

数学 CSCA March 2026

Instruction: Each question has four options among which only one is correct.

Question 1 Let $A = \{x \mid -2 < x \leq 3\}$ be a set. Which of the following statements is correct?

- (A) $-3 \in A$
- (B) $3 \in A$
- (C) $-2 \in A$
- (D) $2 \notin A$

Question 2 Let $M = \{x \mid -5 \leq x < 2\}$, $N = \{x \mid -4 \leq x \leq 2\}$ be two sets. Then $M \cap N =$

- (A) $[-4, 2)$
- (B) $(-5, 2)$
- (C) $[-5, 2]$
- (D) $(-4, 2)$

Question 3 The solution set of the inequality $x^2 - x - 6 > 0$ is

- (A) $\{x \mid x < -2 \text{ or } x > 3\}$
- (B) $\{x \mid -2 < x < 3\}$
- (C) $\{x \mid x > 3\}$
- (D) $\{x \mid x < -2\}$

Question 4 The domain of the function $f(x) = \frac{1-x^2}{1-x}$ is

- (A) $(-\infty, 0) \cup (0, +\infty)$
- (B) $\mathbb{R}$
- (C) $(-\infty, -1) \cup (-1, +\infty)$
- (D) $(-\infty, 1) \cup (1, +\infty)$

Question 5 If $a = -2$, $ab < 0$, then the point (a, b) belongs to

- (A) the third quadrant
- (B) the fourth quadrant
- (C) the second quadrant
- (D) the first quadrant

Question 6 Let $\alpha = \frac{5}{6}\pi$. Then $\cos \alpha =$

- (A) $-\frac{\sqrt{3}}{2}$
- (B) $\frac{\sqrt{3}}{2}$
- (C) $-\frac{1}{2}$
- (D) $\frac{1}{2}$

Question 7 Over its domain, the function $f(x) = \ln(x^2)$ is

- (A) uncertain about its parity
- (B) neither odd nor even
- (C) odd
- (D) even

Question 8 The inverse function of $y = \frac{3x - 2}{2x + 1}$ is

- (A) $y = \frac{x + 2}{2x - 3}$
- (B) $y = \frac{2x - 3}{x + 2}$
- (C) $y = -\frac{2x - 3}{x + 2}$
- (D) $y = -\frac{x + 2}{2x - 3}$

Question 9 The function $f(x) = \sin x$ is monotonic increasing over

- (A) $[-\frac{\pi}{2}, \frac{\pi}{2}]$
- (B) $[-\pi, \pi]$
- (C) $(-\infty, +\infty)$
- (D) $[0, \pi]$

Question 10 Let $\{a_n\}$ be an arithmetic sequence, with the first term $a_1 = 2$ and common difference $d = 3$. Then $a_{100} =$

- (A) 298
- (B) 299
- (C) 302
- (D) 305

Question 11

The solution set of the inequality

$$\frac{2x - 3}{3x - 4} \leq 0$$

is ().

- (A) $[\frac{4}{3}, \frac{3}{2})$
- (B) $(\frac{4}{3}, \frac{3}{2})$
- (C) $(\frac{4}{3}, \frac{3}{2}]$
- (D) $[\frac{4}{3}, \frac{3}{2}]$

Question 12

The geometric mean of 3 and 12 is ()

- (A) ± 10
- (B) ± 8
- (C) ± 4
- (D) ± 6

Question 13

The angle of inclination of the line $x + \sqrt{3}y - 2 = 0$ is ()

- (A) 150°
- (B) 60°
- (C) 30°
- (D) 120°

Question 14

If a triangle $\triangle ABC$ has sides $BC = 5$, $AC = 12$, $AB = 13$, then $\sin A$ is ().

- (A) $\frac{5}{13}$
- (B) $\frac{5}{12}$

(C) $\frac{12}{13}$

(D) $\frac{7}{12}$

Question 15

In a geometric sequence $\{a_n\}$, if $a_1 = 4$ and $a_4 = 32$, then a_3 is ()

(A) 8

(B) 16

(C) -8

(D) -16

Question 16

Which of the following points is in the third quadrant? ()

(A) $(1, 2)$

(B) $(1, -2)$

(C) $(-1, -2)$

(D) $(-1, 2)$

Question 17

Let $A(-2, -1)$ and $B(a, 3)$ be two points, and $|AB| = 5$. Then the value of a is ()

(A) ± 5

(B) ± 1

(C) -1 or 5

(D) 1 or -5

Question 18

Suppose that a line l passes through two points $M(0, -1)$ and $N(-2, 0)$. Then the equation of l is ()

(A) $2x + y + 2 = 0$

(B) $x + y + 2 = 0$

(C) $2x + y + 1 = 0$

(D) $x + 2y + 2 = 0$

Question 19

Which of the following inequalities is correct? ()

