What to Expect on the Placement Exam

The ACCUPLACER placement exam is an adaptive test created by the College Board Educational Testing Service. This document was created to give prospective CLC student and other interested parties an overview of how the placement exam works and the types of questions one might expect to see on it.

General Information:
- The exam is computerized and is not timed.
- Questions are presented in a multiple-choice format. No partial credit is awarded.
- Scratch paper is provided.
- Handheld calculators are not allowed. The testing software provides a pop-up calculator for use on some questions.
- There is a limit to the number of times a student may take the placement exam.

CLC Mathematics department wants each student to do as well as possible on the placement exam and makes the following recommendations:
- Prepare for the exam. Don’t take it cold. Studying for the exam may decrease the number of math classes you are required to take. Free practice questions/answers are available online at the Accuplacer website, located at https://accuplacer.collegeboard.org/students. Other review materials are available at the Math Center. (847) 543-2449
- Take the exam when you are rested and refreshed.
- Allow plenty of time for testing so that you can relax and fully concentrate on what you are doing.
- Triple-check answers before moving on to the next question. The computer only knows if your answer is right or wrong. It cannot tell the difference between a careless mistake, a minor error, or a major error.
- Stay calm if you don’t know the answer to a question. Remember that the placement test is adaptive and is used to test many levels of mathematics. It increases or decreases the level of the questions based on your previous answers.

A student desiring to place into **Intermediate Algebra (MTH 108)** must first pass the twelve question **Basic Algebra** portion of the exam. The student will then be given the opportunity to answer questions from the College Mathematics portion of the exam.

**NOTE:** The examples provided below are not intended to be a complete list of problem types. The examples are simply illustrations of problem types.

1. The student must be able to demonstrate sense of order relationships and the relative size of signed numbers. The student must be able to order rational numbers from algebraically least to algebraically greatest.

   **Example:** Graph the following numbers on a number line.

   \[-7, \frac{2}{3}, 0.09, -\frac{1}{5}, |-3|, -\frac{3}{7}, \frac{3}{4}, 1.07, -0.9, |-3|\]
2. The student must be able to multiply a binomial times a monomial such as, a whole number or algebraic expression.

**Examples:** Perform the following indicated multiplication exercises.

a) \(2x(3x - 7)\)
b) \(17(3x - 7)\)
c) \(\frac{2}{3}x(3y - \frac{1}{2}z)\)
d) \(-2(5 - 3z)\)

3. The student must be able to add, subtract, multiply, and divide with signed numbers while following proper order of operations.

**Examples:**

a) Simplify \(2(-3)^2 + 5[-3^2 -(-5)]\)
b) Simplify \(\frac{1}{5}(-\frac{2}{3}) + \frac{2}{15} - 17\left(\frac{5}{1} - \left(-\frac{2}{3}\right)\right)\)

4. The student must be able to combine like terms in algebraic expressions.

**Examples:** In the following algebraic expressions, combine (add) the like terms.

a) \(3x - 2y + x + 5(2x) + 3y - 5\)
b) \(2x^2 + 3x^3 - 5x^5 + x^2 - (-3x^3)\)
c) \(2xy^2 - 3x^2y + (-2xy) + 3xy^2 - 4yx\)

5. The student must be able to multiply binomials.

**Examples:** Perform the following multiplications.

a) \((3x - 2)(5x + 2)\)
b) \((3x - 2y)(5x + 3y)\)
c) \((3x^2 + y)(2x - 3y)\)
d) \((3a - 9b)^2\)

6. The student must be able to evaluate algebraic expressions.

**Examples:**

a) Evaluate \(3x^2 + 2x - 7\) when \(x = 2\)
b) Evaluate \(-\frac{3}{5}x^3 + \frac{2}{5}x^2 - x + 2\) when \(x = -3\)
c) Evaluate \(\frac{x^2 + xy - 2y}{3x^2 + 2y^2}\) when \(x = -1\) and \(y = 3\)
7. The student must be able to demonstrate the ability to add radicals, numerical fractions and algebraic fractions using least common denominators.

