SOLUTIONS

1. Answer. A
Let (x - a) is the factor of both quadratic equation.
i.e. x = a is the root of both equation.
Then x = a will satisfy both the equation.
So, $a^2 - 5a + \alpha = 0$ ....(i)
$a^2 - 7a + 2\alpha = 0$ ....(ii)
Using quadratic formula for both(i)and (ii), we get
a = $\frac{5\pm\sqrt{25-4\alpha}}{2}$ (from (i))
and a = $\frac{7\pm\sqrt{49-8\alpha}}{2}$ (from (ii))
Now,
$\frac{5\pm\sqrt{25-4\alpha}}{2} = \frac{7\pm\sqrt{49-8\alpha}}{2}$
$=> 5 \pm \sqrt{25-4\alpha} = 7 \pm \sqrt{49-8\alpha}$
$=> \sqrt{25-4\alpha} - \sqrt{49-8\alpha} = 7 - 5$
$=> \sqrt{25-4\alpha} - \sqrt{49-8\alpha} = 2$
Squaring both sides, we get
$25 - 4\alpha + 49 - 8\alpha + 2\sqrt{(25-4\alpha)(49-8\alpha)} = 4$
$=> (6\alpha - 35)^2 = (25-4\alpha)(49-8\alpha)$
$=> 1225 - 396\alpha = 32\alpha^2 = 36\alpha^2 + 1225 - 420\alpha$
$=> 4\alpha^2 - 24\alpha = 0$
$=> 4\alpha(\alpha - 6) = 0$
$=> \alpha = 0 \text{ or } \alpha = 6$
Hence option (a)

2. Answer. A
LCM of 2, 3, 4 and 5 is 60.
Number or numbers divisible by 60 from 1 to 600 = 10
Number of numbers divisible by 60 from 601 to 900 i.e. from 300 numbers= 5
Number divisible by 60 from 901 to 1000 = 1
Total numbers = 10+5+1 = 16
Hence option (a)

3. Answer. C
The given 'polynomial is of the form $ax^3 + bx^2 + cx + d$
Let A, B and C be three zeroes of the given polynomial
Then, sum of the zeroes i.e. A + B + C = $\frac{-b}{a}$ = - 4
Product of the zeroes (taken two at a time) i e. = AB+BC+CA = $\frac{c}{a}$ = -11
Product of the zeroes (individual) i.e. ABC = $\frac{-d}{a}$ = 30
Now, we will check each option for the correct
In option (a) we have 2, -3 and -5 as three zeroes. Sum of these zeroes is - 6 and product of these zeroes is 30.
In option (b), we have -2, -3 and 5 as three zeroes. Sum of these zeroes is 0 and product of these zeroes is 30
In option (c) we have -2, 3 and -5 as three zeroes. Sum of these zeroes is - 4 and product of these zeroes is 30.
In option (d) we have -2, 3 and 5 as three zeroes. Sum of these zeroes is 6 and product of these zeroes is 30.
Out of these options, only results of option (c) matches with the results calculated above.
Thus, our correct option is (c)
Hence option (c)

4. Answer. B
Given that
x = 111......1 (20 digits)
y = 333......3 (10 digits)
Therefore, $\frac{x-y^2}{z} = \frac{1111......(20digits) - (333.....3)^2(10\ digits)}{2222....2(10\ digits)}$
$= \frac{1111......(20digits) - 3^2\ (111....1)^2(10\ digits)}{2222....2(10\ digits)}$
$= \frac{1111......(20digits)}{2(111.....1)10digits} - \frac{9(111...1)(10\ digits)}{2}$
Since $\frac{111111}{111} = 1001, therefore$
$\frac{1111......(20digits)}{2(111.....1)10digits} - \frac{9(111...1)(10\ digits)}{2} = \frac{10000000001-999...9(10digits)}{2}$
Now, since 1001-999 = 2
Therefore $\frac{10000000001-999...9(10digits)}{2} = \frac{2}{2} = 1$
Hence option (b)

5. Answer. A
Let the two roots be 3x and 2x,
Let $\alpha = 3x \text{ and } \beta = 2x$, sum of root a+b = 3x + 2x = $\frac{-m}{12}$
=> 5 x = $\frac{-m}{12}$
=> m = -60x ------ (i)
Products of roots,
$\alpha\beta = 3x \times 2x = \frac{5}{12}$
=> $6x^2 = \frac{5}{12}$
=> $x^2 = \frac{5}{72}$
=> x = $\pm\frac{\sqrt{5}}{\sqrt{72}} = \pm\frac{\sqrt{5}}{6\sqrt{2}}$
Putting this value of x in (i), we get m = -60× $(\pm\frac{\sqrt{5}}{6\sqrt{2}})$
Since we need positive value of m therefore
m = 60× $(\frac{\sqrt{5}}{6\sqrt{2}}) = 5\sqrt{10}$
Hence option (a)

6. Answer. B
Let f(x) = $ax^3 + bx^2 + cx + d$
And g(x) = $ax^4 + bx^3 + cx^2 + dx + e$
Then f(x)g(x) $= (ax^3 + bx^2 + cx + d) \times (ax^4 + bx^3 + cx^2 + dx + e)$
$= a^2x^7 + abx^6 + acx^5 \dots\dots . d^2x + de$
Thus, it is clear that degree of f(x)g(x) = 7
Hence option (b)

7. Answer. D
Let f(x) = $5x^3 + 5x^2 - 6x + 9$ and g(x) = x+3
To find the remainder g(x) should be equal to zero
Therefore g(x) = x+3 => x = -3
Putting this value in f(x) we get
f(x) = $5(-3)^3 + 5(-3)^2 - 6(-3) + 9$

f(x) = - 63
Hence option (d)
8. Answer. D
We are given that HCF = p^2 and product of two non-zero expressions = $(x+y+z)p^3$
We know that HCF×LCM = product of two numbers
Therefore,
P^2×LCM = $(x+y+z)p^3$
=> LCM = $\frac{(x+y+z)p^3}{p^2} = (x+y+z)p$
Hence option (d)
9. Answer. B
We have
P = $0.8\bar{3}$ and Q = $0.6\bar{2}$
The distance between P and Q = $0.2\bar{1}$ = x
Expressing this distance in the form of rational numbers, we assume $0.2\bar{1}$ = x
Number of digit with bar = 1
Number of digit without bar = 1
Therefore, the denominator would be 90
Number of digit after the decimal = 2
Therefore, the nominator = 21 – 2 = 19
Thud x = $\frac{19}{90}$
Hence option (b)
10. Answer. A
As, the discount taking two at a time 20% & 12.5%
Single equivalent discount = $\left(x+y-\frac{xy}{100}\right)\%$ = $\left(20+12.5-\frac{20\times12.5}{100}\right)\% = 30\%$
No consider 30% and 5%
Final reduction = $\left(30+5-\frac{30\times5}{100}\right) = 33.5\%$
Hence option (a)
11. Answer. C
Let the number of mangoes the fruit seller has originally be 100x
5% of total mangoes are rotten i.e. 5x mangoes are rotten, remaining mangoes = 95x
Seller sells 75% mangoes of remaining i.e. $95x \times \frac{75}{100}$
Remaining mangoes = 95x – 71.25x = 95 => x = 4
Seller has initially 100x mangoes = 100×4 = 400 mangoes
Hence option (c)
12. Answer. B
Here, we need to find the time that will take to cross 91 km stones completely.
Given that, in 1 hr. train travels 60 km i.e. 60 km is travelled in 60 min.
This means in 1 minute 1 km is travelled.
Therefore, 90 km is travelled in 90 minutes i.e. 1 hour 30 minutes
And the remaining 1 km in 12 seconds.
Thus, the total time taken is 1 hr. 30 min. 12 sec.
Hence option (b)
13. Answer. B

