MATHS

BOOKS - UNITED BOOK HOUSE

HARE SCHOOL

Exercise

1. Find the minimum value of $\cos^2\theta + \sec^2\theta$

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2. If $\theta + \phi = 60^\circ$,then show that $\sin(120^\circ - \theta) = \cos(30^\circ - \phi)$

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3. Prove that $\tan 62^\circ = 2\tan 34^\circ + \tan 28^\circ$

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4. If $|z+2| \leq 2$,find the maximum and minimum values |z|.

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5. Show that the roots of $(b+c)x^2 - (a+b+c)x + a = 0$are rational .where a,b,c are rational.

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6. The sum of n terms of an A.P is n^2.Find the common difference.

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7. If three equal positive numbes a,b,c are in G.P,then show that

$a + c > 2b$

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8. For what value(S)of K the point (1,-1),(2,1) and (K,5) lie on the same line?

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9. $\left(at^2, 2at\right)$ is a point on the line 2x-5y+12a=0,from this find the co-oridnates of two points on the line.

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10. Find the angle between the two lines $x - \sqrt{3}y = 3$and $\sqrt{3}x - y + 1 = 0$

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11. Evaluate: $\lim_{x \to 0} \frac{3^x - 1}{(4 + x)^{\frac{1}{2}} - 2}$

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12. What is the probability of obtaining 7 points with the rolling of two dice.

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13. Show that the equation of straight line $x\cos\alpha + y\sin\alpha = p$ can be expressed in the following form : $\dfrac{x - p\cos\alpha}{-\sin\alpha} = \dfrac{y - p\sin\alpha}{\cos\alpha} = r$

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14. If G is the G.M between two positive numbers a and b.show that $\dfrac{1}{G^2 - a^2} + \dfrac{1}{G^2 - b^2} = \dfrac{1}{G^2}$

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15. Three positive numbers a,b,c are in A.P prove that $\dfrac{1}{\sqrt{b} + \sqrt{c}}$, $\dfrac{1}{\sqrt{c} + \sqrt{a}}$ and $\dfrac{1}{\sqrt{a} + \sqrt{b}}$ are aslo in A.P

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16. If $a_1, a_2, a3, \ldots, a_a$are in A.P then show that $\frac{1}{a_1 a_2} + \frac{1}{a_2 a_3} + \frac{1}{a_3 a_4} + \ldots + \frac{1}{a_{n-1}} = \frac{n-1}{a_1 a_n}$

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17. If the roots of the equation $p(q-r)x^2 + q(r-p)x + r(p-q) = 0$ be equal ,show that 1/p+1/r=2/q

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18. Solve :$\bar{z} = iz^2$(z being a complex number)

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19. if α,β,γ are in A>P show that cot=(sinalpha-singamma)/(cosgammacosalpha)`

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20. Prove that $\frac{1}{2\sin 10^\circ} - 2\sin 70^\circ = 1.$

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21. Prove that $0 \leq 3\cos\theta + 4\sin\theta + 5 \leq 10$

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22. Show that $4\left(\cos^3 10^\circ + \sin^3 20^\circ\right) = 3(\cos 10^\circ + \sin 20^\circ)$

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23. If the equation $x^2 - cx + d = 0$and $x^2 - ax + b = 0$ have a common root,and the roots of the second equations are equal ,then prove that 2(b+d)=ac

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24. If $\alpha$and $\beta$are roots of the equation $qx^2 + px + p = 0$,show that $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{p}{q}} = 0$

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25. If z_1 and z_2 be two complex numbers show that $Re(\bar{z}_1 z_2) = \frac{1}{2}(z_1\bar{z}_2 + \bar{z}_1 z_2)$ where $Re(z)$ is the real part if z.

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26. Find the sum up to n terms : $1 + \frac{2}{3} + \frac{3}{3^2} + \frac{4}{3^3} + \ldots$

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27. If $x^{\frac{1}{a}} = y^{\frac{1}{b}} = z^{\frac{1}{c}}$ where a,b,c are in A.P.,than show that x,y,z are in G.P.

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28. If $\frac{a\cos\theta\sec\phi - x}{a\sin(\theta + \phi)} = \frac{y - b\sin\theta\sec\phi}{b\cos(\theta + \phi)} = \tan\phi$ show that $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

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29. IF $A+B+C=\pi$,then prove that $\tan\left(\frac{A}{2}\right)\tan\left(\frac{B}{2}\right)+\tan\left(\frac{B}{2}\right)\tan\left(\frac{C}{2}\right)+\tan\left(\frac{C}{2}\right)\tan\left(\frac{A}{2}\right)=1$

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30. Prove that $\sec x=\frac{2}{\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8x}}}}$

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31. Prove that $\tan 20^\circ+4\sin 20^\circ=\sqrt{3}$

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32. A(1,2)and B(5,-2)are two points. P is a point moving in such a way that the area of the $\triangle ABP$ is 12 sq.units.Find the locus of P.

