# CAREER POINT

## MOCK TEST PAPER

## CENTRAL BOARD OF SENIOR SECONDARY EXAMINATION

**SET-1**

**Series CPC**

**Code No. 16/1/M**

Roll No. | | | | | | | | |

Candidates must write the Code on the title page of the answer-book

- Please check that this question paper contains 5 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate
- Please check that this question paper contains **29** questions.
- Please write down the Serial Number of the question before attempting it.
- 15 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

# MATHEMATICS

**Time allowed: 3 hours** **Maximum Marks : 100**

**P.T.O**

***General Instructions* :**

***1.*** *All questions are compulsory.*

***2.*** *The question paper consists of 29 questions divided into three sections A, B and C. Section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each and section C comprises of 07 questions of six marks each.*

***3.*** *All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.*

***4.*** *There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.*

***5.*** *Use of calculators in not permitted. You may ask for logarithmic tables, if required.*

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# SECTION A

**Q.1** Let A = {3, 4, 5} and B = {4, 12, 15}find *R*, where *R* is the relation '*x* divides *y*' from set *A* to *B*. Also find $R^{-1}$. **[1]**

**Q.2** Write the principal value of $\cos^{-1}\cos\left(\frac{5\pi}{3}\right)$ **[1]**

**Q.3** Give an example to show that the relation R in the set of natural numbers, defined by $R = \{(x, y), x, y \in N, x \le y^2\}$ is not transitive. **[1]**

**Q.4** Evaluate : $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$ **[1]**

**Q.5** Find the distance of the point (*a*, *b*, *c*) from *x*-axis. **[1]**

**Q.6** A square matrix *A*, of order 3, has |*A*| = 5, find |*A*. adj *A*|. **[1]**

**Q.7** Find the values of *x* and *y* if

$$2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}.$$ **[1]**

**Q.8** Write the value of $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin^5 x dx$ **[1]**

**Q.9** Find the position vector of mid point of the line segment joining the points $A\ (5\hat{i}\ +\ 3\hat{j}\ )$ and $B\ (3\hat{i} - \hat{j}\ )$. **[1]**

**Q.10** If $\vec{a}\ = 2\hat{i}\ -\ \hat{j}\ +\ 3\hat{k}$ and $\vec{b}\ = (6\hat{i}\ +\lambda\ \hat{j}\ +9\hat{k}\ )$ and $\vec{a}\ \|\ \vec{b}$, find the value of λ. **[1]**

# SECTION B

**Q.11** Find the Probability of drawing a diamond card in each of the two consecutive draws from well shuffled pack of cards, if the card drawn is not replaced after the first draw. **[4]**

**Q.12** Prove that

$$\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right) = \frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$$ **[4]**

**Q.13** Using properties of determinants, prove that **[4]**

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = (1 + a^2 + b^2 + c^2).$$

**Q.14** For what values of $a$ and $b$, the function $f$ defined as :

$$f(x) = \begin{cases} 3ax + b, if\ x < 1 \\ 11, if\ x = 1 \\ 5ax - 2b, if\ x > 1 \end{cases}$$ is continuous at $x$= 1. **[4]**

**Q.15** If $x^y + y^x = a^b$, find $\frac{dy}{dx}$. **[4]**

**Q.16** Find the interval in which the following function is strictly increasing or strictly decreasing $f(x) = 20 - 9x + 6x^2 - x^3$. **[4]**

**Q.17** Evaluate : $\int_{-1}^{\frac{1}{2}} |x\cos(\pi x)|\,dx$ . **[4]**

**Q.18** Solve the following differential equation :

$$ye^{\frac{x}{y}}\,dx = \left(xe^{\frac{x}{y}} + y\right)dy.$$ **[4]**

**Q.19** Solve the following differential equation :

$(1 + y + x^2y)dx + (x + x^3)dy = 0$, where $y = 0$ when $x = 1$. **[4]**

**Q.20** If $\vec{a}$ , $\vec{b}$ and $\vec{c}$ are three unit vectors such that $\vec{a} . \vec{b} = \vec{a} . \vec{c} = 0$ and angle between $\vec{b}$ and $\vec{c}$ is $\frac{\pi}{6}$, prove that $\vec{a} = \pm 2 (\vec{b} \times \vec{c})$. **[4]**

**Q.21** Show that the four points (0, – 1, –1), (4, 5, 1), (3 9, 4) and (–4, 4, 4) are coplanar. Also, find the equation of the plane containing them. **[4]**

**Q.22** Let $N$ be the set of all natural numbers and $R$ be the relation in $N \times N$ defined by $(a, b)\ R\ (c, d)$ if $ad = bc$. Show that $R$ is an equivalence relation. **[4]**

# SECTION C

**Q.23** If $A$ and $B$ are two events such that

$P(A) = 0.5$, $P(B) = 0.6$ and $P(A \cup B) = 0.8$

Find $P\left(\frac{A}{B}\right)$ and $P\left(\frac{B}{A}\right)$. **[6]**

**Q.24** An aeroplane can carry a maximum of 200 passengers. A profit of Rs 1000 is made on each executive class ticket and a profit of Rs. 600 is made on each economy class ticket. The airline reserves at least 20 seats for the executive class. However, at least 4 times as many passengers prefer to travel by economy class, than by the executive class. Determine how many tickets of each type must be sold, in order to maximize profit for the airline. What is the maximum profit. Make an *L.P.P.* and solve it graphically. **[6]**

**Q.25** If $A = \begin{pmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{pmatrix}$. Find $A^{-1}$ and hence solve the following system of equations :

$2x + y + 3z = 3$

$4x - y = 3$

$-7x + 2y + z = 2$ **[6]**

**Q.26** If the length of three sides of a trapezium, other than the base are equal to 10 cm each, then find the area of trapezium when it is maximum. **[6]**

**Q.27** Evaluate : $\int \frac{1}{\sin x(5-4\cos x)}\,dx$. **[6]**

**Q.28** Using integration, find the area of the region

$\left\{(x, y) : |x-1| \le y \le \sqrt{5-x^2}\right\}$ **[6]**

**Q.29** Show that the lines $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$ and $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ are coplanar. Also find the equation of the plane. **[6]**