ANIKET'S OPERATION

MATHEMATICS

CBSE (XI) – 2023
LEVEL - I

(13th Revised Edition)

DATE : 01 ST JULY 2022

PREFACE

*It is known to every student that **70 – 80 %** questions in **CBSE – XI** Exam, have been asked from **NCERT** Text Book.*

*Though the remaining **20 – 30 % HOTS** (**H**igh **O**rder **T**hinking **S**kills) questions are creating furor in them.*

*As an outcome a lots of students had performed below the level, what they expect from themselves, in their **Unit Tests** or **Formative Assessment Examinations**.*

*So, this '**Operation Mathematics CBSE XI – 2023 (Level – I)**' has been designed for providing relief to such depressed students.*

*This package will not only bring confidence, but help the students in scoring the respectable **70 – 80 % Marks** in coming **CBSE XI – 2023 Exam.***

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1. Set Theory

Q. 1. For three sets A, B and C prove that
$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

Q. 2. Draw Venn – Diagram of the following : $(i)\ A^l \cup B^l$ $(ii)\ (A \cup B)^l$ $(iii)\ A - B$

Q. 3. Using properties of sets, show that,
$(i)\ A \cap (A \cup B) = A$ $(ii)\ A \cup (A \cap B) = A$.

Q. 4. For any sets A and B, show that $P(A \cap B) = P(A) \cap P(B)$.

Q. 5. Assume that $P(A) = P(B)$. Show that $A = B$

Q. 6. Is it true that for any sets A and B, $P(A) \cup P(B) = P(A \cup B)$? Justify your answer.

Q. 7. Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for some set X, show that $A = B$.

Q. 8. Let A, B and C be the sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$. Show that $B = C$.

Q. 9. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2 and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to
(i) Chemical C_1 but not Chemical C_2 (ii) Chemical C_1 or Chemical C_2. (iii) No Chemical
Ans: (i) 90 (ii) 140 (iii) 60

Q. 10. A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products?
Ans: 170

Q. 11. Out of 500 car owners investigated, 400 owned car A and 200 owned car B, 50 owned both A and B cars. Is this data correct? Justify your answer. Ans: No as $n(A^l \cap B^l) < 0$

Q. 12. In a survey of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee, 100 were taking both tea and coffee. Find how many students were taking (i) neither tea nor coffee?
(ii) tea but not coffee? (iii) at least one of the two drink? Ans : (i) 325 (ii) 50 (iii) 275

Q. 13. A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports? Ans: 9

Q. 14. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers.
Find: (i) the number of people who read at least one of the newspapers. Ans : 52
(ii) the number of people who read exactly one newspaper. Ans : 30

Q. 15. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked (i)exactly one product (ii) exactly two products.
Ans : (i) 20 (ii) 16

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2. Relations and Functions

Q. 1. If $P = \{1, 2\}$, find $P \times P \times P$. Ans: $\{(1,1,1), (1,1,2), (1,2,1), (1,2,2), (2,1,1), (2,1,2), (2,2,1), (2,2,2)\}$

Q. 2. The Cartesian product $A \times A$ has 9 elements among which are found $(-1, 0)$ and $(0, 1)$. Find the set A.
Ans: $\{-1, 0, 1\}$

Q. 3. Find the domain and range of the function $f(x) = \sqrt{9 - x^2}$ Ans: $D_f = [-3, 3], R_f = [0, 3]$

Q. 4. Find the and range of the function $f = \left\{\left(x, \frac{x^2}{x^2 + 1}\right) : x \in Real\right\}$ Ans: $[0, 1)$

Q. 5. Let $f = \{(1,1), (2,3), (0,-1), (-1,-3)\}$ be a linear function from Z into Z. Find $f(x)$. Ans: $2x - 1$

Q. 6. Let R be a relation from N to N defined by $R = \{(a, b) : a, b \in N \text{ and } a = b^2\}$. Are the following true?
(i) $(a, a) \in R$, for all $a \in N$ (ii) $(a, b) \in R$, implies $(b, a) \in R$ (iii) $(a, b) \in R, (b, c) \in R$ implies $(a, c) \in R$.
Ans : (i) No (ii) No (iii) No

Q. 7. Let R be a relation from Q to Q defined by $R = \{(a,b): a,b \in Q \text{ and } a-b \in Z\}$. Are the following true?
$(i)\ (a,a) \in R$, for all $a \in Q$ $(ii)\ (a,b) \in R$, implies $(b,a) \in R$ $(iii)\ (a,b) \in R, (b,c) \in R$ implies $(a,c) \in R$.

$Ans: (i)\ Yes\ (ii)\ Yes\ (iii)\ Yes$

Q. 8. Let N be the set of natural numbers and the relation R be defined on N such that
$R = \{(x,y): y = 2x;\ x,y \in N\}$. Find the domain, co-domain and range of R? Is this relation a function?

$Ans: Domain = N; Range = Even\ natural\ numbers;\ Co-domain = N;\ Yes$

Q. 9. Let $A = \{1,2,3,\ldots,14\}$. Define a relation R from A to A by $R = \{(x,y): 3x-y = 0, where\ x,y \in A\}$.
(i) Write R in roster form (ii) Find the domain and co- domain of R (iii) Find the range of R.

$Ans: Domain = \{1,2,3,4\}; Co-domain = A; Range = \{3,6,9,12\}$

Q. 10. Let, $A = \{1,2,3,5\}$ & $B = \{4,6,9\}$. If a relation $R: A \to B$, as $R = \{(x,y): |x-y|\ is\ odd;\ x \in A, y \in B\}$.
(i)Write R in roster form. (ii) Find the domain of R (iii) Find the range of R.

$Ans:\ (i)\ R = \{(1,4),(1,6),(2,9),(3,4),(3,6),(5,4),(5,6)\}\ (ii)\{1,2,3,5\}\ (iii)\{4,6,9\}$

Q. 11. Let $A = \{1,2,3,4,6\}$. Let R be the relation on A as $R = \{(a,b): a,b \in A; b\ is\ exactly\ divisible\ by\ a\}$.
(i)Write R in roster form. (ii) Find the domain of R (iii) Find the range of R.

