

# COMPACTED MATHEMATICS

## CHAPTER 7A

### RATIOS, PROPORTIONS, AND PERCENTAGES

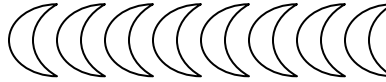
#### TOPICS COVERED:

- Ratios, rates, and unit rates
- Understanding proportions
- Solving proportions
- Word problems with proportions
- Using proportions to determine map distances

A ratio makes a comparison.  
Planet Survivor! has 4 stars and 8 moons.



You can write the ratio of stars to moons in three different ways:



4 to 8          4:8           $\frac{4}{8}$

There are 4 stars for every 8 moons.

You can write a ratio in simplest form the same way you write a fraction in simplest form. The ratio of stars to moons in simplest form is:

1 to 2          1:2           $\frac{1}{2}$

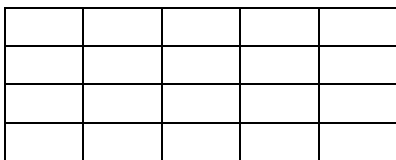
There is 1 star for every 2 moons.

**For each phrase circle the answer that expresses the ratio in simplest form.**

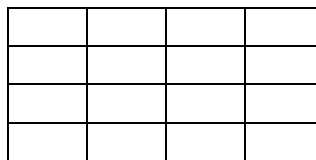
1. 75 out of 90 moons were bright          75:90          5:6          90:15
2. 4 aliens out of 52 had eyes          48:4          4:52          1:13

**Create a drawing below which represents a ratio of 3 squares to 9 circles. You may not draw exactly 3 squares.**

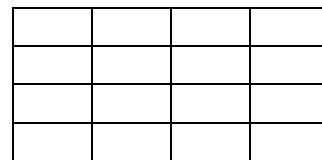
**Place X's in the grids below so that they form the following ratios.**



1 x to 5 small rectangles



2 x's to 4 small rectangles



1 x to 1 small rectangle

Activity 7-2	<b>Rates and Unit Rates</b>	NAME:
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A rate is a ratio that compares quantities that are measured in different units.

**Example 1:** Jim's spaceship flew 135 miles in 5 seconds.

Expressed as a rate:  $\frac{135 \text{ miles}}{5 \text{ seconds}}$

A unit rate compares a quantity to one unit of another quantity.

**Example 2:** Jim's spaceship flew 135 miles in 5 seconds.

Expressed as a unit:  $\frac{135 \text{ miles}}{5 \text{ seconds}} = \frac{27 \text{ miles}}{1 \text{ second}}$

**Ratios: Express each ratio in simplest form in three ways.**

<b>On the table there are 10 cups, 12 knives, 14 forks, and 5 spoons.</b>					
1.	cups to knives		2.	knives to forks	
3.	knives to spoons		4.	total objects to cups	
5.	cups to forks and knives		6.	spoons and knives to cups	
7.	total objects to cups and spoons		8.	spoons and forks to total objects	
9.	knives to cups and spoons		10.	total objects to cups and knives and forks and spoons	

**Rates and Unit Rates: Express each ratio as a rate and then a unit rate.**

		<b>Rate</b>	<b>Unit Rate</b>
11.	105 words typed in 3 minutes		
12.	2,800 miles driven in 7 days		
13.	\$375 saved in 5 years		
14.	12 pounds lost in 4 weeks		
15.	\$38 for 2 sweaters		
16.	72 hits in 24 baseball games		
17.	20 miles in 2 hours		
18.	315 grapes for 15 children		

19.	The ratio of females to males in the computer club is 6 to 5. If four females and six males miss a meeting, the ratio is 10 to 7. How many students are in the computer club?	
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Activity 7-3	<b>Ratios, Rates, and Unit Rates</b>	NAME:
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**Write three ratios equal to the given ratio (using different numbers, not just written a different way).**

1.	$\frac{1}{8}$		2.	2:40	
3.	$\frac{144}{288}$		4.	$\frac{200}{300}$	
5.	3 to 17		6.	$\frac{2}{11}$	
7.	1.6: 4		8.	2.25 to 6	

**Express each ratio as a fraction in simplest form.**

9.	read 75 pages out of 90		10.	4 aces in a deck of 52 cards	
11.	36 black keys out of 88 piano keys		12.	9 caramels in a box of 48 chocolates	
13.	325 full-sized cars out of 500 cars		14.	16 male teachers out of 40 teachers	
15.	35 sopranos in an 84 member chorus		16.	18 goldfish in a tank of 48 fish	

**Using the letters of the phrase “STATE OF MASSACHUSETTS,” write the ratios comparing the numbers of letters.**

17.	A to T		18.	M to E		19.	E to S	
20.	F to A		21.	T to S		22.	H to T	
23.	E to A		24.	vowels to consonants				

**Calculate the unit rates or unit prices for the problems below. Show all your work!**

25.	Gasoline to fill a 5-gallon gas can costs \$6.25. Find the unit price of each gallon.	
26.	The labor charge at Angie’s repair shop is \$60 an hour. Tony charges \$25 a half hour. Which shop charges less?	
27.	A case of 4 bottles of windshield washer fluid costs \$3.88. Find the unit price of each bottle.	
28.	Archie bought 15 gallons of gas for \$23.85. Joe bought 16 gallons of gas for \$24.88. Who paid less per gallon?	
29.	Andy drove 264 miles using 12 gallons of gas. Rita drove 315 miles using 15 gallons of gas. Who got more miles per gallon?	
30.	If a 12 oz. bottle of transmission fluid costs \$1.80 and a bottle containing 14 oz. costs \$1.96, which is a better buy?	

Activity 7-4	<b>Investigating Unit Rates</b>	NAME:
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*(Taken from Connect to NCTM Standards Grade 7)*

Determine the better buy for calculating the unit rate of each item.

		<b>Rate</b>	<b>Unit Rate</b>	<b>Rate</b>	<b>Unit Rate</b>	<b>Better Buy</b>
1.	Applesauce	24 oz. for \$1.25		16 oz. for \$0.89		
2.	Cat Litter	5 lb for \$3.78		20 lb for \$15.50		
3.	Ground Beef	4.3 kg for \$21.70		1.6 kg for \$7.85		
4.	Hamburger Rolls	3 bags of 8 for \$2.98		4 bags of 10 for \$4.25		
5.	Ribbon	5 m for \$6.45		240 cm for \$3.19		
6.	Greeting Cards	3 boxes of 12 for \$30.00		4 boxes of 15 for \$49.00		

7.	An 11-ounce can of condensed soup, to which you must add 1 can of water, costs \$1.45. A 20-ounce can of ready-to-serve soup costs \$1.29. Which is the better buy?	
8.	Stan typed 90 pages in 7.5 hours. Jan typed 110 pages in 9.4 hours. Who has the higher rate?	

Express each ratio as a unit rate. An example is shown below.

	<b>Ratio</b>	<b>Rate</b>	<b>Unit Rate</b>
9.	228 miles in 6 hours	$\frac{228 \text{ miles}}{6 \text{ hours}}$	38 miles per hour
10.	372 students for 12 teachers		
11.	\$47.95 for 7 hours		
12.	\$5.40 for 1 dozen bagels		
13.	57 sit-ups in 3 minutes		
14.	500 words read in 8 minutes		
15.	216 miles on 16 gallons of gas		
16.	36 commercials in 2 hours of TV		

Activity 7-5	<b>Investigating Unit Rates</b>	NAME:
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*(Taken from Connect to NCTM Standards Grade 7)*

Find the unit price of each item. Round to the nearest tenth of a cent.

