

examples



probability

The World Values Survey is an ongoing worldwide survey that polls the world population about perceptions of life, work, family, politics, etc.

The most recent phase of the survey that polled 77,882 people from 57 countries estimates that 36.2% of the world's population agree with the statement "Men should have more right to a job than women."

The survey also estimates that 13.8% of people have a university degree or higher, and that 3.6% of people fit both criteria.

$$P(\text{agree}) = 0.362$$

$$P(\text{uni. degree}) = 0.138$$

$$P(\text{agree \& uni. degree}) = 0.036$$

(I) Are agreeing with the statement "Men should have more right to a job than women" and having a university degree or higher disjoint events?

$$P(\text{agree}) = 0.362$$

$$P(\text{uni. degree}) = 0.138$$

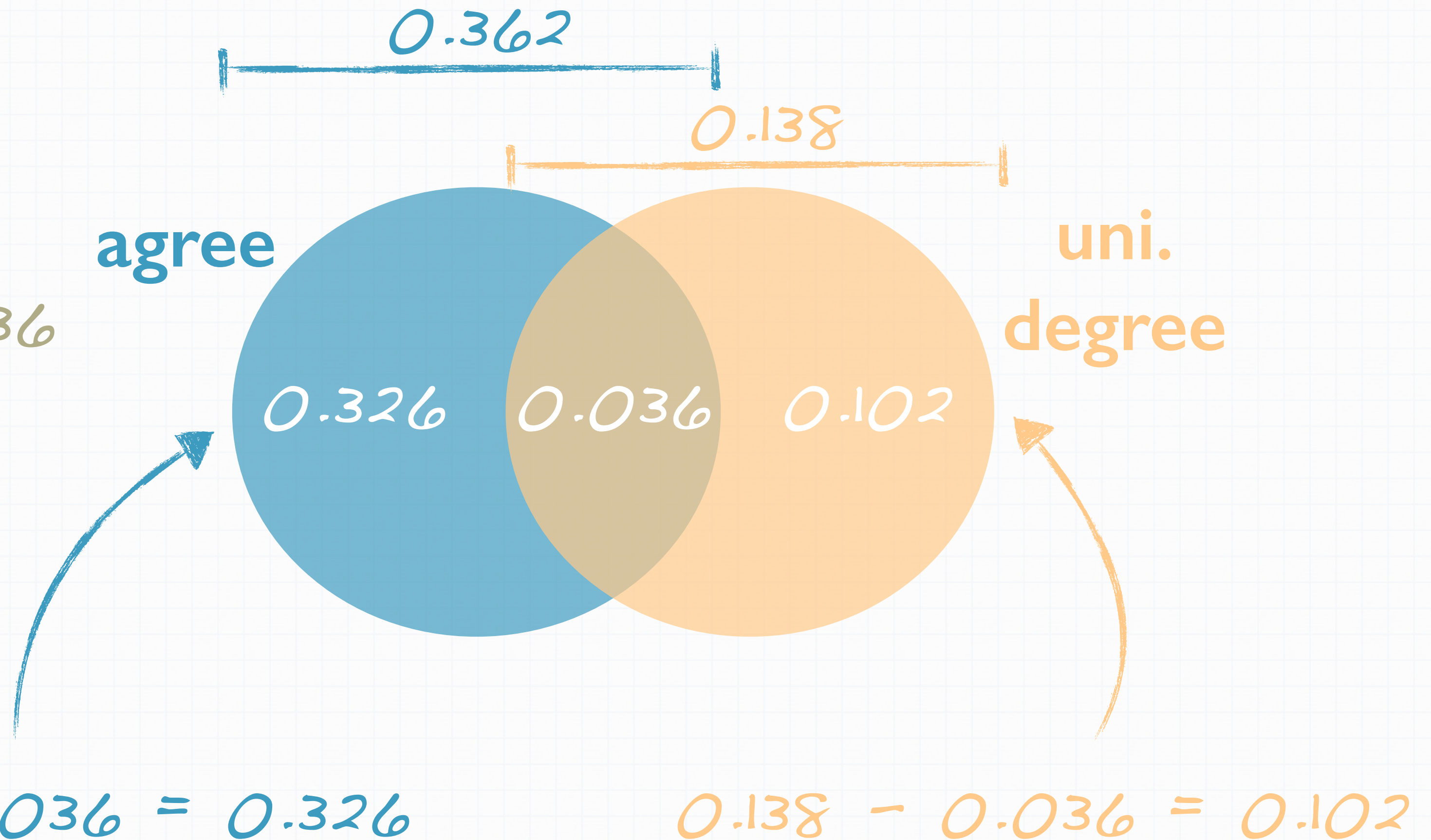
$$P(\text{agree \& uni. degree}) = 0.036 \neq 0 \rightarrow \text{not disjoint}$$

