ACTEX Learning

Study Manual for Exam EA-2F

Fall 2025 Edition

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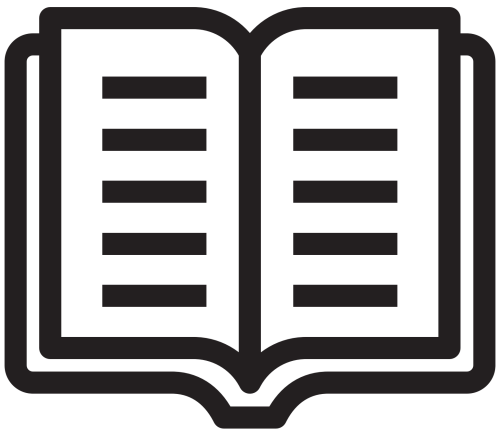

An EA Exam

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Preface

The purpose of this book is to give you all of the information that you will need to take and pass the 2025 EA-2, Segment F exam that will be given in November 2025.

This book is not meant to be a textbook on actuarial mathematics. It is assumed that anyone reading this book already is familiar with the mathematical concepts tested on the EA-1 exam. The text of the book and solutions to exam questions are also written presupposing a test candidate possesses this knowledge (for example, actuarial factors such as $\ddot{a}_{n|\%}$ will be simply given, with no description of the calculation – and it is assumed the reader can match the values provided). Knowledge of these principles is also assumed by the creators of the examination, as noted in the 2024 Examination Program Booklet published by the Joint Board for the Enrollment of Actuaries. This book (and the exam) also assumes candidates have a working knowledge of common commutation functions.

The EA-2, Segment F exam also presupposes knowledge of the topics on the EA-2, Segment L exam, regarding federal pension tax and labor laws that apply to pensions under the Employee Retirement Income Security Act (ERISA).

Those wishing a review of specific actuarial concepts relating to pension plans should consult the book Pension Mathematics for Actuaries, (3^{rd} Edition – 2006) by A.W. Anderson and referenced in the suggested readings located in the Examination Program mentioned above.

If you have not already secured your copy of the 2024 Examination Program Booklet, you should do so immediately. The booklet can be downloaded at the website for the Joint Board Examination program, located at:

http://www.irs.gov/Tax-Professionals/Enrolled-Actuaries/Joint-Board-Examination-Program

Past years exams along with answer keys (although, not explanations as to how the answers are determined, why they are correct, and what published laws affect the correct answer) can also be downloaded from this site at no charge to an exam candidate.

Your first step in preparing for the exam should be to become familiar with the design of the exam and the terms used on the test. Test questions are each worth one to five points. The test is four hours in length and the total point value is 160. This means a qualified candidate is expected to take about $1^1/_2$ minutes per point, and the questions are scored based on the expected length of time a candidate will spend to get that question correct. The exact number of questions is not known and varies from year to year. Over the past several years, the number of questions has ranged from a low of 51 to a high of 60. More questions, of course, means that the individual questions are of lower point values (suggesting they can be performed more quickly) so that the total point value of the exam remains constant.

There is no penalty on the test for incorrect answers, so candidates should make an attempt to answer every question, even if the answer is just a guess. Gauge your time on each question and if you feel you are spending too much time, move on and come back to that question later. The passing score on

the exam is not determined prior to the exam being given, nor is it announced once the passing score is later determined. If you simply cannot arrive at an answer without using up an excessive amount of time, it is acceptable to just guess at a question. A correct guess will improve your score and a wrong guess will not hurt it.

You should make yourself familiar with the Conditions Generally Applicable to All Examination Questions listed in the examination program booklet. All of the conditions listed will also apply to any statements or sample questions in this book, unless explicitly stated otherwise.

You should also look over the commutation factors, and the limits and tables page. These pages will be available to you during the examination, but you should become familiar with them and know how and where to quickly find needed items before the exam begins. Because the guide will present some practice questions based on the commutation tables, a copy of those tables are provided at the back of this book.

Suggested Course of Study

The great majority of questions on the exam follow the same pattern: Information is given about a plan, possibly including data taken from the actuarial valuation of one or more specific years, and possibly including information about one or more plan participants. The exam candidate is then asked to determine some other related value, for example, the minimum required funding contribution or maximum deductible contribution the employer can make for the year.

For this reason, this book is designed to teach *funding methods*, rather than just specific facts about such methods. The facts are explained, but in the context of how all of the individual facts work together to create a single coherent method of determining contribution minimums, maximums, and other related data.

It is recommended that you study the chapters in this book as a complete whole in the order that they are presented. Each chapter builds upon and expands the information in previous chapters. For this reason, it is recommended that you not move to the next chapter until you have a full grasp of the previous chapter, including understanding all of the solutions to the review questions and *why* the answers are correct. It is very useful to read the full explanation of the solutions to problems at the end of each chapter, since they contain hints as to what may be slightly changed to produce a different answer if a similar question is asked again on the next exam.

Once you have completed your study of all of the chapters of the book, take the 2020, 2021, 2022, 2023, and 2024 exams provided in this book. Try to take these past exams under the actual exam conditions you will face. Find a quiet area where you will be undisturbed for a full four hours and answer all of the questions in a single timed sitting. Do not have any reference materials other than those made available for the exam (the reference pages in the exam booklet discussed above) and use the calculator that you plan to use when taking the exam so you can become familiar with the quickest way to use it for calculations common on the exam. Make notes on which types of questions seem to take the most of your time, so you can know to skip past these types of questions on the actual exam and move back to them at the end of the exam, after you have finished the questions that you are comfortable in completing in less time.

After you have completed a past exam, read through the entire answer section for that exam, even those questions that you answered correctly, because the solutions are filled with hints about why the question may have been asked in the way that it was, and can prepare you for what similar or dissimilar types of questions you can expect to see on the upcoming exam. The teaching method of this book focuses on a question and answer approach. I believe that solving actual questions using the funding concepts in the book is a better way to learn the concepts than a simple dry reading of those concepts. Also, for questions that you have missed, go back to the text of this book or the source material (Internal Revenue Code, Treasury regulations and other publications) to study the points that you need to master more fully.

A note on the exam solutions given in this book: The solutions are detailed, and perform the mathematical calculation step by step. Many of the questions and their solutions are repetitive and every single mathematical step is shown on every single question. This has been done to aid the reader in learning through repetition. The goal is to make the concepts in this book and in the exam questions so familiar to you that you will recognize them immediately without having to think about the terms and the rules that you have already committed to memory.

On the actual exam, of course, you should not perform the calculations step by step as is done in the solution guide. For time reasons, you should be able to perform a series of simple calculations immediately in your head, saving your time and energy to focus on the truly difficult aspect of the questions. For example, if a question gives Funding Target = $100,000, assets = $80,000, and Prefunding balance = $10,000, it is hoped that you will immediately see a plan that is 70% funded, without having to waste a moment's though on the calculations: $80,000 minus $10,000 equals $70,000; and $70,000 divided by $100,000 equals 70%. (All of these terms will be defined in the book, so don't worry if you do not recognize them from your previous plan work experience.)

The exam called the EA-2F was introduced in 2013. Prior to 2013, the exams were named differently, and the split of the information on the exams was a bit different. All of the exams from 2013 on have followed the current syllabus (even though the official syllabus itself was not updated until the 2014 exam). If you understand all of the review questions for each chapter and the questions and solutions for the five most recent tests, you should be ready to pass the exam you will actually take in November 2025 (which will follow the same syllabus as the last three exams).

Thank you for your purchase of this book. It is my sincere hope that its contents will help you to pass the exam the next time it is offered in November 2025. Remember that the key to the test is to see immediately what the question is asking and how to most quickly move to that solution. For this reason, it is often a good idea to read a question from the bottom up – first read the question that is asked, and then read through the information provided. Knowing the question you are focusing on from the start may help you choose more quickly just what material is relevant and toward what purpose. This method may or may not help – some candidates prefer to read the question through from the top down. It is suggested you use the three past exams to determine what methods work best for you – *before* you step into the exam room for the actual test.

Also, once you have solved a question, it is best to read it through one last time – to make sure there is no information in the question that you may have overlooked that affects the answer. For every fact given in a question, ask yourself – Did I take that into account? – and if not, is that because it is not

relevant to the solution? The exam writers do not consider any of the given information to be "red herrings," but occasionally information is provided that is not needed, if only to give at least one extra possibility of calculating a wrong answer.

The test is designed with the intent that a properly prepared test taker can and will have sufficient time to complete and answer all of the questions, but the totality of questions do contain enough detail to require the full four hours provided. The key is to be able to answer each question in as little time as necessary, and this book attempts to install such quickness through repetition – solving so many questions so many times that you build your familiarity with the funding methods and their various components. This book attempts to make this point by providing as many practice questions and answers as practical.

Good luck on your examination in November, and if you have any suggestions about how to improve this book, or questions about any of the material it contains – please give us your feedback with the form provided on the following page.

Michael J. Reilly, ASA, EA, MAAA

August 2025

Contents

An Introduction to the EA-2 (Segment F) Exam

In 1974, Congress passed the Employee Retirement Income Security Act (ERISA), a pension law designed to protect employer sponsored retirement plans by, among other things, forcing plan sponsors to follow fundamental rules for calculating and making sufficient contributions to such plans. To be certain that plan sponsors properly followed the requirements of the law, ERISA created the enrolled actuary designation, and empowered the Joint Board for the Enrollment of Actuaries (JBEA) – a new agency under the Treasury Department – to determine the minimum requirements and testing procedures for obtaining the designation.

Currently, there are three exams needed to obtain an Enrolled Actuary designation. The first (exam EA-1) focuses on the actuarial mathematics regarding retirement plans, and the second exam (EA-2 (Segment L)) focuses on aspects of US law with regard to such plans. This book deals with the third and final exam, EA-2 (Segment F) (also called the EA-2F – this book will use both exam names interchangeably), which focuses on proper funding of defined benefit plans – including the annual determination of minimum required funding amounts, maximum tax deductible funding amounts, proper reporting of the valuation results by the plan actuary, and knowledge of excise taxes related to failure to meet minimum funding requirements or exceed deduction limits.

ERISA, as originally passed, required the Enrolled Actuary to assign, within certain guidelines, a funding method to determine the annual required funding of a defined benefit retirement plan. Over the 30+ years since ERISA was passed, Congress has enacted dozens of laws which cumulatively have made hundreds of changes, adjustments, clarifications, and additions to the original set of rules contained in ERISA, many dealing with the funding rules for plans. The IRS, in their interpretation of these laws and changes, has come to recognize and approve certain established funding methods to be tested on this exam.

In 2006, Congress passed the Pension Protection Act (known as PPA '06, or, as will be used throughout this book, simply 'PPA'). Whereas ERISA had established a group of several funding methods from which the actuary could choose, PPA mandates a single funding method that must be used by the actuary in all plan years for single employer sponsored plans. The funding methods under ERISA may still be used, however, for certain collectively bargained plans referred to as "multiemployer" plans.

An Enrolled Actuary must have a familiarity and understanding of both the funding methods under ERISA and the single funding method mandated by PPA. The chapters in this study guide will describe first the PPA method for funding single employer plans (chapters 1-7) and then multiemployer plans (chapters 8-13), although there will be some overlap between these two plan types so that some chapters will be applicable to all plans.

Syllabus

The syllabus for the 2025 EA-2F exam is reprinted below, from the Joint Board's examination booklet for 2025:

Actuarial cost methods, including unit credit, projected unit credit, entry age normal, individual level premium, aggregate, individual aggregate, attained age normal, frozen initial liability, shortfall, one-year term, and variations thereof.

Determination of the actuarial (i.e. smoothed) value of assets.

Valuation of ancillary benefits.

Selection of assumptions.

Valuation techniques for handling employee contributions.

Effect on valuation results of various patterns of experience, including experience with respect to investment earnings, changes in asset value, mortality, disability, employee turnover, changes in compensation, retirement, choice of retirement options, and Social Security.

Effect on valuation results of changes in plan provisions, actuarial cost methods, asset valuation methods, and actuarial assumptions.

Minimum funding requirements including, but not limited to:

> For single employer plans (including multiple employer plans), determination of the minimum required contribution, including calculation of funding target and target normal cost, at-risk provisions, transition rules, effects of IRC section 436 on plan funding, PRA funding relief and MAP-21 and HATFA stabilization provisions, funding balance(s), and waivers of minimum required contributions
>
> For multiemployer plans, the basics of the minimum funding standards including those for plans in critical or endangered status, amortization periods, credit balance, funding standard account, amortization period extensions, and waivers of funding deficiencies
>
> Required quarterly contributions and liquidity shortfall
>
> Certain funding relief provisions contained in the American Rescue Plan Act of 2021 ("ARPA 2021")

Deductible limits for federal income tax purposes.

Penalty taxes for failures to meet minimum funding standards.

The syllabus shown above has not significantly changed in recent years. The current syllabus represents a fundamental change from the syllabus for exams prior to 2013. In connection with the change made in 2013, the EA2 exam names have changed from 2A and 2B to Segment F and Segment L, and certain topics have moved from one exam to the other. Remember that Segment F given in November presumes knowledge of Segment L given in May. Some topics that affect both segments (maximum benefits, top heavy rules, AFTAP rules) are now covered in depth on the Segment L exam, but are still found on the Segment F to the extent that they affect pension funding. These topics are covered in this guide to the extent they may appear on this exam, but you may want to review your study notes from the Segment L exam for more in-depth analysis of these topics.

What part of the syllabus should you spend the most time studying?

The ideal test candidate will become familiar with all aspects of the syllabus, and will be ready to correctly answer every question that is asked on the exam. That being said, very few candidates will score 100% on the exam, and candidates will not be expected to be perfect to receive a passing grade. So the first step in preparing for a successful exam is to know the number and value of questions typically asked on the exam for each syllabus topic.

The following chart shows the syllabus topics one by one, along with the number of test questions and point values of that topic for the most recent three annual exams. Many questions could have been assigned to more than one topic, since they covered elements that overlap more than one area. But for simplicity, each question has been assigned to only one topic, which *best* describes the topic of the question. The topics in the chart below do not match exactly the syllabus above. The chart is meant to reflect the categories of questions actually asked on the exam. Everything in the syllabus above is covered, either directly or indirectly, in the chart below.

It is assumed that exam candidates are familiar with Actuarial Standards of Practice (ASOPs) No. 4, No. 27, No. 35, and No. 51, as listed in the Joint Board Exam Booklet suggested readings, as well as all Society of Actuaries study notes listed. All ASOPs can be downloaded at no cost from the website of the Actuarial Standards Board. An outline of each ASOP is provided with this study manual. The study notes are available from the Society of Actuaries, which may charge a fee for the study notes. The topic of actuarial assumptions does not appear in the table below:

https://www.irs.gov/tax-professionals/enrolled-actuaries/joint-board-examination-program

Here is the table, as it applies to the 2020, 2021, 2022, 2023, and 2024 exams:

Topic	2020 Questions	2021 Questions	2022 Questions	2023 Questions	2024 Questions
PPA funding rules for single employer plans: includes determination of the minimum required contribution, funding target and target normal cost, calculation and use of funding balances, discounting employer contributions including contributions to satisfy quarterly installments, completion of Form 5500 Schedule SB, transition rules, effects of IRC section 436 (AFTAP) rules on plan funding, PRA funding relief and MAP-21 stabilization provisions, rules for multiple employer plans, and waivers of minimum required contributions	1, 2, 6, 7, 9, 13, 18, 21, 22, 23, 24, 25, 27, 29, 33, 34, 37, 43, 44, 46, 49, 50, 55 [66 points]	3, 7, 9, 12, 15, 16, 21, 22, 24, 25, 27, 29, 31, 32, 34, 35, 36, 37, 38, 41, 42, 43, 51, 52, 54, 58 [70 points]	1, 2, 3, 22, 27, 28, 29, 32, 33, 34, 35, 38, 42, 44, 47, 49, 51, 54, 56, 57, 59 [56 points]	1, 10, 11, 16, 17, 18, 19, 20, 23, 24, 25, 29, 30, 37, 38, 40, 41, 43, 45, 46, 48, 49, 50, 52, 53, 54, 55 [73 points]	2, 3, 7, 9, 13, 14, 18, 19, 24, 25, 27, 28, 32, 34, 42, 43, 47, 48, 50, 54, 56 [64 points]
Funding rules for multiemployer plans: Actuarial cost methods, minimum funding standards, amortization periods, credit balance, funding standard account, amortization period extensions, and waivers of funding deficiencies	4, 10, 12, 14, 16, 19, 31, 32, 39, 40, 41, 56, 57 [45 points]	1, 2, 4, 10, 19, 28, 30, 39, 44, 50, 60 [34 points]	10, 11, 25, 36, 40, 46, 50, 55 [27 points]	2, 4, 6, 14, 15, 27, 33, 34, 35, 58 [29 points]	4, 5, 6, 16, 30, 36, 40, 53, 57, 58 [31 points]
Multiemployer plans in critical or endangered status	None [0 points]	46, 47 [7 points]	12, 16 [6 points]	5, 8 [6 points]	38, 39, [5 points]
Deductible limits for federal income tax purposes (both single and multiemployer plans are covered in these questions).	20, 30 [7 points]	45, 57 [4 points]	15, 24, 48 [5 points]	7, 47, 51, 56 [7 points]	11, 12, 26 [6 points]
Effect on valuation results of changes in plan provisions, actuarial cost methods, asset valuation methods and actuarial assumptions.	17, 35, 51, 53 [12 points]	13 [1 point]	37, 39, 45, 53, 58 [16 points]	12, 39, 57, 59 [15 points]	10, 20, 33, 35 [11 points]
Effect on valuation results of various patterns of experience, including experience with respect to investment earnings, changes in asset value, mortality, disability, employee turnover, changes in compensation, retirement, choice of retirement options, and Social Security.	42 [4 points]	8, 17, 20 [12 points]	19 [4 points]	3, 44 [8 points]	8, 21, 37, 44 [14 points]

Topic	2020 Questions	2021 Questions	2022 Questions	2023 Questions	2024 Questions
Selection of actuarial assumptions and effect of such selection on plan funding.	8, 11, 45, 47, 54 [8 points]	5, 6, 14, 55 [8 points]	5, 6, 7, 17, 20, 31, 41, 43 [12 points]	22, 28, 31, 32, 36 [8 points]	22, 23, 31, 45, 51 [10 points]
Determination of the actuarial (i.e. smoothed) value of assets – applicable to both single employer and multiemployer plans – albeit with different rules.	15, 48 [7 points]	18, 33, 40, 59 [9 points]	4, 9, 21, 26 [15 points]	21 [4 points]	15, 17, 29 [8 points]
Valuation of ancillary benefits.	36, 38 [5 points]	11, 53 [4 points]	18, 23, 60 [6 points]	None [0 points]	55 [1 point]
Valuation techniques for handling employee contributions.	28 [2 points]	None [0 points]	None [0 points]	None [0 points]	1 [1 point]
Liquidity shortfall requirements.	3 [1 point]	23, 26, 56 [7 points]	52 [4 points]	42 [4 points]	49 [4 points]
Penalty taxes for failures to meet minimum funding standards.	5, 26, 52 [3 points]	48, 49 [4 points]	8, 13, 14, 30 [9 points]	9, 13, 26 [6 points]	41, 46, 52 [5 points]

The focus of the exam is funding methods for plans (the first two topics listed in the chart), with the emphasis on plans that are sponsored by single employers (the first topic).

