

Exponents and Like Terms

Review: Simplify each using exponents.

1. $3 \cdot a \cdot a \cdot b \cdot b \cdot b \cdot b$ 2. $3a^2 \cdot 5a^5$

Review: Simplify each by combining like terms.

1. $a + a + b + b + b$ 2. $3a^2 - 5a^2$

One of the most difficult concepts for most students involves recognizing the difference between the following two expressions:

$$2x^2 + 5x^2 \quad \text{and} \quad 2x^2 \cdot 5x^2$$

Try another pair. Simplify:

1. $-7xy^2 - 3xy^2$ 2. $-7xy^2(-3xy^2)$

Practice: Simplify each.

1. $5a^2b - 3a^2b$ 2. $5a^2b \cdot 3a^2b$

3. $3x - 7 + 5x$ 4. $3x(5x)$

5. $5c^2 - 2c + 3c^3$ 6. $5c^2(-2c) + 3c^3$

Like Terms and Exponents

Math 8

Practice adding and multiplying terms to simplify each expression.
Write Simplified for any expression that cannot be simplified further.

1. $5x^2 + 3x^2$

2. $5x^2(3x^2)$

3. $7a^3(2a^3)$

4. $-7a^3 + 2a^3$

5. $3a + 5a - 7a + 2$

6. $3a \cdot 5a \cdot 7a \cdot 2$

7. $4a \cdot 3a^2$

8. $4a + 3a^2$

9. $-7x^2y^2 - 3x^2y^2$

10. $-7x^2y^2(-3x^2y^2)$

11. $2x^{10}(-10x^{10})$

12. $2x^{10} - 10x^{10}$

13. $x^2 + x^2 + x^2 + x^2 + x^2$

14. $x^2 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x^2$

15. $3^2 + 3^2 + 3^2$ (use exponents)

16. $3^2 \cdot 3^2 \cdot 3^2$ (use exponents)

17. $2a - a - 9a + 3a$

18. $2a \cdot a \cdot 9a \cdot 3a$

19. $5x^3 - 19x^3$

20. $5x^3(-19x^3)$

Like Terms and Exponents

Math 8

Simplify each expression below:

1. $x^5 + 2x^5$

2. $3x^5(2x^5)$

3. $2a^2(5a^5)$

4. $-2x \cdot 7x \cdot 3x^2$

5. $5a^2 + 7a^2b - 11a^2$

6. $3x - 4x + 7x - 9x$

7. $2x \cdot 7x \cdot 3x$

8. $5^6 \cdot 5^{11}$

9. $4x^2 + 7xy - 3x^2 - 2xy$

10. $2 + 5x - 7 + 9x$

11. $8x^2(10x^2)$

12. $x + x + x + x + x$

13. $a \cdot a \cdot a \cdot a \cdot a \cdot a$

14. $8x + 2 - 7x - 5$

15. $2^2 \cdot 2^2 \cdot 2^2 \cdot 2^2 \cdot 2^2$

16. $x + 2x + 3x + 4x$

17. $2a - 7 - 9a - 13$

18. $2x \cdot x^2 \cdot 9x \cdot 3$

19. Think! If $5^x = 5^7 + 5^7 + 5^7 + 5^7 + 5^7$, what is x ?

The Distributive Property

For any numbers a , b , and c :

$$a(b + c) = ab + ac$$

Examples:

distribute the 5

$$5(x + 3) = 5x + 15$$

distribute the 3

$$3(2a + 4) = 6a + 12$$

$$11(r^2 - s) = 11r^2 - 11s$$

$$(x^2 + x)x = x^3 + x^2$$

Multiply the term outside the parenthesis by both terms inside.

Practice: Rewrite using the Distributive Property.

1. $5(2x + y)$

4. $9(x^2 - 1)$

2. $7(x - 2y)$

5. $(4 - 13b)2$

3. $3x^2(5x - 2)$

6. $8 - y(2y + 7)$

Distributing the negative:

Ex:

distribute the -5

$$-5(x^2 - 1)$$

distribute the -a

$$7a^2 - a(2a - 4) =$$

distribute the negative (-1).

$$3y - (y + 3) =$$

Practice: Rewrite using the Distributive Property then simplify.

