



# MATHS

# **BOOKS - MODERN PUBLICATION**

## SAMPLE PAPER 2020

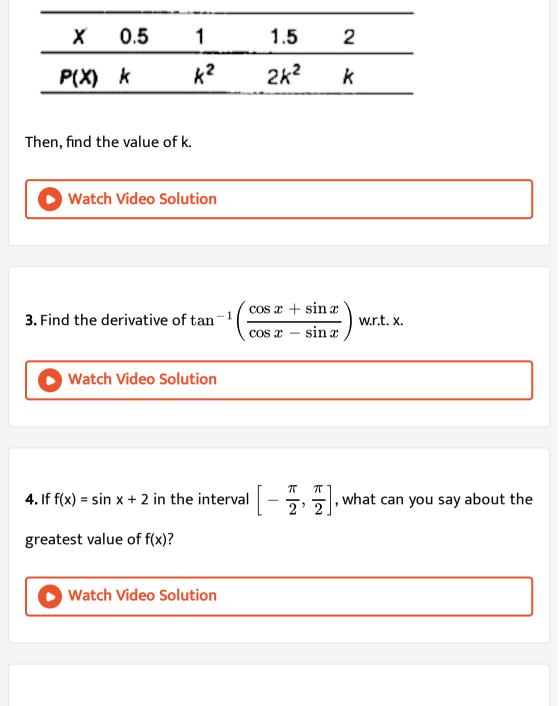


1. A is a square matrix of order 3. write the value n, |2A|=n|A|.

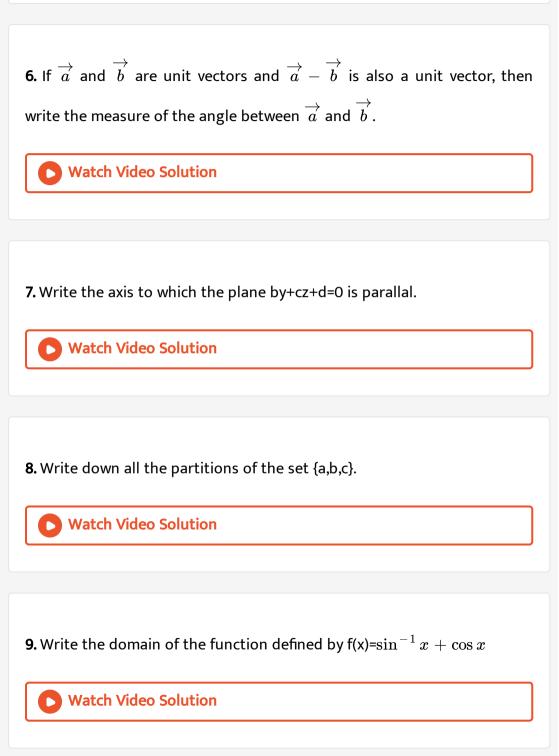
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2. A discrete random variable X has the probability distribution as given

below:



5. Write the differential equation of all non-horizontal lines in a plane.



**10.** A man plans to start a poultry farm by investing at most ₹ 3000. He can buy old hens for ₹80 each and young ones for ₹ 140 each, but he cannot house more than 30 hens. Old hens lay 4 eggs per week ,each ell bing sold at ₹5. It costs ₹ 5 to feed an old hen and ₹8 to feed a young hen per week. Formulate his problem determining the number of hens of each type he should buy so as to earn a proft of more than ₹ 300 per week.

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11. Test whether the relation :  $R = \{(m,n): 2 \mid (m+n)\}$  on  $\mathbb{Z}$  is reflexive, symmetric or transitive.

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12. Prove that for any  $f\colon X o Y,$   $foid_x=f=id_Y$  of.

13. Solve equation 
$$3 an^{-1} rac{1}{\left(2 + \sqrt{3}
ight)} - an^{-1} rac{1}{x} = an^{-1} rac{1}{3}$$

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

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**15.** Two cards are drawn successively with replacement from a wellshuffled deck of 52 cards. Find the probability distribution of the number of aces.

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**16.** Find the inverse of the matrix  $\begin{bmatrix} 4\\3 \end{bmatrix}$ 

$$\left. \begin{array}{cc} 4 & -2 \\ 3 & 1 \end{array} \right]$$

**17.** There are two families A and B. There are 4 men, 6 women and 2 children in family A and 2 men, 2 women and 4 children in family B. The recommended daily amount of calories is 2400 for men, 1900 for women and 1800 for children, and 45 g of proteins for men, 55 g for women and 33 g for children. Represent the above information by matrices. Using matrices multiplication, calculate the total requirement of calories and proteins for each of the 2 families.

