STEM TROOPERS

Level 3

STEM ADVANCEMENT INC.
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STEM TROOPERS LEVEL 3

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Achievements
Educational Services

The Little Engineer A STEM Literary Companion

STEM TROOPERS LEVEL 3

A PROJECT OF ADVANCESTEM.COM
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The Engineering Design Process

THROUGHOUT THIS BOOK YOU WILL COME ACROSS SOME OPEN-ENDED STEM CHALLENGES WHICH ALLOW YOU TO PROBLEM-SOLVE AND FIND SOLUTIONS TO REAL WORLD PROBLEMS USING YOUR SCIENCE, MATH, ENGINEERING, AND TECHNOLOGY SKILLS. THE ENGINEERING DESIGN PROCESS SHOWN BELOW HAS 5 STEPS WHICH WILL HELP GUIDE YOUR THINKING AND ABILITY TO EXPERIMENT.

Ask — IN THIS STEP, YOU WILL BE PRESENTED WITH A REAL-WORLD CHALLENGE

Imagine — IN THIS STEP, YOU WILL BRAINSTORM AND THINK OF MANY DIFFERENT POSSIBLE SOLUTIONS.

Plan — IN THIS STEP, YOU WILL DRAW A SKETCH OR DRAFT OF THE IDEA YOU PLAN TO CREATE.

Create — IN THIS STEP, YOU WILL GATHER MATERIALS FROM YOUR TEACHER AND TRY TO BUILD YOUR OWN SOLUTION.

Improve — IN THIS STEP, YOU WILL IMPROVE YOUR PRODUCT, AND POSSIBLY EVEN START OVER WITH A NEW PLAN IF YOUR FIRST ATTEMPT DID NOT WORK. ENGINEERS DO NOT GIVE UP!

How To Use This Book

THROUGHOUT THIS BOOK YOU WILL COME ACROSS SOME OPEN-ENDED STEM CHALLENGES WHICH ALLOW YOU TO PROBLEM-SOLVE AND FIND SOLUTIONS TO REAL WORLD PROBLEMS USING YOUR SCIENCE, MATH, ENGINEERING, AND TECHNOLOGY SKILLS. THE ENGINEERING DESIGN PROCESS SHOWN BELOW HAS 5 STEPS WHICH WILL HELP GUIDE YOUR THINKING AND ABILITY TO EXPERIMENT.

This book is divided into 8 units. Each unit has 3 lessons.

Lesson 1:

- **Reading** - students will read a story about an engineer who needs to solve a real-life problem.
- **Group Worksheet** - students will answer questions based on the reading in preparation for the activity in Lesson 2.

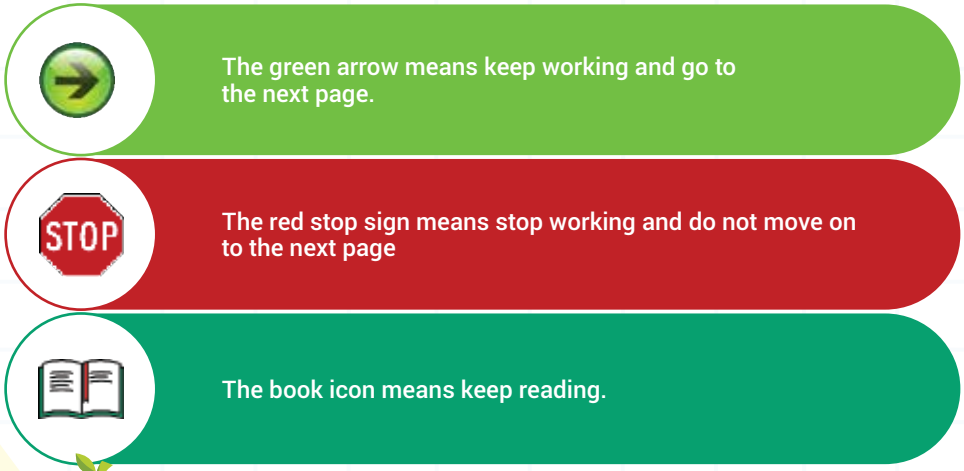
Lesson 2:

- **Lab activity** - students will collect materials from their teacher and complete a lab activity. Students will use the worksheet as they go along.

