Getting Ready for Geometry

1. Solving Multi-Step Equations
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Solving Multi-Step Equations

Solve $5x - 2(4x + 3) = 9$.

$5x - 2(4x + 3) = 9$	**Write original equation**
$5x - 8x - 6 = 9$	**Distributive property**
$-3x - 6 = 9$	**Combine like terms**
$-3x = 15$	**Add 6 to each side**
$x = -5$	**Divide each side by -3**

If you reach a step that is false, the equation has no solution.

If you reach a step that has a variable or number equal to itself, the equation has infinite solutions.

Solve the equation. Check your solution:

1. $3w + 4w - 2 = 12$
2. $4y - (y - 4) = -20$
3. $z + 5 - 4z = 8$
4. $c + 2c - 5 - 5c = 7$
5. $8a - 3(2a + 5) = 13$
6. $16h - 4(5h - 7) = 4$
7. $\frac{3}{2}(b + 1) = 3$
8. $\frac{4}{3}(2x - 1) = -12$

9. $\frac{6}{5}(8k + 2) = -36$

10. $-3z - 1 = 8 - 3z$

11. $16 - 2m = 5m + 9$

12. $2.9w + 5 = 4.7w - 7.6$

13. $4(x - 3) = -2(6 - 2x)$

14. $6(2a + 10) = 5(a + 5)$

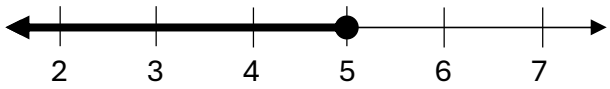
15. $\frac{1}{12}(48 + 24b) = 2(17 - 4b)$

16. $1.5(n + 20) = 0.5(n + 60)$

Solving Multi-Step Inequalities

Solve $-4x + 7 \geq -13$. Graph your solution.

$-4x + 7 \geq -13$	**Write original inequality**
$-4x \geq -20$	**Subtract 7 from both sides**
$x \leq 5$	**Divide each side by -4**



If you multiply or divide by a negative, reverse the inequality symbol.

If you reach a step that is false, the inequality has no solution.

If you reach a step that is always true, the inequality has all real numbers as the solution.

Solve the inequality. Graph your solution.

1. $2g + 11 < 25$

2. $\frac{2}{3}x - 4 \geq 1$

3. $1 - 3x \leq -14 + 2x$

4. $3(y + 1) < 3y + 7$

5. $8(m - 1) > -8 + 8m$

6. $-3(2n - 1) \geq 1 - 8n$

7. $6 - 4(6n + 7) \geq 122$

8. $-8x + 2x - 16 < -5x + 7x$

9. $-x < -x + 7(x - 2)$

10. $-5n + 6 \geq -7(5n - 6) - 6n$

11. $-2(2 - 2x) - 4(x + 5) \leq -24$

12. $-9 > -\frac{1}{3}x + 6$

13. $\frac{3}{5}x - 3 \geq \frac{3}{10}x - 9$

14. $a - 6 \leq 15 + 8a$

Writing Linear Equations in Slope-Intercept Form

Slope-Intercept Form: $y = mx + b$

Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Write an equation with the information given.

Ex 1 – Slope = $\frac{2}{3}$; y-intercept = 4

$y = \frac{2}{3}x + 4$

Ex 2 – Through (-2, -6) and a slope of 2

$y = mx + b$	**Write slope-intercept form**
$-6 = 2(-2) + b$	**Substitute values for y, m, and x**
$-2 = b$	**Solve for b**
$y = 2x - 2$	**Substitute values for m and b**

Write an equation in slope-intercept form.

1. slope = 3; y-intercept = -10
2. slope = $\frac{4}{9}$; y-intercept = 5
3. m = $\frac{-2}{11}$; b = 7
4. Through (-3, -1) and a slope of 4
5. Through (-2, 1); m = 1
6. Through (8, -4); m = -3

7. Through (4, 7) and (5, 1)

8. Through (9, -2) and (-3, 2)

9. Through (8, -8) and (-3, -2)

10. You have a $25 gift card for a bagel shop. A bagel costs $1.25. Write an equation that gives the amount (in dollars) that remains on the card as a function of the total number of bagels you have purchased so far. How much money is on the card after you buy 2 bagels?

