TIPS4RM

# A Variety of Tools and Strategies

# Proportional Reasoning
## Grade 9 Applied - Unit 4: Day 1
## Adjusted Lesson

Ontario

# Unit 4: Ratio Carousel – Adjusted for a Variety of Tools

**75 min**

### Using a Varity of Tools and Strategies Goals
- Use geoboards to form visual representations to compare unit rates (Best Buy).
- Extend the use of a tool (e.g., colour tiles in What's in the Bag?), and introduce a new strategy (e.g., tag the fish/tiles) that simulates a real context for estimating fish population (Fish Tales).
- Use visual estimation as a strategy to recognize objects in the shape of a golden rectangle (Favourite Rectangle), thereby establishing this special ratio in other contexts.

**Materials**
- chart paper and markers
- 2 computers with GSP®4
- 5 geoboards with 5 bands each
- 60 colour tiles and adhesive colour dots
- BLM 4.1.3, 4.1.4, 4.1.5, 4.1.6

**Assessment Opportunities**

**Minds On…**

### Groups of 3 → Graffiti

### Whole Class → Presentation

The stations described here could be combined with the original stations as part of a 2-day carousel, using a Jazz day.

**Action!**

### Groups of 3 → Carousel
Set up 3 or 4 of the carousel stations, depending on the time available and the needs of students in the class. Or, set up all of the carousel stations and have selected students work on 3 of them, based on considerations such as:

- Visual learners may benefit from seeing the visual representations of unit rates generated by using geoboards in the Best Buy activity. If computers are not available, Best Buy could replace GSP® Middle Mania as a carousel station. Middle Mania could be demonstrated for the class.

- If students completed the activity What's in the Bag as part of Data Management, or, if they finish the stations before the rest of the class, they can use the adhesive dots with the colour tiles and the strategy of tagging and sampling to estimate the fish population (Fish Tales).

- Students interested in the arts and visual learners may be motivated to learn how the Golden Ratio can be used as a referent in art through the Favourite Rectangle activity.

- Use a story to increase students' awareness of the interconnections between mathematics and literature, and to reinforce differences between absolute and relative sizes as expressed by ratios. Discuss how they arrived at their solutions.

**Learning Skills (Teamwork)/Observation/Checklist:** Observe and record students' collaboration skills.

Place the bands on the geoboards prior to the activity.

The Fish Tales activity may be appropriate for making connections with science topics.

Favourite Rectangle.gsp

Extend the Favourite Rectangle activity by having students measure their own faces.

**Consolidate Debrief**

### Whole Class → Summarizing
Lead a discussion during which students share what they learned abut tools and strategies.

### Home Activity or Further Classroom Consolidation

*Application*
*Concept Practice*

## 4.1.3: A Global Village

In a global village of 100 people there are:
- 61   people from Asia
- 13   people from Africa
- 12   people from Europe
- 8   people from South America including Central America, Mexico and the Caribbean
- 5   people from the United States and Canada
- 1   person from Oceania (Australia, New Zealand, and Pacific islands)

On the grid represent the global village of 100 by colouring in the squares. Create a legend by marking the colour beside each statistic.

Record the following ratios:
a) people from Europe : people from Asia _____

b) people from South America : people from Oceania _____

c) people from Africa : people from United States and Canada _____

There are approximately 1200 students in a school. If the student body resembled the global village described, how many people would be from each of the 6 regions.
Show your work and describe the strategy that you used.

# 4.1.3: A Global Village (continued)

## 2006 Winter Olympics:
During the Winter Games, the media tell the world about Olympic events and topical issues. In Torino, almost 10 000 men and women provided images, words, and photos of the Olympic Games. If the media resembled the global village described, how many would be from each of the 6 regions? Show your work and describe the strategy that you used.

Do you think that these numbers represent the actual numbers of the media from each region? Explain your thinking.

## Connect and Reflect:
The World Cup of Soccer played in Germany during the summer of 2006.
The distribution of the 32 teams in the tournament representing the same regions of the world is listed below:

| Asia | 4 teams | Africa | 5 teams |
|---|---|---|---|
| Europe | 14 teams | South America | 7 teams |
| United States and Canada | 1 team | Oceania | 1 team |

How well does the distribution of the teams represent the populations for the 6 regions? Explain your thinking.

# 4.1.4: Best Buy

You can buy trail mix at the health food store in four different-sized packages. The table shows the package size and cost:

| Size | Cost |
|------|------|
| 100 g | $1.00 |
| 300 g | $2.00 |
| 500 g | $3.00 |
| 1 kg | $4.50 |

Task: Use a geoboard to find the unit rates per 100g and determine the best buy.

