Penny Barge Calculations

Givens:

The number of pre-1982 pennies has a mass of 3.1 grams. However, pennies made after 1982 are about 2.5 grams. So the average is about 2.78 grams.

Penny Mass: 2.78 grams or .0973 ounces	Cube Volume= LxWxH
1 gram = 0.035 ounces	Pyramid Volume= LxWxH/3
Water weight: 62.4 pounds per cubic foot	Cylinder Volume = $Pi r^2 H$
Water weight: 28316.847 grams per cubic foot	Triangular Volume = $1/2$ x base x height
1 Cubic Foot= 12"x12"x12"	Sphere Volume = 4 Pi $r^3/3$
1 pound = 453.6 grams = 16 ounces	Cone Volume = Pi $r^2 h / 3$

Directions:

1.	. Sketch three (3) vessel in 3D in the space below. Dimension the vessels. Break the form into				
	recognizable 3D forms so volume can be calculated. (20)				
A.		B.	C.		
2. Show all math to determine surface of each Barge to know the material is 144 square inches or less. (40) A. B. C.					
2.	Show all math to determine sur	face of each Barge to know the mater	ial is 144 square inches or less. (40)		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	rial is 144 square inches or less. (40)		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	ial is 144 square inches or less. (40)		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	C. C. (40)		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	ial is 144 square inches or less. (40)		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	ial is 144 square inches or less. (40) C.		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	C.		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	ial is 144 square inches or less. (40) C.		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	ial is 144 square inches or less. (40) C.		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	C.		
2. A.	Show all math to determine sur	B.	C. C.		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	C.		
2. A.	Show all math to determine sur	face of each Barge to know the mater B.	C.		
2. A.	Show all math to determine sur	B.	C. C.		
2. A.	Show all math to determine sur	B.	C. C.		
2. A.	Show all math to determine sur				
2. A.		B. sq. in.	C. sq. in.		
2. A.	Show all math to determine sur				

3. Show all math to determine volume of each Barge or water to be displaced before sinking. (40)				
A.	B.	C.		
cu. in.	cu. in.	cu. in.		

Select the largest volume to construct for your vessel. This will take the most pennies to sink or will it because it might weigh more? Draw the top, side and front views below with dimensions. (100)

	Step	Show Math with all units of measure.	Answer
		No units, no credit!	
4.	Recalculate surface area of your barge design. Show all formulas and math.		SQ. IN.
5.	Recalculate volume of your barge design. Show all formulas and math.		CU. IN.
6.	Determine the number of cubic inches in a cubic foot		Cu. In.
7.	Convert the barge volume in cubic inches to cubic feet.		Cu. Ft.
8.	Determine the pounds of water the barge must displace to sink.		lbs. of water
9.	Convert pounds to ounces by multiplying.		oz.
10.	Determine the mass of the barge in grams using the scale.		g
11.	Convert grams to ounces by multiplying.		OZ.
12.	Determine the allowable penny load by subtracting the weight of the barge from the weight of the displaced water.		ounces of pennies
13.	Determine the number of pennies the barge will hold by converting ounces of pennies to pennies.		pennies
14.	Convert to dollars.		\$

Record estimate and actual penny numbers on homeroom sheet.
Reflection
If number of actual pennies and calculated pennies are not equal, explain why below.
Describe any mishaps in penny load calculations. (5)
Describe any mishaps in vessel construction. (5)
Describe any mishaps with the testing. (5)
Include other scientific phenomena that could aid in buoyancy. (5)