Power Up: Math ACT Prep, Week 6

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Time Frame 35 minutes

Essential Question(s)

How can I increase my ACT score?

Summary

In this activity, students will explore function notation and operations. Students will use function composition and other operations to simplify and evaluate functions. This is the sixth activity in a 10-week "Power Up" series for ACT prep.

Learning Goals

- Use function notation to simplify and evaluate functions.
- Perform operations using function notation.

Attachments

- Activity Slides—Math ACT Prep, Week 6.pdf
- Activity Slides—Math ACT Prep, Week 6.pptx
- Exit Ticket—Math ACT Prep, Week 6.docx
- Exit Ticket—Math ACT Prep, Week 6.pdf
- Function Notation—Math ACT Prep, Week 6 - Spanish.docx
- Function Notation—Math ACT Prep, Week 6 - Spanish.pdf
- Function Notation—Math ACT Prep, Week 6.docx
- Function Notation—Math ACT Prep, Week 6.pdf
- Notation Exploration—Math ACT Prep, Week 6 - Spanish.docx
- Notation Exploration—Math ACT Prep, Week 6 - Spanish.pdf
- Notation Exploration—Math ACT Prep, Week 6.docx
- Notation Exploration—Math ACT Prep, Week 6.pdf

Materials

- Activity Slides (attached)
- Notation Exploration handout (attached; one per pair; printed front only)
- Function Notation handout (attached; one per student; printed front/back)
- Exit Ticket handout (attached; one-half 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**. Share the essential question on **slide 3** and the learning objectives from **slide 4** to the extent you see fit. Have students get their calculator out; follow regular classroom procedures for this.

Display **slide 5** and give each pair of students a copy of the attached **Notation Exploration** handout. Direct students to work with a partner to answer each question in the order it was given. As students work, circulate the room and monitor students' discussions, but remember that this is the time for students to try these problems on their own and later receive more guidance from you.

Teacher's Note: Guiding the Activity

The purpose of this activity is for students to see the pattern of evaluating functions and apply the pattern to interesting situations. Specifically, students are asked to plug in numbers, symbols, and words into the given function in preparation for plugging in a function.

Allow students to have a healthy struggle with this activity but use guiding questions to keep students encouraged. If a student is stuck on a question, ask the student to explain how they did the previous problem. Really listen to how they approached the previous problem. If their explanation is missing some key details, ask them to explain a different previous problem. Then ask why they feel like the current problem needs to be done differently.

As students finish the last few problems, show **slide 6** and encourage the class to check their work for questions 1–5.

Because some students need to hear a pattern more than see a pattern, use slide 6 to read the question and first step aloud, ("f of 3 equals 3 squared minus 5; f of –1 is –1 squared minus 5; ...; f of a star is a star squared minus 5."). Then show **slide 7** and continue reading aloud through question 9. Ask the class what they think f of g of x equals. Click to display the answer for question 10, again reading it aloud. Guide the class to check their work, discuss with their partner, and ask any questions.

Teacher's Note: Guiding the Activity

This activity is also used in the Explore portion of the "Function Operations, Part 2" lesson. If you have taught this lesson previously, you can have students briefly go over this activity again to see what misconceptions exist. Then ask students to practice using function composition by giving different types of functions for $g(x)$. For example, after students complete question 10, ask them to simplify $f(g(x))$ if $g(x) = x + 3$. As time allows and based on your pacing - using types of functions that your students have seen - consider using the following examples for $g(x)$:

- A polynomial such as, $x^2 + 6$
- A radical expression such as, the square root of the quantity $x - 2$
- A rational expression such as x^{-1}
- An exponential or logarithmic expression such as, e^x or $\log(x)$

Consider using letters other than x to help students with flexibility with function notation. Use the hidden **slide 8** as needed.

20 minutes

Activity

Display **slide 9** and give each student a copy of the attached **Function Notation** handout. Explain to students how the composition operation symbol and how to read $f(g(x))$. Emphasize that the composition symbol between the letters is not a multiplication symbol, which is a common misconception.

Show **slide 10** and preview the activity with the class. Their handout has the following three sections: Making Observations, Verbalizing Observations, and Applying Observations. Tell students that they are to continue working in pairs to complete the handout. For the Making Observations section, students are to try to notice patterns among the given four worked-out problems. Then they are to write their observations and try to make generalizations for the Verbalizing Observations portion, and lastly they are to apply what they have learned to answer the ACT-style question in the Applying Observations section.

After previewing the activity, give students approximately five minutes to make observations and verbalize their observations. Then bring the class together and use the guiding questions on the slide to facilitate a brief discussion. Make sure students understand the input and output relationship before moving on. Consider having students rewrite $f(-1) = 4$ as an ordered pair, $(-1, 4)$, to help with understanding the meaning of function notation, if needed.

Transition to **slide 11** and ask for volunteers to share what they wrote.

Sample Student Responses:

- What is in the parentheses is the input of the function, so h(0) = –7 just means that when x = 0, y = –7.
- You just plug what is in the parentheses into the equation for *x*.
- Replace all of the *x*'s with what is in the parentheses, then simplify.

Show **slide 12** and have pairs answer the given ACT-style question.

After approximately one minute, move to **slide 13** and share the sample response with the class. Give students time to correct their work and answer questions.

Direct students' attention to back side of their handout and show **slide 14**. Explain to students how to read $f(g(x))$ and how to algebraically represent the sum, difference, and product of $f(x)$ and $g(x)$.

Show **slide 15** and have students repeat the procedure just as they did on the front side of their paper.

After approximately five minutes, show **slide 16** and facilitate a brief discussion with the class.

Sample Student Responses:

- When you add or subtract functions, you just combine like terms.
- When you multiply functions, it is like FOILing.
- Sometimes you need to replace *x* with whatever is in the parentheses after you combine like terms.
- *f* and *g* are just names of specific functions; it's easier to write the letter than the whole equation.

Show **slide 17** and have pairs answer the given ACT-style question.

After approximately one minute, move to **slide 18** and share the sample response with the class. Give students time to correct their work and answer questions.

5 minutes

Wrap-Up

Teacher's Note: Efficiency

Remind students that on the ACT, they are not required or expected to show much work. Let students know that they need to show just enough work that if their answer is not one of the options that they can easily look through their work to find the small mistake. So the amount of work shown will vary per student. The work shown on the Function Notation handout and the work on the slides are likely more work than they would need to show on the ACT.

Display **slide 19** and use the Exit Ticket strategy to individually assess what students have learned. Explain to students that they will have two minutes to answer two 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 2-minute timer on the slide.

If time allows, unhide **slide 20** and review the answers with the class. Use the hidden **slides 21-22** for sample student responses.

Remind the class that if they answered one of the two questions correctly that they did great. Remind them that they do not need to answer every question correctly on the ACT to do well.

Collect the Exit Ticket handout to use as a formative assessment.

Before you dismiss, show **slide 23**: *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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