Lesson 3:

- **Extension Activity** - students will collect materials from their teacher and complete a STEM challenge on the unit topic.

THE SYMBOLS ON THE BOTTOM OF THE PAGES WILL TELL YOU WHEN A SESSION CONTINUES AND WHEN A SESSION ENDS.



The green arrow means keep working and go to the next page.

The red stop sign means stop working and do not move on to the next page

The book icon means keep reading.

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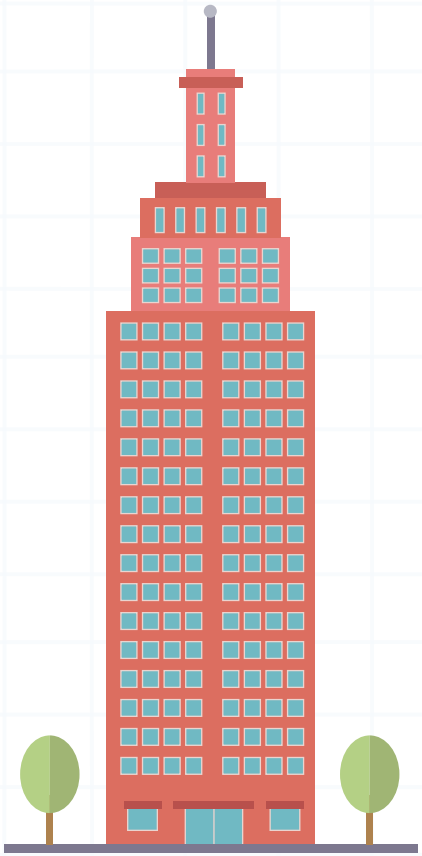
The Little Engineer and the Elevator

STEM TROOPERS LEVEL 3

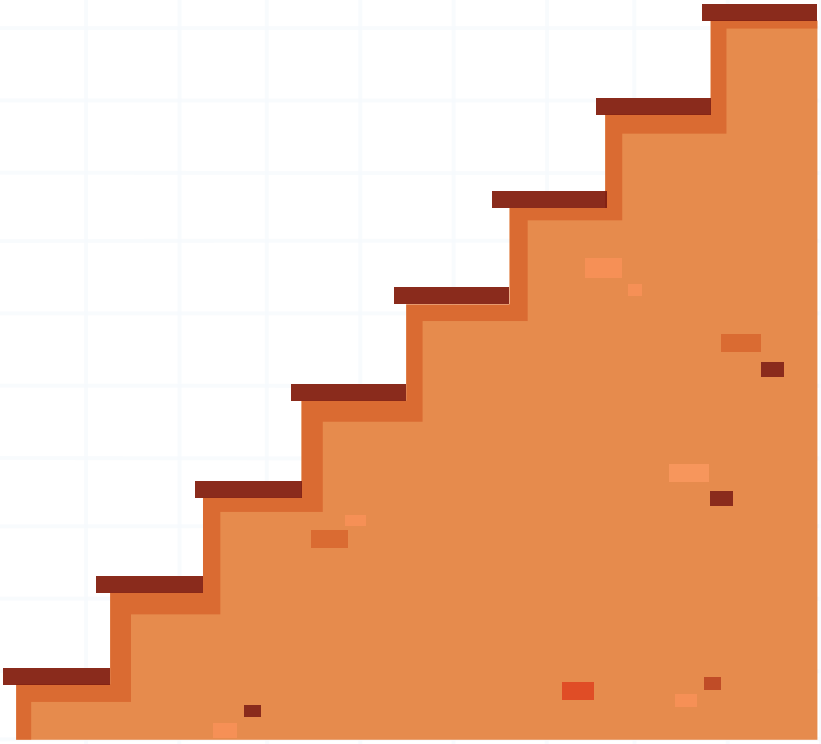
A TASTE OF ENGINEERING III
UNIT 1: CIVIL ENGINEERING

The 5th Ave Bank is one of the tallest buildings in downtown Rivesville.



