OLYMPIAD QUESTIONS

KAT
KNOWLEDGE ASSESSMENT TEST

MATHEMATICS

VI - CLASS

NUMBER SYSTEM

1. **Assertion (A) :** Even × Even × ... × Even (Even number of times) is even. [ ]

   Reason (R) : Even number raised to any integral power gives even number.
   a) Both A and R are correct, R is the correct explanation of A.
   b) Both A and R are correct but R is not the correct explanation of A.
   c) A is correct, R is incorrect.
   d) A is incorrect R is correct.

2. A perfect number among the following is [ ]
   a) 14 b) 16 c) 28 d) 56

3. **Statement (A) :** A number is divisible by '2' then the number is divisible by 4. [ ]
   Statement (B) : A number is divisible by '4' then the number is divisible by 2.
   a) Both A and B are true b) Both A and B are false
   c) A is true and B is false d) A is false and B is true

4. If the number 27 x 4 is divisible by 8 then the least digit to replace 'x' is [ ]
   a) 2 b) 5 c) 0 d) 8

5. The number of divisors of 1080 is [ ]
   a) 9 b) 32 c) 16 d) 7

6. The H.C.F. of 1026, 1215 and 2349 is [ ]
   a) 72 b) 27 c) 702 d) 207

7. **Assertion (A) :** H.C.F. of $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$ is $\frac{1}{12}$. [ ]

   Reason (R) : H.C.F. of fractions = $\frac{\text{H.C.F. of numerators}}{\text{L.C.M. of denominators}}$.

   a) Both A and R are correct and R is the correct explanation of A.
   b) Both A and R are correct but R is not the correct explanation of A.
   c) A is correct, R is incorrect. d) A is incorrect, R is correct.

COMMERCIAL MATHEMATICS

1. If 0.75 : x : : 5 : 6, then x is equal to [ ]
   a) 1.50 b) 0.9 c) 9 d) 15

2. Oranges are bought at 5 for ₹10 and sold at 6 for ₹15. The gain percent is : [ ]
   a) 50% b) 40% c) 35% d) 25%

3. **Assertion (A)** : By decreasing 25% of 24 from it, we get 18. [ ]

Reason (R) : Decrease % = $\frac{\text{Decrease in value}}{\text{Original value}} \times 100\%$

a) Both A and R are correct and R is correct explanation of A
b) Both A and R are correct but R is not correct explanantion of A
c) A is correct, R is incorrect
d) A is incorrect, R is correct

4. The mean proportion of 49 and 36 is [ ]
a) 42 b) 39 c) 54 d) 12

EXPONENTS AND POWERS

1. **Assertion (A) :** $(-1)^{123} \times (-1)^{123} = 1$ [ ]
Reason (R) : $a^m \times a^n = a^{m+n}$, $(-1)^{\text{even number}} = -1$
a) Both A and R are correct and R is the correct explanation to A.
b) Both A and R are correct but R is not the correct explanation to A.
c) A is incorrect, R is correct.
d) A is correct, R is incorrect.

2. If $\left(\frac{1}{5}\right)^x = (125)^4$, then the value of x is [ ]
a) 12 b) -12 c) 125 d) 25

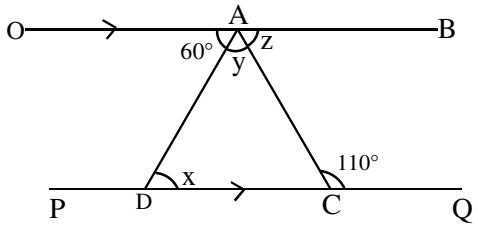
3. The scientific notation of 0.0000021 is [ ]
a) 21×10^7 b) 2.1×10^8 c) 2.1×10^{-6} d) 2.1×10^{-8}

4. If $x + y = 8$ and $2^x + 2^y = 40$, then [ ]
a) x = 3, y = 5 b) x = 5, y = 3 c) xy = 15 d) x = 1, y = 7

GEOMETRY

1. In the given figure, $\overline{OB}$ is parallel to $\overline{PQ}$, $\lfloor OAD = 60°$, $\lfloor ACQ = 110°$, $\lfloor ADC = x°$, $\lfloor DAC = y°$, $\lfloor BAC = z°$. The values of x, y and z are [ ]

a) (60°, 50°, 70°)
b) (30°, 40°, 50°)
c) (40°, 30°, 70°)
d) (20°, 30°, 40°)



2. An angle whose measure is greater than 180° and less than 360° is called a [ ]
a) acute angle b) right angle c) obtuse angle d) reflex angle

3. **Statement (A) :** If $\lfloor PQR = 135°$, then $\frac{4}{3}\lfloor PQR = 175°$ [ ]
Statement (B) : The bisector of an angle divides it into two equal angles.
a) Both A and B are true
b) Both A and B are false
c) A is true, B is false
d) A is false, B is true

