May 2025
Math Summer Packet
Rising 8th grade - 8MZ/Y

Algebra I Continuation

Dear Upper School Students,

This summer, we encourage you to continue to foster a belief in the importance and enjoyment of mathematics at home. Being actively involved in mathematical activities enhances learning.

In preparation for the 2025-2026 school year, each student entering middle school is required to complete a summer math review packet. Each packet focuses on the prerequisite concepts and skills necessary for students succeed. The topics within this packet are important and fundamental concepts that are key for success. READ THE INSTRUCTIONS. Even if it doesn't say "Show Your Work" at the top of the page, **you are expected to show your work on all pages.** If you need extra space, you may attach scratch paper to the back of the packet.

Please bring your completed math packet with you on the first day of school in August. Your math teachers will be collecting them, and the packets will be graded for timeliness and thoroughness of completion.

Have a wonderful summer!

The Middle School Mathematics Department

Name ______________________________

Solving Two-Step Equations

REVIEW

Steps for Solving Two-Step Equations

- Isolate the term with the variable on one side.
- Isolate the variable on one side.

Solve $3x + 4 = 10$.

$$3x + 4 = 10$$

$$3x + 4 - \square = 10 - \square$$ ← **Subtract to isolate 3*x*.**

$$3x = \square$$

$$\frac{3s}{\square} = \frac{6}{\square}$$ ← **Divide to isolate *x*.**

$$x = 2$$

Solve $-8 = \frac{s}{6} - 5$.

$$-8 = \frac{s}{6} - 5$$

$$-8 + \square = \frac{s}{6} - 5 + \square$$ ← **Add to isolate $\frac{s}{6}$.**

$$\square = \frac{s}{6}$$

$$-3 \cdot \square = \frac{s}{6} \cdot \square$$ ← **Multiply to isolate *s*.**

$$\square = s$$

PRACTICE Solve each equation.

1. $3x - 4 = 8$

2. $\frac{z}{4} + 3 = 10$

3. $4y + 5 = -7$

4. $p \div 3 + 9 = 15$

5. $15 = -6 + 3g$

6. $18 = 6 + \frac{t}{3}$

7. $7 - 4d = 43$

8. $12 - \frac{f}{5} = -8$

9. $15z + 6 = 81$

10. $\frac{k}{6} + 4 = 46$

11. $8 + h \div 7 = -4$

12. $25 = m \times 3 - 11$

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Name ______________________________ **A03**

Combining Like Terms

REVIEW Simplify $3a - 6x + 4 - 2a + 5x$ by combining like terms.

STEP 1 Use symbols to show like terms.

$3a$ $\boxed{-6x}$ $+4$ $-2a$ $\boxed{+5x}$ ← **Circle each term with a variable *a*. Draw a rectangle around each term with a variable *x*, and a triangle around each constant term.**

STEP 2 Group the like terms by reordering the terms so that all matching shapes are together.

$3a$ $-2a$ $\boxed{-6x}$ $\boxed{+5x}$ $+4$

STEP 3 Combine like terms by adding coefficients.

$a - x + \boxed{}$

PRACTICE Draw circles, rectangles, and triangles to help you combine like terms and simplify each expression.

1. $3a + 5 - x + 7x - 2a$

2. $2x - 5 + 3a - 5x + 10a$

3. $7b - b - x + 5 - 2x - 7b$

4. $-6m + 3t + 4 - 4m - 2t$

5. $2r + 3s - \frac{5}{2}r$

6. $4 - p - 2x + 3p - 7x$

7. $3k - 2x + 6k + 5$

8. $3 + 2a - 7x + 2.5 + 5x$

9. $4a + 3 - 2y - 5a - 7 + 4y$

10. $c - 3 + 2x - 6c + 4x$

Simplify each expression.

11. $2b + 2 - x + 4$

12. $-5 - c - 4 + 3c$

13. $\frac{1}{2}a - 5 - \frac{1}{2}a$

14. $1.5y - 1.5 + 0.5y + 0.5z + 1$

15. $6a + 3b - 2a + 4$

16. $\frac{2}{3}a + 5 - \frac{1}{3}a - 7$

17. $-8 + x - 2 + 3x$

18. $x + y - z + 4x - 5y + 2z$

19. $\frac{7}{8}x + 5 - \frac{3}{8}x - 4$

20. $10y - 3x + 5 - 8 - 2y$

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Name ______________________________ A04

Equations with Variables on Both Sides

REVIEW Solve $5a - 12 = 3a + 7$.

- To solve, rewrite the equation until all terms with variables are combined on one side and all constant terms are combined on the other side.
- When you perform an operation on one side to move terms with variables, you must do the same on the other.

