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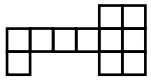
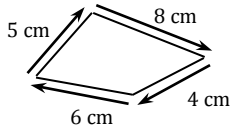
MATH NOTES

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. In the game "Toothpicks and Tiles," the number of tile side lengths (toothpicks) is the same as the **perimeter** of the shape. See the examples at right.

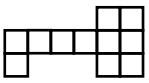


Perimeter = "toothpicks" = 20 units



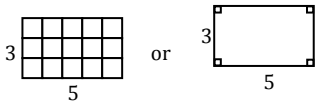
Perimeter = 5 + 8 + 4 +6 = 23 cm

The **area** of a shape is a measure of the number of square units needed to cover a region on a flat surface. In the game, the **area** is equal to the number of "tiles" in the shape.



Area = "tiles" = 11 sq. units

A **rectangle** is a quadrilateral (four sides) with four right angles. The opposite sides are equal in length. Two sides that come together (meet) at a right angle are referred to as the length and width, or base and height. The area (A) of any rectangle is found by the relationship $A = length \bullet width$.



Base = 5, Height = 3
Area = 5 • 3 = 15 square units

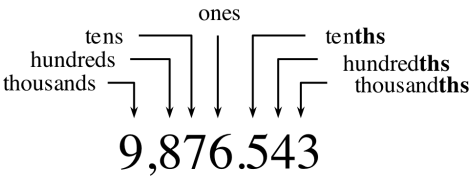
PLACE VALUE

The number assigned to each place that a digit occupies is called the **place value**. In our number system, the place values are all powers of ten.

Starting from the left side of the decimal point, the place values are: ones, tens, hundreds, thousands, ten thousands, and so on.

On the right side, the place values are ten**ths**, hundred**ths**, thousand**ths**, and so on.

In the example at right, the place occupied by 8 has the value of 100, so the value of the digit 8 is 800.



The number above is read, *"nine thousand, eight hundred seventy-six and five hundred forty-three-thousandths."*

The number 64.3 is read, *"sixty-four and three-tenths."*

The number 7.17 is read, *"seven and seventeen-hundredths."*

The only time the word "*and*" is said when reading a number is at the location of the decimal point.

ROUNDING

Sometimes you want an approximation of a number. One way to do this is to **round** the number. For example, 4,738 is 5,000 when rounded to thousands. The number 5,000 is said to be rounded "to the nearest thousand."

To round a number:

1. Find the place to which the number will be rounded.
2. Examine the digit one place to the right.
3. If the digit is 5 or greater, add 1 to the place you are rounding. If the digit is less than 5, keep the digit in the place you are rounding the same.

In the example 4,738, the number 4 is in the thousands place. If you check the hundreds place, you see that 7 is greater than 5. This means the 4 needs to be increased by 1. Here are some other examples:

Round 431.6271 to the nearest tenth.

(1) Focus on the 6 in the tenths place.
(2) The number to the right (in the hundredths place) is 2. This is less than 5.
(3) 431.6 is the answer.

Round 17,389 to the nearest hundred.

(1) Focus on the 3 in the hundreds place.
(2) The number to the right (in the tens place) is 8. This is more than 5.
(3) 17,400 is the answer.

CONJECTURE AND JUSTIFY

A **conjecture** is a statement that appears to be true. It is an educated guess.

To **justify** a conjecture is to give reasons why your conjecture makes sense. In this course you will justify conjectures by using observations of a pattern, an algebraic validation, or some other logical method.

COMPARISONS

Mathematical symbols are used to compare quantities. The most commonly used symbols are the two inequality signs (< and >) and the equal sign (=). You can see how these symbols are used below.

greater than: >	$7 > 5$
less than: <	$3 < 5$
equal to: =	$1 + 2 = 3$
greater than or equal to: ≥	$4 \geq 4$
less than or equal to: ≤	$8 \leq 9$

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NATURAL, WHOLE, AND PRIME NUMBERS

The numbers {1, 2, 3, 4, 5, 6, …} are called **natural numbers** or **counting numbers**. A natural number is **even** if it is divisible by two with no remainder. Otherwise the natural number is **odd**. The **whole numbers** include the natural numbers and zero.

If one natural number divides another without remainder, the first one is called a **factor** of the second. For example, the factors of 12 are 1, 2, 3, 4, 6, and 12. If a number has exactly two factors (1 and itself), it is called a **prime number**. If a number has more than two factors it is called a **composite number**. The number 1 has only one factor, so it is neither prime nor composite.

The prime numbers less than 40 are: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, and 37.