"Balancing and Weighing"
Grade 2 –Summative Assessment

Assessed Understandings

Students should understand:

1. Variables (e.g., weight, size, shape, position of objects and fulcrum).
2. Appropriate tools are used to determine balance and weighing (mass using Unifix cubes).
3. Balance is affected by mass, position of the mass, and the position of the fulcrum.
4. Weight is determined by mass.
5. Balance is a process that can be used to determine mass.

Teacher Notes for the "Balancing and Weighing" Assessment

Introduction

These items are designed to provide a summative assessment of what students know and understand at the completion of the Science, Technology, and Children (STC) "Balancing and Weighing" module. This document includes teacher directions, response sheets for the individual students, and analytical scoring rubrics for each question. A separate document contains the anchor papers for each question. **A close look at the rubrics prior to the administration of the assessment will be helpful to the teacher.**

Time and Preparation

This assessment should take about **one hour** to administer. You are free to read aloud any or all portions of the assessment to your students. Without giving away a more appropriate response, **please help students understand the intent of the question or task**. This is not a test of reading, writing, or artistic ability. Students may be encouraged to use any and all resources available, including material from classroom charts and individual journals. The assessment requires students to use both an equal arm balance with pails and a beam balance to test a variety of objects. Please use the terminology from the investigations within this kit.

Prior to the assessment, the teacher will need to have the following materials *from the kit* available for each student—students may share if needed:

- Equal arm balances with two pails
- Collection of Unifix cubes
- Canisters with lids
- Large paper clips
- Sets of materials (metal nut, metal bolt, and metal cube)
- Check assessment kit: one white cylinder and one clear cylinder

Directions for Administration

You may read each question aloud as students take the assessment. Please do not provide any assistance to students while they are performing their tests. This assessment should be done individually and not in cooperative groups.

Question 1: Students will circle the correct tool.

1. Circle the tool you would use to weigh an object.

Question 2: This requires advance preparation.

2. Use the equal arm balance with pails and Unifix cubes. Record your data in the chart below.

Canister	Number of Cubes
A	
B	
C	

- Prepare equal arm balances with two pails and have a collection of Unifix cubes available to students.
- Label three canisters with lids per group with the letters A, B, and C. Use large paper clips to fill the canisters.

  Fill canister A with 15 large (46 small) paper clips (weighs 10 Unifix cubes).

  Fill canister B with 10 large (32 small) paper clips (weighs 7 Unifix cubes).

  Fill canister C with 22 large (67 small) paper clips (weighs 14 Unifix cubes).

  The teacher should weigh each canister and fill in the chart provided for scoring this question. The weight of the canisters could possibly vary.

  Students will be directed to use the chart to record their data.

Question 3: This requires students to graph their results.

3. Use the data collected from Question 2 to complete the bar graph below.
   - Add a title.
   - Label the horizontal lines.
   - Label the vertical line.
   - Add bars to the graph to show your data.

Question 4: This measures the student's ability to use data from the chart or graph to order the canisters from lightest to heaviest. Students write the matching letters on the line provided.

4. Using the data from the graph, write the letters of the canisters in order from **lightest** to **heaviest.**
   - (B, A, C)

Question 5: This requires advanced preparation. This is a focus question. The teacher will need to prepare sets of materials that include a metal nut, a metal bolt, and a metal cube. Place these objects in a small Ziploc bag.

5. Testing for the heaviest object:
   - Conduct a test.
   - **Circle** the object that weighs the most.

     What did **you do** to find the object that weighs the **most** (**metal cube**, **metal nut**, **metal bolt**)?

Question 6: Check in advance that you have these materials in your assessment kit: one white (polyethylene) cylinder and one clear (acrylic) cylinder. This question requires the use of the beam balance (white cylinder will be in your assessment box).

- Get a balance beam.
- Balance the beam on the fulcrum.
- Put the **white** cylinder on the left edge of the beam.
- Use the **clear** cylinder to balance the beam.
- **Draw an X** where you placed the **clear** cylinder to balance the beam.

Question 7: This requires the use of the beam balance and one clear (acrylic) cylinder. Students need to draw the position of the fulcrum.

- Put the clear cylinder on one end of the beam.
- Balance the beam.
- **Draw** the position of the fulcrum**.**

Question 8: This does not require any materials for the student.

The teacher will need a ruler, a metal cube, and an acrylic cylinder to visually demonstrate the position of the objects on a ruler (i.e., make a model). The teacher places the cube at 2 on the ruler and the cylinder at 9 on the ruler. Allow students to observe the model before answering the question.

- Look at the model.
- Put an **X** where the fulcrum would be on the picture below.

Write a rule that tells where to place the fulcrum to balance the beam.

Scoring Rubrics
"Balancing and Weighing"
Summative Assessment

Question 1: Circle the tool you would use to weigh an object.

This question measures a student's ability to select the appropriate tool to obtain the weight of an object.

Criterion for a complete response:

1. Identifies the equal arm balance with pails as the correct tool.

Code	Response
	Complete Response
10	Meets criterion above.
	Incorrect Response
70	Incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Question 2: Use the equal arm balance with pails and Unifix cubes. Record your data in the chart below.

This question measures a student's ability to use an equal arm balance beam and Unifix cubes to determine the various weights of mystery canisters.

