

Section 1: Introduction to Geometry – Points, Lines and Planes

The following Mathematics Florida Standards will be covered in this section:

MAFS.912.G-CO.1.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
MAFS.912.G-GPE.2.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.
MAFS.912.G-GPE.2.6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
MAFS.912.G-GPE.2.7	Use coordinates to compute the perimeter of polygons and areas of triangles and rectangles.

Topics in this Section

- Topic 1: Basics of Geometry – Part 1
- Topic 2: Basics of Geometry – Part 2
- Topic 3: Midpoint and Distance in the Coordinate Plane – Part 1
- Topic 4: Midpoint and Distance in the Coordinate Plane – Part 2
- Topic 5: Partitioning a Line Segment – Part 1
- Topic 6: Partitioning a Line Segment – Part 2
- Topic 7: Parallel and Perpendicular Lines – Part 1
- Topic 8: Parallel and Perpendicular Lines – Part 2



Section 1 – Topic 1
Basics of Geometry – Part 1

What is **geometry**?

Geometry means “_____,” and it involves the properties of points, lines, planes and figures.

What concepts do you think belong in this branch of mathematics?

Why does geometry matter? When is geometry used in the real world?

Points, lines, and planes are the building blocks of geometry.

Draw a representation for each of the following definitions and fill in the appropriate notation on the chart below.

Definition	Representation	Notation
A point is a precise location or place on a plane. It is usually represented by a dot.		
A line is a straight path that continues in both directions forever. Lines are one-dimensional.		
A line segment is a portion of a line located between two points.		
A ray is a piece of a line that starts at one point and extends infinitely in one direction.		
A plane is a flat, two-dimensional object. It has no thickness and extends forever.		



Definition	Representation	Notation
An angle is formed by two rays with the same endpoint.		
The point where the rays meet is called the vertex .		
Parallel lines are two lines on the same plane that do not intersect.		
Perpendicular lines are two intersecting lines that form a 90° angle.		

What can you say about multiple points on a line segment?

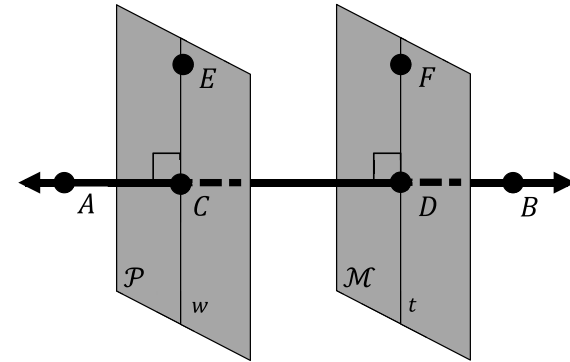
TAKE NOTE!
Postulates &
Theorems

Segment Addition Postulate

If three points, A , B , and C , are collinear and B is between A and C , then $AB + BC = AC$.

Let's Practice!

- Consider the diagram below with parallel planes \mathcal{P} and \mathcal{M} .



For each figure written below, give at most 3 names that represents the figure in the diagram above.

Figure	Name(s) denoted in diagram
Point	
Line	
Line Segment	
Plane	
Ray	
Angle	
Parallel Lines	
Perpendicular Lines	
Segment Addition Postulate	



Try It!

2. Consider the definitions of points, lines, and planes you have learned so far.

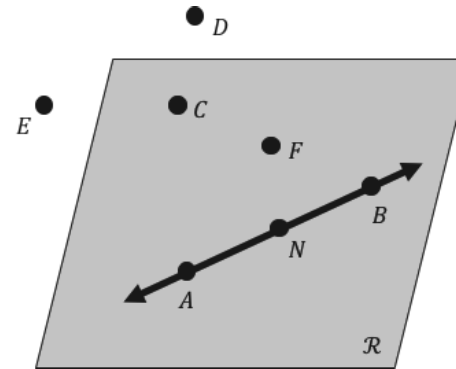
Use the word bank to complete the definitions below. Draw a representation of each one.

Word Bank	Parallel Planes ♦ Coplanar ♦ Parallel Lines Collinear ♦ Nonlinear	
Definition	Points that lie on the same plane are _____.	Points that lie on the same line are _____.
Drawing		

Section 1 – Topic 2
Basics of Geometry – Part 2

Let's Practice!

