Year	Questions	Marks
2012	20	20
2013	15	15
2014	20	20
2015	20	20
2016	20	20
Total	**95**	**95**

1. If $\frac{x}{a}=\frac{y}{b}=\frac{z}{c}$, then $[\frac{a^2x^2+b^2y^2+c^2z^2}{a^3x+b^3y+c^3z}]^{3/2}$ =_________.

(A) $\frac{xyz}{abc}$ (B) $\frac{\sqrt{xyz}}{\sqrt{abc}}$ (C) $\frac{\sqrt{xyz}}{(abc)^2}$ (D) $\frac{(xyz)^2}{\sqrt{abc}}$

Ans: B

Solution: Let x/a = y/b = z/c = k

So, the value of the given expression will be= $(\frac{a^4k^2+b^4k^2+c^4k^2}{a^4k+b^4k+c^4k})^{3/2} = (k^3)^{1/2} = (\frac{xyz}{abc})^{1/2}$.

[2012]

2. What is the sum of an (A) P. whose first term is a, the second term is b and the last term is c?

(A) $\frac{(b+c-2a)(a+c)}{2(b-a)}$ (B) $\frac{(b+c+a)(a+c)}{2b-a}$ (C) $\frac{2(a+c)(b-c+2a)}{b+a}$ (D) $\frac{(b+c-2a)(a-c)}{b+a}$

Ans: A

Solution: Sn = $\frac{n}{2}$ (1st term + last term)

1st term = a & last term = c

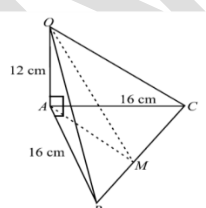
Tn = a + (n − 1) d

c = a + (n − 1) (b − a)

n = $\frac{(b+c-2a)(a+c)}{2(b-a)}$

[2013]

3. In the given figure (not drawn to scale), OABC is a quadrilateral with ABC on horizontal ground and O is vertically above A M is the mid-point of BC If ∠BAC = 90°, AB = AC = 16 cm and OA = 12 cm, calculate the length of OB?



(A) 25 cm (B) 15 cm (C) 20 cm (D) 28 cm

Ans: C

Solution: Here OAB is a right triangle, right angled at A.
So, using Pythagoras theorem we have
OB2 = OA2 + BA2 = 122 + 162 = 144 + 256 = 400
So, OB = 20 cm

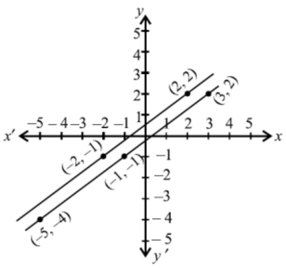
[2014]

4. The number 0.211211121111211111..... Is a.
(A) Terminating decimal
(B) Non-terminating repeating decimal
(C) Non-terminating and non-repeating decimal
(D) none of these

Ans: C
Solution: 0.211211121111211111... In this we can see the decimal is not terminating and digits are not Recurring after certain places, hence it is Non-terminating and non-repeating decimal.

[2015]

5. The equation representing the given graph is ____.



(A) 7x + 2y = 11; y – 2x = 3
(B) 2x + 7y = 11; 5x + (35y/2) = 25
(C) 3x – 7y = 10; 8y – 6x = 4
(D) 3x – 4y = 1; 8y – 6x = 4

Ans: B
Solution: Any number that can be expressed as a fraction a/b where a and b are both integers but b cannot be zero. So, Option B is the correct answer.

[2016]

6. The average of five consecutive natural numbers is m. If the next three natural numbers are also included, how much more than m will the average of these 8 numbers be?
(A) 1
(B) 1.4
(C) 1.5
(D) 2

Ans: C
Solution: Let the five consecutive natural numbers be 1, 2,3,4,5 then its average be m = 3
Also the average of 8 consecutive natural numbers be 4.5
Then difference of averages be more than m = 4.5 – 3 = 1.5

[2012]

7. Find the coordinates of the points which trisect the line joining (–3, 5) and (6, –7).
(A) (0, 1) and (3, –3)
(B) (–1, –1) and (0, 3)
(C) (2, 0) and (1, 1)
(D) (2, 2) and (0, 1)

Ans: A

Solution: Given line segment joining the points A (−3, 5), B (6, −7)
Let P and Q be the point of trisection of AB that is AP = PQ = QB
Therefore, P divides AB internally in the ratio 1:2
Therefore, the coordinates of P, by applying the section formula are
$\left[\frac{m\,x_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right] = \left[\frac{1(6)+2(-3)}{1+2}, \frac{1(-7)+2(5)}{1+2}\right] = [0,1]$
Now Q also divides AB internally in the ratio 2:1, so the coordinate of Q are,
$\left[\frac{m\,x_2+nx_1}{m+n}, \frac{my_2+ny_1}{m+n}\right] = \left[\frac{2(6)+2(-3)}{2+1}, \frac{2(-7)+2(5)}{2+1}\right] = [3,-3]$

[2013]

8. Which of the following have non-terminating repeating decimal?
(A) $\frac{2}{25}$ (B) $\frac{2}{7}$ (C) $\frac{231}{2^2\times5^2\times7}$ (D) $\frac{1323}{6^3\times(35)^2}$

Ans: B
Solution: is an irrational number with non-terminating and non-repeating digits.

[2014]

9. Solve the following system of equations:
(a – b) x + (a + b) y = a^2 – 2ab – b^2
(a + b)(x + y) = a^2 + b^2
(A) a - b, - 2ab (B) a + b, -2ab (C) $a^2 + b^2$, $\frac{-2ab}{a+b}$ (D) a + b, $\frac{-2ab}{a+b}$

Ans: D
Solution: (a – b) x + (a + b) y = a^2 – 2ab – b^2 --------- (1)
(a + b)(x + y) = a^2 + b^2 --------------- (2)
We can rewrite the 2nd
Equation as
(a + b) x + (a + b) y = a^2 +b^2 ---------------- (3)
Subtract equation (3) from equation (1)
- 2bx = -2ab -2b^2
-2b(x) = -2b (a +b)
x= a + b, Plug x = (a + b) in 2nd
Equation
(a + b) (a + b +y) = a^2 + b^2
a^2 + 2ab + b^2 + (a + b) y = a^2 + b^2
2ab + (a + b) y =0
(a + b) y = -2ab, y = -2ab / (a + b)
Hence we get x= a + b and y = -2ab / (a + b).

[2015]

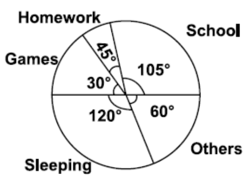
10. The students who passed in half-yearly but failed in annual exams are approximately what percent of total number of students?
(A) 10% (B) 12% (C) 18% (D) 15%

Ans: C

Solution: angle ADC = angle BCD = 60° angle DAB = 100°
Sum of quadrilateral = 360° angle A + angle B + angle C + angle D= 360°
100° + angle B + 60° + 60° = 360° angle ABC = 360-220= 140° angle DOC = 120°
[We have rule, angle A + angle B=240° and angle O is half of sum of both angles]
So, option C is the correct answer.

[2016]

11. The given pie chart shows the hourly distribution of all the major activities of a student. Find the difference between the times (in percent) the students Spends in games and sleeping. Also, what is the difference in time (in hours) spent in school and in homework.



(A) 30%, 2hrs (B) 40%, 3hrs (C) 25%, 4hrs (D) None of these

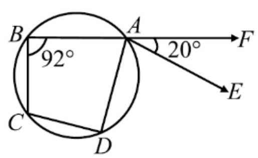
Ans: C

Solution: Difference between the time students spend in games and sleeping = $\left[\frac{120-30}{360}\right] \times 100 = 25\%$

Difference between the time students spends in school and home work= $\left[\frac{105-45}{360}\right] \times 24 = 4\text{ hrs.}$

[2012]

12. ABCD is a cyclic quadrilateral. AE is drawn parallel to CD and BA is produced If ∠ ABC = 92° and ∠FAE = 20°, then ∠BCD =



(A) 88° (B) 108° (C) 115° (D) 72°

Ans: B

Solution: ∠ABC = 92° and ∠FAE = 20°
∠B + ∠D = 92° + ∠D = 1800 ∠D = 88o
∠EAD = ∠ADC = 88°
∠A = 180° − ∠FAE − ∠EAD = 72°
∠C = 180° − 72 = 108°

[2013]

13. A number is chosen at random from 1 to 120. The probability of the number chosen being a multiple of 3 and 15 both is _____.

