

## Toronto Academy of *English, Mathematics* and *Coding*

### Mathematics Terminology Diagnostic Test

The primary purpose of this test is determine if a student is adequately prepared to read and understand mathematical terminologies in the English language. Depending on the student's performance on this test, our staff at EMC will formulate an individualized study plan to help the student improve his/her reading skills in mathematics in the shortest possible time.

#### Mathematical/mathematically related terminologies used in this test

*absolute value; arc length; area; arithmetic progression; average; axis of symmetry; chord of a circle; circle; coefficient; common ratio of a geometric progression; completing the square; conjugate; counterclockwise; cube root; cubes; decreasing order; degrees of polynomials; diagonal of a rectangle; diameter of a circle; difference; distance between two points; divisors; domain of a function; equilateral triangle; even integer; even function; geometric progression; height of a triangle; horizontal asymptote; hundreds digit; hypotenuse; inscribed; intercepts; intersects; intersection of sets; intervals notation; isosceles triangle; lowest common denominator; lowest common multiple; normal vector; obtuse angles; odd integer; odd function; opens downwards; origin; parabola; percentages; perimeter; period; periodic; permutations; perpendicular; plane; polynomials; positive; power of  $x$ ; prime numbers; product; probability; proportion; quadrilateral; quadrupled; quotient of polynomials under division; radius of a circle; range of a function; ratio; rationalize; reciprocals; remainder of a polynomial under division; right-angled triangle; roots of an equation; sector of a circle; slope of a line; sphere; subsets; sum; supplementary angles; system of linear equations; tangent; terms of a sequence; translation of a graph of a function; union of sets; vertex; vertical asymptote; volume; zero of a function.*

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**Question 1** Find the average of the numbers 2,  $-11$ , 3, 3, 13.

**Question 2** Arrange the following numbers in decreasing order:  $-3$ , 4, 7, 0, 22,  $-1$

**Question 3** Which two distinct numbers from 2,  $-3$ ,  $-7$ , 14 will give the smallest product? Which two will give the largest difference? Which two will give the smallest sum?

**Question 4** The proportion of girls in a class is 0.75. If there are a total of 30 students in the class, how many are girls?

**Question 5** Write down all prime numbers between 80 to 100.

**Question 6** List all the positive divisors of 6.

**Question 7** What is the lowest common multiple of 12 and 16?

**Question 8** What is the hundreds digit in 2731?

**Question 9** The cube root of a real number is between 5 and 6. What are the possible values for this number?

**Question 10** Find the number of odd integers among  $1, 2, \dots, 11$ .

**Question 11** A right-angled triangle has an area of 20 square units and its shortest side is 5 units long. How long is the hypotenuse?

**Question 12** One side of a rectangle is 8 units long and its diagonal is 10 units long. How long is the other side?

**Question 13** Two sides of an isosceles triangle have lengths 7 and 5. How large can the length of the remaining side be?

**Question 14** Express 26 as a difference of cubes.

**Question 15** The perimeter of a square is 20 units. How long is each of its sides?

**Question 16** Find the height of an equilateral triangle if one of its sides is 9 units long.

**Question 17** The cube of a number is twice the number. Find this number.

**Question 18** Give an example of a quadratic equation having  $-2$  and  $1$  as its roots.

**Question 19** A circle has radius of length 5 units. The arc length of a sector on this circle is 10 units. Find the area of this sector.

**Question 20** How many obtuse angles can a triangle have?

**Question 21** What is the slope of the line  $3x - y = 1$ ?

**Question 22** The line  $y = 3x - 1$  intersects the line  $2x + y = 3$  at which point?

**Question 23** In terms of percentages, which is a larger increase, from 17 to 20 or from 30 to 35?

**Question 24** Find the sum of the reciprocals of the numbers 2, 3, 4.

**Question 25** How many integers between 1 and 20 are divisible by 3?

**Question 26** The ratio between two positive numbers is 1.5. If the larger number is 10, what is the smaller number?

**Question 27** Give a point that lies one thirds of the way from  $A(1, 2)$  to  $B(4, 11)$ .

**Question 28** Find the value(s) of  $x$  if the absolute value of  $3x - 7$  is no more than 2.

**Question 29** Write down the conjugate of  $\sqrt{2x - 3} + 1$ .

**Question 30** Rationalize  $\frac{3}{\sqrt{5}-7}$ .

**Question 31** What is the coefficient of the highest power of  $x$  when  $(3 - 2x)(1 - 3x)$  is expanded and simplified?

**Question 32** The distance between  $(1, -2)$  and  $(4, b)$  is at least 10 units long. What conditions must  $b$  satisfy?

**Question 33** Two angles in a quadrilateral are supplementary. One angle has a measure of 80 degrees. What is the measure of the other angle in degrees?

