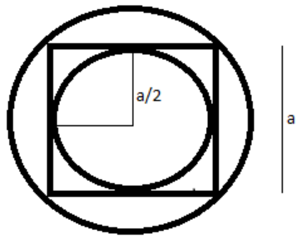
Solution

1-3

1.

Ans. A

Solution



The top view of the given assembly will look like the figure above

Outermost is the sphere. Inside that there is a cube and within that there is a cone and cylinder with same radius.

Here side of cube = a

Diameter of Sphere = body diagnol = √3 a

Radius of sphere = √3 a/2 = $\mathbf{r_1}$

Height of Cylinder = Height of cone = side of cube = a = **h**

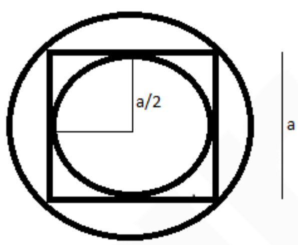
Radius of cylinder = Radius of cone = side of cube/2 = a/2 = $\mathbf{r_2}$ (as shown in the figure)

Volume of sphere/volume of cone = $\frac{Vsphere}{Vcone} = \frac{\frac{4}{3}\pi {r_1}^3}{\frac{1}{3}\pi {r_2}^2 h}$ = 6√3:1

2.

Ans. C

Solution



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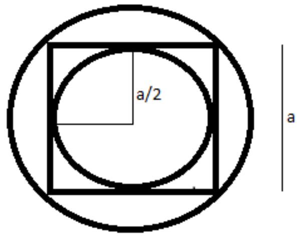
= $\frac{Vcube}{Vcylinder} = \frac{a^3}{\pi {r_2}^2 h} = \frac{a^3}{\pi (a^2/4) a}$

Put π = 22/7

= 14/11

3.
Ans. D
Solution



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Here side of cube = a
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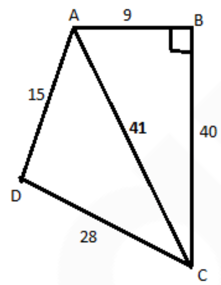
Radius of sphere = √3 a/2 = $\mathbf{r_1}$
Height of Cylinder = Height of cone = side of cube = a = **h**
Radius of cylinder = Radius of cone = side of cube/2 = a/2 = $\mathbf{r_2}$ (as shown in the figure)

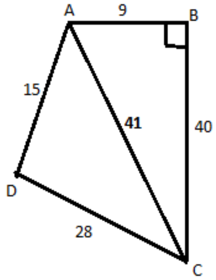
Surface area of Sphere = $4\pi r_1^2 = 3\pi a^2$
Curved Surface area of cone = $\pi r_2 L = \pi r_2(h^2+r_2^2)^{1/2} = \sqrt{5}\,\pi a^2/4$
Surface area of cube = $6a^2$
Curved Surface area of cylinder = $2\pi r_2 h = \pi a^2$
Thus neither 1 nor 2 are true

4-6
4.
Ans. A
Solution



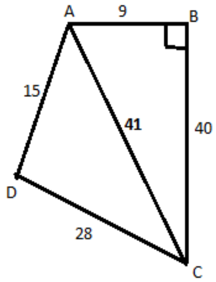
Area of triangle ADC = $\left(s(s-a)(s-b)(s-c)\right)^{1/2}$
Where s is the semi perimeter of triangle = (AD + DC + CA) / 2 = 15+28+41 / 2 = 42 cm
Area = $\left(42(42-15)(42-28)(42-41)\right)^{1/2}$
= $(42 * 27 * 14 * 1)^{1/2}$
= 126 cm^2

5
Ans B
Solution



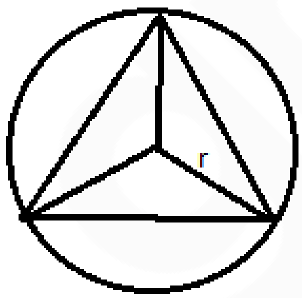
Area of quadrilateral ABCD = area of triangle ADC + area of triangle ABC
= 126 + ½ * 9 * 40 = 306 cm^2

6.
Ans. C
Solution

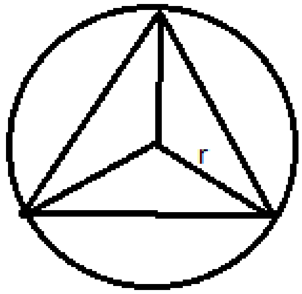


Perimeter of triangle ABC – Perimeter of triangle ADC = (9+40+41)-(15+28+41) = 6cm

7-8
7
Ans. D
Solution



Radius of circumcircle of an equilateral triangle = side / √3
R = a/√3
a = R√3 = 20√3 * √3 = 60cm

8
Ans. C
Solution


For equilateral triangle circumcenter and centroid are the same points
So distance from vertex = radius of circumcircle = 20√3

9-10
9
Ans. A
Solution
Let lengths, breadth and height of cuboid be l, b and h respectively
According to question
l+b+h = 22cm……(i)
and $\sqrt{(l^2+b^2+h^2)}$ = 14cm …..(ii)
Surface area of cuboid = 2(lb+bh+lh)
Squaring eq (i) gives
$l^2+b^2+h^2 + 2(lb+bh+lh) = 484$
Substituting $l^2+b^2+h^2$ from eq (i)
2(lb+bh+lh) = 484-196 = 288 cm^2

10
Ans. C
Solution
Let lengths, breadth and height of cuboid be l, b and h respectively
According to question
l+b+h = 22cm……(i)
and $\sqrt{(l^2+b^2+h^2)}$ = 14cm …..(ii)
$S = l^3+b^3+h^3$ and V = lbh
$S-3V = l^3+b^3+h^3 - 3\ lbh = (l+b+h)(\ l^2+b^2+h^2-[lb+bh+lh])$…(iii)
As we know
Squaring eq (i) gives
$l^2+b^2+h^2 + 2(lb+bh+lh) = 484$
Substituting $l^2+b^2+h^2$ from eq (i)
2(lb+bh+lh) = 484-196 = 288 cm^2
lb+bh+lh = 144 cm^2
Putting this in eq (iii) we get
22(196-144) = 22*52 = 1144cm^2

11.
Ans. B
Solution

Average speed = Total Distance / Total time = $\frac{9*\frac{50}{60}+8*\frac{80}{60}+7.5*\frac{100}{60}}{\frac{50}{60}+\frac{80}{60}+\frac{100}{60}}$

= (45+64+75)/23 = 184/23
= 8 kmph
12.
Ans. C
Solution
a/(b+c) = b/(c+a) = c/(a+b)
Taking reciprocal and adding 1 to each ratio we get;
(b+c)/a + 1 = b/(c+a) + 1 = c/(a+b) + 1
Or (a+b+c)/a = (a+b+c)/b = (a+b+c)/c
So this can only be equal when a=b=c or a+b+c = 0
When a=b=c we get a/(b+c) = ½
When a+b+c = 0 we get b+c = -a
So a/(b+c) = -1
So the ratios are ½ or -1

13.
Ans. B
Solution
$3^{521}/8$
As we know 3^2=9 will leave remainder = 1 when divided by 8
So $3^{521}/8 = [(3^2)^{260} * 3]/8 = 1*3/8 = 3/8$ Thus remainder is 3

14
Ans. D
Solution
For prime no units place cannot be occupied by even number except for 2
Thus no of digits occupying unit digit of prime numbers = 6 (1,2,3,5,7,9)
Example 2,3,5,7,11,19 in itself are prime numbers

15.
Ans. D
Solution
Let CP be Rs x
Then
1.06x – 0.94x = 6
So x = Rs 50

16.
Ans. C
Solution
12 men or 18 women can complete in 14 days
8 men and 16 women can complete in how many days

12men = 18 women (Comparing efficiencies)
1men = 18/12 = 1.5 women
8 men and 16 women = 12women + 16 women = 28 women
18 women completes in 14 days
1 woman completes in 14*18 days
28 women completes in (14*18)/28 days = 9 days

17.
Ans. C
Solution
$3^x = 4^y = 12^z$
Taking log of all 3 we get
xln3 = yln4 = zln12 = k
z = k/ln12 = k / ln(3*4) = k/ln3 + ln4 = k / (k/x +k/y) = xy / (x+y)

18.
Ans. C
Solution
(4a+7b)(4c-7d) = (4a-7b)(4c+7d)
(4a+7b)/(4a-7b) = (4c+7d)/(4c-7d)
Using componendo and dividendo
(4a+7b)+(4a-7b) / (4a+7b)-(4a-7b) = (4c+7d)+(4c-7d) / (4c+7d)-(4c-7d)
Or 8a/14b = 8c/14d
Or a/b = c/d

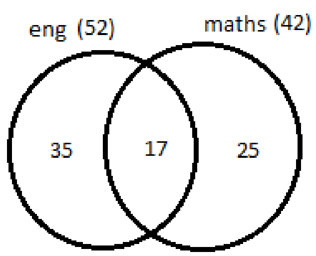
19.
Ans. D
Solution
Since x^2 + ax + b when divided by x-1 or x+1 leaves the same remainder
So on putting x=1 and x=-1 we get the same value
1+a+b = 1-a+b
2a=0
a=0
here b can take any value as it will always get cancelled out

20
Ans. D
Solution
Let them take x hours working together
1/x = 1/10 + 1/6 = 8/30
X= 30/8 hours = 15/4 hours = 3hours 45 minutes

21.
Ans D
Solution
$2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + \cdots.}}}$ = t (let)

$2 + \sqrt{t} = t$
Or $t-2 = \sqrt{t}$
Squaring both sides
$t = t^2 - 4t + 4$
or $t^2 - 5t + 4 = 0$
Or t = 4,1 Now t cannot be equal to 1 as it is clear that it is always greater than 2
So t = 4

22.
Ans D
Solution



venn diagram of no of failed students

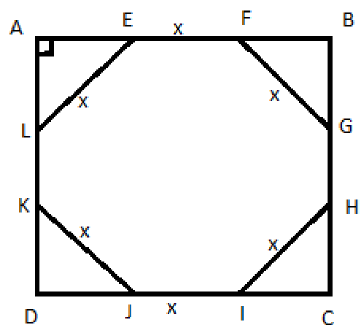
No of students failed in English only = 52 – 17 = 35
No of students failed in maths only = 42 – 17 = 25
Total no of failed students in either of the subjects = 35+17+25 = 77
No of passed student in both subjects = 100 – 77 = 23

23.
Ans. C
Solution
Let his wife get a share of Rs x
Each of the 4 daughters get = Rs 2x
Each of the 5 sons get = Rs 6x
So x + 4*2x + 5*6x = 390000
So 39x = 390000
X= 10000 = wife's share

24.
Ans. B
Solution
A = P$(1 + R/100)^t$
3P < P$(1 + 40/100)^t$
3 < $(1.4)^t$
When t = 3 ; 1.4^3 = 2.744
And when t = 4; 1.4^4 = 3.8416
T=4 is the answer

25.
Ans. B
Solution
Let sum invested @ 5% be P1, @ 6% be P2 then @ 9% = 17200-(P1+P2)
So according to question
P1*5*2/100 = P2*6*2/100 or P1 = (6/5) P2
Also P2*6*2/100 = [17200-(P1+P2)]*9*2/100
Or 2 P2 = [17200 – (11/5)P2] * 3
Or (2 + 33/5)P2 = 17200 * 3
P2 = 17200 * 3 * 5 / 43 = 6000
So P1 = 6/5 P2 = 7200
So Sum invested @ 9% = 17200 –(6000+7200) = Rs 4000

