

CHAPTER 10

ABSOLUTE VALUE GRAPHS AND THE CONIC SECTIONS

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CHAPTER 1

PRE - ALGEBRA

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1.1 RULES FOR ADDITION AND SUBTRACTION

RULE 1: You cannot add or subtract unless the name is the same.

In algebra we call them like terms. (Combine Like Terms)

Examples: (When you add or subtract the name stays the same.)

See p. 168

1. $\frac{2}{3}$ means two of those little thirds

2. $2\sqrt{3}$ means two of those little square roots of threes

3. $2X$ means two of those little X's

The 2 is the number each time and thirds, square roots of three, and X are the names.

Like Names or Like Terms

Not Like Names or Like Terms

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

5. $\frac{3}{8} + \frac{4}{9} =$ need a common denominator

6. $\frac{11}{13} - \frac{5}{13} = \frac{6}{13}$

7. $\frac{13}{23} - \frac{7}{15} =$ need a common denominator

8. $2\sqrt{7} + 3\sqrt{7} = 5\sqrt{7}$

9. $5\sqrt{3} + 7\sqrt{11} =$ simplest form

10. $5X + 6X = 11X$

11. $5X + 6Y =$ simplest form

12. $7X^2Y + 8X^2Y = 15X^2Y$

13. $3X^2Y + 4XY^2 =$ simplest form

PRACTICE: (SOLVE) → (Actually we are simplifying expressions.)

see p. 33

1. $\frac{3}{5} + \frac{1}{7} =$

2. $\frac{7}{8} - \frac{3}{8} =$

3. $5\frac{11}{13} - 2\frac{5}{13} =$

4. $5\sqrt{11} + 7\sqrt{13} =$

5. $6\sqrt{3} + 8\sqrt{3} =$

6. $6X + 7X =$

7. $12X^2Y^3 + 15XY^3 =$

8. $83MN - 17MN =$

9. $13X^2Y + 12X^2Y =$

see p. 33

RULE 2: To "simplify an expression" put like terms together (commutative property) and then combine the like terms.

RULE 3: To carry or borrow ask the question, "How many of these does it take to make one of those."

see conversion chart at 1st of book

EXAMPLES:

1. $234.67 + 54.78 =$

$$\begin{array}{r} 234.67 \\ + 54.78 \\ \hline 289.45 \end{array}$$

2. $467.84 - 98.97 =$

$$\begin{array}{r} 467.84 \\ - 98.97 \\ \hline 368.87 \end{array}$$

3. $4\frac{5}{11} + 3\frac{9}{11} =$

$$\begin{array}{r} 4\frac{5}{11} \\ + 3\frac{9}{11} \\ \hline 7\frac{14}{11} \end{array}$$

$1\frac{3}{11}$
 $11 \overline{) 14} = 1 \text{ R } 3$
 $8\frac{3}{11}$

4. $8\frac{2}{7} - 3\frac{6}{7} =$

$$\begin{array}{r} 8\frac{2}{7} \\ - 3\frac{6}{7} \\ \hline 4\frac{3}{7} \end{array}$$

$1 = \frac{7}{7}$
 $7\frac{2}{7} + \frac{7}{7} = 8\frac{2}{7}$
 $8\frac{2}{7} - 3\frac{6}{7} = 7\frac{9}{7} - 3\frac{6}{7} = 4\frac{3}{7}$

5. 5 yards 2 feet 8 inches
+ 4 yards 2 feet 7 inches

$$\begin{array}{r} 5\text{ft} \quad 15\text{in} \\ - 3\text{ft} \quad - 12\text{in} \\ \hline 10\text{yds} \quad 2\text{ft} \quad 3\text{in} \end{array}$$

6. $17\text{ hours } 46\text{min} + 60\text{min} = 106\text{min}$
 $18\text{ hours } 47\text{ min } 39\text{ sec} + 60\text{sec} = 99\text{sec}$
 $- 12\text{ hours } 52\text{ min } 47\text{ sec}$

