# 8 UNIT EIGHT
## IMPROVE THE TIPPY RAFT

### OBJECTIVE
Students use the design process to improve a brick raft.

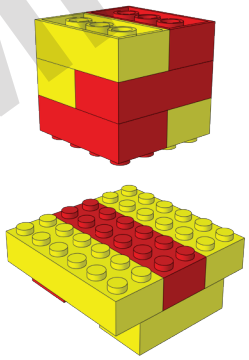
### PREP
Gather materials, read background and build model.

### STANDARDS
**ITEA Standard #11 Apply Design Processes**

Students develop an understanding of how to apply the design process to technology.

- Brainstorm people's needs and wants and pick some problems that can be solved through the design process.
- Build or construct an object using the design process.
- Investigate how things are made and how they can be improved.

### MATERIALS
- BrickLAB
- Pencil
- Paper



### VOCABULARY
Students identify and explain terms in their own words.

- Design Process
- Raft
- Tippy
- Transportation

### NOTES

# 8 UNIT EIGHT
## IMPROVE THE TIPPY RAFT

## BACKGROUND

Technologists use the design process to create and improve things. The engineering design process is a way to make products and systems better, and to address any problems that may arise. The design process is very important to the continuous improvement of products and it is fundamental to technology.

Transportation has been one of humankind's greatest endeavors. The design process has often been applied to improving the means of transportation. For example, the ability to transport people and goods over water represents a tremendous technological achievement.

To cross lakes, rivers, and seas, early humans probably used rafts or simple boats crafted from bundles of sticks.

To be able to float, a raft or boat must displace an amount of water which is greater than or equal to its own weight. Buoyancy is the force that keeps a floating object from sinking.

For example, if you had a wood block that was about 31 centimeters square weighing about 22 kilograms, and lowered it into a pond, the block will move down into the pond until it has displaced about 22 kilograms of water. 22 kilograms of water are pushing back up on the block and making it float. Knowledge of buoyancy made continual improvement in boat design possible, and led to improved sailing vessels such as luxury liners and supertankers.

There are many steps in the design process.

1. Identify the problem.
2. Develop ideas by brainstorming and research.
3. Explore different ways to solve the problem and choose different solutions.
4. Test models and use feedback to refine proposed solutions.
5. Create the solution.
6. Test it!

In this lesson, students improve the design of a model brick raft.

**Concrete Canoe:**

Every year, several schools host a "build a concrete boat" contest. Under normal circumstances, concrete does not float because it is denser than water. The contest challenges engineering teams to design a boat that can displace enough water to be buoyant, using concrete.

There are a lot of interesting facts about rafts and boats. Here are two great examples of rafts.

**Life Rafts:**

A life raft is a raft used if a ship must be abandoned in an emergency. Inflatable life rafts have a lifespan of eight to fifteen years!

**Whitewater Raft:**

A whitewater raft is a special raft made to go over rapids and fast rushing water in rivers. White water rafts can go over rocks, down small waterfalls and navigate fast corners.

# 8 UNIT EIGHT
## IMPROVE THE TIPPY RAFT

### ACTIVITIES

**Investigate and Discuss:**
Review the design process and lead a discussion about the need to improve systems and products. Students build the brick raft model from plans, test their raft by floating it in an appropriate container and identify at least one way that the raft can be improved.

**Engineering Project:**
Build a tippy raft and block.

**Challenge:**
Students place six 2x4 bricks on their floating raft model, and apply the design process to improve the raft's design so it can hold the six bricks without sinking or tipping.

**Real World Extension:**
Students identify and sketch three different products or services in their lives that can be improved through the design process. Some examples might be a bicycle, a pet shelter (such as a doghouse), or an improved way to serve ice cream.

**Small Group Extension:**
Organize students into small groups. Each group builds a brick raft that can hold the maximum number of 2x4 bricks. You may want to hold a competition to see which group's raft can hold the most bricks.

**Written Extension:**
Students write a paragraph documenting the steps they went through to improve their raft design.

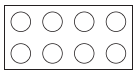
**Cooperative Challenge:**
As a class, design and create the ultimate "falling bricks" scene. Students apply the design process to create a plan and then test different patterns. Use the space below for drawing ideas.

