CS 173, Fall 2015
Examlet 2, Part B

NETID:

FIRST: | **LAST:**

Discussion: **Thursday** **2** **3** **4** **5** **Friday** **9** **10** **11** **12** **1** **2**

1. (5 points) Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   For any positive integers s, t, p, q, if $s \equiv t \pmod{p}$ and $q \mid p$, then $s \equiv t \pmod{q}$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(1183, 351)$. Show your work.

3. (4 points) Check the (single) box that best characterizes each item.

   $-7 \equiv 13 \pmod{6}$ true ☐ false ☐

   For any positive integers p and q,
   if $\mathrm{lcm}(p, q) = pq$, then p and q are relatively prime. true ☐ false ☐

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1. (5 points) Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   Claim: For all natural numbers a and b, if $a \mid b$ and $b \mid a$, then $a = b$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(1609, 563)$. Show your work.

3. (4 points) Check the (single) box that best characterizes each item.

   For any positive integers p, q, and k, if $p \equiv q \pmod{k}$, then $p^2 \equiv q^2 \pmod{k}$ — true ☐ false ☐

   Zero is a multiple of 7. — true ☐ false ☐

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1. (5 points) Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   Claim: For all positive integers a, b, and c, if $\gcd(a, b) = 1$ and $\gcd(b, c) = 1$, then $\gcd(a, c) = 1$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(1012, 299)$. Show your work.

3. (4 points) Check the (single) box that best characterizes each item.

   $k \equiv -k \pmod{k}$ — true for all k ☐ — true for some k ☐ — false for all k ☐

   $\gcd(0, 0)$ — 0 ☐ — k ☐ — undefined ☐

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1. (5 points) Is the following claim true? Informally explain why it is false, or give a concrete example showing that it is true.

   There is an integer n such that $n \equiv 5 \pmod 6$ and $n \equiv 2 \pmod{10}$?

2. (6 points) Use the Euclidean algorithm to compute $\gcd(1568, 546)$. Show your work.

3. (4 points) Check the (single) box that best characterizes each item.

For any integers p and q, if $p \mid q$ then $p \leq q$.	true ☐	false ☐
Two positive integers p and q are relatively prime if and only if $\gcd(p, q) > 1$.	true ☐	false ☐

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1. (5 points) Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   Claim: For any positive integers p and q, $p \equiv q \pmod{1}$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(7839, 1474)$. Show your work.

3. (4 points) Check the (single) box that best characterizes each item.

   Two positive integers p and q are relatively prime if and only if $\gcd(p, q) = 1$. — true ☐ false ☐

   $\gcd(p, q) = \frac{pq}{\text{lcm}(p, q)}$ where p and q are positive integers — true for all p, q ☐ true for some p, q ☐ true for p, q prime ☐

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1. (5 points) Let a and b be integers, $b > 0$. We used two formulas to define the quotient q and the remainder r of a divided by b. One of these is $a = bq + r$. What is the other?

2. (6 points) Use the Euclidean algorithm to compute $\gcd(221, 1224)$. Show your work.

3. (4 points) Check the (single) box that best characterizes each item.

For any positive integers p and q, if $\text{lcm}(p, q) = pq$, then p and q are relatively prime. true ☐ false ☐

$25 \equiv 4 \pmod 7$ true ☐ false ☐