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33. A variable straight line passes through the point of intersection of the starlight lines x/a+y/b=1 and x/b+y/a=1 and intersects the axes at P and Q.Find the locus of mid-point of Pq.

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34. For three mutually exclusive events X,Yand Zit is given that P(x)=2P(Y)=3P(Z)$X \cup Y \cup Z = S$,where S denote sure event.Find the value of P(x).`

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35. In how many different ways can 5 boys and 10 girls sit in a row on 15 seats, so that no two boys may sit side by side?

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36. The Indian cricket eleven is to be selected out of 15 players. 6 of them bowlers and 9 of them batsman. In how many ways the team can be selected so that the team contains at least 3 bowlers.

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37. Show that, if n be any positive integer greater than 1, then $\left(2^{3n}-7n-1\right)$ is divisible by 49.

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38. If $x=\log_{2a}^{a}, y=\log_{3a}^{2a}$ and $z=\log_{4a}^{3a}$ show that xyz = 2yz - 1.

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39. If $x = \log_a^{bc}$, $y = \log_b^{ca}$ and $z = \log_c^{ab}$ then show that

$$\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} = 1, [abc \neq 1]$$

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40. If none of the figures, 3, 4, 5, 6, 7 be repeated, how many different numbers of 4 digits (> 5000) can be formed with them?

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41. State and prove that Cauchy-Schwarz inequality.

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42. If a, b, c be three unequal sides of a triangle show that

$$\frac{1}{b+c-a} + \frac{1}{c+a-b} + \frac{1}{a+b-c} > \frac{9}{a+b+c}$$

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43. If n be a positive integer greater than 1, prove that $\left(\frac{n+1}{2}\right)^n > n$

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44. If a, b, c one positive numbers satisfying 4ab + 6bc + 8ca = 9 find the greatest value of (abc).

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45. Distinguish between attribute and variable.

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46. Find the arithmetic mean and median for first n natural numbers.

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47. Find the AM of 5, 55, 555,...............upto n times.

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48. If P(A) = 1/2, P(B) = 2/3 then prove that $\frac{1}{6} \leq P(A \cap B) \leq \frac{1}{2}$

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49. If 9 biscuits of different types be distributed among 3 children, find the probability that particular child will get 4 biscuits.

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50. Show that $\sum_{i=1}^{n}(x_i - A)^2$ is minimum when $A = \bar{x}$.

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51. If $y = \frac{x-a}{b}$, then prove that $Sy = \frac{Sx}{|b|}$

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52. Prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

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53. The variance of 1, 2,..............n is 24. Find n.

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54. For 10 values of X, it is given that $\sum u = 4$ and $\sum u^2 = 144$, where $u = \frac{x-10}{5}$, find $\sum x^2$

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55. Two groups of 15 and 22 values have variances 9 and 16 respectively. If the group means differ by 8.2, then find the standard deviation of the combined group of values.

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56. For a set of an positive quantities prove that $AM \geq GM \geq HM$.

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57. Prove that $\frac{1}{n}\sum_{E_1}^{n}|x_i - A|$ attains, minimum when A = Median.

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58. Let x be a variable assuming the values 1, 2,.........k and let $F_1 = n, F_2$,......F_k be the corresponding cumulative frequencies of the greater than type show that $\bar{x} = \frac{1}{n}\sum_{i=1}^{k} F_i$.

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59. $|x - 2| \leq 6$ implies that

A. $(-)3 \leq x \leq 7$

B. $3 \leq x \leq 5$

C. $(-)7 \leq x \leq 7$

D. none of these

Answer:

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60. When it comes to comparing different segments among themselves and also their relation to the whole we use

A. pie chart

B. divided bar chart

C. either a or b

D. none of these

Answer:

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61. Mode of a distribution can be obtained from

A. Frequency polygon

B. Histogram

C. ogives

D. none of these

Answer:

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62. Frequency curve is the limiting form of

A. a frequency polygon

B. a histogram

C. either a or b

D. none of these

Answer:

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63. If the AM and HM of two numbers are 16 and 4 respectively, then the GM would be

A. 10

B. 8

C. 9

D. none of these

Answer:

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64. If the median and mode for a moderate asymmetrical distribution are 8 and 5 respectively, then the value of mean is

A. 6.5

B. 10

C. 9.5

D. none of these

Answer:

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65. If $2x + 3y = 6$ and S.D. of X = 6, the S.D. of y is -

A. (-)4

B. 4

C. 9

D. none of these

Answer:

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66. If the C.V. is 40 and $SX^2 = 400$, then $\bar{x}$ is

A. 50

B. 1.25

C. 100

D. none of these

Answer:

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67. If $3x - 2y + 6 = 0$, $R(x) = 4$, then $R(y)$ is

A. 6

B. 4

C. 8

D. none of these

Answer: