



# MATH

STUDENT BOOK

▶ **10th Grade | Unit 1**

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# MATH 1001

## A Mathematical System

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**LIFEPAC Test is located in the center of the booklet.** Please remove before starting the unit.

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# A Mathematical System

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## Introduction

A mathematical system is a logical study of shape, arrangement, and quantity. Algebra, geometry, trigonometry, and calculus are examples of mathematical systems. Geometry is the logical study of the shape and size of things. The word geometry comes from the Greek and means *earth measurement*. Any mathematical system contains four items:

- Basic undefined terms.
- All other terms carefully defined.
- Some basic properties that are accepted without proof. (These are called *postulates*.)
- All other properties that are established by proof. (These are called *theorems*.)

## Objectives

**Read these objectives.** The objectives tell you what you will be able to do when you have successfully completed this LIFEPAAC®. When you have finished this LIFEPAAC, you should be able to:

1. Identify, draw, and label models of undefined terms and defined terms.
2. Define some basic geometric terms.
3. Define *postulate* and *theorem*, and recognize a model of each.
4. Describe the four items that are involved in a mathematical system.



# 1. UNDEFINED TERMS

In geometry there are three terms that we do not attempt to define. They are point, line, and plane. These three terms are the foundation upon which geometry is built.

## Section Objective

When you have completed this section, you should be able to:

1. Identify, draw, and label models of undefined terms and defined terms.

## POINTS

A *point* cannot be seen. It has no size, no shape, no color, no physical properties. It is an imaginary thing. We do, however, represent a point on paper by a dot. A point has position or location.

To be able to talk about a point, we name it with a capital letter and show it on paper as a dot.

Five locations or positions on this page are points and are named *A*, *B*, *C*, *D*, and *E*. More than five points are on the page. In fact, the number of points on this page is infinite.

•  
*A*

•  
*D*

*C*  
•

•  
*B*

•  
*E*



### Complete the following activities.

1.1 We think of a point as a \_\_\_\_\_ .

1.2 A point is represented by \_\_\_\_\_ .

1.3 Place names on these points.



1.4 How many points are located on this page? \_\_\_\_\_

1.5 What physical characteristics do points have? \_\_\_\_\_

1.6 Have you ever seen a point? \_\_\_\_\_

## LINES

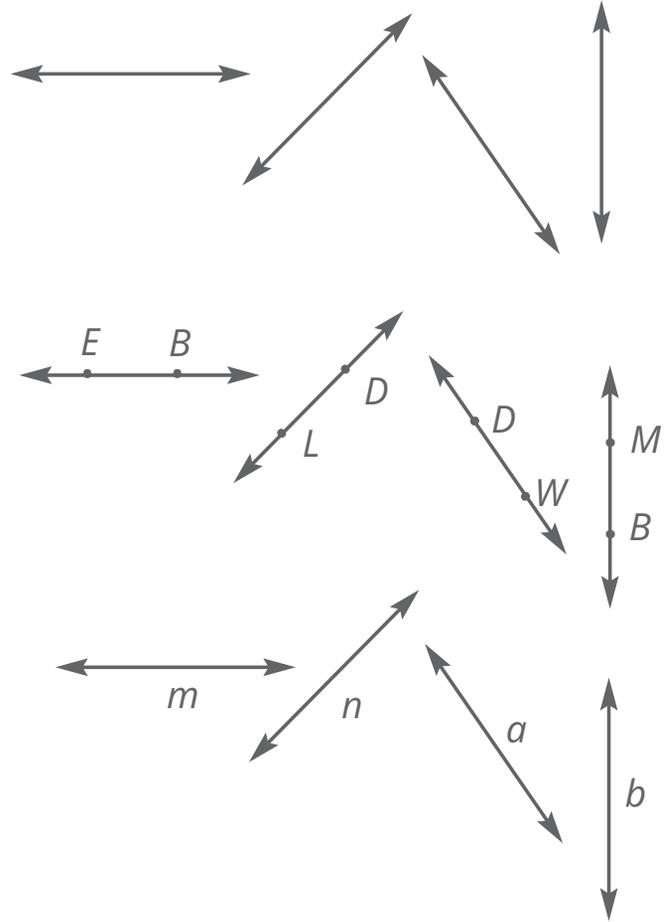
A *line* can be thought of as a collection of points that are lined up one after the other and extend infinitely far in opposite directions. A line in geometry is straight, not curved or bent. Since there are an infinite number of points on this page they can be lined up to form an infinite number of lines.

We represent a line on paper like this:



The arrowheads on the ends tell us the line extends indefinitely. Since a line is made up of points, it has no thickness or other physical characteristics. A line is named by naming two of its points and placing a double-pointed arrow above the two letters.

To the right are four lines named  $\overleftrightarrow{EB}$ ,  $\overleftrightarrow{LD}$ ,  $\overleftrightarrow{DW}$ , and  $\overleftrightarrow{MB}$ . A line may also be named by using a single lower-case letter as illustrated.



