MATHS

BOOKS - CBSE MODEL PAPER

SAMPLE QUESTION PAPER (MATHEMATICS)

Question

1. Check whether the function $F: R \rightarrow$ R defined as $F(X) = x^2$ is one-one or not.

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2. How many reflexive relations are possible in a set A whose $n(A) = 3$.

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3. A relation R in A = {1,2,3} is defined as ? {(1,1),(1,2),(2,2),(3,3)}. Which element(s) of relation R be removed to make R an equivalence relation?

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4. A relation R in the set of real numbers R defined as $R = \{(a, b) : \sqrt{a} = b\}$is a function or not. Justify

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5. An equivalence relation R in A divides it into equivalence classes A_1, A_2, A_3What is the value of$A_1 \cup A_2 \cup A_3$ and $A_1 \cap A_2 \cap A_3$

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6. If A and B are matrices of order$3 \times n$ and $m \times 5$ respectively, then find the order of matrix 5A – 3B, given that it is defined.

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7. Find the value of $A^2$where A is a 2×2matrix whose elements are given by

$$a_{ij} = \begin{cases} 1 \text{if } & i \neq j \\ 0 \text{ if } & i = j \end{cases}$$

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8. Given that A is a square matrix of order 3×3 and |A| = - 4. Find |adj A|

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9. Let A = $[a_{ij}]$ be a square matrix of order 3×3 and |A|= -7. Find the value of $a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13}$

whereA_{ij} is the cofactor of elementa_{ij}

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10. Find $\int e^x \left(1 - \cot x + \cos ec^2 x\right) dx$

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11. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x^2 \sin x dx$

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12. Find the area bounded by $y = x^2$, the $x -$ axis and the lines $x = -1$ and $x = 1$

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13. How many arbitrary constants are there in the particular solution of the differential equation $\frac{dy}{dx} = -4xy^2, y(0) = 1$

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14. For what value of n is the following a homogeneous differential equation:

$$\frac{dy}{dx} = \frac{x^3 - y^n}{x^2y + xy^2}$$

A. 2

B. 3

C. 1

D. none of these

Answer: B

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15. Find a unit vector in the direction opposite to $-\frac{3}{4}\hat{j}$

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16. Find the area of the triangle whose two sides are represented by the vectors $2\hat{i}$ and $-3\hat{j}$

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17. Find the angle between the unit vectors $\hat{a}$ and $\hat{b}$ given that $|\hat{a}+\hat{b}|=1$

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18. Find the direction cosines of the normal to YZ plane?

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19. Find the coordinates of the point where the line $\frac{x+3}{3}=\frac{y-1}{-1}=\frac{z-5}{-5}$ cuts the XY plane.

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20. The probabilities of A and B solving a problem independently are $\frac{1}{3}$ and $\frac{1}{4}$ respectively. If both of them try to solve the problem independently, what is the probability that the problem is solved?

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21. The probability that it will rain on any particular day is 50%. Find the probability that it rains only on first 4 days of the week.

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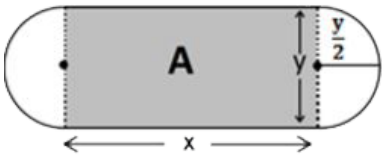
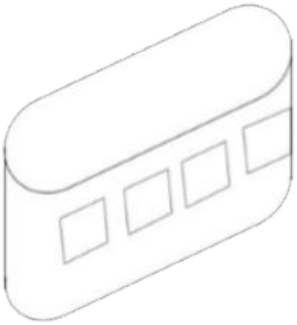
22. An architect designs a building for a multi-national company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200m as shown below:

Design of Floor





Building

based on the above information answer the following

If x and y represents the length and breadth of the rectangular region, then the relation between the variables is

A. $x + \pi y = 100$

B. $2x + \pi y = 200$

C. $\pi x + y = 50$

D. $x + y = 100$

Answer: B

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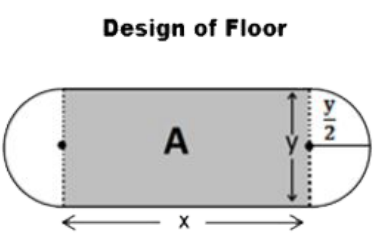

