MIDDLE SCHOOL
MATHEMATICS

Remote Learning Activities

Expect great things.
Middle School Mathematics Remote Learning Activities

Below is a list of activities that students can work on during the unexpected closure of schools. Activities are designed to reinforce the learning already facilitated to students during the 2019-2020 Academic School Year. This Remote Learning Activity Packet was created for a minimum of fourteen (14) days of independent practice.

The content focus is as follows:

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Additional Online Resources through Clever:
- Discovery Education (K-12)  | Edmentum (K-10)
- Everfi STEM Activities (2-12)  | ALEKS (6-12)
- S.O.S. Mathematics (9-12)  | HMH PMT (K-8)
- Math.com (K-12)   |

External Online Resources:
- [https://www.coolmathgames.com/](https://www.coolmathgames.com/)
- [http://www.mathgametime.com/](http://www.mathgametime.com/)
- [https://www.khanacademy.org/](https://www.khanacademy.org/)
- [https://www.stmath.com/coronavirus](https://www.stmath.com/coronavirus)
Formulas that you may need to work questions on this test are found below. You may refer back to this page at any time during the mathematics test.

Triangle

\[ A = \frac{1}{2} bh \]

Trapezoid

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

Rectangle

\[ A = lw \]

Rectangular Prism

\[ V = lwh \]
\[ SA = 2lw + 2lh + 2wh \]

Square

\[ A = s^2 \]

Cube

\[ V = s \cdot s \cdot s \]
\[ SA = 6s^2 \]

Parallelogram

\[ A = bh \]

Triangular Prism

\[ SA = ah + aw + bw + cw \]
Formulas that you may need to work questions on this test are found below.
You may refer back to this page at any time during the mathematics test.

2015
Grade 7

Simple Interest
\[ I = Prt \]

Circle
\[ C = 2\pi r \quad A = \pi r^2 \]

Triangle
\[ A = \frac{1}{2}bh \]

Square
\[ A = s^2 \]

Rectangle
\[ A = lw \quad P = 2l + 2w \]

Parallelogram
\[ A = bh \]

Trapezoid
\[ A = \frac{1}{2}h(b_1 + b_2) \]

Rectangular Prism
\[ V = lwh \quad SA = 2lw + 2lh + 2wh \]

Polygonal Prism
\[ V = Bh, \text{ where } B = \text{area of the base} \]
\[ SA = Ph + 2B, \text{ where } P = \text{perimeter of base} \]
Formulas that you may need to work questions on this test are found below. You may refer back to this page at any time during the mathematics test.

You may use calculator $\pi$ or the number 3.14.

### Exponential Properties

\[ a^m \cdot a^n = a^{m+n} \]
\[ (a^m)^n = a^{m \cdot n} \]
\[ \frac{a^m}{a^n} = a^{m-n} \]
\[ a^{-1} = \frac{1}{a} \]

### Algebraic Equations

**Slope:** \[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

**Slope-Intercept Form:** \[ y = mx + b \]

### Pythagorean Theorem

\[ a^2 + b^2 = c^2 \]

### Cone

\[ V = \frac{1}{3} \pi r^2 h \]

### Cylinder

\[ V = \pi r^2 h \]

### Sphere

\[ V = \frac{4}{3} \pi r^3 \]
Activity 1: Applying Operations with Rational Numbers

When a word problem involves fractions or decimals, use these four steps to help you decide which operation to use.

Tanya has $13\frac{1}{2}$ feet of ribbon. To giftwrap boxes, she needs to cut it into $\frac{7}{8}$-foot lengths. How many lengths can Tanya cut?

**Step 1** Read the problem carefully. What is asked for? The number of lengths is asked for.

**Step 2** Think of a simpler problem that includes only whole numbers. Tanya has 12 feet of ribbon. She wants to cut it into 2-foot lengths. How many lengths can she cut?

**Step 3** How would you solve the simpler problem? Divide 12 by 2. Tanya can cut 6 lengths.

**Step 4** Use the same reasoning with the original problem. Divide $13\frac{1}{2}$ by $\frac{7}{8}$. Tanya can cut 15 lengths.

Activity 1 Practice

Tell whether you should multiply or divide. Then solve the problem.

1. Jan has $37.50. Tickets to a concert cost $5.25 each. How many tickets can Jan buy?

2. Jon has $45.00. He plans to spend $\frac{4}{5}$ of his money on sports equipment. How much will he spend?

3. Ricki has 76.8 feet of cable. She plans to cut it into 7 pieces. How long will each piece be?
4. Roger has \(2 \frac{1}{2}\) cups of butter. A recipe for a loaf of bread requires \(3 \frac{3}{4}\) cup of butter. How many loaves can Roger bake?

5. Four friends split equally a lunch bill of $36.96 plus 20% tip. How much did each person pay?

6. In January, Gene watched 5 movies. Their lengths are shown in the table. How many hours did Gene spend watching movies?
   - What was the average length of a movie in hours?
   - Which movies were longer than the average?

7. Derrick's garden is \(18 \frac{1}{2}\) feet long. He plants bulbs \(\frac{3}{8}\) of a foot apart.
   - How many bulbs can Derrick plant in one row?
   - Derrick plants three rows of bulbs that cost $0.79 each.
   - How much does he spend on bulbs?

8. Yin's cellphone plan costs $30 a month. She used 12.5 hours in May.
   - What was her cost per minute?
   - Yin's average call lasted 3.25 minutes. How much did an average call cost? About how many calls did Yin make in May?
The table shows the length and width of 4 rug designs that a carpet store stocks. Use the table to answer problems 1–2.

