

Name: _____

Instructions: This test is out of 100 points. Please show your work on each question and place your answer in the space provided.

The formulas below are provided for your convenience

Savings Plan Formula:

$$A = Pmt \times \left[\frac{\left(1 + \frac{APR}{n}\right)^{nY} - 1}{\left(\frac{APR}{n}\right)} \right]$$

Loan Payment Formula:

$$Pmt = \frac{P \times \left(\frac{APR}{n}\right)}{\left[1 - \left(1 + \frac{APR}{n}\right)^{-nY}\right]}$$

1. (10 pts) Of the 46 items in my closet, 21 are shirts, 18 are blue, and 23 are clean. 8 of the clean items are not blue and are not shirts. 3 are dirty shirts that are blue, 6 are clean shirts that are not blue and 4 are clean blue items that are not shirts.

(a) Draw a 3 set Venn diagram to illustrate this information.

(b) Use your diagram to answer the following questions:

- How many items in the closet are clean blue shirts?

Answer _____

- How many items other than shirts are dirty?

Answer _____

2. (6 pts) You travel to France where the cost of brie is 8 euros per kilogram. Find the cost in dollars per pound. (1 kilogram is 2.2 pounds, 1 euro is 1.53 dollars)

Answer _____

3. (6 pts) The percentage of sales tax in North Carolina dropped from 4.5% in 1990 to 4.25% in 2006. Find the relative change.

Answer _____

4. (6 pts) If the percent of graduate students in the chemistry department increases by 8% one year and decreases by 11% the next year and then increases by 6% the following year, by what percentage did the number of graduate students in chemistry change over the three-year period?

Answer _____

5. (6 pts) The value of your house is increasing at an average rate of 2% per year.
(a) If your house is worth \$150,000 now, how much will it be worth in 20 years?

Answer _____

6. (10 pts) Your savings plan has an APR of 5.5% compounded daily.

(a) Find the annual percentage yield (APY) of your account.

Answer _____

(b) (10 pts) You decide to start saving for retirement. You plan to make yearly payments (Hint: use the APY estimate of part (a)) of \$4,000 every December. How much money will you have accumulated when you retire in 35 years?

Answer _____

7. You are taking out a 15 year home loan with an annual interest rate (APR) of 6.2%, compounded monthly.

(a) If you take out a loan for \$200,000, what will your monthly payments be?

Answer _____

(b) (10 pts) How much will you pay in interest over the life of the loan if you take out this loan for \$200,000?

Answer _____

(c) If you instead decide to get a 30-year loan at the same rate for the same amount, how much smaller would your monthly payments be (A) and how much would you lose due to interest over the life of the loan (B)?

Answer (A) _____

Answer (B) _____

8. (10 pts) Suppose that the rabbit population grows at a rate of 12% per **month**.

(a) If the population of bunnies is 40 now, how large will the population be in 5 **years**?

Answer _____

(b) How long will it take for this population of bunnies to double in size?

Answer _____

9. (10 pts) You take 600 mg of antibiotic at 10am. A lab test done at 4pm shows that you still have 200 mg of that medication left in your bloodstream. (Please include units in your answer.)

(a) What is the half-life of the antibiotic that you took?

Answer _____

(b) What is the rate of decay of this antibiotic in your bloodstream?

Answer _____

10. (10 pts) The following data represents measurements of the concentration of a substance in a patient's bloodstream, after the start of a treatment that boosts the concentration of this substance.

Days after start of treatment	3	6	8	14
Concentration in ppm	2.1	3.0	3.6	5.4

(a) Create a linear equation that represents this situation.

Answer _____

(b) How long will it take for the concentration to reach 20 ppm?

Answer _____

11. (6 pts) The shape below with the given dimensions is a scale model for a cylinder. The model will be scaled up so that the cylinder will have a surface area of 1296 square inches. What will the radius and the volume of the cylinder be? (Please include units.)

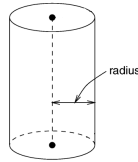


Figure 1: The model cylinder's radius is 2in, its surface area is 144in^2 , and its volume is 119in^3 .

Radius of cylinder _____

Volume of cylinder _____

12. (10 pts) You are filling up water balloons from your kitchen sink. Assume that the perfect water balloon is a sphere with a radius of 2 inches. Water flows from your kitchen sink at a rate of 0.1 gallons per minute. If it takes you no time in between filling water balloons, how long will it take you to fill up 10 water balloons? Please put your answer in units of minutes per gallon. (1 gallon = 231 cubic inches)

Answer _____

13. Simplify the following expressions:

(a) $\frac{x^2y^{-4}}{x^{-3}}y^{-2}$

(b) $\frac{(x^2y)^2}{x^3y^{-3}}$

(c) $\frac{x^7y}{x^4y^{-3}} \times \frac{y^{-6}}{x^3}$

14. Solve for x:

(a) $\frac{t-7}{3} = t + 5$

(b) $\frac{t-6}{t+4} = 2$