

Summer Math  
2016  
for students who will be taking Pre-Algebra

This packet is designed to cover some of the major concepts learned in math this past year. Please work on these handouts over the summer, in an effort to continue practicing math. We hope that you do a little at a time instead of doing the packet all at once.

If you'd like to continue to practice your math skills over the summer, check out these websites:

[www.math-drills.com](http://www.math-drills.com)

[www.ixl.com](http://www.ixl.com)

[www.thatquiz.org](http://www.thatquiz.org)

[www.math.com](http://www.math.com)

**SKILL**  
**10**

Name \_\_\_\_\_ Date \_\_\_\_\_

# Greatest Common Factor

The **greatest common factor (GCF)** of two or more numbers is the greatest number that is a factor of each number. One way to find the greatest common factor is to list the factors of each number and then choose the greatest common factors.

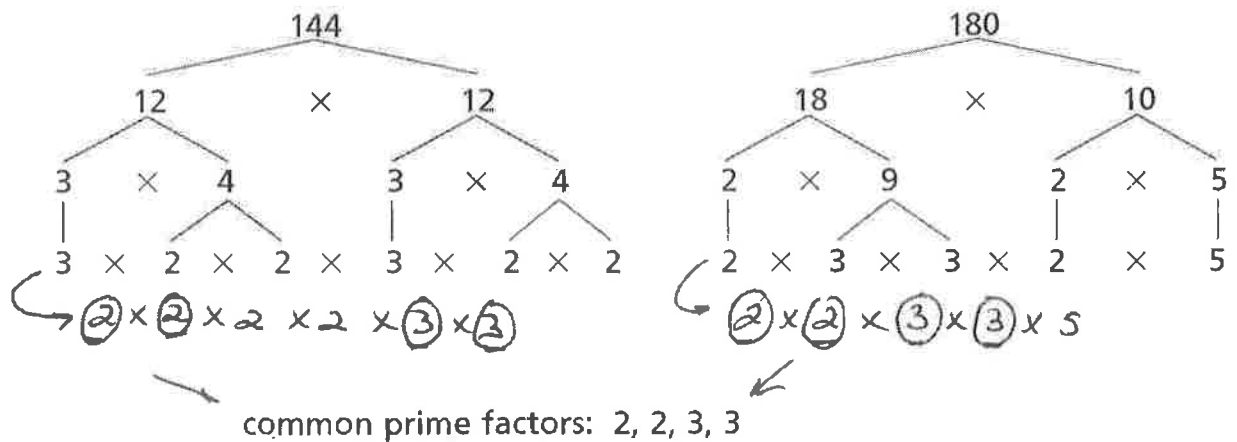
**EXAMPLE** Find the GCF of 36 and 48.

factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36  
 factors of 48: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48  
 common factors: 1, 2, 3, 4, 6, 12

The GCF of 36 and 48 is 12.

Another way to find the GCF is to use the prime factorization of each number. Then identify all common prime factors and find their product.

**EXAMPLE** Find the GCF of 144 and 180.



The GCF of 144 and 180 is  $2 \times 2 \times 3 \times 3$ , or 36.

**EXERCISES**

Find the GCF for each set of numbers.

1. 18, 24
2. 64, 40
3. 60, 75
4. 28, 52
5. 54, 72
6. 48, 72
7. 63, 81
8. 84, 144
9. 72, 170

20. 16, 20, 36

**APPLICATIONS**

22. Sharanda is tiling the wall behind her bathtub. The area to be tiled measures 48 inches by 60 inches. What is the largest square tile that Sharanda can use and not have to cut any tiles? \* Hint: what is the GCF of 48 and 60? \*
23. Mr. Mitchell is a florist. He received a shipment of 120 carnations, 168 daisies, and 96 lilies. How many mixed bouquets can he make if there are the same number of each type of flower in each bouquet, and there are no flowers left over?



# Least Common Multiple

**A** multiple of a number is the product of that number and any whole number. The least nonzero multiple of two or more numbers is the **least common multiple (LCM)** of the numbers.

**EXAMPLE**

*Find the least common multiple of 6 and 8.*

positive multiples of 6: 6, 12, 18, 24, 30, 36, 42, . . .

