



MATHS

BOOKS - UNITED BOOK HOUSE

ANNUAL EXAMINATION QUESTION PAPERS 2015

Exercise

1. If $3 \sin \theta + 4 \cos \theta = 5$, then $4 \sin \theta - 3 \cos \theta =$

A. a)1

B. b)0

C. c)-1

D. d) $\frac{25}{2}$

Answer:



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2. If $i^2 = -1$, then $\sum_{n=0}^{225} i^n$ is

A. a) 0

B. b) $1+i$

C. c) -1

D. d) i

Answer:



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3. If ${}^{16}C_r = {}^{16}C_{(2r+1)}$ then the value of r is

A. a) 6

B. b) 5

C. c) 4

D. d) 3

Answer:



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4. The coefficient of x^{17} in the expansion of $(x-1)(x-2)(x-3)\dots(x-18)$

is

A. a) -171

B. b)171

C. c)153

D. d)-153

Answer:



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5. Find the slope of the lines :

Making inclination of 60° with the positive direction of x- axis.

A. a) α

B. b) $\frac{\pi}{2} + \alpha$

C. c) $-\alpha$

D. d) $\frac{\pi}{2} - \alpha$

Answer:



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6. Find the distance of the point $(3, -5)$ from the line $3x - 4y - 26 = 0$.

A. $a)\sqrt{a^2 + b^2 + c^2}$

B. $b)a$

C. $c)b$

D. $d)c$

Answer:



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7. $\lim_{x \rightarrow 0} \frac{\sin \alpha x}{e^{\beta x} - 1}$ ($\alpha, \beta \neq 0$) equals to

A. a) $\frac{\beta}{\alpha}$

B. b) 0

C. c) $\frac{\alpha}{\beta}$

D. d) limit does not exist

Answer:



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8. IF $f(x)=x|x|$, then the value of $f'(-1)$ is

A. a) 1

B. b) 2

C. c)-1

D. d)-2

Answer:



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9. If $y=2x+3$, and variance of y is 4, then the standard deviation of x is ____

A. a)4

B. b)2

C. c)-1

D. d)1

Answer:



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10. If $P(A)=0.54$, $P(B)=0.69$ and $P(A \cap B) = 0.35$, then the value of $P(A' \cup B')$ is

A. a) 0.80

B. b) 0.12

C. c) 0.65

D. d) 0.16

Answer:



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11. Let R be the relation defined on the set N of natural numbers as $R = \{(x, y) \mid 4x + 5y = 50, x, y \in N\}$. Express R and R^{-1} as set of ordered pairs

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12. If $2f(x) + 3f(-x) = 2x + 1$, then find $f(x)$.

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13. Solve : $\tan x + \tan 2x + \tan 3x = \tan x \tan 2x \tan 3x$, where $0 \leq x \leq 2\pi$

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14. In a $\triangle ABC$, $\sin^2 A + \cos^2 C = \cos^2 B$ find $\angle C$

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15. Find the principal amplitude of $-3 - \sqrt{3}i$

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16. If $y = x + x^2 + x^3 + \dots \infty$ where $|x| < 1$, prove that

$$x = \frac{y}{1 + y}$$

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17. Show that the middle term in the expansion of $(x + 1)^{2n}$

is $\frac{1.3.5 \dots (2n - 1)}{n!} 2^n \cdot x^n$.



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18. The co-ordinates of the focus of the parabola described paraetrically by $x = 5t^2 + 2$, $y = 10t + 4$ are



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19. Determine the equation of the straight line through the point (2,3) which divides the portion of the line segment between the axes In the ratio 2:1



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20. Prove that the derivative of an odd function an ever function .



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21. Evaluate : $\lim_{x \rightarrow y} \frac{\cos^2 x - \cos^2 y}{x^2 - y^2}$



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22. The standard deviation of 32 numbers is 5.If the sum of the numbers is 80,determine the sum of the squares of the numbers.



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23. Find the probability of getting a head when a coin is tossed once. Also find the probability of getting a tail.



