1. Ans. A.
As,
$log_{10}^{\left[1-\left\{1-\left(1-x^2\right)^{-1}\right\}^{-1}\right]^{-\frac{1}{2}}}$
$= log_{10}^{\left[1-\left\{1-\frac{1}{1-x^2}\right\}^{-1}\right]^{-\frac{1}{2}}}$
$= log_{10}^{\left[1-\left\{\frac{1-x^2-1}{1-x^2}\right\}^{-1}\right]^{-\frac{1}{2}}}$
$= log_{10}^{\left[1-\left\{-\frac{x^2}{1-x^2}\right\}^{-1}\right]^{-\frac{1}{2}}}$
$= log_{10}^{\left[1+\frac{1-x^2}{x^2}\right]^{-\frac{1}{2}}}$
$= log_{10}^{\left[\frac{1}{x^2}\right]^{-\frac{1}{2}}}$
$= log_{10}^{x^2\times\frac{1}{2}}$
$= log_{10}^{x}$
According to question
$log_{10}^{x} = 1$
$=> x = 10^1 = 10$
Hence option (b)
2. Ans. D.
As, $4x^2 - 16x + \frac{\lambda}{4} = 0$
$=> x^2 - 4x + \frac{\lambda}{16} = 0$
Sum of roots $(\alpha + \beta) = 4$
Product of roots $(\alpha\beta) = \frac{\lambda}{16}$
As $1 < \alpha < 2$.......... (i)
$2 < \beta < 3$ .... (ii)
From (i) and (ii)
$2 < \alpha\beta < 6$
$1 < \alpha\beta < 3$ [It is not possible because $\alpha + \beta = 4$]
So, $1 \times 3 < \alpha\beta < 2 \times 2$
$3 < \alpha\beta < 4$
⇨ $3 < \frac{\lambda}{16} < 4$
Hence total value of would be 15.
Hence option (d)
3. Ans. A.
As,
$\frac{6^2+7^2+8^2+9^2+10^2}{\sqrt{7+4\sqrt{3}}-\sqrt{4+2\sqrt{3}}}$
$= \frac{36+49+64+81+100}{\sqrt{4+3+4\sqrt{3}}-\sqrt{1+3+2\sqrt{3}}}$
$= \frac{330}{\sqrt{2^2+(\sqrt{3})^2+2\times2\times\sqrt{3}}-\sqrt{1^2+(\sqrt{3})^2+2\times1\times\sqrt{3}}}$
$= \frac{330}{\sqrt{(2+\sqrt{3})^2}-\sqrt{(1+\sqrt{3})^2}}$
$= \frac{330}{2+\sqrt{3}-1-\sqrt{3}}$
$= \frac{330}{1} = 330$
Hence option (a)
4. Ans. B.
As,
$x^2 = y + z$
Then $x^2 + x = x + y + z$
⇨ $x(1 + x) = x + y + z$
⇨ $\frac{1}{1+x} = \frac{x}{x+y+z}$
Similarly,
$\frac{1}{1+y} = \frac{y}{x+y+z}$
$\frac{1}{1+z} = \frac{z}{x+y+z}$
So,
$\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$
$= \frac{x}{x+y+z} + \frac{y}{x+y+z} + \frac{z}{x+y+z}$
$= \frac{x+y+z}{x+y+z}$
$= 1$
Hence option (b)
5. Ans. A.
As,
$5p9 + 3R7 + 2Q8 = 1114$ .... (i)
According to concept of addition
$9 + 7 + 8 = 24$ .... (ii)
$5 + 3 + 2 = 10$ .... (iii)
From (i), (ii) and (iii)
We can simply say that
$2 + P + R + Q = 11$ .... (iv)
Q would be maximum when P and R will be minimum.
So,
$P = R = 0$
From (iv)
$2 + 0 + 0 + Q = 11$
⇨ $Q = 11 - 2$
⇨ $Q = 9$
Hence option (a)
6. Ans. B.
As,
Number = LCM of (2, 3, 4, 5, 6) – (Difference of divisors and remainder)
$= 60 -$ Differences of divisors and remainder .... (i)

As number when divided by 2, 3, 4, 5, 6 gives remainder 1, 2, 3, 4,5 respectively
Then,
$2-1=1$
$3-2=1$
$4-3=1$
$5-4=1$
$6-5=1$
From (i)
Number $= 60 - 1 = 59$
Other number $= 59 \times 2 = 118$
Clearly, there is one number of set A which is below 100
Hence option (b)
7. Ans. B.
Let the number be x
According to question,
$8x - \frac{x}{8} = 2016$
⇨ $\frac{64x-x}{8} = 2016$
⇨ $63x = 2016 \times 8$
⇨ $x = \frac{2016\times 8}{63} = 256$
Hence option (b)
8. Ans. B.
As we know that for real roots of quadratic equation,
Discriminant ≥ 0
⇨ $a^2 - 4b \geq 0$
⇨ $a^2 \geq 4b$ ……….. (i)
The pairs which follows the condition will be (2, 1), (3,1), (3,2), (4,1), (4,2), (4,3), (4,4)
Hence total number of pairs = 7
Hence option (b)
9. Ans. C.
Let two positive integers be x and y such that $x > y$
According to question,
$x^2 + y^2 = 208$ ……. (i)
$x^2 = 18y$ ……. (ii)
From (i) and (ii)
$y^2 + 18y - 208 = 0$
⇨ $(y+26)(y-8) = 0$
⇨ $y = -26$ or $y = 8$
As, $x^2 = 18y$
If $y = -26$
Then $x^2 = 18 \times (-26)$ [Not possible]
If $y = 8$
Then $x^2 = 18 \times 8 = 144$
⇨ $x = 12$
Then $x - y = 12 - 8 = 4$
Hence option (c)
10. Ans. B.
As
$A = \{7,8,9,10,11,12\}$
$B = \{7,10,14,15\}$
$A - B = [x : x \in A \text{ and } x \notin B]$
So, $A - B = \{8,9,11,12\}$
Number of elements in $(A - B) = 4$
Also,
$B - A = [x : x \epsilon R \text{ and } x \notin A]$
So, $B - A = \{14,15\}$
Number of elements in $(B - A) = 2$
Hence option (b)
11. Ans. B.
As, a boy saves Rs. 4.65 daily.

Daily saving (in Rs.)	Number of days	Total savings (in Rs.)
4.65	10	46.5
4.65	20	93
4.65	21	97.65
4.65	25	116.25

From the table,
Clearly, in 20 days the boy will be able to save an exact number of rupees.
Hence option (b)
12. Ans. C.
Total number of rounds $= \frac{Total\ distance}{Distance\ per\ round}$
$= \frac{4}{0.25} = 16$
Speed of A : Speed of B
$= 5 : 4$
As we know that time $\alpha \frac{1}{speed}$
So, time taken by A : time taken by B
$= 4 : 5$
LCM of (4, 5) = 20
Number of Rounds completed by A = $\frac{20}{4} = 5$
Number of Rounds Completed by B = $\frac{20}{5} = 4$
When A will complete 5 rounds then B will complete 4 round and they meet at a point.
i.e. If A will complete 5×3 i.e. 15 rounds
Then he will meet to B.
Hence A will trice pass the B.
Hence option (c)
13. Ans. D.
Option (a):

$\frac{15}{1600} = 0.009375$ [Terminating decimal]
Option (b):
$\frac{23}{8} = 2.875$ [Terminating decimal]
Option (c):
$\frac{35}{50} = 0.7$ [Terminating decimal]
Option (d):
$\frac{17}{6} = 2.83333 \dots \dots = 2.\underline{83}$
[Non-Terminating repeating decimal]
Hence option (d)
14. Ans. B.
As, $25x^2 - 15x + 2 = 0$ .... (i)
If α and β are the roots of (i)
Then $\alpha + \beta = -\frac{(-15)}{25} = \frac{3}{5}$
$\alpha\beta = \frac{2}{25}$
If $(2\alpha)^{-1}$ and $(2\beta)^{-1}$ would be roots then
Sum of roots $= \frac{1}{2\alpha} \times \frac{1}{2\beta}$
$= \frac{\alpha+\beta}{2\alpha\beta}$
$= \frac{\frac{3}{5}}{2\times\frac{2}{25}}$
$= \frac{3}{5} \times \frac{25}{4} = \frac{15}{4}$
Product of roots $= \frac{1}{2\alpha} \times \frac{1}{2\beta}$
$= \frac{1}{4\alpha\beta}$
$= \frac{1\times25}{4\times2}$
$= \frac{25}{8}$
Quadratic equation be
$x^2 - (Sum\ of\ roots)x + Product\ of\ roots = 0$
⇨ $x^2 - \frac{15}{4}x + \frac{25}{8} = 0$
⇨ $8x^2 - 30x + 25 = 0$
Hence quadratic polynomial be
$8x^2 - 30x + 25$
Hence option (b)
15. Ans. A.
If any number in the term
$\frac{a^{p-1}}{p}$ where p = prime number
a & p are co-prime then remainder will be 1.
Given, p = 101 and a = 2
As, $\frac{2^{101-1}}{101}$ .... (i)
Equation (i) satisfies the standard form so, required remainder will be 1
Hence option (a)

