Math 100:11 Assignment 5 Solutions

5.1 24, 36, 68, 80 (any 2)
5.4 34, 38, 50, 60 (any 3)

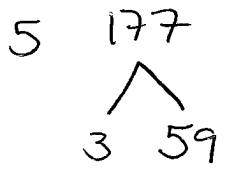
each worth 2
total = 10

5.1 24. 987,654,321

divisible by

2? No - ends in 1
3? 9+8+7+6+5+4+3+2+1 = 45 multiple of 3
Yes
4? No - 21 not multiple of 4
5? No doesn't end in 0 or 5
6? No not divisible by 2
8? No 321 not a multiple of 3
9? sum digits = 45 mult of 9
Yes
10? No doesn't end in 0
12? No not divisible by 4

36. $885 = 3 \times 5 \times 59$



68 ex $3 \times 4 \times 5 = 60 = 6 \times 10$
$7 \times 8 \times 9 = 504 = 6 \times 84$
$11 \times 12 \times 13 = 1716 = 6 \times 286$

} always a multiple of 6

Conjecture: The product of any 3 consecutive natural numbers is always a product of 6

80 $M = 2\times3\times5\times7\cdot11\cdot13 + 1 = 30031$

prime or composite?

Need to check possible prime factors up to $\sqrt{30031} = 173.3$

primes: ~~2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53,~~
59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113,
127, 131, 137, 139, 149, 151, 163, 167, 173

$30031 = 59\times509$ $\sqrt{509} = 22.6$ so couldn't have other factor

thus M is composite!

5.4 34 $(62+95) \bmod 9$

$62 = 9(6)+8$
$95 = 9(10)+5$

$\equiv (8+5) \bmod 9 \equiv 13 \bmod 9 = 4 \bmod 9$

38. $(32\times21) \bmod 8$

$32 = 8(4)+0$
$21 = 8(2)+5$

$\equiv (0\times5) \bmod 8$

$\equiv 0 \bmod 8$

50.

a)

x	0	1	2	3
0	0	0	0	0
1	0	1	2	3
2	0	2	0	2
3	0	3	2	1

$2\times2 = 4 \equiv 0$
$2\times3 = 6 \equiv 2$
$3\times3 = 9 \equiv 1$
} mod 4

b) Satisfies closure, commutative + associative
identity is 1
2+0 don't have inverses

c) inverse of 1 is 1, inverse of 3 is 3

(3)

60. Let x = # spoons

$x \equiv 6 \bmod 7$: 6, 13, 20, 27, 34, 41, 48, 55, 62, 69, 76, 83, 90, 97, 104, 111, 118, 125, 132, 139, 146, (153)

$x \equiv 1 \bmod 8$: 1, 9, 17, 25, 33, 41, 49, 57, 65, 73, 81, 89, 97, 105, 113, 121, 129, 137, 145, (153)

$x \equiv 3 \bmod 15$: 3, 18, 33, 48, 63, 78, 93, 108, 123, 138, (153)

Roxanna has 153 spoons.