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24. Prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$

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25. If $\cos \theta = \frac{a \cos \phi + b}{a + b \cos \phi}$ (θ, ϕ acute \angle) show that
$$\tan\left(\frac{\theta}{2}\right) = \sqrt{\frac{a-b}{a+b}} \tan\left(\frac{\phi}{2}\right) \quad (a > b)$$

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26. If $\frac{\tan 3\alpha}{\tan \alpha} = \lambda$, show that $\frac{\sin 3\alpha}{\sin \alpha} = \frac{2\lambda}{\lambda - 1}$ and hence
prove that the value of λ does not lie between $1/3$ and 3

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27. Prove that by using the principle of mathematical induction for all $n \in \mathbb{N}$:

$$1.3 + 3.5 + 5.7 + \dots + (2n - 1)(2n + 1) = \frac{n(4n^2 + 6n - 1)}{3}$$

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28. Show that 1 is a root of $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$. Hence show that if roots of this equation are equal then $1/a, 1/b, 1/c$ are in A.P.

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29. Find the sum of first n terms of $1+3+7+15+31+\dots$

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30. How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that

(i) repetition of the digits is allowed?

(ii) repetition of the digits is not allowed?

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31. A moving straight line always passes through a fixed point

(α, β) . Prove that the locus of the middle point of the portion

of the line intercepted between the axes is $\frac{\alpha}{x} + \frac{\beta}{y} = 2$

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32. Find equations of all possible circles that touch the y axis

at the point $(0,3)$ and cut the chord of length 8 units from the

x axis .



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33. A ray of light along the line $x-2y+5=0$ is reflected from the line $3x-2y+7=0$. Find the equations of the line containing the reflected ray.



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34. Find the co-ordinates of vertices of a unit cube where the three concurrent edges are co-ordinate axes.



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35. Prove that $\lim_{x \rightarrow 0} \frac{\sqrt{1 - \cos x}}{x}$ does not exist

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36. Find $f'(0)$ where $f(x) = |x+1| + |x-1|$.

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37. Prove that $(2\sqrt{3} + \sqrt{5})$ is an irrational number. Also check whether $(2\sqrt{3} + \sqrt{5})(2\sqrt{3} - \sqrt{5})$ is rational or irrational.

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38. Let a statement p : $\triangle ABC$ is right angle triangle, and another check whether the following statement q : in a $\triangle ABC$, $AB^2 + BC^2 = AC^2$ check whether the following statements are true or false a) p implies q

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39. Let a statement p : $\triangle ABC$ is right angle triangle, and another statement q : in a $\triangle ABC$, $AB^2 + BC^2 = AC^2$ check whether the following statements are true or false b) q implies p

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40. Let a statement p : $\triangle ABC$ is right angle triangle, and another statement q : in a $\triangle ABC$, $AB^2 + BC^2 = AC^2$ check whether the following statements are true or false c) p is true if and only if q is true

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41. Let a statement p : $\triangle ABC$ is right angle triangle, and another statement q : in a $\triangle ABC$, $AB^2 + BC^2 = AC^2$ check whether the following statements are true or false d) $p \implies \neg q$ ($\neg p$ denotes the negation of the statement p).

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42. Find the standard deviation of the diameters of the circles given in the table below:

Diameter (in cm.)	33-36	37-40	41 - 44	45 - 48	49 - 52
Number of circles	15	17	21	22	25

Find the probability that the

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43. Find the median of first n -natural numbers.

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44. Give an example of a relation defined on set of integers which is symmetric and transitive but not reflexive. Justify your answer.

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45. Find the domain and range of the function

$$f(x) = \frac{x}{x^2 - 5x + 4}$$

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46. If $\tan\left(\frac{\theta}{2}\right) = \tan^3\left(\frac{\phi}{2}\right)$ and $\tan\phi = 2\tan\alpha$, then prove that $\theta + \phi = 2\alpha$

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47. If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{3a - ab + 4c}{p}$, then find the value of p.

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48. Prove that $\text{amp}(z) - \text{amp}(-z) = \pm \pi$, according as $\text{amp}(z)$ is positive or negative. (z is a complex number).

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49. The equation of the axis and directrix of a parabola are $x - y + 3 = 0$. One of its focus is at $(-1, 1)$ and its eccentricity is 3. Find the equation of the hyperbola.

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