Lines and Angles

Note: Not all lines and not all planes intersect.

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take note

Key Concept Parallel and Skew

| Definition	Symbols	Diagram
Parallel lines are coplanar lines that do not intersect. The symbol ∥ means "is parallel to."	$\overleftrightarrow{AE} \parallel \overleftrightarrow{BF}$ $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$	
Skew lines are noncoplanar; they are not parallel and do not intersect.	$\overleftrightarrow{AB}$ and $\overleftrightarrow{CG}$ are skew.	
Parallel planes are planes that do not intersect.	plane $ABCD \parallel$ plane $EFGH$	

Use arrows to show
$\overleftrightarrow{AE} \parallel \overleftrightarrow{BF}$ and $\overleftrightarrow{AD} \parallel \overleftrightarrow{BC}$.

Ex 1) Use the diagram shown to answer the following questions.

a) Which segments are parallel to $\overline{AB}$?
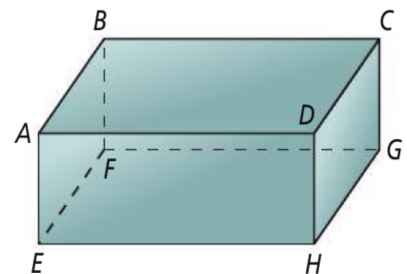
b) Which segments are skew to $\overline{CD}$?
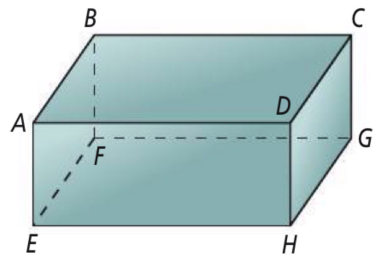
c) What are two pairs of parallel planes?
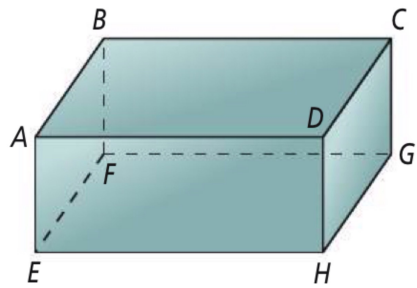
d) What are two segments parallel to plane BCG?

e) Which segments are parallel to $\overline{AD}$?

f) Explain why $\overline{FE}$ and $\overline{CD}$ are not skew.
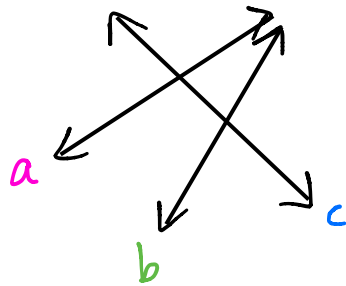
g) What is another pair of parallel planes?

h) What are two segments parallel to plane DCG?

Note: When a line intersects two or more lines, the angles formed at the intersection points create special angle pairs.
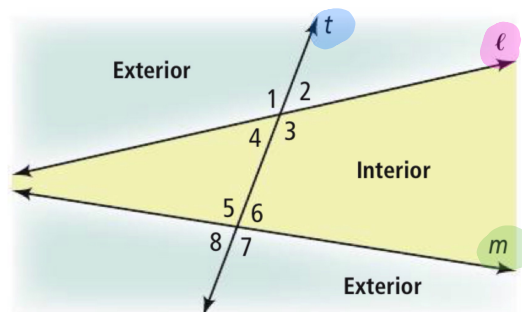
Def: A <u>transversal</u> is a line that intersects two or more coplanar lines at distinct points.

Ex)

line c is a transversal because it intersects lines a and b.

The diagram below shows the eight angles formed by a transversal t and two lines l and m.