All of the remaining topics are, in some way, elements of the actuarial valuations that produce minimum funding levels for the year. For this reason, this study guide will focus only on the actuarial valuation and funding methods. The remaining topics will be covered as results of such funding methods. The study and knowledge of proper actuarial valuation methods – under PPA for single employer plans and under pre-PPA ERISA for multiemployer plans – is the critical feature being tested by the JBEA through the EA-2F exam.

The exam is four hours long, and the point values of all questions total 160 points. Each point theoretically represents about $1^1/_2$ minutes of exam time. The exam contains several true/false questions worth one point, meaning they should take no more than about $1^1/_2$ minutes of consideration. The other questions involve calculations and are scored between 2 (3 minutes) and 5 (about $7^1/_2$ minutes) points.

Structure of this book

Chapters 1 through 5 of this book will comprise describe the funding method for single employer plans mandated by PPA in a piece by piece fashion. Although some of the issues discussed in the first five chapters will apply to multiemployer plans as well as singe employer, the principal aim of chapters 1-5 is to get the candidate, through a process of repetition, thoroughly versed in the aspects of the PPA valuation method. This book will focus on the names, definitions, and interactions of the various terms used under the method, acceptable asset valuation methods under PPA, and the nuances of calculating the amounts needed to meet the minimum required contribution requirements of the PPA method.

Chapters 6 and 7 will discuss maximum deduction limits and at-risk plan rules as they apply to single employer plans (deduction limits for multiemployer plans will be discussed later – at-risk funding rules do not apply to multiemployer plans).

Chapters 8, 9, and 10 will discuss minimum funding rules for multiemployer plans, including various actuarial cost methods not contained in PPA, and the costs and credits applied in maintaining the Funding Standard Account for a multiemployer plan from year to year.

Chapters 11 and 12 correspond to chapters 6 and 7 for single employer plans. These two chapters will discuss the maximum deduction rules as they apply to multiemployer plans, and the rules regarding critical and endangered status of such plans when they are underfunded (as opposed to "At-Risk," the term for an under funded single employer plan).

Each chapter will start with a discussion of the issues to be covered in that chapter, and may include questions and/or examples designed to illustrate the topics covered in the chapter. Review questions at the end of each chapter are taken from past exams. Past exams are an ample source of questions on these topics, and will introduce the reader to the format of questions given on the exam in past years.

The best preparation for future test questions, however, remains the questions that have been asked on the most recent prior exams. This book includes copies of the EA-2F exams given in November 2020, 2021, 2022, 2023, and 2024.

The book also contains solutions to the questions on the five exams. It is recommended that you take the previous exams under simulated exam conditions and within the exam time period.

Whether you simulate taking the prior exams under exam conditions or not, it is strongly recommended that you read through all of the detailed solutions to the questions on the three most recent exams. Keep in mind that the solutions are detailed and that they will explore different topics in a manner that should not be duplicated on the actual exam, for time reasons, but which will be very helpful in describing to the student the way that a small change in the question would affect the manner in which the answer is arrived at.

Many exam questions hinge on one or more small points in the law which, for space reasons, cannot all be discussed in depth in the book's text, but can be addressed in the context of a specific exam solution. Learning methodology in the book's chapters and sample questions and answers is helpful, but seeing the methodology applied to actual examples of questions from previous exams will be the most productive form of studying. Once you are thoroughly familiar with the types of questions asked, the answers to the questions, and, most importantly, the *reasons* the answers are correct, you will be ready to take and pass the 2025 examination.

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Part I

The PPA Funding Method for Single Employer Sponsored Plans

Chapter 2

Funding Target and Target Normal Cost

The definitions of FT and TNC both involve the present value of benefits as of the plan's valuation date. For the simple plan design that a candidate can expect to see on the exam, both values can be found by multiplying the participant's benefit amount by a present value factor. The FT benefit amount is the actual accrued benefit under the plan formula at the start of the plan year. The TNC benefit amount is the end of year benefit minus the beginning of year benefit used to calculate the FT. Since both the FT and TNC are determined *as of* the same date (the plan's valuation date), the present value factor is the same for both determinations.

Determining Benefits

Typically, the primary benefit under a defined benefit plan described in an exam question will be expressed as a formula equal to a dollar amount or percentage of compensation (or average compensation, see the examples below) multiplied by a participant's years of service. In determining the plan benefits, compensation is limited under Code section 401(a)(17). Benefits are also limited to the maximum benefits under Code §415.

Knowledge of 401(a)(17) compensation limits and 415 benefit limits are included in the syllabus of exam EA-2L. These topics will not be covered in this book, but some answers to prior exam questions will hinge on these topics, and they will be explained in the solutions as a refresher of the EA-2L topics.

For the exam, the default provisions regarding such a benefit are that such benefit is a monthly life annuity beginning at the plan's Normal Retirement Age of 65, and that a participant enters the plan on date of hire (so that years of plan participation are equal to total years of service) and all years count for benefit service accrual. The questions also assume that the actuary in performing the plan valuation assumes these default provisions.

Keep in mind that for this purpose (as well as all other purposes on the exam) all of the default provisions may be changed, if such a change is implied or stated directly in the question. Of course, any exam question that specifies a change to the default provisions will include all information necessary to calculate the solution under the changed provisions.

IRS regulation 1.430(d)-1(d) contains rules regarding the amendment of provisions in a plan document, based on the amendment's adoption date and effective date. If an amendment is adopted prior to the plan's valuation date, and the effective date of such amendment is any time during the plan year, then the provisions of such amendment MUST be taken into account for purposes of determining the valuation FT and TNC. If an amendment is adopted after the plan valuation date, but no more than $2\frac{1}{2}$ months after the end of the plan year, then the employer MAY (but is not required to) make a

412(d)(2) election (named for the Code section that permits such retroactive amendments) to apply such amendment in determining the plan's FT and TNC. One other condition is that the amendment's effective date must be no later than the first day of the plan year to qualify for the 412(d)(2) election.

If the 412(d)(2) election is not made, then the amendment is not considered in determining the FT and TNC. An amendment that is made more than $2^1/_2$ months after the end of a plan year must not be taken into consideration in determining FT and TNC, and an amendment that is effective after the end of the plan year is also not taken into consideration.

For all purposes in the above paragraph, an amendment cannot be considered to be effective if it is prohibited from taking effect due to AFTAP restrictions under Code §436(c). Rules regarding the AFTAP are discussed further in Chapter 5.

Examples

Determine the benefit amount to be used for calculating the FT and TNC attributable to the participant described. In all cases, assume that the years given are years of service, years of plan participation, and years of service for benefit accrual. Compensation for benefit accrual is the compensation earned in the most recent year, there is no averaging of compensation over more than one year (this is not a usual plan provision, it is far more common in actual plans to see compensation averaged over a period of not less than 3 years, however, this is a quite common "shortcut" for averaging compensation on exam questions).

1. 1/1/2008 valuation. Benefit formula = 5% times compensation times years of service. Assumed salary scale = 4%. Participant has 2007 compensation of $100,000, and 10 years of service on 1/1/2008.

2. 1/1/2009 valuation. Benefit formula = 5% times compensation times years of service, but the plan is amended during the plan year to increase the formula to 6% times compensation times years of service. The amendment is effective 1/1/09, and the employer makes the election under 412(d)(2) regarding the amendment. Assumed salary scale = 4%. Participant has 2008 compensation of $100,000, and 10 years of service on 1/1/2009.

3. 1/1/2009 valuation. Benefit formula = 5% times compensation times years of service. Assumed salary scale = 4%. Participant has 2008 compensation of $250,000, and 10 years of service on 1/1/2009.

4. 1/1/2009 valuation. Benefit formula = 10% times compensation times years of service. Assumed salary scale = 4%. Participant has 2008 compensation of $200,000, and 2 years of service on 1/1/2009.

5. 1/1/2010 valuation. Benefit formula = $50 per month times years of service. Participant has 2009 compensation of $100,000, and 12 years of service on 1/1/2010.

6. 1/1/2010 valuation. Benefit formula = 50% of compensation at retirement age. Benefits are accrued on a fractional basis for all years of service. Participant has DOB = 1/1/1950; DOH = 1/1/1990; compensation of $100,000.

Solutions

1. BOY benefit = \$100,000 × 5% × 10 = \$50,000 annually

   EOY benefit = \$100,000 × 1.04 × 5% × 11 = \$57,200 annually

   For FT, the benefit to use is \$50,000/yr.

   For TNC, the benefit to use is \$57,200 − \$50,000 = \$7,200/yr.

   Notice that part of the benefit increase is due to the additional year of service, part is due to the assumed increase in compensation. The assumed increase in compensation increases both the current year accrual, and the accrual that is attributable to service performed in the year's prior to the valuation date. However, all of the benefit increase is considered in determining the TNC, and none of the increase is allocated to the FT benefit. This is mandatory under the definition of TNC in IRC §430(b).

2. Because the amendment was timely signed before the date 2½ months following the end of the plan year, and the employer made a 412(d)(2) election with regard to the amendment, the valuation may take this amendment into account for all purposes as if it were adopted on the first day of the plan year.

   BOY benefit = \$100,000 × 6% × 10 = \$60,000 annually

   EOY benefit = \$100,000 × 1.04 × 6% × 11 = \$68,640 annually

   For FT, the benefit to use is \$60,000/yr.

   For TNC, the benefit to use is \$68,640 − \$60,000 = \$8,640/yr.

   The note about benefit increases in question 1 applies here as well, but the amendment, since it is recognized as being adopted at the start of the year, increases both the FT and TNC benefit. Also, the question data made no mention of the plan's AFTAP for 2008 or 2009, and so the default assumption is that there is no restriction preventing the adoption or application of the amendment.

3. The prior year compensation is greater than the §401(a)(17) dollar limit for both the prior and the current year. The considered compensation at the start of the plan year must be limited to the prior year maximum limit, and the assumed compensation at the end of the year must be limited to the current year's maximum.

   BOY benefit = \$230,000 × 5% × 10 = \$115,000 annually

   EOY benefit = \$245,000 × 5% × 11 = \$134,750 annually

   For FT, the benefit to use is \$115,000/yr.

   For TNC, the benefit to use is \$134,750 − \$115,000 = \$19,750/yr.

   Again, the increase in benefit that is attributable to the increase in considered compensation is included entirely in the TNC, even when the increase is due to a change by law to the 401(a)(17) compensation limit rather than a salary scale assumption.

4. By the plan formula:

   BOY benefit = \$200,000 × 10% × 2 = \$40,000 annually

   EOY benefit = \$208,000 × 10% × 3 = \$62,400 annually

   However, the employee is limited to the 2009 maximum benefit under §415 for 2009 of \$195,000, reduced by one tenth for each year of participation less than 10. The §415 reduced benefits are:

   BOY benefit = \$195,000 × 2/10 = \$39,000 annually

   EOY benefit = \$195,000 × 3/10 = \$58,500 annually

   For FT, the benefit to use is \$39,000/yr.

   For TNC, the benefit to use is \$58,500 − \$39,000 = \$19,500/yr.

   In this case, there is no increase attributable to the increase in compensation, since both the BOY and EOY accrued benefit are limited by the §415 dollar limit and not by compensation. Also, note that the 2009 dollar limit under §415 is applied to limit both the beginning and end of year accrued benefit, since both benefits represent benefits in 2009. The 2008 §415 limit is not used to limit the start of year benefit. Contrast this to the use of the 2008 compensation limit to reduce the benefit at the start of 2009 in question 3, since the start of year benefit is based on prior year compensation.

   In this example, the benefit increase for TNC is equal to exactly 10% of the §415 dollar limit, corresponding to the 10% of limit increase (from 20% to 30%) due to one additional year of service. This does not mean that the benefit for TNC can never be larger than 10% of the §415 dollar limit. For example, if in this question, the plan formula yielded a BOY benefit of \$30,000 and an EOY benefit of \$50,000, the benefit increase used to calculate the TNC would be \$20,000. Since both the BOY and EOY benefits are less than the maximum benefit under §415, the fact that the increase is greater than 10% of the §415 dollar limit is not an issue.

5. BOY benefit = \$50 × 12 = \$600 monthly = \$7,200 annually

   BOY benefit = \$50 × 13 = \$650 monthly = \$7,800 annually

   For FT, the benefit to use is \$7,200/yr.

   For TNC, the benefit to use is \$7,800 − \$7,200 = \$600/yr.

   In this example, the participant's compensation is given, but is not needed (neither is an assumed salary scale, not provided in the question), since the benefits are not based on compensation. Exam questions may also give information that is not needed to solve the question. For this example, the monthly benefit was converted to an annual benefit, because exam questions typically provide information used to determine the present value factor with regard to an annual annuity amount, even though the annuity is assumed to be paid monthly.

6. Participant enters plan at age 40 (default assumption is Date of Hire = Date of Plan Entry). Normal retirement is at age 65 (default assumption), and the participant will have 25 years of service at this time (default assumption is that all years of service count for benefit accrual).

   BOY benefit = \$100,000 × 50% × 20/25 = \$40,000 annually

   EOY benefit = \$100,000 × 50% × 21/25 = \$42,000 annually

For FT, the benefit to use is \$40,000/yr.

For TNC, the benefit to use is \$42,000 − \$40,000 = \$2,000/yr.

A specific salary scale provision is not provided in the question data, and so it must be assumed that there is no salary scale used on the valuation. This example shows how the default assumptions can allow a test question to be valid even with a minimum of data provided. This example also shows that knowledge of allowable accrual methods under ERISA (the fractional method in this example) are covered on the EA-2L exam and knowledge of them is presumed for this exam.

Present Value Factors

The present value factor is determined using a combination of three "segment" interest rates. Benefits expected to be paid within five years of the plan's *valuation date* are determined using the first segment interest rate. Benefits expected to be paid within the next fifteen years (five to twenty years after the valuation date) are determined using the second segment interest rate. And benefits expected to be paid at any time thereafter (more than 20 years after the valuation date) are determined using the third segment interest rate.

You should notice that in cases where no benefits are scheduled to be paid less than 20 years in the future, only the third segment interest rate will be used. This type of situation greatly reduces the number of manual calculations required to compute a present value factor, and is often used on actual exam questions to simplify the results. See questions 7. a. and 8. a. below for examples of this situation.

Notice that these rates are not cumulative, as might be expected in other areas of actuarial practice. For example, to determine the present value of a benefit payment 15 years in the future, the payment is not discounted at the second segment interest rate for ten years, and then at the first segment rate for the remaining five years. The entire discount is at the second segment rate for the entire 15 years.

