MATHS

BOOKS - VGS PUBLICATION-BRILLIANT

MODEL PAPER 1

Section A Very Short Answer Type Questions

1. Find the multiplicative of $7 + 4i$.

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2. Simplify

$i^2 + i^4 + i^6 + \ldots . + (2n + 1)$ terms

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3. If $x = cis\theta$, then find the value of $\left[x^6 + \frac{1}{x^6}\right]$.

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4. Form quadratic equation whose roots are :

$\frac{p-q}{p+q}, \frac{-p+q}{p-q}, (p \neq \pm q)$

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5. Find the algebraic equation whose roots are 2 times the roots of $x^5 - 2x^4 + 3x^3 - 2x^2 + 4x + 3 = 0$

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6. Find the the number of functions from a set A containing 5 elements into a set B containing 4 elements.

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7. If ${}^{15}C_{2r-1} = {}^{15}C_{2r+4}$, find r.

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8. If ${}^{22}C_r$ is the largest binomial coefficient in the expansion of $(1+x)^{22}$, find the value of ${}^{13}C_r$.

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9. Find the mean from the mean of the following discrete data 6,7, 10,1213,4,12 ,16

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10. For a binomial distribution with mean 6 and variance 2, find the first tow terms of t6he distirubiton.

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Section B Short Answer Type Questions

1. If the real part of $\frac{z+1}{z+i}$ is 1, then find the locus of z.

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2. Prove that $\frac{1}{3x+1}+\frac{1}{x+1}-\frac{1}{(3x+1)(x+1)}$ does not lie between 1 and 4, if x is real.

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3. Find the number of 4- letter words that can be formed using the letters of the word. MIRACLE. How many of them

begin with an vowel

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4. Find the number of 4- letter words that can be formed using the letters of the word. MIRACLE. How many of them

begin and end with vowels

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5. Find the number of 4- letter words that can be formed using the letters of the word. MIRACLE. How many of them

end with a consonant ?

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6. Prove that $\frac{{}^{4n}C_{2n}}{{}^{2n}C_n} = \frac{1.3, 5.....(4n-1)}{\{1.3.5.... (2n-1)\}^2}$

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7. Resolve $\frac{3x^3 - 2x^2 - 1}{x^4 + x^2 + 1}$ into partial fractions.

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8. The probabilities of three mutually exclusive events are respectively given as $\frac{1+3P}{3}, \frac{1-P}{4}, \frac{1-2P}{2}$. Prove that $\frac{1}{3} \leq P \leq \frac{1}{2}$

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9. If A and B are independent events of a random experiment show that A^C and B^C are also independent.

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Section C Long Answer Type Questions

1. If α, β are the roots of the equation $x^2 - 2x + 4 = 0$ then for any $n \in N$ show that $\alpha^n + \beta^n = 2^{n+1} \cos\left(\frac{n\pi}{3}\right)$.

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2. Find the polynomial equation whose roots are the translates of those of the equation $x^4 - 5x^3 + 7x^2 - 17x + 11 = 0$ by -2.

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3. If the coefficients of x^9, x^{10}, x^{11} in expansion of $(1+x)^n$ are in A.P., the prove that $n^2 - 41n + 398 = 0$.

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4. If $x = \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \ldots$ then prove that $9x^2 + 24x = 11$.

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5. Find the mean deviation about median for the following continuous distribution.

Marks Obtained	No. of Boys
$0-10$	6
$10-20$	8
$20-30$	14
$30-40$	16
$40-50$	4
$50-60$	2

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6. Suppose that an, urn B_1 contains 2 white and.3 black balls and another urn B_2 contains 3 white and 4 black balls. One urn is selected at random and a ball is drawn from it: If the ball drawn is found black, find the probability that the urn chosen was B_1.