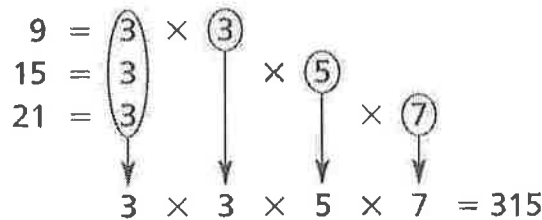
positive multiples of 8: 8, 16, 24, 32, 40, 48, 56, . . .

The LCM of 6 and 8 is 24.

**P** rime factorization can also be used to find the LCM.

**EXAMPLE**

*Find the least common multiple of 9, 15, and 21.*



*Find prime factors of each number. Circle all sets of common factors. Multiply the common factors and any other factors.*

The LCM of 9, 15, and 21 is 315.

**EXERCISES**

*Find the LCM of each set of numbers by listing the multiples of each number.*

- 1. 3, 4
- 2. 10, 25
- 3. 18, 24, 48

*Find the LCM of each set of numbers by writing the prime factorization.*

- 4. 35, 49
- 5. 27, 36
- 6. 10, 12, 15

Find the LCM of each set of numbers.

7. 16, 24

8. 56, 16

9. 28, 20

10. 64, 72

11. 63, 77

12. 110, 120

14. 40, 60, 108

19. Find the GCF and LCM of 36 and 54.

21. List the first five multiples of 6p.

## APPLICATIONS

22. Suppose that your taxes, car insurance, and health club membership fees are all due in August. The taxes are due every three months, car insurance is due every six months, and health club membership is due every two months. Name the next month that all three bills will be due in the same month. \*Hint: What is the LCM of 3, 6 = 2? \*
23. Antoine is buying hamburgers and buns for a class picnic. Hamburgers come in packages of 15 patties and buns come in packages of 8. Antoine wants to have the same number of hamburger patties and buns. What is the least number of hamburger patties and buns he can buy?

**SKILL**  
**12**

Name \_\_\_\_\_

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# Adding and Subtracting Decimals

To add decimals, line up the decimal points. Then add the same way you add whole numbers.

**EXAMPLES**

$16.45 + 18.62$

$$\begin{array}{r} 16.45 \\ + 18.62 \\ \hline 35.07 \end{array}$$

The sum is 35.07.

$77.3 + 88.45 + 90$

$$\begin{array}{r} 77.30 \\ 88.45 \\ + 90.00 \\ \hline 255.75 \end{array}$$

Annex zeros.

The sum is 255.75.

To subtract decimals, line up the decimal points. Then subtract the same way you would subtract whole numbers.

**EXAMPLES**

$45.63 - 15.47$

$$\begin{array}{r} 45.63 \\ - 15.47 \\ \hline 30.16 \end{array}$$

The difference is 30.16.

$134 - 105.67$

$$\begin{array}{r} 134.00 \\ - 105.67 \\ \hline 28.33 \end{array}$$

Annex zeros.

The difference is 28.33.

**EXERCISES***Find each sum or difference.*

1. 
$$\begin{array}{r} 8.22 \\ + 6.83 \\ \hline \end{array}$$

2. 
$$\begin{array}{r} 17.532 \\ - 8.173 \\ \hline \end{array}$$

3. 
$$\begin{array}{r} 47.9 \\ + 134.2 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 46 \\ - 4.49 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 1.0349 \\ + 10.08 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 23 \\ - 4.093 \\ \hline \end{array}$$

$$12. \quad 3 + 24.15 + 56.052$$

$$13. \quad 36 + 215.5 + 4.63$$

$$16. \quad 23 - 1.59$$

$$17. \quad 15.6 - 0.423$$

## APPLICATIONS

*The results of the 2000 presidential election are given at the right. Use this information to answer Exercises 22–24.*

22. What percent of the vote was cast for Bush or Gore?
23. How many more percentage points did Gore receive than Bush?
24. What percent of the vote was cast for listed candidates other than Gore or Bush?
25. Three pieces of cardboard are 0.125 inch, 0.38 inch, and 0.0634 inch thick. What is the combined thickness of all three pieces?

