Power Up: Math ACT Prep, Week 10

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Time Frame 35 minutes

Essential Question(s)

How can I increase my ACT score?

Summary

In this activity, students will recall vocabulary about right triangles, then review sine, cosine, and tangent ratios. Students will then apply this knowledge to find missing sides, unknown angles, and other related information through practicing ACT-style math questions. This is the final activity in a 10-week "Power Up" series for ACT prep.

Learning Goals

- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths.
- Apply basic trigonometric ratios to solve right-triangle problems.

Attachments

- Activity Slides—Math ACT Prep, Week 10.pdf
- Activity Slides—Math ACT Prep, Week 10.pptx
- Exit Ticket—Math ACT Prep, Week 10.docx
- Exit Ticket—Math ACT Prep, Week 10.pdf
- Guided Notes (Sample Responses)—Math ACT Prep, Week 10.pdf
- Guided Notes—Math ACT Prep, Week 10.docx
- Guided Notes—Math ACT Prep, Week 10.pdf
- Vocabulary—Math ACT Prep, Week 10 - Spanish.docx
- Vocabulary—Math ACT Prep, Week 10 - Spanish.pdf
- Vocabulary—Math ACT Prep, Week 10.docx
- Vocabulary—Math ACT Prep, Week 10.pdf

Materials

- Activity Slides (attached)
- Vocabulary handout (attached; one per pair; printed front only)
- Guided Notes handout (attached; one per student; printed front/back)
- Guided Notes (Sample Responses) document (attached; for teacher use)
- Exit Ticket handout (attached; one per student; printed front/back)
- Pencil
- Notebook Paper
- Calculators

5 minutes

Introduction

Introduce the activity using the attached **Activity Slides**. Share the essential question on **slide 3** and the learning objectives from **slide 4**.

Have students find a partner or assign partners, then display **slide 5**. Give each pair a copy of the attached **Vocabulary** handout. Direct students to label the sides of each triangle using the words: *opposite*, *adjacent*, or *hypotenuse*. Then have students use the modified How I Know It strategy to explain how they know which side of the triangle is which by writing a sentence or two next to each side.

After a few minutes, move to **slide 6** and share the correct labels for each side. Ask for volunteers to share how they knew which side to label as opposite. Help students see that the side opposite of θ (the reference angle) should be labeled as the opposite side, the side that is adjacent to θ should be labeled as the adjacent side; and the side that is opposite of the 90° angle should be labeled the hypotenuse.

Repeat this for the second triangle with **slide 7**. Make sure that students understand that the position of θ is what determines which side is opposite and which side is adjacent.

20 minutes

Activity

Have students get their calculator; follow regular classroom procedures for this.

Show **slide 8** and give each student a copy of the attached **Guided Notes** handout. Explain to students that sine is the ratio of the side length of the opposite side to the length of the hypotenuse. Remind students that sine is a function and that the angle is the input.

Transition through **slides 9-10** and explain the ratios for cosine and tangent.

Display **slide 11** and direct students' attention to the first column of their handout: *Find the Missing Side*. Here students are given two completed problems. Remind students of the steps of solving story problems, specifically step 4: write an equation. Guide the class through annotating the completed problems to make notes of what they should be thinking about in order to use the correct trigonometric function to write an equation. Use the **Guided Notes (Sample Responses)** document for examples of annotating the problems. Be sure to show students how to use their calculator to get a decimal approximation.

Teacher's Note: Guiding the Activity

Students can use the same steps from solving story problems to solve trigonometric problems on the ACT: (1) drawing a quick sketch, (2) labeling the known, (3) labeling the unknown, then (4) writing an equation. Often the sketch and sometimes the labeling is given, so it is really important to help students understand the thought process involved to write an equation.

For the question asking to solve for y, help students see that they were given the angle measure and the length of the adjacent side. Since they were asked about the opposite side, tangent is the best choice because it relates the known (adjacent side) with the unknown (opposite side).

For the question asking to solve for h, help students see that they were given the angle measure and the length of the opposite side. Since they were asked about the length of the hypotenuse, sine is the best choice because it relates the known (opposite side) with the unknown (hypotenuse).

Direct students' attention to the second column of their handout: *Find the Missing Angle*. Here students are given one problem solved three ways. Remind students of the steps of solving story problems, specifically step 4: write an equation. Guide the class through annotating the completed problems to make notes of what they should be thinking about in order to use the correct trigonometric function to write an equation. Then briefly explain why the inverse trigonometric function is used to isolate θ. Be sure to show students how to use their calculator to get a decimal approximation for that angle measure.

Teacher's Note: Guiding the Activity

For the question asking to find the unknown angle, help students see why there are three options: all side lengths are known information. If this does happen on the ACT, which it might, remind them to quickly pick one function to work with. Many students select sine, as it is the first one that often comes to mind.

A common question from students is "How do I know when to write a trig equation over another equation, like the Pythagorean Theorem?" Help students understand that when the known and unknown information has a combination of angle(s) and side length(s), then a trigonometric equation is likely the best choice.

Direct students' attention to the back of their handout: *Find the Unknown Value*. Read question 1 aloud, then ask the class what the first step should be. After drawing a quick sketch and labeling what was given, ask the class to identify the unknown: cos(A). Ask the class what equation they think they should write. This is a tricky question, so only give students at most a minute to think about it, then ask: *What is the relationship between what is known (the given trigonometric equation) and the unknown?* Help students see why they are the same. Point out that they are not referring to the same angle, which is what makes this problem feel a little tricky. Use **hidden slide 12** for reference, as needed.