16. Ans. D.
Let k be total number of worker
According to question,
Women worker $= \frac{1}{3} \times k$
Married women worker$= \frac{1}{3} \times k \times \frac{1}{2}$
$= \frac{1}{6} \times k$
Men Worker $= \left(1 - \frac{1}{3}\right) \times k$
$= \frac{2}{3} \times k$
Married Men worker $= \frac{2}{3} \times k \times \frac{3}{4}$
$= \frac{1}{2} \times k$
$\frac{Married\ women}{Married\ men} = \frac{\frac{1}{6}\times k}{\frac{1}{2}\times k}$
$= \frac{k}{6} \times \frac{2}{k} = \frac{1}{3}$
Hence, Married Women: Married man $= 1:3$
Hence option (d)
17. Ans. D.
Let efficiency of B be 100
So, efficiency of A be 150
$\frac{efficiency\ of\ A}{efficiency\ of\ B} = \frac{150}{100} = \frac{3}{2}$
According to question,
$\frac{work\ completed\ by\ A}{work\ completed\ by\ B} = \frac{2}{3}$
⇨ $\frac{work\ completed\ by\ A}{30} = \frac{2}{3}$
⇨ $work\ completed\ by\ A = 20$
Now, Let A and B completed the work in x hours
$\frac{x}{work\ completed\ by\ A} + \frac{12}{work\ completed\ by\ B} + \frac{x}{work\ completed\ by\ B} = 1$
⇨ $x\left[\frac{1}{20} + \frac{1}{30}\right] = 1 - \frac{12}{30}$
⇨ $x \times \frac{5}{60} = \frac{18}{30}$
⇨ $x = \frac{18}{30} \times \frac{60}{5} = 7.2\ hrs$
Hence the required hours be 7.2 hrs
Hence option (d)
18. Ans. B.
Let original speed be 100 then increased speed be 120 time taken in original speed be t
Then time taken in increase speed be $(t - 20)$
As, distance in the both cases will be same
So, $100t = 120(t - 20)$
⇨ $5t = 6(t - 20)$
⇨ $5t = 6t - 120$
⇨ $6t - 5t = 120$
⇨ $t = 120\ minutes$

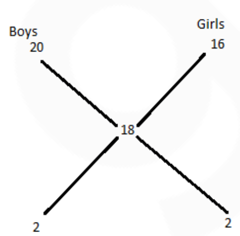
19. Ans. C.
Let maximum marks be p
Marks obtained by A $= \frac{xp}{100}$
Minimum passing marks for
A $= \frac{xp}{100} + a$ …… (i)
Marks obtained by B $= \frac{yp}{100}$
Minimum passing marks for
B $= \frac{yp}{100} - b$…… (ii)
As (i) and (ii), we get
$\frac{xp}{100} + a = \frac{yp}{100} - b$
$\frac{xp}{100} - \frac{yp}{100} = -a - b$
⇨ $\frac{p}{100}(x-y) = -(a+b)$
⇨ $p = -\frac{(a+b)\times 100}{x-y}$
⇨ $p = \frac{100(a+b)}{y-x}$
Hence option (c)
20. Ans. A.
As p and q are the roots of $x^2 + px + q = 0$
Then sum of roots $= p + q = -p$
⇨ $2p + q = 0$ …….. (i)
Also, product of roots = pq = q
⇨ $pq - q = 0$
⇨ $q(p-1) = 0$
⇨ $p = 1$ or $q = 0$
If $q = 0$ from (i)
$p + q = -p$
⇨ $2p + q = 0$
⇨ $2p + 0 = 0$
⇨ $p = 0$
Hence p = 0 or 1
Hence option (a)
21. Ans. D.
Given, cost of 2.5 kg rice $= Rs. 125$
Cost of 9 kg rice $= Rs. \frac{125}{2.5} \times 9$
= cost of 4 kg pulse
Cost of 14 kg pulses $= \frac{125\times 5}{2.5\times 4} \times 14 =$ cost of 1.5 kg tea
Cost of 2 kg tea $= \frac{125\times 9\times 14\times 2}{2.5\times 4\times 1.5} =$ cost of 5 kg nuts
Cost of 11 kg nuts $= Rs. \frac{125\times 9\times 14\times 2\times 11}{2.5\times 4\times 1.5\times 5}$
$= \frac{125\times 9\times 14\times 2\times 11}{25\times 4\times 15\times 5} \times 100$
= 4620
Hence required cost be Rs. 4620
Hence option (d)

22. Ans. C.
Given, number be 1729
$1729 = 12^3 + 1^3$ and
$1729 = 10^3 + 9^3$
i.e. 1729 can be written as the sum of the cubes of two positive integers in two ways only.
Hence option (c)
23. Ans. D.
Let cost price $= Rs. 100$
Market price $= 100 + \frac{100\times 20}{100}$
$= Rs. 120$
Selling price after distance $= 120 - \frac{120\times 10}{100}$
$= 120 - 12 = Rs. 108$
Profit $= \frac{108-100}{100} \times 100$
= 8%
Hence option (d)
24. Ans. D.
Statement 1:
If we take two prime numbers viz 2 and 3 then HCF be 1
Statement 2:
If 7 and 25 be the prime and composite numbers respectively
Then the HCF of 7 and 25 be 1
Statement 3:
If 25 and 16 be the two composite numbers
Then their HCF be also 1
Hence all the three statements are correct.
Hence option (d)
25. Ans. A.
Given,
$\sqrt{1 + \frac{1}{1^2} + \frac{1}{2^2}} + \sqrt{1 + \frac{1}{2^2} + \frac{1}{3^2}} + \cdots \ldots \ldots + \sqrt{1 + \frac{1}{2007^2} + \frac{1}{2008^2}}$
$= \sqrt{\left(\frac{3}{2}\right)^2} + \sqrt{\left(\frac{7}{6}\right)^2} + \cdots \ldots \ldots + \sqrt{\frac{(2007\times 2008+1)^2}{2007^2\times 2008^2}}$
$= \frac{3}{2} + \frac{7}{6} + \frac{13}{12} + \cdots + \frac{2007\times 2008+1}{2007\times 2008}$
$= 1 + \frac{1}{1\times 2} + 1 + \frac{1}{2\times 3} + 1 + \frac{1}{3\times 4} + \cdots \ldots +1 + \frac{1}{2007\times 2008}$
$= 2007 + 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \cdots \ldots + \frac{1}{2007} - \frac{1}{2008}$
$= 2008 - \frac{1}{2008}$
Hence option (a)