$5\text{ hours } 54\text{ min } 52\text{ sec}$

7. $5XY + 6MN + 7XY + 4MN =$

$12XY + 10MN$

8. $3X^2Y + 4XY + -7X^2Y =$

$-4X^2Y + 4XY$

for sign rules see p. 18

PRACTICE: (SIMPLIFY EACH EXPRESSION)

3

1. $345.6 + 24.76 =$

2. $495.34 - 254.375 =$

3. $4\frac{5}{6} + 3\frac{5}{6} =$

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

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

6. $9\frac{3}{11} - 3\frac{9}{11} =$

7. $9 \text{ yards } 2 \text{ feet } 8 \text{ inches}$
 $+ 8 \text{ yards } 2 \text{ feet } 9 \text{ inches}$

8. $19 \text{ hours } 37 \text{ min } 28 \text{ sec}$
 $- 13 \text{ hours } 46 \text{ min } 43 \text{ sec}$

9. $5 \text{ gallons } 3 \text{ quarts } 1 \text{ pint}$
 $+ 3 \text{ gallons } 2 \text{ quarts } 1 \text{ pint}$

10. $7 \text{ meters } 4 \text{ decimeters } 3 \text{ centimeters}$
 $- 3 \text{ meters } 7 \text{ decimeters } 8 \text{ centimeters}$

for sign rules see p. 18

11. $5XY + 7DR + 4XY + 3DR =$ 12. $-3XY + 5MN + 8XY =$ 4

13. $6X^2Z + 5YZ^3 + 3X^2Z =$ 14. $8XYZ + 3X + 4XYZ =$

15. $5\sqrt{6} + 3\sqrt{7} + 8\sqrt{6} =$ 16. $4\sqrt{3} + -2\sqrt{3} + 5\sqrt{7} =$

17. $9\sqrt{5} + 7\sqrt{3} + 6\sqrt{5} + 8\sqrt{3} + 8\sqrt{5} + 9\sqrt{3} =$

18. $7\frac{11}{12} + 9\frac{7}{12} =$

19. $14\frac{5}{12} - 9\frac{11}{12} =$

20. Memorize your metric prefixes. (How Many?)

a. Kilo _____ d. meter _____ length g. deci _____

b. Hecto _____ e. liter _____ volume h. centi _____

c. Deka _____ f. gram _____ weight i. milli _____

see special
rules at
1st of book

1.2 RULES FOR MULTIPLICATION AND DIVISION

RULE 1: The names do not have to be the same. They do not have to be like terms.

RULE 2: Every time you multiply or divide you get a new name.

Multiply the numbers and multiply the names and you get a new name. (To mult. with like bases you add the exponents.) see p. 169

To divide use special rules. On a fraction you reduce the numbers and reduce the names. (To divide with like bases you sub. the exp.)

EXAMPLES:

1. $\frac{2}{3} \times \frac{5}{7} = \frac{10}{21}$ same name new name

2. $3X \times 4X = 12X^{(1+1)} = 12X^2$ HINT: $X+X=2X$ $X \times X = X^2$

3. $5X^2 \times 7X^3 = 35X^{(2+3)} = 35X^5$ $X \times X \times X = X^3$

4. $6\sqrt{3} \times 8\sqrt{5} = 48\sqrt{15}$

5. $X^5 \div X^2 =$ same as $\frac{X^5}{X^2} = X^{(5-2)} = X^3$

6. $\frac{6X^7Y^5}{8X^3Y^2} = \frac{\overset{\text{GCF}}{\cancel{2}X^3Y^2}}{\cancel{2}X^3Y^2} = \frac{3X^4Y^3}{4}$ $\xrightarrow{\text{GCF or Greatest Common Factor}}$

$\begin{array}{r} 2 \overline{)6} \\ \underline{3} \\ 2 \overline{)8} \\ \underline{4} \\ 2 \overline{)4} \\ \underline{2} \end{array}$

 $2 \cdot 3 \cdot X \cdot X \cdot X \cdot X \cdot X \cdot Y \cdot Y \cdot Y \cdot Y$
 $2 \cdot 2 \cdot 2 \cdot X \cdot X \cdot X \cdot Y \cdot Y$
 $2 \cdot X \cdot X \cdot X \cdot Y \cdot Y = 2X^3Y^2$