Solve $5a - 12 = 3a + 7$

$5a - 12 = 3a + 7$ ← **Circle all the terms with variables.**

$5a \boxed{-12} = 3a \boxed{+7}$ ← **Draw rectangles around the constants. Plan to collect variables on one side and constants on the other.**

$5a - 12 - 3a = 3a + 7 - 3a$ ← **To get variables on the same side, subtract $\boxed{}$ from each side.**

$2a - 12 = \boxed{}$ ← **Combine like terms.**

$2a - 12 + \boxed{} = 7 + 12$ ← **To get constants on the other side, add 12 to each side.**

$2a = 19$ ← **Combine like terms.**

$a = \boxed{}$ ← **To undo multiplication by 2, divide each side by 2.**

Check $5(9.5) - 12 \stackrel{?}{=} 3(9.5) + 7$

$47.5 - 12 \stackrel{?}{=} 28.5 + 7$

$35.5 \stackrel{?}{=} 35.5$ ✓

PRACTICE Fill in the blanks to show a plan to solve each equation.

1. $9x + 4 = 6x - 11$ ________ $6x$ ________ each side; subtract $\boxed{}$ from each side.

2. $4b - 13 = 7b - 28$ Subtract $\boxed{}$ from each side; ________ 28 ________ each side.

Use circles and rectangles to mark the variables and constants. Write a plan that tells the steps you would use and then solve each equation.

3. $7c - 4 = 9c - 11$ **4.** $3 - 4d = 6d - 17$ **5.** $5e + 13 = 7e - 21$

Solve and check each equation.

6. $8f - 12 = 5f + 12$ **7.** $3k + 5 = 2(k + 1)$ **8.** $9 - x = 3x + 1$

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Solving Linear Equation Problems

REVIEW Paige has lunch with 3 friends. Two friends order the special for \$9 and the other 2 friends order flatbreads. Each friend orders a lemonade for \$1.50. They add a 20% tip to the bill and evenly split the total cost. Each friend pays \$14.40. How much does each flatbread cost?

STEP 1 Write an equation using words to represent the situation.

$$\frac{\text{Total cost with tip}}{\text{Number of friends}} = \text{How much each pays}$$

STEP 2 Translate the words into numbers and variables.

Total cost with tip = 1.2 · (Cost of food + Cost of drinks)

Cost of food = $2 \cdot 9 + \square \cdot f$ Cost of drinks = $\square \cdot 1.5$

How much each pays = $\square$ Number of friends = $\square$

STEP 3 Write and solve the equation.

$$\frac{1.2 \cdot (2 \cdot 9 + 2f + 4 \cdot 1.5)}{4} = 14.4$$

$$1.2(2 \cdot 9 + 2f + 4 \cdot 1.5) = 14.4 \cdot \square$$ ← **Multiply each side by the denominator.**

$$1.2(24 + 2f) = 57.6$$ ← **Simplify inside the parentheses.**

$$28.8 + 2.4f = 57.6$$ ← **Apply the Distributive Property.**

$$2.4f = 28.8$$ ← **Subtract the constant from each side.**

$$f = 12$$ ← **Divide to isolate the variable.**

The flatbreads cost \$12 each.

PRACTICE Solve.

1. The Drama Club sells 76 adult tickets for \$8 each, plus 54 student tickets. If the club makes a total of \$770 in ticket sales, how much does each student ticket cost?

2. Lily is driving 360 miles. After 4 hours of driving, she is halfway to her destination. What speed does she need to average the rest of the way to make the total drive in 7 hours?

3. The sum of 3 consecutive integers is 96. What are the 3 integers?

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Name ______________________________ A07

Applying the Distributive Property Within Equations

REVIEW Solve $\frac{5}{3}x - \frac{2}{3}(6 - 2x) = 14$.

STEP 1 Apply the Distributive Property, being sure to multiply all terms inside the parentheses by the factor outside.

STEP 2 Combine like terms and solve the resulting equation.

Solve $\frac{5}{3}x - \frac{2}{3}(6 - 2x) = 14$

$\frac{5}{3}x + \left(-\frac{2}{3}\right)(\boxed{}) + \left(-\frac{2}{3}\right)(-2x) = 14$ ← **Distribute the factor $-\frac{2}{3}$ inside the parentheses.**

$\frac{5}{3}x - \boxed{} + \frac{4}{3}x = 14$ ← **Simplify.**

$\frac{5}{3}x + \frac{4}{3}x - 4 = 14$ ← **Rewrite the equation, grouping like terms.**

$\boxed{}x - 4 = 14$ ← **Combine like terms.**

$3x - 4 + 4 = 14 + 4$ ← **Add $\boxed{}$ to each side to isolate $3x$.**

$\frac{3x}{\boxed{}} = \frac{18}{\boxed{}}$ ← **Divide each side by 3 to isolate x.**

$x = \boxed{}$

Check $\frac{5}{3}(6) - \frac{2}{3}(6 - 2(6)) \stackrel{?}{=} 14$

$10 - \frac{2}{3}(-6) \stackrel{?}{=} 14$

$10 + 4 \stackrel{?}{=} 14$

$14 = 14$ ✓

PRACTICE Solve each equation and check your solution.

