"Of students surveyed, 64% prefer English and 32% prefer math. The fact that these numbers do not add up to 100 may help explain why."

MFM 1P

Unit 1: Proportional Reasoning
Mathwithsheppard.weebly.com
## Unit 1: Proportional Reasoning

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Equivalent Ratios

ACTIVITY-RATIO GRIDS
i. Shade the grid on the right so that the ratio of shaded squares to total squares is the same as the ratio in the grid on the left.
ii. Write the ratios of shaded squares to the whole number of squares beside each grid.
iii. Show the ratio in 3 ways

Recall: A ratio is a comparison of two quantities with the same units.
LESSON
Ex. There are 4 soccer balls for every 2 basketballs, the ratio of soccer to basketballs is 4 : 2

Question: How many basketballs for every 2 soccer balls? Let’s make a model:

But it could also be described as 8 : 4, since for every 8 soccer balls, there would be 4 basketballs.

The first term is **double the second** in both cases, so these are **equivalent** (equal).

**If we multiply the two terms by the same amount, we will have an equivalent ratio.**

**Example 1:** Which of these ratios are **equivalent** ratios?

- a) 2 : 5 and 2 : 3
- b) 2 : 5 and 4 : 10
- c) 4 : 10 and 6 : 15

**SCALE FACTORS**

There are two ways to determine equivalent ratios.

**Method A**

*Multiply* each term in a ratio by the *same number.*

eg. 8:10 =

**Method B**

*Divide* each term in a ratio by a *common factor.*

eg. 8:10 =
Example 2: Determine an equivalent ratio. **Show your scale factor**

<table>
<thead>
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<th>By Dividing</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 2:3 =</td>
<td>a) 30:50 =</td>
</tr>
<tr>
<td>b) 4:3 =</td>
<td>b) 21:7 =</td>
</tr>
</tbody>
</table>

Example 4: Find the missing number to make each pair of ratios equivalent.

a) \( 5 \times 6 = \_ \_ \_ : 24 \)

b) \( 12 : 36 = 8 : \_ \_ \_ \)

Example 5: You make 5 cups of punch by mixing 3 cups of cranberry juice with 2 cups of apple juice. How much cranberry juice and how much apple juice do you need to **make four times the original recipe**?

**REDDUCING RATIOS TO LOWEST TERMS**

Express the number of circles to square as a ratio. Reduce to lowest terms if possible.

Write the following ratios using either double dot or fractional notation. Reduce if needed.

a. 18 pounds to 12 pounds

b. 5 days to 31 days

Write each ratio as a fraction in lowest terms, if possible

a. 12 to 4

b. 35:25

c. 60 to 180

d. \( \frac{15}{20} \)

e. 7:4

f. \( \frac{8}{28} \)
Homework 1.2: Equivalent Ratios

1. Write each ratio as a ratio in lowest terms.
   a. 2 to 4
   b. 3 to 12
   c. 35:7
   d. \( \frac{15}{20} \)
   e. 7:4
   f. \( \frac{8}{28} \)
   g. 6:18
   h. 18
   i. 24 to 96

2. Write each ratio using ratio notation, then reduce to lowest terms if possible.
   a) $2$ compared to $8$.
   b) In a class, 14 of 30 students are girls.
   c) The ratio of $46$ to $23$
   d) The ratio of 21 days to 28 days
   e) In a class, there are 32 chairs and 8 tables.

3. Find the missing term in each pair of equivalent ratios.
   a) 7 : 9 = 49 : _____
   b) 7 : 13 = 77 : _____
   c) 45 : 36 = _____ : 12
   d) 30 : 48 = _____ : 8
   e) 72 : 84 = _____ : 7
   f) 121 : 88 = _____ : 8

4. Bob needs to mix 2 cups of orange juice concentrate with 3.5 cups of water to make orange juice. Bob has 6 cups of concentrate. How much water will he need?
5. Use the data about wins and losses on school teams to answer the questions.

   a) Write the ratio of wins to losses for each sport. Reduce to lowest terms.

   c) Which sports have equivalent win–loss ratios?

<table>
<thead>
<tr>
<th>Sport</th>
<th>Wins</th>
<th>Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hockey</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Volleyball</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Baseball</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

6. Trevor is training for a duathlon, which is a race that consists of running and cycling. The cycling leg is longer than the running leg of the race, so while Trevor trains, he rides his bike more than he runs. During training, Trevor runs 4 miles for every 14 miles he rides his bike.

   a) Identify the ratio associated with this problem:

   b) One week, Trevor rode his bike for 84 miles. How much did he run during that week according to Trevor’s training schedule?

   c) When Trevor completed all of his training for the duathlon, the ratio of total number of miles he ran to total number of miles he cycled was 80:280. Is this possible according to Trevor’s training schedule? Explain why or why not.
7. The ratio of sheep to chickens is 5:8.
   a) What is the ratio of chickens to sheep?  
   b) What is the fraction of sheep to animals?

8. a) Simplify each ratio (reduce to lowest terms)  
   b) Which ratios in each pair are equivalent?
   
   a) 12:15 and 48:60  
   b) 3:2 and 25:16  
   c) 3:4 and 15:18  
   d) 625:125 and 180:36

1.2 Answers
1. a) 1:2 b) 1:4 c) 5:1 d) 3:4 e) 7:4 f) 2:7 g) 1:3 h) 3:2 i) 1:4  
2. a) 2:8 = 1:4 b) 14:30 = 7:15 c) 46:23 = 2:1 d) 21:28 = 3:4 e) 32:8 = 4:1  
3. a) 63 b) 143 c) 15 d) 5 e) 6 f) 11  
4. 14 cups of water  
5. a) Hockey 3:2 Volleyball 2:1  
   Baseball: 3:2 b) Hockey and Baseball  
6. a) 4:14 = run : bike b) 24 c) yes  
7. a) 8:5 b) 5:13  
8. a) 4:5 equivalent b) not  
   equivalent c) not equivalent d) 5:1 equivalent
Understanding Rates

RATE

Rate: A comparison of two quantities with different units.

Example: \(90 \text{ miles per 3 hours} \rightarrow \frac{90 \text{ mi}}{3 \text{ hr}}\)

Here are some rates:

- Chris drove 107 miles in two hours.
- Oranges are on sale for $1.49 for 12.
- Gina earns $4.75 per hour for baby-sitting.
- There are 500 sheets on one roll of paper towels.

State 3 examples of rates that you know.

WHEN WRITING RATES, YOU MUST ALWAYS SHOW THE _______________ OF MEASUREMENTS.

Example 1: Write each rate as a fraction in the lowest terms.

a) 132 patients to 8 doctors.  
   b) 72 letters in 4 minutes.
   
   c) 90 texts from 2 students.  
   d) $525 for 25 people.

UNIT RATE

Unit Rate: A rate in which the second quantity is 1.

Example: \(90 \text{ miles per 3 hours} \rightarrow \frac{90 \text{ mi}}{3 \text{ hr}} = \frac{30 \text{ mi}}{1 \text{ hr}}\)
Calculating Unit Rates

Worked example: Gerald pays $90 for 6 yoga classes. What is the cost per class?

\[ \frac{90}{6 \text{ classes}} = \frac{15}{1 \text{ class}} \]

Example 2: A cruise ship travels 200 miles in 50 minutes. How far does the ship travel per minute?

Example 3: Find the unit rate. Show your work.

a) 90 eggs from 15 chickens.

b) 780 km in 12 hours

UNIT PRICE

Unit Price: A unit rate used to compare cost per item.

\[ \text{Example: } \frac{$22.50 \text{ per 6 boxes}}{6 \text{ boxes}} = $3.75 \text{ per 1 box} \]

Example 4: The cost of 2 cartons of milk is $5.50. What is the unit price?

Problem Solving with Unit Rates

You can solve rate problems by using a unit rate or by using equivalent rates.

a) Sarah has two wireless providers to choose from. Super-Cell offers 250 base minutes for $24.99 a month. Easy-Phone has a plan that includes 325 base minutes for $34.99 a month. Which is cheaper?

b) A town in east Texas received 10 inches of rain in 4 days. If it kept raining at this rate for a 31-day month, how much rain did the town receive?
Homework 1.3: Understanding Rates

1. Determine if the following are examples of rates, unit rates, or unit price.
   
a) price of wheat is $2 for 3 Kg
   b) 50 per second
   c) a car goes 100 miles in 1.5 hour
   d) price of petrol is $5 per gallon.
   e) $2.00 for 5 muffins
   f) a car goes 60 miles in 1 hour
   g) price of corn is $2 per ounce
   h) 6 buses to transport a group of 300 people

2. Describe the difference between a rate, a unit rate, and a unit price. Use examples with your descriptions.

3. Give 2 examples of rates that are used in everyday life. Write the units for each of your rates.

4. Write each rate as a fraction in the lowest terms. Be sure to include your includes.
   
a) 72 pills for 36 cats.  
   b) 90 miles on 3 gallons.

5. Write each of the following rates as a unit rate.
   
a) \( \frac{3 \text{ Tbsp}}{2 \text{ tsp}} \)
   b) \( \frac{135 \text{ pitches}}{45 \text{ strikes}} \)
   c) \( \frac{128 \text{ miles}}{4 \text{ hours}} \)
   d) \( \frac{2250 \text{ pencils}}{18 \text{ boxes}} \)

6. Determine the unit rate in each situation.
   
a) 200 miles in 15 hours.  
   b) 42 books for 12 students.
c) An orca swims 110 km in 2 h.

d) Cathy plants 45 daffodils in 30 min.

e) The cruising speed of a blue whale allows it to travel 193 km in 10 h.

7. Lindsay has scored 15 goals in 10 lacrosse games this season.
   a) What is her unit rate of scoring?
   b) How many goals might Lindsay score in 36 games? What assumptions do you make?

8. Gina earns $78.00 for working 6 h. Asad makes $192.50 after working 14 h. Determine each person’s unit rate of pay. Who has a greater hourly rate of pay?

9. Monique worked as a cleaner at the Calgary Stampede and Exhibition. She was paid $84 for an 8-h day.
   a) What was Monique’s hourly rate of pay?
   b) How much would Monique earn for 35 h of work? **FIND HOURLY RATE FIRST

10. Which is a better buy? Show your work.
13 ounces of vinegar for $2.99 OR 48 ounces of vinegar for cost $4.09.

1.3 Answers
1. a) Rate b) unit rate c) rate d) unit price e) rate f) unit rate g) unit price h) rate
2. rate = a comparison between two quantities, unit rate = a rate per one, unit price = the price per one
3. answers may vary
4. a) 2 pills/1 cat b) 30 miles/1 gallon
5. a) 1.5 tbsp/tsp b) 3 pitches/strike c) 32 miles/hours d) 125 pencils/boxes
6. a) 13.3 miles/hours b) 3.5 books/student c) 55 km/h d) 1.5 daf/min e) 19.3 km/h f) 6 times/hours
7. a) 1.5 goals/game b) 54 goals 8. $13 and $13.75, Asad
9. a) $10.50/h b) $367.50
10. 48 ounces
Learning goal: how to calculate unit rate and determine the better buy.

Comparing Rates

Example 1: Shana is at the grocery store comparing two brands of juice. Brand A costs $3.84 for a 16-ounce bottle. Brand B costs $4.50 for a 25-ounce bottle. To compare the costs, Shana must compare prices for equal amounts of juice. How can she do this?

Example 2: Mariah is looking for a part-time job. She wants to work 15 h a week. She has been offered three positions.

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<th>Day Camp Counsellor</th>
<th>Cashier</th>
<th>Library Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>$7.50 per hour</td>
<td>$25.00 for 3 h</td>
<td>$44.00 for 5 h</td>
</tr>
</tbody>
</table>

a) Which job pays the most?  
b) For the job in part a, how much will Mariah earn in one week?
Example 3: Two stores are advertising specials on apples.

<table>
<thead>
<tr>
<th>Store A</th>
<th>Store B</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 apples for $4.40</td>
<td>12 apples for $5.76</td>
</tr>
</tbody>
</table>

Apples are sold individually. How much less would 30 apples cost at Store B than at Store A?
Homework 1.4: Comparing Rates

1. Write a unit rate for each statement. Be sure to include your includes.

   a) $399 earned in 3 weeks   b) 680 km travelled in 8 h
   
   c) 12 bottles of juice for $3.49   d) 3 cans of soup for $0.99
   
   e) 200 miles in 15 hours.   f) 85 feet in 20 seconds.
   
   g) 42 books for 12 students.   h) 39 children from 13 families.

2. The grocery store advertises the following.

   a) Determine the unit rate for each package in $/mL.

   b) Which package is the best buy? Explain your choice.
3. The table shows the price of different-sized packages of mixed nuts.
   a) Determine the unit rate for each package in $/kg.

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<thead>
<tr>
<th>Nut Package</th>
<th>Mass</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300 g</td>
<td>$2.19</td>
</tr>
<tr>
<td>2</td>
<td>500 g</td>
<td>$3.09</td>
</tr>
<tr>
<td>3</td>
<td>700 g</td>
<td>$4.83</td>
</tr>
</tbody>
</table>

   b) Which package is the best buy? Explain your choice.

4. Mr. Gomez travelled 525 km in 6h.
   a) Assume Mr. Gomez travelled the same distance each hour. What is this distance per hour?

   b) At this rate, how long will it take Mr. Gomez to travel 700 km?

5. Which is the greatest average speed? (Hint: Compare the unit rates)
   i) 60 km in 3h
   ii) 68 km in 4h
   iii) 70 km in 5h

6. Lakelse Lake, BC, had the most snow for one day in Canada, which was 118.1 cm. Assume the snow fell at a constant rate. How much snow fell in 1 h?

1.4 Comparing Rates
1. a) $133/week b) 85 km/h c) $0.29/bot d) $0.33/can e) 13.3 mi/h f) 4.25 ft/sec g) 3.5 books/student h) 3 children/family
2. a) A $0.0053/ml B 0.00478/ml C 0.00465/ml b) C
3. a) 1- $0.0073/g 2 - $0.00618/g 3 - $0.0069/g b) 2
4 a) 87.5 km/h b) 8 hours
5. 4.92 cm/h
6. b) A $3.61/kg B $2.21/kg - B is the better buy
Learning goal: how to set up a proportion to solve for a given quantity.

Proportional Reasoning Part 1

Vocab: A proportion = an equation that shows 2 ratios or rates are equal

WARM UP:
Ex. 1 The Suarez family paid $15.75 for 3 movie tickets. How much would they have paid for 12 tickets? Decide on a strategy to solve. Share with a partner & copy another type of strategy to solve.

My Strategy: Another Strategy:

Ex. 2 At Sidekicks leadership camp, the campers are divided into groups. Each group has 16 campers and 2 cabins. How many cabins are needed for 64 campers? Fill in the chart with the different strategies

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<td>Finding Unit Rates</td>
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Reflect: When would you use each strategy?

Ex. 3: Justin takes his pulse and counts 18 heart beats in 15 seconds. What is her heart rate in beats per minute? Hint: there are _____ sec. in every 1 minute.
Ex. 4: Sam works in Peterborough. Each week, he travels 125 km for work and uses approximately 13 L of gasoline. What is his car’s rate of fuel consumption in liters per 100km? Find unit rate to solve.

Ex. 5: At the movie theatre, 65 student tickets were sold for one show. The ratio of adult tickets sold to student tickets sold was 3:5. How many adult tickets were sold? *set up proportion to solve
Homework 1.5: Proportional Reasoning Part 1

1. Determine the missing value to make each rate equivalent. Include the units.

   *** Show scale factor

   a) \( \frac{60\text{km}}{3\text{h}} = \frac{?}{6\text{h}} \)
   b) \( \frac{\$3}{4\text{cans}} = \frac{\$15}{?} \)
   c) \( \frac{178\text{beats}}{2\text{min}} = \frac{?}{1\text{min}} \)

2. Determine the missing value to make each rate equivalent. Include the units.

   a) \( \frac{\$48}{6\text{students}} = \frac{?}{1\text{student}} = \frac{?}{15\text{students}} \)
   b) \( \frac{\$135}{900\text{MB}} = \frac{?}{1\text{MB}} = \frac{?}{160\text{MB}} \)

3. For each of the following questions, set up a proportion, find the unit rate, then solve.
   a) Sean buys 8 DVDs for $120. Each DVD costs the same amount.
      i) How much does 1 DVD cost?  
      ii) How much do 13 DVDs cost?

   b) Lora works for 4 days and earns $224. At this rate:
      i) How much does she earn in 1 day?  
      ii) How much does she earn in 11 days?

4. A machine can bind 1000 books in 8 min.
   a) How many books can the machine bind in 1 h? *there are ___ min in 1 hour

   b) How long will it take to bind 7250 books? Explain.
5. The recommended seeding on a package of grass seed is 200 g per 9 m². Carey spread 150 g over 6.5 m². Is this more than, equal to, or less than the recommended seeding?

6. Lo Choi wants to buy a dozen doughnuts. She has a coupon. This week, the doughnuts are on sale for $3.99 a dozen. If Lo Choi uses the coupon, each doughnut is $0.35. Should Lo Choi use the coupon? Justify your answer.

7. Two cars travel along a highway at the same speed. Car A travels 20 km in 12 min. How long will it take Car B to travel 50 km?

8. A soccer team played 28 games and won 4 out of every 7 games. There were no tied games.
   a) How many games did they lose?
   
   b) What was the team’s win–loss ratio in lowest terms.
   
   c) If this trend continues, how many losses would you expect the team to have once they have won 20 games?
9. Alex makes necklaces using coloured beads. The ratio of blue beads to red beads is 3:4 and the ratio of red beads to yellow beads is 4:1. If Alex would like to make a necklace with 56 beads, how many of each colour would she need?

1.5 Answers
1. a) 120 km b) 20 cans c) 89 beats
2. a) $8/student, $120/15 students b) $0.15/MB, $24/MB
3. a) $15/DVD b) $195
4. a) 7500 b) 58 min
5. more than recommended
6. sale price is cheaper
7. 30 mins
8. a) 12 games b) 4:3 c) 15 losses
9. 21 blue 28 red 7 yellow
Learning goal: how to set up a proportion and solve by multiplication relationships.

Proportional Reasoning Part 2

Solve each proportion by multiplication relationships:

\[ \frac{2}{14} = \frac{1}{k} \quad \text{a) } \]
\[ \frac{a}{7} = \frac{18}{42} \quad \text{b) } \]

Is there another way to solve?
Let’s try a) 

Why is it difficult to solve the following using multiplication relationships:

\[ \frac{u}{12} = \frac{25}{10} \quad \text{c) } \]
\[ \frac{5}{d} = \frac{4}{6} \quad \text{d) } \]
\[ \frac{6}{8} = \frac{r}{9} \quad \text{d) } \]

How could we solve these equations? (Show 2 ways)
Example 1: Solve each word problem using a proportion

a) A recipe for 8 people calls for 3 cups of flour. How much flour would be needed for 12 people?

b) A breakfast cereal contains corn, wheat, and rice in the ratio of 3 to 4 to 2. If a box of cereal contains 225 g of corn, how much rice does it contain?

c) Maya works as a pharmacist. The recommended dosage of flu vaccine for a 15kg child is 0.2 ml. Determine what dosage she should give a 36 kg child if the ratio remains the same.
Homework 1.6: Proportional Reasoning  Part 2

1. Solve for each unknown. Show your work.
   a) $6 : 8 = n : 12$
   b) $\frac{2}{7} = \frac{8}{n}$
   c) $4 : n = 6 : 9$
   
   d) $\frac{n}{6} = \frac{11}{3}$
   e) $\frac{3}{n} = \frac{2}{5}$
   f) $\frac{0.4}{1.5} = \frac{12}{n}$

Solve by using a proportion. Round answers to the nearest tenth (one decimal) if necessary. Answer each question with a sentence.

2. You jog 3.6 miles in 30 minutes. At that rate, how long will it take you to jog 4.8 miles?

3. You earn $33 in 8 hours. At that rate, how much would you earn in 5 hours?

4. If one gallon of paint covers 825 sq. ft., how much paint is needed to cover 2640 sq. ft.?
5. A map scale designates 1 inch = 50 miles. If the distance between two towns on the map is 2.75 inches, how many miles must you drive to go from the first town to the second?

6. At an automotive repair shop, 3.5h of labour costs $311.50. What is the labour charge for a 5-h job? How could you check your answer?

7. You get six pieces of gum in a package that costs $0.87.
   a) If you could buy a package with three pieces of gum, how much would it cost?
   b) How much would you pay for a package of eight?

1.6 Answers
1. a) 9 b) 28 c) 6 d) 22 e) 7.5 f) 45  
2. 40 minutes  
3. $20.63  
4. 3.2 gallons  
5. 137.5 miles  
6. $519.17  
7. a) $0.44 b) $1.16
Minds on. Gummy bears!

Act 1: How many regular bears equal one super bear?
   A number too low: __________  Too high: ________  My guess: ________

How many mini bears would equal one super bear?

Act 2: What information do we need?

Act 3: Answer

Extension:
If you wanted to eat the most gummy for the least money, should you buy regular bears or mini bears?

What would be a fair price for a super bear? _______________________

Example: A bag of fertilizer contains nitrogen to phosphorus to potassium in a ratio of 20 : 10 : 5. The bag contains 3.6 kg of phosphorus. What is the total mass of nitrogen and potassium?
Assignment 1.7: Problem Solving With Proportions

1. In the first year of a fundraising campaign, donations are collected at a rate of $700 each day for 8 days. In the second year, the daily rate doubles and the campaign is 3 days longer. How much money is raised in the second year?

2. You only need four coloured markers. The smallest package available has six markers in it and costs $9.00. One package has been opened and contains only five markers. You ask the sales clerk how much it would cost. What would the cost of this damaged package be? Justify your answer.

3. The table below shows the cost of water for three customers. They each pay the same cost per litre. Frank pays $36.12 for water at the same rate. Determine the number of litres of water that he purchases. Show your work.

<table>
<thead>
<tr>
<th>Amount (L)</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 000</td>
<td>8.60</td>
</tr>
<tr>
<td>20 000</td>
<td>17.20</td>
</tr>
<tr>
<td>30 000</td>
<td>25.80</td>
</tr>
</tbody>
</table>

4. A class is going on a field trip to a location that is 85 km from the school. Fuel for the bus costs $1.09/L. The bus uses 35 L of fuel for every 100 km. Find the cost of fuel for the bus to take the class on the field trip and back to the school.

5. For a certain type of ramp, the ratio of the height of the ramp to the horizontal length of the ramp needs to be 1:4. A ramp has been designed to be 26 m in horizontal length with a height of 7 m. Would this ramp be safe? Show your work and justify your answer.

6. Clarence works at vet’s office. He needs to give a dose of medicine to a 24kg dog. The recommended dosage for a dog that weights 10kg is 25ml. Determine the dose Clarence should give to the 24kg dog if the rate remains the same. Show your work.

7. Lisa and Mario exercised at the gym together. Lisa burned 120 calories in 8 minutes. Mario burned 49 calories in 210 seconds. If they both kept working out at the same pace, which of the two will burn more calories for 1 hour and how many more? Show your work.

1.7 Solutions
1. $1925  2. $7.50 ($1.50 per crayon)  3. 42 000L  4. $64.86  5. Yes (height is less than 4 times as big as length)  6. 60mL  7. Lisa, 60 calories more
Learning goal: how use proportions to solve percent problems.

Solving Percent Problems

A percent is a ratio that compares a number to 100; for example, 30:100.
A percent can also be written with a symbol (%), as a fraction, or as a decimal.
For example, \(30\% = \frac{30}{100} = 0.30\)

**Example 1:** On a particular day, 8% of all of the people in a school building are adults. If there are 2325 people in the school, how many adults are there?

