Algebra II Readiness
Summer Packet 2022

This packet is designed for students who are preparing for success in Algebra II in the upcoming school year.

Name: ___________________________________

INTRODUCTION

This summer packet answers the questions:

> ***How can I set myself up for success in Algebra II this year?***
> *How can I avoid feeling lost in class?*
> *What do you expect me to know already?*

I have come up with a list of **seven** topics that you learned in Algebra I that will help you prepare for success in Algebra II in the upcoming school year. You can think of each topic as completing the sentence, **"I expect you to already know how to ______________."** If you can do these things no-sweat, you will be ready for Algebra II.

Each topic includes a short note about the topic, specific subcategories related to the topic, a brief description of the topic, a few examples, and about 10 practice problems (give or take).

On the next page (p. 3), I also included a list of resources to help you refresh your memory on these topics. I have also included an answer key in the back of this packet (p. 20-24).

While the packet is ***optional*** (unless you were otherwise instructed by either Ms. Leece or Mrs. Edwards), I recommend working on one topic a week this summer to make sure you are prepared for success in math class next year.

Extra credit will be available for turning this packet in during the first week of school.

I. **Simplifying Polynomial Expressions**

II. **Solving Equations**

III. **Rules of Exponents**

IV. **Binomial Multiplication**

V. **Factoring**

VI. **Radicals**

VII. **Graphing Straight Lines**

ALGEBRA II RESOURCES

- Khan Academy - Algebra 1 Take control of your learning by working on the skills you choose at your own pace. ... Math, science, computer programming, history, art, economics, and more.

- Algebasics has video tutorials explaining the basics of algebra, equations, ratio and proportion, absolute value, polynomials, factoring, linear equations, radicals, applications, and much more.

- Algebra-Class.com offers help with solving equations, graphing equations, writing equations, inequalities, functions, exponents and monomials, polynomials, and the quadratic equation. It also has a list of resources.

- Algebra Help contains lessons on topics that include equations, simplifying, factoring, distribution, and trinomials, as well as equation calculators and worksheets. This site also has an extensive list of math resources and study tips.

- Interactive Mathematics has a large section on algebra, including information on factoring and fractions, the quadratic equation, exponents and radicals, systems of equations, matrices and determinants, and inequalities.

- Math Expression has videos, worksheets, and lessons to help you develop your algebra skills. Math topics include algebra, exponents, symmetry, fractions, measurements, angles, and more. The site also includes a list of useful resources.

- Purplemath contains lessons with explanations on everything from absolute value and negative numbers to intercepts, variables, and factoring. In addition, this site includes a forum that allows students to ask questions and receive answers, as well as a list of homework tips and guidelines.

***There are also several great math YouTube channels. Here are a few...*
-The Organic Chemistry Tutor, NancyPi, & Khan Academy

I. Simplifying Polynomial Expressions

A. 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: $5x - 7y + 10x + 3y$

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

$15x - 4y$

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

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

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

B. Applying the Distributive Property

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

$$\begin{aligned} &Ex.\,1:\ 3(9x-4)\\ &3\cdot 9x - 3\cdot 4\\ &27x - 12 \end{aligned}$$

$$\begin{aligned} &Ex.\,2:\ 4x^2(5x^3+6x)\\ &4x^2\cdot 5x^3 + 4x^2\cdot 6x\\ &20x^5 + 24x^3 \end{aligned}$$

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

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

$$\begin{aligned} &Ex.\,1:\ 3(4x-2)+13x\\ &3\cdot 4x - 3\cdot 2 + 13x\\ &12x - 6 + 13x\\ &25x - 6 \end{aligned}$$

$$\begin{aligned} &Ex.\,2:\ 3(12x-5)-9(-7+10x)\\ &3\cdot 12x - 3\cdot 5 - 9(-7) - 9(10x)\\ &36x - 15 + 63 - 90x\\ &-54x + 48 \end{aligned}$$

PRACTICE SET 1

Simplify the following expressions.