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7. A random variable X has the following probability distribution:

$X = x$	$P(X = x)$
0	0
1	k
2	$2k$
3	$2k$
4	$3k$
5	k^2
6	$2k^2$
7	$7k^2 + k$

Find k

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8. A random variable X has the following probability distribution:

$X = x$	$P(X = x)$
0	0
1	k
2	$2k$
3	$2k$
4	$3k$
5	k^2
6	$2k^2$
7	$7k^2 + k$

Find the mean

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9. A random variable X has the following probability distribution:

$X = x$	$P(X = x)$
0	0
1	k
2	$2k$
3	$2k$
4	$3k$
5	k^2
6	$2k^2$
7	$7k^2 + k$

Find $p(0 < x < 5)$

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Section A I Very Short Answer Type Questions

1. Write the conjugate of complex number $\frac{5i}{7+i}$

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2. Express 1 - i in modulas - amplitude form.

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3. If A,B,C are angles of a triangle such that $x = cisA, y = cisB, z = cisC$, then find the value of xyz .

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4. For what values of x, the following expressions are negative ?

$15 + 4x - 3x^2$

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5. Find the transformed equation whose roots are the negative of the roots of $x^4 + 5x^3 + 11x + 3 = 0$

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6. Find the number of 4 letter words that can be formed using the letters of the word PISTON in which atleast one letter is repeated.

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7. If $10.\ {}^{n}C_{2} = 3.\ {}^{n+1}C_{3}$ find n.

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8. Prove the $C_0 + 2.\ C_1 + 4.\ C_2 + 8.\ C_3 + \ldots + 2^n.\ C_n = 3^n$

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9. Find the variance for an ungrouped data 5, 12, 3, 18, 6, 8, 2, 10.

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10. The probability that a person chosen at random is left handed (in hand writing) is 0.1 what is the probability that in a group of ten people there is one and only one who is left handed.

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Section B Ii Short Answer Type Questions

1. Show that the points in the Argand plane represented by the complex numbers $-2+7i, -\frac{3}{2}+\frac{1}{2}+i4-3i\frac{7}{2}(1+i)$ are the vertices of a rhombus.

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2. Prove that $\frac{1}{3x+1}+\frac{1}{x+1}-\frac{1}{(3x+1)(x+1)}$ does not lie between 1 and 4, if x is real.

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3. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the rank of the word MASTER.

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4. Prove that $\frac{{}^{4n}C_{2n}}{{}^{2n}C_n} = \frac{1.3, 5.....(4n-1)}{\{1.3.5.... (2n-1)\}^2}$

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5. Resolve the $\frac{2x^2+3x+4}{(x-1)(x^2+2)}$ into partial fractions.

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6. If A,B,C are three events , Show that $p(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C$

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7. A problem in calculus is given to two students, A and B whose chances of solving it are 1/3, 1/4 respectively. Find the probability of the problem being solved if both of them try'independently.

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Section C Iii Long Answer Type Questions

1. A : $(1+i)^6+(1-i)^6=0$

R : If n is a positive integer then $(1+i)^n+(1-i)^n=2^{(n/2)+1}.\cos\frac{n\pi}{4}$

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2. Solve $x^4-4x^2+8x+35=0$,given that $2+i\sqrt{3}$ is a root.

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3. If the coefficients of $r^{\text{th}}, (r+1)^{\text{th}}$ and $(r+2)^{\text{nd}}$ terms in the expansion of $(1+x)^n$ are in A.P. then show that $n^2 - (4r+1)n + 4r^2 - 2 = 0$.

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4. If $x = \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \ldots$ then prove that $9x^2 + 24x = 11$.

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5. Find the mean deviation from the mean for the following continuous frequency distribution.

Sales in Rs. thousand	$40-50$	$50-60$	$60-70$	$70-80$	$80-90$	90
Number of Companies	5	15	25	30	20	5

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6. State and prove Baye's theorem.

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7. The range of a random variable X is {0, 1, 2}.

Given that

$P(X=0)=3C^3, P(X=1)=4C-10C^2, P(X=2)=5C-1$

Find the value of C.

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8. The range of a random variable X is $\{0,1,2\}$. Given that

$P(X=0)=3c^3, P(X=1)=4c-10c^2, P(X=2)=5c-1$

i) Find the value of c

ii) $P(X<1), P(1<X\leq 2)$ and $P(0<X\leq 3)$

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9. The range of a random variable X is $\{0, 1, 2\}$. Given that

$P(X = 0) = 3c^3, P(X = 1) = 4c - 10c^2, P(X = 2) = 5c - 1$

i) Find the value of c

ii) $P(X < 1), P(1 < X \leq 2)$ and $P(0 < X \leq 3)$

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Section A

1. Find the square root fo $(-5 + 12i)$

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2. If $z_1 = -1, z_2 = i,$ then find $Arg\left(\frac{z_1}{z_2}\right)$.