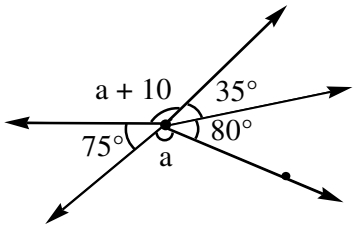
4. In the following figure, the value of 'a'. is [ ]

a) 70°

b) 80°

c) 90°

d) 100°



MENSURATION

5. The area of a square is 49 sq.cm. A rectangle has the same perimeter as the square. If the length of the rectangle is 9.3cm, then [ ]

a) the breadth of a rectangle is 4.7cm b) the area of a rectangle is 35.48cm^2

c) the breadth of a rectangle is 3.5 cm d) the area of a rectangle is 43.71 cm^2

6. Length of a rectangle is 8 cm longer than its width. A square of side x centimeters is cut out of it. If 'x' centimeters is half the width of the rectangle, then the remaining area is square centimeters is [ ]

a) $3x^2 + 16x$ b) $2x^2 + 8x$ c) $3x^2 + 8x$ d) $2x^2 + 16x$

7. The length of a given rectangle is increased by 20% and the breadth is decreased by 20%. Then the resulting area is [ ]

a) Remains the same b) Increases by 5% c) Decreases by 4% d) Decreases by 5%

DATAHANDLING

1. In a family , age (in years) of members Krishna, Ravi, Priya and Nikhil are 23, 47, 13, 15, then the mean of their ages 5 years ago is [ ]

a) 59 b) 24.5 c) 23.5 d) 58

2. The median of the data 39, 38, 10, 15, 23, 16, 8, 90 is [ ]

a) 16 b) 23 c) 18.5 d) 19.5

3. The difference between the largest and smallest observations in a data set is [ ]

a) mode b) median c) range d) mean

VII - CLASS

EXPONENTS AND POWERS

1. If $7^{x-y} = 49$ and $7^{x+y} = 343$, then $6x + 2y =$ [ ]

a) 12 b) 16 c) 20 d) 24

2. **Passage :**

If a, b $\in$ R, a $\neq$ 0, b $\neq$ 0 and m, n $\in$ z then

i) $a^m \times a^n = a^{m+n}$ ii) $a^m \times b^m = (ab)^m$ iii) $\frac{a^m}{a^n} = a^{m-n}$ iv) $\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$

Answer the following :

i) If $2^x = 32$, then $2^{x+2} =$ [ ]

a) 64 b) 128 c) 16 d) 34

ii) If $5^{x-2} = 5$, then $x =$ [ ]

a) 1 b) 2 c) 3 d) 4

iii) If $3^m \times 4^m = 1$, then m = [ ]

a) 0 b) 12 c) 1 d) 1/12

3. Scientific notation of 2012 is [ ]

a) 2012 b) 201.2×10^1 c) 20.12×10^2 d) 2.012×10^3

4. If $x + y = 8$ and $2^x + 2^y = 40$, then x – y = [ ]

a) – 1 b) 0 c) 1 d) 2

5. If $60^a = 3$ and $60^b = 5$, then $12^{\left(\frac{1-a-b}{2(1-b)}\right)}$ is [ ]

a) $\sqrt{3}$ b) 2 c) $\sqrt{5}$ d) 3

MATRICES

1. The matrix $B = [b_{ij}]_{2\times 2}$, whose element b_{ij} is given by $b_{ij} = \frac{(i+2j)^2}{2}$ is [ ]

a) $\begin{bmatrix} \frac{9}{2} & \frac{25}{2} \\ 8 & 18 \end{bmatrix}$ b) $\begin{bmatrix} 4 & 3 & 7 \\ 6 & 8 & -4 \end{bmatrix}$ c) $\begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$ d) $\begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$

2. $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix then x = ____ [ ]

a) 2 b) 3 c) 5 d) 6

3. The product of the cofactors of 3 and –2 in $\begin{bmatrix} 1 & 0 & -2 \\ 3 & -1 & 2 \\ 4 & 5 & 6 \end{bmatrix}$ is [ ]

a) –190 b) – 6 c) 1 d) 19

4. If $A = \begin{pmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 1 & 0 & 1 \end{pmatrix}$ then trace of A is [ ]

a) 1 b) – 1 c) 3 d) 2

5. If the matrix $\begin{bmatrix} x & b & b \\ 1 & 1 & 1 \\ 0 & x & a \end{bmatrix}$ is singular, then x = _____ [ ]

a) 1 b) –3 c) a, b d) 0

NUMBER SYSTEM

1. If d(N) represents number of divisors of N then d(d(18)) is [ ]
   a) 4 b) 5 c) 6 d) 9

2. **Assertion (A) :** Number of odd divisors of 32 is 1 [ ]
   Reason (R) : Number of odd divisors of the number in the form 2^K is 1
   a) Both A and R are correct and R is correct explanation of A
   b) Both A and R are correct but R is not correct explanation of A
   c) A is correct, R is wrong d) A is wrong, R is correct

3. If $1! + 2! + 3! + ... + 100!$ is divided by 24, then the remainder is [ ]
   a) 8 b) 9 c) 5 d) 0

4. If $|x| < a$ then [ ]
   a) $-a < x < a$ b) $x \in [-a, a]$ c) $x \in (-a, a)$ d) $x \in [-a, a)$

5. The last four digits in the binary representation of $(8009)_{10}$ is [ ]
   a) 1001 b) 0001 c) 0101 d) 1010

6. **Assertion (A) :** $\sqrt{-1} \times \sqrt{-2} = \sqrt{2}$ [ ]
   Reason (R) : $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$, $a, b \in R$
   a) Both A and R are correct and R is the correct explanation of A
   b) Both A and R are correct but R is not the correct explanation of A
   c) A is correct, R is incorrect d) A is incorrect, R is correct

PLANE GEOMETRY

1. An angle when added to one - sixth of its complement equals to 40°, then the angle is [ ]
   a) 120° b) 50° c) 30° d) 60°

2. ABC and DEF are two similar triangles such that BC = 4cm, EF = 5cm and area of ΔABC = 64cm², then the area of ΔDEF is [ ]
   a) 100cm² b) 115cm² c) 120cm² d) 125cm²

3. In ΔABC if $DE \| BC$, then $\frac{AD}{AB} =$ [ ]
   a) $\frac{AE}{EC}$ b) $\frac{AE}{AC}$ c) $\frac{AC}{AE}$ d) $\frac{DE}{BC}$