2000 Presidential Elections	
Candidate	Percent (%) of Popular Vote
Browne	0.36
Buchanan	0.42
Bush	47.87
Gore	48.38
Hagelin	0.08
Harris	0.01
Nader	2.74
Phillips	0.09
Write-In	0.02
Other	0.03

Source: *The World Almanac*

**SKILL**  
**13**

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# Multiplying and Dividing Decimals

**EXAMPLE** Multiply 2.56 by 1.03.

$$\begin{array}{r}
 2.56 \quad \leftarrow 2 \text{ decimal places} \\
 \times 1.03 \quad \leftarrow 2 \text{ decimal places} \\
 \hline
 768 \\
 000 \\
 256 \\
 \hline
 2.6368 \quad \leftarrow 4 \text{ decimal places}
 \end{array}$$

The sum of the decimal places in the factors is 4, so the product has 4 decimal places.

The product is 2.6368.

**EXAMPLE** Divide 0.201 by 0.3.

$$\begin{array}{r}
 0.67 \\
 0.3 \overline{)0.201} \\
 \underline{0} \phantom{0} \\
 20 \\
 \underline{18} \\
 21 \\
 \underline{21} \\
 0
 \end{array}$$

Change 0.3 to 3 by moving the decimal point one place to the right.

Move the decimal point in the dividend one place to the right.

Divide as with whole numbers, placing the decimal point above the new point in the dividend.

The quotient is 0.67.

**EXERCISES**

Multiply. Show your work on separate paper!

1. 
$$\begin{array}{r}
 2.5 \\
 \times 1.3 \\
 \hline
 \end{array}$$

2. 
$$\begin{array}{r}
 6.92 \\
 \times 53 \\
 \hline
 \end{array}$$

3. 
$$\begin{array}{r}
 46.89 \\
 \times 0.06 \\
 \hline
 \end{array}$$



Show your work on separate paper!

7. 
$$\begin{array}{r} 20.03 \\ \times 1.86 \\ \hline \end{array}$$

8. 
$$\begin{array}{r} 10.26 \\ \times 30.5 \\ \hline \end{array}$$

9. 
$$\begin{array}{r} 49.76 \\ \times 5.17 \\ \hline \end{array}$$

Divide.

10.  $0.04 \overline{)0.092}$

11.  $0.7 \overline{)0.245}$

12.  $0.06 \overline{)0.204}$

13.  $0.63 \overline{)7.56}$

14.  $4.6 \overline{)115}$

15.  $8.1 \overline{)132.03}$

## APPLICATIONS

- Members of the student body ran 87.75 miles on a 0.25 mile track to raise money for charity. How many laps did they run?
- A factory manager needs 3.25 yards of material to make a skirt. How many yards of fabric must be used to make 200 skirts?
- Samantha worked 40.5 hours this week. She makes \$9.50 per hour. How much money did she earn this week?

**SKILL**  
**14**

Name \_\_\_\_\_ Date \_\_\_\_\_

# Adding and Subtracting Fractions

To add or subtract fractions with unlike denominators, rename the fractions so that they have a common denominator.

**EXAMPLES** Find each sum or difference.

$$\begin{array}{r} \text{a.} \quad \frac{1}{4} = \frac{2}{8} \\ + \frac{5}{8} = + \frac{5}{8} \\ \hline \frac{7}{8} \end{array}$$

The sum is  $\frac{7}{8}$ .

$$\begin{array}{r} \text{b.} \quad \frac{1}{6} = \frac{5}{30} \\ + \frac{7}{10} = + \frac{21}{30} \\ \hline \frac{26}{30} = \frac{13}{15} \end{array}$$

The sum is  $\frac{13}{15}$ .

$$\begin{array}{r} \text{c.} \quad 16\frac{1}{2} = 16\frac{7}{14} \\ + 14\frac{5}{7} = + 14\frac{10}{14} \\ \hline 30\frac{17}{14} = 31\frac{3}{14} \end{array}$$

The sum is  $31\frac{3}{14}$ .

$$\begin{array}{r} \text{d.} \quad \frac{8}{9} - \frac{1}{3} \\ \frac{8}{9} = \frac{8}{9} \\ - \frac{1}{3} = - \frac{3}{9} \\ \hline \frac{5}{9} \end{array}$$

The difference is  $\frac{5}{9}$ .

$$\begin{array}{r} \text{e.} \quad \frac{5}{6} - \frac{3}{8} \\ \frac{5}{6} = \frac{20}{24} \\ - \frac{3}{8} = - \frac{9}{24} \\ \hline \frac{11}{24} \end{array}$$

The difference is  $\frac{11}{24}$ .

$$\begin{array}{r} \text{f.} \quad 6 - 3\frac{2}{5} \\ 6 = 5\frac{5}{5} \\ - 3\frac{2}{5} = - 3\frac{2}{5} \\ \hline 2\frac{3}{5} \end{array}$$

The difference is  $2\frac{3}{5}$ .

