

*Discovering the Story:
A City and Its Culture*

*MEASUREMENT AND
CONVERSIONS IN
CLOTHING SIZES*

A Math Lesson for
Grades 4-8

Based on
Reception Dress
by Selina Cadwallader



Selina Cadwallader (active 1870-1886)
Reception Dress, 1886
Gift of Wilmar Antiques c/o Mr. Maurice Oshry, 1971.550 a-c

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CONCEPT

Measurement in the use of clothing design provides for accuracy in sizing, embellishment placement, and for the efficient use of supplies and goods. Paper patterns serve as a tool to translate gathered data into a physical form for the making of various clothing items in various shapes and styles. These concepts will serve as the topic for study of the Selina Cadwallader *Reception Dress*. The teacher will facilitate student exploration of measurement methods for cloth and fabric in clothing construction and the exploration of conversions among different units of measurement.

OBJECTIVES

- Students will develop an understanding for the need of measurement and standard units of measure, and application to the skill of dressmaking through study of the *Reception Dress*.
- Students will select and apply the U.S. standard units of inch, foot, and yard to emulate mathematical calculations used by Selina Cadwallader in the making of the *Reception Dress*.
- Students will convert between two units of U.S. customary units and between U.S. customary units and metric units.
- Students will become familiar with the function and role of Cincinnati dressmakers through study of the Selina Cadwallader *Reception Dress*.

"Every child is an artist. The problem is how to remain an artist once he grows up."

Pablo Picasso

Teacher Preparation

CLASS PERIODS REQUIRED

- 1 to 2 (30-50 min.) periods for Pre-Lesson Activities
- 1 (50-min.) class period for Videoconference
- 1 to 3 class periods for Post-Lesson Activities

BACKGROUND INFORMATION

Background Information, which contains additional details on the *Reception Dress* and the artist who created it, has been written for teachers to review before the lesson and then share with students and is at <http://www.discoveringthistory.org/goldenage/dress/background.asp>.

VIDEO

Share the dressmaker video with your students prior to the videoconference. The video, which is on the website at <http://www.discoveringthistory.org/goldenage/dress/video.asp>, depicts Museum curator, Cynthia Amneus, as she prepares the *Reception Dress* for exhibition. While she works, she speaks at length on the *Reception Dress*. This video is an excellent resource that will help to prepare students for the videoconference.

Video Duration – 6 minutes.

“Art takes nature as its model.”

Aristotle

PRE- VIDEOCONFERENCE

VOCABULARY

Definitions can be found in the Glossary on the *Discovering the Story* Website at <http://www.discoveringthestory.org/goldenage/bed/glossary.asp>.

Measurement
Metric Units
Ruler
Tape Measure
U.S. Customary Units
Yardstick

GUIDING QUESTIONS

- What is measurement?
- Why do we measure?
- How do we measure?
- What information does measurement give us?
- What are the different ways things can be measured?
- What tools are used to measure length?
- Why is accurate or correct measurement important for the placement or alignment of clothing embellishments, such as buttons or zippers?

MATERIALS

- Museum photograph of the *Reception Dress* from the *Discovering the Story* website at http://www.cetconnect.org/discoveringthestory/goldenage/images/dress_full.jpg.
- Ruler
- Yard or meter stick
- Tape measure

PROCEDURE

Teacher will:

- Introduce students to a visual of the *Reception Dress* and share the following facts for discussion.
 - Selina Cadwallader was a dressmaker or seamstress.
 - She lived in the late 1800s in Cincinnati, Ohio.
 - The *Reception Dress* was designed for a special purpose. (Explain purpose and relationship to the design of the dress.)
 - Attributes of the dress include the use of red silk and lace, covered buttons, pleats, etc.
 - The *Reception Dress* was designed and fitted for a particular person, therefore the woman had to be measured and fitted for the dress construction.
 - Selina Cadwallader would have also needed to measure fabric and lace embellishments.
- Use the guiding questions to lead a discussion on measurement.
- Develop with students a working definition for the words “measure” and “measurement.”
- Introduce the vocabulary and concepts for inch, foot and yard.
- Model for students the various ways to measure items using a 12-inch ruler, a yardstick a tape measure, etc.
- Visually illustrate what an inch looks like and list things that are, or are about, an inch long on the chalkboard. This process will be repeated using feet and yards.
- Repeat above steps with metric units of centimeter and meter.
- Engage students in the discussion of the making of clothing and the role of measurement.
- View with students the *Reception Dress* video, with follow-up discussion on the use of measurement for the making of the dress, the fitting of the dress on the Museum mannequin and the placement and function of buttons.
- Engage students in discussion through the following guiding questions.
 - What were the things that Selina Cadwallader measured?
 - What tools did Selina Cadwallader use when designing, fitting and sewing a garment? Why?
 - How would Selina Cadwallader proceed to design and measure a garment for button placement?

