Scaling a Dog

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| --- | --- | --- |
|  |  | The diagrams to the left are from the *EQUALS INVESTIGATIONS* series, published by the Lawrence Hall of Science in 1994. They were taken from page 73 of *FLEA-SIZED SURGEONS*, one of the books in the series. The instructions were to build with Cuisenaire Rods and tac putty, but we will use multi-link cubes and "edge-length units" instead. Each "rod" consists of cubes snapped together in a straight row. |

Diagram 1, the "T," consists of two rods of length 3.

Diagram 2, the baby, consists of 3 single cubes for the head and arms, one rod of length 4 for the body, and two rods of length 2 for the legs.

Diagram 3, the dog, consists of one rod of length 5 for the body, four rods of length 2 for the legs, and one rod of length 2 for the head.

In this session, you will work as a table group, not as individuals. For example, "build all three shapes" means you will make one of each shape for your table. For efficiency, split up the labor for each task. Check with another group as you complete each task to be sure you have done it correctly.

1. As a table group, build all three shapes.
2. The unit of surface area is a face of a cube and the unit of volume is a cube itself. Use these units to find the surface area and volume of each shape. Then complete the ×1 row in each of the three charts on the next page.
3. Make a double size copy of each shape. That means that each edge length of your "double dog," for example, will be twice as long as before.
4. Find the surface area and volume of each of these larger shapes. Complete the ×2 row in each of the three charts.

Note: Copy 1-sided, not back-to-back.

T Chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scale Factor | T Width | Surface Area | Volume |  |
| ×1 |  |  |  |  |
| ×2 |  |  |  |  |
| ×3 |  |  |  |  |

Baby Chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scale Factor | Baby Height | Surface Area | Volume |  |
| ×1 |  |  |  |  |
| ×2 |  |  |  |  |
| ×3 |  |  |  |  |

Dog Chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Scale Factor | Body Length | Surface Area | Volume |  |
| ×1 |  |  |  |  |
| ×2 |  |  |  |  |
| ×3 |  |  |  |  |

1. Look for patterns in the charts. Use them to complete the ×3 rows without building new shapes. If time permits, build one of them to check.
2. Write your observations about the patterns below.
3. Which of these three objects is "lightest on its feet?" What calculation do you need to make to answer this question? Use the blank last column of the tables to make this calculation. Don't forget to write the column heading.