### Supply the information required.

1.7 We think of a line as a collection of \_\_\_\_\_.

1.8 Unless otherwise indicated, a line in geometry is understood to be (straight, curved, either) \_\_\_\_\_.

1.9 Name the following lines.



a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_

1.10 How many lines are contained on this page? \_\_\_\_\_

1.11 What is indicated by arrowheads on a line? \_\_\_\_\_

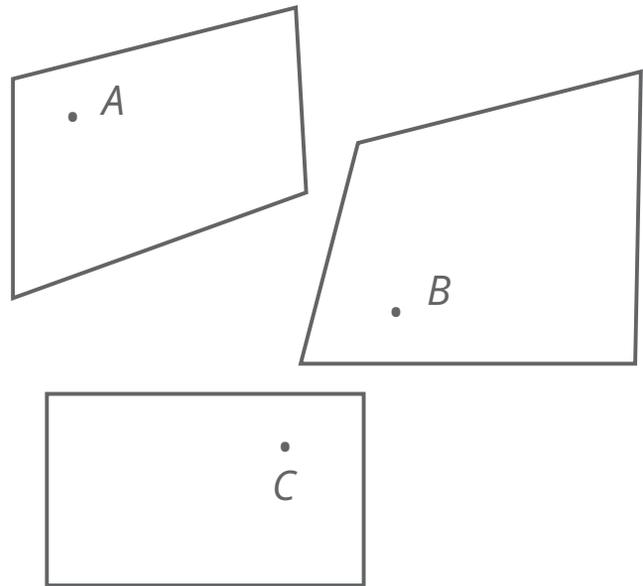
## PLANES

A *plane* can be thought of as a collection of points in a flat surface that extends in all directions without stopping. To represent a plane, a figure is drawn like the ones illustrated.

(Remember that the edges are not really there.)

A plane is named by using the name of one of its points. Thus we have plane *A*, plane *B*, and plane *C*. As with points and lines, planes do not have any physical properties. A billion planes could be stacked

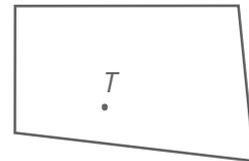
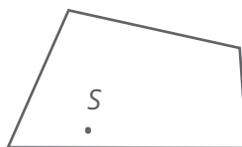
in a pile and still not have enough thickness to be measured. **A plane is defined by at least three points not all on the same line.**



**Write the following information.**

**1.12** A plane can be thought of as a (flat, curved) a. \_\_\_\_\_ surface, made up of  
b. \_\_\_\_\_.

**1.13** Name the following planes.



a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_

**1.14** How long is a plane? \_\_\_\_\_

**1.15** How thick is a plane? \_\_\_\_\_

**1.16** Can planes be seen? \_\_\_\_\_

We may also use models to represent points, lines, and planes. Representing geometric shapes in some tangible way will help to illustrate some of their mutual relationships.

The sharp end of a pin, tack, or pencil, for example, can be a model for a point. A pencil, meter stick, or soda straw can represent a line. A table top, sheet of cardboard, or wall in a room can be a model for a plane.

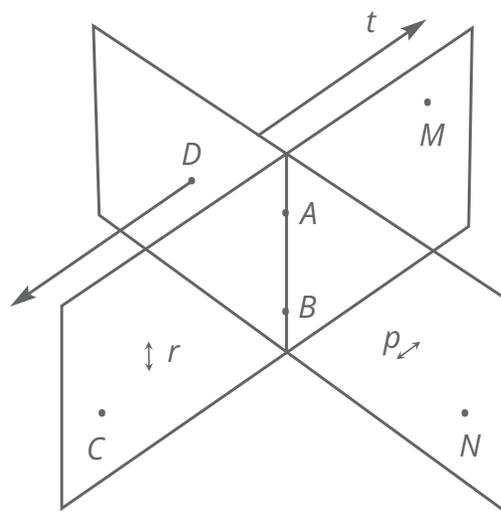
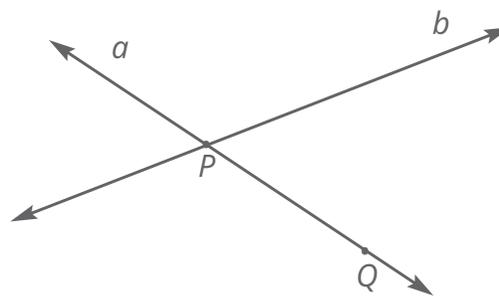
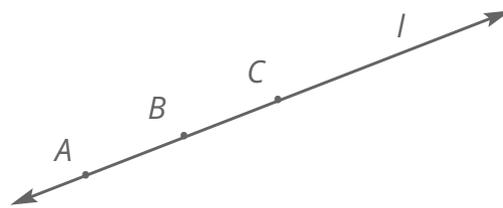
Here are some ways points, lines, and planes are related. Note the terms used in talking about points, lines, and planes.

Points  $A$  and  $B$  are on line  $l$ . Line  $l$  contains points  $A$ ,  $B$ , and  $C$ .  $C$  is a point of  $\overleftrightarrow{AB}$ .

Lines  $a$  and  $b$  intersect at point  $P$ .  $Q$  is not a point of line  $b$ .

