NAME -

New Rochelle High School

Geometry
Summer Assignment

To all Geometry students,

This assignment will help you refresh some of the necessary math skills you will need to be successful in Geometry and it is meant to be a bridge between Algebra and Geometry. The model problems provide a detailed explanation of the required concepts needed to be successful. As you look and work through this packet you will become familiar with its format. Read through the model problems thoroughly before answering the accompanying problems. Also, make sure you read and follow the directions. Pace yourself, do not attempt to complete the entire packet all at once. Your Geometry teacher will be looking forward to meeting you.

Do the math and *show* all of your work! Good luck!

Have a great summer and a very successful upcoming Geometry school year.

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Table of Contents

Evaluating Algebraic Expressions

Evaluate Numerical Expressions - Numerical expressions often contain more than one operation. To evaluate them, use the rules for order of operations shown below.

Order of Operations	**Step 1** Evaluate expressions inside grouping symbols.
	Step 2 Evaluate all powers.
	Step 3 Do all multiplication and/or division from left to right.
	Step 4 Do all addition and/or subtraction from left to right.

Evaluate Algebraic Expressions - Algebraic expressions may contain more than one operation. Algebraic expressions can be evaluated if the values of the variables are known. First, replace the variables with their values. Then use the order of operations to calculate the value of the resulting numerical expression.

Evaluate Numerical Expressions

a. $3[2 + (12 \div 3)^2]$

$3[2 + (12 \div 3)^2] = 3(2 + 4^2)$	Divide 12 by 3.
$= 3(2 + 16)$	Find 4 squared.
$= 3(18)$	Add 2 and 16.
$= 54$	Multiply 3 and 18.

Evaluate Numerical Expressions

Evaluate $x^3 + 5(y - 3)$ if $x = 2$ and $y = 12$.

$x^3 + 5(y - 3)$	
$2^3 + 5(12 - 3)$	Replace x with 2 and y with 12.
$8 + 5(12 - 3)$	Evaluate 2^3.
$8 + 5(9)$	Subtract 3 from 12.
$8 + 45$	Multiply 5 and 9.
53	Add 8 and 45.

The solution is 53.

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Directions – Show all work here and place all final choices/answers on the answer page.

1. What is the value of $5xy^2$ if $x = -2$ and $y = -3$?

(1) -90 (2) 90 (3) -180 (4) 180

2. If $y = 2x^2 - 5x + 6$, what is the value of y when $x = -2$?

(1) 32 (2) -24 (3) 24 (4) 4

3. Evaluate the expression $2[12 + (5 - 2)^2]$.

4. Evaluate the expression $5x - (y + 2z)$ if $x = 6$, $y = 8$, and $z = 3$.

5. Evaluate the expression $(10x)^2 + 100a$ if $x = 2$ and $a = \frac{4}{5}$.

Solving Equations

Multi-Step Equations - To solve equations with more than one operation, often called **multi-step equations**, undo operations by working backward. Reverse the usual order of operations as you work.

Equations With Variables on Each Side - To solve an equation with the same variable on each side, first use the Addition or the Subtraction Property of Equality to write an equivalent equation that has the variable on just one side of the equation. Then solve the equation.

Equations With Grouping Symbols - When solving equations that contain grouping symbols, first use the Distributive Property to eliminate grouping symbols. Then solve.

Multi-Step Equations

Solve $5x + 3 = 23$.

$5x + 3 - 3 = 23 - 3$	Subtract 3 from each side.
$5x = 20$	Simplify.
$\frac{5x}{5} = \frac{20}{5}$	Divide each side by 5.
$x = 4$	Simplify.

Equations With Variables on Each Side

Solve $5y - 8 = 3y + 12$.

$5y - 8 - 3y = 3y + 12 - 3y$	Subtract 3y from each side.
$2y - 8 = 12$	Simplify.
$2y - 8 + 8 = 12 + 8$	Add 8 from each side.
$2y = 20$	Simplify.
$\frac{2y}{2} = \frac{20}{2}$	Divide each side by 2.
$y = 10$	Simplify.

Equations With Grouping Symbols

Solve $4(2a - 1) = -10(a - 5)$.

