Notes

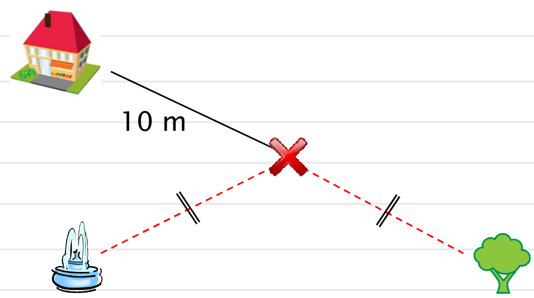
Chapter 01: Points, Lines, Planes, and Angles

Unit 1: Some Basic Figures

Section 1: A Game and Some Geometry

Find the treasure by picking a point that satisfies the following clues:

1. is as far from the fountains as from the oak tree
2. is 10 m (meters) from the building
3. is not the point X.



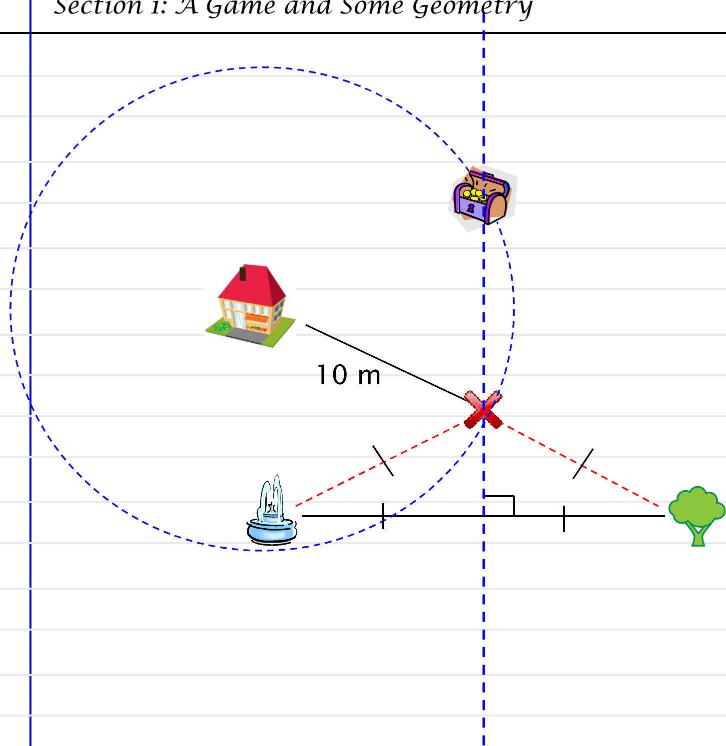
How can you find the treasure?

Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 1: Some Basic Figures

Section 1: A Game and Some Geometry



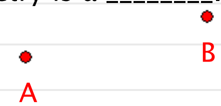
Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 1: Some Basic Figures

Section 2: Points, Lines, and Planes

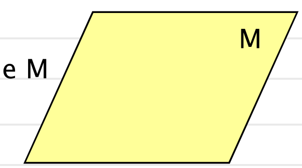
A simplest figure in geometry is a ________. It has no size, nor dimension.



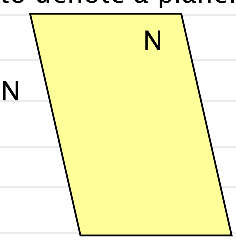
A _______ extends in two directions without ending. Line AB or line BA is denoted by $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$.

A geometric _______ is suggested by a floor, wall, or table top. Unlike the items listed, however, a plane extends without boundary. It is without thickness. We'll, however, show edges to denote a plane.

plane M



plane N



In geometry, the terms *point, line,* and *plane* are accepted as intuitive ideas and are not defined. These *undefined terms* are then used in the definitions of other terms.

Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 1: Some Basic Figures

Section 2: Points, Lines, and Planes

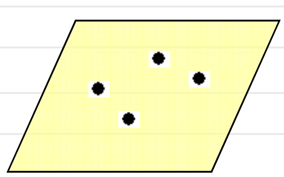
________ is the set of all points.

____________ points are points all in one line.

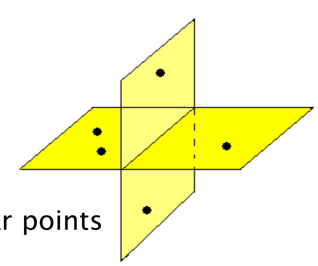
Collinear points

Noncollinear points

_______________ are points all in one plane.



Coplanar points



Noncoplanar points

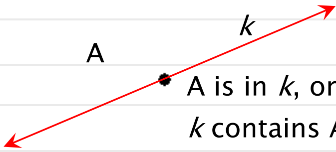
Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 1: Some Basic Figures

Section 2: Points, Lines, and Planes

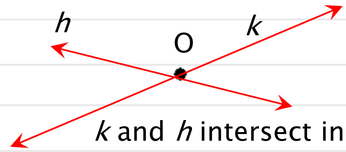
The _____________ of two figures is the set of points that are in both figures.



