Welcome to Geometry!

This summer packet is intended to help students prepare for Geometry at Herndon High School for Fall 2023.

*This summer assignment is ***not required***, but it is ***strongly recommended!*** *

The exercises will give you the opportunity to self-assess how prepared you are for Geometry. Success in our first unit will depend on how well you understand the topics included in this packet, so put your best effort into it! Feel free to use old notes and online resources as needed to ensure that you understand this material.

Please complete this packet over the summer using a separate piece of paper. Do as many of the problems as you can WITHOUT the use of a calculator. It is important to spend time keeping these skills and concepts fresh in your mind – especially your mental math! We will provide you with a key at the start of next year for you to check your work. Be sure to keep track of sticky spots and ask questions when we return. You are also welcomed to reach out to us over the summer; our contact information is below.

The Herndon High School website will also post recommended activities from FCPS for each level of mathematics. These activities are another resource that will help you prepare for next year.

Have a great summer – we are looking forward to meeting you in August!

As you work through the packet, keep track of the following:

"Things I learned, but forgot how to do:"	**"Things I never learned:"**

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All Hornets are capable of success! … No exceptions!

A. Calculating Slope

Example: Find the slope of a line passing through (3, -9) and (2, -1).

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ Formula for slope

$m = \dfrac{-1-(-9)}{2-3} = \dfrac{-1+9}{-1}$ Substitute values and simplify

$m = \dfrac{8}{-1} = -8$ Slope is -8

Exercises: Calculate the slope of the line passing through each set of coordinate points.

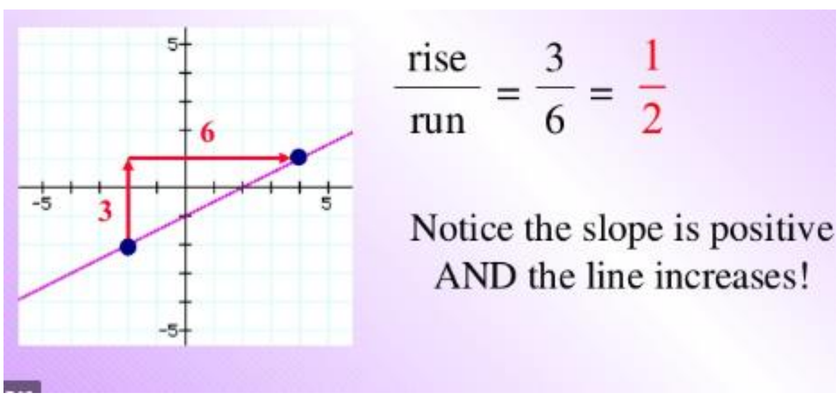
1. (5, 6) (9, 8)

3. (14, -5) (7, 8)

2. (-6, -4) (1, 10)

4. (-9, 13) (2, -10)

B. Given the graph, find the slope of the line



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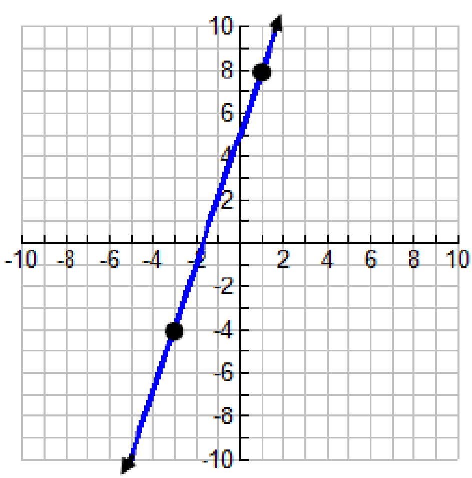

