

$$Q1-2a) \sum_{k=1}^n k(k+1) = \frac{n(n+1)(n+2)}{3}$$

$$\text{Base: } n=1$$

$$\sum_{k=1}^{n=1} k(k+1) = \frac{n(n+1)(n+2)}{3}$$

$$\text{SO: } \sum_{k=1}^n k(k+1) = \frac{k(k+1)(k+2)}{3}$$

$$(1)(2) = \frac{(1)(2)(3)}{3}$$

$$2 = 2 \checkmark$$

$$n=k+1$$

$$\sum_{k=1}^{k+1} k(k+1) = \frac{(k+1)(k+2)(k+3)}{3}$$

$$= \sum_{k=1}^k k(k+1) + (k+1)(k+2)$$

$$= \frac{k(k+1)(k+2)}{3} + (k+1)(k+2)$$

$$= (k+1)(k+2) \left( \frac{k}{3} + 1 \right)$$

$$= (k+1)(k+2) \left( \frac{k+3}{3} \right)$$

$$= \frac{(k+1)(k+2)(k+3)}{3} = \frac{(k+1)(k+2)(k+3)}{3} \checkmark$$



174, 103

1747

✓

174

(un)

27(un)



$$\{ \langle n^2 + 3 \rangle \langle n \rangle : (n) = (n)^* \} \quad \checkmark$$

7

$$n_1 = 10$$

$$\{ n_1 = 8 \}$$



Q1-3)  $3^n$  in  $n$  weighing?

base:  $n=1$

$3^1 = 3$  coins in 1 weighing

put two coins on scale. If one is fake, scale will show. ✓  
If scale doesn't show, 3<sup>rd</sup> coin is fake.

Must know if fake coin  
will be lighter or heavier.  
Otherwise can't be done in  $n$  weighings.

$n=k$

$3^k$  in  $k$

$n=k+1$

$3^{k+1}$  in  $k+1$

Split  $3^{k+1}$  into 3 groups of  $3^k$  and weigh two groups. Same as in base case. (1) weigh to find the group containing the fake.

Now must do for the group of  $3^k$  coins, which takes (k) steps.

So, will take total of (k+1) steps.

Thus,  $3^{k+1}$  takes  $k+1$  steps ✓