



Fundamentals of Actuarial Practice (FAP)  
Descriptions and Objectives

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# Fundamentals of Actuarial Practice (FAP)

## Risk in Actuarial Problems

### FAP Introduction: Course Overview

#### **Description:**

FAP encompasses real-world applications and uses examples to demonstrate actuarial principles and practices. Practical techniques are presented to assist in your day-to-day work.

You will also have opportunities to apply these principles and techniques in traditional and non-traditional actuarial practice areas. With the fundamentals in your toolkit, you will be better prepared to apply your learning to new areas of practice that may emerge during the course of your actuarial career.

FAP design and delivery supports your learning by:

- Introducing you to financial security systems, common actuarial techniques, and practical experiences.
- Describing actuarial practices, principles, approaches, methods, commonalities, problems, and solutions.
- Explaining actuarial practices across the traditional areas of practice:
  - Life insurance
  - Property and casualty insurance
  - Health insurance
  - Retirement benefits
- Explaining actuarial practices as applied directly on behalf of financial security system providers or as a consultant to those providers.
- Preparing you to apply actuarial skills in nontraditional and emerging areas of practice.
- Providing context for the specific mathematical and technical skills tested in the Preliminary Education examinations, some of which you may have already taken, others of which you might be studying for now:
  - Probability
  - Financial Mathematics
  - Investment and Financial Markets
  - Statistics for Risk Management
  - Long-Term Mathematics
  - Short-Term Actuarial Mathematics
  - Statistics for Risk Modeling
  - Predictive Analytics
- Helping you prepare for your professional role as an Associate of the Society of Actuaries (ASA).

#### **Objectives:**

- What are financial security systems? How do they operate?
- What issues do actuaries address? What is the actuary's role?
- How does the business environment affect the work of actuaries?
- How is actuarial practice expanding to fill newly developing roles?
- How do actuaries bring professionalism to their work?
- What types of problems do actuaries solve?
- What is risk in an actuarial context?
- How do actuaries identify, assess and manage risk?
- How do actuaries apply the fundamental concepts of actuarial science in their work?
- What solutions do actuaries bring to their bosses, management, boards of directors or clients?

## Fundamentals of Actuarial Practice (FAP)

- How can you articulate answers to each of these questions to a non-expert audience?

Successful completion of the FAP course will enable you to answer these questions.

### Section 1: Module Overview

#### **Description:**

During your Risk in Actuarial Problems study, you will be exposed to typical actuarial problems and the processes used by actuaries to fully define problems. You will learn that problems revolve around risk and that identifying risks to be managed—i.e., looking below the surface—will help you to better define the real problem. You will learn how effective identification, analysis, and prioritization of various risks leads to a clearer definition of the problem and, ultimately, better solutions.

#### **Objectives:**

After you complete this section, you will be able to:

- Explain Define the Problem within the context of the Control Cycle.
- Explain the significance of identifying and defining the real problem and its associated risks.
- Describe risks that actuaries manage within a financial security system.
- Describe risk management for financial security systems from a global perspective.
- Identify commonalities among problems in existing areas of actuarial practice.

### Section 2: Why Define the Problem

#### **Description:**

Section 2 focuses on Define the Problem as it fits in the Control Cycle and describes examples of scenarios where problems were not correctly defined.

#### **Objectives:**

After you complete this section, you will be able to:

- Explain how Define the Problem fits within the context of the Control Cycle.
- Given an example of a financial security system failure, describe how better problem definition could have been employed to help avoid the crisis.
- Recognize the significance of successfully defining problems.
- Identify risks related to financial security systems.

### Section 3: Introduction to Risk

#### **Description:**

In Module 1 of the FAP course, you were introduced to the concept of risk. In this section, you will review risk and risk analysis as they relate to actuarial problems. You will also have a chance to explore how risk influences the Define the Problem stage of the Control Cycle.

This section also introduces foundations of risk analysis and management. For the purposes of this section, risk management is the art and science of balancing risk and reward across the functional areas within a financial security system.

#### **Objectives:**

After you complete this section, you will be able to:

## Fundamentals of Actuarial Practice (FAP)

- Define risk in an actuarial context.
- Describe risk management.
- Define risk types that need to be managed within a financial security system.
- Explain how risk is transferred from a consumer to a financial security system.
- Explain risk classification.

### Section 4: Define the Problem and Identify Risks

#### **Description:**

In this section, you'll look more closely at the relationship between identifying risks and the Define the Problem stage of the Control Cycle. You will be introduced to some of the basic tools often used by actuaries to analyze financial risks.

#### **Objectives:**

After you complete this section, you will be able to:

- Determine factors or influences that are important to identify and analyze risks.
- Use techniques commonly used in asset-liability management (ALM) with financial security systems.
- Describe the various risk measures that are used in ALM.
- Describe the capital requirements for a financial security system.
- Describe the role of risk measurement tools when analyzing the risks in financial and non-financial organizations.

### Section 5: Recognize Problem Commonalities

#### **Description:**

Understanding the commonalities and similarities that many actuarial problems share provides a foundation or starting point as you define problems. This section examines some of those commonalities.