Also, note that the interest rates used to value payments are determined based on the length of time from the calculation date (the valuation date) and not with regard to the payment start date. For example, if a participant is age 63 on the valuation date and benefits are to begin at age 65, the payments valued at the first interest rate are the annuity payments expected to be made from age 65 to 68 of the participant, not from age 65 to 70.

Prior to the 2014 examination, exam questions would frequently ask candidates to calculate a present value factor using commutation functions given within the question. Beginning with the 2014 exam, however, the materials provided at the start of the exam included lists of commutation functions for ages 60 to 85 at different interest rates for both male and female plan participants. The tables for the exam are published in the JBEA Examination Program Booklet.

The tables remained unchanged from 2014 to 2016 and then changed in 2017. All of the examples below, and the questions on the exams reproduced in this book, are based on these tables which are reproduced at the end of this book. The tables included in the 2018 Examination Booklet have not changed from 2017. You should download the booklet to become familiar with the changes in the new tables for 2018.

The tables provided for the exam are split into Male and Female tables. Generally, plans may not discriminate in favor of either men or women. For example, a lump sum distribution from the plan is calculated using a unisex table (defined in Code §417(e)) so that the payment is the same whether the participant is male or female. However, for purposes of funding, plans may and in most cases are required to use gender specific tables to calculate present value factors for determining the FT and TNC (small plans are permitted to use unisex tables for funding).

If an exam question specifies that a participant is either male or female, the question is probably directing you to use these provided mortality tables. Otherwise, there would be no need to specify the gender of the participant.

The following examples will give you some practice using the tables. For all examples, the valuation segment rates are 5%, 6%, and 7%. Additional information for ages under 60 is given.

Present Value Calculations

7. For purposes of the valuation, the actuary assumes that all participants will work to age 65, and then receive their benefits as a monthly annuity beginning at age 65. There is a pre-retirement death decrement, but no other decrements prior to retirement age 65. Calculate the present value of the future annuity payment on this valuation for a Male participant whose age on the valuation date is:

   a. 40 $D_{40|5\%} = 140{,}634$, $D_{40|6\%} = 96{,}256$, $D_{40|7\%} = 66{,}117$

   b. 55 $D_{55|5\%} = 66{,}504$, $D_{55|6\%} = 39{,}485$, $D_{55|7\%} = 23{,}559$

   c. 62

   d. 65

8. Assume a valuation with the same assumptions as question 7, but this time with no pre-retirement death decrement, or pre-retirement increments of any other kind. How does this affect the present value factor for a Male participant at the age:

   a. 40 $D_{40|5\%} = 140{,}634$, $D_{40|6\%} = 96{,}256$, $D_{40|7\%} = 66{,}117$

   b. 55 $D_{55|5\%} = 66{,}504$, $D_{55|6\%} = 39{,}485$, $D_{55|7\%} = 23{,}559$

   c. 62

   d. 65

Notice the difference in the techniques to calculate a present value factor in questions 7 and 8. Questions on the exam will frequently state that the valuation either does or does not include a pre-retirement mortality assumption. Therefore, it is important that you understand and be able to apply both methods.

Solutions

7. a. Every payment to this participant is more than 20 years in the future, so all calculations are done using the third segment rate commutation factors. The payments begin at age 65, so the formula is simply:

   $N_{65}^{(12)}/\ D_{40} = 116{,}056/66{,}117 = 1.7553$

   b. Payments from age 65 to 75 are valued at the second segment rate, and those after 75 are valued at the third segment rate:

   6%: $(N_{65}^{(12)} - N_{75}^{(12)})/\ D_{55} = (230{,}685 - 79{,}878)/39{,}485 = 3.8193$

   7%: $N_{75}^{(12)}/\ D_{55} = 37{,}386/23{,}559 = 1.5869$

   Present value factor $= 3.8193 + 1.5869 = 5.4062$

   c. Payments from age 65 to 67 are valued using the first segment interest rate, payments from age 67 to 82 are valued using the second segment interest rate, and payments after age 82 are valued using the third segment interest rate, as follows:

   5%: $(N_{65}^{(12)} - N_{67}^{(12)})/\ D_{62} = (463{,}348 - 389{,}761)/45{,}973 = 1.6007$

   6%: $(N_{67}^{(12)} - N_{82}^{(12)})/\ D_{62} = (191{,}293 - 28{,}104)/25{,}543 = 6.3888$

   7%: $N_{82}^{(12)}/\ D_{62} = 12{,}501/14{,}271 = 0.8760$

   Present value factor $= 1.6007 + 6.3888 + 0.8760 = 8.8655$

   d. Payments from age 65 to 70 are valued using the first segment interest rate, payments from age 70 to 85 are valued using the second segment interest rate, and payments after age 85 are valued using the third segment interest rate, as follows:

   5%: $(N_{65}^{(12)} - N_{70}^{(12)})/\ D_{65} = (463{,}348 - 294{,}765)/38{,}875 = 4.3365$

   6%: $(N_{70}^{(12)} - N_{85}^{(12)})/\ D_{65} = (141{,}617 - 15{,}698)/20{,}994 = 5.9979$

   7%: $N_{85}^{(12)}/\ D_{65} = 6{,}827/11{,}403 = 0.5987$

   Present value factor $= 4.3365 + 5.9979 + 0.5987 = 10.9331$

8. The above calculations are changed by the fact that the D_x factors at current age are no longer relevant to the calculation, since there is no pre-retirement mortality considered. Instead, the annuity purchase rate is determined at the annuity start date using the D_r factor at assumed retirement age of 65. The age 65 present value factors are then reduced by interest only (using the appropriate segment rate) to the participant's age on the current valuation. The revised calculations are as follows:

   a. Again, only the third segment rate is considered, since no benefit payment occurs less than 20 years after the valuation date:

   7%: $N_{65}^{(12)}/\ D_{65}/1.07^{25} = 116{,}056/11{,}403/1.0725 = 1.8752$

b. 6%: $(N_{65}^{(12)} - N_{75}^{(12)})/\ D_{65}/1.06^{10} = (230{,}685 - 79{,}878)/20{,}994/1.06^{10} = 4.0111$

7%: $N_{75}^{(12)}/\ D_{65}/1.07^{10} = 37{,}386/11{,}403/1.07^{10} = 1.6667$

Present value factor $= 4.0111 + 1.6667 = 5.6778$

c. 5%: $(N_{65}^{(12)} - N_{67}^{(12)})/\ D_{65}/1.05^{3} = (463{,}348 - 389{,}761)/38{,}875/1.05^{3} = 1.6352$

6%: $(N_{67}^{(12)} - N_{82}^{(12)})/\ D_{65}/1.06^{3} = (191{,}293 - 28{,}104)/20{,}994/1.06^{3} = 6.5265$

7%: $N_{82}^{(12)}/\ D_{65}/1.07^{3} = 12{,}501/11{,}403/1.07^{3} = 0.8949$

Present value factor $= 1.6352 + 6.5265 + 0.8949 = 9.0566$

d. Because the participant has already reached age 65 in question d., there is no pre-retirement decrement of any kind to be modified from the prior question 7. Therefore, the present value factor in situation d. of question 8 is the same as the answer in part d. of question 7.

As expected in answers a through c, the present value is greater in the example that does not include the decrement for pre-retirement death. This is equivalent to the difference between a plan that provides no benefit in the event that a participant dies prior to the annuity starting date and a plan that provides a beneficiary payment equal to the actuarial equivalent of the future annuity, with the value of the benefit of the second plan clearly being more valuable.

Using Benefits and PV Factors to Determine FT and TNC

After the techniques above are used for valuing benefits and present value factors, the actual FT and TNC generated by a single participant can be found by simply multiplying the benefit by the present value factor.

9. Assume the participant in question 1 above is 40 years old, and the benefit present value is calculated according to the method in question 8. Determine the FT and the TNC for this participant.

   Frequently, an exam question will ask you to determine a FT and/or a TNC based on a weighted average of more than one retirement scenario with a defined probability,

10. Assume the same facts as in question 9, except that not all participants are assumed to work to age 65. Instead, an employee can elect an early retirement at age 63 or 64 with a 6% reduction in benefits per year actual retirement precedes normal retirement. It is assumed that 40% of participants will take early retirement at age 63, and 40% of those remaining will retire at age 64. The remainder will retire at age 65. Calculate the FT and TNC for the same 40 year old participant.

Solutions

9. From question 1, the benefit at the start of the year is \$50,000, and the benefit increase for the year is \$7,200. From question 8 above, the present value factor for a 40 year old participant is 1.8752. For this participant, the valuation FT and TNC are:

   FT: $\$50{,}000 \times 1.8752 = \$93{,}760$

   TNC: $\$7{,}200 \times 1.8752 = \$13{,}501$

10. Both the BOY accrued benefit and the increase in benefit for the year are reduced by 6% per year. The FT and TNC are determined assuming a retirement at age 63 and 64 in the same way the numbers above were calculated for age 65:

    Age 64: BOY accrued benefit $= \$50{,}000 \times (1 - .06 \times 1) = \$47{,}000$

    Expected increase in accrued benefit $= \$7{,}200 \times (1 - .06 \times 1) = \$6{,}768$

    PV Factor: $N_{64}^{(12)} / D_{64} / 1.07^{24} = 127{,}945/12{,}301/1.07^{24} = 2.0506$

    FT: $\$47{,}000 \times 2.0506 = \$96{,}378$

    TNC: $\$6{,}768 \times 2.0506 = \$13{,}878$

    Age 63: BOY accrued benefit $= \$50{,}000 \times (1 - .06 \times 2) = \$44{,}000$

    Expected increase in accrued benefit $= \$7{,}200 \times (1 - .06 \times 2) = \$6{,}336$

    PV Factor: $N_{63}^{(12)} / D_{63} / 1.07^{23} = 140{,}764/13{,}257/1.07^{23} = 2.2399$

    FT: $\$44{,}000 \times 2.2399 = \$98{,}556$

    TNC: $\$6{,}336 \times 2.2399 = \$14{,}192$

    From the data given in the question, the employee has a 40% chance of retiring at age 63, a $(1 - .40) \times .40 = 24\%$ chance of retiring at age 64, and a $(1 - .40) \times (1 - .40) \times 1.00 = 36\%$ chance of retiring at age 65. Weighting the above amounts by these probabilities provides the following calculations:

    FT: $(\$98{,}556 \times 40\%) + (\$96{,}378 \times 24\%) + (\$93{,}760 \times 36\%) = \$96{,}307$.

    TNC: $(\$14{,}192 \times 40\%) + (\$13{,}878 \times 24\%) + (\$13{,}501 \times 36\%) = \$13{,}868$.

This example is a fair representation of the type of question which has been asked on past exams. You can see that the large number of calculations required for this type of problem would cause this question to take some time under exam conditions, and thus could be expected to be assigned a high point value on the exam. You can also see how the use of a participant who is more than 20 years from receiving his first benefit payment means that only the third segment interest rate is used, and this greatly reduces the number of calculations that would otherwise be required to solve this problem.

Effective Interest Rate (EIR)

Effective Interest Rate is a term defined in IRC §430(h)(2)(A) as the single interest rate which, if it were applied at all time periods, would produce the same FT as the three segment rates. The term will be used throughout the book interchangeably with the abbreviation EIR. The EIR can be thought of as a weighted average of the three segment rates. By definition, the EIR must be no less than the lowest of the three segment interest rates, and no greater than the largest segment rate.

Example

Suppose a plan has only two participants, each expected to be paid a single lump sum payment in the future. For purposes of computing the FT, Participant 1 will receive a payment of $250,000 three years after the valuation date, and Participant 2 will receive $50,000 on a date 22 years after the valuation date. The three segment interest rates are 5%, 6%, and 7%.

The funding target is calculated as $(\$250{,}000/1.05^3) + (\$50{,}000/1.07^{22}) = \$227{,}245$. The effective interest rate is the interest rate which could replace both 5% and 7% in the previous equation and produce the same result. That is, $(\$250{,}000/(1+\text{EIR})^3) + (\$50{,}000/(1+\text{EIR})^{22}) = \$227{,}245$. Using either algebraic techniques or simple trial and error will allow you to produce the result EIR = 5.61% (Note, the EIR is always rounded to the nearest hundredth of one percent).

Obviously, the calculations for EIR can become quite extensive in the case of annuity payments and plans with hundreds or thousands of participants, rather than two. Such effective interest rate determinations can only be performed using computer software designed for such a task, and any questions regarding EIR on the exam will be restricted to simple examples such as the one above.

Segment Interest Rates

As mentioned above, the three segment interest rates are the rates for benefits due within five years, in five to twenty years, and over twenty years. The rates are based on rates actually being paid on high grade corporate bonds for each of these three periods. These rates can and do change from month to month. Each month, the IRS will release segment interest rates for that month, as well as a 24-month average of such rates. The current rates are used to determine the value of lump sum benefits under 417(e) (this topic is tested on the EA-2L exam), and the 24 month average of such rates produce the three segment rates that are used for funding.

For funding purposes – in other word, to determine the FT and TNC – the plan sponsor is permitted to use the 24 month average interest rates for the month in which the plan valuation occurs, or for any of the four months prior to that month. The month to be used is stated in the written plan document. Once selected, the choice of month to use is a part of the plan's "funding method" and may only be changed with the permission of the IRS.

A plan sponsor may also elect to use a full yield curve, rather than the three segment rates. Under the full yield curve, the IRS publishes a separate interest rate for each year and half year, and every future benefit expected to be paid is reduced by the interest rate corresponding to the expected payment date. Because of the large number of calculations that would be required in using the full yield curve for a plan with a large number of participants, (the PPA law anticipates it would only be used with computer software), exam questions will typically use the segment rates only. Be aware, however, that the yield curve is an option allowed under PPA.

When PPA was passed, it was reasonable to assume that the three segment rates might hover around 5%, 6%, and 7%. After the stock market drop in 2008, however, the nation entered a period of much lower interest rates, with segments of around 1.5%, 3.5%, and 4.5% becoming much more common.

Lower interest rates produced higher mandatory funding contributions – since contributions can be expected to earn less in future years, the contributions themselves must be larger to meet funding targets. In order to ease the financial burden of larger contributions on plan sponsors (so that sponsors would not be encouraged to terminate their defined benefit plans), Congress modified PPA, starting in the 2012 funding year, to allow FT and TNC to be calculated with higher interest rates, producing lower present values for funding.

Congress changed the way segment rates for producing FT and TNC are calculated when it passed the Moving Ahead for Progress in the 21st Century Act (MAP-21). Later, Congress modified the rules again with the Highway and Transportation Funding Act (HATFA). The changes made by these two laws are discussed in more detail in Chapter 6.

In simplified terms, the effect of these two laws is to create a second set of three segment interest rates to be used on actuarial valuations. This new set of segment interest rates (called "adjusted" interest rates under the law and on the exam) produces a smaller FT and TNC for calculating mandatory minimum plan contributions. The segment rates calculated under the unmodified terms of PPA produce a larger FT and TNC, and these values are used to determine the maximum deductible contribution amounts each plan year. Examples in Chapter 6 will demonstrate the actual effects of the MAP-21 and HATFA law changes.

Review Questions

2-1. A plan was amended in December 2010 to increase benefits effective 7/1/2011 and 7/1/2012.

Neither increase is precluded by IRC section 436.

Consider the following statement:

> For the 1/1/2011 valuation, the 7/1/2011 increase must be included and the 7/1/2012 increase must not be included in the funding target and target normal cost.

Is this statement true or false?

(A) True

(B) False

2-2. Interest rates: Segment rates (5%, 6%, 7%).

Expected benefit payments at the beginning of the year for all years:

Year	Expected Benefit Payments
1	$ 1,000
2	0
3	0
4	0
5	$ 5,000
6	0
7	0
8	0
9	$19,500
10	0

In what range is the effective interest rate for 2008?

(A) Less than 5.20%

(B) 5.20% but less than 5.45%

(C) 5.45% but less than 5.70%

(D) 5.70% but less than 5.95%

(E) 5.95% or more

2-3. This question consists of an assertion in the left-hand column and a reason in the right-hand column.

Assertion	**Reason**
It is not necessary to consider the probability of participants electing a lump sum option when setting the assumptions for determining minimum funding requirements.	The funding target cannot reflect the interest rate subsidy, if any, inherent in lump sum distributions.

Which of the following statements is true?

(A) Both the assertion and the reason are true statements and the reason is a correct explanation of the assertion.

(B) Both the assertion and the reason are true statements and the reason is NOT a correct explanation of the assertion.

(C) The assertion is a true statement, but the reason is a false statement.

(D) The assertion is a false statement, but the reason is a true statement.

(E) Both the assertion and the reason are false statements.

2-4. The plan sponsor is considering the following plan changes to be adopted before 1/1/2011.

- **Scenario A** amends the retirement benefit formula to increase the dollar multiplier from \$30 to \$40 for service earned after 8/1/2011.
- **Scenario B** amends the retirement benefit formula to cease the dollar multiplier of \$30 for all benefit accruals after 8/1/2011 (i.e., freeze all benefit accruals on 7/31/2011).
- **Scenario C** amends the retirement benefit formula to increase the dollar multiplier from \$30 to \$40 for all years of service if the participant earned an hour of service on or after 8/1/2011.