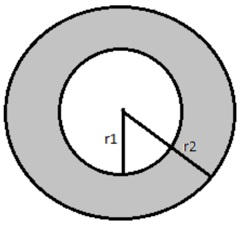
26
Ans. A
Solution



Let side of hexagon be x
$AE^2 + AL^2 = LE^2$
Since we are forming a regular octagon so AE = AL = FB = BG and so on
So AE = SB = x/√2
AE + EF + FB = side of square = a (Given)
So x/√2 + x + x/√2 = a
X = a/(√2+1) = a(√2 - 1)

27.
Ans. A
Solution
let n-1, n, n+1 be 3 consecutive integers
So
$(n+1)^2 = n^2 + (n-1)^2$
$(n+1)^2 - (n-1)^2 = n^2$
$4n = n^2$
So n = 0 or n = 4
n can't be 0 as n-1 will be negative then
So 3,4 and 5 is the only triplet formed

28.
Ans. C
Solution



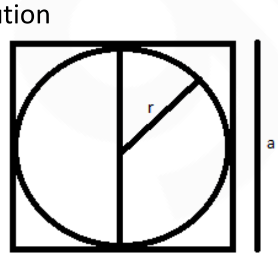
Given $C_1 = 2\pi r_1 = 44$ $C_2 = 2\pi r_2 = 88$
$r_1 = 7$ $r_2 = 14$

Area between circles = $\pi r_2^2 - \pi r_1^2 = 22/7(14^2 - 7^2)$
$= 462\ cm^2$

29.
Ans. C
Solution
Initially carpet is 6×12 = 72 sq feet
Since red border is 6 inches wide from all 4 side
So area without border = 5 × 11 = 55 sq feet
Area of border = total – area without border = 72 – 55 = 17 sq feet

30.
Ans. C
Solution
Let other side and hypotenuse be 4x and 5x respectively
Shortest side^2 + $(4x)^2 = (5x)^2$
Shortest side = 3x
According to question
K*3x = 12x
So k = 4

31.
Ans. B
Solution

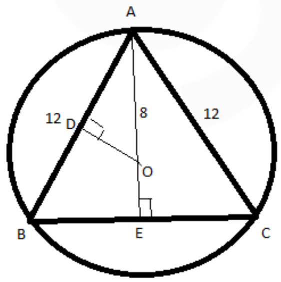


As it is clear that 2r = a where a is the side of the square and
R is the radius of circle
It is given that $2\pi r + 4a = 12$
$a = 12/(\pi+4)$

32.
Ans. A
Solution
4k + k + k = 6x =180 degrees
k= 30 degrees
So triangle is 30,30 and 120 degrees
Let sides of triangle be x,x and y units with y being the largest side opposite to 120 degree angle
Using cosine law
Cos 120 = - sin 30 = -1/2 = $(2x^2 – y^2)/2x^2$
So $3x^2 = y^2$ .... (i)
Given Perimeter = k (Largest side)
Or 2x+y = ky
Putting value of x from eq (i)
2y/√3 + y = ky
K = 2/√3 + 1

33.
Ans. C
Solution
Hypotenuse = 10cm
Let the other 2 perpendicular sides be a and b
Area ½ a*b = 24
So a*b = 48 cm^2
Also using Pythagoras
$a^2 + b^2 = 100$
$(a+b)^2 = a^2 + b^2 + 2ab = 100 + 96 = 196$
a+b = 14
Similarly
a-b = 2
So
a=8 and b=6
Now smaller side is halved and larger side is doubled
So $a_1 = 16$ and $b_1 = 3$
New hypotenuse = $\sqrt{(16^2+3^2)} = \sqrt{265}$

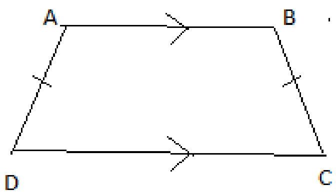
34.
Ans. D
Solution



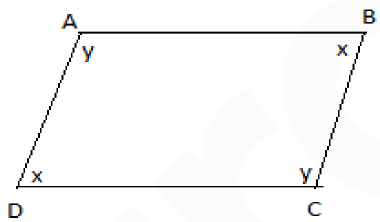
O is the center of circle

Here ABC forms an isosceles triangle as AB=AC=12cm
So AE (a perpendicular bisector) passes through O as OE also bisects chord BC at right angle
AD = DB = 6
In triangle ADO
$AO^2 = AD^2 + DO^2$
OD = √64 – 36 = √28
Now using similarity
AEB~ADO
AB/AO = EB/DO
12/8 = (BC/2)/ √28
BC=6√7

35.
Ans. C
Solution

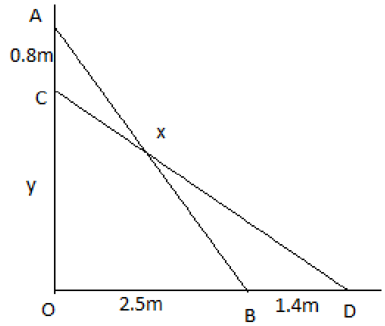


Since it is an isosceles trapezium
So angle C = angle D = x let
A = 180 – D = 180 – x (since AB is parallel to CD)
B = 180-x
A+C = 180 –x + x = 180 degrees (Property of cyclic quadrilateral)



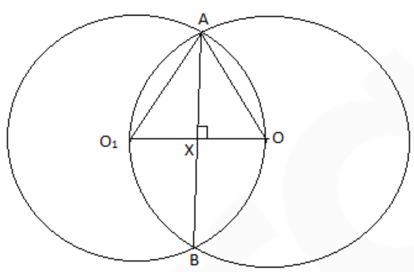
ABCD is cyclic parallelogram with AB // CD and AD // BC
Considering angles
A = C = y (Property of parallelogram) and
B=D = x
Also since it is cyclic
A+C = B+D = 180degrees
So x=y=90degrees
And also opposite sides are equal being a parallelogram
Thus ABCD is a rectangle