<table>
<thead>
<tr>
<th>Rug Design</th>
<th>Length (ft)</th>
<th>Width (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic</td>
<td>$8\frac{1}{2}$</td>
<td>$10\frac{3}{4}$</td>
</tr>
<tr>
<td>Deco</td>
<td>$10\frac{3}{4}$</td>
<td>$9\frac{3}{8}$</td>
</tr>
<tr>
<td>Solid</td>
<td>$7\frac{2}{5}$</td>
<td>$8\frac{3}{5}$</td>
</tr>
<tr>
<td>Modern</td>
<td>$10\frac{3}{5}$</td>
<td>$9\frac{1}{2}$</td>
</tr>
</tbody>
</table>

1. The price of each rug is found by multiplying the area of the rug (length times width) by the price per square foot. The price for all 4 rug designs listed above is $8 per square foot. Which rug is the most expensive? How much does it cost?

2. Pauline orders a custom rug. She wants a rug that is the same final price as the Deco but the same width as the Modern. What is the length of the rug Pauline wants to purchase? Explain.

3. \( \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \ldots, \frac{99}{100} \)

In the list above, each fraction after the first is obtained by adding 1 to both the numerator and denominator of the fraction before it.

For example, the first fraction is \( \frac{1}{2} \). To get the second fraction, add 1 to 1 and to 2: \( \frac{1+1}{2+1} = \frac{2}{3} \). This pattern continues to \( \frac{99}{100} \). What is the product of the fractions in the list above? What pattern can help you find the product quickly?
Activity 2: Solving Problems with Proportions

You can solve problems with proportions in two ways.

A. Use equivalent ratios.
Hanna can wrap 3 boxes in 15 minutes. How many boxes can she wrap in 45 minutes?
\[
\frac{3}{15} = \frac{45}{x}
\]
\[
\frac{3 \times 3}{15 \times 3} = \frac{9}{45}
\]
Hanna can wrap 9 boxes in 45 minutes.

B. Use unit rates.
Dan can cycle 7 miles in 28 minutes. How long will it take him to cycle 9 miles?
\[
\frac{28 \text{ min}}{7 \text{ mi}} = \frac{x}{1 \text{ mi}}
\]
\[
\frac{28}{7} = \frac{28 \div 7}{1 \div 1} = \frac{4}{1}, \text{ or 4 minutes per mile}
\]
To cycle 9 miles, it will take Dan 9 \times 4, or 36 minutes.
Solve each proportion. Use equivalent ratios or unit rates. Round to the nearest hundredth if needed.

1. Twelve eggs cost $2.04. How much would 18 eggs cost?

2. Seven pounds of grapes cost $10.43. How much would 3 pounds cost?

3. Roberto wants to reduce a drawing that is 12 inches long by 9 inches wide. If his new drawing is 8 inches long, how wide will it be?

4. \[ \frac{2}{7} = \frac{\ ?}{20} \]

5. Suki has a 9 foot by 12 foot oriental rug. She is making a scale drawing of the rug that is 1 foot long. How many inches wide should the diagram be?
6. Another rug is 6 feet by 8 feet. For this one, Suki makes a diagram that
   is $1\frac{1}{3}$ feet long. How many inches should its width be?

7. You can buy 4 pounds of peaches for $5.96. What do $4\frac{1}{2}$ pounds of peaches cost?

8. The table shows the number of miles that Dave, Raul, and Sinead drove on their last trips, as well as the time it took for each drive.

<table>
<thead>
<tr>
<th>Driver</th>
<th>Distance (mi)</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dave</td>
<td>15</td>
<td>20 min</td>
</tr>
<tr>
<td>Raul</td>
<td>15</td>
<td>15 min</td>
</tr>
<tr>
<td>Sinead</td>
<td>20</td>
<td>30 min</td>
</tr>
</tbody>
</table>

   a. What is Sinead’s unit rate in miles per minutes?

   b. Whose speed was the slowest?

   c. If all three drivers drove for 2.5 hours at the same speed as their last drive, how many total miles will all three drivers have driven?
Activity 2 Enrichment

A parking lot has three sections. The ratio of the number of cars in the first section to the number of cars in the second section to the number of cars in the third section is 1 : 2 : 3. There are 36 cars in all three sections of the parking lot.

1. How many cars are in each section of the parking lot?

2. What is one way in which you can move some of the cars between sections so the ratio of cars between sections of the parking lot is 1 : 1 : 1?

3. Another parking lot with three sections has 80 cars in it. Is it possible for ratio of the number of cars in the first section to the number of cars in the second section to the number of cars in the third section to be 1 : 2 : 3? Explain why or why not.

4. Suppose 18 cars are added to the original parking lot of 36 cars in which the ratio of the number cars in the first section to the number of cars in the second section to the number of cars in the third section is 1 : 2 : 3. If all 18 cars are placed in the third section, what will be the new ratio of the number of cars in each section?
Activity 3: Solving Percent Problems

You can use this proportion to solve percent problems.

\[ \frac{\text{part}}{\text{total}} = \frac{\text{percent}}{100} \]

9 is what percent of 12?
Think: part unknown total
\[ \frac{9}{12} = \frac{x}{100} \]
\[ 12 \cdot x = 9 \cdot 100 \]
\[ 12x = 900 \]
\[ \frac{12x}{12} = \frac{900}{12} \]
\[ x = 75 \]
So, 9 is 75% of 12.

30% of what number is 24?
Think: percent unknown part
\[ \frac{24}{x} = \frac{30}{100} \]
\[ 30 \cdot x = 24 \cdot 100 \]
\[ 30x = 2,400 \]
\[ \frac{30x}{30} = \frac{2,400}{30} \]
\[ x = 80 \]
So, 30% of 80 is 24.

Activity 3 Practice

Solve.
1. What percent of 25 is 14?
   a. part = _______
   b. total = _______
   c. percent = _______
   d. Write and solve the proportion.

   Answer: ______ % of 25 is 14.

2. 80% of what number is 16?
   a. part = _______
   b. total = _______
   c. percent = _______
   d. Write and solve the proportion.

   Answer: 80% of ______ is 16.

3. What percent of 20 is 11? ______

4. 18 is 45% of what number? ______

5. 15 is what percent of 5? ______

6. 75% of what number is 105? ______
Activity 3 Enrichment

1. Anthony found a number that is 20% of 30% of 400. What percent of 45 is the number that Anthony found?

2. Book A: 120 pages
   Book B: 170 pages
   Book C: 90 pages

   Kevin and Dashawn were both assigned reading from books A, B and C above. Kevin completed 40% of Book A, 30% of Book B, and 10% of Book C. Dashawn completed 50% of Book A, 20% of Book B, and 30% of Book C. How many pages did each student read?

3. The table above shows calories and fat grams for different foods. Fat grams contain 9 calories each. Find the percent of calories from fat for each of the foods above.

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories</th>
<th>Fat (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Milk</td>
<td>150</td>
<td>8</td>
</tr>
<tr>
<td>Egg</td>
<td>80</td>
<td>6</td>
</tr>
<tr>
<td>Hamburger</td>
<td>220</td>
<td>15</td>
</tr>
<tr>
<td>Pizza</td>
<td>160</td>
<td>3</td>
</tr>
</tbody>
</table>

4. Suppose a food has 300 calories per serving. What is the maximum number of grams of fat that the food can contain in order for the percent of calories from fat to be 40% or less?
Activity 4: Solving One-Step Equations

Addition and Subtraction Equations

To solve an equation, you need to get the variable alone on one side of the equal sign.

You can use tiles to help you solve subtraction equations.

Variable \[+1\] \([-1]\]

Addition undoes subtraction, so you can use addition to solve subtraction equations.

One positive tile and one negative tile make a zero pair.

Zero pair: \[+1 + (-1) = 0\]

To solve \(x - 4 = 2\), first use tiles to model the equation.

To get the variable alone, you have to add positive tiles. Remember to add the same number of positive tiles to each side of the equation.

Then remove the greatest possible number of zero pairs from each side of the equation.

The remaining tiles represent the solution. \(x = 6\)

Multiplication and Division Equations

Number lines can be used to solve multiplication and division equations.

Solve: \(3n = 15\)

How many moves of 3 does it take to get to 15?

\[1 \quad 2 \quad 3 \quad 4 \quad 5 \quad \text{number of moves} = 5\]

\(n = 5\) Check: \(3 \times 5 = 15\)

Solve: \(\frac{n}{3} = 4\)

If you make 3 moves of 4, where are you on the number line?

\[n = 12\] Check: \(12 \div 3 = 4\)
Activity 4 Practice

Use tiles to solve each equation.
1. \( x - 5 = 3 \)  
   \( x = \)  
2. \( x - 2 = 7 \)  
   \( x = \)  
3. \( x - 1 = 4 \)  
   \( x = \)
4. \( x - 8 = 1 \)  
   \( x = \)  
5. \( x - 3 = 3 \)  
   \( x = \)  
6. \( x - 6 = 2 \)  
   \( x = \)

Show the moves you can use to solve each equation. Then give the solution to the equation and check your work.
1. \( 3n = 9 \) 
   Solution: \( n = \) 
   Show your check:

2. \( \frac{n}{2} = 4 \) 
   Solution: \( n = \) 
   Show your check:
Write and solve an equation to find the unknown measurement. Then use your answer to find the perimeter of each field or court.

Remember
Area = length \times width or \( A = l \times w \)
Perimeter is the distance around
or \( P = 2l + 2w \)

1. Equation to find area: ______________
   Unknown measurement: ______________
   Equation to find perimeter:
   \( P = \) ______________
   Perimeter of court: ______________

2. Equation to find area: ______________
   Unknown measurement: ______________
   Equation to find perimeter:
   \( P = \) ______________
   Perimeter of field: ______________

3. Equation to find area: ______________
   Unknown measurement: ______________
   \( P = \) ______________
   Perimeter of rink: ______________

4. Equation to find area: ______________
   Unknown measurement: ______________
   \( P = \) ______________
   Perimeter of diamond: ______________
Activity 5: Solving Area Equations

You can use area formulas to find missing dimensions in figures. The formula for area of a parallelogram is $A = bh$.

The formula for area of a trapezoid is $A = \frac{1}{2} h(b_1 + b_2)$.

The formula for area of a rhombus is $A = \frac{1}{2} d_1 d_2$.

The formula for area of a triangle is $A = \frac{1}{2} bh$.

Suppose you know the area of a triangle is 28 square feet. You also know the length of the base of the triangle is 7 feet. What is the height of the triangle?

Use the formula for area of a triangle. $A = \frac{1}{2} bh$

Substitute known values. $28 = \frac{1}{2} (7)h$

Multiply both sides by 2. $56 = 7h$

Divide both sides by 7. $8 = h$

The height of the triangle is 8 feet.

**See formula sheets at the beginning of the packet.**

Activity 5 Practice

Solve.

1. The area of a parallelogram is 150 square meters. The height of the parallelogram is 15 meters. What is the length of the parallelogram?
2. The length of one diagonal of a rhombus is 8 cm. The area of the rhombus is 72 square centimeters. What is the length of the other diagonal of the rhombus?

3. The area of a triangle is 32 square inches. The height of the triangle is 8 inches. What is the length of the base of the triangle?

4. The area of a rectangle is 34 square yards. The length of the rectangle is 17 yards. What is the width of the rectangle?

5. The area of a trapezoid is 39 square millimeters. The height of the trapezoid is 6 millimeters. One of the base lengths of the trapezoid is 5 millimeters. What is the length of the other base of the trapezoid?
Activity 5 Enrichment

Answer the questions about the figure. Explain your answers and show your work.

