

WAMC Lab Template

Math Concept(s): Measurement

Source / Text: NCTA / Beemer

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Attach the following documents:

Lab Instructions – Stride Measurement (“Tools of Measurement – Stride”)

Student Handout(s) – Same as above; Stride Measurement (“Tools of Measurement – Stride”)

Rubric and/or Assessment Tool – Teammate rating scale (rubric) on Handout; Formative

Short Description:

During the first weeks of the Program year, Safety and Tools unit is covered thoroughly. One lesson is, "What's in Your Toolbox?" which allows students to brainstorm and list what they feel they should carry in an industry-inspired toolbox (wrenches, screwdrivers, etc.).

A very important tool is a measurement tool (tape measure). In lieu of that, students are challenged to find an alternative; their personal stride. They determine how long their own stride is, transcribe that measurement and use it in a Lab - to determine vessel length at a local Marina facility.

Students work individually and as a Team of 2. Measurements are taken and in a follow-up lesson, true lengths are validated. (Additional math includes percentages, ratios and conversion)

Lab Plan:

- Lab Title: Stride Measurement (“Tools of Measurement – Stride”)
- Prerequisite skills: Tape measure reading; ability to communicate with teammate; writing legibility
- Lab objective: To utilize a student's stride as a measurement tool / checking accuracies

Standards:

CCSS-M:

- G-GMD.4
- G-MG.3
- G-MG.1

Standards for Mathematical Practice:

- 1 Make sense of problems & persevere in solving them
- 4 Model with mathematics
- 5 Use tools strategically
- 6 Attend to precision

Technology:

- 1.2.1 Communication

Engineering

- HS-ETS 1-2

K-12 Science Standards:

- Cartography

K-12 Learning Standards – ELA:

- Secondary Speaking and Listening Standard 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building others’ ideas and expressing their own clearly and persuasively

Leadership/21st Century Skills:

<p>21st Century Interdisciplinary themes (Check those that apply to the above activity.)</p> <input type="checkbox"/> Global Awareness <input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy <input type="checkbox"/> Civic Literacy <input type="checkbox"/> Health/Safety Literacy <input type="checkbox"/> Environmental Literacy			
<p>21st Century Skills (Check those that students will demonstrate in the above activity.)</p>			
<p>LEARNING AND INNOVATION <u>Creativity and Innovation</u> <input checked="" type="checkbox"/> Think Creatively <input checked="" type="checkbox"/> Work Creatively with Others <input type="checkbox"/> Implement Innovations <u>Critical Thinking and Problem Solving</u> <input checked="" type="checkbox"/> Reason Effectively <input checked="" type="checkbox"/> Use Systems Thinking <input checked="" type="checkbox"/> Make Judgments and Decisions <input checked="" type="checkbox"/> Solve Problems <u>Communication and Collaboration</u> <input checked="" type="checkbox"/> Communicate Clearly <input checked="" type="checkbox"/> Collaborate with Others</p>	<p>INFORMATION, MEDIA & TECHNOLOGY SKILLS <u>Information Literacy</u> <input checked="" type="checkbox"/> Access and Evaluate Information <input checked="" type="checkbox"/> Use and manage Information <u>Media Literacy</u> <input type="checkbox"/> Analyze Media <input type="checkbox"/> Create Media Products <u>Information, Communications and Technology (ICT Literacy)</u> <input type="checkbox"/> Apply Technology Effectively</p>	<p>LIFE & CAREER SKILLS <u>Flexibility and Adaptability</u> <input checked="" type="checkbox"/> Adapt to Change <input checked="" type="checkbox"/> Be Flexible <u>Initiative and Self-Direction</u> <input checked="" type="checkbox"/> Manage Goals and Time <input checked="" type="checkbox"/> Work Independently <input checked="" type="checkbox"/> Be Self-Directed Learners <u>Social and Cross-Cultural</u> <input checked="" type="checkbox"/> Interact Effectively with Others <input checked="" type="checkbox"/> Work Effectively in Diverse Teams</p>	<p>Productivity and Accountability <input type="checkbox"/> Manage Projects <input checked="" type="checkbox"/> Produce Results <u>Leadership and Responsibility</u> <input checked="" type="checkbox"/> Guide and Lead Others <input checked="" type="checkbox"/> Be Responsible to Others</p>

Teacher Preparation:

Materials:

- Tape measures / masking tape

Set-Up Required:

- Verification of Marina site measurements

Lab Organization Strategies:

Grouping/Leadership/Presentation Opportunities:

- Teams (pairing) of students; sharing of post info-gathering

Cooperative Learning:

- Working in groups (Teams of 2)

Expectations:

That all students participate and experience real-life situation to troubleshooting

Timeline:

- 1.5 hours

Post Lab Follow-Up/conclusions:

Discuss real world application of learning from lab:

- When encountering the unfortunate incident of forgetting a tape measure, individual stride can be utilized as an accurate tool; creative alternatives; individual differences

Career Applications:

- Marine services/technology; construction; automotive; manufacturing

Optional or Extension Activities:

- Lesson preceding (“Toolbox”); Follow-up Lab (Validate accurate measurement)

Washington Applied Math Council

<https://wa-appliedmath.org/>

Marine Services

Name _____ Date _____

Tools of Measurement – Stride

In our previous lesson (“What’s in My Toolbox?”), we established that one of our most important tools is one for taking measurements. Speed squares, yardsticks, rulers, calipers and tape measures are just some of these tools.

