INTERACTIVE NOTEBOOK FOLDABLES

SPED SCAFFOLDED

Piecewise & Step Functions

A Complete INB Unit for Algebra 1 with Scaffolded Supports for Special Education / IEP Learners

PREVIEW

This comprehensive interactive notebook unit covers piecewise functions, step functions, and absolute value as piecewise functions through eight carefully designed foldable templates. Color-coded domain intervals, visual procedural anchors, sentence frames, and cut-and-paste supports ensure accessibility while maintaining grade-level rigor.

8 FOLDABLE TEMPLATES INCLUDED

- What is a Piecewise Function? — Concept Card
- Evaluating Piecewise Functions — Flip Book
- Graphing Piecewise Functions — Guided Template
- Step Functions (Floor Function) — Discovery Foldable
- Absolute Value as Piecewise — Accordion
- Domain & Range — Pocket-Sort Activity
- Real-World Models — Tri-Fold (Taxi, Parking, Cell Plans)
- Reflection & Self-Assessment — Exit Ticket

Algebra 1 | Secondary Mathematics

Includes: Answer Key with Detailed Solutions | SpEd Scaffolded Supports Throughout

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SpEd Scaffolded Supports in This Unit

This Interactive Notebook unit is designed with scaffolded supports for Special Education and IEP learners while maintaining grade-level Algebra 1 rigor. The following supports are embedded throughout every foldable:

Reduced Visual Clutter — Clean layouts with ample white space; only essential information displayed at each step to prevent cognitive overload. Decorative elements are minimized so students can focus on mathematical content.

Larger Print — Body text at 11-12pt and math expressions at 11pt ensure readability for students with visual processing needs or tracking difficulties.

Color-Coded Domain Intervals — Each domain interval in a piecewise function is assigned a distinct, consistent color (purple, blue, green) across all foldables, helping students visually match each piece of the function to its domain constraint.

Cut-and-Paste Supports — Dashed border boxes indicate pre-cut foldable templates; fine-motor challenges are accommodated with larger cut zones and simplified shapes that require fewer precise cuts.

Sentence Frames — Reflection and explanation activities include sentence starters (e.g., "I know the function changes at x = ___ because ___") to support expressive language without reducing mathematical demand.

Visual Procedural Anchors — Numbered step arrows appear on every graphing template, showing the order of operations: (1) Identify domain intervals, (2) Evaluate endpoints, (3) Plot points, (4) Connect with appropriate lines, (5) Check open vs. closed circles.

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Closed Circle	Indicates the endpoint IS included in the interval (inequality with =: <= or >=)	At x = 0 for x >= 0

Interactive Concept Card Template

SpEd Support: Cut along the dashed border. Fold on the solid center line. Write the function definition on the outside and the notation example on the inside.

FOLD HERE (center line) | Outside: Definition | Inside: Notation Example

Quick Check

1. In your own words, what makes a function "piecewise"?

Sentence frame: A function is piecewise when ________________________________.

2. If f(x) = { 3x, if x < 2; x + 4, if x >= 2 }, which rule do you use to find f(2)? Explain why.

Sentence frame: I use the rule ________ *because* ________________________________.

Teacher Tip

Use real-world analogies before introducing notation: a parking garage that charges different rates for different time intervals, or a cell phone plan with different per-minute rates. Students grasp the concept faster when they can connect it to everyday "switching points" in pricing or rules.

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3 Graphing Piecewise Functions from Equations

Step-by-Step Graphing Procedure

SpEd Support: Visual procedural anchors (numbered steps with arrows) guide you through the graphing process. Follow each step in order.

1. → Identify each domain interval and its corresponding sub-function.
2. → For each piece, create a mini-table of values within its domain.
3. → Plot the points on the coordinate plane.
4. → Connect points with a line (or curve) only within the domain interval.
5. → Mark endpoints: closed circle (filled) if included; open circle if excluded.
6. → Verify: does the graph pass the vertical line test? Each x-value should have only one y-value.