**EXERCISES** Find each sum or difference.

$$\begin{array}{r} 1. \quad \frac{1}{5} \\ + \frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad \frac{5}{12} \\ + \frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad \frac{1}{6} \\ + \frac{3}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad \frac{7}{8} \\ - \frac{1}{4} \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad \frac{7}{10} \\ - \frac{3}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad \frac{11}{12} \\ - \frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} 7. \ 5\frac{1}{4} \\ + 7\frac{1}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 8. \ 11\frac{3}{4} \\ + 8\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 9. \ 13 \\ + 9\frac{7}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 10. \ 15\frac{1}{2} \\ + 9\frac{4}{5} \\ \hline \end{array}$$

$$\begin{array}{r} 11. \ 12\frac{1}{2} \\ - 8\frac{2}{3} \\ \hline \end{array}$$

$$\begin{array}{r} 12. \ 14\frac{5}{8} \\ - 6\frac{5}{6} \\ \hline \end{array}$$

how your work on separate paper!

$$13. \ 18\frac{7}{8} - 13$$

$$14. \ 11 - 3\frac{5}{9}$$

$$15. \ 16\frac{2}{5} - 13\frac{3}{4}$$

$$16. \ \frac{3}{10} + \frac{4}{15}$$

$$17. \ \frac{3}{8} + \frac{5}{12}$$

$$18. \ 18\frac{5}{18} - 8\frac{1}{9}$$

$$19. \ 2\frac{1}{4} + 3\frac{1}{2} + 5\frac{5}{6}$$

### APPLICATIONS

Show your work on separate paper.

22. Ashley spends  $\frac{1}{4}$  of her study time studying math and  $\frac{1}{6}$  of her time studying history. How much of her study time does she spend on math and history?

24. A tailor buys some cloth to make pants. He buys  $3\frac{5}{6}$  yards of one type of fabric and  $4\frac{7}{36}$  yards of another. How much fabric did he buy in all?

**SKILL**  
**15**

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# Multiplying and Dividing Fractions

To multiply fractions, multiply the numerators and multiply the denominators.

**EXAMPLE** What is the product of  $\frac{5}{6}$  and  $\frac{9}{10}$ ?

$$\begin{aligned}\frac{5}{6} \times \frac{9}{10} &= \frac{5 \times 9}{6 \times 10} && \text{Multiply the numerators.} \\ &&& \text{Multiply the denominators.} \\ &= \frac{45}{60} \text{ or } \frac{3}{4} && \text{Simplify.}\end{aligned}$$

The product is  $\frac{3}{4}$ .

To divide by a fraction, multiply by its reciprocal.

**EXAMPLE** What is the quotient of  $\frac{4}{15}$  and  $\frac{2}{5}$ ?

$$\begin{aligned}\frac{4}{15} \div \frac{2}{5} &= \frac{4}{15} \times \frac{5}{2} && \text{Multiply by the reciprocal of } \frac{2}{5}, \text{ which is } \frac{5}{2} \\ &= \frac{4 \times 5}{15 \times 2} && \text{Multiply the numerators.} \\ &&& \text{Multiply the denominators.} \\ &= \frac{20}{30} \text{ or } \frac{2}{3} && \text{Simplify.}\end{aligned}$$

The quotient is  $\frac{2}{3}$ .