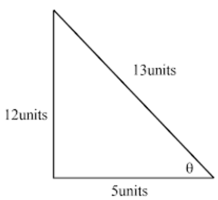
Given that A gives B a start of 8 m.
This means B starts from the point where A finishes its 8 m. therefore B covers 92 m.
Given that A runs at 6 km/hr.
i.e. A runs at $\frac{6\times1000m}{60\ min} = 100m/min$
It is also given that even after giving B a start of 8 m, A reaches early than B by 9 seconds.
Therefore, if A takes 60 seconds to complete 100 m race, then B takes (60 + 9) seconds
i.e. 69 seconds to complete 92 m.
$\frac{D}{T} = \frac{92}{69}m/S = \frac{92}{69}\times\frac{18}{5} = \frac{24}{5}km/hr$ = 4.8km/hr
Hence option(b)
14. Answer. C
$8x^3 - y^3 = (2x)^2 - (y)^3 = (2x-y)(4x^2+y^2+2xy)$
Quotient = $\frac{(2x-y)(4x^2+y^2+2xy)}{2xy+4x^2+y^2}$ = 2x – y
Hence option (c)
15. Answer. A
Given that (x+2) is a common factor of x^2+ax+b and x^2+bx+a
Let f(x) = x^2+ax+b
And g(x) =x^2+bx+a
Let p(x) = x+2 this means x+2 = 0
=>x = - 2, so -2 is a zero of f(x) and g(x)
Therefore $ax^2+ab+b = (-2)^2-2a+b = 4-2a+b$ and
$x^2+bx+a = (-2)^2 - 2b+a$
Both polynomials are same
Thus,
4-2a+b – 4 -2b+a
=> b+2b = a+2a => 3a = 3b => $\frac{3a}{3b} = 1$
=> a:b = 1:1
Hence option (a)
16. Answer. A
As, $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} +\ldots+ a_{n-1}x + a_n$,
where $a_0, a_1, a_2,\ldots, a_n$ are real numbers.
When f(x) will be divided by (ax - b) then from Remainder theorem,
ax – b = 0 => x = $\frac{b}{a}$
Thus, remainder = f($\frac{b}{a}$)
Hence option (a)
17. Answer. D
As, square root of 2222 = 47.13, so, 2222 is not a perfect square.
Square root of 11664 = 108, so, 11664 is a perfect square.
Square root of 343343 = 585.95, so, 343343 is not a perfect square.
Square root of 220347 = 469.41, so, 220347 is not a perfect square.
Thus, A, C and D are not a perfect square.
Hence option (d)
18. Answer. B
As,
$(x+2)(x-2) = (x^2-2^2) = (x^2-4)$ ....(i)
$(x^3-2x^2+4x-8)\ (x^3+2x^2+4x+8)$

$= \left((x^3+4x)-(2x^2+8)\right)\left((x^3+4x)+(2x^2+8)\right)$
$= ((x^3+4x)^2-(2x^2+8)^2)$
$=((x^6+16x^2+8x^4)-(4x^4+64+32x^2))$
$= (x^6+4x^4-16x^2-64)$ ......(ii)
From (i) and (ii)
$\left((x^2-4)(x^6+4x^4-16x^2-64)\right)$
$= (x^8-4x^6+4x^6-16x^4-16x^4+64x^2-64x^2+256)$
$= (x^8-32x^4+256)$
$=(x^4-16)^2$
Thus, product of $(x+2), (x-2), (x^3-2x^2+4x-8)$ and (x^3+2x^2+4x+8) be $(x^4-16)^2$
Hence option (b)
19. Answer. C
As, $x(x+2)(x+3)(x+5)-72$
$= \left((x^2+2x)(x^2+8x+15)-72\right)$
$=(x^4+2x^3+8x^3+16x^2+15x^2+30x-72)$
$=(x^4+10x^3+31x^2+30x-72)$
$=(x^4-x^3+11x^3-11x^2+42x^2-42x+72x-72)$
$=(x^3(x-1)+11x^2(x-1)+42x(x-1)+72(x-1))$
$= \left((x-1)(x^3+11x^2+42x+72)\right)$
$=\left((x-1)(x^3+6x^2+5x^2+30x+12x+72\right)$
$=\left((x-1)(x^2(x+6)+5x(x+6)+12(x+6))\right)$
$=\left((x-1)(x+6)(x^2+5x+12)\right)$
Hence factor of $x(x+2)(x+3)(x+5)-72 = \left((x-1)(x+6)(x^2+5x+12)\right)$
Hence option (c)
20. Answer. B
Since HCF of two polynomials is (x^2+x-2), therefore splitting this polynomial by middle term, we get
x(x+2)-(x+2) = (x-1)(x+2)
Being the HCF of the given polynomial, we conclude that (x-1) and (x+2) is a factor of f(x) and g(x)
By HCF we give the value of a and b
Now, $\frac{(x-1)\,(x^2+3x+\,a))}{(x-1\,)(x+2\,)} = \frac{x^2+3x+a}{x+2}$
And $\frac{(x+2)\,(x^2+2x+\,b)}{(x-1\,)(x+2\,)} = \frac{x^2+2x+b}{x-1}$
Since x is a factor of (x^2+3x+a), therefore x = - 2 will satisfied the polynomial. Thus
$x^2+\,3x+a\ = 0$
⇨ $(-2)^2+\,3(-2)+\,a = 0$
⇨ $a = 2$
Also, since (x - 1) is a factor of (x^2+2x+b), therefore x = 1 will satisfied this polynomial. Thus,
$x^2+\,2x+b\ = 0$, b = -3
Hence a = 2 and b = - 3
Hence option (b)
21. Answer. C
Since we are given that a and c are co-prime
i.e. HCF of a and c is 1, therefore we can say that a definitely divides d exactly.
So, a is a factor of d.
Hence option (c)
22. Answer. C
Since the roots of the given equation are equal, therefore the discriminant of the given equation is zero. Thus, $b^2 - 4ac = 0$
⇨ $[b^2(c-a)^2 - 4\,a(\,b-c)\,.c(a-\,b)] = 0$
⇨ $[b^2(c^2+a^2-2ac\,)\text{- } 4ac(ab-b^2-ac+bc\,)] = 0$
⇨ $[(ab)^2+(bc)^2+(-2ac)^2+2ab^2c-4a^2bc-4abc^2] = 0$
⇨ $[(ab)^2+(bc)^2+(-2ac)^2+2ab.bc+2ab(-2ac)+2bc(-2ac)] = 0$
⇨ $[b^2c^2+b^2a^2-12ab^2c-4a^2bc+4ab^2c-4abc^2] = 0$
⇨ $(ab+bc-2ac)^2 = 0$
⇨ $ab+bc-2ac\ = 0$
⇨ $ab+bc = 2ac$
⇨ $b(a+c)\ = 2ac$
⇨ $\frac{2}{b} = \frac{a+c}{ac}$
⇨ $\frac{2}{b} = \frac{1}{c}+\frac{1}{a}$
Hence option (c)
23. Answer. A
As,
$\frac{a-x^2}{bx}+\frac{b-x^2}{cx} = \frac{c-x}{b}+\frac{b-x}{c}$
$=>\frac{ac-cx^2+b^2-bx^2}{bcx} = \frac{c^2-cx+b^2-bx}{bc}$
$=> ac-cx^2+b^2-bx^2 = x(c^2-cx+b^2-bx)$
$=>ac-cx^2+b^2-bx^2 = c^2x-cx^2+b^{2x}-bx^2$
$=>c^2x+b^2x = ac+b^2$
$=>x = \frac{b^2+ac}{b^2+c^2}$
Hence option (a)
24. Answer. C
we are given that $x^2+7x-14\left(k^2-\frac{7}{8}\right) = 0$ let us check the nature of the roots, we have
D $= b^2 - 4ac = 7^2 - 4\times1\times14\left(k^2-\frac{7}{8}\right)$
$= 49+56k^2 - 49 = 56$
Now,
x= $\frac{-b\pm\sqrt{D}}{2a} = \frac{-7\pm\sqrt{56k^2}}{2} = \frac{-7\pm 2k\sqrt{14}}{2}$
Since $\sqrt{14}$ is an irrational number, therefore any value of k will give an irrational number only.
Therefore, the given equation has no integral roots.
Hence option (c)
25. Answer. C
Using the concept of AP,
As, a = 507, b = 988, d = 13
$n = \frac{b-a}{d}+1,$
$n = \frac{988-507}{13}+1$
$n = 37+1 = 38$
Hence option (C)
26. Answer. D
To maintain M1 cows for D1 days a milk man spends W1 and to maintain M2 cows for D2 days, a milk man spend W2
Then $\frac{M1D1}{W1} = \frac{M2D2}{W2}$

