Measurement in Construction

Media Type: Microsoft® PowerPoint®
Duration: 75 slides

Goal: To explain systems and units of measurement and demonstrate proper measurement techniques.

Description: Measurement plays a crucial role in the architecture, construction and interior design industries. This presentation examines this role and describes the need for precise and accurate measurement. The U.S. customary system and the modern metric system are explained, and units of distance, weight and volume for each system are reviewed. Measurement techniques are also discussed and tips for proper measurement are provided. In addition, the process of drawing to scale is examined.

Objectives:

1. To identify the role of measurement in the construction industry.
2. To explain the U.S. customary system of measurement and recognize its units.
3. To explain the modern metric system of measurement and recognize its units.
4. To demonstrate proper measurement techniques.
5. To examine the process of drawing to scale.

Common Core Standards

College & Career Readiness Anchor Standards for Writing

Writing Standards		
Text Types & Purposes	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.	
	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.	
	9-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
	9-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
Production & Distribution of Writing	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	
	9-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
Research to Build & Present Knowledge	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.	
	9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
	11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

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Common Core Standards

College & Career Readiness Anchor Standards for Speaking and Listening

Speaking & Listening Standards		
Comprehension & Collaboration	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.	
	Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.	
	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.	
	9-12.1	Initiate and participate effectively in a range of collaborative discussions with diverse partners on grades 9–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
	9-10.2	Integrate multiple sources of information presented in diverse media or formats evaluating the credibility and accuracy of each source.
	9-10.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
	11-12.2	Integrate multiple sources of information presented in diverse formats and media in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
	11-12.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Number & Quantity		
Quantities		
Reason quantitatively and use units to solve problems.	CCSS.Math.Content.HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
	CCSS.Math.Content.HSN-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
	CCSS.Math.Content.HSN-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Architecture & Construction Career Cluster (AC)

Cluster	Standard
Use vocabulary, symbols and formulas common to architecture and construction.	
Read, interpret and use technical drawings, documents and specifications to plan a project.	
Construction Career Pathway (AC-CST)	Compare and contrast the building systems and components required for a construction project.
	Demonstrate the construction crafts required for each phase of a construction project.
	Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.
Design/Pre-construction Career Pathway (AC-DES)	Justify design solutions through the use of research documentation and analysis of data.
	Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
	Apply the techniques and skills of modern drafting, design, engineering and construction to projects.
	Employ appropriate representational media to communicate concepts and project design.

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Lesson Plan

Student and Teacher Notes are available to print in outline format. You can access these documents under the "Printable Resources" section. If student licenses have been purchased, an interactive version of the Student Notes is available in the "Interactive Activities" section. If printing the full PowerPoint® is desired, you may download the file and print the handouts as needed.

Class 1: Begin class by passing out the *Measurement in Construction Vocabulary Handout*. Show the *Measurement in Construction - Introduction* segment. Follow the segment with its *Assessment*. Introduce the *Customary vs. Metric Project* for students to begin.

Slides 1-13

Class 2: Remind students to continue using the *Vocabulary Handout* as reference materials. Show slides 14 to 21 of the *Measurement in Construction - Units & Conversion* segment. Allow the remainder of the class to work on their *Project*.

Slides 14-21

Class 3: Show slides 22 to 34 of the *Measurement in Construction - Units & Conversion* segment. Pass out the *Unite Conversion Handout.* Follow the segment with its *Assessment*. Have students begin the *Conversion Activity*. Allow students to finish for homework if necessary.

Slides 22-34

Class 4: Review the *Conversion Activity* as a class. Remind students to continue using the *Vocabulary Handout*. Show slides 35 to 46 of the *Measurement in Construction - Techniques & Tips* segment of the presentation.

Slides 35-46

Class 5: Show slides 47 to 53 of the *Measurement in Construction - Techniques & Tips* segment. Follow the segment with its *Assessment*. Introduce the *Measuring Activity* and allow students the remainder of the class to work.

Slides 47-53

Class 6: Allow students the entire class period to finish the *Measuring Activity*. If/when the *Activity* discussion comes to an end, instruct students to continue work on their *Projects*.

Slides 54-75

Class 7: Show the *Measurement in Construction - Drawing to Scale* segment. Follow the segment with its *Assessment*. Introduce the *Scale Drawing & Model Project* and have students begin working on it.

Class 8: Administer the *Measurement in Construction Final Assessment*. Allow the remainder of the class for students to work on the *Scale Drawing & Model Project*.

Class 9: Distribute the *Measurement Costs Activity* and allow students time to complete it. Allow the remainder of the class for students to finish up their *Projects*.

Class 10: Students should share their *Scale Drawing & Model Project* with the class and turn in their *Customary vs. Metric Project*s.

Lesson Links

Construction Knowledge.net: Measurement Conversions

- http://www.constructionknowledge.net

Construction Zone: Construction Measurement

- http://www.constructionzones.com/Portals/85/ConstrMeasCurrSample.pdf

Career & Technical Student Organizations

SkillsUSA

- Architectural Drafting
- Cabinetmaking
- Carpentry
- Related Technical Math
- Technical Drafting

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LESSON PLAN

Career Connections

Using the *Career Connections Activity*, allow students to explore the various careers associated with this lesson. See the *Activity* for more details. *If student licenses have been purchased:* Students will select the interviews to watch based on your directions. *If only a teacher license is purchased:* Show students all the career interviews and instruct them to only complete the interview form for the required number of interviews.

- iCEV50355, James Rymer, Chief Estimator, Lee Lewis Construction
- iCEV50809, Kristen Harness, Design Manager, OfficeWorks
- iCEV50883, Sheryl Fox, Commercial Interior Designer, Canizaro Cawthon Davis

Lab Activities

Conversion

Directions:
Students will fill in the blanks provided by converting the units of measurement within a system. Then they should fill in the provided tables for converting units of measurement between systems. When necessary, they should round numbers to the nearest tenth. Allow students to keep the tables for future reference.

Measuring

Directions:
Students will work in groups of three or four to practice measuring distance, weight and volume in both U.S. customary units and metric units. Then they will participate in class discussion regarding challenges of measuring and tips for measuring accurately and precisely. See the *Measuring Teacher Instruction Sheet* for instructions and supplies needed.

Measuring Costs

Directions:
For this *Activity*, students will discuss the costs in measurements. Using the information provided, students will estimate the cost of building a floor for the spaces shown. Remind students to think about how large the space is as well as what is needed to properly quote each project. An *Answer Key* has been provided.

Projects

Customary vs. Metric

Directions:
Students will research the U.S. customary system and the modern metric system. Then they will write a report discussing their findings. They should include a brief history of each system, advantages and disadvantages of each system, and their opinion on which system is preferable. Students should include a bibliography documenting their sources according to your instruction.

Scale Drawing & Model

Directions:
Students will imagine their dream homes and create scale drawings and models. They should decide on a reasonable scale and develop a blueprint-like drawing and a simple roof-less model. Homes and elements involved (doors, windows, etc.) should be relatively realistic in terms of size and structure. Each room should be labeled with its purpose (living room, bedroom, etc.), room dimensions and the scaled down measurements used to make the drawing/model. For more details, see the *Scale Drawing & Model Project* handout.