1. Consider the figure below.



Select all the statements that apply to this figure.

- $A, B, C,$ and D are coplanar in \mathcal{R} .
- $A, B, C,$ and F are collinear.
- $A, B,$ and N are collinear and coplanar in \mathcal{R} .
- B lies on \overrightarrow{AN} .
- A, C and F are coplanar in \mathcal{R} .
- C, D, E and F lie on \mathcal{R} .
- $\overline{AN} + \overline{NB} = \overline{AB}$



Try It!

2. Plane Q contains \overline{AB} and \overrightarrow{BC} , and it also intersects \overleftrightarrow{PR} only at point M .

Sketch plane Q .

For points, lines, and planes, you need to know certain postulates.



A **postulate** is a statement that we take to be automatically true. We do not need to prove that a postulate is true because it is something we assume to be true.

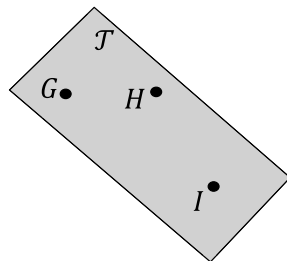
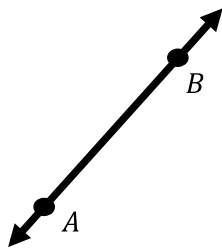
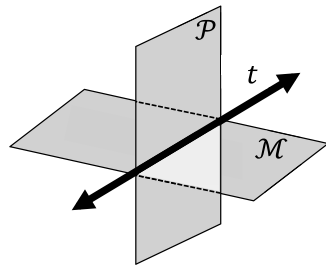
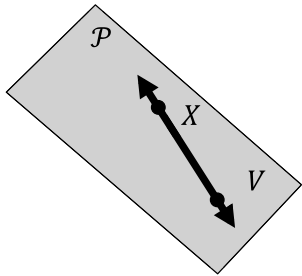
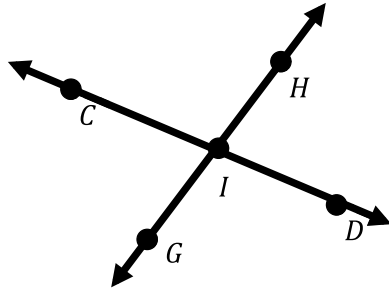
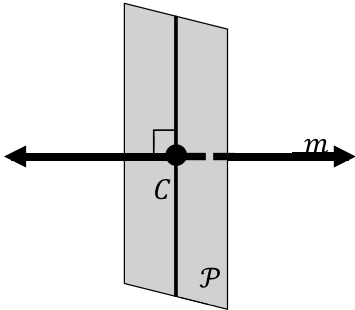
Let's examine the following postulates A through F.

- A. Through any two points there is exactly one line.
- B. Through any three non-collinear points there is exactly one plane.
- C. If two points lie in a plane, then the line containing those points will also lie in the plane.
- D. If two lines intersect, they intersect in exactly one point.
- E. If two planes intersect, they intersect in exactly one line.
- F. Given a point on a plane, there is one and only one line perpendicular to the plane through that point.



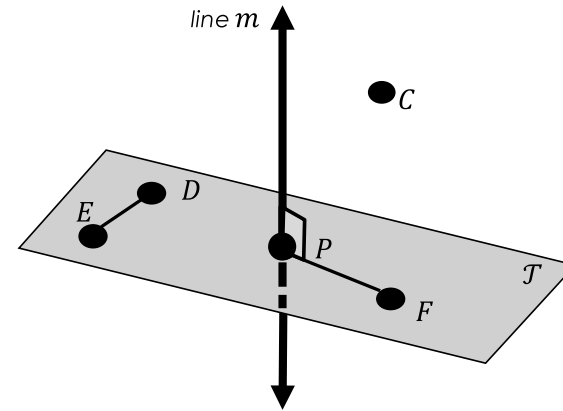
Let's Practice!

3. Use postulates A through F to match each visual representation with the correct postulate.



BEAT THE TEST!

1. Consider the following figure.



Select all the statements that apply to this figure.

- m is perpendicular through P to J .
- $C, D, E,$ and F are coplanar in J .
- $D, P,$ and F are collinear.
- \overline{FC} is longer than \overline{DF} .
- \overline{DE} and \overline{PF} are coplanar in J .

