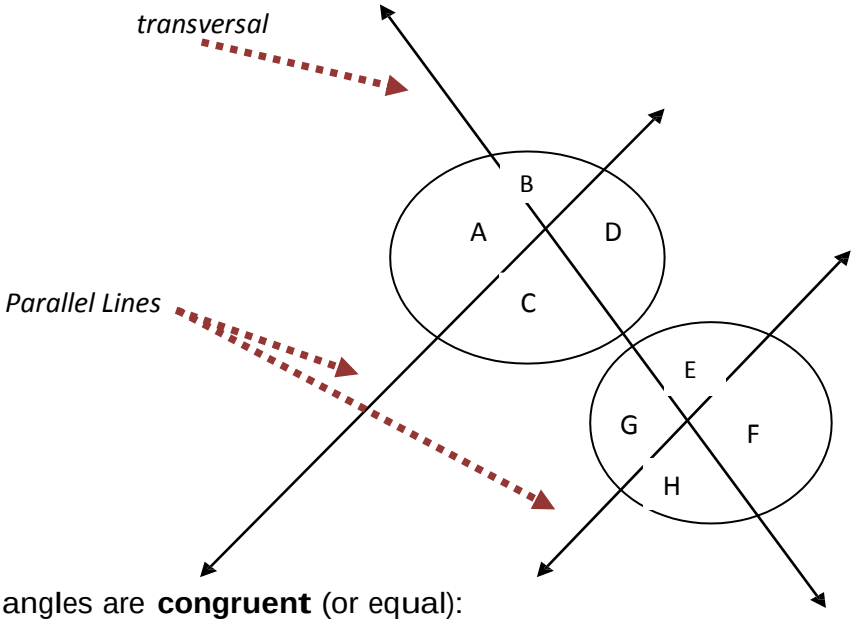
Lesson 8: Parallel Lines

Two coplanar lines are said to be parallel if they never intersect. For any given point on the first line, its distance to the second line is equal to the distance between any other point on the first line and the second line. The common notation for parallel lines is **"||"** (a double *pi*pe); it is not unusual to see **"//"** as well. If line *m* is parallel to line *n*, we write "m || n". Lines in a plane coincide, intersect in a point, or are parallel. Controversies surrounding the Parallel Postulate lead to the development of non-Euclidean geometries.

When two (or more) parallel lines are cut by a transversal, the following angle relationships are true:

1. Corresponding angles are congruent (equal).

   In the diagram, the two sloping lines are parallel to each other, and are crossed by another single sloping straight line (transversal), forming angles.



Set 1: The following angles are **congruent** (or equal):

A and D
A and G
A and F
G and F
G and D
F and D

Corresponding angles are the angle pairs that are in the same position.

The following angles **"correspond"** to each other:

A and G

D and F

These angles are **"alternate"** because they are on opposite sides of the transversal:

A and F

D and G

Set 2: The following angles are **congruent** (or equal):

B and C
B and E
B and H
C and E
C and H
H and C

The following angles **"correspond"** to each other:

B and E

C and H

These angles are "**alternate"** because they are on opposite sides of the transversal.

B and H

C and E

If you know these facts about angles, you can use these facts in other ways. For examples, if you know there are **alternate** or **corresponding** angles equal to each other, then you have proved that the lines concerned are parallel. Remember these rules about parallel lines and angles, and the terms **corresponding** and **alternate**.

2. **Alternate exterior** angles are congruent (equal).

   Using the same diagram, the **alternate exterior** angles are:

   A and F

   B and H

These angles are on *opposite* sides of the transversal and *outside* of the parallel lines.

3. Alternate interior angles are congruent (equal).

   Using the same diagram, the alternate interior angles are:

   C and E

   D and G

These angles are on *opposite* sides of the transversal and *inside* of the parallel lines.

4. **Same-side interior** angles are **supplementary** (the sum of the two angles is equal to 180 degrees).

