

Section 12.3 Odds

1, 3, 5, 7, 9, 11, .....

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The odds against an event is:

$$\frac{P(\text{failure})}{P(\text{success})}$$

Example:

Determine the odds against rolling a 4 on a die.

$$\frac{\textcircled{5}}{6} \div \frac{\textcircled{1}}{6} = \frac{5}{6} \cdot \frac{6}{1} = \frac{\textcircled{5}}{\textcircled{1}}$$

EXAMPLE 2 Hours Worked per Week

The circle graph in Figure 12.4 shows the percent of U.S. workers who work various hours per week. If one U.S. worker is selected at random, use the graph to determine the odds against the person working 35–39 hours per week.

$$\frac{5}{1}$$



$$\frac{4}{5} = \frac{93}{7}$$

Source: Statistical Abstract of the United States

## Odds in Favor of an Event

$$\frac{P(\text{event occurs}) \text{ success}}{P(\text{event fails to occur}) \text{ Failure}}$$

Example:

Find the odds in favor of a person selecting a Jack from a standard deck of cards.

$$\frac{S}{F} = \frac{4}{48} = \frac{1}{12}$$

Find the odds in favor of tossing a heads with a coin.

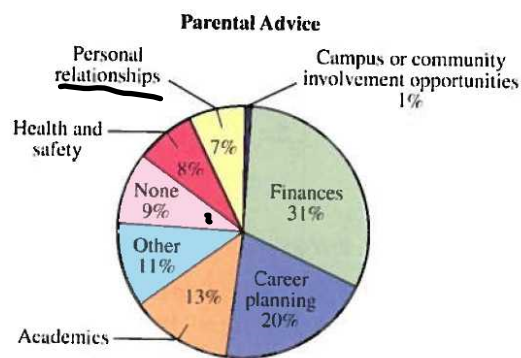
$$\frac{S}{F} = \frac{1}{1}$$

Find the probability of tossing a heads with a coin.

$$\frac{S}{T} = \frac{1}{2}$$

**EXAMPLE 3** *Parents and Children Communicating*

A group of parents whose children attended Middlebury College were asked to identify the topic on which their child requested the most advice during the past year. The circle graph in Figure 12.5 on page 744 shows the parents' responses.



Source: 2006 Middlebury College survey

Figure 12.5

If one parent from those surveyed is selected at random, use the graph to determine

- a) the odds against the parent saying that the child requested career planning advice.  $\frac{f}{s} = \frac{50}{20} = \frac{5}{2}$
- b) the odds in favor of the parent saying that the child requested career planning advice.  $\frac{f}{s} = \frac{1}{4}$

If a parent from those surveyed is selected at random, determine:

- a) the odds against the parent saying that the child requested career planning advice.
- b) the odds in favor of the parent saying that the child requested finances advice.

$$\frac{f}{s} = \frac{31}{69}$$

25. *Students* One person is selected at random from a class of 16 men and 14 women. Determine the odds against selecting

a) a woman.  $\frac{f}{s} = \frac{16}{14} = \frac{8}{7}$

b) a man.  $\frac{f}{s} = \frac{14}{16} = \frac{7}{8}$

26. *Lottery* One million tickets are sold for a lottery in which a single prize will be awarded.

a) If you purchase a ticket, determine your odds against winning.

$$\frac{f}{s} = \frac{999,999}{1}$$

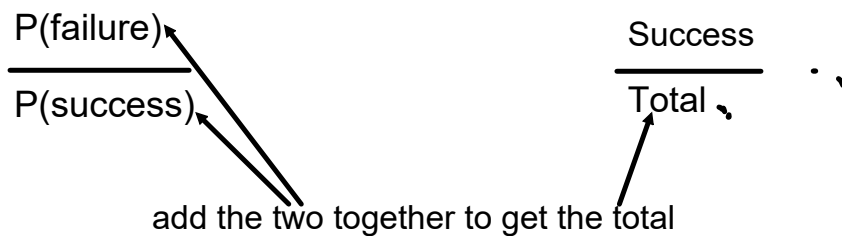
b) If you purchase 10 tickets, determine your odds against winning.

$$\frac{f}{s} = \frac{999,999}{10} = \frac{99,999}{1}$$

## Finding Probability from Odds

The odds against an event is:

The Probability of an event is:



Example:

If the odds against James of getting accepted to attend Yale is 27:5, determine the probability of James getting accepted to Yale.

$$\frac{f}{s} = \frac{27}{5} \quad \text{Prob } \frac{s}{T} = \frac{5}{32}$$

Find the probability of James not getting accepted to Yale.

$$\equiv 1 - \frac{5}{32} = \frac{27}{32}$$

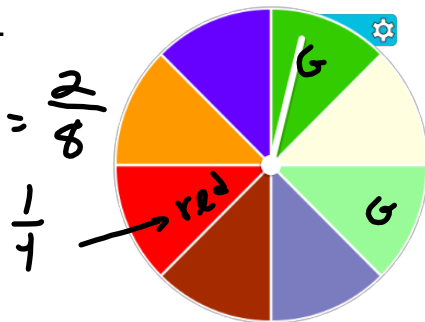
If the probability of John picking the winning horse at the race track is  $\frac{2}{9}$ , what are the odds in favor of him picking the winning horse.

$$\frac{S}{T} = \frac{2}{9} \quad \text{odds} \quad \frac{S}{F} = \frac{2}{7}$$

Assume that the spinner cannot land on a line. Determine the odds against the spinner landing on the color red.