26. Ans. D.
Let speed of boat and current be x and y.
According to question,
$x + y = \frac{20}{2} = 10$ ..... (i)
$x - y = \frac{4}{2} = 2$ .... (ii)
Adding (i) and (ii) we get
$2x = 12$
⇨ $x = 6$
From (i)
$y = 10 - x = 10 - 6 = 4$
Thus speed of current be 4 km/hr
Hence option (d)
27. Ans. A.
Let x and y be $2n + 1$ and $2n + 3$ respectively.
Then,
$x^2 + y^2 = (2n + 1)^2 + (2n + 3)^2$
$= 8n^2 + 16n + 10$
$= 8n^2 + 16n + 8 + 2$
$= 4[2n^2 + 4n + 2] + 2$
i.e. $x^2 + y^2$ is an odd number but not necessarily a multiple of 4
Hence only statement 1 is correct.
Hence option (a)
28. Ans. C.
As,
$2^{x+2}27^{\frac{x}{x-1}} = 3^2$
⇨ $2^{x+2} = \frac{3^2}{3^{\frac{3x}{x-1}}} = 3^{2-\frac{3x}{x-1}}$
⇨ $2^{x+2} = 3^{\frac{-x-2}{x-1}}$
Taking log both sides
$(x + 2)\ log\ log\ 2\ = -\frac{(x+2)}{(x-1)} log\ log\ 3$
$(x + 2)(x - 1) = -(x + 2)\frac{loglog\ 3}{loglog\ 2}$
$(x + 2)(x - 1) + (x + 2)\frac{loglog\ 3}{loglog\ 2} = 0$
$(x + 2)\left[x - 1 + \frac{loglog\ 3}{loglog\ 2}\right] = 0$
Either $x + 2 = 0$
⇨ $x = -2$
Or $x - 1 + \frac{loglog\ 3}{loglog\ 2} = 0$
⇨ $x = 1 - \frac{loglog\ 3}{loglog\ 2}$
Hence option (c)
29. Ans. C.
As ratio of investment of
$A: B: C: D: E: F: G: H: I: J: K: L$be
1: 2: 3: 4: 5: 6: 7: 8: 9: 10: 11: 12
Duration of investment of
$A: B: C: D: E: F: G: H: I: J: K: L$be
12: 11: 10: 9: 8: 7: 6: 5: 4: 3: 2: 1
Multiplying ratio of investment and time we get ratio
12: 22: 30: 36: 40: 42: 42: 40: 36: 30: 22: 12
.... (i)
i.e. F and G equal maximum profit [From (i)]
Hence option (c)
30. Ans. D.
As,
$2^{122} + 4^{62} + 8^{42} + 4^{64} + 2^{130}$
$= 2^{122} + 2^{2\times62} + 2^{3\times42} + 2^{2\times64} + 2^{130}$
$= 2^{122} + 2^{124} + 2^{126} + 2^{128} + 2^{130}$
$= 2^{122}(1 + 2^2 + 2^4 + 2^6 + 2^8)$
$= 2^{122}(1 + 4 + 16 + 64 + 256)$
$= 2^{122} \times 341$
Here 341 is divisible by 11.
Hence $2^{122} + 4^{62} + 8^{42} + 4^{64} + 2^{130}$ will be divisible by 11
Hence option (d)
31. Ans. D.
As,
$2p + 3q = 12$ .... (i)
And $4p^2 + 4pq - 3q^2 = 126$
⇨ $(2p)^2 + 2 \times 2p \times q + q^2 - 4q^2 = 126$
⇨ $(2p + q)^2 - (2q)^2 = 126$
⇨ $(2p + q + 2q)(2p + q - 2q) = 126$
⇨ $12 \times (2p - q) = 126$ [From (i)]
⇨ $2p - q = \frac{126}{12} = \frac{21}{2}$ .... (ii)
From (i) and (ii)
$4p = 12 - \frac{21}{2} = \frac{3}{2}$
⇨ $q = \frac{3}{8}$
Putting the value of q in (i)
$2p = 12 - 3q = 12 - 3 \times \frac{3}{8}$
⇨ $2p = \frac{96-9}{8} = \frac{87}{8}$
⇨ $p = \frac{87}{16}$
Now,
$p + 2q = \frac{87}{16} + 2 \times \frac{3}{8}$
$= \frac{87+12}{16} = \frac{99}{16}$
Hence option (d)
32. Ans. C.
Let $x = 3^{30}$
Taking log both sides
$log_{10}^{x} = log_{10}^{3^{30}}$
⇨ $log_{10}^{x} = 30log_{10}^{3} = 3 \times 0.4711$
⇨ $log_{10}^{x} = 14.3130$

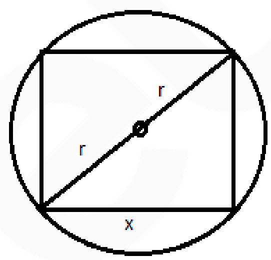
Now, taking antilog both sides,
x =Antilog of 14.313
Hence number of digits (n)
$= 14 + 1 = 15$
Hence option (c)
33. Ans. D.
As we know that unit digit in 7^4 will be 1
Now, $139 = 4 \times 34 + 3$
$7^{139} = 7^{4\times34+3}$
$= 7^{4\times34} \times 7^3$
$= (7^4)^{34} \times (7 \times 7 \times 7)$ .... (i)
The unit digit in $(7^4)^{34}$ will be 1 and the unit digit in $7 \times 7 \times 7$ will be 3.
Thus, unit digit of $(7^4)^{34} \times (7 \times 7 \times 7)$will be (1×3)
Hence unit digit of 7^{139} will be 3
Hence option (d)
34. Ans. C.
As,
$4x + 3a = 0$
⇨ $x = -\frac{3a}{4}$ .... (i)
Also, $x^3 - a^3 = (x - a)(x^2 + ax + a^2)$
$\therefore \frac{1}{x-a} = \frac{x^2+ax+a^2}{x^3-a^3}$ .... (ii)
And $x^3 + a^3 = (x + a)(x^2 - ax + a^2)$
⇨ $\frac{x^2-ax+a^2}{x^3+a^3} = \frac{1}{x+a}$ .... (iii)
Subtract (iii) from (ii)
$\frac{x^2+ax+a^2}{x^3-a^3} - \frac{x^2-ax+a^2}{x^3+a^3}$
$= \frac{1}{x-a} - \frac{1}{x+a}$
$= \frac{x+a-x+a}{x^2-a^2} = \frac{2a}{x^2-a^3}$ .... (iv)
From (i) and (iv)
$\frac{x^2+ax+a^2}{x^3-a^3} - \frac{x^2-ax+a^2}{x^3+a^3}$
$= \frac{2a}{\frac{9a^2}{16}-a^2}$
$= \frac{2a}{\frac{9a^2-16a^2}{16}}$
$= \frac{2a\times16}{-7a^2} = \frac{-32}{7a}$
Hence option (c)
35. Ans. D.
We can solve this question in different cases.
Case 1:
Let income of Mahesh = 2k
Income of Kamal = 3k
Expanses of Mahesh = k
Expanses of Kamal = 3k
Saving of Mahesh = 2k – k = k
Saving of Kamal = 4k – 3k = k
i.e. saving of Mahesh = saving of Kamal
case 2:
Let income of Mahesh = 3k
Income of Kamal = 6k
Expanses of Mahesh = k
Expanses of Kamal = 3k
Saving of Mahesh = 3k – k = 2k
Saving of Kamal = 6k – 3k = 3k
i.e. saving of Mahesh is less than saving of Kamal.
Case 3:
Let income of Mahesh = 5k
Income of Kamal = 10k
Expanses of Mahesh = 3k
Expanses of Kamal = 9k
Saving of Mahesh = 5k – 3k = 2k
Saving of Kamal = 10k – 9k = k
i.e. saving of Mahesh is more than saving of Kamal.
Clearly, it is not possible to determine who saves more.
Hence option (d)
36. Ans. B.
In case of x:
Investment in 1st 3 months = 700
Again investment in next 3 months $= 700 - 700 \times \frac{2}{7}$
$= 700 - 200 = 500$
Investment in next 6 months $= 200 \times \frac{3}{5} + 500$
$= 120 + 500$
$= 620$
Total investment in 1 year by x $= 700 \times 3 + 500 \times 3 + 620 \times 3 = 7320$
Total investment in 1 year by y $= 600 \times 12 = 7200$
Required amount received by x $= \frac{7320}{7320+7200} \times 726$
$= \frac{7320}{14520} \times 726$
$= 366$
Hence x will receive Rs. 366
Hence option (b)
37. Ans. C.
Total work = LCM of 2 and 3
X will perform $= \frac{6}{2} = 3$ unit/hr
Y will perform $= \frac{6}{6} = 1$ unit/hr

X perform between 10:00 AM to 11:00 AM = 6 – 3 = 3 unit.
Now, x and y together will perform = 3 + 1 = 4 unit.
Time taken for remaining work = $\frac{3}{4} \times 60$ min.
$= 45min.$
Hence tank be filled at 11:45 AM
Hence option (c)
38. Ans. B.
Speed of Train A $= 48 \times \frac{5}{18} = \frac{40}{3} m/s$
Speed of Train B $= 42 \times \frac{5}{18} = \frac{35}{3}\ m/s$
Let length of Train A = 2x m
Length of Train B = x m
Total length = 2x + x = 3x m
Combined speed $= \frac{40}{3} + \frac{35}{3} = \frac{75}{3} = 25\ m/s$
As, distance = speed × time
⇨ $3x = 25 \times 12$
⇨ $x = \frac{25\times12}{3} = 100\ m$
Let length of platform = y m
According to question,
$y + 200 = \frac{40}{3} \times 45$
⇨ $y = 600 - 200 = 400\ m$
Hence option (b)
39. Ans. D.
As $speed \propto \frac{1}{time}$
Ratio of time be $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$
$= \frac{1}{2} \times 12 : \frac{1}{3} \times 12 : \frac{1}{4} \times 12$
$= 6 : 4 : 3$
Hence option (d)
40. Ans. B.
According to concept of mixture and allegation

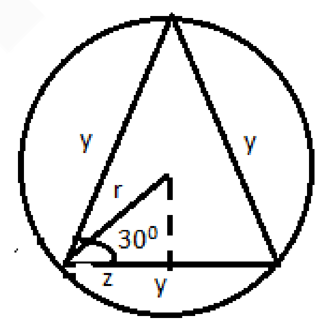


Thus,
Percentage of Boys in the group $= \frac{2}{2+2} \times 100$
$= \frac{2}{4} \times 100$
$= 50\ \%$
Hence option (b)

41. Ans. B.
Let breadth of room (b) = x m.
Length of room (l) = 2x m.
Given, height of room = 4 m.
According to question,
$2h(l + b) = 120$
⇨ $2 \times 4(2x + x) = 120$
⇨ $3x = \frac{120}{2\times4} = 15$
⇨ $x = \frac{15}{3} = 5\ m.$
So, length of room $= 5 \times 2 = 10\ m.$
Breadth of room $= 5\ m.$
Area of the floor $= l \times b$
$= 10 \times 5 = 50\ m^2$
Hence option (b)
42. Ans. A.



As $x = \sqrt{2}r$



As,
$cos\ cos\ 30^0\ = \frac{z}{r}$
⇨ $z = r\ cos\ cos\ 30^0$
⇨ $z = \frac{\sqrt{3}}{2} r$
Also, $y = 2z$
⇨ $y = 2 \times \frac{\sqrt{3}}{2} r = \sqrt{3}r$
Then $\frac{x}{y} = \frac{\sqrt{2}r}{\sqrt{3}r} = \frac{\sqrt{2}}{\sqrt{3}} = \sqrt{\frac{2}{3}}$
Hence option (a)
43. Ans. C.
Let radius and height of right circular cone be r and h respectively.
According to question,

$\frac{2\pi rh}{2\pi r^2+2\pi rh} = \frac{1}{2}$

⇨ $\frac{2\pi rh}{2\pi r(1+h)} = \frac{1}{2}$

⇨ $\frac{h}{r+h} = \frac{1}{2}$

⇨ $2h = r + h$

⇨ $r = h$ .... (i)

Total surface area $= 616\ cm^2$

⇨ $2\pi r(r+h) = 616$

⇨ $2 \times \frac{22}{7} \times r \times (r+r) = 616$

⇨ $r \times 2r = \frac{616\times7}{2\times22}$

⇨ $r^2 = \frac{616\times7}{2\times2\times22}$

⇨ $r = \sqrt{\frac{616\times7}{4\times22}} = 7\ cm$

Volume of cylinder $= \pi r^2 h$

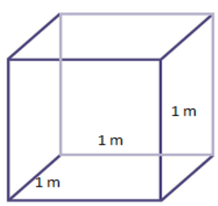
$= \frac{22}{7} \times 7 \times 7 \times 7$ [r = h]

$= 22 \times 7 \times 7$

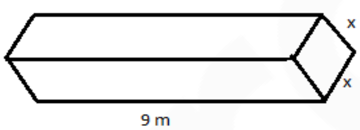
$= 1078\ cm^3$

Hence option (c)

44. Ans. B.



Weight of cube = 9000 kg



Volume of cube = Volume of square bar

⇨ $1 \times 1 \times 1 = x \times x \times 9$

⇨ $x^2 = \frac{1}{9}$

⇨ $x = \frac{1}{3} m$

Now, no of cube cut off × volume of cube of length $\frac{1}{3}$ m = volume of cube of length 1 m

⇨ $n \times \left(\frac{1}{3}\right)^3 = (1)^3$

⇨ $n = 1 \times 27 = 27$

Weight of one cube $= \frac{9000}{27} = \frac{1000}{3} kg$

Hence option (b)

45. Ans. C.

Given radius of cone = 8.4 m

Vertical height of cone = 3.5 m

Number of bag = $\frac{Volume\ of\ conical\ tent}{Volume\ of\ each\ bag}$

$= \frac{\frac{1}{3}\pi r^2 h}{1.96}$

$= \frac{1\times22\times8.4\times8.4\times3.5}{3\times7\times1.96}$

$= 22 \times 6 = 132$

Hence option (c)

46. Ans. C.

Figure 1:

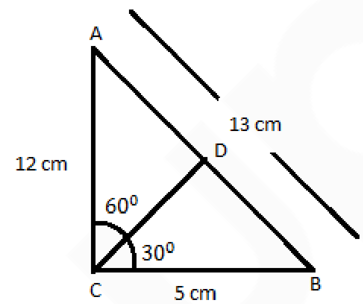
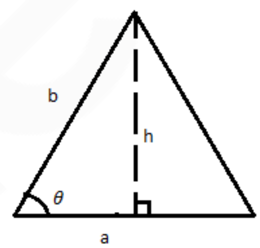


Figure 2:



$sin\ sin\ \theta = \frac{h}{b}$

⇨ $h = b\ sin\ sin\ \theta$

Area of triangle $= \frac{1}{2} \times a \times\ b\ sin\ sin\ \theta$

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

Now, From Figure (i)

Area of ΔBCD + Area of ΔACD = Area of ΔACD

⇨ $\frac{1}{2} \times 5 \times x \times sin\ sin\ 30^0 + \frac{1}{2} \times 12 \times x \times sin\ sin\ 60^0 = \frac{1}{2} \times 12 \times 5$

⇨ $5x \times \frac{1}{2} + 12x \times \frac{\sqrt{3}}{2} = 12 \times 5$

⇨ $x\left(\frac{5}{2} + \frac{12\sqrt{3}}{2}\right) = 12 \times 5$

⇨ $x\left(\frac{5+12\sqrt{2}}{2}\right) = 12 \times 5$

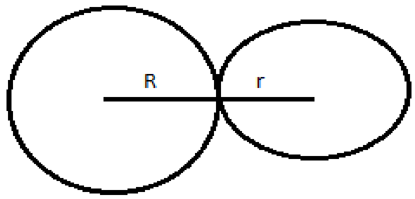
⇨ $x = \frac{120}{5+12\sqrt{2}}$

Hence length of CD = x

$= \frac{120}{5+12\sqrt{2}}$ cm

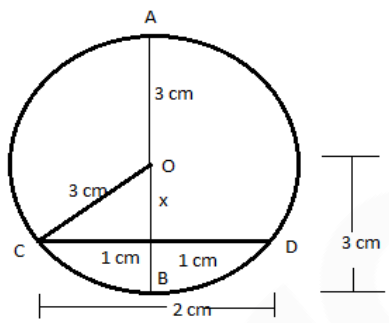
Hence option (c)

47. Ans. D.



Given, $R + r = 14\ cm$ ……… (i)
And $\pi R^2 + \pi r^2 = 130\pi$
⇨ $R^2 + r^2 = 130$ ……… (ii)
$(R + r)^2 = R^2 + r^2 + 2Rr$
⇨ $(14)^2 = 130 + 2\ Rr$
⇨ $2Rr = 196 - 130 = 66$
⇨ $Rr = 33$ ……. (iii)
Also,
$(R + r)^2 = (R + r)^2 - 4Rr$
⇨ $(R - r)^2 = (14)^2 - 4 \times 33$
⇨ $(R - r)^2 = 196 - 132 = 64$
⇨ $(R - r) = \sqrt{64} = 8\ cm$
Hence option (d)

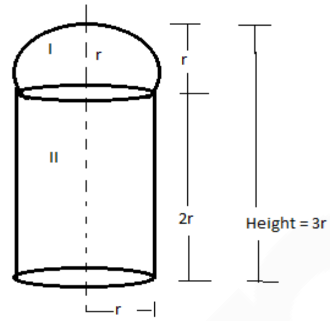
48. Ans. B.



From Pythagoras theorem,
$x = \sqrt{3^2 - 1^2} = \sqrt{8}$
Now, $Ap = 3 + x = 3 + \sqrt{8}$
$BP = 3 - x = 3 - \sqrt{8}$
Then $\frac{AP}{BP} = \frac{3+\sqrt{8}}{3-\sqrt{8}}$
$\therefore AP : BP = 3 + \sqrt{8} : 3 - \sqrt{8}$
Hence option (b)

49. Ans. D.
Diameter of Wheel $= \pi D$
$= \frac{22}{7} \times \frac{5}{11}$
$= \frac{10}{7} m$
Number of rounds $= \frac{Toatl\ distance\ travelled}{Circumference\ of\ wheel}$
$= \frac{7\times1000\times7}{10} = 4900$
Hence option (d)

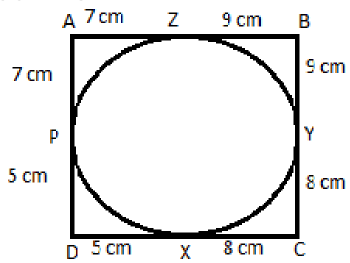
50. Ans. A.



