Solutions to Attendance Quiz # 6 for Dr. Z.'s Number Theory Course for Sept. 23, 2013

1.: Using the recursive algorithm **directly**, find the proudct-of-prime-powers representation of 420

Sol. of 1:

The smallest prime divising 420 is 2. $420/2 = 210$ is an integer. $420/2^2 = 210/2 = 105$ is still an integer, but $420/2^3 = 105/2$ is **not** an integer. So $p_1 = 2, a_1 = 2$ and $n' = 420/2^2 = 105$, and we have

$$L(420) = [2,2], L(105) \quad .$$

The smallest prime dividing 105 is 3. $105/3 = 35$ is an integer, but $105/3^2 = 35/3$ is not, so

$$L(105) = [3,1], L(35) \quad .$$

The smallest prime dividing 35 is 5. $35/5 = 7$ is an integer, but $35/5^2 = 7/5$ is not, so

$$L(35) = [5,1], L(7) \quad .$$

Finally

$$L(7) = [7,1]$$

Going *back*,

$$L(35) = [5,1], [7,1] \quad ,$$

$$L(105) = [3,1], [5,1], [7,1] \quad ,$$

$$L(420) = [2,2], [3,1], [5,1], [7,1] \quad .$$

Or, in the usual notation

$$420 = 2^2 \cdot 3^1 \cdot 5^1 \cdot 7^1 \quad .$$

2. Use any method to find the proudct-of-prime-powers representation of 45^{50} .

Sol. to 2. $45 = 3^2 \cdot 5$, so $45^{50} = (3^2 \cdot 5)^{50} = 3^{100} \cdot 5^{50}$.