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

II. Solving Equations

A. 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

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

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

B. 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.

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

C. 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.

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

PRACTICE SET 2A

Solve each equation. Show your 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. $-(12x - 6) = 12x + 6$

D. Solving Literal Equations

(1) A literal equation is an equation that contains more than one variable.

(2) You can solve a literal equation for one of the variables by getting that variable by itself (isolating the specified variable).

$Ex.\,1:\ 3xy = 18,\quad \text{Solve for } x.$

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

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

$Ex.\,2:\ 5a - 10b = 20,\quad \text{Solve for } a.$

$$+10b \;=+10b$$

$$5a = 20 + 10b$$

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

$$a = 4 + 2b$$

PRACTICE SET 2B

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

III. Rules for Exponents

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

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

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 $x^0 = 1, x \neq 0$ $\quad$ *Ex*: $5x^0y^4 = (5)(1)(y^4) = 5y^4$

PRACTICE SET 3

Simplify the expression using rules for exponents.

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

IV. Binomial Multiplication

A. Reviewing the Distributive Property

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

$$\begin{aligned} &\textit{Ex 1:}\ 8(5x^2 - 9x) \\ &8 \cdot 5x^2 + 8 \cdot (-9x) \\ &40x^2 - 72x \end{aligned}$$

B. Multiplying Binomials – the FOIL method

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

FOIL is the order in which you will multiply your terms, given by the acronym:

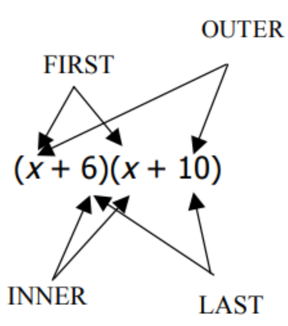
First

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

V. Factoring

A. Using the Greatest Common Factor (GCF) to Factor.

Always determine whether there is a greatest common factor (GCF) first.

Ex. 1 $3x^4 - 33x^3 + 90x^2$

- In this example the GCF is $3x^2$.
- So when we factor, we have $3x^2(x^2 - 11x + 30)$.
- Now we need to look at the polynomial remaining in the parentheses. Can this trinomial be factored into two binomials? In order to determine this make a list of all of the factors of 30.

30	
1	30
2	15
3	10
5	6

30	
-1	-30
-2	-15
-3	-10
-5	-6

Since -5 + -6 = -11 and (-5)(-6) = 30 we should choose -5 and -6 in order to factor the expression.

- The expression factors into $3x^2(x-5)(x-6)$

Note: Not all expressions will have a GCF. If a trinomial expression does not have a GCF, proceed by trying to factor the trinomial into two binomials.

B. Applying the difference of squares: $a^2 - b^2 = (a - b)(a + b)$

Ex. 2 $4x^3 - 100x$

$4x\left(x^2 - 25\right)$

$4x\left(x-5\right)\left(x+5\right)$

Since x^2 and 25 are perfect squares separated by a subtraction sign, you can apply the difference of two squares formula.

PRACTICE SET 5

Factor each expression.

1. $3x^2 + 6x$
2. $4a^2b^2 - 16ab^3 + 8ab^2c$
3. $x^2 - 25$
4. $n^2 + 8n + 15$
5. $g^2 - 9g + 20$
6. $d^2 + 3d - 28$
7. $z^2 - 7z - 30$
8. $m^2 + 18m + 81$
9. $4y^3 - 36y$
10. $5k^2 + 30k - 135$

VI. 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 6

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. $\sqrt{\frac{125}{9}}$

VII. Graphing Lines

A. 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 $m = \dfrac{y_2 - y_1}{x_2 - x_1}$.

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 7A

Find the slope of the straight line that goes through the given points.

