = \frac{7}{3}$

$7x + 162 \times 7 = 567 \times 3$

$x = \frac{1701 - 1134}{7}$

$= \frac{576}{7} = 81$ litres.

88. (C) Length of common tangent

$= \sqrt{(\text{Distance between centres})^2 - (\text{Radius}_1 + \text{Radius}_2)^2}$

$= \sqrt{(10)^2 - (4.5 + 3.5)^2} = \sqrt{36}$

= 6 cm

89. (*)

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

$\frac{8 \times 10 \times 9}{18 \times 2 \times 12} = \frac{x \times 8 \times 6}{18 \times 2 \times 12}$

$x = 30$ men

90. (A) $0.98 \times 0.98 - 0.98 \times 1.52 + 0.76 \times 0.76$
$= 0.98 \times 0.98 - 0.98 \times 2 \times 0.76 + 0.76 \times 0.76$
$= (0.98 - 0.76)^2$
$= (0.22)^2$
$= 0.0484$

91. (B) Required employees

$$= \left(\frac{100-25}{100}\right) \times \frac{32}{100} \times 1800$$

$$= \frac{75}{100} \times \frac{32}{100} \times 1800$$

$= 432$

92. (A) Total employees working in Chennai

$$= \frac{12 \times 1800}{100} = 216$$

ATQ,

$$\frac{2}{9}^{th} \text{ of } 216 = \frac{2}{9} \times 216$$

$= 48$

As 48 employees were transferred from Chennai to Patna.
Total number of employees in Patna

$$= \frac{1800 \times 8}{100} = 144$$

After transfer, the total number of employees working in Patna $= 144 + 48$
$= 192$

93. (A) Required percentage $= \frac{16}{21} \times 100$
$= 76.19$
≈ 76

94. (D)

95. (C) Required Ratio $= 8 : 32$
$= 1 : 4$

96. (D) Average production of sugar in years 1998, 1999, 2000 and 2001

$$= \frac{15 + 50 + 30 + 35}{4}$$

$= 32.5$ thousand metric tonnes
And average production of sugar in years 2001, 2002, 2003 and 2004

$$= \frac{35 + 65 + 75 + 70}{4}$$

$= 61.25$ thousand metric tonnes
$\therefore$ Required difference
$= 61.25 - 32.5$ thousand metric tonnes
$= 28.75$ thousand metric tonnes

97. (A) In 1999 the percent increase in production from the previous year

$$= \frac{50-15}{15} \times 100\%$$

$= 233.33\%$
In 2001 the percent increase in production from the previous year

$$= \frac{35-30}{30} \times 100\%$$

$= 16.66\%$
In 2003 the percent increase in production from the previous year

$$= \frac{75-65}{65} \times 100\%$$

$= 15.38\%$
$\therefore$ In the remaining three was decrease.

98. (D) In 1998 the value of sugar per thousand metric tonne $= \frac{27.5}{15} = ₹\ 1.833$ lakh
In 1999 the value of sugar per thousand metric tonne $= \frac{80}{50} = ₹\ 1.600$ lakh
In 2000 the value of sugar per thousand metric tonne $= \frac{50}{30} = ₹\ 1.666$ lakh
In 2001 the value of sugar per thousand metric tonne $= \frac{57.5}{35} = ₹\ 1.642$ lakh
In 2002 the value of sugar per thousand metric tonne $= \frac{102.5}{65} = ₹\ 1.575$ lakh
In 2003 the value of sugar per thousand metric tonne $= \frac{117.5}{75} = ₹\ 1.571$ lakh
$\therefore$ It is the highest in the year 1998.

99. (D) It is the lowest in the year 2003.

100. (A) Total production
$= (15 + 50 + 30 + 35 + 65 + 75 + 70)$ thousand metric tonnes
25% of the total production

$$= \frac{25}{100} \times 340$$

$= 85$ thousand metric tonnes
And the production of the year 1998 and 2004 $= (15 + 70)$
$= 85$ thousand metric tonnes

SSC MAINS - 24 (ANSWER KEY)

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