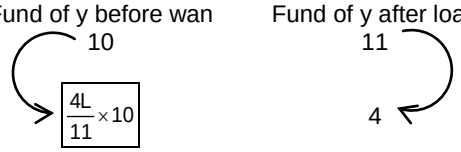
37. A Business Group has 3 Companies X,Y,Z and a Trust P which is engaged in charitable activities. Each group company has to donate 5% of its own funds to the Trust, excluding the loan which the company has taken from other companies of the group. X has given a loan to Y which is equivalent to 10% of the funds of Y. After receiving the loan, Y has funds which are 2 times the funds of Z. If Z gave Rs. 10.000 as donation to the Trust P, how much is the approximate contribution of Y to the Trust P?

(a) Rs. 17,000 (b) Rs. 18,000 (c) Rs. 19,000 (d) Rs. 20,000

Fund of z = 2L.
Fund y after loan from x = 4L
Fund of y before wan Fund of y after loan



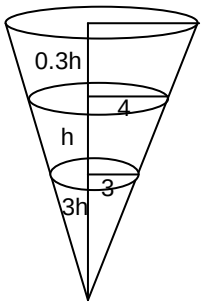
$\therefore$ Duration from y to P

$= 5\%\text{ of }\frac{4L}{11}\times 10 = 18181.81$

Answer is B. (Rs. 18000)

38. A bucket contains 200cc of liquid. A solid ball is dropped in the bucket resulting in the rise of liquid level to 1.3 times of its original level. If the radius of the base of the bucket is 3 cm and the radius of the surface of the liquid level is 1cm more than the radius of the base of the bucket before the ball is dropped. Find the volume of the solid metal ball.

(a) 68cc (b) 80cc (c) 92cc (d) Can't be determined



Vol. of frustum $= \frac{1}{3}\pi(4)^2(4h) - \frac{1}{3}\pi \times 3^2 \times 3h = 200$

$\Rightarrow \frac{1}{3}\pi h\left(4^3 - 3^3\right) = 200$

Vol. of sphere $= \frac{1}{3}\pi(4.3)^2 \times 5.2h - \frac{1}{3}\pi \times 4^2 \times 4h$

$\Rightarrow \frac{200}{V} = \frac{4^3 - 3^3}{(4.3)^3 - 4^3}$

$\Rightarrow V = \frac{200 \times 15.5}{37}$

$= 83 \approx 80$ option (b).

39. P.....Q
R.....S
T ..... U
V.....W

Using 5 dots in each of the lines PQ, RS, TU and VW as the vertices, how many triangles can be drawn such that the base is on any one of the above lines?

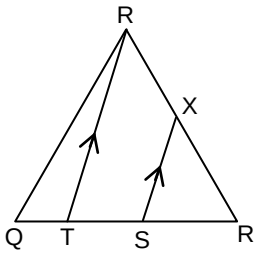
(a) 120 (b) 150 (c) 200 (d) 600

Taking any two pts in a line = $^5C_2$
Taking any are Points from rest of lines = $^{15}C_1$

Choosing any are line as base ${}^4C_1$.
${}^4C_1 \times {}^{15}C_1 \times {}^5C_2$
4 x 15 x 10
= 600 (d)

40. In the triangle PQR, S is the midpoint of QR. X is any point on PR. T is the point on QR such that PT || SX. If the area of triangle PQR is 5.8 sq. cm, then the area of triangle RTX is
(a) 2.9 sq. cm (b) 3.2 sq. cm (c) 5.8 sq. cm (d) 2.45 sq. cm

Δ PQR = 5.8 so cm.

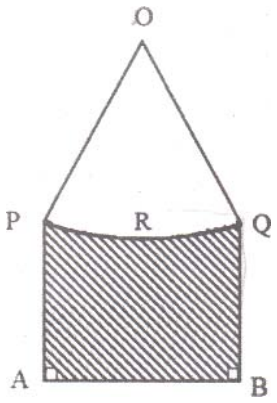


Area of Δ R x T will be less than half area of the Δ PQR
$\frac{5.8}{2} = 2.9$
$\therefore$ Area of Δ R x T = 2.45 (d).

41. Given $P(x,y) = x^2 + xy + y^2$; $Q(x,y) = x^2 - xy + y^2$.
Find the value of P(7, Q(9,4))
(a) 4169 (b) 4197 (c) 4089 (d) 4127

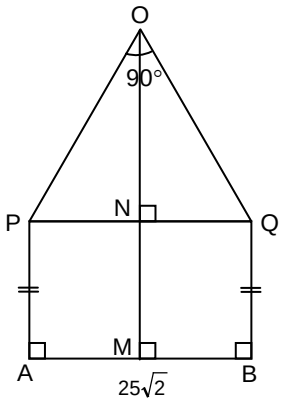
C (a, n) = 81 – 36 + 16 = 61
$P(7 \times 61) = 7^2 + (7 \times 61) + 61^2$
= 49 + 427 + 3721
= 4197 (b).

42. In the given figure, PA=QB and PRQ is the arc of the circle, centre of which is O such that angle POQ = 90°. If AB= 25√2cm and the perpendicular distance of AB from centre O is 30cm. Find the area of the shaded region?



(a) 625√2 sq. cm (b) $625\left(\frac{1}{2}+\frac{\pi}{4}\right)$ sq. cm

(c) $750\sqrt{2} - 625\left(\frac{1}{2}+\frac{\pi}{4}\right)$ sq. cm (d) None



OM = 30

$PQ = 25\sqrt{2}$

$PN = \frac{25}{\sqrt{2}}$

Δ PON = 45 – 45 - 90°

$\therefore$ ON = $\frac{25}{\sqrt{2}}$ $\therefore$ NM = 30 – $\frac{25}{\sqrt{2}} = \frac{(30\times 2-25)}{\sqrt{2}}$

$\therefore OP = \frac{25}{\sqrt{2}}\times\sqrt{2} = 25$ cm

$\therefore$ Area of shaded faction = Area of PQ BA – Area of segment

$$= \left[25\sqrt{2}\times\left(\frac{30\sqrt{2}-25}{\sqrt{2}}\right)\right] - \left[\frac{625\pi}{4} - \frac{1}{2}\times 625\right]$$

$$= 750\sqrt{2} - 625 - 625\pi + \frac{625}{2}$$

(e) $Q = 750\sqrt{2} - 625\left(\frac{1}{2}+\frac{\pi}{4}\right)$.

43. The roots of quadratic equation y^2-8y+14=0 are α and β. Find the value of $(1+\alpha+\beta^2)(1+\beta+a^2)$

(a) 419 (b) 431 (c) $485 + 3\sqrt{22}$ (d) $453 + \sqrt{22}$

$y^2 - 8y + 14 = 0$

$y = \frac{8\pm\sqrt{64-56}}{2} = \frac{8\pm 2\sqrt{2}}{2} = 4\pm\sqrt{2}$

$$\left[1+\left(4+\sqrt{2}\right)+\left(4-\sqrt{2}\right)^2\right]\left[1+\left(4-\sqrt{2}\right)+\left(4+\sqrt{2}\right)^2\right]$$

$$\left(1+4\sqrt{2}+16+7-8\sqrt{2}\right)\left(1+4-\sqrt{2}+16+2+8\sqrt{2}\right)$$

$$= \left(23-7\sqrt{2}\right)\left(23+7\sqrt{2}\right)$$

= 529 – 98 = 431

44. $\frac{1}{\log_x yz+1} + \frac{1}{\log_y xz+1} + \frac{1}{\log_z xy+1} = ?$

(a) 0 (b) 1 (c) xyz (d) $\frac{\log xyz}{\log xyz+1}$

$$\frac{1}{\log_x y^2+1} = \frac{1}{\frac{\log y2+1}{\log x}} = \frac{\log x}{\log xyz}$$

Similarly: - expression given $= \frac{\log x}{\log xyz} + \frac{\log y}{\log xyz} + \frac{\log z}{\log xyz}$

45. Ram, Ravi and Ratan can alone finish an assignment in 9 days, 12 days and 15 days respectively. They decide to complete a work by working in turns. Ram works alone on Monday, Ravi does the work alone on Tuesday, followed by Ratan working alone on Wednesday & so on. What proportion of the complete work is done by Ravi?