Writing Linear Equations in Point-Slope Form

Point-Slope Form: $y - y_1 = m(x - x_1)$

Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Parallel Lines have the same slope. Perpendicular lines have negative reciprocal slopes.

Write an equation with the information given.

Ex 1 – Through (-1, -8) and (3, 4)

$m = \frac{-8-4}{-1-3} = \frac{-12}{-4} = 3$	**Find the slope**
$y - y_1 = m(x - x_1)$	**Write point-slope form**
$y - 4 = 3(x - 3)$	**Substitute values**

Ex 2 – Through (-4, -2) and perpendicular to the line $y = 4x - 7$

The slope of the line is 4 so the slope of the perpendicular line is $\frac{-1}{4}$

$y - y_1 = m(x - x_1)$	**Write point-slope form**
$y - (-4) = \frac{-1}{4}(x - (-2))$	**Substitute values**
$y + 4 = \frac{-1}{4}(x + 2)$	**Simplify**

Write an equation in point-slope form.

1. slope = 2; y-intercept = 4

2. Through (4, 7) and (5, 1)

3. Through (9, -2) and (-3, 2)

4. Through (8, -8) and (-3, -2)

5. Through (0, 2); parallel to $y = -4x + 6$

6. Through (0, 2); perpendicular to $y = -4x + 6$

7. Through (2, -3); parallel to $y = -2x - 3$

8. Through (6, 0); perpendicular to $y = \frac{3}{4}x - \frac{1}{4}$

9. You have a $25 gift card for a bagel shop. A bagel costs $1.25. Write an equation that gives the amount (in dollars) that remains on the card as a function of the total number of bagels you have purchased so far. How much money is on the card after you buy 2 bagels?

Solving Linear Systems

Solve the linear system by substitution:

$$3x + y = -9$$

$$y = 5x + 7$$

$3x + 7 = -9$	**Write 1st equation**
$3x + (5x + 7) = -9$	**Substitute in 2nd equation**
$x = -2$	**Solve for x**
$y = 5(-2) + 7 = -3$	**Substitute x-value into 2nd equation**

Solution: (-2, -3)

Solve the linear system by elimination:

$$5x - y = 8$$

$$-5x + 4y = -17$$

$5x - y = 8$ $-5x + 4y = -17$ $3y = -9$	**Add the equations together**
$y = -3$	**Solve for y**
$5x - (-3) = 8$	**Substitute y into the 1st equation**
$x = 1$	**Solve for x**

Solution: (1, -3)

Solve the linear system using substitution.

1. $y = 2x - 7$
   $x + 2y = 1$

2. $x + 4y = 9$
   $x - y = 4$

3. $2x + y = -15$
   $y - 5x = 6$

4. Kara spends $16 on tubes of paint and disposable brushes for an art project. Each tube of paint costs $3, and each disposable brush costs $0.50. Kara purchases twice as many brushes as tubes of paint. Find the number of number of brushes and the number of tubes of paint that she purchases.

Solve the linear system using elimination.

5. $\begin{aligned} -x + y &= -4 \\ 2x - 3y &= 5 \end{aligned}$

7. $\begin{aligned} 3x - 5y &= -7 \\ -4x + 7y &= 8 \end{aligned}$

6. $\begin{aligned} x + 6y &= 28 \\ 2x - 3y &= -19 \end{aligned}$

8. $\begin{aligned} 8x - 7y &= -3 \\ 6x - 5y &= -1 \end{aligned}$

Combining Polynomials

Adding/Subtracting polynomials

Ex 1:

$(2x^3 + 4x^2 + 1) + (5x^2 + x + 4) = 2x^3 + 9x^2 + x + 5$

Ex 2:

$(3x^2 + 2) - (4x^2 - x - 9) = -x^2 + x + 11$

Multiplying polynomials

$(2x^2 + 4x + 1)(3x - 2)$	**Original product**
$6x^3 - 4x^2 + 12x^2 - 8x + 3x - 2$	**Distributive Property**
$6x^3 + 8x^2 - 5x - 2$	**Combine like terms**

Keep terms in descending order of degree

Find the sum or difference.

