1.

a) Some dogs have been in a movie.

First,

Let the domain consist of all dogs.

P(x) : "x has been in a movie".

$\exists x P(x)$

Second,

Let the domain consist of all living creatures.

Q(x) : "x has been in a movie".

D(x) : "x is a dog".

$\exists x(Q(x) \wedge D(x))$

b) All dogs have fur.

First,

Let the domain consist of all dogs.

P(x) : "x has fur".

$\forall x P(x)$

Second,

Let the domain consist of all living creatures.

Q(x) : "x has fur".

D(x) : "x is a dog".

$\forall x(D(x) \rightarrow Q(x))$

c) No dog can fly.

First,

Let the domain consist of all dogs.

P(x) : "x can fly".

$\forall x \neg P(x)$

Second,

Let the domain consist of all living creatures.

Q(x) : "x can fly".

D(x) : "x is a dog".

$\forall x \neg (D(x) \land Q(x))$

2.

a) Every Ashesi student is hardworking.

S(x) : "x is an Ashesi student"

H(x) : "x is hardworking".

U = all people

$\forall x(S(x) \rightarrow H(x))$

Negation: $\exists x(S(x) \land \neg H(x))$

Negation in English: There is an Ashesi student who is not hardworking.

b) There is a pig that knows logic programming.

P(x) : "x is a pig"

K(x) : "x knows logic programming".

U = all animals

∃x(P(x) ∧ K(x))

Negation: **∀x¬(P(x) ∧ K(x))**

Negation in English: There is no pig that knows logic programming.

c) No cat enjoys being on camera.

C(x) : "x is a cat"

E(x) : "x enjoys being on camera".

U = all animals

∀x¬(C(x) ∧ E(x))

Negation: **∃x(C(x) ∧ E(x))**

Negation in English: There is a cat that enjoys being on camera.

3.

a) $\exists x \exists y P(x, y)$ –

Some faculty member from my university has taught some student from my class.

b) $\exists x \forall y P(x, y)$ –

There is a faculty member from my university that has taught all students from my class.

c) $\forall x \exists y P(x, y)$ –

Every faculty member from my university has taught at least one student from my class.

d) $\exists y \forall x P(x, y)$ –

Some student from my class has been taught by all faculty members from my university.

e) $\forall y \exists x P(x, y)$ –

Every student from my class has been taught by some faculty member from my university.

f) $\forall x \forall y P(x, y)$ –

All faculty members from my university have taught all students from my class.