A Bag Contains 19 Blue, 28 Purple, 21red, And 29 Orange Balls. You Pickone Ball At Random. Find Theprobability

Introduction

A Bag Contains 19 Blue, 28 Purple, 21 Red, And 29 Orange Balls. You Pick One Ball At Random. Find The Probability.
This problem involves basic probability principles, specifically calculating the likelihood of selecting a certain color of ball from a bag containing multiple colors with different quantities. Understanding how to approach such a problem requires knowledge of total outcomes, individual favorable outcomes, and how to express these as probabilities. In this article, we will explore the concepts step by step, analyze the problem comprehensively, and provide detailed calculations to arrive at the solution.

Understanding the Components of the Problem

The Total Number of Balls

The first step in solving this problem is to determine the total number of balls in the bag. Since the ball counts for each color are given, we can find the total by summing these quantities.

Favorable Outcomes

For each color, the favorable outcomes refer to the event where the ball drawn is of that particular color. For example, the favorable outcomes for blue are simply the number of blue balls in the bag.

Probability Definition

Probability is a measure of the likelihood that a particular event will occur. It is calculated as:

$$
\text{Probability of an event} = \frac{\text{Number of favorable outcomes}}{\text{Total number of possible outcomes}}
$$

In this context, the total number of possible outcomes is the total number of balls, and the favorable outcomes depend on the color of the ball.

Calculating the Total Number of Balls

Adding the Quantities

Given data:
- Blue balls = 19
- Purple balls = 28
- Red balls = 21
- Orange balls = 29

Total number of balls:

$$
\text{Total} = 19 + 28 + 21 + 29
$$

Calculating step-by-step:

$$
19 + 28 = 47
$$
$$
47 + 21 = 68
$$
$$
68 + 29 = 97
$$

Therefore, the total number of balls in the bag is 97.

Calculating Individual Probabilities

Probability of Drawing a Blue Ball

Number of favorable outcomes: 19 (blue balls)
Total outcomes: 97

$$
P(\text{Blue}) = \frac{19}{97}
$$

Probability of Drawing a Purple Ball

Number of favorable outcomes: 28 (purple balls)
Total outcomes: 97

$$
P(\text{Purple}) = \frac{28}{97}
$$

Probability of Drawing a Red Ball

Number of favorable outcomes: 21 (red balls)
Total outcomes: 97

$$
P(\text{Red}) = \frac{21}{97}
$$

Probability of Drawing an Orange Ball

Number of favorable outcomes: 29 (orange balls)
Total outcomes: 97

$$
P(\text{Orange}) = \frac{29}{97}
$$

Interpreting and Using the Probabilities

Basic Probability Facts

- The sum of probabilities of all mutually exclusive outcomes equals 1:

$$
P(\text{Blue}) + P(\text{Purple}) + P(\text{Red}) + P(\text{Orange}) = 1
$$

- These probabilities are all less than 1 individually, as expected, and sum up to 1, confirming that these are all possible outcomes.

Probability of Specific Events

Depending on the question, you might be asked to find the probability of drawing a ball of a certain color, or perhaps the probability of drawing a ball that is either blue or purple. Here are some common extensions:

- Probability of drawing a blue or purple ball:

$$
P(\text{Blue or Purple}) = P(\text{Blue}) + P(\text{Purple}) = \frac{19}{97} + \frac{28}{97} =
$$

$$
\frac{47}{97}
$$

- Probability of drawing a red or orange ball:

$$
P(\text{Red or Orange}) = \frac{21}{97} + \frac{29}{97} = \frac{50}{97}
$$

- Probability of drawing a ball that is not blue:

$$
P(\text{Not Blue}) = 1 - P(\text{Blue}) = 1 - \frac{19}{97} = \frac{78}{97}
$$

Note: These calculations assume each draw is independent and the ball is replaced after each draw, or that the problem involves a single, random selection without replacement.

