SSC CGL Tier - II Mathematics Exam. Practice Set

Answers with Explanation

1. (c)
2. (c) L.C.M. of 3, 4, 6 = 12

$(9)^{1/3} \Rightarrow 9^{4/12}$

$\Rightarrow \sqrt[12]{9^4} = \sqrt[12]{6561}$

$(20)^{1/4} \Rightarrow 20^{3/12}$

$\sqrt[12]{20^3} = \sqrt[12]{8000}$

$(25)^{1/6} = 25^{2/12}$

$= \sqrt[12]{25^2} = \sqrt[12]{625}$

$= \sqrt[6]{25} < \sqrt[3]{9} < \sqrt[4]{20}$

3. (b) take n = 7, because 4 × 1 + 3 = 7
   So, 2n = 14, the remainder will be = 2
4. (b) We need the next instances when the signals light up together.
   That means the Least Common Multiple (LCM) of 3, 4, 8, 10, 12
   3, 4 divide 12 so neglect them.
   ∴ They light up together after 2 hours
   After starting, they light up together 1st time in 2 hours.
   Then 2nd time in 2 + 2 = 4 hours.
   Then 3rd time in 6 hours.
   And 4th time in 8 hours.
5. (a) N = H.C.F. of (4665 - 1305), (6905 - 4665) and (6905 - 1305) = H.C.F. of 3360, 2240 and 5600 = 1120.
   Sum of digits in N = (1 + 1 + 2 + 0) = 4
6. (d) L.C.M. of 6, 9, 15 and 18 is 90.
   Let required number be $90k + 4$, which is multiple of 7.
   Least value of k for which $(90k + 4)$ is divisible by 7 is $k = 4$.
   ∴ Required number = (90 × 4) + 4 = 364.
7. (c) $\Rightarrow \frac{3}{\frac{963}{999}} + \frac{2}{\frac{654}{999}}$

$\Rightarrow 999\left[\frac{1}{321} + \frac{1}{327}\right] = 999\left[\frac{327+321}{321\times 327}\right]$

$= \frac{(1000-1)648}{321\times 327}$

$= \frac{(1000-1)72}{107\times 109} = \frac{71928}{11663}$

8. (b)
9. (d)
10. (c) Let first no. be (x)
    There are 44 odd nos.
    Total = x + (x + 2) + (x + 4) + ……+(x + 86)
    TOTAL = 44x + 2 [1 + 2 + 3 …….+43]
    = 44x+(2 × 43 × 44)/2
    Average = (44x+43×44)/44=144
    x = 101
    Largest no. = (101 + 86) = 187
11. (d) No. of students = x and avg. weight = y

$\frac{xy+50}{x+1} = y+1$

x + y = 49 .....(i)

$\frac{xy+50+50}{x+2} = y+1.5$

1.5x + 2y = 97 .....(ii)
y = 47

12. (c) Total number of passengers = 10×20 = 200
    In 9 compartments the total number of passengers
    = 12 + 13 + 14 + 15 + 16 + 17 + 18 + 19 + 20 = 144
    So, the number of passengers in 10th coach = 200 – 144 = 56
13. (c) $52 = \frac{20\times 80 + 25\times 31 + x\times 55}{100}$

5200 = 1600 + 775 + x × 55
5200 – 2375 = 55 × x
55x = 2825

$x = \frac{2825}{55}$

= 51.3636
≅ 51.4

14. (a) Let the present ages of Sameer and Anand be $5x$ years and $4x$ years respectively.

Then, $\frac{5x+3}{4x+3} = \frac{11}{9}$

$\Rightarrow 9(5x + 3) = 11(4x + 3)$
$\Rightarrow 45x + 27 = 44x + 33$
$\Rightarrow 45x - 44x = 33 - 27$
$\Rightarrow x = 6.$
Anand's present age = $4x$ = 24 years.

15. (a) Let the present ages of mother and son be x years and (45 – x) years respectively.
Then, $(x - 5)(45 - x - 5) = 4(x - 5)$
$\Rightarrow 40 - x = 4$
$\Rightarrow x = 36$
The present ages of mother and son are 36 yrs & 9 yrs. respectively.

16. (a) Let the four parts into which 3150 is divided are a, b, c and d.
$\Rightarrow a/2=b/3=c/4=d/12=k$
Then a = 2k, b = 3k, c = 4k and d = 12k
As a + b + c + d = 3150
$\Rightarrow (2k+3k+4k+12k) = 3150$
$\Rightarrow 21k = 3150$
$\Rightarrow k = 150$
Hence the four parts are 300, 450, 600, 1800
So, the largest part is 1800

17. (b) $50 \times 6x + 100 \times 3x + 150 \times 2x = 4500$
$900x = 4500$
$x = 5$
So, weekly wages paid to man, a woman and a child 210, 105 and 70 rupees.

