Corrections —

The original version said n not divisible by 3 meant that $n = 2k + 1$ or $n = 2k + 2$.

> An integer n is **divisible by** m iff $n = mk$ for some integer k. (This can also be expressed by saying that m evenly divides n.) So for example, n is divisible by 2 iff $n = 2k$ for some integer k; n is divisible by 3 iff $n = 3k$ for some integer k, and so on. Note that if n is *not* divisible by 2, then n must be 1 more than a multiple of 2 so $n = 2k + 1$ for some integer k. Similarly, if n is not divisible by 3 then n must be 1 or 2 more than a multiple of 3, so $n = 3k + 1$ or $n = 3k + 2$ for some integer k.

The original version incorrectly listed 10, 11, 12, etc as hexadecimal values instead of A, B, C, etc.

hexadecimal	binary	hexadecimal	binary
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

A $\neg$ was left out in the third premise.

5. [12 points] Give a formal proof that the following argument is valid. Be sure to state a reason for each step in the proof. (If the rule you are using isn't named, write "unnamed rule".)

$$\begin{array}{l} A \to C \\ C \to B \\ \neg B \wedge D \\ E \vee A \\ E \wedge F \to G \\ F \\ \hline \therefore G \end{array}$$

While not strictly necessary, adding parens around the $\forall y F(y, x)$ in part (d) adds clarity.

6. [12 points] Consider the following propositions, where the domain of discourse in all cases is the set of people:

   $S(x)$ stands for "x is successful"
   $K(x)$ stands for "x is kind"
   $F(x, y)$ stands for "x is friends with y"

   (d) Express the proposition $\neg\exists x((\forall y F(y, x)) \rightarrow S(x))$ as a sentence in natural English.