

AP Statistics - Probability Rules and Simulation - Worksheet

Common Core AP STAT 4.1, AP STAT 4.2, AP STAT 4.3, AP STAT 4.4, HSS-CP.A.1, HSS-CP.B.7 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

These 20 problems practice AP Statistics topics 4.1 to 4.4. You will interpret probability as long-run frequency, build sample spaces, apply the complement and addition rules, read Venn diagrams, and design and run simple simulations.

AP Statistics · Common Core State Standards: **AP STAT 4.1, AP STAT 4.2, AP STAT 4.3, AP STAT 4.4, HSS-CP.A.1, HSS-CP.B.7**

Exercise 1 - Interpret a probability

A weather service says the chance of rain tomorrow is 30%. Interpret this statement.

Exercise 2 - Law of large numbers

050100150200Number of coin flips0.000.250.500.751.00Proportion of heads

The graph shows the proportion of heads in 200 flips. Why does the line wobble at first but settle near 0.5?

Exercise 3 - Gambler's fallacy

A fair coin lands tails 6 times in a row. Diego says heads is now more likely. Is he right?

Exercise 4 - Equally likely outcomes

A bag has 5 red, 3 blue, and 2 green marbles. One is picked at random. Find $P(\text{red})$, $P(\text{blue or green})$.

Exercise 5 - Sample space of two coins

List the sample space for flipping two coins and find the probability of exactly one head.

Exercise 6 - Two dice

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Sample space for two dice: 36 equally likely outcomes.

Two fair dice are rolled. Find $P(\text{sum} = 7)$ and $P(\text{sum} = 11)$.

Exercise 7 - Complement rule

The probability that a bus arrives on time is 0.82. Find the probability it is late.

Exercise 8 - At least one

Two dice are rolled. Find the probability that at least one die shows a 6.

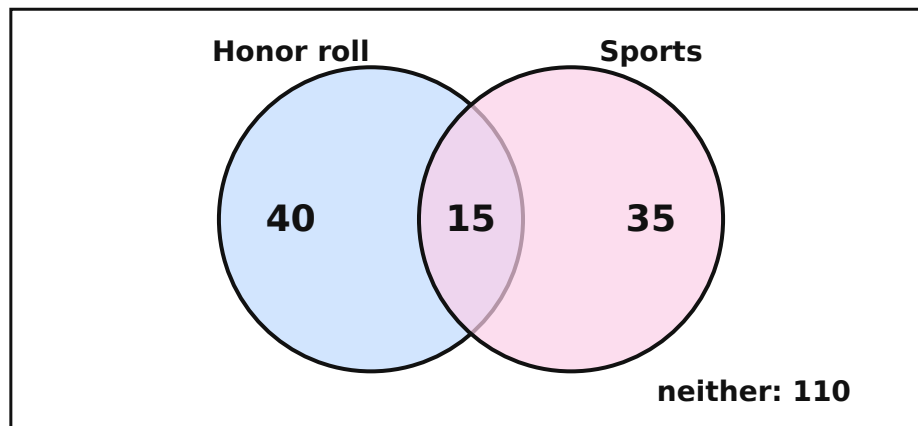
Exercise 9 - Mutually exclusive events

In a deck of 52 cards, find $P(\text{king or queen})$ for one card.

Exercise 10 - General addition rule

In a deck of 52 cards, find $P(\text{heart or king})$.

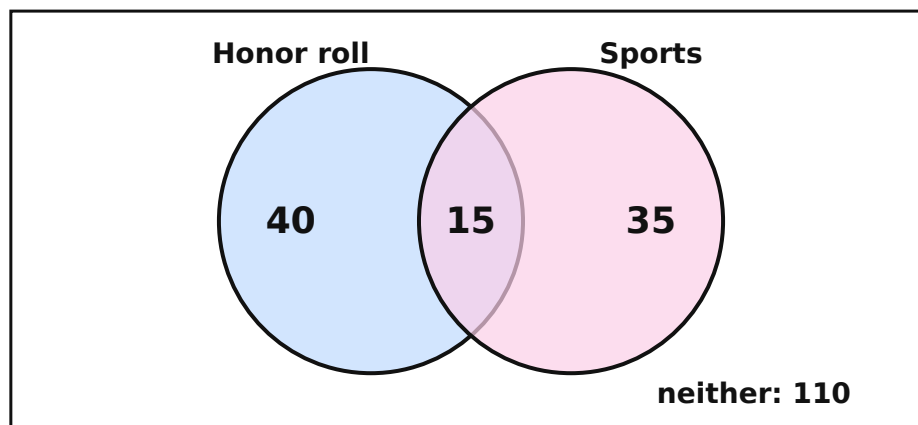
Exercise 11 - Read a Venn diagram



Venn diagram of 200 students. $P(\text{honor roll or sports}) = (40 + 15 + 35)/200$.

The Venn diagram shows 200 students. Find $P(\text{honor roll})$, $P(\text{sports})$, and $P(\text{honor roll and sports})$.

Exercise 12 - Neither



Venn diagram of 200 students. $P(\text{honor roll or sports}) = (40 + 15 + 35)/200$.

Using the same Venn diagram, find the probability a student is on the honor roll or plays sports, and the probability of neither.

Exercise 13 - Are they mutually exclusive?

For a randomly chosen student, A = plays a sport and B = plays an instrument. $P(A) = 0.5$, $P(B) = 0.3$, $P(A \text{ or } B) = 0.6$. Are A and B mutually exclusive? Find $P(A \text{ and } B)$.

Exercise 14 - Run a simulation

Random digits
0 3 8 1 5 6 4 9 2 7 6 1 0 5 8 2 3 4 9 6 7 1 5 2 8 3 0 6 4 9

Thirty random digits for the simulation.

A shooter makes 70% of her free throws. Digits 0 to 6 mean a made shot and 7 to 9 a miss. Use the digits above in groups of 3 (3 shots per trial, 10 trials) to estimate the probability that she makes at least 2 of 3 shots.

Exercise 15 - Compare with the exact value

For the shooter with probability 0.7 per shot, the exact probability of at least 2 made shots in 3 is 0.784. Compare it with the simulation estimate of the previous problem and explain any difference.

Exercise 16 - Design a simulation

About 25% of cereal boxes contain a prize. Describe a simulation to estimate how many boxes you expect to buy until you get a prize.

Exercise 17 - Probability of a union

$P(A) = 0.4$, $P(B) = 0.35$, and the events are mutually exclusive. Find $P(A \text{ or } B)$ and $P(\text{neither})$.

Exercise 18 - Raffle

A raffle has 200 tickets and Maya buys 8. What is the probability she wins one prize? If there are 3 prizes drawn (without replacement), what is the probability she wins none? Give a bound or compute exactly.

Exercise 19 - Multi-step

In a survey, 60% of students have a laptop, 45% have a tablet, and 25% have both. Find the percent with a laptop or a tablet, and the percent with neither.

Exercise 20 - At least one six

A die is rolled 4 times. Find the probability of at least one 6.