A is in *k*, or A is on *k.*

k contains A.

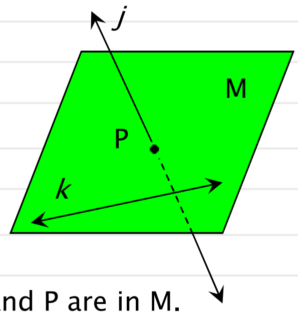
k passes through A.

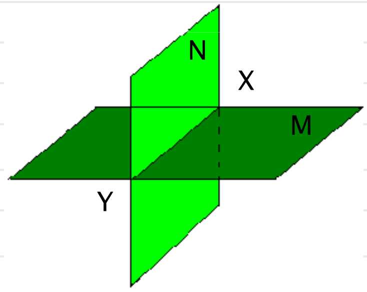


k and *h* intersect in O.

k and *h* intersect on O.

O is the intersection of k and *h*.





k and P are in M.

M contains *k* and P.

j intersects M at P.

P is the intersection of *j* and M.

M and N intersect in line XY.

line XY is the intersection of M and N.

line XY is in M and N.

M and N contains line XY.

Extra

Chapter 01: Points, Lines, Planes, and Angles

Unit 1: Some Basic Figures

Quick Quiz

Classify each statement as true or false. Justify your answer.

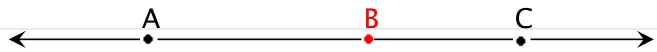
1. All points on a line are coplanar.

2. A line has one endpoint.

3. A point is named by a capital letter.

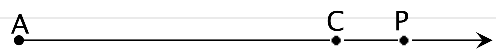
4. Two lines intersect in two points.

5. The edge of a plane is a line.



The point B is between points A and C. Note that B must lie on line AC.

Segment AC, denoted $\overline{AC}$, consists of points A and C and all points that are between A and C. Points A and C are called the __________ of $\overline{AC}$.

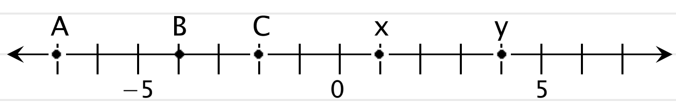


Ray AC, denoted $\overrightarrow{AC}$, consists $\overline{AC}$ and all other points P such that C is between A and P. The *endpoint* of $\overrightarrow{AC}$ is A, the point named first.

Ray BA and ray BC, from above, are called ___________ rays.
B is __________ A and C.

Notes

Chapter 01: Points, Lines, Planes, and Angles
Unit 2: Definitions and Postulates
Section 3: Segments, Rays, and Distance



The length of segment BC ($\overline{BC}$), denoted by BC, is the distance between B and C.

Find the value of the following:

(a) CA (b) BC (c) $|x-y|$ (d) AB

Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 2: Definitions and Postulates

Section 3: Segments, Rays, and Distance

Postulate 1 Ruler Postulate

1. The points on a line can be paired with the real numbers in such a way that any two points can have coordinates 0 and 1.
2. Once a coordinate system has been chosen in this way, the distance between any two points equals the absolute value of the difference of their coordinates.

Postulate 2 Segment Postulate

If B is between A and C, then

$$AB+BC=AC.$$

<u>Example</u>

B is between A and C, with AB=2x, BC=x+3, and AC=30. Find:

(a) the value of x (b) BC

Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 2: Definitions and Postulates

Section 3: Segments, Rays, and Distance

In Geometry two objects that have the *same size and shape* are called ________________. In other words, ______________ means having a same measurement.

Congruent segments are segments that have equal lengths.

To indicate that $\overline{DE}$ and $\overline{FG}$ have equal lengths, we write

$$DE=FG.$$

To indicate that $\overline{DE}$ and $\overline{FG}$ are congruent, we write

$$\overline{DE} \cong \overline{FG}.$$

Notes

Chapter 01: Points, Lines, Planes, and Angles
Unit 2: Definitions and Postulates
Section 3: Segments, Rays, and Distance

The __________ of a segment is the point that divides the segment into two congruent segments.