Volume of $I = \frac{2}{3}\pi r^3$ [r = radius]
Volume of $II = \pi r^2(2r) = 2\pi r^3$ [As h=2r]
Volume of building $= \frac{2}{3}\pi r^3 + 2\pi r^3$
$= \frac{8}{3}\pi r^3$
According to question:
$\frac{8}{3}\pi r^3 = 67\frac{1}{21} = \frac{1408}{21}$
⇨ $r^3 = \frac{1408\times3}{21\times8\times\pi}$
⇨ $r^3 = \frac{1408\times3\times7}{21\times8\times22} = 8$
⇨ $r^3 = 2^3$
⇨ $r = 2$
Hence, height of building $= 3r = 3 \times 2 = 6\ m$
Hence option (a)

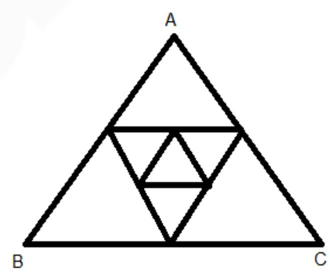
51. Ans. C.
Let radius and height of base of solid circular cylinder be r and h respectively.
Given,
$\frac{r}{h} = \frac{2}{3}$
⇨ $r = \frac{2h}{3}$ ………. (i)
Volume of cylinder $= \pi r^2 h$
⇨ $1617 = \frac{22}{7} \times \left(\frac{2h}{3}\right)^2 \times h$
⇨ $\frac{1617\times7}{22} = \frac{4h^2}{9} \times h$
⇨ $h^3 = \frac{9\times1617\times7}{22\times4}$
⇨ $h^3 = 1157.625$
⇨ $h^3 = (10.5)^3$
⇨ $h = 10.5\ cm$
so, $r = \frac{2\times10.5}{3}$ [From (i)]
⇨ $r = 7$
Total surface Area of cylinder $= 2\pi r^2 + 2\pi rh$
$= 2\pi r(r + h)$
$= 2 \times \frac{22}{7} \times 7 \times (7 + 10.5)$

$= 770\ cm^2$
Hence option (c)
52. Ans. C.
As surface Area of spherical vessel
$= 4\pi(radius)^2$
$= 4 \times \frac{22}{7} \times \left(\frac{14}{2}\right)^2$
$= 4 \times \frac{22}{7} \times 7 \times 7$
$= 616 cm^2$
Cost of painting per square centimeter =
$Rs. \frac{8008}{616} = Rs. 13$
Hence option (c)
53. Ans. B.



As DX and DP are pair of tangent from D to circle and we know that length of pair of tangent be same in this case.
So, Let DX = DP = 5 cm
Similarly,
Let CX = CY = 8 cm
BY = BZ = 9 cm
AP = AZ = 7 cm
Now, According to question
BD = 9 + 8 = 17 cm
AC = 7 + 5 = 12 cm
AC + BD = 17 + 12 = 29 cm
Also,
AB + CD = 29 cm
Hence the sum of a pair of opposite side equals to sum of the other pairs of opposite sides.
Hence option (b)
54. Ans. B.
Let side of square be x then perimeter of square = 4x
Perimeter of circle having radius $r = 2\pi r$
According to question
$2\pi r = 4x$
$\Rightarrow\ r = \frac{4x}{2\pi} = \frac{2x}{\pi}$
Area of square $= x^2$

Area of circle $= \pi \left(\frac{2x}{\pi}\right)^2$
$= \frac{4x^2}{\pi}$
$= \frac{4\times7}{22} x^2$
$= \frac{14}{11} x^2$
Here, $\frac{14}{11} x^2 > x^2$
Hence Area of circle is greater than area of square.
Hence option (b)
55. Ans. A.
Given, height (h) = 24 cm
Radius of bottom circle (r)= $\frac{18}{2} = 9cm$
Also, given capacity of glass
i.e. volume of glass is in shape of frustum be
πx .... (i)
As, volume of frustum $= \frac{\pi h}{3}[r^2 + R^2 + rR]$
$= \pi \times \frac{24}{3}[2^2 + 9^2 + 2 \times 9]$
$= \pi \times 8[4 + 81 + 18]$
$= \pi \times 824$ ....(ii)
After comparing (i) and (ii), we get
$x = 824$
Hence option (a)
56. Ans. C.



Here all triangles are equilateral triangle and formed after taking the mid-point of sides.
Let Area of ΔABC be A then Area of nth triangle $(A_n) = \left(\frac{1}{4}\right)^n A$ .... (i)
According to question,
$\frac{A_4}{A_7} = \frac{\left(\frac{1}{4}\right)^4 A}{\left(\frac{1}{4}\right)^7 A} = \frac{4^7}{4^4} = \frac{64}{1}$
Hence, $A_4 : A_7 = 64 : 1$
Hence option (c)
57. Ans. C.
Given diameter of base and height of cylinder vessel be 2 m and 3.5 m respectively.
Then radius of base (r) $= \frac{2}{2} = 1\ m$
$h = 3.5\ m$

Let height of roof be H m

Then volume of roof $= 22 \times 20 \times H$ .... (i)

Volume of cylindrical vessel $= \pi r^2 h$

$= \frac{22}{7} \times 1^2 \times 3.5$ ...... (ii)

As $(i) = (ii)$

Then, $22 \times 20 \times H = \frac{22}{7} \times 1 \times 3.5$

⇨ $H = \frac{22\times3.5}{7\times22\times20}$

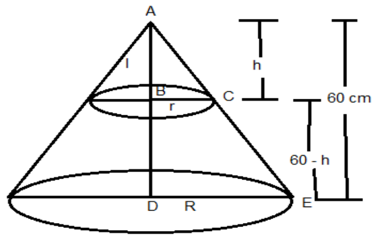
⇨ $H = 0.025$

⇨ $H = 0.025 \times 100\ cm$

⇨ $H = 2.5\ cm$

Hence option (c)

58. Ans. D.



Given, $\frac{V_I}{V_{original}} = \frac{1}{64}$ .... (i)

As, $\Delta ABC \sim \Delta ADE$

So, $\frac{r}{R} = \frac{h}{60} \ldots..(i)$

From (i)

$\frac{\frac{1}{3}\pi r^2 h}{\frac{1}{3}\pi R^2 \times 60} = \frac{1}{64}$

⇨ $\left(\frac{r}{R}\right)^2 \times \frac{h}{60} = \frac{1}{64}$

⇨ $\left(\frac{h}{60}\right)^2 \times \frac{h}{60} = \frac{1}{64}$

⇨ $h^3 = \frac{60\times60\times60}{64}$

⇨ $h^3 = \left(\frac{60}{4}\right)^3 = 15^3$

⇨ $h = 15\ cm$

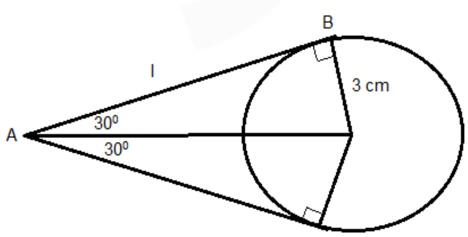
Hence height from the base at which the section is made $= 60 - h$

$= 60 - 15$

$= 45\ cm$

Hence option (d)

59. Ans. A.



As, $\angle OAB = 30^0$

[Because both triangle is congruent]

In right angled triangle OAB:

$tan\ tan\ 30^0 = \frac{OB}{AB}$

⇨ $AB = \frac{OB}{tantan\ 30^0}$

⇨ $l = \frac{3}{\left(\frac{1}{\sqrt{3}}\right)} = 3\sqrt{3}$

Hence option (a)

60. Ans. A.

Given radius of sphere (r) be 3 cm

As, volume of sphere $= \frac{4\pi r^3}{3}$

$= \frac{4\pi}{3} \times (3)^3$

$= \frac{4\pi}{3} \times 3 \times 3 \times 3$

$= 36\pi\ cm^3$

Hence option (a)

61. Ans. C.

We can solve this question by hit and trial method.

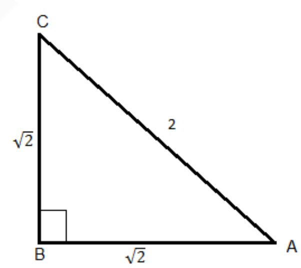
Let $a = b = c = 1\ cm$

Then sides of triangle be

$\sqrt{a^2+b^2} = \sqrt{1^2+1^2} = \sqrt{2}$

$\sqrt{c^2+a^2} = \sqrt{1^2+1^2} = \sqrt{2}$

$(b+c) = 1 + 1 = 2$



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

$= 1\ cm^2$

Option (a):

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

$= \frac{\sqrt{1^2+1^2+1^2}}{2} = \frac{\sqrt{3}}{2} cm^2$

Option (b):

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

$= \frac{\sqrt{1^2\times1^2+1^2\times1^2+1^2\times1^2}}{2}$

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

$= \frac{\sqrt{3}}{2} cm^2$

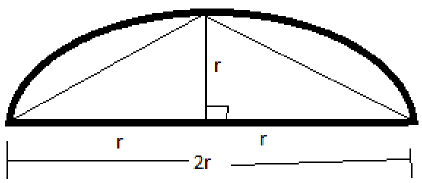
Option (c):

Area $= \frac{a(b+c)}{2} = \frac{1\times(1+1)}{2}$

$= \frac{2}{2} = 1\ cm^2$

Hence option (c)

62. Ans. A.



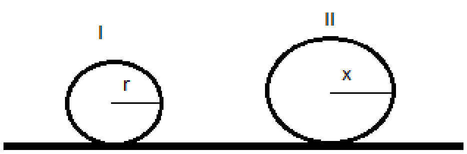
Radius of semi-circle be r Area of largest triangle inscribed in a semi-circle

$= \frac{1}{2} \times r \times 2r$

$= r^2\ square\ units$

Hence option (a)

63. Ans. C.



Given, wheel II revolves n times.

