

1.4 Examples

Translate these statements into English, where $R(x)$ is “ x is a rabbit” and $H(x)$ is “ x hops” and the domain consists of all animals.

1. $\forall x(R(x) \rightarrow H(x))$

2. $\forall x(R(x) \wedge H(x))$

3. $\exists x(R(x) \rightarrow H(x))$

4. $\exists x(R(x) \wedge H(x))$

- a) Every animal is a rabbit and hops.
- b) There exists an animal such that if it is a rabbit, then it hops.
- c) Every rabbit hops.
- d) Some hopping animals are rabbits.
- e) There exists an animal that is a rabbit and hops.
- f) Some rabbits hop.
- g) If an animal is a rabbit, then that animal hops.
- h) All rabbits hop.

Translate these statements into English, where $R(x)$ is “ x is a rabbit” and $H(x)$ is “ x hops” and the domain consists of all animals.

1. $\forall x(R(x) \rightarrow H(x))$
c,g,h

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- The diagram shows four logical statements on the left and eight English translations on the right. Lines connect the statements to their correct translations: Statement 1 connects to c and g; Statement 2 connects to a; Statement 3 connects to b; Statement 4 connects to d, e, f, and h.
- | | |
|--|--|
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c,g,h | a) Every animal is a rabbit and hops. |
| 2. $\forall x(R(x) \wedge H(x))$
a | b) There exists an animal such that if it is a rabbit, then it hops. |
| 3. $\exists x(R(x) \rightarrow H(x))$
b | c) Every rabbit hops. |
| 4. $\exists x(R(x) \wedge H(x))$
d,e,f | d) Some hopping animals are rabbits. |
| | e) There exists an animal that is a rabbit and hops. |
| | f) Some rabbits hop. |
| | g) If an animal is a rabbit, then that animal hops. |
| | h) All rabbits hop. |

Let $Q(x)$ be the statement " $x \geq 2x$." If the domain consists of all integers, what are these truth values?

- A. $Q(0)$
- B. $Q(-1)$
- C. $Q(1)$
- D. $\forall x Q(x)$
- E. $\exists x Q(x)$
- F. $\exists x \neg Q(x)$
- G. $\forall x \neg Q(x)$

Let $Q(x)$ be the statement “ $x \geq 2x$.” If the domain consists of all integers, what are these truth values?

A. $Q(0)$ True $0 \geq 0$

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- D. $\forall x Q(x)$ False - C is a counterexample
- E. $\exists x Q(x)$
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- E. $\exists x Q(x)$ True - A&B are examples
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Let $Q(x)$ be the statement " $x = x^4$ " If the domain consists of all integers, what are these truth values?

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- E. $\forall x Q(x)$
- F. $\exists x Q(x)$

Let $Q(x)$ be the statement " $x = x^4$ " If the domain consists of all integers, what are these truth values?

A. $Q(0)$ True $0 = 0$

B. $Q(1)$

C. $Q(2)$

D. $Q(-1)$

E. $\forall x Q(x)$

F. $\exists x Q(x)$

Let $Q(x)$ be the statement " $x = x^4$ " If the domain consists of all integers, what are these truth values?

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B. $Q(1)$ True $1 = 1$

C. $Q(2)$

D. $Q(-1)$

E. $\forall x Q(x)$

F. $\exists x Q(x)$

Let $Q(x)$ be the statement “ $x = x^4$ ” If the domain consists of all integers, what are these truth values?

- A. $Q(0)$ True $0 = 0$
- B. $Q(1)$ True $1 = 1$
- C. $Q(2)$ False $2 \neq 16$
- D. $Q(-1)$
- E. $\forall x Q(x)$
- F. $\exists x Q(x)$

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- D. $Q(-1)$ False $-1 \neq 1$
- E. $\forall x Q(x)$ False. C & D are counter examples
- F. $\exists x Q(x)$

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- E. $\forall x Q(x)$ False. C & D are counter examples
- F. $\exists x Q(x)$ True. A and B are examples.