

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.

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)