18. (a) $4x + 8x + 17x + 34 + 38 + 21 = 8793$
$29x = 8793 - 93$
$29x = 8700$
$x = 300$
Priya's Share = $300 \times 17 + 21 = 5121$

19. (a)

20. (d) $x - \frac{x}{5} - \frac{4x}{5} \times \frac{5}{100} - 120 = 1400$
$x = 2000$

Expenditure on transport $= \frac{1}{25} \times 2000 = 80$ Rs.

21. (c)

	Old	New
Price $\rightarrow$	100	75
	4	: 3

Consumption $\left(\propto \frac{1}{\text{price}}\right) \rightarrow 3:4$

$(4 - 3)r \rightarrow 2$ dozen
$1r \rightarrow 2$ dozen
$3r \rightarrow 6$ dozen

Original Rate $= \frac{162}{6} = 27$ Rs.

22. (b)

23. (a) Let total employee in Tata motors = 100
No of female employees = 70 and
No of male employees =30
No of female employees earn more than 35000

$= 70 - 30 \times \frac{60}{100} = 52$

No of female employees earn 35000 or less
= 70 – 52 = 18

Required fraction $= \frac{18}{70} = \frac{9}{35}$

24. (c) No of trees two years ago

$= 17640 \times \frac{100}{105} \times \frac{100}{105} = 16000$

25. (a)

26. (d) M.P. = Rs. 100
S.P. = 77

$C.P. = \frac{77 \times 100}{63} = \frac{1100}{9}$

New S.P. $= 77 \times \frac{125}{100}$

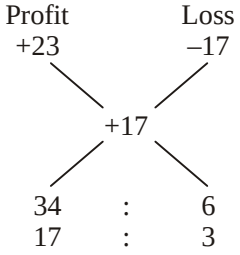
Profit or loss

$= 77 \times \frac{5}{4} - \frac{1100}{9} = \frac{(3465 - 4400)}{36} = -\frac{935}{36}$

$\text{loss} = \frac{\frac{935}{36}}{\frac{1100}{9}} \times 100 = 21.25\%$

27. (a) Let the CP of a pen = Rs. x and that of a book = Rs. y.
$\therefore$ 15y-5x=700
$\Rightarrow$ 3y-x=140 …….(i)
And 2y+x=260 .....(ii)
From equations (i) and (ii),
5y = 400
$\Rightarrow$ y = 400/5 = 80
$\therefore$ Actual Price of the book = Rs.80

28. (c)



$x = \frac{17}{20} \times 60 = 51$

29. (a) Let C.P. of watch = x
Profit % = x%

$x \times \frac{(100+x)}{100} = 96$

$x^2 + 100x = 9600$
$x^2 + 100x - 9600 = 0$
$x^2 + 160x - 60x - 9600 = 0$
$x(x + 160) - 60(x + 160) = 0$
$x = 60$

New S.P. $= 60 \times \frac{220}{100} = 132$

30. (d)

31. (b) Let the principal be 100P

$\therefore 18P = \frac{100P \times R \times 2}{100} \Rightarrow R = 9\%$

$\therefore$ Required CI

$= 7000 \times \left[\left(1+\frac{9}{100}\right)^3 - 1\right]$

= 7000 × $[(1.09)^3 - 1]$ = 2065.2

32. (b) $12\frac{1}{2}\% = \frac{1}{8}$

Remaining $= 1 - \frac{1}{8} - \frac{3}{5} = \frac{40-5-24}{40} = \frac{11}{40}$

ATQ

$1674 = \frac{x}{8} \times \frac{2\times5}{100} + \frac{3x}{5} \times \frac{6\times2}{100} + \frac{11}{40}x \times \frac{10\times2}{100}$

x = 12000.

