

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)