

## Final Exam

Here are some formulas you might find helpful:

- Savings Plan Formula:

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

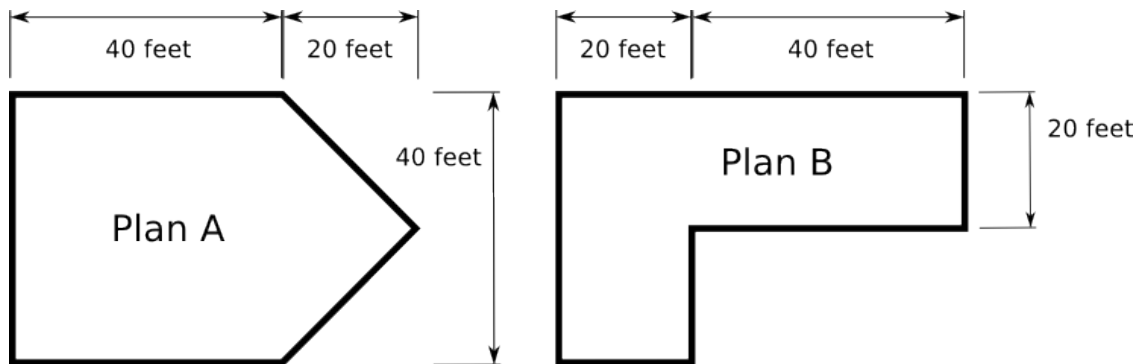
- Loan Payments Formula:

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

1. You are going to lead 30 of your friends on a huge hike up into the Uintas. Before you do, you decide to give the rangers a list of everyone's distinguishing features in case anyone gets lost. You count how many people have long hair, red hair, and blue eyes. Here is the information you come up with:
  - 10 people had long hair
  - 5 people had red hair
  - 12 people had blue eyes
  - 5 people had long hair AND blue eyes
  - 3 people had long red hair
  - 2 people had blue eyes and red hair
  - 1 person had blue eyes and long red hair
  - (a) Draw a Venn diagram describing the three sets, and label all of the regions with the number of people.
  - (b) How many people have either red hair OR blue eyes?
  - (c) How many people don't have blue eyes, red hair, or long hair?
2. While you are driving up to the Uintas, you get into a heated argument with your friend Steve over the nature of the local wildlife. Steve thinks that antelope are ruminants, but you aren't so sure. Here is his argument:
  - Animals that chew their cud are ruminants
  - Antelope chew their cud
  - Antelope are ruminants
  - (a) Draw a Venn diagram representing the argument.
  - (b) Is the argument valid?

