Statement: a sentence that is either true or false, but not both simultaneously

Notes:
- Commands, questions, and opinions are *not* statements.
- Throughout this chapter, we will translate statements to symbols.
- We use lowercase letters such as p, q, r, and s to represent statements.

Example: Which of the following are statements?
Destin is in the Central Time Zone.
Red and yellow makes purple.
Go buy a gallon of milk.
Mr. Mizell is the governor of Florida.
Is Jane six years old?

Negation: The negation of a statement has a meaning that is opposite the original statement. A negation changes a true statement to false and a false statement to true.

The symbol for negation is \( \sim \).

Example: Negate each statement.
1) Mr. Mizell is the governor of Florida.  
2) Today is not Monday.

Example: Let p and q represent the following statements:
- p: Joe is a resident of Alabama.
- q: My dog is not named Spot.

Express each of the following in symbols.
- a) Joe is not a resident of Alabama.
- b) My dog is named Spot.

Example:
- p: Wednesday does not fall on a weekend.
- q: Devin is an English major

Express \( \sim p \) in words.

Express \( \sim q \) in words.
Quantifiers: all, some, no, none. A statement that contains a quantifier is called a *quantified statement.*
Examples: All whales are mammals. Some planets are near the sun. No women have been president.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Equivalent</th>
<th>Negation</th>
</tr>
</thead>
<tbody>
<tr>
<td>All A are B.</td>
<td>There are no A that are not B.</td>
<td>Some A are not B.</td>
</tr>
<tr>
<td>Some A are B.</td>
<td>There exists at least one A that is a B.</td>
<td>No A are B.</td>
</tr>
<tr>
<td>No A are B.</td>
<td>All A are not B.</td>
<td>Some A are B.</td>
</tr>
<tr>
<td>Some A are not B.</td>
<td>Not all A are B.</td>
<td>All A are B.</td>
</tr>
</tbody>
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Note: To help you remember the negations, use this diagram.

All A are B. ──────── No A are B.

Some A are B. ─────── Some A are not B.

Example: Negate each statement.

a) All Jack Russell Terriers are tan.  
b) Some pencils are mechanical.

c) No ants can read.  
d) Some cats are not happy.
Example: Write the equivalent and negation of each statement.

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<tr>
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<tr>
<td>All birds can fly.</td>
<td></td>
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<td>Some thieves are criminals.</td>
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<td>There are no fish who can't swim.</td>
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<td>No flowers are chairs.</td>
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<tr>
<td>All mammals are not cats.</td>
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<td>Some pianists are not keyboard players.</td>
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<td>Not all puppies are friendly.</td>
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<tr>
<td>There exists at least one parakeet that is yellow.</td>
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</table>

We can also express these relationships in diagrams similar to Venn diagrams.

Use each diagram to write a statement.

Negate each statement pictured above.