The Mesivta High School of Greater Philadelphia

Algebra 2H Summer Packet

Show all work for each problem. You may need a separate sheet of paper to properly show work.   The answers are provided for you so you can check your work. The packet is due the first day of school. There will be an assessment early in the school year on the material in the packet as well.

NO CALCULATORS ON THIS PACKET.

I.   Order of Operations

PEMDAS
- **Parentheses and other grouping symbols**
- **Exponential expressions**
- **Multiplication, Division,**
- **Addition and Subtraction**

Simplify each numerical expression. ***Show all work!*** Only use a calculator to check answers.

1) $6 + 2 \times 8 - 12 + 9 \div 3$

2) $25 - (2^3 + 5 \times 2 - 3)$

3) $\dfrac{-2 \bullet (-30) + 0.5 \bullet 20}{4^2 - 6}$

4) $\dfrac{15 - [8 - (2 + 5)]}{18 - 5^2}$

II.   Evaluating Algebraic Expressions

To evaluate:
- **Substitute the given value(s) of the variable(s)**
- **Use order of operations to find the value of the resulting numerical expression.**

Evaluate. ***Show all work!*** Only use a calculator to check answers.

1) $x\left(\dfrac{y}{2} + 3z^2\right) - 2x$ if $x = \dfrac{1}{2}, y = 4, z = -2$

2) $12a - 4a^2 + 7a^3$ if $a = -3$

3) $\dfrac{-b + \sqrt{b^2 - 4ac}}{2a}$ if $a = 1, b = -4, c = -21$

4) $1.2(3)^x$ if $x = 3$

5) $\dfrac{3(x + y) - 2(x - y)}{5x + y}$ if $x = 3$ and $y = 4$

6) $2\left(\dfrac{1}{3}\right)^x$ *if* $x = 2$

III.   Simplifying Radicals

> **An expression under a radical sign is in simplest radical form when:**
> 1. There is no integer under the radical sign with a perfect square factor,
> 2. There are no fractions under the radical sign
> 3. There are no radicals in the denominator

Express the following in simplest radical form.   ***Show all work!***

1) $\sqrt{50}$

2) $\sqrt{24}$

3) $\sqrt{192}$

4) $\sqrt{169}$

5) $\sqrt{147}$

6. $\sqrt{\dfrac{13}{49}}$

7. $\sqrt{\dfrac{6}{27}}$

8. $\dfrac{3}{\sqrt{6}}$

IV.   Solving Linear Equations

Solve for the indicated variable. ***Show all work!*** Only use a calculator to check answers.

1) $3n + 1 = 7n - 5$

2) $2[x + 3(x - 1)] = 18$

3) $6(y + 2) - 4 = -10$

4) $2x^2 = 50$

5) $5 + 2(k + 4) = 5(k - 3) + 10$

6) $6 + 2x(x - 3) = 2x^2$

V.   Properties of Exponents

PROPERTIES OF EXPONENTS

Let a and b be real numbers and let m and n be integers.

Product of powers property $a^m \cdot a^n = a^{\underline{m+n}}$

Power of a power property $(a^m)^n = a^{\underline{mn}}$

Power of a product property $(ab)^m = a^{\underline{m}}b^{\underline{m}}$

Negative exponent property $a^{-m} = \dfrac{1}{a^m}, a \neq 0$

Zero exponent property $a^0 = \underline{1}, a \neq 0$

Quotient of powers property $\dfrac{a^m}{a^n} = a^{\underline{m-n}}, a \neq 0$

Power of a quotient property $\left(\dfrac{a}{b}\right)^m = \dfrac{a^m}{b^m}, b \neq 0$

Simplify each expression. Answers should be written using <u>positive exponents</u>. **Show all work!**

1) $g^5 \cdot g^{11}$ _____

2) $(b^6)^3$ _____

3) w^{-7} _____

4) $\dfrac{y^{12}}{y^8}$ _____

5) $(3x^7)(-5x^{-3})$ _____

6) $(-4a^{-5}b^0c)^2$ _____

7) $\dfrac{-15x^7}{25x^9}$ _____

8) $\left(\dfrac{4x^9}{12x^4}\right)^3$ _____

VI. Operations with Fractions

Perform the indicated operations and simplify (no decimal answers). Show all work!   No Calculator.