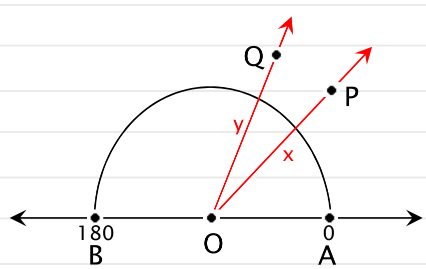
A _________ of a segment is a line, segment, ray, or plane that intersects the segment at its midpoint.

Notes

Chapter 01: Points, Lines, Planes, and Angles
Unit 2: Definitions and Postulates
Section 4: Angles

Postulate 3 Protractor Postulate

On line AB in a given plane, choose any point O between A and B. Consider ray OA and ray OB and all the rays that can be drawn from O on one side of line AB. These rays can be paired with the real numbers from 0 to 180 in such a way that: (a) Ray OA is paired with 0, and ray OB with 180. (b) If ray OP is paired with x, and ray OQ with y, then measure of angle POQ is $|x-y|$.



Postulate 4 Angle Addition Postulate

If point B lies in the interior of angle AOC, then

$$m\measuredangle AOB + m\measuredangle BOC = m\measuredangle AOC.$$

If $\measuredangle AOC$ is a straight angle and B is any point not on line AC, then

$$m\measuredangle AOB + m\measuredangle BOC = 180.$$

Notes

Chapter 01: Points, Lines, Planes, and Angles
Unit 2: Definitions and Postulates
Section 4: Angles

_____________ **angles** are angles that have equal measures.

___________ **angle** (denoted:) are two angle in a plane that have a common vertex and a common side, but no common interior points.

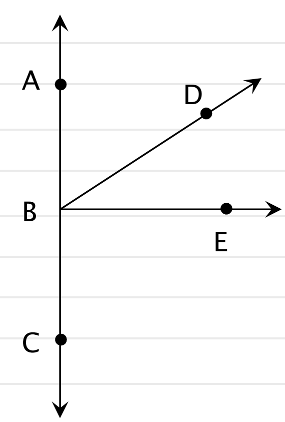
The __________ **of an angle** is the ray that divides the angle into two congruent adjacent angles.

Notes

Chapter 01: Points, Lines, Planes, and Angles
Unit 2: Definitions and Postulates
Section 4: Angles

There are things that you can assume in Geometry, and there are things you can't. Let figure them out.

List all the conclusion from the diagram on the right.



All points shown are _____________.
line AB, ray BD, and ray BE intersect at _____.
A, B, and C are __________
∠ABC is a _________ angle.
D is in the __________ of ∠ABE.
∠ABD and ∠DBE are ___________ angles.

(1) You can't assume size or measurement. This means that you can't assume congruence and right angle.
(2) You can assume relative positions and collinearity.

Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 2: Definitions and Postulates

Section 5: Postulates and Theorems Relating Points, Lines, and Planes

Postulate 5

A line contains at least two points; a plane consists at least three points not all in one line; space contains at least four points not all in one plane.

Postulate 6

Through any two points there is exactly _______ line.

Postulate 7

Through any three points there is **at least** _________ plane, and through any three noncollinear points there is __________ one plane.

Postulate 8

If two points are in a plane, then the line that contains the points is _____ that plane.

Postulate 9

If two planes intersect, then their intersection is a _______.

Notes

Chapter 01: Points, Lines, Planes, and Angles

Unit 2: Definitions and Postulates

Section 5: Postulates and Theorems Relating Points, Lines, and Planes

Theorem 1-1

If two lines intersect, then they intersect in exactly _______ point.

Theorem 1-2

Through a line and a point not in the line there is exactly ______ plane.

Theorem 1-3

If two lines intersect, then exactly _________ plane contains the lines.

<u>Example</u>

Classify each statement as true or false. Give the definition, postulate or theorem that supports your conclusion.

1. A given triangle can lie in more than one plane.

2. Any two points are collinear.

3. Two planes can intersect in only one point.

4. Two lines can intersect in two points.

Extra

Chapter 01: Points, Lines, Planes, and Angles

Unit 2: Definitions and Postulates

Quick Quiz

Complete with always, sometimes, or never.

1. Two points _____________ lie in exactly one line.
2. Three points _____________ lie in exactly one line.
3. Three points _____________ lie in exactly one plane.
4. Three collinear points _____________ lie in exactly one plane.
5. Two planes _____________ intersect.
6. Two intersecting planes _____________ intersect in exactly one point.
7. Two intersecting lines _____________ intersect in exactly one point.
8. Two line _____________ intersect in exactly one point.
9. Two intersecting lines _____________ lie in exactly one plane.
10. A line and a point not on that line _____________ lie in more than one plane.
11. A line _____________ contains exactly one point.
12. When A and B are in a plane, line AB _____________ in that plane.