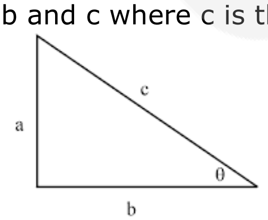
⇨ $\frac{8\times60}{6400} = \frac{5n}{4800}$
⇨ $\frac{3}{40} = \frac{n}{960}$
⇨ n = $\frac{3\times960}{40} = 3\times24 = 72$
Hence milk man need 72 days for maintenance
Hence option (d)
27. Answer. B
Here, the maximum marks are 100% and according to the question,
45+5 = 40%
i.e. 50= 40%
Therefore, by unitary method, 1% = $\frac{50}{40}$
100% = $\frac{50}{40}\times100 = 125$
Hence option (b)
28. Answer. D
$3(2u+v) = 7vu$
$3(u+3v) = 11$
$6u+3v = 7uv$ ...... (1)
$3u+9v = 11uv$ ....(2)
dividing equation 1 and equation 2 by uv we get
$\frac{6}{v}+\frac{3}{u} = 7$
$\frac{3}{v}+\frac{9}{u} = 11$
$let\ \frac{1}{u} = x\ and\ \frac{1}{v} = y$
$6y+3x = 7$ .... (3)
$3y+9x = 11$ .... (4)
multiply equation 4 by 2 we get $6y+18x = 22$ .... (5)
solve equation (5)*and* (3)*we get* $x = 1$ & $x = \frac{1}{u} = 1 \Rightarrow u = 1$
Hence option (d)
29. Answer. b
Let present age of Ram be x and Shyam be y
From question,
(x - 5) = 3(y – 5) => x – 3y = -10 .... (i)
(x+ 4) = 2(y + 4) => x – 2y = 4 .... (ii)
After solving equation (i) and (ii) we get
x = 32
Hence present age of Ram be 32 years
Hence option (b)
30. Answer. C
Let CP of chair be x and CP of stools be y,
According to question,
4x+9y = 1340 ..... (i)
10%of 4x + 20% of 9y = 188 => 4x + 18 y = 1880 ...... (ii)
Solving the equation (i) and (ii) by elimination method, we get
y = 60
Putting the value of y in equation (i), we get
4x = 800,
Thus, the money paid for the chair be Rs. 800
Hence option (c)
31. Answer. B
When we solve the given equation for x,
Then x + 5 = 5 => x = 5 – 5 = 0
Thus, in the given set we have only one element viz. 0
Element φ is a null set i.e. no element in the set.
Hence option (b)
32. Answer. C
As, ab + bc + ca = 0
=>ab + ca = -bc
$\Rightarrow a = \frac{-bc}{b+c}$ and $a^2 = \frac{b^2c^2}{(b+c)^2}$
Now,
$\frac{a^2}{a^2-bc}+\frac{b^2}{b^2-ca}+\frac{c^2}{c^2-ab}$
$= \frac{\frac{b^2c^2}{(b+c)^2}}{\frac{b^2c^2}{(b+c)^2}-bc}+\frac{b^2}{b^2-c\left(\frac{-bc}{b+c}\right)}+\frac{c^2}{c^2-b\left(\frac{-bc}{b+c}\right)}$
$= \frac{b^2c^2}{b^2c^2-(b+c)^2bc}+\frac{b^2(b+c)}{b^2(b+c)+bc^2}+\frac{c^2(b+c)}{c^2(b+c)+b^2c}$
$= \frac{bc}{bc-(b+c)^2}+\frac{b(b+c)}{b(b+c)+c^2}+\frac{c(b+c)}{c(b+c)+b^2}$
$= \frac{bc}{-(b^2+c^2+bc)}+\frac{b(b+c)}{b^2+bc+c^2}+\frac{c(b+c)}{b^2+c^2+bc}$
$= \frac{-bc+b^2+bc+c^2+bc}{b^2+c^2+bc}$
$= \frac{b^2+bc+c^2}{b^2+bc+c^2}$
=1
Hence option (c)
33. Answer. D
Let the total number of students be 100%
Numbers of student failed in Hindi = 35%
Numbers of student failed in English = 45%
Number of students failed in both subject = 20%
Total numbers of students failed = (35+45 - 20)% = 60%
Numbers of students passed in both the subject = (100- 60)% = 40 %
Hence option (d)
34. Answer. B
Let, (x - y) = a, (y - z) = b and (z - x) = c
Now, a + b + c = x – y + y – z + z – x = 0
So, $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 + ab + bc + ca)$
=> $a^3 + b^3 + c^3 - 3abc = 0$ [As, a + b + c = 0]
Again,
$a^3 + b^3 + c^3 = 3abc$
$\Rightarrow \frac{abc}{a^3+b^3+c^3} = \frac{1}{3}$
Hence,
$\frac{(x-y)(y-z)(z-x)}{(x-y)^3+(y-z)^3+(z-x)^3} = \frac{1}{3}$
Hence option (b)
35. Answer. C
As,
$\sqrt{x+\sqrt{x+\sqrt{x+\ldots}}}$ = y(say)
$Now, y = \sqrt{x+y}$
Squaring both sides,
$y^2 = x + y \Rightarrow y^2 - y - x = 0 \Rightarrow y = \frac{\sqrt{4x+1}+1}{2}$
if $\sqrt{x+\sqrt{x+\sqrt{x+\ldots}}}$ then its value is $\frac{\sqrt{4x+1}+1}{2}$

According to question $\frac{\sqrt{4x+1}+1}{2} = \frac{\sqrt{4\times1+1}+1}{2} \frac{\sqrt{5}+1}{2} = \frac{3.236}{2}$ = 1.618
which lies between 1 and 2
Hence option (c)
36. Answer. D
$\log_{10} 8000 + \log_{10} 600 = \log_{10} 8 * 10^3 + \log_{10} 6 * 10^2$
$= \log_{10} 8 + \log_{10} 10^3 + \log_{10} 6 + \log_{10} 10^2$
$= 0.9031 + 3\log_{10} 10 + log_{10} 6 + 2\log_{10} 10$
$= 0.9031 + 3 + 2 + 0.7782$
= 6.6813
Hence option (d)
37. Answer. B
If M1 can do the work in D1 days and M2 man can do the job in M2 days (where all man can work at the same rate),
Then $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
According to the question,
M1 = 30, D1 = 40 W1 = 1, M2 = x, D2 = 40 W2 = 16/40
Thus $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2} = \frac{30\times40}{1} = \frac{x\times40}{\frac{16}{40}} = 1200$
$\frac{40x\times40}{16} = 1200 => x = \frac{1200\times16}{40\times40} = 12$
Thus, the number of man who left the job = (30-12) = 18
Hence option (b)
38. Answer. D
Given 4 goat = 6 sheep i.e. efficiency of goat = 6 and efficiency of sheep = 5
Total field required to graze = 4×6×50 = 1200
Required time = $\frac{1200}{2\times6+2\times5} = 50 days$
Hence option (d)
39. Answer. B
Let us assume the capacity of the tub is 100L.
It is given that a tap can fill 100L in 10 hrs.
This means, in 1 hr. a tap can fill only 10L.
Therefore, in 7 hrs a tap can fill only 70L.
This means in 5 hrs a tap fills only 30L but actually the tap should fill 50L in 5 hrs.
This means that there is a leakage of 20L which has duration of 5 hrs.
If 20L of water is leaked in 5 hrs, then 1L water is leaked in $\frac{5}{20} = \frac{1}{4} hrs$
This means 100L water is leaked in $\frac{1}{4} \times 100 = 25$ hrs.
Hence option (b)
40. Answer. B
Distance travelled by the boy from house to school in 1 hr. i.e. 60 minutes = 12 km
Distance travelled by the boy from house to school in 1 minute = $\frac{12}{60} = \frac{1}{5} km$
Similarly,
distance travelled by the boy from school to house in 60 minutes = 8 km
Distance travelled by the boy from school to house in
1 minute= $\frac{8}{16} = \frac{2}{15} km$
This means, total distance travelled in 2 minutes
Therefore, total distance travelled in I minutes = $\frac{1}{5} + \frac{2}{15} = \frac{1}{3} km$
Therefore, total distance travel in 1 minute = $\frac{1}{3\times2} = \frac{1}{6} km$
Thus, total distance travelled in 50 minutes = $\frac{1}{6} \times 50 = 8.3333 \approx 8km$
Hence option (b)
41. Answer. C
Given that 3 parts are proportional to $1, \frac{1}{3}, \frac{1}{6}$
LCM of denominator is 6
Therefore the ratio will be $\frac{1\times6}{6} = \frac{6}{6} : \frac{1\times2}{3\times2} = \frac{2}{6} : \frac{1}{6}$ i.e. 6 : 2 : 1
Sum of the ratio part is 9, the middle part of 78 is $\frac{78}{9} \times 2 = \frac{52}{3}$
Hence option (c)
42. Answer. D
Given that the ratio of the number of boys in the first and the second standards is 2 : 3 and the ratio The number of boys in the second and third standards is 4 :5
Now, we calculate a common ratio for all the three standards 2 : 3 and 4 : 5will be 2×4:3×4 = 8 : 12 and 4×3 : 5×3 = 12 : 15
Therefore, the common ratio for all the three standards 8 : 12 : 15
Sum of the ratio pats = 8 + 12+ 15 = 35
Numbers of the boys in the first standard = $\frac{8}{35} \times 350$ = 80
Number of boys in third standard = $\frac{15}{35} \times 350 = 150$
Total number of boys in the both standards = 80+150= 230
Hence option (d)
43. Answer. A
The difference between the compound interest (compounded annually) and simple interest on a sum or money deposited for 2 years at R% p.a. be
$P\left(\frac{R}{100}\right)^2 = 15$
=> $P\left(\frac{5}{100}\right)^2 = 15$
=> $P\left(\frac{1}{20}\right)^2 = 15$
=> $\frac{P}{400} = 15$
=> P = 6000
Hence option (a)
44. Answer. D
Decrease in consumption = $\left[\frac{\% \, Price \, increase}{100 + \% \, Price \, Increase}\right] \times 100$
$= \left[\frac{12}{100+12}\right] \times 100 = 10\frac{5}{7}$
Hence, consumption of onion should be decreased by $10\frac{5}{7}$ % so that there is no change in the expenditure

