Summer Review for Students Entering Algebra 2

The following packet is being given as a review of topics from Algebra 1. These are necessary skills for success in Algebra 2. Your packet will be collected during the first week of school. It will be graded on completeness and correctness. Please use a pencil and make sure to show relevant work. You will lose points if you fail to show the required work to reach the correct answer.

Please do not wait until the last day of vacation to get started! On the other hand, do not attempt to complete the packet during the first week of vacation. This packet is designed to maintain your current knowledge of Algebra so that the topics discussed in the fall will be fresh in your mind.

If you are having difficulties with the packet, use the examples given or feel free to search the internet for help on certain topics. Also, it may be beneficial to work with others.

Have an enjoyable summer!

We look forward to working with you this fall!

Mr. Mak and Miss Prosser

A. Simplifying Polynomial Expressions

I. Combining Like Terms

- You can add or subtract terms that are considered "like", or terms that have the same variable(s) with the same exponent(s).

Ex. 1: $5x - 7y + 10x + 3y$

$\underline{5x} \underline{- 7y} + \underline{10x} + \underline{3y}$

$15x - 4y$

Ex. 2: $-8h^2 + 10h^3 - 12h^2 - 15h^3$

$\underline{-8h^2} + \underline{10h^3} \underline{- 12h^2} \underline{- 15h^3}$

$-20h^2 - 5h^3$

II. Applying the Distributive Property

- Every term inside the parentheses is multiplied by the term outside of the parentheses.

Ex. 1: $3(9x-4)$

$3 \cdot 9x - 3 \cdot 4$

$27x - 12$

Ex. 2: $4x^2(5x^3+6x)$

$4x^2 \cdot 5x^3 + 4x^2 \cdot 6x$

$20x^5 + 24x^3$

III. Combining Like Terms AND the Distributive Property (Problems with a Mix!)

- Sometimes problems will require you to distribute AND combine like terms!!

Ex. 1: $3(4x-2)+13x$

$3 \cdot 4x - 3 \cdot 2 + 13x$

$12x - 6 + 13x$

$25x - 6$

Ex. 2: $3(12x-5)-9(-7+10x)$

$3 \cdot 12x - 3 \cdot 5 - 9(-7) - 9(10x)$

$36x - 15 + 63 - 90x$

$-54x + 48$

PRACTICE SET

Simplify.

1. $8x - 9y + 16x + 12y$

2. $14y + 22 - 15y^2 + 23y$

3. $5n - (3 - 4n)$

4. $-2(11b - 3)$

5. $10q(16x + 11)$

6. $-(5x - 6)$

7. $3(18z - 4w) + 2(10z - 6w)$

8. $(8c + 3) + 12(4c - 10)$

9. $9(6x - 2) - 3(9x^2 - 3)$

10. $-(y - x) + 6(5x + 7)$

B. Solving Equations

I. Solving Two-Step Equations

A couple of hints:

1. To solve an equation, UNDO the order of operations and work in the reverse order.
2. REMEMBER! Addition is "undone" by subtraction, and vice versa. Multiplication is "undone" by division, and vice versa.

$$\begin{aligned} &Ex.\,1: 4x - 2 = 30 \\ &\quad +2 \quad +2 \\ &\quad 4x = 32 \\ &\quad +4 \quad +4 \\ &\quad x = 8 \end{aligned}$$

$$\begin{aligned} &Ex.\,2: 87 = -11x + 21 \\ &\quad -21 \qquad -21 \\ &\quad 66 = -11x \\ &\quad +-11 \quad +-11 \\ &\quad -6 = x \end{aligned}$$

II. Solving Multi-step Equations With Variables on Both Sides of the Equal Sign

- When solving equations with variables on both sides of the equal sign, be sure to get all terms with variables on one side and all the terms without variables on the other side.