(2) Draw a Venn diagram summarizing the variables and their associated probabilities.

$$P(\text{agree}) = 0.362$$

$$P(\text{uni. degree}) = 0.138$$

$$P(\text{agree \& uni. degree}) = 0.036$$

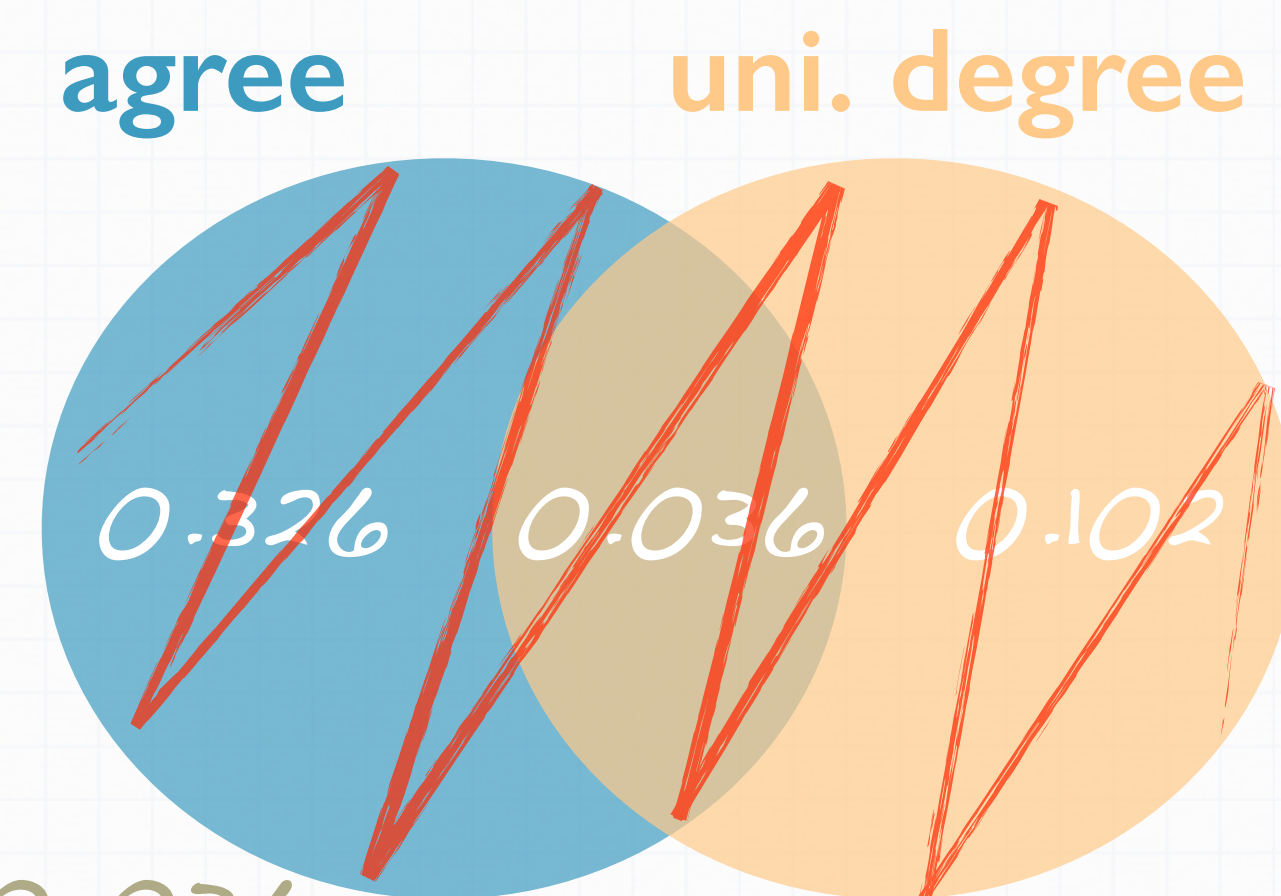


(3) What is the probability that a randomly drawn person has a university degree or higher or agrees with the statement about men having more right to a job than women?

$$P(\text{agree}) = 0.362$$

$$P(\text{uni. degree}) = 0.138$$

$$P(\text{agree \& uni. degree}) = 0.036$$



$$P(\text{agree or uni. degree})$$

$$= P(\text{agree}) + P(\text{uni. degree}) - P(\text{agree \& uni. degree})$$

$$= 0.362 + 0.138 - 0.036$$

$$= 0.464$$

General addition rule:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$0.326 + 0.036 + 0.102 = 0.464$$