45. Answer. D
Let the speed of the man in still water be x km/hr and
let the speed of the stream be y km/hr
Speed of the man downstream = x + y km/hr
Speed of the man upstream = x -y km/hr
Therefore $x + y = \frac{18}{4}$ ….. (i)
$x - y = \frac{18}{10} = 1.8km/h$ …….. (ii)
Solving these equations by elimination method, we get
$2x = \frac{18}{4} + 1.8 = 4.5 + 1.8 = 6.3 => x = 3.15km/h$ …….(iii)
$3.15 - y = 1.8 => y = 1.35km/h$ ………(iv)
Therefore, equations (ii), (iii) and (iv) implies that all the given statements are correct
Hence option (d)
46. Answer. D

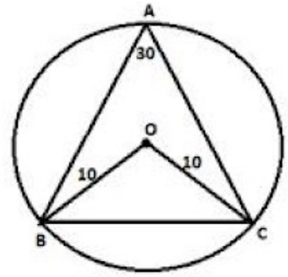


Since we know that 5, 13 and 12 forms a Pythagorean triplet, the side with 13 units is the longest
side and the angle between the other two sides is 90^0
Therefore $sin\theta = \frac{P}{H} = \frac{12}{13}$ and $cos\theta = \frac{B}{H} = \frac{5}{13}$
Thus $sin\theta + cos\theta = \frac{12}{13} + \frac{5}{13} = \frac{17}{13}$
Hence option (d)
47. Answer. B
As, 0 < x < $\frac{\pi}{2}$
Then, $sin0^0 < sinx < sin\frac{\pi}{2}$ => 0 < sinx < 1 ……(i)
0 < x < $\frac{\pi}{2}$
Then, $cos0^0 > cosx > cos\frac{\pi}{2}$ => 1 > cosx > 0 ……(ii)
Adding (i) and (ii), we get,
$0 < sinx + \cos x < 2$
Hence option (b)
48. Answer. A
Suppose we have right angled triangle with sides a, b and c where c is the longest side.



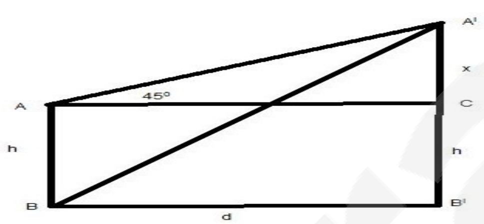
Now, we see that $sin\theta = \frac{a}{c}$ and $cos\theta = \frac{b}{c}$
Here, we can see that in both the denominators we have the same hypotenuse which means from
all the given options,
Only option (a) has the same hypotenuse as given in the question i.e. $m^2 + n^2$

49. Answer. B

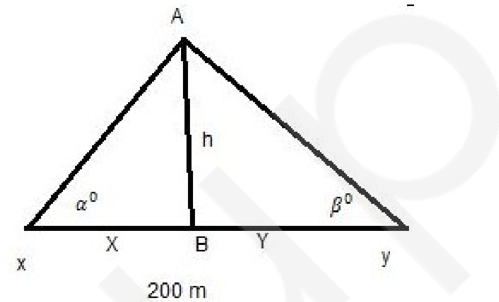


Since $\angle A = 30°$ and we know that the angle subtended by an arc at the centre of a circle is double
the angle subtended by it at any point the remaining part of the circle, therefore in the centre,
$\angle O = 2 \times 30° = 60°$
Also, since triangle OBC is an isosceles triangle so, its base angles will he equal i.e. ∠B and ∠C
are equal.
Let these angles be x.
Therefore, by angle sum property of a triangle,
∠O + ∠B + ∠C = 180 degree => $60° + x + x = 180°$
⇨ $60° + 2x = 180° => 2x = 120° => x = 60°$
Thus, we say that triangle OBC is an equilateral triangle and hence, BC is also equal to 10 cm.
Hence option (b)
50. Answer. A
As, $A = \frac{\sin 45° - \sin 30°}{\cos 45° + \cos 60°} = \frac{\frac{1}{\sqrt{2}} - \frac{1}{2}}{\frac{1}{\sqrt{2}} + \frac{1}{2}} = \frac{2-\sqrt{2}}{2+\sqrt{2}} = \frac{(2-\sqrt{2})(2-\sqrt{2})}{(2+\sqrt{2})(2-\sqrt{2})} = \frac{4+2-4\sqrt{2}}{4-2}$
$= \frac{2(3-2\sqrt{2})}{2}$ = (3 - 2×1.41) = 0.18
Now, $B = \frac{\sec 45° - \tan 45°}{cosec\ 45° + \cot 45°} = \frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{(\sqrt{2}-1)(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)} = \frac{2+1-2\sqrt{2}}{2-1}$
= (3-2√2) = (3 - 2×1.41) = 0.18
Hence, A = B
Hence option (a)
51. Answer. B
For calculating the angle between the hour hand and the minute hand of a clock when the time is
4 : 36 pm, we can say that the angle will be approximately equal to the angle made from 4 :20 pm to 4 : 36 pm.
Thus, we need to calculate the angle made by the hands of a clock in 16 minutes.
In 60 minutes, the angle made by the hands of a clock is 360°.
So, the angle made by the hands of a clock in 16 minutes = $\frac{360}{60} \times 16 = 96^0$
Thus, the angle lies between 72° to 108° i.e. $\frac{2\pi}{5}$ to $\frac{3\pi}{5}$
Hence, $\frac{2\pi}{5} < \theta < \frac{3\pi}{5}$
Hence option (b)
52. Answer. D
Statement 1:
As, $45^0 < \theta < 60^0$
If we consider θ = 45^0
Then, $\sec^2\theta + cosec^2\theta = \sec^2 45^0 + cosec^2 45^0$ = 2 + 2 = 4

So, $a^2 = 4 \Rightarrow a = 2 > 1$
If we consider $\theta = 60^0$
Then, $\sec^2\theta + \mathrm{cosec}^2\theta = \sec^2 60^0 + \mathrm{cosec}^2 60^0 = 4 + \frac{4}{3} = \frac{16}{3}$
So, $a^2 = \frac{16}{3} \Rightarrow a = 2.31 > 1$
Thus, statement 1 is correct.
Statement 2:
As, $0^0 < \theta < 45^0$
If we consider $\theta = 0^0$
Then, $\frac{1+\cos\theta}{1-\cos\theta} = \frac{1+\cos 0^0}{1-\cos 0^0} = \infty$
So, $x^2 = \infty \Rightarrow x = \infty$
If we consider $\theta = 45^0$
Then, $\frac{1+\cos\theta}{1-\cos\theta} = \frac{1+\cos 45^0}{1-\cos 45^0} = \frac{(\sqrt{2}+1)}{(\sqrt{2}-1)} = \frac{(\sqrt{2}+1)(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)} = \frac{2+1+2\sqrt{2}}{1} = 3 + 2\sqrt{2} = 5.828$
So, $x^2 = 5.828 \Rightarrow x = 2.414 > 2$
Hence statement 2 is correct.
Statement 3:
As, $0^0 < \theta < 45^0$
If we consider $\theta = 45^0$
Then, $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} = \frac{\cos 45^0}{1-\tan 45^0} + \frac{\sin 45^0}{1-\cot 45^0} = \frac{\frac{1}{\sqrt{2}}}{1-1} + \frac{\frac{1}{\sqrt{2}}}{1-1} = \infty \geq 2$
Hence statement 3 is correct.
Hence all the three statements are correct.
Hence option (d)
53. Answer. C