Examples:

a) Add: \(3\sqrt{5} + 4\sqrt{5} - 2\sqrt{5}\)

b) Add: \(17\sqrt{7} + 5\sqrt{5} - 6\sqrt{5} + \sqrt{7}\)

c) Add: \(\frac{3}{5} + \frac{2}{3} + \frac{3}{15}\)

d) Add: \(\frac{2}{3}x + \frac{3}{5}y\)

e) Add: \(\frac{2x}{b} + \frac{5x}{c} + \frac{2x}{cb}\)

8. The student must be able to factor trinomials of the form \(ax^2 + bx + c\) where \(a = 1\).

Examples: Completely factor the following trinomials.

a) \(x^2 + x - 12\)

b) \(z^2 - 4z - 12\)

c) \(y^2 - 3xy - 28x^2\)

9. The student must be able to factor the difference of squares.

Examples: Factor the following binomials.

a) \(x^2 - 4y^2\)

b) \(\frac{1}{25}z^2 - 36w^2\)

10. The student must be able to square binomials.

Examples: Perform the following indicated squaring operations.

a) \((9x + 3y)^2\)

b) \((16x + 2y)^2\)

c) \((\frac{1}{2}x - \frac{1}{3}y^2)^2\)

11. The student must be able to solve all forms of linear equations with integer coefficients.

Examples: Solve the following equations for the variable \(x\), \(y\), or \(z\).

a) \(3x + 2(3x - 4) = -2x + 7\)

b) \(3y + 2(3 - 7y) - 2(y - 1) + 7 = -(y - 7) + 3y - 6\)

c) \(z(3 - 5) + 3z = -2z - 5(5 - z)\)
12. The student must be able to write simple types of algebraic fractions in lowest terms.

**Examples:** Simplify the following fractions.

a) \( \frac{6}{6 + 6a} \)

b) \( \frac{(3x^2)(16r)}{(8r^3)(9x)} \)

13. The student must be able to solve simple systems of two equations in two unknowns.

**Examples:**

a) If \( 3x + 4y - 22 = 46 \) and \( y = -3z \), what is the value of \( y \)?

b) Solve the equation \( 3x + 2y = 17 \) for \( y \) when \( x = 0.5y \).

14. The student must be able to solve basic story problems.

**Examples:**

a) If two numbers are related such that one is twice as big as the other and their sum is 30, how large is the smaller of the two original numbers?

b) If the width of a rectangle is 6 units less than its length and half the perimeter of the rectangle is 24 units, how wide is the rectangle?
What to Expect on the Placement Exam

1. The student must be able to demonstrate a sense of order relationships and the relative size of signed numbers. The student must be able to order rational numbers from algebraically least to algebraically greatest.

   **Example:** Graph the following numbers on a number line.

   \[-7, \frac{2}{3}, 0.09, -\frac{1}{5}, -|3|, -\frac{3}{7}, \frac{3}{4}, 1.07, -0.9, -|3|\]

   **Answer:**

   ![Graph of numbers on a number line]

2. The student must be able to multiply a binomial times a monomial such as, a whole number or algebraic expression.

   **Examples:**
   
   a) \(2x(3x-7)\)  \(6x^2 - 14x\)
   
   b) \(17(3x-7)\)  \(51x - 119\)
   
   c) \(\frac{2}{3}x(3y - \frac{1}{2}z)\)  \(2xy - \frac{1}{3}xz\)
   
   d) \(-2(5-3z)\)  \(-10 + 6z\)
3. The student must be able to add, subtract, multiply, and divide with signed numbers while following proper order of operations.

**Examples:**

<table>
<thead>
<tr>
<th></th>
<th><strong>Answers:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Simplify: 2(-3)^2 + 5[-3^2 -(-5)]</td>
<td>2(-3)^2 + 5[-9 +5]</td>
</tr>
<tr>
<td></td>
<td>= 2(-3)^2 + 5[-4]</td>
</tr>
<tr>
<td></td>
<td>= 2(9) + 5[-4] = 18 – 20 = -2</td>
</tr>
<tr>
<td>b) Simplify: [ \frac{1}{5} \left( -\frac{2}{3} \right) + \frac{2}{15} - 17 \left[ \frac{5}{51} - \left( -\frac{2}{3} \right) \right] ]</td>
<td>[ \frac{2}{15} + \frac{2}{15} - 17 \left[ \frac{5}{51} + \frac{2}{3} \right] ]</td>
</tr>
<tr>
<td></td>
<td>= [ \frac{4}{15} - 17 \left[ \frac{39}{51} \right] ]</td>
</tr>
<tr>
<td></td>
<td>= [ \frac{4}{15} - 17 \left[ \frac{13}{17} \right] ]</td>
</tr>
<tr>
<td></td>
<td>= [ \frac{4}{15} - \left[ \frac{195}{15} \right] ]</td>
</tr>
<tr>
<td></td>
<td>= -[ \frac{191}{15} ]</td>
</tr>
</tbody>
</table>

4. The student must be able to combine like terms in algebraic expressions.

**Examples:** In the following algebraic expressions, combine (add) the like terms.

<table>
<thead>
<tr>
<th></th>
<th><strong>Answers:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 3x – 2y + x + 5(2x) + 3y – 5</td>
<td>Answer: 3x – 2y + x + 5(2x) + 3y – 5 = 3x – 2y + x + 10 x + 3y – 5 = 14x + y – 5</td>
</tr>
<tr>
<td>b) 2x^2 + 3x^3 – 5x^5 + x^2 – (-3x^3) =</td>
<td>Answer: 2x^2 + 3x^3 – 5x^5 + x^2 – (-3x^3) = 2x^2 + 3x^3 – 5x^5 + x^2 + 3x^3 = 3x^2 + 6x^3 – 5x^5</td>
</tr>
<tr>
<td>c) 2xy^2 – 3x^2 y + (-2xy) + 3yx^2 – 4yx</td>
<td>Answer: 2xy^2 – 3x^2 y + (-2xy) + 3yx^2 – 4yx = 2xy^2 – 3x^2 y – 2xy + 3yx^2 - 4yx = 2xy^2 - 6xy</td>
</tr>
</tbody>
</table>

5. The student must be able to multiply binomials.

**Examples:**

<table>
<thead>
<tr>
<th></th>
<th><strong>Answers:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) (3x – 2)(5x + 2)</td>
<td>15x^2 - 4x - 4</td>
</tr>
<tr>
<td>b) (3x – 2y)(5x + 3y)</td>
<td>15x^2 - xy – 6y^2</td>
</tr>
<tr>
<td>c) (3x^2 + y)(2x – 3y)</td>
<td>6x^2z + 2yz – 9x^2y – 3y^2</td>
</tr>
<tr>
<td>d) (3a – 9b)^2</td>
<td>9a^2 - 54ab + 81b^2</td>
</tr>
</tbody>
</table>
6. The student must be able to evaluate algebraic expressions.

Examples:
   a) Evaluate $3x^2 + 2x - 7$ when $x = 2$
      \[3(2)^2 + 2(2) - 7 = 12 + 4 - 7 = 9\]
   b) Evaluate $-\frac{3}{5}x^3 + \frac{2}{5}x^2 - x + 2$ when $x = -3$
      \[-\frac{3}{5}(-27) + \frac{2}{5}(9) + 3 + 2 = \frac{81}{5} + \frac{18}{5} + 5 = \frac{124}{5}\]
   c) Evaluate $\frac{x^2 + xy - 2y}{3x^2 + 2y^2}$ when $x = -1$ and $y = 3$
      \[
      \frac{(-1)^2 + (-1)(3) - 2(3)}{3(-1)^2 + 2(3)^2} = \frac{1 - 3 - 6}{3 + 18} = \frac{-8}{21}
      \]

7. The student must be able to add radicals, numerical fractions and algebraic fractions using least common denominators.

Examples:
   a) Add: $3\sqrt{5} + 4\sqrt{5} - 2\sqrt{5}$
      \[= 5\sqrt{5}\]
   b) Add: $17\sqrt{7} + 5\sqrt{5} - 6\sqrt{5} + \sqrt{7}$
      \[= 18\sqrt{7} - \sqrt{5}\]
   c) Add: $\frac{3}{5} + \frac{2}{3} + \frac{3}{15}$
      \[= \frac{9}{15} + \frac{10}{15} + \frac{3}{15} = \frac{22}{15}\]
   d) Add: $\frac{2}{3}x + \frac{3}{5}y$
      \[= \frac{2}{3}x + \frac{3}{5}y\]
   e) Add: $\frac{2x}{b} + \frac{5x}{c} + \frac{2x}{cb}$
      \[= \frac{2cx}{bc} + \frac{5bx}{bc} + \frac{2x}{bc} = \frac{2cx + 5bx + 2x}{bc}\]

8. The student must be able to factor trinomials of the form $ax^2 + bx + c$ where $a = 1$.

Examples:
   a) Factor $x^2 + x - 12$
      \[= (x+4)(x-3)\]
   b) Factor $z^2 - 4z - 12$
      \[= (z-6)(z+2)\]
   c) Factor $y^2 - 3xy - 28x^2$
      \[= (y-7x)(y+4x)\]

9. The student must be able to factor the difference of squares.

Examples:
   a) Factor $x^2 - 4y^2$
      \[= (x-2y)(x+2y)\]
   b) Factor $\frac{1}{25}z^2 - 36w^2$
      \[= \left(\frac{1}{5}z - 6w\right)\left(\frac{1}{5}z + 6w\right)\]
10. The student must be able to square binomials.

Examples:  
\[
\begin{align*}
a) \quad (9x+3y)^2 &= 81x^2 + 54xy + 9y^2 \\
b) \quad (16x+2y)^2 &= 256x^2 + 64xy + 4y^2 \\
c) \quad \left(\frac{1}{2}x - \frac{1}{3}y^2\right)^2 &= \frac{1}{4}x^2 - \frac{1}{3}xy^2 + \frac{1}{9}y^4
\end{align*}
\]

Answers:

11. The student must be able to solve all forms of linear equations with integer coefficients.

Examples: Solve the following equations for the variable \(x\), \(y\), or \(z\).

a) \[3x + 2(3x - 4) = -2x + 7\]

Answer: \[9x - 8 = -2x + 7\]
\[11x = 15\]
\[x = \frac{15}{11}\]

b) \[3y + 2(3 - 7y) - 2(y - 1) + 7 = -(y - 7) + 3y - 6\]

Answer: \[3y + 6 - 14y - 2y + 2 + 7 = -y + 7 + 3y - 6\]
\[-13y + 15 = 2y + 1\]
\[14 = 15y\]
\[y = \frac{14}{15}\]

c) \[z(3 - 5) + 3z = -2z - 5(5 - z)\]

Answer: \[3z - 5z + 3z = -2z - 25 + 5z\]
\[z = 3z - 25\]
\[-2z = -25\]
\[z = \frac{25}{2}\]

12. The student must be able to write simple types of algebraic fractions in lowest terms.

Examples:  
\[
\begin{align*}
a) \quad \text{Simplify} \quad \frac{6}{6 + 6a} &= \frac{6}{6(1 + a)} = \frac{1}{1 + a} \\
b) \quad \text{Simplify} \quad \frac{(3x^2)(16r)}{(8r^3)(9x)} &= \frac{2x}{3r^2}
\end{align*}
\]
13. The student must be able to solve simple systems of two equations in two unknowns.

Examples:

a) If \(3z + 4y - 22 = 46\) and \(y = -3z\), then what is the value of \(y\)?

Answer: 
\[
\begin{align*}
3z + 4(-3z) - 22 &= 46 \\
3z - 12z - 22 &= 46 \\
-9z &= 68 \\
z &= -\frac{68}{9} \\
\text{Since } y &= -3z, \quad y = -3\left(-\frac{68}{9}\right) = \frac{68}{3}
\end{align*}
\]

b) Solve the equation \(3x + 2y = 17\) for \(y\) when \(x = 0.5y\).

Answer: 
\[
\begin{align*}
3(0.5y) + 2y &= 17 \\
1.5y + 2y &= 17 \\
3.5y &= 17 \\
y &= \frac{17}{3.5} = \frac{34}{7}
\end{align*}
\]

14. The student must be able to solve basic story problems.

Examples:

a) If two numbers are related such that one is twice as big as the other and their sum is 30, how large is the smaller of the two original numbers?

Answer: Let \(x\) = the small number. The bigger number is \(2x\).
\[
\begin{align*}
x + 2x &= 30 \\
3x &= 30 \\
x &= 10 \quad \text{The smaller number is 10}
\end{align*}
\]

b) If the width of a rectangle is 6 units less than its length and half the perimeter of the rectangle is 24 units, how wide is the rectangle?

Answer: Let the length = \(x\) and the width = \(x - 6\)
\[
\begin{align*}
x + (x - 6) &= 24 \\
2x - 6 &= 24 \\
2x &= 30 \\
x &= 15 \quad \text{So the length is 15 units.} \\
\text{The width is } x - 6 &= 15 - 6 = 9 \text{ units.}
\end{align*}
\]