



MATHS

BOOKS - SHARAM PUBLICATION

MODEL QUESTION PAPER 19



1. If R be a relation on a finite set A having n elements, then the number

of relations on A is-

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2. If A and B are independent events and $P(A) = \frac{3}{5}$, $P(B) = \frac{1}{5}$ then what is $P(A \cap B)$.

3. Write the value of k, if

| $ aa_1 $ | aa_2 | aa_3 | | $ a_1 $ | b_1 | c_1 |
|----------|--------|--------|----|---------|-------|-------|
| ab_1 | ab_2 | ab_3 | =k | a_2 | b_2 | c_2 |
| | ac_2 | | | | | c_3 |

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4. If
$$\begin{bmatrix} 3 & x \\ 7 & 5 \end{bmatrix} + \begin{bmatrix} 1 & -2 \\ -4 & y \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 5 & 1 \end{bmatrix}$$
 then we

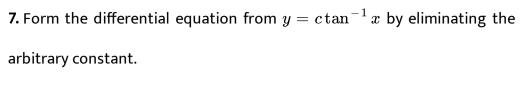
then write the value of x and y.

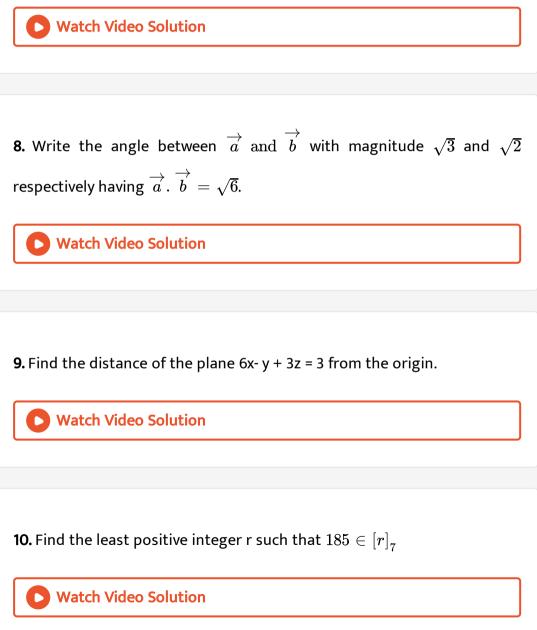
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5. Write the anti-derivative of $3x^2 + 4x^3$.



6. Differentiate
$$\log \tan^{-1} (1 + x^2)$$
 w.r.t x .





11. If $f \colon R o R$ is the function defined by $f(x) = 4x^3 + 7$, then show

that f is a bijection.



12. if * is the binary operation on N given by a * b= L. C. M of a and b. Find 20 * 16. Is * Commutative.

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13. Show that
$$2 \tan^{-1} \left(rac{1}{4}
ight) + 2 \tan^{-1} \left(rac{2}{9}
ight) = an^{-1} \left(rac{4}{3}
ight).$$

.

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14. Evaluate
$$\int \frac{1}{\sqrt{x}\sqrt{x-a^2}} dx$$

15. Evaluate
$$\int \frac{x+3}{\sqrt{9-x^2}} dx.$$

16. Evaluate
$$\int\!\!\cos(2-7x)dx$$

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17. Solve
$$rac{d^2y}{dt^2}=e^{2t}+e^{-t}.$$

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18. Using integration, find the area of the region bounded by the curves

$$y = x^2$$
 and $y = x$.



19. Find the value of a such that the function f defined by

$$f(x) = \left\{egin{array}{cc} rac{\sin ax}{\sin x} & ext{if} & x
eq 0 \ rac{1}{a} & ext{if} & x = 0 \end{array}
ight.$$

is continuous at x=0.

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20. Find
$$rac{dx}{dy}$$
 when $y=(\sin x)^x.$

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21. Differentiate
$$y= an^{-1}$$
. $rac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}$

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22. Find the points on the curve $y = x^3 - 11x + 5$ at which the equation

of the tangent is y = x - 11.

23. If
$$A = egin{bmatrix} -1 & 3 & 5 \ 1 & -3 & -5 \ -1 & 3 & 5 \end{bmatrix}$$
 Show that $A^2 = A.$

24. If
$$egin{bmatrix} x+y & x-2 \\ 2x-z & 0 \end{bmatrix} = egin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$$
 then the values of x,y,z.

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25. Prove that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$
 or $(abc+bc+ca+ab)$

26. Prove that
$$\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$$
 = (a-b)(b-c)(c-a)(a+b+c).

27. If
$$A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix} B = \begin{bmatrix} 2 & 5 \\ -3 & 2 \end{bmatrix}$$
 find AB and BA.

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28. If the sum of two unit vectors is a unit vectors find the magnitude of

their difference.

29. Find a vector of magnitude 5 units and parallel to the resultant of

$$\overrightarrow{a}=2\hat{i}+3\hat{j}-\hat{k}$$
 and $\overrightarrow{b}=\hat{i}-2\hat{j}+\hat{k}.$

30. Show that
$$\begin{bmatrix} \overrightarrow{a} + \overrightarrow{b} & \overrightarrow{b} + \overrightarrow{c} & \overrightarrow{c} + \overrightarrow{a} \end{bmatrix} = 2 \begin{bmatrix} \overrightarrow{a} & \overrightarrow{b} & \overrightarrow{c} \end{bmatrix}$$

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31. Find the equation of the plane through the points (1, 2, -3), (2,3, -4)

and perpendicular to the plane x + y + z + 1 = 0.

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32. If p is a prime and $ab \equiv 0 \pmod{p}$ then show that either a=0 (mod p)

or $b \equiv 0 \pmod{p}$.



$$\sin^{-1}\Bigl(rac{x}{a}\Bigr)+\sin^{-1}\Bigl(rac{y}{b}\Bigr)=lpha$$
 prove that $rac{x^2}{a^2}+rac{2xy}{ab}{
m cos}lpha+rac{y^2}{b^2}=\sin^2lpha$

If

34. Solve the following LPP graphically

Maximize, Z=20x+30y

Subject to $3x+5y\leq 15$

 $x,y\geq 0.$

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35.
$$\begin{bmatrix} 2 & 5 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 3 & 1 \\ -2 & 3 \end{bmatrix} = \begin{bmatrix} x & y \\ 1 & z \end{bmatrix}$$
 find x,y and z.

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36. Using properties of determinants, prove the following
$$\begin{vmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} = 4a^2b^2c^2.$$

37. If
$$x = \frac{1 - \cos^2 \theta}{\cos \theta}, y = \frac{1 - \cos^{2n} \theta}{\cos^n \theta}$$
 then show that $\left(\frac{dy}{dx}\right)^2 = n^2 \left(\frac{y^2 + 4}{x^2 + 4}\right)$

38. Find the tangent to the curve $y = \cos(x+y), 0 \le x \le 2\pi$ which is

parallel to the line x + 2y = 0

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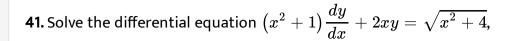
39.
$$\int_{\pi/6}^{\pi/3} rac{dx}{1+\sqrt{\cot x}}$$

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40. Using integration, find the area bounded by the curve $x^2 = 4y$ and

the line y = x.





42. Find a unit vector perpendicular to both of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $b = \hat{i} + 2\hat{j} + 3\hat{k}$.

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43. Find the vector and cartesian equations of the line passing through

the point (2, 1, 3) and perpendicular to the lines $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ and $\frac{x}{-3} = \frac{y}{2} = \frac{z}{5}$.