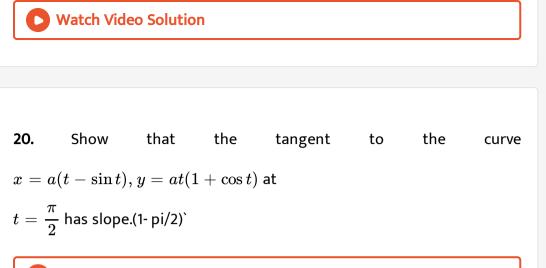
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18. Eliminate x,y,z from

a=x/y-z, b=y/z-x, c=z/x-y



**19.** There are 25 girls and 15 boys in class XI and 30 boys and 20 girls in class XII. If a student chosen from a class, selected at random, happens to be a boy, find the probability that he has been chosen from class XII.



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**21.** If sin  $(x + y) = y \cos(x + y)$  then prove that

$${dy\over dx}=~-~{1+y^2\over y^2}$$

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22. What is the derivative of 
$$\sec^{-1}\left(\frac{1}{2x^2-1}\right)$$
,with respect to  $\left(\sqrt{1-x^2}
ight)$ ?

#### **23.** Find the approximate value of $\sqrt{48.96}$



24. Solve : 
$$In\left(\frac{dy}{dx}\right) = 3x + 4y$$
 given that y=0, when x=0.

$$25. \int \frac{2\sin x + 3\cos x}{3\sin x + 4\cos x} dx = ?$$

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26. Evaluate the following integrals :

$$\int_0^{\pi/2} \log \Bigl| rac{4+3\sin x}{4+3\cos x} \Bigr| dx.$$

27. The area between  $x = y^2$  and x = 4 is divided into two equal parts by

the line x = a. Find the value of a.



**28.** Solve :  $x(dy)/(dx) + y = y^2$ 

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**29.** Prove that the measure of the angle between two main diagonals of a

cube is 
$$\cos^{-1}\frac{1}{3}$$
.

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**30.** Prove that the four points with position vectors  $2\overrightarrow{a} + 3\overrightarrow{b} - \overrightarrow{c}, \overrightarrow{a} - 2\overrightarrow{b} + 3\overrightarrow{c}, 3\overrightarrow{a} + 4\overrightarrow{b} - 2\overrightarrow{c}$  and  $\overrightarrow{a} - 6\overrightarrow{b} + 6\overrightarrow{c}$ 

are coplanar.



**31.** If  $\overrightarrow{a} = 3\hat{i} + \hat{j} + 2\hat{k}$ ,  $\overrightarrow{b} = 2\hat{i} - 3\hat{j} + 4\hat{k}$  then verify that  $\overrightarrow{a} \times \overrightarrow{b}$  is perpendicular to both  $\overrightarrow{a}$  and  $\overrightarrow{b}$ .

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32. Passing through the point  $(2,\ -3,1)$  and (-1,1-7) and

perpendicular to the plane x - 2y + 5z + 1 = 0.

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**33.** Find the perpendicular distance of the point (-1, 3, 9) from the line

$$rac{x-13}{5} = rac{y+8}{-8} = rac{z-31}{1}$$

**34.** Find the solution of the following differential equations:

(4x+6y+5)dx-(2x+3y+4)dy=0



**35.** Find the area of the smaller region bounded by the ellipse  $\frac{x^2}{9} + \frac{y^2}{4} = 1$  and the line  $\frac{x}{3} + \frac{y}{2} = 1$ .

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**36.** Evaluate : 
$$\int \!\! \frac{x^5+x^4+x^3+x^2+4x+1}{x^2+1} dx$$

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37. Solve the following LPP graphically Optimize  $Z=5x_1+25x_2$  subject

 ${\sf to} - 0.5 x_1 + x_2 \le 2, \, x_1 + x_2 \ge 2, \, -x_1 + 5 x_2 \ge 5, x_1, x_2 \ge 0$ 

$$\sin^{-1}x + \sin^{-1}y + \sin^{-1}z = \pi$$
 prove that  $x^4 + y^4 + z^4 + 4x^2y^2z^2 = 2(x^2)$ 

**39.** The probability of a shooter hitting a target is  $\frac{3}{4}$  Find the minimum number of times he must fire, so that the probability of hitting the target atleast once is greater than 0.999.



40. Prove the following:

$$egin{bmatrix} (b+c)^2 & a^2 & bc\ (c+a)^2 & b^2 & ca\ (a+b)^2 & c^2 & ab \end{bmatrix} \ = & (a^2+b^2+c^2)(a+b+c)(b-c)(c-a)(a-b) \end{split}$$

**41.** If A,B,C are matrices of order  $2 \times 2$  each and  $2A + B + C = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$ 

$$A+B+C = \begin{bmatrix} 0 & 1 \\ 2 & 1 \end{bmatrix}$$
  
 $A+B-C = \begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix}$  find A,B and C.

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42. If 
$$y=x^{\sin x}+x^3rac{\sqrt{x^2+4}}{\sqrt{x^3+3}}$$
 find  $rac{dy}{dx}.$ 

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43. Show that the semivertical angle of a cone of given slant height is

 $an^1\sqrt{2}$  when its volume is maximum.