“The arts must be at the heart of every child’s learning experience if...they are to have a chance to dream and to create, to have beliefs, to carry a sense of cultural identity.”

James D. Wolfensohn
former chairman
The Kennedy Center

VIDEOCONFERENCE

OBJECTIVES

- Students will interact with the Cincinnati Art Museum staff through a sixty-minute videoconference. Information is at <http://www.discoveringthestory.org/videoconference/>.
- Students will learn about Cincinnati history from 1850 to 1900.
- Students will use Museum objects to reinforce activities completed in preparation for this videoconference.

CONCEPT

A videoconference conducted by the Cincinnati Art Museum staff extends student learning through emphasis on the viewing and discussion of art objects. During this videoconference with the Museum, students will explore Cincinnati art history and the methods and practices of many of the artists working in the city.

SCHEDULE

- **5 minutes** Introduction to CAM staff (*This is also buffer time in case of connection complications*)
- **10 minutes** Brief discussion of student pre-videoconferencing activities.
- **10 minutes** Museum staff will lead an interactive discussion with students on the history of Cincinnati from 1850-1900
- **20 minutes** Museum staff will lead students in an in-depth investigation of selected Museum objects.

Objects Include:

- *Bedstead* by Benn Pitman, Adelaide Nourse Pitman, and Elizabeth Nourse. http://www.discoveringthestory.org/goldenage/images/bedstead_full.jpg
- *Reception Dress* by Selina Cadwallader. This image can be found at http://www.discoveringthestory.org/goldenage/images/dress_full.jpg
- *Aladdin Vase* by Maria Longworth Nichols Storer, which is available at http://www.discoveringthestory.org/goldenage/images/aladdin_full.jpg
- *Ali Baba Vase* by M. Louise McLaughlin, which is available at http://www.discoveringthestory.org/goldenage/images/alibaba_full.jpg
- *Vase and Dedication Medallion* by Tiffany & Co. This image is on the Website at http://www.discoveringthestory.org/goldenage/images/springer_full.jpg
- **10 minutes** Questions and student sharing of art projects.

- **5 minutes** Closing (*This is also buffer time in case of connection complications*)

POST- VIDEOCONFERENCE

MATERIALS

- Each student and the teacher will bring in an extra shirt from home
- Ruler
- Yard or meter Stick
- Tape measure

PROCEDURE

Teacher will:

- Demonstrate to students how to measure the torso length, sleeve length and neck size of a shirt.
- Have students select the appropriate measurement tool for each of these measurements.
- Have students determine the torso length, sleeve length and neck size of the shirt each brought in using U.S. customary units.
- Have students convert these three measurements to metric units (1 inch = 2.54 centimeters; 1 yard = 0.91 meter).
- Have students determine how to convert these ratios from decimals to fractions.

EXTENSIONS

MATERIALS

Materials

- Construction paper
- Linear measurement tools
- Scissors
- Glue
- Buttons
- Needle and thread
- Various shirts with buttons

PROCEDURE

Teacher will:

- Have students examine various button-up shirts or blouses brought in by the teacher and observe the positioning of the buttons and buttonholes.
- Have students chart the differences in size, number and distance of one button/buttonhole to another.
- Have students discuss how placement of the buttons and buttonholes adds to the physical structure of an item, as well as function for modesty and embellishment.
- Have students create a step-by-step manual illustrating how to make a button and buttonhole panel; students should include text, drawings and incremental measurements.
- Have students revisit their button manuals to answer the following questions:
 - Why did you choose the pattern that you did? For function, embellishment or both?
 - What pattern is illustrated by your button/buttonhole placement (e.g., ●● , ●●● , ●●●● , ●●●●● , ●●●●●● , or ●●●●●●●)?
- Have students devise a symbol system to denote and encode the button/buttonhole pattern, e.g., aa, bb, abab, etc. (For grades 7 and 8, teacher may choose to extend patterning to algebraic formula and problem solving, e.g., when $a=1\frac{1}{2}$ ", $b=2$ " then the pattern= $6\frac{1}{2}$ "; write an algebraic formula to measure an extension of pattern to the "nth" set.)
- Have students construct a paper bodice or shirt front from their previous button/buttonhole panel design and reflect the correct measurements and alignments in the construction. (See direction below.)
- Have students glue their panels to their written manuals and include identification of patterns.