Using the same diagram, the same side supplementary angles are:

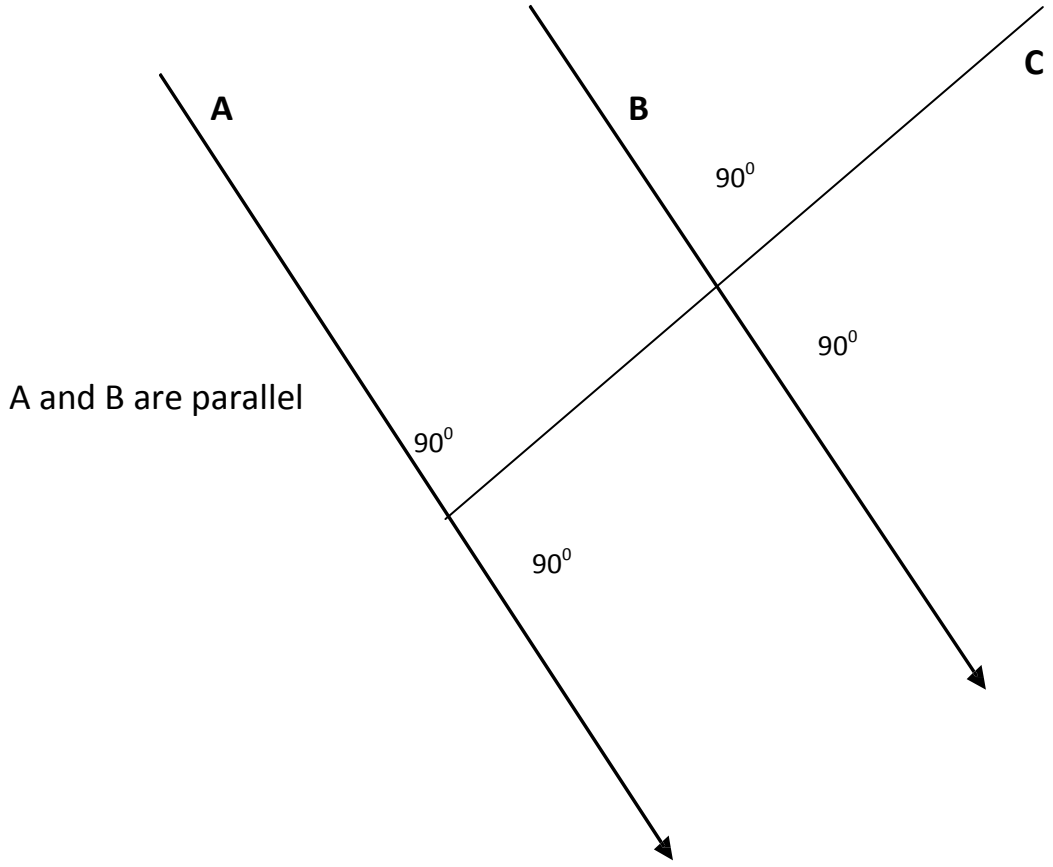
A and B
C and D
E and F
G and H

AND

A and C
B and D
E and G
F and H

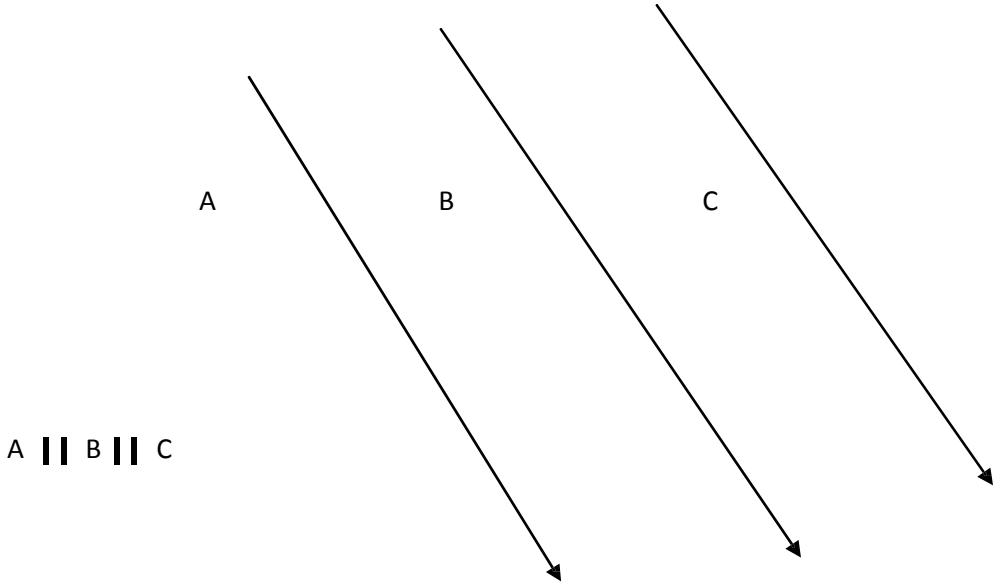
5. If a line in a plane is perpendicular to one of the two parallel lines, it is also perpendicular to the other line.

