(1) (5 pts. each) Define the following terms.
   (a) least common multiple
   (b) relatively prime

(2) (5 pts.) State without proof: The Well Ordering Principle.

(3) (10 pts.)
   (a) Apply the Euclidean Algorithm to find the greatest common divisor of 522 and 1260.
   (b) Illustrate Bezout’s Identity by writing the answer in part (a) as a linear combination of 522 and 1260.

(4) (5 pts. each) Give examples of the following. No proofs required.
   (a) two numbers that are relatively prime
   (b) two numbers $a$ and $b$ such that $(a, b) = 22$
   (c) two numbers $a$ and $b$ such that $[a, b] = 48$

(5) (5 pts. each) True or false? If true, give a proof. If false, give a counterexample.
   (a) If $d \mid a$ and $d \mid b$, then $d = (a, b)$.
   (b) If $a \mid b$ and $b \mid c$, then $a \mid c$.
   (c) If $(a, b) = 1$ and $(b, c) = 1$, then $(a, c) = 1$.

(6) (15 pts.) Prove using Mathematical Induction: For all $n \geq 1$,
   \[ 2 + 4 + \cdots + 2n = n(n + 1). \]

(7) (15 pts.) Prove: If $b = aq + r$ then $(a, b) = (a, r)$.

(8) (15 pts.) Prove: If $(a, c) = d$ and $(b, c) = 1$, then $(ab, c) = d$. 