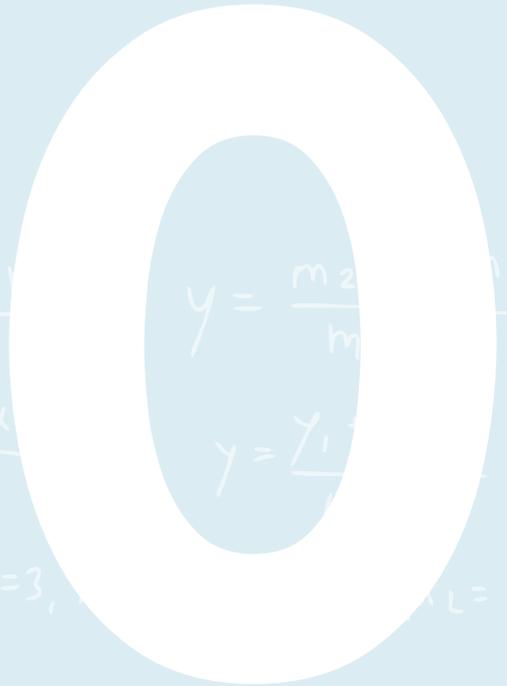




Certified Actuarial Analyst Resource Guide

Module 0 2017



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Welcome to Module 0 – the Entry exam of the Certified Actuarial Analyst qualification

The Certified Actuarial Analyst (CAA) is a professional qualification from CAA Global.

It is designed to provide you with a technical skills qualification if you:

- work alongside actuaries – in areas such as data analysis, pricing and marketing
- work in the wider financial services area – perhaps you already have other qualifications, and would like to develop a skill set that will mark you out in a competitive environment
- work in a service centre environment – the analytical skills you'll learn can then be added to your business knowledge
- have strong maths skills, and you want to and learn on the job rather than going to university.

The aim of the Module 0 Entry exam is to ensure that you have a solid grounding in the mathematics and basic statistics that underpin actuarial work.

This Resource guide for Module 0 gives you the syllabus you will cover for the exam, and details of some online and other resources that will help you study for the Module 0 exam. There is also a specimen exam paper giving examples of the type of questions you will be asked.

Additional information about the Module 0 exam, including:

- How to enter for the exam
- What will happen at the exam centre

can be found in the:

- Guide to Module 0
- Student Actuarial Analyst Handbook.

If you have any further questions contact the CAA Administration Team who will be happy to help you.

Email the team at:

**enquiries@
caa-global.org**

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 =$$



The Certified Actuarial Analyst qualification

There are seven exams which you will need to complete for the qualification:

Module title	Assessed by
Fundamental Mathematics & Statistics – Module 0	2 hour Computer Based Assessment of 60 questions
Finance and Financial Mathematics – Module 1	2 hour Computer Based Assessment
Statistics and Models – Module 2	2 hour Computer Based Assessment
Long Term Actuarial Mathematics – Module 3	2 hour Computer Based Assessment
Short Term Actuarial Mathematics – Module 4	2 hour Computer Based Assessment
Models and Audit Trails – Module 5	3 hour examination
Online Professional Awareness Test (PAT)	90 minute examination

In addition to passing the above exams, you must complete at least one year of relevant work experience (Work-based skills).

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The syllabus for the Module 0 exam

The mathematical topics covered by the Module 0 exam are:

- Numerical methods
- Mathematical constants and standard functions
- Algebra
- Calculus
- Probability and statistics.

You can find the full Module 0 syllabus in Appendix 1 of this Resource guide.

Assessment of the Module 0 exam

The Module 0 exam is assessed by a 2 hour computer based exam containing 60 multiple choice questions.

Before you start your 2 hour exam you will have an extra 15 minutes for:

- reading the exam instructions, and
- working through some basic sample questions so that you become familiar with the format of the exam.

You will also need to sign a statement of confidentiality in relation to the exam materials.

Pass standards for the exam are set by CAA Global. Details of pass standards for CAA exams will be published in due course.



You can sit the exam at one of the many centres worldwide managed by Pearson VUE.

You can find details of your local exam centre on their website by using their regional contact details:

www.pearsonvue.com/caaglobal

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$



Studying for the Module 0 exam

Recommended study hours

We recommend that you spend 125-150 hours studying to prepare for the exam.

Tuition

BPP  BPP Actuarial Education (ActEd), provides online study material for this exam.

Details of their training materials and services are available on their website.

Website: www.bppacted.com

Email: ActEd@bpp.com

Tel: +44 (0)1235 550 005

Please note

Education providers are listed here for information purposes. CAA Global has not assessed the quality of the services provided.

Textbooks

Alternatively an A-level text book (or similar books you may use for your own higher school qualifications) should cover most of the content of the Module 0 syllabus.

Examples of such text books are:

- Core Maths for Advanced Level. L. Bostock and F. S. Chandler. 3rd Edition, 2013
- AS/A Level Maths for Edexcel – S1. 2012
- Foundation Mathematics. K. A. Stroud and Dexter J. Booth. 2009.

You can buy these from bookshops or other online retailers.

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Free online resources

Listed below are samples of free web-based resources in which learning support links covering most, though not all, of the topics in Module 0 have been identified.

Please note

The content of these websites has not been quality assured by CAA Global. The material should not be used as your primary learning resource, but may reinforce and/or supplement other sources.

Assumed knowledge

There is some knowledge that you are assumed to have before you study for Module 0.

See the Module 0 syllabus in Appendix 1 for full details of this.