1. $4 + 3(x - 1) = 1$

2. $3(2 - 3x) - 12 = -15$

3. $8 - (x + 6) = 9$

4. $\frac{1}{2}(4x + 6) + x = 9$

5. $4x - \frac{1}{3}(6x - 9) = -4$

6. $-1 = \frac{4}{5}x - (x + 2)$

7. $\frac{1}{3}(5x - 1) - \frac{7}{3}x = \frac{1}{3}$

8. $-4 = 8x - 3(x + 1)$

9. $x - (4x - 1) = -11$

10. $\frac{2}{5}(3 - 4x) + \frac{1}{4}x = \frac{3}{4}$

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Name ____________________

Transforming Formulas

REVIEW Solve the surface area formula $s = 2\pi r^2 + 2\pi rh$ for h.

$s = 2\pi r^2 + 2\pi rh$ ← **Circle all terms that include *h*, and put a rectangle around all terms that do not include *h*. Plan steps to collect all terms with *h* on one side and all terms without *h* on the other.**

$s - 2\pi r^2 = 2\pi r^2 + 2\pi rh - 2\pi r^2$ ← **To get $2\pi rh$ alone, subtract $2\pi r^2$ from each side.**

$s - 2\pi r^2 =$ ________ ← **Simplify.**

$\frac{s - 2\pi r^2}{2\pi r} = \frac{2\pi rh}{2\pi r}$ ← **Divide each side by ________ to isolate *h*.**

$\frac{s - 2\pi r^2}{2\pi r} = h$ ← **Simplify.**

PRACTICE Solve for the indicated variable.

1. $y = mx + b$, for x

2. $y = mx + b$, for m

3. $p = 6s$, for s

4. $A = \frac{1}{2}h(B + b)$, for h

5. $I = Prt$, for P

6. $y = \frac{2}{3}x - 5$, for x

7. $t = 0.05p$, for p

8. $V = \ell wh$, for w

9. $k = \frac{1}{2}mv^2$, for m

10. $W = p(V - L)$, for V

11. $F = \frac{gm_1m_2}{r^2}$, for G

12. $W = p(V - L)$, for L

13. $V = \frac{h}{e}v - \frac{E}{e}$, for e

14. $mv = (m + M)u$, for m

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Name ______________________ **A09**

Solving Multi-Step Inequalities

REVIEW Solve $3x + 2 < 5 + 2x$. Graph and check the solution.

- If you multiply or divide both sides of an inequality by a negative number, reverse the direction of the inequality symbol.
- Use an open circle for $<$ or $>$, and a closed circle for $\leq$ or $\geq$.
- Check three values on your graph: the number where the arrow starts, a number to the right of the starting value, and another to the left.

$3x + 2 < 5 + 2x$ ← **Circle all of the terms with variables and box all of the constants. Plan to collect the variable terms on one side and the constants on the other.**

$3x + 2 - 2x < 5 + 2x - 2x$ ← **To get all variables on the left side, subtract $\boxed{}$ from each side.**

$x + 2 < 5$ ← **Simplify.**

$x + 2 - 2 < 5 - 2$ ← **To get constants on the right side, subtract $\boxed{}$ from each side.**

$x < 3$ ← **Simplify.**

← **Graph your solution on a number line. Since 3 is not a solution, use an open circle. If 3 were a solution, you would use a closed circle.**

Check three values for the variable: 0, 3 (where the arrow starts), and 4.

$3(0) + 2 \overset{?}{<} 5 + 2(0)$	$3(3) + 2 \overset{?}{<} 5 + 2(3)$	$3(4) + 2 \overset{?}{<} 5 + 2(4)$
$2 < 5$	$11 \not< 11$	$14 \not< 13$

PRACTICE Use circles and boxes to identify the variable terms and constants. Then solve, graph, and check your solution for each inequality.

1. $4x + 3 < 11$

2. $3x + 2 < 2x + 5$

3. $5x + 4 > 14$

4. $4x - 3 < 3x - 1$

5. $2(x + 3) > x + 5$

6. $-3(x + 1) < 6$

7. $9 - x < 6 + 2x$

8. $\frac{2}{3}x + 2 \geq 2x + 6$

9. $-6x - 4 \leq -16$

10. $\frac{1}{2}x - 3 \leq x - 1$

11. $3.5x + 4 \geq 2x + 1$

12. $-0.2x + 0.6 > -1$

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Name ______________________________

Compound Inequalities

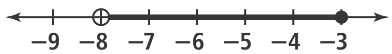
REVIEW Solve and graph each compound inequality.

