# Engineering Measurement Kit

Mid-Valley
STEM-CTE HUB

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# Engineering Measurement Kit


The Engineering Measurement Kit introduces students to the tools and techniques used by engineers, architects, surveyors, and construction professionals to measure and design the built environment. Using tape measures, contour gauges, speed squares, and levels, students investigate distance, angles, elevation, alignment, and surface profiles while developing spatial reasoning and geometric thinking. Through hands-on engineering challenges and real-world measurement activities, students apply mathematical concepts, collect accurate measurements, and practice the same skills used in engineering, manufacturing, construction, and other technical careers.

## Grade Level

**6th - 12th**

## Group Size

**1-2 per group**

## Time Duration

**30 - 90 minutes**

## Content of Kits

### Components

- 15 Rigid Tape Measures
- Long Reel Tape Measure
- 15 10" Contour Gauges
- 15 Speed Squares
- 15 Levels

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# Usage

## Getting Started

1. **Inventory and Organize the Measurement Tools**

Begin by unpacking the kit and verifying that all tape measures, contour gauges, speed squares, levels, and the long reel tape measure are present and in good condition. Organize the tools by type so each student pair has access to the equipment needed for their investigation.

2. **Introduce Each Measurement Tool**

Demonstrate how each tool is used and explain its purpose in engineering and construction. Discuss when an engineer or builder would choose a contour gauge instead of a ruler or when a level is needed to ensure accurate construction.

3. **Practice Basic Measurement Skills**

Allow students to practice measuring classroom objects, walls, tables, doorways, and other surfaces before beginning engineering challenges. Encourage students to compare measurements and discuss techniques for improving accuracy.

4. **Prepare Data Collection Sheets**

Provide students with engineering notebooks or measurement tables to record dimensions, angles, elevations, and observations. Encourage them to include units, sketches, and notes that document their measurement process.

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## Storage

- **Clean and Organize Equipment After Use**

Wipe dirt and debris from equipment before returning them to the kit. Organize tools by type to simplify inventory and classroom setup.

- **Protect Measuring Tools**

Retract tape measures fully before storage and avoid stacking heavy objects on contour gauges or levels.

## Troubleshooting

- **Measurements Do Not Match**

If student measurements differ, review proper measuring techniques and confirm that everyone is measuring from the same starting point. Repeating measurements and comparing results can improve consistency and accuracy.

- **Contour Gauge Does Not Capture the Shape Clearly**

Ensure the contour gauge is pressed firmly and evenly against the object's surface before removing it. Avoid twisting or shifting the gauge while capturing the profile, as this may distort the shape.

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# Activity Guide

## Beginner

**Engineering Measurement Scavenger Hunt**
Students use a variety of engineering measurement tools to measure classroom objects and determine which tool is best suited for each task.

**Oregon Math Standards Alignment**
6.RP.A.3, 7.GM.B, 8.DR.B, & HS.NQ.B

**Procedure**

1. Assign each team a list of classroom objects to measure.
2. Select the most appropriate measuring tool for each object.
3. Record measurements and explain why each tool was chosen.
4. Compare measurements with another team.
5. Discuss how engineers select tools based on the task.

## Intermediate

**Build It Level**
Students investigate how levels and speed squares help engineers and builders create safe, accurate structures. Teams measure angles, check level surfaces, and evaluate classroom structures.

**Oregon Math and Science Standards Alignment**
MS-ETS1-2, 7.GM.B, & Science and Engineering Practice

**Procedure**

1. Measure and inspect classroom furniture or structures.
2. Determine whether surfaces are level or square.
3. Record measurements and observations.
4. Discuss why accurate alignment is important in construction.
5. Identify improvements that could be made to increase structural accuracy.

## Advanced

**Design Like an Engineer**
Student teams investigate an object or structure, collect accurate measurements, create a scaled sketch, and evaluate how engineering measurements contribute to successful design.

**Oregon Math and Science Standards Alignment**
MS-ETS1-3, 7.GM.A.1, 7.GM.B, & Science and Engineering Practice

**Procedure**

1. Select an object or structure to investigate.
2. Measure dimensions, angles, and surface profiles.
3. Create a labeled scale drawing using collected measurements.
4. Review the drawing for accuracy.
5. Present the design and explain how measurements contributed to the final product.

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# Learning Extensions

## STEAM Connections: Engineering - Math - Science

## Learning Objectives:

- Select and use engineering and construction measurement tools to collect accurate data.
- Measure distance, angles, elevation, alignment, and surface profiles using appropriate instruments.
- Apply geometric reasoning and spatial thinking to engineering and design challenges.
- Create scale drawings and models using collected measurements.
- Analyze measurement data to improve engineering designs and solve real-world problems.
- Communicate engineering solutions using accurate measurements, sketches, and technical vocabulary.

## Career Connections:

- **Civil Engineer –** Designs and oversees the construction of roads, bridges, buildings, and other public infrastructure.
- **Architect –** Plans and designs safe, functional, attractive buildings and other structures.
- **Land Surveyor –** Measures land and determines property boundaries to support construction and development projects.
- **Construction Manager –** Coordinates building projects and manages teams.
- **Carpenter –** Measures, cuts, and assembles building materials to construct structures.
- **Industrial Designer –** Creates products that are functional, efficient, and visually appealing by combining engineering and design principles.

## Essential Employability Skills:

- Critical Thinking
- Problem Solving
- Communication
- Collaboration
- Observation and Attention to Detail
- Spatial Reasoning
- Responsibility

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# Resources and Accessibility

## Safety Guidelines

- **Use Measuring Tools Carefully**

Handle tape measures, speed squares, contour gauges, and levels responsibly. Retract tape measures slowly, avoid swinging tools, and keep fingers clear of moving parts to prevent injury.

- **Maintain a Safe Workspace**

When measuring large objects or distances, keep walkways clear and be aware of others working nearby. Return tools to the designated workspace after use to reduce tripping hazards.

## Accessibility

- **Provide Multiple Ways to Participate**

Students can measure, record data, sketch designs, verify calculations, inspect structures, or present findings. Assigning a variety of roles allows all learners to contribute meaningfully to engineering investigations.

- **Support Learning with Visual and Hands-On Strategies**

Model the proper use of each measurement tool before activities begin and provide labeled diagrams, sample measurements, and step-by-step demonstrations. Encourage students to communicate their understanding through sketches, verbal explanations, written notes, or digital presentations to support diverse learning styles.

## Library Catalog

## Library Resources

## Feedback

QR to feedback survey