On the geoboard, create unit rate triangles for each of the four trail mix package sizes. The vertical scale is the cost and the horizontal scale is the weight.

Use the following *horizontal* scale:     1 space = 100 g

Use the following *vertical* scale:       1 space = $0.50

Use geobands to make rate triangles for each of the four packages on your geoboard. Record your triangles below:
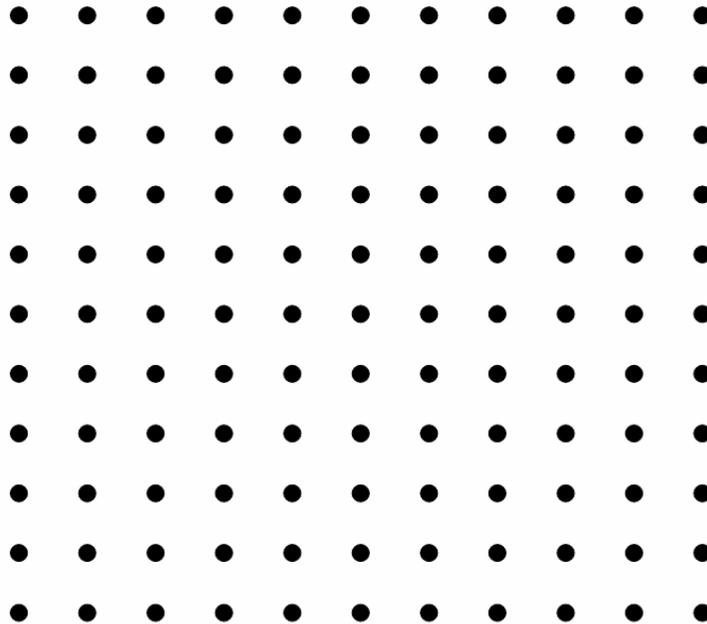
## 4.1.4: Best Buy (continued)

Determine and record the unit rate (per 100g) for each package of trail mix:

| Package | Cost / 100g |
|---------|-------------|
| 100g | |
| 300g | |
| 500g | |
| 1 kg | |

Rank the four packages from best value to least value:

1.

2.

3.

4.

Which package would you recommend? Give reasons for your choice.

Explain how the geoboard helped you with this problem.

How does unit rate relate to rate of change in this problem?

# 4.1.5: Fish Tales

Have you ever wondered how scientists estimate how many fish there are in a lake? Try this "capture-recapture" activity.

The shoebox is your "lake." It has an unknown quantity of fish (colour tiles). You cannot see how many fish are in the lake.

- Take a handful of the fish.

- "Tag" the fish by placing a dot sticker on each of the colour tiles.

- Count the number of tagged fish and place them back into the lake.

- Mix the tiles up and redistribute the tagged fish in your lake.

- Each group member:
    - Takes one handful of fish
    - Counts the total number of captured fish
    - Counts the number of tagged fish

- Gather everyone's data and use the information to estimate the number of fish in the lake.


What is the ratio of tagged fish to untagged fish?




What is the ratio of the total number tagged and the total population in the lake?




Compare your answer to the actual value. How close was your estimate?




Where else could this method for approximation of total population be used?

# 4.1.6: Favourite Rectangle?

Since the early Greeks, a ratio of length to width of approximately 1.618:1 has been considered the most visually appealing. This ratio, called the golden ratio, not only appears in art and architecture, but also in natural structures.

1.  On the GSP sketch, choose 3 rectangles that you estimate might have a length:width ratio of approximately 1.618:1.


    Rectangle _____        Rectangle _____        Rectangle _____


2.  For each rectangle you have chosen, find the length, width and the $\dfrac{length}{width}$ using the measure menu. Follow the instructions below:


    To find the length, use the select tool and choose the longer side of the rectangle. Pull down the **Measure** menu and choose **Length**. Repeat to measure the width. Record the measurements in the table below.