$$\begin{aligned} &Ex.\,3: 8x + 4 = 4x + 28 \\ &\quad -4 \qquad -4 \\ &\quad 8x = 4x + 24 \\ &\quad -4x \quad -4x \\ &\quad 4x = 24 \\ &\quad +4 \quad +4 \\ &\quad x = 6 \end{aligned}$$

III. Solving Equations that need to be simplified first

- In some equations, you will need to combine like terms and/or use the distributive property to simplify each side of the equation, and then begin to solve it.

$$\begin{aligned} &Ex.\,4: 5(4x - 7) = 8x + 45 + 2x \\ &\quad 20x - 35 = 10x + 45 \\ &\quad -10x \qquad -10x \\ &\quad 10x - 35 = 45 \\ &\quad +35 \quad +35 \\ &\quad 10x = 80 \\ &\quad +10 \quad +10 \\ &\quad x = 8 \end{aligned}$$

PRACTICE SET

Solve each equation. You must show all work.

1. $5x - 2 = 33$
2. $140 = 4x + 36$
3. $8(3x - 4) = 196$
4. $45x - 720 + 15x = 60$
5. $132 = 4(12x - 9)$
6. $198 = 154 + 7x - 68$
7. $-131 = -5(3x - 8) + 6x$
8. $-7x - 10 = 18 + 3x$
9. $12x + 8 - 15 = -2(3x - 82)$
10. $-(12x - 6) = 12x + 6$

IV. Solving Literal Equations

- A literal equation is an equation that contains more than one variable.
- You can solve a literal equation for one of the variables by getting that variable by itself (isolating the specified variable).

Ex. 1: $3xy = 18$, Solve for x.

$$\frac{3xy}{3y} = \frac{18}{3y}$$

$$x = \frac{6}{y}$$

Ex. 2: $5a - 10b = 20$, Solve for a.

$$+10b \quad = +10b$$

$$5a = 20 + 10b$$

$$\frac{5a}{5} = \frac{20}{5} + \frac{10b}{5}$$

$$a = 4 + 2b$$

PRACTICE SET

Solve each equation for the specified variable.

1. $Y + V = W$, for V

2. $9wr = 81$, for w

3. $2d - 3f = 9$, for f

4. $dx + t = 10$, for x

5. $P = (g - 9)180$, for g

6. $4x + y - 5h = 10y + u$, for x

C. Rules of Exponents

Multiplication: Recall $(x^m)(x^n)=x^{(m+n)}$ $\quad$ *Ex:* $(3x^4y^2)(4xy^5)=(3\cdot4)(x^4\cdot x^1)(y^2\cdot y^5)=12x^5y^7$

Division: Recall $\frac{x^m}{x^n}=x^{(m-n)}$ $\quad$ *Ex:* $\frac{42m^5j^2}{-3m^3j}=\left(\frac{42}{-3}\right)\left(\frac{m^5}{m^3}\right)\left(\frac{j^2}{j^1}\right)=-14m^2j$

Powers: Recall $(x^m)^n=x^{(m\cdot n)}$ $\quad$ *Ex:* $(-2a^3bc^4)^3=(-2)^3(a^3)^3(b^1)^3(c^4)^3=-8a^9b^3c^{12}$

Power of Zero: Recall $x^0=1,\ x\neq0$ $\quad$ *Ex:* $5x^0y^4=(5)(1)(y^4)=5y^4$

PRACTICE SET:

Simplify each expression.

1. $(c^5)(c)(c^2)$
2. $\frac{m^{13}}{m^3}$
3. $(k^4)^5$
4. d^0
5. $(p^4q^2)(p^7q^5)$
6. $\frac{45y^3z^{10}}{5y^3z}$
7. $(-t^7)^3$
8. $3f^3g^0$
9. $(4h^5k^3)(15k^2h^3)$
10. $\frac{12a^4b^6}{36ab^2c}$
11. $(3m^2n)^4$
12. $(12x^2y)^0$
13. $(-5a^2b)(2ab^2c)(-3b)$
14. $4x(2x^2y)^0$
15. $(3x^4y)(2y^2)^3$

D. Binomial Multiplication

I. Reviewing the Distributive Property

The distributive property is used when you want to multiply a single term by an expression.