(a) 2/9 (b) 12/47 (c) 1/3 (d) 4/9

	Ram	Ravi	Ratan	Ram + Ravi + Ratan (3 day cycle)	Ram	Ravi	Ratan
Days	9	12	15	3	1	1	$\frac{9}{20}$
Rate	20	15	12	47	20	15	20
Work		180		141	20	15	9

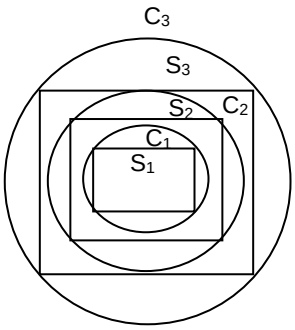
Ravi would work for 4 days

$\frac{15\times 4}{180}=\frac{60}{180}=\frac{1}{3}.$

Answer C.

46. Let Si be a square of side 4 cm. Circle C_1 circumscribes the square S_1 such that all its comers are on C_1. Another square S_2 circumscribes the circle C_1. Circle C_2 circumscribes the square S_2, and square S_3 circumscribes circle C_2, & so on. If A_N is the area between the square S_N and the circle C_N, where N is the natural number, then the ratio of sum of all A_N to A_1 is

(a) 1 (b) $\frac{\pi}{2}-1$ (c) Can't be determined (d) None of these



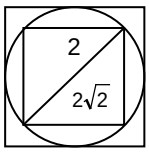
Area of $S_1 = 4$

A_1 = Area of C_1 and S_1.

$= (2\pi - 4)$

$A_2 = (4\pi - 8)$

$A_3 = (8\pi - 16)$



Req. Ratio $= \frac{(2\pi-4)+(4\pi-8)+(8\pi-16)}{2\pi-4}$

$\frac{\cancel{(2\pi-4)}[1+2+4+8.....4]}{\cancel{(2\pi-4)}}$

N is not known hence 'c'.

Cannot be determined.

47. Joseph diametrically crosses a semi-circular playground and takes 48 seconds less than if he crosses the playground along the semi-circular path. If he walks 50 metres in one minute, the diameter of playground is

(a) 54 metres (b) 70 metres (c) 85 metres (d) 35 metres

$\pi r - 2r = \frac{48}{60}\times 50$

$\therefore$ r = 35m

$\therefore$ Diameter = 2 x 35 = 70 m

48. Garima had only Rs. 200, Rs. 500 and Rs. 2000 notes in her wallet. She goes to Shoppers Stop, purchases some dresses and gives half of her Rs. 2000 notes & in turn receives same number of Rs. 200 notes. She then goes to a restaurant and gives all her Rs. 500 notes and receives thirty Rs. 2000 notes, which increases the number of Rs. 2000 notes she had by 75%. If now she has fifty Rs. 200 notes, what were the original number of Rs. 2000 and Rs. 200 notes she had at the start?

(a) 60, 10 (b) 60, 15 (c) 80, 10 (d) 80, 15

Using options,
Option (c)

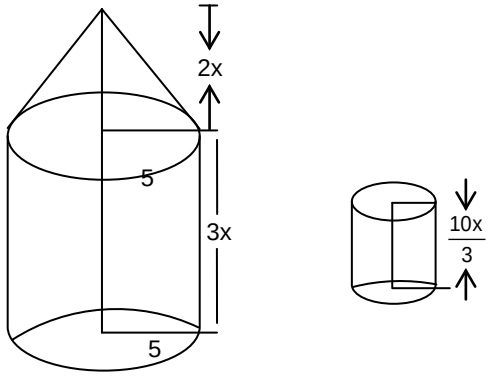
	200	500	2000
Initially	10	x	80
After shoppers stop	10	x	40
After rest	50	0	70

Number of 200 notes = 50 & increase in 200 notes = $\frac{30}{40}\times 100 = 75\%$

Option (c).