Then,

(Circumference of wheel I) × m = $(Circumference\ of\ wheel\ II) \times n$

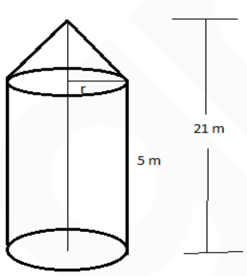
⇨ $(2\pi y) \times m = (2\pi x) \times n$

⇨ $m = \frac{2\pi x \times n}{2\pi y}$

⇨ $m = \frac{nx}{y}$

Hence option (c)

64. Ans. B.



Radius of cylinder $= \frac{126}{2} = 63\ m =$ radius of cone

Height of cone (h) $= 21 - 5 = 16\ m$

Slant height (l) $= \sqrt{r^2 + h^2}$

$= \sqrt{63^2 + 16^2}$

$= \sqrt{3969 + 256}$

$= \sqrt{4225} = 65\ m$

Hence option (b)

65. Ans. A.

Radius of cylinder (r) $= 63\ m$

Height of cylinder (H) $= 5\ m$

Curved surface area of cylinder $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 63 \times 5$

$= 1980\ m^2$

Hence option (a)

66. Ans. D.

Canvas used = Curved surface Area of cylinder + Curved surface Area of cone

$= 1980 + \pi rl$

$= 1980 + \frac{22}{7} \times 63 \times 65$

$= 1980 + \frac{90090}{7}$

$= 14850\ m^2$

Hence option (d)

67. Ans. C.

Given diameter of wheel be 80 cm.

So, radius (r) of wheel $= \frac{80}{2} = 40\ cm$

Speed of car $= 66 \times \frac{5}{18}\ m/sec$

$= \frac{11\times5}{3} = \frac{55}{3} m/sec$

Time $= 10\ minutes.$

$= 10 \times 60 = 600\ sec$

Distance covered by car $= speed \times time$

$= \frac{55}{3} \times 600$

$= 11000\ m$

$= 1100000\ cm$

Number of revolution of wheel $= \frac{Distance\ covered}{Circumference\ of\ wheel}$

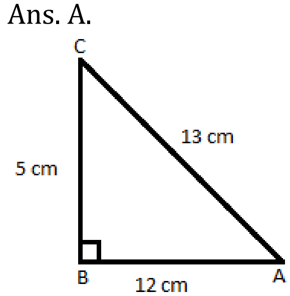
$= \frac{1100000}{2\pi r}$

$= \frac{1100000}{2\times\frac{22}{7}\times40}$

$= 4375$

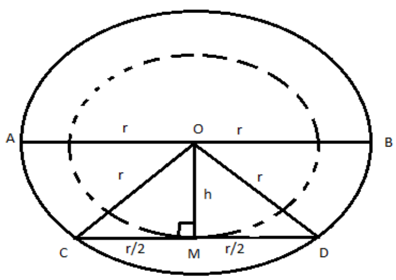
Hence option (c)

68. Ans. A.

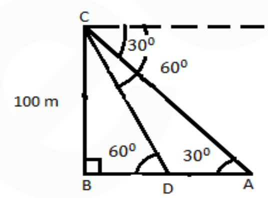


Area of right-angled triangle ABC = $\frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 12 \times 5$
$= 30\ cm^2$
Hence option (a)
69. Ans. B.
Perimeter of circle when radius r = Perimeter of square with side a
$=> 2\pi r = 4a$
$=> a = \frac{2\pi r}{4} = \frac{\pi r}{2}$............(i)
$\frac{Area\ of\ circle}{Area\ of\ square} = \frac{\pi r^2}{a^2} = \frac{\pi r^2}{\left(\frac{\pi r}{2}\right)^2}$
$= \frac{\pi r^2}{\pi \times \pi \times r^2} \times 2^2$
$= \frac{4}{\pi}$
$= \frac{4}{22} \times 7 = \frac{14}{11}$
Hence option (b)
70. Ans. D.

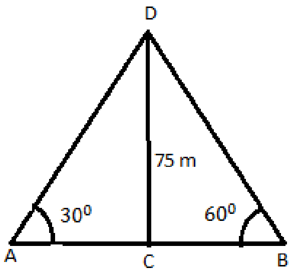


Here OCD be an equilateral triangle.
In right angled triangle OCM
$OC^2 = CM^2 + OM^2$
⇨ $r^2 = \left(\frac{r}{2}\right)^2 + h^2$
⇨ $h^2 = r^2 - \frac{r^2}{4}$
⇨ $h^2 = \frac{3r^2}{4}$
⇨ $h = \frac{\sqrt{3}r}{2}$
Here, required radius of circle be $\frac{\sqrt{3}r}{2}$
Hence option (d)
71. Ans. B.
As,
$sin\ sin\ \theta + cos\ cos\ \theta = \frac{\sqrt{7}}{2}$
Let $sin\ sin\ \theta - cos\ cos\ \theta = a$
As we know that
$(x + y)^2 + (x - y)^2 = 2(x^2 + y^2)$
Then,
$(sin\ sin\ \theta + cos\ cos\ \theta)^2 + (sin\ sin\ \theta - cos\ cos\ \theta)^2 = 2(\theta + \theta)$
⇨ $\left(\frac{\sqrt{7}}{2}\right)^2 + a^2 = 2 \times 1$
⇨ $a^2 = 2 - \frac{7}{4} = \frac{8-7}{4}$
⇨ $a^2 = \frac{1}{4}$
⇨ $a = \frac{1}{2}$
Hence $sin\ sin\ \theta - cos\ cos\ \theta = \frac{1}{2}$
Hence option (b)
72. Ans. B.
As, $sin\ sin\ x + x = 1$
$=> sin\ sin\ x = 1 - x$
$=> sin\ sin\ x = x$ .... (i)
Now,
$x + 2x + x = (x)^2 + 2x \cdot x + (x)^2$
$= (x + x)^2$
$= (x + x)^2$ [As, $x = sin\ sin\ x$]
$= (1)^2 = 1$
Hence option (b)
73. Ans. B.



As angle of elevation = angle of depression
In triangle ABC:
$tan\ tan\ 30^0 = \frac{BC}{AB}$
⇨ $AB = \frac{BC}{tantan\ 30^0} = \frac{100}{\left(\frac{1}{\sqrt{3}}\right)}$
⇨ $AB = 100\sqrt{3}$......... (i)
In triangle BCD:
$tan\ tan\ 60^0 = \frac{BC}{BD}$
⇨ $BD = \frac{100}{tantan\ 60^0} = \frac{100}{\sqrt{3}}$
⇨ $BD = \frac{100}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{100\sqrt{3}}{3}$ .... (ii)
From (i) and (ii)
$AD = AB - BD$
$= 100\sqrt{3} - \frac{100\sqrt{3}}{3}$
$= \left(\frac{3-1}{3}\right) 100\sqrt{3}$
$= \frac{2}{3} \times 100\sqrt{3}$
$= \frac{200\sqrt{3}}{3}$
Hence distance travelled by car during time be $\frac{200\sqrt{3}}{3}\ m$
Hence option (b)

74. Ans. A.



In Triangle ACD:

$tan\ tan\ 30^0 = \frac{CD}{AC}$

⇨ $AC = \frac{CD}{tantan\ 30^0} = \frac{75}{\left(\frac{1}{\sqrt{3}}\right)}$

⇨ $AC = 75\sqrt{3}$

In Triangle BCD:

$tan\ tan\ 60^0 = \frac{CD}{BC}$

⇨ $BC = \frac{CD}{tantan\ 60^0}$

⇨ $BC = \frac{75}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

⇨ $BC = \frac{75\sqrt{3}}{3}$

⇨ $BC = 25\sqrt{3}$

Then,

$AB = AC + BC$

⇨ $AB = 75\sqrt{3} + 25\sqrt{3}$

⇨ $AB = 100\sqrt{3}$

Hence required distance be $100\sqrt{3}$ m

Hence option (a)

75. Ans. D.

As,

$\theta\ = 1 + \theta$

⇨ $\theta = 1 - \theta\ \ .....(i)$

Also, $cosec^2\theta - \theta = 1\ \ ....(ii)$

As, $cosec^2 68^0 + 56^0 - 34^0 - 22^0$

$= (90^0 - 68^0) - 22^0 + cosec^2(90^0 - 56^0) - 34^0$

$= (22^0 - 22^0\ ) + (cosec^2 34^0 - 34^0\ )$

$= 1 + 1 = 2$

Hence option (d)