The plan amendments are permitted under IRC section 436(c).

Define the following items:

TNC-**A** = the 2011 target normal cost for Scenario A.

TNC-**B** = the 2011 target normal cost for Scenario B.

TNC-**C** = the 2011 target normal cost for Scenario C.

Which of the following statement is true?

(A) TNC-**A** > TNC-**B** > TNC-**C**

(B) TNC-**A** > TNC-**C** > TNC-**B**

(C) TNC-**C** > TNC-**A** > TNC-**B**

(D) TNC-**C** > TNC-**B** > TNC-**A**

(E) The correct answer is not given by (A), (B), (C), or (D) above.

2-5.
- A defined benefit plan has mandatory employee contributions of 1.0% of pay.
- There is no funding standard carryover balance or prefunding balance as of 1/1/2011.
- Plan-related expenses expected to be paid from plan assets during the 2011 plan year: $104,000.
- The plan was exempt from establishing a shortfall amortization base in all years before the 2011 plan year.
- Selected valuation results as of 1/1/2011:

Total plan compensation for all employees	$10,000,000
Actuarial (market) value of assets	$34,100,000
Funding target	$33,900,000
Target normal cost (before adjustment for expenses and employee contributions)	$ 1,615,000

In what range is the **minimum required contribution** for 2011?

(A) Less than $1,400,000

(B) $1,400,000 but less than $1,500,000

(C) $1,500,000 but less than $1,600,000

(D) $1,600,000 but less than $1,700,000

(E) $1,700,000 or more

2-6.
- Normal retirement benefit: $10 per month times years of service.
- Valuation interest rates:

Segment rates	(5%, 6%, 7%)
Effective rate	5.75%

- Data for active participants as of 1/1/2008:

Number	Age	Service
100	50	20

- Funding target as of 1/1/2008 attributable to inactive plan participants: $750,000.

- Selected commutation values:

	5.00% Interest		6.00% Interest		7.00% Interest	
Age	N_x	D_x	N_x	D_x	N_x	D_x
65	4,108	368	2,052	199	1,035	108
70	2,534	263	1,220	136	593	70
85	292	59	126	26	55	12

In what range is the funding target as of 1/1/2008?

(A) Less than $1,620,000

(B) $1,620,000 but less than $1,650,000

(C) $1,650,000 but less than $1,680,000

(D) $1,680,000 but less than $1,710,000

(E) $1,710,000 or more

2-7.
- Normal retirement benefit: 1.5% of final compensation for each year of service.
- Early retirement eligibility: Age 62 with 20 or more years of service.
- Early retirement reduction: 6.0% per year before age 65.
- Valuation assumptions:

Segment rates	{4.0%, 6.0%, 8.0%}
Retirement rates	25% at age 62
	100% at age 65
Pre-retirement mortality	None

- Data for participant Smith:

Date of birth	1/1/1951
Date of hire	1/1/1981
2010 compensation	$100,000

- Selected commutation functions:

	Segment rate 1		Segment rate 2		Segment rate 3	
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$
60	4,990	65,080	2,830	33,650	1,610	17,600
62	4,460	55,610	2,480	28,330	1,390	14,600
65	3,750	43,270	2,030	21,570	1,100	10,870
80	1,190	7,920	560	3,530	260	1,590

In what range is the 1/1/2011 funding target for Smith?

(A) Less than $340,000

(B) $340,000 but less than $365,000

(C) $365,000 but less than $390,000

(D) $390,000 but less than $415,000

(E) $415,000 or more

2-8.
- Plan effective date: 7/1/2001.
- Plan year: 7/1 - 6/30.
- Normal retirement benefit: 6.0% of highest 5 consecutive year average compensation for each year of service.
- Valuation date: 7/1/2011.
- Segment rates: {5.0%, 6.0%, 6.5%}.
- Pre-retirement mortality: None.
- Data for sole plan participant Smith:

Date of birth 7/1/1961

Date of hire 7/1/2001

Plan year end	Compensation	Plan year end	Compensation
6/30/2006	$230,000	6/30/2009	$210,000
6/30/2007	$215,000	6/30/2010	$250,000
6/30/2008	$230,000	6/30/2011	$200,000

- Selected commutation functions:

	Segment rate 1		Segment rate 2		Segment rate 3	
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$
50	85,511	1,401,273	53,234	781,250	42,073	586,334
60	51,213	713,162	28,999	368,975	21,866	266,552
65	38,821	482,841	20,965	240,861	15,440	170,799
70	28,602	309,979	14,731	149,149	10,597	103,844

In what range is the funding target as of 7/1/2011?

(A) Less than $575,000

(B) $575,000 but less than $595,000

(C) $595,000 but less than $615,000

(D) $615,000 but less than $635,000

(E) $635,000 or more

2-9.
- Valuation date: 1/1/2011.
- Segment rates for 2011: {5.0%, 6.0%, 7.0%}.
- Data for participant Smith:

Date of birth	1/1/1944
Date of retirement	1/1/2009
Monthly benefit amount	$1,000
Benefit form	10-year certain and life

- Selected commutation functions:

	Segment rate 1		Segment rate 2		Segment rate 3		Effective interest rate	
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$
67	34,491	391,596	18,277	191,930	9,743	95,048	13,334	134,894
75	20,229	175,082	9,936	81,019	4,913	37,847	6,981	55,310
77	17,293	137,466	8,335	62,702	4,045	28,867	5,801	42,495
87	5,678	26,482	2,489	11,214	1,100	4,792	1,653	7,322

- Selected annuity certain factors (payable monthly) as of 1/1/2011:

	Segment rate	Effective interest rate
8-year	6.53	6.31
10-year	7.69	7.42

In what range is the funding target for Smith as of 1/1/2011?

(A) Less than $127,500

(B) $127,500 but less than $129,000

(C) $129,000 but less than $130,500

(D) $130,500 but less than $132,000

(E) $132,000 or more

2-10.
- Valuation date: 1/1/2009.
- Normal retirement benefit: $1,750 per year for each year of service.
- Early retirement eligibility: Age 55 with 25 years of service.
- Early retirement benefit: Unreduced immediate benefit.
- 2009 segment interest rates: (5.60%, 5.75%, 6.35%).
- Data for participant Smith:

Date of birth	1/1/1964
Date of hire	1/1/1994

- Selected post-retirement commutation functions:

	Segment 1		Segment 2		Segment 3	
Age	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x
55	494,928	36,155	450,843	33,440	386,161	29,367
65	221,321	19,724	199,375	17,985	167,616	15,426

- Retirement rates:

Age 55	50%
Age 65	100%

- There are no pre-retirement decrements.

In what range is the funding target for Smith as of 1/1/2009?

(A) Less than \$135,000

(B) \$135,000 but less than \$139,000

(C) \$139,000 but less than \$143,000

(D) \$143,000 but less than \$147,000

(E) \$147,000 or more

2-11.
- 2009 segment interest rates: (5.0%, 5.5%, 6.0%)
- Normal retirement benefit: \$100 per month for each year of service.
- Early retirement eligibility: Age 60 with 10 years of service.
- Early retirement benefit: Accrued benefit reduced by 7% for each year by which the benefit commencement age precedes age 65.
- Unreduced early retirement eligibility: Age 62 with 20 years of service.
- Data for sole participant:

Date of birth	1/1/1969
Date of hire	1/1/1999

- Probabilities of retirement and selected commutation functions:

Retirement		Segment 1		Segment 2		Segment 3	
Age	Rate	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x
60	25%	8,967	667	8,152	606	7,411	551
62	100%	7,699	599	6,999	544	6,363	495

- There are no pre-retirement decrements.

In what range is the funding target as of 1/1/2009?

(A) Less than \$39,000

(B) \$39,000 but less than \$44,000

(C) \$44,000 but less than \$49,000

(D) \$49,000 but less than \$54,000

(E) \$54,000 or more

2-12.
- Type of plan: Cash balance.
- Death benefit eligibility for unmarried participants: years of service.
- Death benefit: Account balance paid at end of year of death.
- Valuation date: 1/1/2010.
- Segment rates: {5.0%, 6.0%, 7.0%}.
- Selected assumptions:

  Future interest crediting rate 6%

  ${}_4p_{61} = 0.98237$
- Assumed form of payment Lump sum.
- No decrements before retirement other than mortality are assumed.
- Data for sole plan participant Smith as of 1/1/2010:

Age	61
Years of service	1
Account balance	$200,000
Marital Status	Single

In what range is the funding target for participant Smith as of 1/1/2010?

(A) Less than $192,000

(B) $192,000 but less than $197,000

(C) $197,000 but less than $202,000

(D) $202,000 but less than $207,000

(E) $207,000 or more

2-13.
- Normal retirement benefit: $100 per month per year of service.
- Segment rates: {5.0%, 6.0%, 7.0%}.
- Data for sole participant Smith:

Date of birth	1/1/1949
Date of hire	1/1/2000

- Selected commutation factors:

	Segment 1		Segment 2		Segment 3	
Age	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x
65	45,046	3,862	22,460	2,085	11,315	1,132
66	41,286	3,640	20,438	1,947	10,221	1,048
67	37,744	3,426	18,552	1,815	9,210	968
...						
80	8,188	1,275	3,666	597	1,656	282
81	6,971	1,147	3,099	532	1,390	249
82	5,880	1,024	2,595	471	1,155	218

In what range is the funding target as of 1/1/2010?

(A) Less than $95,000

(B) $95,000 but less than $100,000

(C) $100,000 but less than $105,000

(D) $105,000 but less than $110,000

(E) $110,000 or more

2-14. The applicable interest rate for a calendar year qualified defined benefit plan is based on the segment rates in effect for September before the plan year that contains the IRC section 417(e) lump sum distribution date.

Consider the following statement:

> The plan sponsor must use the September 2009 segment rates to determine the funding target at 1/1/2010.

Is the above statement true or false?

(A) True

(B) False

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Solutions to Review Questions – Chapters 1–13

Chapter 1

1-1. PPA specified that, beginning with the 2008 plan year, single employer defined benefit plans must use the first day of the plan year as the plan's valuation date. However, an exception was made for small plans (100 or fewer participants), which may use any day of the year as the plan valuation date (see IRC §430(g)(2)). So the question's statement is false in suggesting the rule applies to all plans.

ANSWER B

1-2. The determination of whether a funding balance is available for use in the current plan year is based on comparing the adjusted assets C to the funding target of the prior plan year. In this question, to determine if the funding balance is available in 2011, the adjusted assets C is determined for 2010. This is the actuarial value of plan assets reduced by the PFB, but not the COB ($90,000,000 − $5,000,000) = $85,000,000, or 85% of the 2010 funding target. Since this value is greater than 80%, the funding balance is available in 2011.

ANSWER A

NOTE: This question contains information regarding the 2011 assets, PFB, and COB, all of which are not relevant to answering the question. The key to answering the question is to remember that use of a credit balance in the current year is based on funding percentages from the prior year. Remember that exam questions may provide data for more than one year, even though only one year's data are needed to answer the question, and use of the incorrect year could produce an incorrect answer.

1-3. I. The determination of whether a plan is at-risk (see IRC §430(i)(4)) is based on the plan's 'funding target attainment percentage.' This term is defined in IRC §430(d)(2), and references assets as determined under §430(f)(4)(B) (what this book calls Adjusted Assets B). This Code section specifies that both the COB and PFB are subtracted from assets for this purpose. Statement I is True.

II. The determination of whether a plan is exempt from establishing a new shortfall amortization base is defined in IRC §430(c)(5), and references assets as determined under §430(f)(4)(A). This Code section specifies that only the PFB (and not the COB) be subtracted from assets for this purpose, and furthermore this subtraction is required only in cases where some portion of the PFB is applied to the plan's current year funding requirement. Statement II is False.

III. The determination of whether a plan is permitted to apply any existing COB or PFB to the current year's MRC is defined in IRC §430(f)(3)(C), and references assets as determined under §430(f)(4)(C). This Code section specifies that only the PFB (and not the COB) be subtracted from assets for this purpose. Statement III is False.

The True statement is I only. **ANSWER A**

1-4. I. 2010 adjusted assets C = \$1,000,000 − \$150,000 = \$850,000. 2010 funding ratio = \$850,000 / \$1,000,000 = 85%. The ratio is greater than 80%, and the 2011 balances can be applied against the 2011 MRC. Statement I is True.

II. 2010 adjusted assets B = \$1,000,000 − \$150,000 − \$100,000 = \$750,000, which is less than the 2010 FT. The plan is not fully funded in 2010, and the plan will be subject to quarterly contribution requirements in 2011. Statement II is True.

III. 2011 adjusted assets B = \$1,250,000 − \$300,000 − \$100,000 = \$850,000, which is less than the 2011 FT. The plan's 2011 funding shortfall is greater than \$0, and statement III is False.

Statements I and II only are True. **ANSWER A**

1-5. IRC §430(f)(5)(B) states that a defined benefit plan that has a COB greater than \$0 may not elect to use any portion of the PFB to reduce the MRC until such time as the COB is reduced to \$0.

Note that the plan sponsor could elect to reduce the MRC by both the COB and then the PFB. The question makes no reference to the prior year funding percentage and the exam default is to assume that the prior year percentage was at least 80% and the current year balances are available to apply against MRC. However, the question's use of the word or indicates the use of PFB alone must be allowed in order for the answer to be True.

The question, as written, is False. **ANSWER B**

1-6. This question requires the candidate to know the difference among the three methods of adjusting plan assets (referred to in the text as adjusted assets A, B, and C, based on the three subsections of Code section 430(f)(4)).

I – This statement is true if:

2009 Adjusted Assets C > 80% 2009 FT

2009 Actuarial Value of Assets minus 2009 PFB > 80% 2009 FT

\$25,500,000 − \$950,000 > 80% × \$25,000,000

\$24,550,000 > \$20,000,000

This statement is True, so I is True.

II – This statement is true if:

2010 Adjusted Assets A > 100% of 2010 FT

2010 Actuarial Value of Assets minus 2010 PFB (only because the question states that the plan will apply the COB and the PFB to MRC in 2010) > 100% of 2010 FT

\$32,600,000 − \$1,100,000 > 100% × \$32,500,000

\$31,500,000 > \$32,500,000

This statement is False, so II is False.

III – This statement is true if:

2009 Adjusted Assets B < 2009 FT

2009 Actuarial Value of Assets minus 2009 COB minus 2009 PFB < 2009 FT

$\$25{,}500{,}000 - \$1{,}250{,}000 - \$950{,}000 < \$25{,}000{,}000$

$\$23{,}300{,}000 < \$25{,}000{,}000$

This statement is True, so III is True.

Statements I and III only are True. **ANSWER B**

Chapter 2

2-1. This question references the rules on when benefit increases added to a plan by an amendment are considered in determining the plan's Funding Target and Target Normal Cost. These rules are addressed in IRS regulation 1.430(d)-1(d)(1). In this example, the amendment is adopted before the valuation date. The changes that are effective in the plan year containing the valuation date (in this case, those effective on 7/1/2011) are considered. Changes that are not effective during the year containing the valuation date (in this example, the changes effective 7/1/2012) are not considered. The statement as shown is True.

ANSWER A

2-2. The first payment at the start of year 1 is an immediate (unreduced) payment, the second payment, four years after the start of year 1 valuation date, is reduced at the first segment rate, and the final payment, eight years after the valuation date, is valued at the second segment rate. The value of the three payments, using the three segment rates, is:

$\$1{,}000 + (\$5{,}000/1.05^4) + (\$19{,}500/1.06^8) = \$17{,}348$

The question now becomes to determine an interest rate, i, such that:

$\$1{,}000 + (\$5{,}000 \times v^4) + (\$19{,}500 \times v^8) = \$17{,}348$

One way to solve this is to set $x = v^4$, and rearrange the terms to create the formula:

$\$19{,}500x^2 + \$5{,}000x + \$1{,}000 = \$17{,}348$

This can be solved with the quadratic formula with $a = 19{,}500$, $b = 5{,}000$, and $c = -16{,}348$.

Solving this gives $x = 0.7963464$, $v = .94465995$, and $i = 5.858197\%$

An alternative solution is to notice that the exact value is not needed, and that you can find the present value of the three payments using the single interest rate at the top of each answer range:

$i = 5.20\%$; $\$1{,}000 + (\$5{,}000 \times v^4) + (\$19{,}500 \times v^8) = \$18{,}081$

$i = 5.45\%$; $\$1{,}000 + (\$5{,}000 \times v^4) + (\$19{,}500 \times v^8) = \$17{,}798$

$i = 5.70\%$; $\$1{,}000 + (\$5{,}000 \times v^4) + (\$19{,}500 \times v^8) = \$17{,}521$

$i = 5.95\%$; $\$1{,}000 + (\$5{,}000 \times v^4) + (\$19{,}500 \times v^8) = \$17{,}249$

Since the desired solution of \$17,348 falls between the third and fourth equation results, the interest rate sought must fall between 5.70% and 5.95%. Both solution methods yield the correct solution of:

ANSWER D

Notes on Exam Solutions

The solutions given for all past exams show how the official correct answer was arrived at. This means that all of the solutions on the following pages reflect the law as it was written at the time the particular exam was given. The following sections containing the last four exams have no questions removed – the complete exam has been left intact to give you an idea of how much computation is involved and how much time it takes to complete a full test. Occasionally, an answer previously approved by the JBEA will not be correct under current law. For example, solutions on these exams may not reflect subsequent laws passed or final regulations later published by IRS.

