CMPU 2012-2, Number Theory 1, Problem Sheet 1

Answers

Q. 1 (i) $417 = 12(34) + 9$

(ii) $1052 = 36(29) + 8$

(iii) $-121 = -5(29) + 24$

(iv) $2396 = (-219)(-11) + 9$

(v) $-121 = 5(-29) + 24$

Q. 2 (i) gcd = 12

(ii) gcd = 14

Q. 3 (i) 12

(ii) 14

(iii) 204

(iv) 751

Q. 4 Note: $LCM(a,b) \times GCD(a,b) = |a \times b|$

(i) 420

(ii) 392

(iii) 2448

(iv) 654,446,183

Q. 5 (i) The set of residues $\mathbb{Z}_n$ is the set of all possible integers when working in modular "n" arithmetic ie. the non-negative remainders we dividing "n" into any integer.

Q.5 (ii) $(a+b) \equiv 0 \pmod{n}$

(iii) $(a \times b) \equiv 1 \pmod{n}$

Q.6

Z_{11}	0	1	2	3	4	5	6	7	8	9	10
multiplicative inverse	–	1	6	4	3	9	2	8	7	5	10

Q.7 64 is the multiplicative inverse of 19 in Z_{81}

Q.8 100 is the multiplicative inverse of 23 in Z_{121}