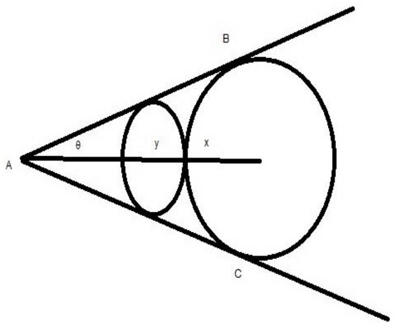
In triangle AA′C:
$\tan 45^0 = \frac{A'C}{AC} = \frac{x}{AC} \Rightarrow \frac{x}{AC} = 1 \Rightarrow AC = BB' = x \Rightarrow x = d$
Adding h on both sides, we get
h + x = h + d
So, h + x > d
Hence statement 1 is correct.
In triangle A′BB′:
If we take angle be 45^0
Then, $\tan 45^0 = \frac{A'B'}{BB'} = \frac{h+x}{d} \Rightarrow \frac{h+x}{d} = 1 \Rightarrow d = h + x$
But, by statement 1, this is not possible.
Thus, $\theta \neq 45^0$
Now, either $\theta < 45^0$ or $\theta > 45^0$
Let, $\theta = 60^0 > 45^0$
In triangle A′BB′
$\tan 60^0 = \frac{A'B'}{BB'} = \frac{h+x}{d} \Rightarrow \sqrt{3} = \frac{h+x}{d} \Rightarrow d\sqrt{3} = h + x$
……. (i)
Let, $\theta = 30^0 < 45^0$
In triangle A′BB′
$\tan 45^0 = \frac{A'B'}{BB'} = \frac{h+x}{d} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h+x}{d} \Rightarrow d = \sqrt{3}(h + x)$
……. (ii)
From (i), we can conclude that either LHS = RHS or, LHS > RHS
But, from (ii), clearly LHS < RHS
Hence, we cannot conclude that the angle of depression of B from A′ is less than 45^0
Hence statement 2 is incorrect.
Hence option (c)
54. Answer. C



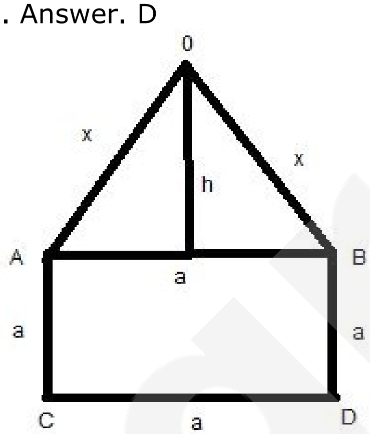
Here, AB is the breadth of river.
In triangle ABX:
$\tan a^0 = \frac{AB}{XB} = \frac{h}{x} \Rightarrow 2 = \frac{h}{x} \Rightarrow x = \frac{h}{2}$
In triangle ABY:
$\tan\beta^0 = \frac{AB}{BY} = \frac{h}{y} \Rightarrow 0.5 = \frac{h}{y} \Rightarrow y = 2h$
Given, x + y = 200
$\Rightarrow \frac{h}{2} + 2h = 200$
$\Rightarrow h = \frac{200\times 2}{5} = 80$
Hence the breadth of river be 80 m
Hence option (c)
55. Answer. B
As,
$\frac{\sin 1^0}{\sin 1^c} = \frac{0.0174}{\sin(\frac{180}{\pi})} = \frac{0.0174}{\sin(\frac{180}{3.14})} = \frac{0.0174}{\sin 57.32^0} = \frac{0.0174}{0.8417} = 0.0206 < 1$
Hence option (b)
56. Answer. D
Let the radius of two circle are 12r and 5r
And, sum of area of two circles $= \pi(12r)^2 + \pi(5r)^2$
Area of circles whose diameter is 65 cm $= \pi\left(\frac{65}{2}\right)^2$
According to question,

$\pi(144r^2) + \pi(25r^2) = \pi\left(\frac{4225}{4}\right)$
$\Rightarrow 169r^2 = \left(\frac{4225}{4}\right) \Rightarrow r^2 = \frac{4225}{4\times 169}$
$\Rightarrow r = \frac{65}{26} = \frac{5}{2}$
Hence radius of the circles are $\left(12 \times \frac{5}{2}\right) = 30\ cm\ and\ \left(5 \times \frac{5}{2}\right) = 12.5cm$
Hence option (d)
57. Answer. B
Given that a rectangular cello tape of length 4 cm and breadth 0.5 cm is used for joining each pair of edges.
Thus, area of the cello tape used for each face of the cube is x^2.

Thus, total area of the cello tape used is $6x^2$.
Now, we have $6x^2 = 6(4 \times 0.5)(4 \times 0.5) = 6 \times 2 \times 2 = 24$ sq. cm.
Hence option (b)
58. Answer. B

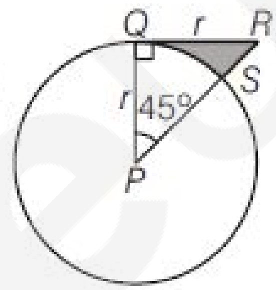


Let the radius of bigger circle be x and radius of the smaller circle be y.
Then the angle made by direct common tangents when two circles of radius x and y touch externally is given by
$\Theta = 2\sin^{-1}\frac{x-y}{x+y}$
Given that area of the bigger circle = 9 ×(area of the smaller circle)
$=> \pi x^2 = 9\pi y^2 => x^2 = 9y^2 => x = 3y$
Let us consider Angle BAC = θ
Then, $\theta = 2\sin^{-1}\frac{x-y}{x+y} = 2\sin^{-1}\frac{3y-y}{3y+y} = 2\sin^{-1}\frac{2y}{4y} = 2\sin^{-1}\frac{1}{2}$
$= 2 \times 30^0 = 60^0$
Hence option (b)
59. Answer. D

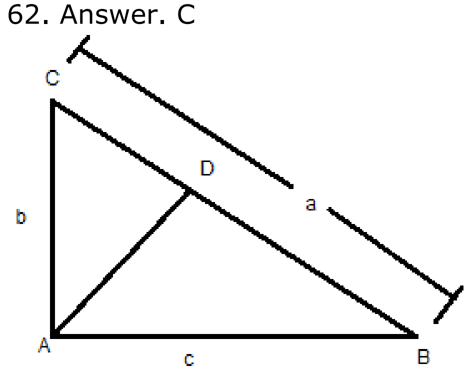


Let the side of each of the square be a and the other two sides of the triangle be x
Given, Perimeter of the complete figure = $\frac{7}{6}$(perimeter of the original square)
$=> 3a + 2x = \frac{7}{6}(4a) => 3a + 2x = \frac{7}{3}(2a)$
$=> 3(3a + 2x) = 14a$
$=> 9a + 6x = 14a$
$=> 6x = 5a$ ………(i)
Using Pythagoras theorem
In upper triangle:
$h = \sqrt{x^2 - \left(\frac{a}{2}\right)^2} = \sqrt{\left(\frac{5a}{6}\right)^2 - \frac{a^2}{4}} = \sqrt{\frac{25a^2}{36} - \frac{a^2}{4}} = \sqrt{\frac{25a^2-9a^2}{36}}$
$= \sqrt{\frac{16a^2}{36}} = \frac{4a}{6} = \frac{2a}{3}$

Again,
Ratio of the area of triangle to the original square =
$\frac{\frac{1}{2}\times a \times \frac{2a}{3}}{a^2} = \frac{\frac{a^2}{3}}{a^2} = \frac{1}{3}$
Hence required ratio be 1 : 3
60. Answer. C
By using Heron's formula:
Semi perimeter(S) $= \frac{a+b+c}{2} = \frac{51+37+20}{2} = \frac{108}{2} = 54$
[As, a = 51, b = 37 and c = 20]
Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)} =$
$\sqrt{54(54-51)(54-37)(54-20)}$
$= \sqrt{54 \times 3 \times 17 \times 34} =$
$\sqrt{(3 \times 3 \times 3 \times 2) \times 3 \times 17 \times (17 \times 2)} = 3 \times 3 \times 2 \times 17 =$
$306\ sq.cm$
Hence option (c)
61. Answer. B

