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Assignment III: MTH 213, Fall 2017

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QUESTION 1. Let X be number of defective computers. Given : a) X is an divisible by 6, b) $X \equiv 9 \pmod{15}$, and $X \equiv 7 \pmod{11}$. Find X if $330 \leq X \leq 660$ [Note that X is divisible by 3 means $X \equiv 0 \pmod{3}$)

We have X = 0 (mod 6), X = 9 (mod 15), X = 7 (mod 11). Since gcd (6, 15) = 3. We need to get rid of the factor 3 from 15 or 6. Note that X = 0 (mod 6) implies X = 0 (mod 3). Also X = 9 (mod 15) implies X = 9 (mod 3) and hence implies X = 0 (mod 3). So you may remove the factor 3 from 6 or from 15.
New system: SOLVE X = 0 (mod 6) , X = 4 (mod 5), X = 6 (mod 11)[Here we removed 3 from 15, Since 9 mod 5 = 4, X = 9 (mod 5) is the same as X = 4 (mod 5).
OR Solve X = 0 (mod 2), X = 9 (mod 15), X = 6 (mod 11)[Here we removed 3 from 6]
Either one should give you the same solution : 204 + 330 = 534.

QUESTION 2. (i) Add $(7AC43)_{16} + (29B)_{16}$

(ii) Subtract $(7854)_9 - (1428)_9$

(iii) multiply $(234)_5 \cdot (42)_5$

(iv) multiply $(A6B)_{16} \cdot (9A)_{16}$

QUESTION 3. Solve over Z : $x \equiv 7 \ (mod\ 8)$, $x \equiv 1 \ (mod\ 6)$, and $x \equiv 4 \ (mod$ the number here is 5

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See comments on Question one: gcd(8, 6) = 2. So we need to get rid of the factor 2 from 6 or 8. Note x = 7 (mod 8) implies x = 7 (mod 2) implies x = 1 (mod 2)[Since 7 mod 2 is 1]. Now x = 1 (mod 6) implies x = 1 (mod 2).
So SOLVE x = 7 (mod 8), x = 1 (mod 3), x = 4 (mod 5) [Here we removed the factor 2 from 6]
NOW if we remove the factor 2 from 8, we have x = 3 (mod 4) , x = 1 (mod 6), x = 4 (mod 5) and we cannot use the CRT. So we must stick with the first option. Solution 79 + 120n, where n any integer.