36.
Ans. B



AB = CD = x = Length of ladder
Let OC = y m
$y^2 + 3.9^2 = x^2$
$(y+0.8)^2 + 2.5^2 = x^2$
So $y^2 + 3.9^2 = (y+0.8)^2 + 2.5^2$
y = 5.2m
x= $\sqrt{(5.2^2+3.9^2)}$
x= 6.5m

37.
Ans. C
Solution

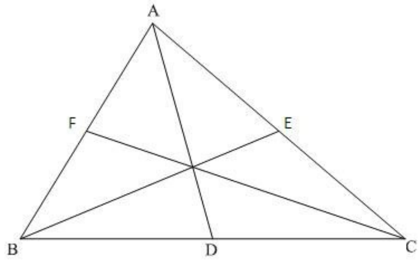


Let there be 2 circles with centre O_1 and O
AB is the common chord
Since both passes through the center of each other as shown in figure
So O_1O is the radius of both
Let $O_1O = r = AO_1 = AO$
AX = AB / 2 = 5√3 cm (since OX perpendicular to chord bisects it)
AOO_1 forms an equilateral triangle with on side = radius = r
Sin 60 = √3/2 = AX / AO = 5√3/r
So r = 10cm
So diameter = 20 cm

38
Ans. D
Solution
(1) Only one circle can be drawn through 3 non collinear points
Angle in the minor segment is always obtuse

39
Ans. D
Solution
AC-AB<BC Or AB+BC>AC
BC-AC<AB Or AB+AC>BC
AB-BC<AC Or AC+BC>AB
Sum of 2 sides of triangle is always greater than the third side
So all three statements are true

40.
Ans. C
Solution
1. Perimeter of triangle is greater than the sum of 3 medians



Let ABC be the triangle and D. E and F are midpoints of BC, CA and AB respectively.
Recall that the sum of two sides of a triangle is greater than twice the median bisecting the third side,(Theorem to be remembered)
Hence in ΔABD, AD is a median
⇒ AB + AC > 2(AD)
Similarly, we get
BC + AC > 2CF
BC + AB > 2BE
On adding the above inequations, we get
(AB + AC) + (BC + AC) + (BC + AB)> 2AD + 2CD + 2BE
2(AB + BC + AC) > 2(AD + BE + CF)
∴ AB + BC + AC > AD + BE + CF

2.
To prove: AB + BC + CA > 2AD
Construction: AD is joined
Proof: In triangle ABD,
AB + BD > AD [because, the sum of any two sides of a triangle is always greater than the third side] ---- 1
In triangle ADC,
AC + DC > AD [because, the sum of any two sides of a triangle is always greater than the third side] ---- 2
Adding 1 and 2 we get,
AB + BD + AC + DC > AD + AD
=> AB + (BD + DC) + AC > 2AD
=> AB + BC + AC > 2AD
Hence proved

41.
Ans. C
Solution
Mean = (sum of $f_i x_i$)/ (sum of f) = (8*5 + 12*15 + 10*25 + P*35 + 9*45) / (8+12+10+P+9) = 25.2
(875 + 35P)/(39+P) = 25.2
P = 11

42.
Ans. C
Solution
Summation of frequencies = 6+4+5+8+9+6+4 = 42
Median = mid value = average of 21^{st} and 22^{nd} value
Arranging data in increasing order we get

x	f
4	6
5	4
6	5
7	4
8	6
9	9
10	8

So mid value i.e 21^{st} and 22^{nd} value = 8

43.
Ans. B
Solution
Sum of n consecutive natural numbers = n(n+1)/2
Average of n consecutive natural numbers = (n+1)/2
For first 50 average = 51/2 = x
Last 50 average = 55/2 = x+2

44.
Ans. C
Solution
All such 2 digit numbers are 11,22,33,44……. upto 99
Forms an AP
So sum = n/2(a+l)
= 9/2(11+99)
Average = sum/9 = ½(11+99) = 55

45.
Ans. D
Solution
All three are types of data representation
Pictogram uses pictures so show different identities with different numbers

46.
Ans. D
Solution
Primary data is information that you collect specifically for the **purpose** of your research project. An advantage of primary data is that it is specifically tailored to your research needs. A disadvantage is that it is expensive to obtain.

47.
Ans. B
Solution
15 cm corresponds to 6000 rs
Education = 480/6000 * 15 cm = 1.2cm
Miscellaneous = 1660/6000 * 15cm = 4.15 cm

48.
Ans. A
Solution
Mean of m observations is n
Mean of n-m observations is m
So total = nm + (n-m)m
Total observations = n
Mean = Total / Total observations = $(2mn-m^2)/n = 2m – m^2/n$

49.
Ans. A
Solution
An ogive (oh-jive), sometimes called a cumulative frequency polygon, is a type of frequency polygon that shows cumulative frequencies. In other words, the cumulative percents are added on the graph from left to right. An ogive graph plots cumulative frequency on the y-axis and class boundaries along the x-axis. Only median can be traced using frequency polygon curve. Thus it has a graphical location on the curve. Hence the only option correctly matched is option A.