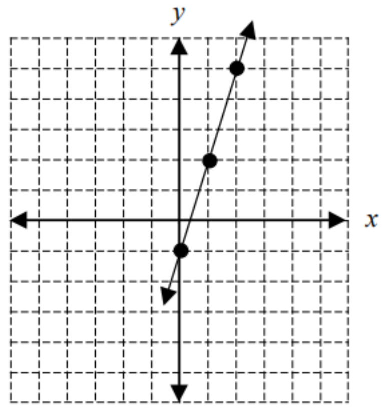
1. (-1, 4) and (1, -2)
2. (3, 5) and (-3, 1)
3. (1, -3) and (-1, -2)
4. (2, -4) and (6, -4)
5. (2, 1) and (-2, -3)
6. (5, -2) and (5, 7)

B. 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. $y = 3x - 1$

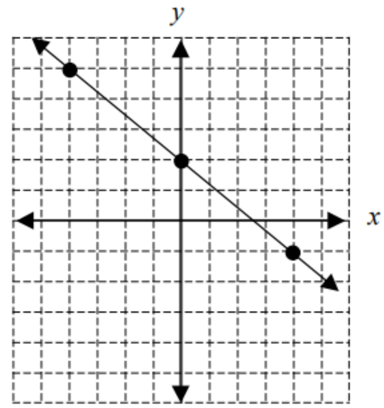
Slope: 3 $\quad$ y-intercept: -1



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



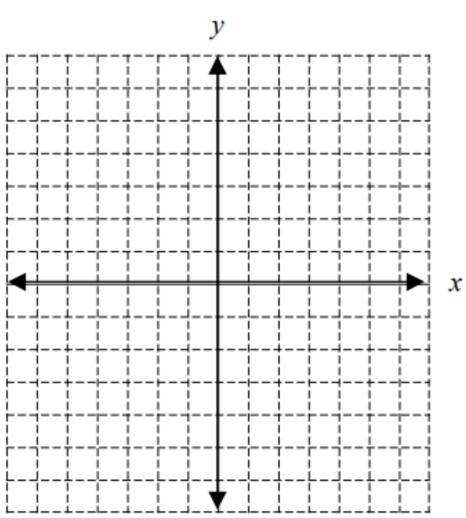
Place a point on the y-axis at 2. Slope is -3/4 so travel down 3 on the y-axis and over 4 to the right. Or travel up 3 on the y-axis and over 4 to the left.

PRACTICE SET 7B

Graph each line and state the slope and y-intercept.

