CS 173, Spring 2016
Examlet 2, Part B

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

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 $\gcd(1183, 351)$. Show your work.

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

$7 \equiv 5 \pmod 1$ true ☐ false ☐

$\gcd(k, 0)$ 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 $n \equiv 6 \pmod 7$?

2. (6 points) Write pseudocode (iterative or recursive) for a function gcd(a,b) that implements the Euclidean algorithm. Assume both inputs are positive.

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 ☐

   $29 \equiv 2 \pmod 9$ 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 $\gcd(1609, 563)$. Show your work.

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

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

   $7 \mid 0$ 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, b, and c if $ac \mid bc$, then $a \mid b$.

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.

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

   $\gcd(0, 0)$ 0 ☐ k ☐ undefined ☐

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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 $\gcd(a, b) = 1$ and $\gcd(a, c) = 1$.

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.

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

   For all prime numbers p, there are exactly two natural numbers q such that $q \mid p$. true ☐ false ☐