Unit IV: Ratios and Rates

Teachers' Notes on Meaning Activities

Activity 1

This is a real problem faced by shoe manufacturers. A discussion of the results from the class should be encouraged.

Activity 2

Other materials may be substituted for M & Ms if their use is considered unhealthy. If M & Ms are used, then an interesting activity is to find out if the ratios of colors are consistent among packages. When ratios between different colors are considered, many ratios can be found using the same data.

Activity 3

Unit rate is a fundamental concept in rate problems. It is an alternative to using proportion statements.

Activity 4

Unit rate is directly applied in the unit-price approach to comparison shopping. Of course, different amounts can be considered units.

Activity 5

Many excellent applications of the rate/ratio concept are possible once a map is available.

Meaning Activity 1 Rates and Equivalent Ratios

With the help of your teacher and classmates, fill in the following tables:

Girls' Shoe Size	4	5	6	7	8	9	10	Total
Number of Girls								

Boys' Shoe Size	6	7	8	9	10	11	12	Total
Number of Boys								

1. Write the ratios of the numbers of each shoe size to the total number of people for that table. This should provide about six ratios for each table.
2. What is the ratio of the number of girls' size 8 to the total number of girls? How does this compare with the ratio for boys' size 8? Which ratio is larger?
3. What is the ratio of the number of girls' size 6 to the total number of girls? How does this compare with the ratio for boys' size 6? Which ratio is larger?
4. Using the population of Grade 8 students in your school, find the number of girls and the number of boys who wear each size.
5. If there are 8,000 Grade 8 students in Calgary and half of them are girls, how many shoes of various sizes would need to be stocked for this market? Calculate this for the boys also.
6. Construct other questions that you could answer based on the information from your class.

Meaning Activity 2 Ratios—Activity and Equivalent Ratios

Teacher Sheet

1. Provide each group of four students with one package of M & Ms. Have students complete the following chart:

Color	Number of M & Ms
Red	
Brown	
and so on	
Total	

2. Compile the information from each group on a transparency representing the entire class. (See Activity 2 transparency.)
3. Have each group determine ratios such as (a) red to brown, (b) brown to green, (c) green to red and so on.
4. From your experience, define ratio.
5. Using information from the transparency, the teacher could ask equivalent ratio questions based on information about M & Ms. For example, if Group 3 had eight brown M & Ms and five yellow M & Ms, how many yellow M & Ms would you expect them to have if they had forty brown ones?
6. Using transparency information, have students answer the following as well as similar problems:
   (a) Group 3 has 40 M & Ms. They have 8 yellow ones. Group 4 has 7 yellow. How many M & Ms in all will Group 4 need to have the same ratio as Group 3? (7/x = 8/40)
   (b) Group 2 has 50 M & Ms. They have 7 orange ones. Group 5 has 48 M & Ms. How many orange ones would they need to have the same ratio as Group 2? (x/48 = 7/50)

Meaning Activity 2 Transparency

	Groups								
Color	1	2	3	4	5	6	7	8	Class Total
Number of M&Ms									
Total									

Meaning Activity 3 Rates

Unit rate is a good way to handle rate problems. When you use this method, you always find the rate of one unit.

Find the unit rates of the following:

1. Six apples cost $1.50 = ____ dollars per apple.
2. 200 km in two hours = ____ km per hour
3. $360 for 30 hours work = ____ dollars per hour
4. 200 words typed in five minutes = ____ words per minute.

To solve problems using this method, *always* express the given information as a *unit rate*, then continue to solve the problem.

1. Apples cost $1.50 for six apples. How much would ten apples cost?
   Ans: Unit rate is $0.25 per apple. Cost of ten apples: 10 x $0.25 = $2.50.
2. Joe worked 30 hours and made $240. At this rate, how much would he get for 22 hours?
3. Twelve eggs cost $1.08. How many eggs could you buy for 75 cents? How much change would you get?
4. Sally can type 350 words in five minutes. How long would it take her to type a 1,000-word essay?

Meaning Activity 4 Rates

Although all of these problems can be solved by "solving proportions," and in some cases "solving proportions" is faster, be sure that you understand the unit-rate idea. It can be used in many problems.

When we use the unit-rate method in comparison shopping, it becomes the *unit-price* method. In this method, we always find the cost of one unit of the product. Find the *unit price* of the following:

1. Three dozen oranges cost $4.50. Find *two* unit prices: per dozen, per orange.
2. Three hundred grams of rice cost $1.75. What is the unit price?
3. For $12, you get eight cans of tomatoes. What is the unit price?