Ex 1: $8(5x^2 - 9x)$

$8 \cdot 5x^2 + 8 \cdot (-9x)$

$40x^2 - 72x$

II. Multiplying Binomials – the FOIL method

When multiplying two binomials (an expression with <u>two</u> terms), we use the "FOIL" method. The "FOIL" method uses the distributive property <u>twice</u>!

FOIL is the order in which you will multiply your terms.

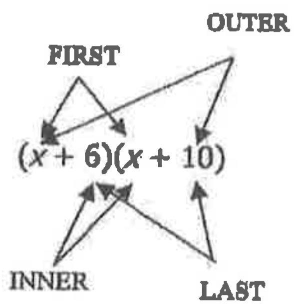
First

Outer

Inner

Last

Ex. 1: $(x + 6)(x + 10)$



First	$x \cdot x$ ------> x^2
Outer	$x \cdot 10$ -----> $10x$
Inner	$6 \cdot x$ ------> $6x$
Last	$6 \cdot 10$ -----> 60

$x^2 + 10x + 6x + 60$

$x^2 + 16x + 60$
(After combining like terms)

Recall: $4^2 = 4 \cdot 4$

$x^2 = x \cdot x$

Ex. $(x + 5)^2$

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

Now you can use the "FOIL" method to get a simplified expression.

PRACTICE SET 4

Multiply. Write your answer in simplest form.

1. $(x + 10)(x - 9)$

2. $(x + 7)(x - 12)$

3. $(x - 10)(x - 2)$

4. $(x - 8)(x + 81)$

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

6. $(-2x + 10)(-9x + 5)$

7. $(-3x - 4)(2x + 4)$

8. $(x + 10)^2$

9. $(-x + 5)^2$

10. $(2x - 3)^2$

E. Radicals

To simplify a radical, we need to find the greatest perfect square factor of the number under the radical sign (the radicand) and then take the square root of that number.

Ex. 1: $\sqrt{72}$

$\sqrt{36} \cdot \sqrt{2}$

$6\sqrt{2}$

Ex. 2: $4\sqrt{90}$

$4 \cdot \sqrt{9} \cdot \sqrt{10}$

$4 \cdot 3 \cdot \sqrt{10}$

$12\sqrt{10}$

Ex. 3: $\sqrt{48}$

$\sqrt{16}\sqrt{3}$

$4\sqrt{3}$

OR

Ex. 3: $\sqrt{48}$

$\sqrt{4}\sqrt{12}$

$2\sqrt{12}$ ← **This is not simplified completely because 12 is divisible by 4 (another perfect square)**

$2\sqrt{4}\sqrt{3}$

$2 \cdot 2 \cdot \sqrt{3}$

$4\sqrt{3}$

PRACTICE SET

Simplify each radical.

1. $\sqrt{121}$
2. $\sqrt{90}$
3. $\sqrt{175}$
4. $\sqrt{288}$
5. $\sqrt{486}$
6. $2\sqrt{16}$
7. $6\sqrt{500}$
8. $3\sqrt{147}$
9. $8\sqrt{475}$
10. $\sqrt{\frac{125}{9}}$

F. Graphing Lines

I. Finding the Slope of the Line that Contains each Pair of Points.

Given two points with coordinates (x_1, y_1) and (x_2, y_2), the formula for the slope, m, of the line containing the points is $m = \frac{y_2 - y_1}{x_2 - x_1}$.

Ex. (2, 5) and (4, 1)

$m = \frac{1-5}{4-2} = \frac{-4}{2} = -2$

The slope is -2.