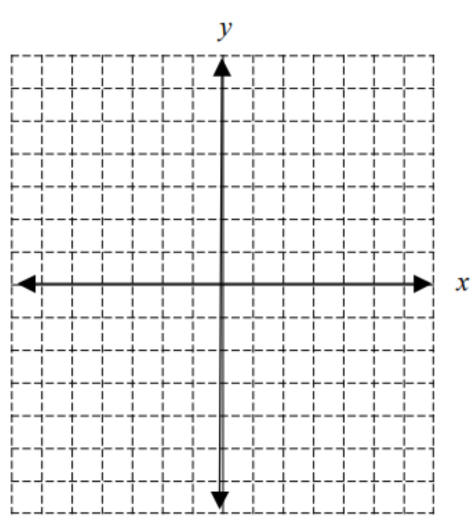
1. $y = 2x + 5$

Slope: _____ y-intercept: _____



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

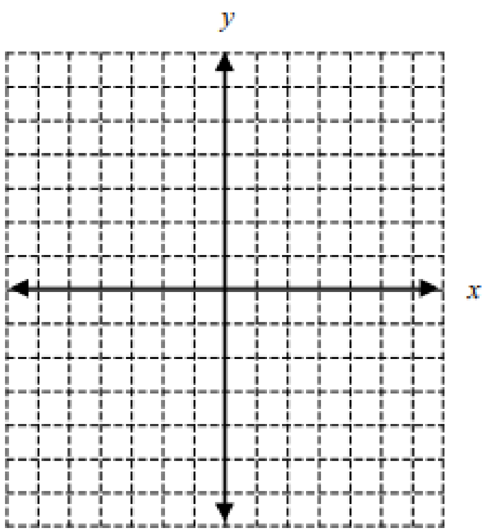
Slope: _____ y-intercept: _____



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

Slope: _______________

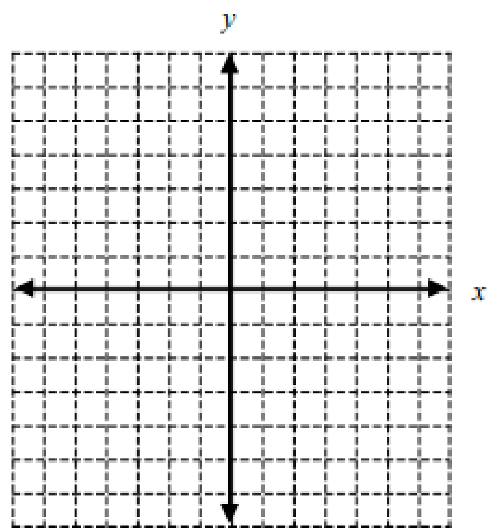
y-intercept: _______________



4. $y = -3x$

Slope: _______________

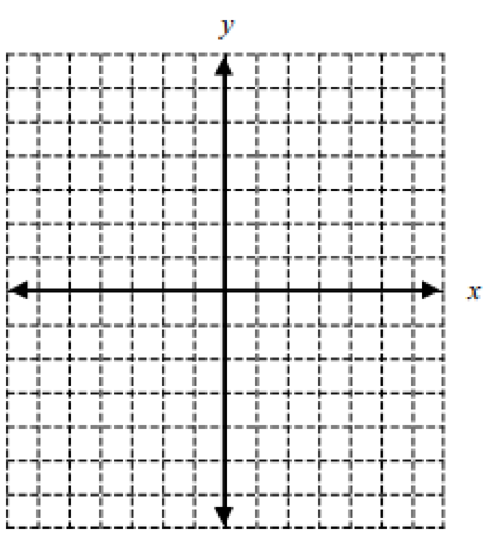
y-intercept _______________



5. $y = -x + 2$

Slope: _______________

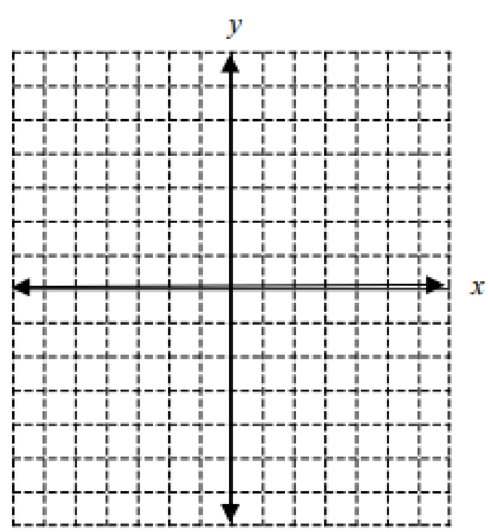
y-intercept: _______________



6. $y = x$

Slope: _______________

y-intercept _______________



C. Using Standard Form to Graph a Line

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

(1) Rewrite the equation in $y = mx + b$ form, identify the y-intercept and slope, then graph as in Part II above.

(2) 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

(3) 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 $y = 0$:

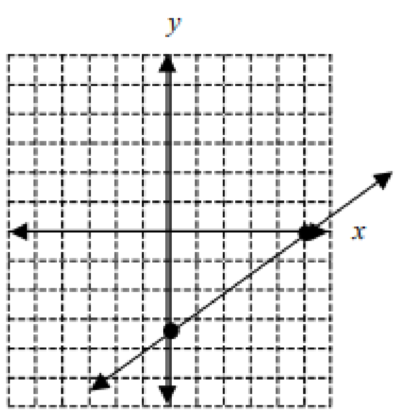
$$2x - 3(0) = 10$$
$$2x = 10$$
$$x = 5$$

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.

