# CS 173, Spring 18 Examlet 2, Part B

**Name:**________________________________________

**NetID:**________________________ **Lecture:** **A** **B**

**Discussion:** **Thursday** **Friday** **9** **10** **11** **12** **1** **2** **3** **4** **5** **6**

1. (5 points) Let $a$ and $b$ be integers, $b > 0$. The formula $a = bq + r$ partially defines the quotient $q$ and the remainder $r$ of $a$ divided by $b$. What other constraint must we add to completely determine $q$ and $r$?

2. (6 points) Use the Euclidean algorithm to compute $\gcd(2262, 546)$. Show your work.

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

$7 \mid 0$ true ☐ false ☐

$7 \equiv -7 \pmod{k}$ always ☐ sometimes ☐ never ☐

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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 $\gcd(a, bc) > 1$, then $\gcd(a, b) > 1$ or $\gcd(a, c) > 1$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(2079, 759)$. Show your work.

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

   $-2 \equiv 2 \pmod 9$ true ☐ false ☐

   If $a$ and $b$ are positive and $r = \text{remainder}(a, b)$, then $\gcd(b, r) = \gcd(b, a)$ 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 $\gcd(2385, 636)$. Show your work.

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

   $-7 \equiv 13 \pmod 5$ true ☐ false ☐

   For any integers $p$ and $q$, if $p \mid q$ then $p \leq q$. 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.

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

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.

   $-7 \mid 0$ true ☐ false ☐

   $k \equiv -k \pmod{7}$ always ☐ sometimes ☐ never ☐

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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.

   For any positive integers $a$, $b$, and $c$, if $a \mid c$ and $b \mid c$, then $ab \mid c$

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.

   $-11 \equiv 4 \pmod 7$ true ☐ false ☐

   For any positive integers $p$, $q$, and $k$,
   if $p \equiv q \pmod k$, then $p^2 \equiv q^2 \pmod k$ 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.

   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 $\gcd(4340, 1155)$. Show your work.

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

   $-7 \equiv 13 \pmod{5}$ true ☐ false ☐

   $\gcd(k, 0)$ for $k$ positive 0 ☐ k ☐ undefined ☐