



Habib University
shaping futures

Science and Engineering Entrance Exam (SEE) College-Level Math

College-level Math

The College Level Math test measures students' ability to solve problems that involve college-level mathematics concepts. There are 20 questions on this test and six content areas measured on this test:

1. **Algebraic Operation:** The Algebraic Operations content area includes simplification of rational algebraic expressions, factoring and expanding polynomials, and manipulating roots and exponents.
 - Addition of algebraic fractions
 - Addition and subtraction of expressions involving absolute value
 - Operations with polynomials
 - Multiplication, division, and simplification of algebraic fractions
 - Operations with exponents
 - Powers, roots, radicals
 - Factoring quadratic expressions
2. **Solutions of Equations and Inequalities:** The Solutions of Equations and Inequalities content area includes the solution of linear and quadratic equations and inequalities, systems of equations, and other algebraic equations.
 - Linear equations and inequalities
 - Quadratic equations
 - Systems of equations and inequalities
 - Exponential equations
 - Equations of degree greater than 2
3. **Coordinate Geometry:** The Coordinate Geometry area presents questions involving plane geometry, the coordinate plane, straight lines, conics, sets of points in the plane, and graphs of algebraic functions.
 - The coordinate plane
 - Straight lines
 - Conics
 - Locus of points
 - Graphs of algebraic functions
4. **Applications and other Topics:** The Applications and other Algebra Topics area contain complex numbers, series and sequences, determinants, permutations and combinations, factorials, and word problems
 - Translation
 - Complex numbers
 - Series and Sequences

- Determinants
 - Permutations and combinations
 - Factorials
 - Polygons
5. **Functions:** The Functions content area includes questions involving polynomial, algebraic, exponential, and logarithmic functions.
- Functions of degree greater than 2
 - Exponents and logarithms
 - Graphical properties, exponential and logarithmic functions
 - Domain and range
 - Composition of functions
 - Inverse functions
 - Computations with simple functions
 - Periodicity, amplitude, and other properties
6. **Trigonometry:** The Trigonometry area includes trigonometric functions. Fundamental definitions of trig functions
- Right triangle trigonometry and circular functions
 - Laws of sines and cosines
 - Graphs of trigonometric functions
 - Trigonometric equations and inequalities
 - Trigonometric identities
 - Trigonometric functions of two angles
 - Inverse trigonometric functions

Sample Questions

For each of the questions below, choose the best answer from the four choices given. You may use the paper you received as scratch paper.

1. $2^{5/2} - 2^{3/2}$

- A. $2^{1/2}$
- B. 2
- C. $2^{3/2}$
- D. $2^{5/3}$
- E. 2^2

2. If $a \neq b$ and $\frac{1}{x} + \frac{1}{a} = \frac{1}{b}$, then $x =$

- A. $\frac{1}{b} - \frac{1}{a}$
- B. $b - a$
- C. $\frac{1}{ab}$
- D. $\frac{a-b}{ab}$
- E. $\frac{ab}{a-b}$

3. If $3x^2 - 2x + 7 = 0$, then $\left(x - \frac{1}{3}\right)^2 =$

- A. $\frac{20}{9}$
- B. $\frac{7}{9}$
- C. $-\frac{7}{9}$
- D. $-\frac{8}{9}$
- E. $-\frac{20}{9}$

4. The graph of which of the following equations is a straight line parallel to the graph of $y = 2x$?

- A. $4x - y = 4$
- B. $2x - 2y = 2$
- C. $2x - y = 4$
- D. $2x + y = 2$
- E. $x - 2y = 4$

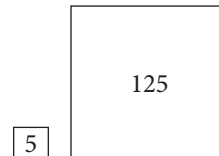
5. An equation of the line that contains the origin and the point $(1, 2)$ is

- A. $y = 2x$
- B. $2y = x$
- C. $y = x - 1$
- D. $y = 2x + 1$
- E. $\frac{y}{2} = x - 1$

6. An apartment building contains 12 units consisting of one- and two-bedroom apartments that rent for \$360 and \$450 per month, respectively. When all units are rented, the total monthly rental is \$4,950. What is the number of two-bedroom apartments?

- A. 3
- B. 4
- C. 5
- D. 6
- E. 7

7. If the two square regions in the figures below have the respective areas indicated in square yards, how many yards of fencing are needed to enclose the two regions?