Every question on the 2019 exam will reflect the current law. It is not recommended that you devote any study time to learning past law and when it changed to current law. If you plan to simulate taking past exams under exam conditions (strongly recommended as a valuable study aid), do not be discouraged if you arrive at a "wrong" answer using current law when the "correct" exam solution is based on a point of law that has since been revised.

The solutions given are detailed. All of the steps taken to arrive at a solution are shown for full explanation, and the solutions sometimes explore tangential issues that may not have direct bearing on the question at hand, but may be helpful to know for future exam questions. Due to the time constraints on the actual exam, it is not recommended that you work out every step in a solution. You will need to memorize the formulas and solve the questions quickly in order to complete the exam. The detailed solution methods given in this book should only be used as a study aid.

Often an exam questions will provide details about a plan participant. The participant is always named Smith (additional participants may be named Jones, Green, Brown, or other common surnames). Smith usually has a date of birth and date of hire of January 1st, so that all calculations on a first day of the year valuation date will be in whole numbers, eliminating the need to decide how to account for fractional years.

On many past exams, Smith was never referred to as 'he' or 'she,' and Smith had no first name. Since laws regarding pension plan participants are gender neutral, the question should not be affected by the gender of the participant. However, beginning with the 2014 exam, the preparation materials contain gender distinct commutation factors, reproduced in the previous pages of this book. For this reason, questions on the 2014 exam may state whether Smith is Male or Female. Questions that explicitly state the gender of Smith should be taken as an indication that the gender specific factors will be needed to answer the question and you should have the tables available to look up such factors.

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AMERICAN SOCIETY OF PENSION PROFESSIONALS AND ACTUARIES
JOINT BOARD FOR THE ENROLLMENT OF ACTUARIES
SOCIETY OF ACTUARIES

Enrolled Actuaries Pension Examination, Segment F

EA-2, Segment F

Date: Tuesday, November 5, 2019
Time: 8:30 a.m. – 12: 30 p.m.

INSTRUCTIONS TO CANDIDATES

1. Write your candidate number here _____. Your name must not appear.

2. Do not break the seal of this book until the supervisor tells you to do so.

3. Special conditions generally applicable to all questions on this examination are found at the front of this book.

4. All questions should be answered in accordance with laws, rules and regulations in effect as of May 31, 2019.

5. This examination consists of 58 multiple-choice questions of varying value. The point value for each question is shown in parentheses at the beginning of each question. Total point value is 160.

6. Your score will be based on the point values for the questions that you answer correctly. No credit will be given for omitted answers and no credit will be lost for wrong answers; hence, you should answer all questions even those for which you have to guess. Answer choices C, D, and E will be considered incorrect answers on True-False questions.

7. A separate answer sheet is inside the front cover of this book. During the time allotted for this examination, record all your answers on side 2 of the answer sheet. NO ADDITIONAL TIME WILL BE ALLOWED FOR THIS PURPOSE. No credit will be given for anything indicated in the examination book but not transferred to the answer sheet. Failure to stop writing or coding your answer sheet after time is called will result in the disqualification of your answer sheet or further disciplinary action.

8. Up to five answer choices are given with each question, each answer choice being identified by a key letter (A to E). For each question, blacken the oval on the answer sheet which corresponds to the key letter of the answer choice that you select.

9. Use a soft-lead pencil to mark the answer sheet. To facilitate correct mechanical scoring, be sure that, for each question, your pencil mark is dark and completely fills only the intended oval. Make no stray marks on the answer sheet. If you have to erase, do so completely.

10. Do not spend too much time on any one question. If a question seems too difficult, leave it and go on.

11. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

12. Clearly indicated answer choices in the test book can be an aid in grading examinations in the unlikely event of a lost answer sheet.

13. Use the blank portions of each page for your scratch work. Extra blank pages are provided at the back of the examination book.

14. When the supervisor tells you to do so, break the seal on the book and remove the answer sheet.

    On the front of the answer sheet, space is provided to write and code candidate information. Complete the information requested by printing in the squares and blackening the circles (one in each column) corresponding to the letters or numbers printed. For each empty box blacken the small circle immediately above the "A" circle. Fill out the boxes titled:

    (a) Name
    (include last name, first name and middle initial)

    (b) Candidate Number
    (Candidate/Eligibility Number, use leading zeros if needed to make it a five digit number)

    (c) Test Site Code
    (the supervisor will supply the number)

    (d) Examination Part
    (code the examination that you are taking by blackening the circle to the left of "Course EA-2, Segment F")

    (e) Booklet Number
    (booklet number can be found in the upper right-hand corner of this examination book. Use leading zeros if needed to make it a four digit number.)

    In box titled "Complete this section only if instructed to do so", fill in the circle to indicate if you are using a calculator and write in the make and model number.

    In the box titled "Signature and Date" sign your name and write today's date. **If the answer sheet is not signed, it will not be graded**.

    Leave the boxes titled "Test Code" and "Form Code" blank.

    On the back of the answer sheet fill in the Booklet Number in the space provided.

15. After the examination, the supervisor will collect this book and the answer sheet separately. DO NOT ENCLOSE THE ANSWER SHEET IN THE BOOK. All books and answer sheets must be returned. THE QUESTIONS ARE CONFIDENTIAL AND MAY NOT BE TAKEN FROM THE EXAMINATION ROOM.

Data for Question 1 (1 point)

Segment interest rates are being used for the IRC section 430 valuation.

Consider the following statement:

> Stabilized segment interest rates are required to be used to determine both minimum funding requirements under IRC section 430 and maximum deductible contributions under IRC section 404.

Question 1

Is the above statement true or false?

(A) True

(B) False

Data for Question 2 (1 point)

In 2015, the plan sponsor added a lump sum option to the plan. The 2019 valuation included the assumption that optional forms of payment would be elected as follows:

Single life annuity	50%
50% J&S	25%
100% J&S	25%
Lump sum	0%

Experience has shown that 25% of the participants have taken the lump sum.

Consider the following statement:

> The actuary is required to change the assumption for the election of optional forms of payment for the 2020 valuation to 25% of participants choosing a lump sum.

Question 2

Is the above statement true or false?

(A) True

(B) False

Data for Question 3 (2 points)

Plan effective date:	1/1/2000
Valuation date:	1/1/2020
2019 AFTAP:	55%
2020 AFTAP:	59%
Normal retirement benefit:	1.00% of final compensation per year of service

All employees are under normal retirement age.

The plan has not been specifically amended to cease accruals.

Plan-related expenses are assumed not to be paid from the trust.

Consider the following statement:

> The target normal cost as of 1/1/2020 is $0.

Question 3

Is the above statement true or false?

(A) True

(B) False

Data for Question 4 (3 points)

Valuation date: 1/1/2020

Normal retirement benefit: $100 per month per year of service

A plan amendment takes effect on 1/1/2020 that increases the benefit to $120 per month per year of service for all years of service.

Segment rates for 2020: {4.00%, 5.00%, 6.00%}

Selected data for sole participant Smith:

Gender	Female
Date of birth	1/1/1978
Date of hire	1/1/2010

$X is the increase in the funding target for Smith at 1/1/2020 due to this plan amendment.

Question 4

In what range is $X?

(A) Less than $7,000

(B) $7,000 but less than $7,400

(C) $7,400 but less than $7,800

(D) $7,800 but less than $8,200

(E) $8,200 or more

Data for Question 5 (3 points)

Type of plan: Multiemployer

A plan amendment effective 1/1/2020 increased the monthly normal retirement benefit. This increased the actuarial accrued liability by $150,000.

Actuarial cost method: Entry age normal

Valuation interest rate: 7.00%

Credit balance as of 12/31/2019: $75,000

Selected information as of 1/1/2020:

Normal cost (after amendment)	$21,000
Amortization charges (before amendment)	$60,000
Amortization credits	$37,000

Sole contribution for 2020 plan year made on 3/1/2021: $105,000

Question 5

In what range is the credit balance as of 12/31/2020?

(A) Less than $111,000

(B) $111,000 but less than $116,000

(C) $116,000 but less than $121,000

(D) $121,000 but less than $126,000

(E) $126,000 or more

Data for Question 6 (4 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Credit balance at 12/31/2019:	$0
Actuarial cost method:	Projected unit credit
Normal retirement benefit:	1.10% of final three-year average compensation per year of service
Valuation interest rate:	7.00%

Assumed rate of compensation increases:

Valuation date	1/1/2019	1/1/2020
	3.00%	2.50%

There are no assumed pre-retirement decrements other than mortality.

Actuarial (market) value of assets at 1/1/2020: $110,000

Selected data for participant Smith:

Gender	Male
Date of birth	1/1/1960
Date of hire	1/1/1998
2017 compensation	$60,000
2018 compensation	$62,000
2019 compensation	$65,000

$X is the absolute value of the change in the required contribution at 12/31/2020 for the 2020 plan year due to the compensation assumption change for Smith.

Question 6

In what range is **$X**?

(A) Less than $300

(B) $300 but less than $375

(C) $375 but less than $450

(D) $450 but less than $525

(E) $525 or more

Data for Question 7 (2 points)

A plan is in at-risk status for 5 consecutive years, including the current plan year.

Consider the following statements regarding the special retirement age assumptions required to determine the at-risk funding target:

I. All active participants are assumed to elect the normal form of benefit at retirement.

II. The special retirement age assumptions do not affect termination of employment assumptions prior to the employee's earliest retirement age.

III. All active participants are assumed to commence an immediate distribution at the earliest retirement age under the plan.

Question 7

Which, if any, of the above statements is (are) true?

(A) None

(B) I only

(C) II only

(D) III only

(E) The correct answer is not given by (A), (B), (C), or (D) above

Data for Question 8 (3 points)

There was no funding shortfall in 2018.

Selected information as of 1/1/2019:

Prefunding balance	$100,000
Minimum required contribution	$100,000
Effective interest rate	6.00%

Actual rate of return on assets during 2019: 1.00%

Sole contribution for the 2019 plan year made on 7/1/2019: $150,000

$X is the prefunding balance as of 1/1/2020.

Question 8

In what range is **$X**?

(A) Less than $147,000

(B) $147,000 but less than $148,000

(C) $148,000 but less than $149,000

(D) $149,000 but less than $150,000

(E) $150,000 or more

Data for Question 9 (2 points)

Valuation date: 1/1/2020

Prefunding balance as of 1/1/2020: $75,000

Consider the following funding balance elections:

I. On 2/1/2020, the plan sponsor makes an election to apply a portion of the prefunding balance to offset the remaining 2019 minimum required contribution.

II. On 4/15/2020, the plan sponsor makes an election to apply a portion of the prefunding balance to offset the quarterly installment due on 4/15/2020.

III. On 7/1/2020, the actuary certifies the 2020 AFTAP resulting in a deemed reduction of the prefunding balance.

Question 9

From first to last, in what order are these funding balance elections taken into account?

(A) I, II, III

(B) I, III, II

(C) II, I, III

(D) III, I, II

(E) The correct answer is not given by (A), (B), (C), or (D) above

Data for Question 10 (4 points)

Type of plan:	Multiemployer
Actuarial cost method:	Projected unit credit
Normal retirement benefit:	1.30% of final year's compensation per year of service
Early retirement eligibility:	Age 62
Early retirement reduction:	5.00% for each year that the benefit commencement date precedes age 65

No pre-retirement decrements are assumed.

Actuarial assumptions for 1/1/2020 valuation:

Interest rate: 6.00%

Rate of compensation increases: 3.50% per year

Retirement Rates:

Age	Rate
62	40%
65	100%

The assumed rate of retirement is 0% at all other ages.

Selected data for participant Smith:

Gender	Male
Date of birth	1/1/1961
Date of hire	1/1/2010
2019 compensation	$95,000

Question 10

In what range is the normal cost as of 1/1/2020 for Smith?

(A) Less than $11,000

(B) $11,000 but less than $12,500

(C) $12,500 but less than $14,000

(D) $14,000 but less than $15,500

(E) $15,500 or more

Data for Question 11 (4 points)

Valuation date: 1/1/2020

Asset valuation method: The average of the market value of assets on the valuation date and the adjusted market value of assets for the preceding valuation date.

Selected information:

	2019 plan year	2020 plan year
Segment rates	{4.00%, 5.00%, 6.00%}	{3.00%, 4.00%, 5.00%}
Effective interest rate	5.00%	4.00%

Assumed rate of return on assets for 2019: 7.50%

Selected asset information, excluding contributions receivable for the 2019 plan year:

	2019	2020
Market value of assets, 1/1	\$600,000	\$500,500
Benefit payments	\$ 30,000	
Expenses paid from trust	\$ 7,500	

Benefit payments and expenses are assumed to be paid on 7/1/2019.

There were no contributions made during 2019 for the 2018 plan year.

Contributions for the 2019 plan year:

Date	Amount
10/1/2019	\$15,000
9/15/2020	\$40,000

Question 11

In what range is the actuarial value of assets as of 1/1/2020?

(A) Less than \$593,000

(B) \$593,000 but less than \$594,000

(C) \$594,000 but less than \$595,000

(D) \$595,000 but less than \$596,000

(E) \$596,000 or more

Data for Question 12 (3 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Aggregate
Normal retirement benefit:	\$50 per month per year of service
Valuation interest rate:	6.00%
Credit balance as of 12/31/2019:	\$75,000
Actuarial (market) value of assets as of 1/1/2020:	\$400,000

Selected data for all 10 participants:

Gender	Male
Date of birth	1/1/1970
Date of hire	1/1/2010
Status	Active

\$X is the normal cost as of 1/1/2020.

Question 12

In what range is **\$X**?

(A) Less than \$33,000

(B) \$33,000 but less than \$35,000

(C) \$35,000 but less than \$37,000

(D) \$37,000 but less than \$39,000

(E) \$39,000 or more

Data for Question 13 (1 point)

Valuation date: 1/1/2020

The IRS approved a waiver of the entire 2019 minimum required contribution.

Consider the following statement:

> The waiver amortization installment is calculated using the segment rates for 2019.

Question 13

Is the above statement true or false?

(A) True

(B) False

Data for Question 14 (3 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Unit credit
Valuation interest rate:	7.00%
Credit balance as of 12/31/2019:	$250,000

Selected information as of 1/1/2020:

Normal cost	$1,000,000
Net amortization charge	$ 500,000

The plan is not in critical or endangered status as of 1/1/2020.

Sole contribution for 2020 plan year made on 12/31/2020: $1,000,000

$X is the amount of the initial excise tax, if any, that must be paid for failing to meet minimum funding standards for the 2020 plan year.

Question 14

In what range is **$X**?

(A) Less than $19,000

(B) $19,000 but less than $23,000

(C) $23,000 but less than $27,000

(D) $27,000 but less than $31,000

(E) $31,000 or more

Data for Question 15 (3 points)

Valuation date: 1/1/2020

A plan amendment increasing benefits was adopted in 2019 and effective 1/1/2019.

Selected valuation information as of 1/1/2020:

Actuarial (market) value of assets	$600,000
IRC 404 funding target before amendment	$400,000
IRC 404 funding target after amendment	$475,000
IRC 404 target normal cost	$250,000
Minimum required contribution	$100,000
Increase in IRC 404 funding target due to salary increases before amendment	$ 60,000
Increase in IRC 404 funding target due to salary increases after amendment	$ 60,000
Effective interest rate	3.00%
Number of participants	75

$X is the deduction limit for 2020, disregarding the at-risk floor on the deduction limit.

Question 15

In what range is **$X**?

(A) Less than $350,000

(B) $350,000 but less than $400,000

(C) $400,000 but less than $450,000

(D) $450,000 but less than $500,000

(E) $500,000 or more

Data for Question 16 (4 points)

Valuation date: 1/1/2020

Selected valuation results as of 1/1/2019:

Minimum required contribution	$520,000
Effective interest rate	5.00%

Prefunding balance as of 1/1/2020: $200,000

Selected valuation results as of 1/1/2020:

Minimum required contribution	$610,000
Effective interest rate	6.50%

Quarterly installments are required for the 2020 plan year.

Contribution for the 2020 plan year made on 4/1/2020: $150,000

No other contributions were made for the 2020 plan year until 10/15/2020.

The plan sponsor elects to use available funding balances to offset the remaining quarterly installments for the 2020 plan year on 6/1/2020.

$X is the contribution to be made on 10/15/2020 in the smallest amount to satisfy the third quarterly installment.

Question 16

In what range is **$X**?