**EXERCISES** Multiply. Express each answer in simplest form.

1.  $\frac{2}{3} \times \frac{1}{4}$

2.  $\frac{3}{7} \times \frac{1}{2}$

3.  $\frac{7}{10} \times \frac{5}{7}$

4.  $\frac{5}{8} \times \frac{1}{4}$

5.  $\frac{1}{6} \times \frac{3}{5}$

6.  $\frac{4}{5} \times \frac{9}{10}$

*Divide. Express each answer in simplest form.*

10.  $\frac{3}{4} \div \frac{1}{2}$

11.  $\frac{1}{5} \div \frac{1}{4}$

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

13.  $\frac{4}{5} \div \frac{2}{5}$

14.  $\frac{7}{8} \div \frac{1}{4}$

15.  $\frac{4}{7} \div \frac{8}{9}$

16.  $\frac{4}{9} \div \frac{2}{3}$

17.  $\frac{5}{9} \div 5$

18.  $20 \div \frac{3}{10}$

*Find each product or quotient. Express each answer in simplest form.*

19.  $\frac{2}{3} \times \frac{5}{9}$

20.  $\frac{1}{6} \div \frac{2}{9}$

21.  $\frac{9}{10} \div \frac{1}{4}$

22.  $\frac{1}{15} \times 15$

23.  $\frac{15}{16} \div \frac{15}{16}$

24.  $\frac{4}{5} \times \frac{15}{24}$

## APPLICATIONS

25. A piece of lumber 12 feet long is cut into pieces that are each  $\frac{2}{3}$  foot long. How many short pieces are there?
26. About  $\frac{1}{20}$  of the population of the world lives in South America. If  $\frac{1}{35}$  of the population of the world lives in Brazil, what fraction of the population of South America lives in Brazil?
27. There is  $\frac{1}{3}$  pound of peanuts in 2 pounds of mixed nuts. What part of the mixed nuts are peanuts?

**SKILL**  
**16**

Name \_\_\_\_\_ Date \_\_\_\_\_

# Changing Fractions to Decimals

A fraction is another way of writing a division problem. To express a fraction as a decimal, divide the numerator by the denominator. If the division ends, or terminates, with a zero, the decimal is a **terminating decimal**.

**EXAMPLE** Express  $\frac{3}{4}$  as a decimal.

$\frac{3}{4}$  means  $3 \div 4$  or  $4 \overline{)3}$ .

$$\begin{array}{r} 0.75 \\ 4 \overline{)3.00} \\ \underline{28} \phantom{00} \\ 20 \phantom{00} \\ \underline{20} \phantom{00} \\ 0 \end{array} \quad \text{Annex zeros as needed.}$$

0 Division ends when the remainder is 0.

So,  $\frac{3}{4} = 0.75$ .

If the decimal repeats a pattern in the digits rather than terminates, the decimal is a **repeating decimal**. You can use bar notation to show that a number repeats indefinitely. A bar is written over the digits that repeat.

**EXAMPLE** Express  $\frac{5}{6}$  as a decimal.

$$\begin{array}{r} 0.8333 \\ 6 \overline{)5.0000} \\ \underline{48} \phantom{0000} \\ 20 \phantom{0000} \\ \underline{18} \phantom{0000} \\ 20 \phantom{0000} \\ \underline{18} \phantom{0000} \\ 20 \phantom{0000} \\ \underline{18} \phantom{0000} \\ 2 \phantom{0000} \end{array}$$

The number 3 repeats.

The remainder after each step is 2.

So, using bar notation,  $\frac{5}{6} = 0.8\bar{3}$ .

**EXERCISES**

Express each fraction as a decimal. Use bar notation if necessary. You may use a calculator for problems that don't involve familiar or "friendly" denominators!

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

2.  $\frac{2}{3}$

3.  $\frac{1}{8}$

4.  $\frac{2}{9}$

5.  $\frac{4}{11}$

6.  $\frac{1}{2}$

7.  $\frac{3}{10}$

8.  $\frac{3}{8}$

9.  $\frac{5}{12}$

10.  $\frac{4}{9}$

11.  $\frac{7}{16}$

12.  $\frac{17}{20}$

13.  $\frac{1}{6}$

14.  $\frac{28}{42}$

15.  $\frac{17}{32}$

16.  $\frac{13}{25}$

17.  $\frac{63}{100}$

18.  $\frac{19}{22}$

19.  $\frac{37}{50}$

20.  $\frac{49}{99}$

**APPLICATIONS**

Ms. Breckenridge uses the grading scale shown at the right.

25. If a student gets  $\frac{19}{25}$  of the questions on a quiz correct, what was the student's score?
26. What grade should be given to a student who got 25 out of 30 questions correct if each question was worth the same value?
27. On the first quiz of the grading period, a student answered  $\frac{8}{9}$  of the questions correctly. On the second quiz, the student got 22 out of 25 questions correct. Which quiz had the higher score?

