



MATHS

BOOKS - SHARAM PUBLICATION

QUESTION PAPER 2020



1. Write down all the partitions of the set {a,b,c}.

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2. Write the domain of the function defined by f(x)= $\sin^{-1}x + \cos x$

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

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

below:

x	0.5	1	1.5	2	
P(X)	k	k²	2k ²	k	

Then, find the value of k.

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5. Find the derivative of
$$\tan^{-1}\left(\frac{\cos x + \sin x}{\cos x - \sin x}\right)$$
 w.r.t. x.

6. If $f(x) = \sin x + 2$ in the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2} \right]$, what can you say about the greatest value of f(x)? Watch Video Solution

7. If
$$\int_{-rac{1}{2}}^{rac{1}{2}}\cos xInrac{1+x}{1-x}dx=kIn^2$$
 then write the value of k.

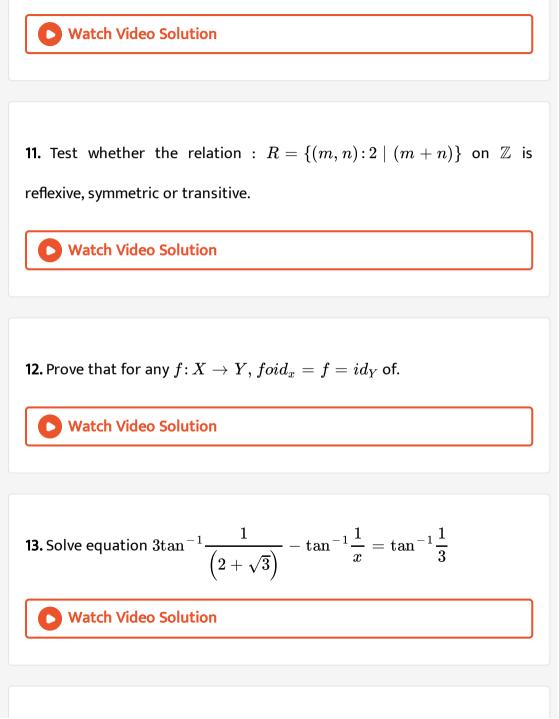
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8. Write the differential equation of all non-horizontal lines in a plane.



9. If \overrightarrow{a} and \overrightarrow{b} are unit vectors and $\overrightarrow{a} - \overrightarrow{b}$ is also a unit vector, then write the measure of the angle between \overrightarrow{a} and \overrightarrow{b} .

10. Write the axis to which the plane by+cz+d=0 is parallal.



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. 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.



16. Find the inverse of the matrix $\begin{bmatrix} 4 & -2 \\ 3 & 1 \end{bmatrix}$

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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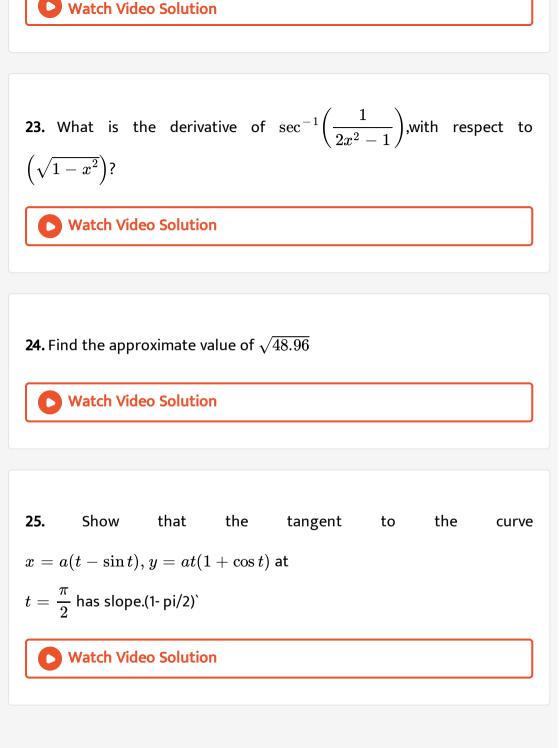
20. Four cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of aces. Calculate the mean and variance of the number of aces.

21. Examine the continuity of the following function at x = 0: $f(x) = \begin{cases} 2x + 1 & \text{if } x \le 0 \\ x & \text{if } 0 < x \le 1 \\ 2x - 1 & \text{if } x \ge 0 \end{cases}$ Watch Video Solution

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

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





$$26. \int \frac{2\sin x + 3\cos x}{3\sin x + 4\cos x} dx = ?$$



27. Evaluate the following integrals :

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

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28. 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.

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29. Solve:
$$x rac{dy}{dx} + y = y^2 \ln x$$

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

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31. 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.

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32. 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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33. Passing through the point (2, -3, 1) and (-1, 1-7) and perpendicular to the plane x - 2y + 5z + 1 = 0.

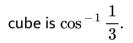


34. Find the perpendicular distance of the point (-1, 3, 9) from the line

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

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



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36.

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

37. Solve the following LPP graphically Optimize $Z=5x_1+25x_2$ subject to $-0.5x_1+x_2\leq 2,\,x_1+x_2\geq 2,\,-x_1+5x_2\geq 5,\,x_1,\,x_2\geq 0$

38. If A,B,C are matrices of order 2×2 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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39. Prove the following:

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

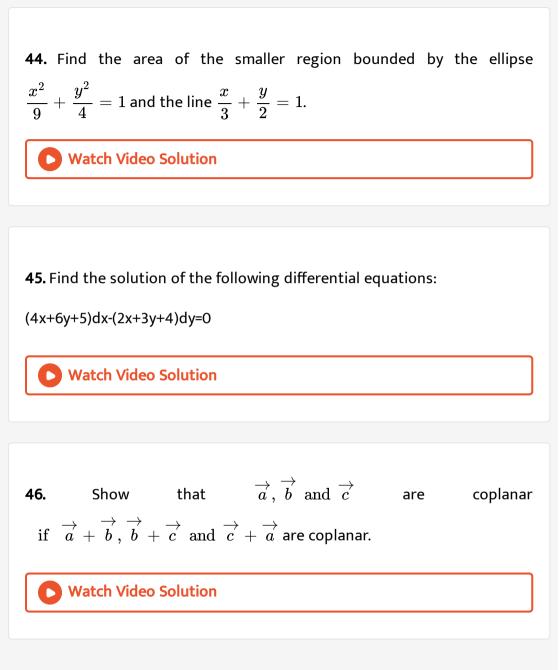
40. The probability of a shooter hitting a target is $\frac{3}{4}$ Find the minimum number of times he must fire, so that the probability of hitting the target atleast once is greater than 0.999.

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

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42. Show that the semivertical angle of a cone of given slant height is $\tan^1\sqrt{2}$ when its volume is maximum.

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43. Evaluate :
$$\int \frac{x^5 + x^4 + x^3 + x^2 + 4x + 1}{x^2 + 1} dx$$
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47. Find the shortest distance between the lines

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