Exercise 7.1

(Q1) (i) $4! = 4\times3\times2\times1 = 24$

(ii) $6! = 6\times5\times4\times3\times2\times1 = 720$

(iii) $\frac{8!}{7!} = \frac{8\times7\times6\times5\times4\times3\times2\times1}{7\times6\times5\times4\times3\times2\times1} = 8.$

(iii) $\frac{8!}{7!} = \frac{8\times7!}{7!} = 8.$

(iv) $\frac{10!}{7!} = \frac{10\times8\times8\times7!}{7!} = 720.$

(vi) $\frac{6!}{3!3!} = \frac{6\times5\times4\times3!}{3!\,3!} = \frac{120}{6} = 20.$

(vi) $\frac{11!}{4!7!} = \frac{11\times10\times9\times8\times7!}{4!\times7!} = 330.$

(vii) $\frac{8!}{4!2!} = \frac{8\times7\times6\times5\times4!}{4!\times2!} = 840.$

(viii) $\frac{11!}{2!4!5!} = \frac{11\times10\times9\times8\times7\times6\times5!}{2!4!5!} = \frac{332640}{48} = 6930.$

(ix) $\frac{9!}{2!(9-2)!} = \frac{9!}{2!\,7!} = \frac{9\times8\times7!}{2!\times7!} = \frac{72}{2} = 36.$

(x) $\frac{15!}{15!(15-15)!} = \frac{15!}{15!(0!)} = \frac{1}{0!} = \frac{1}{1} = 1.$ $\{\because 0! = 1\}$

(xi) $\frac{3!}{0!} = \frac{3\times2\times1}{1} = 6$.

(xii) $4! \times 0! \times 1! = (4\times3\times2\times1)(1)(1) = 24$.

(Q2) (i) $\frac{6\cdot5\cdot4\times3!}{3!}$ {Multiply and divide by 3!}

$= \frac{6!}{3!}$

(ii) $= 12\cdot11\cdot10$ (multiply and divide by 9!)

$= \frac{12\cdot11\cdot10\cdot9!}{9!} = \frac{12!}{9!}$

(iii) $= \frac{20\cdot19\cdot18\cdot17\cdot16!}{16!}$ {Multiply and divide by 16!}

$= \frac{20!}{16!}$

(iv) $= \frac{10\cdot9}{2!}$ {Multiply and divide by 8!}

$= \frac{10\cdot9\cdot8!}{2!\times8!} = \frac{10!}{2!8!}$

(v) $\frac{8\cdot7\cdot6}{3\cdot2\cdot1}$ [multiply and divide by 5!]

$= \frac{8\cdot7\cdot6\cdot5!}{3!5!} = \frac{8!}{3!5!}$

(vi) $\frac{52 \cdot 51 \cdot 50 \cdot 49}{4 \cdot 3 \cdot 2 \cdot 1}$

$= \frac{52 \cdot 51 \cdot 50 \cdot 49 \cdot 48!}{4 \cdot 3 \cdot 2! \cdot 48!}$ {Multiply and divide by 48!}

$= \frac{52!}{4! 48!}$

(vii) $n(n-1)(n-2)$ {Multiply and divide by $(n-3)!$}

$= \frac{n(n-1)(n-2)(n-3)!}{(n-3)!}$

$= n!$

(viii) $(n+2)(n+1)(n)$

$= \frac{(n+2)(n+1)(n)(n-1)!}{(n-1)!}$ {Multiply and divide by $(n+1)!$}

$= \frac{(n+2)!}{(n-1)!}$

(ix) $\frac{(n+1)(n)(n-1)(n-2)!}{3 \cdot 2 \cdot 1 \ (n-2)!} = \frac{(n+1)!}{3!(n-2)!}$ {Multiply and divide by $(n-2)!$}

(x) $n(n-1)(n-2)\cdots(n-r+1)$

As we see the numbers are decreasing by 1. Thus the next number would be:-

$\therefore (n-r+1-1) = n-r$.

$= \frac{n(n-1)(n-2)\cdots(n-r+1)(n-r)!}{(n-r)!}$ {Multiply and divide by $(n-r)!$}

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

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