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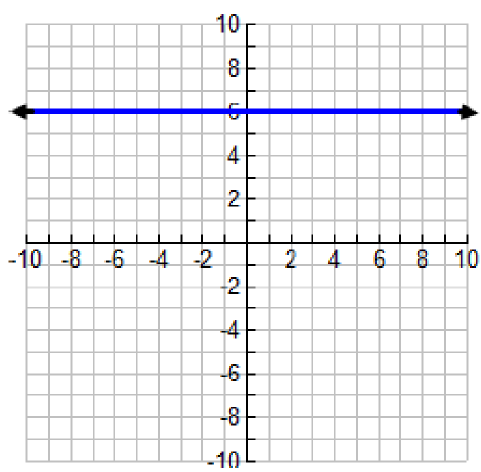

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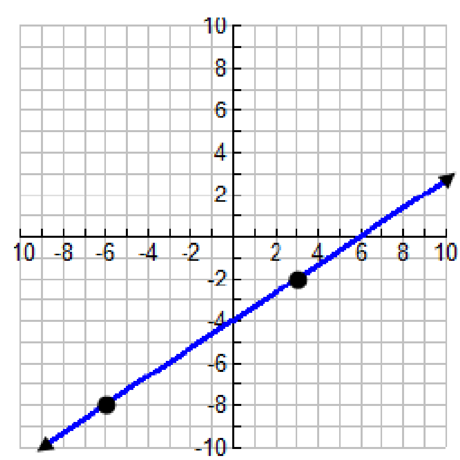

C. Writing the Equation of a Line

Example: Write an equation of the line that passes through the point (3, 4) and has a y-intercept of 5.

$y = mx + b$	Write the slope-intercept form
$4 = 3m + 5$	Substitute values for b, x and y; then simplify
$-1 = 3m$	
$-\frac{1}{3} = m$	Slope is $m = -\frac{1}{3}$. The equation of the line is $y = -\frac{1}{3}x + 5$

Exercises: Write the equation of the line passing through the following point and y intercept.

8. (-3, 10); b = 8

10. (5, -8); b = 7

9. (-1, 4): b = -8

11. (2, 3); b = 2

D. Writing the Equation of a Line

Example: Write the equation of the line that passes through the points (4, 8) and (3, 1).

$m = \frac{1-8}{3-4}$	Substitute values to find the slope of the line
$m = \frac{-7}{-1} = 7$	Simplify.
$1 = 7(3) + b$	Substitute values into $y = mx + b$ and solve for b.
$1 = 21 + b$	
$-20 = b$	**The equation of the line is y = 7x - 20**

Exercises: Write the equation of the line passing through each set of coordinate points.

12. (5, -1) (4, -5)

14. (-3, 2) (-5, -2)

13. (1, 2) (-1, -4)

15. (-6, 4) (6, -1)

E. Distance Formula

Example: Find the distance between the points (-4, 3) and (-7, 8).

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ Substitute coordinate values to find the distance

$= \sqrt{(-7 - (-4))^2 + (8 - 3)^2}$ Simplify.

$= \sqrt{(-3)^2 + (5)^2}$ $= \sqrt{34}$

Exercises: Find the distance between the following points:

16. (-3, 4) (1, 4)

17. (-8, 5) (-1, 1)

F. Combining Like Terms

Example: Simplify.

$\mathbf{8x^2 + 16xy - 3x^2 + 3xy - 3x}$

$\mathbf{8x^2 - 3x^2 + 16xy - 3xy - 3x}$

$\mathbf{5x^2 - 3x + 19xy}$

Exercises: Simplify.

18. $-5m+3q+4m-q$

20. $3x^2y - 5xy^2 + 6x^2y$

19. $-3p - 4t - 5t - 2p$

21. $5x^2 + 2xy - 7x^2 + xy$

G. Solving Equations with Variables on Both Sides

Example: Solve.

$\mathbf{6a - 12 = 5a + 9}$

$\mathbf{a - 12 = 9}$

$\mathbf{a = 21}$ **Subtract *5a* from each side. Add 12 to each side.**

Exercises: Simplify.

22. $8m + 1 = 7m - 9$

23. $3a - 12 = -6a - 12$

24. $-7x + 7 = 2x - 11$

26. $\frac{1}{2}(x - 16) = 7$

25. $16 = \frac{3}{4}x + 1$

27. $-(4x - 8) = 2(x + 4)$

H. Solving Proportions

Example: Use cross products to solve.

