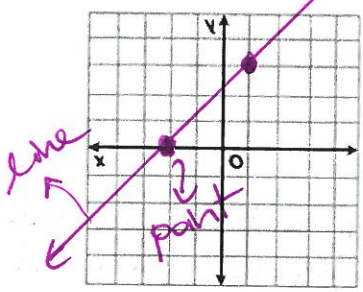
Name KEY Date _____ Period _____

Chapter 1 Tools of Geometry

Lesson 1.1. Notes – Points, Lines and Planes

1 Points, Lines, and Planes Unlike the real-world objects that they model, shapes, points, lines, and planes do not have any actual size. In geometry, *point*, *line*, and *plane* are considered **undefined terms** because they are only explained using examples and descriptions.



The phrase *exactly one* in a statement such as, "There is exactly one line through any two points," means that there is *one and only one*.

KeyConcept Undefined Terms

A **point** is a location. It has neither shape nor size.

Named by a capital letter

Example point *A*

A **line** is made up of points and has no thickness or width. There is exactly one line through any two points.

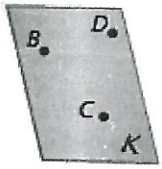
Named by the letters representing two points on the line or a lowercase script letter

Example line *m*, line *PQ* or $\overleftrightarrow{PQ}$, line *QP* or $\overleftrightarrow{QP}$

A **plane** is a flat surface made up of points that extends infinitely in all directions. There is exactly one plane through any three points not on the same line.

Named by a capital script letter or by the letters naming three points that are not all on the same line

Example plane *K*, plane *BCD*, plane *CDB*, plane *DCB*, plane *DBC*, plane *CBD*, plane *BDC*

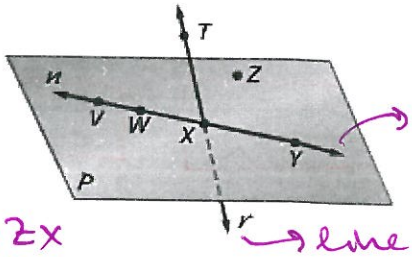


Collinear points are points that lie on the same line. *Noncollinear* points do not lie on the same line. **Coplanar** points are points that lie in the same plane. *Noncoplanar* points do not lie in the same plane.

* Don't forget ↔ while naming lines.

Name Lines and Planes

1) **Use the figure to name each of the following.**



a. a line containing point W

line n, $\overleftrightarrow{VW}$, $\overleftrightarrow{WV}$, $\overleftrightarrow{VX}$, $\overleftrightarrow{XV}$, $\overleftrightarrow{VY}$, $\overleftrightarrow{YV}$, $\overleftrightarrow{WX}$, $\overleftrightarrow{XW}$, $\overleftrightarrow{WY}$, $\overleftrightarrow{YW}$, $\overleftrightarrow{XY}$, $\overleftrightarrow{YX}$

b. a plane containing point X

plane P, Plane XZY, Plane WZX

VZY

VZW

VZX

WZY

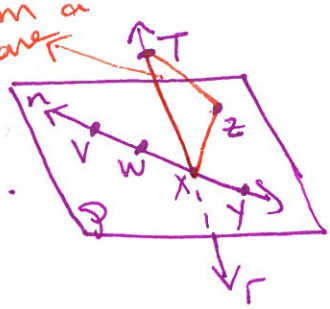
c. a line containing point T.

line r

d. a plane containing points T and Z.

We may form a new plane

Plane TZX can be formed.



2) Use the figure below and answer the following questions.

a. How many planes appear in this figure?

Plane M, XYZ, XYT, YTZ

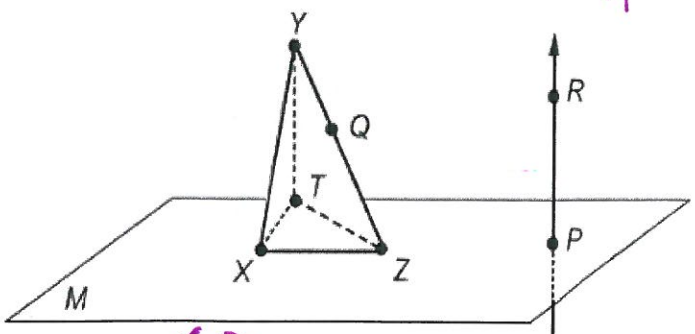
b. Name three points that are collinear.

