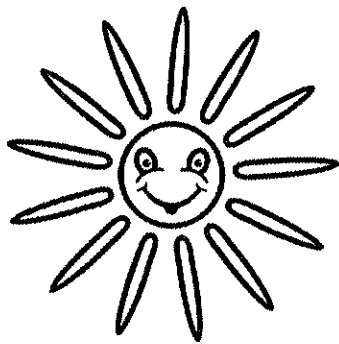# Grade 7

Summer Math
2024

Name: _____

Decimal and Fraction Operations

Adding & Subtracting Decimals

1. Write the problem vertically, lining up the decimal points.

2. Add additional zeroes at the end, if necessary, to make the numbers have the same number of decimal places.

3. Add/subtract as if the numbers are whole numbers

4. Bring the decimal point straight down

ex: 14.2 - 7.934

$$\begin{array}{r} 14.200 \\ - 7.934 \\ \hline \boxed{6.266} \end{array}$$

Multiplying Decimals

1. Write the problem vertically with the numbers lined up to the right. The decimal points do NOT need to be lined up.

2. Ignore the decimals and multiply as if the numbers are whole numbers.

3. Count the total number of decimal places in the factors and put a decimal point in the product so that it has that same number of decimal places.

ex: 6.94 x 7.8

$$\begin{array}{r} 6.94 \longrightarrow \text{2 decimal places} \\ \times 7.8 \longrightarrow \text{1 decimal place} \\ \hline \end{array}$$

$$\begin{array}{r} +5552 \\ 48580 \\ \hline 54132 \end{array} \quad \boxed{54.132}$$

3 decimal places

Dividing Decimals

1. Write the dividend under the long division symbol and the divisor to the left of it.

2. Move the decimal point in the divisor after the number to turn it into a whole number and then move the decimal in the dividend the same number of places. Then bring it up.

3. Divide as if the numbers are both whole numbers.

4. Annex zeros in the dividend as needed until there is no remainder. If your answer is a repeating decimal, write the answer using bar notation.

ex: 25.3 ÷ 0.3

$$\begin{array}{r} \boxed{84.\overline{3}} \\ 0.3\overline{)25.3\hphantom{0}0} \\ -24 \\ \hline 13 \\ -12 \\ \hline 10 \\ -9 \\ \hline 1 \end{array}$$

Order of Operations

1. Grouping Symbols (parentheses, brackets, etc.)

2. Exponents

3. Multiplication & Division (left to right)

4. Addition & Subtraction (left to right)

ex: 5 + 4(3 - 1.2)

5 + 4(1.8)

5 + 7.2

$\boxed{12.2}$

Evaluate each expression.

1. $5.983 + 2.99$	2. $224 - 56.73$	3. $6.12 - 4.923$
4. $24.5 \cdot 3.2$	5. $0.23 \cdot 7$	6. $3.86 \cdot 9.15$
7. $14.8 \div 5$	8. $46.3 \div 1.5$	9. $147 \div 2.25$
10. $24.33 - 2.5 \cdot 7$	11. $3.9 + 4.5^2$	12. $9.25(18.4 - 2 \cdot 1.2)$

Solve each word problem, showing all work.

13. Jeff had $46.18 in his wallet Monday morning. He gave half of his money to his brother. He then bought two donuts for $0.75 each and a cup of coffee for $2.99. How much money did Jeff have left?	14. Five friends split a $65.20 bill at a restaurant. They also each left $2.75 for the tip. How much money did each person pay in all?

Adding Fractions & Mixed Numbers

1. Find a common denominator for the two fractions.

2. Add the two numerators and keep the denominator the same.

3. Add the whole numbers.

4. Simplify the answer and/or change improper fraction answers to mixed numbers.

ex: $3\frac{3}{4} + 2\frac{1}{2}$

$$3\frac{3}{4} = 3\frac{3}{4}$$
$$+ \quad 2\frac{1}{2} = 2\frac{2}{4}$$
$$\overline{\qquad\qquad 5\frac{5}{4}} = \boxed{6\frac{1}{4}}$$

Subtracting Fractions & Mixed Numbers

1. Find a common denominator for the two fractions.

2. Subtract the two numerators and keep the denominators the same. If the top numerator is smaller than the bottom numerator, borrow from the whole number and rename the top fraction.

3. Subtract the whole numbers.

4. Simplify the answer.

ex: $5\frac{1}{4} - 1\frac{2}{3}$

$$5\frac{1}{4} = 5\frac{3}{12} = 4\frac{15}{12}$$
$$- \quad 1\frac{2}{3} = 1\frac{8}{12} = 1\frac{8}{12}$$
$$\overline{\qquad\qquad\qquad\qquad \boxed{3\frac{7}{12}}}$$

Multiplying Fractions & Mixed Numbers

1. Turn any mixed numbers and whole numbers into improper fractions.

2. Cross-simplify if possible.

3. Multiply the numerators and then multiply the denominators

4. Simplify the answer and/or change improper fraction answers to mixed numbers.

ex: $2\frac{1}{6} \cdot \frac{4}{7}$

$$\frac{13}{\cancel{6}_{3}} \cdot \frac{\cancel{4}^{2}}{7} = \frac{26}{21} = \boxed{1\frac{5}{21}}$$

Dividing Fractions & Mixed Numbers

1. Turn any mixed numbers and whole numbers into improper fractions.

2. Keep the first fraction the same, change the division to multiplication, and flip the second fraction to its reciprocal.

3. Multiply the fractions.

4. Simplify the answer and/or change improper fraction answers to mixed numbers.

ex: $7 \div 1\frac{3}{4}$

$$\frac{7}{1} \div \frac{7}{4}$$
$$\downarrow$$
$$\frac{\cancel{7}^{1}}{1} \cdot \frac{4}{\cancel{7}_{1}} = \frac{4}{1} = \boxed{4}$$

Evaluate each expression.

15. $\frac{4}{5} + \frac{3}{4}$	16. $4\frac{2}{7} + 2\frac{9}{14}$	17. $8\frac{11}{12} + 9\frac{5}{18}$
18. $6 - \frac{3}{8}$	19. $8\frac{3}{5} - 2\frac{1}{3}$	20. $4\frac{1}{6} - \frac{8}{9}$
21. $\frac{4}{25} \cdot \frac{15}{16}$	22. $2\frac{3}{4} \cdot 8$	23. $6\frac{5}{8} \cdot 3\frac{1}{2}$
24. $\frac{7}{9} \div \frac{2}{3}$	25. $\frac{4}{5} \div 10$	26. $5\frac{2}{3} \div 2\frac{5}{6}$

Solve each word problem, showing all work.

27. Jaimie ran $3\frac{1}{2}$ miles on Monday. She ran half as far on Tuesday as she did on Monday. How far did Jaimie run in all on Monday and Tuesday?	28. A $5\frac{1}{2}$ quart pot is filled $\frac{2}{3}$ of the way with water. How many more quarts of water can the pot hold?

Ratios and Proportions

Ratios

Ratios are comparisons of two quantities. There are 3 different ways to write ratios:

- Fraction $\left(\frac{A}{B}\right)$
- Colon (A:B)
- Word Form (A to B)

Ratios can be simplified just like fractions.

ex: write the ratio of triangles to circles in 3 ways: ▲ ▲ ▲ ▲ ◎ ◎

$$\frac{4}{2} = \boxed{\frac{2}{1}, \quad 2:1, \quad 2 \text{ to } 1}$$

Rates & Unit Rates

Rates are ratios that compare quantities measured in different units. A unit rate is a rate with a denominator of 1.

To convert a rate to a unit rate:

1. Divide the numerator by the denominator
2. Either write your answer as a fraction with a label for the both the numerator and denominator OR as one number labeled with the first unit "per" the second unit

ex: express as a unit rate: 125 miles in 4 hours

$$\frac{125 \text{ mi}}{4 \text{ hr}} \qquad 125 \div 4 = 31.25$$

$$\boxed{\frac{31.25 \text{ mi}}{1 \text{ hr}} \text{ or } 31.25 \text{ miles per hr}}$$

Fractions, Decimals, & Percent

To convert a:

- <u>Decimal to Percent</u>: move the decimal point 2 places to the right

  ex: $0.345 = \boxed{34.5\%}$

- <u>Percent to Decimal</u>: move the decimal point 2 places to the left

  ex: $7\% = \boxed{0.07}$

- <u>Decimal to Fraction</u>: write the decimal over the place value of the last digit and then simplify

  ex: $0.008 = \frac{8}{1000} = \boxed{\frac{1}{125}}$

- <u>Fraction to Decimal</u>: divide the numerator by the denominator

  ex: $\frac{1}{5} = 5\overline{)1.0}\;\boxed{0.2}$

- <u>Percent to Fraction</u>: write the percent over 100 and then simplify

  ex: $45\% = \frac{45}{100} = \boxed{\frac{9}{20}}$

- <u>Fraction to Percent</u>: convert the fraction to a decimal and then convert the decimal to a percent

  ex: $\frac{3}{10} = 0.3 = \boxed{30\%}$

Percent of a Number

1. Turn the percent to a fraction or decimal.
2. Multiply the fraction/decimal by the number.

ex: Find 18% of 40

$$0.18 \cdot 40 = \boxed{7.2}$$

Write each ratio in 3 ways.

29. A bank contains 15 pennies and 12 nickels. Write the ratio of nickels to pennies.	30. A bowl contains 6 apples and some bananas. If there are a total of 10 pieces of fruit, find the ratio of apples to bananas.

Convert each rate to a unit rate.

31. $4.25 for 64 fluid ounces	32. 247 miles on 11 gallons of gas	33. 124 feet in 10 seconds

Complete the chart by converting each number to a percent, fraction, and/or decimal.

	Fraction	Decimal	Percent
34.	$\frac{3}{8}$		
35.		0.45	
36.			72%
37.		0.1	
38.	$\frac{3}{200}$		

Find each percent of a number.

39. 30% of 90	40. 15% of 38	41. 50% of 86
42. 75% of 160	43. 24% of 35	44. 2% of 74

Unit: NUMBER RELATIONSHIPS and COMPUTATION

Objective: Identify and determine equivalent forms of proper fractions as decimals, percents, and ratios - **A**.

Examples: Write $\dfrac{21}{25}$ as a decimal

Method 1:

Change $\dfrac{21}{25}$ to a fraction with a denominator of 10, 100, or 1000

EX: $\dfrac{21}{25} = \dfrac{?}{100}$

(Use 100, since 25 divides into 100 evenly)

$\dfrac{21}{25} = \dfrac{x4}{x4} = \dfrac{84}{100}$ $\dfrac{84}{100} = 0.84$ as a decimal

Method 2: Divide 21 by 25

$$\dfrac{21}{25} \rightarrow 25\overline{)21.00} 0.84$$

$$-200$$
$$100$$
$$-100$$

Therefore: $\dfrac{21}{25} = 0.84$

1.) Write $\dfrac{19}{20}$ as a decimal. Use method 1	2.) Write $\dfrac{7}{8}$ as a decimal. Use method 2.
3.) Write $\dfrac{3}{16}$ as a decimal. Use method 2	4.) Write $\dfrac{27}{40}$ as a decimal. Use method 2
5.) Write $\dfrac{3}{4}$ as a decimal. Use method 1	6.) Write $\dfrac{3}{5}$ as a decimal. Use method 1
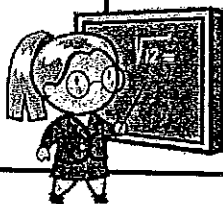
Unit: NUMBER RELATIONSHIPS and COMPUTATION
Objective: Identify and determine equivalent forms of proper fractions as decimals, **percents**, and ratios - B.

Key Concept: Percent (%) is a ratio that compares a number to 100

Fraction to Percent:

EX: Change $\dfrac{19}{25}$ to a percent

Since % means out of 100, $\dfrac{19}{25} = \dfrac{?}{100}$

$\dfrac{19}{25} = \dfrac{x4}{x4} = \dfrac{76}{100}$

$\dfrac{76}{100} = 76\%$

Percent to fraction:

EX: Change 75% to a fraction in simplest form

75% means *75 out of 100*

$75\% = \dfrac{75}{100}$ Write the percent as a fraction with a denominator of 100

$\dfrac{75 \div 25}{100 \div 25} = \dfrac{3}{4}$ Simplify

1.) Change $\dfrac{17}{20}$ to a percent	2.) Change 84% to a fraction in simplest form
3.) Change $\dfrac{3}{4}$ to a percent	4.) Change 90% to a fraction in simplest form
5.) Juan answered $\dfrac{24}{25}$ questions correctly on his quiz. What percent of the questions did he get correct?	6.) 78% of the class completed their homework last night. What fraction of the class completed their homework?

Number System and Geometry Part 1

Comparing Integers

Integers are numbers without fractional parts. They can be positive, negative, or zero. The further right a number is on the number line, the greater it is.
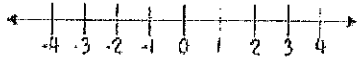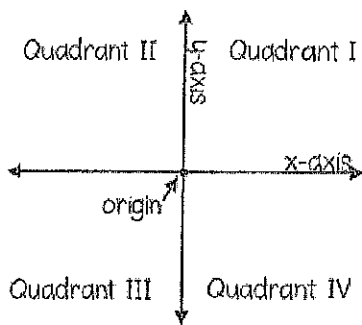

The absolute value of a number is the distance the number is from zero.

ex: compare with <, >, or =

-7 ◯ $|-9|$ ← The absolute value of $-9 = 9$

-7 $<$ 9

The Coordinate Plane

Quadrant II   Quadrant I
y-axis
x-axis
origin
Quadrant III   Quadrant IV

Ordered Pair: (x, y)

To graph a point on the coordinate plane, start at the origin. The first number in the ordered pair (the x-coordinate) tells you how far left (if negative) or right (if positive) to move. The second number (the y-coordinate) tells you how far up (if positive) or down (if negative) to move.

ex: Graph the point (-3, 2) and state the quadrant in which it is located.

Start at the origin, and move LEFT 3 and UP 2
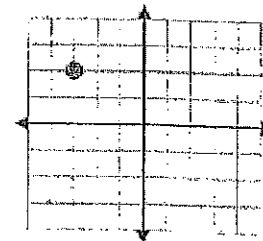
Quadrant II

Perimeter, Area and Volume

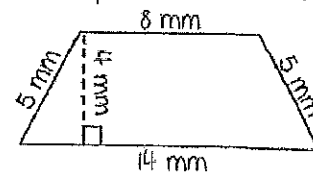- Perimeter of Any Polygon: add all side lengths

- Area of a Rectangle: $A = lw$

- Area of Parallelogram: $A = bh$

- Area of Triangle: $A = \frac{1}{2}bh$

- Area of Trapezoid: $A = \frac{1}{2}h(b_1 + b_2)$

- Volume of Rectangular Prism: $V = lwh$

ex: Find the perimeter & area:

Perimeter: $P = 5 + 8 + 5 + 14 =$ 32 mm

Area: This is a trapezoid, so use the area of a trapezoid formula: $A = \frac{1}{2}h(b_1 + b_2)$

The bases are the sides that are parallel, and the height is perpendicular to the bases.

→ $A = \frac{1}{2}(4)(8+14) =$ 44 mm²

Compare the integers with <, >, or =.

45. -4 ◯ -5	46. 2 ◯ -2	47. |-5| ◯ |5|	48. -7 ◯ 6	49. -13 ◯ -9
50. |-7| ◯ -6	51. -17 ◯ -14	52. |-3| ◯ |-2|	53. 0 ◯ -6	54. |-4| ◯ |6|

Graph and label each of the ordered pairs in the coordinate plane. Then state the quadrant or axis in/on which the point is located.

55. A(2, 4)	56. B(0, -3)
57. C(1, -1)	58. D(3, 3)
59. E(-4, 1)	60. F(2, 0)
61. G(-3, -2)	62. H(-2, 3)
63. I(0, 2)	64. J(-1, -4)

Find the perimeter, area, and/or volume of the given figure.

65. Find the perimeter & area:	66. Find the perimeter & area:	67. Find the perimeter & area:
13 cm, 5 cm, 12 cm	3.5 in, 5 in, 8 in	$3\frac{1}{2}$ in
68. Find the perimeter & area:	69. Find the area of a square with a perimeter of 45 cm	70. Find the volume:
8 ft, 3.5 ft, 4 ft, 7 ft		$2\frac{1}{8}$ mm, $6\frac{3}{4}$ mm, 2 mm

The Coordinate Plane

Graph each point on the grid below. Connect each point to the previous one as you graph it. Then connect the last point to the first point.

1. (0, –10)   2. (–1, –9)   3. (–2.5, –7)   4. (–5, –7)

5. (–6, –5)   6. (–10, –5)   7. (–13, –3)   8. (–15, –1)

9. (–16, 2)   10. (–15, 8)   11. (–15, 10)   12. (–3, 9)

13. (4, 8)   14. (4, 7)   15. (6, 8)   16. (6, 4)

17. (8, 6)   18. (9, 6)   19. (9, 3)   20. (11, 5)

21. (16, 10)   22. (18, 8)   23. (16, 6)   24. (18, 4)

25. (14, 1)   26. (14, –1)   27. (11, –5)   28. (12.5, –8)

29. (13, –10)   30. (11, –9)   31. (9, –6)   32. (2.5, –7)
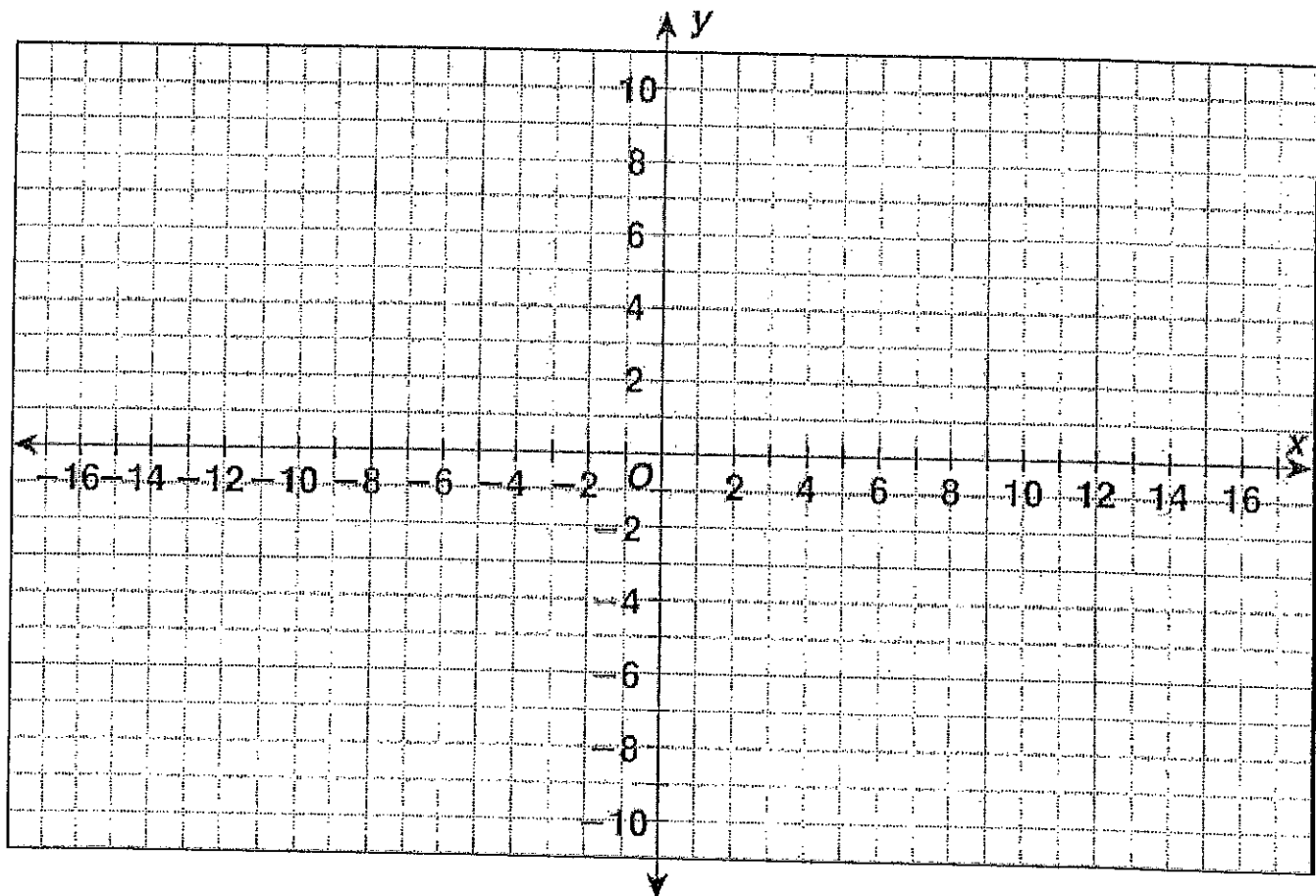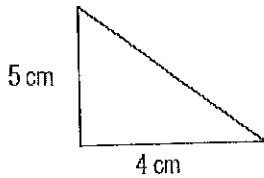
Geometry Part 2

Objective: Estimate and determine the area of a triangle with whole number dimensions.
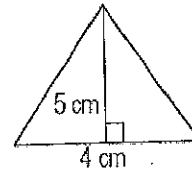
The area (A) of a triangle is one half the product of the base (b) and the height (h).
The formula for finding the area of a triangle is: $A = \frac{1}{2}bh$ and is measured in square units.

Examples:

5 cm

4 cm

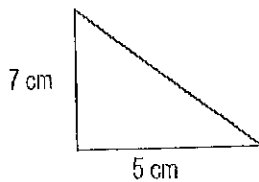$A = \frac{1}{2}bh \quad A = \frac{1}{2} \times 4 \times 5 \quad A = \frac{1}{2} \times 20$

$A = 10 \text{ cm}^2$

5 cm

4 cm

$A = \frac{1}{2}bh \quad A = \frac{1}{2} \times 4 \times 5 \quad A = \frac{1}{2} \times 20$
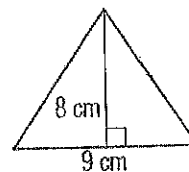
$A = 10 \text{ cm}^2$

1.) Determine the area of the triangle.

$A = \underline{\hspace{1cm}} \text{ cm}^2$

7 cm

5 cm

2.) Determine the area of the triangle.

$A = \underline{\hspace{2cm}}$

8 cm

9 cm

3.) Determine the area of an obtuse triangle with a height of 11 cm and a base of 22 cm.

$A = \underline{\hspace{2cm}}$

4.) Determine the area of an isosceles triangle with a base of 13 cm and a height of 26 cm.

$A = \underline{\hspace{2cm}}$

5.) World famous pastry chef, Chen Lee, is designing a birthday cake for his son, who is a Geometry teacher. He has 4 layers, all triangles. He wants to put the largest layer (in area) on the bottom and the smallest layer on the top. Determine the area of each layer and order them from largest to smallest (4 = largest, 1 = smallest)

___ Milk Chocolate layer   b = 12"   h = 6"   A =

___ Yellow cake layer   b = 7"   h = 11" A =

___ Dark Chocolate layer   b = 4"   h = 17" A =

___ White cake layer   b = 9"   h = 9"   A =

6.) Natasha's dorm room is shaped like a triangle. The college brochure says it has an area of 875 square feet. The room is 35 feet long. Determine the width of the room at its widest point.
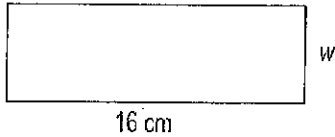
Unit: KNOWLEDGE of MEASUREMENT

Objective: Determine the missing measure of a square or rectangle given the area using whole number dimensions.

The area (A) of a rectangle or square can be found by multiplying the length (l) by the width (w). $A = l \times w$

The **missing measure** of a square or rectangle can be determined by using **division**.
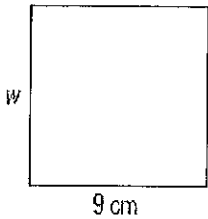
Examples:

$$A = l \times w$$
$$\frac{64}{16} = \frac{16 \times w}{16}$$

$A = 64 \text{ cm}^2$ $4 = w$ The width of the rectangle is 4 cm.

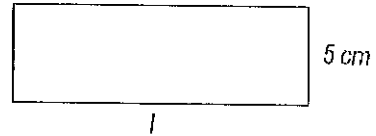|	
1.) Determine the missing side of the square. Please show your work. $A = 81 \text{ cm}^2$ $w =$ 9 cm	**2.)** Determine the missing side of the rectangle. Please show your work. 5 cm l $A = 65 \text{ cm}^2$ $l =$
3.) Determine the missing side of a rectangle with an area of 144 cm² and a width of 8 cm. Please show your work.	**4.)** Determine the missing side of a rectangle with an area of 480 cm² and a length of 32 cm. Please show your work.
5.) Marcus plans to paint a bright green rectangle on the bottom of his pool. He has enough paint to cover an area of 273 square feet. He wants the width of the rectangle to be 13 feet. Determine what the length of the rectangle should be. Please show your work.	**6.)** Brianna wants to put stickers, to celebrate her birthday, on top of chocolate bar wrappers. The bar is 48 mm wide and has an area of 4128 mm². What must be the length of the sticker to cover the top of the bar?

Unit: KNOWLEDGE of MEASUREMENT

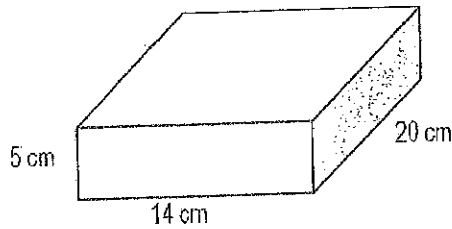Objective: Estimate and determine the volume of rectangular prisms with whole number dimensions.

The amount of space inside a three-dimensional figure is the **volume** of the figure.

Volume (V) is measured in **cubic units**.

The volume of a **rectangular prism** is related to its dimensions. Volume (V) = length (l) x width (w) x height (h)
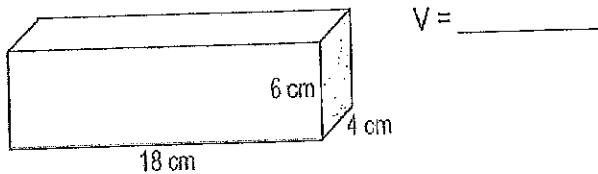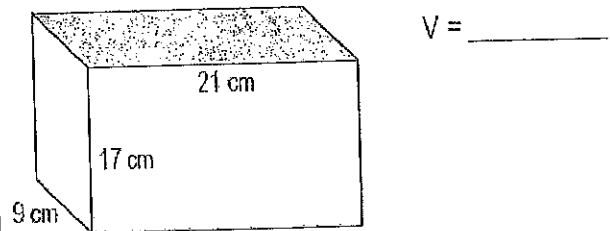
Examples:

$V = l \times w \times h$

$V = 20 \times 14 \times 5$

$V = 1400 \text{ cm}^3$

5 cm   20 cm   14 cm

1.) Determine the volume of the rectangular prism. Please show your work.

6 cm   4 cm   18 cm

V = _____

2.) Determine the volume of the rectangular prism. Please show your work.

21 cm   17 cm   9 cm

V = _____

3.) Determine the volume of a rectangular prism with a length of 13 cm, a width of 55 cm, and a height of 65 cm. Please show your work.

4.) Determine the volume of a rectangular prism with a height of 35 cm, a length of 89 cm, and a width of 15 cm. Please show you work.

5.) Tyrone has a fish tank that measures 36 in. long, 24 in. high, and 18 in. wide. He wants to fill the fish to a height of 14 inches. What will be the volume of water in the tank? Please show your work.

V = _____

Draw the tank and label the dimensions. Draw the water level. This does not need to be drawn to scale.

6.) Shanika has a lamp that she wants to send to her sister in Baltimore. The lamp is in the shape of a rectangular prism. It measures 14" high, 9" wide, and 3" long. She wants to buy a box so that there is 1" all around the lamp for bubble wrap.

What should be the dimensions of the box?

What is the volume of the box? Please show your work.