Using this idea of unit price, do the following questions:

4. Which is a better buy: three bulbs for $3.60, or five for $6.00?
5. You are choosing between 100 ml of toothpaste for $1.29 or 175 ml for $2.69. Which is the better buy?

In solving question 5, you probably found the unit price of each and compared unit prices. Can you think of a slightly different way to solve these, also using unit price?

6. If you needed 1,000 feet of lumber, what would be the difference in price you would pay at these stores:
   Store A: 8-foot boards cost $2.13
   Store B: 25 feet cost $5.00

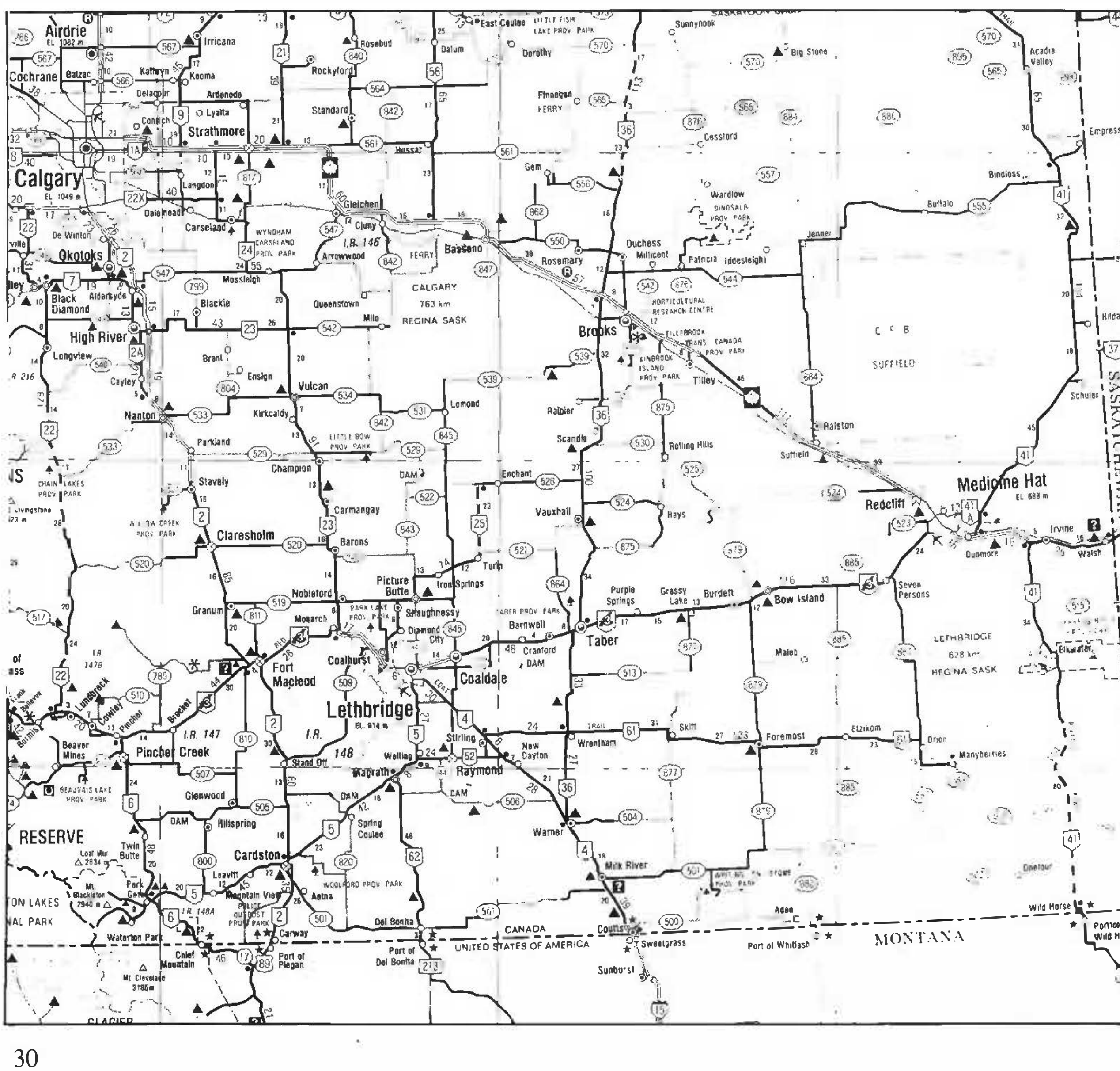
Although many comparison shopping questions can be done using different methods, ***be sure you can use the*** unit price ***method.***

Meaning Activity 5 Map Scales

A scale for a map is given as Drawing : Actual. The scale for the accompanying map is 1:1,500,000. This means 1 cm is equivalent to 1,500,000 cm.

