

NAME: _____

DATE: _____

PROBABILITY

PERIOD: _____

Do Now!
(Topic #3)

You randomly choose one number below. Find the favorable outcomes of the event.

10, 11, 12, 13, 14, 15, 16, 17, 18, 19

1. Choosing a 14
2. Choosing an even number
3. Choosing an odd number less than 15
4. Choosing a number greater than 16
5. Choosing a number divisible by 2

You randomly choose one number below. Find the probability of the event.

2, 5, 6, 9, 13, 16, 22, 25, 27, 31

6. Choosing an even number
7. Choosing an odd number
8. Choosing a prime number
9. Choosing a number greater than 30
10. Choosing a number less than 2

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How Do You Find the Theoretical Probability of an Event?

(Topic #3)

Theoretical Probability is based on mathematical reasoning – “What should happen?”

The following formula can be used to find the probability, P, that an event will occur.

Theoretical Probability
<p>The probability of an event is a ratio that compares the number of favorable outcomes to the number of possible outcomes.</p> $P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$

EXAMPLE 1: Finding the Probability of an Event

There are six equally likely outcomes if a number cube with sides labeled 1 through 6 is rolled.

- Find P(6) or the probability of rolling a 6. Write your answer as a fraction, percent, and decimal.
- Find the probability of rolling a 2, 3, or 4 on the number cube. Write your answer as a fraction, percent, and decimal.

PRACTICE: Read each question carefully. Show your work.

- A coin is tossed. Find the probability of the coin landing on heads. Write your answer as a fraction, percent, and decimal.
- A spinner has 10 equal sections labeled A-J. Find the probability of each event. Write each answer as a fraction, percent, and decimal.
 - P(F)
 - P(D or G)
 - P(vowel)

Complementary events are two events in which either one or the other must happen, but they cannot happen at the same time. *For example*, a coin can either land on heads or *not* land on heads. The sum of the probability of an event and its complement is 1 or 100%.

EXAMPLE 2: Finding the Probability of the Complement

Find the probability of *not* rolling a 6 in Example 1.

PRACTICE: Read each question carefully. Show your work.

3. A bag contains 5 blue, 8 red, and 7 green marbles. A marble is selected at random. Find the probability the marble is *not* red.
4. Mr. Harada surveyed his class and discovered that 30% of his students have blue eyes. Identify the complement of this event. Then find the probability.

EXAMPLE 3: Using Theoretical Probability

The theoretical probability that you randomly choose a green marble from a bag is $\frac{3}{8}$. There are 40 marbles in the bag. How many are green?

PRACTICE: Read each question carefully. Show your work.

5. The probability that you randomly draw a short straw from a group of 50 straws is $\frac{9}{25}$. How many are short straws?

6. The theoretical probability that you spin an odd number on a spinner is 0.6. The spinner has 10 sections. How many sections have odd numbers?
7. The probability that you randomly select a blue crayon from a box of 40 crayons is $\frac{3}{20}$. How many are blue crayons?

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HOMEWORK - (Topic #3)

Finding the Theoretical Probability of an Event

Theoretical Probability

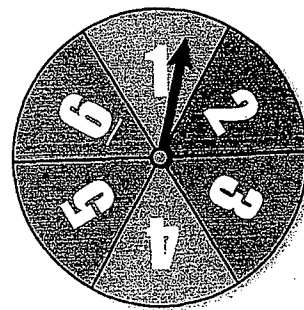
The probability of an event is a ratio that compares the number of favorable outcomes to the number of possible outcomes.

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

1. An event has a theoretical probability of 0.5. What does this mean?
2. Describe an event that has a theoretical probability of $\frac{1}{4}$.

Use the spinner to determine the theoretical probability of the event.

3. $P(1)$
4. $P(\text{odd number})$
5. $P(\text{multiple of } 2)$
6. $P(\text{number less than } 7)$
7. $P(7)$
8. $P(2 \text{ or } 5)$



