

Counting Methods and Probability Rules

Grade 12 – Precalculus math · Test · Standards: S-CP.B.8, S-CP.B.9, S-MD.A.1, S-MD.A.2

Name: _____ Date: _____ Class: _____

This 45-minute test has 8 questions worth 20 points. Show the formula and the numbers you substitute. Give probabilities as fractions in lowest terms unless the question asks for decimals.

Standards: S-CP.B.8, S-CP.B.9, S-MD.A.1, S-MD.A.2 · **Level:** Grade 12 Precalculus

Time: 45 minutes · 8 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Full Meals (2 points)

A restaurant offers 4 appetizers, 6 entrees and 3 desserts. A full meal has one of each.

- How many different full meals are possible? (1 point)
- How many meal choices are possible if the dessert is optional (a diner may skip it)? (1 point)

Question 2 Permutation or Combination (2 points)

Evaluate $P(7, 3)$ and $C(7, 3)$. Then explain in one sentence why they are different.

Question 3 Random Committee (3 points)

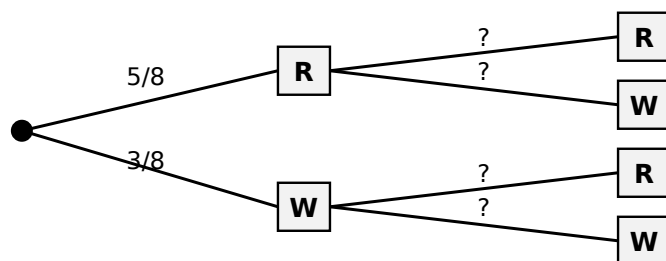
A committee of 3 is chosen at random from 6 boys and 4 girls.

- How many different committees are possible? (1 point)
- Find the probability that exactly 2 members are girls. (1 point)
- Find the probability that at least one member is a girl. (1 point)

Question 4 Trophy Shelf (2 points)

Five different trophies are placed in a row. (a) How many arrangements are there? (b) How many have the tallest trophy in the middle position?

Question 5 Marbles Without Replacement (3 points)

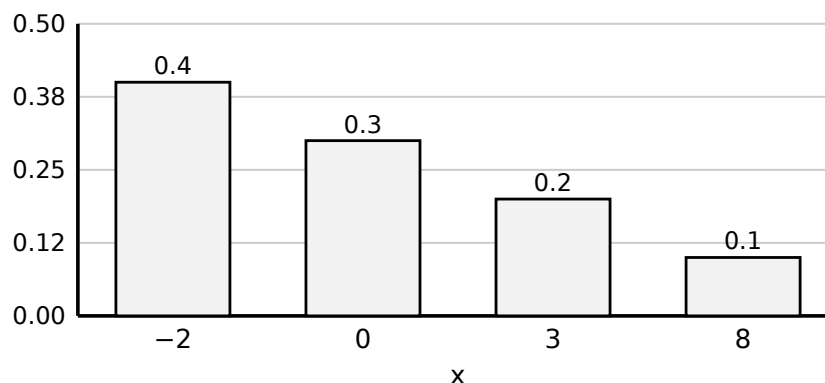


First-draw probabilities are given.

A bag holds 5 red and 3 white marbles. Two are drawn without replacement.

- Find the four second-draw probabilities marked ? in the tree. (1 point)
- Find the probability that both marbles are red. (1 point)
- Find the probability that the marbles are different colors. (1 point)

Question 6 Expected Value of a Game (3 points)



Probability distribution of the random variable.

X is a player's net gain in dollars in a game. The chart shows its distribution.

- Show that the probabilities form a valid distribution. (1 point)
- Find $E(X)$. (1 point)
- Explain what $E(X)$ means for a player. (1 point)

Question 7 Die Game (3 points)

A player pays \$5 to roll a fair die. Rolling a 6 wins \$12, rolling a 4 or a 5 wins \$3, and any other roll wins nothing. Should the player expect to come out ahead? Show the distribution of the winnings, the expected winnings and the expected net gain.

Question 8 Pets Survey (2 points)

Forty students were asked how many pets they have. The counts were 0 pets: 8 students, 1 pet: 16, 2 pets: 10, 3 pets: 6. Write the empirical probability distribution and find the expected number of pets.