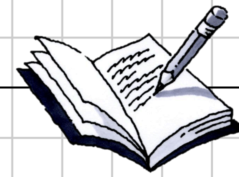
CHAPTER 1: INTRODUCTION AND PROBABILITY

Date:

Lesson:

Learning Log Title:



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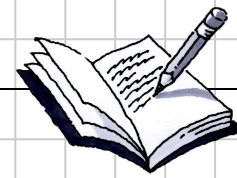

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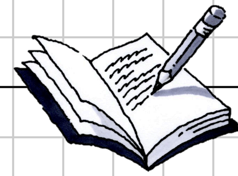
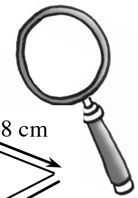


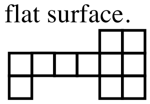
MATH NOTES

Notes:

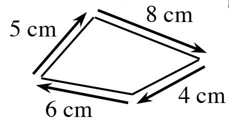
PERIMETER AND AREA



The **perimeter** of a shape is the total length of the boundary (around the shape) that encloses the interior (inside) region on a flat surface. See the examples at right.

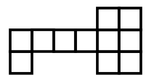


Perimeter = 20 units



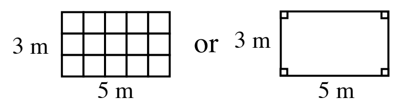
Perimeter = 5 + 8 + 4 + 6 = 23 cm

Area is a measure of the number of square units needed to cover a region on a flat surface. See the examples at right.



Area = 11 sq. units

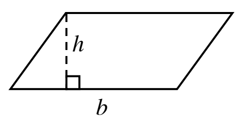
The **area of a rectangle** is found by multiplying the lengths of the base and height. See the examples at right.



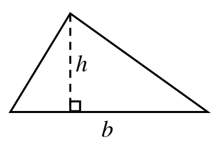
Area = $5 \cdot 3 = 15\ m^2$ (square meters)

$A = b \cdot h$

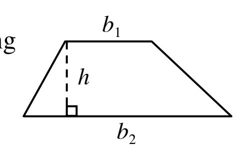
The **area of a parallelogram** is equal to the area of a rectangle with the same base and height. If the base of the parallelogram is length b and the height is length h, then the area of the parallelogram is $A = b \cdot h$.



The **area of a triangle** is half the area of a parallelogram with the same base and height. If the base of the triangle is length b and the height length h, then the area of the triangle is $A = \frac{1}{2} b \cdot h$.



Finally, the **area of a trapezoid** is found by averaging the two bases and multiplying by the height. If the trapezoid has bases b_1 and b_2 and height h, then the area is: $A = \frac{1}{2}(b_1 + b_2)h$.



Notes:

MEAN

To understand a set of data, you often need to be able to describe the approximate "center" of that data. One way to do this is to find the **mean** of the data set, which is also called the **arithmetic average**.

To find the mean of a set of data, add the values of the data elements (numbers) and then divide by the number of items of data. The mean is a useful way to describe the data when the set of data does not contain **outliers**. Outliers are numbers that are much smaller or much larger than most of the other data in the set.

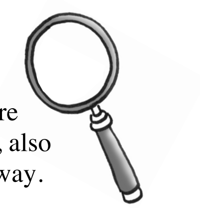
Suppose the following data set represents the number of home runs hit by the best seven players on a Major League Baseball team during one season:

16, 26, 21, 9, 13, 15, and 9.

The mean is $\frac{16+26+21+9+13+15+9}{7} = \frac{109}{7} \approx 15.57$.

This number shows that a typical player among the best seven home-run hitters on the team hits about 15 or 16 home runs each season.

MEDIAN



The mean is a useful way to find the center when data values are close together or are evenly spaced. Another tool, the **median**, also locates the approximate "center" of a set of data in a different way.

The **median** is the middle number in a set of data *arranged numerically*. If there is an even number of values, the median is the mean of the two middle numbers. The median is more accurate than the mean as a way to find the center when there are outliers in the data set.

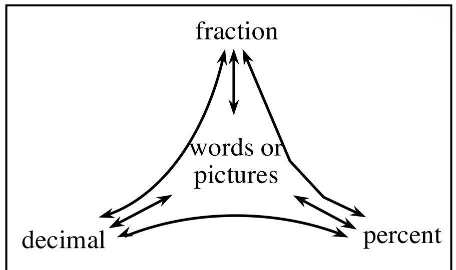
Suppose the following data set represents the number of home runs hit by the best seven players on a Major League Baseball team:

16, 26, 21, 9, 13, 15, and 9.

In this example, the median is 15. This is because when the data are arranged in order (9, 9, 13, 15, 16, 21, 26), the middle number is 15. Mean and median are called **measures of central tendency** because they each describe the "center" of a set of data, but in different ways.

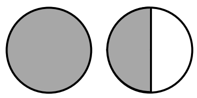
REPRESENTATIONS OF PROPORTIONS

The portions web diagram at right illustrates that fractions, decimals, and percents are different ways to represent a portion of a number. Portions can also be represented in words, such as "four-fifths" or "seven-fourths," or with diagrams such as those shown below. A complete portions web is shown below right.