**Example 2:** Suppose a school has 720 students. At least 60% are required to participate in a fund-raiser before a sponsoring company will help with a school event. How many students are needed?

**Example 3:** Vince scored 82.5% on a math test. John had 15 out of 18 on the same test. Who did better? How do you know?
Example 4: Student council estimates that 85% of the grade 9 students at John F. Ross are going to the dance.

a) What percentage of students are not going to the dance?

b) If there are 462 grade 9 students, how many are going to the dance?

c) If one third of the grade 9 students going to the dance bought their tickets at the door, how many tickets do they need for grade 9s at the door?

Example 5: Ethan had $550 in the bank. He took out $50 to spend on a present.

a) What percent of his money is still in the bank?

b) How much could he have taken out if he wanted to make sure that 70% was still in the bank?
Homework 1.8: Solving Percent Problems

1. There were 288 spectators at the football game. 75% were cheering for the home team.
   a) How many spectators were cheering for the home team? Explain.
   b) Approximately 40% of the spectators were students. How many spectators were adults?

2. The Incredible Chocolate Chip Company has discovered that 36 out of 400 chocolate chip cookies do not contain enough chocolate chips. What percent of the chocolate chip cookies do not have enough chips?

3. Hershey is in a kennel with 15 cats and 35 dogs. 40% of the pets are scared of thunderstorms (eek!). With the incoming storm, how many pets will need some calming measures to ease their anxiety?

4. Mrs. Sheppard gave a $5.00 tip to a waitress for serving a meal costing $27.00. What percent of the bill was her tip?

5. In the Central City Grand Prix, out of 30 cars that started the race, 12 of them finished. What percent of the cars finished the race? What percent did not finish the race?
6. Eric earned 60 points on his last test. If there were 75 possible points, what was his percent grade?

7. In a volleyball game, Caroline served the ball over the net 16 out of 20 times. What percent did she not make her serve over the net?

8. Restaurant etiquette dictates that you should leave a 15% tip for the server if the service is acceptable. If that is the case, how much should you tip if your total is $36.00?

9. In 2014, 20% of 200 students voted to protest a ban on junk food. In 2015, 30% of 100 students voted to protest the same ban. How many more members voted to protest the ban in 2014 than in 2015?

1.8 Answers
1. a) 216 people b) 115 people
2. 9% 
3. 20 pets 
4. 14% 
5. 80% 
6. 87.5% 
7. 20% 
8. $5.40 
9. 10 more
Tips and Taxes

WARM UP: Take a couple minutes to discuss what you know about tipping at a restaurant.

What are some things to consider when determining the amount to tip a server?

Example 1: The general guideline is 20% for excellent service, and 15% for a minimum tip. If a meal costs $45.29, what would be the tip for excellent service?

EASY WAY TO CALCULATE TIPS “ON THE FLY”....
Mental Math: 10% of anything is easy to figure out in your head because you just move the decimal to the left one place. You can double 10% to find 20%.

ie. 10% of $55.00 is 5.50, so 20% is $11.00.

Example 2: Calculate each amount without a calculator.

10% of $34 = ________          20% of $43 = ________

10% of $16 = ________          20% of $36 = ________
CALCULATING TAXES

Tax is EXTRA AMOUNT YOU HAVE TO PAY on most items that you purchase: clothes, gifts, food from a restaurant, etc. In Ontario, we pay ____________________________ (HST) on many of our purchases. On current rate of HST is_______, which means that you pay an extra $______ in tax for each 100 dollars that you spend.

Where do our taxes go? What items don’t get taxed?

Example 3: Suppose an item costs $89 and you have to pay HST.

a) Estimate the HST on the item.* hint: think of our short cut

b) Calculate the HST on that item. c) How much is the total cost including the tax?

Example 4: Calculate the tax (13% HST) on a new TV that cost $457.
TAXES -- SHORT CUT

Sydney calculated the HST for an item multiplying by 0.13. Why does that make sense?

