

The Pizza of Data: Understanding and Creating Pie Graphs

Materials Needed

- Paper (plain or light graph paper)
- Pencil and Eraser
- Ruler
- Protractor (Essential for measuring angles)
- Compass (Essential for drawing the circle)
- Calculator (Recommended for quick calculations)
- Colored Pencils or Markers (for labeling and aesthetics)
- Data Set Worksheet (provided in the lesson body)

Introduction: The Whole Story (15 Minutes)

Hook: What's Your Favorite Slice?

Imagine you took a survey of everyone you know (family, classmates, friends) about their favorite dessert. If 50% of people chose chocolate cake, how could you show that information visually in a single shape?

Pie graphs (or circle graphs) are the perfect tool for this! They help us see how a total amount is divided into different parts, just like slicing a pizza. The entire circle represents 100% (or the total number of people surveyed).

Learning Objectives (Tell Them What You'll Teach)

By the end of this lesson, you will be able to:

1. Accurately interpret and describe data presented in any pie graph.
2. Convert raw data (counts or percentages) into the precise angles (degrees) needed for a pie graph.
3. Construct a fully labeled and accurate pie graph using a protractor and compass.

Body: Teaching the Slices (45 Minutes)

Phase 1: Interpretation (I Do)

Success Criteria for Interpretation

I know I understand a pie graph if I can immediately identify the smallest, largest, and combined categories.

Modeling: How to Read the Graph

Educator Talk: A circle always contains 360 degrees. This represents the 'whole' of our data. When you look at a pie graph, the size of the slice tells you how big that part is compared to the whole. If a slice takes up half the circle (180 degrees), it represents 50% of the data.

Example Scenario: Favorite Movie Genres (Imagine showing or drawing a simple pie graph example where Action is 40%, Comedy is 30%, and Sci-Fi is 30%.)

- **Q:** Which genre is the most popular? (Action - largest slice.)
- **Q:** If 100 people were surveyed, how many chose Comedy? (30 people, since it's 30%.)

Formative Check: Quick Q&A

If two slices combined make up a quarter of the circle, what percentage of the data are they covering? (Answer: 25%)

Phase 2: The Math of the Slice (We Do)

The Core Formula

To draw a pie graph, we must figure out how many degrees each category needs. We use this formula:

$$\text{Degrees} = \left(\frac{\text{Part}}{\text{Total}} \right) \times 360^\circ$$

Guided Practice: The "Snack Survey"

We surveyed 40 students about their favorite after-school snack. Let's calculate the angles together.

Snack Category	Count (Part)	Calculation (Part/Total * 360)	Degrees (Angle)
Fruit	10	$(10 / 40) * 360$	90°
Chips	16	$(16 / 40) * 360$	144°
Nuts	4	$(4 / 40) * 360$	36°
Cookies	10	$(10 / 40) * 360$	90°
TOTAL	40		360° (Must equal 360)

We Do Steps:

1. **Step 1 (Find Total):** Confirm the total count (40).
2. **Step 2 (Calculate):** Use the calculator to divide the count by 40, then multiply by 360. (e.g., $4 / 40 = 0.1$. $0.1 * 360 = 36$ degrees.)
3. **Step 3 (Check):** Add up all the final degrees ($90 + 144 + 36 + 90 = 360$). If it doesn't equal 360, go back and check the math!

Phase 3: Construction (You Do)

Task: Constructing the Graph

Now, use the calculated angles from the "Snack Survey" to draw the pie graph.

Success Criteria for Construction

The final graph must have a clear title, a key/legend, and the angles must add up to exactly 360 degrees when measured.

Step-by-Step Instructions (Modeling with Tools)

1. **Draw the Circle:** Use the compass to draw a perfect circle on your paper. Mark the exact center

point (where the compass pivot rested).

2. **Draw the Start Line:** Use your ruler to draw a straight radius line from the center point to the top edge of the circle. This is your starting line (like 12 o'clock).
3. **Measure Angle 1 (Fruit, 90°):** Place the protractor center point exactly on the center of the circle. Line up the baseline of the protractor with your starting line. Measure 90 degrees and draw a new radius line.
4. **Measure Angle 2 (Chips, 144°):** Now, use the *new* line (the 90° mark) as your baseline. Reposition the protractor and measure 144 degrees from that line. Draw the next radius line.
5. **Measure Angle 3 (Nuts, 36°):** Use the 144° line as your new baseline and measure 36 degrees.
6. **Measure Angle 4 (Cookies, 90°):** The last segment should automatically be 90 degrees. If your final line meets your original starting line exactly, you have succeeded!
7. **Label and Decorate:** Add a title ("Favorite After-School Snacks"), label each slice directly or create a colored key/legend, and indicate the percentage or degree measure for each slice.

Conclusion: Recap and Application (10 Minutes)

Review and Reinforcement (Tell Them What You Taught)

We covered three major steps today:

1. **Interpreting:** Understanding that the whole circle is 100% or 360 degrees.
2. **Calculating:** Using the formula (Part / Total * 360) to find the correct angle size.
3. **Constructing:** Using a compass and protractor accurately to draw the slices.

Summative Assessment: The Final Product

Your finished "Favorite After-School Snacks" pie graph will serve as the final assessment. It must adhere to the Construction Success Criteria (Title, Key, Accuracy of Angles).

Real-World Connection

Where do we see pie graphs used most often?

- **Business:** Showing budget allocation (where money goes).
- **Government:** Displaying election results or demographics.
- **Science:** Illustrating the composition of air or soil.
- **Personal Finance:** Tracking how you spend your allowance (savings vs. spending).

Differentiation and Adaptability

Scaffolding (For learners needing extra support)

- **Math Support:** Provide a pre-calculated table of percentages and degrees, requiring the student only to focus on the physical drawing and measuring with the protractor.
- **Tool Support:** Use large print protractors/compasses or guide the learner's hand through the first angle measurement.

Extension (For advanced learners)

- **Comparative Analysis:** Have the learner take the Snack Survey data and also create a Bar Graph. Then, write a short paragraph explaining which graph type (pie or bar) is better for showing the breakdown of the "whole" and why.

- **Data Collection Project:** Challenge the learner to design their own survey (5 categories, 30+ responses from friends/family/online), collect the raw data, perform all calculations, and construct the final graph independently.