1. What are the areas of parallelograms ACJH and BCDE? (Hint: Use the grid to find the areas.)

2. What is the sum of the areas of parallelograms ACJH and BCDE?

3. Draw auxiliary lines to form triangles inside or outside of parallelogram ABFG. How does the area of ABFG compare to the sum of the areas of parallelograms ACJH and BCDE?

4. Use the Pythagorean Theorem, $a^2 + b^2 = c^2$, to find the length of side AB of right triangle ABC.

5. How does the length of AB affect the area of ABFG as it relates to the sum of the areas of parallelograms ABFG, ACJH, and BCDE?
Activity 6: Solving Volume Equations

Volume is the number of cubic units needed to fill a space. To find the volume of a rectangular prism, first find the area of the base.

\[
\text{length} = 3 \text{ units} \\
\text{width} = 2 \text{ units} \\
A = lw = 3 \cdot 2 = 6 \text{ square units}
\]

The area of the base tells you how many cubic units are in the first layer of the prism.

The height is 4, so multiply 6 by 4.

\[
6 \cdot 4 = 24
\]

So, the volume of the rectangular prism is 24 cubic units.

Activity 6 Practice

Find each volume.

1. 
   \[
   4 \text{ ft} \quad 2 \text{ ft} \\
   2 \text{ ft}
   \]

2. 
   \[
   5 \text{ m} \\
   3 \text{ m} \\
   2 \text{ m}
   \]

3. 
   \[
   15 \text{ cm} \\
   3 \text{ cm} \\
   2 \text{ cm}
   \]

4. 
   \[
   10 \text{ yd} \\
   10 \text{ yd} \\
   10 \text{ yd}
   \]

5. 
   \[
   3 \text{ mm} \\
   3 \text{ mm} \\
   3 \text{ mm}
   \]

6. 
   \[
   5 \text{ in.} \\
   6 \text{ in.} \\
   4 \text{ in.}
   \]
Activity 6 Enrichment

Which rectangular prism has the greatest surface area? Which rectangular prism has the greatest volume? The answers to both questions depend on the dimensions of the prisms you are comparing.

The surface area of a rectangular prism can be found by using the formula below, where \( h \) is a prism's height, \( l \) is its length, and \( w \) is its width.

\[
S.A. = 2hl + 2lw + 2wh
\]

The volume of a rectangular prism can be found by using the formula

\[
V = l \times w \times h.
\]

Suppose the sum of the height, length, and width of a rectangular prism is 30 meters. The table shows three possible sets of length, width, and height whose sum is 30 meters. Complete the table. Then answer the questions that follow.

<table>
<thead>
<tr>
<th>Height</th>
<th>Length</th>
<th>Width</th>
<th>S.A.</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 m</td>
<td>10 m</td>
<td>10 m</td>
<td>1.</td>
<td>2.</td>
</tr>
<tr>
<td>15 m</td>
<td>5 m</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>20 m</td>
<td>6.</td>
<td>5 m</td>
<td>7.</td>
<td>8.</td>
</tr>
</tbody>
</table>

9. Based on the data in the table, what conclusion can you draw about the shape of a rectangular prism that will yield the greatest volume?

10. How does the surface area of the figure with the greatest volume compare to the surface areas of the other shapes?

11. Describe the shape of the rectangular-prism boxes that are commonly used to package dry cereal and dry detergent.

12. Are these boxes designed to hold the maximum amount of product? If not, why do you think the packaging has the shape it does?
Activity 7: Data Distribution

Box Plots

A box plot gives you a visual display of how data are distributed.

Here are the scores Ed received on 9 quizzes: 76, 80, 89, 90, 70, 86, 87, 76, 80.

Step 1: List the scores in order from least to greatest.

Step 2: Identify the least and greatest values.

Step 3: Identify the median.
If there is an odd number of values, the median is the middle value.

Step 4: Identify the lower quartile and upper quartile. If there is an even number of values above or below the median, the lower or upper quartile is the average of the two middle values.

Step 5: Draw a number line that includes the values in the given data.

Step 6: Place dots above the number lines at each value you identified in Steps 2–4. Draw a box starting at the lower quartile and ending at the upper quartile. Mark the median, too.
Dot Plots

A dot plot gives you a visual display of how data are distributed.

Example: Here are the scores Yolanda received on math quizzes: 6, 10, 9, 9, 10, 8, 7, 7, and 10. Make a dot plot for Yolanda’s quiz scores.

Step 1: Draw a number line.

Step 2: Write the title below the number line.

Step 3: For each number in the data set, put a dot above that number on the number line.

Describe the dot plot by identifying the range, the mean, and the median.

Step 4: Identify the range. 10 – 6 = 4
Step 5: Find the mean. 76 ÷ 9 = 8.4
Step 6: Find the median. 9

Histograms

Histograms can be used to display data. Use intervals of 10.

<table>
<thead>
<tr>
<th>Pounds of Newspapers</th>
<th>Interval</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collected for Recycling</td>
<td>1–10</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>11–20</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>21–30</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>31–40</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>41–50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>51–60</td>
<td>2</td>
</tr>
</tbody>
</table>

A histogram is a bar graph in which the bars represent the frequencies of the numeric data within intervals. The bars on a histogram touch, but do not overlap.
Activity 7 Practice

Use the data at the right for Exercises 1–5. Complete each statement.

1. List the data in order: ____________________________

2. Least value: ____________ Greatest value: ____________

3. Median: ____________

4. Lower quartile: ____________ Upper quartile: ____________

5. Draw a box plot for the data.

Use the data set at the right to complete Exercises 1–4.