33. (d)

34. (d) Interest on $4500 = \frac{4500 \times 5 \times 13}{100} = 2925$

Interest on 2nd amount = 5694 – 2925 = 2769

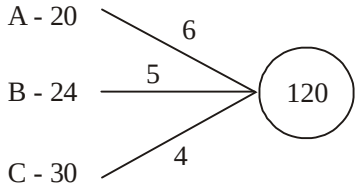
$2769 = \frac{P \times 5 \times 13}{100}$

P = 4260

35. (b) $P = \frac{882}{1+\frac{5}{100}} + \frac{882}{\left(1+\frac{5}{100}\right)^2} = 882\left[\frac{20}{21} + \frac{400}{441}\right]$

$= 882\left[\frac{420+400}{441}\right] = 1640$

36. (c) From the LCM method,



So, we have total work = 120
4 day's work by (A + B + C) = (6 + 5 + 4) × 4 = 60
6 day's work by 'C' alone = 4 × 6 = 24
So, remaining work done by (B + C) in

$= \frac{120-(60+24)}{(5+4)} = 4$ days

So, total days = [4 + 6 + 4] = 14 days

37. (b) Work done by A in 1 day $= \frac{1}{40}$ units

Work done by A in 5 days

$= 5 \times \left(\frac{1}{40}\right) = \frac{1}{8}$ units

Remaining work $= 1 - \frac{1}{8} = \frac{7}{8}$ units

Work done by B in 1 day $= \frac{7}{8\times21} = \frac{1}{24}$ units

Work done by both A and B in 1 day

$= \frac{1}{40} + \frac{1}{24} = \frac{1}{15}$ unit

Required no. of days $= \frac{1}{\frac{1}{15}} = 15$ days

38. (a) Here, a = 4, b = 6, n = 20, c = 6 and d = 11
If a men or b women complete a work in n days then time taken by c men and d women to complete the same work

$= \left(\frac{nab}{bc+ad}\right)$ days

$= \left(\frac{20\times4\times6}{6\times6+4\times11}\right)$ days = 6 days.

When work is triple then no. of days = 18 days.

39. (d) Aruna 20 ——— 3
60
Ashima 30 ——— 2

Work done by Aruna in 4 days = 3 × 4 = 12
Work done by Ashima in 18 days = 2 × 18 = 36
Remaining work = 60 – (12 + 36) = 12
Work done by Jamia in18 days = 12
Time required by Jamia to complete the work alone $= \frac{18}{12} \times 60 = 90$ days

40. (a) Ratio of time taken by a woman, a man and a boy = 8 : 6 : 12 = 4 : 3 : 6
So, 4 women = 3 men = 6 boy
(12 men + 12 women + 12 boys)
= (12 + 9 + 6) men = 27 men
Let the required number of days be x
9 × 6 × 6 = 27 × 8 × x

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

41. (b) Part filled by (A + B + C) in 3 minutes

$= 3\left(\frac{1}{30} + \frac{1}{20} + \frac{1}{10}\right) = \left(3 \times \frac{11}{60}\right) = \frac{11}{20}$

Part filled by C in 3 minutes = $\frac{3}{10}$

$\therefore$ Required ratio = $\left(\frac{3}{10} \times \frac{20}{11}\right) = \frac{6}{11}$

42. (c) (A + B)'s 1 hour's work =

$= \left(\frac{1}{12} + \frac{1}{15}\right) = \frac{9}{60} = \frac{3}{20}$

(A + C)'s 1 hour's work

$= \left(\frac{1}{12} + \frac{1}{20}\right) = \frac{8}{60} = \frac{2}{15}$

Part filled in 2 hrs $= \left(\frac{3}{20} + \frac{2}{15}\right) = \frac{17}{60}$

Part filled in 6 hrs. $= \frac{17}{60} \times 3 = \frac{17}{20}$

Remaining part $= \left(1 - \frac{17}{20}\right) = \frac{3}{20}$

Now, it is the turn of A and B and $\frac{3}{20}$ part is filled by A and B in 1 hour.
∴ Total time taken to fill the tank = (6 + 1) hrs = 7 hrs.

43. (d) Let the total capacity of the tank is 30 units.
The efficiency of Leakage(Pipe A) will be
= 30/10 = 3
And the efficiency of the leakage (Pipe A) and another Pipe (B) which is filling the tank will be = 30/15 = 2
Pipe A is emptying at 3 units/hr and when filling pipe B started then the emptying rate will come down to 2 units/hr.
∴ Filling Pipe B efficiency is 3 - 2 = 1unit/hr
Pipe B will be fill the tank in = 30/ 1= 30 hrs
Filling rate of Pipe B per minute is 4 liter
∴ Total Capacity of tank will be
= (4 × 60) × 30 = 7200 liters

44. (c) Part filled in 2 hours = 2/6=1/3

Remaining part = $\left(1 - \frac{1}{3}\right) = 2/3$

(A + B)'s 7 hour's work = 2/3
(A + B)'s 1 hour's work = 2/21
C's 1 hour's work
= { (A + B + C)'s 1 hour's work } – { (A + B)'s 1 hour's work }

$= \frac{1}{6} - \frac{2}{21} = 1/14$

C alone can fill the tank in 14 hours.