1. $\dfrac{4}{9} + \dfrac{1}{9}$

2. $4\dfrac{2}{7} - 2\dfrac{5}{7}$

3. $\dfrac{1}{2} + \dfrac{3}{7}$

4. $\dfrac{8}{9} - \dfrac{3}{4}$

5. $1\dfrac{1}{2} + 2\dfrac{3}{4}$

6. $3\dfrac{1}{6} - 1\dfrac{3}{5}$

7. $\left(-\dfrac{3}{4}\right)\left(-\dfrac{1}{9}\right)\left(-\dfrac{6}{5}\right)$

8. $\dfrac{8}{9} \div \dfrac{2}{3}$

VII. Operations with Polynomials

Examples:
a) $(x^2 + 3x - 2) - (3x^2 - x + 5)$
$x^2 + 3x - 2 - 3x^2 + x - 5$
$\boxed{-2x^2 + 4x - 7}$

b) $3x(2x + 5)^2$
$3x(4x^2 + 20x + 25)$
$\boxed{12x^3 + 60x^2 + 75x}$

c) $4(5x^2 + 3x - 4) + 3(-2x^2 - 2x + 3)$
$20x^2 + 12x - 16 - 6x^2 - 6x + 9$
$\boxed{14x^2 + 6x - 7}$

d) $(4x - 5)(3x + 7)$
$12x^2 + 28x - 15x - 35$
$\boxed{12x^2 + 13x - 35}$

Perform the indicated operations and simplify. *Show all work!*

1) $(7x^2 + 4x - 3) - (-5x^2 - 3x + 2)$

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

3) $(4x + 5)(5x + 4)$

4) $(n^2 + 5n + 3) + (2n^2 + 8n + 8)$

5) $(5x^2 - 4) - 2(3x^2 + 8x + 4)$

6) $-2x(5x + 11)$

7) $(2m + 6)(2m + 6)$

8) $(5x - 6)^2$

VIII. Factoring Polynomials

Examples:

Factoring out the GCF

a) $6x^2 + 21x$

$3x(2x + 7)$

Difference of Squares

b) $x^2 - 64$

$(x - 8)(x + 8)$

Perfect Square Trinomial

c) $x^2 - 10x + 25$

$(x - 5)^2$

Trinomial

d) $3x^2 + 7x + 2$

$(3x + 1)(x + 2)$

Trinomial

e) $2x^2 - 13x + 15$

$(2x - 3)(x - 5)$

Trinomial

f) $6x^2 + x - 1$

$(3x - 1)(2x + 1)$

Factor completely. **Show all work!**

1) $16y^2 + 8y$

2) $18x^2 - 12x$

3) $6m^2 - 60m + 10$

4) $6y^2 - 13y - 5$

5) $20x^2 + 31x - 7$

6) $12x^2 + 23x + 10$

7) $x^2 - 2x - 63$

8) $8x^2 - 6x - 9$

9) $x^2 - 121$

IX.   Linear Equations in Two Variables

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

Equations of a Line:
Slope-intercept form: $y = mx + b$
Point-slope form: $y - y_1 = m(x = x_1)$
Standard form: $Ax + By = C$

Examples:

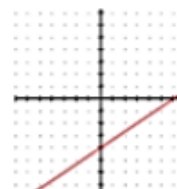a) **Find the slope** of the line passing through the points (-1, 2) and (3, 5).

$$\text{slope} = m = \frac{Y_2 - Y_1}{X_2 - X_1} \quad \rightarrow \quad m = \frac{5-2}{3-(-1)} = \frac{3}{4}$$

b) **Graph**   y = (2/3) x - 4   with slope-intercept method.
Reminder: **y = mx + b** is slope-intercept form where **m** = slope and **b** = y-intercept.
   Therefore, slope is 2/3 and the y-intercept is – 4.
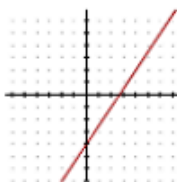
Graph accordingly.   ───────►

c) **Graph** 3x - 2y - 8 = 0   with slope-intercept method.
   Put in Slope-Intercept form: y = -3/2 x + 4

m = 3/2   b = -4
Graph accordingly.   ───────►

d) **Write the equation** of the line with a slope of 3 and passing through the point (2, -1)
y = mx + b
-1 = 3(2) + b
-7 = b   ───────────►   Equation: y = 3x – 7

