

Pre Algebra

Fall 2007
Study Guide

Your final exam will be on Wednesday, December 19 from 10:15 to noon. We'll conduct short review sessions every day between now and then.

1. Introduction to Integers and Algebraic Expressions

Add, Subtract, Multiply & Divide Positive and Negative Numbers

Notes:

- Adding a negative number is the same as subtracting. For example, $2 + (-14) = -12$.
- Subtracting a negative number is the same as adding. For example, $2 - (-14) = 16$.
- Multiplying or dividing two negatives is a positive; one positive & one negative is a negative.

Add or subtract:

1. $6 + (-17)$
2. $0 - 12$
3. $-8 - (-27)$
4. $27(-10)$
5. $-56 / 7$
6. $-72 / (-9)$
7. $29 - (3 - 5)^2$
8. The average January temperature in Anchorage, Alaska is -9° Celsius. If the temperature drops another 23° C, what will the temperature be?

Combine Like Terms

Notes:

- Vocabulary: term. It's part of a math "sentence", separated from other terms by addition and subtraction. 15 and $5x$ are terms in $5x + 15 = 20$.
- Terms may be combined (added or subtracted) only when they're 1) just numbers, 2) have the same variable, or 3) have the same variable raised to the same power.

Combine like terms:

1. $\frac{3}{8}x - \frac{1}{2}x$
2. $5\frac{2}{11}a - 3\frac{1}{5}a$
3. $\frac{1}{2} + \frac{1}{3}x - \frac{5}{3}x$
4. $\frac{1}{4}x + \frac{1}{4}y - \frac{1}{8}x$

2. Fraction Notation: Multiplication & Division

Find Prime Factorizations for a Number

Notes:

- Prime Factorization = all the prime numbers that, if multiplied, will give you the original. For example, Prime Factorization of $130 = 2, 5, 13$.

Find the prime factorization of these numbers:

1. 27
2. 80
3. 62
4. 99
5. 217

Multiply Fractions

Notes:

- To multiply a fraction and an integer, multiply the top number (the numerator) by the integer and keep the same denominator. For example, $3 \cdot 1/4 = 3/4$.
- To multiply two fractions, multiply the numerators and multiply the denominators. For example, $1/4 \cdot 4/5 = 4/20 = 1/5$.

1. $\frac{2}{5} \cdot (-3)$

2. $\frac{-2}{5} \cdot -3$

3. $\frac{1}{3} \cdot \frac{1}{5}$

4. $-\frac{3}{4} \cdot -\frac{3}{5}$

5. A patio is being tiled. An area $\frac{3}{5}$ of the length and $\frac{3}{4}$ of the width is covered. What fraction of the patio has been tiled?

Reciprocals and Division

Notes:

- If the product of two numbers is 1, we call those numbers **reciprocals**. In other words, a reciprocal is the “upside down” version of any number. For example, the reciprocal of $\frac{3}{4}$ is $\frac{4}{3}$.
- To divide a fraction, multiply by the reciprocal. For example, $(\frac{3}{4}) \div (\frac{1}{4})$ is $(\frac{3}{4}) \cdot (\frac{4}{1}) = \frac{12}{4} = \frac{3}{1} = 3$.

Divide, simplify when possible:

1. $(\frac{3}{7}) \div (\frac{3}{4})$

2. $(\frac{-8}{15}) \div (\frac{4}{5})$

3. $(\frac{-1}{3}) \div (\frac{1}{6})$

4. $\frac{3}{8} \div 24$

5. $(\frac{7}{20}) \div (\frac{8}{5})$

6. $(\frac{8}{21}) \div (\frac{6}{5})$

The Multiplication Principle

Notes:

- The Multiplication Principle says that if $a = b$, then $a \cdot c = b \cdot c$. For example, $5 = 4 + 1$ and $5 \cdot 3 = (4 + 1) \cdot 3$.
- Put the multiplication principle to use! There are 2 things going on here:
 - A number times its reciprocal is 1.
 - Multiply “both sides” of the equation by a reciprocal to keep the equation the same as before you started messing with it.
- Get a variable by itself. For example, $\frac{1}{2}x = 4$ and $(\frac{2}{1}) \cdot (\frac{1}{2})x = 4(\frac{2}{1}) = 8$.

Solve for the variable:

1. $-5x = 15$

2. $\frac{1}{4}x = \frac{3}{5}$

3. Fraction Notation: Addition & Subtraction

Least Common Multiples, Addition & Subtraction

Notes:

- Least Common Multiple (LCM) is the smallest number that's a multiple of both. We learned 2 ways to find an LCM:
 - Make a list of multiples for each number and find the smallest on both lists.
 - By Prime Factorization.
- Adding fractions.
 - If denominators are same, add numerators, keep the denominators, and possibly simplify.
 - If denominators are different, Find the LCM of the denominators, multiply by 1 where 1 is in the form of n/n so that the LCD appears in each fraction. For example, convert $3/4$ into eighths by multiplying by $2/2$.
- Subtracting fractions works like adding fractions. Make sure you have common denominators then subtract the numerators.

Find the Least Common Denominators then add the fractions:

1. $\frac{1}{8} + \frac{1}{6}$

2. $\frac{7}{12} + \frac{3}{8}$

3. $\frac{1}{9} + \frac{1}{6}$

4. $\frac{-7}{a} + \frac{5}{a}$

5. $\frac{-3}{4} + \frac{1}{12}$

6. A tile $\frac{5}{8}$ thick is cemented to subflooring that is $\frac{7}{8}$ thick. The cement is $\frac{3}{32}$ thick. How thick is the result?

7. $\frac{4}{t} - \frac{6}{t}$

8. $\frac{3}{4} - \frac{3}{28}$

9. $\frac{4}{7}a - \frac{1}{3}a$

10. $\frac{-5}{18} - \frac{2}{27}$

Solving Equations with Addition & Multiplication Principles

Notes:

- If you have an equation like $2x + 5 = 15$, the steps to solve it are:
 - Subtract 5 from both sides of the equation so you end up with $2x = 10$
 - Divide both sides of the equation by 2 so you end up with $x = 5$
- If fractions are involved, remember that division with fractions is the same as taking the reciprocal and multiplying.

Solve using the addition principle and/or the multiplication principle:

1. $7x - 6 = 22$

2. $\frac{2}{5}x + \frac{3}{10} = \frac{3}{5}$

3. $7 = 5 + \frac{3}{2}t$

4. $\frac{1}{2}x - \frac{1}{4} = \frac{1}{2}$

5. $-3 = \frac{3}{4}t - \frac{1}{2}$

6. $\frac{-1}{4} = \frac{-2}{3} - \frac{1}{6}x$

7. $12 = 8 + \frac{7}{2}t$