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Question 1:

a). True, because the only the odd numbers are greater than zero

b) True, because all negative numbers are even

c) False, because there are negative even numbers in the domain. Ex -48, -14, -8

d) True, because the only number that has a ones digit of two has a tens digit of 3. Ex 32

e) False, because there are digits with a ones digit of 6 that are not 1 or 2. Ex 36

Question 2:

a) True, because for any digit in D, there exists a number in E that cancels out the digit in D. Ex:

$D(-2)+E(2) = 0$, $D(-1)+E(1)=0$, $D(0)+E(0)=0$, $D(1)+E(-1)=0$, $D(2)+E(-2)=0$

b) True, because both domains contain zero, therefor all numbers in E have an X that will be the same result, $x = D(0)$

$D(0)+E(-2)=-2$, $D(0)+E(-1)=-1$, $D(0)+E(0)=-0$, $D(0)+E(1)=1$, $D(0)+E(2)=2$,

Question 3:

a) Everybody = E, somebody = D

$\forall x$ in E, $\exists y$ in D that x loves y

Negation: $\exists x$ in E, $\forall y$ in D that x does not love y

b) Everybody = E, somebody = D

$\exists x$ in D, $\forall y$ in E such that x loves y

Negation: $\forall x$ in D, $\exists y$ in E such that x does not love y

c) Any even integer = D, Any integer = E

$\forall x$ in D, $\exists y$ in E that $2y = x$

Negation: $\exists x$ in D, $\forall y$ in E that $2y$ does not $= x$

d) Any action = D, Opposite reaction = E

$\forall x$ in D, $\exists y$ in E such that $x = y$

Negation: $\exists x$ in D, $\forall y$ in E such that x does not $= y$

e) Any program = D, Any answer E

$\exists x$ in D, $\forall y$ in E such that y

Negation: $\forall x$ in D, $\exists y$ that $\sim y$

Question 4.

a) Heathy People = D, People who eat an apple a day = E, a = Alice, x = any person

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

$E(a)$

$\therefore D(a)$

Invalid because of a converse error in logic

b) Studies discreet mathematics = D Good at logic = E, Bob = b, x = any student

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

$D(b)$

$\therefore E(x)$

Valid by Modus Ponens

c) Compilation of the program produces error messages = E, Program is not correct = D, p = this program, x = any program

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

$\sim E(p)$

$\therefore \sim D(p)$

Invalid because of an inverse error in logic

d) Product of two positive numbers = E, Positive = P, x = any positive number, y = any positive number,

$\forall x\ \forall y\ E(x, y) \rightarrow P(E(x, y))$

$P(E(p, q))$

$\therefore P(p, q)$

Invalid because of a converse error in logic. It impossible to know if p and q were both positive initially.

e) An even number = E, double is even = D, x = any even number

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

$D(n)$

$\therefore E(n)$

Invalid because of a converse error in logic. It is impossible to know if n was positive initially.