(A) 1/15 (B) 1/16 (C) 1/17 (D) 1/19

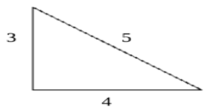
Ans: A

Solution: P (3) =, P (5) =
Therefore, P (3 and 5) = x

[2014]

14. If sinθ = $\frac{3}{5}$, then evaluate $\frac{\cos\theta - \frac{1}{\tan\theta}}{2\cot\theta}$.
(A) -1/5 (B) 1/5 (C) 2/5 (D) -2/5

Ans: A
Solution:



If sin = 3/5 (In first quadrant) then cos = 4/5 tan = ¾ and cot = 4/3 cos - 1/ tan = 4/5 – 4/3 = (12-20)/15 = -8/15 (-8/15) /2 cot = (-4/15) × (3/4) = -1/5.
Though there is another possibility we can check for 2nd quadrant as well, in 2nd quadrant cos = -4/5, tan = - 3/4, and cot
= - 4/3 cos - 1/ tan = -4/5 + 4/3 = 8/15 (8/15)/ 2cot = 4/15 × (-3/4) = -1/5
Hence -1/5 is the correct answer.

[2015]

15. Directions (20-21): Study the following table and answer the questions that follow. Results of half-yearly and annual examinations of class X in a school

Results	Number of students			
	Section A	Section B	Section C	Section D
Students failed in both exams	28	23	17	27
Students failed in half-yearly but passed in annual exams	14	12	8	13
Students passed in half-yearly but failed in annual exams	6	17	9	15
Students passed in both exams	64	55	46	25

Ans: D
Solution: Total number of students = 75000
C = 24% of 75000 = 18000
E = 12% of 75000 = 9000
Ratio between C and E = 18000:9000
= 2:1 so, option D is the correct answer.

[2016]

16. The incomes of A, B and C are in the ratio 7: 9: 12 and their spending's in the ratio 8: 9: 15. If A saves $(1/4)^{th}$ of his income, then the savings of A, B and C are in the ratio _____.
(A) 56:99:69 (B) 69:56:99 (C) 99:56:69 (D) 99:69:56

Ans: A

Solution: Sum of the ratio spending = 32

Savings of A $=\frac{7\times 32}{4}=56$, hence the savings of A, B, C are in the ratios 56:99:69.

[2012]

17. Express in lowest terms: $\frac{x^8-a^8}{x^6-a^6}$

(A) $\frac{(x^2+a^2)(x^2-a^2)}{(x^2+ax+a^2)^2}$ (B) $\frac{(x^2+a^2)(x^4+a^4)}{(x^2+ax+a^2)(x^2-ax+a^2)}$ (C) $\frac{(x^4+a^4)(x^2+a^2)}{(x^2-ax+a^2)^2}$ (D) $\frac{(x^2+a^2)(x^4+a^4)}{(x^2+ax-a^2)(x^2-ax+a^2)}$

Ans: C

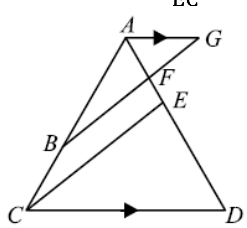
Solution: $\frac{x^8-a^8}{x^6-a^6}=\frac{(x^4)^2-(a^4)^2}{(x^3)^2-(a^3)^2}=\frac{(x^4+a^4)((x^2)^2-(a^2)^2)}{(x^3+a^3)(x^3-a^3)}$

$sa=\frac{(x^4+a^4)(x^2+a^2)(x+a)(x-a)}{(x-a)(x^2-ax+a^2)(x+a)(x^2-ax+a^2)}$

$\frac{x^8-a^8}{x^6-a^6}=\frac{(x^4+a^4)(x^2+a^2)}{(x^2-ax+a^2)^2}$

[2013]

18. In the given figure (not drawn to scale), AG is parallel to CD and AG = $\frac{2}{7}$ CD. The point B on AC is such that BC = $\frac{2}{7}$ AC. If the line BG meets AD at F and the line through C is parallel to BG which meets AD at E, then find the value of $\frac{FG}{EC}$.



(A) $\frac{1}{7}$ (B) $\frac{3}{7}$ (C) $\frac{4}{7}$ (D) $\frac{2}{7}$

Ans: D

Solution: In triangle ACE, BF is parallel to CE.

So, BF/CE = 5/7 as AB/AC = 5/7

Thus, we get EG/CE = 2/7

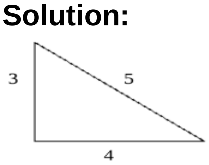
[2014]

19. If sinθ = $\frac{3}{5}$, then evaluate $\frac{\cos\theta-\frac{1}{\tan\theta}}{2\cot\theta}$.

(A) -1/5 (B) 1/5 (C) 2/5 (D) -2/5

Ans: A

Solution:



If sin = 3/5 (In first quadrant) then cos =4/5 tan = ¾ and cot = 4/3 cos - 1/ tan = 4/5 – 4/3 = (12-20)/15 = -8/15 (-8/15) /2 cot = (-4/15) × (3/4) = -1/5.
Though there is another possibility we can check for 2nd quadrant as well, in 2nd quadrant cos = -4/5, tan = - 3/4, and cot
= - 4/3 cos - 1/ tan = -4/5 + 4/3 = 8/15 (8/15)/ 2cot = 4/15 × (-3/4) = -1/5
Hence -1/5 is the correct answer.

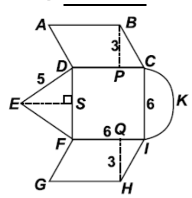
[2015]

20. Let ABC be a right triangle in which AB = 3 cm, BC = 4 cm and ∠B = 90°. BD is the perpendicular from B on AC. The circle through B, C, and D is drawn. Given below are the steps of construction of a pair of tangents from A to this circle. Which of the following
Steps are INCORRECT?
Step I: Draw ∆ABC and perpendicular BD from B on AC.
Step II: Draw a circle with BC as diameter. This circle will pass through D.
Step III: Let O be the mid-point of BC. Join AO.
Step IV: Draw a circle with AO as diameter. This circle cuts the circle drawn in step II at B and P. Join AO, AP and AB are desired tangents drawn from A to the circle passing through B, C and D.
(A) Only step I (B) Only step II (C) only step III (D) Only step IV

Ans: C
Solution: 4x + 6 = 5x-4
5x – 4x=6 + 4
X = 10
So, option C is the correct answer.

[2016]

21. Radhika draws the figure of an aero plane as given in the figure. Here the wing ABCD and GHIF forms a parallelogram. The tail DEF is an isosceles triangle, the cockpit CKI is a semi-circle and middle-part DCIF is a square. The measurements (in cms) are given in the figure. The area of the plane figure if BP CD and HQ FI is _____.



(A) 97.24 cm2 (B) 98.14 cm2 (C) 96.82 cm2 (D) 90 cm2

Ans: B
Solution: Area of square = a2= 16, Area of 2 parallelograms = 2bh = 36
Area of isosceles triangle = $\frac{bh}{2} = 12(\text{ since } h = 4\text{ , using the formula })$
Area of semi-circle = $\frac{\pi r^2}{2} = 14.13$
Therefore total area of the plane = 18 + 18 + 36 + 12 + 14.13 = 98.3 cm2.

[2012]

22. Express as a rational expression. $\frac{1}{x-1}-\frac{1}{x+1}-\frac{2}{x^2+1}-\frac{4}{x^4+1}$

(A) $\frac{(3x^2-14)}{x^2-1}$ (B) $\frac{(x^2+3)}{x^4+1}$ (C) $\frac{8}{(x^8-1)}$ (D) $\frac{2(x+4)}{x+1}$

Ans: C

Solution: $\frac{1}{x-1}-\frac{1}{x+1}-\frac{2}{x^2+1}-\frac{4}{x^4+1}$

Take LCM and simplify we get,

$$=\frac{(x+1)(x2+1)(x4+1)-(x-1)(x2+1)(x4+1)-2(x-1)(x+1)(x4+1)-4\,(x-1)(x+1)(x2+1)}{(x-1)(x+1)(x2+1)(x4+1)}=\frac{8}{(x^8-1)}$$

[2013]

23. If two zeroes of the polynomial x4 – 6x3 – 26x2 + 138x – 35 are $2-\sqrt{3}$ and $2+\sqrt{3}$, then find all the zeros.

(A) –5, 7 (B) –7, 5 (C) 3, –5 (D) 5, –3

Ans: A

Solution: If 2 - and 2+ are the roots of x 4 – 6x 3 – 26x 2 +138x – 35 then, it can be factorized as:

[x – (2)][x – (2+)] [x^2 – 2x - 35]

Because [x – (2-)] [x – (2+)] = x^2 – 4x + 1

And x^2 – 2x – 35 gives x=-5, 7 as other two roots.

[2014]

24. Given below are the steps of construction of a pair of tangents to a circle of radius 4 cm from a pointing the concentric circle of radius 6 cm. Find which of the following step is wrong?

(P) Take a point O on the plane paper and draw a circle of radius OA = 4 cm. Also, draw a concentric circle of radius OB = 6 cm.