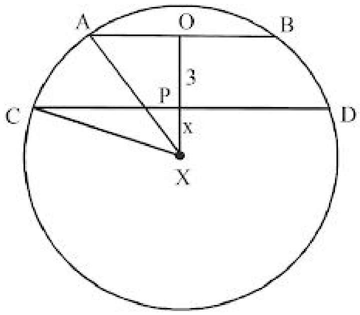


As, PQR is a triangle and QR = r
Radius of circle = r
Area of shaded region = area of triangle PQR – area of sector PQSP
=> Area of shaded region $= \frac{1}{2}r^2 - \frac{45^0}{360^0} \times \pi r^2 = \frac{r^2}{2} - \frac{\pi r^2}{8}$
Hence option (b)
62. Answer. C



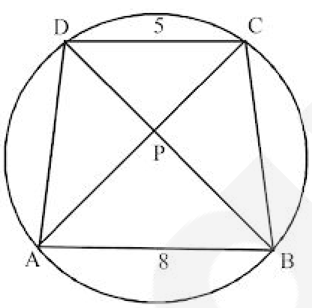
In triangle ABC:
AD is perpendicular on BC
Angle BAC = 90^0
As, AB = c, BC = a, CA = b and AD = p
Area of triangle ABD = area of triangle ACD
$=> \frac{1}{2}AC \times BC = \frac{1}{2}BC \times AD$
$=> AC \times BC = BC \times AD$
$=> bc = pa$
$=> p = \frac{bc}{a}$
Hence option (c)

63. Answer. C



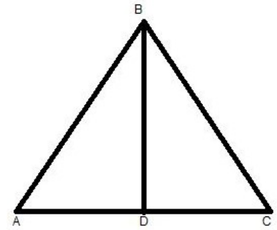
Given that AB = 4 cm and CD = 10 cm
Let the radius of the circle be r cm
Since the perpendicular from the center of a circle to a chord bisects the chord
So, AO = OB = 2 cm and CP = PD = 5 cm
In triangle AOX:
By using Pythagoras theorem,
$2^2 + (3 + x)^2 = r^2$
$=>4 + 9 + x^2 + 6x = r^2$
$=>13 + x^2 + 6x = r^2$ ....(i)
In triangle CPX:
$5^2 + x^2 = r^2$
$=>25 + x^2 = r^2$ ....(ii)
From equation (i) and (ii), we get
$13 + x^2 + 6x = 25 + x^2$
=>6x = 12
=>x = 2
From equation (ii), we get
$r^2 = 25 + 2^2 = 25 + 4 = 29$
$=>r = \sqrt{29}$ cm
Hence option (c)

64. Answer. D



Since ABCD is a cyclic quadrilateral and a trapezium so, AB parallel CD
In triangle APB and triangle CPD:
Angle CDP = angle ABP (Alternate interior angle)
Angle DCP = angle PAB (Alternate interior angle)
Thus, by AA similarity criteria triangle APB ~ triangle CPD
Now, the ratio of areas of similar triangles is equal to ratio of the squares of one of its proportional sides
Thus,
$\frac{area\ of\ triangle\ APB}{area\ of\ triangle\ CPd} = \frac{AB^2}{CD^2}$
$=>\frac{24}{area\ of\ triangle\ CPD} = \frac{8^2}{5^2} = \frac{64}{25}$
=>area of triangle CPD $= \frac{24\times25}{64} = \frac{3\times25}{8} = \frac{75}{8} =$ $9.375\ sq.cm$
Hence option (d)

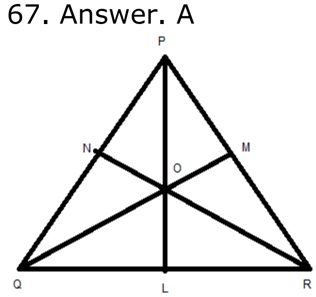
65. Answer. C



Since ABC is an equilateral triangle and BD is a perpendicular, therefore AD = DC
In triangle BCD, using Pythagoras theorem,
$Bc^2 = BD^2 + CD^2$
$=>BD^2 = BC^2 - CD^2$
$=>BD^2 = AC^2 - CD^2$ [As, BC = AC]
$=>BD^2 = (AD + DC)^2 - CD^2$
$=> BD^2 = AD^2 + DC^2 + 2ADCD - CD^2$
$=>BD^2 = AD^2 + 2DC^2$ [As, CD = AD]
$=>BD^2 = AD^2 + 2AD^2$ [As, DC = AD]
$=> BD^2 = 3AD^2$
Hence option (c)

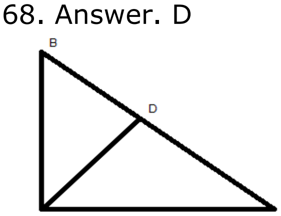
66. Answer. A
Given that radius of first circle(R) = 9 cm
radius of second circle(r) = 4 cm
Distance between the centers of two circles(d) = 13 cm
The length of the direct common tangent of these circles $= \sqrt{d^2 - (R - r)^2}$
$= \sqrt{13^2 - (9 - 4)^2} = \sqrt{169 - 25} = \sqrt{144} = 12$ cm
Hence option (a)

67. Answer. A



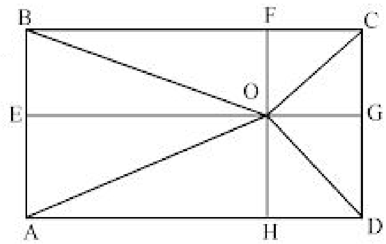
From the figure, clearly Q is outside the triangle OPR.
Also, triangle OPR is an obtuse angled triangle.
Since, orthocenter of an obtuse angled triangle is always outside the triangle.
Thus, Q is orthocenter of the triangle OPR.
Hence option (a)

68. Answer. D

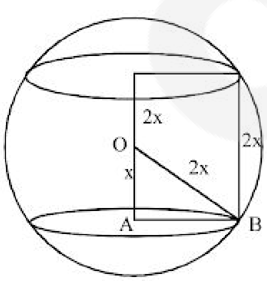


$(CD)^{-2} = (BC)^{-2} + (CA)^{-2}$

$=> \frac{1}{(CD)^2} = \frac{1}{(BC)^2} + \frac{1}{(CA)^2}$
$=> \frac{1}{(CD)^2} = \frac{(CA)^2+(BC)^2}{(BC)^2(CA)^2}$
$=> \frac{1}{(CD)^2} = \frac{(AB)^2}{(BC)^2(CA)^2}$ [As, $(CA)^2 + (BC)^2 = (AB)^2$]
$=> (CD)^2 = \frac{(BC)^2(CA)^2}{(AB)^2}$
$=> (CD)^2(AB)^2 = (BC)^2(CA)^2$
$=> (CD)(AB) = (BC)(CA)$
Thus, $(AB)(CD) = (BC)(CA)$
Hence option (d)
69. Answer. C

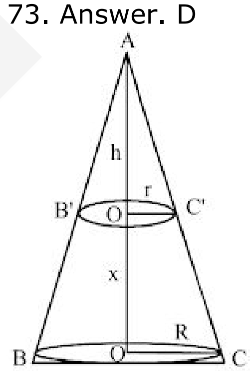


As, ABCD is a rectangle with point O inside the rectangle.
Draw lines OA, OB, OC and OD
Again draw from point O perpendicular to the sides i.e. OE, OF, OG and OH.
We can use Pythagorean theorem in different right angled triangle in above figure.
$OA^2 = AH^2 + OH^2 = AH^2 + AE^2$ [As, OH =AE].......(i)
$OC^2 = CG^2 + OG^2 = EB^2 + HD^2$ [As, CG = EB and OG = HD]......(ii)
$OB^2 = EO^2 + BE^2 = AH^2 + BE^2$ [As, EO = AH].........(iii)
$OD^2 = HD^2 + OH^2 = HD^2 + AE^2$ [As, OH = AE]......(iv)
Adding (i) and (ii), we get
$OA^2 + OC^2 = AH^2 + HD^2 + AE^2 + EB^2$ ....(v)
Adding (iii) and (iv), we get
$OB^2 + OD^2 = AH^2 + HD^2 + AE^2 + EB^2$ ....(vi)
From (v) and (vi), we get
$OA^2 + OC^2 = OB^2 + OD^2$
Hence option (c)
70. Answer. A