$8a - 4 = -10a + 50$	Distributive Property
$8a - 4 + 10a = -10a + 50 + 10a$	Add 10a to each side.
$18a - 4 = 50$	Simplify.
$18a - 4 + 4 = 50 + 4$	Add 4 to each side.
$18a = 54$	Simplify.
$\frac{18a}{18} = \frac{54}{18}$	Divide each side by 18.
$a = 3$	Simplify.

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Directions – Show all work here and place all final choices/answers on the answer page.

6. If $12x - 8x + 12 = 10$, then $x =$

(1) 3 (2) 2 (3) $-\frac{1}{3}$ (4) $-\frac{1}{2}$

7. If $5(2x - 7) = 15x - 10$, then $x =$

(1) $\frac{4}{7}$ (2) $\frac{7}{12}$ (3) -5 (4) -9

8. Solve $3x + 21 = 9x - 45$.

9. Solve $3(3x + 5) - 8x = 1$.

10. Solve $5(6 - x) = -3(x + 2)$.

Factoring

Factor $x^2 + bx + c$ - To factor a trinomial of the form $x^2 + bx + c$, find two integers, m and p, whose sum is equal to b and whose product is equal to c.

Factoring $x^2 + bx + c$	$x^2 + bx + c = (x + m)(x + p)$, where $m + p = b$ and $mp = c$

Factor $x^2 + 7x + 10$

In this trinomial, $b = 7$ and $c = 10$.

Factors of 10	Sum of Factors
1, 10	11
2, 5	7

Since $2 + 5 = 7$ and $2 \times 5 = 10$, let $m = 2$ and $p = 5$.
$x^2 + 7x + 10 = (x + 5)(x + 2)$

Factor $x^2 - 8x + 7$

In this trinomial, $b = -8$ and $c = 7$. Notice that $m + p$ is negative and mp is positive, so m and p are both negative. Since $-7 + (-1) = -8$ and $(-7)(-1) = 7$, $m = -7$ and $p = -1$.
$x^2 - 8x + 7 = (x - 7)(x - 1)$

Factor $x^2 + 6x - 16$

In this trinomial, $b = 6$ and $c = -16$. This means $m + p$ is positive and mp is negative. Make a list of the factors of -16, where one factor of each pair is positive.

Factors of –16	Sum of Factors
1, –16	–15
–1, 16	15
2, –8	–6
–2, 8	6

Therefore, $m = -2$ and $p = 8$.
$x^2 + 6x - 16 = (x - 2)(x + 8)$

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Directions – Show all work here and place all final choices/answers on the answer page.

11. Which is a factor of $y^2 + y - 30$?

(1) $(y-6)$ (2) $(y+6)$ (3) $(y-3)$ (4) $(y+3)$

12. Which product is a factored form of $2x^2 + 2x - 12$?

(1) $2(x+2)(x-2)$ (2) $2(x+3)(x-2)$ (3) $2(x+6)(x-1)$ (4) $2(x+1)(x-6)$

13. Factor $x^2 + 8x + 15$

14. Factor $x^2 - 13x + 42$

15. $x^2 - 17x - 60$

Solving Quadratic Equations

Solve Equations by Factoring - Factoring and the Zero Product Property can be used to solve many equations of the form $x^2 + bx + c = 0$.

Solve $x^2 + 6x = 7$

$x^2 + 6x = 7$	Original equation
$x^2 + 6x - 7 = 0$	Rewrite equation so that one side equals 0.
$(x - 1)(x + 7) = 0$	Factor.
$x - 1 = 0$ or $x + 7 = 0$	Zero Product Property
$x = 1$ $x = -7$	Solve each equation.

The solution set is {–7, 1}, the roots are –7 and 1.

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Directions – Show all work here and place all final choices/answers on the answer page.

16. If $(x-3)(x+2)=0$, which is the greater of the two roots?

(1) –2 (2) 2 (3) 3 (4) –3

17. If $x^2+11x+30=0$, which is the smaller of the two roots?

(1) –6 (2) –5 (3) 5 (4) 6

18. Solve $y^2+3y+2=0$.

19. Solve $x^2-2x-15=20$.

20. Solve $x^2=-3x+10$.

Slope

Find Slope - The **slope** of a line is the ratio of change in the *y*-coordinates (rise) to the change in the *x*-coordinates (run) as you move in the positive direction.