1.	64 ounces of orange juice for \$2.79	
2.	5 pounds of roast beef for \$28.45	
3.	16 ounces of spaghetti for \$0.50	
4.	24 cans of dog food for \$7.60	
5.	7 kg of chicken for \$19.87	
6.	6.5 ounces of tuna for \$1.59	
7.	2.2 L of cola for \$2.19	
8.	12 pairs of socks for \$8.88	
9.	1.5 dozen granola bars for \$5.99	
10.	4.4 kg of cashews for \$62.25	

Using either newspaper ads, grocery store fliers, or visiting the store, find the prices for different items. Name the item, list its rate, and determine its unit rate. Find 8 different items,

	<b>Item</b>	<b>Rate</b>	<b>Unit Rate</b>
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Activity 7-6	<b>Rates: Fire Alarm</b>	NAME:
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What are the fire safety rules in your school building? Mr. Mangham is interested in fire prevention and safety. He knows that if rooms are too crowded, everyone might not be able to leave quickly.

The maximum occupancy of a room is the number of people that can be evacuated safely in 1 minute.

Do you know the maximum occupancy of your classroom or other rooms in your school? You can determine the maximum safe occupancy of your classroom, your cafeteria, or your school.

1. Have everyone in your class exit through the classroom door in an orderly fashion. Time how long this takes.

Number of students	Time to leave classroom (min.)	Rate (Students:Minute)	Unit Rate (Students:Minute)	Width of door (in.)

2. Make an estimate of the rate at which people can exit the cafeteria and the entire building through the doors.

Unit Rate in Cafeteria (Students:Minute)	Unit Rate of Building (Students:Minute)

3. Taking your yardstick, check the number and size of the cafeteria doors. Then calculate the rate at which people can exit the cafeteria through all its doors. Complete the same exercise for the school as a whole.

	Number of doors	Total width of all doors (in.)	$\frac{\text{Total width of all doors}}{\text{Width of classroom door}}$	Unit Rate* (Students:Minute)
Cafeteria				
School				

\* The unit rate can be determined by taking the answer to the width division and multiplying this by the unit rate you calculated for your classroom. The unit rate is equal to the maximum occupancy.

4. Can your class safely evacuate your classroom?

5. Estimate the number of students in the cafeteria at lunch. Could the students safely evacuate the cafeteria?

Activity 7-7	<b>Unit Rates per Gallon</b>	NAME:
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Think a gallon of gas is expensive?

This makes one think, and also puts things in perspective

- Diet Snapple 16 oz \$1.29 ..... \$10.32 per gallon
- Lipton Ice Tea 16 oz \$1.19 .....\$9.52 per gallon
- Gatorade 20 oz \$1.59 ..... \$10.17 per gallon
- Ocean Spray 16 oz \$1.25 ..... \$10.00 per gallon
- Brake Fluid 12 oz \$3.15 ..... \$33.60 per gallon
- Vick's Nyquil 6 oz \$8.35 .... \$178.13 per gallon
- Pepto Bismol 4 oz \$3.85 ..... \$123.20 per gallon
- Whiteout 7 oz \$1.39 ..... \$25.42 per gallon
- Scope 1.5 oz \$0.99 .....\$84.48 per gallon
- Evian water 9 oz \$1.49.....\$21.19 per gallon?! \$21.19 for WATER - and the buyers don't even know the source.
- Mountain Dew Code Red 2 liters \$1.49....\$2.82 per gallon
- Dasani Bottled Water 20 oz \$1.09....\$3.49 gallon
- Mr. Bubble bubble solution 8 oz \$0.79....\$6.32 gallon
- Louis Roederer Champagne 750 milliliters \$29.99....\$151.15 gallon
- Nail polish 0.5 oz. \$4.79.....\$613.12 gallon
- Channel Allure Eau de Toilette Spray Perfume 3.4 oz at \$75.....\$1411.76 gallon
- Snake antivenin 10 milliliters at \$900.....\$340,200 gallon

Activity 7-8	<b>Proportions</b>	NAME:
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A proportion is an equation that shows two ratios are equivalent. To determine if a pair of ratios form a proportion, you can find their cross products. If the cross products are equal, then the ratios form a proportion.

