

1. **(3 points)** *In 2010, 13.5% of the population of the Louisville metro area was 65 years old or older, and the total population of the Louisville metro area was 741,096. How many people who are 65 years old or older lived in Louisville metro in 2010?*

Because the population which is 65 years old or older is a part of the whole population, we *multiply* the total population by the proportion to find the size of the subpopulation:

$$741096 \times 13.5\% = 741096 \times 0.135 = 100047.96$$

So about 100,048 Louisvillians were age 65 or older. (note: in actuality, any number of Louisvillians from 99,677 to 100,418 could plausibly be described as “13.5% of the population”, with roundoff error)

2. **(3 points)** *Sales tax in the District of Columbia is 5.75%. The total cost of a lunch special in a DC restaurant (including tax) is \$10. What was the menu (i.e. pre-tax) cost of the special?*

Since the sales tax is an addition to the 100% of the price that is already there, the price with sales tax is the price multiplied by 105.75%. Thus the price without sales tax is the post-tax price *divided* by 105.75%, giving

$$\frac{\$10}{1.0575} \approx \$9.46.$$

3. **(5 points)** *I offer you a \$200 loan demanding repayment of \$250 in eight months. What is the annual simple interest rate which is described by these terms on the loan?*

This loan has a present value of \$200 and a future value of \$250, accruing over a course of 8 months, or  $\frac{8}{12}$  years. We wish to calculate the interest rate, described by the relationship

$$r = \frac{F - P}{Pt} = \frac{250 - 200}{200 \times \frac{8}{12}} = 0.375 = 37.5\%$$

4. **(4 points)** *An investment offers an annual simple interest rate of 1.25%. If I place \$30 in such an investment, how much will it be worth in 5 years?*

The present value of our investment is \$30, with annual interest rate 1.25% and time scale of 5 years, so our future value is

$$P + Prt = \$30 + \$30 \times 0.0125 \times 5 \approx \$31.87$$

5. **(5 points)** *If you put \$4500 into an account which bears 2% interest compounded annually, how much will your investment be worth in 30 years?*

The present value of our investment is \$4500, with annual interest rate 2% and time scale of 30 years, so our future value is

$$P(1 + r)^t = \$4500 \times (1.02)^{30} = \$8151.13$$