50.
Ans. D
Solution
Area of the polygon gives sum of $f_i x_i$ not summation of f_i
51.
Ans. C
Solution.
Let the breadth of the rectangle = x
Length of the the rectangle will be = 3 times of breadth = 3x
So the initial perimeter = 2(length + breadth) = 2(x + 3x) = 8x
New breadth after increase = x + 10x/100 = 1.1x
New length after increase = 3x + 30*3x/100 = 3.9x
New perimeter = 2(1.1x + 3.9x) = 10x
Percentage change in perimeter = (10x-8x)*100/8x = 25%

52.
Ans. A
Solution
Area of triangle of = ½*a*b* sinθ = A
Where a and b are sides of the triangle and θ be the angle between them
After decreasing each side
New area = ½*(a/2)*(b/2)*sinθ = ¼ A
%decrease = [(A – ¼ A)/A]*100 = 75%

53.
Ans. A
Solution
Let the volume of spherical balloon initially = V
New volume after increase = V + 700*V/100 = 8V
Since we know that volume of sphere is directly proportional to the radius of sphere

$$\frac{inital\ volume}{final\ volume} = \frac{(initial\ radius)^3}{(final\ radius)^3}$$

$$\frac{V}{8V} = \frac{(initial\ radius)^3}{(final\ radius)^3}$$

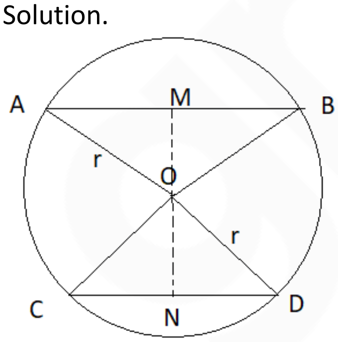
Final radius = 2* initial radius
Since surface area of sphere is directly proportional to the square of the radius of sphere,()

$$\frac{inital\ surface\ area}{final\ surface\ area} = \frac{(initial\ radius)^2}{(final\ radius)^2}$$

$$\frac{inital\ surface\ area}{final\ surface\ area} = \frac{(R)^2}{(2R)^2}$$

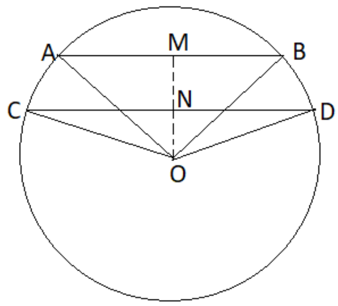
Final surface area = 4*initial surface area
% change = $\frac{Final\ area - initial\ area}{initial\ area} \times 100$ = 300%

54.
Ans. B
Solution.



Case – 1
When both the chords are in two different halves of the circle
Distance between chords = OM + ON = $\sqrt{r^2 - ND^2} + \sqrt{r^2 - MB^2}$

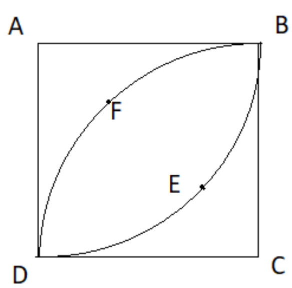
$$= \sqrt{10^2 - \left(\frac{12}{2}\right)^2} + \sqrt{10^2 - \left(\frac{16}{2}\right)^2} = 8cm + 6cm = 14cm$$



Case – 2
When both the chords are in two different halves of the circle
Distance between chords = OM + ON = $\sqrt{r^2 - ND^2} + \sqrt{r^2 - MB^2}$

$$= \sqrt{10^2 - \left(\frac{12}{2}\right)^2} - \sqrt{10^2 - \left(\frac{16}{2}\right)^2} = 8cm - 6cm = 2cm$$

55.
Ans. C
Solution.



Area of leaf BEDFB = Area of two quarter circle – area of square
= $2\pi r^2/4 - a^2$
= $\pi a^2/2 - a^2 = a^2(\pi/2 - 1)$

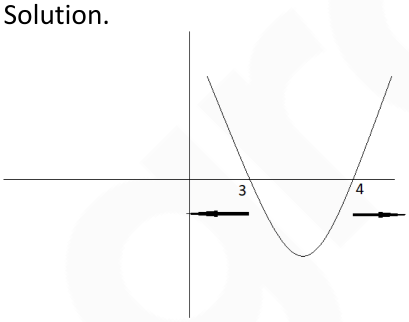
56.
Ans. A
Solution.
We know that when a+b+c = 0, then
$a^3 + b^3 + c^3 = 3abc$
in the above question,
(x-y) + (y-z) + (z-x) = 0
Therefore,
$(x-y)^3 + (y-z)^3 + (z-x)^3 = 3(x-y)(y-z)(z-x)$

$$\frac{(x-y)3 \ + \ (y-z)3 \ + \ (z-x)3}{3(x-y)(y-z)(z-x)} = 1$$

57.
Ans. C
Solution.
$a^x = b^y = c^z = k$
$a = k^{1/x}$
$b = k^{1/y}$
$c = k^{1/z}$
given $b^2 = ac$, putting the above values of a,b,c in the equation we get
$k^{2/y} = k^{1/x} . k^{1/z}$
$2/y = 1/x + 1/z$

58.
Ans. B
Solution.
In the below equation,
$x^2 – 15x + r = 0$
sum of roots = p + q = -(-15)/1 = 15 (sum of roots for equation $ax^2 + bx + c$ is -b/a)
product of roots = pq = r/1 = r (product of roots for equation $ax^2 + bx + c$ is c/a)
given p – q = 1
also we know that p+q = 15
subtracting the squares of both
$(p+q)2 + (p-q)2 = 15^2 – 1$
p2 + q2 + 2pq – p2 – q2 +2pq = 225 -1
4pq = 224
4r = 224
r = 56

59.
Ans.D
Solution.



As we can see from the graph of the quadratic equation, that the value of the equation is greater than zero for the values of x < 3 and x > 4

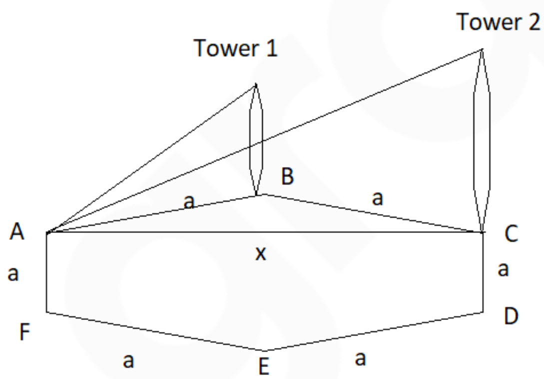
60.
Ans. C
Solution.
$5^{2n} – 2^{3n} = (5^2)^n – (2^3)^n = (25)^n – (8)^n$
We know that $a^n – b^n$ always have a common factor (a - b)
Therefore one of the factor is 25 – 8 = 17

61.
Ans. B
Solution.
tan x = 1
then
x = 45^o
2sin x. cos x = $2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = 1$

62.
Ans. C
Solution.
sin 46^o. cos 44^o + cos 46^o. sin 44^o
sin 46^o. sin $(90 - 44)^o$ + cos 46^o. cos $(90 - 44)^o$
= $\sin^2 46^o + \cos^2 46^o = 1$

63.
Ans. B
Solution.
We know that,
Arithmetic mean ≥ Geometric mean
$(4\sin^2 \theta + 1)/2 \geq \sqrt{4\sin^2 \theta \cdot 1}$
$4\sin^2 \theta + 1 \geq 2.\ 2 \sin \theta$
$4\sin^2 \theta + 1 \geq 4\sin \theta$

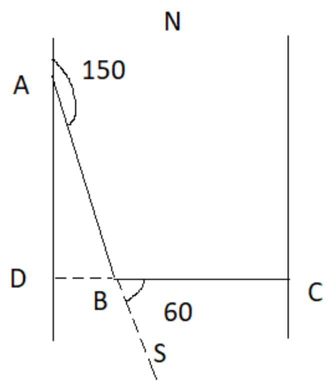
64.
Ans. B
Solution



Let the side of regular hexagon be 'a'
Let height of the tower1 be h_1 and tower 2 be h_2
Height of tower 1 = h1 = (distance between A and B)* (tan 30^o) = $a.\frac{1}{\sqrt{3}}$
Distance between A and C = $2*\sqrt{3}.a/2 = \sqrt{3}a$
Height of tower 2 = h2 = (distance between A and C)* (tan 45^o) = $\sqrt{3}a$ .1 = $\sqrt{3}a$
Ratio of height of towers at B and C respectively = $\frac{\frac{a}{\sqrt{3}}}{\sqrt{3}a} = \frac{1}{3}$

65.
Ans. B
Solution.
tan 1^o. tan 89^o = tan 1^o. cot 1^o = 1
similarly,
tan 2^o. tan 88^o = tan 2^o. cot 2^o = 1
tan 3^o. tan 87^o = tan 3^o. cot 3^o = 1
hence the equation will reduce to
tan 45^o = 1

66.
Ans. C
Solution.



Initially the person is travelling from south to north i.e. D to A
He takes 150^o right turn and moves AB distance and then he takes 60^o left turn travels BC
AB = 20km/hr * 15/60 hr = 5km
BC = 30 * 20/60 = 10 km
We know that distance between both the streets is DC = DB + BC
DB = AB cos 60^o = 5. ½ = 2.5 km
So the distance between streets = 12.5 km

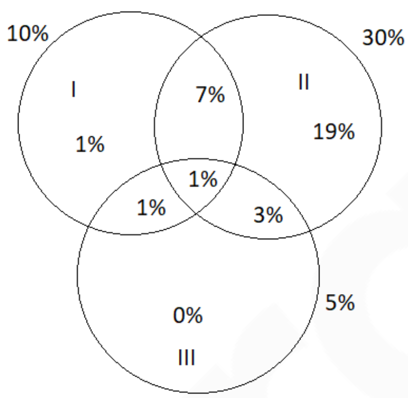
67.
Ans. A
Solution.
3tan θ = cot θ
3tan θ = 1/tan θ
$\tan^2 θ = 1/3$
$\tan θ = 1/\sqrt{3}$
θ = π/6

68.
Ans.B
Solution.
$\sin^2 25^o + \sin^2 65^o = \sin^2 25^o + \sin^2 (90 – 25)^o = \sin^2 25^o + \cos^2 25^o = 1$

69.
Ans. A
Solution.
$\sin^6\theta + \cos^6\theta + 3\sin^2\theta.\cos^2\theta - 1$
$\sin^6\theta + \cos^6\theta + 3\sin^2\theta.\cos^2\theta. 1 - 1$
$\sin^6\theta + \cos^6\theta + 3\sin^2\theta.\cos^2\theta. (\sin^2\theta + \cos^2\theta) - 1$
$(\sin^2\theta + \cos^2\theta)^3 - 1 = 1 - 1 = 0$

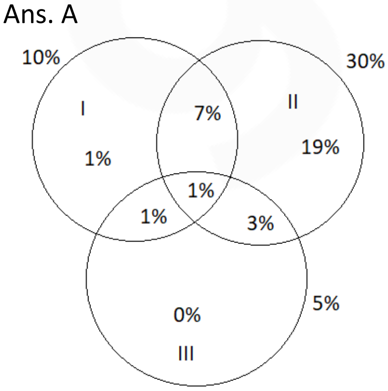
70.
Ans. C
Solution.
Sec of any number can never be less than 1
tan can take any value from $-\infty$ to $+\infty$
cosec of any number can never be less than 1
cos of any number can never be greater than 1
so option 1,3,4 are not possible

71 to 73
71.
Ans. A
Solution.