#### **Objectives:**

After you complete this section, you will be able to:

- Describe aspects of actuarial work that are both fundamental and common to all practice areas.
- Categorize commonalities in actuarial problems.

### Section 6: Communications

#### **Description:**

In today's business environment, professionals of all disciplines are turning to actuaries to identify, quantify, and manage risk-related issues. You can no longer assume your role as an actuary is to tabulate numbers. The reasoning behind actuarial calculations and the business decisions resulting from actuarial analysis are valuable to today's organizations.

This section will provide you with tips and guidelines on how to communicate effectively with professionals across all disciplines. It will also provide video examples demonstrating effective communication, as well as videos of expert actuaries who share their tips for effective communication.

#### **Objectives:**

## Fundamentals of Actuarial Practice (FAP)

After you complete this section, you will be able to:

- Prepare to communicate by answering six key communication questions.
- Describe elements of effective presentations.
- Describe elements of effective reports.
- Eliminating and limiting use of acronyms.
- Avoid common mistakes when communicating as an actuary.
- Apply the principles of Actuarial Standards of Practice 41 (US), Standards of Practice 1700(Canada), and Section 8 Principle 6 (UK)

### Designing and Pricing an Actuarial Solution

#### Section 1: Module Overview

**Description:**

You have already learned quite a bit about actuarial modeling. In Module 4, you were introduced to the Model Control Cycle, what a model is (“... a construction designed to imitate reality”) and why models are so important to actuarial work (“...actuaries gain insight into how the system operates and can assist their employers or clients in designing strategies to manage the financial risk in the system”). You were introduced to the modeling process, model selection and building, model limitations and modeling techniques. By the end of Module 4, you were able to understand how models are indispensable tools for designing solutions to actuarial problems.

In this module, Designing and Pricing an Actuarial Solution, you will further explore models by tying together what you have already learned into a framework for models that emphasizes pricing, reserving and funding.

Pricing is the function related to the determination of the cost for an individual to participate in a financial security system. Reserving is the function related to the determination of the amount of assets currently needed to be available to meet the financial security system’s obligations. Funding is the function related to the determination of the financial security system’s future capital needs and the allocation of current and future assets to meet those needs.

The purposes and details of each of these types of models will be analyzed.

**Objectives:**

After you complete this module, you will be able to:

- Explain how the fundamental actuarial formula provides the basis for all modeling.
- Demonstrate how models are applied to develop pricing, reserving and funding solutions.
- Explain how models are applied on an individual and group basis in the different practice areas.
- Apply primary and secondary models to practice area pricing, reserving and funding problems.

#### Section 2: Overview of Actuarial Models

**Description:**

This section introduces you to the concept of a fundamental actuarial formula that represents this idea as it pertains to risk management problems. This section also introduces you to a framework that categorizes actuarial models according to this formula. The framework provides a useful way of thinking about models and provides the structure for the remaining sections in this module.

**Objectives:**

After you complete this section, you will be able to:

- Describe how the fundamental actuarial formula provides the basis for all modeling.
- Describe how models are applied to develop pricing, reserving and funding solutions.
- Describe how models are applied on an individual and group basis in the different practice areas.

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### Section 3: Pricing Models

#### Description:

In this section, you will learn about pricing and pricing models, which are based upon the following fundamental formula:

$$0 = V_0 = \sum_{t=0}^{\infty} B_t d_t v^t - \pi_t \Delta_t v^t$$

In this section, you will also see how each practice area employs pricing models.

#### Objectives:

After you complete this section, you will be able to:

- Explain how pricing models are used to solve pricing problems.
- Explain how to use “secondary” models/methods to define parameters for pricing models.
- Apply primary and secondary models to practice area pricing problems.

### Section 4: Models for Reserving and the Allocation of Capital

#### Description:

In the previous section, you learned about pricing problems and pricing models. In this section, you will learn about reserving problems and reserving models. Models for reserving purposes are created using the following simplified formula:

$$V_x = \sum_{t=x}^{\infty} B_t d_{x,t} v^{t-x} - \pi_t \Delta_{x,t} v^{t-x}$$

Reserving is a process an actuary uses to determine the current liability associated with future claims. It is a point estimate for future periods.

#### Objectives:

In this section, you’ll learn more about reserving models. After completing this section, you will be able to:

- Explain how reserving models are used to solve for reserving problems.
- Explain how to use “secondary” models/methods to define parameters for reserving models.
- Apply primary and secondary models to practice area reserving problems.
- For reserving purposes, the application of models to solve the fundamental simplified equation as noted above can be completed on a “prescribed basis” or using a “principles-based” approach

### Section 5: Models for Funding and the Planning for Capital Needs

#### Description:

In the previous two sections, you learned about pricing and reserving and their associated models. In this section, you will cover funding models, which are created to solve the following simplified formula:

$$V_x = \sum_{t=0}^{x-1} \pi_t \Delta_{t,x} v^{t-x} - B_t d_{x,t} v^{t-x}$$

As mentioned in Section 2, funding involves the question “Will future funds be sufficient to meet the financial security system’s future needs?” Funding models are used by financial security systems to determine an appropriate build-up of funds to be used for future purposes. Traditionally, funding has been used to secure the long-term benefits promised to the beneficiaries of a financial security system. Funding methods were initially developed for defined benefit pension plans and you will begin your study of funding models with the models typically used for such plans.

