LESSON MAKER PRO

Count the Chances

Selections, arrangements, and compound probability

HIGH SCHOOL · S.P.1.3

S.P.1.3 "Use counting techniques (e.g., permutations and combinations) to solve mathematical and real-world problems, including determining probabilities of compound events."

NAME _____ DATE _____

COUNT BEFORE YOU DIVIDE

When order does not matter, count selections with C(n,r) = n!/[r!(n-r)!]. When order matters, count arrangements with P(n, r) = n!/(n-r)!. For equally likely outcomes, probability is the number of favorable outcomes divided by the total number of outcomes.

WORKED EXAMPLE

A bag holds 14 tokens, including 9 marked tokens. You draw 4 tokens without replacement. What is the probability that all 4 are marked?

1. Count favorable selections: C(9,4) = 126.
2. Count all selections: C(14,4) = 1001.
3. Divide and simplify: 126/1001 = 18/143.

Answer: 18/143

PRACTICE 6 problems

1 You have 6 different books. How many ways can you select 2 to display?

ANSWER _____

2 Seven runners compete for first and second place. How many possible ordered results are there?

ANSWER _____

3 Of 10 tickets, 5 are winners. You draw 2 without replacement. What is the probability that both win?

ANSWER _____

4 A bag holds 2 green chips and 6 orange chips. You draw 2 without replacement. What is the probability of getting one of each color?

ANSWER _____

5 A playlist has 12 songs, including 5 upbeat songs. If you select 2 songs at random, what is the probability that at least one is upbeat?

ANSWER _____

6 A team has 8 players, including 5 seniors. A captain and an alternate are chosen at random. What is the probability that both are seniors?

ANSWER _____

APPLY IT Show your work

1 A student club has 7 volunteers, including 5 who have run an event before. The club randomly selects 2 volunteers to plan its next event. What is the probability that both have event experience?

WORK SPACE

ANSWER _____

2 A DJ shuffles 10 tracks, including 6 hip-hop tracks, then plays the first 2. What is the probability that the first track is hip-hop and the second is not?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student council has 12 members, including 5 seniors. It randomly assigns different members to president, secretary, and treasurer. What is the probability that exactly 2 of the officers are seniors? Show how you count the favorable assignments.

WORK SPACE AND ANSWER

Count the Chances

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	You have 6 different books. How many ways can you select 2 to display?	**15**
2	Seven runners compete for first and second place. How many possible ordered results are there?	**42**
3	Of 10 tickets, 5 are winners. You draw 2 without replacement. What is the probability that both win?	**2/9**
4	A bag holds 2 green chips and 6 orange chips. You draw 2 without replacement. What is the probability of getting one of each color?	**3/7**
5	A playlist has 12 songs, including 5 upbeat songs. If you select 2 songs at random, what is the probability that at least one is upbeat?	**15/22**
6	A team has 8 players, including 5 seniors. A captain and an alternate are chosen at random. What is the probability that both are seniors?	**5/14**

PART 2 · APPLY IT

1. **10/21** There are C(5,2) = 10 experienced pairs and C(7,2) = 21 possible pairs.
2. **4/15** Multiply the probability of hip-hop first by the probability of a different genre second: (6/10)(4/9) = 4/15.

CHALLENGE

7/22. Choose the 2 offices held by seniors in C(3,2) = 3 ways, assign seniors in P(5,2) = 20 ways, and fill the remaining office in 7 ways. The probability is (3 × 20 × 7)/(12 × 11 × 10) = 7/22.

Accept equivalent fractions and correct counting methods. In the challenge, students may count unordered groups first if they also account for all possible officer assignments.