Noah calculated the final price for an item including HST by multiplying by 1.13. Why does that make sense?

Example 5: Use your short-cut strategy to determine the final price of the following items including HST.

a) A new truck that costs $32 000
b) A candle that costs $8.50

Example 6: Tierney goes to the movie theatre and has $20 to spend on treats.
• Soft drink $2.29
• Chocolate bars $1.69
• Popcorn $3.49
She buys two soft drinks, a chocolate bar and popcorn. She also pays 13% tax. How much change should Tierney receive from her $20? Show your work.
1. The Andersons went to dinner at Swiss Chalet. If their dinner cost $42.95 and they left a 15% tip for their server, how much did they leave as a tip?

2. The Kerwoods went out to eat at Montana’s. If the bill was $58.65 and they gave their server a 15% tip, how much did they pay altogether?

3. Mark and his three friends ate out at Applebee’s. Their bill totalled $52.35. If they left the server a 20% tip, how much would each person pay splitting the bill evenly?

4. Vicky made some purchases at the Sunflower Market. She bought strawberries for $3.50, carrots for $2.25 and a bouquet of flowers for $9.95. If sales tax is 13%, what is her final bill?
5. You have a $20 gift card from a bookstore that you use to buy two books for $18.49. The sales tax is 5.75%. Will your gift card cover the cost? Explain.

6. Rick bought 3 shirts for $18 each, 2 pair of socks for $3.99 a pair, and a pair of pants for $45.00. How much did he pay including HST?

1.9 Answers
1. $6.44
2. 67.45
3. $15.71 total for each person
4. $17.74
5. Yes, it will cost $19.55
6. $120.89
Discounts and Sale Prices

Most flyers that you look at always have sales.

Explain the difference between the following words

<table>
<thead>
<tr>
<th>Regular Price</th>
<th>Discount</th>
<th>Sale Price</th>
</tr>
</thead>
</table>

LOOKING AT DISCOUNTS

Some times discounts are given as a dollar amount off and other times it is given as a percentage of the price.

Which of the following deals is better?
Calculating the discount →

**Example 1:** An phone that regularly sells for $280 is on sale for 25% off. What is the amount of discount?

**Example 2:** HDTVs are on sale for 25% off. What is the discount on a television that normally costs $885?

Calculating Sale Price →

**Example 3:** A jacket was regularly priced at $159.99. It was marked down by 30%.

**Method #1:** Calculate the discount, then subtract find the sale price
**Method #2:** Determine sale to percentage and calculate the sale price

**Example 4:** A video game is discounted by 30%. Its regular price is $89.99.

a) Calculate the sale price of the video game before taxes.

b) Calculate the sale price of the video game including taxes (13%).
Homework 1.10: Discounts and Sale Price

1. How much will Jordon save on the price of a computer listed at $989.98 if it is discounted by 30%?

2. In a department store, a $40 dress is marked, "Save 25%." What is the discount? What is the sale price of the dress?

3. A bicycle has a regular price of $175. It is on sale for 20% off. Determine the total cost, including 13% tax? Show your work.

4. A video store offers these choices.
   - Choice A: 30% off each DVD with regular price $25.00
   - Choice B: Buy two DVDs for $40.00. Which is the better deal for the customer? Justify your answer.
5. Margaret manages a second-hand clothing store in Langley, BC. The store advertises that if you buy 3 items, you will get 15% off the most expensive item, 20% off the second most expensive, and 30% off the cheapest item. You choose three items costing $10.00, $25.00, and $12.00. How much will you pay for the three items?

6. Susan buys a tennis racket from a store.
   • The tennis racket’s original price is $75.
   • All tennis rackets are on sale for 25% off the original price.
   • The tennis racket has a scratch, so she receives an additional 10% off the sale price.
How much does Susan pay for her tennis racket, including 13% tax? Show your work.

1.10 Answers
1. $296.99
2. Discount $10, sale price $303.
3. Discount $35, sale price $140, taxes 18.20 total $158.20
4. Choice A is better
5. $21.25 + $9.60 + $7 = $37.85
6. $57.20