



MATHS

BOOKS - UNITED BOOK HOUSE

SET 9

Exercise

1. Total number of relations that can be defined on set $A = \{1,2,3,4\}$ is

A. 2^4

B. 2^8

C. 2^{12}

D. 2^{16}

Answer:



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2. Which of the following is the value of $\cot \left(\cos^{-1} 2 + \cos^{-1} \left(\frac{1}{2} \right) \right)$?

A. 1

B. 0

C. -1

D. $\sqrt{3}$

Answer:



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3. if A be a symmetric matrix then A^n will be

A. symmetric

B. skew symmetric

C. square matrix

D. scalar matrix

Answer:



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4. The value of $\int \sin x^\circ dx$ is

A. $\frac{\pi}{180} \cos x^\circ + c$

B. $\frac{180}{\pi} \cos x^\circ + C$

C. $-\frac{180}{\pi} \cos x^\circ + c$

D. $-\frac{\pi}{180} \cos x^\circ + C.$

Answer:



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5. The slope of the normal to rectangular hyperbola $xy=4$ at $\left(2t, \frac{2}{t}\right)$ is

a) $-t^2$ b) t^2 c) $2t$ d) $-2t$

A. $-t^2$

B. t^2

C. $2t$

D. $-2t$

Answer:



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6. The direction ratios of the line parallel to the line

$\frac{x-1}{3} = \frac{y-5}{1} = \frac{z-3}{0}$ are proportional to

A. 3,1,0

B. 3,-1,0

C. 1,5,3

D. $-3, 1, 0$

Answer:



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7. A number is chosen at from the first 11 natural number, then the probability that the chosen number is even is

A. $\frac{6}{11}$

B. $\frac{5}{6}$

C. $\frac{4}{11}$

D. $\frac{5}{11}$

Answer:



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8. The mean of the binomial distribution with parameters n and p is

A. np

B. $n(1-p)$

C. $(n+1)p$

D. $(n-1)p$

Answer:



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9. Prove that $\sin \cos e c^{-1} \cot(\tan^{-1} x) = x$



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10. Prove without expanding
$$\begin{vmatrix} a & a^2 & bc \\ b & b^2 & ca \\ c & c^2 & ab \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$$



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11. Find the matrix A, when $A^{-1} = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$

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12. Evaluate : $\text{Lt}_{x \rightarrow e} \frac{\log x - 1}{x - e}$

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13. Examine whether Rolle's theorem is applicable to the function

$$f(x) = \cot x \text{ in } -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

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14. $\int \left(\frac{x^2 + \sin^2 x}{1 + x^2} \right) \sec^2 x dx$ is equals

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15. Find the degree and order of the differential equation

$$1 + \left(\frac{d^3y}{dx^3} \right)^2 = \sqrt[3]{\frac{d^2y}{dx^2}}.$$



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16. answer any three questions: (iii) if $x > 0$, $y > 0$ and $xy = 25$, then find the minimum value of $x + y$



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17. Find the value of $\tan 44^\circ$, given $\tan 1^\circ = 0.01745$.



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18. Find the direction cosines and direction ratios of the vector $2\hat{i} + 2\hat{j} + 5\hat{k}$.



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19. The cartesian equation of a line AB is $\frac{3-x}{1} = \frac{y+2}{-2} = \frac{z-5}{4}$. Find the direction ratios of a line parallel to AB.

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20. If $P(\bar{A} \cup \bar{B}) = \frac{5}{6}$, $P(A) = \frac{1}{2}$ and $P(\bar{B}) = \frac{2}{3}$ show that A and B are two independent events.

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21. Find the probability that in a family of 4 children there will be at least one boy. (Assume that the probability of a male child is $\frac{1}{2}$)

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22. answer any one question : (ii) prove that ,

$$\tan\left(\frac{\pi}{4} + \frac{1}{2}\left(\cos^{-1}\left(\frac{a}{b}\right)\right)\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2}\left(\cos^{-1}\left(\frac{a}{b}\right)\right)\right) = \frac{2b}{a}.$$

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23. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $O = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ show that $A^2 - 5A + 7I = O$. Hence find A^{-1} .

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24. Show that, $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -1 \\ -2 & 2 & -1 \end{bmatrix}$ are orthogonal matrix and hence find A^{-1} .

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25. Solve for x

$$|x - 2, 2x - 3, 3x - 4, x - 4, 2x - 9, 3x - 16, x - 8, 2x - 27, 3x - 64| =$$

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26. Show that the following determinant is a perfect square
$$\begin{vmatrix} 1 & a & a^2 \\ a^2 & 1 & a \\ a & a^2 & 1 \end{vmatrix}$$

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27. If $\sin y = x \sin(a + y)$ then show that
$$\frac{dy}{dx} = \frac{\sin a}{1 - 2x \cos a + x^2}.$$

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28. Let $y = (\sin^{-1} x)^2 + (\cos^{-1} x)^2$ show that

$$(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} = 4$$

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29. Evaluate: $\int \frac{dx}{1+x^3}$

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30. Evaluate: $\int \frac{x^2 dx}{x^4 - x^2 + 1}$.

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31. Solve: $x dx + y dy + \frac{x dy - y dx}{x^2 + y^2} = 0$ given $y = 1$ when $x = 1$.

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32. Solve: $(x + \tan y) dy = \sin 2y dx$.

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33. D,E,F are the midpoints of the sides \overline{BC} , \overline{CA} and \overline{AB} respectively of the triangle ABC. If P is any point in the plane of the triangle, show that $\overline{PA} + \overline{PB} + \overline{PC} = \overline{PD} + \overline{PE} + \overline{PF}$.



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34. The dot product of a vector with the vectors $\hat{i} - 3\hat{k}$, $\hat{i} - 2\hat{k}$ and $\hat{i} + \hat{j} + 4\hat{k}$ are 0,5,8 respectively. Find the vector.



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35. Evaluate: $\int_0^{\pi/2} \frac{\sin^{3/2} x}{\sin^{3/2} x + \cos^{3/2} x} dx$



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36. The probability distribution of a discrete random variable X is as follows:

x	-2	-1	0	2	4
$p(x)$	0.1	0.2	0.4	0.25	0.05

Find the expectation and S.D. of X .

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37. A ballong leaves the ground 50 ft from an observer. If it rises vertically at the rate of 6 ft/s how fast is it reducing form the point of observation when it is 120 ft above the ground?

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38. A particle moves in a straight line such that its distance x from a fixed point on it at any time t is given by $x = \frac{1}{4}t^4 - 2t^3 + 4t^2 - 7$. Find the time its velocity is maximum and the time when its acceleration is minimum.

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39. Find the area of the region $\{(x, y) : y^2 \leq 4x, 4x^2 + 4y^2 \leq 9\}$



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40. Find the shortest distance between the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x}{2} = \frac{y-5}{3} = \frac{z+1}{4}$$



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41. Find the distance between the point $P(6,5,9)$ and the plane passing through $A(3,-1,2)$, $B(5,2,4)$ and $C(-1,-1,6)$.



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