7. $\frac{12\sqrt{15}}{15\sqrt{3}} \div \frac{3\sqrt{3}}{3\sqrt{3}} = \frac{4\sqrt{5}}{5}$ 8. $0.5 \times 0.12 =$ same as $\frac{5}{10} \times \frac{12}{100} =$

9. $(.05)^2$ ← squared (times itself)

$\begin{array}{r} .05 \\ \times .05 \\ \hline .0025 \end{array}$

$\frac{60}{1000} \div \frac{20}{20} = \frac{3}{50}$

$\begin{array}{r} 0.12 \\ \times 0.5 \\ \hline .060 \end{array}$

 Count up the number of decimal places in the factors and put that many in the product

 thousandths place (3 decimal places)

PRACTICE : (simplify each expression)

6

1. $\frac{3}{4} \times \frac{5}{7} =$

2. $\frac{5}{6} \times \frac{7}{8} =$

3. $5X \times 6X =$

4. $3Y \times 7Y =$

5. $8X^2 \times 7X^3 =$

6. $4Z^3 \times 5Z^4 =$

7. $\frac{30X^2}{6X} =$

8. $\frac{24Z^5}{8Z^3} =$

9. $\frac{24X^5Y^7}{36X^3Y^{10}} =$

10. $\frac{6M^3R^5}{8MR^3} =$

11. $5\sqrt{3} \times 7\sqrt{5} =$

12. $4\sqrt{6} \times 5\sqrt{7} =$

13. $\frac{45\sqrt{21}}{9\sqrt{7}} =$

14. $\frac{25\sqrt{6}}{15\sqrt{3}} =$

15. $0.7 \times 0.13 =$

16. $0.02 \times 0.003 =$

17. $0.6 \times 0.6 =$

18. $(0.07)^2 =$

19. $.7\overline{)091} = \text{same as } \frac{91}{1000} \div \frac{7}{10} =$

SPECIAL RULES FOR DIVISION:

RULE 1: To divide by a decimal move it over enough places in the divisor so that it becomes a whole number then move it the same number of spaces in the dividend. see p. 239

RULE 2: To divide by a fraction you reciprocate it and then multiply. Remember- multiply the numbers then multiply the names and you get a new name.

EXAMPLES:

1. $.012 \overline{)3.648}$

$\begin{array}{r} 304 \\ -36 \\ \hline 048 \\ -48 \\ \hline 0 \end{array}$

12 wouldn't go into 4 so put a zero

see page 239

2. $\frac{3}{4} \div \frac{5}{6} = \frac{3}{4} \cdot \frac{6}{5} = \frac{9}{10}$

reciprocate & multiply

PRACTICE:

1. $.04 \overline{)3.284}$

2. $.006 \overline{)306}$

3. $\frac{3}{4} \div \frac{5}{7} =$

4. $\frac{5}{8} \div \frac{15}{16} =$

5. $.24 \overline{)4.896}$

6. $3.5 \overline{)70.70}$

7. $.0015 \overline{)450.6}$

7A

8. $\frac{5}{8} \div \frac{15}{56} =$

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

10. $\frac{7}{8} \div \frac{7}{8} =$

11. $\frac{4}{11} \div \frac{12}{55} =$

12. $\frac{3}{4} \div \frac{8}{9} \div \frac{5}{13} \times \frac{15}{39} =$

1.3 ADDING AND SUBTRACTING UNLIKE FRACTIONS 8

RULE: You must get a common name or common denominator. The common denominator will be the least common multiple. see p. 230

EXAMPLE:

1. Find the least common multiple of 75 and 135.

- Prime Numbers 2, 3, 5, 7, 11, 13, 17, 19, 23, -----
- Do the prime factorization of each number.
- Take the largest power of each prime and multiply them.

