

**DEFENCE SERVICES TECHNOLOGICAL ACADEMY
ENTRANCE EXAMINATION for TWENTY FIRST INTAKE**

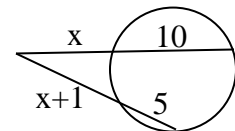
MATHEMATICS (SET A)

Time Allowed : (2) Hours

1. Choose the correct or the most appropriate answer for each question.

Write only the letter of the answer.

- (1) Given that $f(x) = \frac{bx}{ax-4}$, $x \neq \frac{4}{a}$, $b \neq 0$. If $f(1) = -2$ and $f(2) = 2$, then $a+b=$
A. 1 B. 2 C. -1 D. -2 E. 5
- (2) A function f is defined by $f(2+x) = 3-x$. The value of $f(5) =$
A. 1 B. 2 C. 3 D. 4 E. 0
- (3) The function $f: R \rightarrow R$ is such that $f(x) = (\sqrt{2})^x$. If $f(2) = 2^p$ then $p =$
A. 1 B. $\sqrt{2}$ C. 2 D. 4 E. $\frac{1}{2}$
- (4) The remainder when $x^3 + 2x^2 - 5x - 12$ is divided by $x + 2$ is
A. 2 B. -2 C. 4 D. -4 E. 0
- (5) When $(x+1)(4x-1)(4x+k)$ is divided by $2x-1$, the remainder is -3. Then $k=$
A. 4 B. -4 C. 5 D. -5 E. -6
- (6) If $x - 2$ is a factor of $x^{2n+1} + 3x^2 - 44$, then $n =$
A. 2 B. -2 C. 0 D. 1 E. -1
- (7) In the expansion of $(k + 3x)^6$, the coefficient of x^3 is 20, then $k =$
A. 3 B. $-\frac{1}{3}$ C. $\frac{1}{3}$ D. -3 E. ± 3
- (8) ${}^{20}C_{18} =$
A. 100 B. 95 C. 200 D. 190 E. non of these
- (9) The solution set of the inequation $(2x - 3)^2 < 0$ is
A. $\{0\}$ B. R C. $\{2\}$ D. $\{1.5\}$ E. \emptyset
- (10) if $x^2 - 5 < 4$ then
A. $-3 < x < 3$ B. $x < 3$ C. $x < -3$ D. $x < -4$ E. non of these
- (11) The first term of an A.P. is 5, the last term 45 and the sum 400. Then the number terms is
A. 16 B. 8 C. 15 D. 14 E. 12
- (12) The sum to infinity of the G.P. 3, 0.3, 0.03, ... is
A. $\frac{10}{3}$ B. $\frac{3}{10}$ C. $\frac{11}{10}$ D. $\frac{10}{11}$ E. $\frac{11}{9}$
- (13) The sum of the A.M. and G.M. between 3 and 27
A. 16 B. 18 C. 20 D. 22 E. 24
- (14) Let $A = \begin{bmatrix} 1 & -2 \\ 4 & a \end{bmatrix}$. If $\det(3A) = 3\det A$, then $a =$
A. 8 B. -8 C. 4 D. -4 E. 6
- (15) Let $\begin{bmatrix} x^2 & 0 \\ 0 & 1 \end{bmatrix} = 1$, then $x =$
A. 0 B. 1 C. -1 D. ± 1 E. 2
- (16) The probability that an event A will occur is twice the probability that it will not occur. The expected number of times that A will not occur in 600 trials is
A. 400 B. 360 C. 300 D. 240 E. 200
- (17) A box contains 5 cards numbered as 2, 3, 4, 5 and 9. If a card is chosen, then the probability of getting a number not greater than 4 is
A. $\frac{2}{3}$ B. $\frac{3}{5}$ C. $\frac{2}{5}$ D. $\frac{1}{5}$ E. $\frac{1}{3}$
- (18) The coin is tossed 3 times, the probability of getting exactly 2 tails and a head is
A. $\frac{2}{8}$ B. $\frac{3}{8}$ C. $\frac{4}{8}$ D. $\frac{5}{8}$ E. $\frac{6}{8}$
- (19) The opposite angle of a cyclic quadrilateral are such that the larger angle is 30° greater than the smaller angle. Then the degree measure of the larger angle is
A. 105° B. 110° C. 75° D. 80° E. non of these
- (20) In the Figure $x=$
A. 2 B. 4 C. 3
D. 1 E. 2.5
- (21) The angle in semicircle is
A. 45° B. 75° C. 35° D. 90° E. 180°



