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 ☐

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

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 ☐

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.

   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 ☐

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

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

$-7 \equiv 13 \pmod 6$ true ☐ false ☐

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.

   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 ☐

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 $\gcd(a, b) = n$ 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 ☐

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 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 ☐

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 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 ☐

Name:____

NetID:____________________ **Lecture:** **B**

Discussion: **Friday** **11** **12** **1** **2** **3** **4** **5**

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.

   $7 \mid 0$ true ☐ false ☐

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

Name:____

NetID:____________________ **Lecture:** **B**

Discussion: **Friday** **11** **12** **1** **2** **3** **4** **5**

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 $\gcd(2737, 2040)$. Show your work.

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

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

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

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 ☐

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) 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 ☐

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) 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 ☐

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) 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 ☐

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.

   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 ☐

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) 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 ☐

CS 173, Fall 17 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) 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 $\gcd(2015, 837)$. Show your work.

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

$0 \mid 0$	true ☐	false ☐
Two positive integers p and q are relatively prime if and only if $\gcd(p, q) > 1$.	true ☐	false ☐

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

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

   $(5 \times 5) \equiv 1 \pmod 6$ true ☐ false ☐

CS 173, Fall 17 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) 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 $\gcd(2380, 391)$. Show your work.

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

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

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

CS 173, Fall 17 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) 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) 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.

$2 \mid -4$	true ☐	false ☐
If a and b are positive and $r = \text{remainder}(a, b)$, then $\gcd(a, b) = \gcd(r, a)$	true ☐	false ☐

CS 173, Fall 17 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) Explain how to use the Euclidean algorithm to test whether two positive integers p and q are relatively prime.

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

$29 \equiv 2 \pmod{9}$ true ☐ false ☐

Name:____

NetID:______________________ **Lecture: A B**

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

1. (5 points) For any real numbers x and y, let's define the operation $\oslash$ by the equation $x \oslash y = x^2 + y^2$. Is the following claim true? Informally explain why it is, or give a concrete counter-example showing that it is not.

   Claim: For any real numbers x,y, and z, $(x \oslash y) \oslash z = x \oslash (y \oslash z)$

2. (6 points) Use the Euclidean algorithm to compute $\gcd(2737, 2040)$. Show your work.

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 ☐

   $-3 \equiv 3 \pmod 4$ true ☐ false ☐

Name:____

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

Discussion: **Thursday** **Friday** **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 real numbers x and y, if x or y is irrational, then xy is irrational.

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.

   $7 \mid -7$ true ☐ false ☐

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

Name:____

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

Discussion: **Thursday** **Friday** **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) Use the Euclidean algorithm to compute $\gcd(3927, 637)$. Show your work.

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

   $\gcd(k, 0)$ for k non-zero 0 ☐ k ☐ undefined ☐

   $7 \equiv 5 \pmod 1$ true ☐ false ☐

Name:____

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

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

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 $\gcd(4263, 667)$. Show your work.

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

For all prime numbers p, there are exactly two natural numbers q such that $q \mid p$.	true ☐	false ☐
Zero is a factor of 7.	true ☐	false ☐

Name:____

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

Discussion: **Thursday** **Friday** **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, q and r, if $a = bq + r$, then $\gcd(a, b) = \gcd(a, r)$.

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.

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

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

Name:____

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

Discussion: **Thursday** **Friday** **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 $n \equiv 2 \pmod{10}$?

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.

   $\gcd(0, 0)$ 0 ☐ k ☐ undefined ☐

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

Name:____

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

Discussion: **Thursday** **Friday** **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.

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

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