

## Honors Geometry Algebra Review Work

These problems will review some of the pre-requisite algebra skills necessary for a successful start to Honors Geometry. You will be able to ask questions about specific problems during the first few days of class. A test over these skills will be scheduled soon after the beginning of the course. **Complete these problems showing all work. These problems and your work will be collected** on the day of the Algebra Review Test. (rev 2-22)

### Algebra Review: Linear Equations

Example:  $4x - 2(1 - x) = -38$   
 $4x - 2 + 2x = -38$   
 $6x - 2 = -38$   
 $6x = -36$   
 $x = -6$

Solve each equation:

1)  $2p + 5 = 13$

2)  $12 + 2b = 2 + 5b$

3)  $4x + 5 + 5x + 40 = 180$

4)  $2(4x + 4) = x + 1$

5)  $2(x + 5) = 3(2x + 3)$

6)  $4x + 2 = \frac{2}{3}(6x + 3)$

7)  $3(180 - y) = 2(90 - y)$

8)  $6x - 3(6 - 5x) + 3x = 10 - 4(2 - x)$

9)  $\frac{1}{2}(6 + 4x) - \frac{3}{4}(8x - 12) = \frac{3}{2}(2x - 4)$

10)  $5x - [7 - (2x - 1)] = 3(x - 5) + 4(x + 3)$

## Algebra Review: Proportions

Definition:  $\frac{a}{b} = \frac{c}{d}$  if and only if  $ad = bc$

Examples:

$$1) \frac{3}{2} = \frac{y}{22}$$

$$3(22) = 2y$$

$$66 = 2y$$

$$33 = y$$

$$2) \frac{x+4}{5} = \frac{x-2}{3}$$

$$3(x+4) = 5(x-2)$$

$$3x + 12 = 5x - 10$$

$$22 = 2x$$

$$11 = x$$

Solve the following proportions using the format in the examples:

$$1) \frac{7}{2} = \frac{y}{3}$$

$$2) \frac{7}{3} = \frac{21}{x}$$

$$3) \frac{25}{15} = \frac{10}{x}$$

$$4) \frac{10}{6x+7} = \frac{6}{2x+9}$$

$$5) \frac{4}{x-3} = \frac{6}{x+3}$$

$$6) \frac{3x-5}{2} = \frac{x-15}{4}$$

$$7) \frac{2-4x}{-6} = \frac{6x-8}{10}$$

$$8) \frac{x+2}{5} = \frac{4}{x+1}$$

$$9) \frac{2}{x-3} = \frac{x-2}{6}$$

## Algebra Review: Systems of Equations

### Substitution Method:

Example:

$$y = 5 - 2x$$

$$5x - 6y = 21$$

Solution: Substitute  $5 - 2x$  for  $y$  in equation 2

$$5x - 6(5 - 2x) = 21$$

$$5x - 30 + 12x = 21$$

$$17x - 30 = 21$$

$$17x = 51$$

$$x = 3 \text{ (don't forget to find } y\text{)}$$

now substitute 3 for  $x$

$$y = 5 - 2(3)$$

$$y = -1$$

**solution: (3, -1)**

Solve each system of equations by the substitution method.

1)  $y = 2x + 5$

$$3x - y = 4$$

2)  $8x + 3y = 26$

$$2x = y - 4$$

3)  $x = 8 + 3y$

$$2x - 5y = 8$$

4)  $x - 7y = 13$

$$3x - 5y = 23$$

5)  $3x + 2y = 71$

$$y = 4 + 2x$$

6)  $3x + y = 19$

$$2x - 5y = -10$$

**Elimination Method:**

**Example:**  $3x + 4y = -10$

$5x - 2y = 18$  X 2

**solution: (2,-4)**

$3x + 4y = -10$

$+ 10x - 4y = 36$

$13x = 26$

$x = 2$

substitute 2 for x and solve for y

$3(2) + 4y = -10$

$4y = -16$

$y = -4$

**Example:**  $5x - 2y = -19$  X 3

$2x + 3y = 0$  X 2

**solution (-3,2)**

$15x - 6y = -57$

$+ 4x + 6y = 0$

$19x = -57$

$x = -3$

substitute -3 for x and solve for y

$2(-3) + 3y = 0$

$3y = 6$

$y = 2$

Solve each system of equations using the elimination method. Use the format shown in the examples.

