



Revised 6/04

Lesson # 38
Tower Power
Grade Level: 5-6

Teachers, this is a basic lesson plan that you may modify at your discretion.

Overall educational objectives: Students will demonstrate understanding of basic building and engineering concepts by constructing a structure that will support weight. They will be able to demonstrate understanding of basic business concepts by estimating the cost and value of a building.

Associated Standard and/or CORE objective:

- 5050-04 The students will recognize the interrelatedness of mathematical concepts within the field of mathematics as well as throughout other disciplines, especially as they apply to daily living.
- 5060-01 The students will apply mathematical concepts and skills to solve problems they encounter in daily living.
- 5060-0105 Acquire confidence in using mathematics meaningfully.

Materials list:

8 boxes each containing:

- 6 - long round dowels
- 6 - small squares
- 10 - rectangle blocks
- 10 - short, fat round dowels
- 6 - small triangle pyramids
- 6 - rubber bands
- 5 - large triangles
- 4 - large squares
- \$50.00

Teacher Kit:

- 4 - 6 oz. bean bag
- Toy \$1, \$5, \$10 bills
- 1 - measuring tape
- 3 - boxes of additional building blocks

Teacher provides: 8 calculators

Lesson activities:

1. Ask, "What kinds of jobs might be involved in constructing a building (house, bridge, skyscraper)?" Have students volunteer responses and list these on the board. There are many career opportunities available in the building field. Since it is a business, a building company must be able to make a profit in order to succeed. As a building company, you must be able to build a structure for less than the cost of materials and labor. (Have the students brainstorm how they could bring their project in under budget. Pre-plan, draw a blueprint, follow a blueprint.)

2. Divide the class into groups of three or four students and remind the groups (building companies) that each of the members has strengths that will contribute to the success of the construction of their building. The object of today's activity is to build a tower of the highest value possible with the resources that have been given to you. The test is that your tower must be sturdy enough to remain standing while supporting a bean bag.
3. Each company will be given \$50, a box of building blocks, and an official rule sheet. Tell each company that the blocks represent a bulk purchase at a discount price of \$100. The extra \$50 is for students to buy additional materials from the supply company.
4. If your company did not use all the building materials, you may sell them to another company or return them to the supply company for a refund.
5. The winner will be judged according to the height and stability of the tower and the financial status at the completion of the project. The teacher will act as the building inspector to measure a building's height and will verify a building's stability by putting a bean bag on the top of the tower. The teams will complete their balance sheet to tally their financial status. Be sure to allow 5-10 minutes for this step.
6. Have the students take five minutes to refill the box with the beginning inventory.
7. Teachers: remember to allow 5-10 minutes for whole group discussion about what happened. Why are some towers stable/less stable, taller/shorter, or expensive/less expensive. What would the students do differently? How did the different companies work together for success/failure? (Teamwork)

Teacher tips: It will be necessary to have an aid act as the banker if you're going to allow students to trade in parts and purchase new materials.

The rule sheet for Tower Power is designed to be copied as a separate sheet. If you would like to use these rules, please duplicate and have a set for each team. You are free to make up your own rules if you would like. The balance sheet master is designed to tally team scores. Each 8 $\frac{1}{2}$ " x 11" page has four sheets. Please copy and cut apart.

Please make your students aware that this lesson relates to the following:

Career Fields: SCIENCE, TECHNICAL, BUSINESS

Occupations: Architect: They plan and design the construction for houses, apartments, office buildings, factories, and other buildings. They will also plan and design projects such as parks, airports, and highways. They prepare detailed drawings about the scale and structure of the project, the dimensions of all the parts, and the location of the plumbing and heating units.



Education: Bachelor's Degree

Civil Engineer: They plan, design, and oversee the construction and maintenance of roads, railroads, airports, bridges, harbors, channels, dams, irrigation projects, pipelines, power plants, and water supply and sewage systems. They may work in areas of design, research, construction, or teaching.

Education: Bachelor's Degree

* **Contractor:** Coordinate and manage an entire construction project and assume full responsibility for its completion within a time frame and at a cost specified agreement in the contract. There are four main types of contractors: building contractors, heavy industrial construction contractors, municipal utilities contractors, and highway contractors.

Education: Bachelor's Degree

* **Welder:** Perform manual welding, in which the work is entirely controlled by the welder, or semi-automatic welding, in which the welder uses machinery. They plan work from drawings or specifications, or by analyzing damaged metal parts, using their knowledge of welding and metals. They construct and repair ships, automobiles, spacecraft, etc. They join beams when constructing buildings, bridges, and other structures, and pipes in pipelines, nuclear power plants, and refiners.

* **Taken from Occupational Outlook Handbook 1998-1999.**

Review Questions:

1. Why are some towers stable/less stable, taller/shorter, or expensive/less expensive?
2. What would the students do differently?
3. How did the different companies work together for success/failure?
4. What are the two main factors in assuming success? (amount of materials and design decisions)

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Tower Power

Official Rule Sheet

Your company has been selected to build a tower for a large business.