$-3 < x + 5 \leq 2$

$$-3 < x + 5 \leq 2$$ ← **Rewrite the compound inequality with space in the middle for future operations.**

$$-3 - \square < x + 5 - 5 \leq 2 - \square$$ ← **Any operation you do to one part, you need to do to all three parts.**

$$\square < x \leq -3$$ ← **Simplify.**



← **Graph the inequality. The solution set contains all numbers that are solutions of both parts of the compound inequality.**

$-2x + 1 < -5$ or $-x + 4 \geq 2$

$-2x + 1 < -5$ or $-x + 4 \geq 2$ ← **Rewrite the compound inequality with space for future operations.**

$-2x + 1 - 1 < -5 - 1$ or $-x + 4 - 4 \geq 2 - 4$ ← **Solve each part of the *or* inequality.**

$-2x < \square$ or $-x \geq -2$ ← **Simplify.**

$\frac{-2x}{-2} > \frac{-6}{-2}$ or $\frac{-x}{-1} \leq \frac{-2}{-1}$ ← **Reverse the inequality signs when multiplying or dividing by negative numbers.**

$x > 3$ or $x \leq 2$ ← **Simplify.**

← **Graph the inequality. The solution set of an *or* inequality contains all numbers that are solutions of at least one of the parts.**

PRACTICE Solve each inequality and graph the solution.

1. $-3 \leq x - 5$ or $x + 5 \leq 2$

2. $x + 5 \leq 4$ or $-2x < -6$

3. $x - 2 \geq -6$ and $5 + x < 7$

4. $x - 2 \leq -6$ or $5 + x > 7$

5. $-2 \leq x + 1 < 4$

6. $3 \geq \frac{1}{2}x > -2$

7. $-5 \leq 2x - 1 < 7$

8. $3x < -6$ or $4x - 3 \geq 9$

9. $-5x < 15$ or $x \leq -5$

10. $-1 \leq \frac{1}{2}x + 1 < 0$

11. $1 - 2x \leq -5$ or $2x < -10$

12. $-0.5 < 0.25x \leq 2$

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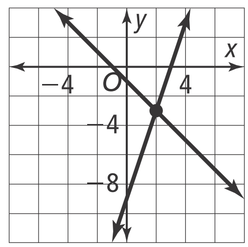
Name ______________________________ A12

Solving Linear Systems by Graphing

REVIEW Solve the system by graphing.
$y = 3x - 9$
$y = -x - 1$

- Lines that have the same slope but different y-intercepts are parallel and will never intersect. These systems have *no solution*.
- Lines that have both the same slope and the same y-intercept are the same line and intersect at every point. These systems have *infinitely many solutions*.
- Lines that have different slopes will intersect, and the system will have *one solution* at the intersection point.

STEP 1 **Graph each equation on the same coordinate plane.**



You can use what you know about slope-intercept form.

$y = 3x - 9$: $m = 3$ and $b = -9$

$y = -x - 1$: $m = \boxed{}$ and $b = \boxed{}$

STEP 2 **Estimate the coordinates of the intersection point.**

The intersection point of these lines appears to be (2, –3).

STEP 3 **Check your solution.**

Substitute the x-coordinate of the intersection point for x and the y-coordinate for y in both equations in the system.

$y = 3x - 9$	$y = -x - 1$
$-3 \stackrel{?}{=} 3(2) - 9$	$\boxed{} \stackrel{?}{=} -(2) - 1$
$-3 = -3$ ✓	$-3 = -3$ ✓

PRACTICE Solve each system of equations by graphing.

1. $y = 5x - 2$
$y = x + 6$

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

3. $y = x + 2$
$y = -x + 2$

4. $y - 3x = 2$
$y = 3x - 4$

5. $y = 2x + 1$
$2y = 4x + 2$

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

7. $y = \frac{3}{2}x + \frac{7}{2}$
$y = -\frac{1}{2}x - \frac{1}{2}$

8. $2x + 3y = 2$
$4x + y = -1$

9. $y - 0.5x = 2.5$
$x - 2y = 5$

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Name ______________________________

Solving Systems Using Substitution

REVIEW Solve the system using substitution.

$$-4x + y = -13$$
$$x - y = 1$$

STEP 1 Solve one of the equations for either *x* or *y*.

$$x - y = 1$$
$$x = 1 + \boxed{}$$

STEP 2 Substitute for *x* in the other equation and solve for *y*.

$$-4x + y = -13$$
$$-4(1 + y) + y = -13$$
$$\boxed{} + (-4y + y) = -13$$
$$-3y = \boxed{}$$
$$y = \boxed{}$$

STEP 3 Substitute the value of *y* into one of the equations and solve for *x*.

$$x - y = 1$$
$$x - \boxed{} = 1$$
$$x = \boxed{}$$

The solution of the system of equations is ($\boxed{}$, $\boxed{}$).

