Section 1.1 – Introduction Worksheet 1

Understanding Points, Lines, and Planes (undefined terms in geometry)

A **point** has no size. It is named using a capital letter.
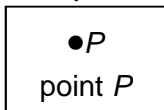All the figures below contain points.

●*P*

point *P*

Figure	Characteristics	Diagram	Symbols
line	0 endpoints extends forever in two directions		$\overleftrightarrow{AB}$
line segment or segment	2 endpoints has a finite length		$\overline{XY}$
ray	1 endpoint extends forever in one direction		$\overrightarrow{RQ}$ *A ray is named starting with its endpoint.*
plane	extends forever in all directions		*FGH* (3 or more letters) $\mathcal{V}$ (Capital cursive letter)

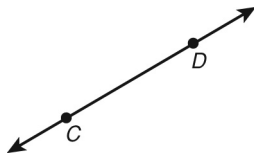**Draw and label a diagram for each figure.**

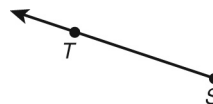1. point *W*

2. $\overleftrightarrow{MN}$

3. $\overline{JK}$

4. $\overrightarrow{EF}$
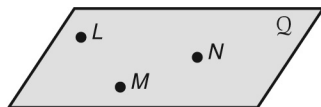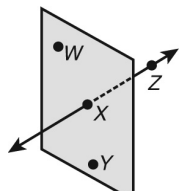
Name each figure using symbols.

5.

_____

6.

_____
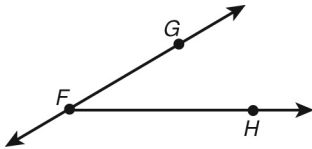
7. Name the plane in two different ways.

_____

8.

_____

Understanding Points, Lines, and Planes continued

Term	Meaning	Model
collinear	points that lie on the same line	
noncollinear	points that do not lie on the same line	*F* and *G* are collinear. *F*, *G*, and *H* are noncollinear.
coplanar	points or lines that lie in the same plane	
noncoplanar	points or lines that do not lie in the same plane	*W*, *X*, and *Y* are coplanar. *W*, *X*, *Y*, and *Z* are noncoplanar. 3 noncollinear points form a plane.

Figures that intersect share a common set of points. In the first model above, $\overleftrightarrow{FH}$ intersects $\overrightarrow{FG}$ at point *F*. In the second model, $\overrightarrow{XZ}$ intersects plane *WXY* at point *X*.

Use the figure for Exercises 9–14. Name each of the following.
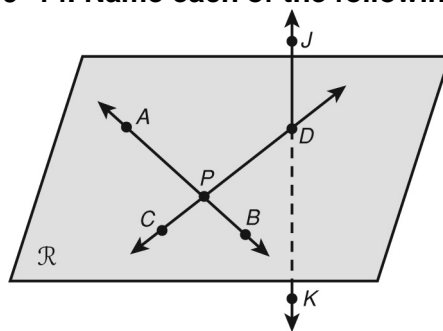
9. three collinear points

_____

10. three noncollinear points

_____

11. four coplanar points

_____

12. four noncoplanar points

_____

13. two lines that intersect $\overleftrightarrow{CD}$

_____

14. the intersection of $\overleftrightarrow{JK}$ and plane $\mathcal{R}$

_____

Name _____ Date _____ Class_____

Section 1.1 Worksheet 2

Understanding Points, Lines, and Planes

Fill in the blank with the appropriate vocabulary.

1. Name the points that determine plane *ABC*._____

2. Two points determine one _____ .

3. Collinear points lie on the same _____.

4. Three noncollinear points determine a _____.

5. Coplanar points lie in the same _____.

Answer each question.

6. How are a line and a line segment the same?

    _____

7. How are a line and a line segment different?

    _____

8. How are a line segment and a ray the same?

    _____

9. How are a line segment and a ray different?

    _____

    _____

Choose the best answer.

10. In a building, planes $\mathcal{W}$, $\mathcal{X}$, and $\mathcal{Y}$ represent each of the three floors; planes $\mathcal{Q}$ and $\mathcal{R}$ represent the front and back of the building; planes $\mathcal{S}$ and $\mathcal{T}$ represent the sides. Which is a true statement?

    A Planes $\mathcal{W}$ and $\mathcal{Y}$ intersect in a line.
    B Planes Q and $\mathcal{X}$ intersect in a line.
    C Planes $\mathcal{W}$, $\mathcal{X}$ and $\mathcal{T}$ intersect in a point.
    D Planes $\mathcal{Q}$, $\mathcal{R}$, and $\mathcal{S}$ intersect in a point.