Plane  $M$  and plane  $N$  intersect at  $\overleftrightarrow{AB}$ . Their intersection is  $\overleftrightarrow{AB}$ . Point  $C$  is in plane  $M$  but not in plane  $N$ . Line  $t$  intersects plane  $N$  at point  $D$ . Plane  $M$  contains line  $r$ . Every point of line  $r$  is in plane  $M$ .

Points  $A$  and  $B$  are in both planes  $M$  and  $N$ .



## TEACHER CHECK



initials

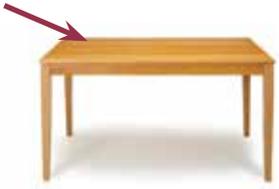
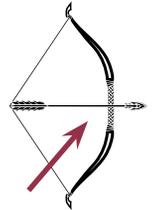
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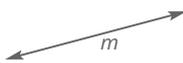
**Review the material in this section in preparation for the Self Test.** The Self Test will check your mastery of this particular section. The items missed on this Self Test will indicate specific areas where restudy is needed for mastery.

# SELF TEST 1

Name the undefined terms for which each is a model (each answer, 3 points).

	<b>Figure 1</b>	<b>Figure 2</b>	<b>Figure 3</b>
1.01			
1.02			
1.03			
	<b>Figure 4</b>	<b>Figure 5</b>	<b>Figure 6</b>
1.04			
1.05			
1.06			

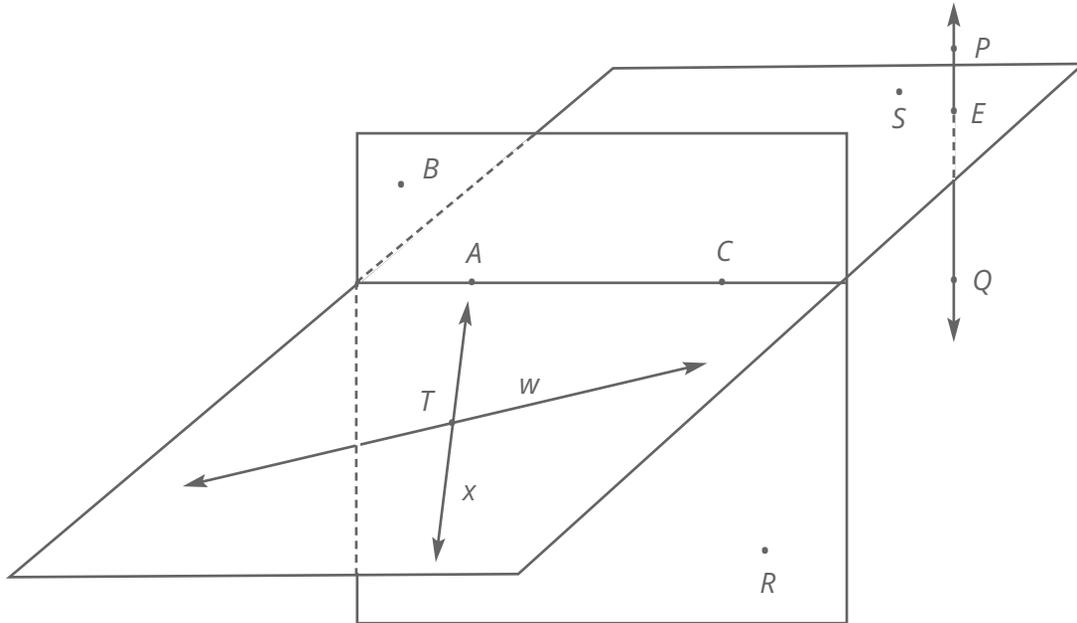
Match the description in Column II with its model in Column I (each answer, 2 points).

	Column I	
1.07	• <i>B</i>	_____
1.08		_____
1.09		_____
1.010	• <i>T</i>	_____
1.011		_____
1.012		_____

### Column II

- a.  $\overleftrightarrow{MN}$
- b. Point *T*
- c. Plane *R*
- d. Plane *S*
- e. Point *B*
- f. Line *m*

Refer to the model and complete the statements (each answer, 2 points).



- 1.013 The intersection of plane  $S$  and plane  $R$  is \_\_\_\_\_ .
- 1.014 Line  $PQ$  a. \_\_\_\_\_ plane  $S$  at point b. \_\_\_\_\_ .
- 1.015 Line  $w$  and line  $x$  intersect at \_\_\_\_\_ .
- 1.016 Points  $B$  and  $R$  are in plane \_\_\_\_\_ .
- 1.017 Name three lines shown to be in plane  $S$ .  
 a. \_\_\_\_\_ b. \_\_\_\_\_ c. \_\_\_\_\_
- 1.018 Line  $w$  lies in plane \_\_\_\_\_ .
- 1.019 Name all the points shown to be in plane  $S$ . \_\_\_\_\_
- 1.020 Name all the points shown to be in plane  $R$ . \_\_\_\_\_

<div style="border: 1px solid black; padding: 5px; display: inline-block;">                 42  <hr style="width: 50%; margin: 0;"/>                 52             </div>	<b>SCORE</b> _____	<b>TEACHER</b> _____	initials _____ date _____
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