Power Up: Math ACT Prep, Week 4

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Time Frame 35 minutes

Essential Question(s)

How can I increase my ACT score?

Summary

In this activity, students will focus on probability and Venn diagrams. Students will be given a brief introduction of probability, use Venn diagrams to help with counting, and then practice probability-related ACT-style math questions. This is the fourth activity in a 10-week "Power Up" series for ACT prep.

Learning Goals

- Determine the probability of an event and the probability of its complement.
- Use a Venn diagram to calculate probability.
- Apply the concept of probability to unique situations.

Attachments

- Activity Slides—Math ACT Prep, Week 4.pdf
- Activity Slides—Math ACT Prep, Week 4.pptx
- Exit Ticket—Math ACT Prep, Week 4.docx
- Exit Ticket—Math ACT Prep, Week 4.pdf
- Probability—Math ACT Prep, Week 4 - Spanish.docx
- Probability—Math ACT Prep, Week 4 - Spanish.pdf
- Probability—Math ACT Prep, Week 4.docx
- Probability—Math ACT Prep, Week 4.pdf

Materials

- Activity Slides (attached)
- Probability handout (attached; one per student; printed front/back)
- Exit Ticket handout (attached; one per student; printed front only)
- Pencil
- Paper
- Calculators

5 minutes

Introduction

Teacher's Note: ACT Enhancements

The following resource has been updated to better align with the test changes that began in April 2025 for the online test and in September 2025 for the paper-pencil test. Some outside resources linked are based on the previous version of the ACT. Learn more about enhancements to the ACT in 2025.

Introduce the activity using the attached **Activity Slides**. Use the Bell Ringer strategy to begin class. Have students get their calculator; follow regular classroom procedures for this.

Once students have their calculator, move to **slide 3** and have students independently answer the question on a piece of notebook paper or elsewhere if you have a classroom norm for bell work. After a minute, ask for a volunteer to share their thinking. Facilitate a brief discussion covering that there are four options for a math question on the ACT, and since one of those options is the correct answer, one-quarter or 0.25 or 25% is the likelihood of guessing correctly on a question from the math portion of the ACT.

Move to **slide 4** and have students answer the second bell ringer question. This question should take less time since they already found the chance of guessing correctly. Since three of the four options are incorrect, then three-fourths or 0.75 or 75% is the chance of guessing incorrectly on a question from the math portion of the ACT.

Show **slide 5** and ask the class if they think that the likelihood of guessing correctly would increase or decrease if they could eliminate some of the options before guessing. Facilitate a brief discussion about not leaving questions blank, and the benefits of guessing, especially educated guessing (eliminating some of the wrong options).

Share the essential question on **slide 6** and the learning objectives on **slide 7**.

20 minutes

Activity

Teacher's Note: Guiding the Activity

The idea of probability should be a review for students; however, it is likely that they have not discussed probability since middle school or at least since Algebra 1.

The Probability handout is designed to give an overview of probability. There are two scenarios that all questions reference: mutually exclusive events are introduced with a bag of gems, and not mutually exclusive events are introduced with a given survey about playing video games.

Give each student a copy of the attached **Probability** handout, then show **slide 8**. Review the definition of *outcomes* on the slide and share the example using the illustration of a bag of gems. Have students write the example on their handout.

Then display **slide 9** and review the definition of *event* and share the example on the slide. As time allows, ask for students to share another example of an event that may or may not be related to the bag of gems.

Show **slide 10** and review the definition of *probability* and share the example on the slide. As time allows, ask for students to share another example of probability that may or may not be related to the bag of gems. Again, encourage students to write an example on their handout.

Display **slide 11** and explain the idea of events being *mutually exclusive*. As time allows, ask for students to share another example of a mutually exclusive event that may or may not be related to the bag of gems. Again, encourage students to write an example on their handout.

Sample Student Responses

- Examples of Events: R = drawing a red gem; F = rolling a 5 on a die; H = drawing a card with a heart from a standard deck of cards; etc.
- Examples of Probability: finding the likelihood of winning the lottery; the chance of rolling a 3 on a die; the likelihood of getting a full house in a game of poker; etc.
- Mutually Exclusive: rolling a 2 and a 4 on a die at the same time; drawing one gem from the bag and it being both green and yellow; etc.

Transition to **slide 12** and define G as the event of drawing a green gem from the given bag. Direct students to talk with a partner about what they notice from the bag of gems. Give students 2-3 minutes to take some notes.

Then move to **slide 13** and define *probability* as the ratio of the number of ways event A can occur over the total number of possible outcomes. Have students work in pairs to find the probability and complete the corresponding Venn diagram.

After a couple of minutes, move to **slide 14** and explain to students how to label the Venn diagram and how to find the probability of drawing a green gem.

Teacher's Note: Guiding the Activity

Let students know that often the ACT will not provide a blank Venn diagram, so students need to be able to quickly sketch and label one. When taking a timed test, remind students that "labeling" should be less formal, but still clear. In other words, practicing labeling by always putting the total at the top means that writing the word "total" will become less necessary.

Next, introduce the *complement* of event A with **slide 15**. Have pairs work together to find the probability of the complement of G and complete the corresponding Venn diagram.

