CS 173, Spring 19 Examlet 2, white

Name:____

NetID:________________________ **Lecture: A B**

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

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.

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

   Zero is a factor of 7. true ☐ false ☐

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

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, $\gcd(ca, cb) = c \cdot \gcd(a, b)$

2. (6 points) Use the Euclidean algorithm to compute $\gcd(2015, 837)$. Show your work.

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

   $\gcd(0, 0)$ 0 ☐ k ☐ undefined ☐

   $25 \equiv 4 \pmod 7$ true ☐ false ☐

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

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 integer k, $(k-1)^2 \equiv 1 \pmod{k}$.

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.

   If a and b are positive and $r = \text{remainder}(a, b)$, then $\gcd(b, r) = \gcd(b, a)$ true ☐ false ☐

   $7 \mid -7$ true ☐ false ☐

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

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) 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.

   $\gcd(p, q) = \frac{pq}{\text{lcm}(p, q)}$ (p and q positive integers) always ☐ sometimes ☐ never ☐

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

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

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 $a \mid bc$, then $a \mid b$ or $a \mid c$

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.

   If a and b are positive integers and $r = \text{remainder}(a, b)$, then $\gcd(b, r) = \gcd(r, a)$ true ☐ false ☐

   $29 \equiv 2 \pmod 9$ true ☐ false ☐

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

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 $\gcd(a, b) = n$ and $\gcd(a, c) = p$, then $\gcd(a, bc) = np$.

2. (6 points) Use the Euclidean algorithm to compute $\gcd(2380, 391)$. 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 ☐

   $2 \mid -4$ true ☐ false ☐

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

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 $\gcd(7917, 357)$. Show your work.

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

   If a and b are positive integers and $r = \text{remainder}(a, b)$, then $\gcd(a, b) = \gcd(r, a)$ true ☐ false ☐

   $-2 \equiv 2 \pmod{4}$ true ☐ false ☐

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

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

   There is an integer n such that $n \equiv 5 \pmod 6$ and $n \equiv 6 \pmod 7$?

2. (6 points) Use the Euclidean algorithm to compute $\gcd(1224, 850)$. 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 ☐

   $0 \mid 0$ true ☐ false ☐