1. Draw a dot plot for the data.

2. Find the range. ____________

3. Find the mean. ____________

4. Find the median. ____________
Use the histogram to complete Exercises 1–4.

1. Which interval has the greatest number of collections?
   
   ______________________________

   ______________________________

2. Were there any collections of less than 11 pounds? Explain your answer.
   
   ______________________________

   ______________________________

3. Which display can you use to find the median? ______________________

4. What is the median of the data? ______________________
Activity 7 Enrichment

The box plot has 6 data points between the third quartile (Q3) and the largest value (MAX) of the data set. The minimum value (MIN) of the data set is 21. The interquartile range (IQR) is 27.

| MIN | Q1 |  | M | Q3 | MAX |

Solve.

1. How many data points are in the distribution? ________________

2. Write an inequality for the value, V1, of any of the data points between the first quartile (Q1) and the median (M).

3. Write an inequality for the value, V2, of any of the data points between the minimum-value point (MIN) and the first quartile (Q1).

4. Write an inequality for the value of V1 in terms of the minimum data point’s value.

5. Use the grid to find the values of Q1, M, Q3, and MAX.
   
   Q1:  
   M:  
   Q3:  
   MAX:  

6. Given what you have found, create a data set of the values shown in the box plot. Check to make sure that all of the values you come up with are consistent with the features of the box plot.
For any problem involving percent, you can use a simple formula to calculate the percent.

\[
\text{amount} = \text{percent} \times \text{total}
\]

The amount will be the amount of tax, tip, discount, or whatever you are calculating.

For simple-interest problems,

\[
\text{Interest} = \text{principal} \times \text{rate} \times \text{time (in years)}
\]

\[
I = Prt
\]

A. Find the sale price after the discount.

Regular price = $899
Discount rate = 20%

You know the total and the percentage. You don't know the discount amount. Your formula is:

\[
\text{amount} = \% \times \text{total}
\]

\[
= 0.20 \times 899
\]

\[
= 179.80
\]

The amount of discount is $179.80. The sale price is the original price minus the discount.

\[
899 - 179.80 = 719.20
\]

The sale price is $719.20

B. A bank offers 8% simple interest on a certificate of deposit. Jamie invests $500 and for two years. How much interest will he earn?

You know the total deposited—the principal. You know the interest rate and can convert the percent to a decimal. You don't know the interest. Since the time is 2 years, use the formula to find the interest:

\[
I = Prt
\]

\[
I = 500 \times 0.08 \times 2
\]

\[
I = 80
\]

Jamie earns $80 in interest.

To find the total amount now in his account, add his initial investment ($500) to the interest ($80).

\[
500 + 80 = 580
\]

Jamie now has $580 in his account.
1. Complete the table.

<table>
<thead>
<tr>
<th>Sale Amount</th>
<th>5% Sales Tax</th>
<th>Total Amount Paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>$67.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$98.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$399.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$12,50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$12500.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Complete the table.

<table>
<thead>
<tr>
<th>Principal</th>
<th>Rate</th>
<th>Time</th>
<th>Interest Earned</th>
<th>New Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$300</td>
<td>3%</td>
<td>4 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$450</td>
<td>3%</td>
<td>3 years</td>
<td>$67.50</td>
<td></td>
</tr>
<tr>
<td>$500</td>
<td>4.5%</td>
<td>3 years</td>
<td>$112.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8%</td>
<td>2 years</td>
<td>$108.00</td>
<td></td>
</tr>
</tbody>
</table>

Solve.

3. Joanna wants to buy a car. Her parents loan her $5,000 for 5 years at 5% simple interest. How much will Joanna pay in interest?
4. This month Salesperson A made 11% of $67,530. Salesperson B made 8% of $85,740. Who made more commission this month? How much did that salesperson make?

5. Jon earned $38,000 last year. He paid $6,840 for entertainment. What percent of his earnings did Jon pay in entertainment expenses?

6. Nora makes $3,000 a month. The circle graph shows how she spends her money. How much money does Nora spend on each category?
   a. rent ___________
   b. food ___________
   c. medical ___________
   d. clothes___________
   e. miscellaneous ___________
Activity 8 Enrichment

1. Complete the table.

<table>
<thead>
<tr>
<th>Sale Amount</th>
<th>Tax</th>
<th>Amount of Tax</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$49.95</td>
<td></td>
<td>$4.00</td>
<td>$53.95</td>
</tr>
<tr>
<td>$499.99</td>
<td>5%</td>
<td>$6.43</td>
<td></td>
</tr>
<tr>
<td>$499.99</td>
<td>7.5%</td>
<td>$103.96</td>
<td>$2,702.96</td>
</tr>
<tr>
<td>$12,499.00</td>
<td>7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Complete the table.

<table>
<thead>
<tr>
<th>Principal</th>
<th>Annual Rate</th>
<th>Time</th>
<th>Interest Earned</th>
<th>New Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,400</td>
<td>4.9%</td>
<td>6 months</td>
<td>$4.41</td>
<td>$2,442.00</td>
</tr>
<tr>
<td>$9,460.12</td>
<td>5%</td>
<td>2 years</td>
<td></td>
<td>$12,061.65</td>
</tr>
<tr>
<td>$3,923.87</td>
<td>2.2%</td>
<td>5 years</td>
<td>$64.74</td>
<td></td>
</tr>
</tbody>
</table>

Solve.

3. Jorge earns a 9% commission on all of his sales. He had sales of $89,400 for the month. Harris works for a different company, and also sold $89,400 for the month but made $447 more than Jorge. What is Harris' commission rate?

4. Danielle wants to buy a video game. At the local Big Box store, it costs $49.95. Danielle has a coupon for 10% off at the store, and she will pay a 6.5% sales tax. At an online store, the game is $44.95, with $4.00 shipping charge and no sales tax. Which purchase would be cheaper?