- A. $4\sqrt{130}$
- B. $20\sqrt{10}$
- C. $24\sqrt{5}$
- D. 100
- E. $104\sqrt{5}$

8. If $\log_{10} x = 3$, then $x =$

- A. 3^{10}
- B. 1,000
- C. 30
- D. $\frac{10}{3}$
- E. $\frac{3}{10}$

9. If $f(x) = 2x + 1$ and $g(x) = \frac{x-1}{2}$, then $f(g(x)) =$

- A. x
- B. $\frac{x-1}{4x+2}$
- C. $\frac{4x+2}{x-1}$
- D. $\frac{5x+1}{2}$
- E. $\frac{(2x+1)(x-1)}{2}$

10. If θ is an acute angle and $\sin \theta = \frac{1}{2}$, then $\cos \theta =$

- A. -1
- B. 0
- C. $\frac{1}{2}$
- D. $\frac{\sqrt{3}}{2}$
- E. 2

11. $5y(2y - 3) + (2y - 3) =$

- A. $(5y + 1)(2y + 3)$
- B. $(5y + 1)(2y - 3)$
- C. $(5y - 1)(2y + 3)$
- D. $(5y - 1)(2y - 3)$
- E. $10y(2y - 3)$

12. For what real numbers x is $x^2 - 6x + 9$ negative?

- A. $-3 < x < 3$
- B. $x < -3$ or $x > 3$
- C. $x = -3$ or $x = 3$
- D. $0 < x < 6$
- E. For no real numbers x

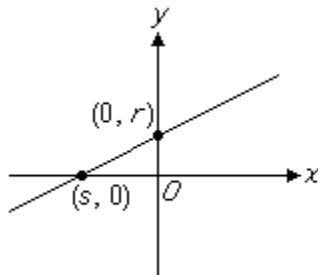
13. A root of $x^2 - 5x - 1 = 0$ is

- A. $\frac{1 - \sqrt{29}}{2}$
- B. $\frac{5 - \sqrt{17}}{2}$
- C. $\frac{1 + \sqrt{29}}{2}$
- D. $\frac{5 + \sqrt{17}}{2}$
- E. $\frac{5 + \sqrt{29}}{2}$

14. In the xy -plane, the graph of $y = x^2$ and the circle with center $(0,1)$ and radius 3 have how many points of intersection?

- A. None
- B. One
- C. Two
- D. Three
- E. More than three

15.



If an equation of the linear function in the figure above is $y = mx + b$, then $m =$

- A. $-\frac{r}{s}$
- B. $\frac{r}{s}$
- C. rs
- D. r
- E. $-s$

16. One ordering of the letters T, U, V and W from left to right is $UTVW$. What is the total number of orderings of these letters from left to right, including $UTVW$?

- A. 8
- B. 12
- C. 16
- D. 20
- E. 24

17. If $f(x) = \frac{3x-1}{2}$ and f^{-1} is the inverse of f , what is the value of $f^{-1}(3)$?

- A. $\frac{1}{3}$
- B. $\frac{2}{3}$
- C. 1
- D. 2
- E. $\frac{7}{3}$

18. The sequence $\{a_n\}$ is defined by $a_0 = 1$ and

$a_{n+1} = 2a_n + 2$ for $n = 0, 1, 2, \dots$. What is the value of a_3 ?

- A. 8
- B. 10
- C. 16
- D. 20
- E. 22

19. From 5 employees at a company, a group of 3 employees will be chosen to work on a project. How many different groups of 3 employees can be chosen?

- A. 3
- B. 5
- C. 6
- D. 10
- E. 15

20. If $f(x) = \left(\frac{1}{3}\right)^x$ and $a < b$, which of the following must be true?

- A. $f(a) + f(b) = 3$
- B. $f(a) + \frac{1}{3} = f(b)$
- C. $f(a) = f(b)$
- D. $f(a) < f(b)$
- E. $f(a) > f(b)$

Answer Key

Question Number	Answer
1	C
2	E
3	E
4	C
5	A
6	E
7	C
8	B
9	A
10	D
11	B
12	E
13	E
14	C
15	A
16	E
17	E
18	E
19	D
20	E