Combinations Ex 17.1 Q20(ii)

$$n \times {}^{n-1}C_{r-1}$$

$$= n \times \frac{(n-1)!}{(r-1)!\left[(n-1)-(r-1)\right]!}$$

$$= \frac{n! \times (n-r+1)}{(r-1)!(n-r)!(n-r+1)}$$

multiplying numerator and denominator by $(n-r+1)]$

$$= \frac{(n-r+1) \times n!}{(r-1)!(n-r+1)!}$$

$$= (n-r+1)^{n}C_{r-1}$$

Hence Proved

Combinations Ex 17.1 Q20(iii)

$${}^{n}C_{r} = \frac{n!}{r!(n-r)!}$$

$${}^{n-1}C_{r-1} = \frac{(n-1)!}{(r-1)!(n-1)-(r-1)!}$$

$$\text{Or } \frac{{}^{n}C_{r}}{{}^{n-1}C_{r-1}} = \frac{n!(r-1)!(n-r)!}{r!(n-r)!(n-1)!}$$

$$= \frac{n \times (n-1)!(r-1)! \times (n-r)!}{r \times (n-1)! \times (r-1)! \times (n-r)!}$$

$$= \frac{n}{r}$$

Hence Proved

Combinations Ex 17.1 Q20(iv)

L.H.S $\Rightarrow {}^{n}C_{r} + 2\,{}^{n}C_{r-1} + {}^{n}C_{r-2}$

$= \left({}^{n}C_{r} + {}^{n}C_{r-1}\right) + \left({}^{n}C_{r-2} + {}^{n}C_{r-1}\right)$

$= {}^{n+1}C_{r} + {}^{n+1}C_{r-1} \qquad \left[\because\ {}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}\right]$

$= \left(n+1\right) + {}^{1}C_{r}$

$= {}^{n+2}C_{r}$

*********** END **********