CONDITIONAL PROBABILITY AND DIFFERENCE RULE

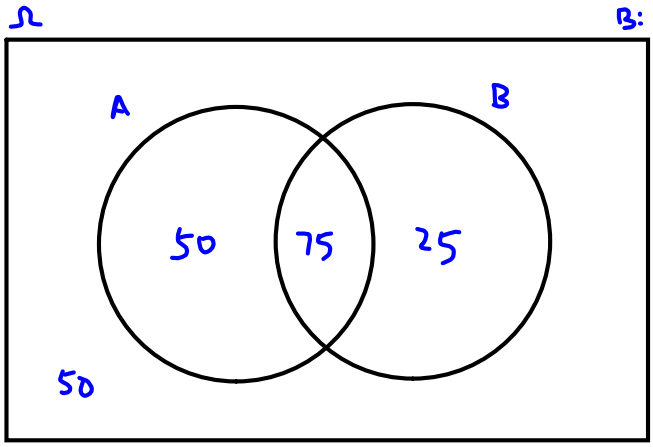
Goal:

- to determine the conditional probability of an event

- to apply the difference rule to determine the probability of an event

There are 200 people at a bbq. 125 people have chosen are eating hamburgers, 100 people are eating hot dogs and 75 people are having both.

A: Hamburgers
B: Hot dogs



If you choose a person at random determine:

a) probability they ate hamburger

$$P(A) = \frac{125}{200} = \frac{5}{8}$$

b) probability they didn't eat a hamburger or hot dog

$$P(A \cup B)' = \frac{50}{200} = \frac{1}{4}$$

c) probability they ate a hamburger given they ate a hot dog

$$P(A|B) = \frac{75}{100}$$

conditional probability: "given" or "if"

d) probability they ate a hot dog but not a hamburger

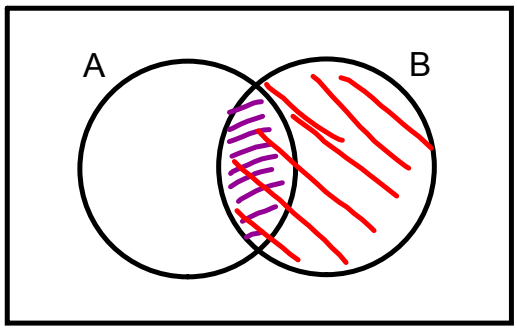
$$P(B \setminus A) = \frac{25}{200} = \frac{1}{8}$$

(25 ← hot dogs only)

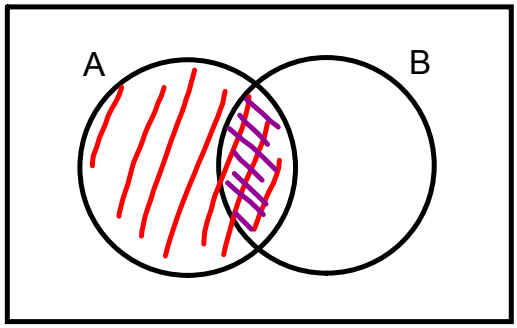
difference rule: but not....

Conditional probability:

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$



$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$



What is the probability of rolling a 6 given the roll is even?

$$P(6|\text{even}) = \frac{1}{3}$$

$$P(6|\text{even}) = \frac{P(6 \cap \text{even})}{P(\text{even})}$$

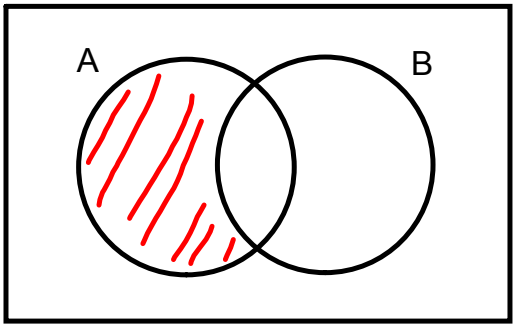
$$= \frac{\frac{1}{6}}{\frac{3}{6}}$$

$$= \frac{1}{6} \cdot \frac{6}{3} = \frac{1}{3}$$

Difference rule:

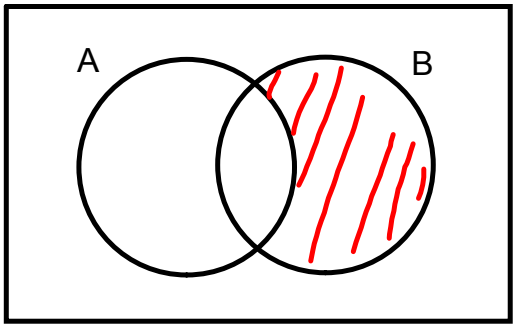
$P(A \setminus B)$: A but not B

$= P(A) - P(A \cap B)$



$P(B \setminus A)$

$= P(B) - P(A \cap B)$



What is the probability of rolling an even number that is not 2?

$$P(\text{even} \setminus 2) = P(\text{even}) - P(\text{even} \cap 2)$$

$$= \frac{3}{6} - \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$

p.157

#26. a) $P(G') = 25\%$

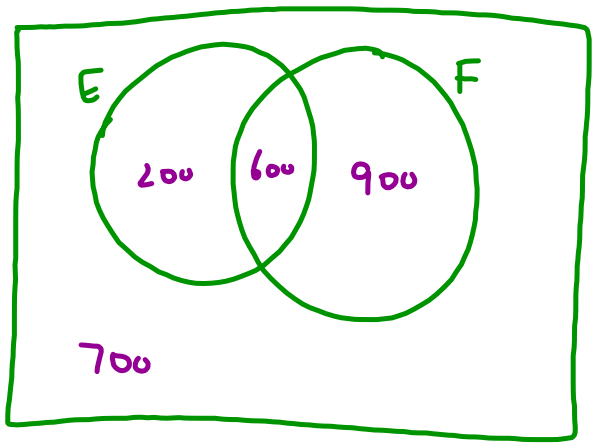
b) 25%.

c) 10%.

d) 15%.

	G	G'	Total
C	50	10	60
C'	25	15	40
Total	75	25	100

27.



a) $P(F) = \frac{1500}{2400} = \frac{5}{8}$

b) $P(E \setminus F) = \frac{200}{2400} = \frac{1}{12}$

c) $P(E \cup F) = \frac{1700}{2400} = \frac{17}{24}$

d) $P(\text{one only}) = \frac{1100}{2400} = \frac{11}{24}$

e) $P(E|F) = \frac{600}{1500} = \frac{2}{5}$

f) $P(F|E) = \frac{600}{800} = \frac{3}{4}$

p. 157 #28

p. 162 # 3