MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

GOVT. MODEL QUESTION PAPER - 2 (2018 - 19)

Section I

1. If two sets A and B have 17 elements in common, then the number of elements common to the set $A \times B$ and $B \times A$ is

A. 2^{17}

B. 17^2

C. 34

D. insufficient data

Answer: A::B

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2. If $\mathbb{R}$ is the set of all real number and if $f: \mathbb{R} - \{3\} \to \mathbb{R}$ is defined by $f(x) = \frac{3x + x}{3 - x}$ for $x \in \mathbb{R} - \{3\}$, then the range of f is

A. $\mathbb{R}$

B. $\mathbb{R} - \{1\}$

C. $\mathbb{R} - \{-1\}$

D. $\mathbb{R} - \{-3\}$

Answer: A::C

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3. Find a so that the sum and product of the roots of the equation $2x^2 + (a-3)x + 3a - 5 = 0$ are equal is

A. 1

B. 2

C. 0

D. 4

Answer: B

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4. Which one of the following is not true?

A. $|\sin x| \leq 1$

B. $|\sec x| < 1$

C. $|\cos x| \leq 1$

D. $\text{cosec} x > 1 \text{ or } \text{cosec} x \leq -1$

Answer: A::B::C

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5. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots + \cos 179^\circ =$

A. 0

B. 1

C. -1

D. 89

Answer: A

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6. If 10 lines are drawn in a plane such that no two of them are parallel and no three are concurrent, then the total number of points of intersection are

A. 45

B. 40

C. 40!

D. 2^{10}

Answer: A::D

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7. The remainder when 2^{2020} is divided by 15 is

A. 4

B. 8

C. 1

D. 2

Answer: A::C

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8. The HM of two positive numbers whose AM and GM are 16, 8 respectively is

A. 10

B. 6

C. 5

D. 4

Answer: D

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9. In the equation of a striaght line $ax + by + c = 0$, if a,b,c are in arithmetic progression then the point on the straight line is

A. (1,2)

B. (1, -2)

C. (2, -1)

D. (2,1)

Answer: A::B

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10. If the two straight lines $x + (2k - 7)y + 3 = 0$ and $3kx + 9y - 5 = 0$ are perpendicular then the value of k is

A. 3

B. $\frac{1}{3}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: A::C

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11. If $\left|\vec{a}\right| = 13, \left|\vec{b}\right| = 5$ and $\vec{a} \cdot \vec{b} = 60$ then $\left|\vec{a} \times \vec{b}\right|$ is

A. 15

B. 35

C. 45

D. 25

Answer: B::D

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12. A vector $\overrightarrow{OP}$ makes 60° and 45° with the positive direction of x and y axes respectively. Then the angle between $\overrightarrow{OP}$ and z axis is

A. 45°

B. 60°

C. -90°

D. 30°

Answer: B

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13. A vector perpendicular to both $\hat{i}+\hat{j}+\hat{k}$ and $2\hat{i}+\hat{j}+3\hat{k}$ is,

A. $2\hat{i}+\hat{j}-\hat{k}$

B. $2\hat{i}-\hat{j}-\hat{k}$

C. $3\hat{i}+\hat{j}+2\hat{k}$

D. $3\hat{i}+\hat{j}-2\hat{k}$

Answer: A::B

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14. $\lim\ (x \to 0)\dfrac{\sin|x|}{x}$ is

A. 1

B. -1

C. 0

D. does not exist

Answer: D

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15. If $f: R \to R$ is defined by $f(x) = |x-3| + |x-4|$ for $x \in R$ then $\lim\limits_{x \to 3^-} f(x)$ is equal to ..... .

A. -2

B. -1

C. 0

D. 1

Answer: C

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16. if $f(x) = \begin{cases} x^3 & x < 0 \\ 3a + x^2 & x \geq 0 \end{cases}$ is continuous at x = 0 , then a is

A. -2

B. -1

C. 0

D. 1

Answer: C

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17. The derivative of $f(x) = x|x|$ at x = -3 is

A. 6

B. -6

C. does not exist

D. 0

Answer: A

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18. $\int \frac{dx}{x(x+1)}$ is

A. $\log\left|\frac{x+1}{x}\right| + c$

B. $\log\left|\frac{x}{x+1}\right| + c$

C. $\log\left|\frac{x-1}{x}\right| + c$

D. $\log\left|\frac{x}{x-1}\right| + c$

Answer: A::B::C

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19. $\int 2^{3x+5} dx$ is

A. $\frac{3\left(2^{3x+5}\right)}{\log 2} + C$

B. $\frac{2^{3x+5}}{2\log(3x+5)} + C$

C. $\frac{2^{3x+5}}{2\log 3} + C$

D. $\frac{2^{3x+5}}{3\log 2} + C$

Answer: B::C::D

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20. If X and Y be two events such that $P(X/Y) = \frac{1}{2}, P(Y/X) = \frac{1}{3}$ and $P\left(X \bigcap Y\right) = \frac{1}{6}$

, then $P(X \cup Y)$ is

A. $\frac{1}{3}$

B. $\frac{2}{5}$

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

D. $\frac{2}{3}$

Answer: B::C::D

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Section Ii

1. From the graph $y = \cos x$, draw $|y| = \cos x$.

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2. If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$, then prove that xyz = 1.

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3. Show that

$$\tan(45^\circ - A) = \frac{1-\tan A}{1+\tan A}$$

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4. How many ways are there to arrange the letters of the word "Garden" with vowels in the alphabetical order.

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5. Find the sum $1 + \frac{4}{5} + \frac{7}{25} + \frac{10}{125} + \ldots$

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6. Show that the points whose position vectors are $2\hat{i} + 3\hat{j} - 5\hat{k}, 3\hat{i} + \hat{j} - 2\hat{k}$ and $6\hat{i} - 5\hat{j} + 7\hat{k}$ are collinear.

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7. Examine the continuity of the following :

$$\frac{x^2 - 16}{x + 4}$$

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8. Find the derivative of $y = \log_{10} x$ with respect to x.

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9. Evaluate: $\int \frac{\sin x}{1 + \cos x} dx.$

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10. If A = $\begin{bmatrix} 4 & 2 \\ -1 & x \end{bmatrix}$ and such that (A-2I) (A-3I) = 0, find the value of x.

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Section Iii

1. Check the relation R={(1,1),(2,2),(3,3),.....,(n,n)} defined on the set S={1,2,3,.....n) for the three basic relations.

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2. Prove that

$$-\frac{\cot(180^\circ+\theta)\sin(90^\circ-\theta)\cos(-\theta)}{\sin(270^\circ+\theta)\tan(-\theta)\cos ec(360^\circ+\theta)}=\cos^2\theta\cot\theta$$

.

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3. In an examination a student has a answer 5 questions, out of 9 questions in which 2 are compulsory . In how many ways a student can answer the questions ?

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4. Find the co-efficient of x^{15} in $\left(x^2+\frac{1}{x^3}\right)^{10}$

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5. Find the equation of the straight lines, making the y-intercept of 7 and angle between the line and the y-axis is 30°.

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6. Show that $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$

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7. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are vectors with magnitudes 3,4 and 5 respectively and $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

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8. Evaluate: $\int x\log x dx$.

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9. If A and B are mutually exclusive events $P(A)=\frac{3}{8}$ and $P(B)=\frac{1}{8}$, then find

(i) $P\left(\overline{A}\right)$ (ii) $P(A \cup B)$ (iii) $P\left(\overline{A} \cap B\right)$

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10. Evaluate: $\lim_{x \to \infty} \frac{\sqrt{x+2} - \sqrt{2}}{x}$.

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Section Iv

1. If $f, g: \mathbb{R} \to \mathbb{R}$ are defined by $f(x) = |x| - x$, and $g(x) = |x| - x$, find $g \circ f$ and $f \circ g$.

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2. Sovle the linear inequalities and exhibit the solution set graphically:

$x + y \geq 3, 2x - y \leq 5, \ -x + 2y \leq 3.$

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3. In a $\triangle ABC$, prove that a cos A+b cos B+c cos C=2a sin B sin C

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4. Prove that the sun of first n' non-zero even numbers in $n^2 + n$

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5. The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture originally, how many bacteria will be present at the end of 2^{nd} hour, 4^{th} hour and n^{th} hour ?

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6. Show that $\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix} = 0$

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7. Show that the vectors are coplanar

$$\hat{i} - 2\hat{j} + 3\hat{k},\ -2\hat{i} + 3\hat{j} - 4\hat{k},\ -\hat{j} + 2\hat{k}$$

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8. Determine if f defined by

$$f(x) = \begin{cases} x \sin \frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$ is a continuous function?

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9. If $\sin y = x \sin(a + y)$, then prove that $\frac{dy}{dx} = \frac{\sin^2(a + y)}{\sin a}, a \neq n\pi.$

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10. Using the substitution $2x + 1 = t^2$, show that

$$\int \frac{6x}{\sqrt{2x+1}} dx = 2(x-1)\sqrt{2x+1} + c.$$

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11. A construction company employs 2 executive engineers, Engineer I does the work for 60% of jobs of the company. Engineer 2 does the work for 40% of jobs of the company. It is known from the past experience that the probability of an error when engineer does the work is 0.03, whereas the probability of an error in

the work of engineer 2 is 0.04. Suppose a serious error occurs in the work, which engineer would you guess did the work?

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12. At a particular moment, a student needs to stop his speedy bike to avoid a collision with the barrier ahead at a distance 40 meters away from him. Immediately he shows (ratardation) the bike under braking at a rate of 8 $\mathrm{metre}/\mathrm{second}^2$. If the bike is moving at a speed of 24 m/s, when the brakes are applied, would it stop before collision?

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13. Find the separate equation of the following pair of straight lines

$2x^2 - xy - 3y^2 - 6x + 19y - 20 = 0$

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