Guided Example

Graph: f(x) = { x + 2, if x < 1; -x + 4, if x >= 1 }

Piece 1 (Purple): f(x) = x + 2, when x < 1

x	-2	-1	0	1*
f(x)	0	1	2	3 (open)

**x = 1 is the boundary; we evaluate it but use an OPEN circle since x < 1 does not include 1.*

Piece 2 (Blue): f(x) = -x + 4, when x >= 1

x	1**	2	3	4
f(x)	3 (closed)	2	1	0

***x = 1 is included here (x >= 1), so we use a CLOSED circle at (1, 3).*

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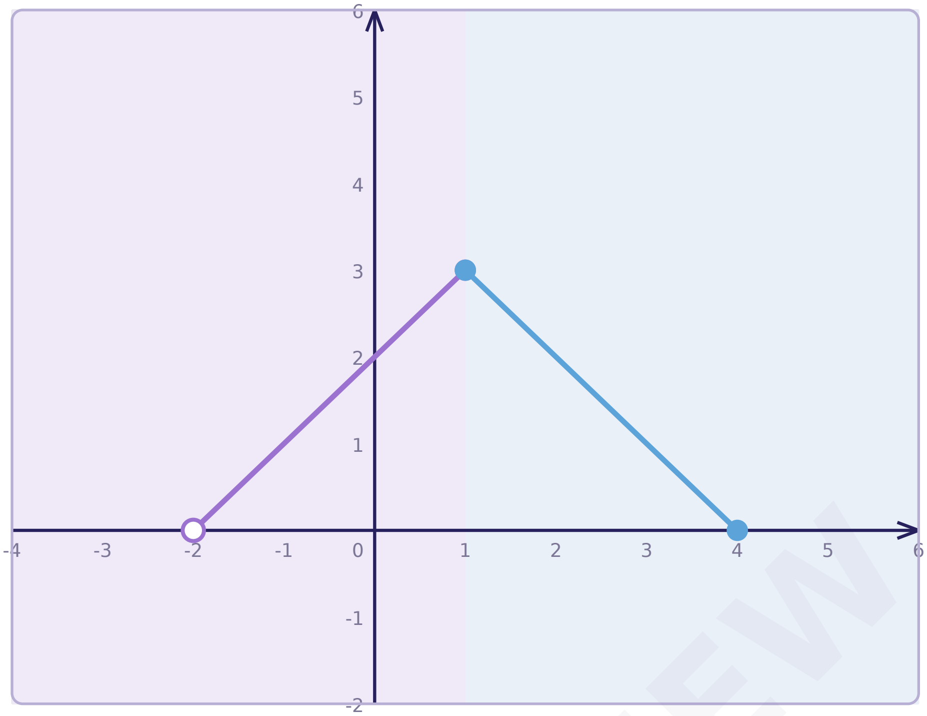
Graph of f(x)



Key Observation: At x = 1, there is an open circle at (1, 3) from the purple piece and a closed circle at (1, 3) from the blue piece. Since the closed circle "wins" (the point is actually included), the function is continuous at x = 1.

Guided Practice — Your Turn!

Graph: g(x) = { 2x - 1, if x < 2; -x + 5, if x >= 2 }

Step 1: Identify domain intervals: _______________ and _______________

Step 2: Create mini-tables for each piece:

x				
g(x)				

x				
g(x)				

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4 Step Functions — Discovery Foldable

What is a Step Function?

A **step function** is a special type of piecewise function where the output value stays constant (flat) over each interval of the domain, then "jumps" to a new value at the next interval. The graph looks like a staircase, with horizontal line segments at different heights. The most important step function in Algebra 1 is the **greatest integer function**, also called the **floor function**.

The Greatest Integer Function

Notation: f(x) = floor(x) or f(x) = [[x]]

Definition: floor(x) = the greatest integer that is less than or equal to x.

In plain language: "Round down to the nearest integer." No matter what decimal x has, drop the decimal part and go to the next lower integer (or keep the same number if x is already an integer).

Examples:

floor(3.7) = 3 (3 is the greatest integer <= 3.7)

floor(3.0) = 3 (3 is already an integer)

floor(-2.3) = -3 (-3 is the greatest integer <= -2.3; NOT -2, because -3 < -2.3 < -2)

floor(0.9) = 0 (0 is the greatest integer <= 0.9)

floor(-0.1) = -1 (-1 is the greatest integer <= -0.1)

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Discovery Activity

Complete the table below, then graph the results to discover the staircase pattern of the greatest integer function.

x	floor(x)	Reasoning
2.1	2	2 is the greatest integer <= 2.1
2.5	2	2 is the greatest integer <= 2.5
2.9	2	2 is the greatest integer <= 2.9
3.0	3	3 is the greatest integer <= 3.0
3.2	3	3 is the greatest integer <= 3.2
-1.3	-2	-2 is the greatest integer <= -1.3