**Example 1:** Is  $\frac{5}{6} = \frac{12}{18}$  ?       $5 \cdot 18 = 90$      $6 \cdot 12 = 72$

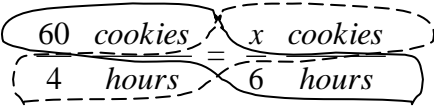
Therefore,  $\frac{5}{6}$  and  $\frac{12}{18}$  do not form a proportion.

**Use cross products to determine whether each pair of ratios forms a proportion.**

1.	$\frac{8}{12}, \frac{5}{10}$		2.	$\frac{12}{30}, \frac{2}{5}$	
3.	$\frac{8}{24}, \frac{6}{18}$		4.	$\frac{10}{24}, \frac{5}{8}$	
5.	$\frac{12}{15}, \frac{3}{4}$		6.	$\frac{4}{5}, \frac{20}{25}$	

Proportions can be solved utilizing the BUTTERFLY method.

**Example 2:** Emily baked 60 cookies in 4 hours. How many cookies can she bake in 6 hours?



$$60 \cdot 6 = 4 \cdot x$$

$$\frac{360}{4} = \frac{4x}{4}$$

$$90 \text{ cookies} = x$$

**Solve each proportion using the Butterfly Method.**

7.	$\frac{8}{15} = \frac{m}{45}$		8.	$\frac{9}{12} = \frac{6}{c}$	
9.	$\frac{5}{p} = \frac{3}{9}$		10.	$\frac{v}{21} = \frac{4}{6}$	
11.	$\frac{14}{8} = \frac{x}{4}$		12.	$\frac{9}{r} = \frac{27}{30}$	
13.	$\frac{10}{4} = \frac{m}{20}$		14.	$\frac{1}{c} = \frac{12}{24}$	

Activity 7-9	<b>Proportions</b>	NAME:
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**Use cross products to determine whether each pair of ratios forms a proportion.**

1.	$\frac{4}{9}, \frac{12}{27}$		2.	$\frac{5}{6}, \frac{25}{36}$	
3.	$\frac{5}{12}, \frac{7}{18}$		4.	$\frac{2}{7}, \frac{16}{36}$	
5.	$\frac{3}{14}, \frac{9}{42}$		6.	$\frac{3}{4}, \frac{18}{24}$	

**Solve each proportion using the Butterfly Method.**

7.	$\frac{6}{7} = \frac{a}{56}$		8.	$\frac{27}{x} = \frac{3}{8}$	
9.	$\frac{2}{3} = \frac{34}{b}$		10.	$\frac{s}{54} = \frac{7}{9}$	
11.	$\frac{4}{5} = \frac{c}{75}$		12.	$\frac{r}{48} = \frac{7}{12}$	
13.	$\frac{8}{15} = \frac{24}{t}$		14.	$\frac{36}{m} = \frac{2}{6}$	

**Use ratios and proportions to answer each question about an amusement park field trip.**

15.	One of the buses traveled 133 miles and used 19 gallons of gasoline. How many miles per gallon did the bus get?	
16.	Each turnstile can admit 36 people per 2 minutes. There are 8 turnstiles at entrance A. How many people can enter the park at this entrance in one minute?	
17.	Each student was given an amusement park drink cup for attending as a group. Each time it is filled, the beverage cost 6 cents per ounce. How much does it cost to fill your 16 oz. cup four times?	
18.	The Whip-A-Round spins five times every 3 seconds. If you go on the minute-and-a-half ride how many times have you spun around?	
19.	One vendor sells fruit salad for \$4.16 a pound. You want 6 ounces. How much will you pay?	
20.	The Cliff Drop can accommodate 720 people per hour. There are 444 people in front of you. How long until you get to ride?	
21.	The Wave Runner cycles 240 gallons of water per minute. How many gallons does it cycle each second?	
22.	One gear on the Spiral Coaster turns 7 revolutions every 2 seconds. How many revolutions are on each minute and a half ride?	