11. Suppose point *G* represents a duck flying over a lake, points *H* and *J* represent two ducks swimming on the lake, and plane $\mathcal{Z}$ represents the lake. Which is a true statement?

    F There are two lines through *G* and *J*.

    G The line containing *G* and *H* lies in plane $\mathcal{Z}$

    H *G*, *H*, and *J* are noncoplanar.

    J There is exactly one plane containing points *G*, *H*, and *J*.

Section 1.1 Worksheet 3

Understanding Points, Lines, and Planes

Use the figure for Exercises 1–3.

1. "This is plane *HIJ*." Explain why this statement is incorrect.

   _____

   _____
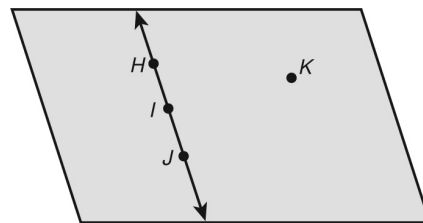
2. Name the plane.

   _____

3. Give six names for the line._____

4. Explain why $\overrightarrow{ST}$ and $\overrightarrow{TS}$ are or are not the same figure.

   _____

   _____

5. Explain why $\overrightarrow{ST}$ and $\overrightarrow{TS}$ are or are not opposite rays.

   _____

6. Imagine $\overrightarrow{ST}$ and $\overrightarrow{TS}$ drawn in the same plane. Taken together,

   what kind of figure do the rays form? _____

7. Name three undefined terms in geometry. _____

Postulates are basic true statements accepted without proof. Each statement below is incorrect. Rewrite each statement so that it is true.

8. Through any three points there is exactly one plane containing them.

   _____

9. If two planes intersect, then they intersect in exactly one plane.

   _____

10. A frame holding two pictures sits on a table.
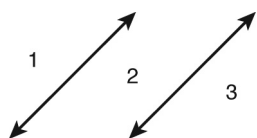   Which is NOT a true statement?

    A $\overline{PN}$ and $\overline{NM}$ lie in plane $\mathcal{T}$

    B $\overline{PN}$ and $\overline{NM}$ intersect in a point.

    C $\overline{LM}$ and *N* intersect in a line.

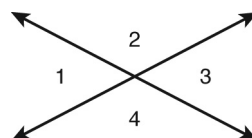   D *P* and $\overline{NM}$ are coplanar.
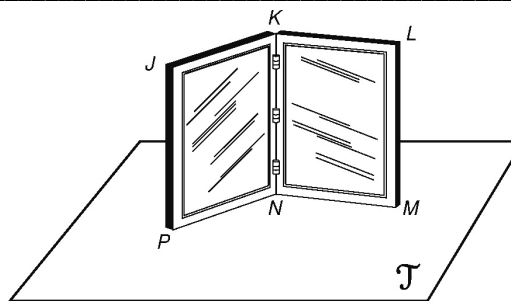
Section 1.1 Worksheet 4

Understanding Points, Lines, and Planes

Lines in a plane divide the plane into **regions.** The number of regions depends on the relationship between the lines. Consider two lines in a plane.

If the lines are parallel, three regions are determined.

If the lines intersect, four regions are determined.

1. a. Complete the table.

   b. Describe the pattern in the table.

Number of lines in a plane	0	1	2	3	4
Greatest number of regions determined			4		

   _____

   c. Predict the greatest number of regions determined by five lines in a plane.

   _____

   d. Make a drawing to verify your prediction from part c.

2. You can use an approach similar to the one in Exercise 5 to investigate the greatest possible number of points of intersection for *n* lines in a plane. Make a table and look for a pattern. What is the greatest possible number of points of intersection for six lines in a plane?   _____

