

TITLE: WHAT ARE THE ODDS?

SUBJECT: Mathematics/Algebra 2

Grade level: High school

ALIGNMENTS:

Standards: 2.7.A2.A, 2.7.A2.C

ANCHOR: A2.2.3.2.2

ELIGIBLE CONTENT: M11.E.3.1.2

VOCABULARY:

- Probability: A number from 0 to 1 that indicates how likely something is to happen. Can be expressed as a decimal, fraction, or percent.
- Odds: The odds of an event occurring is the ratio of the number of ways the event can occur (successes) to the number of ways the event cannot occur (failures).
- Favorable outcomes: the outcomes for an event you wish to have happen

OBJECTIVES:

- Students will find the probability and/or odds of an event.
- Students will convert probability to odds and/or odds to probability.
- Students will determine which event has the better chance of occurring based on the odds of one event and probability of another event.

ESSENTIAL QUESTIONS:

- How do we calculate probability and odds?
- How do we convert probability to odds and odds to probability?
- How can we determine which event has a better chance of occurring based on the odds of one event and the probability of the other event?

DURATION: 45-60 min

MATERIALS:

- Board/Interactive white board
- Partner/Team Worksheet
- Internet access
- Calculators

INSTRUCTIONAL PROCEDURES:

W: For a warm up, have decimal numbers that students have to convert to a percent, percent that they have to convert to decimal, decimal they have to convert to fraction, fraction they have to convert to percent. Here are some examples you could have on the board/interactive white board as a warm up.

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|---|-----------|
| 1. Convert the decimal 0.52 to a fraction. | A: 13/25 |
| 2. Convert the fraction 16/82 to a percent. | A: 19.51% |
| 3. Convert the fraction 4/9 to a decimal. | A: 0.44 |
| 4. Convert the percent 59% to a decimal. | A: 0.59 |
| 5. Convert the percent 32% to a fraction. | A: 8/25 |

Check answers before moving on to lesson.

“What does *probability* mean?” Allow students time to think and respond. Write their responses on board/interactive white board. Have students write down responses on their notes. The students should come up with something like: the likelihood that an event will occur.

“What does *odds* mean?” Allow students time to think and respond. This one might be more difficult for students. Write their responses on the board/interactive board. Have students write down responses on their notes. Students will probably say probability or give examples of how they have heard odds being used, like: the chances of winning the lottery are 1 to 100,000.

“What are some other words that can be used for *probability*?” Allow students time to think and respond. Write their responses on board/interactive white board. Have students write down responses on their notes. The students should come up with something like: chances, percentage, long shot, proportion, likelihood, maybe even odds.

“Where do you see/hear *probability/odds* being used in every day life?” Allow students time to think and respond. Write their responses on board/interactive white board. Have students write down responses on their notes. The students should come up with something like: Weather – 30% chance of rain, lottery – less than 10% chance of winning, horse races – horse has a 10 to 2 chance of winning, and buying a vehicle – the chances that you will have to repair it.

“Good, today we are going to be finding the probability and odds of events. Then we are going to be given the odds of an event and convert it to probability and vice versa. We are going to do a few guided problems together, then you and your partner will do 8 problems, and when you are done with that, we will use the internet game, “*What are the Odds?*” to evaluate your understanding.”

H: “We know what probability means but how do we find it? Probability is the favorable outcomes divided by the total number of outcomes.” Write this on the board/interactive whiteboard for students. Have them write it in their notes. **“What is a favorable outcome?”** Allow students time to think/talk with partner/team. Students should come up with something like ‘what we want to happen’. **“Yes, a favorable outcome is what we want to happen. And when we divide that by total number of outcomes, what is that?”** Allow students time to think/talk with partner/team. Students should come up with ‘the total outcomes possible’ or ‘everything that could happen’.

“Let’s say an algebra class has 17 males and 16 females. One student is chosen at random from the class. What is the probability that the student chosen is a female?” Allow students time to respond – talk with their partner/team to come up with an answer. Students should come up with $16/33$ or 48.48%, or 0.4848. Write all responses on board/interactive board. **“Probability can be expressed as a decimal, fraction, or percent. Remember when we reviewed that earlier in the warm up? That is why we reviewed that because all of these answers, $16/33$, 48.48% or 0.4848, are correct.”**