- This tower should be as tall as possible and still be able to hold a small amount of weight on the very top.
- You should have a box that contains:
 - (6) long round dowels
 - (6) small squares
 - (10) rectangle blocks
 - (10) short, fat round dowels
 - (6) small triangle pyramids
 - (6) rubber bands
 - (5) large triangles
 - (4) large squares
- You should also receive \$50.00 to spend on additional building materials if they are available.
- The cost to purchase each item for cash is \$2.00. Each item is worth a different amount when it is included in the structure. The value of each is as follows:

	Value if used in the building	Cost to purchase	Trade-in value
long round dowels	\$10.00	\$2.00	\$1.00
small squares	\$ 4.00	\$2.00	\$1.00
rectangle blocks	\$ 4.00	\$2.00	\$1.00
short, fat round dowels	\$ 5.00	\$2.00	\$1.00
small triangle pyramids	\$ 8.00	\$2.00	\$1.00
rubber bands	\$ 2.00	\$2.00	\$1.00
large triangles	\$ 7.00	\$2.00	\$1.00
large squares	\$ 5.00	\$2.00	\$1.00

APPRAISING VALUE: The value of a building is calculated by adding up the materials used in the building. In addition, your building will also increase in value \$1.00 for each inch of height of your structure.

BUILDING INSPECTION: At the end of the time, you will need to have your structure tested by the building inspector (your teacher). If it passes, you will add up the value of your building and subtract the \$150 lent to you for start-up materials as well as any loans you may have signed with the supply company.

OVERSTOCK: Any materials you do not include in your structure are worth \$1.00 each. These materials can be traded back to the supply company in exchange for an item you may need.

Tower Power Balance Sheet

ADD:

- 1. Height in inches: ____ x \$1.00 =
- 2. Materials used:
 - long round dowels ____ x \$10.00 ea. =
 - small squares ____ x \$4.00 ea. =
 - rectangle blocks ____ x \$4.00 ea. =
 - short, fat round dowels ____ x \$5.00 ea. =
 - small triangle pyramids ____ x \$8.00 ea. =
 - rubber bands ____ x \$2.00 ea. =
 - large triangles ____ x \$7.00 ea. =
 - large squares ____ x \$5.00 ea. =
- 3. Money left =

	Credits	Debits
SUB-total:		

SUB-total:

1. Start-up loan \$150 = \$150.00

SUB-total:

(SUBTRACT debits from credits)

TOTAL:

=====

Tower Power Balance Sheet

ADD:

- 1. Height in inches: ____ x \$1.00 =
- 2. Materials used:
 - long round dowels ____ x \$10.00 ea. =
 - small squares ____ x \$4.00 ea. =
 - rectangle blocks ____ x \$4.00 ea. =
 - short, fat round dowels ____ x \$5.00 ea. =
 - small triangle pyramids ____ x \$8.00 ea. =
 - rubber bands ____ x \$2.00 ea. =
 - large triangles ____ x \$7.00 ea. =
 - large squares ____ x \$5.00 ea. =
- 3. Money left =

	Credits	Debits
SUB-total:		

SUB-total:

1. Start-up loan \$150 = \$150.00

SUB-total:

(SUBTRACT debits from credits)

TOTAL:

=====

Tower Power Balance Sheet

ADD:

- 1. Height in inches: ____ x \$1.00 =
- 2. Materials used:
 - long round dowels ____ x \$10.00 ea. =
 - small squares ____ x \$4.00 ea. =
 - rectangle blocks ____ x \$4.00 ea. =
 - short, fat round dowels ____ x \$5.00 ea. =
 - small triangle pyramids ____ x \$8.00 ea. =
 - rubber bands ____ x \$2.00 ea. =
 - large triangles ____ x \$7.00 ea. =
 - large squares ____ x \$5.00 ea. =
- 3. Money left =

	Credits	Debits
SUB-total:		

SUB-total:

1. Start-up loan \$150 = \$150.00

SUB-total:

(SUBTRACT debits from credits)

TOTAL:

=====

Tower Power Balance Sheet

ADD:

- 1. Height in inches: ____ x \$1.00 =
- 2. Materials used:
 - long round dowels ____ x \$10.00 ea. =
 - small squares ____ x \$4.00 ea. =
 - rectangle blocks ____ x \$4.00 ea. =
 - short, fat round dowels ____ x \$5.00 ea. =
 - small triangle pyramids ____ x \$8.00 ea. =
 - rubber bands ____ x \$2.00 ea. =
 - large triangles ____ x \$7.00 ea. =
 - large squares ____ x \$5.00 ea. =
- 3. Money left =

	Credits	Debits
SUB-total:		

SUB-total:

1. Start-up loan \$150 = \$150.00

SUB-total:

(SUBTRACT debits from credits)

TOTAL:

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