Basic Factorial Problems

Question 1: $\dfrac{(n+1)!}{(n-1)!} = 72$, find n

Solution : $\dfrac{(n+1)(n)(n-1)!}{(n-3)!} = 72$

$(n+1)\,n = 72$

As per hit and trial method we put n = 8 (9 x 8 = 72)

Question 2: Find n, $^nP_4 : {}^nP_5 = 1:5$

Solution : $\dfrac{^nP_4}{^nP_5} = \dfrac{1}{5}$

$\dfrac{\frac{n!}{(n-4)!}}{\frac{n!}{(n-5)!}} = \dfrac{1}{5} \Rightarrow \dfrac{(n-5)!}{(n-4)!} = \dfrac{1}{5}$

$\dfrac{(n-5)!}{(n-4)(n-5)!} = \dfrac{1}{5} \Rightarrow \dfrac{1}{n-4} = \dfrac{1}{5}$

n - 4 = 5 $\Rightarrow$ n = 9

Question 3: Convert the product into factorial , 4 x 8 x 12 x 16 x 20 x 24

Solution : = (4 x 1)(4 x 2)(4 x 3)(4 x 4)(4 x 5)(4 x 6)

= 4^6 x (1 x 2 x 3 x 4 x 5 x 6)

= 4^6 x 6!

Question 4 : If $\dfrac{^nP_3}{^{n-1}P_3} = \dfrac{9}{8}$ then n = _____ .

Solution : $\dfrac{^{n}P_3}{^{n-1}P_3} = \dfrac{9}{8}$

$\therefore \quad \dfrac{\dfrac{n!}{(n-3)!}}{\dfrac{(n-1)!}{(n-4)!}} = \dfrac{9}{8}$

$\therefore \quad \dfrac{n!}{(n-3)!} \cdot \dfrac{(n-4)!}{(n-1)!} = \dfrac{9}{8}$

$\therefore \quad \dfrac{n(n-1)!}{(n-3)(n-4)!} \cdot \dfrac{(n-4)!}{(n-1)!} = \dfrac{9}{8}$

$\therefore \quad \dfrac{n}{(n-3)} = \dfrac{9}{8}$

$\therefore$ 8n = 9n - 27

$\therefore$ n = 15

Question 5 : Find x , if $\dfrac{1}{4!} + \dfrac{1}{5!} = \dfrac{x}{6!}$

Solution : $\dfrac{1}{4!} + \dfrac{1}{5 \cdot 4!} = \dfrac{x}{6 \cdot 5 \cdot 4!}$

$\dfrac{1}{4!} \left(1 + \dfrac{1}{5}\right) = \dfrac{x}{6 \cdot 5 \cdot 4!}$

$\dfrac{6}{5} = \dfrac{x}{6 \cdot 5}$

x = 36

Note: expand the higher factorial upto the lower factorial.