NAME _____ DATE _____ PERIOD _____

2-5 Study Guide and Intervention

Postulates and Paragraph Proofs

Points, Lines, and Planes In geometry, a **postulate** is a statement that is accepted as true. Postulates describe fundamental relationships in geometry.

Postulate 2.1: Through any two points, there is exactly one line.
Postulate 2.2: Through any three noncollinear points, there is exactly one plane.
Postulate 2.3: A line contains at least two points.
Postulate 2.4: A plane contains at least three noncollinear points.
Postulate 2.5: If two points lie in a plane, then the entire line containing those points lies in the plane.
Postulate 2.6: If two lines intersect, then their intersection is exactly one point.
Postulate 2.7: If two planes intersect, then their intersection is a line.

Example: Determine whether each statement is *always, sometimes, or never true.*

a. There is exactly one plane that contains points *A*, *B*, and *C*.
Sometimes; if *A*, *B*, and *C* are collinear, they are contained in many planes. If they are noncollinear, then they are contained in exactly one plane.

b. Points *E* and *F* are contained in exactly one line.
Always; the first postulate states that there is exactly one line through any two points.

c. Two lines intersect in two distinct points *M* and *N*.
Never; the intersection of two lines is one point.

Exercises

Determine whether each statement is *always, sometimes,* or *never* true.

1. A line contains exactly one point.

2. Noncollinear points *R*, *S*, and *T* are contained in exactly one plane.

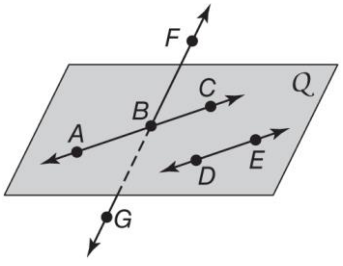
3. Any two lines ℓ and *m* intersect.

4. If points *G* and *H* are contained in plane $\mathcal{M}$, then $\overline{GH}$ is perpendicular to plane $\mathcal{M}$.

5. Planes $\mathcal{R}$ and $\mathcal{S}$ intersect in point *T*.

6. If points *A*, *B*, and *C* are noncollinear, then segments $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$ are contained in exactly one plane.

In the figure, $\overline{AC}$ and $\overline{DE}$ are in plane *Q* and $\overline{AC} \parallel \overline{DE}$. State the postulate that can be used to show each statement is true.



7. Exactly one plane contains points *F*, *B*, and *E*.

8. $\overleftrightarrow{BE}$ lies in plane *Q*.

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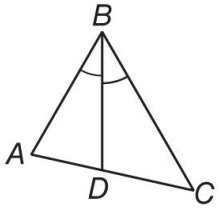
2-5 Study Guide and Intervention *(continued)*

Postulates and Paragraph Proofs

Paragraph Proofs A logical argument that uses deductive reasoning to reach a valid conclusion is called a **proof**. In one type of proof, a **paragraph proof**, you write a paragraph to explain why a statement is true.

A statement that can be proved true is called a **theorem**. You can use undefined terms, definitions, postulates, and already-proved theorems to prove other statements true.

Example: In $\triangle ABC$, $\overline{BD}$ is an angle bisector. Write a paragraph proof to show that $\angle ABD \cong \angle CBD$.

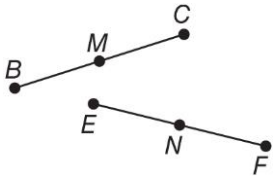


By definition, an angle bisector divides an angle into two congruent angles. Since $\overline{BD}$ is an angle bisector, $\angle ABC$ is divided into two congruent angles. Thus, $\angle ABD \cong \angle CBD$.

Exercises

1. Given that $\angle A \cong \angle D$ and $\angle D \cong \angle E$, write a paragraph proof to show that $\angle A \cong \angle E$.

2. It is given that $\overline{BC} \cong \overline{EF}$, M is the midpoint of $\overline{BC}$, and N is the midpoint of $\overline{EF}$. Write a paragraph proof to show that $BM = EN$.



3. Given that S is the midpoint of $\overline{QP}$, T is the midpoint of $\overline{PR}$, and P is the midpoint of $\overline{ST}$, write a paragraph proof to show that $QS = TR$.