SOCIETY OF ACTUARIES

Group & Health Analytics and Management Exam

Exam GH 301

Date: Wednesday, November 19, 2025

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 6 questions numbered 1 through 6 with a total of 50 points.

   The points for each question are indicated at the beginning of the question.

2. 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 provided in this document.

Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel file as directed. Graders will only look at work in the indicated file.

   a) In the Word document, answers should be entered in the box marked ANSWER. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1 (and ^ used to indicate a superscript).

   b) In the Excel document formulas should be entered. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.

   c) Individual exams may provide additional directions that apply throughout the exam or to individual items.

2. The answer should be confined to the question as set.

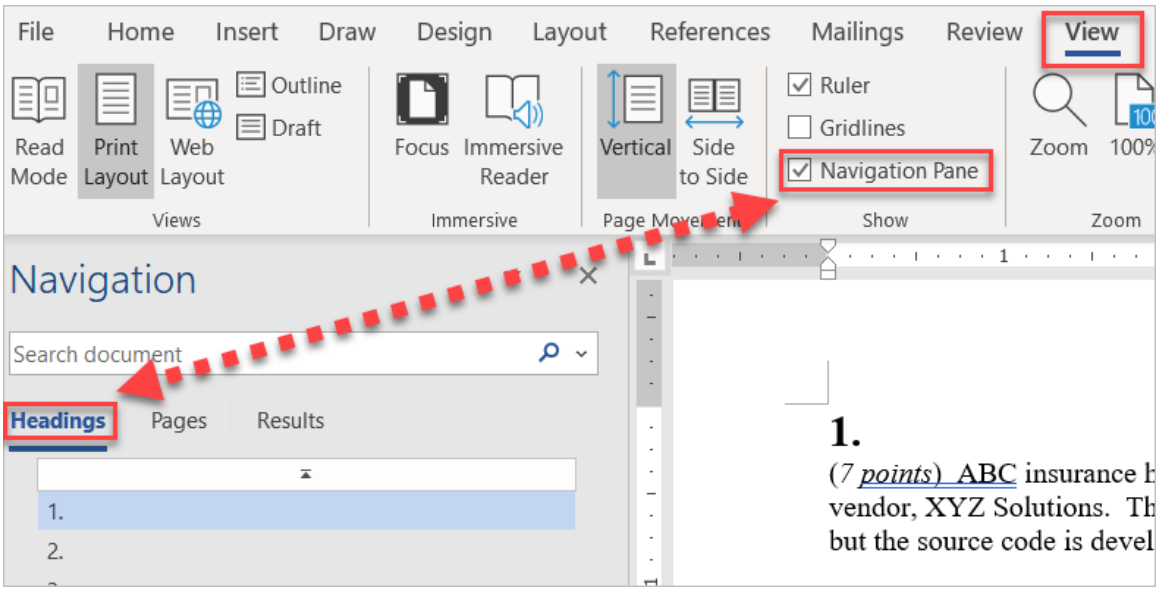
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your unique candidate number in the filename.

4. The Word and Excel files that contain your answers must be uploaded before the five-minute upload period expires.

Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(*6 points*) You are given the following risk score formula based on the Social Determinants of Health (SDOH) Model for MassHealth for predicting the total cost of care for a Medicaid population:

Predicted Cost = max[$15, min(f(x), $125,000)]

(a) (*4 points*)

(i) (*1 point*) Describe the components of the risk score formula.

ANSWER:

(ii) (*1 point*) Describe the total cost of care calculation in the Medicaid risk adjustment model prior to adding any SDOH variables.

ANSWER:

(iii) (*2 points*) Describe the SDOH factors that were added to the model, including their impact to the predicted cost.

ANSWER:

1. Continued

You are given the following additional information for the risk adjustment model:

Age-Sex Categories	Coefficient
0-1 Female	1208
2-5 Female	1105
6-12 Female	829
13-17 Female	926
18-24 Female	711
25-34 Female	758
35-44 Female	279
45-54 Female	377
55-59 Female	494
≥60 Female	481
0-1 Male	1287
2-5 Male	1535
6-12 Male	1262
13-17 Male	718
18-24 Male	578
25-34 Male	-43
35-44 Male	6
45-54 Male	-172
55-59 Male	-451
≥60 Male	-352

Other Categories	Coefficient
NSS7s	43
RRS	3337
Serious Mental	2295
Substance Use	2014

1. Continued

(b) (*2 point*s)

(i) (*1 point*) Calculate the predicted claim cost for an individual with the following characteristics. Show your work.