HW from Textbook.
Pp. 9-11 # 7,8,13,16,25-27,31-34,36,39-41,43,44

⑦ $\overline{MN}$ M   N

⑧ $\overrightarrow{FG}$ F   G

⑬ A, B, E   ⑯ $\overleftrightarrow{XY}$ X   Y

㉕ U   ㉖ U   ㉗ U

㉛ Always   ㉜ Never   ㉝ Always   ㊴ Sometimes

㊱ ¼

A, B, C ← only collinear
A, C, D   So, $\frac{1}{4}$
A, B, D
B, C, D

㊲ C   ㊵ F   ㊶ D

㊸ 6   ㊹ 45

1 →(+2) 3 →(+3) 6 →(+4) 10 →(+5) 15 }+6

45 ←(+9) 36 ←(+8) 28 ←(+7) 21
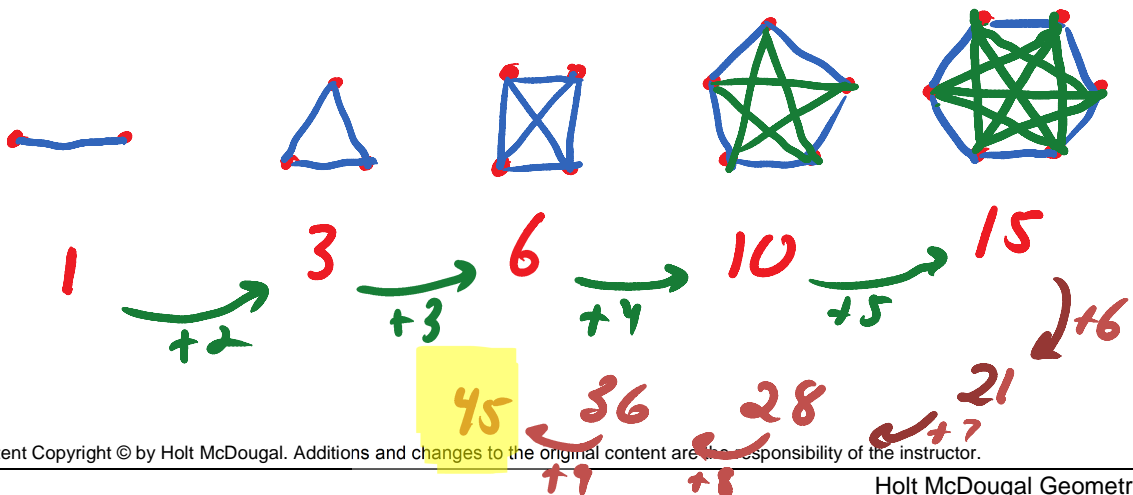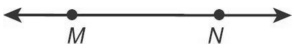
Answers for Section 1.1 Worksheets

Worksheet 1

1. •*W*

2. *M*   *N*

3. *J*   *K*

4. *E*   *F*

5. line *CD* or $\overleftrightarrow{CD}$

6. ray *ST* or $\overrightarrow{ST}$

7. plane *LMN*; plane $\mathcal{Q}$

8. segment *WX*; $\overline{WX}$

9. Possible answers: *A*, *P*, and *B*; *C*, *P*, and *D*; *J*, *D*, and *K*

10. Sample answer: *A*, *P*, and *D*

11. Sample answer: *C*, *P*, *B*, and *D*

12. Sample answer: *J*, *D*, *P*, and *B*

13. $\overrightarrow{AB}$ and $\overrightarrow{JK}$

14. point *D*

Worksheet 2

1. line

2. line

3. plane

4. plane

5. A line segment is a specific portion of a line that begins and ends.

6. A line goes on forever in both directions, while a segment has endpoints.

7. A ray and a line segment are both parts of a line.

8. A line segment has 2 endpoints. A ray has 1 endpoint and extends forever in one direction.

9. B

10. J

Worksheet 3

1. A plane is named with three noncollinear points. *H*, *I*, and *J* are collinear.

2. Possible answers: plane *HIK*; plane *HJK*; plane *IJK*

3. $\overleftrightarrow{HI}, \overleftrightarrow{HJ}, \overleftrightarrow{IJ}, \overleftrightarrow{IH}, \overleftrightarrow{JH},$ and $\overleftrightarrow{JI}$

4. $\overrightarrow{ST}$ and $\overrightarrow{TS}$ are not the same figure because $\overrightarrow{ST}$ has its endpoint at *S* and $\overrightarrow{TS}$ has its endpoint at *T*.

5. $\overrightarrow{ST}$ and $\overrightarrow{TS}$ are not opposite rays because they do not have the same endpoint.

6. a line

7. point, line, plane

8. Through any three noncollinear points there is exactly one plane containing them.

9. If two planes intersect, then they intersect in exactly one line.

10. C

Worksheet 4

1

Number of lines in a plane	0	1	2	3	4
Greatest number of regions determined	1	2	4	7	11

1b. Sample answer: The pattern is one of increasing differences.

1c. 16 regions (16 − 11 = 5)

1d. Answer: 5d. Drawings will vary.

2. 15