(Q) Find the mid-point A of OB and draw a circle of radius BA = AO.
Suppose this circle intersects the circle of radius 4 cm at P and Q.

(R) Join BP and BQ to get the desired tangents from a point B on the circle of radius 6 cm.

(A) Only (P) (B) Only (Q) (C) Both (P) & (Q) (D) Both (Q) & (R)

Ans: B

Solution: Statement Q is wrong. P and R or correct P states how to make concentric circles and R states how to draw a tangent on the circle of Radius 6 as B is the point on circle joining P and Q passing with B will be a tangent line if those points are outside of the circle.

[2015]

25. What is the total number of students who failed in either of the two exams but not both?

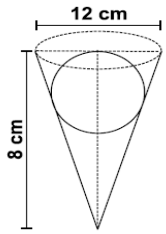
(A) 94 (B) 90 (C) 47 (D) None of these

Ans: A

Solution: Euler's formula, Faces+ Vertices- Edges (F + V – E) <Incomplete>

[2016]

26. A conical vessel of radius 6 cm and height 8 cm is filled with water. A sphere is lowered into the water and its size is such that when it touches the sides of the conical vessel, it is just immerse D How much water will remain in the cone after the overflow?



(A) 188.57 cm^3 (B) 160 cm^3 (C) 181.30 cm^3 (D) 175.46 cm^3

Ans: A

Solution: Volume of Conical Vessel $= \frac{1}{3}\pi r^2 h = 301.59 cm^3$

Volume of a sphere (r = 3) $= \frac{4}{3}\pi r^3 = 113.1 cm^3$

Remaining water in the cone = 188.5 cm^3.

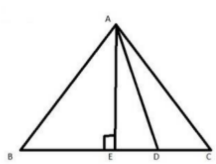
[2012]

27. A point D is on the side BC of an equilateral ΔABC such that $DC = \frac{1}{4}BC$. Then AD^2 =

(A) 13 CD^2 (B) 9 AB^2 (C) 6 CD^2 (D) 12 BC^2

Ans: A

Solution:



If ABC is an equilateral triangle, ∠C = 60° and AE is perpendicular to BC.

Therefore, ⊿ AEC, AE = $\frac{\sqrt{3}}{2}$ AC and also given that DC = $\frac{1}{4}$ BC

⇒ AB = BC = AC = 4 DC

AD2 = AE2 + DE2 = $(\frac{\sqrt{3}}{2}AC)^2 + (CE - CD)^2$

$= \frac{3}{4}AC^2 + (\frac{BC}{2} - \frac{CE}{2})^2$

$= \frac{3}{4}AC^2 + (\frac{4DC}{2}) - (\frac{2DC}{2})^2 \rightarrow \frac{3}{4}AC^2 + DC^2$

$= \frac{3}{4}(4 \times DC)^2 + DC^2 = 13DC^2$

[2013]

28. Solve: (sin4 – cos4 + 1) cosec2

(A) 1 (B) –2 (C) 2 (D) 0

Ans: C

Solution: $(\sin^4 - \cos^4 + 1) \text{cosec}^2$
$= ((\sin^2 - \cos^2)(\sin^2 + \cos^2) + 1) \text{cosec}^2$
$= (\sin^2 - \cos^2 + 1) \text{cosec}^2$
$= (\sin^2 + \sin^2) \text{cosec}^2$
$= (2 \sin^2) \text{cosec}^2 = 2$

[2014]

29. Find the median from the following data:

Marks	0-10	10-30	30-60	60-80	80-90
No. of students	5	15	30	8	2

(A) 10 (B) 20 (C) 30 (D) 40

Ans: D
Solution: We need to convert cumulative frequencies distribution into simple frequencies

Marks	Number of students (f)	Cumulative Frequency (c f)
0-10	5	5
10-30	15	20
30-60	30	50
60-80	8	58
80-90	2	60

But the range is not equally distributed we can divide in 3 intervals as 0-30, 30-60 and 60-90 (h= 30)

Marks	Number of students (f)	Cumulative Frequency (c f)
0-30	20	20
30-60	30	50
60-90	10	60
	N = 60	

Median (M) = 60/2 = 30th Item
30th Item falls in 30-60th range
Hence M = L1 + [{(N/2) – c f} /f] × h
=30 + [{30 – 20}/30] × 30
= 30 + 10 = 40

[2015]

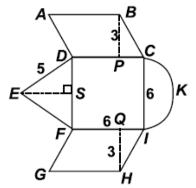
30. The circumference of the base of a cylindrical vessel is 132 cm and its height is 25 cm. How many liters of water can it hold?
(A) 34.11 L (B) 45.40 L (C) 24.65 L (D) 34.65 L

Ans: D
Solution: we know, volume of cylinder = pi r2h
Here, h = 25 cm radius = r
Circumference of base = 132
2 pi r= 132

2 × 22/7 × r= 132 therefore, r= 21 cm
Numbers of liters of water it can hold= 22/7 × 21 × 21 × 25 = 34650 cm3 = 34650 × 1/1000 (liters) = 34.650 liters, option D is the correct answer.

[2016]

31. Radhika draws the figure of an aero plane as given in the figure. Here the wing ABCD and GHIF forms a parallelogram. The tail DEF is an isosceles triangle, the cockpit CKI is a semi-circle and middle-part DCIF is a square. The measurements (in cms) are given in the figure. The area of the plane figure if BP CD and HQ FI is _____.

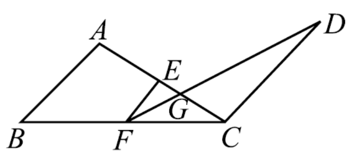


(A) 97.24 cm^2 (B) 98.14 cm^2 (C) 96.82 cm^2 (D) 90 cm^2

Ans: B
Solution: Area of square = a^2= 16, Area of 2 parallelograms = 2bh = 36
Area of isosceles triangle = $\frac{bh}{2} = 12(\text{ since } h = 4\text{, using the formula })$
Area of semi-circle = $\frac{\pi r^2}{2} = 14.13$
Therefore total area of the plane = 18 + 18 + 36 + 12 + 14.13 = 98.3 cm^2.

[2012]

32. In the given figure, AB, EF and CD are parallel lines. Given that EG = 5 cm, GC = 10 cm and DC = 18 cm, then EF =

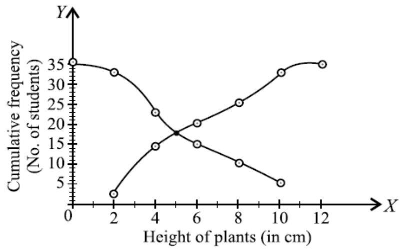


(A) 9 cm (B) 25 cm (C) 13 cm (D) 16 cm

Ans: A
Solution: In △ GEF and △ GCD, we have
∠EFG = ∠ GCD (Alternative Angles)
∠EFG = ∠CGD (Vertically opposite angles)
Therefore, △ GEF ~ △ GCD
Thus, $\frac{GE}{CG} = \frac{EF}{CD} = \frac{G}{10} = \frac{EF}{18} \rightarrow EF = 9\text{cm}$

[2013]

33. What is the value of the median of the data using the graph in the figure given below, of less than give and more than ogive?



(A) 8 (B) 4 (C) 5 (D) 17.5

Ans: C
Solution: Median is the point where more than and less than ogive meets. Hence 5 is the answer.

[2014]

34. If the pth, qth and rth terms of an A.P. are P, Q, R respectively, then P (q – r) + Q(r – p) + R (p – q) is equal to ______.

(A) 0 (B) 1 (C) p q r (D) p + q r

Ans: A
Solution: Let a 1st term and d be the common difference of the given AP.
So we can write
P = a+ (p-1) d ----------- (1)
Q = a+ (q-1) d------------- (2)
R = a+ (r-1) d------------- (3)
Subtract equation 2 from equation 1
P-Q = (p-q) d --------- (4)
Subtract equation 3 from equation 2
Q-R = (q-r) d ---------- (5)
Subtract equation 1 from equation 3
R-P = (r-p) d ------------- (6)
Multiply equation 4, equation 5 and equation 6 by R, P and Q respectively
R (P-Q) = R (p-q) d ----- (7)
P (Q-R) = P (q-r) d --------- (8)
Q(R-P) = Q (r-p) d---------- (9)
Add equations 7, 8 and 9
0 = R (p-q) d + P (q-r) d + Q (r-p) d
As d is the common difference of the AP
Hence we can write
P (q-r) + Q (r-p) + R (p-q) = 0

[2015]

35. The mean of the following frequency distribution is 180 cm. Find the missing frequency f.

Height of plants (in cm)	120-140	140-160	160-180	180-200	200-220	220-240
Number of plants	4	f	20	12	6	8

(A) 10 (B) 8 (C) 12 (D) 15

Ans: D

Solution: Total numbers of students are 75000

B, D, E = 14% + 16% + 12% = 42%

So, 42% of 75000 = 31500

Average number of students studying in schools B, D, E = 31500/3= 10,500 Option D is the correct answer.