Activity 7-10	<b>Proportions</b>	NAME:
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**Use ratios and proportions to answer the following questions.**

1.	The Jelly Junior High School color is made by mixing red paint with yellow paint. The ratio of red to yellow is 3 to 5. How much red paint should be mixed with 20 oz. of yellow?	
2.	The Lawn Order lawnmower factory can produce 12 lawnmowers in 8 hours. How many hours will it take the factory to produce 30 lawnmowers?	
3.	An object that weighs 10 lb. on earth would weigh only 4 lb. on Mars. If you weigh 95 lb. on Earth, how much would you weigh on Mars?	
4.	The ratio of orange juice to pineapple juice in Tropical Treat Punch is 4 to 3. Bill has 64 oz. of orange juice. How much pineapple juice does he need?	
5.	A cookie recipe for 60 cookies calls for 4 cups of flour. How much flour is needed to make 90 cookies?	
6.	Jose can read 7 pages of his book in 5 minutes. At this rate, how long will it take him to read the entire 175-page book?	
7.	While exercising, Julie found that her heart was beating 12 times every 5 seconds. How many times was it beating per minute?	
8.	If there are 1,200 calories in 8 oz. of hot fudge, how many calories are in 3 oz. of hot fudge?	
9.	At Texas A&M, the ratio of men to women is 6 to 5. If there are 1,500 men, how many women are there?	
10.	One of the world's largest stained glass windows is at Kennedy International Airport in New York. It is a rectangle with a height to length ratio of 2 to 25. If the window is 24 feet high, how long is it?	
11.	In 3 hours, 225 cases of candy can be produced. At that rate, how much candy can be produced in 8 hours?	
12.	Jim weighs 120 pounds and can lift 80 pounds above his head. To lift the same ratio, how much should a 150-pound boy lift?	
13.	A copier can produce 50 copies in 2 minutes. At that rate, how long will it take to produce 150 copies?	
14.	Rachel sold 38 papers in 2 hours. At that rate how many papers would she sell in 3 hours?	
15.	A 9-inch piece of rubber can be stretched to a length of 15 inches. At that rate, to what length can a 12-inch piece of rubber be stretched?	
16.	A car used 8 gallons of gasoline in traveling 120 miles. At that rate, how many gallons will be used in traveling 860 miles?	

Activity 7-11	<b>Proportion Word Problems</b>	NAME:
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For each word problem below, write a proportion that can be used to solve the problem. Then use the Butterfly Method to solve the problem. Show all work on a separate sheet of paper. **Label.**

1. Justin ate 5 cookies every 10 days. How many cookies would he eat in 15 days?	2. McKenzie can make 6 bracelets every 3 hours. How many bracelets can she make in 9 hours?																		
Survey of 20 students' favorite and least favorite colors <table border="1" style="margin: auto;"> <thead> <tr> <th>Color</th> <th>Least favorite</th> <th>Favorite</th> </tr> </thead> <tbody> <tr> <td>Blue</td> <td>4</td> <td>7</td> </tr> <tr> <td>Green</td> <td>3</td> <td>2</td> </tr> <tr> <td>Purple</td> <td>11</td> <td>8</td> </tr> <tr> <td>Red</td> <td>1</td> <td>1</td> </tr> <tr> <td>Orange</td> <td>1</td> <td>2</td> </tr> </tbody> </table> Use this chart to answer questions #3 through #6.		Color	Least favorite	Favorite	Blue	4	7	Green	3	2	Purple	11	8	Red	1	1	Orange	1	2
Color	Least favorite	Favorite																	
Blue	4	7																	
Green	3	2																	
Purple	11	8																	
Red	1	1																	
Orange	1	2																	
3. If 30 students were surveyed, how many students would choose blue as their least favorite color?	4. If 120 students were surveyed, how many students would choose purple as their favorite?																		
5. If 120 students were surveyed, how many students would choose green as their favorite?	6. If 120 students were surveyed, how many students would NOT choose green as their favorite?																		
7. Ashley bought 8 purple bracelets for \$12. How many could she buy if she had \$21?	8. Lindsey read 5 books every 3 weeks. How many weeks would it take her to read 25 books?																		
9. Dani sang "You Are My Sunshine" 6 times in 10 minutes. How many minutes would it take her to sing the song 15 times?	10. Bailey ate 3 cookies in 1.5 hours. How many minutes would it take Bailey to eat 12 cookies?																		
11. Sherri loves to draw. She drew 16 pictures in 14 minutes. How many pictures can she draw in 21 minutes?	12. If you make 6 out of every 10 free throws, how many free throws will you make in 30 tries?																		
13. Two apple trees have a total of 50 apples. How many apples will be on five apple trees?	14. Mike jumps off a plane 10 times each month. How many times will Mike jump in one year?																		
15. Trey blinks 28 times in two minutes. How many times will Trey blink in 1 hour?	16. Brooke drew 2 pictures in 3 minutes. How long does it take her to draw 28 pictures?																		
17. Lucy kissed Charlie Brown 3 times every 6 seconds. How many kisses does Charlie Brown get in one minute?	18. Mr. Underwood gives us homework 4 of out every 5 school days. How many times will we have homework each school year (one school year = 175 days)?																		
19. Calvin eats 12 plates of disgusting green food every 6 comic strips. How many comic strips will it take Calvin to eat 102 plates of green food?	20. Duke won 19 out of every 20 basketball games. How many games will it take for Duke to win 76 games?																		

Activity 7-12	<b>Recognizing and Using Proportions</b>	NAME:
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(Taken from Connect to NCTM Standards 7<sup>th</sup> Grade)

Read each problem. Decide whether or not you can use a proportion to solve it. Solve the problems for which there is a proportion.

		<b>Proportion (Y/N)</b>	<b>If a proportion, write the proportion and solve.</b>
1.	A game board is 20 inches wide by 50 inches long. You want to make a smaller version of the board with a width of 12 inches. How long should the board be?		
2.	You have a square with an 8-inch side. You want to draw a triangle with a base 3 times greater than a side of the square. What is the altitude of the triangle?		
3.	The recipe calls for milk and flour in a 3 to 4 ratio. How many cups of flour do you need if you use 8 cups of milk?		
4.	A map shows that 1 inch represents 50 miles. How many miles does 8 inches represent?		
5.	If it snows 3 inches in 1 hour, how much snow does the Department of Public Services have to remove?		
6.	The warmest day last summer was 106 degrees Fahrenheit and the coldest was 50 degrees Fahrenheit. What was the average high temperature last summer?		
7.	The painter mixed the green paint using a 2 to 5 ratio of blue to yellow paint. How much yellow paint is there in 1 gallon of green paint?		
8.	There are 345 students in the school. There are 2 boys for every 3 girls. How many girls are in the school?		

Write a proportion to solve each problem. Then solve.

		<b>Proportion</b>	<b>Answer</b>
9.	If 18 plums weigh 54 ounces, then 27 plums weigh $x$ ounces.		
10.	If 40 nails hold 5 rafters, then 96 nails hold $r$ rafters.		
11.	If 32 addresses are on 2 pages, then $a$ addresses are on 9 pages.		
12.	If 360 inches of tape are on 3 spools. Then $t$ inches are on 10 spools.		
13.	If 60 mushrooms are on 4 pizzas, then $m$ mushrooms are on 15 pizzas.		
14.	If a heart beats 98 times per minute, then it beats $y$ times per hour.		

Activity	<b>Rates, Unit Rates, and Proportions</b>	NAME:
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**Ratio** – a comparison of two numbers by division.