(A) Less than $31,000

(B) $31,000 but less than $31,700

(C) $31,700 but less than $32,400

(D) $32,400 but less than $33,100

(E) $33,100 or more

Data for Question 17 (2 points)

Valuation date: 1/1/2020

Selected information as of 1/1/2019:

Prefunding balance	$ 3,000
Actuarial (market) value of assets	$154,000
Funding target	$153,000
Minimum required contribution	$ 6,000

Selected information as of 1/1/2020:

Prefunding balance	$ 5,000
Actuarial (market) value of assets	$175,000
Funding target	$165,000
Minimum required contribution	$ 8,000

$X is the required quarterly installment for the 2020 plan year.

Question 17

In what range is **$X**?

(A) Less than $900

(B) $900 but less than $1,400

(C) $1,400 but less than $1,900

(D) $1,900 but less than $2,400

(E) $2,400 or more

Data for Question 18 (5 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Projected unit credit
Retirement benefit:	1.00% of final 3-year average compensation per year of service, reduced by 5.00% for each year that the benefit commencement date precedes age 65

Actuarial assumptions for the 1/1/2020 valuation:

Interest rate	7.00%
Rate of compensation increases	3.00%

Assumed rates of retirement:

Age	Rate
62	20%
65	100%

The assumed rates of retirement are 0% at all other ages. There are no assumed pre-retirement decrements other than mortality.

Selected data for participant Smith:

Gender	Male
Date of birth	1/1/1960
Date of hire	1/1/2015

Compensation	2017	2018	2019
	$50,000	$51,000	$52,000

$X is the actuarial accrued liability for Smith as of 1/1/2020.

Question 18

In what range is **$X**?

(A) Less than $20,000

(B) $20,000 but less than $20,600

(C) $20,600 but less than $21,200

(D) $21,200 but less than $21,800

(E) $21,800 or more

Data for Question 19 (1 point)

Consider the following statement regarding the calculation of the liquidity shortfall:

> The cap on the liquidity shortfall is the amount that, when added to prior installments for the plan year, is necessary to increase the FTAP of the plan for the plan year (taking into account the expected increase in funding target due to benefits accruing or earned during the plan year) to 100%.

Question 19

Is the above statement true or false?

(A) True

(B) False

Data for Question 20 (4 points)

Valuation date:	1/1/2020
2019 minimum required contribution:	\$800,000
2020 minimum required contribution:	\$1,000,000
2020 prefunding balance:	\$0
Effective interest rate for 2020:	5.00%

The first three quarterly contributions for the 2020 plan year are made on their due dates.

No further contributions are made until 9/15/2021.

\$X is the **smallest amount that satisfies the minimum funding standard** as of 9/15/2021 for the 2020 plan year.

Question 20

In what range is **\$X**?

(A) Less than \$427,000

(B) \$427,000 but less than \$440,000

(C) \$440,000 but less than \$453,000

(D) \$453,000 but less than \$466,000

(E) \$466,000 or more

Data for Question 21 (3 points)

A plan has 5,000 active participants.

The plan properly suspends benefits post normal retirement date and does not provide actuarial increases.

The plan is amended to provide for the greater of actuarial increases or continued accruals after normal retirement.

In addition, eligibility for post-retirement medical benefits is increased from age 60 to 62.

Assumed retirement rates (before plan changes):

Age	Rate
55-59	6%
60-61	20%
62	25%
63-64	10%
65	100%

The actuary made the following changes to the assumed retirement rates to reflect the plan changes:

I. The actuary reduced the rates at ages 60 and 61

II. The actuary increased the rate at age 62

III. The actuary reduced the rate at age 65 and extended the table.

Question 21

Which, if any, of the above statements describe a reasonable change to assumed retirement rates?

(A) I and II only

(B) I and III only

(C) II and III only

(D) I, II and III

(E) The correct answer is not given by (A), (B), (C), or (D) above

Data for Question 22 (3 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Entry age normal
Valuation interest rate:	6.00%
Credit balance as of 12/31/2019:	$20,000

For the 2020 valuation, the actuary changes the assumed retirement rates for the plan.

Amortization amounts as of 1/1/2020 (prior to assumption change):

Total amortization charges	$200,000
Total amortization credits	$140,000

Selected valuation results as of 1/1/2020:

Actuarial accrued liability (prior to assumption change)	$1,000,000
Actuarial accrued liability (after assumption change)	$1,100,000
Normal cost (after assumption change)	$ 250,000

$X is the **smallest amount that satisfies the minimum funding standard** that can be contributed on 12/31/2020 for the 2020 plan year.

Question 22

In what range is **$X**?

(A) Less than $305,000

(B) $305,000 but less than $320,000

(C) $320,000 but less than $335,000

(D) $335,000 but less than $350,000

(E) $350,000 or more

Data for Question 23 (1 point)

Optional form of payment: Lump sum determined using the applicable mortality table and applicable interest rates

Assumed form of payment: 100% lump sum

No participants are affected by the IRC section 415 limits.

The plan has never been top-heavy.

Consider the following statement regarding the calculation of the plan's funding target:

> The actuary must substitute the applicable interest rates under IRC section 417(e)(3) for the valuation interest rates.

Question 23

Is the above statement true or false?

(A) True

(B) False

Data for Question 24 (1 point)

Type of plan: Multiemployer

Actuarial cost method: Entry age normal

The plan is amended 1/1/2020 to provide a lump sum payment, in addition to the retiree's monthly annuity, of $1,000 for each retiree as of 1/1/2020, 1/1/2021, and 1/1/2022.

Consider the following statement:

> The increase in the past service liability that arises from this amendment is amortized over 15 years.

Question 24

Is the above statement true or false?

(A) True

(B) False

Data for Question 25 (1 point)

Consider the following statement:

> In determining the prefunding balance of a plan for the current plan year, the prior plan year prefunding balance is adjusted by the rate of return on plan assets for the prior plan year determined on the basis of the actuarial value of assets.

Question 25

Is the above statement true or false?

(A) True

(B) False

Data for Question 26 (1 point)

Valuation date: 1/1/2020

The plan sponsor timely filed for a Form 5500 extension using Form 5558. Therefore, the due date for the 2020 plan year Form 5500 is 10/15/2021.

Consider the following statement:

> The plan sponsor may elect to add to the plan's prefunding balance for the 2020 plan year on 10/15/2021.

Question 26

Is the above statement true or false?

(A) True

(B) False

Data for Question 27 (2 points)

Valuation date: 1/1/2020

Selected information as of 1/1/2019:

Funding balances	$ 0
Actuarial (market) value of assets	$500,000
Funding target	$490,000
Minimum required contribution	$ 54,000

The 2020 minimum required contribution is $70,000.

Consider the following statement:

> The required quarterly installment for the 2020 plan year is $13,500.

Question 27

Is the above statement true or false?

(A) True

(B) False

Data for Question 28 (1 point)

Consider the following statement regarding the calculation of the liquidity shortfall:

> The base amount for a quarter is 3 times the adjusted disbursements for the 12-month period ending on the last day of the quarter.

Question 28

Is the above statement true or false?

(A) True

(B) False

Data for Question 29 (4 points)

Valuation date: 1/1/2020

A plan provides benefits only at normal retirement age, and a lump sum option calculated using the applicable interest rate and applicable mortality is available.

Valuation segment rates for 2020: {5.00%, 6.00%, 7.00%}

IRC section 417(e) segment rates for 2020: {3.00%, 4.00%, 5.00%}

The actuary assumes 50% of participants elect a lump sum and 50% of participants elect a single life annuity.

The plan has fewer than 100 participants.

Selected data for participant Smith as of 1/1/2020:

Gender	Male
Age	45
Monthly accrued benefit	$3,500

$\ddot{a}_{65}^{(12)}$ using IRC section 417(e) mortality:

Interest rate	Factor
4.00%	13.88
5.00%	12.65
6.00%	11.59
7.00%	10.68

$X is the funding target for Smith as of 1/1/2020.

Question 29

In what range is **$X**?

(A) Less than $100,000

(B) $100,000 but less than $115,000

(C) $115,000 but less than $130,000

(D) $130,000 but less than $145,000

(E) $145,000 or more

Data for Question 30 (3 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Projected unit credit
Normal retirement benefit:	2.00% of final three-year average compensation per year of service
Valuation interest rate:	5.00%
Assumed rate of compensation increases:	3.00% per year

Selected data for participant Smith:

Gender	Male
Date of birth	1/1/1960
Date of hire	1/1/2014
Compensation for 2019	$30,000

Question 30

In what range is the normal cost for Smith as of 1/1/2020?

(A) Less than $6,400

(B) $6,400 but less than $6,500

(C) $6,500 but less than $6,600

(D) $6,600 but less than $6,700

(E) $6,700 or more

Data for Question 31 (3 points)

Valuation date: 1/1/2020

Asset valuation method: Market value

Effective interest rate:

2019 plan year	5.50%
2020 plan year	6.50%

Actual rate of return on assets during 2019: 4.00%

Market value of assets as of 1/1/2020 (excluding receivable contributions): $750,000

Contributions made for the 2019 plan year:

Date	Amount
7/1/2019	$ 5,000
9/1/2020	$200,000

$X is the actuarial value of assets for the 1/1/2020 valuation.

Question 31

In what range is **$X**?

(A) Less than $942,000

(B) $942,000 but less than $943,000

(C) $943,000 but less than $944,000

(D) $944,000 but less than $945,000

(E) More than $945,000

Data for Question 32 (4 points)

Valuation date: 1/1/2020

Segment rates for 2019 and 2020: {5.00%, 6.00%, 7.00%}

There were no shortfall amortization bases prior to 1/1/2019.

Shortfall amortization installment for 2019 funding shortfall: $36,328

The plan received a waiver of $70,000 for the 2019 plan year minimum required contribution.

Selected information as of 1/1/2020:

Funding balances	$ 0
Actuarial value of assets	$150,000
Funding target	$340,000
Target normal cost	$ 50,000

$X is the **minimum required contribution** as of 1/1/2020.

Question 32

In what range is **$X**?

(A) Less than $89,700

(B) $89,700 but less than $90,100

(C) $90,100 but less than $90,500

(D) $90,500 but less than $90,900

(E) $90,900 or more

Data for Question 33 (3 points)

Valuation date: 1/1/2020

Selected information as of 1/1/2020:

Funding standard carryover balance	$ 270,000
Prefunding balance	$ 520,000
Actuarial (market) value of assets, before receivable	$12,000,000
Funding target	$11,300,000
Target normal cost	$ 1,800,000

Effective interest rate for 2019 and 2020: 6.00%

Sole contribution for the 2019 plan year made on 7/1/2020: $600,000

On 1/1/2020, the plan sponsor elects to apply $270,000 in funding balances to offset the minimum required contribution for the 2020 plan year. This was the only funding balance election made for the 2020 plan year.

$X is the contribution on 1/1/2020 that would be needed to satisfy the remainder of the minimum required contribution, after reflecting the election to apply funding balances for the 2020 plan year.

Question 33

In what range is **$X**?

(A) Less than $750,000

(B) $750,000 but less than $1,000,000

(C) $1,000,000 but less than $1,250,000

(D) $1,250,000 but less than $1,500,000

(E) $1,500,000 or more

Data for Question 34 (3 points)

Valuation date: 1/1/2020

Normal retirement benefit: 1.20% of final year's compensation per year of service

Segment rates: {3.00%, 4.00%, 5.00%}

Assumed rate of compensation increases: 3.00% per year

Selected data for participant Smith:

Gender	Female
Date of birth	1/1/1970
Date of hire	1/1/2010
2018 compensation	$100,000
2019 compensation	$115,000

$X is the funding target for Smith as of 1/1/2020.

$Y is the funding target for Smith as of 1/1/2020 that would have been determined had Smith's 2019 compensation equaled the expected 2019 compensation based on Smith's 2018 compensation.

Question 34

In what range is the absolute value of **$X−$Y**?

(A) Less than $9,300

(B) $9,300 but less than $11,300

(C) $11,300 but less than $13,300

(D) $13,300 but less than $15,300

(E) $15,300 or more

Data for Question 35 (4 points)

Type of plan: Multiemployer

Valuation date: 1/1/2020

Actuarial cost method: Projected unit credit

Normal retirement benefit: 1.00% of final three-year average compensation per year of service

Selected actuarial assumptions:

Interest rate	7.00%
Annual compensation increases	3.00%

There were no assumption changes from the prior year.

Selected data for participant Smith:

Gender	Male
Date of birth	1/1/1961
Date of hire	1/1/2003
2018 compensation	$62,000
2019 compensation	$64,500

$X is the absolute value of the change in the actuarial accrued liability as of 1/1/2020 due to Smith's actual 2019 compensation being different from Smith's assumed compensation.

Question 35

In what range is the absolute value of **$X**?

(A) Less than $800

(B) $800 but less than $850

(C) $850 but less than $900

(D) $900 but less than $950

(E) $950 or more

Data for Question 36 (5 points)

Type of plan: Multiemployer

Actuarial cost method: Projected unit credit

Valuation interest rate: 7.00%

The sponsor elected the special amortization under IRC section 431(b)(8)(A) of the experience attributable to net investment losses established in 2009.

All amortization charges and credits as of 1/1/2019:

	Years Remaining	Outstanding Balance
Charge base due to plan amendment	2	$1,500,000
Actuarial gain	14	$ 900,000
Actuarial loss	15	$1,100,000
Special amortization base	19	$8,000,000

Effective 1/1/2020, the plan is amended to eliminate future benefit accruals. This decreases the actuarial accrued liability by $1,600,000.

The plan receives approval as of 1/1/2020 for an automatic 5-year extension of amortization periods for charge bases established before 1/1/2020.

$X is the amortization charges less amortization credits as of 1/1/2020 before the automatic extension.

$Y is the amortization charges less amortization credits as of 1/1/2020 after the automatic extension.

Question 36

In what range is the absolute value of **$X−$Y**?

(A) Less than $640,000

(B) $640,000 but less than $660,000

(C) $660,000 but less than $680,000

(D) $680,000 but less than $700,000

(E) $700,000 or more

Data for Question 37 (4 points)

Valuation date: 1/1/2020

The plan provides a supplemental benefit of $400 per month payable until age 65 for participants who retire on or after age 62 with at least 15 years of service.

Segment rates for 2020: {5.00%, 6.00%, 7.00%}

No pre-retirement decrements assumed.

Assumed rates of retirement:

Age	Rate
Under 62	0%
62	50%
63	0%
64	0%
65	100%

Selected data for sole participant Smith:

Gender	Male
Date of birth	1/1/1960
Date of hire	1/1/2005

$X is the portion of the funding target for Smith at 1/1/2020 attributable to this supplemental benefit.

Question 37

In what range is **$X**?

(A) Less than $4,250

(B) $4,250 but less than $4,750

(C) $4,750 but less than $5,250

(D) $5,250 but less than $5,750

(E) $5,750 or more

Data for Question 38 (3 points)

Valuation date: 1/1/2020

At-risk status for plan years:

2016	At-risk
2017	Not at-risk
2018	Not at-risk
2019	At-risk
2020	At-risk

Selected information as of 1/1/2020 disregarding load and phase-in:

Funding target without regard to at-risk assumptions	$1,000,000
At-risk funding target without regard to load	$1,240,000
Number of participants (for all years)	550

$X is the funding target for the 2020 plan year.

Question 38

In what range is **$X**?

(A) Less than $1,000,000

(B) $1,000,000 but less than $1,067,000

(C) $1,067,000 but less than $1,134,000

(D) $1,134,000 but less than $1,201,000

(E) $1,201,000 or more

Data for Question 39 (4 points)

Type of plan: Multiemployer

Valuation date: 1/1/2020

Actuarial cost method: Unit credit

Valuation interest rate: 7.00%

Selected information as of 1/1/2020:

Market value of assets	$1,300,000
Actuarial value of assets	$1,500,000
Actuarial accrued liability	$2,000,000
Normal cost	$ 40,000
Actuarial gain during 2019	$ 50,000

Funding standard account information as of 1/1/2020 (excluding the actuarial gain during 2019):

Outstanding balance of amortization charges	$925,000
Amortization charges	$100,000
Outstanding balance of amortization credits	$300,000
Amortization credits	$ 60,000

Sole contribution for the 2020 plan year made on 2/1/2020: $86,500

$X is the credit balance as of 12/31/2020.

Question 39

In what range is **$X**?

(A) Less than $30,000

(B) $30,000 but less than $60,000

(C) $60,000 but less than $90,000

(D) $90,000 but less than $120,000

(E) $120,000 or more

Data for Question 40 (3 points)

Valuation date:	1/1/2020
Segment rates:	{5.00%, 6.00%, 7.00%}
Prefunding balance as of 1/1/2020:	$75,000
Effective interest rate for 2020 plan year:	6.50%
Required quarterly installments for 2020 plan year:	$50,000

On 1/1/2020, the plan sponsor makes an election to apply the entire prefunding balance to offset the minimum required contribution for the 2020 plan year.

$X is the smallest amount required to be paid on 7/15/2020 to satisfy the 7/15/2020 quarterly installment.

Question 40

In what range is **$X**?