    To find $\dfrac{length}{width}$ use the Measure menu and choose Calculate. Select the length measurement on your screen, ÷, then the width measurement.

| Rectangle (letter name) | Length | Width | $\dfrac{Length}{Width}$ |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

3.  Check your estimate. What strategy did you use to select the rectangles? How close was this number to 1.618?

## 4.1.6: Favourite Rectangle? (continued)

4. Check the $\dfrac{length}{width}$ ratio of some other common shapes that we use regularly:

| Rectangle | Length (longer side) | Width (shorter side) | $\dfrac{Length}{Width}$ |
|---|---|---|---|
| 3″ × 5″ index card | | | |
| 8.5″ × 11″ paper | | | |
| 2″ × 3″ rectangle | | | |

Since these ratios are close to 1.618:1, suggest a strategy that you could use to choose another rectangle from the GSP® sketch provided. Use your strategy to choose a new rectangle and check to see if it is close to the golden ratio.
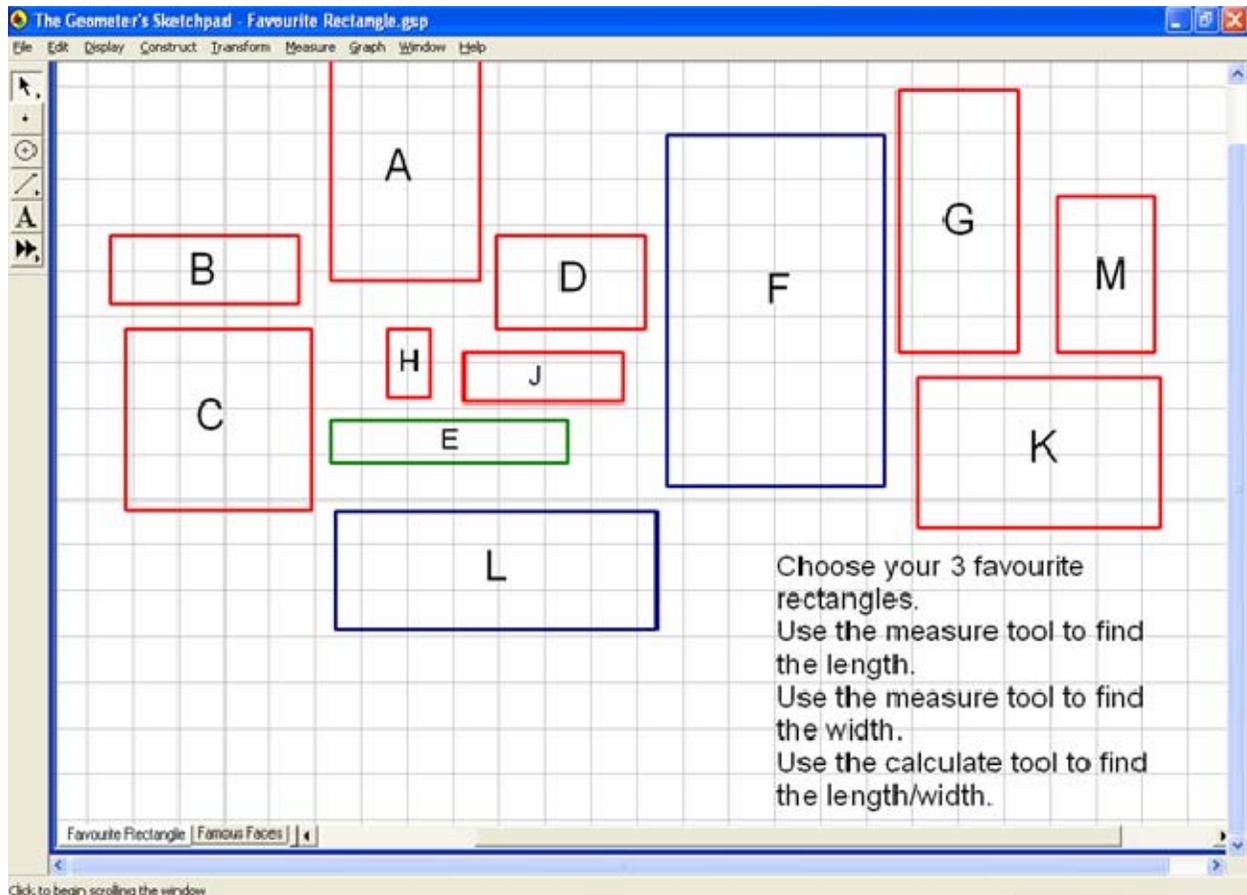
Rectangle _____     length_____     width_____     $\dfrac{length}{width}$ _____

5. Some artists used the golden rectangle in their work on purpose, but others did not. Yet many famous paintings, sculptures, and structures are composed of golden rectangles. Explain why you think this happened?

6. If you were in marketing, how would you use the golden rectangle to your advantage?

# Favourite Rectangle (GSP®4 File)

Favourite Rectangle.gsp

## Favourite Rectangle Activity