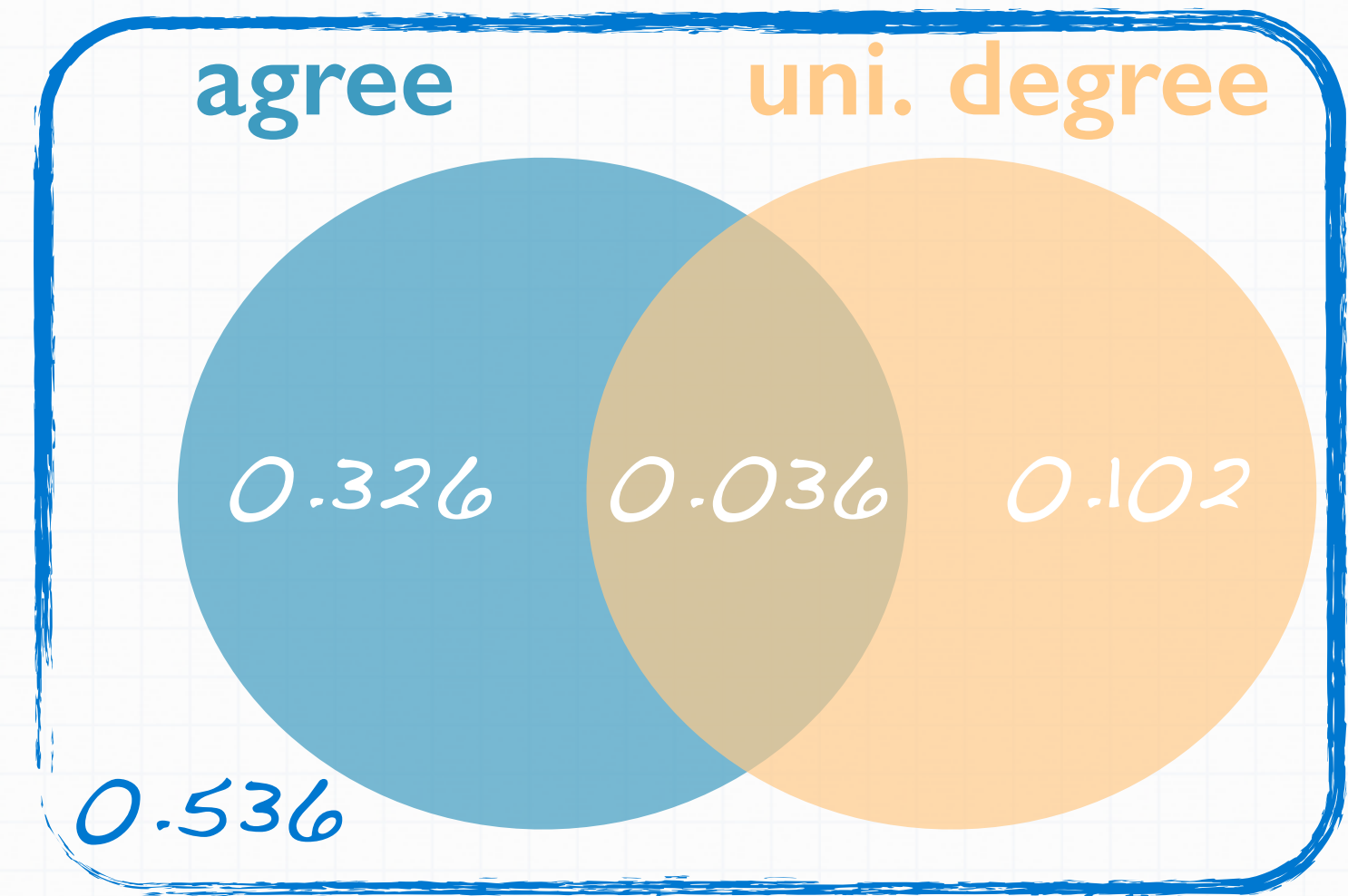
(4) What percent of the world population do not have a university degree and disagree with the statement about men having more right to a job than women?