Four out of five cars were red. This ratio can be written in three different ways:

$$4 \text{ to } 5 \qquad 4:5 \qquad \frac{4}{5}$$

**Rate** – a ratio of two measurements with different units.

Mr. Underwood ran 400 yards in 80 seconds.  $\frac{400 \text{ yards}}{80 \text{ seconds}}$  is a rate.

**Unit Rate** – a rate in which the denominator is 1.

In the example above, Mr. Underwood's unit rate =  $\frac{50 \text{ yards}}{1 \text{ seconds}}$  or 50 yards/second.

**Proportion** – an equation that shows that two ratios are equivalent.

Fred got two out of every three questions right. If there were six questions, Fred got four questions correct.

$$\frac{2}{3} = \frac{4}{6} \text{ is a proportion}$$

Proportions can be solved utilizing the BUTTERFLY method.

Problem: Emily baked 60 cookies in 4 hours. How many cookies can she bake in 6 hours?

$$\frac{60 \text{ cookies}}{4 \text{ hours}} = \frac{x \text{ cookies}}{6 \text{ hours}}$$

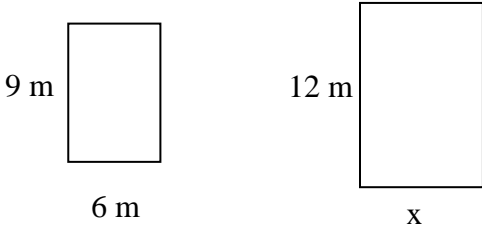
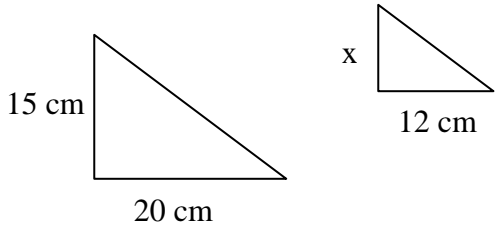
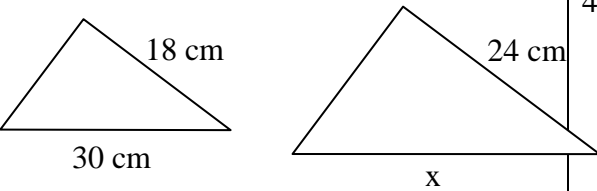
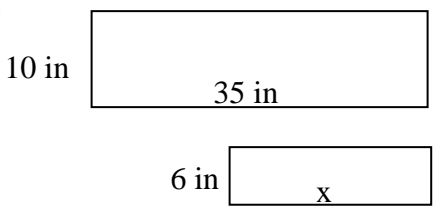
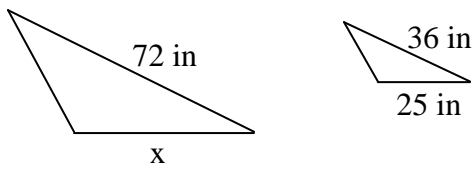
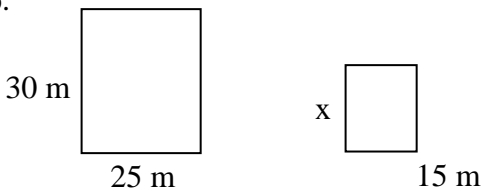
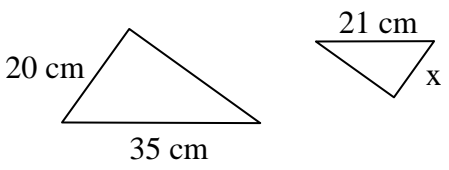
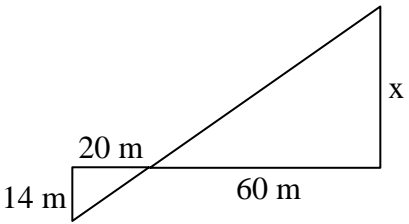
$$60 \bullet 6 = 4 \bullet x$$

$$\frac{360}{4} = \frac{4x}{4}$$

$$90 = x$$

$$x = 90 \text{ cookies}$$

For each pair of similar figures write a proportion and use the proportion to find the length of  $x$ . Use a separate sheet of paper.

