



## MATHS

### BOOKS - UNITED BOOK HOUSE

### HIGHER SECONDARY QUESTION 2018

#### Exercise

1. 1. choose the correct answer from the given alternatives: 1. if  $X$  be the random variable of the no. of points obtained in a single throw of unbiased die, then the value of  $\bar{X}$  will be

A. 7

B. 14

C.  $\frac{7}{2}$

D.  $\frac{1}{6}$

**Answer:**



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2. choose the correct answer from the given alternatives : 2.if

A and B are two independent events and  $P(A)=\frac{3}{5}$  and

$P(A \cap B) = \frac{4}{9}$  then the value of  $P(B)$  will be -

A.  $\frac{5}{91}$

B.  $\frac{8}{9}$

C.  $\frac{5}{27}$

D.  $\frac{20}{27}$

**Answer:**



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3. choose the correct answer from the given alternatives :3 the projection of the vector  $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$  on the vectors  $\hat{b} = \hat{i} - 2\hat{j} + \hat{k}$  will be

A.  $\frac{5}{\sqrt{6}} \text{unit}$

B.  $\frac{2}{\sqrt{6}} \text{unit}$

C.  $\frac{3}{\sqrt{5}} \text{unit}$

D.  $\frac{4}{\sqrt{5}} \text{unit}$

**Answer:**



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4. choose the correct answer from the given alternatives : the straight line  $\frac{x-3}{2}=\frac{y+4}{0}=\frac{z-2}{5}$  is perpendicular to

A. x axis

B. y-axis

C. z-axis

D. both x-axis and z-axis

**Answer:**



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5. choose the correct answer from the given alternatives: if the straight line  $y=mx+1$  be the tangent of the parabola  $y^2 = 4x$ , then the value of m will be

A. 1

B. 2

C. -1

D. -2

**Answer:**



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6. choose the correct answer from the given alternatives : the

value of  $\int e^{a \log_e x} dx$  will be-

A.  $\frac{1}{a} e^{a \log_e x}$

B.  $1/x + c$

C.  $ax^{a-1} + c$

D.  $\frac{x^{a+1}}{a+1} + c$

**Answer:**



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7. choose the correct answer from the given alternative : if  $f(x)=\sin x / x(x \neq 0)$  is continuous at  $x=0$  then the value of  $f(0)$  will be -

A. 0

B. 1

C.  $\pi$

D.  $\frac{\pi}{2}$

**Answer:**



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8. choose the correct answer from the given alternative : if A is a square matrix of order  $3 \times 3$ , then the value of  $|KA|$  will be-

A.  $K|A|$

B.  $K^2|A|$

C.  $K^3|A|$

D.  $3K|A|$

**Answer:**



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9. choose the correct answer from the given alternative: let  $A = \{1, 2, 3\}$  and  $R$  be a relation defined on  $A$ , such that  $R = \{(1, 1), (1, 2), (2, 1)\}$ , then the relation  $R$  will be

- A. reflexive
- B. symmetric
- C. transitive
- D. none of these

**Answer:**



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10. The principal value of  $\tan^{-1}(-\sqrt{3})$  is

- A.  $\frac{\pi}{3}$



B.  $\frac{\pi}{4}$

C.  $-\frac{\pi}{4}$

D.  $-\frac{\pi}{3}$

**Answer:**



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**11. 1 (a)** answer any one question :(i) suppose  $\mathbb{R}$  be the set of all real no. and the mapping  $f:\mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2x^2 - 5x + 6$ . find the value of  $f^{-1}(3)$



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12. answer any one question :(ii) if  $\sin^{-1} x = \tan^{-1} y$ , then show that  $\frac{1}{x^2} - \frac{1}{y^2} = 1$ .

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13. (b) answer any one question : (i) prove that  $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

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14. answer any one question  $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$  and I be the unit matrix of second order. If  $A^2 = 8A + kI$ , then find the value of k.

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15. (c) answer any three questions: (i) if the function ,

$$f(x) = \begin{cases} \frac{1 - \cos(ax)}{x^2} & , \text{ when } x \neq 0 \\ 1 & \end{cases} \text{ be continuous at } x=0, \text{ then}$$

find the value of a

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16. If  $x\sqrt{1+y} + y\sqrt{1+x} = 0$ , prove that  $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$

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17. 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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18. answer any three questions: (iv) a particle moves along the parabola  $y^2 = 4x$  . Find the coordinates of the point on the parabola ,where the rate of increment of abscissa is twice the rate of increment of the ordinate.

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19. verify lagrange's mean value of theorem in the interval  $4 \leq x \leq 6$  for function  $f(x) = x^2 + 2x + 3$  .

