

Warm-Up

Minnesota is known as the Land of 10,000 Lakes. Scientists sampled 65 of those lakes and found Eurasian Watermilfoil in 15 of them. How many lakes in Minnesota could you expect to have Eurasian Watermilfoil based on this sample?

- A. 15
- B. 15/65
- C. 2308**
- D. 65

$$\frac{15}{65} \cdot 10000$$

$$\frac{15}{65} = \frac{x}{10000}$$

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Warm-Up

Northstar Cash Prizes

When You Match You Win Probability

5 of 5 numbers	\$25,000	×	1 in 169,911	+
4 of 5 numbers	\$50	×	1 in 1,307	+
3 of 5 numbers	\$5	×	1 in 52	+
2 of 5 numbers	\$1	×	1 in 7	+

What are your expected winnings for this scratch ticket? Is this game fair if you pay \$1 to play it?

$$.42$$

$$42¢$$

~~42¢~~

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Questions on Homework

Learning Targets

- Understand the concept of a fair game
- Analyze a game of chance by building a probability model and calculating expected values from scratch

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Ex. In a Pick 3 lottery, if your number is chosen you win \$400. If it costs \$1 to play, what are your expected winnings?

$$\frac{3}{10} \cdot \frac{0}{10} \cdot \frac{0}{10} = 1000 \text{ #'s}$$

outcomes	\$400	\$0
probability	$\frac{1}{1000}$	$\frac{999}{1000}$

$$E(x) = \$400\left(\frac{1}{1000}\right) + \$0\left(\frac{999}{1000}\right) = .40$$

Is this game fair?

No, can't win \$1 back

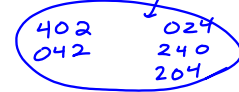
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Ex. In a Pick 3 lottery, if your number is chosen you win \$400. If the chosen ticket has your 3 numbers in a different order you win \$40. If it costs \$1 to play, what are your expected winnings?

outcomes	\$400	\$40	\$0
probability	$\frac{1}{1000}$	$\frac{5}{1000}$	$\frac{994}{1000}$

$$420$$

$$60¢$$



Is this game fair?

No, still can't win \$1

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Simulation

Pay \$1 to play this game:
Roll a die and then flip a coin.

If you get an even number on the die and a head, you win \$3.

If you get an even number on the die and a tail, you win \$1.

If you get an odd number, you win \$0.

Do this simulation 25 times and keep track of what you win each time.

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Experimental Probability--what you got when you did this simulation (experiment).

What are your chances, according to the outcomes you got, of winning \$3, \$1 and \$0?

	Olivia	Whitney	Tim
P(\$3) =	$\frac{4}{25}$	$\frac{7}{25}$	$\frac{8}{25}$
P(\$1) =	$\frac{10}{25}$	$\frac{4}{25}$	$\frac{4}{25}$
P(\$0) =	$\frac{11}{25}$ \$.88	$\frac{14}{25}$ \$.56	$\frac{13}{25}$ \$.52

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Theoretical Probability--the real probability based on analyzing the outcomes mathematically

Find the theoretical probability of each of the outcomes:

$$P(\$3) = P(\text{Even}) \cdot P(H) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

$$P(\$1) = P(\text{Even}) \cdot P(T) = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$$

$$P(\$0) = P(\text{odd}) = \frac{1}{2}$$

$$E(x) = \$3\left(\frac{1}{4}\right) + \$1\left(\frac{1}{4}\right) + \$0\left(\frac{1}{2}\right) = \$1$$

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Find the **Expected Value** of this game. To find the expected value you use the theoretical probability not the experimental probability.

$E(x) =$

Is this game fair?

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Homework:

Section 3.2 #1, 2, 6-10, 12, 13, 15, 16

Learning Targets

- Understand the concept of a fair game
- Analyze a game of chance by building a probability model and calculating expected values from scratch

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