Figure out how many kilometres are represented by 1 cm on the map. 1 cm = ____ km. (Be sure you have this correct before you answer the following questions.)

1. What is the straight line distance from Calgary (centre of dot) to Lethbridge? ____ How does this compare to road distance?
2. The road distance to Medicine Hat is 293 km. What is the air distance? ____ Why is the air distance shorter?
3. The cost of shipping a large carton of medical supplies from Calgary to Medicine Hat is $45 per km by truck and $70 per km by air. Which would be cheaper? ____ Besides cost, what might be some other factors to consider in deciding which method to use?
4. What is the actual length of the Alberta/Montana border?
5. If the rat patrol wants to set up a station every 20 km along the Alberta/Montana border, how many stations would it need?



Problem Solving Activity 1 Ratio

1. Roll a pair of dice. What are the possible ways to roll the following combinations? (It may help to think of one die as colored red and the other black.)

   2: 1 + 1
   3: 2 + 1; 1 + 2
   4: 1 + 3; 3 + 1; 2 + 2
   5: 1 + 4; 4 + 1; 2 + 3; 3 + 2
   6:
   7:
   8:
   9:
   10:
   11:
   12:

   (a) What is the total number of possibilities in a roll of two dice?

   (b) What is the ratio of rolling:
   (i) 6 to the total? (iii) 2 to the total?
   (ii) 7 to the total? (iv) 8 to the total?

   These ratios are called *probability*.

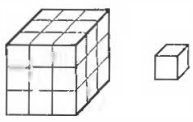
2. During a school election, Shelly got 10 votes for every 3 votes Kari received. Fill in the following information:

   (a)

Shelly	Kari
10	3
?	6
40	?
210	?

   (b) If 325 students voted, how many votes did each receive? (Hint: find a pattern.)

Problem Solving Activity 2 Equivalent Ratio



1. You have a cube, measuring 3 cm to a side. The cube is painted red. Cut the 3-cm cube into 1-cm cubes.

   (a) How many cuts are required to do this?

   (b) Find the ratio of cubes with no painted surfaces to cubes with three painted surfaces.

   (c) Find the ratio of cubes with two painted surfaces to cubes with one painted surface.

2. Refer to above, increase the size of the cube by three times and do 1a and 1b again. Compare answers. Do you have equivalent ratios? Why? Why not? Explain.

Problem Solving Activity 3 Rates

1. An athlete's heart beats about 24 times in 30 seconds.

   (a) What is this in heartbeats per minute?

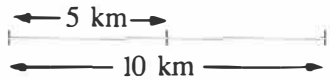
   (b) During exercise, the heart rate triples. What does it become?

2. A car travels 60 km in 30 minutes.

   (a) What is its rate per second?

   (b) What is the unit rate in km per minute?

   (c) How many kilometres would be traveled in one hour?

3. 

   (a) How long would it take to go 5 km at 30 km/hr?

   (b) If you had to travel 50 km/hr, how long would it take to make the whole trip of 10 km?

   (c) Subtract 3a from 3b to see how much time you have left in which you must travel the remaining 5 km. Quite fast!

   (d) Why is this answer such a surprise?

Problem Solving Activity 4 Ratio, Scale, Map Problems

1. You are asked to draw a scale model of a car, which is 4 m long and 1.5 m wide, so that it fits in this rectangle. What scale would you choose?

2. In a class, there are 10 boys and 15 girls. Three of the boys like classical music, 5 girls like country and western and the remaining students like pop music. How many different ratios can you find? (There are about 15.) Which of these ratios would you use to find the number of students in 2,000 who do not like classical music?

3. On a map with scale 1:1,500,000, the straight-line distance from Edmonton to Calgary measures 20 cm. A man bought a suit in Calgary for $400 and had it sent to Edmonton. The salesclerk said that it would cost $0.47 per km to send plus $10 for wrapping. What was the total cost of the suit?