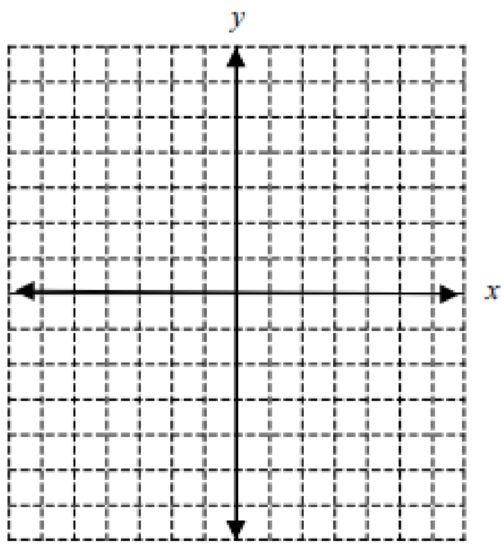
On the y-axis place a point at $-\frac{10}{3} = -3\frac{1}{3}$

Connect the points with the line.

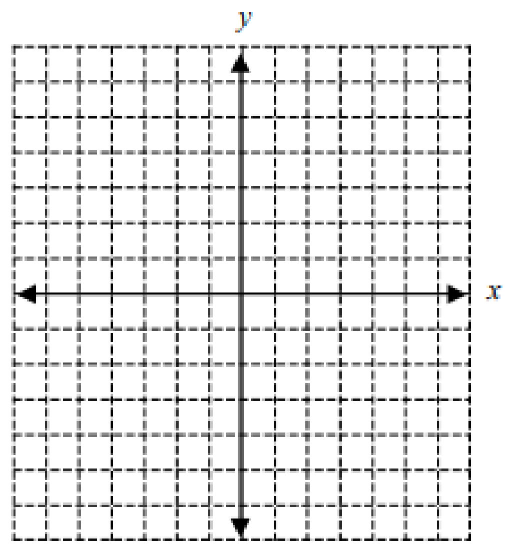
PRACTICE SET 7C

Sketch the graph of the line given by the following equations.

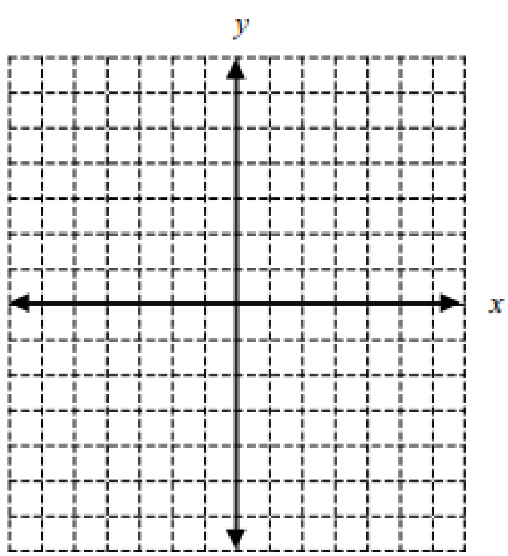
1. $3x + y = 3$



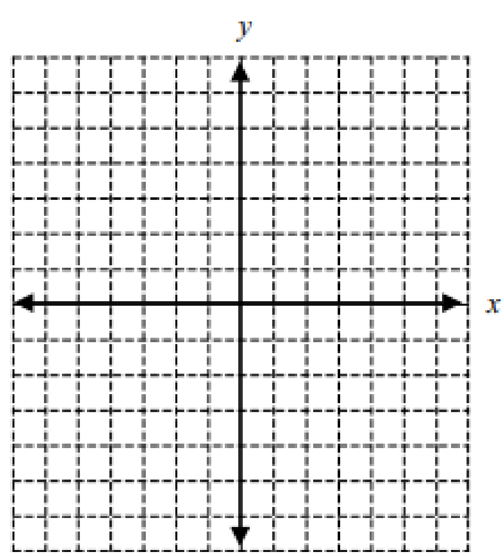
2. $5x + 2y = 10$



3. $y = 4$



4. $4x - 3y = 9$



ANSWER KEY

I. Simplifying Polynomial Expressions

PRACTICE SET 1

1. $24x + 3y$
2. $-15y^2 + 37y + 22$
3. $9n - 3$
4. $-22b + 6$
5. $160qx + 110q$
6. $-5x + 6$
7. $74z - 24w$
8. $56c - 117$
9. $-27x^2 + 54x - 9$
10. $-y + 31x + 42$

