# CS 173, Spring 2015
# Examlet 2, Part B

**NETID:**

**FIRST:** **LAST:**

**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 $\gcd(1702, 1221)$. Show your work.

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

$-7 \equiv 13 \pmod 5$ true ☐ false ☐

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

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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 $\gcd(1012, 299)$. Show your work.

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

| | | |
|---|---|---|
| Zero is a multiple of 7. | true ☐ | false ☐ |
| For any positive integers $p$ and $q$, if $\text{lcm}(p, q) = pq$, then $p$ and $q$ are relatively prime. | true ☐ | false ☐ |

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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 $\gcd(2262, 546)$. Show your work.

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

| | | |
|---|---|---|
| $k \equiv -k \pmod 7$ | true for all $k$ ☐ | true for some $k$ ☐ |
| | false for all $k$ ☐ | |

| | | |
|---|---|---|
| For all prime numbers $p$, there are exactly two natural numbers $q$ such that $q \mid p$. | 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 non-zero integers $a$ and $b$, if $a \mid b$ and $b \mid a$, then $a = b$.

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.

   gcd(0,0) 0 ☐ 1 ☐ infinite ☐ undefined ☐

   If $a$ and $b$ are positive integers and $r = \text{remainder}(a, b)$, then $\gcd(b, r) = \gcd(a, b)$ 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 $\gcd(1495, 221)$. Show your work.

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

   If $p$, $q$, and $k$ are positive integers, then $\gcd(pq, qk) =$ $q$ ☐ $pq$ ☐ $pqk$ ☐ $q\gcd(p,k)$ ☐

   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.

   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.

| | | | | | | |
|---|---|---|---|---|---|---|
| $25 \equiv 4 \pmod{7}$ | true | ☐ | false | ☐ | | |
| gcd(k,0) | 0 | ☐ | k | ☐ | undefined | ☐ |