Direct students to work with their partner to answer question 2. After a couple of minutes, show **slide 13**. Give students time to check their work, then ask for volunteers to share how they found the unknown.

10 minutes

Wrap-Up

Display **slide 14** 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 a piece of notebook paper. Have students use the notebook paper to cover the questions on the handout. Let them know that they will be allowed to use it for scratch work. Once everyone has a copy of the handout, tell them to move their notebook paper and begin. Start the 5-minute timer on the slide.

After the time expires, show **slide 15** 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.

Use **slides 16-21** as needed to review the work for the given questions.

Before you dismiss, show **slide 22**: *You Powered Up!* and congratulate students on completing the 10-week ACT prep series of activities. Remind students to practice the action they selected on their Goal Setting handout from week 1.

Additional Content

If you have additional time consider sharing **slides 23-29**, following the directions below.

Many students come from a family where taking the ACT or going to college was not the norm. Some of your students will be the first in their family to attend college. This additional content helps distinguish the difference between state testing for the ACT and national testing. This may feel like common knowledge to you, but to many of your students, this is new information.

Plan to spend approximately 5-10 minutes going through the additional content. If your students have more questions than time allows, consider using the Parking Lot strategy to ensure that students will get answers to their many questions. This can be done using sticky notes, index cards, etc. as a place for students to jot down questions. Designate a place for students to put their questions; this could be on a poster, on your desk, etc.

Display **slide 23** and share with students that the main differences between a national and state ACT is when it is taken and how they register. If students live in a state that requires high school students to take the ACT, such as Oklahoma, then their school is required to offer the ACT during school hours. National tests are usually offered on Saturdays and may be given at a location other than their high school.

Move to **slide 24** and encourage students to be ready for their next test, likely in April.

Share the idea of superscoring with students by showing **slide 25**. By taking the ACT more than once, they can use their best scores from each section to create a higher composite score.

Show **slide 26** and talk more about national testing dates. Encourage students who want to find these dates to search online using the keywords: “ACT test dates.”

Display **slide 27** and explain that the regular registration date is very important. If they want to take the ACT on a certain date at a certain location, then they need to register before that deadline. And if they miss the deadline, they can expect to pay a late registration fee. A helpful way to avoid missing deadlines is to plan ahead. Usually in July, the ACT releases the national testing dates for the following school year. Show **slide 28** and share the months that the ACT is usually administered.

Lastly, for students who are going above and beyond to improve their scores, share **slide 29**. Share that they can buy the Test Information Release (TIR), which includes their multiple-choice test with their answers and the correct answers. If they took the writing portion, then it will also include the writing prompt and grading rubric. This feedback can really help students. And any students who qualify for a fee waiver, this TIR is free. Remind students to check with their counselor to see if they are eligible for fee waivers.

Additional Resources

- For more information on Fee Waivers, go to https://www.act.org/content/act/en/products-and-services/the-act/registration/fees/fee-waivers.html or to "Power Up: Math ACT Prep, Week 1."
- For more information about TIR, go to https://www.act.org/content/act/en/products-and-services/the-act/scores/request-a-copy-of-qa.html.
- For more information about Oklahoma's ACT expectations, go to https://www.act.org/content/act/en/products-and-services/state-and-district-solutions/oklahoma/the-act.html.
- For more information about ACT national testing dates: https://www.act.org/content/act/en/products-and-services/the-act.html.

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 equity, 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.
- Bishop, N.S. & Davis-Becker, S. (2016). Preparing examinees for test taking: guidelines for test developers and test users. 2nd edition. Crocker, L. (Ed). In Handbook of Test Development (pp. 129-142). Routledge.
- Black, S. E., Cortes, K. E., & Lincove, J. A. (2016). Efficacy versus equity: what happens when states tinker with college admissions in a race-blind era? Educational Evaluation and Policy Analysis, 38(2), 336–363. http://www.jstor.org/stable/44984542
- Buckley, J., Baker, D., & Rosinger, K. (2020). Should state universities downplay the SAT?. Education Next, 20(3).
- K20 Center. (n.d.). Bell ringers and exit tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). How I know it. Strategies. https://learn.k20center.ou.edu/strategy/144
- K20 Center. (n.d.). Parking lot. Strategies. https://learn.k20center.ou.edu/strategy/131
- K20 Center. (2021, September 21). K20 Center 5 minute timer. [Video]. YouTube. https://youtu.be/EVS_yYQoLJg?si=fJvuvFWH3vJ3B0z9
- Klasik, D. (2013). The ACT of enrollment: the college enrollment effects of state-required college entrance exam testing. Educational Researcher, 42(3), 151–160. http://www.jstor.org/stable/23462378
- McMann, P. K. (1994). The effects of teaching practice review items and test-taking strategies on the ACT mathematics scores of second-year algebra students. Wayne State University. https://www.monroeccc.edu/sites/default/files/upward-bound/McMannP.-the-effects-of-teaching-practice-review-items-ACT-mathematics-second-year-algebra.pdf
- Moore, R., & San Pedro, S. Z. (2021). Understanding the test preparation practices of underserved learners. ACT Research & Policy. Issue Brief. ACT, Inc. https://files.eric.ed.gov/fulltext/ED616526.pdf