LESSON MAKER PRO

Count the Chances

Use counting to find probabilities.

HIGH SCHOOL · FM.AC.A.9

FM.AC.A.9 "Use various counting techniques to determine probabilities of events."

NAME _____ DATE _____

COUNT BEFORE YOU DIVIDE

When order does not matter, count the possible groups. You can count ordered choices and divide by the number of ways to arrange each group. When outcomes are equally likely, probability is the number of favorable outcomes divided by the total number of outcomes.

WORKED EXAMPLE

A box has 13 different cards, including 7 foil cards. You randomly select 4 cards without replacement. What is the probability that all 4 are foil?

1. Total groups: (13 × 12 × 11 × 10) / (4 × 3 × 2 × 1) = 715.
2. All-foil groups: (7 × 6 × 5 × 4) / (4 × 3 × 2 × 1) = 35.
3. Probability: 35/715 = 7/143.

Answer: 7/143

PRACTICE 6 problems

1 A set has 6 different cards, and 2 are marked. You randomly choose 2 cards without replacement. What is the probability that both are marked?

ANSWER _____

2 A set has 8 different cards, and 6 are marked. You randomly choose 2 cards without replacement. What is the probability that both are marked?

ANSWER _____

3 A bag holds 10 different tokens: 2 blue and 8 red. You randomly choose 2 without replacement. What is the probability of choosing one of each color?

ANSWER _____

4 A code uses 2 different letters from A, B, C, D, and E. Every possible code is equally likely. What is the probability that the first letter is a vowel and the second is a consonant?

ANSWER _____

5 Six different songs play in random order. What is the probability that one particular song plays first and another particular song plays second?

ANSWER _____

6 A club has 12 members: 6 juniors and 6 seniors. Two members are randomly selected. What is the probability that they are in the same grade?

ANSWER _____

APPLY IT Show your work

1 A student art page has 8 different designs, including 2 featured designs. The page randomly displays 2 designs without replacement. What is the probability that at least one displayed design is featured?

WORK SPACE

ANSWER _____

2 A music app plays 2 different songs in random order from a playlist of 10 songs. Six are upbeat, 2 are slow, and 2 are instrumental. What is the probability that an upbeat song plays first and a slow song plays second?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Eight finalists compete for gold, silver, and bronze awards. Two finalists are seniors and 6 are juniors. If each award order is equally likely, what is the probability that exactly one senior wins an award? Show how you counted the award orders.

WORK SPACE AND ANSWER

Count the Chances

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A set has 6 different cards, and 2 are marked. You randomly choose 2 cards without replacement. What is the probability that both are marked?	**1/15**
2	A set has 8 different cards, and 6 are marked. You randomly choose 2 cards without replacement. What is the probability that both are marked?	**15/28**
3	A bag holds 10 different tokens: 2 blue and 8 red. You randomly choose 2 without replacement. What is the probability of choosing one of each color?	**16/45**
4	A code uses 2 different letters from A, B, C, D, and E. Every possible code is equally likely. What is the probability that the first letter is a vowel and the second is a consonant?	**3/10**
5	Six different songs play in random order. What is the probability that one particular song plays first and another particular song plays second?	**1/30**
6	A club has 12 members: 6 juniors and 6 seniors. Two members are randomly selected. What is the probability that they are in the same grade?	**5/11**

PART 2 · APPLY IT

1. **13/28** Count the opposite event: neither is featured. Its probability is (6 × 5) / (8 × 7) = 15/28, so the requested probability is 1 − 15/28 = 13/28.
2. **2/15** There are 10 × 9 possible ordered pairs and 6 × 2 pairs with the requested order. The probability is 12/90 = 2/15.

CHALLENGE

15/28. There are 8 × 7 × 6 = 336 possible award orders. Choose the senior's award position in 3 ways, the senior in 2 ways, and the juniors for the other positions in 6 × 5 ways. That gives 3 × 2 × 6 × 5 = 180 favorable orders, so the probability is 180/336 = 15/28.

Accept equivalent fractions. In the challenge, a valid solution may count groups instead of award orders if it correctly accounts for exactly one senior.