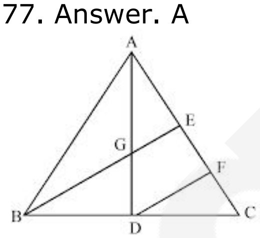
In triangle OAB, by using Pythagoras theorem
Radius of triangle = $\sqrt{OB^2 - OA^2}$ = $\sqrt{(2x)^2 - x^2}$ = $\sqrt{3x^2}$ = $\sqrt{3}$x
Curved surface area of cylinder = 2πrh = 2π($\sqrt{3}$x)(2x) [As, r = $\sqrt{3}$x and h = 2x]
= 4$\sqrt{3}$πx^2
Surface area of the sphere = 4πr^2 = 4π(2x)^2 = 16πx^2

Hence required ratio = $\frac{4\sqrt{3}\pi x^2}{16\pi x^2} = \frac{4\sqrt{3}}{16} = \frac{\sqrt{3}}{4}$
Hence required ratio be $\sqrt{3}$: 4
Hence option (a)
71. Answer. D
Since the sphere is dropped in the cylindrical vessel partially filled with water and is completely immersed.
Therefore, the volumes of both will be equal.
Let r be the radius of cylinder and R be the radius of the sphere.
Thus, volume of cylinder = volume of sphere
$=> \pi r^2 h = \frac{4}{3}\pi R^3$
$=> 30 \times 30 \times h = \frac{4}{3} \times 15 \times 15 \times 15$ [As, r = 30 and R = 15]
$=> h = \frac{4\times15\times15\times15}{3\times30\times30} = 5$
Hence height of water in the cylinder rise = 5 cm
Hence option (d)
72. Answer. C
Let the radius of base circle of cone be r cm
Given that slant height(l) = $\sqrt{2}$r cm
Then, height of cone (h) = $\sqrt{l^2 - r^2}$ = $\sqrt{(\sqrt{2}r)^2 - r^2}$ = $\sqrt{r^2}$ = r
Hence volume of cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 r = \frac{\pi r^3}{3}$
Hence option (c)
73. Answer. D

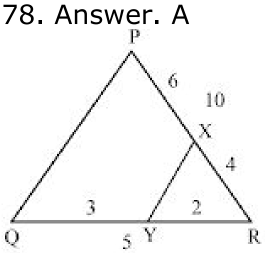


Let the radii of frustum of a cone be R and r
Given that, $\frac{R}{r} = \frac{2}{1}$ ....(i)
Let angle AC′O′ = angle ACO = θ
Now, in triangle AC′O′:
tan θ = $\frac{h}{r} = \frac{h}{k}$ [As, $\frac{R}{2} = \frac{r}{1} = k$].......(ii)
In triangle ACO,
tan θ = $\frac{h+x}{R} = \frac{h+x}{2k}$ ......(iii)
From (ii) and (iii), we get
$\frac{h}{k} = \frac{h+x}{2k}$
$=> h = \frac{h+x}{2}$
=>2h = h + x
=>h = x
Therefore, H = h + x = h + h = 2h
$=> \frac{H}{h} = \frac{2}{1}$
Now, volume of frustum of cone = $\frac{\pi h}{3}(R^2 + Rr + r^2)$
and volume of cone = $\frac{1}{3}\pi r^2 H$

Hence required ratio = $\frac{\frac{\pi h}{3}(R^2+Rr+r^2)}{\frac{1}{3}\pi r^2 H} = \frac{h(R^2+Rr+r^2)}{R^2 H} = \frac{h(4r^2+r^2+2r^2)}{4r^2\times 2h} = \frac{7r^2}{8r^2} = \frac{7}{8}$
Hence required ratio be 7 : 8
Hence option (d)
74. Answer. D
As, the conical cavity in the cylinder is hollowed out.
Therefore, inner surface area of the cavity is curved surface area of the cone.
Thus, curved surface area of cone = $\pi r l =$
$\pi \times 6 \times \sqrt{8^2 + 6^2}$
$= \pi \times 6 \times \sqrt{100} = \pi \times 6 \times 10 = 60\pi$
Hence inner surface area of cavity = 60π sq. cm
Hence option (d)
75. Answer. B
As, volume of cylinder = $\pi r^2 h = \pi(50)^2(10) =$ 25000π *cubic meter* [As, r = 50 m and h = 10 m]
Volume of cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(50)^2(15-10) =$ $\frac{1}{3}\pi \times 2500 \times 5 = \frac{12500\pi}{3}$ *cubic meter* [As, h = 15 – 10 = 5]
Total volume = $25000\pi + \frac{12500\pi}{3} = \frac{87500\pi}{3}$ *cubic meter*
76. Answer. B
The maximum possible volume of the circular cylinder that can be formed from a rectangular sheet will have the largest length and breadth.
So, we will consider the rectangular sheet with length 4π and breadth 2π.
The length of the rectangular sheet = circumference of the cylinder
=>4 π = 2 πr
=>r = 2
Volume of cylinder = $\pi r^2 h = \pi \times 4 \times 2\pi = 8\pi^2$
77. Answer. A



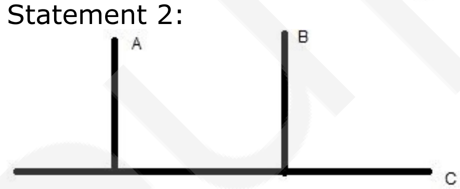
Since BE is the median of AC.
Therefore, AE = EC
Also, AC = 9 cm
So, AE = EC = 3 cm
i.e. FC < EC
Thus, according to option FC = 2.25 cm
78. Answer. A



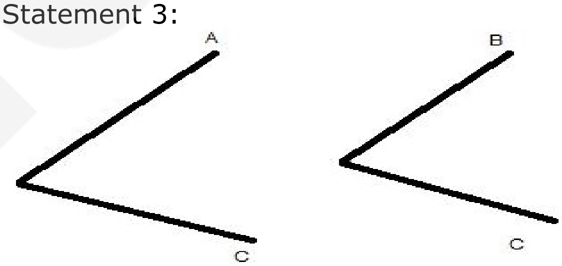
As, $\frac{RY}{YQ} = \frac{RX}{XP}$
$=> \frac{2}{3} = \frac{4}{6}$
$=> \frac{2}{3} = \frac{2}{3}$
So, by converse of basic proportionality theorem XY parallel to PQ
Hence option (a)
79. Answer. A

Statement 1:

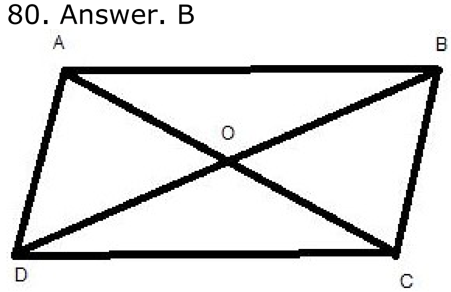
Clearly, statement 1 is correct.
Statement 2:



Here, A is perpendicular to C and B is also perpendicular to B.
So, A must be parallel to B
Statement 3:

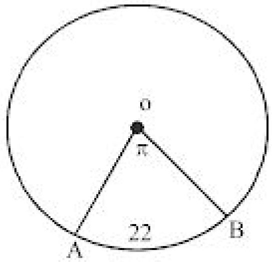


Clearly, A is parallel to B.
Hence all the three statements are correct.
Hence option (a)
80. Answer. B



Since the diagonals of rhombus bisect each other.
Thus, AO = OC = 10 cm and BO = OD = 24 cm
In triangle AOB:
Using Pythagoras theorem, we get
$AB = \sqrt{AO^2 + OB^2}$
$=> AB = \sqrt{10^2 + 24^2}$
$=> AB = \sqrt{676}$
$=> AB = 26\ cm$
Hence side of rhombus be 26 cm
Hence option (b)