45. (c) Let the speed of train on level terrain = x km/h
And mountainous terrain = (x – 10) km/h

mountainous | level
←111 km→ ←188 km→

$\frac{188}{x} + \frac{111}{x-10} = 7$

x = 47 km/hr

46. (a)

110 km
A ——— B

10 : 30 am
After 30 min, A started moving towards B.
Distance travelled by A in 1 hr till 12 pm.
= 20 ×1 = 20 km
∴ Distance remained = 110 – 20 = 90 km

Now, Time taken to meet $= \frac{90}{20-15} = \frac{90}{5} = 18$ hr
∴ They meet on = 12 PM + 18 = 6 : 00 A.M.

47. (d) $6 = \frac{60}{x+y}$

x + y = 10 ... (i)

$5 = \frac{60}{\frac{2}{3}x + 2y}$

x + 3y = 18 ... (ii)

From (i) & (ii)
$2y = 8$
$y = 4$ km/hr
$x = 6$ km/hr

48. (b) Let the speed of bus is 's'
$st = 48$ _____(i)
$(s + 4)(t - 1) = 48$ _____(ii)
$st + 4t - s - 4 = st$
Put value of t from (i)
$-s^2 - 4s + 4 \times 48 = 0$
$s = 12, s = -16$
So, speed = 12 km/hr

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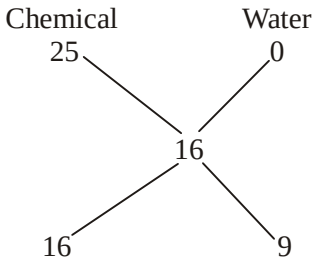
49. (c) Selling, price of mixture = Rs.20 per litre

Cost price of mixture $= \frac{100}{125} \times 20$
= Rs.16 per litre

By the rule of alligation,



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So. required ratio = 9 : 16

50. (b) Let the quantity of the wine in the cask originally be x litres.
Then, quantity of wine left in cask after 4 operations $= = \left[x\left(1-\frac{8}{x}\right)^4\right]$

$$\therefore \left(\frac{x\left(1-(8/x)\right)^4}{x}\right) = \frac{16}{81}$$

$$\Rightarrow \left(1-\frac{8}{x}\right)^4 = \left(\frac{2}{3}\right)^4$$

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

$\Rightarrow 3x - 24 = 2x$
$\Rightarrow x = 24.$

51. (d) Let speed of boat in still water is x kmph and speed of stream is y kmph.

$$\frac{24}{x-y} + \frac{28}{x+y} = 6 \quad \text{... (i)}$$

$$\frac{30}{x-y} + \frac{21}{x+y} = 6.5 \quad \text{...(ii)}$$

From (i) and (ii) we get
x = 10 kmph
y = 4 kmph

52. (d) Downstream (v) : Upstream (u)
Time $\rightarrow$ 1 : 2

When Distance is same then, time $\propto \frac{1}{\text{speed}}$

Speed $\rightarrow$ 2 : 1

Speed of Boat $= \frac{2+1}{2} = \frac{3}{2}$

Speed of Current $= \frac{2-1}{2} = \frac{1}{2}$

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$S_B : S_C = \frac{3}{2} : \frac{1}{2} = 3:1$

53. (a) Speed downstream = (5 + 1) kmph = 6 kmph.
Speed upstream = (5 - 1) kmph = 4 kmph.
Let the required distance be x km.

Then, $\frac{x}{6} + \frac{x}{4} = 1$
$\Rightarrow 2x + 3x = 12$
$\Rightarrow 5x = 12$
$\Rightarrow x = 2.4$ km

54. (d)
55. (b)
56. (a) $a \cos 2\theta + b \sin 2\theta = c$
$a(\cos^2\theta - \sin^2\theta) + 2b \sin\theta \cos\theta = c$
$a(1 - \tan^2\theta) + 2b \tan\theta = c \sec^2\theta$
$\tan^2\theta (c + a) - 2b \tan\theta + (c - a) = 0$
roots of equation are $\tan\alpha$ & $\tan\beta$

$$\therefore \tan\alpha + \tan\beta = \frac{2b}{c+a} \text{ \& } \tan\alpha \tan\beta = \frac{c-a}{c+a}$$