STEP 4 Check to see whether (4, 3) makes both equations true.

$$-4(4) + 3 \stackrel{?}{=} -13 \qquad 4 - 3 \stackrel{?}{=} 1$$
$$-16 + 3 \stackrel{?}{=} -13 \qquad 1 = 1 \checkmark$$
$$-13 = -13 \checkmark$$

PRACTICE Solve each system using substitution.

1. $-3x + y = -2$
$y = x + 6$

2. $y + 4 = x$
$-2x + y = 8$

3. $y - 2 = x$
$-x = y$

4. $6y + 4x = 12$
$-6x + y = -8$

5. $3x + y = 5$
$2x - 5y = 9$

6. $x + 4y = 5$
$4x - 2y = 11$

7. $2y - 3x = 4$
$x = -2$

8. $3y + x = -1$
$x = -3$

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Applications of Linear Systems

REVIEW Last year, Zach received \$469.75 in interest from two investments. The interest rates were 7.5% on one account and 8% on the other. If the total amount invested was \$6000, how much was invested at each rate?

STEP 1 Define variables and write a system to relate them.

x = investment in first account; y = investment in second account

$$x + y = \boxed{}$$

$$0.075x + 0.08y = \boxed{}$$

STEP 2 Choose a solution method and use it to solve the system.

The first equation is almost in $y = mx + b$ form, which makes substitution a good choice.

$y = -x + 6000$ ← **Solve $x + y = 6000$ for y.**

$0.075x + 0.08(-x + 6000) = 469.75$ ← **Substitute $-x + 6000$ for y in the second equation.**

$-0.005x = -10.25$ ← **Simplify.**

$x = 2050$

$2050 + y = 6000$ ← **Substitute 2050 for x in the first equation.**

$y = 3950$ ← **Solve for y.**

The amount invested in the first account was \$2050.
The amount invested in the second account was \$3950.

PRACTICE Solve using elimination, substitution, or graphing.

1. A company provided lunch for several employees on Monday and Tuesday. On Monday, the company paid \$70 for five sandwiches and four salads. On Tuesday, they paid \$60 for four of each. Find the price of a sandwich and the price of a salad.

2. A landscape company had a one-week sale. On Monday, Brianna bought five plants and one cactus for \$82. On Friday, she bought two plants and one cactus for \$37. Find the price of a plant and the price of a cactus.

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Linear Inequalities

REVIEW Graph the inequality $y - 3 < x$.

STEP 1 Solve the inquality for *y*.

Solve $y - 3 < x$ for y.

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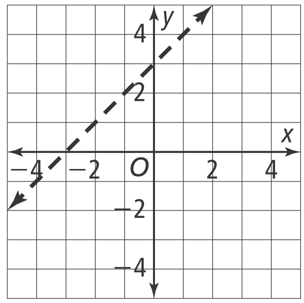
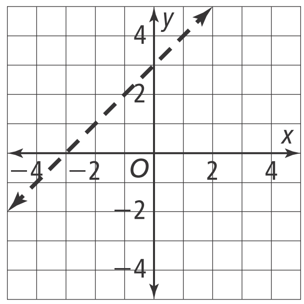
STEP 2 Graph the boundary line. Use a dashed line if the inequality symbol is < or > to show that points ON the line do not make the inequality true. Otherwise, use a solid line.



The boundary line is $y = x + 3$.
The inequality symbol is <, so use a dashed line.

STEP 3 Shade the solution of the inequality.



If the inequality sign is <, shade the lower region.
If the line is vertical, shade the left region.

If the inequality sign is >, shade the upper region.
If the line is vertical, shade the right region.

Shade the graph at the right to show the solution of the inequality.

STEP 4 Test a point for the shaded region.

The point (0, 0) is included in the shaded region.
See whether (0, 0) satisfies the original inequality.

$y - 3 < x$

$0 - 3 < 0$

$\boxed{} < \boxed{}$

The inequality is true for (0, 0) so the shaded region is correct.

PRACTICE Graph each linear inequality on a coordinate plane.

1. $y < x + 2$ **2.** $y \leq 2x + 1$ **3.** $y + 5 > x$ **4.** $y \geq \frac{1}{2}x + 6$

5. $y - 6 < -4.5$ **6.** $-3y \geq 9$ **7.** $y > 3x - 5$ **8.** $x + 7 < y$

9. $y - \frac{1}{4}x \geq 5$ **10.** $0.6y - 1.8x \leq 3$ **11.** $-4y + 12 < 2x$ **12.** $\frac{1}{3}y + 1 > 2$

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Name ____

Systems of Linear Inequalities

REVIEW Solve this system of inequalities by graphing.

