Shrine Catholic High School

REQUIRED Summer Math Packet

Designed for Students entering

Honors Algebra 1

SHRINE
CATHOLIC
High School

Dear Parents and Students:

Summer work is useful in achieving grade-level mastery and "bridging" the gap between school years. The Math Department believes that any assigned summer work should be appropriate and purposeful.

Math Department Summer Work Expectations

Students Entering MATH 6, MATH 7, PREALGEBRA, MATH 8, ALGEBRA I, HONORS ALGEBRA I, GEOMETRY, HONORS GEOMETRY, ALGEBRA II, HONORS ALGEBRA II, PRECALCULUS, HONORS PRECALCULUS, COLLEGE ALGEBRA, CALCULUS and AP CALCULUS mathematics classes:

- **All students need to complete the summer math packet for the class for which he/she is registered for in the Fall Semester.**
  The packet is available for printing online.
  High School Students
  https://shrineschools.com/high-school-students
  Academy Students
  https://www.shrineschools.com/academy-students

  This should be completed with all work shown and without the aid of a graphing calculator for graphing problems.

- For students who experience difficulty with any portion of the packet, we recommend seeking outside help. There are many resources online including videos that will reteach any of these topics.

- **Completed summer math work is due on the first full day of classes in August.**

ALL math students will take a Mastery Quiz with similar problems when school begins in order to ensure readiness for their new math class. Students whose performance on this quiz does not show mastery of previous grade-level content may be required to attend math help sessions outside of class time and re-take the quiz until mastery is achieved.

Thank you for your continued support and have a great summer!

Shrine Catholic High School and Academy Math Department

Summer Math Assignment FAQs

What am I required to do this summer?

- Complete the summer math packet for the class you are entering in the Fall.
- Your job is to do your best work to practice your math skills over the summer. We want you to have the best chance for success in your math class next year. These skills will help.

Can I use a calculator?

- You need to show your work for each of the problems. We want to see all of your math thinking in action!
- Math 6, Math 7, Prealgebra and Math 8 students may not use a calculator for any problems.
- All other math students must complete the graphing problems without the aid of a graphing calculator but may use a calculator for standard calculations.

What if I need more help?

- Google the title of the skill and choose as many videos as you need to re learn the topic.
- You can ask for help from family, friends, and tutors. We need you ready to go in August.

When is the packet due?

- The first full day of school in August.

Will I be tested on these skills?

- There will be a mastery quiz during the first weeks of school. The questions will be similar to the ones in the packet and will cover each of the skills that you worked on over the summer.

Evaluating Algebraic Expressions

1. Substitute the given values for the variables in the expression
2. Evaluate the expression using the order of operations
   - Parentheses/Brackets (inside to outside)
   - Exponents
   - Multiplication/Division (left to right)
   - Addition/Subtraction (left to right)

ex: $9x^2 - 4(y + 3z)$
for $x = -3$, $y = 2$, $z = 5$

$9(-3)^2 - 4(2 + 3 \cdot 5)$

$9(-3)^2 - 4(2 + 15)$

$9(-3)^2 - 4 \cdot 17$

$9 \cdot 9 - 4 \cdot 17$

$81 - 4 \cdot 17$

$81 - 68 = \boxed{13}$

The Distributive Property

1. Multiply the number outside the parentheses by each term in the parentheses.
2. Keep the addition/subtraction sign between each term.

ex: $5(8x - 3)$

$5(8x - 3)$

$5(8x) - 5(3)$

$\boxed{40x - 15}$

Simplifying Algebraic Expressions

1. Clear any parentheses using the Distributive Property
2. Add or subtract like terms (use the sign in front of each term to determine whether to add or subtract)

ex: $2(3x - 4) - 12x + 9$

$2(3x - 4) - 12x + 9$

$6x - 8 - 12x + 9$

$\boxed{-6x + 1}$

Evaluate each expression for $a = 9$, $b = -3$, $c = -2$, $d = 7$. Show your work.

1. $a - cd$	2. $2b^3 + c^2$	3. $\frac{a + d - c}{b}$	4. $(a - b)^2 + d(a + c)$
5. $4c - (b - a)$	6. $\frac{a}{b} - 5a$	7. $2bc + d(12 - 5)$	8. $b + 0.5[8 - (2c + a)]$

Simplify each expression using the Distributive Property.

9. $5(2g - 8)$	10. $7(y + 3)$	11. $-3(4w - 3)$	12. $(6r + 3)2$

Simplify each expression, showing all work.