Ex. (-3, 2) and (2, 3)

$m = \frac{3-2}{2-(-3)} = \frac{1}{5}$

The slope is $\frac{1}{5}$

PRACTICE SET

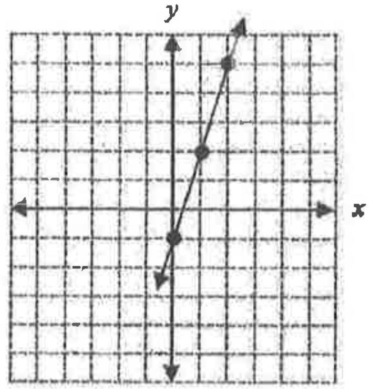
1. (-1, 4) and (1, -2)
2. (3, 5) and (-3, 1)
3. (1, -3) and (-1, -2)
4. (2, -4) and (6, -4)
5. (2, 1) and (-2, -3)
6. (5, -2) and (5, 7)

II. Using the Slope – Intercept Form of the Equation of a Line.

The slope-intercept form for the equation of a line with slope m and y-intercept b is $y = mx + b$.

Ex. $y = 3x - 1$

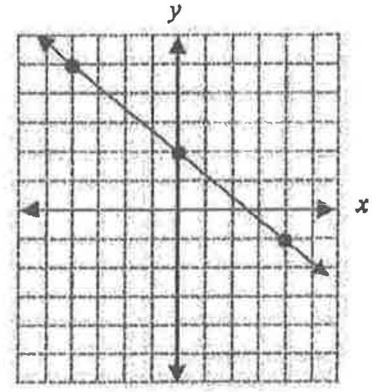
Slope: 3 y-intercept: -1



Place a point on the y-axis at -1. Slope is 3 or 3/1, so travel up 3 on the y-axis and over 1 to the right.

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

Slope: $-\frac{3}{4}$ y-intercept: 2

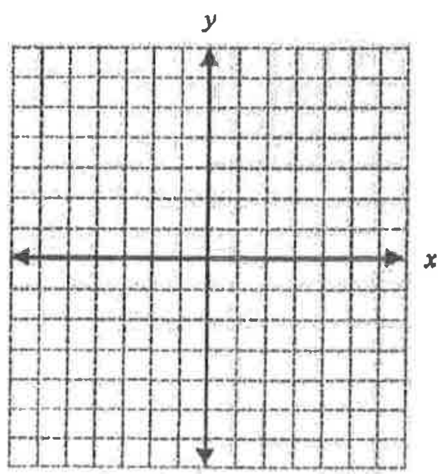


Place a point on the y-axis at 2. Slope is -3/4 so travel down 3 on the y-axis and over 4 to the right. Or travel up 3 on the y-axis and over 4 to the left.