Funding problems, however, also apply in the other practice areas. For example, an actuary working in the finance practice area must consider the problems associated with ensuring that the insurance company resources will be sufficient to meet its future obligations. This is a funding problem.

### **Objectives:**

After you complete this section, you will be able to:

- Explain how funding models are used to solve funding problems.
- Explain how to use “secondary” models/methods to define parameters for funding models.  
Apply models to practice area funding problems.

### Section 6: Tying It All Together

#### **Objectives:**

Are you able to answer the questions below?

- How does the fundamental actuarial formula provide the basis for all modeling?
- How are models applied to develop pricing, reserving and funding solutions?
- How are models applied on individual and group bases?
- How are models applied to the various areas of actuarial practice?

### Model Selection and Solution Design

#### Section 1: Module Overview

**Description:**

Designing and Pricing an Actuarial Solution, focused on common actuarial models being used in the practice areas. A framework for thinking about models was introduced and you learned how the fundamental actuarial formula provides a basis for all modeling. You learned how models are applied to develop pricing, reserving and funding solutions as well as how they are applied on an individual and group basis in various practice areas. Finally, the application of primary and secondary models to practice area pricing, reserving and funding problems was presented.

Building on Designing and Pricing an Actuarial Solution, Model Selection and Solution Design provides an overview of the model selection and solution design process. This module begins with an explanation of how the model selection and model building process fits within the context of the Control Cycle. A three-stage process for building and selecting models (i.e., define the problem, match the model to the problem and design the solution) provides the basis for the remainder of the content within this module. Specific modeling steps that occur within each stage of the Control Cycle are also covered.

**Objectives:**

After you complete this module, you will be able to:

- Review modeling techniques and models used in actuarial practice.
- Define the business problem that needs to be modeled.
- Match the model to the problem in context.
- Design a solution.

To achieve these objectives, you will complete case studies from different practice areas that will provide you with practical applications of modeling concepts. To allow you more time for this practice, you will complete fewer readings during this module than you have completed in previous modules.

#### Section 2: The Module Control Cycle

**Description:**

This section begins with a review of the relationship between the model definition and building processes and the Control Cycle introduced earlier. You will also review the types of models used in actuarial work.

**Objectives:**

After you complete this section, you will be able to:

- Explain how the model definition and model building process fits within the context of the Control Cycle.
- Work through the process of defining and building a model.
- Apply Control Cycle principles to the process of model design and building.
- Describe the rationale for selecting a particular model.

#### Section 3: Pricing Module

**Description:**

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In this section, you will begin with an extension of the Term Life Insurance case study from Designing and Pricing an Actuarial Solution. This portion of the case study will involve pricing and pricing models that are based upon the following fundamental formula:

$$0 = V_0 = \sum_{t=0}^{\infty} B_t d_t v^t - \pi_t \Delta_t v^t$$

### Objectives:

After you complete this section, you will be able to:

- Use the Model Control Cycle to solve a pricing problem
- Describe how different models can be applied to solve the same problem
- Determine which model is most appropriate for the presented pricing problem
- Practice applying a model to solve a pricing problem

### Section 4: Reserving and the Allocation of Capital

#### Description:

The Health Reserves case study presented in this section focuses on various reserve models applied to develop reserves for incurred but not reported (IBNR) claims of a small but growing Health Management Organization (HMO) called YourHealth. YourHealth has become a concern for the insurance commissioner. In particular, the commissioner is worried about the adequacy of YourHealth's IBNR reserves.

### Objectives:

After completing the case study in this section, you will be able to:

- Evaluate YourHealth's reserve methodology
- Determine if YourHealth's reserves are adequate
- Determine the size of the reserve deficiency or surplus

### Section 5: Funding and the Planning for Capital Needs

#### Description:

Just as you completed case study work around the selection of models and design of solutions in Sections 3 and 4, this section will provide additional opportunities for you to work with other models and concepts that you've learned in Modules 1-5.

The first case study, Retirement Benefits, illustrates issues related to the selection of models and design of solutions in private pension related problems. This case study emphasizes the concepts and processes involved. The calculations are very simple.

The second case study, Structured Settlement, focuses on the determination of projected profitability and potential volatility of the financial results of a structured annuity line of business. In addition to working through the Retirement Benefits and Structured Settlement case studies, you will continue to work on the Retiree Medical Funding case study that you started in Designing and Pricing an Actuarial Solution.

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In this section of the module, you will begin with a case study that is based on a series of retirement benefits business problems. The case will include a traditional funding problem and will also include pension reserving and pricing problems.

First you will review the original business problem that must be managed, in part, by the use of an actuarial model. This will include a review of the following steps related to the original business problem:

- identify risks
- identify external forces
- identify stakeholders and their issues
- understand the business problem as defined

### **Objectives:**

Before you can define the model, you must have a complete understanding of all the aspects of the original business problem. Once this research is complete, you can proceed to the Define the Model stage of the Model Control Cycle. This will involve the following:

- identify existing models that may be used or adapted for the business problem.
- identify available data and determine its adequacy, appropriateness and sensitivity.
- identify required model inputs, assumptions and constraints.
- define the model to be used for the business problem.

