Math Placement Test Study Guide

General Characteristics of the Test

1. All items are to be completed by all students. The items are roughly ordered from elementary to advanced. The expectation is that less prepared students will answer fewer questions correctly than more prepared students.

2. The test consists entirely of multiple choice questions, each with five choices.

3. The test is scored as the number of correct answers, with no penalty for guessing. Each item has only one acceptable answer. This number correct score is converted to a standard score between 150 and 850 for the purposes of score reporting.

4. The Mathematics Placement Test is designed as a test of skill and not speed. Ample time is allowed for most students to answer all questions. Ninety (90) minutes are allowed to complete the test.

5. The mathematics basics component has a reliability of .85. The algebra component has a reliability of .90. The trigonometry component has a reliability of .85. For all three sections, items are selected of appropriate difficulty to provide useful information within the range of scores used for placement throughout the System campuses.

Test Description

The Mathematics Test Development Committee decided on three broad categories of items: mathematics basics, algebra, and trigonometry. The entire Mathematics Placement Test is designed to be completed in 90 minutes, sufficient time for most students to complete the test.

Items for each of the three components are selected to conform to a carefully created set of detailed objectives.

It is a good idea to be familiar with the following topics.

Basic Math Skills Section

Add, subtract, multiply and divide rational numbers (includes integers, fractions, and decimals).

Use the order of operations correctly to simplify expressions.

Be familiar with introductory algebra skills, such as distributing and combining like terms.

Factor algebraic expressions, including quadratic expressions.

Simplify algebraic expressions.

Be able to use exponent rules. Note that exponents may not be integers. For instance, it is possible to have a rational number or an algebraic expression as an exponent.

Solve linear equations.

Solve literal equations for a given variable.

Know geometry definitions such as the definition for an equilateral triangle and the radius of a circle.

Solve introductory geometry problems, such as finding the surface area of a three-dimensional figure or finding the area of a rectangle. Also, be able to solve more complex problems using geometry definitions.

Find the perimeter, area, and volume of geometric figures.

Algebra Section

Add, subtract, multiply and divide polynomials.

Solve quadratic and rational equations.

Solve and graph equations with inequalities.

Graph linear equations.

Solve systems of linear equations.

Solve and graph equations with an absolute value.

Simplify radical expressions and solve radical equations.

Know the definition, notation, and interpretation of functions.

Be able to use the algebra of functions to solve problems. For instance, be able to use the fact that $(f \circ g)(x) = f(g(x))$.

Understand and be able to solve problems with both rational and inverse functions.

Understand and be able to solve problems with exponential and logarithmic functions. Also, be able to solve application problems with algebra, such as using logarithms to help determine the loudness of a sound.

Solve problems with complex numbers.

Solve problems related to the Theory of Equations, such as finding roots of polynomials and calculating the discriminant.

Know and be able to apply right triangle relationships, such the Pythagorean Theorem.

Know and be able to use the distance formula.

Solve problems that involve parallel and perpendicular lines. An example of this would be using the parallel postulate to determine angle measurements.

Solve problems that involve similar figures, such as using proportions to determine the lengths of the sides in two similar figures.

Solve problems involving circles and other conics, such as finding the area of a circle. Other conics include hyperbolas, ellipses, and parabolas.

Trigonometry Section

Know and be able to use basic trigonometry definitions and identities.

Use trigonometry to solve problems with triangles, such as finding the length of a side of a triangle using the sine function.

Know the graphs of trigonometric functions.

Understand the relationship between trigonometry and circles, including topics such as the unit circle and arc length.

Be able to solve more complex problems involving parallel and perpendicular lines.

You may find it beneficial to review the following problems.

Sample Problems from the Basic Mathematics Component

1. The greatest common divisor of 20 and 36 is
   a. 180
   b. 108
   c. 56
   d. 4
   e. 2

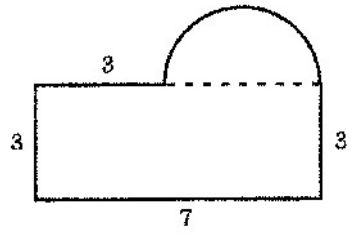
2. 2¼ yards is
   a. 27 in.
   b. 36 in.
   c. 72 in.
   d. 81 in.
   e. 96 in.

3.One factor of $3x^2 - 6x + 9$ is
   a. $x^2 - 2x + 3$
   b. $x^2 - 6x + 9$
   c. $x^2 - 2x + 9$
   d. $x + 3$
   e. None of these

4. $(p^x)^y =$
   a. p^{x+y}
   b. pxy
   c. yp^x
   d. p^{xy}
   e. None of these

5.

The perimeter of the figure with semicircular top is



a) 21

b) $16 + 2\pi$

c) $16 + 4\pi$

d) $16 + 8\pi$

e) None of these

6. In the triangle shown below the measure of angle C is $(x + 30^\circ)$. The measure of angle A is

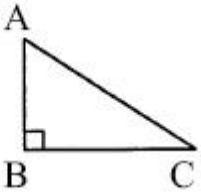
a. $(60 - x)^\circ$

b. $(90 - x)^\circ$

c. $(120 - x)^\circ$

d. $(x - 60)^\circ$

e. $(x - 120)^\circ$



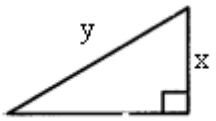
Sample Problems from the Algebra Component