5. A clothing store ran advertisements for a special sale. The store's ads read "Buy one at regular price, get a second one for half price." Explain how the terms of the clothing store’s sale are different from offering a 50% discount. Use $100 as the regular price for the item to write your explanation.
Activity 9: Algebraic Expressions

Algebraic expressions can be written from verbal descriptions. Likewise, verbal descriptions can be written from algebraic expressions. In both cases, it is important to look for word and number clues.

**Algebra from words**
“One third of the participants increased by 25.”

**Clues**
Look for “number words,” like
- “One third.”
- “Of” means multiplied by.
- “Increased by” means add to.

Combine the clues to produce the expression.
- “One third of the participants.” $\frac{1}{3}p$ or $\frac{p}{3}$.
- “Increased by 25.” +25

“One third of the participants increased by 25.”
$\frac{1}{3}p + 25$ or $\frac{p}{3} + 25$

**Use the Distributive Property.**
$4(6x + 14y)$
$4 \cdot 6x + 4 \cdot 14y$
$24x + 56y$

**Words from algebra**
“Write $0.75n - \frac{1}{2}m$ with words.”

**Clues**
Identify the number of parts of the problem.
- “$0.75n$” means “three fourths of $n$” or 75 hundredths of $n$. The exact meaning will depend on the problem.
- “-” means “minus,” “decreased by,” “less than,” etc., depending on the context.
- “$\frac{1}{2}m$” is “one half of $m$” or “$m$ over 2.”

Combine the clues to produce a description.
“75 hundredths of the population minus half the men.”

**Factor.**
$5x + 10y + 30z =$
$5 \cdot x + 5 \cdot 2y + 6 \cdot 5z -$
$5 \cdot (x + 2y + 6z)$
$5 (x + 2y + 6z)$
Write an algebraic expression for each phrase.

1. Four more than the price, \( p \)
2. Five less than three times the length, \( L \)

Write a word phrase for each algebraic expression.

3. \( 25 - 0.6x \)
4. \( \frac{2}{3}y + 4 \)

Use the Distributive Property to simplify each expression.

5. \( (100 + 4z)20 \)
6. \( 0.75(3.5a - 6b) \)

Factor each expression.

7. \( 45c + 10d \)
8. \( 27 - 9x + 15y \)
Solve. Show each step.

1. A construction worker bought several bottles of juice for $3 at the convenience store. She paid for them with a $20 bill. If \( j \) represents the number of bottles of juice, write an expression for the change she should receive.

2. A giant bamboo plant grew an average of 18 centimeters per year. The botanist started measuring the plant when it was 5 centimeters tall. If \( y \) represents the number of years the botanist has measured the plant, what expression represents its height?
Activity 10: Solving Two-Step Equations

Here is a key to solving an equation.

Example: Solve $3x - 7 = 8$.

Step 1: Describe how to form the expression $3x - 7$ from the variable $x$:
- Multiply by 3. Then subtract 7.

Step 2: Write the parts of Step 1 in the reverse order and use inverse operations:
- Add 7. Then divide by 3.

Step 3: Apply Step 2 to both sides of the original equation.
- Start with the original equation: $3x - 7 = 8$
- Add 7 to both sides: $+7 \quad +7$
  - $3x = 15$
- Divide both sides by 3: $\frac{3x}{3} \quad \frac{3}{3}$
  - $x = 5$

Activity 10 Practice

Solve the equation.

1. $4x + 11 = 19$
2. $-3y + 10 = -14$
3. $\frac{r - 11}{3} = -7$
4. $5 - 2p = 11$
Write a two-step equation to represent each problem.

7. Twelve and three tenths more than five and thirteen thousandths of a number $d$ is equal to fifteen and three hundred two thousandths. What is the value of $d$?

8. A home repair crew charges seventy-five dollars per day plus two hundred fifty-five dollars for each hour the crew works. One day the crew works $c$ hours and charges a total amount of one thousand, six hundred five dollars. How many hours does the crew work?

---

**Activity 10 Enrichment**

Write an equation to represent the problem. Then solve the equation.

1. Two years of local Internet service costs $685, including the installation fee of $85. What is the monthly fee?

2. The sum of two consecutive numbers is 73. What are the numbers?
The **surface area** of a three-dimensional figure is the combined areas of the faces.

You can find the surface area of a prism by drawing a net of the flattened figure.

Notice that the top and bottom have the same shape and size. Both sides have the same shape and size. The front and the back have the same shape and size.

Remember: $A = lw$
Since you are finding area, the answer will be in square units.

The **volume** of a solid figure is the number of cubic units inside the figure.

A prism is a solid figure that has *length, width, and height*.

Each small cube represents one cubic unit.

Volume is measured in cubic units, such as $in^3$, $cm^3$, $ft^3$, and $m^3$.

The volume of a solid figure is the product of the area of the base ($B$) and the height ($h$).

$$V = Bh$$
Rectangular Prism

The base is a rectangle. To find the area of the base, use $B = lw$.

Triangular Prism

The base is a triangle. To find the area of the base, use $B = \frac{1}{2}bh$.

Trapezoidal Prism

The base is a trapezoid. To find the area of the base, use $B = \frac{1}{2}(b_1 + b_2)h$.

Activity 11 Practice

Find the surface area of each solid figure.

1. [Diagram of a rectangular prism]

2. [Diagram of a rectangular prism]

Find the volume of each figure.

3. [Diagram of a rectangular prism]

4. [Diagram of a triangular prism]

5. [Diagram of a trapezoidal prism]
Use the situation below to answer 5–7.

Cydney built a display stand out of two cubes. The larger cube is 8 inches on each side. The smaller cube is 4 inches on each side. She painted the entire outside of each cube before she put the cubes together.