“Now let’s take that same example -- an algebra class has 17 males and 16 females -- and find the odds of selecting a male. Odds are computed by the number of favorable outcomes: number of unfavorable outcomes.” Write this on board for students. Have them write it on their notes. **“The colon is where you would say “to”.** For example, if the odds of an event were 5:3, you could say “5 to 3”. **So let’s find the odds of selecting a male from the algebra class.”** Allow students time to respond – talk with partner/team to come up with an answer. Students should come up with 16:17. **“The answer is 16:17. Let’s say we found odds of an event to be 2:6. Do we leave it that way or could we simplify that?”** Allow students time to think or talk with partner/team. Students should come up with an answer of 1:3. **“The answer is 1:3. You do need to simplify the ratio.”**

“Now let’s get into converting probability to odds. Let’s say you have the probability of an event is $2/5$.” (Write on board.) **“What would the odds be for the same event?”** Allow students time to respond – talk with partner/team to come up with an answer. Student should come up with an answer of 2:3. If a person/team/partner got the right answer, have him/her/them explain how they got the answer. **“The odds of the same event are 2:3. The odds have to add up to the total, which if you look at the probability, the total is 5. So to find the odds from probability, you keep the first number, the 2, then subtract the two numbers, $5-2$, to get the second number for the odds. 2:3.”** (Write on board.)

“Now let’s convert the odds, 4:23 (write on board) of an event to probability.” Allow students time to respond – talk with partner/team to come up with answer. Student should come up with an answer $4/27$. If a person/team/partner got the right answer, have him/her/team explain how they got the answer. **“The probability of the same event is $4/27$. The probability needs the total so you have to add up the two numbers to get the total, 27. Then it is the first number, 4, over 27. $4/27$.”** (Write on board.)

E: “Okay, now we are going to do 8 problems with your partner. When you are done, let me check them and then you can get on the computer and play “What are the Odds?” Hand out Partner/Team worksheet. You could have students work in teams or

partners, however things work in your classroom. The main thing here is to make sure students check their work with someone before moving onto the next problem. Answers:

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|-------------------|------------------------------------|-------------------|-------------------|
| 1. $\frac{3}{17}$ | 2. $\frac{2}{10}$ or $\frac{1}{5}$ | 3. 10: 50 or 1:5 | 4. 6: 3 or 2:1 |
| 5. 1:24 | 6. 4: 9 | 7. $\frac{5}{17}$ | 8. $\frac{7}{26}$ |

R: As students are working in partners, monitor student performance. Visit each group and have students explain their thinking and clarify any misunderstandings.

Once they have show mastery, have students get on the internet for activity below.

E: For individual practice, have students go to <http://wpsu.org/games/odds.swf>

SUGGESTED INSTRUCTIONAL STRATEGIES:

T: For those students who are showing strong proficiency of the concepts, you can have one of the partners make up their own probability (or odds) word problem and the other partner will then work it out. Then they have to check the work.

For those still struggling with the concept after the partner activity, pull together a small group to continue practicing. Then have them get on the Internet.

O: The goal of this lesson is to find probability and odds of events and, to convert probability to odds and vice versa. The activities in this lesson are intended to move the student from the teacher guided items to independent rigorous problems for converting probability to odds and odds to probability.

FORMATIVE ASSESSMENT:

- Ongoing teacher observation during partner work work, student interaction, and computer activity
- Partner worksheet

KEY WORDS: probability, odds, converting probability to odds, converting odds to probability, favorable outcomes,

RELATED MATERIALS & RESOURCES:

Interactive: <http://wpsu.org/games/odds.swf>

Student Handout: See next page.

PROBABILITY & ODDS

Partner/Team Worksheet.

Name: _____

1. There are 3 blue marbles, 8 red marbles, and 6 orange marbles in a jar. What is the **probability** that Caleb will draw a blue marble at random?
2. What is the **probability** a randomly selected letter in the word METROPOLIS is an "O"?
3. A machine randomly selects a stuffed animal. There are 12 giraffes, 3 panda bears, 10 elephants, 5 horses, 21 teddy bears, 4 dogs, and 5 cats. What are the **odds** that you get an elephant?
4. You randomly choose an integer from 0 through 9. What are the **odds** that the integer is **4 or more**?
5. The **probability** of a person winning a door prize is $\frac{1}{25}$. What are the **odds** that the person will win the door prize?
6. The **probability** of an event is $\frac{4}{13}$. What are the **odds** of the same event occurring?
7. The **odds** of an event occurring are 5:12. What is the **probability** of the same event occurring?
8. The **odds** of an event occurring are 7:19. What is the **probability** of the same event occurring?