Additional Considerations and Variations

Probability of Multiple Events

Suppose the problem extends to multiple draws, such as drawing two balls without replacement. The probabilities become more complex, involving conditional probabilities:

- Probability of drawing two blue balls in succession:

$$
P(\text{First Blue}) = \frac{19}{97}
$$

$$
P(\text{Second Blue} | \text{First Blue}) = \frac{18}{96}
$$

$$
P(\text{Two Blue}) = \frac{19}{97} \times \frac{18}{96}
$$

Similarly, for other combinations.

Understanding the Impact of Replacement

- If the ball is replaced after each draw, each draw has the same probability distribution.
- If not replaced, probabilities change after each draw, requiring calculation of conditional probabilities.

Summary and Final Remarks

In this problem, the total number of balls in the bag is calculated by summing the individual counts, resulting in 97 balls. The probability of drawing a ball of each color is simply the ratio of that color's count to the total. Specifically:

- Probability of Blue: $\frac{19}{97}$
- Probability of Purple: $\frac{28}{97}$
- Probability of Red: $\frac{21}{97}$
- Probability of Orange: $\frac{29}{97}$

These probabilities provide a complete picture of the likelihood of drawing each color at random. The concepts extend to more complex scenarios involving multiple draws, replacement, and combined events. Understanding these foundational principles equips you with the tools to solve a wide range of probability problems involving finite sample spaces.

By mastering these calculations, you can confidently analyze similar problems and interpret their outcomes, which are essential skills in statistics, data analysis, and decision-making processes involving randomness.

Frequently Asked Questions

What is the total number of balls in the bag?

The total number of balls is 19 (Blue) + 28 (Purple) + 21 (Red) + 29 (Orange) = 97 balls.

What is the probability of randomly selecting a blue ball from the bag?

The probability is 19/97.

What is the probability of randomly selecting a purple ball from the bag?

The probability is 28/97.

What is the probability of randomly selecting a red ball from the bag?

The probability is 21/97.

What is the probability of randomly selecting an orange ball from the bag?

The probability is 29/97.

If one ball is picked at random, what is the probability that it is not orange?

The probability is (97 - 29)/97 = 68/97.

What is the probability of selecting a ball that is either blue or purple?

The probability is (19 + 28)/97 = 47/97.

Are the probabilities of selecting each color ball equal?

No, the probabilities differ because the number of each color varies.

What is the probability of selecting a red or orange ball?

The probability is (21 + 29)/97 = 50/97.

If two balls are picked without replacement, what is the probability that both are purple?

The probability is (28/97) (27/96) = 756/9312 ≈ 0.0812.

Additional Resources

A Bag Contains 19 Blue, 28 Purple, 21 Red, And 29 Orange Balls. You Pick One Ball At Random. Find The Probability is a classic problem in probability theory that exemplifies the fundamental concepts of calculating likelihoods in real-world scenarios. This problem provides a practical example to understand how to determine the probability of selecting a specific type of object—in this case, a ball of a certain color—from a mixed collection. By analyzing this problem, students and enthusiasts can gain insight into basic probability calculations, the importance of understanding total outcomes, and how to interpret probability in various contexts.

Understanding the Problem

Before diving into calculations, it’s essential to understand the problem’s components and what is being asked. The problem states that a bag contains a total of four different colors of balls:

- Blue balls: 19
- Purple balls: 28
- Red balls: 21
- Orange balls: 29

You are asked to find the probability of randomly selecting one ball from this collection. Typically, such a problem will specify the probability of selecting a particular color or set of colors. Since the problem as presented asks for the probability of "picking one ball at random," it usually implies that we want to understand the probability of selecting a specific color or the overall probability of any event related to the ball selection.

Key points to clarify:
- Are we asked to find the probability of selecting a ball of a particular color? For example, Blue or Red?
- Or are we calculating the probability of selecting any ball (which is trivially 1 since you must pick one)?
- Most likely, the problem intends for us to find the probability of selecting a ball of a particular color, given the total number of balls.