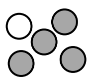


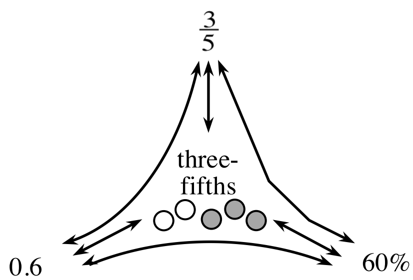
Representations of a Portion

150% of one circle is shaded:



$\frac{4}{5}$ of the objects are shaded:



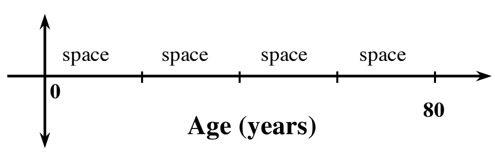


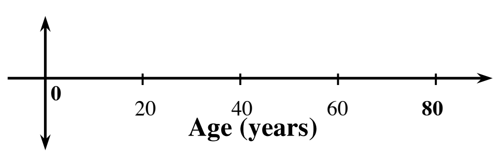
SCALING AXES

The numbers on each axis of a graph or a number line show the **scaling** of the axes. The difference between consecutive markings tells the size of the **interval**. When you scale each axis, you must use equal intervals to represent the data accurately. For example, an interval of 5 creates a scale numbered $-15, -10, -5, 0, 5, 10, 15$, etc. Unequal intervals distort the relationship in the data.

Notice on the graph at right that 80 marks the end of the *fourth* interval from zero on the horizontal axis. If you divide 80 years by 4 you can see that the length of an interval on this graph is 20.

$80 \div 4 = 20$





The second graph has each interval labeled. Labeling the graph this way is called "scaling the axis."

Notes:

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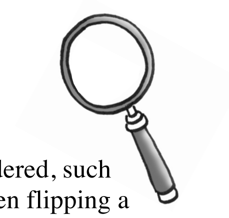
PROBABILITY VOCABULARY AND DEFINITIONS



Outcome: Any possible or actual result of the action considered, such as rolling a 5 on a standard number cube or getting tails when flipping a coin.

Event: A desired (or successful) outcome or group of outcomes from an experiment, such as rolling an even number on a standard number cube.

Sample space: All possible outcomes of a situation. For example, the sample space for flipping a coin is heads and tails; rolling a standard number cube has six possible outcomes (1, 2, 3, 4, 5, and 6).

Probability: The likelihood that an event will occur. Probabilities may be written as fractions, decimals, or percents. An event that is guaranteed to happen has a probability of 1, or 100%. An event that has no chance of happening has a probability of 0, or 0%. Events that "might happen" have probabilities between 0 and 1 or between 0% and 100%. In general, the more likely an event is to happen, the greater its probability.

Experimental probability: The probability based on data collected in experiments.

$$\text{Experimental probability} = \frac{\text{number of successful outcomes in the experiment}}{\text{total number of outcomes in the experiment}}$$

Theoretical probability is a calculated probability based on the possible outcomes when they all have the same chance of occurring.

$$\text{Theoretical probability} = \frac{\text{number of successful outcomes (events)}}{\text{total number of possible outcomes}}$$

In the context of probability, "successful" usually means a desired or specified outcome (event), such as rolling a 2 on a number cube (probability of $\frac{1}{6}$). To calculate the probability of rolling a 2, first figure out how many possible outcomes there are. Since there are six faces on the number cube, the number of possible outcomes is 6. Of the six faces, only one of the faces has a 2 on it. Thus, to find the probability of rolling a 2, you would write:

$$P(2) = \frac{\text{number of ways to roll 2}}{\text{number of possible outcomes}} = \frac{1}{6}\text{ . or } 0.1\overline{6}\text{ .or approximately } 16.7\%$$

MULTIPLICATIVE IDENTITY

If any number or expression is multiplied by the number 1, the number or expression does not change. The number 1 is called the **multiplicative identity**. So, for any number x $1 \cdot x = x \cdot 1 = x$.

One way the multiplicative identity is used is to create equivalent fractions using a Giant One.

$$\frac{2}{3} \cdot \frac{2}{2} = \frac{4}{6}$$

By multiplying a fraction by a fraction equivalent to 1, a new, equivalent fraction is created.

EQUIVALENT FRACTIONS

Fractions that are equal, but written in different forms, are called **equivalent fractions**. Rewriting a fraction in an equivalent form is useful when you want to compare two fractions or when you want to combine portions that are divided into pieces of different sizes.

A Giant One is a useful tool to create an equivalent fraction. To rewrite a fraction in a different form, multiply the original fraction by a fraction equivalent to 1. For example:

$$\frac{2}{3} \cdot \frac{4}{4} = \frac{2 \cdot 4}{3 \cdot 4} = \frac{8}{12}$$

A picture can also demonstrate that these two fractions are equivalent:

Notes: