

- 1) I buy a \$500,000 house with a 30 year loan at 3.3% interest **compounded monthly**. My monthly payments, paid at the beginning of each month, begin immediately. The bank says that my monthly payments should be \$2,183.77. I actually pay \$2,500 per month, paid at the beginning of each month. How many months does it actually take for me to pay off my house? (7 pts.)

$$2500 \cdot \left( \frac{\left(1 + \frac{0.033}{12}\right)^n - 1}{\frac{0.033}{12}} \right) \left(1 + \frac{0.033}{12}\right) = 500000 \left(1 + \frac{0.033}{12}\right)^n$$

$$\left(1 + \frac{0.033}{12}\right)^n - 1 = 0.548491648 \left(1 + \frac{0.033}{12}\right)^n$$

$$0.451508352 \left(1 + \frac{0.033}{12}\right)^n = 1$$

$$\left(1 + \frac{0.033}{12}\right)^n = 2.214798454$$

$$\ln \left(1 + \frac{0.033}{12}\right) = \ln(2.214798454)$$

$$n = \frac{\ln(2.214798454)}{\ln\left(1 + \frac{0.033}{12}\right)}$$

$$n = 289.5470016$$

290 months

- 2) Let information be as in Problem 1. After 15 years of payments, your wealthy uncle dies leaving you a fortune. You decide to pay off your mortgage. How much will you need to pay the bank? Assume that you pay off the house immediately after the 180<sup>th</sup> payment. (7 pts.)

$$500000 \left(1 + \frac{0.033}{12}\right)^{180} - 2500 \left( \frac{\left(1 + \frac{0.033}{12}\right)^{180} - 1}{\frac{0.033}{12}} \right) \left(1 + \frac{0.033}{12}\right) = A$$

$$A = \$236,835.32$$

- 3) I won a prize that promises to pay \$P at the beginning of the year for 30 years beginning on Jan. 1, 2015. Find P, given that the present value of my prize at 4.5% interest is \$1,000,000 on Jan. 1, 2015. (7 pts.)

$$1,000,000 = P \left( \frac{(1.045)^{30} - 1}{0.045} \right) (1.045)^{-30}$$

$$1,000,000 = 17.0218853 P$$

$$P = \$ 58,747.89$$

- 4) Beginning in year 2000, I began depositing \$5000 per year at the end of each year into a retirement account that was earning 3.6% per year. However, after 10 deposits, I was forced to reduce my deposits to \$4000 per year. What will be the total accumulation in my account on Dec. 31, 2014, immediately after my 15<sup>th</sup> deposit? (7 pts.)

$$5000 \left( \frac{(1.036)^{10} - 1}{.036} \right) (1.036)^5 + 4000 \left( \frac{(1.036)^5 - 1}{.036} \right) = A$$

$$A = 70327.65763 + 21492.77984$$

$$A = \$ 91,820.44$$

## 5) Define

## a. Insurable interest requirement (5 pts.)

The insurable interest requirement is that in order to buy a policy on someone, the policyholder must truly suffer a loss if the insured individual dies.

## b. Valued Contract (5 pts.)

A valued contract is used in life insurance and states a specific amount of money that is to be paid at the time of a loss, regardless of the cost of the loss.

## c. HMO (5 pts.)

HMO (Health maintenance organization) is a group of people who pay together to receive health insurance benefits.

## d. Antiselection (5 pts.)

Antiselection is the idea that people who believe they have a greater-than-average likelihood of loss are more likely to buy insurance than those who believe they have an average likelihood of loss.

- 6) According to J&L what are two legal requirements that must be met for a fraternal benefit society to sell insurance? (5 pts.)

A fraternal benefit society must have elected officers and a lodge system and it must only offer insurance to its members.

- 7) These questions consider workman's compensation insurance.

- a. In the United States who pays the premiums? (3 pts.)

The employer pays workman's compensation premiums in the United States.

- b. I am covered by workman's compensation. I have an accident that was determined to be 40% my fault and 60% my company's fault. What fraction of my hospital bills will workman's compensation pay? (3 pts.)

The workman's compensation will pay all of your hospital bills since workman's compensation is no-fault.

8) Richard has an accident and hits Mary's car. It is Richard's fault. Mary is fully insured. Richard only has liability insurance and the amount he has is less than his state requires. Assume the coverage is not in a no-fault state. Thus the state is a tort jurisdiction.

a) Mary's daughter Jane, who was riding with her, has to be taken to the hospital and treated for her injuries. Which coverages could be used to pay Jane's medical expenses? Give as complete of an answer as possible. (3 pts.)