76. Ans. C.

As, $2y\ cos\ cos\ \theta\ = x\ sin\ sin\ \theta$

$\Rightarrow x = \frac{2ycoscos\ \theta}{sinsin\ \theta}$

$\Rightarrow x = 2y\ cos\ cos\ \theta\ .cosec\ \theta$ .... (i)

Also,

$2x\ sec\ sec\ \theta - y\ cosec\ \theta = 3$

⇨ $2(2y\ cos\ cos\ \theta\ .cosec\ \theta) \times \frac{1}{coscos\ \theta} - y\ cosec\ \theta = 3$

⇨ $\frac{4ycoscos\ \theta.cosec\ \theta}{coscos\ \theta} - y\ cosec\theta = 3$

⇨ $3y\ cosec\ \theta = 3$

⇨ $y = \frac{3}{3\ cosec\ \theta} = sin\ sin\ \theta$

$x = 2 \times sin\ sin\ \theta.cos\ cos\ \theta.cosec\ \theta$

[From (i)]

⇨ $x = \frac{2sinsin\ \theta.coscos\ \theta}{sinsin\ \theta} = 2\ cos\ cos\ \theta$

Now,

$x^2 + 4y^2$

$= 4\theta + 4\theta$

$= 4(\theta + \theta\ \ ) = 4 \times 1 = 1$

Hence option (c)

77. Ans. D.

As,

$sin\ sin\ \theta + cos\ cos\ \theta = \frac{1+\sqrt{3}}{2}\ \ , 0 < \theta < \frac{\pi}{2}$

⇨ $sin\ sin\ \theta + cos\ cos\ \theta = \frac{1}{2} + \frac{\sqrt{3}}{2}$

⇨ $sin\ sin\ \theta + cos\ cos\ \theta = sin\ sin\ 30^0 + cos\ cos\ 30^0$

After comparing, we get $\theta = 30^0$

Now,

$tan\ tan\ \theta + cot\ cot\ \theta = tan\ tan\ 30^0 + cot\ cot\ 30^0$

$= \frac{1}{\sqrt{3}} + \sqrt{3}$

$= \frac{1+\sqrt{3}}{\sqrt{3}} = \frac{4}{\sqrt{3}}$

Hence option (d)

78. Ans. B.

As,

$A = \theta + \theta,\ \ 0 < \theta < \frac{\pi}{2}$

⇨ $A = 1 - \theta + \theta$

⇨ $A = (\theta\ )^2 - 2 \times \theta \times \frac{1}{2} + \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 + 1$

⇨ $A = \left(\theta - \frac{1}{2}\right)^2 - \frac{1}{4} + 1$

⇨ $A = \left(\theta - \frac{1}{2}\right)^2 + \frac{3}{4}$ ..... (i)

A will be minimum when

$\theta - \frac{1}{2} = 0$

Then

$A_{min} = \frac{3}{4}$ [From (i)]

$For\ A_{max}$:

$\theta = 1$ [As, $0 \le \theta \le 1$]

Then

$A_{max} = \left(1 - \frac{1}{2}\right)^2 + \frac{3}{4}$

$= \left(\frac{1}{2}\right)^2 + \frac{3}{4}$

$= \frac{1}{4} + \frac{3}{4} = 1$

Hence $\frac{3}{4} \leq A \leq 1$

Hence option (b)

79. Ans. A.

As we know that $1 + A \ = cosec^2 A$

$=> cosec^2 A - A = 1$

$=> (cosec\ A - cot\ cot\ A\ )(cosec\ A +$
$cot\ cot\ A\ ) = 1$ .... (i)

As,

$\frac{cotcot\ A + cosec\ A - 1}{cotcot\ A - cosec\ A + 1} = \frac{(cotcot\ A + cosec\ A\ ) - (cosec\ A - cotcot\ A\ )(cosec\ A + cotcot\ A\ )}{(cotcot\ A - cosec\ A\ ) + 1}$

[From (i)]

$= \frac{(cotcot\ A + cosec\ A\ )(1 - cosec\ A + cotcot\ A\ )}{(cotcot\ A - cosec\ A + 1\ )}$

$= \frac{(cotcot\ A + cosec\ A\ )(cotcot\ A - cosec\ A + 1\ )}{(cotcot\ A - cosec\ A + 1\ )}$

$= cot\ cot\ A + cosec\ A$

$= \frac{coscos\ A}{sinsin\ A} + \frac{1}{sinsin\ A}$

$= \frac{coscos\ A + 1}{sinsin\ A}$

$= \frac{1 + coscos\ A}{sinsin\ A}$

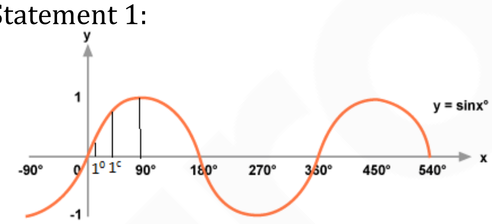
Hence option (a)

80. Ans. D.

As we know that

$1^c = 57^0 16' 22''$

Statement 1:

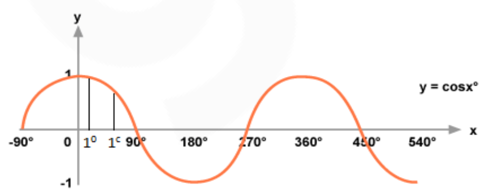


Clearly,

$sin\ sin\ 1^c > sin\ sin\ 1^0$

Hence statement 1 is incorrect.

Statement 2:

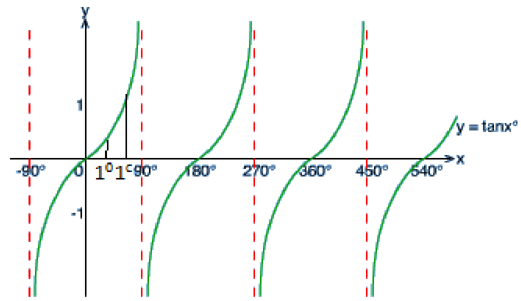


Clearly,

$cos\ cos\ 1^0 > cos\ cos\ 1^c$

Hence statement 2 is incorrect.

Statement 3:



Clearly,

$tan\ tan\ 1^0 < tan\ tan\ 1^c$

Hence statement 3 is incorrect.

Hence option (d)

81. Ans. C.

As,

$x + \frac{1}{x} = 2$ .... (i) $\qquad 0^0 < x < 90^0$

As,

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

⇨ $a = 1$........ (ii)

Comparing (i) and (ii) we can conclude

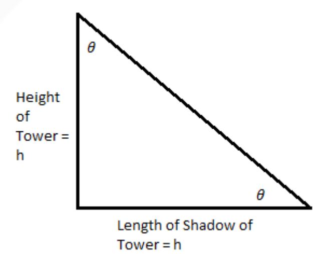
$tan\ tan\ x = 1$

⇨ $tan\ tan\ x = tan\ tan\ 45^0$

⇨ $x = 45^0$

Hence option (c)

82. Ans. C.



As, $tan\ tan\ \theta = \frac{h}{h} = 1$

⇨ $tan\ tan\ \theta = tan\ tan\ 45^0$

⇨ $\theta = 45^0$

Hence altitude of sun be 45^0

Hence option (c)

83. Ans. D.

Statement 1:

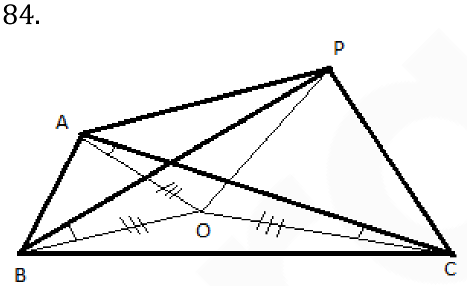
As $sin\ sin\ \theta = cos(90^0 - \theta)$

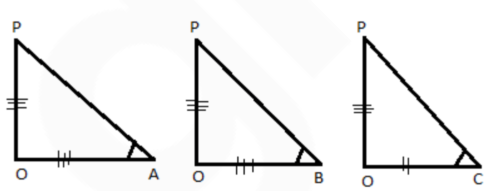
And $cos\ cos\ \theta = sin\ sin\ (90^0 - \theta)$

$\frac{coscos\ 75^0}{sinsin\ 15^0} + \frac{sinsin\ 12^0}{coscos\ 78^0} - \frac{coscos\ 18^0}{sinsin\ 72^0}$

$= \frac{coscos\ 75^0}{sinsin\ (90^0 - 75^0)} + \frac{sinsin\ (90^0 - 78^0)}{coscos\ 78^0} - \frac{coscos\ 18^0}{sinsin\ (90^0 - 18^0)}$