49. A metallic solid is made up of a solid cylindrical base with a solid cone on its top. The radius of the base of the cone is 5 cm. and the ratio of the height of the cylinder and the cone is 3:2. A cylindrical hole is drilled through the solid with height equal to 2/3rd of the height of solid. What should be the radius (in cm) of the hole so that the volume of the hole is 1/3rd of the volume of the metallic solid after drilling?

(a) $\sqrt{\frac{45}{8}}$ (b) $\sqrt{\frac{35}{8}}$ (c) $\sqrt{\frac{65}{8}}$ (d) $\sqrt{\frac{55}{8}}$



Volume of cylindrical hole $=\frac{1}{4}\times$ volume of solid

$\frac{1}{4}\left[\pi(5)^2(3x)+\frac{1}{3}\pi(5)^2(2x)\right]$

On solving, $r=\sqrt{\frac{55}{8}}$

Option (d).

50. Nitin installed an overhead tank on the roof of his newly constructed house. Three taps are connected to the tank: *2* taps A and B to fill the tank and one tap C to empty it. Tap A alone can fill the tank in 12 hours, while tap B alone takes one and a half times more time than tap A to fill the tank completely. Tap C alone can empty a completely filled tank in 36 hours. Yesterday, to fill the tank, Nitin first opened tap A, and then after 2 hours opened tap B also. However after 6 hours he realised that tap C was open from the very beginning. He quickly closes tap C. What will be the total time required to fill the tank?

(a) 8 hours 48 minutes (b) 8 hours 30 minutes (c) 9 hours 12 minutes (d) 9 hours 36 minutes

Solution With family international

A	B	–C	A – C	A + B – C	A + B
3	2	1	2	9	5
12	18	36	2	4	$\frac{16}{5}=3\frac{1}{5}$
36	36	36	4	16	16

Total $2 + 4 + 3\frac{1}{5}$ hour

= 9 hour & 12 min

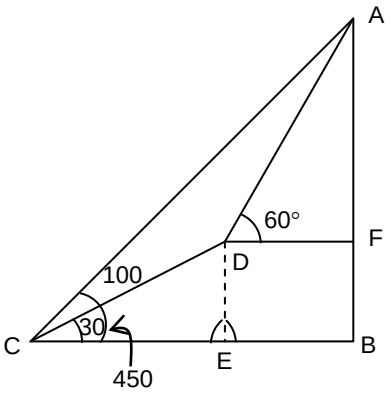
Option (c).
Actual solution no. option mate hours

Total time = $2 + 4 + 4\ \frac{4}{7}$

$= 10\frac{4}{7}$ hour .

51. At the foot of the mountain, the angle of elevation of the summit at the top of the mountain is 45°. After ascending 100 metres, at a slope of 30° up the mountain towards the summit, the angle of elevation of the summit is 60°. Find the height of the summit

(a) $50(\sqrt{3}+1)$ metres (b) $50(\sqrt{5}+1)$ metres (c) $50(\sqrt{3}+2)$ metres (d) $50\sqrt{3}$ metres



Let AB = h $\Rightarrow$ BC = h ($\therefore$ tan 4 5° = 1)
& CDE is a 30 – 60 – 90 triangle
$\therefore$ CE = $50\sqrt{3}$ & De = 50
In ΔAFD, AF = h – 50 & DF = h – $50\sqrt{3}$

$\tan 60° = \frac{AF}{FD}$

$\sqrt{3} = \frac{h-50}{h-50\sqrt{3}}$

On solving, h = 50 $\left(\sqrt{3}+1\right)$ option A.

52. Land Cruiser Prado, the latest SUV from Toyota Motors, consumes diesel at the rate of $\frac{1}{400}\left\{\frac{1000}{x}+x\right\}$ litres per Km, when travelling at the speed of x km/hr. The diesel costs Rs. 65 per litre and the driver is paid Rs. 50 per hour. Find the steady speed that will minimize the total cost of a 1000 km trip?