Find the slope of the line that passes through (–3, 5) and (4, –2).

Let (–3, 5) = (x_1, y_1) and (4, –2) = (x_2, y_2).

$m = \frac{y_2 - y_1}{x_2 - x_1}$	Slope formula
$= \frac{-2 - 5}{4 - (-3)}$	$y_2 = -2$, $y_1 = 5$, $x_2 = 4$, $x_1 = -3$
$= \frac{-7}{7}$	Simplify.
$= -1$	

Find the value of *r* so that the line through (10, *r*) and (3, 4) has a slope of $-\frac{2}{7}$.

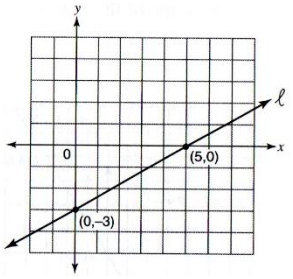
$m = \frac{y_2 - y_1}{x_2 - x_1}$	Slope formula
$-\frac{2}{7} = \frac{4 - r}{3 - 10}$	$m = -\frac{2}{7}$, $y_2 = 4$, $y_1 = r$, $x_2 = 3$, $x_1 = 10$
$-\frac{2}{7} = \frac{4 - r}{-7}$	Simplify.
$-2(-7) = 7(4 - r)$	Cross multiply.
$14 = 28 - 7r$	Distributive Property
$-14 = -7r$	Subtract 28 from each side.
$2 = r$	Divide each side by –7.

Directions – Show all work here and place all final choices/answers on the answer page.

21. What is the slope of line *l* shown in the accompanying diagram?

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

(3) $\frac{5}{3}$ (4) $\frac{3}{5}$



22. What is the slope of a line through points $(-4, 2)$ and $(6, 8)$?

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

(3) $\frac{5}{3}$ (4) $-\frac{5}{3}$

23. Determine the slope of the line through the points $A(-2, 3)$ and $B(1, 7)$?

24. Determine the slope of the line through the points $A(4, 3)$ and $B(0, 6)$?

25. If points $(3, 2)$ and $(x, -5)$ are on a line whose slope is $-\frac{7}{2}$, what is the value of *x*?

Equations of Lines

Slope-Intercept Form	$y = mx + b$, where m is the slope and b is the y-intercept

Write an Equation Given the Slope and a Point

Write an equation of the line that passes through (–2, –1) with a slope of $\frac{1}{4}$.

The line has slope $\frac{1}{4}$. Replace m with $\frac{1}{4}$ and (x, y) with (–2, –1) in the slope-intercept form.

$y = mx + b$	Slope-intercept form
$-1 = \frac{1}{4}(-2) + b$	$m = \frac{1}{4}$, $y = -1$, and $x = -2$
$-1 = -\frac{1}{2} + b$	Multiply.
$-\frac{1}{2} = b$	Add $\frac{1}{2}$ to each side.

Therefore, the equation is $y = \frac{1}{4}x - \frac{1}{2}$.

Write an Equation Given Two Points

Write an equation of the line that passes through (1, 2) and (3, –2).

Find the slope m. To find the y-intercept, replace m with its computed value and (x, y) with (1, 2) in the slope-intercept form. Then solve for b.

$m = \frac{y_2 - y_1}{x_2 - x_1}$	Slope formula
$m = \frac{-2 - 2}{3 - 1}$	$y_2 = -2$, $y_1 = 2$, $x_2 = 3$, $x_1 = 1$
$m = -2$	Simplify.
$y = mx + b$	Slope-intercept form
$2 = -2(1) + b$	Replace m with –2, y with 2, and x with 1.
$2 = -2 + b$	Multiply.
$4 = b$	Add 2 to each side.

Therefore, the equation is $y = -2x + 4$

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Directions – Show all work here and place all final choices/answers on the answer page.