$= \frac{\cos\cos 75^0}{\cos\cos 75^0} + \frac{\cos\cos 78^0}{\cos\cos 78^0} - \frac{\cos\cos 18^0}{\cos\cos 18^0}$
$= 1 + 1 - 1 = 1$
Hence statement 1 is correct.
Statement 2:
$\frac{\cos\cos 35^0}{\sin\sin 55^0} - \frac{\sin\sin 11^0}{\cos\cos 79^0} +$
$\cos\cos 28^0 . cosec\ 62^0$
$= \frac{\cos\cos 35^0}{\sin\sin (90^0-35^0)} - \frac{\sin\sin (90^0-79^0)}{\cos\cos 79^0}$
$= \frac{\cos\cos 35^0}{\sin\sin (90^0-35^0)} - \frac{\sin\sin (90^0-79^0)}{\cos\cos 79^0} + \frac{\cos\cos 28^0}{\sin\sin 62^0}$
$= \frac{\cos\cos 35^0}{\cos\cos 35^0} - \frac{\cos\cos 79^0}{\cos\cos 79^0} + \frac{\cos\cos 28^0}{\sin\sin (90^0-28^0)}$
$= 1 - 1 + \frac{\cos\cos 28^0}{\cos\cos 28^0}$
$= 1$
Hence statement 2 is correct.
Statement 3:
$\frac{\sin\sin 80^0}{\cos\cos 10^0} - \sin\sin 59^0 . \sec\sec 31^0$
$= \frac{\sin\sin (90^0-10^0)}{\cos\cos 10^0} - \frac{\sin\sin 59^0}{\cos\cos 31^0}$
$= \frac{\cos\cos 10^0}{\cos\cos 10^0} - \frac{\sin\sin (90^0-31^0)}{\cos\cos 31^0}$
$= 1 - \frac{\cos\cos 31^0}{\cos\cos 31^0} = 1 - 1 = 0$
Hence statement 3 is correct.
Hence option (d)
84.





Here, ⊿POA≅⊿POB (BY AAS) then AO = BO
⊿POB≅⊿POC (BY AAS) then BO = CO
i.e. AO = BO = CO (Distance of sides from vertex are equal)
AS, we know that, distance between the circumcenter and vertices are equal.
Hence, P must be circumcenter.
Hence option (b)

85. Ans. B.
As, $\tan 1^0 \tan 2^0 \tan 3^0$ ....$\tan 87^0 \tan 88^0 \tan 89^0$
$= \tan(90^0 - 89^0)\tan(90^0 - 88^0)$...............$\tan 88^0 \tan 89^0$
$= \cot 89^0 \cot 88^0$ ....$\tan 88^0 \tan 89^0$
$= \frac{1}{\tan 89^0} \times \frac{1}{\tan 88^0} \times \ldots\ldots\ldots\ldots \tan 88^0 \tan 89^0$
$= 1 \times 1 \times 1 \ldots\ldots\ldots\ldots \times 1 \times 1$
=1
Hence option (b)
86. Ans. A.
Total score of class X = 83x
Total score of class Y = 76y
Total score of class Z = 85z
According to question,
$\frac{83x+76y}{x+y} = 79$
=>$83x + 76y = 79x + 79y$
=>$4x = 3y$........(i)
Also,
$\frac{76y+85z}{y+z} = 81$
=>$76y + 85z = 81y + 81z$
=>$4z = 5y$........(ii)
From equation (i) and (ii), we get
$\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ = t (say)
Then, x = 3t, y = 4t, z = 5t
Now,
$\frac{83x+76y+85z}{x+y+z} = \frac{83\times3t+76\times4t+85\times5t}{3t+4t+5t}$
$=\frac{249t+304t+425t}{12t} = \frac{978}{12} = 81.5$
Hence average score of x, y and z be 81.5
Hence option (a)
87. Ans. A.
Data in ascending order be
x -3.5, x-3, x-2.5, x-2, x-0.5, x+0.5, x+4, x+5
Here number of term is even.
Median = $\frac{\left(\frac{n}{2}\right)^{th} term+\left(\frac{n}{2}+1\right)^{th} term}{2}$
$=\frac{x-2+x-0.5}{2} = \frac{2x-2.5}{2} = x - 1.25$
Hence option (a)
88. Ans. D.
Let data be p, q, r, s, 20.5, t, u, v, w
After increasing the largest four number by 2 then new data be
p, q, r, s, 20.5, t + 2, u + 2, v + 2, w + 2 .....(i)
Clearly, from (i),
Median remains same.
Hence option (d)

89. Ans. C.
Let the cricketer's average be x run per match
According to question,
$\frac{10x+108}{11} = x + 6$
$=> 11x + 66 = 10x + 108 => x = 42$
New average = 42 + 6 = 48
Hence option (c)
90. Ans. A.
As mean of 20 observation = 17
Then, sum of 20 observations = 17×20 = 340
According to question,
$\frac{340-3-6+8+9}{20} = \frac{348}{20} = 17.4$
Hence option (a)
91. Ans. B.
Discrete data is information that can be categorized into a classification. Discrete data is based on counts. Only a finite number of values is possible, and the values cannot be subdivided meaningfully.
Hence number of credit card held by an individual can be treated as discrete data.
Hence option (b)
92. Ans. B.
Number of total students = 100
Number of boys = 70
Number of girls = 30
Average of boys = 75
Total marks of boys = 75×70 = 5250
Average of class = 72
Total marks of class = 72×100 = 7200
Average marks of girls = $\frac{7200-5250}{30} = \frac{1950}{30} =$ 65
Hence option (b)
93. Ans. C.
As a particular sector of pie chart for corporate tax be 108^0 at the center
Then, percentage of income from corporate tax to total funds = $\frac{108^0}{360^0} \times 100 = 30\%$
Hence option (c)
94. Ans. D.
When the lower and the upper class limit is included, then it is an **inclusive class interval**. For example - 220 - 234, 235 - 249 ..... etc. are inclusive type of class intervals.
When the lower limit is included, but the upper limit is excluded, then it is an **exclusive class interval**. For example - 150 - 153, 153 - 156.....etc are exclusive type of class intervals.e.g. 15-20, 20-25 etc
Hence both the statements are incorrect.
Hence option (d)
95. Ans. D.
Given, class interval be 10-15
Frequency be 30
Frequency density = $\frac{frequency}{upper\ limit - lower\ limit} = \frac{30}{15-10} = \frac{30}{5} = 6$
Hence option (d)
96. Ans. C.
As, s = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
According to question,

Number	Pairs(a, b) when, ab>12 and a ≠b
12×1+4 = 16	(8,2) and (2,8)
12×2+4 = 28	(4,7) and (7,4)
12×3+4 = 40	(10,4), (4,10), (5,8) and (8,5)
12×4+4 = 52	Not possible pairs
12×5+4 = 64	Not possible pairs
12×6+4 = 76	Not possible pairs
12×7+4 = 88	Not possible pairs

Hence possible number of pairs = 8
Hence option (c)
97. Ans. D.
As we know that
$(x^n + y^n)$ is divided by (x + y)
If n be odd, then remainder be zero.
From question,
$(13^5 + 16^5) + (14^5 + 15^5)$
As, $(13^5 + 16^5)$ is divided by 29 so, remainder be zero.
Also, $(14^5 + 15^5)$ is divided by 29 so, remainder be zero.
Hence, $13^5 + 14^5 + 15^5 + 16^5$ is divided by 29 then remainder will be zero.
Hence option (d)
98. Ans. B.
As we know that, $\sum n^2 = \frac{n(n+1)(2n+1)}{6}$
And, $\sum n^3 = \left(\frac{n(n+1)}{2}\right)^2$
$\sum_{n=1}^{10} n^2 = \frac{10\times11\times21}{6} = 385$
$\sum_{n=1}^{10} n^3 = \left(\frac{10\times11}{2}\right)^2 = 3025$
Required difference = 3025 – 385 = 2640

Hence option (b)
99. Ans. C.
Since distance is same in both ride.
Then, the average speed = $\frac{2xy}{x+y} = \frac{2\times50\times30}{50+30} = \frac{3000}{80} = 37.5\ km/hr$
Hence option (c)
100. Ans. B.
As, $x + \frac{1}{1+\frac{1}{2+\frac{1}{3}}} = 2$
$=> x + \frac{1}{1+\frac{1}{\frac{6+1}{3}}} = 2$
$=> x + \frac{1}{1+\frac{3}{7}} = 2$
$=> x + \frac{1}{\frac{10}{7}} = 2$
$=> x + \frac{7}{10} = 2$
$=> x = 2 - \frac{7}{10}$
$=> x = \frac{20-7}{10} = \frac{13}{10}$
Hence option (b)