57. (d)
58. (b) It's a GP series

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$$S_\infty = \frac{a}{1-r}$$

Here, a = 1, r = sin x

$$\frac{1}{1-\sin x} = \frac{3\sqrt{2}}{3\sqrt{2}-3}$$

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

$\therefore \sin x = \frac{1}{\sqrt{2}}$

$\Rightarrow x = 45^o$

59. (c) $A + B = 90^o \Rightarrow A = 90^o - B$ অ্যাচিভার্স

$\Rightarrow \sin A = \sin(90^o - B) = \cos B$

Similarly,

$\cos A = \sin B$, $\tan A = \cot B$

$\therefore \sin A.\cos B + \cos A.\sin B - \tan A.\tan B + \sec^2 A - \cot^2 B$

$= \cos^2 B + \sin^2 B - \cot B.\tan B + \sec^2 A - \tan^2 A$

$= 1 - 1 + 1 = 1$

60. (b) $\tan(A+B) = \frac{\frac{n}{n+1} + \frac{1}{2n+1}}{1 - \frac{n}{n+1} \times \frac{1}{2n+1}}$

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

$= \frac{2n^2 + 2n + 1}{2n^2 + 2n + 1} = 1$

61. (b)

62. (d)

63. (c)

64. (d) $\operatorname{cosec}\theta + \operatorname{cosec}^2\theta = 1$ অ্যাচিভার্স

$\operatorname{cosec}\theta = 1 - \operatorname{cosec}^2\theta$

$\operatorname{cosec}\theta = -\cot^2\theta$

$\cot^2\theta = -\operatorname{cosec}\theta$ ..(i)

$(\cot^{12}\theta - 3\cot^{10}\theta + 3\cot^8\theta - \cot^6\theta)$

$= (\cot^4\theta - \cot^2\theta)^3$

$= (\operatorname{cosec}^2\theta - \cot^2\theta)^3$ (from eq (i))

$= 1^3 = 1$

65. (a) Max. value of $\sin\theta = 1$

So, $\sin^3\theta + 2\sin^2\theta + 3\sin\theta$

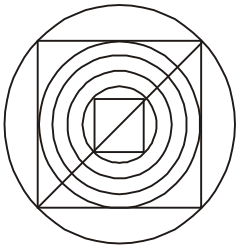
$= 1 + 2 + 3 = 6$

At $\theta = 0^o$, $\sin\theta = 0$

$\sin^3\theta + 2\sin^2\theta + 3\sin\theta = 0$

So, statement (1) is correct.

66. (d)



$\Rightarrow$ Diagonal of innermost square

$= \sqrt{50} \times \sqrt{2} = 10$ cm

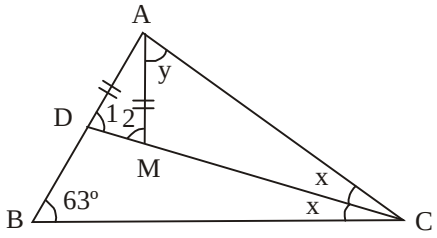
$\Rightarrow$ Diagonal of outermost square

$= 10 + 2.75 \times 8 = 32$ cm

$\therefore$ Side of outermost square

$= \frac{32}{\sqrt{2}} = 16\sqrt{2}$ cm

67. (c)



In ΔBDC,

$\angle 1 = 63 + x$ অ্যাচিভার্স

In ΔAMC,

$\angle 2 = x + y$

$AM = AD$ given

$(\angle 1 = \angle 2)$

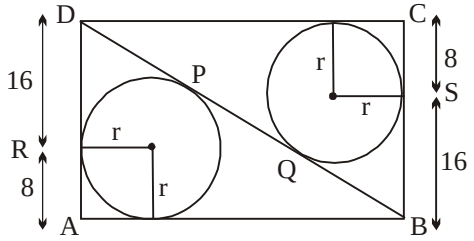
$63 + x = x + y$

$y = 63^o$

$\angle MAC = 63^o$

$2.\angle MAC = 126$

68. (a)



In right angle ΔABD

$BD = \sqrt{32^2 + 24^2} = 40$ cm

Now, In ΔABD, inradius is given by

$r = \frac{P + B - H}{2} = \frac{32 + 24 - 40}{2}$ অ্যাচিভার্স

$\Rightarrow r = 8$ cm

$\therefore DR = (24 - 8)$ cm $= 16$ cm

Also,

From a point D, length of two tangents will be equal

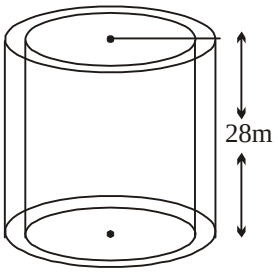
$DR = DP = 16$ cm

Similarly, for the second circle

$BS = BQ = 16$ cm

$\therefore$ Required length of $PQ = 40 - 16 - 16 = 8$ cm

69. (a)



