

12.2 Conditional Probability

Conditional Probability - Contains a condition that may limit the sample space for an event.

Use the notation $P(B|A)$, which reads "the probability of event B, given event A"

The table below shows results of a class survey.

Do you own a pet?

	yes	no
Female	8	6
Male	5	10

Find the following.

- A) $P(\text{own a pet} | \text{female}) = \frac{8}{14} = \frac{4}{7}$
- B) $P(\text{female} | \text{own a pet}) = \frac{8}{13}$
- C) $P(\text{don't own a pet} | \text{male}) = \frac{10}{15} = \frac{2}{3}$

Municipal Waste Collected in the US (millions of tons)

	Recycled	Not Recycled
Paper	34.9	48.9
Metal	6.5	10.1
Glass	2.9	9.1
Plastic	1.1	20.4
Other	15.3	67.8
	60.7	156.3

A) Find the probability that a sample of recycled waste was plastic.

$$\frac{1.1}{60.7} \approx .018$$

B) Find the probability that a sample of not-recycled waste was paper.

$$\frac{48.9}{156.3} \approx .313$$

C) $P(\text{glass} | \text{recycled}) = \frac{2.9}{60.7} \approx .048$

D) $P(\text{recycled} | \text{glass}) = \frac{2.9}{12} \approx .242$

E) $P(\text{not recycled} | \text{metal}) = \frac{10.1}{16.6} \approx .608$

Conditional Probability Formula. For any two events A and B from a sample space with $P(A) \neq 0$.

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

Eighty percent of an airline's flights depart on schedule. Seventy-two percent of its flights depart and arrive on schedule. Find the probability that a flight that departs on time also arrives on time.

$$P(B|A) = \frac{.72}{.8} = .9$$

90%

Researchers asked people who exercise regularly whether they jog or walk.

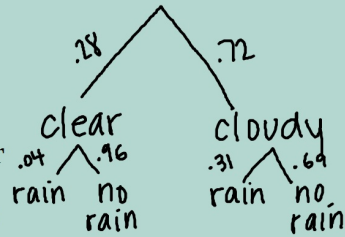
Fifty-eight percent of the respondents were male. Twenty percent of all respondents were males who said that they jog. Find the probability that a male respondent jogs.

$$\frac{.2}{.58} = .34$$

34%

A student made the following observations of the weather in his hometown. Use a tree diagram to find the probability that a day will start out clear and then it will rain.

- On 28% of the days, the sky is mostly clear
- During the mostly clear days, it rained 4% of the time
- During the cloudy days, it rained 31% of the time.



$$.28(.04) = .0112$$

Then find $P(\text{not rain} \mid \text{start cloudy})$

$$.72(.69) = .497$$

homework:

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