Tutorial 1 - Key Concepts

1. (a) For both premium and claims data, describe the following methods for grouping ratemaking experience:
   - Policy Year
   - Calendar Year
   - Accident Year

   (b) For purposes of ratemaking, which method above is most responsive and which is least responsive?

2. You are given the following payment and reserve information about two different claims on two different policies:

Policy Eff. Date	DOL	Trans. Date	Payment	Case Reserve
Jul 1, 2006	Dec 1, 2006	Dec 1, 2006	\$0	\$5,000
		Mar 1, 2007	\$500	\$3,500
		Oct 1, 2007	\$3,500	\$2,000
		Mar 1, 2008	\$3,000	\$0
Oct 1, 2006	Mar 1, 2007	Mar 1, 2007	\$5,000	\$10,000
		Oct 1, 2007	\$9,000	\$1,000
		Mar 1, 2008	\$1,000	\$0

   (a) Calculate the calendar year reported claims for 2006 and 2007.

   (b) Calculate the accident year reported claims for 2006 and 2007 evaluated as of Dec 31, 2008.

   (c) Calculate the policy year reported claims for 2006 and 2007 evaluated as of Dec 31, 2008.

   (d) Identify one advantage and disadvantage associated with using policy year reported claims for ratemaking.

3. Given the following activity on five annual personal automobile policies as of Jun 30, 2009:

Policy	Effective Date	Expiration Date	Cancellation Date
1	07/01/2007	06/30/2008	N/A
2	10/01/2007	09/30/2008	03/30/2008
3	01/01/2008	12/31/2008	N/A
4	03/01/2008	02/28/2009	06/30/2008
5	07/01/2008	06/30/2009	N/A

   The base exposure is earned car years.

(a) Calculate the 2008 calendar year written exposure.

(b) Calculate the 2008 calendar year earned exposure.

(c) Calculate the 2007 policy year written exposure.

(d) Calculate the in-force exposure as of Apr 1, 2008.

4. An insurer is considering changing the exposure base used to price personal auto from earned car years to annual miles driven. Evaluate the merits of this change based on each of three different criteria of a good exposure base.

   Given that the three desirable criteria for an exposure base are:

   (a) Proportional to expected claims

   (b) Practical (It should be objective, well-defined and relatively easier to obtain)

   (c) Historical Precedence

5. Given that:

   - Each policy insures only one car
   - Policies are earned evenly throughout the year

Policy	Effective Date	Expiration Date	Cancellation Date
A	Feb 1, 2009	Jul 31, 2009	
B	May 1, 2009	Oct 31, 2009	
C	Aug 1, 2009	Jan 31, 2010	
D	Nov 1, 2009	Apr 30, 2010	Jan 31, 2010
E	Jan 1, 2010	Jun 30, 2010	
F	Jul 1, 2010	Dec 31, 2010	

   (a) Calculate the written car years in calendar year 2010.

   (b) Calculate the written car years in policy year 2010.

   (c) Calculate the earned car years in calendar year 2010.

   (d) Calculate the earned car years in policy year 2010.

   (e) Calculate the number of in-force policies as of Jan 1, 2010.

6. You are given:

Effective Date	No. of Cars Written
01/01/96	10
04/01/96	20
07/01/96	40
10/01/96	60
01/01/97	100
04/01/97	120
07/01/97	150
10/01/97	200

All policies are effective for six months and the average writen premium is $500 per car each policy period.

(a) Calculate the earned exposure (in years) for calendar year 1997.

(b) In-force exposures (cars) on 01/01/97.

(c) Calendar year 1996 earned premium.

7. Suppose that a policy with annual term was written on Mar 1, 2016 for a premium of $900. Calculate the following:

(a) Calendar Year 2016 Written Premium.

(b) Calendar Year 2016 Earned Premium.

(c) In-force premium as of Dec 31, 2016.

8. You are given the following five annual policies.

Policy	Eff. Date	Premium
A	Jan 1, 2007	$750
B	Apr 1, 2007	$1,200
C	Jul 1, 2007	$900
D	Oct 1, 2007	$800
E	Jan 1, 2008	$850

Assume that the premium is earned uniformly throughout the year. Calculate

(a) The total calendar year 2007 written premium.

(b) The total calendar year 2008 earned premium.

(c) The total policy year 2007 earned premium as of Mar 31, 2008.

(d) The total in-force premium as of Jul 1, 2008.

9. Company ABC began writing annual personal automobile policies on Jan 1, 2010, using the following rating structure:

- Policy Premium = Base Rate × Class Factor + Policy Fee
- Base Rate = $1,000
- Policy Fee = $50
-

Class	Class Factor
Teens	2.00
Adults	1.00

On Jul 1, 2010, the company increased the base rate to $1,100 and revised the class factor for adults to 0.90.

Assuming the company writes 5 policies of teen and 5 policies of adults per quarter, each with an effective date of the beginning of the quarter. Calculate the calendar year 2010 earned premium.

10. You are given:

Eff. Date	Rate Change
04/01/94	+5.0%
07/01/95	+13.0%
04/01/96	-3.0%

All policies are annual and written uniformly throughout the year. Using parallelogram method, what is the on-level premium factor to bring calendar year 1995 earned premium to current rate level?

11. Given the following:

- All policies are 2-year policies
- Policies are written uniformly throughout the year

Calendar Year	Earned Prem.	Eff. Date	Rate Change
1997	$10,000	Jul 1, 1997	+5.2%
1998	$11,500	No change	No change
1999	$14,000	Apr 1, 1999	+7.4%

Determine the calendar year 1999 on-level earned premium. Show all work.

12. Assume that a -8% of rate change was implemented effective Mar 1, 2005 and that all policies have annual terms.

(a) Calculate the on-level factors for calendar years 2006 earned premium using the parellelogram method.

(b) Calculate the on-level factors for policy years 2005 earned premium using the parellelogram method.

13. Given that

- All policies are semi-annual
- +5% rate change was implemented effective Oct 1, 2007
- A benefit change of +10% was enacted affecting premium on all outstanding policies on Jul 1, 2008

Find the on-level factor for calendar year 2008 earned premium.