$$P(\text{agree}) = 0.362$$

$$P(\text{uni. degree}) = 0.138$$

$$P(\text{agree \& uni. degree}) = 0.036$$

$$P(\text{agree or uni. degree}) = 0.464$$



$$P(\text{neither agree nor uni. degree})$$

$$= 1 - P(\text{agree or uni. degree})$$

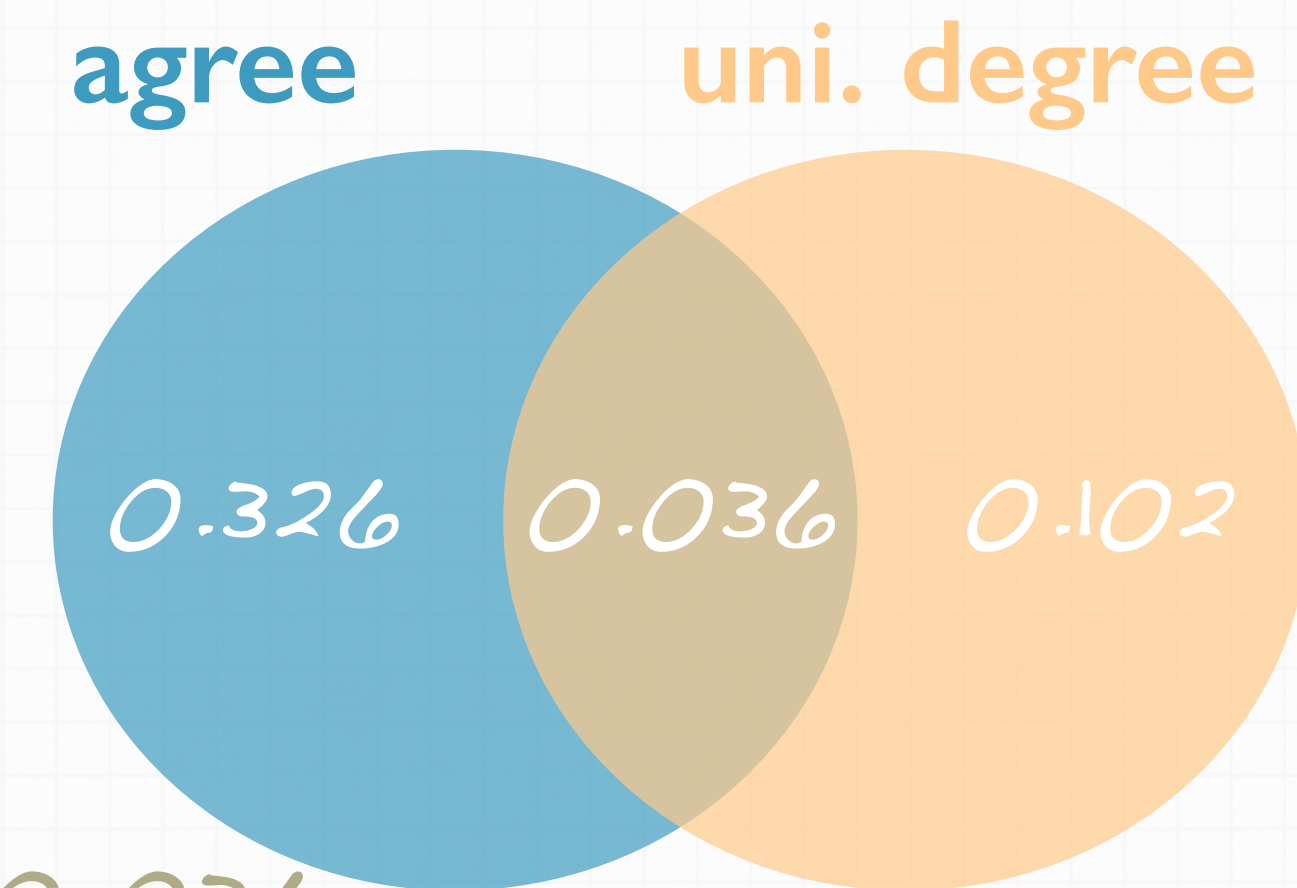
$$= 1 - 0.464 = 0.536$$

(5) Does it appear that the event that someone agrees with the statement is independent of the event that they have a university degree or higher?

$$P(\text{agree}) = 0.362$$

$$P(\text{uni. degree}) = 0.138$$

$$P(\text{agree \& uni. degree}) = 0.036$$



Product rule for independent events:

If A and B are independent, $P(A \text{ and } B) = P(A) \times P(B)$

$$P(\text{agree \& uni. degree}) \stackrel{?}{=} P(\text{agree}) \times P(\text{uni. degree})$$

$$0.036 \stackrel{?}{=} 0.362 \times 0.138$$

$$0.036 \neq 0.05 \rightarrow \text{not independent}$$

(6) What is the probability that at least 1 in 5 randomly selected people agree with the statement about men having more right to a job than women?

$$P(\text{agree}) = 0.362$$

$$S = \{0, 1, 2, 3, 4, 5\} \longrightarrow S = \{0, \text{at least } 1\}$$

$$P(\text{at least } 1 \text{ agree}) = 1 - P(\text{none agree})$$

$$= 1 - P(\underline{D} \underline{D} \underline{D} \underline{D} \underline{D})$$

$$= 1 - 0.638^5$$

$$= 1 - 0.106 = 0.894$$

$$P(\text{disagree})$$

$$= 1 - P(\text{agree})$$

$$= 1 - 0.362$$

$$= 0.638$$

- ▶ sample spaces
- ▶ disjoint, complementary, and independent events
- ▶ addition rule for unions of events
- ▶ multiplication rule for joint probabilities for independent events