- 20-year-old male
- RRS of 3
- Substance abuse disorder (SUD)
- Serious mental illness
- Living in a neighborhood with a NSS7 four standard deviations above the mean

The response for this part is to be provided in the Excel spreadsheet.

(ii) (*1 point*) State whether the calculation is impacted by the minimum or maximum restraints.

ANSWER:

2.

(*7 points*)

(a) (*1 point*) List considerations for managing a provider network.

ANSWER:

(b) (*2 points*) Describe four examples of providers with whom administrators may not choose to contract when developing a network.

ANSWER:

A health insurer has the following characteristics and goals:

Characteristics:

- Small regional insurer
- In business for 40 years
- Rented broad national network
- Low/Medium income demographic
- FFS provider reimbursement
- High consumer satisfaction
- High claims expense trend
- Members have higher than average morbidity

Goals:

- Control costs
- Maintain high consumer reputation
- Utilize best practice techniques for ensuring quality, safety, and efficiency

(c) (*3 points*) Recommend actions the health plan can take to meet its goals regarding the management of provider networks. Justify your response.

ANSWER:

2. Continued

You are given the following information:

	In-Network Benefit	Out-of-Network
Billed Charge	$1,000	$1,000
Allowed Amount	$600	$900
Member Coinsurance	20%	40%

(d) (*1 point*) Calculate the amount both the plan administrator and member would pay in both the in-network and out of network scenario. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

The Excel spreadsheet has
additional data and information applicable to this question.

3.

(*12 points*) You are an employee at Company ABC and your team is responsible for generating the risk adjustment projections for ABC's Medicare Advantage (MA) bid.

(a) (*2 points*) Describe why ASOPs 23, 41, and 45 are applicable to the MA bid process.

ANSWER:

You are given the following Medicare Advantage bid projection factors:

- Normalization factor
- MA coding adjustment factor
- Risk score coding trend factor

(b) (*2 points*)

(i) (*1 point*) Describe the purpose of each bid projection factor.

ANSWER:

(ii) (*1 point*) Describe risks and implications to ABC of overestimating and underestimating each of the factors.

ANSWER:

3. Continued

In the accompanying Excel file, you are given the risk adjustment factors for two risk score models, Version 1 and Version 2.

You are also given the following risk adjustment assumptions and the status for three continuously enrolled individuals:

- Lung disorders = HCCs 276, 277, and 279
- Heart Failure = HCCs 222 and 225
- Diabetes = HCCs 36 and 37
- HCC 276 supersedes HCCs 277 and 279 in the hierarchy
- HCC 277 supersedes HCC 279 in the hierarchy
- HCC 222 supersedes HCC 225 in the hierarchy
- HCC 36 supersedes HCC 37 in the hierarchy
- Assume the following weights for a blended risk score:

Model	Weight
Version 1	0.33
Version 2	0.67

Age	**Gender**	**Rating Category**	**Medicaid and Disability Category**	**Disease(s)**
84	Female	Institutional	Disabled and Medicaid	Cystic Fibrosis Severe Persistent Asthma Moderate Dementia
67	Male	Community, Full Benefits Dual, Aged	Originally Disabled	Multiple Sclerosis End Stage Heart Failure Acute Heart Failure
56	Male	Community, Non-Dual, Disabled	NA	Diabetes with Severe Acute Complications Morbid Obesity Acute Heart Failure Diabetes with Chronic Complications

(c) (*3 points*) Calculate the blended risk score for each enrolled individual. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

3. Continued

Your colleague has drafted the following e-mail to ABC's Chief Actuary:

> To*: Chief Actuary, ABC*
>
> *From: Actuarial Colleague*
> *Subject: Quick Update on MA Bid Risk Score Projections*
>
> *The actuarial department has completed its risk score projections for the upcoming Medicare Advantage (MA) bid. These projections are essential as they directly inform the payments ABC receives from CMS. The team has been hard at work and believe the projections are actuarially sound.*
>
> *As a reminder, the purpose of the MA risk adjustment system is to encourage MA Organizations (MAOs) to focus on quality and cost control instead of member selection. To achieve this goal, the risk adjustment program adjusts an MAO's compensation for the acute and chronic conditions of its members via a hierarchical system. There are separate models for Part C and Part D that predict the allowed cost of providing benefits based on age/gender factors and concurrent diagnosis codes.*
>
> *ABC expects to enroll a considerable volume of members who are new to Medicare. These members have risk scores less than or equal to existing members because their risk scores are only based on age/gender factors, while existing members also layer on any applicable HCC factors. We accounted for this in our projections with a population change adjustment.*
>
> *We have ensured compliance with relevant ASOPs and are on schedule to submit our MA bids in June.*
>
> *Sincerely,*
> *Actuarial Colleague*

(d) (*5 points*) Recommend revisions to any inaccuracies in your colleague's e-mail. Justify your response.

