§7.5 Homework Solutions

1) [BB] $n=7$, $r=30$. 3) [BB] $n=6$, $r=5$.

8) 4 ways to decide who gets 6 books and $\binom{18}{6}$ ways to decide which books they get
3 ways to decide who gets 2 books and $\binom{12}{2}$ — — — — — — — — —
Of the 2 remaining people, pick first one in alphabet, say. Choose their books in $\binom{10}{5}$ ways.
The last 5 books go to the last person.
So By Multiplication Rule: Answer is $4\times\binom{18}{6}\times 3\times\binom{12}{2}\times\binom{10}{5}$.

10) $\binom{12}{6}\binom{6}{4}$ $\left(\text{or } \binom{12}{4}\binom{8}{6} \text{ or } \binom{12}{2}\binom{10}{6} \text{ etc}\right)$.

11) a) [BB]. $\binom{60}{10}$ ways to place eg. red balls, then $\binom{50}{10}$ ways to place white balls, then $\binom{40}{10}$ ways to place blue balls, so $\binom{60}{10}\binom{50}{10}\binom{40}{10}$.

b). $\binom{69}{10}$ ways to distribute the red balls, and same for white and blue
So answer is $\binom{69}{10}^3$.

15) If all the flags were different the answer would be $30!$
Taking account of the repeats we get $\dfrac{30!}{10!5!7!8!}$

16) Fill the single rooms first in $P(30,5)$ ways.
Next fill the double rooms (in numerical order say) in $\binom{25}{2}\binom{23}{2}\binom{21}{2}\binom{19}{2}\binom{17}{2}$
Then — — triple — — — — — — — — $\binom{15}{3}\binom{12}{3}\binom{9}{3}\binom{6}{3}\binom{3}{3}$
} Multiply together to get answer

OR If there were 30 single rooms the answer would be $30!$ But each double room is like a once repeated flag in Q15 and each triple room is like a doubly repeated flag

So answer is $\dfrac{30!}{(2!)^5(3!)^5}$ (Better (more elegant) than the first method).