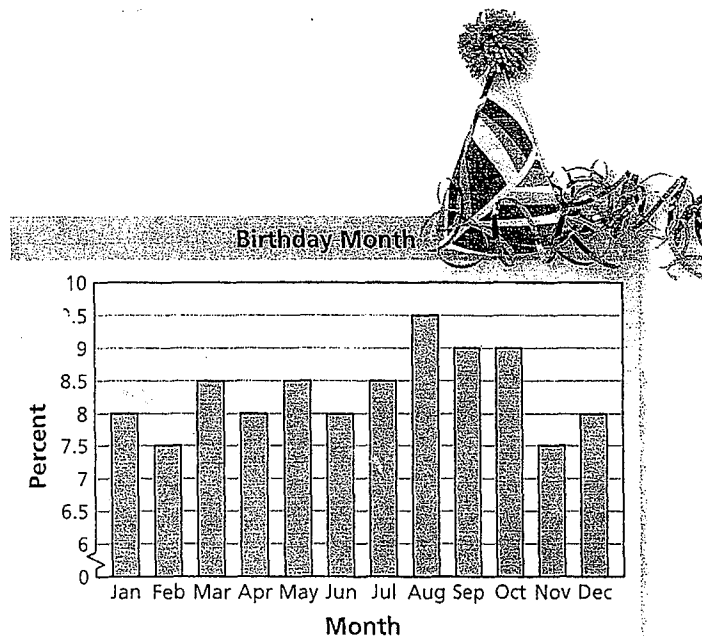
9. Each letter of the alphabet is printed on an index card. What is the theoretical probability of randomly choosing any letter not Z?

10. On a game show, a contestant randomly chooses a chip from a bag that contains numbers and strikes. The theoretical probability of choosing a strike is $\frac{3}{10}$. There are 30 chips in the bag. How many are strikes? **Show your work below.**

The bar graph shows the birthday months of all 200 employees at a local business.

11. What is the theoretical probability of randomly choosing a person at the business who was born in a month with an R in its name?

12. What is the theoretical probability of randomly choosing a person at the business who has a birthday in the first half of the year?



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You randomly choose one number below. Find the favorable outcomes of the event.

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1. Choosing a 14

14

2. Choosing an even number

10, 12, 14, 16, 18

3. Choosing an odd number less than 15

13, 11

4. Choosing a number greater than 16

17, 18, 19

5. Choosing a number divisible by 2

10, 12, 14, 16, 18

You randomly choose one number below. Find the probability of the event.

2, 5, 6, 9, 13, 16, 22, 25, 27, 31

6. Choosing an even number

$$\frac{4}{10} = \frac{2}{5}$$

7. Choosing an odd number

$$\frac{6}{10} = \frac{3}{5}$$

8. Choosing a prime number

$$\frac{4}{10} = \frac{2}{5}$$

9. Choosing a number greater than 30

$$\frac{1}{10}$$

10. Choosing a number less than 2

$$\frac{0}{10} = 0$$

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How Do You Find the Theoretical Probability of an Event? (Topic #3)

Theoretical Probability is based on mathematical reasoning – “What should happen?”

The following formula can be used to find the probability, P, that an event will occur.

Theoretical Probability
The probability of an event is a ratio that compares the number of favorable outcomes to the number of possible outcomes.
$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$

EXAMPLE 1: Finding the Probability of an Event

There are six equally likely outcomes if a number cube with sides labeled 1 through 6 is rolled.

- a) Find P(6) or the probability of rolling a 6. Write your answer as a fraction, percent, and decimal.

$$\frac{1}{6} = 0.\overline{16} = 16.\overline{6}\%$$

- b) Find the probability of rolling a 2, 3, or 4 on the number cube. Write your answer as a fraction, percent, and decimal.

$$\frac{3}{6} = \frac{1}{2} = 0.5 = 50\%$$

PRACTICE: Read each question carefully. Show your work.

1. A coin is tossed. Find the probability of the coin landing on heads. Write your answer as a fraction, percent, and decimal.

$$P(\text{heads}) = \frac{1}{2} = 0.5 = 50\%$$

2. A spinner has 10 equal sections labeled A-J. Find the probability of each event. Write each answer as a fraction, percent, and decimal.

a) P(F)

$$\frac{1}{10}$$

$$0.1$$

$$10\%$$

b) P(D or G)

$$\frac{2}{10} = \frac{1}{5}$$

$$0.2$$

$$20\%$$

c) P(vowel)

$$\frac{3}{10}$$

$$0.3$$

$$30\%$$

Complementary events are two events in which either one or the other must happen, but they cannot happen at the same time. For example, a coin can either land on heads or *not* land on heads. The sum of the probability of an event and its complement is 1 or 100%.

EXAMPLE 2: Finding the Probability of the Complement

Find the probability of *not* rolling a 6 in Example 1.

$$P(\text{not } 6) = \frac{5}{6}$$

PRACTICE: Read each question carefully. Show your work.