Once the model has been defined, you will proceed to the Build the Model stage of the process. This will involve the following:

- build and test the selected model.
- confirm that the model output addresses the original business problem and that the results are reasonable and explainable.
- go back and forth between the Define the Model and Build the Model stages.

Finally, you will return to the original business problem to communicate your findings once you have interpreted the model results. This section will not focus on model maintenance or redefinition.

### Selection of Initial Assumptions

#### Section 1: Module Overview

**Description:**

From your FAP studies, you have already learned quite a bit about assumptions. Module 4: Actuarial Solutions, Section 5 provided you with a thorough overview of assumptions. In that section, you learned that the definition of an assumption is “any non-factual, non-verifiable item that the actuary relies on in a model.” You also learned that assumptions may involve filling in a missing piece of data, projecting a future expectation, or hypothesizing about the relationship between two variables. You were also introduced to the major types of assumptions: economic, demographic and experience-based. You learned why assumptions are important to actuaries and their stakeholders.

In addition to what you have learned about assumptions in Module 4, you have also had an opportunity to see the use of assumptions in actuarial work in the FAP course’s case studies and exercises. In those, you were provided with the assumptions. While completing those exercises, you learned about the effect of changes in assumptions on a model’s results.

How does an actuary select assumptions? What is the set of assumptions that are material to the business problem, solution and model? What constraints or other determinants should be considered when selecting them? What methods and tools are available to actuaries when they need to quantify assumptions? These are the questions that will be answered in this module. [Click here](#) to review some additional, important questions.

**Objectives:**

After you complete this module, you will be able to:

- Recall and describe the major categories of assumptions.
- Describe assumption constraints and determinants.
- Describe methods and tools for quantifying assumptions.
- Describe the interdependency of assumptions.

#### Section 2: Overview of Selecting Assumptions

**Description:**

In this section you will learn about the selection of initial assumptions.

**Objectives:**

After you complete this section, you will be able to:

- Recognize the significance of assumptions to the success of ongoing risk management of the financial security system.
- Identify types of actuarial assumptions.
- Describe the processes used to select initial assumptions.

#### Section 3: Assumption Constraints

**Description:**

You learned in the previous section that there are different types of assumptions and that they are very important in the Control Cycle. Other important factors to consider when selecting assumptions are the

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constraints and other determinants. This section of Selection of Initial Assumptions covers constraints and other determinants as well as the external forces that actuaries face when defining the set of assumptions.

### **Objectives:**

As a result of completing this section, you will be able to:

- Identify assumption constraints and other determinants
- Describe assumption constraints
- Describe other determinants for assumptions

## Section 4: International Considerations and Constraints

### **Description:**

In this section you will learn about the selection of initial assumptions.

### **Objectives:**

After you complete this section, you will be able to describe:

- Identify the differences between principle-based and rule-based approaches, which will differ applicable solvency regimes.
- Describe supplementary regulation and supervision, including corporate governance, risk and solvency assessment, supervisory review process, group supervision and reporting requirements.
- Describe definitions and guidelines regarding corporate governance.

## Section 5: Methods and Tools for Quantifying Assumptions

### **Description:**

In previous sections, you learned about some of the criteria, constraints and other determinants used to select assumptions for actuarial models. This section provides a high-level description of the methods used to quantify and select assumptions. A number of different methods are presented through readings from the various practice areas.

### **Objectives:**

After you complete this section, you will be able to describe:

- Types of methods and tools used to quantify assumptions
- Methods used to select initial assumption
- Tools used to select assumptions

## Section 6: Applying Assumption Concepts

### **Description:**

Thus far in this module, you have studied quite a bit about actuarial assumptions. In addition to learning more about types of assumptions (i.e., economic, demographic and experience-based), you have learned how assumptions relate to the Control Cycle and the process used to select initial assumptions. Further, you looked at how actuaries treat assumption constraints (e.g., those placed by regulatory bodies, the profession or the client/employer) and other determinants (e.g., materiality, the effect of internal or external forces). Finally, you looked at methods and tools actuaries use to quantify

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assumptions that are used in actuarial models.

In this section, you will have an opportunity to apply your knowledge about assumptions setting to the Retirement Benefits, Structured Settlement, Term Life Insurance, Retiree Medical Funding and Health Assumptions case studies.

### **Objective:**

After you complete this section, you will be able to:

- Apply assumptions concepts to realistic actuarial scenarios.

## Section 7: Interdependency of Assumptions

### **Description:**

Throughout this module you have read about the constraints and other determinants that an actuary needs to consider when selecting economic, demographic and experience-based assumptions. This section covers the interdependency of the different assumption types and the dependency of assumptions on the design of the solution.