After a couple of minutes, move to **slide 16** and ask for a volunteer to explain how to label the Venn diagram and how to find the probability of drawing a gem that is not green. Let students know that their Venn diagram labeling will feel repetitive, as they are referring to the same scenario, but have them pay attention to what is and what is not shaded on the Venn diagram and how it relates to the corresponding question.

Move to **slide 17** and explain the idea of finding the probability of event A or event B is the sum of the probabilities of each. Let students know that this is true for mutually exclusive events, but that it is not always true. They will see an example on the back of their handout where the events are not mutually exclusive. Have pairs work together to find the probability of the drawing a green or red gem and complete the corresponding Venn diagram.

After a couple of minutes, move to **slide 18** and ask for a volunteer to explain how to label the Venn diagram and how to find the probability of drawing a green or red gem.

Display **slide 19** and direct students' attention to the back of the handout: NOT Mutually Exclusive Events. Read the problem aloud:

A survey asked 100 students on what device they played video games. The results showed that 50 students play video games on their console, 45 students play video games on their PC, and 15 students play video games on their console and PC.

Then ask pairs to label their given Venn diagram. After a couple of minutes, ask the class what is different about this Venn diagram than the ones on the front of their handout. Facilitate a brief discussion that the overlapping portion of the circles represents those who play video games on both their console and PC, so this event is **not** mutually exclusive.

As students work, circulate the room and transition through **slides 20-21** slowly so that students can check their work and ask questions. For example, after a minute or two of students labeling their Venn diagram, display slide 20. Then as they are finishing labeling their Venn diagram, show slide 21. As pairs complete their Venn diagrams, bring the class together for a brief discussion of how to label the Venn diagram.

Teacher's Note: Guiding the Activity

Since 15 students play video games on both their console and PC, then the total number of students playing on a console, 50, minus 15 gives the number of students who only play on their console: 35. Similarly, the total number of those who play on their PC, 45, minus those who play on both, 15, equals the total number of students who only play on their PC: 30.

The problem said there were 100 students; that total minus those who play on only console, both, and only PC, 35, 15, and 30 respectively, leaves 20 students. So those represent the students who do not play on a console or PC and are represented outside the two circles.

After the class agrees on the labeling of the Venn diagram, direct pairs to answer questions 1-4 on their handout. Transition through **slides 22-25** so students can check their work.

10 minutes

Wrap-Up

Show **slide 26** and ask students to think back to the bell ringer questions. Were they expected to put their final answers as fractions or decimals or percentages? The questions were not multiple-choice and the directions did not specify. Share the test-taking tip of glancing at the multiple-choice options to see how to format the final answer. Advise students to start the math problem using pencil and paper, then glance at the answers to see if their final answer should be a decimal, fraction, etc. or if they even need to simplify their work. Then they will have more direction as they finish the problem.

Display **slide 27** and use the Exit Ticket strategy to individually assess what students have learned. Explain to students that they will have five minutes to answer five questions. Give each student a copy of the **Exit Ticket** handout and have students keep the paper face down until you start the timer. Once everyone has a copy of the handout, tell them to turn their paper over. Start the 5-minute timer on the slide.

After the time expires, show **slide 28** and review the answers with the class. Remind students that the ACT is not designed for everyone to earn a perfect score and that it is okay if they only answered approximately half of the questions correctly on this assessment.

Teacher's Note: ACT Scoring

If students are trying to earn a score in the 16-19 range on the math portion of the ACT, then they should be trying to answer approximately 28-44% of the questions correctly. Students trying to earn a score in the 20-23 range on the math portion of the ACT should be trying to answer approximately 46-55% of the questions correctly.

Use **slides 29-33** as needed to review the work for the given questions.

Before you dismiss, show **slide 34**: *You Powered Up!* and remind students to practice the action they selected on their Goal Setting handout from week 1.

Research Rationale

Standardized testing in high schools has long stood as a metric for assessing college readiness and school accountability (McMann, 1994). While there has been debate surrounding the accuracy of such metrics, as well as concerns regarding fairness, many institutions of higher education continue to make these scores part of the admissions process (Allensworth & Clark, 2020; Black et al., 2016; Buckley et al., 2020). Aside from admissions, it is also important to keep in mind that standardized test scores can also provide students with scholarship opportunities they wouldn't otherwise have (Klasik, 2013). Though the topic of standardized testing continues to be debated, effective test prep can ensure that our students are set up for success.

With several benefits to doing well on college admissions tests, it is important to consider how best to prepare students for this type of high stakes test. Those students from groups that may historically struggle to find success, such as those in poverty or first generation college students, especially stand to benefit from effective test preparation (Moore & San Pedro, 2021). The American College Test (ACT) is one option students have for college admissions testing that is provided both at national centers and school sites. Taking time to understand this test including the timing, question types, rigor, and strategies for approaching specific questions can help to prepare students to do their best work on test day and ensure their score is a more accurate representation of what they know (Bishop & Davis-Becker, 2016).

Resources

- Allensworth, E. M., & Clark, K. (2020). High school GPAs and ACT scores as predictors of college completion: Examining assumptions about consistency across high schools. Educational Researcher, 49(3), 198-211.
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