Discrete Mathematics
Peergrade assignment 2

1. Let $A = \{2, 4\}$, $B = \{x \in \mathbb{N} \mid (x \mid 28)\}$[1], and $C = \{1, 3, 5\}$. Set the universal set to be $U = \mathbb{N}$ for A, B, C.
   Write each of the following sets in set-roster notation (e.g. $A \cup C = \{1, 2, 3, 4, 5\}$):
   (a) $(A \cup C) \cap B$
   (b) $A \cup (C - B)$
   (c) $C \times A$
   (d) $\mathcal{P}(A)$
   (e) $B^c \cap C$
2. Find $\gcd(6\,256, 2\,346)$ using the Euclidean algorithm. Give the intermediate steps of the algorithm.[2]
3. Prove the following statements:
   (a) For all integers a and b, if a is odd and b is odd, then $a + b$ is even.
   (b) For all integers a, b and c, if $a \nmid bc$ then $a \nmid b$.

   Note: To prove (a), use the following facts:
   - an integer n is odd iff there is an integer k such that $n = 2k + 1$
   - an integer n is even iff there is an integer k such that $n = 2k$

   To get started on (b), it might help to look through chapter 4.7 of the book.

[1] "x such that x divides 28"

[2] See page 253 in our textbook. For example, to find $\gcd(18, 12)$, the calculation is: $\gcd(18, 12) = \gcd(12, 6) = \gcd(6, 0) = 6$.