$y - x < 5$
$y + 6 \geq 2x$

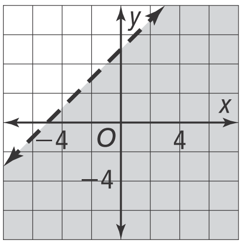
STEP 1 Rewrite the inequalities in slope-intercept form.

$y - x < 5 \quad \rightarrow \quad y < x + 5$
$y + 6 \geq 2x \quad \rightarrow \quad y \geq 2x - 6$

STEP 2 Graph the solutions to the first inequality ($y < x + 5$).

The boundary line is solid if the points on the line are included as solutions, or dashed if the points on the line are not included as solutions. The inequality uses the < symbol, so the boundary line should be dashed.

Test the inequality $y < x + 5$ using the point (0, 0).



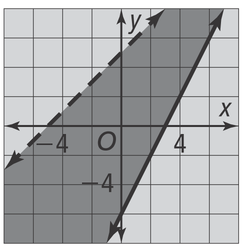
$0 < 0 + 5 \quad \rightarrow \quad \square < \square$

The inequality is true, so shade the region ____________________ the dashed line.

STEP 3 Graph the solutions to the second inequality ($y \geq 2x - 6$).

The inequality uses the ≥ symbol, so the boundary line should be solid.

Test the inequality $y \geq 2x - 6$ using the point (0, 0).



$\square \geq 2 \cdot \square - 6 \quad \rightarrow \quad \square \geq \square$

The inequality is true, so shade the region ____________________ the solid line.

The region where the shading overlaps contains all the points that represent solutions to the system of inequalities.

PRACTICE Solve each system of inequalities by graphing.

1. $y < 4x - 7$
$y > \frac{1}{2}x + 4$

2. $y - 4 < x$
$3y < x + 6$

3. $2x + 3y > 6$
$x - y \geq 0$

4. $x + 2y < 6$
$y \geq 0$

5. $y > 2x$
$y \geq x + 1$

6. $y < 2x + 3$
$y \geq -x + 4$

7. $\frac{1}{2}y > 2$
$3x + y < 0$

8. $y > -4$
$x + 2y \leq 8$

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Algebraic Expressions

REVIEW Simplify $3(4x^2 + 5y) - 2(3x^2 - 7y)$. Then evaluate the expression for $x = -2$ and $y = 3$.

- To simplify an algebraic expression, combine like terms using the basic properties of real numbers. Like terms have the same variables raised to the same powers.
- To evaluate an algebraic expression, replace the variables in the expression with numbers and follow the order of operations to simplify.

STEP 1 Simplify the expression.

$3(4x^2 + 5y) - 2(3x^2 - 7y)$

$= 3(4x^2 + 5y) + (-2)(3x^2 + (-7)y)$ ← **Definition of subtraction**

$= 12x^2 + 15y + \boxed{}\,x^2 + \boxed{}\,y$ ← **Distributive Property**

$= 12x^2 + \boxed{}\,x^2 + 15y + \boxed{}\,y$ ← **Commutative Property of Addition**

$= (12 + (\boxed{}))x^2 + (15 + \boxed{})y$ ← **Distributive Property**

$= \boxed{}\,x^2 + \boxed{}\,y$

STEP 2 Evaluate the simplified expression.

$6x^2 + 29y$

$6(\boxed{})^2 + 29(\boxed{})$ ← **Replace x with −2 and y with 3.**

$= \boxed{} + 87$ ← **Simplify.**

$= \boxed{}$

The value of the expression is 111 when $x = -2$ and $y = 3$.

PRACTICE Simplify each algebraic expression. Then evaluate each simplified expression for the given value(s).

1. $(4x + 1) + 2x$; $x = 3$

2. $7(t^2 + 3)$; $t = 4$

3. $3y^2 + 4y - 5y^2 + y$; $y = -1$

4. $2(u + v) - (u - v)$; $u = 8$, $v = -3$

5. $5a^2 + 5a + a + 1$; $a = -2$

6. $6p^2 - (3p^2 + 2q^2)$; $p = 1$, $q = 5$

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Rewriting Multi-Variable Equations

REVIEW Rewrite the equation $\frac{ax - b}{2} = x + 2b$ to show x in terms of b.

- Rewrite an equation as an equivalent equation with a specified variable by itself on one side.
- Use the properties of equality and the properties of real numbers to rewrite an equation as a sequence of equivalent equations.

$$\frac{ax - b}{2} = x + 2b$$

$\boxed{}\left(\frac{ax - b}{2}\right) = \boxed{}(x + 2b)$ ← **Multiply each side by** $\boxed{}$.