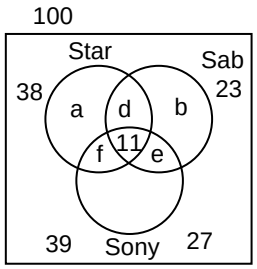
(a) 33 km/hr (b) 36 km/hr (c) 39 km/hr (d) 52 km/hr

Total cost = 1000 x 65 x $\frac{1}{400}\left[\frac{100}{x}+x\right]+\frac{1000}{x}\times 50$

Dift. W.r. to x & equate it to zero,
We get,
x = 36 kmph (approx)
option (b).

53. In a survey on the viewership of the TV channels, 73% of those surveyed viewed at least one of the three Channels: Star Plus, Sab TV, and Sony. 38% of those surveyed viewed Star Plus, 39% viewed Sony, and 23% viewed Sab TV. 11% of all those surveyed viewed all the three channels. What percentage of those surveyed, viewed more than one of the three TV channels?

(a) 16 (b) 38 (c) 27 (d) Data Inadequate



a + b + c + d +e + f = 62---------- (1)
a + d + f = 27 ---------- (2)
b + d + e = 12---------- (3)
c + e + f = 28---------- (4)
on adding (2), (3) & 4
a + b + c + 2(d + e + f) = 67---------- (5)
Subtract (1) from (5)
d + e + f = 5
$\therefore$ d + e + f + 11 = 5 + 11
Option (A) = 16.

54. A physical therapist of Russian football team knows that the team will play 40% of its matches on artificial turf, this season. Because of his vast experience, he knows that a football player's chances of incurring a knee injury is 50% higher if he is playing on artificial turf instead of grass. If the player's chances of a knee injury on artificial turf is 0.42, what is the probability that a football player with knee injury, incurred the injury while playing on grass?

(a) 0.28 (b) 0.336 (c) 0.5 (d) None of these

P(AT) = 40%
$\therefore$ P (grass) = 60%
P(Injury/AT) = 0.42
$\therefore$ P (Injury/grass) = 0.25 $\left(\frac{2}{3}\times 0.42\right)$
$\therefore$ The required probability $= \frac{0.25\times 0.6}{0.28\times 0.6 + 0.42\times 0.4} = 0.5$
Option (c).

55. The square root of $1+x^2+\sqrt{1+x^2+x^4}$ is

(a) $\frac{1}{\sqrt{2}}[\sqrt{1+x+x^2}+\sqrt{1-x+x^2}]$ (b) $\frac{1}{\sqrt{2}}[\sqrt{1+x+x^2}-\sqrt{1-x+x^2}]$

(c) $\frac{1}{\sqrt{2}}\sqrt{(1+x^2+x^4+x^8)}$ (d) None of these

Let us solve by options; let us square option A.

$$\left[\frac{1}{\sqrt{2}}\left(\sqrt{1+x+x^2}+\sqrt{1-x+x^2}\right)\right]^2$$

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

$$=\frac{1}{2}\left[2+2x^2+2\sqrt{1+2x^2+x^4-x^2}\right]$$

$$=1+x^2+\sqrt{1+x^2+x^4}$$

Which is the required expression
Hence option is (A).

56. $\log_2 x.\log_{\frac{x}{64}} 2 = \log_{\frac{x}{16}} 2$; then x = ?

(a) 2 (b) 4 (c) 12 (d) 16

$\log_2 x \times \log_{\frac{x}{64}} 2 = \log_{\frac{x}{16}} 2$

$\frac{\log x}{\cancel{\log 2}} \times \frac{\cancel{\log 2}}{\log x - \log 64} = \frac{\log 2}{\log x - \log 16}$ (let the base be 2)

$\frac{\log x}{\log x - 6} = \frac{1}{\log x - 4}$

$(\log x)^2 - 4\log x = \log x - 6$
$(\log x)^2 - 5\log x + 6 = 0$
$(\log x - 2)(\log x - 3) = 0$
$\log_2 x = 2$ or $\log_2 x = 3$
$x = 2^2 = 4$ or $x = 2^3 = 8$
option (b).