Criterion for a complete response:

1. Weighs each canister correctly within +/- one Unifix cube.

Code	Response
	Complete Response
30	Meets the above criteria.
	Partially Correct Response
20	Weighs only canisters A and B correctly.
21	Weighs only canisters A and C correctly.
22	Weighs only canisters B and C correctly.
	Minimally Correct Response
10	Identifies only canister A correctly.
11	Identifies only canister B correctly.
12	Identifies only canister C correctly.
	Incorrect Response
70	Lists number of cubes instead of the number on the canister.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Canister	Number of Cubes
A	**10**
B	**7**
C	**14**

Question 3: Use the data collected from Question 2 to complete the bar graph below.

This question measures a student's ability to transfer data from a chart to a graph.

Criteria for a complete response:

1. Adds a related title (e.g., Number of Unifix cubes for each canister).
2. Labels the axis (e.g., Y = Number of Unifix cubes, X = A, B, C).
3. Adds bars to the graph to show the data.

Code	Response
	Complete Response
30	Meets the criteria above.
39	Meets criteria but graph is somewhat sloppy.
	Partially Correct Response
20	Represents data correctly on graph but omits or makes error in one label.
21	Makes one error in plotting data. Other criteria met.
22	Interchanges labels of horizontal and vertical axes.
29	Any other response with one error.
	Minimally Correct Response
10	Correctly represents data on graph but includes only one correct label.
11	Makes more than one error in plotting data. Other criteria met.
19	Any other minimally correct response.
	Incorrect Response
70	Response represents incorrect data on graph.
71	Fails to complete graph.
72	Omits all labels.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Question 4: Using the data from the graph, write the letters of the canisters in order from lightest to heaviest.

This question measures a student's ability to use data from the graph to order the canisters from lightest to heaviest.

Criterion for a Complete Response:

1. Orders the canisters from lightest to heaviest (e.g., **B, A, C**).

Code	Response
	Complete Response
10	Meets the above criterion.
	Incorrect response.
70	Serial order of canisters is incorrect.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Question 5: Conduct a test. Circle the object that weighs the most. What did you do to find the object that weighs the most?

This question measures a student's ability to conduct a test with the appropriate tool to determine the heaviest object.

Criteria for a complete response:

1. Chooses an appropriate method for determining the heaviest object (e.g., using and equal arm balance to weigh one against another or a fulcrum and beam to balance one against the other).
2. Explains why this method will determine which object weighs the most.

Code	Response
	Complete Response
20	Meets the criteria above. (Circles the metal bolt and explains using the equal arm balance to determine the heaviest object.)
21	Meets the criteria above. (Circles the metal bolt and explains using the fulcrum and beam to determine the heaviest object.)
29	Any other scientifically correct response.
	Partially Correct Response
10	Circles the correct object but has some flaw in the explanation.
11	Appropriate explanation but circles the wrong object.
19	Any other partially correct response.
	Incorrect Response
70	Circles an object with no explanation provided.
76	The response merely repeats the substance or stem of the question.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Question 6: Get a balance beam. Balance the beam on the fulcrum. Put the white cylinder on the left edge of the beam. Use the clear cylinder to balance the beam. Draw an X where you placed the clear cylinder to balance the beam.

This question measures a student's ability to balance a beam with a fixed fulcrum.

Criterion for a complete response:

1. Places an X that represents the position of the clear cylinder (heavier). The X should be placed closer to the fulcrum than the white cylinder (lighter).

Code	Response
	Complete Response
10	Meets the criteria above.
	Incorrect Response
70	Places X on beam but the position is incorrect.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Question 7: Put the clear cylinder on one end of the beam. Balance the beam. Draw the position of the fulcrum.

This question measures a student's ability to **identify** the center of gravity.

Criteria for a complete response:

1. Places cylinder at the end of the beam.
2. Positions the fulcrum off center just to the right of the cylinder.

Code	Response
	Complete Response
10	Meets the criteria above.
19	Any other scientifically correct response.
	Incorrect Response:
70	Draws the fulcrum but positions it on the other side of the midpoint.
71	Draws the fulcrum and positions it on the correct side of the midpoint but too far from the cylinder.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

Question 8: Look at the model. Put an X where the fulcrum would be on the picture below. Write a rule that tells where to place the fulcrum to balance the beam.

This question measures a student's ability to locate the position of a fulcrum to balance a beam and then generate a rule to explain how to balance two objects on a beam (e.g., the fulcrum should be placed closer to the heavier object).

Criteria for a complete response:

1. Places an X to represent the correct position of the fulcrum.
2. Writes an appropriate rule to explain the placement of the fulcrum.

Code	Response
	Complete Response
20	Meets the criteria above.
29	Any other scientifically correct response.
	Partially Correct Response
10	Positions fulcrum correctly but fails to write a rule.
11	Writes the rule but fails to mark the position of the fulcrum correctly.
12	Positions the fulcrum correctly and attempts to write a rule, but the rule is not clearly stated.
19	Any other partially correct response.
	Incorrect Response:
70	Places an X for the fulcrum but positions it incorrectly.
76	The response merely repeats the substance of the question.
79	Any other incorrect response.
	Non-Response
90	Crossed out, erased, illegible, or impossible to interpret.
99	Blank.