### **Objectives:**

After you complete this section, you will be able to:

- Describe interdependency
- Explain how assumptions are dependent on other assumptions
- Explain how assumptions are dependent on the product's design

### Monitoring Results

#### Section 1: Module Overview

**Description:**

In Module 1 of this course, you learned that the Control Cycle can be stated quite simply as three stages:

- Define the Problem
- Design the Solution
- Monitor the Results

In Modules 1 through 7 you learned to Define the Problem and to Design the Solution. In Monitoring Results, you will explore the Monitor the Results stage of the Control Cycle.

Read Chapter 17, pages 495-526 omitting Section 17.4.4, pages 504-509 in Understanding Actuarial Management (2010). Chapter 17 discusses the Monitoring Results stage of the Control Cycle.

**Objectives:**

After you complete this module, you will be able to:

- Describe each element of the Monitoring Results Control Cycle
- Identify the results to be monitored
- Explain how to validate data gathered for monitoring results
- Describe possible methods of analyzing experience data
- Identify the source of experience deviations
- Identify possible solutions to problems resulting from experience deviations
- Explain the importance of appropriate communication and documentation while monitoring results

To achieve these objectives, you will complete case studies from different practice areas that will provide you with practical applications of monitoring results.

#### Section 2: Introduction to Gathering Data

**Description:**

In Understanding Actuarial Management (2010), you learned that:

A major component of the Actuarial Control Cycle is the regular comparison of expected outcomes with experience, i.e., actual outcomes. Analysis of actual experience is an essential element of this comparison.

This section will focus on the process used to monitor results. You will learn about a framework for this process. This framework will provide you with a useful way of thinking about monitoring results.

**Objectives:**

After you complete this section, you will be able to:

- Explain how the Monitor the Results stage fits within the context of the larger Control Cycle.
- Describe each element of the Monitoring Results control cycle.

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- Describe the process of identifying and gathering data necessary to monitor the results.
- Describe the process of validating data.
- Apply concepts related to gathering data in an actuarial scenario.

### Section 3: Analyzing Results

**Description:**

The Monitoring Results Control Cycle and the Gather Data element were introduced to you in Section 1. This section will discuss the second element of the Monitoring Results Control Cycle, Analyze Results.

**Objectives:**

After you complete this section, you will be able to:

- Identify various methods for analyzing data when monitoring results.
- Explain six data analysis methods including when to apply each.
- Apply concepts related to analyzing results in an actuarial scenario.

### Section 4: Providing Feedback

**Description:**

In the previous section, you learned about analyzing results to identify differences between expected and actual experience. In this section you will learn about providing feedback about the discrepancies identified.

**Objectives:**

After you complete this section, you will be able to:

- Identify possible sources of error.
- Identify possible solutions to problems caused by adverse experience.
- Explain the critical importance of appropriate communication and documentation.
- Apply concepts related to providing feedback in actuarial scenarios.

### Section 5: Recap of the Control Cycle

**Description:**

This section summarizes the Fundamentals of Actuarial Practice course by using the Control Cycle to highlight key actuarial concepts. The Control Cycle, along with its associated "micro" control cycles and illustrations, provided the structure for this course and provides a framework for recapping key concepts.

**Objectives:**

After you complete this section, you will be able to:

- Recall key actuarial concepts and principles related to Control Cycle elements.

### Optional Modules

#### Module 1: Introduction/Role of the Professional Actuary

##### **FAP Introduction: Course Overview**

###### *Description:*

FAP encompasses real-world applications and uses examples to demonstrate actuarial principles and practices. Practical techniques are presented to assist in your day-to-day work. You will also have opportunities to apply these principles and techniques in traditional and non-traditional actuarial practice areas. With the fundamentals in your toolkit, you will be better prepared to apply your learning to new areas of practice that may emerge during the course of your actuarial career.

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- Describing actuarial practices, principles, approaches, methods, commonalities, problems, and solutions.
- Explaining actuarial practices across the traditional areas of practice:
  - Life insurance
  - Property and casualty insurance
  - Health insurance
  - Retirement benefits
- Explaining actuarial practices as applied directly on behalf of financial security system providers or as a consultant to those providers.
- Preparing you to apply actuarial skills in nontraditional and emerging areas of practice.
- Providing context for the specific mathematical and technical skills tested in the Preliminary Education examinations, some of which you may have already taken, others of which you might be studying for now:
  - Probability
  - Financial Mathematics
  - Investment and Financial Markets
  - Statistics for Risk Management
  - Long-Term Mathematics
  - Short-Term Actuarial Mathematics
  - Statistics for Risk Modeling
  - Predictive Analytics
- Helping you prepare for your professional role as an Associate of the Society of Actuaries (ASA).

###### *Objectives:*

- What are financial security systems? How do they operate?
- What issues do actuaries address? What is the actuary's role?
- How does the business environment affect the work of actuaries?
- How is actuarial practice expanding to fill newly developing roles?
- How do actuaries bring professionalism to their work?
- What types of problems do actuaries solve?
- What is risk in an actuarial context?
- How do actuaries identify, assess and manage risk?
- How do actuaries apply the fundamental concepts of actuarial science in their work?

## Fundamentals of Actuarial Practice (FAP)

- What solutions do actuaries bring to their bosses, management, boards of directors or clients?
- How can you articulate answers to each of these questions to a non-expert audience?

Successful completion of the FAP course will enable you to answer these questions.

### Section 1: Module Overview

#### *Description:*

This section introduces the overall goals and purposes of Module 1: Role of the Professional Actuary. You will be introduced to the profession, to traditional and nontraditional areas of actuarial practice, to the positions actuaries hold, and to their contributions as volunteers.

#### *Objectives:*

After you complete this section, you will be able to:

- Explain what actuaries are.
- Describe what actuaries do.
- Explain how actuaries practice.
- Explain how actuaries work in a global context.
- Explain how the Control Cycle facilitates actuarial work.

### Section 2: The Actuary

#### *Description:*

The purpose of Section 2: The Actuary is to provide a brief history of the profession, to consider the future of the actuarial profession, to explore the role of today's actuary, to detail the actuary's skill sets and to review the profession's codes of conduct.

#### *Objectives:*

After you complete this section, you will be able to:

- Describe important historical events influencing the actuarial profession.
- Describe today's actuarial practice.
- Define "actuary."
- Identify the actuary's knowledge, skills, and abilities.
- Describe what an actuary contributes as a professional.
- Describe actuarial codes of conduct.

### Section 3: What Actuaries Do

#### *Description:*

The purpose of Section 3: What Actuaries Do is to explore the varied definitions of risk and identify how to define it in context, to consider how financial security systems function to manage and reduce risk, to introduce and investigate the areas of practice in which actuaries work, to investigate how actuaries manage risk, and to look at the services actuaries provide.

#### *Objectives:*

After you complete this section, you will be able to:

- Define risk.
- Explain how financial security systems interact to combat financial insecurity.
- Describe the actuary's contributions within each area of practice.
- Explain ways in which actuaries manage risk.
- Identify services actuaries provide for financial security systems.

### Section 4: External Forces

#### *Description:*

In the previous sections, we reviewed how professionalism surrounds the Control Cycle. Professional codes of conduct and standards govern all actuarial work, emphasizing the fact that an actuary is an expert employing a well-defined body of knowledge. An actuarial designation provides you with instant credibility.

To maintain your expert status in your practice area, however, you must stay current. You must always be aware of emerging issues in the profession and in your clients' lines of business. You must be aware of new advances in technology and how these advances may affect your work. You must assume the responsibility for continuing your education through formal offerings as well as informally through personal reading, for example.

Your clients will assume that, as a professional, you are always up-to-date on the external factors that affect their business as well as the actuarial profession. External factors not only affect the work you will do as an actuary, they also affect how the actuarial profession conducts its business. A practicing actuary does not work in a vacuum. External forces influence how the actuary works today and will work in the future. External forces can be thought of as forces that affect the problem or its solution. Further, changes in external forces may affect an existing solution and become apparent as an actuary monitors the results of a solution.

#### *Objectives:*

After you complete this section, you will be able to:

- List external forces that affect business
- Describe the elements of the Control Cycle.
- Explain how the Control Cycle facilitates actuarial work.
- Apply the Control Cycle in the context of an actuarial problem.

### Section 5: The Control Cycle

#### *Description:*

You've been introduced to the Control Cycle as a framework for solving actuarial problems. You've learned that professionalism underlies the Control Cycle, while external forces, though generally outside of the actuary's sphere of influence, integrate with and affect the actuary's work.

The purpose of Section 5 is to complete your introduction to the Control Cycle by focusing on its Define the Problem, Design the Solution, and Monitor the Results stages. Section 5 also includes a Case Study that enables you to apply your learning and review a sample actuarial problem in the context of the Control Cycle.

#### *Objectives:*

After you complete this section, you will be able to:

- Explain the purpose of the Control Cycle.
- Describe the elements of the Control Cycle.
- Explain how the Control Cycle facilitates actuarial work.
- Apply the Control Cycle in the context of an actuarial problem.

### Section 6: Communications

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### *Description:*

In today's business environment, professionals of all disciplines are turning to actuaries to identify, quantify, and manage risk-related issues. You can no longer assume your role as an actuary is to tabulate numbers. The reasoning behind actuarial calculations and the business decisions resulting from actuarial analysis are valuable to today's organizations.

This section will provide you with tips and guidelines on how to communicate effectively with professionals across all disciplines. It will also provide video examples demonstrating effective communication, as well as videos of expert actuaries who share their tips for effective communication.

### *Objectives:*

After you complete this section, you will be able to:

- Prepare to communicate by answering six key communication questions.
- Describe elements of effective presentations.
- Describe elements of effective reports.
- Eliminating and limiting use of acronyms.
- Avoid common mistakes when communicating as an actuary.
- Apply the principles of Actuarial Standards of Practice 41 (US), Standards of Practice 1700 (Canada), and Section 8 Principle 6 (UK)

### Module 2: Core External Forces

#### **Section 1: Module Overview**

##### *Description:*

As you learned in Module 1, the actuary works within the framework of a Control Cycle—Define the Problem, Design the Solution and Monitor the Results—and manages this process to arrive at an optimal solution. Central to the actuary’s work is the continuous examination of the core external forces that create new problems, constrain any potential solutions, change the problem being solved or affect existing solutions.