Exterior

1 / 2
4 / 3

Interior

5 / 6
8 / 7

Exterior

Notice that angles 3, 4, 5, and 6 lie <u>between</u> lines l and m. They are <u>interior angles.</u>

Notice that angles 1, 2, 7, and 8 lie <u>outside</u> of lines l and m. They are <u>exterior angles.</u>

take note

Key Concept Angle Pairs Formed by Transversals

Definition	Example	
Alternate interior angles are nonadjacent interior angles that lie on opposite sides of the transversal.	∠4 and ∠6 ∠3 and ∠5	
Same-side interior angles are interior angles that lie on the same side of the transversal.	∠4 and ∠5 ∠3 and ∠6	
Corresponding angles lie on the same side of the transversal *t* and in corresponding positions.	∠1 and ∠5 ∠4 and ∠8 ∠2 and ∠6 ∠3 and ∠7	
Alternate exterior angles are nonadjacent exterior angles that lie on opposite sides of the transversal.	∠1 and ∠7 ∠2 and ∠8	

Ex 2) Use the diagram shown to answer the following
   questions.
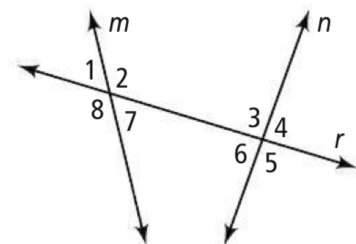
a) Which is a pair of alternate
   interior angles?

(A) ∠1 and ∠3   (C) ∠2 and ∠6

(B) ∠6 and ∠7   (D) ∠4 and ∠8

**b)** What are three pairs of corresponding angles?
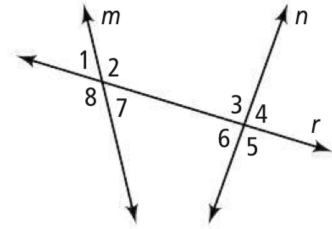
c) What is one pair of same-side interior angles?

d) What are two pairs of alternate exterior angles?
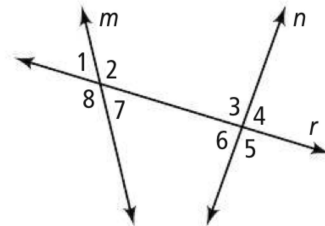
e) Name four pairs of vertical angles.

Ex 3a) The photo below shows the Royal Ontario Museum in Toronto, Canada. Are angles 2 and 4 alternate interior angles, corresponding angles, same-side interior angles, or alternate exterior angles?
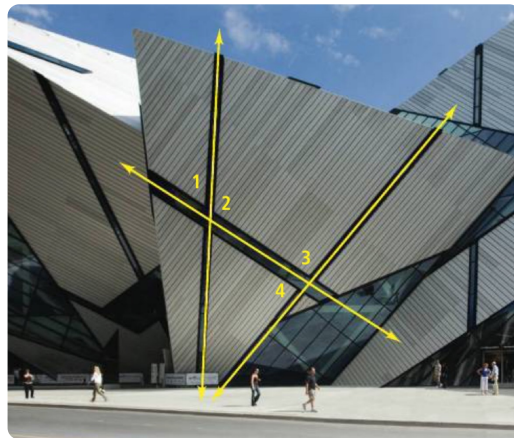
Ex 3b) What type of angle pair are angles 1 and 3 in the photo above?
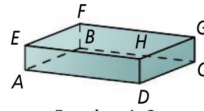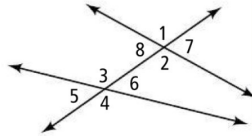
Lesson Check

Lesson Check

Do you know HOW?

Name one pair each of the segments, planes, or angles.
Lines and planes that appear to be parallel are parallel.

1. parallel segments
2. skew segments
3. parallel planes
4. alternate interior
5. same-side interior
6. corresponding
7. alternate exterior

Exercises 1–3

Exercises 4–7

Do you UNDERSTAND? MATHEMATICAL PRACTICES

8. **Vocabulary** Why is the word *coplanar* included in the definition for parallel lines?

9. **Vocabulary** How does the phrase *alternate interior angles* describe the positions of the two angles?

10. **Error Analysis** In the figure at the right, lines and planes that appear to be parallel are parallel. Carly says $\overline{AB} \parallel \overline{HG}$. Juan says $\overline{AB}$ and $\overline{HG}$ are skew. Who is correct? Explain.
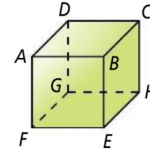
Homework:
Textbook p. 144-145
#11-16, 21-28, 30-35, 37-43
(27 problems total)