1. $5xy - 3x(2x + y)$

4. $-5 - 4(a^2 - 3)$

2. $8 - 3(-5 + y)$

5. $6x - (4x - y)$

3. $3x - (x - 2)$

6. $-y - (2y + 7)$

Distribution

Distribute then simplify by combining like terms where possible.
Arrange answers with the larger exponents on the left.

1. $x(5x - 2)$

2. $5(x - 2)$

3. $2a(5 - a)$

4. $-2x(x^2 + 3)$

5. $5a^2 + 2(a^2 + 7)$

6. $3x + 2(x - 5)$

7. $-5x(4 - 2x)$

8. $(x - 9)4x$

9. $-2a^3(5a^2 - 2a + 1)$

10. $5 - 2(a - 6)$

11. $2 - x(3 - 2x)$

12. $8x - 5(2x - 7)$

13. $3a - (15 - 2a)$

14. $-2x(x^2 + 3)$

15. $5a^2 + 2(a^2 + 7)$

16. $-(x - 5) + 2x$

17. $4 + x - 3(2 - x)$

18. $(2a - 5)(-4a^2)$

19. $-3a(2 - a - a^2) + a$

20. $-2(a - 6) - 4(a + 3)$

Quiz Review

Math 8

Review: Simplify each. (100 pts each).

Write answers with exponents in descending order.

100. $-5a^2 - 3a^2$

100. $5x^2y - 3x - 2x^2y$

100. $3x^2 - 7x - 5x^2 + 7x$

100. $-3xy - 5xy + xy$

100. $12c^2 - 2c + 3c^3$

100. $-2w^2 - 3w^2 - 4w^2$

Review: Simplify each. (100 pts each).

100. $-5a^2(3a^2)$

100. $5x^2y(-3x^2y)$

100. $3x^2 \cdot x \cdot 5x^2 \cdot 7x$

100. $-3xy(-5xy) \cdot xy$

100. $12c^{-2} \cdot 3c^3$

100. $2w^7 \cdot 3w^6 \cdot 4w^5$

Review: Simplify each. (100-600pts each).

Write answers with exponents in descending order.

100. $5(a^2 - 2)$

200. $5x^2(3xy + x)$

300. $5 - 3(3 - 5a)$

400. $x^3 - 3x^2(3 - x)$

500. $x - (x - 7) + 2x$

600. $2(4 - w) - 3(w - 2)$

Review: Simplify Completely (1,000 pts):

1000. $5x(xy^2 + xy - 3xy^2) - 2x^2(y + 3y^2 - 5) - 10x^2$

Practice Quiz: Like Terms, Exponents, Distribution.**Math 8****Simplify Each:**

1. $a^2 \cdot a^2$

1. _____

2. $a^2 + a^2$

2. _____

3. $a(a^2 + a)$

3. _____

4. $a(5 - 7a)$

4. _____

5. $5a - 7a$

5. _____

6. $5a(-7a)$

6. _____

7. $2x^2 - 7x + 3x^2$

7. _____

8. $2x^2(-7x + 3)$

8. _____

9. $2x^2 \cdot 7x \cdot 3$

9. _____

10. $4m + 5m^3 - 12m^2$

10. _____

11. $-4m(5m^3 - 12m^2)$

11. _____

12. $5m^3 \cdot 4m(2m^2)$

12. _____

Practice Quiz: Like Terms, Exponents, Distribution.**Math 8**

**Simplify Each: Distribute and combine like terms where possible.
Arrange terms with greater exponents on the left.**

13. $a + 5(a + 6)$

13. _____

14. $2x - 5(x - 4)$

14. _____

15. $3x - 7x(5 - x)$

15. _____

16. $x - (5 + x)$

16. _____

17. $3m(2 - 7m) + 2m^2$

17. _____

18. $-b - (2 - b)$

18. _____

19. $a^5(a^3 - 5) + a^{15}$

19. _____

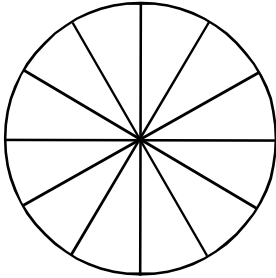
20. Fill-in the blanks: $a(\underline{\quad} + \underline{\quad}) = 5a^4 + 7a^2$

20. _____ + _____

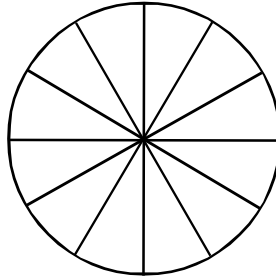
Working with Fractions.

