

Intermediate Algebra Preparation: The Math 111 Readiness Guide

Knowledge of the following topics is a prerequisite for Math 111. During the class your instructor will assume proficiency at these skills. The “**You Try**” problems suggested are to be used only as a guideline – if you have trouble with the ones in parentheses, *attempt more problems until you feel confident*. All **You Try** problems are from *Functions Modeling Change for the University of Oregon*, by Connally, Hughes-Hallett, Gleason, et al. Odd-numbered exercises have answers in the appendix. Practice these before your readiness quiz on the first week of classes.

Basic Simplification

Apply order of operations to numerical and algebraic expressions.

Ex 1 Simplify: $2(3 - 4(5 - 8))$.

Solution: $2(3 - 4(5 - 8)) = 2(3 - 4(-3)) = 2(3 + 12) = 2(15) = \boxed{30}$.

Ex 2 Simplify: $-3(a - 3(6a + 1))$.

Solution: $-3(a - 3(6a + 1)) = -3(a - 18a - 3) = -3(-17a - 3) = \boxed{51a + 9}$.

You Try: 1.1 #S1 – S8, 1.2 #S1 – S10

Algebraic Manipulation

Add, subtract, and multiply algebraic expressions; combine algebraic terms that are alike; apply the distributive property to algebraic expressions (the term “FOIL” *only* refers to distribution between two binomials; ask your instructor to show you why FOIL works!).

Ex 3 Simplify by combining like terms: $(x - y)(x^2 + xy + y^2)$.

Solution: $(x - y)(x^2 + xy + y^2) = x^3 + \cancel{x^2y} + \cancel{xy^2} - \cancel{yx^2} - \cancel{xy^2} - y^3 = \boxed{x^3 - y^3}$.

Ex 4 Expand and simplify completely: $3(4v - 2a)^2$.

Solution: $3(4v - 2a)^2 = 3(4v - 2a)(4v - 2a) = 3[(4v)(4v) - (4v)(2a) - (2a)(4v) + (2a)(2a)]$
 $= 3[16v^2 - 16av + 4a^2] = \boxed{48v^2 - 48av + 12a^2}$.

You Try: 3.1 #S1 – S8, 2.1 #S1 – S6, 2.4 #S7 – S10

Rational Expressions

Simplify fractions by finding factors in common; add/subtract fractions by first rewriting with a least common denominator; multiply/divide rational expressions; simplify complex fractions.

Ex 5 Write as a single, reduced fraction: $\frac{2}{3} - \frac{4}{5}$.

Solution: $\frac{2}{3} - \frac{4}{5} = \frac{10}{15} - \frac{12}{15} = \frac{-2}{15} = \boxed{-\frac{2}{15}}$.

Ex 6 Reduce to lowest terms: $\frac{\frac{1}{x} - \frac{1}{x-2}}{x}$.

Solution: $\frac{\frac{1}{x} - \frac{1}{x-2}}{x} = \frac{\frac{1}{x} - \frac{1}{x-2}}{x} \cdot \frac{x(x-2)}{x(x-2)} = \frac{\frac{x(x-2)}{x} - \frac{x(x-2)}{x-2}}{x \cdot x(x-2)} = \frac{(x-2) - x}{x^2(x-2)} = \boxed{\frac{-2}{x^2(x-2)}}$.

Solving Equations

Solve linear equations; solve absolute value equations; solve quadratic equations by employing factoring or the quadratic formula.

Ex 8 Solve for m : $3(m + 4) + 2m = 4 - 3m$.

Solution: $3(m + 4) + 2m = 4 - 3m \Rightarrow 3m + 12 + 2m = 4 - 3m \Rightarrow 8m = -8 \Rightarrow \boxed{m = -1}$.

Ex 9 Solve for q : $2q^2 + 7 = 9q$.

$$2q^2 + 7 = 9q \Rightarrow 2q^2 - 9q + 7 = 0 \Rightarrow (2q - 7)(q - 1) = 0$$

Solution: $\Rightarrow 2q - 7 = 0$ or $q - 1 = 0 \Rightarrow \boxed{q = \frac{7}{2} \text{ or } q = 1}$.

You Try: 1.4 #S1 – S10, 2.1 #S7 – S10

Simplifying Exponents and Radicals

Use properties of exponents, and radicals as rational exponents, to simplify expressions and solve equations.

Ex 9 Solve for t : $(t - 5)^3 - 4 = 23$.

Solution: $(t - 5)^3 - 4 = 23 \Rightarrow (t - 5)^3 = 27 \Rightarrow t - 5 = 27^{1/3} \Rightarrow \boxed{t = 3 + 5 = 8}$

Note that $27^{1/3}$ is equivalent to $\sqrt[3]{27}$.

You Try: 2.4 #S1 – S6, 11.1 #S1 – S10

Modeling in Mathematics

Use key words like “sum”, “difference”, “product”, “ratio”, and “is” to translate an English expression into mathematics, perform the desired simplification or solving if necessary, and then restate the result in English.

Ex 11 At a particular university, there are eight times as many students as instructors. Express this relationship as an equation.

Solution: Let S be the number of students and I be the number of instructors. We are told that the number of students is equal to eight times the number of instructors, and so $\boxed{S = 8I}$.

Ex 12 The perimeter of a rectangular carpet is 40 feet, and the length of the carpet is six feet greater than its width. How long is the carpet?

Solution: The perimeter of a rectangle with length l and width w is $P = 2w + 2l$. We are told that the length is six units larger than w , or $l = w + 6$. Then we get

$$P = 2w + 2l$$

$$40 = 2w + 2(w + 6)$$

$$40 = 4w + 12$$

$$28 = 4w$$

$$w = 7.$$

Finally, $l = w + 6 = 7 + 6 = 13$, so the length of the carpet is 13 feet.