DIRECTIONS FOR CONSTRUCTION OF PAPER BODICE OR SHIRT FRONT

Teacher will:

- Pass out two sheets of medium- to heavy-weight 8 ½ by 11 paper to each child.

Students will:

- Place one sheet of paper in a vertical position, and then take a ruler and measure a one-inch line from top to bottom from the left edge of the paper.
- Take a ruler and with a pencil place light markings to the front of one side of paper for the locations of your buttons, based on previous design for the button/buttonhole manual. Do the same for placement of buttonholes. Measure the distance between each button and buttonhole. Emphasize to students that buttons and buttonholes are usually on opposite sides for men's and women's clothing. (Buttons on the left for women, and on the right for men.)
- Draw the same one-inch line on the second sheet of paper, and fold that line under.
- Rotate the paper so the fold is on the correct side for buttonhole placement. (Right side for women, left side from men.) Buttonhole placement will be identical (aligned) to button

placement. Check to make sure measurements between buttons and buttonholes are the same on both sheets of paper. Make a dot or pin prick to show buttonhole placement.

- Glue or sew buttons to the first sheet of paper within the one-inch line. Space buttons accordingly. (Some will allow the same distance between all buttons, and others may choose an equal distance between button groupings.)
- Measure the diameter of the buttons. Make buttonholes that fit the size of the buttons.
- Draw the diameter measurement on each dot representing buttonhole placement. (Buttonholes need to be spaced identically to the corresponding buttons and be the same length.)
- Carefully use scissors to cut the buttonhole.
- Test placement of button and buttonhole by actually buttoning up paper garment.
Optional: add other embellishments such as trims or ribbons. Measure the width and length of trims before placement. Each side of garment top will have symmetrical placement of trims.

ASSESSMENT OBJECTIVES

- Students demonstrated understanding of measurement terms and units.
- Students demonstrated use of the tools, 12-inch ruler, yardstick and tape measure.
- Students were able to convert between U.S. customary units and metric units.
- Students accurately of student measurements for design, measurement and placement of button and buttonholes.
- Students were able to identify and code button patterns.
- Students were able to follow directions for paper construction of bodice or shirt front and aligned placement of buttons and buttonholes.
- Students were able to complete a quality finished product, mock bodice or shirtfront.
- Students demonstrate understanding of the use of nonstandard units for measurement.

ACADEMIC CONTENT STANDARDS

NATIONAL STANDARDS: MATHEMATICS

Standard 4: Understands and applies basic and advanced properties of the concepts of measurement.

Grades: 3–5

Benchmark 2: Selects and uses appropriate tools for given measurement situations (e.g., rulers for length, measuring cups for capacity, protractors for angles).

Benchmark 3: Knows approximate size of basic standard units (e.g., centimeters, feet, grams) and relationships between them (e.g., between inches and feet).

Benchmark 7: Selects and uses appropriate units of measurement, according to type and size of unit.

Grades: 6–8

Benchmark 6: Selects and uses appropriate units and tools, depending on degree of accuracy required, to find measurements for real-world problems.

OHIO STANDARDS: MATHEMATICS

Measurement: Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools, and technologies.

Grades: 3–4

Benchmark A: Selects appropriate units for perimeter, area, weight, volume (capacity), time and temperature, using:

- U.S. customary units; e.g., mile, square inch, cubic inch, second, degree Fahrenheit and other units as appropriate;

Benchmark B: Knows that the number of units is inversely related to the size of the unit for any item being measured.

Grades 5–8

Benchmark A: Selects appropriate units to measure angles, circumference, surface area, mass and volume, using:

- U.S. customary units; e.g., degrees, square feet, pounds and other units as appropriate.

Benchmark B: Converts units of length, area, volume, mass and time within the same measurement system.

Benchmark C: Selects a tool and measures accurately to a specified level of precision.