Y, Q, Z

c. Name the intersection of plane XYZ and plane M.

line XZ, $\overleftrightarrow{XZ}$

d. At what point do lines $\overleftrightarrow{PR}$ and $\overleftrightarrow{TZ}$ intersect? Explain.



Lines $\overleftrightarrow{PR}$ & $\overleftrightarrow{TZ}$ do not intersect unless $\overleftrightarrow{TZ}$ is in the same direction with point P.

Model Points, Lines, and Planes

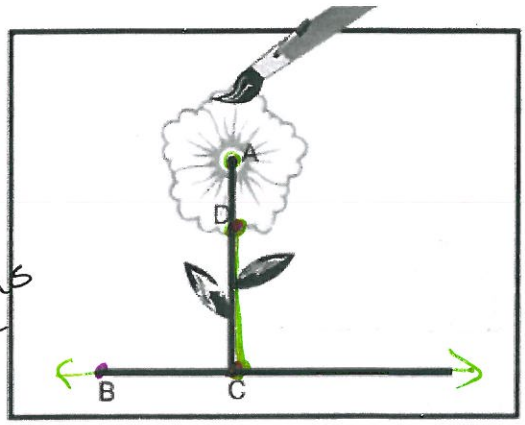
1) Name the geometric shapes modeled by the picture.

• A - center of the flower

$\overline{DC}$ - segment - stem of the flower

$\overleftrightarrow{BC}$ - grass

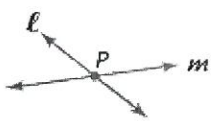
BCD canvas models canvas ← the plane



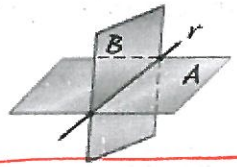
2) Name the geometric term modeled by each object.

a.stripes on a sweater. line b.corner of a box point c.cover of a book plane

2 Intersections of Lines and Planes The **intersection** of two or more geometric figures is the set of points they have in common. Two lines intersect in a point. Lines can intersect planes, and planes can intersect each other.



P represents the intersection of lines ℓ and m.

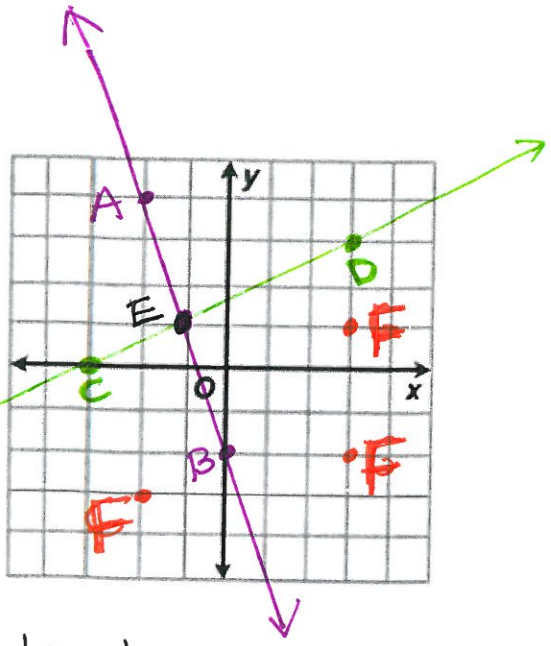


Line r represents the intersection of planes A and B.

Draw Geometric Figures

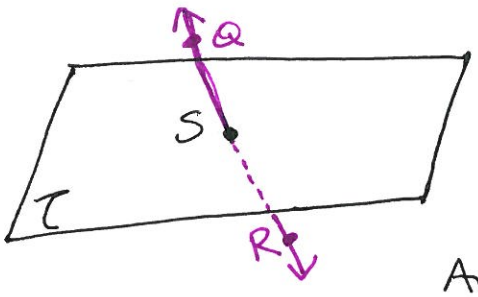
Draw and label a figure for each relationship.

3) **a. ALGEBRA** Lines AB and CD intersect at E for $A(-2, 4)$, $B(0, -2)$, $C(-3, 0)$, and $D(3, 3)$ on a coordinate plane. Point F is coplanar with these points, but not collinear with $\overleftrightarrow{AB}$ or $\overleftrightarrow{CD}$.



Since point F is coplanar with A, B, C, D & E, it could be anywhere on the coordinate plane except on the AB and the CD.

b. QR **intersects plane** T **at point** S.

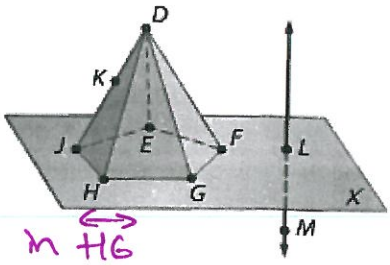


line $\overleftrightarrow{QR}$ intersects plane T at point S.