$Ans: (i)\{(1,1),(1,2),(1,3),(1,4),(1,6),(2,2),(2,4),(2,6),(3,3),(3,6),(4,4),(6,6)\}\ (ii)\ A\ (iii)\ A$

Q. 12. Find the domain, range of the function $f(x) = [x]$, where [.] is greatest integer function. Also plot the graph of the function. $Ans: Domain = R, Range = Z(integers)$

Q. 13 Draw the graph of the real valued function $f: R-\{0\} \to R$ defined by $f(x) = \frac{1}{x}$.

Q. 14. Find the domain and range of the function $f(x) = \begin{cases} 1-x\ ;\ x<0 \\ 1\ \ \ \ ;\ x=0 \\ 1+x\ ;\ x>0 \end{cases}$, also plot the graph of the function.

Q. 15. Draw the graph of the function $f: R \to R$ defined by $f(x) = x^3, x \in R$.

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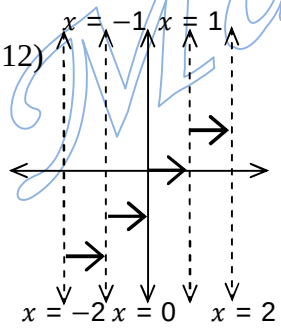

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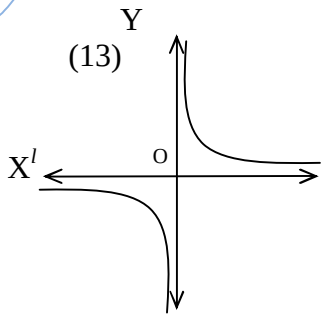

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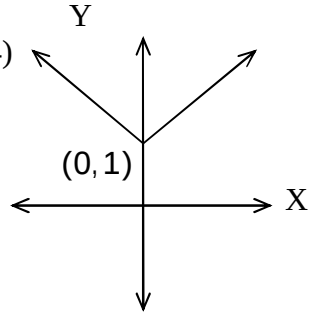

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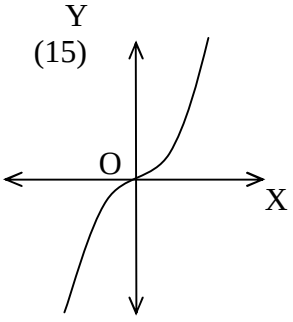

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3. Trigonometry

Prove the following $(Q.1 - Q.10)$

Q. 1. $cos^2 x + cos^2\left(x+\frac{\pi}{3}\right) + cos^2\left(x-\frac{\pi}{3}\right) = \frac{3}{2}$

Q. 2. $tan\,4x = \frac{4\,tan\,x\,(1-tan^2\,x)}{1-6tan^2\,x+tan^4\,x}$

Q. 3. $2\cos\left(\frac{\pi}{13}\right).\cos\left(\frac{9\pi}{13}\right) + \cos\left(\frac{3\pi}{13}\right) + \cos\left(\frac{5\pi}{13}\right) = 0$

Q. 4. $\frac{sin\,5x - 2sin\,3x + sin\,x}{cos\,5x - cos\,x} = tan\,x$

Q. 5. $\cos 2x.\cos\left(\frac{x}{2}\right) - \cos 3x.\cos\left(\frac{9x}{2}\right) = \sin 5x.\sin\left(\frac{5x}{2}\right)$

Q. 6. $cos\,4x = 1-8\,sin^2 x\,.cos^2 x$

Q. 7. $tan\,6x = \frac{sin\,3x + sin\,5x + sin\,7x + sin\,9x}{cos\,3x + cos\,5x + cos\,7x + cos\,9x}$

Q. 8. $tan\left(\frac{\pi}{8}\right) = \sqrt{2}-1$

Q. 9. $cos\,6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$

Q. 10. $sin^2\,6x - sin^2\,4x = sin\,10x.sin\,2x$

Q. 11. $cot\,x.cot\,2x - cot\,2x.cot\,3x - cot\,3x.cot\,x = 1$

Q. 12. $tan\,3x.tan\,2x.tan\,x = tan\,3x - tan\,2x - tan\,x$

Q. 13. $sin\,3x + sin\,2x - sin\,x = 4sin\,x.cos\left(\frac{x}{2}\right).cos\left(\frac{3x}{2}\right)$

Q. 14. If $sin\,x = \frac{3}{5}, cos\,y = -\frac{12}{13}$, where x & y both lie in second quadrant, find the value of $sin\,(x+y)$.

Q. 15. Find the value of, $sin\left(\frac{x}{2}\right), cos\left(\frac{x}{2}\right)$ & $tan\left(\frac{x}{2}\right)$ if $tan\,x = \frac{3}{4};\ \pi \le x \le \frac{3\pi}{2}$ $Ans: \frac{3}{\sqrt{10}}, -\frac{1}{\sqrt{10}}, -3$

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5. Complex Number

Q. 1. Find the conjugate of the complex number $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$ $Ans: \frac{63+16i}{25}$

Q. 2. Reduce $\left(\frac{1}{1-4i}-\frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$ to the standard form. $Ans: \frac{307+599i}{442}$

Q. 3. Find the real numbers x & y if $(x-iy)(3+5i)$ is the conjugate of $-6-24i$. $Ans: x=3, y=-3$

Q. 4. Evaluate $(i^{18}+i^{-25})^3$ $Ans: 2-2i$

Q. 5. Find the least positive integral value of m if $\left(\frac{1+i}{1-i}\right)^m = 1$ $Ans: m \geq 4$

Q. 6. If $x-iy = \sqrt{\frac{a-ib}{c-id}}$ then prove that $(x^2+y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$

Q. 7. If $a+ib = \frac{(x+i)^2}{2x^2+1}$ then prove that $a^2+b^2 = \left(\frac{x^2+1}{2x^2+1}\right)^2$

Q. 8. If 'α' and 'β' are two different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$

Q. 9. Find real x such that, $\frac{3+2i\sin x}{1-2i\sin x}$ is purely real. $Ans: x = 0$

Q. 10. If $(x+iy)^3 = u+iv$, then show that $\frac{u}{x}+\frac{v}{y} = 4(x^2-y^2)$

Q. 11. If $z_1 = 2-i$ and $z_2 = 1+i$, find $\left|\frac{z_1+z_2+1}{z_1-z_2+1}\right|$ $Ans: \frac{4\sqrt{5}}{5}$

Q. 12. Find the square root of the complex numbers $(i)\ -7-24i$ $Ans: \pm(3-4i)$

$(ii)\ 1-i$ $Ans: \pm\sqrt{\frac{\sqrt{2}+1}{2}} \mp i\sqrt{\frac{\sqrt{2}-1}{2}}$