4. The number of diagonals in decagon is [ ]
   a) 35 b) 28 c) 21 d) 14

5. In ΔABC a = 4cm, b = 5cm, c = 3cm, then the length of median m_b is [ ]
   a) 2 b) 2.5 c) 3 d) 4

POLYNOMIALS

1. If $A = 4x^3 - 5x$, $B = 3x^2 - 6x - 5$, $C = x^2 - 2x + 3$, then the degree of (A + B) C is [ ]
   a) 5 b) 6 c) 7 d) 12

2. If $x^2 + ax + b$ and $x^2 + bx + a$ are exactly divisible by $(x - p)$, then the common factor is
   a) $(x+1)$ b) $(x-1)$ c) $(x-2)$ d) $(x-4)$ [ ]

3. $(b - c + d + a)(d + a - b + c) + (c - d + a + b)(b + c + d - a) =$ [ ]
a) $3(ad + bc)$ b) $2(ad + bc)$ c) $4(ad + bc)$ d) $(ad + bc)$

4. If $(2010^{2011} + 2011^{2011})$ is divided by (4021), then the remainder is [ ]
a) 0 b) 1 c) 2 d) 3

COMMERCIAL MATHEMATICS

1. A shopkeeper sells two T.V. sets at the same price. There is a gain of 20% on one T.V. and loss of 20% on the other. Then the loss percentage is [ ]
a) 4% b) 65 c) 10% d) 8%

2. A train 120m long is running at 54 km/hr. Then how much time will it pass a bridge 180 m long is [ ]
a) 15 sec b) 35 sec c) 20sec d) 40sec

3. Reena can knit a pullover in 6 hours while Tina can do it in 8 hours. Working together, then how much time would they take to knit 7pullovers is [ ]
a) 48 hours b) 24 hours c) 12 hours d) 36 hours

DATA HANDLING

1. The number of observations in a group is 40. If the average of first 10 is 4.5 and that of the remaining 30 is 3.5, then the average of the whol e group is [ ]
a) $\frac{1}{5}$ b) $\frac{15}{4}$ c) 6 d) 8

2. If the difference between mean and mode is 63, then difference between mean and median is [ ]
a) 21 b) 31.5 c) 48.5 d) 189

3. Mean of the numbers 1, 2, 3 ... n with respective weights $1^2 + 1$, $2^2 + 2$, $3^2 + 3$, ... $n^2 + n$ is [ ]
a) $\frac{3n+2}{2}$ b) $\frac{3n+1}{4}$ c) $\frac{2n+1}{3}$ d) $\frac{3n(n+1)}{2(2n+1)}$

VIII - CLASS

LOGARITHMS

1. $3^{\sqrt{\log_3 7}} - 7^{\sqrt{\log_7 3}} =$ [ ]
a) 0 b) 1 c) – 1 d) 2

2. If $x > 1$, then the least value of $2\log_{10} x - \log_x 0.01$ is [ ]
a) 2 b) 4 c) 6 d) 8

3. If $\log_{30} 3 = a$, $\log_{30} 5 = b$, then the value of $\log_{30} 32$ in terms of a, b is [ ]
a) $3(1 + a + b)$ b) $3(1 + a - b)$ c) $5(1 - a - b)$ d) $3(1 - a + b)$

4. If $\frac{1}{\log_2 a} + \frac{1}{\log_4 a} + \frac{1}{\log_8 a} + \frac{1}{\log_{16} a} + \cdots$ to n terms $= \frac{n(n+1)}{2k}$, then k = [ ]
a) $\log_a 2$ b) $\log_a 4$ c) $\log_2 a$ d) $\log_4 a$

5. If $a^2 = b^2 + c^2$, then $\frac{1}{\log_{a-b} c} + \frac{1}{\log_{a+b} c} =$ [ ]

a) 0 b) 1 c) – 1 d) 2

6. If $5^x = (0.5)^y = 1000$, then $\frac{1}{x} - \frac{1}{y} =$ [ ]

a) 1 b) $\frac{1}{2}$ c) $\frac{1}{3}$ d) $\frac{1}{4}$

7. If $\log_{10} 3 = 0.4771$, then the number of digits in 3^{40} is [ ]

a) 20 b) 21 c) 22 d) 23

TRIGONOMETRY

1. If $\tan x = \frac{b}{a}$ then the value of a cos2x + bsin 2x is [ ]

a) a b) a – b c) a + b d) b

2. A+ B = 60^O then $\cos^2 A + \cos^2 B - \cos A \cos B$ = [ ]

a) $\frac{1}{4}$ b) $\frac{2}{3}$ c) $\frac{3}{4}$ d) $\frac{4}{3}$

3. $\tan 9^0 - \tan 27^0 - \tan 63^0 + \tan 81^0 =$ [ ]

a) 4 b) 3 c) 2 d) 1

4. If A + B + C = 180^o , then sin2A + sin2B – sin2C= [ ]

a) 4sinA cosB sinC b) 4cosA sinB sinC

c) 4cosA cosB sinC d) 4cosA sinB cosC

5. **Assertion (A) :** $\tan 40° + \tan 80° - \sqrt{3} \tan 40° \tan 80° = -\sqrt{3}$ [ ]

