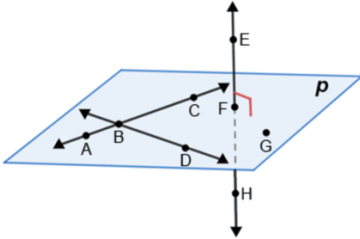


Check Your Understanding 1.2

Basic	Intermediate	Advanced
Row 1 Spiral — What Makes a Good Definition → Classification and differentiation		
<i>Basic — Spiral</i> 1. A student defines a rectangle as: 'A shape with four sides.' Is this a good definition? What does it classify correctly? What does it fail to differentiate?	<i>Intermediate — Spiral</i> 2. Write a definition for 'even number' using classification and differentiation. Then write a definition for 'right triangle.' For each, test your definition against two examples and two non-examples.	<i>Advanced — Spiral</i> 3. A definition must include all examples and exclude all non-examples. A student defines a polygon as: 'A closed figure made of straight lines.' Test this definition against: a circle, a square, a figure-eight shape, and an open triangle (three line segments, no closed shape). Revise the definition if any test fails.
The Foundational Objects → Naming what we reason about		
<i>Basic</i> 4. Define each term and draw a labeled diagram for each. (a) Point (b) Line (c) Ray (d) Line segment (e) Plane 5. Write the correct notation for each. (a) A line through A and B. (b) A ray starting at C through D. (c) A segment with endpoints P and Q.	<i>Intermediate</i> 6. Look at the diagram and identify each object using correct notation.  Image from https://www.math.net/plane (a) Two lines. (b) Three segments. (c) A set of collinear points. (d) A set of non-collinear points.	<i>Advanced</i> 7. Your younger cousin says lines and line segments are 'basically the same thing.' Write a precise explanation using the definitions correctly. 8. Why are point, line, and plane undefined terms? What connects this to what you learned about definitions in Lesson 1.1? 9. Why are two points not sufficient to define a plane? Explain carefully.
Algebra Spiral Simplify	<i>Algebra Spiral</i> Simplify each expression completely. (a) $7x^2 - 2x + 3x^2 - 8x$ (b) $6(2a - 1) - 4(a + 3)$ (c) $(8y^3 - 5y + 3) - (2y^3 - y + 7)$	

Answers — CYU 1.2**Row 1 Spiral**

1. Not a good definition. Classifies correctly as a shape with 4 sides. Fails to differentiate from 4 sided shapes that don't have 4 right angles.
2. Even number: an integer (category) divisible by 2 (differentiation). Right triangle: a triangle (category) with exactly one 90° angle (differentiation). Accept any clear examples and non-examples.
3. Circle: fails — not made of straight lines → definition correctly excludes it. Square: passes. Figure-eight: closed and made of straight lines but not a polygon (it self-intersects) → definition fails to exclude it. Open triangle: not closed → correctly excluded. Revised: a closed, non-self-intersecting figure made of straight line segments.

The Foundational Objects

4. Accept any accurate definition with a correctly labeled diagram. Key features: point — location only; line — infinite in both directions; ray — one endpoint, infinite one direction; segment — two endpoints, finite; plane — flat, infinite in two dimensions.
 - 5a. Line AB (with double arrow over AB)
 - 5b. Ray CD (arrow over CD from C)
 - 5c. Segment PQ (bar over PQ)
6. Answers will vary
7. A line has no endpoints and extends infinitely in both directions. A segment has exactly two endpoints and a finite length. They share two points but differ fundamentally in boundedness.
8. Point, line, and plane are so fundamental that any attempt to define them requires terms that are equally basic or would create a circular definition. As we saw with definitions in Lesson 1.1, every system of definitions must eventually bottom out in agreed-upon starting terms.
9. Two points determine a line. That line can tilt at any angle through space, lying in infinitely many different planes. A third non-collinear point pins the plane to exactly one orientation.

Algebra Spiral

- (a) $10x^2 - 10x$
- (b) $8a - 18$
- (c) $6y^3 - 4y - 4$