

Probability Rules and Conditional Events

Grade 11 – Algebra 2 math · Worksheet · Standards: S-CP.A.1, S-CP.A.2, S-CP.A.3, S-CP.A.4, S-CP.A.5, S-CP.B.6, S-CP.B.7

Name: _____ Date: _____ Class: _____

These problems train sample spaces, unions and intersections, the addition rule, independence, conditional probability, two-way tables and tree diagrams, covering standards S-CP.A.1 through S-CP.B.7.

The first problems apply single rules. Later ones combine tables, trees and real situations such as quality control and medical testing.

Standards: S-CP.A.1, S-CP.A.2, S-CP.A.3, S-CP.A.4, S-CP.A.5, S-CP.B.6, S-CP.B.7 · **Level:** Grade 11 Algebra 2

Problem 1 Sample space for two stages (easy)

A coin is flipped and a six-sided die is rolled. List how many outcomes are in the sample space and find $P(\text{heads and an even number})$.

Problem 2 Complement of an event (easy)

A shuttle bus arrives on time with probability 0.88. Find the probability that it does not arrive on time.

Problem 3 Events as subsets (easy)

Let the sample space be $\{1, 2, \dots, 12\}$, A = multiples of 3 and B = even numbers. List $A \cap B$ and find $P(A \cup B)$.

Problem 4 Addition rule (easy)

Suppose $P(A) = 0.62$, $P(B) = 0.41$ and $P(A \cap B) = 0.27$. Evaluate $P(A \cup B)$.

Problem 5 Mutually exclusive events (medium)

In one visit to the library, Noor borrows a novel with probability 0.2 or a biography with probability 0.5, but never both on the same visit. Find the probability she borrows at least one of the two types and the probability she borrows neither.

Problem 6 Check independence (medium)

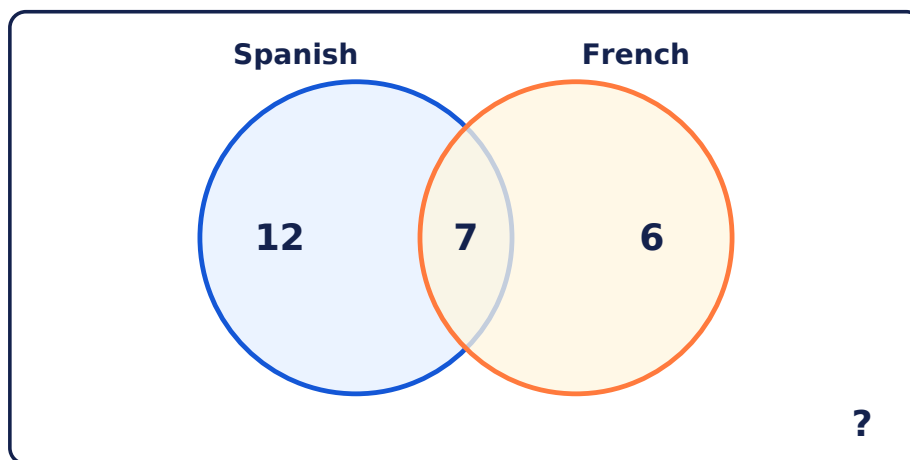
At a raffle, 35% of tickets are blue, 20% of tickets are marked with a star, and 7% are both blue and starred. Are “blue” and “starred” independent events?

Problem 7 Two free throws (medium)

A player makes 70% of free throws, and shots are independent. Find the probability of making both of two shots and of making exactly one.

Problem 8 Venn diagram of language classes (medium)

Among 35 students, 19 take Spanish, 13 take French and 7 take both. The Venn diagram shows the counts in the three inner regions. Find the number taking neither language and $P(\text{French} \mid \text{Spanish})$.

**Problem 9 Two-way table probabilities** (medium)

The table shows phone type by grade for 120 students. Find $P(\text{iPhone})$, $P(\text{Junior} \mid \text{iPhone})$ and $P(\text{iPhone} \mid \text{Senior})$.