<p>1.</p> 	<p>2.</p> 	
<p>3.</p> 	<p>4.</p> 	
<p>5.</p> 	<p>6.</p> 	
<p>7.</p> 	<p>8.</p> 	
<p>9.</p>	<p>A flagpole casts a shadow 10 ft long. If a man 6 ft tall casts a shadow 4 ft long at the same time of day, how tall is the flagpole?</p>	
<p>10.</p>	<p>A photograph is 25 cm wide and 20 cm high. It must be reduced to fit a space that is 8 cm high. Find the width of the reduced photograph.</p>	

**CREATING A SCALE DRAWING**

- Introduce scale drawings:
  - What is a scale drawing?
  - What are scale drawings used for? What people/professions use them?
- GOAL: Produce a scale drawing of your cartoon 64 times larger than the original one.

**PROCEDURE:**

1. Select cartoon. The “cell” should be no longer than 3.5 inches to properly fit on the posterboard. Sunday comics work best since they are color. There are many Calvin & Hobbes (or Peanuts or Garfield) books available at bookstores that work very well.
2. Photocopy the original comic so everyone can remember the order the cells go in once finished.
3. Each student gets one (or two if they are small) cells from the original comic. If a group is working to complete one entire comic, it may be a good idea upfront to determine which cells are not as necessary. That way the finished comic still makes sense even if you don’t use all the cells.)
4. Tape the cutout cell on a piece of computer paper.
5. Grid the original cartoon.
  - What size grid should we use? What if it is too big/too small? (Use  $\frac{1}{4}$  in. for the cartoons)
  - Using a ruler place equidistant marks across the top and bottom and connect them with lines. Place equidistant marks across the sides and connect them with lines.
6. Grid the construction paper.
  - What size grid should we use? What if it is too big/too small? (Use 2 in. for the posterboard)
  - Using a ruler place equidistant marks across the top and bottom and connect them with lines. Place equidistant marks across the sides and connect them with lines.
7. Copy box for box. The students need to place their SCALE somewhere on the new drawing to indicate to others how it compares to the original (i.e. Scale:  $\frac{1}{4}$  in.= 2in.) Cut out any extra boxes around the comic.
8. Color with markers, etc. A good idea is to have the first students who color to start listing the colors they use on the board so that the whole group will use a common set of colors for items that are the same.
9. Tape the original cartoon somewhere on the front of the posterboard.
10. Grade is based on both neatness and accuracy.

# CREATING A SCALE DRAWING

- What is a scale drawing? What are scale drawings used for? What people/professions use them?
- **GOAL** Produce a scale drawing of a cartoon \_\_\_\_\_ times larger than the original one.

## **PROCEDURE**

1. Grid the original cartoon.
  - Starting at the top, left corner, place marks every \_\_\_\_\_ across the top.
  - Starting at the bottom, left corner, place marks every \_\_\_\_\_ across bottom.
  - Connect the top marks and the bottom marks with lines.
  - Starting at the top, left corner, place marks every \_\_\_\_\_ across the left side.
  - Starting at the bottom, left corner, place marks every \_\_\_\_\_ across right side.
  - Connect the left and right marks with lines.
2. Grid the posterboard.
  - Repeat above procedure with marks every \_\_\_\_\_ .
3. Copy each box on the original to each box on your posterboard.
4. Place the SCALE somewhere on the new drawing to indicate to others how it compares to the original  
(i.e. Scale:  $\frac{1}{4}$  in.= 2 in.)
5. Color with markers, etc.
6. Tape the original cartoon on the front side of the posterboard.
7. Grade is based on both neatness and accuracy.