1. When $x^3 + 3x^2 - 2x + 7$ is divided by $x + 1$, the remainder is
   a. 7
   b. 8
   c. 9
   d. 11
   e. 13

2. Reduce to lowest terms: $\frac{2x^2 - 3x - 2}{10 + x - 3x^2}$
   a. $\frac{2x + 1}{5 - 3x}$
   b. $\frac{1 - 2x}{3x - 5}$
   c. $\frac{2x + 1}{3x + 5}$
   d. $\frac{2x + 1}{3x - 5}$
   e. $\frac{-2x - 1}{3x + 5}$

3. Suppose $\frac{x}{6} = \frac{k}{y}$ and that $x = 2$ when $y = 12$. What is x when y is 8?
   a. $\frac{4}{3}$
   b. $\frac{3}{4}$
   c. 3
   d. 4
   e. None of these

4. What is the area of the triangle shown below?



a. $\frac{xy}{2}$

b. $\frac{x(y-x)^2}{2}$

c. $\frac{\sqrt{y^2-x^2}}{2x}$

d. $\frac{x\sqrt{y^2-x^2}}{2}$

e. None of these

5. An equation of the line tangent to the circle $x^2+y^2=25$ at the point $(3, 4)$ is

a. $x+y=7$

b. $x+y=5$

c. $4x-3y=0$

d. $4x+3y=25$

e. $3x+4y=25$

6. Let C be the circle $(x-1)^2+(y-2)^2=144$ and P be the point P(10,10). Which of the following is true?

a. P is the center of C.

b. P is inside C, but not the center of C.

c. P is outside C.

d. P is on C.

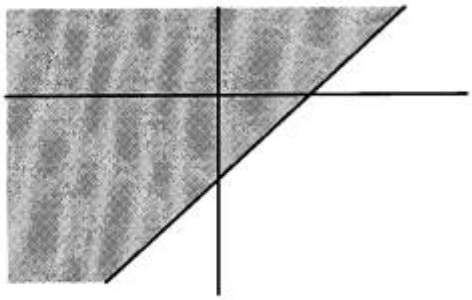
e. The location of P relative to C cannot be determined.

7. If $3 < x < 4$, then
   a. $|x - 7| < 3$
   b. $|x - 5| < 2$
   c. $|x - 4| < 3$
   d. $|x - 3| < 4$
   e. $|x - 2| < 5$

8. One factor of $27x^3 - 8y^3$ is
   a. $9x + 2y$
   b. $9x - 2y$
   c. $3x + 2y$
   d. $3x - 2y$
   e. None of these

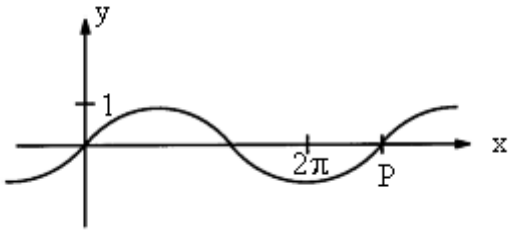
9. If $\log_2(x) = \log_2(a) + \log_2(b) - \log_2(c)$ then x is
   a. 2^{a+b-c}
   b. $a + b - c$
   c. $\frac{ab}{c}$
   d. $2^a + 2^b - 2^c$
   e. $-abc$

10. If $a > 0$, the shaded region below is best represented by
    a. $y \leq ax + b$
    b. $y \leq -ax + b$
    c. $y > ax + b$
    d. $y > -ax + b$
    e. $y = ax + b$



Sample Problems from the Trigonometry Component

1. The sine function shown below has a minimum at $x = 2\pi$ and an x-intercept at $x = 0$:



The x-intercept at P is given by

a. $x = \frac{9\pi}{4}$

b. $x = \frac{5\pi}{2}$

c. $x = \frac{8\pi}{3}$

d. $x = 3\pi$

e. $x = 4\pi$

2. $\sin(x) + \sin(\pi - x)$ equals

a. 0

b. 1

c. $2\sin(x)$

d. $\sin(x) + \cos(x)$

e. $\cos^2(x)$

3. The value of $\cos(\sin^{-1} x)$ is

a. 1

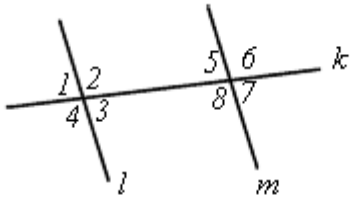
b. x

c. $\frac{1}{x}$

d. $\frac{1}{\sqrt{1 - x^2}}$

e. $\sqrt{1 - x^2}$

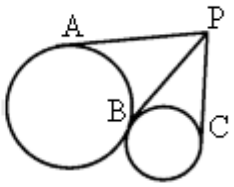
4. Lines *l* and *m* intersect line *k*. Assume angles *4* and *7* are supplementary. Then we can conclude that



a. lines *l* and *m* are perpendicular.
b. angle *8* and angle *1* are congruent.
c. lines *l* and *m* are parallel.
d. angles *1* and *2* are complementary.
e. angles *1* and *5* are supplementary.

5. PA, PB, and PC are tangents. One circle has radius 4; the other has radius 2. How are PC, PB, and PA related?

a. PC < PB = PA
b. PC = PB < PA
c. PC < PB < PA
d. PC = PB = PA
e. PB < PC = PA



Answers

Basic Mathematics	Algebra	Trigonometry
1. d	1. d	1. c
2. d	2. e	2. c
3. a	3. c	3. e
4. d	4. d	4. c
5. b	5. e	5. d
6. a	6. c	
	7. b	
	8. d	
	9. c	
	10. c	