1. $(9x + 6x^3 - 8x^2) + (-5x^3 + 6x)$

2. $(7a^3 - 4a^2 - 2a + 1) + (a^3 - 1)$

3. $(11y^5 + 3x^2 - 4) + (y^2 - y + 1)$

4. $(3n^2 - 4n + 1) - (8n^2 - 4n + 17)$

5. $(2b^3 + 8) - (-3b^3 + 7b - 5)$

6. $(-k^2 + 7k + 5) - (2k^4 - 3k^3 - 6)$

Find the product in simplest terms.

7. $(3y + 4)(y + 2)$

8. $(2x^2 + x)(x - 3)$

9. $(5b - 1)(b^2 + 6)$

10. $(x^2 + 3x - 1)(x + 7)$

11. $(a^2 + 4)(2a^2 - 2a - 4)$

12. $(w^2 - 4w + 2)(3w^2 + 2w - 5)$

Factoring Polynomials and Solving Polynomial Equations

Special Factoring Rules:

$$x^2 - y^2 = (x - y)(x + y)$$

$$x^2 + 2xy + y^2 = (x + y)^2$$

$$x^2 - 2xy + y^2 = (x - y)^2$$

Factor the following polynomials.

Ex 1 – $4x^2 + 32x$

$4x^2 + 32x$	**Write original problem**
$4x(x + 8)$	**Factor the GCF**

Ex 2 – $y^2 + 15y + 26$

$y^2 + 15y + 26$	**Write original problem**
$(y + 13)(y + 2)$	**Factor**

Solve the following equation.

Ex 3 – $6x^2 + 42x = 0$

$6x^2 + 42x = 0$	**Write original equation**
$6x(x + 7) = 0$	**Factor left side**
$6x = 0$ or $x + 7 = 0$	**Zero Product Property**
$x = 0$ or $x = -7$	**Solve for x**

Factor the polynomials.

1. $8x^2 - 24x$

2. $6y^4 - 20y^2$

3. $p^2 - 81$

4. $n^2 + 10n - 11$

5. $b^2 - 5b - 14$

6. $a^2 + 5a - 84$

7. $3w^2 + 4w - 4$

Solve the following polynomial equations.

8. $2a^2 + 26a = 0$

9. $5y^2 = -50y$

10. $w^2 - 4 = 0$

11. $b^2 - 10b + 21 = 0$

12. $x^2 + 8x + 15 = 0$

13. $4n^2 + 3 = 7n$

14. $7x^2 - 8x + 1 = 0$

Applying Exponent Properties

Exponent Rules:

Product: $x^a x^b = x^{a+b}$

Quotient: $\frac{x^c}{x^d} = x^{c-d}$

Power: $(x^e)^f = x^{ef}$

Zero: $x^0 = 1$

Negative: $x^{-g} = \frac{1}{x^g}$

Ex 1 - $\left(\frac{x^3}{y}\right)^4 \cdot \frac{2}{x^5}$

$\frac{(x^3)^4}{y^4} \cdot \frac{2}{x^5}$	**Power property**
$\frac{x^{12}}{y^4} \cdot \frac{2}{x^5}$	**Power property**
$\frac{2x^{12}}{x^5 y^4}$	**Multiply fractions**
$\frac{2x^7}{y^4}$	**Quotient Property**

Simplify the expression.

1. $4^3 \cdot 4^3$

2. $z^3 \cdot z^5 \cdot z^5$

3. $(y^4)^5$

4. $-(8xy)^2$

5. $(2x^2)^4 \cdot x^5$

6. $\frac{(-3)^7}{(-3)^4}$

7. $\frac{5^2 \cdot 5^4}{5^3}$

8. $\frac{6}{7r^{10}} \cdot \left(\frac{r^5}{p}\right)^5$

9. $\left(\frac{7x^5y^0}{y^2}\right)^3$

11. 3^{-2}

10. $7^{-5} \cdot 7^5$

12. $\frac{x^{-2}}{xy^2}$