$ax - b = \boxed{}(x + 2b)$ ← **Simplify.**

$ax - b = \boxed{}x + \boxed{}b$ ← **Use the Distributive Property.**

$ax - \boxed{}x = \boxed{}b + b$ ← **Add and subtract to get terms with x on one side and terms without x on the other side.**

$ax - 2x = \boxed{}b$ ← **Combine like terms.**

$x(a - \boxed{}) = 5b$ ← **Distributive Property**

$x = \frac{\boxed{}b}{a - 2}$ ← **Divide each side by $a - 2$.**

PRACTICE Rewrite each equation to show the indicated variable.

1. $3m - n = 2m + n$, for m

2. $2(u + 3v) = w - 5u$, for u

3. $ax + b = cx + d$, for x

4. $k(y + 3z) = 4(y - 5)$, for y

5. $\frac{1}{2}r + 3s = 1$, for r

6. $\frac{2}{3}f + \frac{5}{12}g = 1 - fg$, for f

7. $\frac{x + k}{j} = \frac{3}{4}$, for x

8. $\frac{a - 3y}{b} + 4 = a + y$, for y

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Solving Inequalities

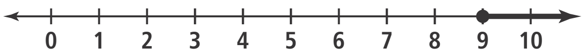
REVIEW

Solve and graph the inequality $2x - 5 \geq 13$.

$2x - 5 \geq 13$

$2x \geq 18$ $\leftarrow$ **______ 5 to each side.**

$x \geq \boxed{}$ $\leftarrow$ **Divide each side by $\boxed{}$.**



Solve and graph the inequality $4 + 3(1 - 2x) > 37$.

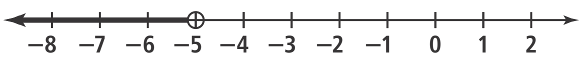
$4 + 3(1 - 2x) > 37$

$4 + 3 - \boxed{}\,x > 37$ $\leftarrow$ **Use the Distributive Property.**

$\boxed{} - \boxed{}\,x > 37$ $\leftarrow$ **Simplify.**

$-\boxed{}\,x > \boxed{}$

$x < \boxed{}$ $\leftarrow$ **Divide. Because each side is divided by a negative number, reverse the inequality.**



PRACTICE Solve each inequality. Graph the solutions.

1. $3(y - 5) \leq 6$

2. $-4t > 2$

3. $3 - 4m < 11$

4. $7d \leq 2(d + 5)$

5. $-2(3 - h) + 2h \geq 0$

6. $3k - (1 - 2k) > 1$

7. $5p + 12 \leq 9p - 20$

8. $3 - 2r < 7 - r$

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Absolute Value Equations and Inequalities

REVIEW Solve the equation $2|x-3|+1=6x+7$.

- For any number x, the solutions to the equation $|x|=a$, where a is a positive real number, are $x=a$ or $x=-a$.
- An *extraneous solution* is a value that is possible for the absolute value term, but is not a solution to the equation. Discard extraneous solutions when solving.

STEP 1 **Use the properties of equality to rewrite the equation as an equivalent equation with the absolute value expression on one side by itself.**

$$2|x-3|+1=6x+7$$

$$2|x-3|=6x+\boxed{}$$

$$|x-3|=3x+3$$

STEP 2 **Rewrite as a compound inequality and solve each equation.**

$x-3=3x+3$ or $x-3=-(3x+3)$

$-2x=6$ $\quad$ $4x=0$

$x=\boxed{}$ $\quad$ $x=\boxed{}$

STEP 3 **Substitute each value for *x* in the original equation to check for extraneous solutions.**

$2|-3-3|+1\stackrel{?}{=}6(-3)+7$ or $2|0-3|+1\stackrel{?}{=}6(0)+7$

$2(6)+1\stackrel{?}{=}-18+7$ $\quad$ $2(3)+1\stackrel{?}{=}7$

$13\ \boxed{}\ -11$ $\quad$ $7\ \boxed{}\ 7$

Since -3 does not satisfy the original equation, it is an extraneous solution. The only solution to the equation $2|x-3|+1=6x+7$ is $x=0$.

PRACTICE Solve each equation.

1. $|2x+7|=5$

2. $|x-3|=-1$

3. $|x+7|=2x+8$

4. $|x-0.5|+0.3=1$

5. $3|2x+5|=15$

6. $|5x-1|+7=3x$

7. $2|x+1|+x=1$

8. $|x+1|=2x$

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Two-Variable Inequalities

REVIEW Graph the inequality $6x - 2y \le 12$.

STEP 1 Solve the inequality for *y*.

$6x - 2y \le 12$

$-2y \le \square x + 12$ ← **Subtract $\square$ x from each side.**

$y \; \square \; 3x - 6$ ← **Divide each side by –2. Reverse the inequality.**

STEP 2 Graph the boundary line.

If the inequality contains $\ge$ or $\le$, the boundary line is solid. If the inequality contains $>$ or $<$, the boundary line is dashed.

The graph of $y \ge 3x - 6$ will be a ________ line.