Typically, the bank clerks who work in the building will use the elevator.

They don't enjoy climbing up 47 flights of stairs!



One day, 8 clerks piled into the elevator and pushed the button for the 47th floor.

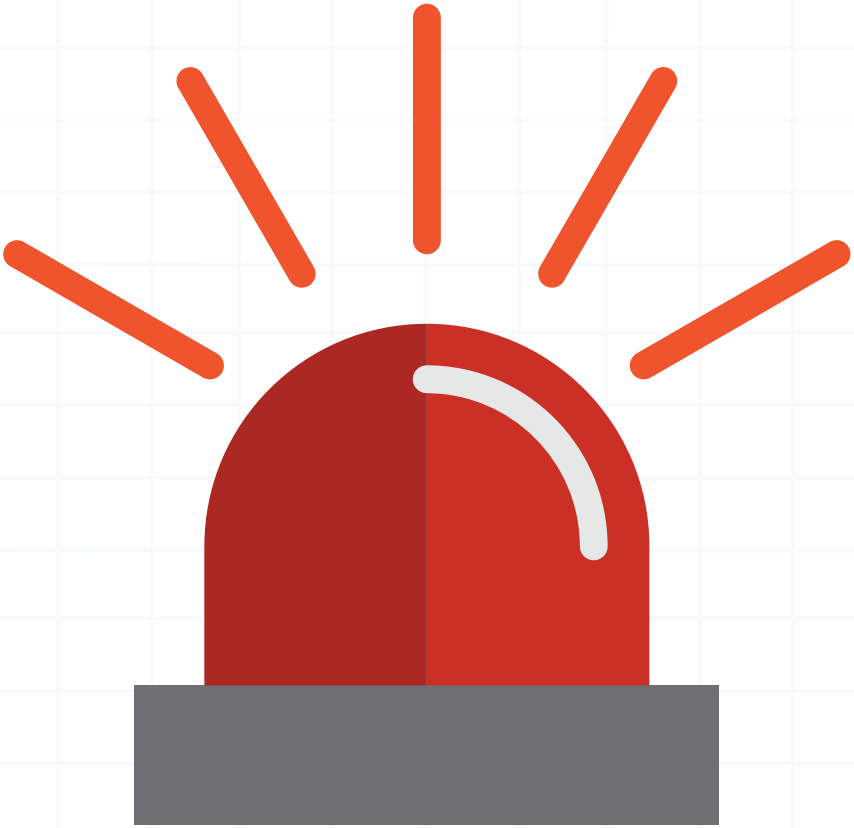
The elevator doors closed. However, the elevator did not start moving upwards as it usually did.

Instead, the elevator gave a lurch and began slowly moving downwards.

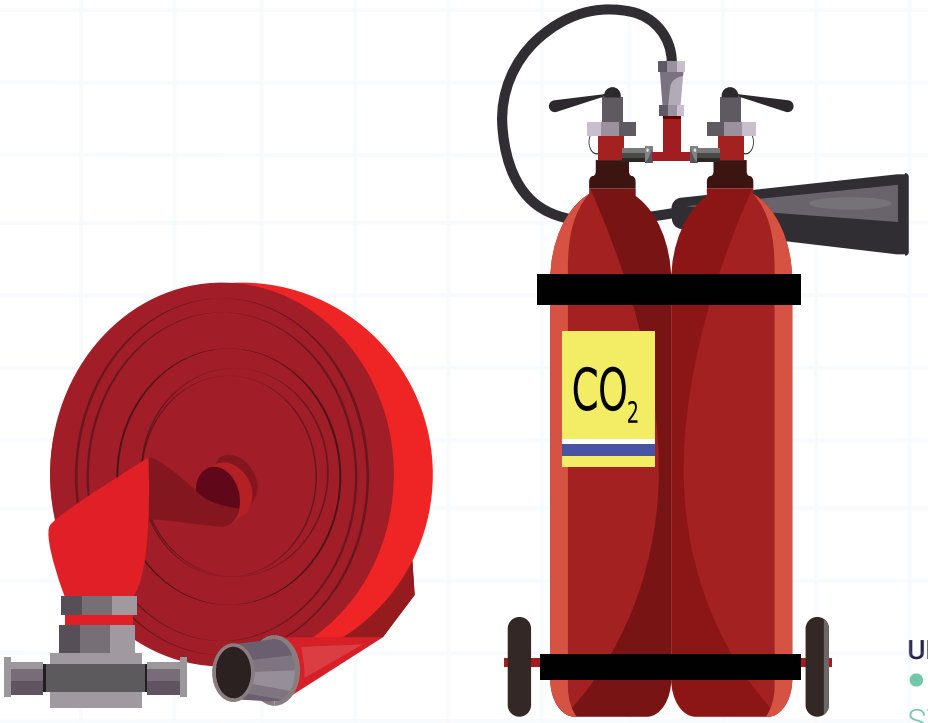
The clerks were VERY concerned.