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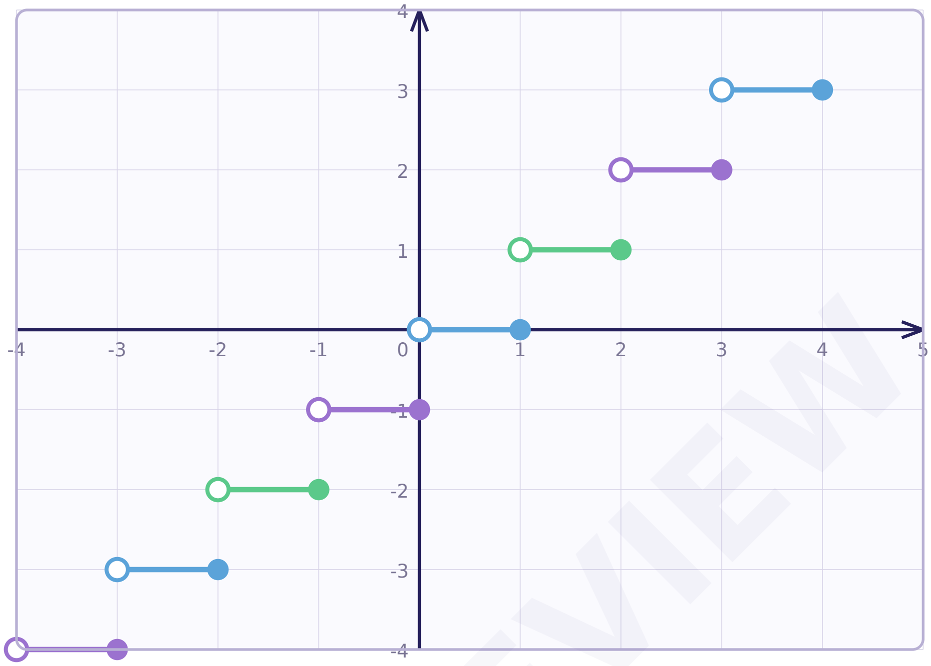
-0.5	-1	-1 is the greatest integer <= -0.5
0.8	0	0 is the greatest integer <= 0.8
-2.7	-3	-3 is the greatest integer <= -2.7

Graph of f(x) = floor(x)



Key Features of the Step Function Graph:

1. Each "step" is a horizontal line segment of length 1 (from one integer to the next).

2. At each integer x-value, there is an open circle (excluded from the left piece) and a closed circle (included from the right piece).

3. The function is discontinuous at every integer value of x.

4. The domain is all real numbers; the range is all integers.

Practice

1. Evaluate: floor(4.8) = _____, floor(-3.2) = _____, floor(0) = _____

2. For h(x) = 2 * floor(x) + 1, find h(1.5) and h(-0.3).

Sentence frame: First I find floor(_____) = _____, then I multiply by 2 and add 1 to get _____.

3. A parking lot charges $5 for the first hour and $3 for each additional hour (or part thereof). If x is the number of hours parked, write a function for the total cost using floor(x).

*Hint: The charge for x hours = $5 + $3 * (floor(x) - 1) when x > 1, and $5 when 0 < x <= 1.*

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5 Absolute Value as a Piecewise Function — Accordion

Connecting Absolute Value to Piecewise Functions

The absolute value function f(x) = |x| is one of the most familiar functions in Algebra 1. What many students do not realize is that the absolute value function is actually a piecewise function in disguise. The definition of absolute value depends on whether x is negative or non-negative, which creates two distinct rules. Understanding this connection is crucial because it allows you to apply all the piecewise function tools (evaluation, graphing, domain/range analysis) to absolute value functions as well.