Q. 13. Let $a = 2-i$ and $b = -2+i$, then find $(i)\ Re\left(\frac{ab}{\bar{a}}\right)$ $(ii)\ Im\left(\frac{1}{a\bar{a}}\right)$ $Ans: (i)\ -\frac{2}{5}$ $(ii) 0$

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6. Inequations

Q. 1. Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40. $Ans: (11,13), (13,15), (15,17), (17,19)$

Q. 2. To receive *Grade A* in a course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Sunita's marks in first four examinations are 87, 92, 94 and 95, find minimum marks that Sunita must obtain in fifth examination to get *Grade A* in the course. $Ans: 82$

Q. 3. A man wants to cut three lengths from a single piece of board of length $91cm$. The second length is to be $3cm$ longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second? $Ans: \geq 8cm\ and\ \leq 22cm.$

Q. 4. The longest side of a triangle is 3 times the shortest side and the third side is $2cm$ shorter than the longest side. If the perimeter of the triangle is at least $61cm$, find the minimum length of the shortest side. $Ans: 9cm$

Q. 5. A manufacturer has 600 l of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%? $Ans: > 120\ l\ \&\ < 300\ l$

Q. 6. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 l of the 8% solution, how many litres of the 2% solution will have to be added? $Ans: > 320\ l\ \&\ < 1280\ l$

Q. 7. How many litres of water will have to be added to 1125 l of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content? $Ans: > 562.5\ l\ \&\ < 900\ l$

Q. 8. Solve by using the real number line: $5(2x-7)-3(2x+3) \leq 0, 2x+19 \leq 6x+47$

Q. 9. In an experiment, a solution of hydrochloric acid is to be kept between 30° and 35° Celsius. What is the range of temperature in degree Fahrenheit if conversion formula is given by $C = \frac{5}{9}(F - 32)$, where C and F represent temperature in degree Celsius and degree Fahrenheit, respectively.

Q. 10. A solution is to be kept between $68^\circ F$ and $77^\circ F$. What is the range in temperature in degree Celsius (C) if the Celsius / Fahrenheit (F) conversion formula is given by $C = \frac{5}{9}(F - 32)$

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7. Permutation & Combination

Q. 1. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available. $Ans: 320$

Q. 2. In how many ways can the letters of the word $PERMUTATIONS$ be arranged if the (i) Vowels are all together, (ii) There are always 4 letters between P and S? $Ans: (i)\frac{8! \times 5!}{2!}\ (ii)14 \times \frac{10!}{2!}$

Q. 3. Find the number of words with or without meaning which can be made using all the letters of the word $AGAIN$. If these words are written as in a dictionary, what will be the 50^{th} word? $Ans: NAAIG$

Q. 4. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) Four cards are of the same suit, (ii) Four cards belong to four different suits. $Ans: (i)2860\ (ii)13^4$

Q. 5. From a class of 25 students, 10 are to be chosen for an excursion party. There are 3 students who decide that either all of them will join or none of them will join. In how many ways can the excursion party be chosen? $Ans: {}^{22}C_{10} + {}^{22}C_7$

Q. 6. If the different permutations of all the letter of the word $EXAMINATION$ are listed as in a dictionary, how many words are there in this list before the first word starting with E? $Ans: \frac{10!}{4}$

Q. 7. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of (i) at least 3 girls ? (ii) at most 3 girls ? $Ans: (i)588\ (ii)1632$

Q. 8. Find the number of different 8 $letter$ arrangements that can be made from the letters of the word $DAUGHTER$ so that, (i) All vowels occur together. $Ans: 4320$

(ii) All vowels do not occur together. $Ans: 36000$

Q. 9. In how many of the distinct permutations of the letters in $MISSISSIPPI$ do the four $I's$ not come together? $Ans: 33810$

Q. 10. In an examination, a question paper consists of 12 questions divided into two parts $i.e.$, Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions? $Ans: 420$

Q. 11. How many numbers greater than 1000000 can be formed by using the digits $1, 2, 0, 2, 4, 2, 4$? $Ans: 360$

Q. 12. Find the number of arrangements of the letters of the word $INDEPENDENCE$. In how many of these arrangements, (i) do all the vowels always occur together (ii) do the vowels never occur together. $Ans: (i)\ 16800\ (ii)1646400$

Q. 13. Find n, if $C(2n\,3) : C(n\,3) = 12:1$ OR ${}^{2n}C_3 : {}^{n}C_3 = 12:1$ $Ans: n = 5$

Q. 14. Find r, if $5P(4, r) = 6P(5, r-1)$ OR $5\,{}^4P_r = 6\,{}^5P_{r-1}$ $Ans: r = 3$

Q. 15. Find n, if $P(n, 5) = 42P(n, 3)$ OR ${}^nP_5 = 42\,{}^nP_3$ $Ans: n = 10$

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8. Binomial Theorem

Q. 1. Find the middle term(s) in the expansions of

$(i)\left(3 - \frac{x^3}{6}\right)^7 \quad (ii)\left(\frac{x}{3} + 9y\right)^{10}.$ $Ans: (i)\ {}^7C_3 3\left(\frac{x^9}{8}\right);\ {}^7C_4\left(\frac{x^{12}}{48}\right) \quad (ii)\ {}^{10}C_5(3xy)^5$

Q. 2. Find the term independent of x in the expansion of $\left(\sqrt[3]{x} + \frac{1}{2\sqrt[3]{x}}\right)^{18}, x > 0$ $Ans: {}^{18}C_9\left(\frac{1}{2^9}\right)$