Reason (R) : $\tan(A + B) = \tan A + \tan B + \tan(A + B) \tan A \tan B$

a) Both A and R are correct and R is correct explanation of A

b) Both A and R are correct and R is not correct explanation of A

c) A is correct, R is incorrect d) A is incorrect, R is correct

SETS AND RELATIONS

1. The number of all possible proper subsets of {2, 3, 5} is : [ ]

a) 3 b) 3 ! c) 7 d) 8

2. Let A = {0, 1, 3, 4} B = {5, 6, 1, 3, 9} and C = {0, 1, 2, 3, 9, 13}. Then, $(A \cap B) \cup C$ is [ ]

a) {0, 1, 2, 4, 9, 13} b) {0, 1, 2, 3, 9, 13}

c) {0, 1, 3} d) {1, 3}

3. A group of 30 people take either tea or coffee . If 12 people do not take tea and 15 people take coffee, then the number of people who take tea are [ ]

a) 18 b) 16 c) 15 d) 12

4. The relation > is [ ]

a) reflexive b) symmetric c) transitive d) equivalence

5. If n(A – B) = 25 + x, n(B – A) = 2x and n (A ∩ B) = 2x and if n(A) = 2n(B), then the value of x is
a) 1 b) 5 c) 4 d) 6

6. If n(A) = 8 and n(B) = 5, then the minimum number of elements in A ∪ B is [ ]
a) 6 b) 7 c) 8 d) 13

SURDS

1. If $a=\sqrt{17}-\sqrt{16}, b=\sqrt{15}-\sqrt{14}$ then [ ]
a) a > b b) a < b c) a = b d) a + b = 0

2. $\frac{2}{\sqrt[3]{9}-\sqrt[3]{3}+1}-\frac{1}{\sqrt[3]{9}+\sqrt[3]{3}+1}=$ [ ]
a) 1 b) – 1 c) $\sqrt[3]{3}$ d) $-\sqrt[3]{3}$

3. If $1 \le a \le 2$, then $\sqrt{a+2\sqrt{a-1}}-\sqrt{a-2\sqrt{a-1}}=$ [ ]
a) $2\sqrt{a-1}$ b) $\sqrt{a-1}$ c) $\sqrt{a+1}$ d) $\frac{1}{2}\sqrt{a-1}$

POLYNOMIALS

1. If $f(x) = x+x^9+x^{25}+x^{49}+x^{81}$ is divided by (x^3-x), then the remainder is [ ]
a) x^{27} b) x^2+5x+1 c) $5x^2$ d) $5x$

2. If $f(x)$ is a real function such that $f(x+y)=f(xy)$ and $f\left(\frac{-2}{3}\right)=\frac{2}{3}$ for all x, y then $f(2001) =$
a) 2001 b) $\frac{-2001}{3}$ c) $\frac{2001}{3}$ d) $\frac{2}{3}$ [ ]

3. If α, β, γ are the roots of $x^3+qx+r=0$, then $\alpha^2+\beta^2+\gamma^2 =$ [ ]
a) – 2q b) – 3r c) $2q^2$ d) – 6q

NUMBER SYSTEM

1. $\left[\sqrt{1}\right]+\left[\sqrt{2}\right]+\left[\sqrt{3}\right]+.....\left[\sqrt{100}\right]=$ [ ]
a) 560 b) 660 c) 625 d) 624

2. If 5^{99} is divided by 13, then the remainder is [ ]
a) 07 b) 13 c) 12 d) 08

3. The value of $\sqrt{5\sqrt{5\sqrt{5}.....}}$ is [ ]
a) 0 b) 125 c) 5 d) - 5

IX - CLASS

PERMUTATIONS AND COMBINATIONS

1. The number of ways in which 5 boys and 5 girls can sit in a row so that the boys and girls sit alternatively is [ ]
   a)14,400 b) 28,800 c) 26,500 d) 18, 400
2. S_1, S_2,,,,,,S_{10} are the speakers in a conference. If S_1 addresses only after S_2, then the number of ways the speakers address is : [ ]
   a) 10! b) 9! c) $10\times 8!$ d) $(10!)/2$
3. $1+1\times 1!+2\times 2!+3\times 3!+.....+n\times n!=$ [ ]
   a) n! b) $(n-1)!$ c) $(n+1)!$ d) $n\times(n+1)!$
4. The number of quadratic expressions with the coefficients drawn from the set {0,1,2,3} is [ ]
   a) 27 b) 36 c) 48 d) 64
5. The number of ways in which the letters of the word ALGEBRA can be arranged without changing the relative positions of vowels and consonants is [ ]
   a) 36 b) 54 c) 72 d) 144

QUADRATIC EQUATIONS

1. If 3 + 4i is a root of the equation $x^2 + px + q = 0$, then [ ]
   a) p = 6, q = 25 b) p = 6, q = 1 c) p = – 6, q = – 7 d) p = – 6, q = 25
2. The ratio of the roots of the equation $ax^2 + bx + c = 0$ is same as the ratio of the roots of the equation $px^2 + qx + r = 0$. If D_1 and D_2 are the discriminants of $ax^2 + bx + c = 0$ and $px^2 + qx + r = 0$ respectively, then $D_1 : D_2$ is [ ]
   a) $a^2 : p^2$ b) $b^2 : q^2$ c) $c^2 : r^2$ d) b : q
3. The value of a for which each one of the roots of $x^2 - 4ax + 2a^2 - 3a + 5 = 0$ is greater than 2, are [ ]
   a) $a \in (1, \infty)$ b) a = 1 c) $a \in (-\infty, 1)$ d) $a \in (9/2, \infty)$
4. If x is real then the minimum value of $\frac{x^2 - x + 1}{x^2 + x + 1}$ is [ ]
   a) 1/3 b) 3 c) 1/2 d) 1
5. If a, b, c are the sides of a triangle then the range of $\frac{a^2+b^2+c^2}{ab+bc+ca}$ is [ ]
   a) [1, 2] b) $(-\infty,1]\cup[2,\infty)$ c) zero d) $\left[1,\frac{3}{2}\right]$