Richard's liability insurance could cover Jane's medical expenses until it reached its limit. Mary's underinsured motorist coverage could also pay. Mary's insurer would likely sue if it need to pay for any of Jane's medical expenses.

b) Richard also is injured and has to be treated at the hospital. Which coverages could be used to pay Richard's medical expenses? Give as complete of an answer as possible. (3 pts.)

Richard's medical expenses would not be covered.

c) Mary's car is damaged from the accident. Which coverages could be used to pay the damages to Mary's car? Give as complete of an answer as possible. (3 pts.)

Richard's liability insurance could be used to pay the damages to Mary's car. Mary's collision coverage also could be used to pay for the damage. Mary's insurer would likely sue if it needed to pay for any of the damage to her car.

- 9) Assume that in question 8) the state IS no-fault state. How would the answer to part c) change? Explain. (3 pts.)

In a no-fault state, part c in question 8 would still be covered in the same way. Richard's liability insurance could be used to pay damages for Mary's car. Mary's collision coverage could also be used to pay for the damages. Mary's insurer would likely sue if it needed to pay for any of the damage to her car.

- 10) A home owner's policy generally consists of two major sections, the first labeled A-D and a second part, labeled Part II. My house had a fire.

- a. The fire damaged my neighbor's house. Does my insurance cover the damage to the neighbor's house? If so, which section/part of my policy? (3 pts.)

Yes, Section II. Liability

- b. The fire caused the electricity to go out in the house which caused the food to spoil in my freezer. My claim to cover the food spoilage was denied by the insurance company due to the **doctrine of proximate cause**. What does this tell you about the coverage of my homeowner's policy? Explain in terms of the doctrine of proximate cause. (3 pts.)

In the doctrine of proximate cause, a covered peril needs to be the proximate cause of a covered loss. In your case, either fire was not a covered peril or food spoilage was not a covered loss.



- c. It was determined that the fire was caused by a new heater I had just bought which was shown to have been poorly made by the Hades Heater Company. This resulted in a subrogation lawsuit. Explain this concept. Specifically, who is suing whom? If the lawsuit is successful, who gets paid? What, if any, is my role in this action? Why? (4 pts.)

Your insurer is suing Hades Heater Company. Subrogation is when the insurer assumes the legal rights of the policyholder. If the lawsuit is successful, the insurer gets paid. You do not have a role in this action because you gave up the legal rights to sue the Hades Heating Company for faulty products when you bought the policy.

11) My house is currently worth \$200,000. I have it insured for \$100,000. My insurance company requires 80% coinsurance. How much will the insurance company pay on a \$30,000 loss? (5 pts.)

$$\frac{100000}{200000} (.8) (30000) = A$$

$$A = \$18,750$$

- 12) I have a \$300,000 fully insured house with a linearly disappearing deductible. For losses of \$2000 or less, I pay everything while for losses \$5,000 or more I pay nothing. How much would I pay for a loss of \$4,500? (6 pts.)

$$X = \frac{5000 - 4500}{5000 - 2000} (2000)$$

$$X = \frac{500}{3000} (2000)$$

$$X = \$333.33$$

13) Below you are given a table of losses evaluated at 1/1/2013 for No Go Auto Insurance. Assume all losses are fully developed at 48 months. Fill in the corresponding paid loss development factors in the second table. Give answer accurate to at least two digits after the decimal. (4 pts.)

**Loss Reserves**

Accident Year	Cumulative Paid Losses Development Stage in Months			
	12	24	36	48
2010	2,000	2,600	3,120	3,744
2011	3,000	3,300	4,950	
2012	2,500	3,000		
2013	1,000			

**Development Stage in Months  
Paid Loss Development Factors**

Accident Year	Cumulative Paid Losses Development Stage in Months		
	12-24	24-36	36-48
2010	1.30	1.20	1.20
2011	1.10	1.50	
2012	1.20		
2013			

- 14) Based on the data in the preceding problem, No Go's actuaries decided to use the loss development factors given below. What would their estimated reserves be for each of 2010, 2011, 2012, and 2013? (4 pts.)

### Selected Loss Development Factors

12-24	24-36	36-48	48-Ult.
1.1	1.2	1.4	1

2010 Reserve = \$ 0

2011 Reserve = \$ 1980

2012 Reserve = \$ 2040

2013 Reserve = \$ 848

$$4950(1.4) = 6930 - 4950 = 1980$$

$$3000(1.2)(1.4) = 5040 - 3000 = 2040$$

$$1000(1.1)(1.2)(1.4) = 1848 - 1000 = 848$$