Suddenly, there was a loud "BANG", and the elevator settled on the bottom floor.

The clerks stayed calm and pressed the "emergency " button to alert the fire department .

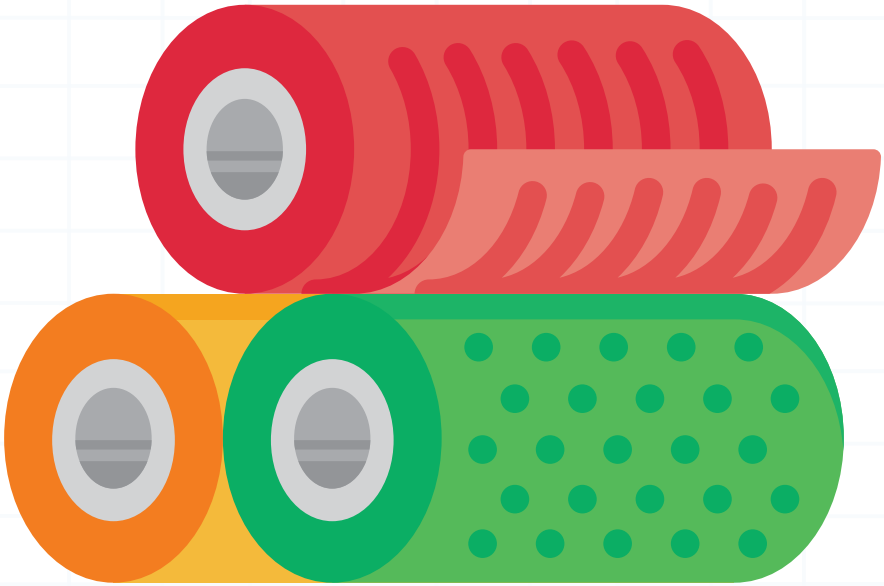


Very soon after, the clerks heard some noises above them. The fire department was trying to tell them something.

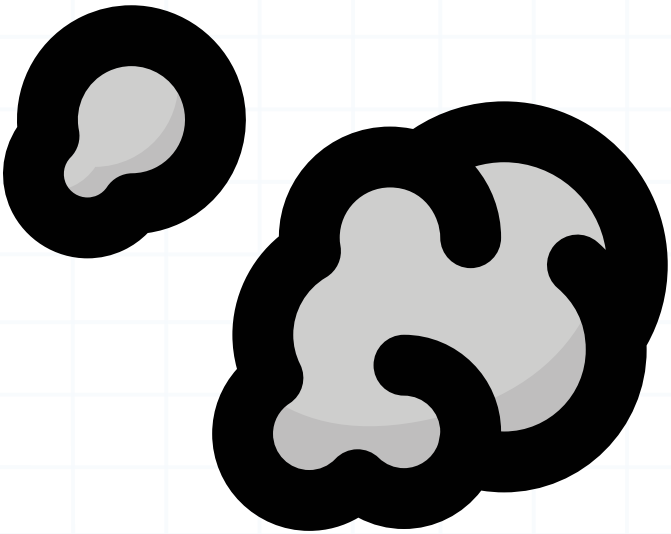


The firemen were telling them to grab onto the paper they were pushing through the opening!