What if you arrived at the Marina to measure a boat and found you forgot your toolbox back at Class? What could be a reliable measurement tool in a pinch?

Try using your feet! Each individual has a stride length that is quite unique; one person’s may be 28 inches while another’s is 34”. You will use your own to estimate - as accurately as you can - some common distances.

For this Lab, you’ll work individually - in Teams of two to establish your stride length. Each Team will need some masking tape and a tape measure. Starting at a marked point on the Project Area floor, walk forward 10 steps. Have your teammate mark the tenth step. Repeat this, measure and simply average the 2 attempts.

(Each student will do this for themselves)

First _____ ft _____ in Second _____ ft _____ in Average _____ ft _____ in

Convert your total distance (ft & in) to inches _____ Next, show how you’ll find your stride length: **(Show your work)**

This is your stride length!

Now - using your stride length - let’s practice measuring some common distances within our facility.

A) Drinking fountain to North entry doors: _____ steps = _____ ft _____ in

B) Project Area doors to rollup door: _____ steps = _____ ft _____ in

C) Our Classroom: _____ steps = _____ ft _____ in

(Both ways = Area) _____ steps = _____ ft _____ in

Your Team is going to visit A Dock at Cap Sante Marina. Each of you will take stride measurements of prescribed vessels and structures. Record your individual results.

A) Fuel Dock – entire float length: _____ = _____ ft _____ in

B) “Adventurer II” (Whale watcher): _____ = _____ ft _____ in

C) Small recreational boat (A 27): _____ = _____ ft _____ in

D) Commercial vessel (A18): _____ = _____ ft _____ in



Extra Credit:

Total # of slips on A Dock: _____ Vacant slips: _____

Fill rate (% of occupancy): _____

Ratio of recreational to Commercial vessels: _____ to _____

Are the longer lengths going to be more or less accurate? _____

Why? _____

On a follow-up visit, we will take exact measurements (with Tapes) to clarify how accurate our stride measurements really are

How accurate do you believe your stride length estimate will be (in %)? _____ +/-

RUBRIC:

Rate your Teammate (1 = poor / 5 = excellent) on:

Following directions _____ Cooperation _____ Accuracy _____ Completion _____

For our own purposes this week, let's amend this Lab

We'll use The Red Lion Inn for measurement practice

In Teams of 2, follow the instructions on both preceding pages – substituting the following for the (above) Marina examples

Each Team member take your stride measurement / compare with Teammate

Each Team take a different location to measure
(I'll select the Teams)

(In the Bar) Length of bar top – long length only: _____ steps = _____

Corridor #1(vending machine hall) – west to east doors: _____ steps = _____

Outside Fountain to front entrance doors: _____ steps = _____

Swimming pool (L x W): _____ steps = _____

Outdoor front entrance “pillars” (distance between): _____ steps = _____

The Car Wash (SE lower hotel lot) length: _____ steps = _____

Corridor #2 (McNary doors to Executive Board Rm): _____ steps = _____

“Red Lion Inn” street sign (length): _____ steps = _____

(Diameter of) Fountain “circle”: _____ steps = _____

(E lower hotel “Agent” office) Sidewalk – end-to-end: _____ steps = _____

(2 separate Teams – **please** – use measuring tapes to get correct accurate measurements of the above ten examples)





Marine Services

Assessment

Formative – During the Stride Measurement Lab, the following forms of formative assessment are utilized:

- Observation – Instructor oversees the various Teams as they execute the Lab; following directions; students working collaboratively
- Checking-in – Students are questioned during their Lab for assistance, clarification, tools usage, etc.
- Group rubric – At the end of their Lab sheet, the student is asked to “rate” their Teammate on: Following directions; cooperation; accuracy; completion
- “On track” – giving directions to Teams, as necessary

Summative - The following forms of summative assessment are utilized:

- Competency test – embedded in the Lab sheet is a “comparison” of actual taken measurements vs tape-measured measurements. This is done as a follow-up to the Lab
- A weekly “Recap Quiz” is given, which includes this unit
- Exit ticket – students individually turn in their Lab sheet, proof of their understanding and completion

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