[2016]

36. A circle of radius 'r' has been inscribed in a triangle of area A If the semi - perimeter of the triangle be S, Then ____

(A) S = AR (B) $r^2 = \frac{S}{A}$ (C) $r = \frac{A}{S}$ (D) $r = \frac{A^2}{S}$

Ans: C

Solution: When circle is inscribed in a triangle of area A and S is the semi perimeter, we can divide The triangle into three triangles with base a, b and C respectively and height be r for all triangles then area of the triangle $A = \frac{1}{2}ar + \frac{1}{2}br + \frac{1}{2}cr = \frac{1}{2}[a+b+c]r = Sr$ Hence A = Sr then $r = \frac{A}{S}$.

[2012]

37. If sinθ + cosθ = $\sqrt{2}$ sin (90°-θ), then cotθ =

(A) 1 (B) $\sqrt{2}$-1 (C) $\sqrt{2}$+1 (D) -1

Ans: C

Solution: sin θ + cos θ = $\sqrt{2}$ sin (90° − θ)

sin θ + cos θ = $\sqrt{2}$ cos θ ÷ cos θ

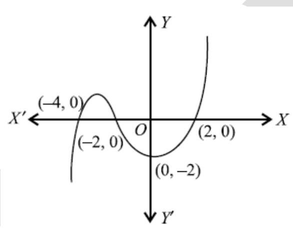
$\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\cos\theta} = \sqrt{2}$

tan θ = $\sqrt{2}$ − 1

cot θ = ($\sqrt{2}$ − 1)−1= ($\sqrt{2}$ + 1)

[2013]

38. The number of zeroes for the given graph is ____.



(A) 3 (B) 2 (C) 4 (D) 1

Ans: A

Solution: Number of zeros is the count the curve cuts the x-axis. Therefore, the answer is 3.

[2014]

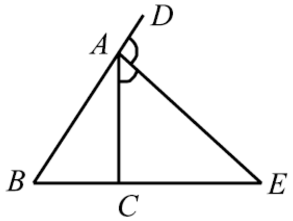
39. If ∝ and β are the zeros of the quadratic polynomial $x^2 – 3x + 2$, then a quadratic polynomial whose zeros are $\frac{1}{2\propto + \beta}$ and $\frac{1}{2\beta + \propto}$ is

(A) $20x^2 + 9x + 1$ (B) $20x^2 – 9x – 1$ (C) $20x^2 – 9x + 1$ (D) $20x^2 + 9x - 1$

Ans: C
Solution: If α and βare the zeros of the quadratic polynomial x^2-3x+2
Then $\alpha\times\beta = 2$ and $\alpha + \beta = 3$,
$(\alpha- \beta)^2 = (\alpha+\beta)^2 - 4\alpha\times\beta$
$= 9 - 4\times2 = 1$
Hence $\alpha - \beta= 1$ or -1
Hence one of the zero is 1 and other is 2
Now given zeroes of required quadratic polynomials are
$1/ (2\alpha+\beta) = 1 / (2\times1 + 2) = 1/4$ and $1/ (2 \beta+\alpha) = 1/ (2\times2 + 1) = 1/5$
Hence we can write $(x - ¼) (x -1/5) = 0$
$(4x -1)(5x-1) = 0$
$20x^2 -9x +1 = 0$ the quadratic equation $20x^2-9x +1$

[2015]

40. In the given figure, AE is the bisector of the exterior ∠C A D meeting B C produced at E. If AB = 10 cm, AC = 6 cm and BC = 12 cm, find CE.



(A) 12 cm (B) 16 cm (C) 20 cm (D) 18 cm

Ans: A
Solution: Let $a = x^4 + 2x^2 - 3x + 7$
Let $c = x^3 + x^2 + x - 1 \Rightarrow a - b = c$
$(x^4 + 2x^2 - 3x + 7) - b = (x^3 + x^2 + x - 1)$
$(x^4 + 2x^2 - 3x + 7) - (x^3 + x^2 + x - 1) = b$
$x^4 + 2x^2 - 3x + 7- x^3 - x^2 - x + 1 = b$
Therefore, $b= x^4 + x^2 - 4x + 8 - x^3$
Option A is the correct answer.

[2016]

41. The incomes of A, B and C are in the ratio 7: 9: 12 and their spending's in the ratio 8: 9: 15. If A saves (1/4)th of his income, then the savings of A, B and C are in the ratio _____.
(A) 56:99:69 (B) 69:56:99 (C) 99:56:69 (D) 99:69:56

Ans: A
Solution: Sum of the ratio spending = 32
Savings of A =$\frac{7\times32}{4} = 56$, hence the savings of A, B, C are in the ratios 56:99:69.

[2012]

42. Find the values of p and q respectively for which the following system of linear equations has infinite solutions.
2x + 3y = 7
(p + q) x + (2p – q) y = 21

(A) 2, 6 (B) –7, 3 (C) –3, –5 (D) 5, 1

Ans: D

Solution: $\frac{(p+q)}{2} = \frac{(2p-q)}{3} = \frac{21}{7} = 3$

p + q = 6 ------- (1) and 2p − q = 9 -------- (2)

Solving equation 1 and 2 we get p= 5 and q = 1

[2013]

43. Find the mode (approx.) from the given frequency distribution.

Expenditure on food in a month	Number of workers
300-309	10
310-319	20
320-329	24
330-339	38
340-349	48
350-359	27
360-369	17
370-379	6
Total	190

(A) 336.41 (B) 307.20 (C) 343.22 (D) 342.72

Ans: D

Solution: Mode can be found using the following formula:

Estimated Mode = L + $\frac{f_m - f_{m-1}}{(f_m - f_{m-1}) + (f_m - f_{m+1})} \times w$

From the data in the table, we have:

L = 339.5

fm -1 = 38

fm+1 = 27

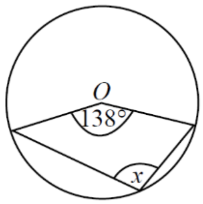
fm = 48

w = 10

On putting the values and solving, we get, Mode = 342.72

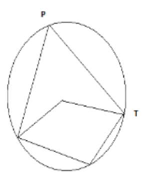
[2014]

44. In the diagram, O is the Centre of the circle. Find the value of x.



(A) 111° (B) 123° (C) 69° (D) 49°

Ans: A
Solution:



Using Central Angle Theorem, The angle made at circumference will be half of the angle made at Centre. Angle at P < SPT) will be half of the angle at Centre = 138/2 = 69^o PSUT is a cyclic quadrilateral and opposite angles are supplementary hence <SUT = x = 180 -69 = 111^o

[2015]

45. If p and q are zeroes of the quadratic polynomial $2x^2 + 2(m + n) x + m^2 + n^2$, find the quadratic polynomial whose zeroes are $(p + q)^2$ and $(p – q)^2$.
(A) $x^2 + 2\ mnx + (m^2 + n^2)^2$ (B) $x^2 – 4\ mnx – (m^2 – n^2)^2$
(C) $x^2 – 2\ mnx – (m^2 – n^2)^2$ (D) $x^2 + 4\ mnx – (m^2 – n^2)^2$

Ans: B
Solution: From the given polynomial $2x^2 + 2(m + n)x + m^2 + n^2$, we get
sum of roots = p + q = -2(m + n)/2 = - (m + n) -- -- -(A)
product of roots = pq = $(m^2 + n^2)/2$ -- -- -- (B)
Now, using (A) and (B) we will find the value of $(p – q)^2$.
$(p – q)^2 = (p + q)^2 – 4pq = - (m – n)^2$ (Using A and B) -- -- -- -- -- (C)
Now, applying the formula to find the quadratic polynomial whose roots are $(p + q)^2$ and $(p – q)^2$.
i.e., $x^2 – \{(p + q)^2 + (p – q)2 \}x + \{(p + q)^2 (p – q)^2$
Putting the values from (A), (B) and (C), we get the required polynomial
$x^2 – \{(m + n)^2 - (m – n)^2 \}x - (m^2 + n^2)^2 = x^2 – 4mnx - (m^2 - n^2)^2$

[2016]

46. A group of girls planned a picnic the budget for food was 2400. Due to illness, 10 girls could not go to the picnic and cost of food for each girl increased by 8. How many girls had planned the picnic?
(A) 60 (B) 50 (C) 65 (D) 57

Ans: A
Solution: Total Budget = Rs.2400
Let us assume the number of girls planned for picnic is 60 then per girl cost is Rs.40.
As per question 10 girls not participated then number of girls in picnic = 50

Cost for per girl = $\frac{2400}{50}$ = Rs.48
Increase of price = Rs.8
Hence proved the number of girls planned for picnic is 60.