Begin by shading-in the following fractions of the circles below:

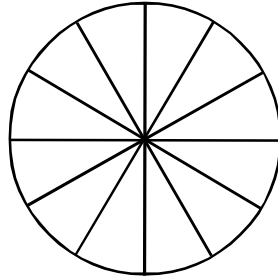
$$\frac{1}{2}$$



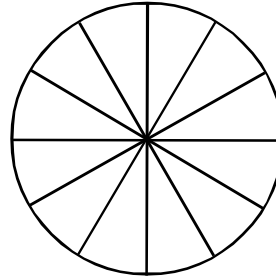
$$\frac{1}{4}$$



$$\frac{1}{6}$$



$$\frac{1}{3}$$



Now, consider what happens when we add $\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{3}$.

To add fractions, we must use a common denominator. Just as you cannot add unlike terms, you cannot add unlike fractions.

The pieces you are adding must be the same.

Examples: Simplify.

$$1. \quad \frac{5}{8} + \frac{1}{3} =$$

$$2. \quad \frac{4}{9} - \frac{3}{10} =$$

$$3. \quad -\frac{3}{5} + \frac{7}{15} =$$

Practice: Simplify each.

$$1. \quad \frac{2}{7} + \frac{1}{5} =$$

$$2. \quad \frac{7}{12} - \frac{1}{4} =$$

$$3. \quad -\frac{6}{11} - \frac{4}{5} =$$

Mixed Numbers: Two Methods.

There are two methods used when dealing with mixed numbers:

Method 1: Convert to improper fractions.

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

$$1\frac{3}{8} - \frac{3}{4} =$$

This method is great when the numbers are small, but with larger numbers this is less practical.

Method 2: "Borrowing" from the whole number.

To begin, replace each question mark with the correct number.

$$7\frac{1}{3} = 6\frac{?}{3}$$

$$5\frac{3}{8} = 4\frac{?}{8}$$

Now, simplify each without converting to improper fractions.

$$7\frac{1}{5} - 3\frac{4}{5} =$$

$$5\frac{7}{8} + 4\frac{3}{4} =$$

Practice: Simplify.

1. $1\frac{5}{8} + \frac{1}{4} =$

2. $7\frac{2}{9} - \frac{2}{3} =$

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

Practice: Simplify.

1. $\frac{5}{8}x + \frac{3}{4}x =$

2. $5\frac{2}{9}x^2 - \frac{2}{3}x^2 =$

Fractions

Math 8

Simplify each. Express improper fractions as mixed numbers.

1. $\frac{6}{7} + \frac{4}{7} =$

2. $\frac{5}{8} - \frac{1}{4} =$

3. $\frac{7}{9} + \frac{1}{3} =$

4. $-\frac{2}{5} - \frac{1}{6} =$

5. $1\frac{2}{3} + \frac{5}{6} =$

6. $7 - \frac{7}{16} =$

7. $\frac{7}{15} + 2\frac{1}{6} =$

8. $-2\frac{1}{5} - 3\frac{1}{2} =$

9. $-2\frac{1}{5} + 1\frac{7}{10} =$

10. $6\frac{1}{9} - 2\frac{2}{3} =$

Fractions

Math 8

11. $7\frac{4}{5} + 6\frac{5}{7} =$

12. $3\frac{1}{8} - 11\frac{1}{4} =$

13. $2\frac{4}{11} - 3\frac{1}{2} =$

14. $5\frac{2}{5} - 1\frac{3}{4} =$

15. $\frac{2}{5}x + \frac{1}{6}x =$

16. $5m - \frac{2}{3}m =$

17. $3\frac{2}{3}x + \frac{1}{4}x - 2x =$

18. $2b - \frac{1}{4}a - \frac{2}{5}a + \frac{3}{2}b =$

Fractions: Multiplying

Mental calculations:

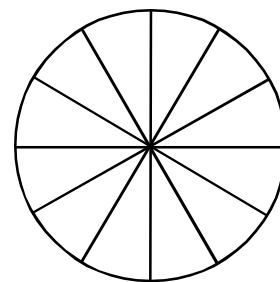
How could you multiply 12 by $\frac{2}{3}$ in your head?

What is two-thirds of 12?

How could you multiply 15 by $\frac{4}{5}$ in your head?

