

8/25 SL 1A

Some Probability Formulas

The Addition Rule

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



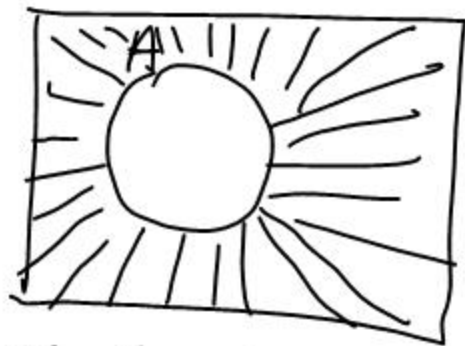
"inclusive" or

This means one or the other or both

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

Complementary Events

$$P(A') = 1 - P(A)$$



The complement of A is shaded: A'

Playing Cards

52 cards

Suits

13 hearts ♡ red

13 diamonds ◇ red

13 spades ♠ black

13 clubs ♣ black

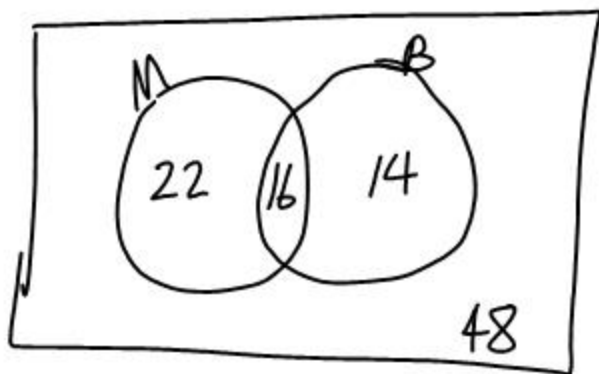
Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10,
jack, queen, king
face cards

Conditional Probability

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

"The probability of A given B"
B is the condition

Ex.



M = students taking HL Math
B = students taking HL Bio

$$P(M|B) = \frac{16}{30}$$

← students taking both
← students taking Bio

Ex $P(A) = \frac{9}{20}$ and $P(B) = \frac{3}{10}$ and

$$P(A \cup B) = 2P(A \cap B).$$

(a) Find $P(A \cup B)$.

Use the addition rule: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

add $\frac{1}{2}P(A \cup B)$
to both sides

$$P(A \cup B) = \frac{9}{20} + \frac{3}{10} - \frac{1}{2}P(A \cup B)$$

$$\cancel{\frac{2}{2}} \cdot \cancel{\frac{3}{2}} P(A \cup B) = \cancel{\frac{3}{20}} + \cancel{\frac{2}{10}} - \cancel{\frac{1}{2}} P(A \cup B)$$

$$P(A \cup B) = \frac{1}{2}$$

(b) Find $P(A \cup B)'$

$$\begin{aligned}P(A \cup B)' &= 1 - P(A \cup B) \\&= 1 - \frac{1}{2} \\&= \frac{1}{2}\end{aligned}$$

(c) $P(A \cap B') = \frac{1}{5}$



$$\begin{aligned}P(A \cap B) &= P(A) + P(B) - P(A \cup B) \\&= \frac{9}{20} + \frac{3}{10} - \frac{1}{2} \\&= \frac{1}{4}\end{aligned}$$

Ex Out of 53 teachers, 36 drink tea, 18 drink coffee, and 10 drink neither of these.

(a) How many drink both?

(b) Find the prob. that a teacher drinks tea but not coffee

(c) Find the prob. that if he drinks tea he also drinks coffee

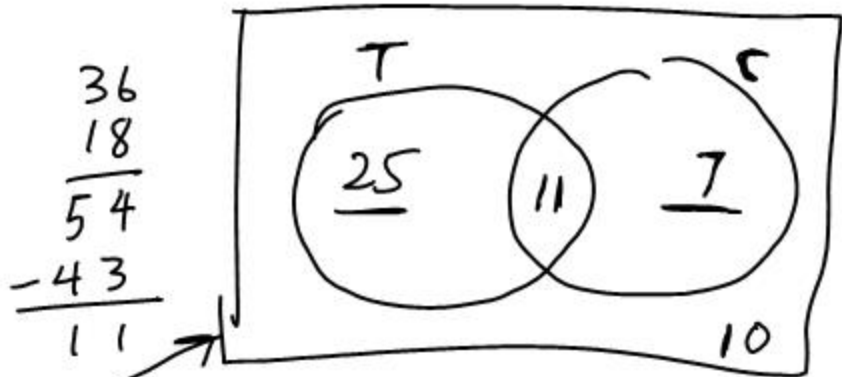
a $P(T \cap C) = \frac{11}{53}$

b $P(T \cap C') = \frac{25}{53}$

c $P(C|T)$

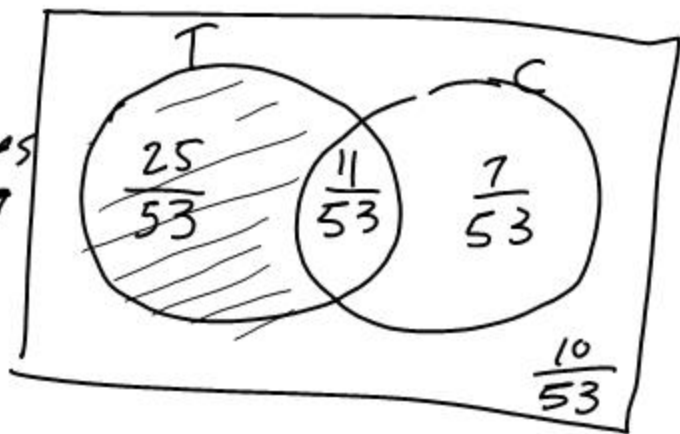
$$= \frac{P(C \cap T)}{P(T)}$$

$$= \frac{\frac{11}{53}}{\frac{36}{53}} = \frac{11}{36}$$



36
18
—
54
-43
—
11

Count data



Probabilities

HW [3C] #4, 6, 7, 8

[3G] #1, 2, 6