

Example: Given the proposition “There is a student in our class who has been to every ASU home football game in the Fall semester”.

(a) Introduce variables with their universe of discourse and predicates to translate this sentence into symbolic form.

(b) Give the negation both in symbolic form and in English.

(a) **There is** a student in our class who has been to **every** ASU home football game in the Fall semester.

s : students in our classroom

g : ASU home football games in the Fall semester.

$P(s,g)$: s has been to g .

$$\exists s \forall g P(s, g)$$

(b) Negation in symbolic form: $\neg \exists s \forall g P(s, g) \equiv \forall s \exists g \neg P(s, g)$

Negation in English:

Every student in our class has not been to at least one ASU home football game in the Fall semester.

Example: Given the proposition “Every student in our class has been to at least one classroom of every building of the ASU Tempe campus”.

(a) Introduce variables with their universe of discourse and predicates to translate this sentence into symbolic form.

(b) Give the negation both in symbolic form and in English.

(a) **Every** student in our class has been to **at least one** classroom of **every** building of the ASU Tempe campus.

s : students in our classroom

b : buildings on ASU Tempe campus.

c : classrooms on ASU Tempe campus.

P(s,c): s has been to c.

Q(c,b): c is in b.

$$\forall s \forall b \exists c (Q(c, b) \wedge P(s, c))$$

Why not $\forall s \forall b \exists c (Q(c, b) \rightarrow P(s, c))$

This is true for all classrooms that are not in the building regardless if the student has been there.

(b) Negation in symbolic form: $\neg \forall s \forall b \exists c (Q(c, b) \wedge P(s, c)) \equiv$

$$\exists s \exists b \forall c \neg (Q(c, b) \wedge P(s, c)) \equiv \exists s \exists b \forall c (\neg Q(c, b) \vee \neg P(s, c)) \equiv$$

$$\exists s \exists b \forall c (Q(c, b) \rightarrow \neg P(s, c))$$

Negation in English:

There is a student in our class who has not been to any classroom of at least one building of the ASU Tempe campus.