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3. Find the value of $(1 + i)^{16}$.

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4. If α, β are the roots of the equation $ax^2 + bx + c = 0,$ then find the value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$.

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5. Find the algebraic equation whose roots are 2 times the roots of $x^5 - 2x^4 + 3x^3 - 2x^2 + 4x + 3 = 0$

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6. Find the number of ways of arranging the letters of the word "INTERMEDIATE".

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7. If ${}^nP_r = 5040$ and ${}^nC_r = 210$, find n and r.

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8. If $(1+x)^n = a_0 + a_1x + a_2x^2 + \ldots\ldots\ldots + a_nx^n$, then show that

(i) $a_0 - a_2 + a_4 - a_6 + \ldots\ldots\ldots = 2^{n/2}\cos.\frac{n\pi}{4}$

(ii) $a_1a_3 + a_5 - a_7 + \ldots\ldots\ldots = 2^{n/2}\sin.\frac{n\pi}{4}$

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9. The variance of 20 observations is 5. If each observations is multiplied by 2, then the new variance of the resulting observations is

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10. A poisson variable satisfies P(X= 1) = P (X = 2). Find P(X = 5).

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11. Find the complex conjugate of $(3+4i)(2-3i)$

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12. If $z_1 = -1,$ and $z_2 = -i,$ then find Arg $(z_1 z_2)$

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13. Find the values of the following :

$$\left(\frac{\sqrt{3}}{2}+\frac{i}{2}\right)^5-\left(\frac{\sqrt{3}}{2}-\frac{i}{2}\right)^5$$

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14. If α, β are the roots of the equation $ax^2+bx+c=0$, find the values of the following expressions in terms of a,b,c.

$$\frac{1}{\alpha}+\frac{1}{\beta}$$

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15. If the product of the roots of

$4x^3 + 16x^2 - 9x - a = 0$ is 9 , then find a .

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16. Find the number of ways of arranging the letters of the word.

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17. If $10.\ {}^nC_2 = 3.\ {}^{n+1}C_3$ find n.

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18. Find the set of values of x for which the binomial expansion $(3-4x)^{3/4}$ is valid.

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19. Find the mean deviation from the mean of the data 6,7,10,4,12,13,12,16.

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20. The probability that a person chosen at random is left handed (in hand writing) is 0.1 what is the probability that in a group of ten people there is one and only one who is left handed.

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Section B

1. If z = x + iy and if the point P in the argand plane represents z , then the locus of P satisfying the equation

|z-2-3i|=5

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2. Find the range of $\frac{x+2}{2x^2+3x+6}$

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3. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the rank of the word "REMAST" .

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4. Find the number of ways of selecting a cricket team of 11 players from 7 batsmen and 6 bowlers such that there will be atleast 5 bowlers in the team.

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5. Resolve $\frac{x^2-3}{(x+2)(x^2+1)}$ into partial fractions.

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6. Two persons A and B are rolling die on the condition that the person who gets 3 will win the game. If A starts the game, then find the probabilities of A and B respectively to win the game.

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7. A problem in calculus is given to two students, A and B whose chances of solving it are 1/3, 1/4 respectively. Find the probability of the problem being solved if both of them try'independently.

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8. Show that the points in the Argand plane represented by the complex numbers $-2+7i, -\frac{3}{2}+\frac{1}{2}+i4-3i\frac{7}{2}(1+i)$ are the vertices of a rhombus.

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9. Prove that $\frac{1}{3x+1}+\frac{1}{x+1}-\frac{1}{(3x+1)(x+1)}$ does not lie between 1 and 4, if x is real.

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10. If the letters of the word EAMCET are permuted in all possible ways and if the words thus formed are arranged in the dictionary order, find the rank of the word EAMCET.