1)  $3x + 4y = 9$

$-3x - 2y = -3$

2)  $4x - 6y = -26$

$-2x + 3y = 13$

3)  $5x + 3y = 30$

$3x + 3y = 18$

4)  $2x - 8y = 24$

$3x + 5y = 2$

5)  $2x + y = 3$

$x + 3y = 8$

6)  $5x - 9y = 47$

$6x + 2y = 18$

## Algebra Review: Fractions

Examples: a)  $\frac{8w}{2}$

b)  $\frac{5x-10}{15}$

c)  $\frac{x+6}{x^2-36}$

KEY WORD: FACTOR!!!

4w

$$\frac{5(x-2)}{15}$$

$$\frac{\cancel{x+6}}{(x-6)(\cancel{x+6})}$$

$$\frac{x-2}{3}$$

$$\frac{1}{x-6}$$

1)  $\frac{14}{70}$

2)  $\frac{75}{15}$

3)  $\frac{18a}{36}$

4)  $\frac{24}{32}$

5)  $\frac{3x}{x}$

6)  $\frac{15a^2}{25a^4}$

7)  $\frac{x}{3x}$

8)  $\frac{5bc}{10b^2}$

9)  $\frac{-8y^2}{2y}$

10)  $\frac{-18r^3t}{12rt}$

11)  $\frac{6a+12}{6}$

12)  $\frac{9x-6y}{3}$

13)  $\frac{33ab-22b}{11b}$

14)  $\frac{3x+3y}{x^2+xy}$

15)  $\frac{x+2}{3x+6}$

16)  $\frac{2c-2d}{2c+2d}$

17)  $\frac{t^2-1}{t-1}$

18)  $\frac{5a+5b}{a^2-b^2}$

19)  $\frac{b^2-25}{b^2-12b+35}$

20)  $\frac{a^2+8a+16}{a^2-16}$

21)  $\frac{x^2+7x-8}{x^2+6x-7}$

## Algebra Review: Radical Expressions

Examples:      a)  $\sqrt{56}$                       b)  $\sqrt{\frac{7}{3}}$                       c)  $(3\sqrt{7})^2$

Solutions:      a)  $\sqrt{56} = \sqrt{4} \cdot \sqrt{14} = 2\sqrt{14}$

b)  $\sqrt{\frac{7}{3}} = \frac{\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{21}}{\sqrt{9}} = \frac{\sqrt{21}}{3}$

c)  $(3\sqrt{7})^2 = (3\sqrt{7})(3\sqrt{7}) = 3 \cdot 3 \cdot \sqrt{7} \cdot \sqrt{7} = 9 \cdot \sqrt{49} = 9 \cdot 7 = 63$

Simplifying the following:

1)  $\sqrt{36}$

2)  $\sqrt{81}$

3)  $\sqrt{24}$

4)  $\sqrt{98}$

5)  $\sqrt{300}$

6)  $\sqrt{125}$

7)  $\sqrt{\frac{1}{4}}$

8)  $\frac{\sqrt{5}}{\sqrt{3}}$

9)  $\sqrt{\frac{80}{25}}$

10)  $\frac{2\sqrt{3}}{\sqrt{12}}$

11)  $\frac{2}{\sqrt{6}}$

12)  $\frac{3}{\sqrt{3}}$

13)  $\frac{\sqrt{2}}{\sqrt{7}}$

14)  $\sqrt{13^2}$

15)  $(\sqrt{17})^2$

16)  $(2\sqrt{3})^2$

17)  $(3\sqrt{8})^2$

18)  $(9\sqrt{2})^2$

19)  $5\sqrt{18}$

20)  $4\sqrt{27}$

21)  $6\sqrt{24}$

22)  $5\sqrt{8}$

23)  $9\sqrt{40}$

24)  $3\sqrt{32}$

25)  $6\sqrt{20}$

26)  $\sqrt{15} \cdot \sqrt{6}$

27)  $4\sqrt{3} \cdot 2\sqrt{2}$

## Algebra Review: Factoring

Example: (quadratic)  $x^2 + 7x + 12$   
 $(x + 3)(x + 4)$

Factor each expression completely:

1)  $x^2 + 3x$

2)  $2x^2 - 10x$

3)  $x^2 + 3x + 2$

4)  $x^2 - 8x + 15$

5)  $x^2 + 8x + 16$

6)  $x^2 - 6x - 27$

7)  $x^2 + 5x - 36$

8)  $x^2 - 25$

9)  $9x^2 - 49$

10)  $3x^2 - 5x - 2$

11)  $2x^2 + x - 10$

12)  $x^3 - 4x^2 - 21x$

## Algebra Review: Quadratic Equations

Example:  $3x^2 + 14x + 8 = 0$

$$(3x + 2)(x + 4) = 0$$

$$3x + 2 = 0 \text{ or } x + 4 = 0$$

$$x = -2/3 \text{ or } x = -4$$

1) set = to 0

2) factor

3) set each factor = to 0

4) solve each equation

Solve by factoring:

