# B.2 Ratio Concept

## Ratio and Proportion *(Steiert)*

The project is designed for a Grade VII class of about 25 students in groups of five. The entire workshop will take only two or three classes, with the final class being a presentation of results. Using objects of their own experience will, I hope, stimulate and keep the interest of the pupils throughout. They are free to make observations beyond those specified.

MATERIALS Measuring tape, rulers, scale models of aircraft, cars or boats, (opportunity to compare models with originals, e.g., cars) squared paper, globes, atlas, road maps, envelopes of Christmas cards or letters received during summer holidays from out of town, solid shapes, string, cubes, books to look up statistics, paper, scissors, (11 results must be recorded).

ACTIVITIES

I. a) Using one large piece of paper, cut it into parts and compare each smaller part to the whole and each smaller part to other parts of the whole.

b) Compare the measurement of your waist to your neck. Is there a general tie within your group? Compare your height to the measurement of your arms from fingertip to fingertip. Why common ratios?

II. Check the length of your shadow several times during the day. Make a record of the shadow length and the time. The group can agree on variables which are to be kept constant. Compare your height to the length of your shadow using ratios. At what time would you expect your shadow to be the same length as your height?

III. Choose some models from a set of solids. Find the perimeter of each face. Make a chart showing how these perimeters compare.

a) Compare the perimeter of each face of a model to the perimeter of each of the other faces.

b) Compare the perimeters of the faces of the model to those of another model.

c) If a model were twice as large how would this affect the perimeters of its faces?

IV. Use unit cubes to build larger cubes. Record your findings on a chart with:

a) edge distance
b) face area
c) total surface area
d) volume
e) ratio volume/surface area.

What happens to the ratios as cubes get larger? Find other ratios from the chart.

V. Measure and record lengths of the sides of various rectangles in the room.

a) Estimate the ratio of the sides of the classroom door.

b) Using that ratio, how long would the chalkboard be if its sides were in the same ratio?

c) What would the width of the table be if its sides were in the same ratio? (Ratios of 2:1 or 4:1 could be tried first if your ratio is difficult to find.)

VI. Choose one of the following

a) Using scale models of airplanes, cars or boats, calculate dimensions of actual objects and draw life size plans. Also discover the scale of some models by comparison with the originals.

b) Using about ten cards or letters received from out of town, calculate the distances they have travelled on both a globe and a flat map. (The distance around the earth is about 250,000 miles at the equator. Use this distance and a piece of string to find the above distances.)

c) Compare distances on a globe and a flat map.

d) Use road maps to compare "crow's flight" distances to road distances.

VII. An added activity for those interested.

a) Compare the sizes of ten major cities to the number of people in them.

b) Compare the average size of the young of five animals to the size of a full-grown adult.

[*As a follow-up and perhaps reinforcement exercise, there are two sheets on ratio and proportion from "The World Book Encyclopedia Cycle-Teacher Learning Aid." This device, if available, gives the student an opportunity to do questions and correct himself.*]

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## Simple Machines: The Wheel and Axle *(Eremko)*

MATERIALS (approximately one set per station). Wooden circular discs with comparable circumferences (to keep calculations simple) or rubber-tired LEGO wheels of different sizes (or LEGO gears), tape measure, assortment of wooden dowels, strip of paper or tape, stop watch or a watch with a second hand.

### WHEEL COMPARISONS

1. Measure two different wheels. What distance would each travel if they made one revolution? two? five?

2. How many turns would it take each wheel to go 5 feet? 10 feet? 50 feet?

3. If each wheel made 10 revolutions a minute, how long would each of them take to go 100 feet?

### FIXED AXLES

1. Affix a dowel (or axle) solidly to a wheel. Compare the diameters of the axle and wheel. How many times does the axle turn for each revolution of the wheel? Attach a string to the axle and one to the wheel. What length of string is taken up in one revolution? two? five?

2. Connect another wheel solidly to the other end of the axle. Attach a string to this wheel. Does it take up string at the same speed as the first wheel? Demonstrate and record various uses of such a combination. How can this combination be used in machines?

A wheel and axle can be used to gain force or speed. To gain speed, apply force to the smaller wheel or axle. To gain force apply power to the larger wheel. When dealing with gears or wheels and axles, they can be arranged to drive other wheels or gears in a straight line or at right angles. Belts and chains are used to transfer speed and force in different directions. Basically, combinations of wheels and axles are the most common form of mechanical apparatus.

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