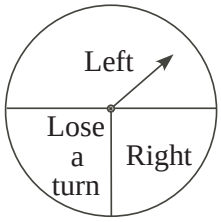
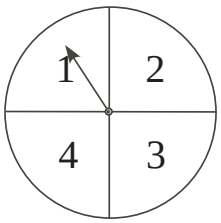
Problem

A board game is played using the two spinners shown at the right, one which tells the number of squares the player can move, and the other tells the direction, or that the player loses a turn (i.e., can make no move at all).





a) Using the number spinner only, what is the probability of spinning a 4? a 2?

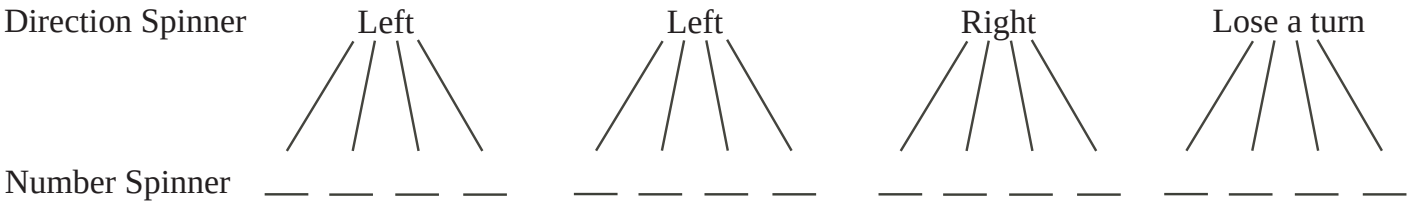
b) Using the direction spinner only, what is the probability of losing a turn?

c) When a player spins both spinners, find the probability of each of the following outcomes:

(i) the player moves 2 squares to the left;

(ii) the player moves 1 square to the right.

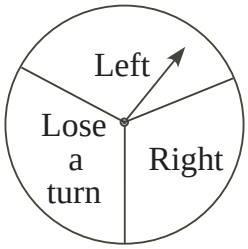
Complete the tree diagram below to help you decide. Note that there are two 'left' choices because you are twice as likely to spin a 'left' as a 'right' or a 'no turn'.



Extensions:

1. When a player spins both spinners for his turn in the game, is there an outcome which has a probability of $\frac{1}{12}$? Explain.

2. How would the tree diagram change if the direction spinner had three equal subdivision, as shown at right? Would this change your answer to Extension 1. ?



Hints

Part c)

Hint 1 - How many outcomes are possible in total?

Hint 2 - What are the ways a player can achieve the desired outcome?

Solution

a) Using the number spinner only, there is an equal chance of spinning any one of the four numbers, namely $\frac{1}{4}$.

b) Using the direction spinner only, the probability of spinning a 'left' is $\frac{1}{2}$, since 'left' occupies half the area of the circle.

c) Completing the tree enables students to see that:

(i) there are 2 outcomes where a player gets a move of 2 to the left, and the total number of outcomes is 16; hence the probability is $\frac{2}{16}$ or $\frac{1}{8}$;

(ii) there is only 1 outcome where a player gets a move of 1 to the right, and hence the probability is $\frac{1}{16}$.

Extensions:

1. Another way to show this is as follows:
   Using their tree diagram, students can just list all the probabilities for all the possible events to see that none has a probability of $\frac{1}{12}$. For an event to have a probability of $\frac{1}{12}$, there would have to be a number n of outcomes such that $\frac{n}{16} = \frac{1}{12}$, i.e., $\frac{n}{16} \times 16 = \frac{1}{12} \times 16$, or $n = \frac{16}{12} = \frac{4}{3}$; but $\frac{4}{3}$ is not a whole number of outcomes, and hence no such outcome is possible. Using their tree diagram, students can just list all the probabilities for all the possible events to see that none has a probability of $\frac{1}{12}$.

2. One of the two 'left' parts of the tree is removed, since now 'left', 'right', and 'lose a turn' are equally likely. Thus the total number of outcomes is 12, and every outcome has equal probability, $\frac{1}{12}$, since no repeats are possible.