Answers vary depending on which direction you draw line QR.

Definitions or **defined terms** are explained using undefined terms and/or other defined terms. **Space** is defined as a boundless, three-dimensional set of all points. Space can contain lines and planes.

4) Answer the following questions using the figure.



a. How many planes appear in this figure? Write their names.

Six: Plane X, plane JDH, plane HDG, plane GDF plane EDF, plane JDE

b. Name three points that are collinear.

D, K and J are collinear

c. Name the intersection of plane HDG with plane X.

Plane HDG intersects plane X: in $\overleftrightarrow{HG}$

d. At what point do $\overleftrightarrow{LM}$ **and** $\overleftrightarrow{EF}$ **intersect? Explain.**

From the figure, it doesn't seem that these lines intersect. $\overleftrightarrow{EF}$ lies in plane X, but only point L of $\overleftrightarrow{LM}$ lies in X.

$\overleftrightarrow{EF}$ may intersect $\overleftrightarrow{LM}$ if it is in the direction of point L only.

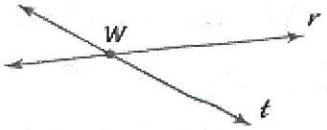
Describing What You See

The figures and descriptions below help you visualize and write about points, lines, and planes.

Point Q is on ℓ.

Line ℓ contains Q.

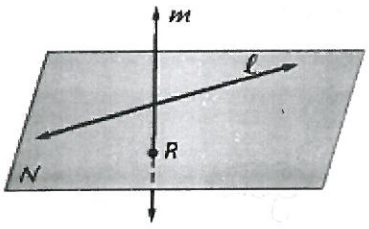
Line ℓ passes through Q.



Lines r and t intersect at W.

Point W is the intersection of r and t.

Point W is on r. Point W is on t.



Line ℓ and point R are in $\mathcal{N}$.

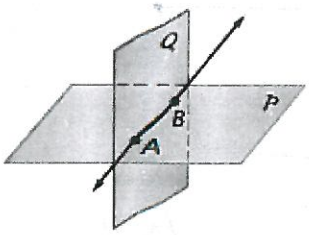
Point R lies in $\mathcal{N}$.

Plane $\mathcal{N}$ contains R and ℓ.

Line m intersects $\mathcal{N}$ at R.

Point R is the intersection of m with $\mathcal{N}$.

Lines ℓ and m do not intersect.



$\overleftrightarrow{AB}$ is in P and Q.

Points A and B lie in both P and Q.

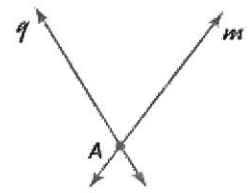
Planes P and Q both contain $\overleftrightarrow{AB}$.

Planes P and Q intersect in $\overleftrightarrow{AB}$.

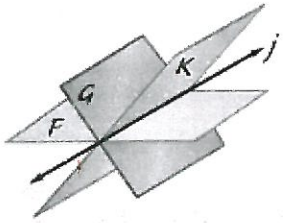
$\overleftrightarrow{AB}$ is the intersection of P and Q.

Homework: Write a description for each figure for questions 1-3 and answer 4 (just as the examples on this page.)

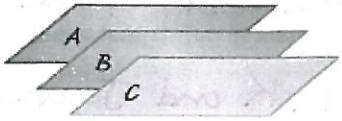
1.



2.



3.



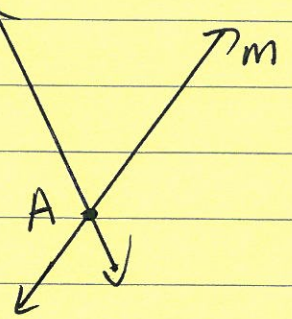
4. Draw and label a figure for the statement Planes $\mathcal{N}$ and P contain line a.

See next page for solutions.

ANSWER ALL 4 QUESTIONS IN YOUR GEOMETRY NOTEBOOK! NO WORK = 0 GRADE!!!

KEEP THIS NOTES IN YOUR BINDER. IF YOU LOOSE IT = 0 GRADE!!!

Homework Solutions (Pg 4)

1) 

- Lines q and m intersect at point A.
- Point A is on m
- Point A is the intersection of m and q.

2) Line j lies in planes F, G and K.

3) Planes A, B and C do not intersect.

4)