(A) Less than $23,000

(B) $23,000 but less than $23,500

(C) $23,500 but less than $24,000

(D) $24,000 but less than $24,500

(E) $24,500 or more

Data for Question 41 (1 point)

A plan amendment increasing benefits is adopted before the first day of the 2020 plan year and takes effect on the first day of the 2020 plan year.

2020 AFTAP (after amendment): 85%

Consider the following statement:

> The plan amendment must be reflected in the 2020 funding valuation.

Question 41

Is the above statement true or false?

(A) True

(B) False

Data for Question 42 (4 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Entry age normal
Normal retirement benefit:	\$150 per month per year of service
Valuation interest rate:	7.00%

Selected data for participant Smith:

Gender	Female
Date of birth	1/1/1958
Date of hire	1/1/2005

\$X is the actuarial accrued liability for Smith as of 1/1/2020.

Question 42

In what range is **\$X**?

(A) Less than \$235,000

(B) \$235,000 but less than \$250,000

(C) \$250,000 but less than \$265,000

(D) \$265,000 but less than \$280,000

(E) \$280,000 or more

Data for Question 43 (2 points)

The plan provides a Social Security level income option.

2019 AFTAP: 85%

Selected information as of 1/1/2020:

Funding standard carryover balance	$ 7,000
Prefunding balance	$ 10,000
Actuarial (market) value of assets	$300,000

As of 4/1/2020, the actuary has not issued a 2020 AFTAP certification.

Consider the following statement:

> As of 4/1/2020, the funding balances are deemed to be reduced to avoid benefit restrictions.

Question 43

Is the above statement true or false?

(A) True

(B) False

Data for Question 44 (4 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Projected unit credit
Normal retirement benefit:	\$160 per month per year of service

Early retirement benefit before amendment:	Accrued benefit reduced 4.00% for each year that the benefit commencement date precedes age 65
Early retirement benefit after amendment:	Unreduced accrued benefit, plus a supplement payable until age 65 of \$32 per month per year of service

Selected assumptions as of 1/1/2020:

Valuation interest rate	6.00%
Preretirement decrements other than death	None
Retirement age	60

Selected data for participant Smith:

Gender	Male
Date of birth	1/1/1970
Date of hire	1/1/1995

Selected commutation function at 6%: $D_{50} = 53{,}487$

\$X is the change in accrued liability for Smith as of 1/1/2020 due to the amendment.

Question 44

In what range is **\$X**?

(A) Less than \$25,000

(B) \$25,000 but less than \$50,000

(C) \$50,000 but less than \$75,000

(D) \$75,000 but less than \$100,000

(E) \$100,000 or more

Data for Question 45 (3 points)

Valuation date: 1/1/2020

Selected information as of 1/1/2020:

Prefunding balance	$ 20,000
Actuarial (market) value of assets	$1,900,000
Funding target	$1,860,000
Present value of all benefits expected to accrue during the year	$ 100,000
Expected plan-related expenses to be paid from the plan during the plan year	$ 10,000
Expected mandatory employee contributions during the plan year	$ 7,000

$X is the **minimum required contribution** as of 1/1/2020.

Question 45

In what range is **$X**?

(A) Less than $70,000

(B) $70,000 but less than $80,000

(C) $80,000 but less than $90,000

(D) $90,000 but less than $100,000

(E) $100,000 or more

Data for Question 46 (3 points)

Type of plan:	Statutory hybrid (cash balance)
Valuation date:	1/1/2020
Segment rates:	{5.00%, 6.00%, 7.00%}
Interest crediting rate:	5.00% per year

Interest credits are based on the account balance as of the beginning of the year.

Pay credits and interest credits are credited at the end of the year.

Assumed form of payment: Lump sum

Selected data for sole participant Smith:

Date of birth	1/1/1974
Pay credit for 2020	$5,000

$X is the target normal cost for Smith as of 1/1/2020.

Question 46

In what range is **$X**?

(A) Less than $3,500

(B) $3,500 but less than $3,750

(C) $3,750 but less than $4,000

(D) $4,000 but less than $4,250

(E) $4,250 or more

Data for Question 47 (1 point)

A plan sponsor has two plans, Plan A and Plan B.

The number of deaths during the most recent experience study period:

Plan A	400
Plan B	80

Consider the following statement:

> Each plan may use its own substitute mortality table to determine the minimum required contribution.

Question 47

Is the above statement true or false?

(A) True

(B) False

Data for Question 48 (3 points)

Type of plan: Multiemployer

Valuation date: 1/1/2020

Asset valuation method: Smoothed market value using a smoothing period of four years, as described in Rev. Proc. 2000-40

	1/1/2019	1/1/2020
Market value of assets	$10,000,000	$9,000,000

Valuation interest rate: 7.00%

Sole contribution for 2019 plan year made on 7/1/2019: $1,500,000

Benefit payments paid on 7/1/2019: $200,000

Administrative expenses paid on 7/1/2019: $40,000

Asset gain/loss amounts:

Gain during 2017:	$200,000
Gain during 2018:	$400,000

$X is the actuarial value of assets as of 1/1/2020.

Question 48

In what range is **$X**?

(A) Less than $8,750,000

(B) $8,750,000 but less than $9,500,000

(C) $9,500,000 but less than $10,250,000

(D) $10,250,000 but less than $11,000,000

(E) $11,000,000 or more

Data for Question 49 (3 points)

Valuation date: 1/1/2020

Selected information as of 1/1/2019:

Funding standard carryover balance	$23,000
Prefunding balance	$ 3,000
Minimum required contribution	$18,000
Effective interest rate	5.00%
Actual rate of return on assets during 2019	7.00%

On 1/1/2019, the plan sponsor elected to apply $18,000 of the funding balances toward the 2019 minimum required contribution.

Sole contribution for 2019 plan year made on 12/31/2019: $26,000

$X is the prefunding balance as of 1/1/2020.

Question 49

In what range is **$X**?

(A) Less than $29,100

(B) $29,100 but less than $29,300

(C) $29,300 but less than $29,500

(D) $29,500 but less than $29,700

(E) $29,700 or more

Data for Question 50 (5 points)

Valuation date: 1/1/2020

A plan amendment that increases benefits for all years of service is adopted and takes effect on 1/1/2020.

Normal retirement benefit before amendment: $100 per month per year of service

Normal retirement benefit after amendment: $130 per month per year of service

Prefunding balance as of 1/1/2020: $0

Segment rates for 2020 valuation: {3.00%, 4.00%, 5.00%}

There are no assumed pre-retirement decrements other than mortality.

Actuarial value of assets as of 1/1/2020: $210,000

There were no shortfall amortization bases prior to 1/1/2020.

Selected data for sole participant Smith:

Gender	Female
Date of birth	1/1/1960
Date of hire	1/1/2005

$X is the increase in the **minimum required contribution** due to the 2020 plan amendment.

Question 50

In what range is **$X**?

(A) Less than $13,000

(B) $13,000 but less than $17,000

(C) $17,000 but less than $21,000

(D) $21,000 but less than $25,000

(E) $25,000 or more

Data for Question 51 (2 points)

Valuation date: 1/1/2020

Selected information as of 1/1/2020:

Funding standard carryover balance	$ 10,000
Prefunding balance	$ 25,000
Actuarial (market) value of assets	$915,000
Funding target	$900,000

The plan sponsor does not elect to use any funding balances to offset the minimum required contribution for the 2020 plan year.

Consider the following statement:

> The plan is exempt from the requirement to establish a new shortfall amortization base for the 2020 plan year.

Question 51

Is the above statement true or false?

(A) True

(B) False

Data for Question 52 (3 points)

Valuation date:	1/1/2020
Prefunding balance as of 1/1/2020:	$0
Effective interest rate for the 2020 plan year:	6.00%
Actual rate of return on assets during 2020:	3.00%
Minimum required contribution for 2020 plan year:	$100,000
Sole contribution for 2020 plan year made on 6/30/2021:	$50,000

$X is the initial excise tax due on the unpaid minimum required contribution for the 2020 plan year under IRC section 4971(a).

Question 52

In what range is **$X**?

(A) Less than $3,300

(B) $3,300 but less than $5,300

(C) $5,300 but less than $7,300

(D) $7,300 but less than $9,300

(E) $9,300 or more

Data for Question 53 (4 points)

Valuation date:	1/1/2020
There were no shortfall amortization bases prior to 1/1/2019.	
Shortfall amortization charge for the plan year beginning 1/1/2019:	$100,000
The 2020 plan year AFTAP is first certified on 9/15/2020.	
Prefunding balance as of 1/1/2020 (before reduction):	$150,000

There is a $50,000 deemed reduction to the prefunding balance on 4/1/2020 to avoid the limitation on accelerated benefit distributions under IRC section 436(d).

Segment rates: {5.00%, 6.00%, 7.00%}

Selected information as of 1/1/2020:

Actuarial (market) value of assets	$1,000,000
Funding target	$1,300,000
Target normal cost	$ 300,000
Effective interest rate	6.25%

$X is the **smallest amount that satisfies the minimum funding standard** that can be contributed on 4/15/2020 for the 2020 plan year.

Question 53

In what range is **$X**?

(A) Less than $260,000

(B) $260,000 but less than $270,000

(C) $270,000 but less than $280,000

(D) $280,000 but less than $290,000

(E) $290,000 or more

Data for Question 54 (2 points)

Valuation date: 1/1/2020

The plan sponsor elected to apply funding relief using a 15-year amortization schedule for the shortfall amortization base established for the 2011 plan year.

The shortfall amortization installment for this shortfall base for 2020 is $200,000.

There have been no installment acceleration amounts.

Segment rates for 2011: {3.00%, 4.00%, 5.00%}

Segment rates for 2020: {5.00%, 6.00%, 7.00%}

$X is the outstanding balance of this base as of 1/1/2020.

Question 54

In what range is **$X**?

(A) Less than $1,075,000

(B) $1,075,000 but less than $1,125,000

(C) $1,125,000 but less than $1,175,000

(D) $1,175,000 but less than $1,225,000

(E) $1,225,000 or more

Data for Question 55 (4 points)

Plan effective date: 1/1/2015

Valuation date: 1/1/2020

Segment rates for 2020: {5.00%, 6.00%, 7.00%}

The plan has been at-risk only in 2017, 2018, and 2020.

Selected information as of 1/1/2020 disregarding any loads and phase-in:

Prefunding balance	$ 500,000
Actuarial (market) value of assets	$ 9,500,000
Funding target without regard to at-risk assumptions	$10,000,000
Funding target using at-risk assumptions	$11,750,000
Target normal cost without regard to at-risk assumptions	$ 2,000,000
Target normal cost using at-risk assumptions	$ 2,350,000
Number of participants	750

Shortfall amortization installments as of 1/1/2020:

Year established	Installment	Outstanding balance
2016	$ 80,000	$228,752
2017	$ 55,000	$204,776
2018	$ 10,000	$ 45,460
2019	$ 50,000	$264,660
Total	$195,000	$743,648

$X is the **minimum required contribution** as of 1/1/2020.

Question 55

In what range is **$X**?

(A) Less than $2,315,000

(B) $2,315,000 but less than $2,415,000

(C) $2,415,000 but less than $2,515,000

(D) $2,515,000 but less than $2,615,000

(E) $2,615,000 or more

Data for Question 56 (3 points)

Type of plan:	Multiemployer
Valuation date:	1/1/2020
Actuarial cost method:	Frozen initial liability
Valuation interest rate:	6.00%
Credit balance as of 12/31/2018:	$0

Selected information as of 1/1/2019:

Unfunded accrued liability:	$800,000
Normal cost:	$ 50,000

Selected information as of 1/1/2020:

Market value of assets:	$ 7,500,000
Actuarial value of assets:	$ 7,000,000
Present value of future benefits:	$10,000,000
Present value of expected future compensation:	$15,000,000
Present value of total compensation for 2020 for all participants:	$ 1,000,000

Sole contribution for the 2019 plan year made on 6/1/2019: $200,000

Question 56

In what range is the normal cost as of 1/1/2020?

(A) Less than $135,000

(B) $135,000 but less than $155,000

(C) $155,000 but less than $175,000

(D) $175,000 but less than $195,000

(E) $195,000 or more

Data for Question 57 (1 point)

Type of plan: Multiemployer

The plan is in endangered status for the 2020 plan year.

Consider the following statement:

> The initial excise tax on any accumulated funding deficiency for 2020 is 5%.

Question 57

Is the above statement true or false?

(A) True

(B) False

Data for Question 58 (1 point)

Optional form of payment: Lump sum, determined using the applicable mortality table and applicable interest rates.

Assumed form of payment: 100% lump sum

No participants are affected by the IRC section 415 limits.

The plan has never been top-heavy.

Consider the following statement regarding the calculation of the plan's funding target:

> The actuary must substitute the applicable mortality table under IRC section 417(e)(3) for the valuation mortality table for the period after benefit commencement.

Question 58

Is the above statement true or false?

(A) True

(B) False

****END OF EXAMINATION****

IMPORTANT

THESE FACTORS MAY BE USED FOR ALL QUESTIONS UNLESS OTHER FACTORS ARE PROVIDED, FOR BOTH SINGLE EMPLOYER AND MULTIEMPLOYER PLANS

2019 EA-2 (Segment F) Examination – Selected Commutation Factors
Interest Rates: 3.0%, 4.0%, **and** 5.0%

MALES	Interest Rate = 3.0%		Interest Rate = 4.0%		Interest Rate = 5.0%		MALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	163,039	2,756,535	91,311	1,383,316	51,424	703,318	60
61	157,484	2,596,042	87,352	1,293,819	48,726	653,131	61
62	152,011	2,441,066	83,506	1,208,229	46,137	605,592	62
63	146,612	2,291,530	79,765	1,126,438	43,650	560,594	63
64	141,282	2,147,361	76,126	1,048,341	41,262	518,039	64
65	136,032	2,008,486	72,593	973,834	38,972	477,826	65
66	130,857	1,874,826	69,160	902,815	36,776	439,860	66
67	125,754	1,746,308	65,824	835,184	34,668	404,051	67
68	120,729	1,622,857	62,586	770,844	32,649	370,308	68
69	115,777	1,504,397	59,441	709,700	30,713	338,546	69
70	110,891	1,390,860	56,386	651,659	28,857	308,683	70
71	106,067	1,282,180	53,414	596,635	27,076	280,643	71
72	101,297	1,178,299	50,521	544,547	25,366	254,351	72
73	96,573	1,079,167	47,702	495,317	23,722	229,738	73
74	91,890	984,741	44,952	448,875	22,142	206,740	74
75	87,239	894,983	42,267	405,154	20,621	185,296	75
76	82,614	809,864	39,642	364,090	19,156	165,346	76
77	78,011	729,359	37,073	325,626	17,744	146,838	77
78	73,424	653,450	34,557	289,706	16,382	129,718	78
79	68,849	582,123	32,093	256,278	15,069	113,938	79
80	64,284	515,366	29,676	225,293	13,802	99,449	80
81	59,727	453,171	27,308	196,702	12,579	86,208	81
82	55,198	395,520	24,994	170,455	11,404	74,167	82
83	50,702	342,383	22,738	146,495	10,275	63,281	83
84	46,247	293,723	20,540	124,764	9,194	53,501	84
85	41,845	249,494	18,406	105,202	8,160	44,781	85

FEMALES	Interest Rate = 3.0%		Interest Rate = 4.0%		Interest Rate = 5.0%		FEMALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	165,530	2,969,131	92,707	1,481,092	52,210	749,053	60
61	160,193	2,806,047	88,855	1,390,150	49,564	698,056	61
62	154,946	2,648,259	85,118	1,303,008	47,028	649,655	62
63	149,785	2,495,678	81,492	1,219,552	44,595	603,742	63
64	144,695	2,348,226	77,965	1,139,677	42,259	560,218	64
65	139,688	2,205,826	74,544	1,063,280	40,020	518,985	65
66	134,756	2,068,399	71,220	990,259	37,871	479,950	66
67	129,888	1,935,874	67,988	920,521	35,808	443,024	67
68	125,094	1,808,183	64,848	853,972	33,829	408,123	68
69	120,370	1,685,255	61,800	790,521	31,932	375,163	69
70	115,712	1,567,020	58,837	730,079	30,111	344,066	70
71	111,116	1,453,414	55,957	672,562	28,365	314,755	71
72	106,576	1,344,379	53,154	617,890	26,688	287,159	72
73	102,083	1,239,862	50,424	565,987	25,076	261,210	73
74	97,629	1,139,821	47,760	516,784	23,525	236,845	74
75	93,208	1,044,219	45,159	470,216	22,032	214,005	75
76	88,812	953,026	42,615	426,223	20,593	192,633	76
77	84,432	866,222	40,124	384,750	19,204	172,676	77
78	80,060	783,794	37,681	345,745	17,863	154,087	78
79	75,688	705,738	35,280	309,165	16,566	136,819	79
80	71,308	632,058	32,919	274,967	15,310	120,828	80
81	66,913	562,764	30,593	243,114	14,093	106,076	81
82	62,517	497,866	28,308	213,568	12,916	92,523	82
83	58,118	437,366	26,064	186,288	11,778	80,129	83
84	53,719	381,264	23,859	161,235	10,680	68,854	84
85	49,327	329,558	21,698	138,367	9,620	58,660	85

