5.2 Probability and Odds

Probability: a measure of the likelihood of something happening

$$\text{Probability} = \frac{\text{\# of favourable outcomes}}{\text{\# of all possible outcomes}}$$

$P(\text{Halloween costume}) = \frac{9}{22} = 0.41 = 41\%$

Odds in favour: the ratio of the number of favourable outcomes to the number of unfavourable outcomes

$$\text{Odds} = \frac{\text{\# of favourable outcomes}}{\text{\# of unfavourable outcomes}}$$

$n(\text{costume}) = 9$

$n(\text{no costume}) = 13$

$O(\text{costume}) = 9:13$

Odds against: the ratio of the number of unfavourable outcomes to the number of favourable outcomes

$O(\text{against}) = 13:9$

$$\text{Odds} = \frac{\text{\# of unfavourable outcomes}}{\text{\# of favourable outcomes}}$$

Investigate pg. 304 together

EXAMPLE 1 Determining odds using sets

Bailey holds all the hearts from a standard deck of 52 playing cards. He asks Morgan to choose a single card without looking.

Determine the odds in favour of Morgan choosing a face card.

$n(\text{face}) = 3$

$n(\text{face}') = 10$

$O(\text{face}) = 3:10$

Your Turn

a) Determine the odds against Morgan drawing a face card.

b) Compare the odds in favour of this event to the odds against it. Do you think Morgan is more likely to draw a face card or something different? Explain.

a) $O(\text{against}) = O(\text{face}') = 10:3$

b) There are more ways of getting face', so Morgan is more likely to NOT draw a face card.

EXAMPLE 2 Determining odds from probability

Research shows that the probability of an expectant mother, selected at random, having twins is $\frac{1}{32}$.

O (twins) = 1 : 31

a) What are the odds in favour of an expectant mother having twins?

b) What are the odds against an expectant mother having twins?

favourable = 2
unfavourable = 5 − 2 = 3

O (against) = 31 : 1

Your Turn

Suppose that the probability of an event happening is $\frac{2}{5}$.

a) What are the odds in favour of the event happening?

b) What are the odds against the event happening?

a) O (on) = 2 : 3

b) O (against) = 3 : 2

EXAMPLE 3 Determining probability from odds

A computer randomly selects a university student's name from the university database to award a $100 gift certificate for the bookstore. The odds against the selected student being male are 57 : 43. Determine the probability that the randomly selected university student will be male.

n (all) = 57 + 43 = 100

P(Male) = $\frac{43}{100}$

EXAMPLE 5 Interpreting odds against and making a decision

A group of Grade 12 students are holding a charity carnival to support a local animal shelter. The students have created a dice game that they call Bim and a card game that they call Zap. The odds against winning Bim are 5 : 2, and the odds against winning Zap are 7 : 3. Which game should Madison play?

To win, Madison should play Zap.

P (lose Bim) = $\frac{5}{7}$ = 71.4%

P (lose Zap) = $\frac{7}{10}$ = 70%

Your Turn

The Grade 12 students want to include one more game at their charity carnival. They need to choose between game A and game B. The odds against winning game A are 11 : 3, and the odds against winning game B are 17 : 6. The goal is to raise as much money as possible for the animal shelter. Which game should the students choose? Assume that people are equally likely to play the two games.

P (lose A) = $\frac{11}{14}$ = 78.6%

P (lose B) = $\frac{17}{23}$ = 73.9%

Homework: pg. 310 #5, 6, 8, 9, 11, 12*, 15-19

In order to make more money, the student council should select the game with the highest probability of losing ... game A.