[2012]

47. The product of 12% of an integer and 20% of the next integer is 61.2. Find the integer.
(A) 50 (B) –51 (C) 63 (D) Both A and B

Ans: D
Solution: (12% of 50) x (20% of 51) = 61.2
(12% of (-51)) x (20% of (-50)) = 61.2

[2013]

48. If the roots of the quadratic equation x2 + px + q = 0 are tan 30° and tan 15° respectively, then the value of 2 + q – p is ______.
(A) 0 (B) 1 (C) 2 (D) 3

Ans: D
Solution: Sum of the roots = and Product of the roots = therefore, = tan30^0 + tan15^0 or p = - (tan30^0 + tan15^0) – eq.1 and = tan30^0 x tan15^0 or q = tan30^0 x tan15^0 – eq.2 on subtracting eq.1 from eq.2 and adding 2 to it, we get: q – p + 2 = 3 (on rationalizing and solving).

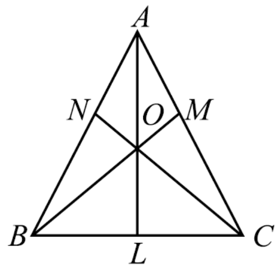
[2014]

49. Find the values of a and b respectively for which the following system of linear equations has infinite number of solutions.
2x – 3 y = 7
(a + b) x – (a + b – 3) y = 4a + b
(A) –1, –5 (B) –1, 5 (C) 1, 5 (D) –5, –1

Ans: D
Solution: To get the infinite number of solutions
(a + b)/2 = (a+b-3)/3 = (4a +b)/7 = k
A + b = 2k ---- (1)
A + b - 3 = 3k --- (2)
4a + b = 7k----- (3)
Subtract equation 1 from equation 3
- 3 = k hence lets plug the value of k = -3 in equation 1 and 2
A + b = -6 –------------- (4)
4a +b = -21---------- (5)
Subtract equation 4 from equation 5
3a = -15, we get a= -5 and on solving a + b = -6 we get b= -1
So answer is a= -5 and b= -1

[2015]

50. A point O is taken inside an equilateral ∆ABC. If OL BC, OM AC and ON AB such that OL = 14 cm, OM = 10 cm and ON = 6 cm,
then find the area of ∆ABC.



(A) 300 $\sqrt{3}$ cm2 (B) 200 $\sqrt{3}$ cm2 (C) 300 cm2 (D) 325 $\sqrt{2}$ cm2

Ans: B
Solution: Let x = 3
5x-1+ 5x + 5x+1 = 775
53-1+ 53 + 53+1 = 775
52 + 53 + 54 = 775
25 + 125 + 625 = 775
775 = 775
LHS = RHS
So, option B is the correct answer.

[2016]

51. A number x is selected from the numbers 1, 2 & 3 and then a second number y is randomly selected from the numbers 1, 4 & 9. What is the probability that the product x y of the two numbers will be less than 9?
(A) $\frac{5}{9}$ (B) $\frac{9}{10}$ (C) $\frac{2}{9}$ (D) $\frac{7}{10}$

Ans: D
Solution: Total number of product possibilities = 9
Total number of product less than 9 = 5
Then probability for the product xy to less than 9 = $\frac{5}{9}$

[2012]

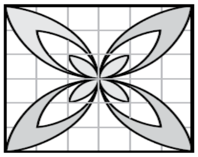
52. Find k, so that 4k + 8, k3 + 3k + 6 and 3k2 + 4k + 4 are three successive terms of an (A) P.
(A) 0 (B) 2 (C)–1 (D) Both A and B

Ans: D
Solution:

If k = 0,	8, 6, 4
If k = -1	16, 20, 24

[2013]

53. The given figure is created by using the arcs of quadrants with radii 1 cm; 2 cm and 3 cm. find the total area of the shaded region.
(Take π = 3.14).



(A) 31.93 cm2 (B) 15.96 cm2 (C) 63.84 cm2 (D) 13.68 cm2

Ans: D
Solution: Alternate Way: Method of approximation
The total Area = 6 x 6 cm2
Now, let us find the UN shaded area in terms of number Full Square, number of ¾ squares, number of ½ squares and so one. UN shaded parts Full square = 8, Half square = 8, ¾ of a squares = 8, number of squares inside the leaves = 4 so, area not shaded = 8 + 8 x ½ + 8 x ¾ + 4 = 8 + 4 + 6 + 4 = 22
Thus shaded area = 36 – 22 = 14 cm 2 the nearest option is D.

[2014]

54. In the Math's test two representatives, while solving a quadratic equation, committed the following mistakes:
(i) One of them made a mistake in the constant term and got the roots as 5 and 9.
(ii) Another one committed an error in the coefficient of x and got the roots as 12 and 4.
But in the meantime, they realized that they are wrong and they managed to get it right jointly.
Find the correct quadratic equation.
(A) $x^2 + 4x + 14 = 0$ (B) $2x^2 + 7x – 24 = 0$ (C) $x^2 – 14x + 48 = 0$ (D) $3x^2 – 17x + 52 = 0$

Ans: C
Solution: Fist representative made error in the constant term and got the roots as 5 and 9, so the equations he got was $(x - 5) (x - 9) = x^2 -14x +45$ (but 45 is not the correct constant term)
The second representative made error in coefficient of x and got the roots as 12 and 4, so he got the answer as $(x -12) (x - 4) = x^2 -16x + 48$ (but -16 is not the coefficient of x) Removing the errors of both the representative we get the correct quadratic equation as $x^2 -14x + 48$

[2015]

55. In an A.P., Sm = n and Sn = m also m > n, find the sum of first (m – n) terms.
(A) $\frac{(m-n)(m+2n)}{m}$ (B) $\frac{(m+n)(2m+n)}{m}$ (C) $\frac{(m-n)(m+2n)}{n}$ (D) $\frac{(m-n)(2m+n)}{n}$

Ans: C
Solution: x/2 + x/3 - x/4=7
10x-3x/12= 7
7x= 12×7
x= 12×7 / 7
x= 12 so, option C is the correct answer.

[2016]

56. How many sides does a regular polygon have, whose interior angle is eight times its exterior angle?

(A) 16 (B) 24 (C) 18 (D) 20

Ans: C

Solution: Let x be the side of a regular polygon

Sum of interior angles = 8 times sum of exterior angles

That is (x - 2)180 = 8 × 360 then x = 18.

[2012]

57. If H. (C) F of $(x - 5)(x^2 – x - a)$ and $(x - 4)(x^2 - 2x - b)$ is $(x - 4)(x - 5)$, find the value of a and b respectively.

(A) 15, 18 (B) 10, 7 (C) –8, 10 (D) 12, 15

Ans: D

Solution: $(x − 5)(x^2 − x − a) = (x − 4)(x − 5) = (x − 4)(x^2 − 2x − b)$

$(x − 5)(x^2 − x − a) = (x − 4)(x^2 − 2x − b)$

$x^3 − 6x^2 + (5 − a)x + 5a = x^3 − 6x^2 + (8 − b)x + 4b$

Equating coefficient of x on both sides and also equating constant on both sides

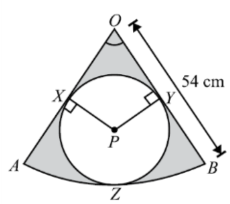
5 − a = 8 − b −a + b = 3 -------- (1)

5a = 4b a = $(\frac{4}{5})$ b -------- (2)

Substituting a = $(\frac{4}{5})$ b in (1) w get, a = 12 and b = 15.

[2013]

58. The given figure shows sector OAB with Centre O and radius 54 cm. Another circle XYZ with Centre P, is enclosed by the sector OAB If ∠AOB = 60°. Find the area of OXPY.



(A) 161 cm2 (B) 461 cm2 (C) 324 cm2 (D) 561.2 cm2

Ans: D

Solution: Sector OAB with Centre O and radius 54 cm is given.