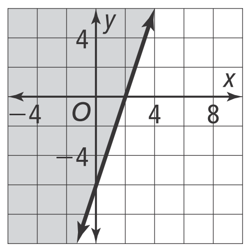
STEP 3 Test a point.

Substitute a point into the inequality. If the result is true, shade the region containing the point. If the result is false, shade the region that does not contain the point.

Test (0, 0): $6(0) - 2(0) \le 12$

$\square - \square \le 12$

$\square \le 12$ which is ________.



PRACTICE Graph each inequality.

1. $x + y < 4$
2. $3x + 4y \le 12$
3. $2y - 3x > 6$
4. $3x - 2 \le 5x + y$
5. $x \le -4$
6. $y \ge 5$
7. $x - 2y \ge 4$
8. $3x - 3y < 3$.
9. $3x > 2$

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Solving Linear Systems of Equations Algebraically

REVIEW Solve the system using the elimination method. $\begin{cases} 2x + 5y = 11 \\ 3x - 2y = -12 \end{cases}$

STEP 1 **Identify the terms where you want to have opposite coefficients.**

$$2x + 5y = 11$$
$$3x - 2y = -12$$

STEP 2 **Multiply each term of each equation by the appropriate number to obtain opposite coefficients.**

$\boxed{}(2x + 5y = 11) \rightarrow 6x + \boxed{}y = 33$ ← **Multiply each term of the first equation by 3.**

$\boxed{}(3x - 2y = -12) \rightarrow -6x + 4y = \boxed{}$ ← **Multiply each term of the second equation by −2.**

STEP 3 **Add the equations.**

$19y = 57$ ← **$6x + -6x$ is 0, $15y + 4y$ is $19y$, and $33 + 24$ is 57.**

STEP 4 **Solve for the remaining variable.**

$$y = \boxed{}$$

STEP 5 **Substitute the value obtained in Step 4 into either of the original equations and solve for the other variable.**

$$3x - 2(3) = -12$$
$$x = \boxed{}$$

STEP 6 **Check the solution using the other original equation.**

$$2(-2) + 5(3) = 11$$
$$-4 + 15 = 11$$
$$11 = 11 \checkmark$$

The solution is (−2, 3).

PRACTICE Solve each system of equations using elimination.

1. $\begin{cases} 3x + 2y = -17 \\ x - 3y = 9 \end{cases}$ **2.** $\begin{cases} 5f + 4m = 6 \\ -2f - 3m = -1 \end{cases}$ **3.** $\begin{cases} 3x - 2y = 5 \\ -6x + 4y = 7 \end{cases}$ **4.** $\begin{cases} -2x - 4y = 2 \\ 10x + 20y = -10 \end{cases}$

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Solving Systems of Inequalities

REVIEW Daniela earns $12 for every necklace she sells and $10 for each bracelet. She wants to earn at least $120 per week. Daniela can make at most 14 items in a week, and at least 5 must be necklaces. How many necklaces and bracelets should Daniela make to meet her goals?

STEP 1 Define the variables.

x = number of necklaces made each week

y = number of _________ made each week

STEP 2 Write inequalities to model the constraints.

$\boxed{}x + \boxed{}y \geq \boxed{}$ ← **Daniela wants to earn at least $120 each week. She earns $12 for each necklace and $10 for each bracelet.**

$x + y \leq \boxed{}$ ← **Daniela cannot make more than 14 total items.**

$\boxed{} \geq 5$ ← **Daniela must make at least 5 necklaces.**

STEP 3 Solve two of the inequalities for *y*. Graph all three inequalities.

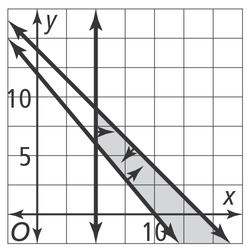
$12x + 10y \geq 120$

$y \geq -\frac{6}{5}x + \boxed{}$

$x + y \leq 14$

$y \leq -x + \boxed{}$

Use arrows to show the region of the graph that satisfies each inequality. Shade the region that satisfies all three.



Any point in the shaded region, such as (10, 1), is a solution. If Daniela makes $\boxed{}$ necklaces and $\boxed{}$ bracelet, she will meet her goals.

PRACTICE Define the variables. Then write the inequalities modeling each situation and graph. Write one possible solution.

1. Derek needs at least 3 pounds of fruit to make fruit salad. He has $21 to spend, and blackberries cost $4 per pound while strawberries cost $3 per pound. How many pounds of each fruit should he buy for the fruit salad?

2. The school's baseball team plans to make at least $600 during their fundraiser. They are selling bags of roasted almonds for $5 and tubs of popcorn for $6 each. They predict they will not be able to sell more than 200 items, but must sell at least 20 tubs of popcorn. How many of each item should the team sell to reach their goals?

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