1)  $x^2 + 5x - 6 = 0$

2)  $x^2 - 7x - 18 = 0$

3)  $x^2 - 25 = 0$

4)  $x^2 = 20x - 36$

5)  $x^2 + 8x = 20$

6)  $x^2 = 3x + 10$

7)  $4x^2 + 15 = 17x$

8)  $3x^2 - 13x - 10 = 0$

9)  $3x^2 - 5x = -2$

10)  $8x^2 + 10x - 25 = 0$



## Algebra Review: Quadratic Equations (Quadratic Formula)

Example:  $x^2 - 5x + 4 = 0$  Solve using the quadratic formula

$$\text{Quadratic formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(4)}}{2(1)} = \frac{5 \pm \sqrt{25 - 16}}{2} = \frac{5 \pm \sqrt{9}}{2} = \frac{5 \pm 3}{2} = 4, 1$$

Solve each equation by the quadratic formula.

1)  $x^2 + 6x + 9 = 0$

2)  $x^2 - 6x - 40 = 0$

3)  $x^2 + 8x + 15 = 0$

4)  $x^2 - 4x - 12 = 0$

5)  $x^2 + 6x - 4 = 0$

6)  $2x^2 + 6x + 3 = 0$

7)  $2x^2 - 7x - 3 = 0$

8)  $5x^2 - x - 4 = 0$

9)  $x^2 + 8x + 5 = 0$

10)  $x^2 - 2x - 6 = 0$

## **Algebra Review: Writing equations of lines**

**Slope is the ratio of the change in the y-coordinates over the change in the x-coordinates**

$$m = \text{rise/run}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{where } (x_1, y_1) \text{ and } (x_2, y_2) \text{ are points on the line.}$$

**Example:** Find the slope of the line that passes through (3, 6) and (-4, 4).

1. Substitute into the formula.

$$m = \frac{4 - 6}{-4 - 3}$$

2. Simplify:  $m = -2/-7$  so  $m = 2/7$

**Practice: Find the slope of the line that passes through each pair of points.**

1) (2, 3) and (-4, 8)

2) (-2, 4) and (9, 4)

3) (-5, -2) and (-1, 3)

4)  $(1/4, 1/2)$  and  $(3/4, 3/8)$

**The slope-intercept form of a line is  $y = mx + b$  where  $m$  is the slope and  $b$  is the y-intercept.**

Example: State the slope and y-intercept of  $y = 2x - 5$

Answer: Slope =  $m = 2$       y-intercept =  $y = -5$

**Practice: State the slope and y-intercept of the following lines**

5)  $y = 4x - 6$

6)  $y = \frac{1}{2}x + 8$

7)  $5x + 2y = 5$

## Write an equation of a line using slope-intercept form

Using slope-intercept form

1. Find the y-intercept or "b". Substitute the slope (m) and the point (x,y) into  $y = mx + b$  and solve for "b".
2. Substitute the slope "m" and "b" into  $y = mx + b$

Example: Write the equation of the line with slope 5 and passing through (-3,-8)

1. Find the y-intercept "b".

Substitute  $m = 5$ ,  $x = -3$  and  $y = -8$  into  $y = mx + b$

$$-8 = 5(-3) + b \quad \text{Solve for "b".}$$

$$-8 = -15 + b$$

$$7 = b$$

2. Now substitute into the slope-intercept form of a line

$$y = 5x + 7 \quad \text{this is the equation asked for}$$

**Practice: Write the equation of a line in slope-intercept form for the lines with the following slopes and y-intercepts .**

8)  $m = 2/3$  through (3, -4)

9)  $m = -4$  through (1,-3)

10)  $m = -2$  through (-4,3)

11)  $m = \frac{1}{2}$  through (7,5)

**How do you write an equation of a line given two points?**

1. Find the slope using the formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$
2. Now write the equation of the line using slope-intercept form.

Example: Write the equation of a line through (2,-1) and (3, -3)

1. Find the slope:  $m = \frac{-3 - (-1)}{3 - 2} \quad m = -2$
2. Substitute into the slope-intercept form. (choose one of the given points)  
 $-1 = -2(2) + b$   
 $-1 = -4 + b$   
 $3 = b$
3. Substitute  $m = -2$  and  $b = 3$  into  $y = mx + b$   
 $y = -2x + 3$  this is the equation

**Practice: Write the equation for the following lines through:**

12) (3, -6) and (6, 2)

13) (-7, 2) and (-3, 5)

14) (11, 7) and (9, 3)