Find the slope of the line passing through each pair of points. **Show all work!**
1)   (-3, -4) (-4, 6)   2)   (-4, -6) (-4, -8)   3)   (-5, 3) (-11, 3)

Write an equation of a line in slope-intercept form using the given information. **Show all work!**
4)   (5, 4)   m = $\dfrac{-2}{3}$ 5)   (-2, 4)   m = -3   6)   (-6, -3) (-2, -5)
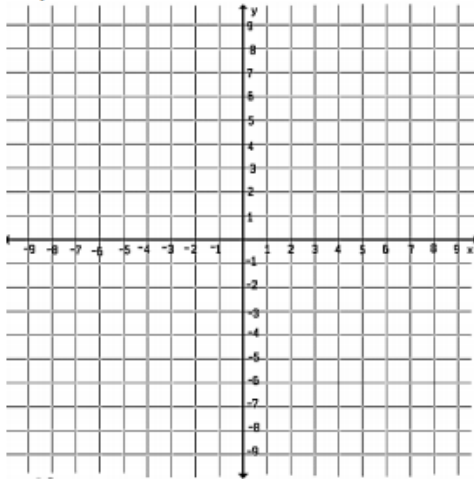
Write an equation in point- form using the given information. **Show all work!**
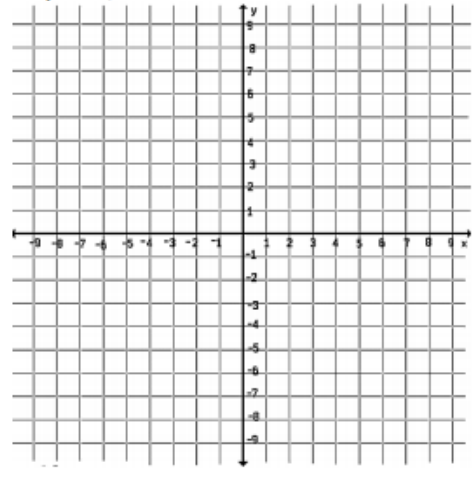7) passes through (2, 3), m= 4   8) passes through (-4, 0), m= $\dfrac{4}{3}$

Using the slope and y-intercept, sketch a graph of each line
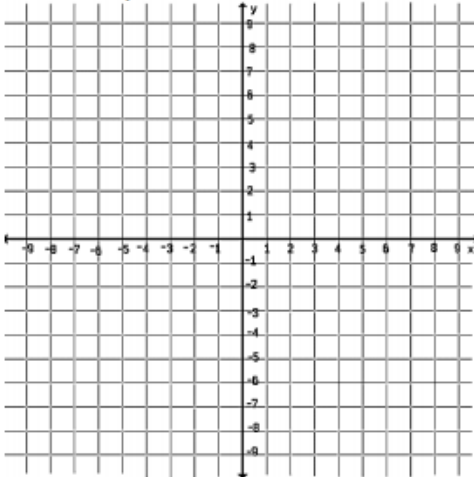
8. $y = 2x - 1$
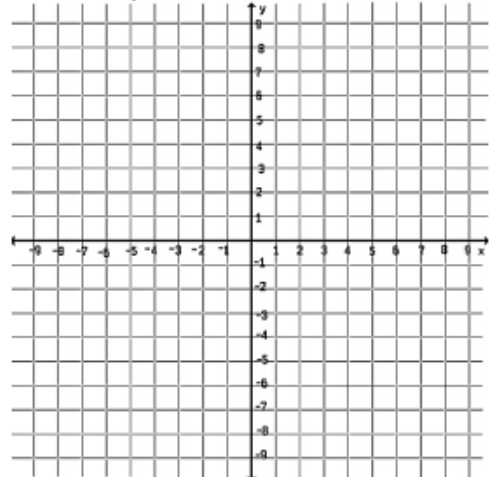
9. $y = -2/3x + 3$