3. A bag contains 5 blue, 8 red, and 7 green marbles. A marble is selected at random. Find the probability the marble is *not* red. TOTAL = 20

$$P(\text{not red}) = \frac{12}{20} = \frac{3}{5}$$

4. Mr. Harada surveyed his class and discovered that 30% of his students have blue eyes. Identify the complement of this event. Then find the probability.

$$P(\text{not blue}) = 70\% = .7 = \frac{7}{10}$$

EXAMPLE 3: Using Theoretical Probability

The theoretical probability that you randomly choose a green marble from a bag is $\frac{3}{8}$. There are 40 marbles in the bag. How many are green?

$$\left(\frac{\text{green}}{\text{total}}\right) \quad \frac{3}{8} = \frac{x}{40}$$

$$8x = 3(40)$$

15 are green.

$$\frac{8x}{8} = \frac{120}{8}$$

$$x = 15$$

PRACTICE: Read each question carefully. Show your work.

5. The probability that you randomly draw a short straw from a group of 50 straws is $\frac{9}{25}$. How many are short straws?

$$\left(\frac{\text{short}}{\text{total}}\right) \quad \frac{9}{25} = \frac{x}{50}$$

$$25x = 9(50)$$

18 are short.

$$\frac{25x}{25} = \frac{450}{25}$$

$$x = 18$$

6. The theoretical probability that you spin an odd number on a spinner is 0.6. The spinner has 10 sections. How many sections have odd numbers?

$$0.6 = \frac{6}{10}$$

$$\left(\frac{\text{ODD}}{\text{TOTAL}} \right) \frac{6}{10} = \frac{x}{10}$$

$$10x = 6(10)$$

$$\frac{10x}{10} = \frac{60}{10}$$

$$x = 6$$

6 sections have odd #s.

7. The probability that you randomly select a blue crayon from a box of 40 crayons is $\frac{3}{20}$. How many are blue crayons?

$$\left(\frac{\text{blue}}{\text{total}} \right) \frac{3}{20} = \frac{x}{40}$$

$$20x = 3(40)$$

$$\frac{20x}{20} = \frac{120}{20}$$

$$x = 6$$

There are 6
blue crayons.

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HOMEWORK - (Topic #3)

Finding the Theoretical Probability of an Event

Theoretical Probability

The probability of an event is a ratio that compares the number of favorable outcomes to the number of possible outcomes.

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

1. An event has a theoretical probability of 0.5. What does this mean?

There is a 50% chance you will get a favorable outcome.

2. Describe an event that has a theoretical probability of $\frac{1}{4}$.

Picking a "1" out of 1, 2, 3, or 4.

Use the spinner to determine the theoretical probability of the event.

3. P(1)

$$\frac{1}{6}$$

4. P(odd number)

$$\frac{3}{6} = \frac{1}{2}$$

5. P(multiple of 2)

$$\frac{3}{6} = \frac{1}{2}$$

6. P(number less than 7)

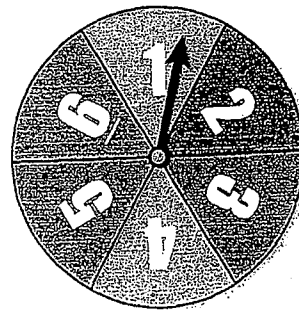
$$\frac{6}{6} = 1$$

7. P(7)

$$\frac{0}{6} = 0$$

8. P(2 or 5)

$$\frac{2}{6} = \frac{1}{3}$$



9. Each letter of the alphabet is printed on an index card. What is the theoretical probability of randomly choosing any letter not Z?

$$P(\text{not Z}) = \frac{25}{26}$$

10. On a game show, a contestant randomly chooses a chip from a bag that contains numbers and strikes. The theoretical probability of choosing a strike is $\frac{3}{10}$. There are 30 chips in the bag. How many are strikes? **Show your work below.**

$$\left(\frac{\text{strikes}}{\text{total}} \right) = \frac{3}{10} = \frac{x}{30}$$

$$10x = 3(30)$$

$$\frac{10x}{10} = \frac{90}{10}$$

$$x = 9$$

There are 9 strikes.

The bar graph shows the birthday months of all 200 employees at a local business.

11. What is the theoretical probability of randomly choosing a person at the business who was born in a month with an R in its name?

12. What is the theoretical probability of randomly choosing a person at the business who has a birthday in the first half of the year?

