NAME:

Quiz 3

February 1, 2013

Instructions: Do all the problems on **both sides** of this paper. Show all your work. The World Islands is an artificial archipelago off the coast of Dubai. The islands were created from $321,000,000$ cubic meters of sand and $31,000,000$ tons of rock.

1. [**7 points**] How many cubic miles of sand were moved? (1 mile = 1.60 km)
   We are asked for the volume of sand that was moved in units of cubic miles. We will start out with the right quantity (volume of sand) but in the wrong units, and then convert to cubic miles. We have

   $$321,000,000\,\text{m}^3\left(\frac{1\,\text{km}}{1000\,\text{m}}\right)\left(\frac{1\,\text{km}}{1000\,\text{m}}\right)\left(\frac{1\,\text{km}}{1000\,\text{m}}\right) = 0.321\,\text{km}^3$$

   We now have to convert this to cubic miles:

   $$0.321\,\text{km}^3\left(\frac{1\,\text{mi}}{1.6\,\text{km}}\right)\left(\frac{1\,\text{mi}}{1.6\,\text{km}}\right)\left(\frac{1\,\text{mi}}{1.6\,\text{km}}\right) = 0.078369\,\text{mi}^3$$

2. [**6 points**] I recently won the lottery, and am contemplating buying one of the islands in the World Archipelago. The price of the island in United Arab Emirates Dirhams (AED) is $103,000,000$ dirhams. How much does the island cost in U.S. Dollars (USD)?
   (1 USD = 3.67 AED)
   We have to convert $103,000,000$ dirhams into U.S. dollars.

   $$103,000,000\,\text{AED}\left(\frac{1\,\text{USD}}{3.67\,\text{AED}}\right) = 28,065,395\,\text{USD}$$

3. [**7 points**] The island I want to buy has area $0.042\,\text{km}^2$. How large is the island measured in acres? (1 mile = 1.60 km, 1 mi^2 = 640acres) We have to convert square kilometers into acres. We have to be careful about two things. First, the units of km^2 means we will have to multiply by the conversion factor $\frac{1\,\text{mi}}{1.6\,\text{km}}$ twice to cancel both terms of km in the numerator. Second, look at the exponents in the conversion factor between square miles and acres. The fact that there is no square on "acres" tells us that acres is a measurement of area (as opposed to length), so we can use this conversion factor just once to cancel both terms of miles in the numerator. We convert $0,042\,\text{km}^2$ directly as follows

   $$0.042\,\text{km}^2 = 0.042\,\text{km}\cdot\text{km}\left(\frac{1\,\text{mi}}{1.6\,\text{km}}\right)\left(\frac{1\,\text{mi}}{1.6\,\text{km}}\right)\left(\frac{640\,\text{acres}}{1\,\text{mi}^2}\right)$$