Modular arithmetic homework - MA478

1 Determine all solutions to the congruence $x \equiv 2 \pmod 3$
2 Determine all solutions to the congruence $x \equiv 2 \pmod 7$
3 Determine all solutions to the congruence $x \equiv 2 \pmod{21}$
4 Determine all solutions to the congruence $4x \equiv 2 \pmod 7$
5 Determine all solutions to the congruence $4x \equiv 2 \pmod{21}$

A *zero divisor* is a non-zero residue that divides zero. for example, 2 is a zero divisor modulo 6 because $2 \cdot 3 \equiv 0 \pmod 6$. (This congruence also tells us that 3 is a zero divisor modulo 6)
6 Find all zero divisors modulo 21
7 Describe all n so that zero divisors exist modulo n.

The *order* of an residue, a, modulo n is the least positive integer h so that $a^h \equiv \pmod n$.
8 Determine the order of 2 modulo 11.
9 For each residue, a, modulo 11, determine the exponent g so that $2^q \equiv a \pmod{11}$
10 Determine the order of 4 modulo 11.

A *primitive root* modulo n is a residue a so that the order of a modulo n is $\phi(n)$.
11 Determine all primitive roots modulo 11.
12 Determine all primitive roots modulo 55.
13 Determine g so that $2^g \equiv 17 \pmod{55}$.