$1 = 100\%$

9. b. $\frac{25}{58}$ ← conditional probability

↖ subset of original group

d. $\frac{33}{58}$

probability

$P(A \text{ or } B) = P(A) + P(B)$ if A + B are mutually exclusive

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ A + B are not mutually exclusive

Multiplication Rule

Independent events – A and B are independent if the occurrence of A does not affect the probability of the occurrence of B.

$P(A \text{ and } B) = P(A)P(B)$ Multiplication Rule for independent events

example: A = event of rolling a 4
B = tossing tails

$P(A \text{ and } B) = \frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$

example: A = 1st child a girl
B = 2nd child a boy

$P(A \text{ and } B) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

example: What is the probability of having 6 boys?

$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{64} = 0.0156$

example: Bowl with 5 marbles, 3 blue, 2 yellow
Choose 1 marble, put it back, choose another marble.
A = blue on first draw
B = yellow on second draw
} independent events because you're sampling with replacement

$P(A \text{ and } B) = P(A)P(B) = \frac{3}{5} \cdot \frac{2}{5} = \frac{6}{25}$

example: Same problem, but sample without replacement.

$$P(A \text{ and } B) = \frac{3}{5} \cdot \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$$

$$P(A \text{ and } B) = P(A) \cdot P(B|A)$$

Multiplication Rule for dependent events

↑ "given"

$P(B|A)$ = conditional probability

example: A = yellow on 1st
B = yellow on 2nd
w/o replacement

$$P(A \text{ and } B) = \frac{2}{5} \cdot \frac{1}{4} = \frac{2}{20} = \frac{1}{10}$$

example: 52 card deck
A = ace on 1st draw
B = king on 2nd draw
w/o replacement (dependent)

$$P(A \text{ and } B) = \frac{4}{52} \cdot \frac{4}{51} = 0.006$$

example: A = ace on 1st draw
B = ace on 2nd draw

$$P(A \text{ and } B) = \frac{4}{52} \cdot \frac{3}{51} = \frac{12}{2652} = .0045$$

example: A = 1st person survived
B = 2nd person survived
} two different people

$$P(A \text{ and } B) = \frac{711}{2201} \cdot \frac{710}{2200} = 0.104$$

Determining whether Events are Independent

example: $P(\text{survived}) = \frac{711}{2201} = 0.323$

$P(\text{survived} \mid 1\text{st class}) = \frac{203}{325} = 0.625$

↖ different — dependent events

If $P(A) = P(A|B)$, A and B are independent.

A = passing
B = man

$P(A) = \frac{120}{150} = 0.80$

$P(A|B) = \frac{80}{100} = 0.80$

↖ The same — independent events

Homework: Finish packet