PRACTICE SET

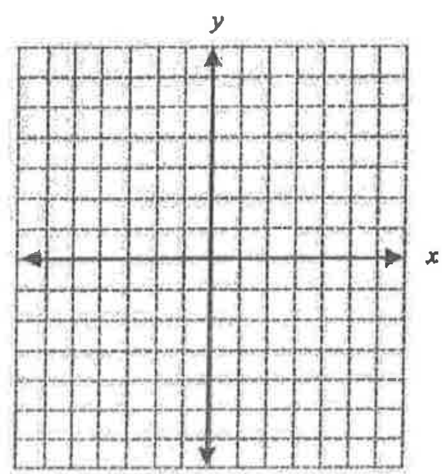
1. $y = 2x + 5$

Slope: _____ y-intercept: _____



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

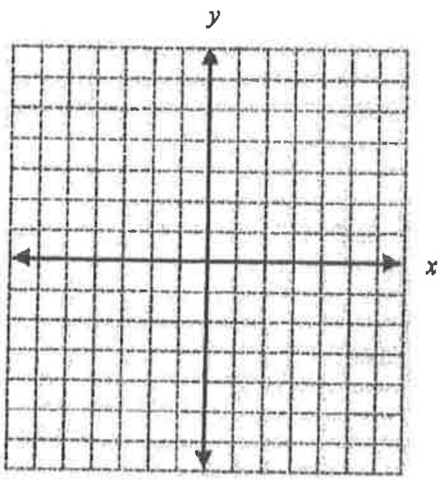
Slope: _____ y-intercept: _____



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

Slope: ____________

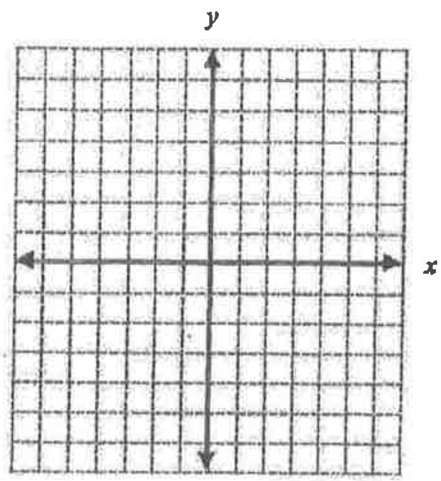
y-intercept: ____________



4. $y = -3x$

Slope: ____________

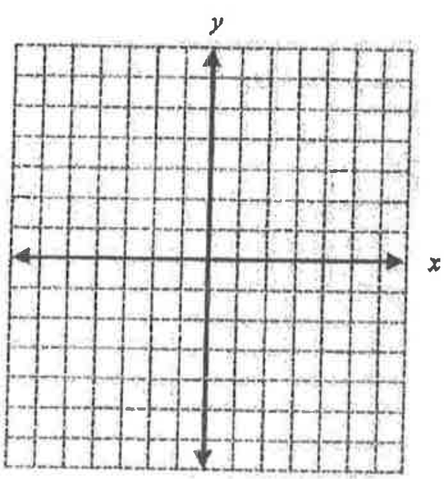
y-intercept ____________



5. $y = -x + 2$

Slope: ____________

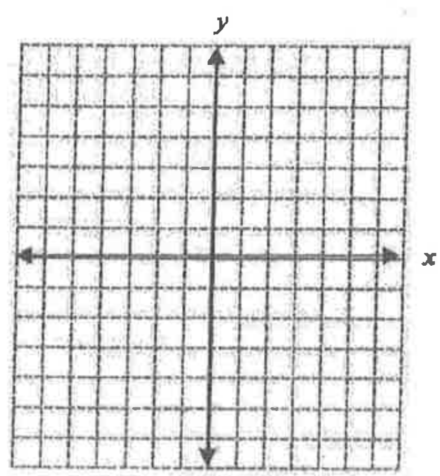
y-intercept: ____________



6. $y = x$

Slope: ____________

y-intercept ____________



III. Using Standard Form to Graph a Line.

An equation in standard form can be graphed using several different methods. Two methods are explained below.

a. Re-write the equation in $y = mx + b$ form, identify the y-intercept and slope, then graph as in Part II above.

b. Solve for the x- and y- intercepts. To find the x-intercept, let $y = 0$ and solve for x. To find the y-intercept, let $x = 0$ and solve for y. Then plot these points on the appropriate axes and connect them with a line.

Ex. $2x - 3y = 10$

a. Solve for y.

$-3y = -2x + 10$

$y = \frac{-2x + 10}{-3}$

$y = \frac{2}{3}x - \frac{10}{3}$

OR

b. Find the intercepts:

let $y = 0$:

$2x - 3(0) = 10$

$2x = 10$

$x = 5$

So x-intercept is $(5, 0)$

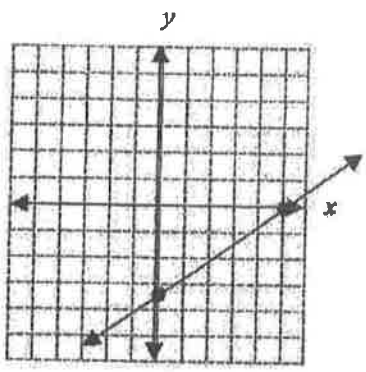
let $x = 0$:

$2(0) - 3y = 10$

$-3y = 10$

$y = -\frac{10}{3}$

So y-intercept is $\left(0, -\frac{10}{3}\right)$



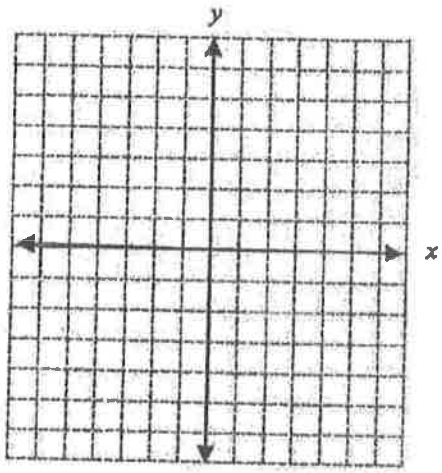
On the x-axis place a point at 5.

On the y-axis place a point at $-\frac{10}{3} = -3\frac{1}{3}$

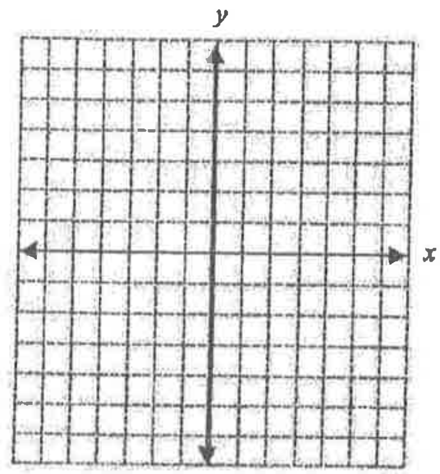
Connect the points with the line.

PRACTICE SET

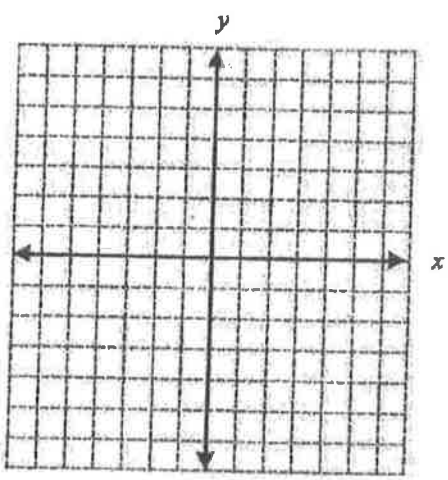
1. $3x + y = 3$



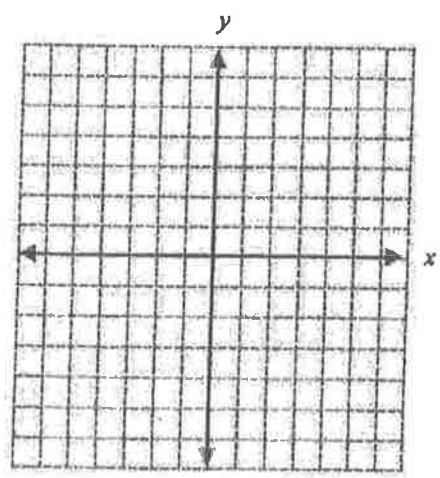
2. $5x + 2y = 10$



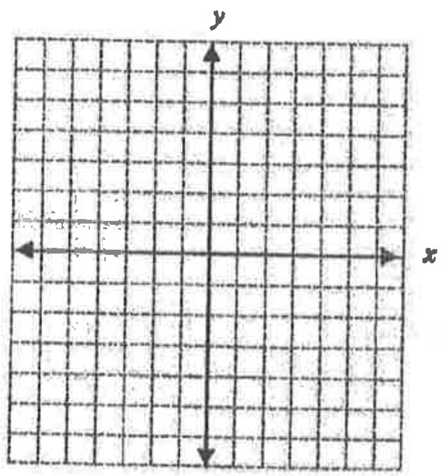
3. $y = 4$



4. $4x - 3y = 9$



5. $-2x + 6y = 12$



6. $x = -3$