Math 120 HW 1 Hints

The following question have been popular in office hours and quiz section, so I offer a few hints to get you started:

Problem 1.3: The book does similar problems in one step. I would do it in two. Here's how to do part of the problem:

1. First note that $density = \frac{mass}{volume}$, so $volume = \frac{mass}{density}$. So we have
   - density of lead $= 11.34\frac{\text{g}}{\text{cm}^3}$ and mass $= 50$ kg $= 50{,}000$ g.
   - Therefore, $volume = \frac{50000}{11.34} = 4409.1710758377$ cm^3
2. Second, recall that $volume\ of\ a\ sphere = \frac{4}{3}\pi r^3$. So
   - $4409.1710758377 = \frac{4}{3}\pi r^3$, which gives
   - $\frac{4409.1710758377}{\left(\frac{4}{3}\pi\right)} = r^3$
   - $1052.612057486 = r^3$
   - $r = \sqrt[3]{1052.612057486} = 1052.612057486^{1/3} = 10.1723847975$ (cube root and 1/3 power give the same value)
   - $r = 10.17$ cm

Problem 1.4: Some of you might have read this and thought you need trig, but you don't. You have a square (the base of the tower) inside a circle (the base of the cylinder). If you labeled the diagonal of the square x, then you get a couple right triangle with side length 25. So you can use the Pythagorean theorem to find x. That is $25^2 + 25^2 = x^2$, now solve for x. You can use this to then find the radius of the circle. Then find the volume of the cylinder and then the mass of the air (and don't forget to subtract the mass of the tower). Hopefully that gets you going. A similar labeling of sides of a triangle may help you on 1.10.

Problem 2.3: We discussed this a bit in class. Perhaps it is more clear to introduce two variables as follows:

1. Let $t_1 =$ 'the time since 6 AM' and let $t_2 =$ 'the time since 8 AM'.
2. Steve's Distance = (3 miles/hour)(t_1 hours) = $3t_1$ miles and so Steve's Location = $(0, 3t_1)$
3. Elsie's Distance = (3.5 miles/hour)(t_2 hours) = $3.5t_2$ miles and so Elsie's Location = $(-3.5t_2, 0)$
4. Distance between $= \sqrt{(0 - -3.5t_2)^2 + (3t_1 - 0)^2} = 25$ miles
5. Finally, note that $t_1 = t_2 + 2$, so $\sqrt{(0 - -3.5t_2)^2 + (3(t_2 + 2) - 0)^2} = 25$ miles, solve for t_2 (which will give you the time since 8 AM).