Q. 3. Show that $9^{n+1} - 8n - 9$ is divisible by 64, whenever n is a positive integer.

Q. 4. Using Binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25.

Q. 5. The coefficients of the $(r-1)^{th}$, r^{th} and $(r+1)^{th}$ terms in the expansion of $(x+1)^n$ are in the ratio $1:3:5$. Find n and r. $Ans: n=7, r=3$

Q. 6. The coefficients of three consecutive terms in the expansion of $(1+a)^n$ are in the ratio $1:7:42$. Find n. $Ans: n=55$

Q. 7. The $2^{nd}, 3^{rd}$ and 4^{th} terms in the binomial expansion $(x+a)^n$ are $240, 720$ and 1080, respectively. Find x, a and n. $Ans: n=5, x=2, a=3$

Q. 8. If a and b are distinct integers, using binomial theorem prove that $a-b$ is a factor of $a^n-b^n, n \in Z_+$

Q. 9. Find a, b and n in the expansion of $(a+b)^n$ if the first three terms of the expansion are $729, 7290$ and 30375 respectively. $Ans: n=6, a=3, b=5$

Q. 10. If the coefficients of a^{r-1}, a^r and a^{r+1} in the expansion of $(1+a)^n$ are in $A.P$, prove that $n^2-n(4r+1)+4r^2-2=0$.

Q. 11. Show that the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5.---(2n-1)}{n!}2^n.x^n$; $n \in Z_+$

Q. 12. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2}+\frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6}:1$. $Ans: n=10$

Q. 13. Show that the coefficient of the middle term in the expansion of $(1+x)^{2n}$ is equal to the sum of the coefficients of two middle terms in the expansion of $(1+x)^{2n-1}$.

Q. 14. The sum of the coefficients of the first three terms in the expansion of $\left(x-\frac{3}{x^2}\right)^m$, $x \neq 0, m \in N$, is 559. Find the term of the expansion containing x^3. $Ans: -5940x^3$

Q. 15. Find the coefficient of x^4 in the product $(1+2x)^4(2-x)^5$ using binomial theorem. $Ans: -438$

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9. Sequence & Series

Q. 1. The sum of n terms of two arithmetic progressions are in the ratio $(3n+8):(7n+15)$. Find the ratio of their 12^{th} terms. $Ans: 7:16$

Q. 2. The ratio of the sums of m and n terms of an $A.P.$ is $m^2:n^2$. Show that the ratio of m^{th} and n^{th} term is $(2m-1):(2n-1)$.

Q. 3. If the sum of n terms of an $A.P.$ is $3n^2+5n$ and its m^{th} term is 164, find the value of m. $Ans: 27$

Q. 4. If the first and the n^{th} term of a $G.P.$ are a & b, respectively, and if P is the product of n terms, prove that $P^2=(ab)^n$

Q. 5. Find the sum of the sequence $8+88+888+8888+---+n\ terms$ $Ans: \frac{8}{9}\left\{\frac{10}{9}(10^n-1)-n\right\}$

Q. 6. If $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is the $A.M$ between the two numbers a & b. Then find the value of n. $Ans: n=-1$

Q. 7. If $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the $G.M$ between the two numbers a & b. Then find the value of n. $Ans: n=-\frac{1}{2}$

Q. 8. Between 1 and 31, m numbers have been inserted in such a way that the resulting sequence is an $A.P.$ and the ratio of 7^{th} and $(m-1)^{th}$ numbers is $5:9$. Find the value of m. $Ans: m=14$

Q. 9. If the p^{th}, q^{th} & r^{th} terms of a $G.P.$ are a, b & c, respectively. Prove that, $a^{q-r}.b^{r-p}.c^{p-q}=1$

Q. 10. If a, b, c & d are in $G.P.$ show that $(i)(a^2+b^2+c^2)(b^2+c^2+d^2)=(ab+bc+cd)^2$

$(ii)(a^n+b^n),(b^n+c^n),(c^n+d^n)$ are in $G.P.$

Q. 11 Let S be the sum, P the product and R the sum of reciprocals of n terms in a $G.P.$ Prove that $P^2R^n=S^n$.

Q. 12. If p^{th}, q^{th}, r^{th} & s^{th} terms of an $A.P$ are in $G.P$, then show that $(p-q),(q-r),(r-s)$ are also in $G.P.$

Q. 13. If a and b are the roots of $x^2-3x+p=0$ and c, d are roots of $x^2-12x+q=0$, where a, b, c, d form a $G.P.$ Prove that $(q+p):(q-p)=17:15$.

Q. 14. The sum of three numbers in $G.P.$ is 56. If we subtract $1, 7, 21$ from these numbers in that order, we obtain an arithmetic progression. Find the numbers. $Ans: 8, 16, 32$

Q. 15. If f is a function satisfying $f(x+y) = f(x).f(y)$ for all $x, y \in N$ such that $f(1) = 3$ and $\sum_{x=1}^{n} f(x) = 120$, find the value of n. $Ans: n = 4$

Q. 16. If a, b, c are in $A.P.$, b, c, d are in $G.P.$ and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in $A.P.$ Prove that a, c, e are in $G.P.$

Q. 17. If, $a\left(\frac{1}{b}+\frac{1}{c}\right), b\left(\frac{1}{c}+\frac{1}{a}\right), c\left(\frac{1}{a}+\frac{1}{b}\right)$ are in $A.P.$ Prove that a, b, c are in $A.P$

Q. 18. The sum of two numbers is 6 times their geometric means, show that numbers are in the ratio $\frac{3+2\sqrt{2}}{3-2\sqrt{2}}$.