IMPORTANT

THESE FACTORS MAY BE USED FOR ALL QUESTIONS UNLESS OTHER FACTORS ARE PROVIDED, FOR BOTH SINGLE EMPLOYER AND MULTIEMPLOYER PLANS

2019 EA-2 (Segment F) Examination – Selected Commutation Factors
Interest Rates: 5.0%, 6.0%, **and** 7.0%

MALES	Interest Rate = 5.0%		Interest Rate = 6.0%		Interest Rate = 7.0%		MALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	51,424	703,318	29,119	362,032	16,577	188,545	60
61	48,726	653,131	27,331	333,733	15,413	172,501	61
62	46,137	605,592	25,634	307,180	14,322	157,588	62
63	43,650	560,594	24,024	282,284	13,296	143,737	63
64	41,262	518,039	22,495	258,960	12,334	130,881	64
65	38,972	477,826	21,046	237,129	11,432	118,961	65
66	36,776	439,860	19,673	216,712	10,586	107,917	66
67	34,668	404,051	18,371	197,636	9,793	97,695	67
68	32,649	370,308	17,137	179,831	9,050	88,242	68
69	30,713	338,546	15,969	163,229	8,354	79,511	69
70	28,857	308,683	14,863	147,767	7,703	71,456	70
71	27,076	280,643	13,814	133,385	7,092	64,033	71
72	25,366	254,351	12,819	120,027	6,520	57,203	72
73	23,722	229,738	11,875	107,641	5,984	50,929	73
74	22,142	206,740	10,980	96,176	5,481	45,176	74
75	20,621	185,296	10,129	85,586	5,009	39,912	75
76	19,156	165,346	9,320	75,828	4,566	35,106	76
77	17,744	146,838	8,552	66,860	4,150	30,731	77
78	16,382	129,718	7,821	58,643	3,760	26,759	78
79	15,069	113,938	7,126	51,140	3,394	23,167	79
80	13,802	99,449	6,466	44,316	3,051	19,930	80
81	12,579	86,208	5,837	38,138	2,728	17,027	81
82	11,404	74,167	5,242	32,574	2,427	14,437	82
83	10,275	63,281	4,679	27,590	2,146	12,139	83
84	9,194	53,501	4,147	23,155	1,884	10,112	84
85	8,160	44,781	3,646	19,238	1,641	8,339	85

FEMALES	Interest Rate = 5.0%		Interest Rate = 6.0%		Interest Rate = 7.0%		FEMALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	52,210	749,053	29,564	383,780	16,830	199,053	60
61	49,564	698,056	27,801	355,024	15,678	182,750	61
62	47,028	649,655	26,129	327,990	14,598	167,567	62
63	44,595	603,742	24,544	302,587	13,584	153,434	63
64	42,259	560,218	23,039	278,733	12,632	140,286	64
65	40,020	518,985	21,612	256,348	11,739	128,063	65
66	37,871	479,950	20,259	235,356	10,901	116,708	66
67	35,808	443,024	18,975	215,686	10,115	106,167	67
68	33,829	408,123	17,757	197,269	9,377	96,391	68
69	31,932	375,163	16,603	180,041	8,686	87,330	69
70	30,111	344,066	15,509	163,940	8,037	78,942	70
71	28,365	314,755	14,471	148,907	7,430	71,183	71
72	26,688	287,159	13,487	134,887	6,860	64,015	72
73	25,076	261,210	12,553	121,828	6,325	57,400	73
74	23,525	236,845	11,665	109,682	5,823	51,305	74
75	22,032	214,005	10,822	98,403	5,351	45,698	75
76	20,593	192,633	10,020	87,949	4,908	40,550	76
77	19,204	172,676	9,256	78,279	4,492	35,833	77
78	17,863	154,087	8,528	69,357	4,100	31,521	78
79	16,566	136,819	7,834	61,147	3,731	27,590	79
80	15,310	120,828	7,172	53,616	3,384	24,018	80
81	14,093	106,076	6,540	46,734	3,057	20,784	81
82	12,916	92,523	5,937	40,470	2,749	17,868	82
83	11,778	80,129	5,363	34,796	2,460	15,251	83
84	10,680	68,854	4,817	29,684	2,189	12,916	84
85	9,620	58,660	4,298	25,105	1,935	10,843	85

2019 EA-2 (Segment F) Examination – Selected Amortization Factors

Segment Rates = {3.0%, 4.0%, 5.0%}

Remaining Period	Amortization Factor
7 years	6.3293
6 years	5.5390
5 years	4.7171
4 years	3.8286
3 years	2.9135
2 years	1.9709

Segment Rates = {5.0%, 6.0%, 7.0%}

Remaining Period	Amortization Factor
7 years	5.9982
6 years	5.2932
5 years	4.5460
4 years	3.7232
3 years	2.8594
2 years	1.9524

LIMITS AND TABLES

(Included with the 2019 EA-2 (Segment F) examination)

Maximum Benefit Limit IRC section 415(b)	
Year	Limit ar SSRA
2000	135,000
2001	140,000
Year	Limit ar 65
2002 – 2003	160,000
2004	165,000
2005	170,000
2006	175,000
2007	180,000
2008	185,000
2009 – 2011	195,000
2012	200,000
2013	205,000
2014 – 2016	210,000
2017	215,000
2018	220,000
2019	225,000

Compensation Limit IRC section 401(a)(17)	
Year	Limit
2000 – 2001	170,000
2002 – 2003	200,000
2004	205,000
2005	210,000
2006	220,000
2007	225,000
2008	230,000
2009 – 2011	245,000
2012	250,000
2013	255,000
2014	260,000
2015 – 2016	265,000
2017	270,000
2018	275,000
2019	280,000

Key Employee Compensation IRC section 416		
Year	Officer	1% owner
2003	130,000	150,000
2004	130,000	150,000
2005	135,000	150,000
2006	140,000	150,000
2007	145,000	150,000
2008	150,000	150,000
2009 – 2011	160,000	150,000
2012 – 2013	165,000	150,000
2014 – 2016	170,000	150,000
2017 – 2018	175,000	150,000
2019	180,000	150,000

Highly Compensated Employee Compensation IRC section 414(q)	
Year	Limit
2000 – 2001	85,000
2002 – 2004	90,000
2005	95,000
2006	100,000
2007	100,000
2008	105,000
2009 – 2011	110,000
2012 – 2014	115,000
2015 – 2018	120,000
2019	125,000

Answer Key EA-2F Fall 2019
August 19, 2019

Question	Answer		Question	Answer
1	B		31	B
2	B		32	B
3	B		33	C
4	C		34	B
5	D		35	C
6	C		36	B
7	C		37	D
8	D		38	C
9	B		39	D
10	B		40	B
11	B		41	A
12	C		42	C
13	A		43	B
14	A		44	D
15	B		45	C
16	A		46	C
17	C		47	B
18	C		48	D
19	A		49	D
20	D		50	D
21	D		51	A
22	B		52	C
23	B		53	D
24	B		54	A
25	B		55	B
26	B		56	B
27	B		57	A
28	A		58	A
29	B			
30	B			

Solutions to the November 2019 EA-2F Examination

Q1. Code Section 430(h)(2)(C)(iv) states that stabilized segment rates are used for purposes of determining the funding target and target normal cost, provided that the plan sponsor has not elected to use the corporate bond yield curve. However, Code Section 404(o)(6) states that stabilization is to be disregarded for purposes of determining the maximum deductible limit.

The statement is FALSE.

ANSWER B

Q2. Code Section 430(h)(1) states that actuarial assumptions should each be reasonable and, in combination, offer the actuary's best estimate of anticipated experience under the Plan. More specifically, Code Section 430(h)(4) addresses actuarial assumptions for optional payment forms and states that such assumptions should be made "on the basis of the plan's experience and other related assumptions" but does not require the actuary to set rates that match actual experience. Moreover, ASOP 35 outlines some general considerations for making optional form of benefit election assumptions but does not require the actuary to set rates that match actual experience.

The statement is FALSE.

ANSWER B

Q3. Code Section 430(b) defines the target normal cost as the sum of (1) the present value of benefit accruals during the plan year and (2) the expected plan-related expenses expected to be paid from plan assets during the year.

The question states that plan-related expenses are not paid from the trust, and so the target normal cost in this question is equal to the present value of benefit accruals during the plan year.

Code Section 436(e) states that benefit accruals shall cease for any plan year for which the AFTAP falls below 60%, which is the case in this question.

However, with respect to the calculation of the target normal cost, Regulation 1.430(d)−1(c)(1)(iii)(D) states that the Section 436 restriction on benefit accruals can only be taken into account if the plan is specifically amended to cease benefit accruals. Since the question explicitly states that the plan was not amended to cease accruals, the target normal cost must be determined as if benefit accruals are not restricted under Section 436. Therefore, the target normal cost is not $0 because it equals the present value of benefit accruals as if the Section 436 restrictions were not in effect.

The statement is FALSE.

ANSWER B

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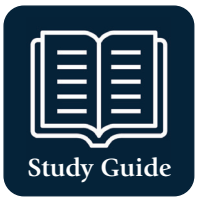

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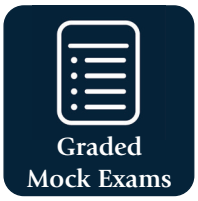

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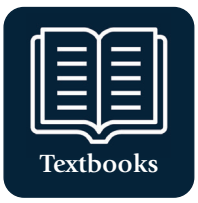

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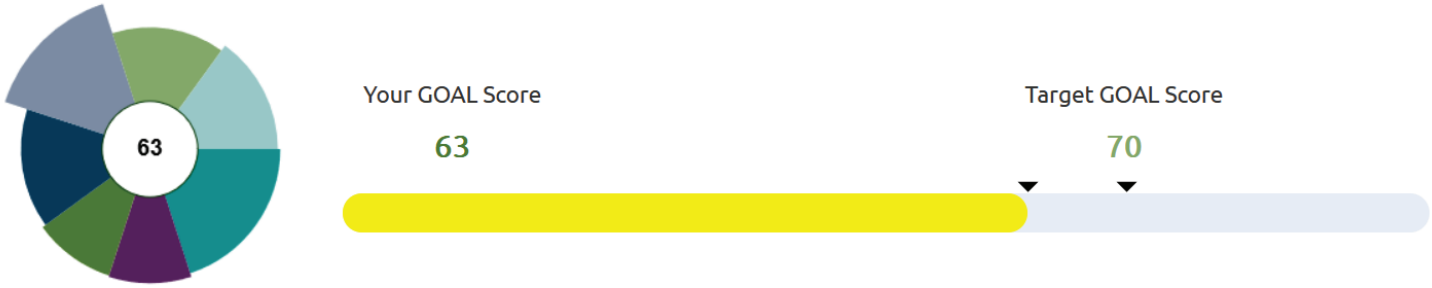

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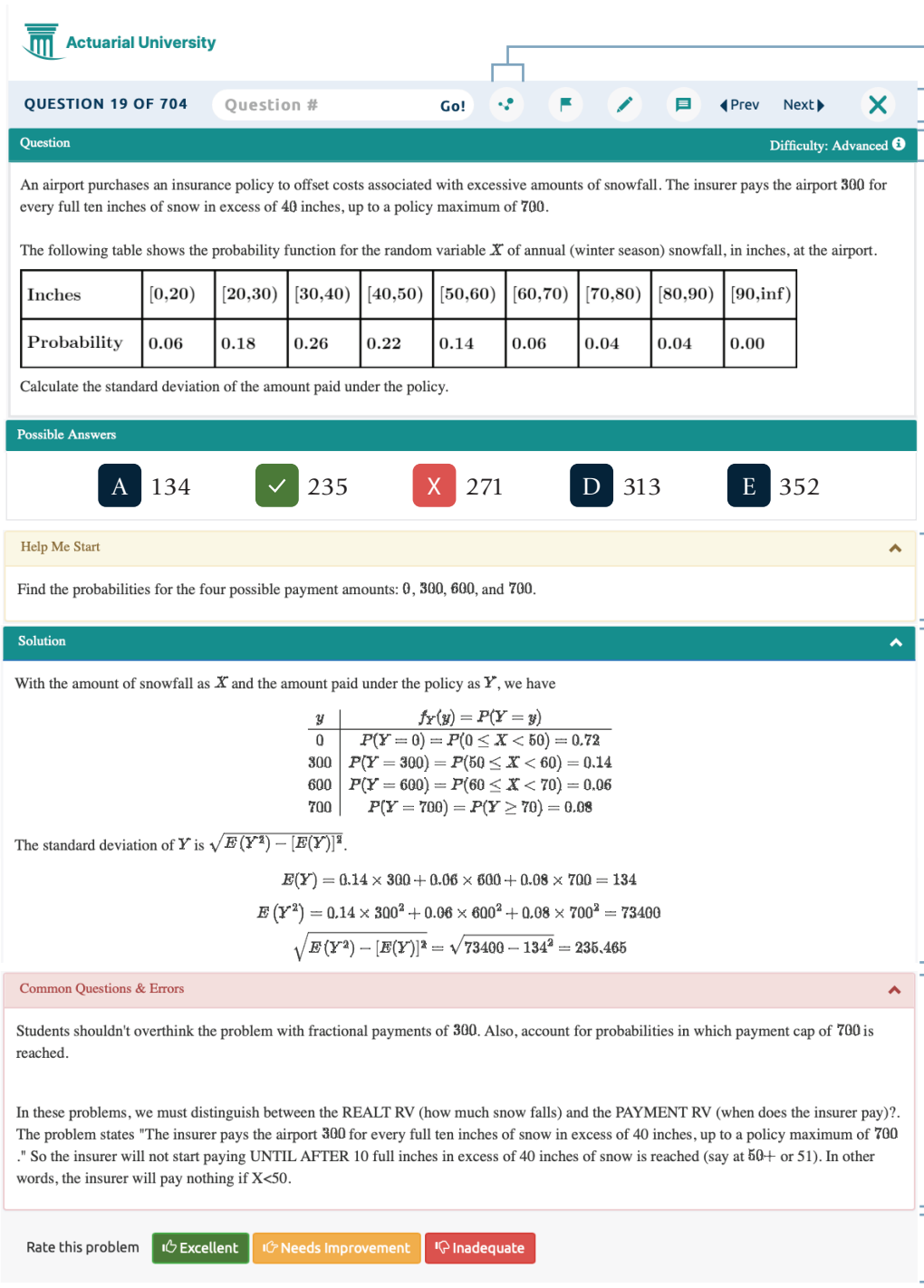

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QUESTION 19 OF 704 | Question # | Go! | Prev | Next

Question — Difficulty: Advanced

An airport purchases an insurance policy to offset costs associated with excessive amounts of snowfall. The insurer pays the airport 300 for every full ten inches of snow in excess of 40 inches, up to a policy maximum of 700.

The following table shows the probability function for the random variable X of annual (winter season) snowfall, in inches, at the airport.

Inches	[0,20)	[20,30)	[30,40)	[40,50)	[50,60)	[60,70)	[70,80)	[80,90)	[90,inf)
Probability	0.06	0.18	0.26	0.22	0.14	0.06	0.04	0.04	0.00

Calculate the standard deviation of the amount paid under the policy.

Possible Answers

A 134 ✓ 235 X 271 D 313 E 352

Help Me Start

Find the probabilities for the four possible payment amounts: 0, 300, 600, and 700.

Solution

With the amount of snowfall as X and the amount paid under the policy as Y, we have

y	$f_Y(y) = P(Y = y)$
0	$P(Y = 0) = P(0 \le X < 50) = 0.72$
300	$P(Y = 300) = P(50 \le X < 60) = 0.14$
600	$P(Y = 600) = P(60 \le X < 70) = 0.06$
700	$P(Y = 700) = P(Y \ge 70) = 0.08$

The standard deviation of Y is $\sqrt{E(Y^2) - [E(Y)]^2}$.

$$E(Y) = 0.14 \times 300 + 0.06 \times 600 + 0.08 \times 700 = 134$$

$$E(Y^2) = 0.14 \times 300^2 + 0.06 \times 600^2 + 0.08 \times 700^2 = 73400$$

$$\sqrt{E(Y^2) - [E(Y)]^2} = \sqrt{73400 - 134^2} = 235.465$$

Common Questions & Errors

Students shouldn't overthink the problem with fractional payments of 300. Also, account for probabilities in which payment cap of 700 is reached.

In these problems, we must distinguish between the REALT RV (how much snow falls) and the PAYMENT RV (when does the insurer pay)?. The problem states "The insurer pays the airport 300 for every full ten inches of snow in excess of 40 inches, up to a policy maximum of 700 ." So the insurer will not start paying UNTIL AFTER 10 full inches in excess of 40 inches of snow is reached (say at 50+ or 51). In other words, the insurer will pay nothing if X<50.

Rate this problem | Excellent | Needs Improvement | Inadequate

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