II. Solving Equations

PRACTICE SET 2A

1. $x = 7$
2. $x = 26$
3. $x = 9.5$
4. $x = 13$
5. $x = 3.5$
6. $x = 16$
7. $x = 19$
8. $x = -2.8$
9. $x = 9.5$
10. $x = 0$

PRACTICE SET 2B

1. $V = W - Y$
2. $w = \frac{9}{r}$
3. $f = \frac{9 - 2d}{-3} = -3 + \frac{2}{3}d$
4. $x = \frac{10 - t}{d} = \frac{10}{d} - \frac{t}{d}$
5. $g = \frac{P + 1620}{180} = \frac{P}{180} + 9$
6. $x = \frac{9y + u + 5h}{4}$

III. Rules of Exponents

PRACTICE SET 3

1. c^8	2. m^{12}	3. k^{20}
4. 1	5. $p^{11}q^7$	6. $9z^9$
7. $-t^{21}$	8. $3f^3$	9. $60h^8k^5$
10. $\dfrac{a^3b^4}{3c}$	11. $81m^8n^4$	12. 1
13. $30a^3b^4c$	14. $4x$	15. $24x^4y^7$

IV. Binomial Multiplication

PRACTICE SET 4

1. x^2+x-90	2. $x^2-5x-84$
3. $x^2-12x+20$	4. $x^2+73x-648$
5. $8x^2+2x-3$	6. $50-100x+18x^2$
7. $-6x^2-20x-16$	8. $x^2+20x+100$
9. $25-10x+x^2$	10. $4x^2-12x+9$

V. Factoring

PRACTICE SET 5

1. $3x(x+2)$	2. $4ab^2(a-4b+2c)$
3. $(x-5)(x+5)$	4. $(n+5)(n+3)$
5. $(g-4)(g-5)$	6. $(d+7)(d-4)$
7. $(z-10)(z+3)$	8. $(m+9)^2$
9. $4y(y-3)(y+3)$	10. $5(k+9)(k-3)$

VI. Radicals

PRACTICE SET 6

1. $\mathbf{11}$
2. $\mathbf{3\sqrt{10}}$
3. $\mathbf{5\sqrt{7}}$
4. $\mathbf{12\sqrt{2}}$
5. $\mathbf{9\sqrt{6}}$
6. $\mathbf{8}$
7. $\mathbf{60\sqrt{5}}$
8. $\mathbf{21\sqrt{3}}$
9. $\mathbf{40\sqrt{19}}$
10. $\mathbf{\dfrac{5\sqrt{5}}{3}}$