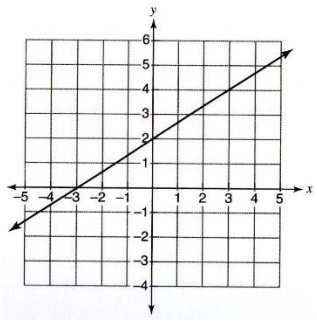
26. What is an equation of the line in the accompanying diagram?

(1) $y = -\frac{3}{2}x + 2$

(2) $y = \frac{3}{2}x - 3$

(3) $y = \frac{2}{3}x + 2$

(4) $y = \frac{2}{3}x - 3$



27. The line whose equation is $3x - 2y = 12$ has

(1) slope = $\frac{3}{2}$; y-intercept = –6

(2) slope = $-\frac{3}{2}$; y-intercept = 6

(3) slope = 3; y-intercept = –2

(4) slope = –3; y-intercept = –6

28. Write the equation of the line whose slope is 2 and y-intercept is 5.

29. Write the equation of the line that passes through the point $(0,2)$ and has a slope of 4?

30. Write the equation of the line that contains the points $(1,3)$ and $(-1,1)$?

Graphing Lines

Slope-Intercept Form	$y = mx + b$, where m is the slope and b is the y-intercept

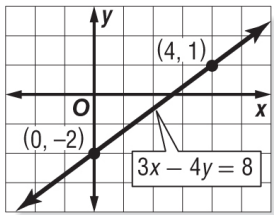
Graph $3x - 4y = 8$.

$3x - 4y = 8$ Original equation

$-4y = -3x + 8$ Subtract $3x$ from each side.

$\frac{-4y}{-4} = \frac{-3x + 8}{-4}$ Divide each side by -4.

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



The y-intercept of $y = \frac{3}{4}x - 2$ is -2 and the slope is $\frac{3}{4}$. So graph the point $(0, -2)$. From this point, move up 3 units and right 4 units. Draw a line passing through both points.

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Directions – Show all work here and place all final choices/answers on the answer page.

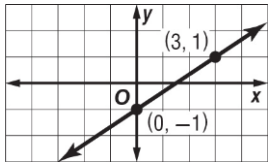
31. Find the equation in slope-intercept form that describes the line graphed below.

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

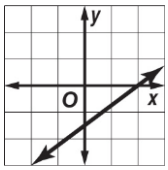
(2) $y = \frac{2}{3}x + \frac{3}{2}$

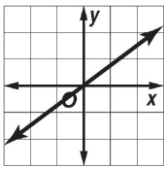
(3) $y = \frac{3}{2}x - 1$

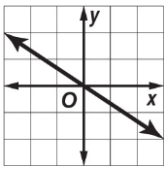
(4) $y = \frac{3}{2}x + \frac{3}{2}$

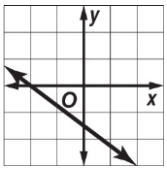


32. Which is the graph of $3x - 4y = 6$?

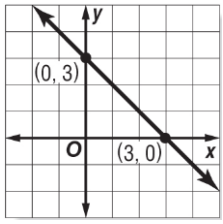
(1) 

(2) 

(3) 

(4) 

33. Write an equation in slope-intercept form for the graph shown.

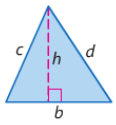
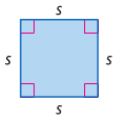
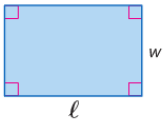
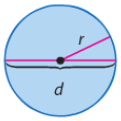


34. Graph $y = \frac{1}{2}x + 3$ on the answer page.

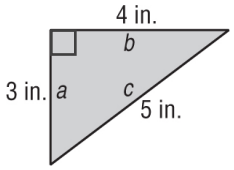
35. Graph $3y + x = 12$ (show work here, place graph on the answer page).

Perimeter and Circumference

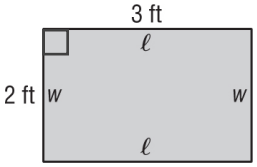
Perimeter and Circumference – The distance around a figure. Perimeter and circumference is measured in linear units.