   For example, in the diagram below, lines A and B are parallel. Transversal C is perpendicular to line B, and so is also perpendicular to line A.



6. If a line in a plane is parallel to one of two parallel lines, it is also parallel to both parallel lines.

For example, in the diagram below, lines A and B are parallel. Line C is parallel to line B, and so is also parallel to line C.



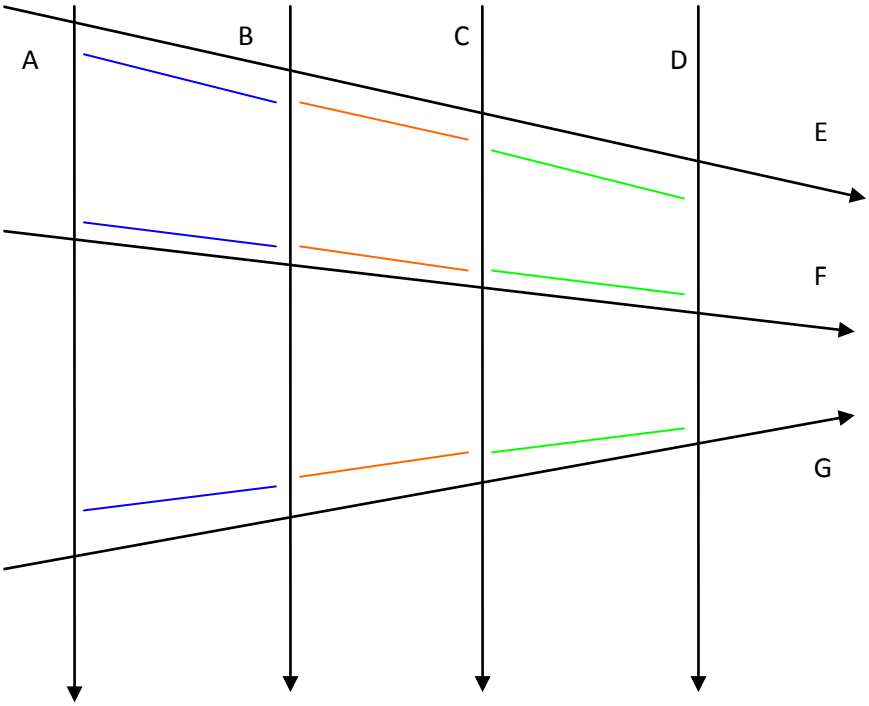
7. If three or more parallel lines are intersected by two or more transversals, then the transversals are divided proportionately.

A ∥ B ∥ C ∥ D

(lines A, B, C, and D are all parallel)

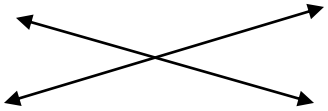
Transversals E, F and G intersect lines A, B, C and D.

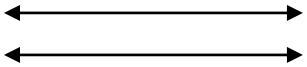
The color matching line segments of the transversals between lines A, B, C and D illustrate which sections are equal.