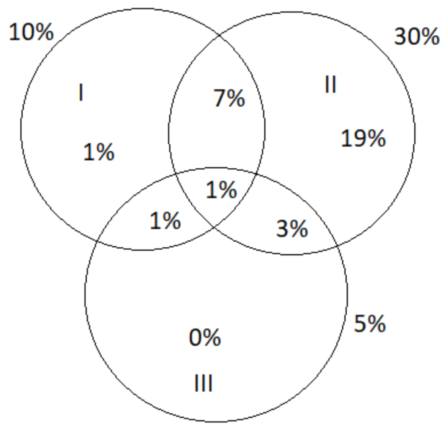
The number of people who read only I , only II and only II are
1 % + 19% + 0% = 20% of total population = 20/100 * 100000 = 20000

72.
Ans. A



As we can see from the above venn diagram the number of people who read two or more newspapers are 1% + 1% + 3% + 7% = 12% = 12/100 * 100000 = 12000

73.
Ans. D
Solution.



Number of people who do not read any of these newspaper = total population – number of people who read atleast one of these newspapers.
number of people who read atleast one of these newspapers = 1% + 1% + 3% + 1% + 7% + 19% = 32% of total population = 32000
required number of people = 100000 – 32000 = 68000

74.
Ans.C
Solution.

	Repitition values of unit digits according to their power								
power	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	1	2	3	4	5	6	7	8	9
2	1	4	9	6	5	6	9	4	1
3	1	8	7	4	5	6	3	2	9
4	1	6	1	6	5	6	1	6	1

From the above table we can see that the power 73 is of the form 4x + 1
Therefore the unit digit according to the table = 7

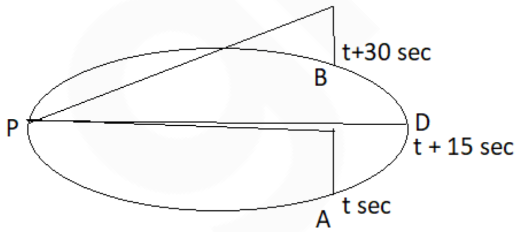
75.
Ans.C
Solution.
$N^2 + 48 = k^2$
$48 = k^2 – N^2$
(k - N)(k + N) = 48
So the possible number of pairs of (k - N) and (k + N) are
(1,48),(2,24), (3,16), (4,12), (6,8)
On solving the above pairs for (k - N) and (k + N), we get the integer values of N and k as
N=1 ,k= 7

N=4 , k=8
N=11,k=13
So the total possible values of N are three

76.
Ans. D
Solution.
x = $\frac{4\sqrt{6}}{\sqrt{2}+\sqrt{3}}$
on rationalizing,
x = $\frac{4\sqrt{6}}{\sqrt{2}+\sqrt{3}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$
x = $12\sqrt{2} - 8\sqrt{3}$
putting the value of x in the equation
$\frac{14\sqrt{2}-8\sqrt{3}}{10\sqrt{2}-8\sqrt{3}} + \frac{12\sqrt{2}-6\sqrt{3}}{12\sqrt{2}-10\sqrt{3}} = \frac{7\sqrt{2}-4\sqrt{3}}{5\sqrt{2}-4\sqrt{3}} + \frac{6\sqrt{2}-3\sqrt{3}}{6\sqrt{2}-5\sqrt{3}}$
$\frac{2\sqrt{2}}{5\sqrt{2}-4\sqrt{3}} + 1 + 1 + \frac{2\sqrt{3}}{6\sqrt{2}-5\sqrt{3}}$
2 + $\frac{2\sqrt{2}(6\sqrt{2}-5\sqrt{3})+2\sqrt{3}(5\sqrt{2}-4\sqrt{3})}{(5\sqrt{2}-4\sqrt{3})(6\sqrt{2}-5\sqrt{3})}$
2 + $\frac{24-10\sqrt{6}+10\sqrt{6}-24}{(5\sqrt{2}-4\sqrt{3})(6\sqrt{2}-5\sqrt{3})}$ = 2 + 0 = 2

77.
Ans. D
Solution.
x = 30% of z = 30z/100 = 3z/10
y = 40% of z = 40z/100 = 4z/10
According to the question,
(x/y)*100 = p%
p% = $\frac{3z/100}{4z/100} \times 100$ = 75%

78.
Ans.C
Solution.



Let the plane be at point A at t seconds and at point B after t + 30 seconds
Since the motion is uniform, we can say that at time t+15 seconds, the plane is above the point is diametrically opposite to the point P from where the angle is same.
Now since the time taken to cover the full circle is 3 minutes (180 seconds), the time taken by the plane to reach the diametrically opposite point will be 90 seconds.
So the time after which the plane reaches the point P will be = t+ 15 + 90 seconds = (t + 105)seconds

79.
Ans.D
Solution.
All the given statements are true. The following are the examples for all the statements
Statement 1: Both p and q may be prime numbers. E.g. 3 and 5
Statement 2 : Both p and q may be composite numbers. E.g. 4 and 9
Statement 3 : One of p and q may be prime and the other composite. E.g. 7 and 12

80.
Ans. A
Solution.
By alligation,
girls boys
24 32
30
2 : 6
1 : 3
So the number of girls will be =(1/(1+3))*100 = 25

81.
Ans. C
Solution.
For the equation,
$\sqrt{(a-b)^2}+\sqrt{(b-a)^2}$
Where a and b are real numbers,
The roots of number is always positive and hence it can be zero only at a=b
So the above equation is positive only when a=b

82.
Ans. C
Solution.
Let a = x then b = 6x
Also let c = y then d = 6y
$\frac{a^2+c^2}{b^2+d^2}=\frac{x^2+y^2}{(6x)^2+(6y)^2}=\frac{1}{36}$

83.
Ans. A
Solution.
$.\overline{53}+0.5\overline{3}$
= 0.5353535353….+0.5333333333…..
= 1.068686868 = $1.0\overline{68}$

84.
Ans. D
Solution.
$3^N > N^3$ holds for all the natural numbers except N = 3 at which $3^N = N^3$

85.
Ans. D
Solution.
A number that cannot be represented in the form p/q where p and q are two integers, is known as irrational number $\sqrt{59049} = 243$. Hence it is rational
$\frac{231}{593}$ is already in the form of rational number
0.4545454545……. can be represented in the form of p/q as 5/9
0.12112211122211112222……… cannot be represented in the form of p/q as there is no recurring digits in the given number

86.
Ans. D
Solution.
The number $17^{29} = (18 - 1)^{29}$ when divided by 18 leaves the remainder $(-1)^{29}$ = 18-1 = 17
The number $19^{29} = (18 + 1)^{29}$ when divided by 18 leaves the remainder $(1)^{29} = 1$
Then after adding these two the remainder will be 17+1 = 18 which is divisible by 18
Hence the remainder will be 0

87.
Ans.A
Solution.
For the number to be divisible by 10^n , it must contain the same powers for 2 and 5
Power of 2 = $2^{5+2.8+7+3.12+6+2.14+11} = 2^{5+16+7+36+6+28+11} = 2^{109}$
Power of 5 = $5^{3+6+12+14+2.15} = 5^{65}$
Hence maximum possible power of 10 can be 65 only.

