A Golden Crown?

**The Story:** Legend says that a powerful queen once came to Archimedes with a question of great importance. The queen had recently received her new crown made of gold and silver. The craftsman who made the crown told the queen that he used more gold than silver, but the queen suspected that he might have lied. She asked Archimedes to use his mathematical expertise to determine whether the craftsman lied. Archimedes was busy with his latest invention, so he entrusted this problem to our class.

**Identify Relevant Variables:** What information matters in this problem? Make a list.

**Record Relevant Information:** Your teacher will help you find the information you want. Write it down here.

**The Work:** Using the Mathematics you learned in this unit, help Archimedes determine whether the craftsman told the truth. Find out whether there really is more gold than silver.

**The Verdict:** You must convince the queen whether or not there is more gold than silver in her crown. If there was **not** more gold than silver, then the craftsman will be sent to the guillotine. A life is at stake, so you must be able to explain your mathematics and justify your conclusions. Write your explanation here.

**For Teachers:**

You will decide how you introduce this problem and how to give students the information they need. I suggest using wolframalpha.com or google.com to look up the density of gold, silver, conversions, or anything else you need. The information is also listed below for your convenience.

I would suggest also asking students what information is **not** important (how long it took to make the crown, the color of the queen’s dress, etc).

Crown:

Volume = 125 cubic centimeters

Mass = 1.8 kg

Gold:

1 kg = 50 cubic centimeters

Silver:

1 kg = 100 cubic centimeters

Possible Answers:

From a volume perspective, the crown has 55cc of gold and 70cc of silver (off with his head!).

From a mass perspective, however, the crown has 1.1kg gold and 0.7 kg silver (stay your blade!).

Rubric:

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| 0 | No effort shown. |
| 1 | Student identifies variables and records information, but does not incorporate that information into a solution. |
| 2 | Student uses systems of equations to describe the problem mathematically. The work may be incomplete or unclear. There may be major errors in reasoning. |
| 3 | Student solves the problem using systems of equations and interprets their solution in context. Work may contain minor errors or fails to clearly communicate how the mathematics connects to the situation. |
| 4 | Student solves the problem using systems of equations and interprets their solution in context. Student clearly communicates the meaning of each equation and variable. The work is clear and complete. The student fully justifies their conclusion. |