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20.  $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$  is

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21. (d) answer any one question : (i) if the three vectors

$\vec{a}, \vec{b}, \vec{c} = 0$  are such that

$\vec{a} + \vec{b} + \vec{c} = \vec{0}$  and  $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ , then

show that  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} = -25$



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22. answer any one question : (ii) find the equation of the

plane passing through the intersection of the planes

$2x+y+2z=9$  and  $4x-5y-4z=1$  and through the point  $(3,2,-1)$ .



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23. e) answer any one question : (i) if

$$P\left(\frac{A}{B}\right) = 0.8, P\left(\frac{B}{A}\right) = 0.6 \text{ and } P(A^c \cup B^c) = 0.7, \text{ then}$$

find the value of  $P(A \cup B)$



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24. answer any one question : (ii) an unbiased coin is tossed 6 times . Using binomial distribution , find the probability of getting at least 5 heads.



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25. A relation R is defined on the set of natural numbers N as follows:  $R = \{(x,y) \mid x,y \text{ in } N \text{ and } 2x+y=41\}$  show that R is neither reflexive nor symmetric nor transitive.



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26. 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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27. (b) answer the foll. Questions: (i) express the matrix

$$A = \begin{bmatrix} 3 & 2 & 3 \\ 4 & 5 & 3 \\ 2 & 4 & 5 \end{bmatrix} \text{ as the sum of a symmetric matrix and a skew}$$

-symmetric matrix.



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28. if  $\begin{vmatrix} x-1 & 1 & 1 \\ 1 & x+1 & -1 \\ -1 & 1 & x+1 \end{vmatrix} = 0$ , find the value of x.

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29. answer the foll. Questions: (i) if  $y = \frac{\sin^{-1} x}{\sqrt{1-x^2}}$ , then show that  $(1-x^2) \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} - y = 0$

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30. or, find the derivatives of  $\tan^{-1} \left( \frac{\sqrt{1+x^2}-1}{x} \right)$  with respect to  $\tan^{-1} \left( \frac{2x\sqrt{1-x^2}}{1-2x^2} \right)$  at  $x=0$ .

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31. answer the foll. Questions: (ii) evaluate :  $\int \frac{x^4 + 1}{x^6 + 1} dx$

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32. or, evaluate :  $\int \frac{dx}{\cos x + \sqrt{3} \sin x}$

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33. answer the foll. Question: (iii) solve :

$x \frac{dy}{dx} = y + x \tan\left(\frac{y}{x}\right)$ , given that  $y = \frac{\pi}{2}$ , when  $x=1$ .

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34. or, solve:  $(1 - x^2) \frac{dy}{dx} - xy = 1$ .



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35. (d) answer any one question : (i) if three vectors  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  of magnitudes 3,4and5 are such that each vector is perpendicular to the sum of the other two vectors,then prove that  $\left| \vec{a} + \vec{b} + \vec{c} \right| = 5\sqrt{2}$ .

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36. answer any one question : (ii) let  $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$ ,  $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$  and  $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$ . Find a vector  $\vec{d}$  which is perpendicular to both the vectors  $\vec{a}$  and  $\vec{b}$  and  $\vec{c} \cdot \vec{d} = 18$

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### 37. Evaluate

$$\lim_{n \rightarrow \infty} \left[ \frac{1^2}{n^3 + 1^3} + \frac{2^2}{n^3 + 2^3} + \frac{3^2}{n^3 + 3^3} + \dots + \frac{1}{2n} \right]$$



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38. answer any one question : (ii) evaluate :  $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} dx$



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39. answer any one question : (ii) if  $X$  and  $Y$  are two independent variables , then rove that  $var(aX + bY) = a^2 var(X) + b^2 var(Y)$ , where  $a$  and  $b$  are constants



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40. (b) answer any two questions : (i) a circular ink blot grows at the rate of  $2c \frac{m^2}{\text{sec}}$ . find the rate at which the radius is increasing after  $2\left(\frac{6}{11}\right)$  seconds

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41. answer any two questions :(iii) if the straight line  $lx+my=n$  be a normal to the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ , then by the application of calculus prove that  $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{(a^2 + b^2)^2}{n^2}$ .

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42. answer any two questions :(iv) solve :  $(2x - 10y^3) \frac{dy}{dx} + y = 0$ .

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43. ©answer any one question: (i) find the vector equation of the plane at a distance  $\frac{6}{\sqrt{29}}$  unit from the origin and perpendicular to the vector  $2\hat{i} - 3\hat{j} + 4\hat{k}$ . Also convert this equation in cartesian form.

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44. answer any one question : (ii) find the equation of the line which is perpendicular to both of the lines  $\frac{x}{2} = \frac{y}{1} = \frac{z}{3}$  and  $\frac{x-3}{-1} = \frac{y-2}{3} = \frac{z+5}{5}$  and passing through the point (1,2,3)

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