- (A) $2.1^{\frac{2}{3}} > 1.2^{\frac{2}{3}}$
- (B) $2.1^{-2} > 1.2^{-2}$
- (C) $3^{2.25} > 3^3$
- (D) $0.75^{-0.2} > 0.75^{-0.4}$

Question 20

A circle centered at $A(-3, 2)$, with a radius 3 has equation ()

- (A) $(x - 3)^2 + (y + 2)^2 = 3$
- (B) $(x + 3)^2 + (y - 2)^2 = 9$
- (C) $(x - 3)^2 + (y + 2)^2 = 9$
- (D) $(x + 3)^2 + (y - 2)^2 = 3$

Question 21

Which of the following is correct? ()

- (A) $\tan x = \frac{\cos x}{\sin x} \quad (\sin x \neq 0)$
- (B) $\tan x = \frac{\sin x}{\cos x} \quad (\cos x \neq 0)$
- (C) $\tan x = \frac{1}{\sin x} \quad (\sin x \neq 0)$
- (D) $\tan x = \frac{1}{\cos x} \quad (\cos x \neq 0)$

Question 22

In an arithmetic sequence $\{a_n\}$, if $a_1 = 1$ and its common difference $d = 2$, then $a_{10} = ()$

- (A) 19
- (B) 17
- (C) 15
- (D) 21

Question 23

Let $a > b$. Then which of the following is correct? ()

- (A) $a^3 > b^3$
- (B) $|a| > |b|$
- (C) $a^2 > b^2$
- (D) $|a| < |b|$

Question 24

Which of the following is the equation of a circle with center $(-3, 2)$ and radius 2? ()

- (A) $(x + 3)^2 + (y - 2)^2 = 16$
- (B) $(x + 3)^2 + (y - 2)^2 = 4$
- (C) $(x - 3)^2 + (y + 2)^2 = 4$
- (D) $(x - 3)^2 + (y + 2)^2 = 16$

Question 25

If an exponential function $y = a^x$ is monotonic increasing on $\mathbb{R}$, then the range of a is ()

- (A) $a > 1$
- (B) $a < 0$ or $a > 1$
- (C) $0 < a < 1$
- (D) $a > 0$

Question 26

If $\sin a = \frac{\sqrt{3}}{3}$, then $\cos 2a = ()$

- (A) $\frac{2}{3}$
- (B) $\frac{1}{3}$
- (C) $-\frac{1}{3}$
- (D) $-\frac{2}{3}$

Question 27

If three lines $ax + 2y + 8 = 0$, $4x + 3y = 10$ and $2x - y = 10$ intersect at one point, then $a = ()$

- (A) 1
- (B) -1
- (C) 3
- (D) -3

Question 28

Let $mx^2 + ny^2 = 1$ be a hyperbola. Then m, n satisfy ()

- (A) $mn > 1$
- (B) $mn < 0$
- (C) $mn < 1$

(D) $mn > 0$

Question 29

Let $a = \lg 4$, $b = \lg 5$. Then $a + 2b = ()$

(A) 100

(B) 4

(C) 5

(D) 2

Question 30

The distance between the points $P(-1, 2)$ and $Q(3, 1)$ is $()$.

(A) $\sqrt{5}$

(B) 5

(C) $\sqrt{13}$

(D) $\sqrt{17}$

Question 31

The minimum positive period of the function $f(x) = 3 \cos \left(4x - \frac{\pi}{3} \right)$ is $()$

(A) $\frac{\pi}{4}$

(B) 2π

(C) $\frac{\pi}{2}$

(D) $\frac{\pi}{3}$

Question 32

The equation of the directrix of the parabola $y = -\frac{1}{4}x^2$ is $()$

(A) $y = \frac{1}{16}$

(B) $x = \frac{1}{16}$

(C) $y = 1$

(D) $x = 1$

Question 33

The line that is parallel to $4x - 2y - 1 = 0$ is $()$

(A) $x + 2y - 1 = 0$

(B) $2x - y - 1 = 0$

(C) $2x + y - 1 = 0$

(D) $x - 2y - 1 = 0$

Question 34

Suppose that $\cos \alpha = -\frac{1}{2}$, $\alpha \in (\frac{\pi}{2}, \pi)$, then the value of $\sin \frac{\alpha}{2}$ is ().