LOGARITHMS

1. $\frac{1}{\log_3 \pi}+\frac{1}{\log_4 \pi}$ [ ]
   a) is equal to 2 b) is less than 2 c) is greater than 2 d) cannot be determined
2. If $\log x = \log (a + b) + \log (a^2 - ab + b^2)$, then x = [ ]
   a) $a^3 + b^3$ b) $a^2 + b^2$ c) a + b d) ab

3. $\log_2\left(1+\frac{1}{2}\right)+\log_2\left(1+\frac{1}{3}\right)+.....+\log_2\left(1+\frac{1}{31}\right)=$ [ ]

a) 0 b) 1 c) 5 d) 4

4. If $\frac{1}{\log_2 n}+\frac{1}{\log_3 n}+.....+\frac{1}{\log_{43} n}=\frac{1}{\log_x n}$, then x = [ ]

a) 43 b) 43^n c) 43 ! d) n^{43}

5. If $a^x = b^y = c^z = d^w$, then $\log_a$ (bcd) = [ ]

a) $x\left(\frac{1}{y}+\frac{1}{z}+\frac{1}{w}\right)$ b) $\frac{1}{x}\left(\frac{1}{y}+\frac{1}{z}+\frac{1}{w}\right)$ c) $x\left(\frac{1}{y}+\frac{1}{z}-\frac{1}{w}\right)$ d) $\frac{1}{x}\left(\frac{1}{y}+\frac{1}{z}-\frac{1}{w}\right)$

FUNCTIONS

1. If $f(x)$ is a function such that $f(x+y)=f(x)+f(y)$ and $f(1)=7$, then $\sum_{r=1}^{n} f(r)=$ [ ]

a) $\frac{7n}{2}$ b) $\frac{7(n+1)}{2}$ c) $7n(n+1)$ d) $\frac{7n(n+1)}{2}$

2. If $f: R\to R$ and $g: R\to R$ defined by $f(x) = 5x + 1$ and $g(x) = 3 - 2x$, then $(f^{-1}og^{-1})(11) =$ [ ]

a) – 1 b) 1 c) 0 d) – 2

3. If $f(x)=\alpha x+\beta$ and f = {(1, 1), (2, 3), (3, 5), (4, 7)}, then the values of $\alpha+\beta$ are [ ]

a) 2, -1 b) -2, 1 c) 3, -1 d) -2, -1

PLANE GEOMETRY

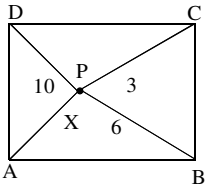
1. In the following rectangle, let P be the point in its interior with distances from the four corners as shown. Then the value of x.

a) $\sqrt{127}$

b) $\sqrt{73}$

c) $\sqrt{55}$

d) 13



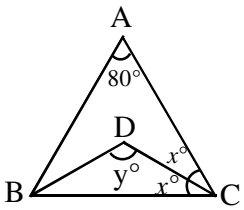
2. In the given figure $\angle A=80°$, $\angle B=60°$, $\angle C=2x°$ and $\angle BDC = y°$. BD and CD bisect angles B and C respectively. The values of x and y is respectively, are [ ]

a) 10°, 70°

b) 20°, 130°

c) 15°, 150°

d) 25°, 100°



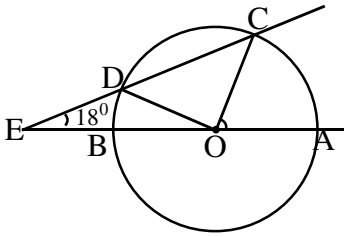
3. Secants $\overline{EDC}$ and $\overline{EBA}$ intersect a circle centered at O, making a diameter and a chord. If AB = 2DE and If $m\angle AEC = 18°$, then $m\angle COA =$ [ ]

a) 36°

b) 18°

c) 54°

d) 72°



POLYNOMIALS

1. If the polynomial *f(x)* is such that *f(x)* = 1 – *f* (1–*x*), then the value of

$$f\left(\frac{1}{999}\right)+f\left(\frac{2}{999}\right)+.....+f\left(\frac{998}{999}\right)=$$ [ ]

a) 998 b) 499 c) 999 d) 498

2. A biquadratic polynomial $f(x)$ has zeroes – 2, 3, 5 and 7. If f(0) = 1 and $f(x)$ is divided by $(x-1)$, then the remainder is [ ]

a) $\frac{18}{23}$ b) $\frac{14}{29}$ c) $\frac{24}{35}$ d) $\frac{13}{29}$

3. If $f(x+3)=x^2+x-6$, then the factor of $f(x)$ is [ ]

a) (x – 1) b) (x – 3) c) (x – 4) d) (x – 5)

TRIGONOMETRY

1. **Statement – I:** $\cos x+\cos y=\frac{1}{3}, \sin x+\sin y=\frac{1}{4}\Rightarrow \cos(x+y)=\frac{-7}{25}$ [ ]

Statement – II: $\sin x+\sin y=\frac{1}{4}, \sin x-\sin y=\frac{1}{5}$ then $4\cot\left(\frac{x-y}{2}\right)=5\cot\left(\frac{x+y}{2}\right)$

a) only I is true
b) only II is true
c) Both I and II are true
d) Neither I nor II are true

2. The period of $f(x)=\cos^{-1}(\cos x)$ is [ ]

a) 2π b) $2^2\pi$ c) $2^3 x$ d) $\frac{\pi}{2}$

3. $\sin^2\theta=\frac{(x+y)^2}{4xy}$ is possible only, when [ ]

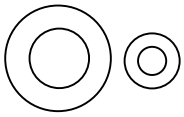
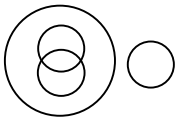
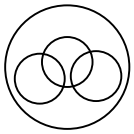
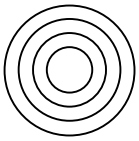
a) $x>0, y>0$ *and* $x\neq y$ b) $x>0, y>0$ *and* $x=y$
c) $x<0, y<0$ *and* x=y d) all the above .

4. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$, then the value of $\cos\left(\theta - \frac{\pi}{4}\right) =$ [ ]

a) $\frac{1}{2\sqrt{2}}$ b) $\frac{1}{\sqrt{2}}$ c) $\frac{1}{3\sqrt{2}}$ d) $\frac{1}{4\sqrt{2}}$

SETS AND RELATIONS

1. Among the following diagrams illustrate the relationship among the set of natural numbers, the set of square number, the set of primes, and the set of even inegers is [ ]

a)  b)  c)  d) 

2. If $n(A \cap B) = 10$, $n(B \cap C) = 20$ and $n(A \cap C) = 30$,then the greatest possible value of $n(A \cap B \cap C)$ is [ ]

a) 15 b) 20 c) 10 d) 4

3. The set $\{x : (x - 2)(x - 3) > 0\}$ is equal to [ ]

a) $\{x : 2 < x < 3\}$ b) $\{x : x < 3\} \cup \{x : x < 2\}$

c) $\{x : x > 3\} \cup \{x : x < 2\}$ d) None of these

SURDS

1. $x\sqrt{x+\sqrt{x^2+\sqrt{x^3+....}}} =$ [ ]

a) $\sqrt{x^3+\sqrt{x^4+\sqrt{x^5+....}}}$ b) $\sqrt{x^3+\sqrt{x^6+\sqrt{x^{11}+....}}}$

c) $\sqrt{x^3+\sqrt{x^6+\sqrt{x^9+....}}}$ d) $\sqrt{x^3+\sqrt{x^6+\sqrt{x^{12}+....}}}$

2. If $\sqrt{\sqrt{27}+\sqrt{15}} = \sqrt[4]{3}\left(\sqrt{a}+\sqrt{b}\right)$, then [ ]

a) *a= 2, b = 5* b) *a = 1/2, b = 5/2* c) *a = 1, b = 5/2* d) *a = 1, b = 5*

3. If $x > 3$, then the positive square root of $2x-1+2\sqrt{x^2-x-6}$ is [ ]

a) $\sqrt{x-3}+\sqrt{x+2}$ b) $\frac{1}{\sqrt{2}}\left(\sqrt{x-3}+\sqrt{x+2}\right)$

c) $\frac{1}{\sqrt{2}}\left(\sqrt{x-2}+\sqrt{x+3}\right)$ d) $\sqrt{x-2}+\sqrt{x+1}$

X- CLASS

INTEGRATIONS

1. $\int\left(\sum_{r=0}^{\infty}\frac{x^r 3^r}{r!}\right)dx =$ [ ]

a) $e^x + c$ b) $\frac{e^{3x}}{3}+c$ c) $\frac{-3}{1-3x}+c$ d) $3e^{3x} + c$

2. If $\int\frac{3\cos x-2\sin x}{4\sin x+5\cos x}dx = A\,x + B\log|5\cos x + 4\sin x|$ then (A, B) = [ ]

a) $\left(\frac{7}{41},\frac{22}{41}\right)$ b) $\left(\frac{22}{41},\frac{7}{41}\right)$ c) $\left(\frac{15}{41},\frac{7}{21}\right)$ d) $\left(\frac{7}{21},\frac{15}{41}\right)$

3. **Assertion (A) :** $\int(2x\tan x\sec^2 x+\tan^2 x)dx=x\tan^2 x+c$ [ ]

Reason (R) : $\int\left(x f'(x)+f(x)\right)dx=x f(x)+c$

The correct answer is
a) Both (A) and (R) are true and (R) is the correct explanation of (A)
b) Both (A) and (R) are true and (R) is not the correct explanation of (A)
c) (A) is true but (R) is false d) (A) is false but (R) is true

4. $\int\frac{x^2+1}{x^4+1}dx =$ [ ]

a) $\frac{1}{\sqrt{2}}\mathrm{Tan}^{-1}\left(\frac{x^2-1}{\sqrt{2}x}\right)+c$ b) $\sqrt{2}\mathrm{Sin}^{-1}\left(\frac{x^2-1}{\sqrt{2}x}\right)+c$

c) $\frac{1}{\sqrt{2}}\mathrm{Sinh}^{-1}\left(\frac{x^2-1}{\sqrt{2}x}\right)+c$ d) $\sqrt{2}\mathrm{Cosh}^{-1}\left(\frac{x^2-1}{\sqrt{2}x}\right)+c$

5. If $\int\frac{4e^x+6e^{-x}}{9e^x-4e^{-x}}dx = Ax + B\log(9e^x-4e^{-x})+C$ then [ ]

a) $A=\frac{-19}{36}, B=\frac{35}{36}, C=0$ b) $A=\frac{35}{36}, B=\frac{-19}{36}, C=0$

c) $A=\frac{-19}{36}, B=\frac{35}{36}, C\in R$ d) $A=\frac{35}{36}, B=\frac{-19}{36}, C\in R$

PROBABILITY

1. If 4 different biscuits are distributed among 3 children at random, the probability that the first child receives exactly one biscuit is [ ]

a) $\frac{32}{81}$ b) $\frac{27}{81}$ c) $\frac{17}{81}$ d) $\frac{1}{81}$

2. The probabilities of a problem being solved by two students are $\frac{1}{2}$ and $\frac{1}{3}$. The probability that the problem being solved is [ ]

a) $\frac{2}{3}$ b) $\frac{1}{6}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$

