Exercise 8B

3 b $\frac{8!}{3!} = 8\times7\times6\times5\times4 =$

c $\frac{7!}{4!\times3!} = \frac{7\times6\times5}{3\times2} = 35$

4 a $\frac{8!}{4!}$

b. $\frac{12!}{8!}$

c $\frac{n!}{(n-3)!}$

d $n(n^2-1) = n(n+1)(n-1)$

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

e $\frac{(n+3)!}{(n-1)!}$

f $\frac{(n+6)!}{(n+3)!}$

g $8!$

h $n!$

5 a $\frac{12!}{11!} = 12$

b $23! - 22!$

$= 23\times22! - 22!$

$= 22!(23-1)$

$= 22\times22!$

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

d $(n+1)! - n!$

$= n\times n!$

7 a $n=5$

$P_{r+1} = \frac{n-r}{r+1}P_r$

$P_1 = \frac{5}{1} = 5$

$P_2 = \frac{5-1}{1+1}\times5 = 10$

$P_3 = \frac{5-2}{2+1}\times10 = 10$

$P_4 = \frac{5-3}{4}\times10 = 5$

$P_5 = \frac{1}{4+1}\times5 = 1$

8 $P_{r+1} = \frac{n-r}{r+1}P_r$

$\binom{9}{6} = ?$ $n=9,\ r+1=6$

$r=0$ $P_1 = \frac{9}{1}\cdot1 = 9$

$r=1$ $P_2 = \frac{8}{2}\frac{9}{1} = 36$

$r=2$ $P_3 = \frac{7}{3}\cdot\frac{8}{2}\frac{9}{1}$

$r=3$ $P_4 = \frac{6}{4}\frac{7}{3}\frac{8}{2}\frac{9}{1}$

$r=4$ $P_5 = \frac{5}{5}\frac{6}{4}\frac{7}{3}\cdot\frac{8}{2}\frac{9}{1}$

$r=5$ $P_6 = \frac{4}{6}\cdot\frac{5}{5}\cdot\frac{6}{4}\cdot\frac{7}{3}\cdot\frac{8}{2}\cdot\frac{9}{1}$

$= \frac{9!}{3!6!}$

8 a. $\binom{11}{4} = \frac{11!}{4!7!}$

b $\binom{11}{7} = \frac{11!}{7!4!}$

c. $\binom{10}{5} = \frac{10!}{5!5!}$

d $\binom{12}{3} = \frac{12!}{3!9!}$

e. $\binom{12}{9} = \frac{12!}{9!3!}$

10 a $\binom{6}{3} + \binom{6}{4} = \binom{7}{4}$

$\frac{4}{4}\ \frac{6!}{3!3!} + \frac{6!}{4!2!}\ \frac{3}{3}$

$\frac{4\ 6!}{4!3!} + \frac{6!\ 3}{4!3!} = \frac{6!\ 7}{3!4!} = \frac{7!}{3!4!} = \binom{7}{4} = \binom{7}{3}$

b $\binom{8}{5} + \binom{8}{6} = \binom{9}{6}$

$\frac{6}{6}\ \frac{8!}{5!3!} + \frac{8!}{6!2!}\ \frac{3}{3}$

$= \frac{6\ 8!}{6!3!} + \frac{3\ 8!}{6!3!} = \frac{9\ 8!}{6!3!} = \frac{9!}{3!6!}$

$= \binom{9}{3} = \binom{9}{6}$

$\boxed{\binom{n}{r} + \binom{n}{r+1} = \binom{n+1}{r+1}}$