Q. 19. The ratio of the $A.M.$ and $G.M.$ of two positive numbers a and b is $m:n$. Show that $\frac{a}{b} = \frac{m+\sqrt{m^2-n^2}}{m-\sqrt{m^2-n^2}}$

Q. 20. If a, b, c, d and p are different real numbers such that, $(a^2+b^2+c^2)p^2 - 2(ab+bc+cd)p + (b^2+c^2+d^2) \leq 0$, then show that a, b, c & d are in $G.P.$

Q. 21. If p, q, r are in $G.P.$ and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in $A.P.$

Q. 22. A $G.P.$ consists of an even number of terms. If the sum of all the terms is 5 times the sum of terms occupying odd places, then find its common ratio. $Ans: 4$

Q. 23. Find four numbers forming a geometric progression in which the third term is greater than the first term by 9, and the second term is greater than the fourth by 18. $Ans: 3, -6, 12, -24$

Q. 24. The difference between any two consecutive interior angles of a polygon is 5°. If the smallest angle is 120°, find the number of the sides of the polygon. $Ans: 9$

Q. 25. Let $x = 1 + a + a^2 + - - - \infty$ and $y = 1 + b + b^2 + - - - \infty$ where $|a| < 1$ & $|b| < 1$ Prove that $1 + ab + (ab)^2 + - - - \infty = \frac{xy}{x+y-1}$

Q. 26. Sum the series to infinity: $\frac{2}{5} + \frac{3}{5^2} + \frac{2}{5^3} + \frac{3}{5^4} + - - -$ $Ans: \frac{13}{24}$

Q. 27. If the sum of an infinite geometric series is 15 and the sum of the squares of these terms is 45, find the series. $Ans: 5, \frac{10}{3}, \frac{20}{9}, \frac{40}{27} - - - \infty$

Q. 28. A farmer buys a used tractor for Rs 12000. He pays Rs 6000 cash and agrees to pay the balance in annual instalments of Rs 500 plus 12% interest on the unpaid amount. How much will the tractor cost him?

$Ans:$ 16680

Q. 29. A person writes a letter to four of his friends. He asks each one of them to copy the letter and mail to four different persons with instruction that they move the chain similarly. Assuming that, the chain is not broken and that it costs 50 paise to mail one letter. Find the amount spent on the postage when 8^{th} set of letter is mailed.

$Ans: Rs$ 43690

Q. 30. 150 workers were engaged to finish a job in a certain number of days. 4 workers dropped out on second day, 4 more workers dropped out on third day and so on. It took 8 more days to finish the work. Find the number of days in which the work was completed.

$Ans:$ 25

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10. Straight Lines

Q. 1. If p and q are the lengths of perpendiculars from the origin to the lines $x\cos\theta - y\sin\theta = k\cos 2\theta$ and $x\sec\theta + y\,\text{cosec}\,\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$

Q. 2. Find the equation of the line passing through the point $(2, 2)$ and cutting off intercepts on axes whose sum is 9. $Ans: 3x + 6y = 18;\ 6x + 3y = 18$

Q. 3. Find the foot of the perpendicular drawn from the point $(-1, 3)$ to the line $3x - 4y = 16$. $Ans: \left(\frac{68}{25}, -\frac{49}{25}\right)$

Q. 4. Assuming that straight lines work as the plane mirror for a point, find the image of the point $(1, 2)$ in the line $x - 3y + 4 = 0$. $Ans: \left(\frac{6}{5}, \frac{7}{5}\right)$

Q. 5. Prove that area of the triangle formed by the lines $y = m_1x + c_1;\ y = m_2x + c_2\ ; x = 0$ is $\frac{(c_1 - c_2)^2}{2|m_1 - m_2|}$

Q. 6. If three lines $y = m_1x + c_1;\ y = m_2x + c_2$ & $y = m_3x + c_3$ are concurrent, prove that $m_1(c_2 - c_3) + m_2(c_3 - c_1) + m_3(c_1 - c_2) = 0$

Q. 7. Prove that the product of the lengths of the perpendiculars drawn from the points $\left(\sqrt{a^2 - b^2},\ 0\right)$ and $\left(-\sqrt{a^2 - b^2},\ 0\right)$ to the line $\frac{x}{a}cos\,\theta + \frac{y}{b}sin\,\theta = 1$ is b^2.

Q. 8. A ray of light passing through the point $(1, 2)$ reflects on the $x-axis$ at the point A and the reflected ray passes through point $(5, 3)$, then find the coordinate of the point A. $Ans: \left(\frac{13}{5}, 0\right)$

Q. 9. Find perpendicular distance from the origin of the line joining the points $(\cos\theta\ , sin\,\theta)$ and $(cos\,\emptyset, sin\,\emptyset)$ $Ans: \left|\cos\left(\frac{\theta - \emptyset}{2}\right)\right|$

Q. 10. A line is such that its segment between the lines $5x - y + 4 = 0$ and $3x + 4y = 4$ is bisected at the point $(1, 5)$. Obtain its equation. $Ans: 107x - 3y = 92$

Q. 11. Find the distance of the line $4x + 7y + 5 = 0$ from the point $(1, 2)$ along the line $2x - y = 0$. $Ans: \frac{23\sqrt{5}}{8}$

Q. 12. Find the distance of the line $4x - y = 0$ from the point $P(4, 1)$ measured along the line making an angle of 135° with the positive $x - axis$. $Ans: 3\sqrt{2}$

Q. 14. Find the direction in which a line must be drawn through the point $(-1, 2)$ so that its point of intersection with the line $x + y = 4$ may be at a distance $3\ units$ from this point. $Ans: Slope = 0\ \&\ \infty$

Q. 15. Find the equation of the line through the point $(3, 2)$ and which makes an angle 45° with $x - 2y = 3$. $Ans: 3x - y = 7; x + 3y = 9$

Q. 16. Show that the equation of the line passing through the origin and making an angle θ with the line $y = mx + c$ is $\frac{y}{x} = \frac{m \pm \tan\theta}{1 \mp m.tan\,\theta}$

Q. 17. A person standing at the junction of two straight paths represented by the equations $3x + 4y = 5$ and $2x - 3y + 4 = 0$ wants to reach the path whose equation is $6x - 7y + 8 = 0$ in the least time. Find equation of the path that he should follow. $Ans: 119x + 102y = 205$

Q. 18. Find the path (equation) of a moving point such that its distances from two lines $3x - 2y = 5$ and $3x + 2y = 5$ are equal. $Ans: y = 0, 3x = 5.$