In probability problems involving multiple outcomes, the typical question is: What is the probability of selecting a ball of a particular color? For this review, we will explore the probability of selecting each color and the overall probability, as well as the process to determine these.

Total Number of Balls in the Bag

The first essential step is to calculate the total number of balls in the collection because probability depends on the ratio of favorable outcomes to total outcomes.

The total number of balls is the sum of all individual colored balls:

Total balls = Blue + Purple + Red + Orange
= 19 + 28 + 21 + 29
= 97

This total (97) forms the denominator in our probability calculations.

Calculating Individual Probabilities

The probability of picking a ball of a specific color is given by:

P(Color) = (Number of balls of that color) / (Total number of balls)

Let’s compute these probabilities for each color:

Probability of Picking a Blue Ball

P(Blue) = 19 / 97 ≈ 0.1959 (or 19.59%)

Probability of Picking a Purple Ball

P(Purple) = 28 / 97 ≈ 0.2887 (or 28.87%)

Probability of Picking a Red Ball

P(Red) = 21 / 97 ≈ 0.2165 (or 21.65%)

Probability of Picking an Orange Ball

P(Orange) = 29 / 97 ≈ 0.29897 (or 29.90%)

These probabilities sum up to 1 (or very close, accounting for rounding), confirming they cover all possible outcomes.

Features and Significance of These Calculations

Understanding these individual probabilities allows us to analyze various scenarios, such as:

- The likelihood of drawing a particular color.
- Comparing probabilities between colors.
- Planning strategies in games or experiments based on these odds.

Features:

- Simplicity: The calculations are straightforward, involving basic division.
- Foundation: These probabilities form the basis for more complex probability models, such as conditional probability or combined events.
- Real-world application: Such calculations are essential in industries like quality control, gaming, or any scenario involving random sampling.

Combined and Conditional Probabilities

Beyond individual probabilities, we might be interested in:

- The probability of drawing a ball of either blue or purple.

- The probability of drawing a red ball given that a ball is red.
- The probability that a ball is not orange.

Combined probability of Blue or Purple:

P(Blue or Purple) = P(Blue) + P(Purple)
= (19 + 28) / 97
= 47 / 97 ≈ 0.4845 (48.45%)

This indicates nearly half the balls are either blue or purple.

Probability of not Orange:

P(Not Orange) = 1 - P(Orange)
= 1 - 29/97
= (97 - 29) / 97
= 68 / 97 ≈ 0.7010 (70.10%)

These calculations help in understanding the distribution and likelihoods of various outcomes.

Application and Broader Context

The problem of calculating probabilities in a collection of colored balls can be extended to more complex scenarios:

- Sampling without replacement: How does the probability change after drawing one or more balls?
- Expected value: What is the expected number of balls of a certain color in multiple draws?
- Real-world modeling: Such calculations are used in quality assurance, inventory management, and games of chance.

Pros and Cons

Pros:
- Clear and straightforward to compute.
- Provides a solid foundation for understanding probability.
- Useful in practical decision-making.

Cons:
- Assumes all outcomes are equally likely, which might not always be true in real-world situations.
- Doesn’t account for dependencies if multiple draws are made without replacement.
- Limited to simple probability calculations unless extended with more complex models.

Conclusion

The problem involving a bag of balls of various colors is a fundamental example of probability theory in practice. By accurately counting total outcomes and individual favorable outcomes, we can determine the likelihood of selecting any particular color at random. These calculations are foundational in statistics, decision-making, and randomness analysis. Understanding the principles demonstrated here enables learners to approach more complex probability problems confidently, applying similar logic to diverse fields such as data science, engineering, economics, and beyond. Whether used for academic purposes or practical applications, mastering such probability calculations is essential for navigating an uncertain world with mathematical confidence.

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