CSCA67 - Exercises #4

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For each of the following arguments, prove if they are valid or not.

1.1

Every insect has six legs. Charlotte has six legs. Therefore, Charlotte is an insect.
Let $I(x)$ be "x is an insect". $L(x)$ be "x has six legs. Universe of discourse is live beings.

The argument given is:

$$\begin{array}{ll} \forall x(I(x) \to L(x)) & (1) \\ L(Charlotte) & (2) \\ \hline I(Charlotte) & \text{(Conclusion)} \end{array}$$

1.2

Every insect has six legs. At least one insect flies. Therefore, at least one six-legged being flies.
Let $I(x)$ be "x is an insect". $L(x)$ be "x has six legs, $F(x)$ be "x flies." Universe of discourse is live beings.

The argument given is:

$$\begin{array}{ll} \forall x(I(x) \to L(x)) & (1) \\ \exists x,(I(x) \wedge F(x)) & (2) \\ \hline \exists x,(L(x) \wedge F(x)) & \text{(Conclusion)} \end{array}$$

1.3

Every insect has six legs. Only insects fly. Therefore, every flying being has six legs.
Let $I(x)$ be "x is an insect". $L(x)$ be "x has six legs, $F(x)$ be "x flies." Universe of discourse is live beings.

The argument given is:

$$\begin{array}{ll} \forall x(I(x) \to L(x)) & (1) \\ \forall x,(F(x) \to I(x)) & (2) \\ \hline \forall x,(F(x) \to L(x)) & \text{(Conclusion)} \end{array}$$

1.4

All birds eat at least one species of insect. At least one species of insect can fly. Therefore, all birds eat some flying being.
Let $I(x)$ be "x is a species of insect.", $B(x)$ be "x is a bird, $F(x)$ be "x flies.", and $E(x,y)$ be "x eats y". Universe of discourse is live beings.

The argument given is:

$$\begin{array}{ll} \forall x\ (B(x) \to \exists y(I(y) \wedge E(x,y))) & (1) \\ \exists x,(I(x) \wedge F(x)) & (2) \\ \hline \forall x,(B(x) \to \exists y(F(y) \wedge E(x,y))) & \text{(Conclusion)} \end{array}$$