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11. Simplify ${}^{34}C_5 + \sum_{r=0}^{4} {}^{(38-r)}C_4$.

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12. Resolve the $\frac{2x^2 + 3x + 4}{(x-1)(x^2+2)}$ into partial fractions.

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13. If two numbers are selected randomly from 20 consecutive natural numbers, find the probability that the sum of the two numbers is (i) an even number (ii) an odd number.

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Section C

1. Find all the roots of the equation

$x^{11} - x^7 + x^4 - 1 = 0$

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2. Solve the following equations . $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$

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3. Prove that : If n is a positive integer and x is any nonzero real number, then prove that

$$C_0 + C_1\frac{x}{2} + C_2.\frac{x^2}{3} + C_3.\frac{x^3}{4} + \ldots. + C_n.\frac{x^n}{n+1} = \frac{(1+x)^{n+1} - 1}{(n+1)x}$$

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4. If $x = \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \ldots$ then prove that $9x^2 + 24x = 11.$

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5. Calculate the mean, vartiance and standard deviation for the following distribution.

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

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6. If P(A) = 0.3, P(B) = 0.4, P(C) = 0.8, $P(A \cap B) = 0.08, P(A \cap C) = 0.28, P(A \cap B \cap C) = 0.09, P(A \cup B \cup C$ then show $P(B \cap C)$ lies in [0.23, 0.48].

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7. Find the mean and variance of the random variable X which follows the following distribution

$X = x$	1	2	3	4
$P(X = x)$	0.1	0.2	0.3	0.4

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8. If A, B are independent events with P (A) =0.2, P (B) = 0.5 Find

$P\left(\frac{A}{B}\right)$

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9. If A, B are independent events with P (A) =0.2, P (B) = 0.5 Find

$P\left(\frac{B}{A}\right)$

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10. If A, B are independent events with P (A) =0.2, P (B) = 0.5 Find

$P(A \cap B)$

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11. If A, B are independent events with P (A) =0.2, P (B) = 0.5 Find

$P(A \cup B)$

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12. If $\cos\alpha + \cos\beta + \cos\gamma = 0 \sin\alpha + \sin\beta + \sin\gamma$, Prove that

$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = \frac{3}{2} = \sin^2\alpha + \sin^2\beta + \sin^2\gamma.$

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13. Solve $x^4 + x^3 - 16x^2 - 4x + 48 = 0$ given that the product of two of the roots is 6.

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14. If the coefficients of $r^{\text{th}}, (r+1)^{\text{th}}$ and $(r+2)^{\text{nd}}$ terms in the expansion of $(1+x)^n$ are in A.P. then show that $n^2 - (4r+1)n + 4r^2 - 2 = 0$.

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15. If $x = \frac{5}{(2!).3} + \frac{5.7}{(3!).3^2} + \frac{5.7.9}{(4!).3^3} + \ldots$

then find the value of $x^2 + 4x$.

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16. Find the mean deviation about the mean for the following data.

Marks obtained	0–10	10–20	20–30	30–40	40–50
No. of students	5	8	15	16	6

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17. State and prove addition theorem on probability.

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18. The range of a random variable X is {0, 1, 2}. Given that

$P(X=0)=3c^3, P(X=1)=4c-10c^2, P(X=2)=5c-1.$ find

the value of c

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19. The range of a random variable X is {0, 1, 2}. Given that

$P(X=0)=3c^3, P(X=1)=4c-10c^2, P(X=2)=5c-1.$ find

the value of c

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20. The range of a random variable X is $\{0, 1, 2\}$. Given that $P(X = 0) = 3c^3, P(X = 1) = 4c - 10c^2, P(X = 2) = 5c - 1$

i) Find the value of c

ii) $P(X < 1), P(1 < X \leq 2)$ and $P(0 < X \leq 3)$

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21. The range of a random variable X is {0, 1, 2}. Given that $P(X = 0) = 3c^3, P(X = 1) = 4c - 10c^2, P(X = 2) = 5c - 1$ where c is constant.

Find (i) the value of c (ii) $P(X < 1)$

(iii) $P(1 < X \leq 2)$ (iv) $P(0 < X \leq 3)$

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