13. $8(x + 1) - 12x$	14. $6w - 7 + 12w - 3z$	15. $9n - 8 + 3(2n - 11)$	16. $3(7x + 4y) - 2(2x + y)$
17. $(15 + 8d)(-5) - 24d + d$	18. $9(b - 1) - c + 3b + c$	19. $20f - 4(5f + 4) + 16$	20. $8(h - 4) - h - (h + 7)$

Solving One-Step Equations

1. Cancel out the number on the same side of the equal sign as the variable using inverse operations (addition/subtraction; multiplication/division)
2. Be sure to do the same thing to both sides of the equation!

ex: $-18 = 6j$

$$\frac{-18}{6} = \frac{\cancel{6}j}{\cancel{6}}$$

$$-3 = j \rightarrow \boxed{j = -3}$$

Solving Two-Step Equations

1. Undo operations one at a time with inverse operations, using the order of operations in reverse (i.e. undo addition/subtraction before multiplication/division)
2. Be sure to always do the same thing to both sides of the equation!

ex: $\frac{a}{7} - 12 = -9$

$$\frac{a}{7} - \cancel{12} = -9$$
$$+ \cancel{12} \quad + 12$$

$$\cancel{7} \times \frac{a}{\cancel{7}} = 3 \times 7$$

$$\boxed{a = 21}$$

Solving Multi-Step Equations

1. Clear any parentheses using the Distributive Property
2. Combine like terms on each side of the equal sign
3. Get the variable terms on the same side of the equation by adding/subtracting a variable term to/from both sides of the equation to cancel it out on one side
4. The equation is now a two-step equation, so finish solving it as described above

ex: $5(2x - 1) = 3x + 4x - 1$

$$10x - 5 = 3x + 4x - 1$$

$$10x - 5 = \cancel{7x} - 1$$
$$- 7x \quad - \cancel{7x}$$

$$3x - \cancel{5} = -1$$
$$+ \cancel{5} \quad + 5$$

$$\frac{\cancel{3}x}{\cancel{3}} = \frac{4}{3}$$

$$\boxed{x = \frac{4}{3}}$$

Solve each equation, showing all work.

21. $f - 64 = -23$	22. $-7 = 2d$	23. $\frac{b}{-12} = -6$	24. $13 = m + 21$
25. $5x - 3 = -28$	26. $\frac{w + 8}{-3} = -9$	27. $-8 + \frac{h}{4} = 13$	28. $22 = 6y + 7$
29. $8x - 4 = 3x + 1$	30. $-2(5d - 8) = 20$	31. $7r + 21 = 49r$	32. $-9g - 3 = -3(3g + 2)$
33. $5(3x - 2) = 5(4x + 1)$	34. $3d - 4 + d = 8d - (-12)$	35. $f - 6 = -2f + 3(f - 2)$	36. $-2(y - 1) = 4y - (y + 2)$

Scientific Notation

Standard Form to Scientific Notation: move the decimal after the first non-zero digit and eliminate any trailing zeros. Multiply by 10 to the power equal to the number of places you moved the decimal point. If the original number was greater than 1, the exponent is positive. If the number was less than 1, the exponent is negative.

ex: 0.0000571

0.000057.1

Original number < 1, so negative exponent

$= \boxed{5.71 \times 10^{-5}}$

Scientific Notation to Standard Form: move the decimal point the number of places indicated by the exponent. If the exponent is positive, move the decimal right. If negative, move left.

ex: 3.5×10^{3}

Positive exponent, so move decimal right

3.500. = $\boxed{3{,}500}$

Negative Exponents & Simplifying Monomials

Zero Exponent: Any number raised to the zero power equals 1

ex: $y^0 = 1$

Negative Exponent: Move the base to the opposite side of the fraction line and make the exponent positive

ex: $x^{-4} = \frac{1}{x^4}$

Monomial x Monomial: Multiply the coefficients and add the exponents of like bases

ex: $(4x^3)(2x^5) = 8x^8$

Monomial ÷ Monomial: Divide the coefficients and subtract the exponents of like bases

ex: $\frac{a}{a^6} = a^{-5} = \frac{1}{a^5}$

Power of a Monomial: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents

ex: $(-2fg^5)^3 = -8f^3g^{15}$

Power of a Quotient: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents

ex: $\left(\frac{5d^3}{c}\right)^2 = \frac{25d^6}{c^2}$

Convert each number to Scientific Notation.

37. 67,000,000,000	38. 0.0009213	39. 0.00000000004	40. 3,201,000,000,000,000

Convert each number to Standard Form.

41. 5.92×10^{-5}	42. 1.1×10^{7}	43. 6.733×10^{-8}	44. 3.27×10^{2}

Simplify each expression. Write your answers using only positive exponents.

45. w^{-9}	46. $\frac{m^5}{m^2}$	47. $f^5 \cdot f^3$	48. $\left(\frac{h^2}{g}\right)^3$
49. $(a^5)^2$	50. $\frac{1}{b^{-3}}$	51. z^0	52. $4r^6 \cdot 3r \cdot 2r^2$
53. $\frac{9p^{-2}}{3q^{-3}}$	54. $\frac{8d^3}{2cd^{-2}}$	55. $(g^4h)^2 \cdot (2g^3h^{-1})^2$	56. $(6a)^0$
57. $(-3n^2k^4)^2$	58. $\left(\frac{w^5x^{-2}y}{w^2xy^4}\right)^3$	59. $\frac{6 \cdot 10^7}{2 \cdot 10^3}$	60. $(1.5 \cdot 10^{-6}) \cdot (4 \cdot 10^9)$

Slope & Rate of Change

<u>Finding the Slope Given Two Points</u>: Use the coordinates from the points in the slope formula:

$$\text{Slope (m)} = \frac{y_2 - y_1}{x_2 - x_1}$$

ex: $(4, -2)$, $(-3, 8)$

x_1 y_1 x_2 y_2

$$m = \frac{8 - (-2)}{-3 - 4} = \frac{10}{-7} = \boxed{-\frac{10}{7}}$$

<u>Finding the Rate of Change From a Table</u>: Determine the amount the dependent variable (y) is changing and the amount the independent variable (x) is changing.

$$\text{Rate of Change} = \frac{\text{change in y}}{\text{change in x}}$$

ex:

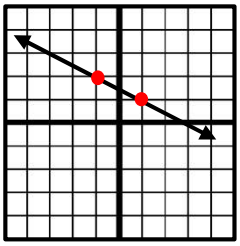
+2 +2 +2

x	# months	3	5	7	9
y	Cost ($)	80	130	180	230

+50 +50 +50

$$m = \frac{50}{2} = \boxed{25 \text{ dollars/month}}$$

<u>Finding the Slope From a Graph</u>: Choose 2 points on the graph. Find the vertical change (rise) and horizontal change (run) between the 2 points and write it as a fraction $\frac{\text{rise}}{\text{run}}$. (Up is positive, down is negative, right is positive, and left is negative).



rise = +1
run = -2

$$m = \frac{1}{-2} = \boxed{-\frac{1}{2}}$$

Find the slope of the line that passes through the points. Show your work.

61. (-5, 3), (2, 1)	62. (8, 4), (11, 6)	63. (9, 3), (9, -1)	64. (-4, -2), (-6, 4)

Find the rate of change. Show your work.

65.

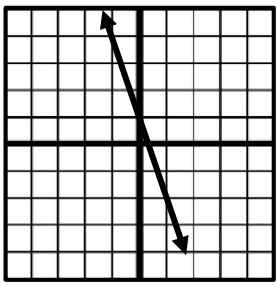
Number of Hours	3	6	9	12
Distance (in miles)	135	270	405	540

66.

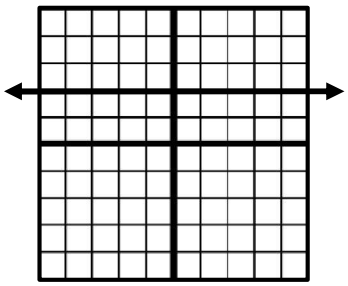
Number of Weeks	1	3	5	7
Pounds	173	169	165	161

Find the slope of the line.

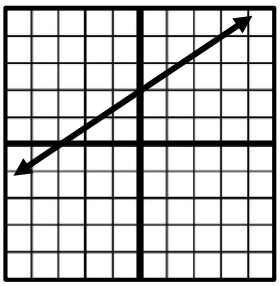
67.



68.



69.



Solving Proportions

1. Set the two cross-products equal to each other
2. Solve the equation for the variable

ex: $\frac{m}{4} = \frac{3}{5}$

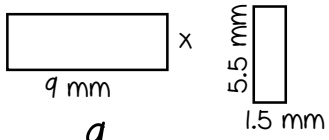
$\frac{5m}{5} = \frac{12}{5}$

$m = 2.4$

Similar Figures

1. To find a missing side length, set up a proportion, matching up corresponding sides.
2. Solve the proportion using the steps above.

ex:



$\frac{x}{1.5} = \frac{9}{5.5}$

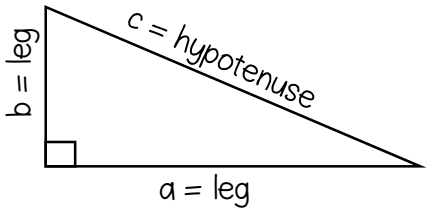
$x = 2.\overline{45}$ mm

The Pythagorean Theorem

*** The Pythagorean Theorem applies to right triangles only **

The sides next to the right angle (a & b) are legs

The side across from the right angle (c) is the hypotenuse

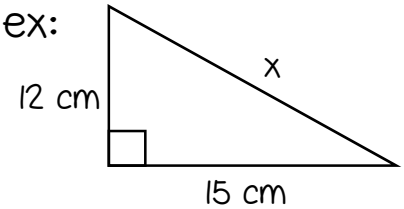


Pythagorean Theorem: $a^2 + b^2 = c^2$

To find the hypotenuse: add the squares of the legs and then find the square root of the sum

To find a leg: subtract the square of the given leg from the square of the hypotenuse and then find the square root of the difference

ex:



x is the hypotenuse

$12^2 + 15^2 = x^2$

$144 + 225 = x^2$

$369 = x^2$

$x = \sqrt{369}$ ≈ 19.2 cm

ex: a = ?, b = 3, c = 6

a is a leg

$a^2 + 3^2 = 6^2$

$a^2 + 9 = 36$

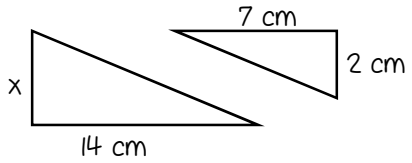
$a^2 = 36 - 9 = 27$

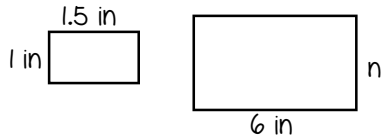
$a = \sqrt{27}$ ≈ 5.2

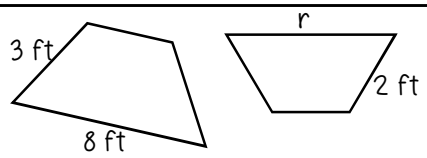
Solve each proportion, showing all work.

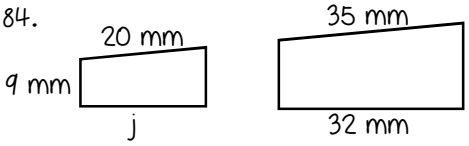
76. $\frac{6}{7} = \frac{4}{m}$	77. $\frac{12}{5} = \frac{k}{3}$	78. $\frac{h}{7} = \frac{8}{2}$	79. $\frac{22}{n} = \frac{9}{36}$	80. $\frac{4}{21} = \frac{3}{c}$

Assume each pair of figures is similar. Find the missing side length, showing all work.

81.


82.


83.


84.


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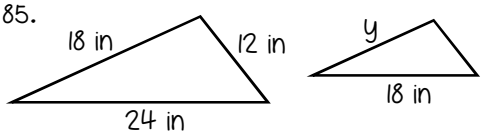
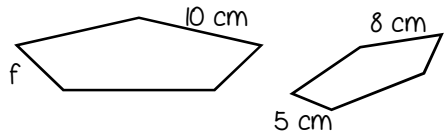
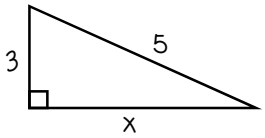
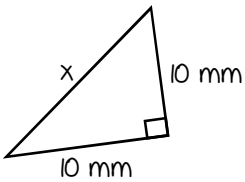
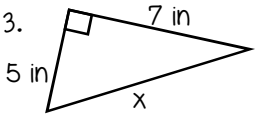
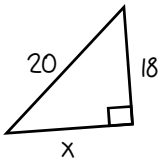
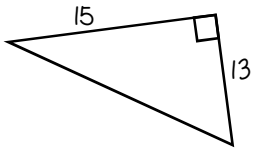
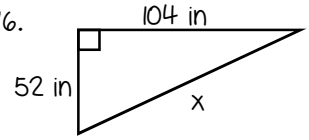
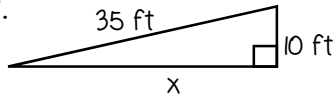
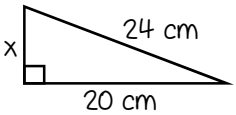


86.


Find the missing side length in each right triangle to the nearest tenth. Show your work!

87. a = 6, b = 8, c = ?	88. a = ?, b = 9 cm, c = 13 cm	89. a = 7, b = ?, c = 14	90. a = 14 in, b = 14 in, c = ?
91. 	92. 	93. 	94. 
95. 	96. 	97. 	98. 

Determine whether or not you can form a right triangle from the given side lengths. Explain.

99. 18, 22, 26	100. 5, 12, 13