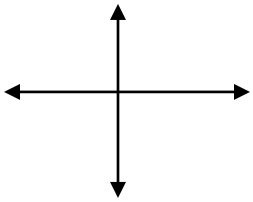


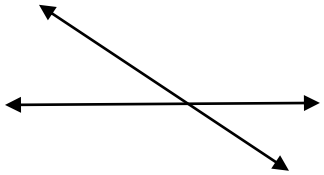
Lesson 8 Review

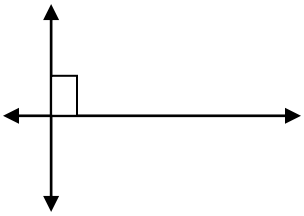
Part A: Classify each of the following lines as parallel, transversal or perpendicular.

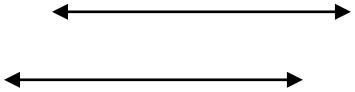
1. 

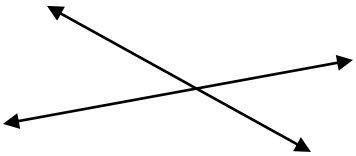
2. 

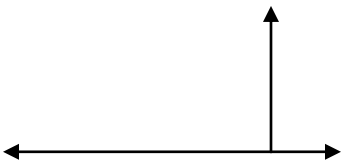
3. 

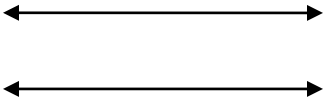
4. 

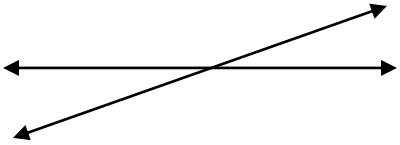
5. 

6. 

7. 

8. 

9. 

10. 

Part B: Identify the pairs of angles named in each figure. For example, in Figure #1, the supplementary angles are:

>AFC and >CFB

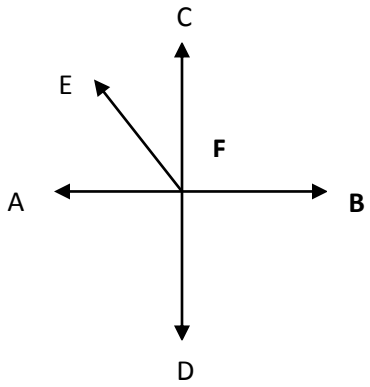
>AFD and >DFB

>CFB and >BFD

>BFD and >DFA

>DFA and >AFC

1.



In figure #2, identify all of the vertical pairs of angles,

In figure #3, identify all of the complementary pairs of angles,

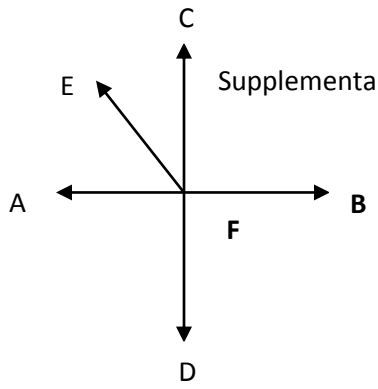
In figure #4, identify all of the vertical pairs of angles,

And so on for numbers 5-10.

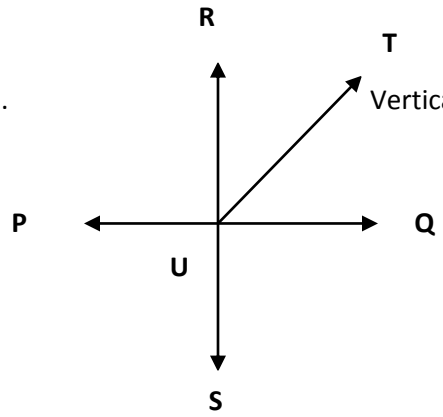
Scroll down to view figures 2-10.

#1 was done for you as an example.