Grade	Score
A	93–100
B	82–92. $\bar{9}$
C	71–81. $\bar{9}$
D	60–70. $\bar{9}$
F	0–59. $\bar{9}$

**SKILL**  
**17**

Name \_\_\_\_\_ Date \_\_\_\_\_

# Percents as Fractions and Decimals

To write a percent as a fraction, write a fraction with the percent in the numerator and with a denominator of 100,  $\frac{r}{100}$ . Then write the fraction in simplest form.

**EXAMPLES** Express each percent as a fraction.

a. 40%

$$40\% = \frac{40}{100}$$

$$= \frac{2}{5}$$

$$\text{Therefore, } 40\% = \frac{2}{5}.$$

b.  $87\frac{1}{2}\%$

$$87\frac{1}{2}\% = \frac{87\frac{1}{2}}{100}$$

$$= \frac{175}{200}$$

$$= \frac{175}{2} \times \frac{1}{100}$$

$$= \frac{175}{200}$$

$$= \frac{7}{8}$$

$$\text{Therefore, } 87\frac{1}{2}\% = \frac{7}{8}.$$

To express a percent as a decimal, first express the percent as a fraction with a denominator of 100. Then express the fraction as a decimal.

**EXAMPLES** Express each percent as a decimal.

a. 51%

$$51\% = \frac{51}{100}$$

$$= 0.51$$

$$\text{Therefore, } 51\% = 0.51.$$

b. 90.2%

$$90.2\% = \frac{90.2}{100}$$

$$= \frac{90.2 \times 10}{100 \times 10}$$

$$= \frac{902}{1,000}$$

$$= 0.902$$

$$\text{Therefore, } 90.2\% = 0.902.$$



**EXERCISES**

Express each percent as a fraction, in lowest terms.

1. 75%

2. 84%

3. 90%

4.  $18\frac{1}{2}\%$

Express each percent as a decimal.

9. 82%

10. 61.5%

11. 8.9%

12.  $48\frac{1}{2}\%$

Write each percent as a fraction in simplest form and write as a decimal.

18%

22%

23. 0.5625%

24. 4.9%

**APPLICATIONS**

Fractions must be in simplest form.

25. The average household in the United States spends 15% of its money on food. Express 15% as a decimal.
26. Bananas grow on plants that can be 30 feet tall. A single banana may be 75% water. Express 75% as a fraction and as a decimal.
27. In the United States, showers usually account for 32% of home water use. Express this percent as a fraction and as a decimal.
28. Only 2% of earthquakes in the world occur in the United States. Express this percent as a fraction and as a decimal.

# All Operations with Integers (E)

Use an integer strategy to find each answer.

$15 + (-10) =$

$(-10) - 13 =$

$(-14) - (-3) =$

$3 - (-3) =$

$66 \div 11 =$

$6 + (-13) =$

$6 + (-1) =$

$10 + 5 =$

$14 \times (-12) =$

$135 \div (-9) =$

$6 + (-13) =$

$24 \div 6 =$

$6 - (-10) =$

$2 + (-8) =$

$(-9) - 6 =$

$(-5) - (-13) =$

$(-6) - 5 =$

$6 \times (-8) =$

$2 \times (-10) =$

$15 + (-5) =$

$(-156) \div (-13) =$

$(-8) + (-9) =$

$(-11) + (-12) =$

$(-6) + 15 =$

$8 + (-12) =$

$(-10) + 3 =$

$(-7) + (-1) =$

$21 \div (-7) =$

$(-8) \times 10 =$

$3 + (-9) =$

Name: \_\_\_\_\_

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## Order of Operations

Please complete the problems below. Remember PE M/D A/S!

a.  $4 + 8 + (1^2 + 2 \times 9)$

b.  $(5 \times 4 \times 6)$

c.  $4^2 - (8 + 6) - 1$

d.  $(7 - 3 + 3)$

e.  $2 + 8 + (3 \div 3) \div 5$

f.  $(8^2 + 1 \times 1 - 4) + 6$

g.  $(8 - 2 \times 2)$

h.  $7^2 + (7 + 3^2) \times 2$

i.  $1 + (5 + 4^2) \times 1 + 4$

j.  $(4^2 + 5^2) - 8 + 8$

k.  $(2 \times 3^2) + 5 \times 9$

l.  $(8 - 7 \div 1^2) + 7$