

Chapter 1

10. 1 2 3 4 5 6 7 8

Any person \nearrow Any beside the first one
 $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
 $8!$

b) $7! \cdot 2!$ $2! \rightarrow (AB)$
 $(CDEFGH)$
 $7!$

c) $(M \ W) (M \ W) (M \ W) (M \ W)$
 $(W \ M) (W \ M) (W \ M) (W \ M)$

I can have $4!$ different way to organize the first set. Same for the second. $4! \cdot 4! \cdot 2!$
 $\leftarrow 2$ mean either men or women at the first sit

d) $5! \cdot 4!$
 $= 5! \cdot 4!$

e) $4! \cdot 2! \cdot 2! \cdot 2! \cdot 2!$
 $2! \ 2! \ 2! \ 2!$

10. In how many ways can 8 people be seated in a row if

- (a) there are no restrictions on the seating arrangement?
- (b) persons A and B must sit next to each other?
- (c) there are 4 men and 4 women and no 2 men or 2 women can sit next to each other?
- (d) there are 5 men and they must sit next to each other?
- (e) there are 4 married couples and each couple must sit together?

16-a.

$$\binom{6}{2} + \binom{7}{2} + \binom{4}{2}$$

I can choose from any subject
so can use Union(+). I then can
choose 2 from any subject

16. A student has to sell 2 books from a collection of 6 math, 7 science, and 4 economics books. How many choices are possible if

- (a) both books are to be on the same subject?
(b) the books are to be on different subjects?

$$\begin{aligned} \text{b). } & \binom{6}{1} \binom{7}{1} \cancel{\binom{4}{0}} + \binom{6}{1} \cancel{\binom{7}{0}} \binom{4}{1} + \cancel{\binom{6}{0}} \binom{7}{1} \binom{4}{1} \\ & = \binom{6}{1} \binom{7}{1} + \binom{6}{1} \binom{4}{1} + \binom{7}{1} \binom{4}{1} \end{aligned}$$

$$= 6 \cdot 7 + 6 \cdot 4 + 7 \cdot 4 = 94$$

18 $2R \cap 2D \cap 3I$

$$\binom{5}{2} \cdot \binom{6}{2} \cdot \binom{4}{3}$$

18. A committee of 7, consisting of 2 Republicans, 2 Democrats, and 3 Independents, is to be chosen from a group of 5 Republicans, 6 Democrats, and 4 Independents. How many committees are possible?

Chapter 2

18.

$$\binom{4}{52} \binom{16}{51} + \binom{16}{52} \binom{4}{51}$$

\uparrow Ace \uparrow 10, J, Q, K \uparrow 10, J, Q, K \uparrow Ace

18. Two cards are randomly selected from an ordinary playing deck. What is the probability that they form a blackjack? That is, what is the probability that one of the cards is an ace and the other one is either a ten, a jack, a queen, or a king?

32. $\frac{b}{1} \frac{g}{\leq} \frac{g}{\leq} \frac{b}{1} \frac{b+g}{\leq}$

32. A group of individuals containing b boys and girls is lined up in random order; that is, each the $(b + g)!$ permutations is assumed to be equal likely. What is the probability that the person the i th position, $1 \leq i \leq b + g$, is a girl?

$(b+g)!$ to line them up in random order

g girls to choose from. Given no previous girl is chosen. We can choose any girl to be on the i position.

after we choose that 1 girl we only left with $b+g-1$ people

choose a girl

$$\frac{g (b+g-1)!}{(b+g)!}$$

\leftarrow arrange the rest in random order
 \leftarrow total possibility

New York Times

Consider the following problem from the New York Times. Draw 6 straight lines on a piece of paper so that no two lines are in parallel, all intersections are on the paper, and only two lines form any intersection. How many total triangles are there?

A Δ form from 3 lines. How can I pick three lines from

It is choose with no order, no replacement.

$$\frac{6!}{3!3!} = \frac{6 \cdot 5 \cdot 4}{3 \cdot 2 \cdot 1} = 20$$