1. Supplementary Angles



2. Vertical Angles



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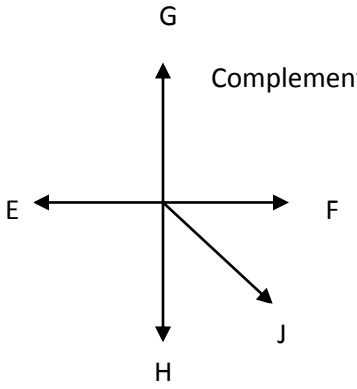
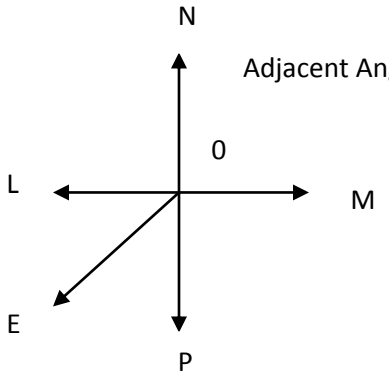
3. Complementary Angles



4. Adjacent Angles



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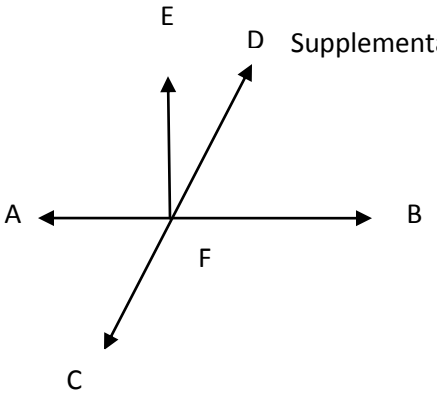
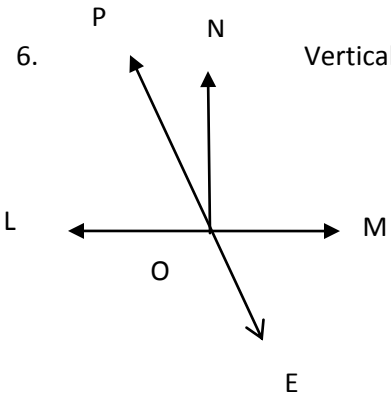
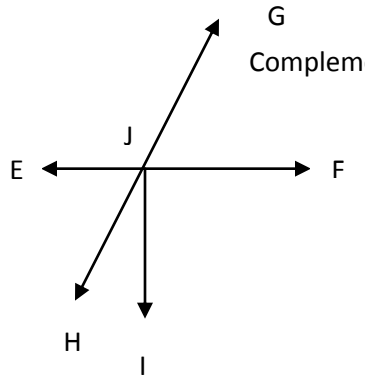
5. Supplementary Angles



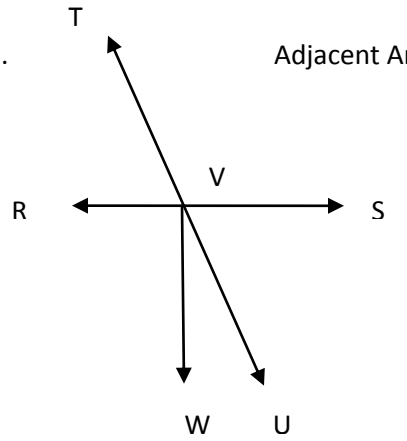
6. Vertical Angles



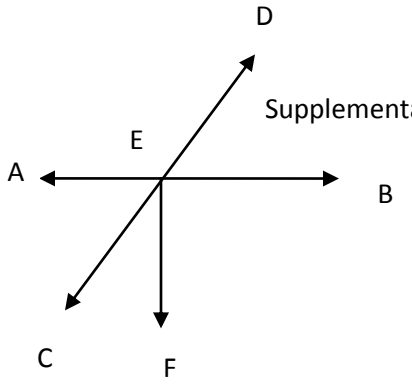
7. Complementary Angles



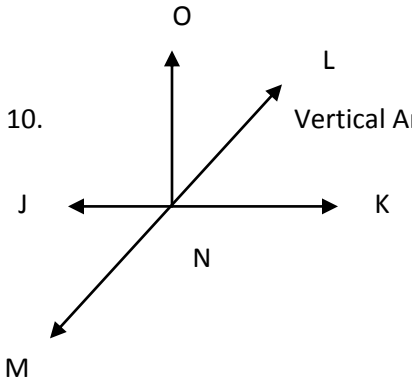
8. Adjacent Angles



9. Supplementary Angles



10. Vertical Angles



Submit your answers in the text box.