3. An urn A contains 8 black balls and 5 white balls. A second urn B contains 6 black and 7 white balls. The probability that a blind folded person in one draw shall obtain a white ball [ ]

a) 5/13 b) 7/13 c) 6/13 d) 5/26

4. A card is drawn at random from a pack, the probability that it may be either king or queen is : [ ]

a) $\frac{11}{13}$ b) $\frac{1}{13}$ c) $\frac{1}{26}$ d) $\frac{2}{13}$

5. If P (A $\cup$ B) = 0.65, P (A $\cap$ B) = 0.15, then $P(\bar{A}) + P(\bar{B}) =$ (EAMCET-2003) [ ]

a) 1.2 b) 0.2 c) 0.8 d) 0.6

FUNCTIONS

1. Let $f : N \to R$ such that $f(x) = \frac{2x-1}{2}$ and $g : Q \to R$ such that $g(x) = x + 2$ be two functions. Then $(gof)\left(\frac{3}{2}\right)$ is equal to [ ]

a) 3 b) $\frac{7}{2}$ c) 1 d) not defined

2. If $f : R \to [0.\infty)$ defined by $f(x) = 10^x$ then $f^{-1}(x) =$ [ ]

a) $\log_x 10$ b) x^{10} c) $\log_{10} x$ d) 10^x

3. The domain of $f(x) = \frac{1}{\sqrt{(x-1)(x-2)(x-3)}}$ is [ ]

a) $(-\infty, 1) \cup (3, \infty)$ b) $(1, 2) \cup (3, \infty)$ c) $(-\infty, 2)$ d) R

4. If $f : R \to R$ is given by $f(x) = \frac{a^x}{a^x + \sqrt{a}}$ $\forall$ $x \in R$,then [ ]

$$f\left(\frac{1}{1997}\right) + f\left(\frac{2}{1997}\right) + \ldots\ldots + f\left(\frac{1995}{1997}\right) + f\left(\frac{1996}{1997}\right) =$$

a) 997 b) 998 c) 1997 d) 1998

5. The domain of the function $f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$ is [ ]

a) [2, 3] b) [2, 3) c) [1, 2] d) [1, 2)

6. If $f(x)$ is a function such that $f(x + y) = f(x) + f(y)$ and $f(1) = 7$, then $\sum_{r=1}^{n} f(r) =$ [ ]

a) $\frac{7n}{2}$ b) $\frac{7(n+1)}{2}$ c) $7n(n+1)$ d) $\frac{7n(n+1)}{2}$

7. The domain of the function $f(x) = {}^{16-x}C_{2x-1} + {}^{20-3x}C_{4x-5}$ is [ ]

a) {1, 2, 3, 4} b) {1, 2, 3} c) {2, 3, 4} d) {2, 3}

8. $f(x) = \cos^2 x + \cos^2\left(\frac{\pi}{3} + x\right) - \cos x.\cos\left(\frac{\pi}{3} + x\right)$ is [ ]

a) an odd function b) an even function c) a periodic function d) f(0) = f(1)

LIMITS AND CONTINUITY

1. If $f(9) = 9,\ f'(9) = 4$ then $\lim_{x\to 9} \frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3} =$ [ ]

a) 2 b) 4 c) – 2 d) – 4

2. $\lim_{x\to 0} (\cos x)^{\cot x}$ is equal to [ ]

a) 1 b) 2 c) 3 d) 4

3. $\underset{x\to\frac{\pi}{4}}{Lt} \frac{\cos x - \sin x}{\frac{\pi}{4} - x} =$ [ ]

a) $\sqrt{2}$ b) $-\sqrt{2}$ c) $\frac{1}{\sqrt{2}}$ d) $\frac{-1}{\sqrt{2}}$

4. If $f(x) = \left(1 + \tan^2 x^2\right)^{\frac{1}{2x^4}}$ is continuous at x = 0, then $f(0) =$ [ ]

a) e b) $\sqrt{e}$ c) $\frac{1}{e}$ d) $\frac{1}{\sqrt{e}}$

5. If $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x} & for\ -1 \le x < 0 \\ 2x^2 + 3x - 2 & for\ 0 \le x < 1 \end{cases}$ is continuous at $x = 0$ then $k =$ [ ]

a) – 4 b) – 3 c) –2 d) – 1

6. $f(x) = (1 + x)^{5/x},\ x \neq 0$, $f(0) = e^5$, at x = 0 f is [ ]

a) continuous b) discontinuous c) not determined d) none

DIFFERENTIATION

1. $\frac{d}{dx}\left[\frac{x}{2}\sqrt{a^2 + x^2} + \frac{a^2}{2}\log\left(x + \sqrt{a^2 + x^2}\right)\right] =$ [ ]

a) $\frac{1}{\sqrt{a^2 + x^2}}$ b) $\sqrt{a^2 + x^2}$ c) $\frac{2x}{\sqrt{a^2 + x^2}}$ d) $\sqrt{a^2 - x^2}$

2. If $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$ then $\frac{dy}{dx}=$ [ ]

a) $a\sqrt{\frac{1-y^2}{1-x^2}}$ b) $\sqrt{\frac{1-x^2}{1-y^2}}$ c) $\sqrt{\frac{1-y^2}{1-x^2}}$ d) $a\sqrt{\frac{1-x^2}{1-y^2}}$