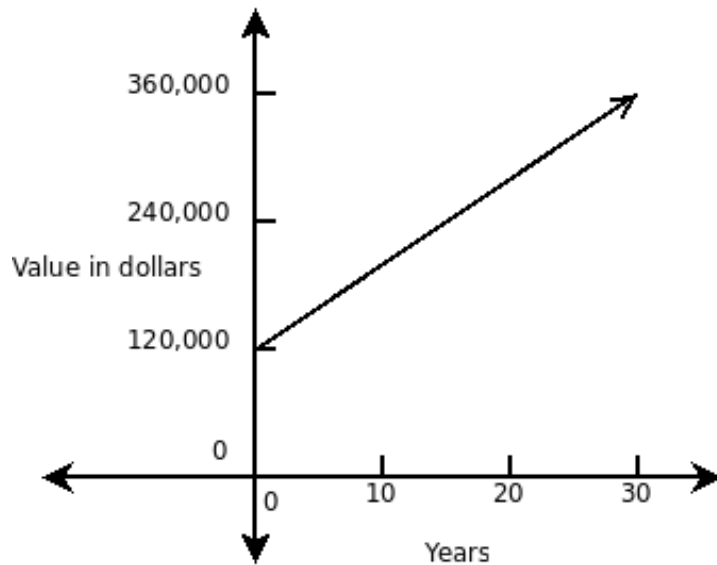
3. When you arrive, your friends want to help pay for gas.
  - (a) The drive to the Uintas took about 70 minutes, and you were driving at an average of 40 miles per hour. How far did you drive?
  - (b) Your car gets about 25 miles per gallon on average. How many gallons of gas did you use for the round trip?
  - (c) Gas costs about \$2.00 per gallon, and you had four people in your car (including yourself). How much should each of you pay, if you divide the price up evenly?
4. You were hoping to go on a trail that didn't have too many other hikers on it. The rangers told you that this trail had about 20 hikers per week last year, and 15 hikers per week this year.
  - (a) What is the absolute change in hikers per week from last year to this year?
  - (b) What is the relative change?
5. While you are hiking through Painter's Basin, you come across an old hermit who utters dire prophecies. He tells you that there were 50% more dark omens in the mountains this year than last year.
  - (a) If there were 24 dark omens in the mountains this year, how many were there last year?
  - (b) What percent *fewer* dark omens were there last year than this year?
  - (c) If dark omens keep increasing at the same rate, how many will there be in 20 years?
6. While hiking back to your cars, you decide to relieve the tension by estimating the total number of blades of grass in the basin.
  - (a) You guess that there are 5,000,000,000 blades of grass in the basin. Each of them grows by .02 grams per day. Rewrite both of these in scientific notation.
  - (b) How many grams of grass grow in the basin all total every day?
7. When you get back to Salt Lake City, you discover that the old man in problem 5 was right – disaster has struck, and zombies are attacking the city!
  - (a) The zombie population is increasing by 4% per hour. How long does it take for the zombie population to double?
  - (b) There are about 100 zombies now. How many will there be in two days?
  - (c) How long will it take before there are 3200 zombies?
8. Imagine the function describing the number of zombies in the city at a given time, just like in problem 7. Remember that there can't be more than 2 million, since that is the population of Salt Lake City.
  - (a) Does this represent exponential growth, or linear growth?
  - (b) What is the independent variable?
  - (c) What is the dependent variable?

- (d) What is the range of the function?
- (e) Suppose there are 100 zombies now. Sketch a graph of the function over the next 72 hours. You may use a table of values if you like.
9. The zombies have finally taken over the city, but the zombie economy is in shambles. The zombie city council decides to set up a bank. The bank will be offering an account with a 3% APR, compounded monthly.
- (a) What is the annual percentage yield on the account?
- (b) Zombie Joe is saving up to buy a new car, so he is going to begin making regular monthly payments into his account. He wants to have \$30,000 in his account in four years. How much should he deposit in his account each month?
10. Zombie Janet gets a graduation gift of \$2000 from her uncle. She deposits it in a bank account now, making 3.6% APR compounded quarterly. She will go on a vacation to Ireland once she has \$5000. How long will she have to wait?
11. (a) The zombie bank is doing very well, so they begin offering a new account, which has a 4% APR and compounds continuously. If zombie Sue deposits \$1000 now, how much will she have in four years?
- (b) A zombie couple, Toshi and Hanako, want to buy a house. They find a very nice one in the Avenues. If they get a 30 year mortgage at 5% APR with an initial principal of \$200,000, what will their monthly payments be?
12. Instead of buying the house in the Avenues, zombie Toshi and zombie Hanako decide to hire zombie Frank Lloyd Wright to design one for them. He presents them with a scale model 2 feet tall. The real house will be 20 feet tall.
- (a) The surface area of the model is 80 feet<sup>2</sup>. What will the surface area of the real house be?
- (b) The volume of the model is 48 feet<sup>3</sup>. What will the volume of the real house be?
13. Here are two proposed floor plans:



Which one is larger?

14. Zombie Toshi and Hanako's financial planner gives them this graph describing the value of their house after a given number of years:



- (a) How many dollars per year is their house's value increasing by?  
(b) Write down a linear equation that describes this situation.
15. Being very environmentally conscious zombies, Toshi and Hanako decide to install a cistern in their house to capture rainwater for their household needs. The cistern is a cylinder with radius 1.5 meters and height 3 meters.
- (a) How many liters can it hold? (Remember that 1 liter = 1000 cubic centimeters.)  
(b) How many square meters of sheet metal were required to build it?