ALGEBRA 4

Day 55

Bell Work

To get a driver's license, an applicant must pass a written test and a driving test. Past records show that 80% of the applicants pass the written test and 60% of those who have passed the written test pass the driving test. Based on these figures, how many applicants in a random group of 1,000 applicants would you expect to get driver's licenses?

A. 200
B. 480
C. 600
D. 750
E. 800

From Last Time

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11.2 Probability

- Objective: To find the probability of an event using theoretical, experimental, and simulation methods

Probability: the likelihood an event will occur indicated by a number between 0 and 1
(Can be written as a fraction, decimal, or percentage)

- 1 = will always occur
- 0 = will never occur

Experimental Probability:

The number of times an event occurs compared to the number of trials;

$$P(A) = \frac{number\ of\ times\ the\ event\ occurs}{number\ of\ trials}$$

Theoretical Probability:

The probability that an event will occur can be represented by;

$$P(A) = \frac{number\ of\ outcomes\ in\ A}{total\ number\ of\ outcomes}$$

Example: Experimental or Theoretical?

1.) Roll a die 30 times and record the amount of times each number shows up. What do you find? How does it compare to what you'd expect?

2.) *You roll a six-sided die whose sides are numbered from 1 through 6. Find the probability of:*

a.) Rolling a 4 b.) *Rolling an odd number*

Answer the following:

A jar contains 2 red marbles, 3 blue marbles, and 1 green marble. Find the probability of randomly drawing the given type of marble.

1) A red marble

2) A green marble

3) A yellow marble

4) A blue or a green marble

5) A red or a blue marble

6) A red or blue or green marble

Think Deeper…

You put a CD that has 8 songs in your CD player. You set the player to play the songs at random. The player plays all 8 songs without repeating any song.

1) What is the probability that the songs are played in the same order they are listed on the CD?

2) You have 4 favorite songs on the CD. What is the probability that 2 of your favorite songs are played first, in any order?

11.3 Probability of Multiple Events

Objective: To find the probability of event A and B.
To find the probability of event A or B

Independent Events: if the occurrence of one event has NO effect on the occurrence of the other. (Ex: spinning a wheel, rolling a die, flip a coin, draw a marble with replacement)

Dependent Events: if the occurrence of one event AFFECTS the occurrence of the other. (Ex: Drawing marbles or cards without replacing)

Probability of A and B (Independent):

If A and B are independent events, then the probability that both A and B occur is:

P(A and B) = P(A) * P(B)

Probability of A and B (Dependent):

The probability that event B will occur given that A has already occurred:

P(A and B) = P(A) * P(B|A|) ← prob of B given A

Mutually Exclusive Events: Event A and Event B share no intersection.

P(A and B) = 0

Probability of A or B:

If A and B are independent events, then the probability that both A and B occur is:

P(A and B) = P(A) + P(B) – P(A and B)

If event A is drawing a queen from a deck of cards and event B is drawing a king from the remaining cards, are the events A and B dependent or independent?

If event A is rolling a two on a six-sided die and event B is rolling a four on a different six-sided die, are the events A and B dependent or independent?

If event A is drawing a queen from a deck of cards and event B is drawing a king from the remaining cards, are the events A and B dependent or independent?

Dependent

If event A is rolling a two on a six-sided die and event B is rolling a four on a different six-sided die, are the events A and B dependent or independent?

Independent

Examples

Events A and B are independent. Find the indicated probability.

a) P(A) = 0.3

P(B) = 0.9

P(A and B) = ____

b) P(A) = ___

P(B) = 0.3

P(A and B) = 0.06

Examples

Events A and B are independent. Find the indicated probability.

a) P(A) = 0.3

P(B) = 0.9

P(A and B) = __.27__

b) P(A) = _.2__

P(B) = 0.3

P(A and B) = 0.06

A jar contains 12 red marbles, 16 blue marbles, and 18 white marbles.

a) Find the probability of choosing a red marble and then a white marble is chosen with replacement.

b) Three marbles are chosen from the jar with replacement. What is the probability that all are white?

c) Four marbles are chosen from the jar with replacement. What is the probability that none are blue?

A jar contains 12 red marbles, 16 blue marbles, and 18 white marbles.

a) Find the probability of choosing a red marble and then a white marble is chosen with replacement.

$$\frac{12}{46} * \frac{18}{46} = \frac{216}{2116} \approx 0.102$$

b) Three marbles are chosen from the jar with replacement. What is the probability that all are white?

$$\frac{16}{46} * \frac{16}{46} * \frac{16}{46} = \frac{4096}{97336} \approx 0.042$$

c) Four marbles are chosen from the jar with replacement. What is the probability that none are blue?

$$\frac{30}{46} * \frac{30}{46} * \frac{30}{46} * \frac{30}{46} = \frac{810000}{4477456} \approx 0.181$$

In a survey of 200 pet owners, 103 owned dogs, 88 owned cats, 25 owned birds, 18 owned reptiles.

a) None of the respondents owned both a cat and a bird. What is the probability that they owned a cat or a bird?

b) Of the respondents, 52 owned both a cat and a dog. What is the probability that a respondent owned a cat or a dog?

c) Of the respondents, 119 owned a dog or a reptile. What is the probability that they owned a dog and a reptile?

a) None of the respondents owned both a cat and a bird. What is the probability that they owned a cat or a bird?

$$\frac{88}{200} + \frac{25}{200} - \frac{0}{200} = \frac{113}{200} \approx 0.565$$

b) Of the respondents, 52 owned both a cat and a dog. What is the probability that a respondent owned a cat or a dog?

$$\frac{103}{200} + \frac{88}{200} - \frac{52}{200} = \frac{139}{200} \approx 0.695$$

c) Of the respondents, 119 owned a dog or a reptile. What is the probability that they owned a dog and a reptile?

$$\frac{119}{200} = \frac{103}{200} + \frac{18}{200} - P(A \text{ and } B)$$

$$P(A \text{ and } B) = \frac{2}{100} = 0.01$$

For Next Time

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Quiz Next Time