Expressions and Equations

Evaluating Algebraic Expressions

1. Substitute the given numbers for the variables

2. Evaluate the expression using the order of operations

ex: evaluate $x + 4y$ for
$x = 4$ & $y = 6$

$4 + 4(6)$
$4 + 24 = \boxed{28}$

One-Step Addition & Subtraction Equations

- Addition Equations: Subtract the number being added to the variable from both sides of the equation

ex: $4 + x = 18$
$\underline{-4 \qquad -4}$
$\boxed{x = 14}$

- Subtraction Equations: Add the number being subtracted from the variable to both sides of the equation

ex: $20 = a - 5$
$\underline{+5 \qquad +5}$
$25 = a \rightarrow \boxed{a = 25}$

One-Step Multiplication & Division Equations

- Multiplication Equations: Divide both sides of the equation by the number next to the variable

ex: $\dfrac{7b}{7} = \dfrac{28}{7}$
$\boxed{b = 4}$

- Division Equations: Multiply both sides of the equation by the number under the variable

ex: $5 \cdot \dfrac{n}{5} = 10 \cdot 5$
$\boxed{n = 50}$

Problem Solving

1. Read the problem. Identify the question that is being asked and the key information in the problem.

2. Plan how you are going to solve the problem and estimate the answer.

3. Solve the problem using the strategy of your choice.

4. Check your answer. Make sure your answer is reasonable and compare it to your estimate. Label your answer with appropriate units.

Evaluate each expression for $a = 5$, $b = 12$, $c = 10$, & $d = 2$.

71. $2b - a$	72. $d(ab - c)$	73. $3 + \dfrac{b}{d}$
74. $\dfrac{4a}{b + 4d}$	75. $2a^2 - c$	76. $b - c + d$

Solve each one-step equation.

77. $g + 3 = 17$	78. $r - 6 = 7$	79. $6b = 18$	80. $\dfrac{h}{9} = 3$
81. $5 = f - 8$	82. $48 = 12b$	83. $a + 24 = 83$	84. $17 + x = 23$
85. $10 = \dfrac{m}{5}$	86. $86.5 = f - 7.63$	87. $\dfrac{n}{6} = 11$	88. $\dfrac{3}{4}h = 12$

Unit: KNOWLEDGE of ALGEBRA, PATTERNS, and FUNCTIONS
Objective: Determine the unknown in a linear equation (addition & subtraction).

• **Addition equations:** Subtract the same number from each side of the equation so that the two sides remain equal.
• **Subtraction equations:** Add the same number to each side of the equation so that the two sides remain equal.

Examples:

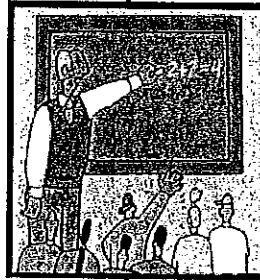|				
$b + 3 = 6$	original equation		$b - 8 = 4$	original equation
$-3\ \ -3$	subtract 3 from each side		$+8\ \ +8$	add 4 to each side
$b + 0 = 3$	solution		$b + 0 = 12$	solution
$b\ \ \ = 3$	simplify		$b\ \ \ = 12$	simplify

1.)

$$g + 5 = 12$$

2.)

$$s - 12 = 29$$

3.)

$$m + 3.5 = 10.5$$

4.)

$$k - 5.5 = 8.5$$

5.)

$$w + 6.25 = 22$$

6.)

$$g - 3.75 = 49.75$$

Unit: KNOWLEDGE of ALGEBRA, PATTERNS, and FUNCTIONS

Objective: Determine the unknown in a linear equation (multiplication & division).

• In a **multiplication equation**, the number by which a variable is multiplied is called the **coefficient**. In the multiplication equation $2x = 8$, the coefficient is 2.

• **Multiplication equations**: Divide both sides by the coefficient so that the two sides remain equal.

• In a **division equation**, the number by which the variable is divided is called the **divisor**. In the division equation $\frac{x}{4}$, 4 is the divisor.

• **Division equations**: Multiply both sides of the equation by the divisor so that the two sides remain equal.

Examples:

$4b = 16$	original equation	$\frac{m}{6} = 11$	original equation
$\frac{}{4} \quad \frac{}{4}$	divide both sides by 4	$6 \times \frac{m}{6} = 11 \times 6$	multiply each side by 6
$1b = 4$	solution	$1m = 66$	solution
$b = 4$	simplify	$m = 66$	simplify

1.) $7x = 63$	**2.)** $\frac{k}{9} = 8$
3.) $5b = 3.55$	**4.)** $\frac{n}{7} = 5.55$
5.) $12m = 84.72$	**6.)** $\frac{p}{13} = 2.67$