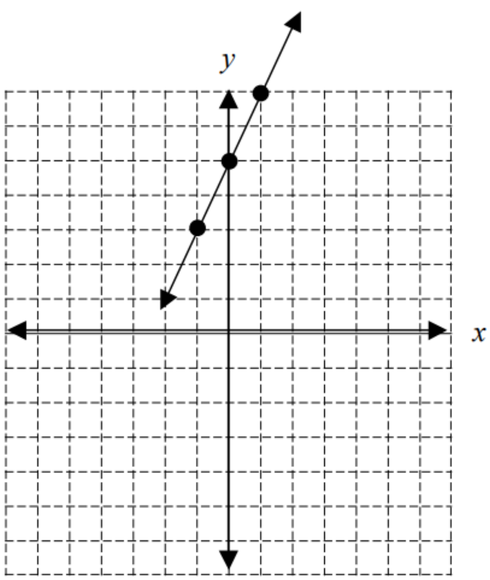
VII. Graphing Straight Lines

PRACTICE SET 7A

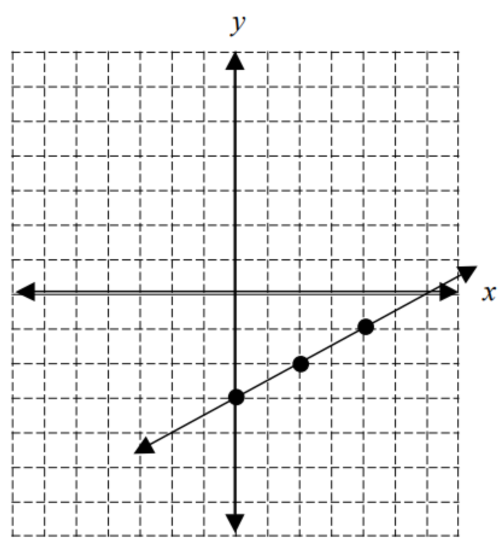
1. $\mathbf{-3}$
2. $\mathbf{\dfrac{2}{3}}$
3. $\mathbf{-\dfrac{1}{2}}$
4. $\mathbf{0}$
5. $\mathbf{1}$
6. **undefined**

PRACTICE SET 7B

1. Slope: $\mathbf{2}$ y-intercept: $\mathbf{5}$



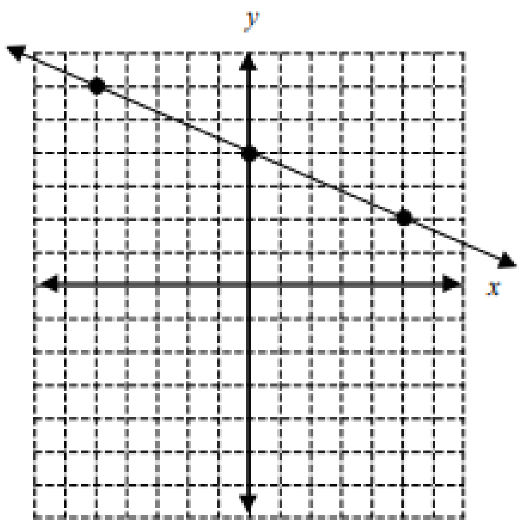
2. Slope: $\mathbf{\dfrac{1}{2}}$ y-intercept: $\mathbf{-3}$