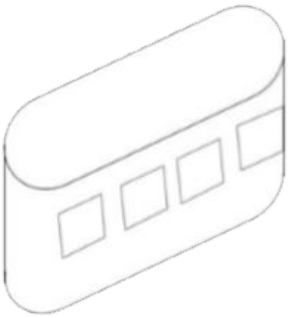

Building

based on the above information answer the following

The area of the rectangular region A expressed as a function of x is

A. $\frac{2}{\pi}(100x - x^2)$

B. $\frac{1}{\pi}(100x - x^2)$

C. $\frac{x}{\pi}(100 - x)$

D. $\pi y^2 + \frac{2}{\pi}(100x - x^2)$

Answer: A

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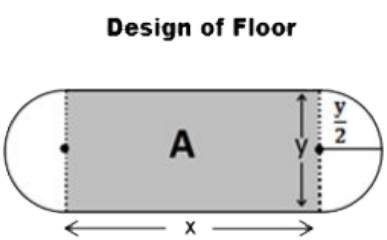

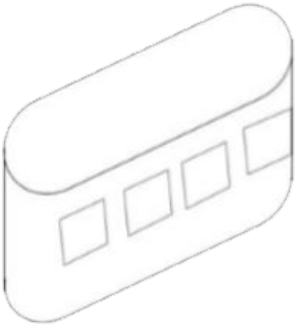

Building

based on the above information answer the following

The maximum value of area A is

A. $\frac{\pi}{3200}m^2$

B. $\frac{3200}{\pi}m^2$

C. $\frac{10000}{\pi}m^2$

D. $\frac{1000}{\pi}m^2$

Answer: C

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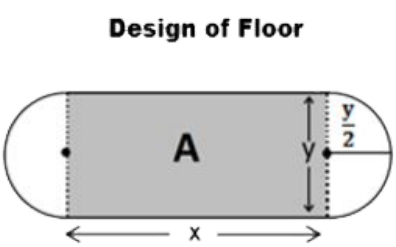
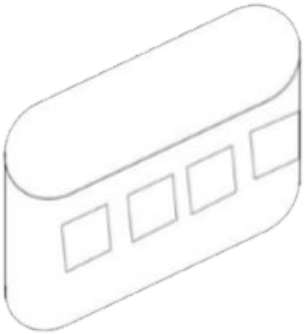
25. An architect designs a building for a multi-national company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200m as shown below:





Building

based on the above information answer the following

The CEO of the multi-national company is interested in maximizing the area of the whole floor including the semi-circular ends. For this to happen the valve of x should be

A. 0m

B. 30 m

C. 50 m

D. 80m

Answer: A

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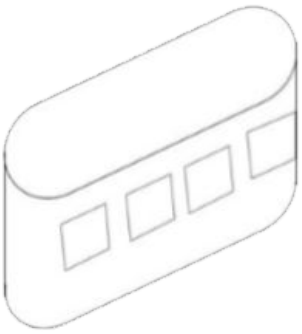
26. An architect designs a building for a multi-national company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200m as shown below:

Design of Floor



Building

based on the above information answer the following

The extra area generated if the area of the whole floor is maximized is :

A. $\frac{3000}{\pi}m^2$

B. $\frac{5000}{\pi}m^2$

C. $\frac{7000}{\pi}m^2$

D. No change Both areas are equal

Answer: D

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27. In an office three employees Vinay, Sonia and Iqbal process incoming copies of a certain form. Vinay process 50% of the forms. Sonia processes 20% and Iqbal the remaining 30% of the forms. Vinay has an error rate of 0.06, Sonia has an error rate of 0.04 and Iqbal has an error rate of 0.03

The conditional probability that an error is committed in processing given that Sonia processed the form is :

A. 0.0210

B. 0.04

C. 0.47

D. 0.06

Answer: B

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28. In an office three employees Vinay, Sonia and Iqbal process incoming copies of a certain form. Vinay process 50% of the forms. Sonia processes 20% and Iqbal the remaining 30% of the forms. Vinay has an error rate of 0.06, Sonia has an error rate of 0.04 and Iqbal has an error rate of 0.03

The probability that Sonia processed the form and committed an error is :

A. 0.005

B. 0.006

C. 0.008

D. 0.68

Answer: C

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29. In an office three employees Vinay, Sonia and Iqbal process incoming copies of a certain form. Vinay process 50% of the forms. Sonia processes 20% and Iqbal the remaining 30% of the forms. Vinay has an error rate of 0.06, Sonia has an error rate of 0.04 and Iqbal has an error rate of 0.03

The total probability of committing an error in processing the form is

A. 0

B. 0.047

C. 0.234

D. 1

Answer: B

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30. In an office three employees Vinay, Sonia and Iqbal process incoming copies of a certain form. Vinay process 50% of the forms. Sonia processes 20% and Iqbal the remaining 30% of the forms. Vinay has an error rate of 0.06, Sonia has an error rate of 0.04 and Iqbal has an error rate of 0.03

)The manager of the company wants to do a quality check. During

inspection he selects a form at random from the days output of processed forms. If the form selected at random has an error, the probability that the form is NOT processed by Vinay is :

A. 1

B. $30/47$

C. $20/47$

D. $17/47$

Answer: D

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31. In an office three employees Vinay, Sonia and Iqbal process incoming copies of a certain form. Vinay process 50% of the forms. Sonia processes 20% and Iqbal the remaining 30% of the forms. Vinay has an error rate of 0.06, Sonia has an error rate of 0.04 and Iqbal has an error rate of 0.03

)Let A be the event of committing an error in processing the form and let E1, E2 and E3 be the events that Vinay, Sonia and Iqbal processed the form. The value of $\sum_{i=1}^{3} P(E_i \mid A)$ is

A. 0

B. 0.03

C. 0.06

D. 1

Answer: D

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32. Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right), \frac{-3\pi}{2} < x < \frac{\pi}{2}$ in the simplest form

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33. If a is a square matrix of order 3 such that $A^2 = 2A$ then find the value of |A|

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34. if $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = 0$.

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35. Find the values (s) of k so that the following function is continuous at x=0 $f(x) = \begin{cases} \frac{1-\cos kx}{x\sin x} & \text{if } x \neq o \\ \frac{1}{2} & If x = 0 \end{cases}$

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36. Find the equation of the normal to the curve $y = x + \frac{1}{x}, x > 0$ perpendicular to the line $3x - 4y = 7$.

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37. $\int \frac{1}{\cos^2 x(1 - \tan x)^2} dx$

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38. Evaluate $\int_0^1 x(1-x)^n dx$

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39. Find the area of the region bounded by the parabola $y^2 = 8x$ and the line $x = 2$

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40. Solve the following differential equation:

$\frac{dy}{dx} = x^3 \cos ecy$ given that $y(0) = 0$.

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41. Find the area of the parallelogram whose one side and a diagonal are represented by coinitial vectors $\hat{i} - \hat{j} + \hat{k}$ and $4\hat{i} + 5\hat{k}$respectively

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42. Find the vector equation of the plane that passes through the point (1,0,0) and contains the line $\overrightarrow{r} = \lambda\hat{j}$

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43. A refrigerator box contains 2 milk chocolates and 4 dark chocolates. Two chocolates are drawn at random. Find the probability distribution of

the number of milk chocolates. What is the most likely outcome?

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44. Given that E and F are events such that $P(E) = 0.8, P(F) = 0.7, P(E \cap F) = 0.6$. Find $P(E \mid F)$

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45. Check whether the relation R in the set Z of integers defined as $R = \{(a, b) : a + b$ is divisible by 2$\}$ is reflexive, symmetric or transitive. Write the equivalence class containing 0 i.e. [0].

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46. If $y = e^{x \sin^2 x} + (\sin x)^x$, find $\frac{dy}{dx}$

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47. Prove that the greatest integer function defined by $f(x) = [x], 0 < x < 2$ is not differentiable at $x = 1$

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48. If $x = a\sec\theta, y = b\tan\theta$ find $\frac{d^2y}{dx^2}$ at $x = \frac{\pi}{6}$

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49. Find the intervals in which the function f given by

$f(x) = \tan x - 4x, x \in \left(0, \frac{\pi}{2}\right)$ is

(a) Strictly increasing (b) strictly decreasing

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50. find $\int \frac{x^2+1}{(x^2+2)(x^2+3)} dx.$

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51. Find the area of the region bounded by the curves

$x^2 + y^2 = 4, y = \sqrt{3}x$ and $x -$ axis in the first quadrant

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52. Find the area of the ellipse $x^2 + 9y^2 = 36$ using integration

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53. Find the general solution of the following differential equation:

$x dy - \left(y + 2x^2\right) dx = 0$

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54. If $\begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, find A^{-1}. Using A^{-1}, solve the system of linear equations $x - 2y = 10, 2x - y - z = 8, -2y + z = 7$.

