Q1. For each of the following pairs of integers, write a in the form

$$a = bq + r$$

where q is the quotient and r is the remainder, with $0 \leq r < |b|$.

i. $a = 417, b = 34$

ii. $a = 1052, b = 29$

iii. $a = -121, b = 29$

iv. $a = 2396, b = -11$

v. $a = -121, b = -29$

Q2. Using "brute force", i.e., by listing factors, find the gcd of

i. 60 and 84

ii. 98 and 56

Q3. Using Euclid's algorithm, find the gcd of

i. 60 and 84

ii. 98 and 56

iii. 816 and 612

iv. 2064499 and 238067

Q4. Calculate the lcm of

i. 60 and 84

ii. 98 and 56

iii. 816 and 612

iv. 2064499 and 238067

5.

The notation Z_n stands for the set of residues. What does that mean?

If I say that a number b in Z_n is the additive inverse of a number a in the same set, what does that say about $(a + b)\ mod\ n$?

If I say that a number b in Z_n is the multiplicative inverse of a number a in the same set, what does that say about $(a \times b)\ mod\ n$?

6.

Find the multiplicative inverse of each nonzero element in Z_{11}.

7. Use the Extended Euclidean Algorithm to find the inverse of 19 mod 81.

8. Use the Extended Euclidean Algorithm to find the inverse of 23 mod 121.