1. What was the surface area she painted for the smaller cube?

2. What was the surface area she painted for the larger cube?

3. What was the total area that she painted on both cubes?

4. What is the volume of the display?
A **dot plot** is a visual way to show the spread of data. A number line is used to show every data point in a set. You can describe a dot plot by examining the center, spread, and shape of the data.

![Paula: Goals Scored Per Game This Season](image)

This dot plot shows a symmetric distribution of data. Recall that symmetric means that the two halves are mirror images. In a symmetric distribution, the mean and median are equal.

- The data are symmetric about the center, 5.
- The median has the greatest number of data.
- The mean and the median are both 5.

Some data sets may cluster more to the left or right. The mean and the median for data that are clustered this way are not necessarily equal.

![Paula: Goals Scored Per Game Last Season](image)

This dot plot shows data that are clustered to the left.

- The data are not symmetric.
- The mean, about 3.4, is more than the median, 2.
Activity 12 Practice

Find the values for each dot plot.
1.

Range: Median: Mode:

2.

Range: Median: Mode:

Compare the dot plots by answering the questions.
3. How do the ranges compare?  
4. Compare the number of elements.
5. How do the modes compare?  
6. How do the medians compare?

7. Describe the distribution of the dots in each plot.
Activity 12 Enrichment

Solve each puzzle.

1. There are 6 whole numbers in a set of numbers. The least number is 8, and the greatest number is 14. The mean, the median, and the mode are 11. What are the numbers?

2. There are 7 whole numbers in a set of numbers. The least number is 10, and the greatest number is 20. The median is 16, and the mode is 12. The mean is 15. What are the numbers?

3. There are 8 whole numbers in a set of numbers. The greatest number is 17, and the range is 9. The median and the mean are 12, but 12 is not in the data set. The modes are 9 and 14. What are the numbers?

4. The mean of a data set of 6 numbers is 8. The mean of a different data set of 6 numbers is 20. What is the mean of the combined data sets?

5. Find the mean of 7 numbers if the mean of the first 4 numbers is 5 and the mean of the last 3 numbers is 12. What is the mean of the combined data sets?

6. The mean of a data set of 3 numbers is 12. The mean of a data set of 9 numbers is 40. What is the mean of the combined data sets?
Activity 13: Writing Linear Equations from Situations and Graphs

You will be asked to find the slope \((m)\) and the \(y\)-intercept \((b)\) of graphs of linear equations in the form \(y = mx + b\). Both slope and \(y\)-intercept can be identified from the wording of a problem.

**\(y\)-intercept, \(b\)**
- No initial or beginning value means \(b = 0\).
- A nonzero beginning or starting means \(b \neq 0\).

**slope, \(m\)**
- A rate indicates slope, \(m\).
- A change “per” some variable;
  - increasing \((m > 0)\)
  - decreasing \((m < 0)\)

**Example**

The concession stand has 500 pom-poms before the game. The fans bought them at a rate of 25 per minute. How long will it take for the supply to be gone?

What is \(b\)? \(b = 500\)

What is \(m\) and why is it negative? \(m = -25\), because 25 are being sold each minute.

What else do you know? In the equation, \(y = 0\) when all of the pom-poms are sold.

Replace the variables in the equation: \(y = mx + b\)

\[0 = -25t + 500\]

\[25t = 500\]

Solve for \(t\)

\(t = 20\) minutes
Activity 13 Practice

Write the slope, y-intercept, and equation for each situation.

1. The race begins at a rate of 1.5 meters per second. What distance, \(d\), is covered after \(t\) seconds?
   Slope: _______________; y-intercept: _____________
   Equation: _____________________________

2. Fifty azalea plants arrive at a florist’s shop on the first day of the week. After that, they arrive at an average of 75 plants per day. How many plants will be at the shop after \(t\) days?
   Slope: _______________; y-intercept: _____________
   Equation: _____________________________

3. An electrician can wire on average 4.5 houses in a week. How many months will it take her to wire 55 houses if she wires the same number each week and figures on 4.5 weeks per month?

4. A water tank holds 24,000 gallons. How many hours will it take for \(\frac{2}{3}\) of the water to be used if the water is used at an average rate of 650 gallons per day?

Write an equation in the form \(y = mx + b\) for each situation.

5. [Diagram of a graph showing water level (gallons) over time (minutes)]

6. | Height (m), \(y\) | Time (s), \(x\) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>360</td>
<td>0</td>
</tr>
<tr>
<td>330</td>
<td>5</td>
</tr>
<tr>
<td>240</td>
<td>20</td>
</tr>
<tr>
<td>162</td>
<td>33</td>
</tr>
<tr>
<td>120</td>
<td>40</td>
</tr>
</tbody>
</table>
Activity 13 Enrichment

Back to the Future

Although time travel often occurs in movies and books, it isn’t possible in real life. But if it were possible, companies would probably exist to sell trips!

1. Imagine that Timely Travel charges $5 per year to go forward in time. Complete the table for this relationship. Draw the graph on the grid at the right.

<table>
<thead>
<tr>
<th>Years (t)</th>
<th>200</th>
<th>400</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (c)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Write an equation for the graph.

3. Timely Travel charges $15 per year to go backward in time. Complete this table and draw the graph.

<table>
<thead>
<tr>
<th>Years (t)</th>
<th>-200</th>
<th>-400</th>
<th>-500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (c)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Write an equation for the graph.

5. Compare the constants of proportionality. Why is one positive and one negative?
Activity 14: Solving Multi-Step Equations

When solving an equation, it is important to simplify on both sides of the equal sign before you try to isolate the variable.

\[3(x + 4) + 2 = x + 10\]

Since you cannot combine \(x\) and 4, multiply both by 3 using the Distributive Property.

\[3x + 12 + 2 = x + 10\]

Then combine like terms.

\[3x + 14 = x + 10\]

Subtract 14 to begin to isolate the variable term.

\[-14\]
\[\frac{3x}{2} = \frac{x}{2}\]

Subtract \(x\) to get the variables to one side of the equation.

\[-\frac{x}{2} - \frac{x}{2}\]
\[2x = -4\]
\[\frac{2x}{2} = \frac{-4}{2}\]
\[x = -2\]

The solution is \(-2\).