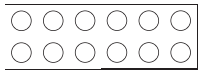
**Assessment**

# 8 UNIT EIGHT

## IMPROVE THE TIPPY RAFT

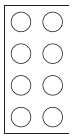
### BUILD A TIPPY RAFT AND BLOCK

8  2x4 Bricks

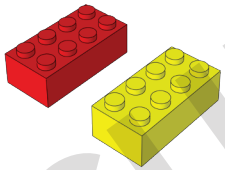
3  2x6 Bricks

**1**

2

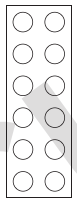


2x4

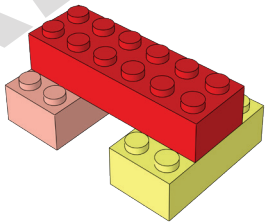


**2**

1

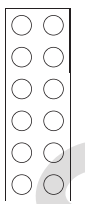


2x6

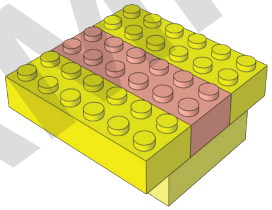


**3**

2

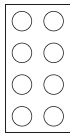


2x6

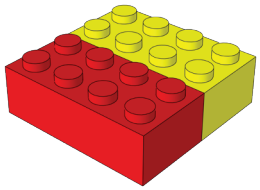



**4**

2

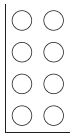


2x4

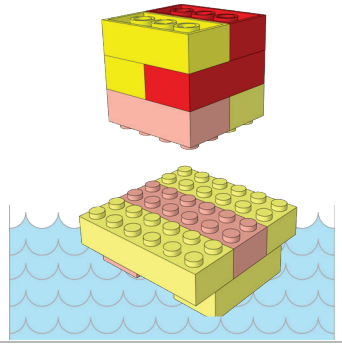


**5**

4



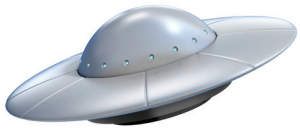
2x4



# 8 UNIT EIGHT
## ASSESSMENT

1. Write the letter "T" under the pictures that show transportation.





_____ _____ _____

2. Humans can always solve a problem the first time they try.

- ◯ True
- ◯ False

3. The design process is...

- ◯ A way to solve problems
- ◯ A way to make rafts
- ◯ The way to process signs
- ◯ A great way to set up dominoes

4. Moving people or items to other places is called:

- ◯ The design process
- ◯ Transportation
- ◯ Tippy

5. What does a raft do? Why are they not used much any more?

_____

_____

_____

_____

6. Describe how you improved your raft.

_____

_____

_____

_____

7. Identify three things that are used for water transportation.

1. _____
2. _____
3. _____

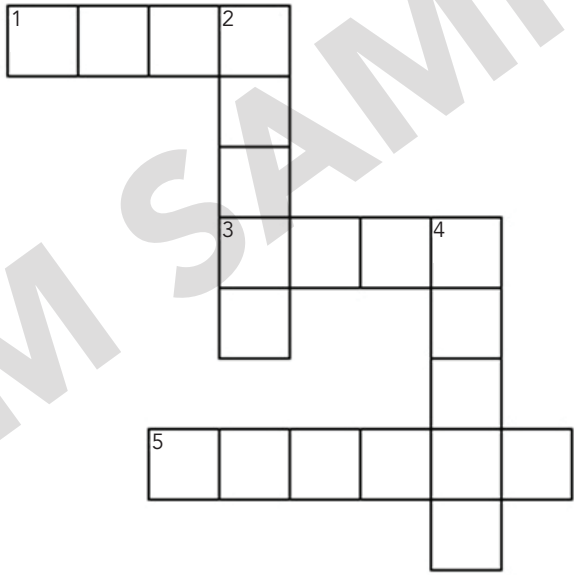
# 8 UNIT EIGHT

## TECHNOLOGY STANDARD 11

Find the hidden vocabulary words.
They may be backwards, vertical, horizontal or diagonal.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | Y | C | L | Y | E | V | N | M | T | J | T | L | N | N |
| O | D | Q | R | Q | G | O | B | S | U | P | Z | O | W | G |
| N | T | O | P | A | I | G | K | M | I | U | I | P | O | I |
| A | J | E | M | T | F | O | Y | P | N | T | J | X | N | S |
| C | L | D | C | I | Z | T | S | P | A | G | X | M | E | E |
| B | D | A | W | E | N | Z | W | T | P | T | L | H | V | D |
| J | E | T | E | G | E | O | R | S | K | I | I | K | S | V |
| R | D | K | U | B | T | O | R | S | B | Y | T | C | Q | M |
| N | D | S | P | L | P | U | S | E | B | T | E | C | M | V |
| O | I | Z | E | S | J | Z | D | C | T | N | A | P | S | A |
| J | H | U | N | Q | N | D | N | O | E | Z | B | D | C | P |
| E | B | A | Q | K | Y | I | C | R | H | N | G | A | A | L |
| K | R | U | E | U | K | W | V | P | Y | T | V | L | T | J |
| T | G | T | G | S | U | R | G | V | L | A | T | X | T | V |
| C | H | A | I | N | I | O | V | T | M | Q | E | Y | I | B |

CANOE
CHAIN
DESIGN
DOMINO
PIPS
PROCESS
RAFT
REACTION
SCENE
TIPPY
TRANSPORTATION




**Across:**

1. A flat floating platform
3. Another word for dots
5. A rectangular game piece with dots

**Down:**

2. Easily tipped over
4. The name for the time when dominoes fall