Q. 19. In the triangle ABC with vertices $A(2, 3), B(4, -1)$ & $C(1, 2)$, find the equation and length of altitude from the vertex A. $Ans: y - x = 1, \sqrt{2}$

Q. 20. The slope of a line is double of the slope of another line. If tangent of the angle between them is $\frac{1}{3}$, find the slopes of the lines. $Ans: (1, 2); (-1, -2); \left(\frac{1}{2}, 1\right); \left(-\frac{1}{2}, -1\right)$

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11. Conic – Section

Q. 1. Find the equation of the circle which passes through the point $(4, 1)$ and $(6, 5)$ and whose centre lies on the line $4x + y = 16$. $Ans: x^2 + y^2 - 6x - 8y + 15 = 0$

Q. 2. Find the equation of the circle with radius $5\ units$, whose centre lies on the $x-axis$ and which passes through the point $(2, 3)$. $Ans: x^2 + y^2 + 4x - 21 = 0, x^2 + y^2 - 12x + 11 = 0$

Q. 3. Find the equation of the circle passing through origin and making intercepts a & b on the coordinate axes. $Ans: x^2 + y^2 - ax - by = 0$

Q. 4. Find focus, axis, directrix and LLR (length of the latus rectum) of the parabola $x^2 = -9y$. $Ans: \left(0, -\frac{9}{4}\right);\ y-axis, 4y = 9, LLR = 9$

Q. 5. Find the foci, vertices, eccentricity, and LLR of the ellipse $16x^2 + y^2 = 16$. $Ans: \left(0,\ \pm\sqrt{15}\right);\ (0,\ \pm 4); e = \frac{\sqrt{15}}{4}, LLR = \frac{1}{2}$

Q. 6. Find the foci, vertices, eccentricity and LLR of the hyperbola $9y^2-4x^2 = 36$.

$Ans: (0, \pm\sqrt{13});\ (0, \pm 2); e = \frac{\sqrt{13}}{2}, LLR = 9$

Q. 7. Find the equation of hyperbola having foci $(\pm 4, 0)$ and LLR is 12. $Ans: 3x^2-y^2 = 12$

Q. 8. Find the equation of the hyperbola having foci on $(0, \pm\sqrt{10})$ and which passes through $(2, 3)$.

$Ans: y^2-x^2 = 5$

Q. 9. Find the equation of the ellipse, such that major axis is $x-axis$, centre is at origin and the ellipse passes through $(4, 3)$ and $(6, 2)$. $Ans: x^2 + 4y^2 = 52$

Q. 10. Find the equation of ellipse having foci on $(\pm 4, 0)$ and vertices $(\pm 5, 0)$ $Ans: 9x^2 + 25y^2 = 225$

Q. 11. Find the equation of hyperbola having foci on $(0, \pm 5)$ and vertices $(0, \pm 3)$ $Ans: 16y^2 - 9x^2 = 144$

Q. 12. Find the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of its latus rectum. $Ans: 18\ sq.units$

Q. 13. A beam is supported at its ends by supports which are 12 m apart. Since the load is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection 1 cm? $Ans: 2\sqrt{6}\ m$

Q. 14. The cable of uniform loaded suspension bridge hangs in the form of a parabola. The roadway is horizontal and 100 m long is supported by vertical wire attached to the cable, the longest wire being 30 m and the shortest wire being 6 m. Find the length of the wire attached to the roadway 18 m from the middle.

$Ans: 9.11\ m(approx.)$

Q. 15. A man is running on a racecourse notes that the sum of the distances from the two flag posts from him is always 10 m and the distance between the flag posts 8 m. Find the equation of the path traced out by the man.

$Ans: 9x^2 + 25y^2 = 225$

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12. Three – Dimension

Q. 1. Find the coordinates of the point which divides the line segment joining the points $(1, -2, 3)$ & $(3, 4, -5)$ in the ratio $2:3$ (i) internally (ii) externally. $Ans: (i)\ \left(\frac{9}{5}, \frac{2}{5}, -\frac{1}{5}\right)\ (ii)\ (-3, -14, 19)$

Q. 2. Three vertices of a parallelogram $ABCD$ are $A(3, -1, 2), B(1, 2, -4)$ & $C(-1, 1, 2)$. Find the coordinates of the fourth vertex. $Ans: (1, -2, 8)$

Q. 3. Find the equation of the set of points which are equidistant from the points $(1, 2, 3)$ & $(3, 2, -1)$.

$Ans: x = 2z$

Q. 4. Find the equation of the set of points P, the sum of whose distances from $A(4, 0, 0)$ & $B(-4, 0, 0)$ is equal to 10. $Ans: 9x^2 + 25y^2 + 25z^2 = 225.$

Q. 5. Using section formula, prove that the three points $A(-4, 6, 10), B(2, 4, 6)$ & $C\ (14, 0, -2)$ are collinear. Also find the ratio in which C divides AB. $Ans: Externally\ 3:2$

Q. 6. Find the ratio in which the line segment joining the points $(4, 8, 10)$ and $(6, 10, -8)$ is divided by the $YZ-plane$ $Ans: Externally\ 2:3$

Q. 7. Find the coordinates of centroid of triangle whose vertices are (x_1, y_1, z_1), (x_2, y_2, z_2) & (x_3, y_3, z_3).

$Ans: \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3}\right)$

Q. 8. Show that the points $A(1, 2, 3), B(-1, -2, -1), C(2, 3, 2)$ & $D(4, 7, 6)$ are the vertices of a parallelogram $ABCD$, but it is not a rectangle.