Triangle	Square	Rectangle	Circle
			
$P = b + c + d$	$P = s + s + s + s$ $= 4s$	$P = \ell + w + \ell + w$ $= 2\ell + 2w$	$C = 2\pi r$ or $C = \pi d$
$A = \frac{1}{2}bh$	$A = s^2$	$A = \ell w$	$A = \pi r^2$
P = perimeter of polygon	A = area of figure		C = circumference
b = base, h = height	ℓ = length, w = width		r = radius, d = diameter

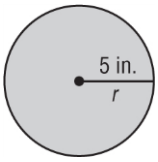
Find the perimeter or Circumference. Round to the nearest tenth.

a. 

$P = a + b + c$
$= 3 + 4 + 5$
$= 12$ in.

b. 

$P = 2\ell + 2w$
$= 2(3) + 2(2)$
$= 10$ ft.

c. 

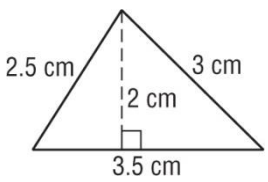
$C = 2\pi r$
$= 2\pi(5)$
$= 10\pi = 31.4$ in.

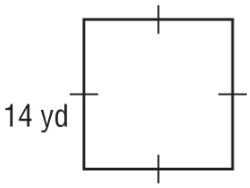
Directions – Show all work here and place all final choices/answers on the answer page.

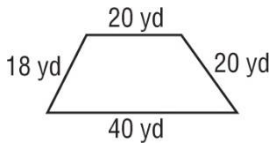
36. A rectangle is 6.2 inches long and 1.7 inches wide. Find its perimeter.
(1) 7.9 in. (2) 105.4 in.^{2} (3) 15.8 in. (4) 10.54 in.^{2}

37. If a circle has a radius of 6 inches, what is the circumference rounded to the nearest whole number?
(1) 19 in. (2) 38 in. (3) 113 in. (4) 76 in.

Find the perimeter of each figure.

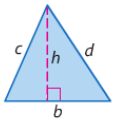
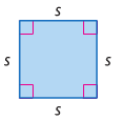
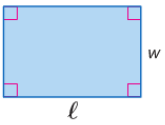
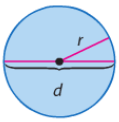
38. 

39. 

40. 

Area

Area – The number of square units needed to cover a surface. Area is measured in square units.

Triangle	Square	Rectangle	Circle
			
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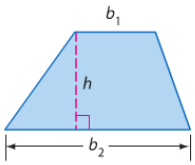
$A = \frac{1}{2}bh$	$A = s^2$	$A = \ell w$	$A = \pi r^2$
P = perimeter of polygon	A = area of figure		C = circumference
b = base, h = height	ℓ = length, w = width		r = radius, d = diameter

Area of a Trapezoid

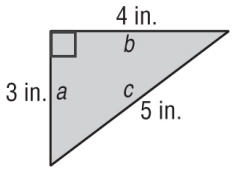
The area A of a trapezoid is one half the product of the height h and the sum of its bases, b_1 and b_2.

$A = \frac{1}{2}h(b_1 + b_2)$



Find the area. Round to the nearest tenth.

a.

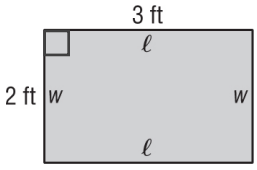


$A = \frac{1}{2}bh$

$= \frac{1}{2}(4)(3)$

$= 6 \text{ in}^2$

b.

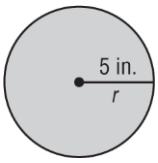


$A = lw$

$= (3)(2)$

$= 6 \text{ ft}^2$

c.



$A = \pi r^2$

$= \pi(5)^2$

$= 25\pi = 78.5 \text{ in}^2$

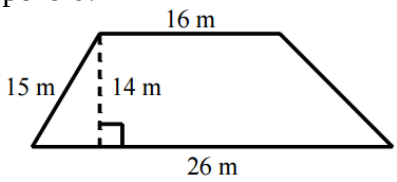
Directions – Show all work here and place all final choices/answers on the answer page.

41. What is the area of a circle whose diameter is 14 centimeters?

(1) 615.75 cm^2 (2) 87.96 cm^2 (3) 43.98 cm^2 (4) 153.94 cm^2

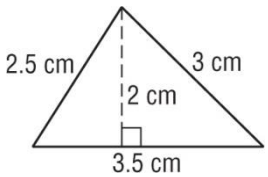
42. Find the area of the trapezoid.