ANSWER:

4.

(*7 points*)

(a) (*2 points*) Describe examples for each of the following categories of medical and drug codes:

- Diagnosis
- Procedure
- Prescription drug
- Hospital billing

ANSWER:

(b) (*2 points*)

(i) (*1 point*) Describe challenges actuaries face with Electronic Health Records (EHRs).

ANSWER:

(ii) (*1 point*) List examples of data available in an EHR dataset.

ANSWER:

4. Continued

(c) (*3 points*)

(i) (*1 point*) Identify the type of study method used in each of the following scenarios:

A. A study of brain cancer epidemiology in all employees at several manufacturing plants located across the country over five decades.
B. A study of all identified brain cancer patients in an area via interviews, medical records, and genetic studies to obtain knowledge on risk factors for brain cancer outside of the workplace.
C. A study of the outcomes of a group of patients receiving a new experimental drug treatment and another group of patients receiving standard treatment.
D. A study observing the prevalence and daily life impact of brain cancer symptoms by surveying a subset of identified patients.

ANSWER:

(ii) (*2 points*) Compare and contrast the study methods in part (i).

ANSWER:

5.

(*9 points*) You have been asked to assess whether to implement a care management program. You have been given the following information:

- Post-tax hurdle rate is 20%
- Corporate tax rate is 30%
- Risk margin is 5%

(a) (*2 points*)

(i) (*1 point*) Calculate the pre-tax hurdle rate and risk margin adjusted hurdle rate. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

(ii) (*1 point*) Describe reasons for applying a risk margin.

ANSWER:

You have been given the following information for two care management programs:

	Program 1	Program 2
Number of Health Plan Members	20,000	20,000
Number of Chronic Members	100	500
Annual Program Cost	$100,000	$300,000
Annual Gross Savings	$150,000	$400,000

(b) (*2 points*) Calculate the gross return on investment (ROI) and total net savings PMPM for each program. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

5. Continued

(c) (*1 point*) Recommend which program is a better investment. Justify your response.

ANSWER:

You are given the following information for a risk management economic model:

Penetration Level (%)	No. of Members (Cumulative)	Event Rate	Cost/Event	Expected Events Avoided	Cumulative Expenses
2%	20	75%	$30,000	40%	$280,000
7%	70	50%	$25,000	30%	$380,000
12%	120	40%	$20,000	25%	$650,000

(d) (*4 points*)

(i) (*3 points*) Calculate the gross ROI for each penetration level. Show your work.

The response for this part is to be provided in the Excel spreadsheet.

(ii) (*1 point*) Explain the ROI's pattern over the three penetration levels.

ANSWER:

6.

(*9 points*) You are an actuary for an Accountable Care Organization (ACO). The ACO has recently hired a new Chief Financial Officer (CFO) who is critical of the firm's prospective risk scores. The CFO notes the following:

- The US Department of Health and Human Services' Hierarchical Condition Categories (HHS-HCC) risk score model has stronger correlation than the ACO's risk scores.
- The ACO's risk score model has a correlation below what the CFO would deem as satisfactory.
- Every year the ACO invests a lot of time and resources to updating their risk score model, but in recent years the accuracy of these improvements has not increased.

(a) (*2 points*) Critique the use of the HHS-HCC risk score model instead of the ACO's prospective risk scores for estimating the future claims cost.

ANSWER:

(b) (*4 points*)

(i) (*2 points*) Describe challenges with using healthcare claims data for predictive analytics.

ANSWER:

(ii) (*2 points*) Propose an approach to mitigate each challenge.

ANSWER:

6. Continued

(c) (*3 points*)

(i) (*1 point*) Describe external disruptors the ACO should monitor.

ANSWER:

(ii) (*2 points*) Propose how the ACO might address each external disruptor.

ANSWER:

****END OF EXAMINATION****