Complete the statement.

1. A _______________ has six sides.

2. If two lines form a _______________ angle, they are perpendicular.

3. Two angles that form a right angle are _______________ angles.

4. A _______________ angle has measure of 180°.

Essential Question

When is a conditional statement true or false?

Work with a partner. A hypothesis can either be true or false. The same is true of a conclusion. For a conditional statement to be true, the hypothesis and conclusion do not necessarily both have to be true. Determine whether each conditional statement is true or false. Justify your answer.

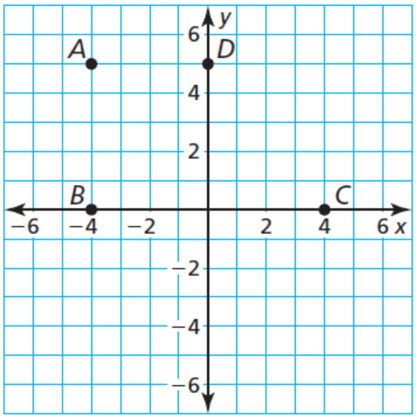
a. If yesterday was Wednesday, then today is Thursday.

b. If an angle is acute, then it has a measure of 30°.

c. If a month has 30 days, then it is June.

d. If an even number is not divisible by 2, then 9 is a perfect cube.

Work with a partner. Use the points in the coordinate plane to determine whether each statement is true or false. Justify your answer.



a. $\triangle$*ABC* is a right triangle.

b. $\triangle$*BDC* is an equilateral triangle.

c. $\triangle$*BDC* is an isosceles triangle.

d. Quadrilateral *ABCD* is a trapezoid.

e. Quadrilateral *ABCD* is a parallelogram.

Work with a partner. Determine whether each conditional statement is true or false. Justify your answer.

a. If $\triangle ADC$ is a right triangle, then the Pythagorean Theorem is valid for $\triangle ADC$.

b. If $\angle A$ and $\angle B$ are complementary, then the sum of their measures is 180°.

c. If figure *ABCD* is a quadrilateral, then the sum of its angle measures is 180°.

d. If points *A*, *B*, and *C* are collinear, then they lie on the same line.

e. If $\overleftrightarrow{AB}$ and $\overleftrightarrow{BD}$ intersect at a point, then they form two pairs of vertical angles.

Core Concept

Conditional Statement

A **conditional statement** is a logical statement that has two parts, a *hypothesis p* and a *conclusion q*. When a conditional statement is written in **if-then form**, the "if" part contains the **hypothesis** and the "then" part contains the **conclusion**.

Words If p, then q. **Symbols** $p \rightarrow q$ (read as "p implies q")

https://www.youtube.com/watch?v=8WQHcQ3ueYA

Use red to identify the hypothesis and blue to identify the conclusion. Then rewrite the conditional statement in if-then form.

a. All birds have feathers.

If an animal is a bird, then it has feathers.

b. You are in Texas if you are in Houston.

If you're in Houston, then you're in TX.

Use red to identify the hypothesis and blue to identify the conclusion. Then rewrite the conditional statement in if-then form.

1. All 30° angles are acute angles.

If an angle is 30°, then it's acute.

2. $2x + 7 = 1$, because $x = -3$.

If $2x+7=1$, then $x=-3$.

Core Concept

Negation

The **negation** of a statement is the *opposite* of the original statement. To write the negation of a statement p, you write the symbol for negation ($\sim$) before the letter. So, "not p" is written $\sim p$.

Words not p **Symbols** $\sim p$

$\sim p \rightarrow q$

$\sim p \rightarrow \sim q$

Write the negation of each statement.

a. The ball is red.

b. The cat is *not* black.

Core Concept

Related Conditionals

Consider the conditional statement below.

Words If p, then q. **Symbols** $p \rightarrow q$

Converse To write the **converse** of a conditional statement, exchange the hypothesis and the conclusion.

Words If q, then p. **Symbols** $q \rightarrow p$

Inverse To write the **inverse** of a conditional statement, negate both the hypothesis and the conclusion.

Words If not p, then not q. **Symbols** $\sim p \rightarrow \sim q$

Contrapositive To write the **contrapositive** of a conditional statement, first write the converse. Then negate both the hypothesis and the conclusion.

Words If not q, then not p. **Symbols** $\sim q \rightarrow \sim p$

A conditional statement and its contrapositive are either both true or both false. Similarly, the converse and inverse of a conditional statement are either both true or both false. In general, when two statements are both true or both false, they are called **equivalent statements**.

Conditional: $p \rightarrow q$

Converse : $q \rightarrow p$

Inverse : $\sim p \rightarrow \sim q$

Contrapositiv: $\sim q \rightarrow \sim p$

Let p be “you are a guitar player” and let q be “you are a musician.” Write each statement in words. Then decide whether it is *true* or *false*.

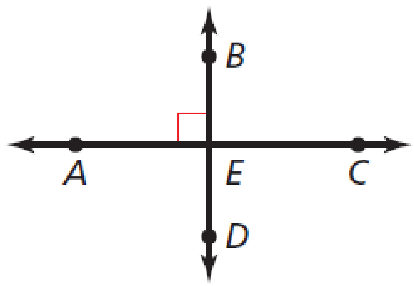
a. the conditional statement $p \rightarrow q$

b. the converse $q \rightarrow p$

c. the inverse $\sim p \rightarrow \sim q$

d. the contrapositive $\sim q \rightarrow \sim p$

Decide whether each statement about the diagram is true. Explain your answer using the definitions you have learned.



a. $\overleftrightarrow{AC} \perp \overleftrightarrow{BD}$

b. $\angle AEB$ and $\angle CEB$ are a linear pair.

c. $\overrightarrow{EA}$ and $\overrightarrow{EB}$ are opposite rays.

Core Concept

Biconditional Statement

When a conditional statement and its converse are both true, you can write them as a single *biconditional statement*. A **biconditional statement** is a statement that contains the phrase "if and only if."

Words p if and only if q **Symbols** $p \leftrightarrow q$

Any definition can be written as a biconditional statement.

Rewrite the definition of perpendicular lines as a single biconditional statement.

Definition If two lines intersect to form a right angle, then they are perpendicular lines.

HW 2.1

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