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Volume of cylinder = 2464 cm^3

$\pi(R^2 - r^2)h = 2464$

$\Rightarrow \frac{22}{7} \times \left(8^2 - r^2\right) \times 28 = 2464$

$\Rightarrow r = 6$ cm

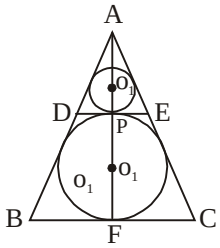
$\therefore$ Total surface area

$= 2\pi Rh + 2\pi rh + 2\pi (R^2 - r^2)$

$= 2\pi h (R + r) + 2\pi (R^2 - r^2)$

$= 2 \times \frac{22}{7} \times 28(8+6) + 2 \times \frac{22}{7} \times (8^2 - 6^2) = 2640$

70. (c)



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ABC is an equilateral triangle

$AF = \frac{\sqrt{3}a}{2} = \frac{\sqrt{3}}{2} \times 54 = 27\sqrt{3}$

$\therefore$ In radius $(R_1) = \frac{a}{2\sqrt{3}} = \frac{54}{2\sqrt{3}} = 9\sqrt{3}$

$\therefore AP = AF - 2R_1$

$= 27\sqrt{3} - 9\sqrt{3} \times 2 = 9\sqrt{3}$

Now, ΔADE is also an equilateral triangle

$AP = \frac{\sqrt{3}}{2} DE = 9\sqrt{3}$

$DE = 18$ cm

In radius of ΔADE

$= \frac{DE}{2\sqrt{3}} = \frac{18}{2\sqrt{3}} = 3\sqrt{3}$ cm

71. (c) $(2r - h) = \sqrt{h^2 + r^2}$

$(2r - h)^2 = h^2 + r^2$

$4r^2 + h^2 - 4hr = h^2 + r^2$

$r(3r - 4h) = 0$

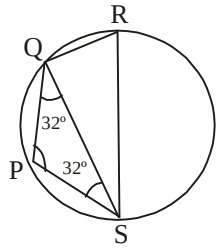
$3r = 4h$

$\frac{r}{h} = \frac{4}{3}$

$\frac{\text{Vol of cylinder}}{\text{Vol. of hemisphere}} = \frac{\pi r^2 h}{\frac{2}{3}\pi r^3} = \frac{3h}{2r}$

$= \frac{9}{8}$

72. (c)



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As PQ = PS

Then $\angle PQS = \angle PSQ = 32^\circ$

$\angle QPS = 116^\circ$

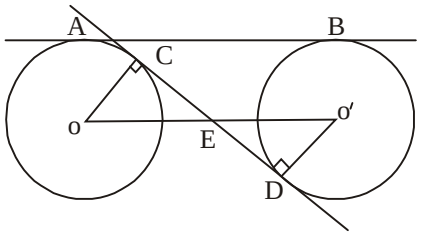
As PQRS is a cyclic quadrilateral then $\angle QPS + \angle QRS = 180^\circ$

$\angle QRS = 180^\circ - 116^\circ = 64^\circ$

$\because$ RS is the diameter of the circle $\angle RQS = 90^\circ$

$\therefore \angle QSR = 180 - (90 + 64) = 26^\circ$

73. (d)



OC = O′D = 7 cm (radius)

CD = 48 cm

$\Delta COE \sim \Delta DO'E$

$\frac{OC}{O'D} = \frac{CE}{DE} = 1$

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In ΔCOE

$OE^2 = C'E^2 + OC^2$

$= 24^2 + 7^2 = 625$

$OE = 25$ cm

$\therefore OO' = OE + EO' = 25 + 25 = 50$ cm

$\therefore AB = 50$ cm.

74. (a)

75. (c) As, Area ABD $= \frac{1}{2}$ area ABC

$\Rightarrow \frac{1}{2}y \times x = \frac{1}{2} \times \frac{1}{2} \times (z+y) \times x$

$\Rightarrow y = \frac{z+y}{2} \Rightarrow z = y$

Now, AD $= \sqrt{x^2 + y^2}$

& $w^2 = x^2 + (y+z)^2$

$w^2 = x^2 + 4y^2$

$\Rightarrow x^2 = w^2 - 4y^2$

$\therefore AD = \sqrt{w^2 - 3y^2}$

76. (d)

$$20 = \frac{1}{2}\begin{vmatrix} 1 & 1 & 1 \\ x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \end{vmatrix} = \frac{1}{2}\begin{vmatrix} 1 & 1 & 1 \\ -5 & 3 & x' \\ 0 & 0 & y' \end{vmatrix}$$

$40 = (3y' - 0) + (0 + 5y') + 0$

$y' = \pm 5$

and corresponding $x = 7$ or -3

Co-ordinates of third point (7, 5) or (–3, –5)

77. (c) The co-ordinates of the point of division are

$$= \left(\frac{3k-4}{k+1} \cdot \frac{7k+5}{k+1}\right)$$

But it lies on y-axis then

$\frac{3k-4}{k+1} = 0$

$k = \frac{4}{3}$

Required ratio is 3 : 4

78. (c) If centroid is at origin then,

$\frac{a+b+c}{3} = 0$

$(a + b + c) = 0$

Hence, $a^3 + b^3 + c^3 - 3abc = 0$

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

79. (b) Slope of AB, $m_1 = \frac{5-5}{4-3} = 0$

Slope of AC, $m_2 = \frac{6-5}{4-3} = 1$

$\therefore \tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right| = \left|\frac{0-1}{1+0}\right| = 1$

So $\theta = 45^\circ$

80. (c) Let the coordinate of the moving point P be (h, k).

Then, $[h - (m+n)]^2 + [k - (n-m)]^2$

$[h - (m-n)]^2 + [k - (n+m)]^2$

$\Rightarrow h^2 + (m+n)^2 - 2h(m+n) + k^2 + (n-m)^2 - 2k(n-m)$

$= h^2 + (m-n)^2 - 2h(m-n) + k^2 + (n+m)^2 - 2k(m+n) \Rightarrow -2[h(m+n) + k(n-m)]$

$= -2[h(m-n) + k(m+n)]$

$\Rightarrow mh + nh + nk - mk = mh - nh + mk + nk$

$\Rightarrow 2nh = 2mk \Rightarrow nh = mk$

$\therefore$ Required locus is $nx = my$

81. (c) Required ratio $= \frac{\frac{220000}{100} \times \frac{85}{11} \times 7}{\frac{200000}{100} \times \frac{58}{5} \times 3} = \frac{595}{348}$

82. (a) Total population of city 5

$= \frac{\left[\frac{259210}{7} \times 16\right]}{92} \times 100 = 644000$

83. (d) City 1 = 80% of 250000 = 200000
City 2 = 85% of 200000 = 170000
City 3 = 78% of 220000 = 171600
City 4 = 63% of 300000 = 189000
City 5 = 92% of 150000 = 138000
City 6 = 58% of 400000 = 232000
So, City 6 > City 1 > City 4 > City 3 > City 2 > City 5

84. (d) Average amount of interest paid by the Company during the given period:
= Rs. (23.4 + 32.5 + 41.6 + 36.4 + 49.4)/5
= Rs. 36.66 lakhs.

85. (b) Required percentage

$= \frac{(83+108+74+88)}{(342+324+336+420)} \times 100 = 24.824\%$

86. (c) Required percentage:
[(288 + 98 + 3.00 + 23.4 + 83)]
(420 + 142 + 3.96 + 49.4 + 98)] x100%
= 69% (Approx.)

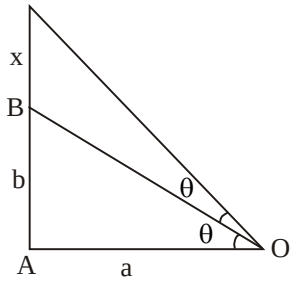
87. (c) Average production $= \frac{1200}{6} = 200$
In 2012, 2013 and 2014 the production is more than 200.