81. Answer. B



Length of arc = $\frac{\theta}{360} \times 2\pi r$

=>$22 = \frac{\pi}{360} \times 2\pi r$

For finding the value in degree, multiple with $\frac{180}{\pi}$ with RHS

Thus, $22 = \frac{180}{\pi} \times \frac{\pi}{360} \times 2\pi r$

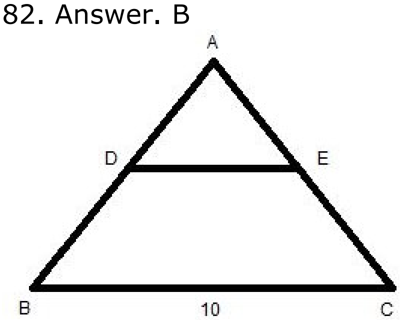
=>$\pi r = 22$

=>$r = \frac{22}{\pi} = \frac{22 \times 7}{22} = 7$

Hence radius of circle be 7 cm

Hence option (b)

82. Answer. B



According to question,

By basic proportionality theorem

$\frac{AD}{AB} = \frac{AE}{AC}$ and angle A is common

So, Triangle ADE ~ triangle ABC [By SAS similarity]

As, we know that the ratio of the areas of two similar triangles is equal to the square of its proportional sides

Thus, $\frac{area\ of\ triangle\ ADE}{area\ of\ triangle\ ABC} = \frac{DE^2}{BC^2}$ .....(i)

Given that,

$area\ of\ triangle\ ADE = \frac{1}{5}(area\ of\ triangle\ ABC)$ ....(ii)

From (i) and (ii), we get

$\frac{area\ of\ triangle\ ABC}{5(area\ of\ triangle\ ABC)} = \frac{DE^2}{10^2}$

=>$\frac{1}{5} = \frac{DE^2}{100}$

=>$DE = \sqrt{\frac{100}{5}} = 2\sqrt{5}$

Hence option (b)

83. Answer. C

As we know that, two non-parallel lines are always intersect at a point.

Thus, the maximum number of points at which they can intersect = $^8C_2 = \frac{8!}{2! \times 6!} = \frac{8 \times 7 \times 6!}{2 \times 1 \times 6!} = 4 \times 7 = 28$

Hence option (c)

84. Answer. B

For finding the sum of the interior angles of a polygon is the same, whether the polygon is regular or irregular.

So, we would use the formula (n — 2) x 180°.

Where n is the number of sides in the polygon.

Let one angle of the polygon be x and other 5 equal angles be y.

According to the question,

x = y + 30…….(i)

(n - 2)×180^0 = x + 5y……(ii)

From (i) and (ii), we get

(n - 2)×180^0 = y + 30 + 5y

=>(6 - 2) ×180^0 = 30 + 6y

=>4×180^0 = 30 + 6y

=>6y = 690

=>y = $\frac{690}{6} = 115^0$

Hence value of equal angles be 115^0

Hence option (b)

85. Answer. A

Statement 1:

Since the point of intersection of the perpendicular bisectors of the sides of a triangle is called circumcenter and the circumcenter for an obtuse triangle lie outside the triangle.

Hence statement 1 is correct.

Statement 2:

Also, since the point of intersection of the perpendiculars drawn from the vertices to the opposite sides of a triangle is called orthocenter and orthocenter cannot lie on two sides.

Hence statement 2 is incorrect.

Hence option (a)

86. Answer. C

Subject→ Girls/Boys↓	Mathematics	Physics	Statistics	Chemistry
Number of Girls	240 – 150 = 90	300 – 180 = 120	250	(3/5)×340 = 204
Number of Boys	150	60% of 300 = 180	320 – 250 = 70	136
Total	20% of 1200 = 240	1200/4 = 300	320	1200-(240 + 300 + 320) = 340

Total number of boys studying Statistics and Physics = 70 + 180 = 250

Hence option (c)

87. Answer. B

Number of girls studying Statistics = 250

Total Number of students studying Chemistry = 340
Thus, required percentage = $\frac{250}{340} \times 100 = 73.52 = 73.5(approx)$
Hence option (b)
88. Answer. C
Difference between the number of boys and girls in Mathematics = 150 – 90 = 60
Difference between the number of boys and girls in Physics = 180 – 120 = 60
Difference between the number of boys and girls in Statistics = 250 – 70 = 180
Difference between the number of boys and girls in Chemistry = 204 – 136 = 68
Hence Difference between the number of boys and girls in Mathematics and Physics are equal.
Hence option (c)
89. Answer. B
Number of boys studying Mathematics = 150
Number of girls studying Physics = 120
Difference between the number of boys studying Mathematics and the number of girls studying Physics = 150 – 120 = 30
Hence option (b)
90. Answer. A
Total number of Boys = 150 + 180 + 70 + 136 = 536
Total number of Girls = 90 + 120 + 250 + 204 = 664
The ratio of the total number of boys to the total number of girls = 536 : 664 = 67 : 83 (After dividing by 8)
Hence option (a)
91. Answer. A
As, we know that Frequency density of a class is the ratio of Class frequency to the class length
Or, Frequency density of a class is the ratio of Class frequency to the class width.
Hence option (a)
92. Answer. A

categories of workers	Number of workers	Salary per workers (in Rs.)	Total salary (in Rs.)
A	1	65000	65000×1 = 65000
B	3	25000	25000×3 = 75000
C	5	20000	20000×5 = 100000
	Total = 9		Total = 240000

Mean Salary of workers = $\frac{240000}{9} = 26666.67$
Clearly, workers of B and C categories are gaining salary which is less than the mean salary of the workers.
Hence the number of workers earning less than the mean salary = 3 + 5 = 8
Hence option (a)
93. Answer. A
As we know that,
$Average\ speed = \frac{Total\ distance}{Total\ time\ taken}$
$=> Average\ speed = \frac{12+10}{\frac{12}{4}+\frac{10}{5}} = \frac{22}{3+2} = \frac{22}{5} = 4.4\ km/hr$
Hence option (a)
94. Answer. A
We can solve this question according to given options.
Option (a):
If the monthly expenditure of families A would be Rs. 16000
If the monthly expenditure of families B would be Rs. 9000
Then, required ratio would be 16000 : 9000 = 16 : 9
Hence appropriate data used for the the pie diagrams on the monthly expenditure of two families
A and B be Rs. 16000 and Rs. 9000 respectively are drawn with radii of two circles taken in the ratio 16 : 9 to compare their milk.
Hence option (a)
95. Answer. C
Statement 1:
As we know that the value of a random variable having the highest frequency is mode.
Hence statement 1 is correct
Statement 2:
A distribution having single mode is known as Unimodal and the distribution having more than one mode bimodal, trimodal etc or in general multimodal.
Thus, mode is not unique.
Hence statement 2 is incorrect.
Hence option (c)
96. Answer. D
A pie chart is a circular statistical graphic which is divided into slices to illustrate numerical proportion. In a pie chart, the arc length of each slice (and consequently its central angle and area), is proportional to the quantity it represents.
Hence the proportion of various items in a pie diagram is not proportional to the Perimeters of the slices.
Hence option (d)
97. Answer. C
As, geometric mean of x and y = $\sqrt{xy}$ = 6 …..(i)
Also, geometric mean of x, y and z = $\sqrt[3]{xyz}$ = 6 …..(ii)
From (i) and (ii), we get
$\sqrt{xy} = \sqrt[3]{xyz} => (xy)^{\frac{1}{2}} = (xyz)^{\frac{1}{3}}$
$Taking\ power\ 6\ both\ sides, we\ get$
$(xy)^3 = (xyz)^2$

=>x^3y^3 = $x^2y^2z^2$
=>$\frac{x^3y^3}{x^2y^2} = z^2$
=>xy = z^2
=>6^2 = z^2 (From equation (i))
Hence, z = 6
Hence option (c)
98. Answer. B
As we know that secondary data is the data collected from sources other than user itself.
Thus, The total number of live births in a specific locality during different months of a specific year was obtained from the office of the Birth Registrar. This set of data may be called secondary data.
Hence option (b)
99. Answer. B
The "Mean" is the "average" = $\frac{150+165+161+144++155}{5} = \frac{775}{5} = 155$
The "Median" is the "middle" value in the list of numbers, given number is 144,150,155,161 and 165, middle value of given numbers is 155 i.e. median of given number is 155
Mean = 155 and median = 155
Hence option (b)
100. Answer. C
Given average height of 22 students of a class is 140 cm
∴ total height of 22 students = $22 \times 140 = 3080$
And average height of 28 students of another class is 152 cm
∴ total height of 28 students
$= 28 \times 152 = 4256$
Now average height of total students = $\frac{height\ of\ total\ students}{number\ of\ total\ student} = \frac{7336}{50} = 146.72$
Hence option (c)

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