<AOB = 60°

OZ = OB = OA = 54 cm

Join O and P

Let XP = a, then OP = 54 - a

In ΔOXP right angled at X,

<XOP = 30°

$Sin30^0$ = XP/OP = a/54 – a = 1/2

Thus we get, a = 18 cm _______ (A)

Now, OP = 54 – 18 = 36 cm

So, $XP^2 + OX^2 = OP^2$

i.e, $18^2 + OX^2 = 36^2$

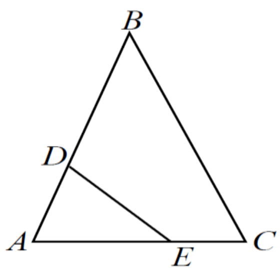
Thus OX = 18√3 cm ______ (B)

Now, area of OXPY quadrilateral = 2 x area of ΔOXP

= 2x ½ x 18√3 x 18 = 561.2 cm

[2014]

59. In the given diagram, ∠ABC = ∠AED, AD = 3 cm, AE = 5 cm and EC = 2 cm. Find:



(i) BD (ii) $\frac{\text{Area of }\Delta\text{AED}}{\text{Area of }\Delta\text{ABC}}$

(A) $8\,\frac{2}{3}$ cm $\frac{9}{49}$ (B) $8\,\frac{2}{3}$ cm $\frac{9}{23}$ (C) $\frac{2}{5}$ cm $\frac{9}{49}$ (D) $\frac{2}{5}$ cm $\frac{9}{23}$

Ans: A

Solution: Given < ABC = < AED, AD = 3cm, AE = 5 cm and EC = 2cm

Hence AC = AE +EC = 7 cm

<DAE = <BAC (This angle is common in both triangles)

As 2 angles < ABC = < AED and <DAE = <BAC hence

<ADE = <BCA

Therefore Triangle ABC and triangle AED are similar triangles

AB/AE = AC/AD

AB/5 = 7/3

AB = 35/3

BD = AB- AD = (35/3) – 3 = 26/3

As the ratio of sides of the smaller triangle to the larger triangle is 3/7 hence the area of both triangles Will be in ratio would be $(3)^2/(7)^2 = 9/49$

Hence the correct option is A.

[2015]

60. Which of the following statements is INCORRECT?

(A) The rational form of 17.6 is $\frac{53}{3}$.

(B) 0.423442344423...is a rational number.

(C) The equivalent form of 16 + 2.9 is $\frac{19}{1}$.

(D) $\sqrt{25} + \sqrt{64}$ Is a rational number.

Ans: B

Solution: (4×6) - (12×4)

= (4+6/2) – (12+4/2)

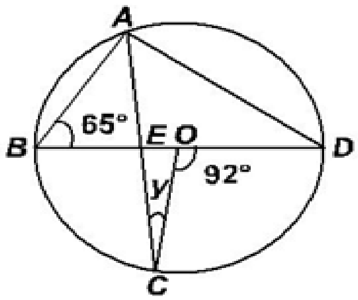
= 5 – 8

= 2(5) + 8 / 3

= 10+8 / 3
= 18/3
= 6 so, option B is the correct answer.

[2016]

61. In the given figure, BD is the diameter of the circle with center O, ∠COD = 92° and ∠ABD = 65°. Then y equals ______.

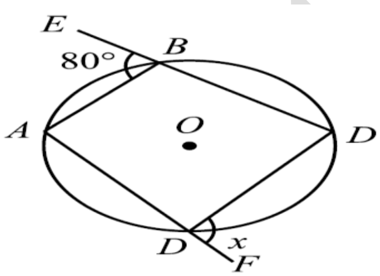


(A) 65° (B) 46° (C) 44° (D) 21°

Ans: D
Solution: <y = 180 - (<OEC + <EOC)
<COD = 92^0, <ABD = 65^0<BAD = 92^0, <BAE = <EAD = 46^0
Then <BEA = 69^0 &<AED = 111^0, <EOC = 180^0 – 92^0 = 88^0
All the angles of the triangle EOC are less than 90 and < y should be the least, hence <y = 21^0

[2012]

62. Find the value of x in the given figure, where O is the Centre of the circle.

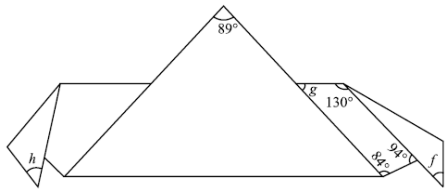


(A) 80° (B) 160° (C) 100° (D) 105°

Ans: C
Solution: ∠EBA = 80° ∠ABD = 180° − ∠EBA = 100°
A cyclic quadrilateral is a quadrilateral whose vertices all touch the circumference of a circle.
The opposite angles add up to 180°.
Therefore, ∠B + ∠D = 180° ⇒∠D = 180° − 100° = 80°
∠ADC + ∠CDF = 180° ⇒∠CDF = 180° − 80° = 100°

[2013]

63. Swati folded the three corners of a triangle. She managed to measure four of the angles as shown below before breaking her protractor. She needs help to figure out what the named angles are.
Help her find f, g and h.

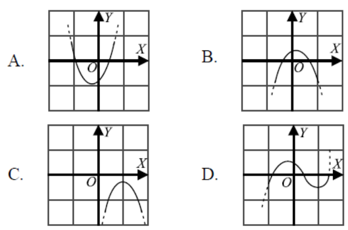


(A) 52°44°47° (B) 44°52°47° (C) 44°47°52° (D) 47°44°52°

Ans: B
Solution: Sum of the angles of a quadrilateral is 360^0. Therefore: $130^0 + 84^0 + 94^0 + g = 360^0$
Or $g = 52^0$. So, clearly option B becomes the answer.

[2014]

64. Which of the following is not the graph of a quadratic polynomial?



Ans: D
Solution: Graph A, B and C are parabolic (represents quadratic polynomial) but Graph D is a sinusoidal graph.

[2015]

65. For which of the following system of equations, x = 6, y = –4 is the solution?
(I) $\frac{1}{2x} - \frac{1}{y} = -1$ and $\frac{1}{x} + \frac{1}{2y} = 8$
(II) $\frac{2}{x} + \frac{2}{3y} = \frac{1}{6}$ and $\frac{3}{x} + \frac{2}{y} = 0$
(A) Only (I) (B) Only (II) (C) Both (I) and (II) (D) Neither (I) nor (II)

Ans: D
Solution: Option D is the correct match.

[2016]

66. There are two examination rooms A and B If 10 candidates are sent from A to B, the number of students in each room is the same.
If 20 candidates are sent from B to A, the number of students in A is double the number of students in B
Find the number of students in each room.
(A) A = 60, B = 40 (B) A = 110, B = 60 (C) A = 95, B = 70 (D) A = 100, B = 80

Ans: D

Solution: Let us assume that 100 and 80 students in room A & B respectively, If 20 is sent from B to A, Then A becomes 120 and B be 60 .that is A is the double of A .Hence the solution is A = 100 & B = 80.

[2012]

67. If xcos3 θ + ysin3 θ = sinθ cosθ and xcosθ = ysinθ, then $x^2 + y^2$ =

(A) 0 (B) 4 (C) 1 (D) 2

Ans: C

Solution: Given that x cos θ = y sin θ ------ (1)

X $\cos^3 \theta + y \sin^3 \theta = \sin \theta \cos \theta$

(X cos θ) $\cos^2 \theta$ + (y sin θ) $\sin^2 \theta$ = sin θ cos θ

(Y sin θ) $\cos^2 \theta$ + (y sin θ) $\sin^2 \theta$ = sin θ cos θ

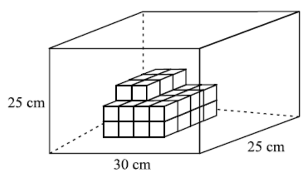
(Y sin θ) [$\text{Cos}^2 \theta + \sin^2 \theta$] = sin θ cos θ y = cos θ

Substituting y = cos θ in (1) we get, x = sin θ

$x^2 + y^2 = \sin^2 \theta + \cos^2 \theta = 1$

[2013]

68. Kunal arranged some metal blocks at the bottom of a tank as seen in the figure below. Then he filled the 30 cm by 25cm by 25cm tank with water. If each block is 4 cm long, 3 cm wide and 5 cm tall, then how much water is needed to fill the tank to 80% of the tank's height?



(A) 15000 cm^3 (B) 2280 cm^3 (C) 12720 cm^3 (D) 16470 cm^3

Ans: C

Solution: 80% of 25cm = 20cm.

Now, 38 blocks of size 4cm x 3cm x 5cm are put into the tank.

They will displace a volume of 4 x 3 x 5 x 38 cm^3 = 2280cm^3

Total volume – volume displaced by cubes = required water.

Therefore, required water = 20 x 30 x 25 – 2280 = 12720 cm^3.

[2014]

69. If $\tan^2 \theta = 1 - a^2$, then sec θ + tan3θ cosec θ = $(2 - a^2)$n, where n =

(A) 2 (B) $\frac{3}{2}$ (C) 1 (D) $\frac{2}{9}$

Ans: B

Solution: $\tan^2 \theta = 1 - a^2$

add 1 both side $1 + \tan^2 \theta = 2 - a^2$

$\sec^2 \theta = 2 - a^2$

sec θ+ tan3 θ cosec θ = ($\sec^2 \theta$)n

sec θ(1+ $\tan^2 \theta$) = ($\sec^2 \theta$)n

$\sec^3\theta = (\sec^2\theta)n$

We get n= 3/2

[2015]

70. If the sum of the zeroes of the quadratic polynomial f (t) = kt2 + 2t + 3k is equal to their product, then find the value of k.

(A) $\frac{-2}{3}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) $\frac{-1}{3}$

Ans: D

Solution: (15.01)2 × square root of 730

= 225.3001 × 27.0185

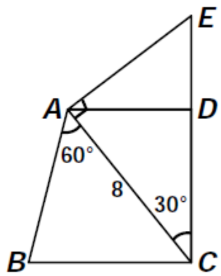
= 6087.2707

= 6100 approx.

So, option D is the right answer

[2016]

71. The given diagram represents some beams which supports part of a roof. If AC 8metres, ∠BAC 60, ∠ ACD 30, ∠ADC 90 and ∠ CAE 90, then the length of the beam AD is ______.



(A) 5 cm (B) 8 cm (C) 4 cm (D) 12 cm

Ans: C

Solution: cos 600 = $\frac{AD}{8}$ then AD = 8 × cos 600 = 8 × 0.5 = 4.

[2012]

72. If one root of the equation a (b - c) x2 + b (c - a) x + c (a - b) = 0 is 1, then the other root is _________.

(A) $\frac{b(c-a)}{a(b-c)}$ (B) $\frac{a(b-c)}{c(a-b)}$ (C) $\frac{a(b-c)}{b(c-a)}$ (D) $\frac{c(a-b)}{a(b-c)}$

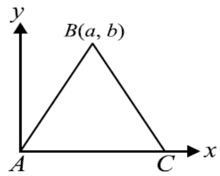
Ans: D

Solution: The product of roots of the quadratic equation $ax^2 + bx + c = 0$ is $\frac{c}{a}$

Therefore, $\frac{c(a-b)}{a(b-c)}$

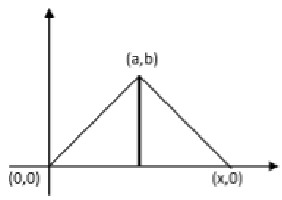
[2013]

73. If the area of the triangle given below is 20 sq. units, then what are the co-ordinates of point C?



(A) $(0, \frac{40}{a})$ (B) (a2 + b2, 0) (C) $(\frac{20}{b}, 0)$ (D) $(\frac{40}{b}, 0)$

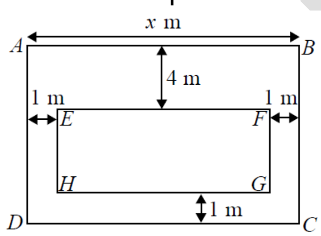
Ans: D
Solution:



Area of triangle = base x height
= (x) (b)
Given that the area = 20 sq. units.
Therefore, (x) (b) = 20
→ x = $(\frac{40}{b}, 0)$

[2014]

74. The area of a rectangular garden, ABCD, is 100 m^2. Inside the garden there is a rectangular lawn, EFGH, whose sides are parallel to those of the garden.



Find the area of the lawn, EFGH (in sq. meters).

(A) 110 – 5x - $\frac{200}{x}$ (B) 110 + 5x - $\frac{200}{x}$ (C) 110 + 5x + $\frac{200}{x}$ (D) 110 – 5x + $\frac{200}{x}$

Ans: A
Solution: As the area of the rectangle is given as 100 m^2 and length of the rectangle is "x" m. Hence breadth AD = BC = 100/x m from the diagram length of the rectangular lawn EF = HG = x-2 meter and breadth of the lawn EH = FG = AD – 4 -1 = (100/x) -5 meter
Hence area of the lawn = (x-2) ((100/x) -5)
= 100 – 200/x -5x +10
= 110 – 5x – 200/x

[2015]

75. The radii of two concentric circles are 16 cm and 10 cm. AB is a diameter of the bigger circle. BD is tangent to the smaller circle touching it at D. Find the length of AD.
    (A) 3 130 cm (B) 2 139 cm (C) 2 130 cm (D) 4 139 cm

    Ans: B
    Solution: We can make (n-2) non-overlapping triangles can we make in a n - gon (polygon having n sides), by joining the vertices. Option B is the correct answer.

[2016]

76. The sums of n terms of the three arithmetical progressions are S1, S2 and S3. The first term of each is unity and the common differences are 1, 2 and 3 respectively, then _____.
    (A) S1 + S3 = 2S2 (B) S1 – S3 = S2 (C) S1 + S2 = S3 (D) S1 + S3 = S2

    Ans: A
    Solution: The sum of 3 terms of S1, S2 & S3 with first term one and common differences 1, 2 & 3 Respectively are 6, 9 & 12 respectively then we can write 6 + 12 = 2 × 9 = S1 + S3 = 2S2.

[2012]

77. If x2 + px + q = 0 and x2 + qx + p = 0 have a common root, then ______.
    (A) p = q (B) 1 + p + q = 0 (C) p + q = 0 (D) Both A and B

    Ans: B
    Solution: Let α be the common root of x2 + px + q = 0 and x2 + px + q = 0.
    Then, α2 + pα + q = 0 and α2 + pα + q = 0.
    Subtracting second form the first,
    α (p - q) + (q - p) = 0
    ⇒ α (p - q) - (p - q) = 0
    ⇒ (p - q) (α - 1) = 0
    ⇒ (α - 1) = 0, [p - q ≠0, since, p ≠ q]
    ⇒ α = 1
    Therefore, from the equation α 2 + pα + q = 0 we get,
    12 + p (1) + q = 0
    ⇒ 1 + p + q = 0

[2014]

78. If $\tan^2 \theta = 1 - a^2$, then $\sec \theta + \tan^3\theta \operatorname{cosec} \theta = (2 - a^2)n$, where n =
    (A) 2 (B) $\frac{3}{2}$ (C) 1 (D) $\frac{2}{9}$

    Ans: B
    Solution: $\tan^2 \theta = 1- a^2$
    add 1 both side 1+ tan2 θ = 2- a2
    $\sec^2 \theta = 2-a^2$
    sec θ+ tan3 θ cosec θ = $(\sec^2 \theta)$n
    sec θ(1+ $\tan^2 \theta$) = $(\sec^2 \theta)$n

sec3 θ= $(\sec^2 \theta)n$
We get n= 3/2

[2015]

79. The probability of getting a bad egg from a lot of 400 eggs is 0.035. Find the number of bad eggs in the lot. Also find the probability of getting a good egg.
(A) 7, 0.965 (B) 14, 0.965 (C) 14, 0.65 (D) 7, 0.65

Ans: B
Solution: In a parallelogram, opposite sides are equal and parallel. Also, opposite angles are equal. So, to construct a parallelogram uniquely, we require the measure of any two non-parallel sides and the Measure of an angle. Hence, the minimum number of measurement required to draw a unique parallelogram is 3. So, option B is the correct answer.

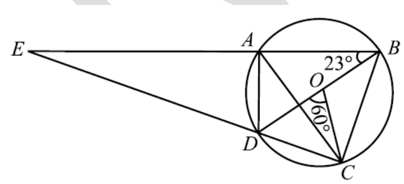
[2016]

80. A sports club has 130 members. An increase of 10% in the number of men and 20% in the number of women brought up the membership to 148. How many men and women were there originally?
(A) 90 men, 40 women (B) 80 men, 50 women
(C) 60 men, 70 women (D) 50 men, 80 women

Ans: B
Solution: Initial number of members in sports club = 130
Total number of members in sports club after 10% and 20%
Increase in men and women
Respectively = 148
Total number of members added to sports club = 148 – 130 = 18
Number of newly added men + Number of newly added women = 18
i.e., x + y = 18
Trial and error method, Let x = 8 and y = 10 then
Number of men originally $= \frac{8\times100}{10} = 80$
Number of women originally $= \frac{10\times100}{20} = 50$
Therefore Men and women originally = 80 and 50.

[2012]

81. In the given figure (not drawn to scale), BD is a diameter of the circle with Centre O. C and A are two points on the circle. BA and CD, when produced, meet at E. If ∠DOC = 60° and ∠ABD = 23°, then find ∠OBC.



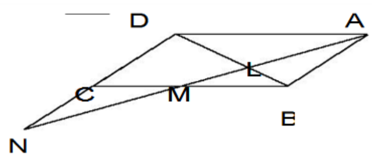
(A) 60° (B) 30° (C) 45° (D) 67°

Ans: B

Solution: DOB is the diameter. Therefore from linear pair of angles forming at O we see,
∠DOC + ∠COB = 180°
→ 60° + ∠COB = 180°
→∠COB = 120°
Now, since COB is isosceles with OB = OC (radius), ∠OCB = ∠OBC.
So, ∠OCB + ∠OBC + ∠COB = 180°
Or 2∠OBC + ∠COB = 180°
Or ∠OBC = 30°

[2014]

82. ABCD is a parallelogram and L is a point on DB.
The produced line AL meets BC at M and DC produced at N. Given that DL = 3LB, find $\frac{AB}{CN}$



(A) 3/2 (B) 1/2 (C) 4/5 (D) ¼

Ans: B
Solution: From the given diagram triangle ALB and triangle NLD are similar
DL/LB = DN / AB
3/1 = (DC + CN) / AB
3/1 = (AB + CN)/ AB
3 = 1 + CN/AB
2 = CN/AB or AB/CN = ½

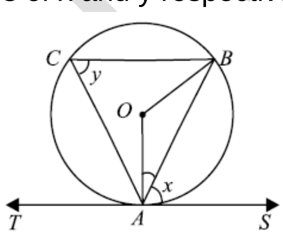
[2015]

83. What is more favorable for a buyer - discount series P of 20%, 15% and 10% or a discount series Q of 25%,12% and 8%?
(A) P (B) Q (C) Both P and Q (D) None of these

Ans: C
Solution: The more favorable discount series is 20 %, 12 %, 8 %.

[2012]

84. In the given figure, TAS is a tangent to the circle, with Centre O, at the point A If ∠OBA = 32°, then find the values of x and y respectively.



(A) 32°, 58° (B) 58°, 48° (C) 58°, 58° (D) 42°, 58°

Ans: A
Solution: ∠OAS = 90^0 (angle subtended at the tangent by radius)
∠OAB = 32^0 (because ∠OAB = ∠OBA)
Therefore ∠AOB = 180 – (32+32) = 116^0
So, ∠ACB = 580 (half of ∠AOB, by property)
And x = 90 – 32 = 58^0

[2014]

85. n2 – 1 is divisible by 8, if n is
(A) An even integer (B) A natural number (C) An odd integer (D) None of these

Ans: C
Solution: if n is an even number then n^2 -1 will be odd, hence option A and B both are wrong. If n is an odd number then we can plug N = 2k+1(2k+1)2 -1 = 4k2 + 4k +1 -1 = 4k (k+1)
K (k+1) will always be an even number and any even number multiplied with 4 are divisible by 8. Hence option C is correct.

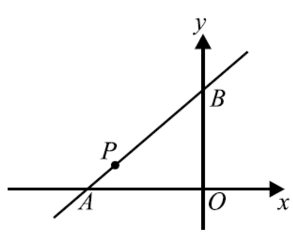
[2015]

86. Three men, four women and six children can complete a work in seven days. A woman does double the work a man does and a child does half the work a man does. How many women alone can complete the work in 7 days?
(A) 14 (B) 8 (C) 7 (D) 12

Ans: C
Solution: Let one woman's work for one day is x
Then one man's work is equal to x/2 & one child's one day's work = 49/7 = 7
So $\frac{3x}{2} + 4x + \frac{6x}{4} = \frac{28x}{4}$
$\frac{28x}{4} = \frac{1}{7}$ thus $x = \frac{1}{49}$, Number of women required = 49 / 7 = 7.

[2012]

87. In the given graph, line APB meets the x-axis at A and y-axis at BP is the point (–4, 2) and AP: PB = 1 : 2. Find the coordinates of A and B respectively.



(A) (–5, 0),(0, 5) (B) (–6, 0),(0, 6) (C) (–6, 0),(0, 5) (D) (6, –6),(–6, 6)

Ans: B
Solution: From the internal section formula,

h = and k = Now, let the coordinates of A be (x, 0) and B be (0, y).
We have. So, on substituting the values in h, k, we get: x = -6, y = 6.

[2014]

88. If ∝ and β are the zeros of the polynomial 3t2 – 6t + 4, Find the value of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}+2\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)+3\alpha\beta$.

(A) 5 (B) 8 (C) 10/3 (D) ½

Ans: B
Solution: given polynomial $3t^2$ -6t +4 α / β + β/ α + 2(1/α +1/β) + 3 αβ
Simplifying this we get $(\alpha)^2$+(β) 2 / αβ + 2((β+α)/αβ) + 3αβ
$((\alpha+\beta)^2$ – 2αβ) / αβ+ 2((β+α)/αβ) + 3αβ
From the given equation sum of roots = - (-6)/3 =2 and product of roots = 4/3
((2)2 – 2×4/3 / (4/3)) + 2 ((2) / (4/3)) + 3×4/3
(4-8/3) / (4/3) + (12/4) + 4 = 1 + 3 + 4 = 8

[2015]

89. Kruti took a loan at simple interest at 6 % in the first year with an increase of 0.5 % in each subsequent year. She paid 3375 as interest after 4 years. How much loan did she take?

(A) 12500 (B) 15800 (C) 33250 (D) 30000

Ans: A
Solution: Let us assume P = 12500
Simple Interest = $\frac{PRT}{100}$
For 1st year 6% interest S.I = 750
For 2nd year 6.5% interest S.I = 812.5
For 3rd year 7% interest S.I = 875
For 4th year 7.5 % interest S.I = 937.5
Interest after 4 years = 7500 + 812.5 + 875 + 937.5 = Rs.3375
Hence the loan amount is Rs.12500.

[2012]

90. Let Sn denote the sum of the first 'n' terms of an A.P.S2n = 3Sn. Then, the ratio S3n/Sn is equal to _____.

(A) 4 (B) 6 (C) 8 (D) 10

Ans: B
Solution: Given S2n = 3Sn
Therefore, [2a + (2n-1) d] = 3[2a + (n-1) d]
Or 2a = nd + d – eq. (1)
Now, we have to find the ratio of
On substituting the value from eq.1 and solving.

[2014]

91. Evaluate : - tan θ cot(90^0 – θ) + $\sin^2 35^0$ + $\sin^2 55^0$ tan 10^0 tan 20^0 tan 30^0 tan 70^0 tan 80^0

(A) $\sqrt{3}$ (B) $2\sqrt{3}$ (C) $\frac{\sqrt{3}}{2}$ (D) 1

Ans: B

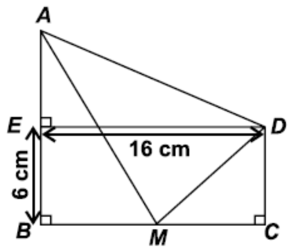
Solution: tan θ= cot (90 - θ) and sec θ= cosec (90 - θ) sin θ= cos (90 - θ)

Hence we can write the given expression as - $\tan^2$ θ + $\sec^2$ θ+ $\sin^2$ (35) + $\cos^2$ (35)

Tan 10 tan 20 tan 30 cot 20 cot 10= (1 + 1) / (1 /$\sqrt{3}$) = $2\sqrt{3}$

[2015]

92. In the adjoining figure, M is the midpoint of BC and AE is half of BE, then AD is _____.



(A) 12.44 cm (B) 17.36 cm (C) 16.27 cm (D) 15.65 cm

Ans: C

Solution: BM =MC (Since M is the midpoint of BC)

AE = 12 BE= 3 cm

AB = 6+ 3 = 9 cm

Then AD = $\sqrt{16^2 + 3^2}$ = 16.27 cm.

[2012]

93. Which of the following equations are not quadratic?

(A) x (2x + 3) = x + 2 (B) $(x – 2)^2 + 1 = 2x – 3$

(C) y (8y + 5) = $y^2 + 3$ (D) y (2y + 15) = $2(y^2 + y + 8)$.

Ans: D

Solution: y (2y+15) = $2(y^2 +y +8)$

$2y^2 +15 y = 2y^2 + 2y +16$

15 y = 2y +16

It is not quadratic.

[2015]

94. If 47.2506 = $4A\frac{7}{B} + 2C + \frac{5}{D} + 6E$, then the value of 5A + 3B + 6C + D + 3E is____________

(A) 53.6003 (B) 53.603 (C) 153.6003 (D) 213.0003

Ans: C

Solution: 5A + 3B + 6C + D + 3E = 153.6003.

[2012]

95. Which of the following statements is correct?

(A) Tossing a fair coin is a fair way to decide that which one team out of the two cricket teams should bat first.

(B) If a coin is tossed once, there are two possible outcomes: a head or a tail. Therefore, for each of these outcomes, the probability is $\frac{1}{3}$.

(C) 3 if two coins of different denominations are tossed simultaneously, there are three possible outcomes: two heads, two tails or one of each. Here, the probability of getting two heads is $\frac{1}{3}$ whereas the probability of getting one head and one tail is $\frac{1}{2}$.

(D) If a dice is tossed once, there are only two possible outcomes: getting a number greater than 4 or less than equal to 4. Therefore, the probability of getting a number greater than 4 is $\frac{1}{2}$.

Ans: A

Solution: Tossing a fair coin is a fair way to decide that which one team out of the two cricket teams should bat first is correct rest all are wrong.

[2015]