1. $\frac{x}{8} = \frac{3}{4}$ $4x = 8 \cdot 3$ $4x = 24$ $x = 6$	1. $\frac{6}{x+4} = \frac{2}{9}$ $6 \cdot 9 = 2(x + 4)$ $54 = 2x + 8$ $46 = 2x$ $23 = x$

Exercises: Use cross products to solve.

29. $\frac{t}{27} = \frac{4}{9}$

32. $\frac{1}{18} = \frac{5}{-4(x-1)}$

30. $\frac{27}{5} = \frac{3}{x}$

33. $\frac{3}{m+4} = \frac{9}{14}$

31. $\frac{19}{x} = \frac{9}{5}$

34. $\frac{r}{3r+1} = \frac{2}{3}$

I. Simplifying Radicals

Example: Simplify the expression $\sqrt{20}$

$$\sqrt{20} = \sqrt{4} \cdot \sqrt{5} = 2\sqrt{5}$$

Use Product Property to simplify.

Exercises: Simplify

35. $\sqrt{52}$

37. $\sqrt{243}$

36. $\sqrt{40}$

38. $\sqrt{320}$

J. Simplifying Radical Expressions

Example: Simplify the radical expression.

$5\sqrt{3} - \sqrt{3} - \sqrt{2} = 4\sqrt{3} - \sqrt{2}$	$(2\sqrt{2})(5\sqrt{3}) = 2 \cdot 5 \cdot \sqrt{2} \cdot \sqrt{3}$ $= 10\sqrt{6}$	$(5\sqrt{7})^2 = 5^2\sqrt{7^2}$ $= 25 \cdot 7$ $= 175$

Exercises: Solve.

39. $\sqrt{64} - \sqrt{28}$

43. $\sqrt{21} \cdot \sqrt{24}$

40. $\sqrt{242} + \sqrt{200}$

44. $(5\sqrt{4})(2\sqrt{4})$

41. $\sqrt{20} + \sqrt{45} - \sqrt{5}$

45. $(8\sqrt{3})^2$

42. $\sqrt{363}\sqrt{300}$

46. $(10\sqrt{11})^2$

K. Simplifying Quotients with Radicals

Example: Simplify the quotient $\frac{6}{\sqrt{5}}$

$$\frac{6}{\sqrt{5}} = \frac{6}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$ Multiply the numerator and denominator by $\sqrt{5}$ to eliminate

$$= \frac{6\sqrt{5}}{\sqrt{5}\sqrt{5}}$$ the radical in the denominator

$$= \frac{6\sqrt{5}}{5}$$

Exercises: Solve:

47. $\frac{16}{\sqrt{24}}$

48. $\frac{9}{\sqrt{52}}$

49. $\frac{\sqrt{27}}{\sqrt{45}}$

50. $\frac{\sqrt{50}}{\sqrt{75}}$

Helpful hints with radicals: a radical is in simplest form if there are 1) no fractions in the radicand, 2) no perfect squares in the radicand and 3) no radicals in the denominator. LOOK for ways to simplify the fraction BEFORE you rationalize the denominator!

L. Solving Literal Equations

Example: Given the formula for the surface area of a right cylinder, solve for *h*:

$\boldsymbol{S = 2\pi r^2 + 2\pi rh}$ $\boldsymbol{S = 2\pi r(r + h)}$ $\boldsymbol{\frac{S}{2\pi} = r + h}$ $\boldsymbol{\frac{S}{2\pi r} - r = h}$	**or**	$\boldsymbol{S = 2\pi r^2 + 2\pi rh}$ $\boldsymbol{S - 2\pi r^2 = 2\pi rh}$ $\boldsymbol{\frac{(S - 2\pi r^2)}{2\pi r} = h}$

Exercises: Solve the literal equation for the indicated variable. Assume variables are positive:

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

52. $P = 2l + 2w; l$

53. $a^2 + b^2 = c^2; b$