Change the following to slope-intercept form, then sketch a graph

10. $3x - 4y = 12$

11. $3x + 6y = 12$

X. Solving Systems of Equations

| Solve for x and y:
x = 2y + 5   3x + 7y = 2

Using **substitution** method:

3(2y + 5) + 7y = 2
6y + 15 + 7y = 2
13y = -13
y = -1

x = 2(-1) + 5
x=3

Solution: (3, -1) | Solve for x and y:
3x + 5y = 1   2x + 3y = 0
Using **elimination** (addition/ subtraction) method:

3(3x + 5y = 1)
-5(2x + 3y = 0)
9x + 15y = 3
-10x - 15y = 0
-1x = 3
x = -3

2(-3) + 3y = 0
y=2
Solution: (-3, 2) |

Solve each system of equations by either the substitution method or the elimination) method. Write your answer as an ordered pair.

1) y = 2x + 4
    -3x + y = - 9

2) 2x + 3y = 6
    -3x + 2y = 17

3) x – 2y = 5
    3x – 5y = 8

4) 3x + 7y = -1
    6x + 7y = 0

Answers

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I.   Order of Operations.

1.	2.	3.	4
13	10	7	-2

II. Algebra Expressions

1.	2.	3.	4.	5.	6.
7	-261	7	32.4	23/19	2/9

III. Simplifying Radicals

1.	2.	3.	4.	5.	6.	7.	8.
$5\sqrt2$	$2\sqrt6$	$8\sqrt3$	13	$7\sqrt3$	$\dfrac{\sqrt{13}}{7}$	$\dfrac{\sqrt2}{3}$	$\dfrac{\sqrt6}{2}$

IV. Solving Equations.

1.	2.	3.	4.	5.	6.
3/2	3	-3	±5	6	1

V.   Properties of Exponents

1.	2.	3.	4.	5.	6.	7.	8.
g^{16}	b^{18}	$\dfrac{1}{w^7}$	y^4	$-15x^4$	$\dfrac{16c^2}{a^{10}}$	$\dfrac{-3}{5x^2}$	$\dfrac{x^{15}}{27}$

VI. Fractions

1.	2.	3.	4.	5.	6.	7.	8.
$\dfrac{5}{9}$	$1\dfrac{4}{7}$	$\dfrac{13}{14}$	$\dfrac{5}{36}$	$4\dfrac{1}{4}$	$1\dfrac{17}{30}$	$-\dfrac{1}{10}$	$1\dfrac{1}{3}$

VII. Polynomials

1.	$12x^2 + 7x - 5$
2	$21x^2 + 40x - 21$
3	$20x^2 + 41x + 20$
4.	$3n^2 + 13n + 11$
5.	$-x^2 - 16x - 12$
6.	$-10x^2 + 22x$
7.	$4m^2 + 24m + 36$
8.	$25x^2 - 60x + 36$

VIII. Factoring

1.	$8y(2y+1)$
2.	$6x(3x-2)$
3.	$2(3m^2 - 30m + 5)$
4.	$(2y-5)(3y+1)$
5.	$(4x+7)(5x-1)$
6.	$(4x+5)(3x+2)$
7.	$(x-9)(x+7)$
8.	$(4x+3)(2x-3)$
9.	$(x+11)(x-11)$

IX. Linear Equations

1.	-10
2.	undefined
3.	0
4.	$Y = -\dfrac{2}{3}x + \dfrac{22}{3}$
5.	$Y = -\dfrac{1}{2}x - 6$
6.	$y-3 = 4(x-2)$
7.	$Y - 4 = -5(x+1)$
8.- 11	See Below

X. Systems

1.	(13,30)
2.	(-3,4)
3.	(-9, -7)
4.	$\left(\dfrac{1}{3}, -\dfrac{2}{7}\right)$

8.	9	10	11.