	Android	iPhone	Total
Junior	34	26	60
Senior	22	38	60
Total	56	64	120

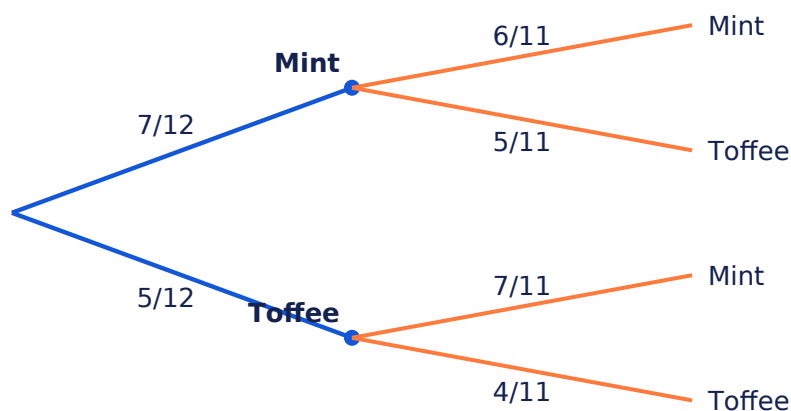
Phone type by grade level.

Problem 10 Conditional probability formula (medium)

In a survey, 35% of teens own a skateboard and 14% own both a skateboard and a helmet. Find the probability that a teen owns a helmet given that the teen owns a skateboard.

Problem 11 Draws without replacement (medium)

A jar holds 7 mints and 5 toffees. Maya takes two candies, one after the other, without putting any back. Find the probability that both are mints.



Probabilities for the two picks.

Problem 12 Test for independence in a table (medium)

Use the table of 120 students from the earlier problem. Are the events “Android” and “Junior” independent? Justify with probabilities.

Problem 13 Conditional from percentages (medium)

In a neighborhood, 60% of households own a pet and 25% own both a pet and a bicycle. Find the probability that a household owns a bicycle given that it owns a pet.

Problem 14 Addition rule with a table (medium)

Using the same table, find $P(\text{Junior or Android})$.

Problem 15 Union with cards (hard)

One card is picked at random from a full deck of 52. Find $P(\text{face card or spade})$, where the face cards are jack, queen and king.

Problem 16 Two alarms (hard)

Two independent alarm clocks each ring with probability 0.92. Find the probability that at least one rings.

Problem 17 Defective parts from three factories (hard)

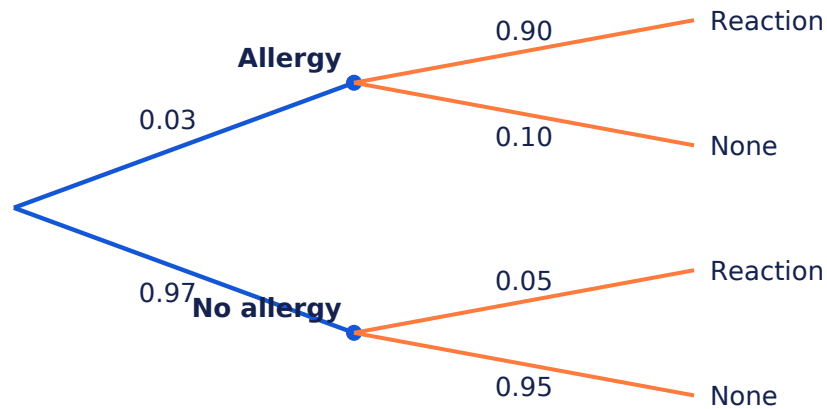
Plant A makes 40% of a company's chargers with a 1% defect rate, plant B makes 35% with a 4% defect rate, and plant C makes 25% with a 2% defect rate. Find $P(\text{defective})$ and $P(\text{made by B} \mid \text{defective})$ to the nearest thousandth.

Problem 18 Two dice, conditional (hard)

Two fair dice are rolled and the sum is 8. Find the probability that at least one die shows a 6, given that the sum is 8.

Problem 19 Allergy screening (hard)

A rare allergy affects 3% of campers. A screening patch shows a reaction for 90% of campers who have the allergy and for 5% of campers who do not. A camper shows a reaction. Find the probability that the camper has the allergy, to the nearest hundredth.



Branches for the screening patch.

Problem 20 Independence of a complement (hard)

Show that if A and B are independent, then A and B' are also independent.