88. (b) Required ratio

$= \frac{100+125+200+225+275+275}{175+150+125+175+175+225}$

$= \frac{1200}{1025} = \frac{48}{41}$

89. (b)



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$\tan\theta = \frac{b}{a}$

$\tan 2\theta = \frac{b+x}{a}$

$\frac{2\tan\theta}{1-\tan^2\theta} = \frac{b+x}{a}$

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

$\frac{2b.a^2}{a^2-b^2} = b+x$

$b\left[\frac{2a^2-a^2+b^2}{a^2-b^2}\right] = x$

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$b\left[\frac{b^2+a^2}{a^2-b^2}\right] = x$

90. (a)

91. (d) $\alpha+\beta = \frac{-b}{a}, a\beta = \frac{b}{a}$

$\frac{a}{\beta} = \frac{p}{q}$

$p = k\alpha, q = k\beta$

$\sqrt{\frac{p}{q}} + \sqrt{\frac{q}{p}} + \sqrt{\frac{b}{a}} = \frac{p+q}{\sqrt{pq}} + \sqrt{\frac{b}{a}}$

$= \frac{-\frac{b}{a}}{\sqrt{\frac{b}{a}}} + \sqrt{\frac{b}{a}} = \frac{\frac{-b}{a}+\frac{b}{a}}{\sqrt{\frac{b}{a}}} = 0$

92. (d) Given equation

$x^2 + x + 1 = 0$

$\alpha+\beta = -1$ and $\alpha\beta = 1 \Rightarrow \beta = \frac{1}{\alpha}$

$\therefore \alpha + \frac{1}{\alpha} = -1$

$\Rightarrow \alpha^3 + \frac{1}{\alpha^3} = (-1)^3 - 3(-1) = -1+3 = 2$

$\Rightarrow \alpha^3 + \frac{1}{\alpha^3} = 2$

$\Rightarrow \alpha^3 + \beta^3 = 2$

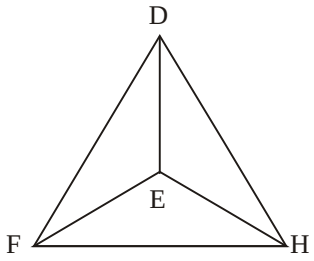
$\rightarrow$ The equation can be written as

x^2 – (sum of roots) x + product of roots = 0

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

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

93. (a)



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$DH = FH = DF = 16\sqrt{2}$

$\Delta DFH = \frac{\sqrt{3}}{4} \times \left(16\sqrt{2}\right)^2$

$= \frac{\sqrt{3}}{4} \times 16\sqrt{2} \times 16\sqrt{2}$

$= 64 \times 2\sqrt{3} = 128\sqrt{3}$

Area of $\Delta DEF = \Delta DEH = \Delta EFH$

$= \frac{1}{2} \times 16 \times 16 = 128$

Total surface area of pyramid $= 128\left(3+\sqrt{3}\right)$

94. (b)

Mark's Gap	No. of Students
0–10	30
10–20	22
20–30	13
30–40	16
40 above	26

No. of Students b/w 20 to 40 marks = 29

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95. (c) Percentage decrease $= \frac{32-27}{32} \times 100 = 15\frac{5}{8}\%$

96. (b)

97. (b) $a^2 + \frac{1}{4a^2} - 1 = 9$

$$a^2+\frac{1}{4a^2}=10 \ ...(i)$$

$$\left(a+\frac{1}{2a}\right)^2 = a^2+\frac{1}{4a^2}+1=11$$

$$a+\frac{1}{2a}=\sqrt{11}$$

$$a^2-\frac{1}{4a^2}=3\sqrt{11} \ ...(ii)$$

$$\left(a^2+\frac{1}{4a^2}\right)\left(a^2-\frac{1}{4a^2}\right)=30\sqrt{11}$$

98. (b) Given,

$x + y + z = 14$

Squaring both sides, we get

$x^2 + y^2 + z^2 + 2(xy + yz + zx) = 196$

$\Rightarrow 28 + 2(xy + yz + zx) = 196$

$\Rightarrow 2(r + r^2 + r^3) = 168$

$\Rightarrow r + r^2 + r^3 = 84$

$\Rightarrow r + r^2 + r^3 = 4 + 16 + 64$

$\Rightarrow r = 4$

$\therefore xy = 4$ and $xz = 16$

$$\frac{xz}{xy}=\frac{16}{4}$$

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

99. (a) Let the initial investment of A and B is 18x & 7x respectively.

According to the question.

$\Rightarrow ((18x\times12)+16000)/((7x\times12)+56000)=2/1$

$x = 2000$

Total initial investment of A and B

$= (18 + 7) \times 2000 = \text{Rs. } 50000$

100. (b) $P = M - D - \frac{MD}{100}$

$$25 = M - 20 - \frac{20M}{100}$$

$$45 = \frac{4M}{5}$$

$$M = \frac{225}{4}\%$$

$25\% \rightarrow 6000$

$100\% \rightarrow 24000$ Rs.

advertised Price

$$= 24000 + 24000\times\frac{225}{400}$$

$= 24000 + 13500$

$= 37500$ Rs.

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