**Question 34** The point  $(2, -3)$  is the lowest point on the graph of  $y = f(x)$ . If this graph is translated 3 units to the right and then 4 units up, find the lowest point on the resulting graph.

**Question 35** The volume of a sphere with radius  $r$  is given by the formula  $\frac{4}{3}\pi r^3$ . If the radius of a sphere is quadrupled, what is the ratio of the new volume to the original volume?

**Question 36** Line  $L_1$ , passing through  $(2, 0)$  and  $(0, -2)$ , is parallel to line  $L_2$  that passes through  $(0, -5)$ . Find the  $x$ -intercept of  $L_2$ .

**Question 37** The line joining  $A(-2, 4)$  and  $B(b, -6)$  is perpendicular to the line  $y = x$ . What is the value of  $b$ ?

**Question 38** The radius of a circle is 5 units long. Find the length of the longest chord of this circle.

**Question 39** What is the remainder when  $x^3 - x^2 + x + 4$  is divided by  $x + 5$ ?

**Question 40** Give an equation of a parabola that opens downwards.

**Question 41** A line passes through the origin has slope equals to  $-2$ . Give another point on this line other than the origin.

**Question 42** When  $2^{3t} - 2^{-t} + 1$  is squared and simplified, what is the lowest exponent of 2 if  $t > 0$ ?

**Question 43** Give two subsets of  $\{3, 5, 7\}$ .

**Question 44** Complete the square for  $2x^2 - 3x + 1$ .

**Question 45** The point  $P(0, 2)$  is rotated counterclockwise through an angle of  $\pi/2$  radians about the origin. Find its image.

**Question 46** Find all value(s) of the constant  $b$  so that all three lines  $2x - y = 1$ ,  $x + 2y = 2$  and  $x + y = 2b$  will pass through a common point.

**Question 47** Let  $f$  be a polynomial of degree 2 with  $f(3) \leq f(x)$  for all real  $x$  and  $f(-1) = 0$ . Find another zero for  $f$ .

**Question 48** Find the lowest common denominator of  $\frac{1}{x^2+5x+6}$  and  $\frac{x}{x^2+2x-3}$ .

**Question 49** Find the quotient when  $x^3 + x - 11$  is divided by  $x - 1$

**Question 50** A parabola has vertex at  $(1, 3)$  and one of its  $x$ -intercepts is 5. A point  $P$  lies on this parabola and its  $x$ -coordinate is  $-1$ . Determine if  $P$  is above or below the  $x$ -axis.

**Question 51** Let  $f(x) = 1 + \frac{x}{2x+3}$ . Determine if the range of  $f$  contains  $4/3$ .

**Question 52** An equilateral triangle is inscribed inside a circle. The length of a side of the triangle is 2 units. Find the length of the diameter of the circle.

**Question 53** All points on the graph of  $y = x^2 - bx + 1$  are on or above the  $x$ -axis. What conditions must  $b$  satisfy?

**Question 54** Find the domain of  $f$ , where  $f(x) = \sqrt{1 - |1 - x|}$ .

**Question 55** Find an equation of a circle centered at  $(-1, 3)$  and with radius of length 5 units.

**Question 56** Express  $\{x \in \mathbb{R} : 2x - 1 > 5\}$  using intervals notation.

**Question 57** How many lines passing through  $(0, 1)$  are there that are tangent to the parabola  $y = x^2 + 4$ ?

**Question 58** What is an equation for the axis of symmetry of the parabola  $y = (2x - 1)^2 - 3$ ?

**Question 59** Consider the circle  $(x - 1)^2 + (y - 2)^2 = 9$ . Find the length of its diameter.

**Question 60** Give an example of a system of 3 linear equations in 2 unknowns which has infinitely many solutions.

**Question 61** Give 2 permutations of 1234

**Question 62** Let  $f(x) = -x^2$  and  $g(x) = x + 1$ . Which one is even? Which one is odd?

**Question 63** The first term of an arithmetic progression is  $-3$  and its common difference is 4. What is its 7th term?

**Question 64** A function  $f : \mathbb{R} \rightarrow \mathbb{R}$  is periodic with period 3. If  $f(-1) = 2$ , find the value of  $f$  at 11.

**Question 65** Give a normal vector for the plane  $2x - y + z = 1$ .

**Question 66** Let  $f(x) = \frac{1}{x}$ . State a vertical asymptote of  $f$ . State a horizontal asymptote of  $f$ .

**Question 67** Give an example of two sets whose intersection is  $\{1, 3\}$ .

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**Question 68** Give an example of three sets whose union is equal to one of these sets.

**Question 69** Find the probability that an even number will occur when a fair die is rolled once.

**Question 70** The third term of a geometric progression is 8 and its common ratio is  $-\frac{1}{2}$ . What is its first term?