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55. Evaluate the product AB , where

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$$

hence solve the system of linear equations

$x - y = 3$

$2x + 3y + 4z = 17$

$y + 2z = 7$

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56. Find the shortest distance between the lines

$$\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(\hat{i} + 2\hat{j} + 2\hat{k}\right) \text{ and } \vec{r} = 5\hat{i} - 2\hat{j} + \mu\left(3\hat{i} + 2\hat{j} + 6\right.$$

If the lines intersect find their point of intersection

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57. Find the foot of the perpendicular drawn from the point (-1, 3, -6) to the plane $2x + y - 2z + 5 = 0$Also find the equation and length of the perpendicular

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58. Solve the L.P.P graphically:

Maximize $Z = x + 2y$

subject to constraints ,

$x + 2y \geq 100$

$2x - y \leq 0$

$2x + y \leq 200$

$x, y \geq 0$

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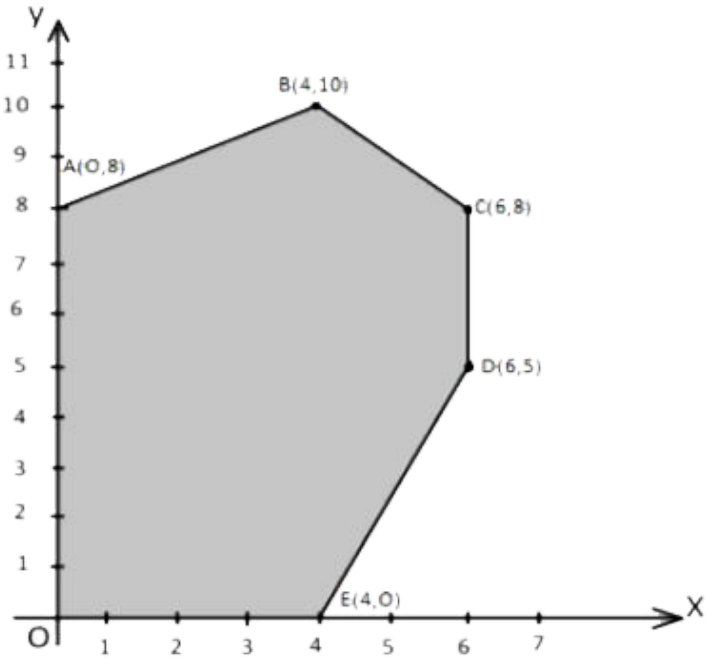
59. The corner points of the feasible region determined by the system of linear constraints are as shown below:



Let $Z = 3x - 4y$ be the objective function. Find the maximum and minimum value of Z and also the corresponding points at which the maximum and minimum value occurs.

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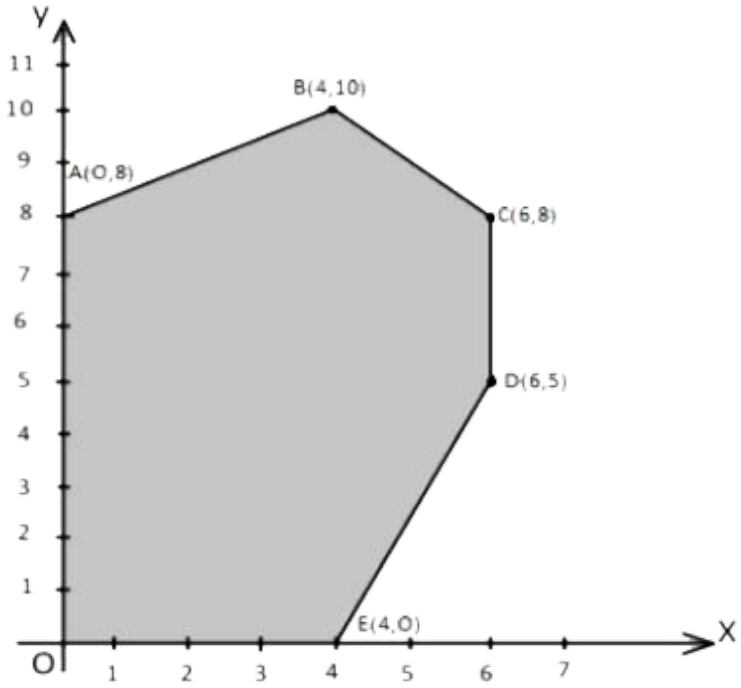
60. The corner points of the feasible region determined by the system of linear constraints are as shown below:



Let $Z = px + qy$ where $p, q > 0$ be the objective function. Find the condition on p and q so that the maximum value of Z occurs at $B(4, 10)$ and $C(6, 8)$Also mention the number of optimal solutions in this case.

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