

## Piecewise Functions

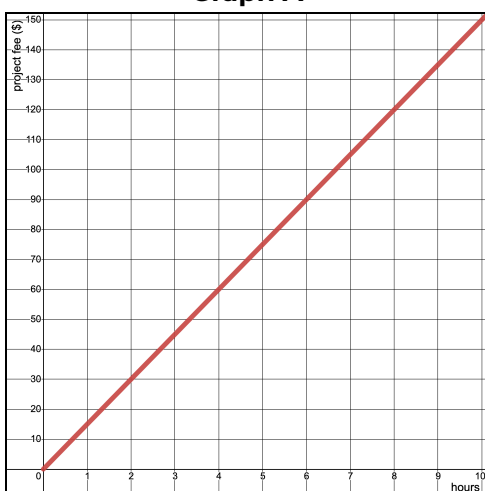
This activity teaches students about piecewise functions by examining real-world examples and identifying patterns in how different functions are applied. By the end of this exercise, students will be able to create and apply piecewise functions to solve different problems.

- Tyrese is a freelance artist who charges a flat fee of \$60 for any project that takes 4 hours or less. If a project takes him longer than 4 hours, he charges \$15 per hour.**

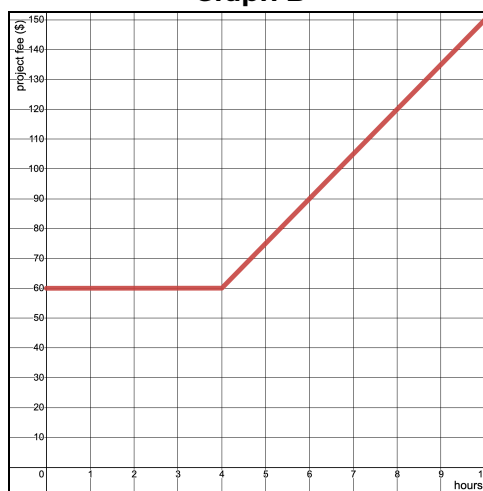
- How much does Tyrese charge for a project that takes him 3 hours?
- How much does Tyrese charge for a project that takes him 8 hours?

- Which of the following graph accurately represents Tyrese's pricing? How do you know?**

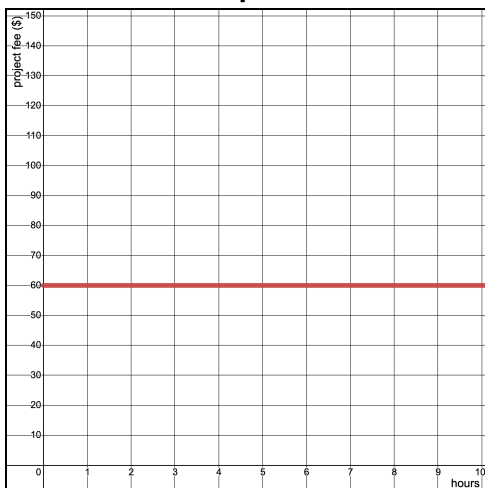
Graph A



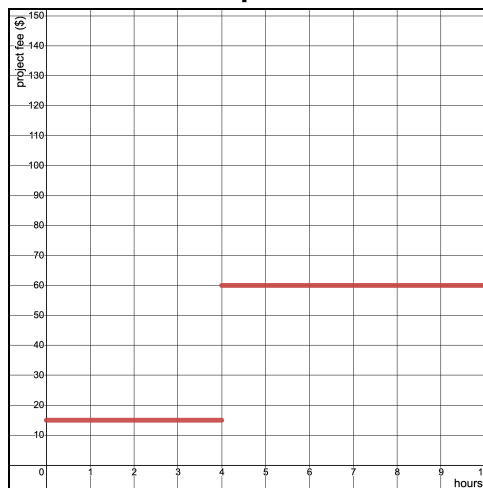
Graph B



Graph C



Graph D



Part 1: Introducing Piecewise Functions

A piecewise function has multiple “pieces” that follow different rules, depending on the domain (x values). We can use case notation to write an equation for piecewise functions. This tells us what rule to apply for each “case” or “piece” of the function. Here is the equation for Tyrese’s project fees:

Equation	What it Means	How to Read It
$f(x) = \begin{cases} 60 & 0 < x \leq 4 \\ 15x & x > 4 \end{cases}$	$f(x) = 60$ for these x values: $0 < x \leq 4$ $f(x) = 15x$ for these x values: $x > 4$	<i>“F of x equals 60 when x is greater than 0 and less than or equal to 4. F of x equals 15x when x is greater than 4.”</i>

1. Tyrese’s business is booming, so he decides to increase his prices. Now, he charges \$100 for any project that takes five hours or less. He charges \$20 per hour for projects that take longer than 5 hours. Write the new equation for his pricing.

$f(x) = \begin{cases} \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \end{cases}$

2. Marshall is renting a bike for the day. It costs \$13 for up to one hour. After one hour, the price increases to \$20. After three hours, the price increases again to \$50. The maximum time he can rent the bike is 10 hours total.
- a. Fill in the blanks to write an equation that represents this situation.

$f(x) = \begin{cases} \underline{\hspace{1cm}} & \underline{\hspace{1cm}} < x \leq \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} < x \leq \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} & \underline{\hspace{1cm}} < x \leq \underline{\hspace{1cm}} \end{cases}$

- b. What is f(4)?
- c. What is f(1)?
- d. For which x values does f(x) = 20?
- e. What is the domain of this function?

## Part 2: Creating Piecewise Functions

Write a piecewise function for each of the scenarios outlined below.

3. An airline charges for in-flight internet. It costs \$7 for 1 hour or less of internet. It costs \$19 for more than 1 hour, with a maximum of 24 hours total. Write an equation for the cost function.
4. Bagels are \$1 each if you buy 12 or fewer bagels. If you buy more than 12 bagels, they cost \$0.75 each.
5. A parking lot charges \$3 to park for anytime up to 2 hours. After 2 hours, they charge \$1.50 per hour
6. Kaustabh is a DJ who charges \$200 for any event under 2 hours. For events 2 hours or longer, he charges \$100 per hour.
7. Apples cost \$3 per pound if you buy less than 5 pounds. If you buy 5 pounds or more, they cost \$1.25 per pound.
8. Sara earns \$16 per hour working at Foods Co-op. If she works more than 40 hours a week, she earns time-and-a-half (ie. a 50% pay increase) for those overtime hours.
9. A stamp costs \$0.58 for any letter that weighs 1 oz or less. It costs an additional \$0.20 per ounce to mail letters that weigh more than 1 oz, up to a maximum of 3.5 oz.
10. Cleo works as a recruiter earning commission. They have a base salary of \$35,000 and are paid \$5,000 per person hired for the first 8 positions they fill. If they fill more than 8 positions, they are paid \$6000 for each additional person hired.
11. Under her health insurance, Toni pays 100% of her medical costs up to \$1000. After that, she pays 30% of any additional medical costs. However, her total payments are limited to \$8000, no matter her medical costs.