88.
Ans. A
Solution.
If the number is divisible by 9 the sum of all its digit is divisible by 9
4+7+9+8+6+5+A+B = 39 + A + B is divisible by 9
Possible values of B are 1,3,5,7,9 as it is given that last digit is odd
For B= 1, A=5
For B = 3 A= 3
For B= 5 , A = 1
For B = 7, A = 8
For B = 9, A= 6

89.
Ans. D
Solution.
999 x abc = def132
We can write the above equation as
(1000 – 1) x abc = def132
abc000 – abc = def000 + 132 = (def +1)x 1000 - 868
on comparing the LHS and RHS, we get
a = 8, b = 6, and c = 8 and d = a = 8 , e = b = 6 and f = c – 1 = 8 -1 = 7

90.
Ans. A
Solution.
Distance covered by A till 6pm = 60 km
Distance covered by A till 7 pm = 120 km
Time taken by B to catch A = 60/(80-60) = 3 hrs
So A and B will meet at 6pm + 3 hrs = 9pm
Since we know that all three met at the same time
The time taken by C to cover 120 km difference will be = 9pm – 7pm = 2hrs
Therefore, (x – 60)*2 = 120
x = 120 km/hr

91.
Ans. C
Solution
Let present age of Priya be p
$p-4 = n^3$
p+4 = √k
since n is a no >1 on putting n= 2 we get p = 12
So p+4 = 16 which is square of an integral number thus consistent with given information
Now after how many years her age becomes such that age – 1 is a square and age + 1 is a cube
Using option if we add 14 years to current age , we get age = 26 years
Here 25 is a square and 27 is a cube thus making 14 the correct answer

92.
Ans. D
Solution
Option C is incorrect as 6n – 1 form can be a prime number but it is not necessarily true.
Example 35 is of form 6n-1 but is not a prime number

93.
Ans. C
Solution
For x>0 Min of x + (x+2)/2x = ?
x + (x+2)/2x = x + ½ + 1/x
So we have to find the minimum of x+1/x and add ½ to it
As AM>GM
So (x+1/x)/2 > √(x*1/x)
Or x + 1/x > 2
So min of x + (x+2)/2x = 2+1/2 = 5/2

94.
Ans. A
Solution.

$$\frac{1+px}{1-px}\sqrt{\frac{1-qx}{1+qx}} = 1$$

On squaring and cross multiplying, we get

$$\left(\frac{1+px}{1-px}\right)^2 = \left(\sqrt{\frac{1+qx}{1-qx}}\right)^2$$

$$\frac{1+p^2x^2+2px}{1+p^2x^2-2px} = \frac{1+qx}{1-qx}$$

On applying componendo and dividend

$$\frac{2(1+p^2x^2)}{-4px} = \frac{2}{-2qx}$$

On solving the above equation, we get

$$x = \pm\frac{1}{p}\sqrt{\frac{2p-q}{q}}$$

95.
Ans. C
Solution
Let initial rent be rs 10
And initial rooms be 10
So initial collection = 10*10 = Rs 100
Now new rent = 10 + 20% of 10 = 12
New no of rooms = 10 + 20% of 10 = 12
So new collection = 12*12 = 144
% change in collection = (144-100)/100*100 = 44%

96.
Ans. C
Solution
Let the distance between be D km
Time taken by radha – Time taken by Hema = 9 mins
So D/8 – D/10 = 9/60 hrs
D = 6km

97.
Ans. B
Solution
$3^{x+2} + 3^{-x} = 10$
Only powers of 3 that add upto 10 is
$3^2 + 3^0 = 10$
X+2 = 0
X= -2 solution is consistent
Or x+2 = 2
X= 0 solution is consistent
Thus x = 0, -2 are the solutions
Alternatively, we can put values from the options and check.

98.
Ans. C
Solution
No of digits in $(108)^{10}$
We have to find the log of the given number with base 10 and add one to its integral part to find the no of digits
$\log (108)^{10} = 10 \log 108 = 10 \log(2^2 * 3^3) = 10[2\log2 + 3\log3]$
$= 10[2*0.301 + 3*0.477] = 20.33$
Integral part = 20
No of digits = 20+1 = 21

99.
Ans. D
Solution
Let the three prime numbers be x, y, y+36
x+y+y+36 = 100
x+2y = 64
2y is an even number always
We know that
Even + even = even or odd + odd = even
So x has to be even to satisfy x+2y = 64
The only even prime no is 2
Put x=2
2y = 62
Or y = 31
So the numbers are 2, 31 , 67
Thus option D is the answer

100.
Ans. B
Solution

$$\frac{16}{23} = \frac{1}{\frac{23}{16}} = \frac{1}{1+\frac{7}{16}} = \frac{1}{1+\left(\frac{1}{\frac{16}{7}}\right)} = \frac{1}{1+\frac{1}{2+\left(\frac{2}{7}\right)}} = \frac{1}{1+\left(\frac{1}{2+\left(\frac{1}{\frac{7}{2}}\right)}\right)} = \frac{1}{1+\left(\frac{1}{2+\left(\frac{1}{3+\frac{1}{2}}\right)}\right)}$$

On comparing equations we get a= 1 , b = 2 and c = 3
Mean = a+b+c/3 = 6/3 = 2

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