3. If $x^2-y^2=a(x-y)$ and $x \neq y$, then $\frac{dy}{dx}=$ [ ]

a) 0 b) 1 c) –1 d) 2

4. The derivative of $Sin^{-1}\frac{2x}{1+x^2}$ w.r.t $Tan^{-1}\frac{2x}{1-x^2}$ is [ ]

a) 1 b) –1 c) 2 d) 0

5. If $y = e^{sin^{-1}x}$, then $(1 - x^2)\, y_2 - xy_1 =$ [ ]

a) 0 b) 1 c) y d) 2y

STATISTICS

1. The A.M. of the series ${}^nC_0, {}^nC_1, {}^nC_2, ... {}^nC_n$ is [ ]

a) $\frac{2^n}{n+1}$ b) $\frac{2^n}{n}$ c) $\frac{2^{n-1}}{n+1}$ d) $\frac{1}{n+1}$

2. The mean weight of 150 students in a certain class is 60 kilograms. The mean weight of boys in the class is 70 kilograms and that of the girls is 55 kilograms, then the number of boys and girls are [ ]

a) 100, 50 b) 50, 100 c) 75, 75 d) 60, 90

3. If the standard deviation of $x_1, x_2, ..., x_n$ is 3.5, then the standard deviation of $-2x_1 - 3, -2x_2 - 3, ... -2x_n - 3$ is [ ]

a) – 7 b) – 4 c) 7 d) 1.75

4. The mean of the numbers a, b, 8, 5, 10 is 6 and the variance is 6.80. Then which one of the following gives possible value of a and b [ ]

a) a = 0, b = 7 b) a = 5, b = 2 c) a = 1, b = 6 d) a = 3, b = 4

POLYNOMIALS

1. If a polynomial f (x) is such that f(0) = 2, f(1) = 3, f(x + 2) = 2 f(x) – f (x + 1), then f (5) =

a) 5 b) 10 c) 8 d) 6 [ ]

2. If $f(x)=2x^4-13x^2+ax+b$ is divisile by x^2-3x+2, then (a,b) = [ ]

a) (– 9 , – 2) b) (6,4) c) (9,2) d) (2,9)

3. If $f(x)=x^4-12x^3+17x^2-9x-7$, then $f(x+3)=$ [ ]

a) $x^4-37x^2-123x-110$

b) $x^4-25x^2-73x-85$

c) $x^4-13x^3-12x^2-15$

d) $x^4-47x^2-125x+165$

4. If α, β, γ are the roots of $x^3 - px^2 + qx - r = 0$, then $\frac{1}{\alpha^2\beta^2} + \frac{1}{\beta^2\gamma^2} + \frac{1}{\gamma^2\alpha^2} =$ [ ]

a) $\frac{q^2 - 2pr}{r^2}$ b) $\frac{p^2 - q}{pq - r}$ c) $\frac{p^2 - 2q}{r^2}$ d) 0

TRIGONOMETRY

1. If $\tan\left[\frac{\pi}{2}\sin\theta\right] = \cot\left[\frac{\pi}{2}\cos\theta\right]$, then $\sin\left(\theta + \frac{\pi}{4}\right) =$ [ ]

a) $\pm\frac{1}{2}$ b) $\pm\frac{1}{\sqrt{2}}$ c) $\pm\frac{1}{2\sqrt{2}}$ d) 2

2. If $1 + \sin x + (\sin x)^2 + ...\infty = 4 + 2\sqrt{3}, 0 < x < \pi, x \neq \frac{\pi}{2}$, then x = [ ]

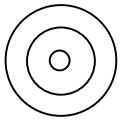
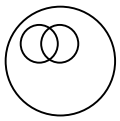
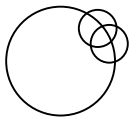
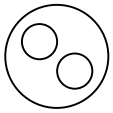
a) $\frac{\pi}{6}, \frac{\pi}{3}$ b) $\frac{\pi}{3}, \frac{5\pi}{6}$ c) $\frac{2\pi}{3}, \frac{\pi}{6}$ d) $\frac{\pi}{3}, \frac{2\pi}{3}$

3. The solution of $(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$ in $\left[0, \frac{\pi}{2}\right]$ is [ ]

a) $\frac{\pi}{6}, \frac{\pi}{3}$ b) $\frac{\pi}{3}, \frac{\pi}{2}$ c) $\pi, \frac{\pi}{2}$ d) $\frac{\pi}{4}, \frac{\pi}{2}$

SETS AND RELATIONS

1. If T = Set of all triangles in a plane, I = Set of all isosceles triangles, and S = Set of all acute trianges, then among the following diagrams describes the above sets is [ ]

a)  b)  c)  d) 

2. If $A_1 \subset A_2 \subset A_3 \subset .....A_{50}$ and $n(A_x) = x - 1$, then $n\left[\bigcap_{x=11}^{50} A_x\right] =$ [ ]

a) 49 b) 50 c) 11 d) 10

3. If $n(A \cap B) = 5$, $n(A \cap C) = 7$ and $n(A \cap B \cap C) = 3$, then the minimum possible value of $n(B \cap C)$ is [ ]

a) 0 b) 1 c) 3 d) 2

MENSURATION

1. The sum of three times a number and two times the other is 2 times the difference of thrice the first number and twice the second. If the first number is greater than second, then find the ratio of two numbers. [ ]

a) 1 : 3 b) 2 : 1 c) 3 : 2 d) 2 : 3

2. A rectangular sheet of paper 22 cm long and 10 cm broad can be curved to form the lateral surface area of right cylinder in two ways, then the difference between the volumes of the two cylinders thus formed is [ ]

a) 200 cm^3 b) 210 cm^3 c) 250 cm^3 d) 252 cm^3

3. If the slant height of a conical tent is 35 m and its diameter is 56 m then the cost of constructing at 2 paise per m^2 is [ ]

a) Rs. 600.50 b) Rs.61.6 c) Rs.620 d) Rs.449.60