(1) 588 m^2
(2) 294 m^2
(3) 630 m^2
(4) 315 m^2

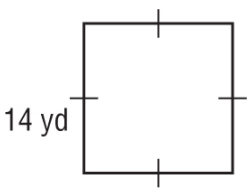


Find the area of each figure.

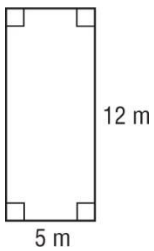
43.



44.

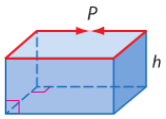
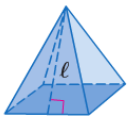
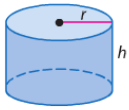
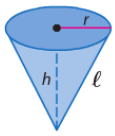
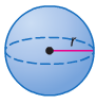


45.



Volume

Volume – The measure of space occupied by a solid. Volume is measured in cubic units.

Prism	Regular Pyramid	Cylinder	Cone	Sphere
				
$V = Bh$	$V = \frac{1}{3}Bh$	$V = \pi r^2 h$	$V = \frac{1}{3}\pi r^2 h$	$V = \frac{4}{3}\pi r^3$

V = volume h = height of a solid

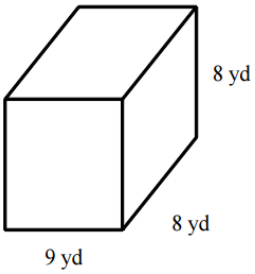
B = area of base

//

Directions – Show all work here and place all final choices/answers on the answer page.

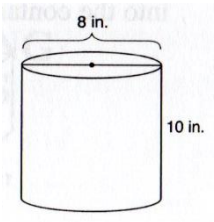
46. Find the volume.

(1) 576 cubic yards
(2) 416 cubic yards
(3) 100 cubic yards
(4) 136 cubic yards



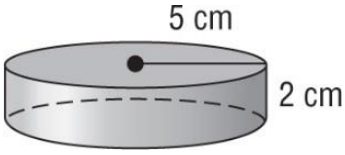
47. A storage container in the shape of a right circular cylinder is shown in the accompanying diagram. What is the number of cubic inches in the volume of this container?

(1) 56.55
(2) 125.66
(3) 251.33
(4) 502.65

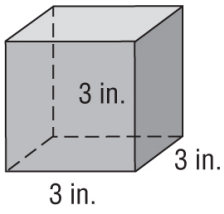


Find the volume of each solid to the nearest tenth.

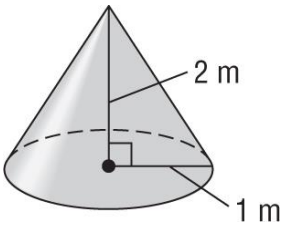
48.



49.

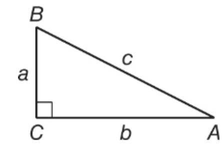


50.



Pythagorean Theorem

<u>The Pythagorean Theorem</u> - The side opposite the right angle in a right triangle is called the **hypotenuse**. This side is always the longest side of a right triangle. The other two sides are called the **legs** of the triangle. To find the length of any side of a right triangle, given the lengths of the other two sides, you can use the **Pythagorean Theorem**.

Pythagorean Theorem	If *a* and *b* are the measures of the legs of a right triangle and *c* is the measure of the hypotenuse, then $c^2 = a^2 + b^2$.	

Find the missing length.

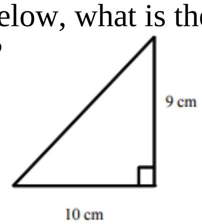
$c^2 = a^2 + b^2$	Pythagorean Theorem
$c^2 = 5^2 + 12^2$	*a* = 5 and *b* = 12
$c^2 = 169$	Simplify.
$c = \sqrt{169}$	Take the square root of each side.
$c = 13$	Simplify.

The length of the hypotenuse is 13.

//

Directions – Show all work here and place all final choices/answers on the answer page.