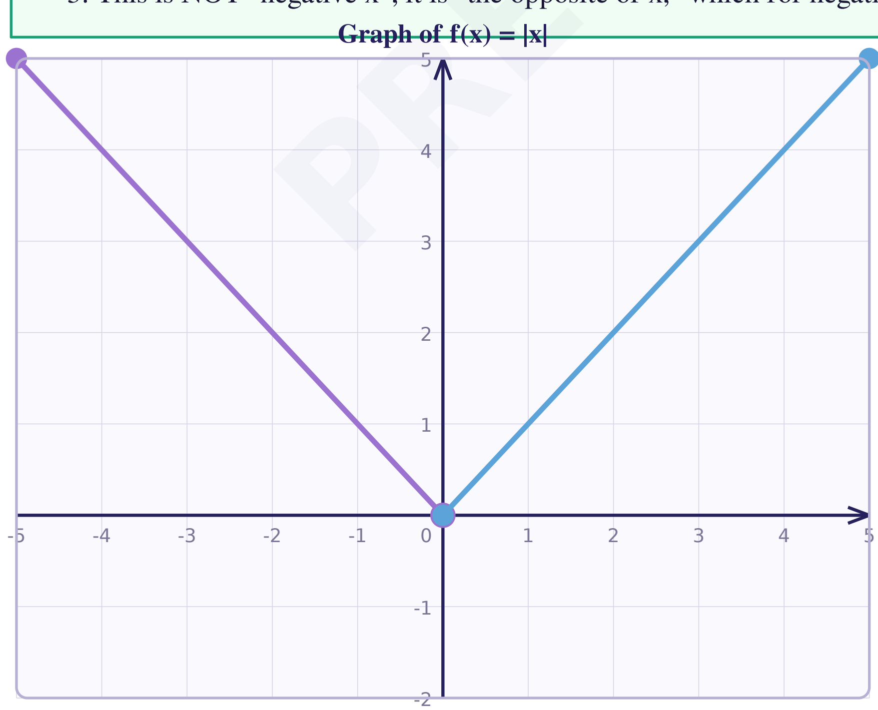
Absolute Value: The Piecewise Definition

|x| = x, if x >= 0

|x| = -x, if x < 0

Why does this work?

When x is already positive (or zero), the absolute value does nothing — it just returns x itself. For example, |5| = 5 and |0| = 0. However, when x is negative, we need to make it positive. The mathematical way to "flip the sign" of a negative number is to multiply by -1, which is the same as writing -x. For example, |-3| = -(-3) = 3. This is NOT "negative x"; it is "the opposite of x," which for negative x produces a positive result.



Extended Examples

Example 1: Write f(x) = |x - 3| as a piecewise function.

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7 Real-World Piecewise Models — Tri-Fold

Why Piecewise Functions Matter in the Real World

Piecewise functions are not just abstract mathematical objects — they model countless real-world situations where rules or rates change at specific thresholds. Taxi fares increase after a certain distance, parking rates change by the hour, cell phone plans charge different rates for different usage levels, and tax brackets apply different percentages to different income ranges. Understanding piecewise functions helps students make sense of these everyday scenarios and become informed consumers and citizens.

Model 1: Taxi Fare

Scenario: A taxi company charges a base fare of $3.00 for the first mile, then $1.50 per mile for each additional mile. There is also a flat $1.00 surcharge for rides over 10 miles.

Piecewise Function:

C(d) = { 3.00, if 0 < d <= 1
{ 3.00 + 1.50(d - 1), if 1 < d <= 10
{ 3.00 + 1.50(d - 1) + 1.00, if d > 10

Worked Problems:

C(0.5) = $3.00 (first mile rate)

C(1) = $3.00 (at exactly 1 mile, still first mile rate)

C(5) = 3.00 + 1.50(5 - 1) = 3.00 + 6.00 = $9.00

C(12) = 3.00 + 1.50(12 - 1) + 1.00 = 3.00 + 16.50 + 1.00 = $20.50

Model 2: Parking Garage Rates

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Panel 1: Taxi Fare | Panel 2: Parking Garage | Panel 3: Cell Phone Plan

Challenge Problem

A streaming service charges $8.99/month for the basic plan (1 screen, standard definition). The standard plan costs $13.99/month (2 screens, HD). The premium plan costs $17.99/month (4 screens, Ultra HD). If the number of screens is s, write a piecewise function for the monthly cost C(s). Then evaluate C(1), C(2), and C(4).

Sentence frame: The cost for s screens is $_____ because s falls in the range _________.

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What's Inside the Full Resource

30 Pages of Comprehensive, SpEd-Scaffolded Content

1. **What is a Piecewise Function?**
   Concept Card

2. **Evaluating Piecewise Functions**
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3. **Graphing Piecewise Functions**
   Guided Template

4. **Step Functions (Floor Function)**
   Discovery Foldable

5. **Absolute Value as Piecewise**
   Accordion

6. **Domain & Range of Piecewise**
   Pocket-Sort Activity

7. **Real-World Piecewise Models**
   Tri-Fold

8. **Reflection & Self-Assessment**
   Exit Ticket

SPEd SCAFFOLDED SUPPORTS THROUGHOUT

Color-Coded Domains | Sentence Frames | Visual Anchors

Cut & Paste Templates | Reduced Clutter | Larger Print

Also Includes

- ✓ Answer Key with Detailed Solutions
- ✓ Bonus Interactive Practice Problems
- ✓ Real-World Modeling (Taxi, Parking, Cell Plans)
- ✓ Match the Function to Its Graph Activity
- ✓ Review Request Page