Q. 9. Find the lengths of the medians of the triangle with vertices $A(0, 0, 6), B(0, 4, 0)$ & $C(6, 0, 0)$

$Ans: 7, \sqrt{34}, 7$

Q. 10. Find the coordinates of a point on $y-axis$ which are at a distance of $5\sqrt{2}$ from the point $P(3, -2, 5)$.

$Ans: (0, 2, 0), (0, -6, 0)$

Q. 11. A point R with x –coordinate 4 lies on the line segment joining the points $P(2, -3, 4)$ & $Q(8, 0, 10)$. Find the coordinates of the point R. $Ans: (4, -2, 6)$

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13. Limits & Derivatives

Q. 1. Find $\lim_{x\to 0} f(x)$ for the function $f(x) = \begin{cases} \frac{|x|}{x} & ; x \neq 0 \\ 0 & ; x = 0 \end{cases}$ *Ans: doesn't exist*

Q. 2. Find $\lim_{x\to 0} f(x)$ and $\lim_{x\to 1} f(x)$ for the function $f(x) = \begin{cases} 2x + 3 & ; x \leq 0 \\ 3(x+1) & ; x > 0 \end{cases}$ *Ans: 3, 6*

Q. 3. Find the value of a and b for the function $f(x) = \begin{cases} a + bx & ; x < 1 \\ 4 & ; x = 1 \\ b - ax & ; x > 1 \end{cases}$, if $\lim_{x\to 1} f(x) = f(1)$ *Ans: 0, 4*

Q. 4. If $\lim_{x\to a} f(x)$ exists, for the function $f(x) = \begin{cases} |x| + 1 & ; x < 0 \\ 0 & ; x = 0 \\ |x| - 1 & ; x > 0 \end{cases}$, find the value of a. *Ans: $a \neq 0$*

Q. 5. If $\lim_{x\to 0} f(x)$ & $\lim_{x\to 1} f(x)$ exists, for the function $f(x) = \begin{cases} mx^2 + n; & x < 0 \\ m + nx; & 0 \leq x \leq 1, \\ m + nx^3; & x > 1 \end{cases}$

Find the possible integral value of m and n *Ans: $m = n, \forall\, m, n \in Z$*

Q. 6. Prove that : $\lim_{x\to 1}\left\{\frac{x-2}{x^2-x} - \frac{1}{x^3-3x^2+2x}\right\} = 2$

Q. 7. Prove that : $\lim_{x\to 3}\left\{\frac{x^4-81}{2x^2-5x-3}\right\} = \frac{108}{7}$

Q. 8. Prove that : $\lim_{x\to 2}\left\{\frac{x^3-4x^2+4x}{x^2-4}\right\} = 0$

Q. 9. Prove that : $\lim_{x\to 2}\left\{\frac{x^3-2x^2}{x^2-5x+6}\right\} = -4$

Q. 10. Prove that : $\lim_{x\to 0}\left\{\frac{\cos 2x - 1}{\cos x - 1}\right\} = 4$

Q. 11. Prove that : $\lim_{x\to \frac{\pi}{2}}\left\{\frac{\tan 2x}{x - \frac{\pi}{2}}\right\} = 2$

Q. 12. Prove that : $\lim_{x\to 5}\left\{\frac{e^x - e^5}{x-5}\right\} = e^5$

Q. 13. Prove that : $\lim_{x\to 0}\left\{\frac{x(e^x-1)}{1-\cos x}\right\} = 2$

Q. 14. Prove that : $\lim_{x\to 0}\left\{\frac{\log_e(1+x^3)}{\sin^3 x}\right\} = 1$

Find the derivative of the following functions:

Q. 15. $\frac{x^5 - \cos x}{\sin x}$ *Ans:* $\frac{1 + 5x^4.\sin x - x^5\cos x}{\sin^2 x}$

Q. 16. $\frac{\sin x + \cos x}{\sin x - \cos x}$ *Ans:* $-\frac{2}{(\sin x - \cos x)^2}$

Q. 17. $\frac{x\cos x}{x - \tan x}$ *Ans:* $\frac{\sin x\,(x\tan x - x^2 - 1) + x\sec x}{(x - \tan x)^2}$

Q. 18. $\frac{x}{\sin^n x}$ *Ans:* $\frac{1 - nx\cot x}{\sin^n x}$

Q. 19. $(ax+b)^m(cx+d)^n$ *Ans:* $(ax+b)^{m-1}(cx+d)^{n-1}\{ac(m+n)x + amd + bcn\}$

Q. 20. $\sin^2 x$ *Ans:* $\sin 2x$

Find the derivative of the following functions from first principle:

Q. 21. $\sin x + \cos x$ *Ans:* $\cos x - \sin x$

Q. 22. $\frac{2x+3}{x-2}$ *Ans:* $-\frac{7}{(x-2)^2}$

Q. 23. $x.\sin x$ *Ans:* $x\cos x + \sin x$

Q. 24. $\tan x$ *Ans:* $\sec^2 x$

Q. 25. $\cos\left(x - \frac{\pi}{8}\right)$ *Ans:* $-\sin\left(x - \frac{\pi}{8}\right)$

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14. Statistics

Q. 1. Find mean deviation about the mean for the following data :

x_i	2	5	6	8	10	12
f_i	2	8	10	7	8	5

$Ans:$ 2.3

Q. 2. Find the mean deviation about the median for the following data:

x_i	3	6	9	12	13	15	21	22
f_i	3	4	5	2	4	5	4	3

$Ans:$ 4.97

Q. 3. Find the mean deviation about the mean for the following data :

Marks obtained	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Number of students	2	3	8	14	8	3	2

$Ans:$ 10

Q. 4. Calculate the mean deviation about median age for the age distribution of 100 persons given below:

Age	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45	46 – 50	51 – 55
Number	5	6	12	14	26	12	16	9

$Ans:$ 7.35

Q. 5. Calculate mean, Variance and Standard Deviation for the following distribution.

Classes	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	3	7	12	15	8	3	2

Ans: 62, 201, 14.18

Q. 6. Calculate Standard Deviation, using short-cut method for the following distribution:

Classes	0 – 30	30 – 60	60 – 90	90 – 120	120 – 150	150 – 180	180 – 210
Frequency	2	3	5	10	3	5	2

$Ans:$ 107, 2276 , 47.707

Q. 7. Find the mean, variance and standard deviation using short-cut method.

x_i	60	61	62	63	64	65	66	67	68
f_i	2	1	12	29	25	12	10	4	5

Ans: 64, 2.85, 1.69

Q. 8. Find the mean and variance standard deviation for the frequency distributions

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	5	8	15	16	6

$Ans:$ 27, 132, 11.489

Q. 9. The mean and standard deviation of 100 observations were calculated as 40 and 5.1, respectively by a student who took by mistake 50 instead of 40 for one observation. What are the correct mean and standard deviation? Ans: 39.9, 5

Q. 10. Find the variance of first n natural number. Ans: $\frac{1}{12}(n^2 - 1)$

Q. 11. The mean and variance of eight observations are 9 and 9.25, respectively. If six of the observations are 6, 7, 10, 12, 12 and 13, find the remaining two observations. Ans: 4, 8

Q. 12. The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases (i) If wrong item is omitted. Ans: 10.1, 1.99

(ii) If it is replaced by 12. Ans: 10.2, 1.98

Q. 13. The mean and standard deviation of six observations are 8 and 4, respectively. If each observation is multiplied by 3, find the new mean and new standard deviation of the resulting observations. Ans: 24, 36

Q. 14. The mean and standard deviation of a group of 100 observations were found to be 20 & 3, respectively. Later on it was found that three observations were incorrect, which were recorded as 21, 21 & 18. Find the mean and standard deviation if the incorrect observations are omitted.

Q. 15. If each of the observation $x_1, x_2, \ldots, x_n$ is increased by 'a', where $a \in Real$, find new mean and variance.

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15. Probability

Q. 1. If A, B & C are any three events associated with any random experiment, then prove that, $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$.

Q. 2. A fair coin is tossed 4 times a person wins $Re1$ for each head and loses Rs 1.50 for each tail that turns up. From the sample space & calculate how many different amount of money the person can have after four tosses also calculate the probability of having each of these amount. Ans: $P(Gain\ Rs\ 4) = \frac{1}{16}$; $P(Gain\ Rs\ 1.50) = \frac{1}{4}$; $P(Loss\ Re\ 1) = \frac{3}{8}$; $P(Loss\ Rs\ 3.50) = \frac{1}{4}, P(Loss\ Rs\ 6) = \frac{1}{16}$

Q. 3. If A & B are any two events such that $P(A) = 0.42, P(B) = 0.48$ & $P(A \cap B) = 0.16$. Determine $(i)\ P(not\ A)$ $(ii)\ P(not\ B)$ $(iii)\ P(A\ or\ B)$ $(iv)\ P(not\ A\ \&\ not\ B)$.
Ans: $(i)\ 0.58\ (ii)\ 0.52\ (iii)\ 0.74\ (iv)\ 0.26$

Q. 4. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards it contains (i) all kings (ii) exactly 3 kings. (iii) at least 3 kings.
$Ans: (i)\ \frac{1}{7735}\ (ii)\ \frac{9}{1547}\ (iii)\ \frac{46}{7735}$

Q. 5. Out of 100 students, two sections of 40 & 60 are formed, if you and your friend are among 100 students. What is the probability that, (i) you both enter the same section ? Ans: $\frac{17}{33}$
(ii) you both enter the different section ? Ans: $\frac{16}{33}$

Q. 6. In Class XI of a school 40% of the students study Mathematics and 30% study Biology. 10% of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology. Ans: 0.6

Q. 7. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that
(i) The student has opted neither NCC nor NSS. Ans: $\frac{11}{30}$
(ii) The student has opted NSS but not NCC. Ans: $\frac{2}{15}$

Q. 8. On her vacations Veena visits four cities A, B, C & D in a random order. What is the probability that she visits (i) A before B? (ii) A just before B? (iii) A before B & B before C?
Ans: $(i)\ \frac{1}{2}\ (ii)\ \frac{1}{4}\ (iii)\ \frac{1}{6}$

Q. 9. Three letters are dictated to three persons and an envelope is addressed to each of them, if the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope. Ans: $\frac{2}{3}$

Q. 10. If 4-digit numbers greater than 5,000 are randomly formed from the digits 0, 1, 3, 5 & 7, what is the probability of forming a number divisible by 5 when, (i) the digits are repeated? (ii) the repetition of digits is not allowed? Ans: $(i)\ \frac{33}{83}\ (ii)\ \frac{3}{8}$

Q. 11. In a relay race there are five teams A, B, C, D & E. (i) What is the probability that A, B & C finish first, second and third, respectively. (ii) What is the probability that, A, B & C are first three to finish (in any order) (Assume that all finishing orders are equally likely) Ans: $(i)\ \frac{1}{60}\ (ii)\ \frac{3}{8}$

Q. 12. If A and B are two events such that $P(A) = 0.54, P(B) = 0.69$ & $P(A \cap B) = 0.35$.
Find $(i) P(A' \cap B')$ $(ii) P(A \cap B')$ $(iii) P(B \cap A')$ Ans: $(i) 0.12\ (ii) 0.19\ (iii) 0.34$

Q. 13. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that (i) Both Anil and Ashima will not qualify the examination. (ii) Atleast one of them will not qualify the examination and (iii) Only one of them will qualify the examination. Ans: $(i)\ 0.87\ (ii)\ 0.98\ (iii)\ 0.11$

Q. 14. A coin is tossed thrice, what is the probability that at least one tail occurs? Ans: $\frac{7}{8}$

Q. 15. The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination? Ans: 0.65

Q. 16. In an entrance test that is graded on the basis of two examinations, the probability of a randomly chosen student passing the first examination is 0.8 and the probability of passing the second examination is 0.7. The probability of passing at least one of them is 0.95. What is the probability of passing both?

Ans: 0.55

Q. 17. From the employees of a company, 5 persons are selected to represent them in the managing committee of the company. Particulars of five persons are as follows:

$S\ No$:	$Name$	Sex	$Age\ in\ years$
1.	$Harish$	M	30
2.	$Rohan$	M	33
3.	$Sheetal$	F	46
4.	$Alis$	F	28
5.	$Salim$	M	41

A person is selected at random from this group to act as a spokesperson. What is the probability that the spokesperson will be either male or over 35 years? Ans: $\frac{4}{5}$

Q. 18. A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that (i) all will be blue? (ii) atleast one will be green? Ans: $(i)\ \frac{7}{11977}\ (ii)\ \frac{4367}{4484}$

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