External forces are any factors outside of the actuary’s sphere of influence. The purpose of Module 2 is to provide you with an understanding of how core external forces affect actuarial work.

Identifying these forces and determining their relevance and interrelationships will help you manage actuarial problems, projects and assignments. An understanding of external forces will help you assess risks in a variety of situations in an ever-changing environment.

##### *Objectives:*

After you complete this module, you will be able to:

- Define external forces.
- Describe and explain how the following categories of external forces apply within and across global areas of actuarial practice and fit into the Control Cycle framework.
  - Cultural/social values.
  - Demographics.
  - Governmental influences.
  - Economic/business environments.
  - Physical environment.
- Describe the changing nature of external forces.
- Explain how changes in external forces can lead to risk.

#### **Section 2: External Forces and the Control Cycle**

##### *Description:*

After describing the categories, Section 2 continues with readings that provide background information to help you better understand the actuarial context. Background information is provided on:

- the insurance industry
- health care delivery systems
- retirement income systems
- financial markets and considerations

External forces affect virtually everything we do as individuals and as actuaries. The purpose of this section is to provide you with an understanding of external forces affecting actuarial work and the role of these forces in the Control Cycle.

A method of categorizing external forces has already been introduced in Module 1 to make it easier to understand how various external forces affect actuarial problems and solutions. This section further describes the categories (cultural/social values, demographics, governmental influences, economic and business environments, and physical environment) and presents examples of core external forces and their effects.

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### *Objectives:*

After you complete this section, you will be able to:

- Describe in simple terms how external forces fit into the control cycle.
- Define external forces.
- Describe categories and associated examples of external forces.
- Describe important external forces for actuaries working in the areas of life and health insurance, retirement benefits and specialty areas including investment, finance and enterprise risk management (ERM).

### **Section 3: Cultural/Social Values**

#### *Description:*

In this section, you will learn about external forces within the cultural/social values category and how they influence the work of an actuary.

#### *Objectives:*

After you complete this section, you will be able to:

- Describe cultural/social values.
- Describe the application of cultural/social values across and within areas of actuarial practice.
- Explain the effects of cultural/social values on the Define the Problem and Design the Solution stages of the Control Cycle.

### **Section 4: Demographics**

#### *Description:*

In Section 4 you will learn about external forces within the demographics category and how they influence the work of an actuary.

#### *Objectives:*

After you complete this section, you will be able to:

- Describe demographics.
- Describe the application of demographics across and within areas of actuarial practice.
- Explain the effects of demographics on the Define the Problem and Design the Solution stages of the Control Cycle.

### **Section 5: Governmental Influences**

#### *Description:*

In Section 5, you will learn about external forces within the governmental influences category and how they affect the work of an actuary.

#### *Objectives:*

- Describe governmental influences.
- Describe the application of governmental influences from a global perspective.
- Explain the effects of governmental influences on the Define the Problem and Design the Solution stages of the Control Cycle.

### **Section 6: Economic and Business Environments**

#### *Description:*

In Section 6, you will learn about external forces within economic and business environments and how

they can affect the work of actuaries.

### *Objectives:*

After you complete this section, you will be able to:

- Describe economic and business environments.
- Describe economic and business applications across and within areas of actuarial practice.
- Explain the effects of economic and business environments on the Define the Problem and Design the Solution stages of the Control Cycle.

### **Section 7: Physical Environment**

#### *Description:*

In Section 7, you will review aspects of the physical environment that can affect an actuary's work.

### *Objectives:*

After you complete this section, you will be able to:

- Describe aspects of the physical environment.
- Describe how the physical environment may affect actuarial work.

### **Section 8: External Forces and Change**

#### *Description:*

In the previous sections of this Module you studied external forces and the roles they play in the Define the Problem and Design the Solution stages of the Control Cycle. In Section 8, we look at changes in external forces and the influence that these changes have on actuarial work.

As discussed in Module 1, the Control Cycle has a third stage, Monitor the Results. This stage is important because, even if you have properly defined the problem and designed and implemented an ideal solution, external forces can alter the problem and change the circumstances that led to the original solution. Monitoring results also provides an opportunity to create better solutions.

### *Objectives:*

After you complete this section, you will be able to:

- Describe the changing nature of external forces.
- Explain how changes in external forces can lead to risk.

### Module 4: Actuarial Solutions

#### **Section 1: Module Overview**

##### *Description:*

Module 4 demonstrates processes that are central to designing effective solutions to typical actuarial problems and exposes you to sample solutions that illustrate the work of an actuary.

##### *Objectives:*

After you complete this module, you will be able to:

- Explain how solution design fits into the context of the Control Cycle.
- Identify typical actuarial solutions.
- Describe important aspects of designing solutions.
- Describe the process of quantifying risks in ERM.
- Identify data needed to design a solution.
- Describe and use appropriate modeling techniques to design a solution.
- Describe the importance of assumptions when designing a solution with a global perspective.
- Describe the importance of validation and reconciliation techniques when designing a solution.

#### **Section 2: Designing the Risk Management Solution**

##### *Description:*

Actuarial solutions are complex and dynamic. Given a clearly defined problem and the associated risks that must be managed, and given a solid understanding of the needs of those who have a stake in the solution, actuaries are equipped to analyze a range of solutions and then produce an optimal solution.