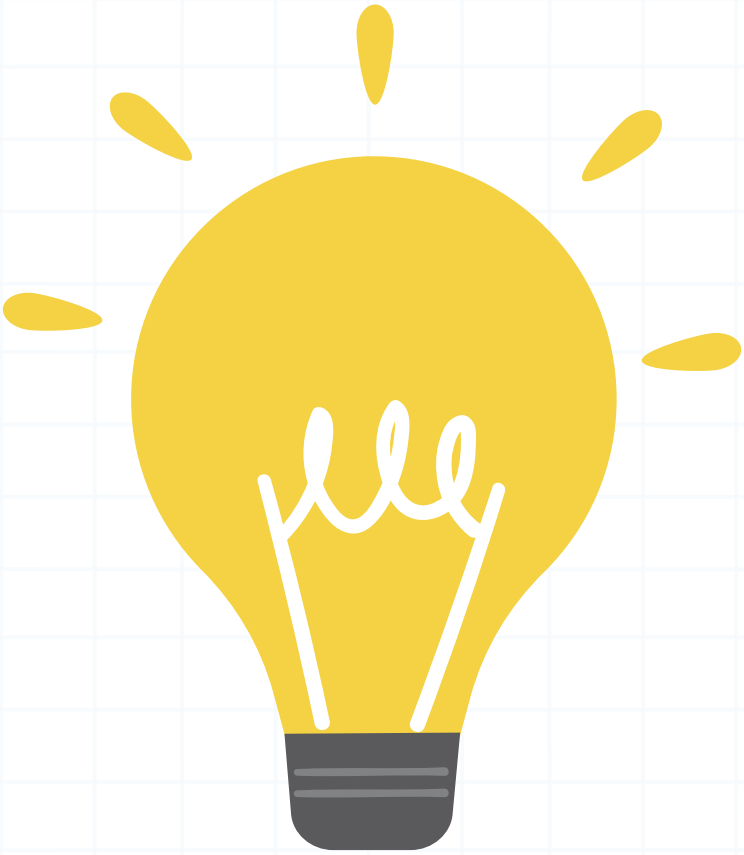
The clerks grabbed on to the paper, but they were too heavy.



The clerks fell backwards into the elevator along with the long glossy thick paper.



Suddenly, one of the clerks cried "I've got it!



"Let's fold the paper in a way that lets us climb on it. If we can reach the top of the elevator, we can push the top off and climb out."

The clerks needs a way to fold the paper so that it is strong enough for them to stand on it. Can you help the clerks?

The Little Engineer and the Elevator

1. What does a Civil Engineer do?

_____

2. What is the problem that the clerks have?

_____

3. How did you try to solve their problem with only paper?

_____

4. What did you notice about different shapes and how well they can support weight?

_____

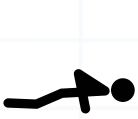
5. Can you think of a material that is weak but gets stronger as you use a lot of it?

_____

Fill-ins:

1. Engineers who work to build buildings and structures are _____.
2. The only material the clerks have is _____.
3. We need to build something that will support the _____ of the clerks.
4. Civil Engineers study how _____ affect buildings and structures.
5. A force is anything that _____ or _____ a building or structure.

Word Box:


Pushes


Pulls


Civil Engineers


Weight


Paper


Forces

The Little Engineer and the Elevator

How Much Weight Can The Paper Hold?

Take a single sheet of paper and hold it vertically.

2. Keeping the paper vertical (standing) bend it into a shape. You may choose round, square, or any other shape.
3. Use a small piece of tape to keep the paper in the shape you chose.
4. Place an index card over the top of the shape.
5. Slowly begin stacking books on top of the paper.
6. Which shape was able to hold the most weight? Why do you think that is so?

Materials Testing