$$\begin{array}{r} 3 \overline{)75} \\ 5 \overline{)25} \\ \underline{5} \end{array}$$

$$\begin{array}{r} 3 \overline{)135} \\ 3 \overline{)45} \\ 3 \overline{)15} \\ \underline{5} \end{array}$$

$$\begin{array}{l} 75 \rightarrow 3^1 \cdot 5^2 \\ 135 \rightarrow 3^3 \cdot 5^1 \end{array}$$

$$\begin{array}{c} \text{LCM} \\ 3^3 \cdot 5^2 = 27 \cdot 25 = \underline{675} \end{array}$$

2. Find the least common multiple of $24X^3Y$ and $90XY^2$.

$$\begin{array}{r} 2 \overline{)24X^3Y} \\ 2 \overline{)12} \\ 2 \overline{)6} \\ \underline{3} \end{array}$$

$$\begin{array}{r} 2 \overline{)90XY^2} \\ 3 \overline{)45} \\ 3 \overline{)15} \\ \underline{5} \end{array}$$

$$\begin{array}{l} 24X^3Y \rightarrow 2^3 \cdot 3^1 \cdot X^3 \cdot Y^1 \\ 90XY^2 \rightarrow 2^1 \cdot 3^2 \cdot 5^1 \cdot X^1 \cdot Y^2 \end{array}$$

$$\begin{array}{c} \text{LCM} \\ 2^3 \cdot 3^2 \cdot 5^1 \cdot X^3 \cdot Y^2 = 8 \cdot 9 \cdot 5 \cdot X^3 \cdot Y^2 \\ \underline{360X^3Y^2} \end{array}$$

SEE ALSO p. 230

$$3. \frac{3}{12} + \frac{5}{54} =$$

$$\begin{array}{r} 3 \times 9 = 27 \\ 12 \times 9 = 108 \\ + \frac{5 \times 2 = 10}{54 \times 2 = 108} \end{array}$$

$$\frac{37}{108}$$

$$4. \frac{25}{32} - \frac{7}{27} =$$

$$\begin{array}{r} 25 \times 27 = 675 \\ 32 \times 27 = 864 \\ - \frac{7 \times 32 = 224}{27 \times 32 = 864} \end{array}$$

$$\frac{451}{864}$$

$$5. \frac{5}{X} + \frac{7}{Y} =$$

$$\begin{array}{r} 5 \times Y = 5Y \\ X \times Y = XY \\ + \frac{7 \times X = 7X}{Y \times X = XY} \end{array}$$

$$\frac{5Y + 7X}{XY}$$

$$6. \frac{3}{18X^2Y} + \frac{5}{50XY^3} =$$

$$\frac{3 \times 25Y^2 = 75Y^2}{18X^2Y \times 25Y^2 = 450X^2Y^3}$$

$$\frac{5 \times 9X = 45X}{50XY^3 \times 9X = 450X^2Y^3}$$

$$\frac{75Y^2 + 45X}{450X^2Y^3}$$

$$\begin{array}{r} 2 \overline{)12} \\ 2 \overline{)6} \\ 3 \end{array}$$

$$12 \rightarrow 2^2 \cdot 3$$

$$54 \rightarrow 2^1 \cdot 3^3$$

$$\begin{array}{r} 2 \overline{)54} \\ 3 \overline{)27} \\ 3 \overline{)9} \\ 3 \end{array}$$

LCM

$$4 \cdot 27 = 108$$

9

$$\begin{array}{r} 2 \overline{)32} \\ 2 \overline{)16} \\ 2 \overline{)8} \\ 2 \overline{)4} \\ 2 \end{array}$$

$$32 \rightarrow 2^5$$

$$27 \rightarrow 3^3$$

$$\begin{array}{r} 3 \overline{)27} \\ 3 \overline{)9} \\ 3 \end{array}$$

LCM

$$32 \cdot 27 = 864$$

$$\begin{array}{r} 1 \\ 32 \\ \times 27 \\ \hline 224 \\ 640 \\ \hline 864 \end{array}$$