##### *Objectives:*

- Identify categories and characteristics of actuarial solutions.
- Describe how approaches to managing risk are related to the types of risk.
- Recognize the significance of successful solution design.
- Describe elements of designing actuarial solutions.
- Design a solution for managing reinvestment risk in an insurance company when asset and liability cash flows do not match (asset-liability management).

#### **Section 3: Data**

##### *Description:*

The goal of the Design the Solution stage of the Control Cycle is to determine the optimal risk management solution for the identified problem and associated risks. What is data? How do actuaries use it? In what ways are actuaries responsible for the quality of data? What resource is needed when designing actuarial solutions?

Data is, after all, our measure of the real world.

Data is the backbone of all of the decision making and modeling that actuaries perform. Data is crucial to modeling both in terms of using data as inputs for the model and using data to make key decisions as to what assumptions are appropriate to use in modeling.

Data can also be used as the basis for predictive analytics, which risk managers may use in their decision

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making. Actuaries have a responsibility to ensure that the data used is appropriate and is as complete and accurate as possible. Decisions about how to identify, collect and use data directly affect the quality of the decision making and modeling results. The conclusions actuaries are able to make are dependent on data.

### *Objectives:*

After you complete this section, you will be able to:

- Explain the role of data collection in solution design.
- Describe the considerations in managing data (e.g., sourcing, quality, quantity, relevancy, governance and use) with a global perspective.
- Describe data collection techniques.

### **Section 4: Modeling**

#### *Description:*

If you were to conduct a search on the keyword “model” on the Society of Actuaries’ website, your search would result in over 1,000 matches across the range of publications. Predictive models, stochastic models, behavioral models, simulation models, asset models, contaminated exponential dispersion loss models...the list goes on and on.

### *Objectives:*

After you complete this section, you will be able to:

- Define models and the modeling process.
- Describe the micro Model Control Cycle.
- Describe modeling considerations.
- Describe modeling techniques used when designing a solution.
- Select and use appropriate modeling techniques to design a solution.

### **Section 5: Assumptions**

#### *Description:*

The quality of an actuarial solution depends on the quality of the underlying actuarial assumptions used.

Actuaries are specifically trained to develop assumptions to represent the key variables in the modeling process. The goal is to develop assumptions for the model that are appropriate for the original business problem and that generate adequate outcomes to support informed decision making.

Actuaries must review and quantify many different types of assumptions, with different characteristics, depending on the business problem and model. The consequences of inappropriate or inadequate assumptions may extend beyond the policyholder or client, to the financial system at large.

### *Objectives:*

After you complete this section, you will be able to:

- Describe what an actuarial assumption is.
- Explain the importance of assumptions in actuarial work.
- Describe a methodology for creating assumptions.
- Identify the characteristics of actuarial assumptions.
- Identify some consequences of making inappropriate assumptions.

### **Section 6: Validation and Reconciliation**

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### *Description:*

Developing and implementing a model involves a significant amount of resources. Actuaries face demanding deadlines around the modeling process, which may tempt them to accept the results from the model without performing a rigorous validation process. It is imperative that sufficient time be allotted to validating the model and subsequently reconciling the model results to emerging results. These activities help verify that the model used in the solution was appropriate for the original business problem.

Failure to properly validate and reconcile has been likened to a car manufacturer that devoted vast resources to developing an exquisite luxury car model. To meet the tight deadline of having the cars available for the new year, the manufacturer minimized the quality control efforts at the end of the manufacturing process. Imagine the manufacturer's reaction when the first car came off the assembly line for a group of photographers and the front wheel fell off.

### *Objectives:*

After you complete this section, you will be able to:

- Explain the roles of validation and reconciliation in the Control Cycle
- Distinguish between validation and reconciliation.
- Describe validation and reconciliation methods.
- Apply validation and reconciliation techniques.

## **Section 7: Landfill Case Study**

### *Description:*

You were introduced to the Landfill case study in Risk in Actuarial Problems. At that time, you were asked to assist in determining the letter of credit amount for New Site, a landfill site recently purchased by Mountain Landfill. This was an initial problem that had already been set out for you. At that time, you were also asked to consider an alternate method to solve the problem related to the pre-funding of New Site's post-closure costs. Should Mountain Landfill establish a system to fund for the closure and post-closure costs associated with New Site in advance? If the post-closure costs were to be funded in advance, then how should advance funding be implemented and managed? The continuation of the Landfill case study in Module 4 addresses a risk management solution for this alternate funding method.

In Risk in Actuarial Problems, you were introduced to some of the underlying elements that will help you design this second solution to meet New Site's post-closure costs problem. These include the external forces surrounding the post-closure administration of New Site Landfill, the regulatory environment governing the post-closure costs of New Site and the stakeholders who have an interest in this problem. The elements that were introduced in Risk in Actuarial Problems remain relevant to the new design of a solution in Module 4. In this section you will work on the post-closure costs problem of Mountain Landfill.

After you complete this section, you will be able to apply Module 4 concepts to design the solution to this problem.