



<b>Author(s):</b> David Nohara			<b>Lesson Title:</b> Shipping Softballs			
<b>Grade Span</b>			<b>ICLE Application Model</b>			
K-4	5-8 XX	9-12	A	B	C	D XX

**Instructional Focus:**

**Number Operations and Concepts**

Students use number, number sense, and number relationships in a problem-solving situation. Students communicate the reasoning used in solving these problems.

**Measurement**

Students use a variety of tools and techniques of measurement in a problem-solving situation. Students communicate the reasoning used in solving these problems.

**Problem-solving and Mathematical Reasoning**

Students apply a variety of problem-solving strategies to investigate and solve problems from across the curriculum as well as from practical applications.

**Writing**

Students write for a variety of purposes and audiences with sophistication and complexity appropriate to the grade level.

**Performance Task**

Your school's softball team just won the World Series of junior high school (or high school) softball. They have signed a contract with an agent to sell 150 autographed softballs. You are in charge of shipping them to the agent. Each ball is packaged in a 4" square box and weighs 9 ounces.

You have gathered information from an office supply store and from the post office. The office supply store has boxes in the following sizes for the following prices:

- 12" x 6" x 6"      \$1.50
- 14" x 14" x 14"    \$2.00
- 20" x 20" x 20"    \$5.00
- 22" x 22" x 12"    \$6.00
- 24" x 20" x 24"    \$8.00

The post office's regulations for packages are as follows:

length (of longest side) + girth (perimeter of side perpendicular to longest side)	classification	rate
<94"	package	\$.04 per ounce
94"-118"	large package	\$.06 per ounce
118"-140"	oversize parcel post	\$49.00 for all weights

**Note: No package can exceed 75 pounds.**

Using this information, and using as many packages as you wish, find the least expensive way to ship the softballs.

Please provide a written explanation of your solution method and answer. You should include a chart comparing the different options you explore. In connection with the chart, please show your calculations.

Teacher's note: As an additional exercise, you may wish to have the students look for a second solution method.

**ICLE Essential Skills**

Perform operations with signed numbers, including decimals, ratios, percents, and fractions. (m1)

Compute the volume of three-dimensional figures. (m17)

Understand and use graphs, charts, and visuals to enhance informational writing and oral presentations. (ela29)

Present information in well-organized fashion that will be clear to the target audience. (ela11)

**Scoring Guide:**

<p>Approach and solution 40 points</p>	<p>Student's explanation identifies an appropriate approach (e.g., calculating how many softballs each box will hold, calculating how much volume is needed for the total number of softballs, or calculating whether all 150 softballs can be put in one box and still meet the weight restrictions)</p> <p>Student recognizes the following:</p> <ul style="list-style-type: none"><li>• dimensions of box are as important as total volume in figuring out how many balls can fit in each box (example: a 12" x 6" x 6" box with 432 cubic inches can hold fewer balls than an 8" x 8" x 6" box with only 384 cubic inches)</li><li>• boxes need not be filled completely (example, if the largest box were to be filled completely, it would exceed the weight limit, but it can be filled partially to take advantage of the lower price)</li><li>• price of boxes must be included and may make a difference in total cost</li></ul> <p>Solution does not violate size or weight restrictions.</p>
<p>Chart 35 points</p>	<p>Chart includes different options (i.e., boxes and combinations of boxes) and the total cost for each. Should also include additional information, such as:</p> <ul style="list-style-type: none"><li>• the number of softballs to be put in each box</li><li>• the sum of the length and the girth</li><li>• weight</li><li>• postal classification</li><li>• shipping cost</li><li>• cost of the boxes</li></ul>
<p>Calculations 25 points</p>	<p>Appropriate formulas and correct calculations for:</p> <ul style="list-style-type: none"><li>• length + girth of boxes</li><li>• volume of softball box</li><li>• volume of boxes</li><li>• number of softballs that can fit in each box</li><li>• weight of boxes</li><li>• shipping cost per box</li><li>• total shipping cost</li></ul>

**Keywords**

<b>English Language Arts</b>	<b>Mathematics</b>	<b>Science</b>
<b>Reading</b>	<b>Algebra</b>	<b>Earth Science</b>
<b>Writing</b> organization explanation compare/contrast	<b>Geometry</b> geometric shapes problem solving spatial sense three-dimensional objects	<b>Life Science</b>
<b>Communications</b>	<b>Statistics</b>	<b>Chemistry</b>
<b>Literature</b>	<b>Calculus</b>	<b>Physics</b>
<b>Other</b>	<b>Trigonometry</b>	<b>Other</b>
	<b>Other</b>	