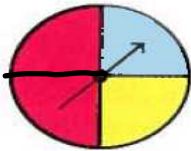
Determine the probability of it landing on green.

$$\frac{F}{S} = \frac{7}{1} \quad P(\text{green}) = \frac{2}{8}$$



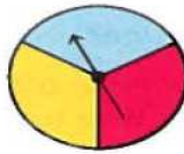
*Spin the Spinner In Exercises 21–24, assume that the spinner cannot land on a line. Determine the odds against the spinner landing on the color red.*

21.



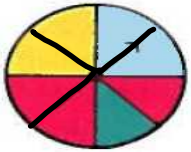
$\frac{3}{5}$   
-1-2

22.



$\frac{2}{3}$   
-1-2

23.



$\frac{5}{6}$

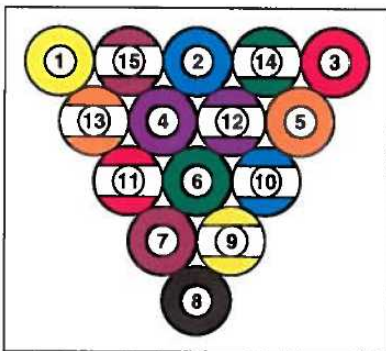
24.



$\frac{7}{8}$



*Billiard Balls In Exercises 27–32, use the rack of 15 billiard balls shown.*



27. If one ball is selected at random, determine the odds against it containing a stripe. (Balls numbered 9 through 15 contain stripes.)
28. If one ball is selected at random, determine the odds in favor of it being a ball other than the 8 ball.
29. If one ball is selected at random, determine the odds in favor of it being an even-numbered ball.

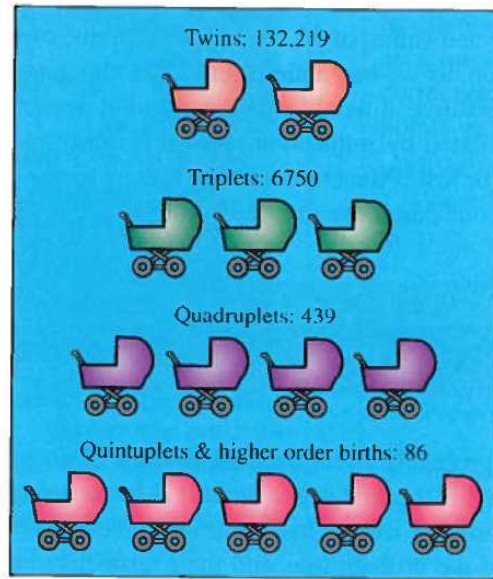
$$\begin{array}{l} \text{F} \\ \text{S} \\ \text{F} \end{array} = \frac{8}{7}$$

$$\begin{array}{l} \text{F} \\ \text{S} \\ \text{F} \end{array} = \frac{14}{1}$$

$$\begin{array}{l} \text{S} \\ \text{F} \\ \text{S} \end{array} = \frac{7}{8}$$

**Multiple Births** Multiple births make up about 3% of births per year in the United States. The following illustrates the number and type of multiple births in 2004.

**Multiple Births in the United States in 2004**

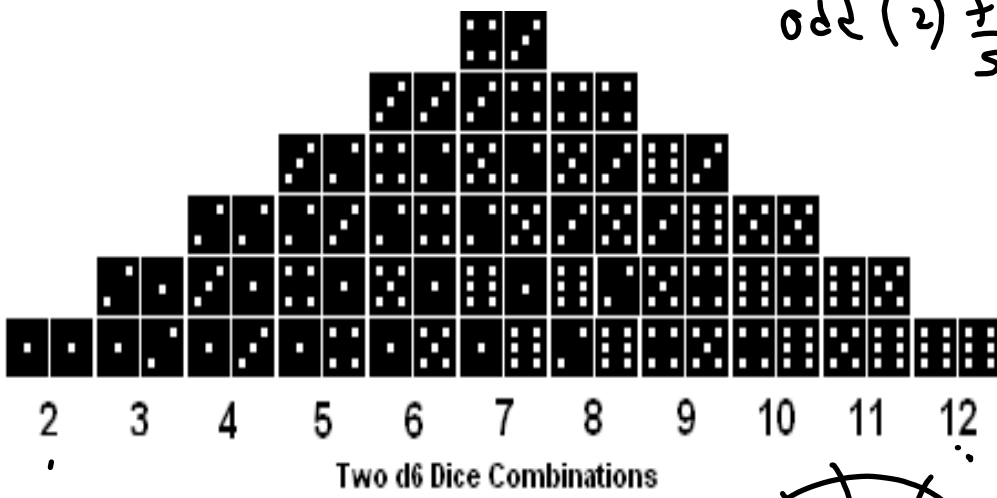


Source: National Center for Health Statistics

Using the above information, determine an estimate for the odds against a birth being a multiple birth in 2004.

$$\frac{f}{S} = \frac{97}{3}$$

1/2



odd (2)  $\frac{f}{s} = \frac{35}{1}$

