

Practice

Form G

Conditional Probability Formulas

At a recent swim meet, half of the swim club members experienced an improvement in their race times over a previous swim meet. The probability of a swim club member experiencing an improvement in their race time and training the week before the meet was 30%.

1. What is the probability that a swimmer trained the week before the meet given that his or her race time improved? 0.6 or 60% $P(\text{trained} | \text{improved}) = \frac{0.3}{0.5} = 0.6$ ✓

2. The probability that a swimmer did not experience an improvement in his or her race times and trained the week before the meet was 10%. What is $P(\text{trained} | \text{did not improve})$? 0.2 or 20% $\frac{0.10}{0.50} = 0.2$ ✓

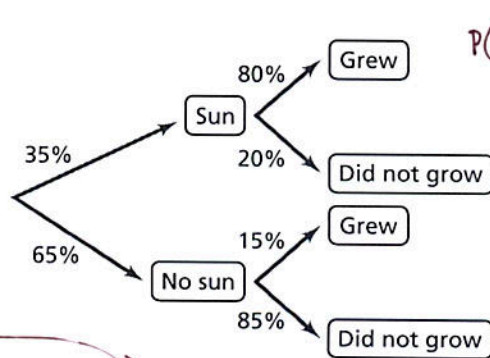
3. Half of a class took Form A of a test, and half took Form B. Of the students who took Form B, 39% passed. What is the conditional probability that a randomly chosen student took Form B and passed? 0.195 or 19.5% $P(\text{passed} | \text{took B}) = \frac{0.39}{0.5} = 0.195$ ✓

4. Three-fourths of a research team worked in a lab while one-fourth of the team worked near a pond. Of the researchers who worked near the pond, 14% collected insects. What is the probability that a randomly chosen researcher worked near the pond and collected insects? 0.035 or 3.5% $P(\text{work pond} \cap \text{collected insects}) = P(\text{collected} | \text{pond}) P(\text{pond}) = 0.14 \cdot 0.25 = 0.035$

5. In the senior class, 24% of the students play softball, 32% of the students play field hockey, and 14% play both. What are the probabilities that a softball player also plays field hockey, and a field hockey player also plays softball? 0.5833 and 0.4375 $P(\text{plays hockey} | \text{softball}) = \frac{P(\text{hockey} \cap \text{softball})}{P(\text{softball})} = \frac{0.14}{0.24} = \frac{7}{12} = 0.5833$

Use the diagram at the right for Exercises 6 and 7.

The tree diagram shows the percentages of plants that received sunlight and whether or not they grew.



6. What is the combined probability that a plant grew? 0.3775

7. What is the combined probability that a plant did not grow? 0.6225

$$P(\text{grew} \cap \text{Sun}) + P(\text{grew} \cap \text{No sun})$$

$$= P(\text{grew} | \text{Sun}) P(\text{Sun}) + P(\text{grew} | \text{No sun}) P(\text{No sun})$$

$$= 0.80 \cdot 0.35 + 0.15 \cdot 0.65$$

$$= 0.3775 \quad \checkmark$$

$$1 - 0.3775 = 0.6225 \quad \checkmark$$

$$P(\text{softball} | \text{hockey}) = \frac{0.14}{0.32} = \frac{14}{32} = \frac{7}{16} = 0.4375$$

Practice (continued)

Form G

Conditional Probability Formulas

Of the people who went to an amusement park last week, 85% rode a rollercoaster, 45% attended a musical review show, and 18% did both.

8. What is the conditional probability that a person who rode a rollercoaster also attended a musical review show? 0.212

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{18}{85} = 0.212$$

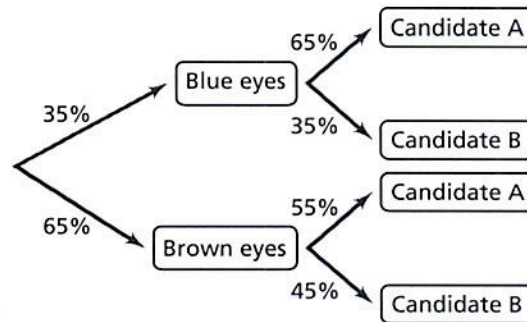
9. **Writing** Explain the meaning of $P(\text{rode a rollercoaster} | \text{attended musical review})$. Then calculate the probability. $P(\text{rode a rollercoaster} | \text{attended musical review})$ is the number of people who rode a rollercoaster given that they attended a musical review show; 0.4

$$\frac{18}{45} = 0.4$$

10. **Writing** Half of your 200 classmates went to the zoo. Of the students who went to the zoo, 25% saw the dolphin show. Explain how to calculate the number of students that attended the dolphin show. The percent of those who went to the zoo and saw the dolphin show is 50% times 25%, or 12.5%. To find the number of students who saw the dolphin show, multiply the total number of students by this percentage. $200 \cdot 0.125 = 25$ students

The diagram at the right shows the percent of blue-eyed voters and brown-eyed voters that voted for 2 candidates. Use the table for Exercises 11 and 12.

11. What is the combined probability that Candidate A won? 0.585



12. **Error Analysis** Your friend says the combined probability of Candidate B winning is 80%. What error did she make? What is the correct combined probability? She added the probabilities beneath each candidate instead of finding the combined probabilities of each branch and adding them; 0.415

→ see #7

13. Of a group of friends, 28% take dance lessons, 32% take singing lessons, and 8% take both. What is the probability that a dancer takes singing lessons? What is the probability that a singer takes dance lessons? 0.286 and 0.25

$$P(\text{Sing} | \text{dance}) = \frac{0.08}{0.28} = 0.286$$

$$P(\text{dance} | \text{sing}) = \frac{0.08}{0.32} = 0.25$$

see #6 on front page