- (22) If area of two similar triangles are 16 sq.cm and 36 sq.cm respectively. Then the ratio of their altitudes is
 A. 4:9 B. 16:81 C. 4:13 D. 2:3 E. 8:9
- (23) Two corresponding altitudes of two similar triangles are 8 cm and 10 cm. Then $\alpha(\text{smaller}\Delta) : \alpha(\text{larger}\Delta) =$
 A. 4:5 B. 3:4 C. 9:25 D. 9:16 E. 16:25
- (24) In ΔABC , D is a point on AC such that $AD=2CD$. E is on BC such that $DE\parallel AB$. IF $\alpha(\Delta CAB) = 36$, then $\alpha(\Delta CDE) =$
 A. 1 B. 2 C. 3 D. 4 E. 5
- (25) The map of the point (4, 0) which rotates through an angle of 270° about the origin O in anticlockwise direction is
 A. (0, 4) B. (1, 4) C. (4, 1) D. (0, -4) E. (-4, 0)
- (26) The magnitude of the vector $9\hat{i} - 40\hat{j}$ is
 A. 37 B. 39 C. 41 D. 43 E. 49
- (27) If A, B, C are the angles of a triangle and $\tan A = 1$ and $\tan B = 2$, then $\tan C =$
 A. 1 B. 2 C. 3 D. -3 E. -1
- (28) The gradient of the curve $y = x^3 - 3x^2 + 5x$ at the point where $x = 2$ is
 A. 2 B. 3 C. 4 D. 5 E. 6
- (29) The curve $y = 2x - x^2$ has a stationary point at
 A. (1, 1) B. (1, -1) C. (-1, -1) D. (1, 0) E. (-1, 1)
- (30) $\lim_{x \rightarrow \infty} \frac{x^3(3-7x)}{x^4-2} =$
 A. 3 B. 5 C. -3 D. 7 E. -7 (30 marks)
2. Two Functions are defined by $f(x) = \frac{1}{x+1}, x \neq -1$ and $g(x) = \frac{x}{x-2}, x \neq 2$. Find the values of x for which $(f \cdot g)(x) + (g \cdot f)(x) = 0$ (10 marks)
3. The expression $2x^3 + bx^2 - cx + d$ leaves the same remainder when divided by $x-1$ or $x+2$ or $2x-1$. Evaluate b and c . Given also that the expression is exactly divisible by $x-2$, evaluate d . (10 marks)
4. The first three terms of an arithmetic progression are $4p^2 - 10, 8p$ and $4p + 3$ respectively. Find two possible values of p . If p is positive and then the n^{th} term of the progression is -93, find the value of n . (10 marks)
5. Find the inverse of the matrix $\begin{bmatrix} 3 & 2 \\ -5 & 1 \end{bmatrix}$, and use it to solve the following system of equations.
 $y - 5x = 7$
 $3x + 2y = 1$ (10 marks)
6. Given circle O, diameter PQ and RS chord intersect at X, $OX=XQ, RX=12\text{cm}, XS=9\text{cm}$, then find the radius of the circle. (10 marks)
7. $\tan \alpha = \frac{1}{2}, \tan(\alpha + \beta) = 1$ and $\tan(\alpha + \beta + \gamma) = \frac{5}{3}$. Without using tables, calculate the values of $\tan \beta$ and $\cot 2\gamma$. (10 marks)
8. If $y = \ln \frac{x^2}{x^2+1}$, find the rate of change of y with respect to x at $x = 2$. Find also $\frac{dz}{dx}$, if $x^3 - 4xz + z^2 = 14$. (10 marks)