$$\begin{array}{l} X \rightarrow X^1 \\ Y \rightarrow Y^1 \end{array}$$

LCM

$$X \cdot Y = XY$$

$$\begin{array}{r} 2 \overline{)18X^2Y} \\ 3 \overline{)9} \\ 3 \end{array}$$

$$\begin{array}{r} 2 \overline{)50XY^3} \\ 5 \overline{)25} \\ 5 \end{array}$$

$$18X^2Y \rightarrow 2^1 \cdot 3^2 \cdot X^2 \cdot Y$$

$$50XY^3 \rightarrow 2^1 \cdot 5^2 \cdot X \cdot Y^3$$

LCM

$$2 \cdot 9 \cdot 25 \cdot X^2 \cdot Y^3$$

$$450X^2Y^3$$

PRACTICE: (SIMPLIFY THE EXPRESSION)

10

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

2. $\frac{7}{32} + \frac{3}{36} =$

3. $\frac{25}{27} - \frac{3}{20} =$

4. $\frac{17}{36} - \frac{2}{45} =$

5. $\frac{5}{M} + \frac{7}{N} =$

6. $\frac{3}{4X^2Y^3} + \frac{5}{18X^3Y^5} =$

7. $\frac{7}{Z} - \frac{5}{W} =$

8. $\frac{3}{MN} - \frac{5}{XY} =$

$$9. \frac{5}{12} + \frac{7}{54} =$$

$$10. \frac{21}{68} - \frac{13}{32} =$$
 10A

$$11. \frac{15}{77} + \frac{7}{33} =$$

$$12. \frac{3}{8} - \frac{13}{42} =$$

$$13. \frac{1}{2} + \frac{1}{4} + \frac{1}{8} =$$

$$14. \frac{2}{3} + \frac{5}{6} + \frac{11}{21} =$$

1.4 MULTIPLYING AND DIVIDING MIXED NUMBERS

RULE: Change each number to an improper fraction and then follow the rules for multiplication and division of fractions.

EXAMPLE:

$$1. 3\frac{1}{2} \times 4\frac{2}{3} = \frac{7}{2} \cdot \frac{14}{3} = \frac{98}{6}$$

Whole = $\frac{2}{2}$ so we have 3 sets of $\frac{2}{2}$ and $\frac{1}{2}$ more

$$3\frac{1}{2} = \frac{3 \times 2 + 1}{2} = \frac{7}{2}$$

$$4\frac{2}{3} = \frac{4 \times 3 + 2}{3} = \frac{14}{3}$$

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

$$6 \overline{) 98} \\ \underline{-6} \\ 38 \\ \underline{-36} \\ 2 \\ \frac{2}{2} = \frac{1}{3}$$

$$16\frac{1}{3}$$

$$5\frac{3}{4} = \frac{5 \times 4 + 3}{4} = \frac{23}{4}$$

$$2\frac{1}{2} = \frac{2 \times 2 + 1}{2} = \frac{5}{2}$$

$$\frac{23}{4} \div \frac{5}{2} = \frac{23}{4} \cdot \frac{2}{5}$$

(reciprocate & multiply)

$$3. \frac{X}{Y} \div \frac{X^2}{Y^3} = \frac{X^1}{Y^1} \cdot \frac{Y^3}{X^2} = \frac{Y^2}{X}$$

$$\frac{23}{4} \cdot \frac{2}{5} = \frac{23}{10}$$

$$10 \overline{) 23} \\ \underline{-20} \\ 3$$

$$4. Z\frac{X}{Y} \times Q\frac{R}{S} = \frac{ZY+X}{Y} \cdot \frac{QS+R}{S}$$

$$Z\frac{X}{Y} = \frac{ZY+X}{Y}$$

$$Q\frac{R}{S} = \frac{QS+R}{S}$$

as far as we know how to go

PRACTICE: (SIMPLIFY THE EXPRESSION)

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

$$2. 9\frac{12}{13} \div 3\frac{4}{13} =$$

$$3. \frac{X^3}{Y^2} \div \frac{Y^3}{X} =$$

$$4. G \frac{D}{B} \times W \frac{N}{M} =$$

12

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

$$6. 5\frac{3}{7} \times 3\frac{2}{5} =$$

$$7. \frac{X}{Y} \times \frac{Z}{Q} =$$