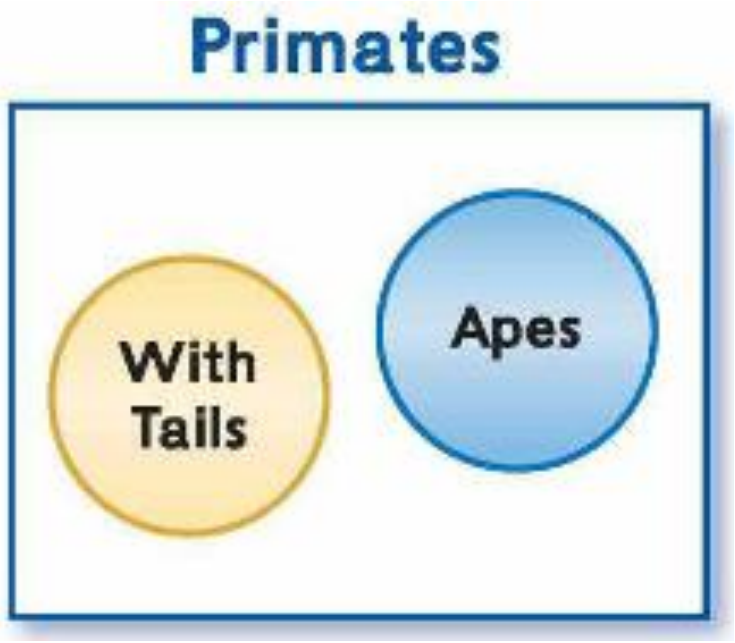
Deductive Reasoning, Postulates, and Proofs

Deductive Reasoning

- Using facts, rules, definitions, or properties to reach logical conclusions from given statements.

Law of Detachment

- A valid form of deductive reasoning; it "detaches" a statement by it's parts.
- As long as the facts given are true, the conclusion will also be true.



Examples

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- All sides of figure ABCD are congruent.

Examples

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- Points *A*, *B*, and *C* lie in plane *G*.

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- Points *A*, *B*, and *C* lie in plane *G*.

- Points *A*, *B*, and *C* are noncollinear.

Law of Syllogism

- A valid form of deductive reasoning; it let's you draw conclusions from two true conditional statements when the conclusion of one statement is the hypothesis of the other.

Given: If you get a job, then you will earn money.
If you earn money, then you will buy a car.

Valid Conclusion: If you get a job, then you will buy a car.

Examples

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- If two angles are supplementary, then the sum of their measures is 180.

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- If two angles are supplementary, then the sum of their measures is 180.

- The sum of the measures of the angles in a linear pair is 180.

Examples

- If Bob completes a course with a grade of C, then he will not receive credit.
- If Bob does not receive credit he will have to take the course again.

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- If Bob completes a course with a grade of C, then he will not receive credit.
- If Bob does not receive credit he will have to take the course again.

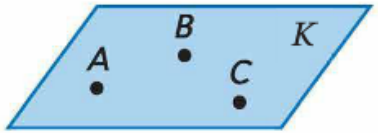
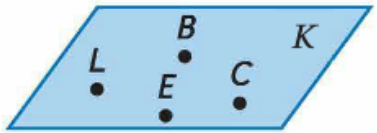
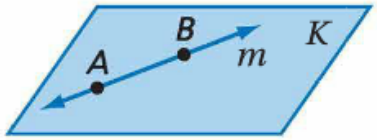
- If Bob completes a course with a grade of C he will have to take the course again.

Postulates

- A postulate is a statement that is accepted as true without proof.

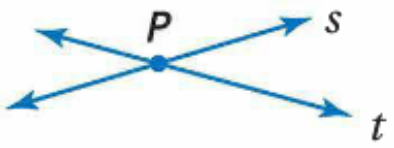
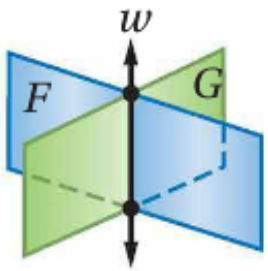
Postulates

Postulates Points, Lines, and Planes

Words	Example	
2.1 Through any two points, there is exactly one line.		Line n is the only line through points *P* and *R*.
2.2 Through any three noncollinear points, there is exactly one plane.		Plane K is the only plane through noncollinear points *A*, *B*, and *C*.
2.3 A line contains at least two points.		Line n contains points *P*, *Q*, and *R*.
2.4 A plane contains at least three noncollinear points.		Plane K contains noncollinear points *L*, *B*, *C*, and *E*.
2.5 If two points lie in a plane, then the entire line containing those points lies in that plane.		Points *A* and *B* lie in plane K, and line m contains points *A* and *B*, so line m is in plane K.

Postulates

Postulates Intersections of Lines and Planes

Words	Example
2.6 If two lines intersect, then their intersection is exactly one point.	 Lines s and t intersect at point *P*.
2.7 If two planes intersect, then their intersection is a line.	 Planes F and G intersect in line w.

Proof

- A logical argument in which each statement you make is supported by a statement that is accepted as true.
- Once a statement has been proven, it is then called a theorem, and it can be used as a reason to justify statements in other proofs.

Theorem

Theorem 2.1 Midpoint Theorem

If M is the midpoint of $\overline{AB}$, then $\overline{AM} \cong \overline{MB}$.

Examples

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

- There is exactly one plane that contains points A, B, and C.

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- 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.

Examples

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

- Two lines intersect in two distinct points M and N.

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

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