You may need to distribute on both sides of the equal sign before simplifying.

\[3(3m - 2) = \frac{3}{4}(4 - 24m)\]

Use the Distributive Property on both sides of the equation to remove the parentheses.

\[9m - 6 = 3 - 18m\]

Add 6 to begin to isolate the variable term.

\[+6\]
\[9m - 6 + 6 = 3 - 18m + 18m\]

Add 18\(m\) to get the variables to one side of the equation.

\[+18m\]
\[\frac{27m}{27} = \frac{9}{27}\]

Divide by 27 to isolate the variable.

\[m = \frac{1}{3}\]

The solution is \(\frac{1}{3}\).

Solve.

1. \[5(i + 2) - 9 = -17 - i\]
2. \[-3(n + 2) = n - 22\]
3. \( 9(y - 4) = -10 \left( y + 2 \frac{1}{3} \right) \)

4. \( -7 \left( -6 - \frac{6}{7} x \right) = 12 \left( x - 3 \frac{1}{2} \right) \)

5. \( 2 \left( -4 \frac{1}{2} + m \right) + 3 = 4(m - 3) + 5 \frac{1}{2} \)

6. \( 0.5(x - 12) + 2 = 1.25(x + 8) - 9.5 \)

Write and solve an equation to find each solution.

7. One bag of trail mix has 5 ounces of raisins and some almonds. Lon buys 3 bags of trail mix and has 48 ounces of trail mix altogether. How many ounces of almonds are in each bag of trail mix?

8. A moving van charges a flat rate of $25 per day plus $0.12 per mile for every mile over 100 driven. If Millie’s bill was $29.46 how many miles to the nearest mile did she drive in all?
Activity 14 Enrichment

Use the information to complete Exercises 1–7.

Happy Trails Ranch charges $25.00 for equipment rental plus $8.50 an hour to ride a horse. Rough Riders Ranch charges $20.75 for equipment rental plus $9.75 an hour to ride.

1. Which is the better deal if a customer plans on riding for 2.5 hours? Show your work.

2. When would the two ranches charge the same amount? Show your work.

3. Rewrite your equation from Exercise 2 using the Distributive Property and 5 as a factor. Solve.

4. How many solutions are there to 25.00 + 8.50x = 5(5 + 1.7x)? Explain your answer.

5. Tina started riding at noon at Happy Trails and rode for 3.4 hours. At what time did she finish her ride? What did her ride cost?

6. Pierre rode for 3.4 hours at Rough Riders. Without doing any computation can you tell how much his ride cost? Explain your reasoning.

7. If a customer planned on riding for 5 hours, at which ranch would he or she get the better deal? Explain.
Activity 15: Volume

You can use your knowledge of how to find the area of a circle to find the volume of a cylinder.

1. What is the shape of the base of the cylinder?
   __________
circle

2. The area of the base is \( B = \pi r^2 \).
   \[ B = 3.14 \cdot 1^2 = 3.14 \text{ cm}^2 \]

3. The height of the cylinder is \( 5 \) cm.

4. The volume of the cylinder is
   \[ V = B \cdot h = 3.14 \cdot 5 = 15.7 \text{ cm}^3 \]
   The volume of the cylinder is \( 15.7 \text{ cm}^3 \).

You can use your knowledge of how to find the volume of a cylinder to help find the volume of a cone.

This cone and cylinder have congruent bases and congruent heights.

**Volume of Cone** = \( \frac{1}{3} \) **Volume of Cylinder**

Use this formula to find the volume of a cone.

\[ V = \frac{1}{3} Bh \]

- All points on a sphere are the same distance from its center.
- Any line drawn from the center of a sphere to its surface is a radius of the sphere.
- The radius is half the measure of the diameter.
- Use this formula to find the volume of a sphere.

\[ V = \frac{4}{3} \pi r^3 \]
Activity 15 Practice

Solve. Use 3.14 for \( \pi \). Round your answer to the nearest tenth, if necessary. Show your work.

1. A feeding trough was made by hollowing out half of a log. The trough is shaped like half a cylinder. It is 5 feet long and has an interior diameter of 1.5 feet. What is the volume of oats that will fill the trough?

2. A cylinder has a height of 8 feet and a volume of 628 cubic feet. Find the radius of the cylinder. Use 3.14 for \( \pi \). Show your work.

3. A funnel has a diameter of 9 in. and is 16 in. tall. A plug is put at the open end of the funnel. What is the volume of the cone to the nearest tenth?

4. A party hat has a diameter of 10 cm and is 15 cm tall. What is the volume of the hat?

5. A globe is a map of Earth shaped as a sphere. What is the volume, to the nearest tenth, of a globe with a diameter of 16 inches?

6. The maximum diameter of a bowling ball is 8.6 inches. What is the volume to the nearest tenth of a bowling ball with this diameter?
Activity 15 Enrichment

Use 3.14 for \( \pi \).

1. Design a cylinder that has a volume of between 430 and 450 cubic inches. Sketch the cylinder and label the radius or diameter and the height. Prove your cylinder meets these conditions by showing your calculations.

2. Design a cone that has a volume of between 90 and 100 cubic inches. Sketch the cone and label the radius or diameter and the height. Prove your cone meets these conditions by showing your calculations.

3. Design a sphere that has a volume of between 980 and 1,005 cubic centimeters. Sketch the sphere and label the radius or diameter. Prove your sphere meets these conditions by showing your calculations.