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

Slope: _____ $-\frac{2}{5}$ _______

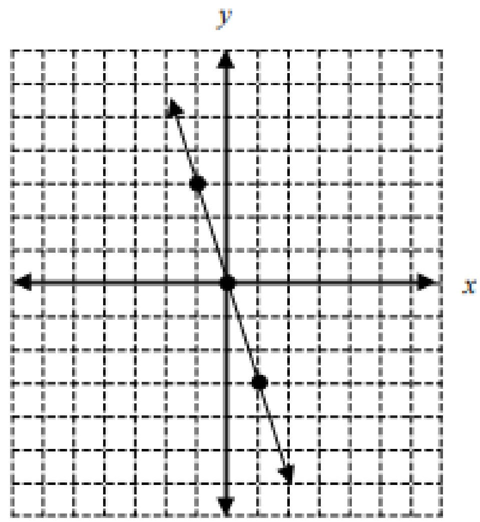
y-intercept: ______ **4** ________



4. $y = -3x$

Slope: ______ **-3** ______

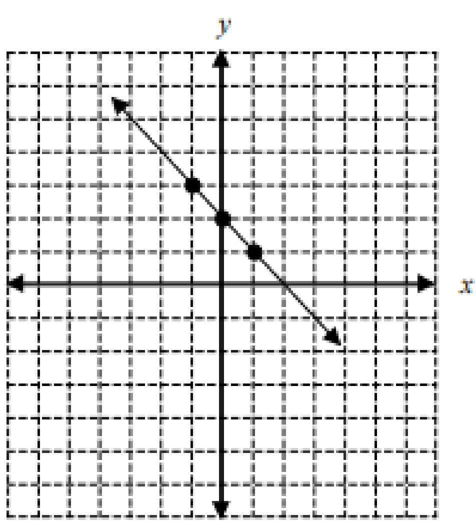
y-intercept ______ **0** ______



5. $y = -x + 2$

Slope: _____ **-1** _______

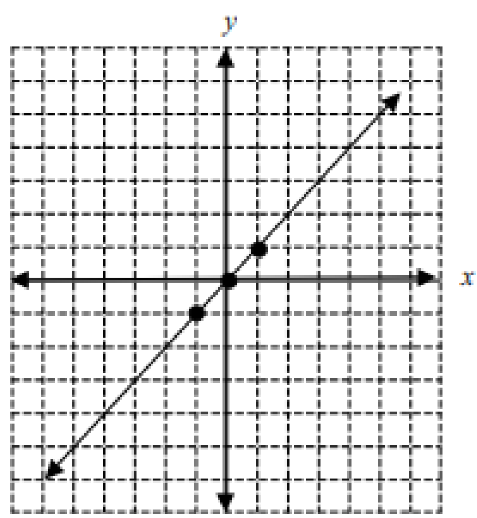
y-intercept: ______ **2** _______



6. $y = x$

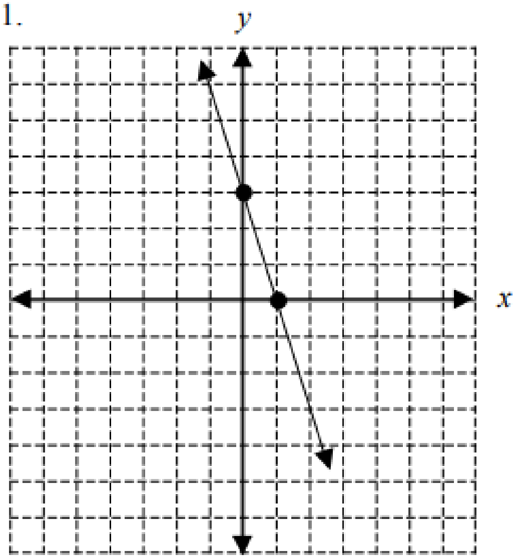
Slope: ______ **1** _______

y-intercept ______ **0** _______

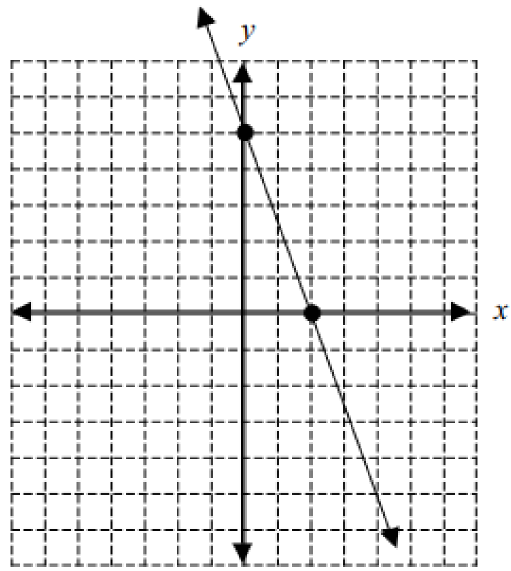


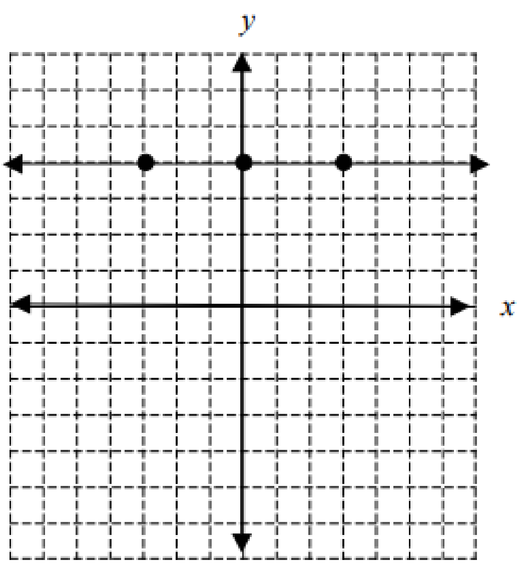
PRACTICE SET 7C

1.



2.





4.