What is four-fifths of 15?

What does it mean to find one-half of two-thirds?
What does it mean to find three-fourths of one-third?
How do we represent the two problems above
with multiplication?



Examples: Multiply.

1. $\frac{1}{2} \cdot \frac{2}{3} =$

2. $\frac{2}{7} \cdot \frac{5}{11} =$

3. $-\frac{15}{46} \cdot \frac{23}{25} =$

Practice: Multiply.

1. $\frac{5}{9} \cdot \frac{11}{15} =$

2. $\frac{2}{3} \cdot \frac{4}{7} =$

3. $2\frac{11}{12} \cdot 1\frac{3}{7} =$

Fractions: Dividing

Practice:

1. You have 15 apples. You give three apples to each of your friends. How many friends can you give three apples to?
2. You have 15 apples. You give half an apple to each of your friends. How many friends can you give half an apple to?
3. You have 15 apples. You give $\frac{3}{4}$ of an apple to each of your friends. How many friends can you give $\frac{3}{4}$ of an apple to?
4. Divide 9 by $\frac{3}{4}$.

It should be obvious that dividing by one-half is the same as multiplying by 2. Dividing by $\frac{3}{4}$ is the same as multiplying by $\frac{4}{3}$.

To divide by a fraction, multiply by its reciprocal.

Examples: Divide.

$$1. \frac{5}{9} \div \frac{10}{11} =$$

$$2. 5 \div \frac{2}{7} =$$

$$3. 1\frac{2}{3} \div 5\frac{1}{2} =$$

Practice: Divide.

$$1. \frac{4}{5} \div \frac{12}{13} =$$

$$2. 6 \div \frac{4}{5} =$$

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

Practice: Solve each.

1. If the average person can eat $\frac{2}{5}$ of a pizza, how many people will 10 pizzas feed?
2. An 4-meter long wooden beam needs to be cut into pieces, and each piece must be $\frac{4}{5}$ of a meter long. How many pieces can be cut from the board?
3. Simplify the following complex fraction: $\frac{\frac{5}{7}}{\frac{4}{5}}$.

Fractions: Multiplication/Division

Math 8

Simplify each. Express improper fractions as mixed numbers.

1. $\frac{6}{7} \cdot \frac{3}{4} =$

2. $\frac{5}{6} \cdot \frac{3}{4} =$

3. $1\frac{1}{9} \cdot \frac{2}{5} =$

4. $-\frac{2}{5} \left(1\frac{1}{4}\right) =$

5. $1\frac{2}{3} \cdot 2\frac{1}{5} =$

6. $-7 \cdot \frac{3}{4} =$

7. $-1\frac{2}{7} \left(-3\frac{1}{2}\right) =$

8. $\frac{7}{15}x \cdot 1\frac{2}{3}x =$

_____ 9. What is two-ninths of 18?

_____ 10. What is three-fourths of 36?

_____ 11. What is three-fifths of one and one-half?

_____ 12. What is six-sevenths of two and three fourths?

Fractions: Multiplication/Division

Math 8

Simplify each. Express improper fractions as mixed numbers.

13. $\frac{6}{11} \div \frac{3}{4} =$

14. $\frac{5}{6} \div \frac{1}{3} =$

15. $2\frac{1}{4} \div \frac{9}{10} =$

16. $-\frac{2}{5} \div 2 =$

17. $5\frac{2}{3} \div 3\frac{2}{5} =$

18. $-8 \div \frac{2}{9} =$

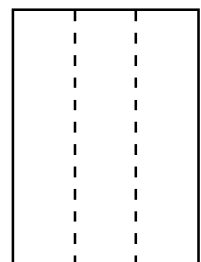
19. $-1\frac{2}{7} \div \frac{6}{11} =$

20. $\frac{4}{5} \div 1\frac{2}{3} + \frac{1}{10} =$

_____ 21. Three and a half pies need to be divided equally among six friends.
How much pie should each person get?

_____ 22. A 12-inch ruler is divided into sections, each $\frac{4}{5}$ of an inch long.
How many sections will the ruler be divided into?

_____ 23. A standard sheet of paper is $8\frac{1}{2}$ inches wide. If you fold the
paper into thirds as shown, what will be the width of each third?



More Distribution

Math 8

Distribution works the same way with fractions as with integers.

$$-5(x+3)-2 = \qquad -\frac{2}{9}(x-3)+x =$$

Examples: Distribute. Simplify. Leave improper fractions improper.

$$1. \ 5\left(\frac{1}{2}x+3\right) = \qquad 2. \ \frac{2}{9}x^2\left(\frac{2}{3}x-3\right) =$$

Practice: Distribute. Simplify. Leave improper fractions improper.

$$1. \ \frac{5}{8}(16x+2) = \qquad 2. \ \frac{1}{3}x^2\left(\frac{4}{5}x^3-x\right) =$$

Examples: Distribute. Simplify. Leave improper fractions improper.

$$1. \ 2x-5\left(\frac{3}{5}x+2\right) = \qquad 2. \ x-6x\left(2-\frac{2}{3}x\right) =$$

Practice: Distribute. Simplify. Leave improper fractions improper.

$$1. \ -3x\left(\frac{1}{6}x+\frac{2}{3}\right)+5x = \qquad 2. \ x^2-2x\left(\frac{1}{2}-\frac{3}{4}x\right) =$$

Fractions: Multiplication/Division

Math 8

Simplify each. Take your time. Leave improper fractions improper.

Show all steps below or on separate paper.

1. $\frac{1}{2}(x-6) =$

2. $3 - \frac{5}{6}(12x - 24) =$

3. $\frac{1}{9}x(6x^2 - 4) =$

4. $-\frac{2}{5}x\left(\frac{1}{4}x - 2\right) =$

5. $3x - \frac{2}{3}(x - 6) =$

6. $-7\left(\frac{1}{2}x - 5\right) + \frac{1}{2}x =$

7. $5x - 2\left(-\frac{3}{4}x + 3\right) =$

8. $\frac{11}{15}x - \frac{4}{5}\left(\frac{2}{3}x - \frac{5}{8}\right) =$

Test Review

Math 8

Simplify:

$$-3x^2 \cdot 5x^2 =$$

$$5xy(2x^2y) =$$

Simplify:

$$-3x^2 + 5x^2 =$$

$$5x^2y - 2x - 3x^2y + 5x =$$

Simplify:

$$-3x^2(2 - x) =$$

$$5x^2 - 2x(x^2 - 5) =$$

Simplify:

$$-\frac{3}{4} + \frac{7}{8} =$$

$$2\frac{1}{3} + 5\frac{7}{9} =$$

Simplify:

$$2\frac{1}{4} - \frac{2}{3} =$$

$$-2\frac{1}{3} + 4\frac{1}{4} =$$

Simplify:

$$2\frac{1}{4} \cdot \frac{2}{3} =$$

$$-5\frac{1}{3} \div \frac{8}{9} =$$

Simplify:

$$\frac{1}{4}x(6x - 8) =$$

$$2x - \frac{3}{4}\left(x + \frac{2}{3}\right) =$$

Practice Test: Unit 1

Simplify Each:

1. $5x \cdot 7x^2$

1. _____

2. $5a^2 \cdot 3a^2 \cdot 4a^2$

2. _____

3. $5c^2(2c^2) + 4c^3$

3. _____

4. $6x + 13x$

4. _____

5. $5a - 13 + a - 2$

5. _____

6. $7x^2y - 9xy^2 + 5xy^2 - 4x^2y$

6. _____

7. $5(a - 2)$

7. _____

8. $3x^2(5x^2 - 2x)$

8. _____

9. $6b - 2(b - 7b)$

9. _____

10. $x^2 - 7(x - 1)$

10. _____

Practice Test: Unit 1

Math 8

Simplify Each: Improper fractions MAY BE LEFT IMPROPER.

11. $\frac{2}{3} + \frac{1}{6} =$

11. _____

12. $-\frac{2}{5} - \frac{4}{5} =$

12. _____

13. $1\frac{2}{5} + \frac{5}{8} =$

13. _____

14. $7\frac{1}{3} - \frac{1}{4} =$

14. _____

15. $6\frac{1}{5} - \frac{2}{3} =$

15. _____

16. $\frac{10}{11} \cdot \frac{4}{15} =$

16. _____

17. $2\frac{1}{3} \div \frac{5}{6} =$

17. _____

18. $\frac{2}{3}(6x^2 - 15)$

18. _____

19. $b - \frac{2}{7}(14b + 7)$

19. _____

20. $-5\left(\frac{1}{6}x - 1\right) + 2x$

20. _____