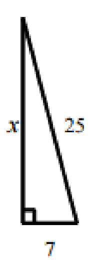
51. Given the right triangle below, what is the length of the hypotenuse?
(1) 181.0 cm
(2) 13.5 cm
(3) 4.4 cm
(4) 19.0 cm



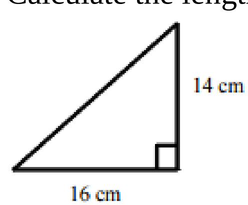
52. Which set of three numbers represent the lengths of the sides of a right triangle?

(1) {4, 5, 6} (2) {6, 8, 10}
(3) {8, 9, 10} (4) {9, 16, 25}

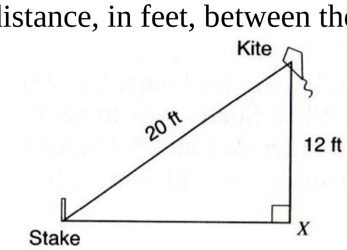
53. Solve for *x*.



54. Calculate the length of the hypotenuse, to the nearest tenth.



55. The accompanying diagram shows a kite that has been secured to a stake in the ground with a 20-foot string. The kite is located 12 feet from the ground, directly over point *X*. What is the distance, in feet, between the stake and point *X*?



Simplifying Square Roots

Product Property of Square Roots - The **Product Property of Square Roots** and prime factorization can be used to simplify expressions involving irrational square roots.

Product Property of Square Roots	For any numbers *a* and *b*, where $a \geq 0$ and $b \geq 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$.

Simplify $\sqrt{180}$

$\sqrt{180} = \sqrt{36 \cdot 5}$ Find the greatest perfect square root factor of 180

$= \sqrt{36} \cdot \sqrt{5}$ Product Property of Square Roots

$= 6\sqrt{5}$ Simplify.

Directions – Show all work here and place all final choices/answers on the answer page.

56. Simplify $\sqrt{12}$

(1) $2\sqrt{6}$ (2) $2\sqrt{3}$ (3) $3\sqrt{2}$ (4) $6\sqrt{2}$

57. Simplify $\sqrt{200}$

(1) $20\sqrt{10}$ (2) $10\sqrt{2}$ (3) $10\sqrt{20}$ (4) $2\sqrt{10}$

58. Simplify $\sqrt{28}$

59. Simplify $\sqrt{50}$

60. Simplify $\sqrt{108}$

NAME – _____ points out of _____ | **Score -** _____

Geometry Summer Assignment
Answer Page

Directions - For **Multiple Choice** questions, place the choice number in the corresponding provided space. For **Short Answer** questions, leave the work in the previous pages and just place the final answer in the corresponding space.

Evaluating Algebraic Expressions Page 2

1. _____ **2.** _____ **3.** _____ **4.** _____ **5.** _____

Solving Equations Page 3

6. _____ **7.** _____ **8.** _____ **9.** _____ **10.** _____

Factoring Page 4

11. _____ **12.** _____ **13.** _____ **14.** _____ **15.** _____

Solving Quadratic Equations Page 5

16. _____ **17.** _____ **18.** _____ **19.** _____ **20.** _____

Slope Page 6

21. _____ **22.** _____ **23.** _____ **24.** _____ **25.** _____

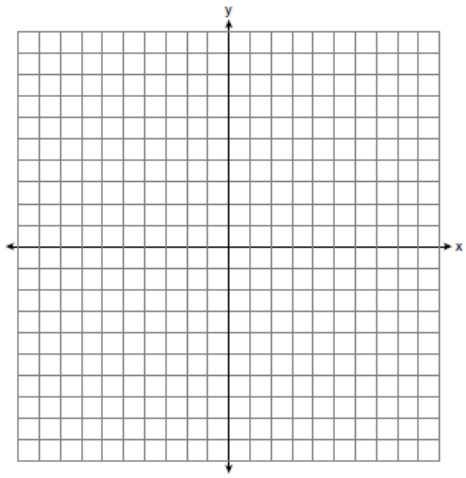
Equations of Lines Page 7

26. _____ **27.** _____ **28.** _____ **29.** _____ **30.** _____

Graphing Lines Page 9

31. _____ **32.** _____ **33.** _____

34.



35.