(A) $\frac{\sqrt{3}}{2}$

(B) $-\frac{\sqrt{3}}{2}$

(C) $-\frac{1}{2}$

(D) $\frac{1}{2}$

Question 35

Let α, β be acute angles. Then which of the following is correct? ()

(A) $\sin \alpha + \sin \beta < \sin(\alpha + \beta)$

(B) $\cos(\alpha - \beta) < \cos(\alpha + \beta)$

(C) $\cos \alpha \cos \beta < \cos(\alpha + \beta)$

(D) $\sin(\alpha - \beta) < \sin(\alpha + \beta)$

Question 36

The range of the function $f(x) = \frac{1}{1+|x|}$ ($x \in \mathbb{R}$) is ()

(A) $(0, 1]$

(B) $[0, 1]$

(C) $[0, 1)$

(D) $(0, 1)$

Question 37

The equation of the directrix of the parabola $y^2 = -x$ is ()

(A) $x = \frac{1}{4}$

(B) $x = \frac{1}{2}$

(C) $x = -\frac{1}{4}$

(D) $x = -\frac{1}{2}$

Question 38

If $\cos \alpha = \frac{1}{3}$ and $-\frac{\pi}{2} < \alpha < 0$, then $\tan \frac{\alpha}{2} = ()$

(A) $-\sqrt{2}$

(B) $\frac{\sqrt{2}}{2}$

(C) $-\frac{\sqrt{2}}{2}$

(D) $\sqrt{2}$

Question 39

If $\sin \alpha = \frac{1}{3}$, then $\cos \left(\frac{\pi}{2} + \alpha \right) = ()$

(A) $-\frac{1}{3}$

(B) $-\frac{2\sqrt{2}}{3}$

(C) $\frac{1}{3}$

(D) $\frac{2\sqrt{2}}{3}$

Question 40

Which of the following descriptions about the function $f(x) = \tan x$ is incorrect? ()

(A) $f(x)$ satisfies $f(-x) = -f(x)$ on its domain

(B) $f(x)$ is even

(C) $f(x)$ is monotonic increasing over $(-\frac{\pi}{2}, \frac{\pi}{2})$

(D) $f(x)$ has exactly one zero on the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$

Question 41

In a sequence $\{a_n\}$, if $a_1 = \frac{1}{2}$ and $\frac{1}{a_{n+1}} = \frac{1}{a_n} + 1, n \geq 1$, then $a_6 = ()$

(A) $\frac{1}{7}$

(B) $\frac{1}{6}$

(C) $\frac{1}{9}$

(D) $\frac{1}{8}$

Question 42

Let $f(x) = \log_5(2x + 1)$. Then the solution set of $f(x) \geq 0$ is ()

(A) $\{x \mid x > 1\}$

(B) $\{x \mid x > 0\}$

(C) $\{x \mid x \geq 0\}$

(D) $\{x \mid x \geq 1\}$

Question 43

Suppose that the major axis of an ellipse is 10, the two foci F_1, F_2 are located at $(3,0)$ and $(-3,0)$. The equation of the ellipse is ()

- (A) $\frac{x^2}{25} + \frac{y^2}{16} = 1$
- (B) $\frac{x^2}{16} + \frac{y^2}{9} = 1$
- (C) $\frac{x^2}{9} + \frac{y^2}{25} = 1$
- (D) $\frac{x^2}{16} + \frac{y^2}{25} = 1$

Question 44

Let $\vec{a} = (-2, 3)$, $\vec{b} = (2, 1)$. Then $\vec{a} - 2\vec{b} = ()$

- (A) $(-6, 1)$
- (B) $(-6, -1)$
- (C) $(6, -1)$
- (D) $(6, 1)$

Question 45

Suppose that a straight line l is perpendicular to another line $l_1 : x + 2y + 4 = 0$, and passes through the intersection of $l_2 : x + y + 1 = 0$ and $l_3 : 2x + y - 1 = 0$. The equation of l is ()

- (A) $2x - y - 7 = 0$
- (B) $x - 2y - 1 = 0$
- (C) $2x + y - 5 = 0$
- (D) $x + 2y - 3 = 0$

Question 46

Suppose that z_1 and z_2 are two roots of the equation $z^2 - 2z + 2 = 0$. Let $a_n = (z_1^n - z_2^n)^2$. Then $a_4 = ()$.

- (A) 32
- (B) -64
- (C) 0
- (D) -32

Question 47

Suppose that $a_n = 2^{n+1} - 3n$, $n \geq 1$. Let S_n be the sum of the first n terms of the sequence. Then $S_n = ()$

(A) $2^{n+2} - \frac{3n(n+1)}{2} + 4$

(B) $2^{n+2} - 3n - 4$

(C) $2^{n+2} + \frac{3n(n+1)}{2} - 4$

(D) $2^{n+2} - \frac{3n(n+1)}{2} - 4$

Question 48

A bag contains five balls identical in size and shape, including two red balls, labeled 1 and 2, two black balls, labeled 1 and 2, one white ball, labeled 1. Two balls are drawn randomly without replacement. The probability that the balls have different colors, and the probability that at least one of the two balls is labeled 1 are () respectively.

(A) $\frac{4}{5}, \frac{9}{10}$

(B) $\frac{3}{5}, \frac{7}{10}$

(C) $\frac{3}{5}, \frac{9}{10}$

(D) $\frac{4}{5}, \frac{7}{10}$