Sample websites covering the knowledge that you are assumed to have

Number:

www.bbc.co.uk/bitesize/ks3/maths/number/

Measure:

www.bbc.co.uk/bitesize/ks3/maths/measures/

Understanding standard mathematical/statistical notation and terminology:

www.rapidtables.com/math/symbols/Basic_Math_Symbols.htm

Estimating the numerical value of expressions:

www.purplemath.com/modules/evaluate.htm

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$



In addition you will study

Topic 1 – Numerical methods

http://en.wikibooks.org/wiki/Numerical_Methods

Topic 2 – Mathematical constraints and standard functions

See: General topic coverage, below

Topic 3 – Algebra

www.bbc.co.uk/bitesize/ks3/maths/algebra/

www.sosmath.com/calculus/calculus.htm

Use this link and cross reference to the following topics in the Module 0 syllabus to find further learning support for:

- Differentiation
- Integration and
- Techniques of Integration

Topic 4 – Probability and statistics

www.mathsisfun.com/data/

General topic coverage

<http://en.wikibooks.org/wiki/Subject:Mathematics>

The Wikibooks link above provides coverage of a number of topics in the Module 0 syllabus.

Specimen exam paper

A specimen exam paper for Module 0, with sample exam questions, is given in Appendix 2. This will show you they types of questions which will be asked in the exam.

Please note

Only 20 sample questions are given in the Specimen exam paper. There will be a total of 60 questions in the Module 0 exam you sit.

The questions found in the specimen paper will not be included in the Module 0 exam.

$$\frac{3)^2 + (0,7 - 4)^2}{2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad z \approx 11,3 \quad x = \frac{x_1}{1}$$



Resources available at the exam centre

Calculators

There is only one authorised calculator for all the CAA exams:

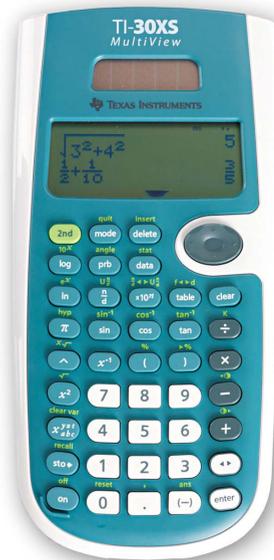
- **Texas Instruments TI-30 Multiview** (with or without suffix).

You should bring your own calculator with you to the exam. It will be checked by exam centre staff, and the memory will be cleared.

If you bring a different calculator model it must be left in the locker with your other personal belongings.

An on-screen scientific calculator will also be available for you to use during the exam. However, some students have reported that they found this on-screen calculator difficult or cumbersome to use, and so you may prefer to take your own TI-30 calculator to the exam with you.

The TI-30 Multiview calculator is available to buy from shops or online retailers.



To clear the memory and reset the calculator:

2
or
 &

Resets the TI-30XS MultiView™ Calculator. Returns unit to default settings; clears memory variables, pending operations, all entries in history, and statistical data; clears the constant feature, K and Ans

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} - 2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$



Making notes during the exam

You will be provided with an erasable note board at the centre to use during the exam.

You will only be given one board at a time but are entitled to as many as you need during the exam, and you will be able to keep these at your desk for the duration of the exam. You should ask the supervisor for more if needed. The Pearson VUE staff will not provide you with an eraser for the note boards.

The note boards will be collected by Pearson VUE staff at the end of the exam.

On occasion you may instead be given scrap paper to make notes on.

Formulae and Tables for actuarial examinations

The book of Formulae and Tables for examinations has been published to help students who sit actuarial exams.

The book gives you formulae for:

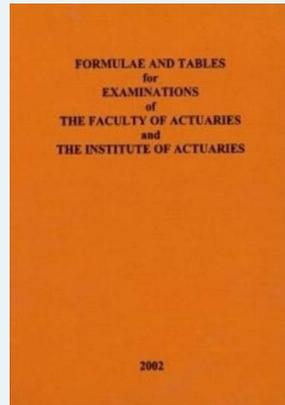
- selected mathematical and statistical methods,
- calculus, time series and economic models, and many other topics.

There are also tables for:

- compound interest calculations,
- selected statistical distributions, and
- other actuarial calculations.

You should make yourself familiar with these tables and formulae during your exam preparation.

You will not be able to use your own copy of the book during your exam, but a PDF copy will be available on your exam screen for you to use.



You can buy a copy by following this link:

www.actuaries.org.uk/catalog/formulae-and-tables

$$\sqrt{3^2 + (0,7 - 4)^2} = \quad x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad \bar{z} \approx 11,3 \quad x = \frac{x_1}{1}$$



Appendix 1

Syllabus: Module 0 – Entry Exam

This module must be passed before a candidate can continue to take the other exams.

Aim

The aim of the Entry Exam syllabus is to ensure that applicants for the Analyst qualification have a grounding in the mathematics and basic statistics that underpin actuarial work.

Module 0 must be passed before a candidate can proceed to later modules.

The following is assumed of applicants studying the syllabus for Module 0.

- Understand standard mathematical notation and terminology, as used in the following mathematical statements:
 - a) $\exists a, b, c, n \in \mathbb{C}, n \geq 3: a^n + b^n = c^n$
 - b) $\forall x \in (-\infty, 0], x^2 \in \mathbb{I}^+ \cup \{0\}$
 - c) $\mathbb{N} = \{x : x = 1, 2, 3, \mathbb{K}\}$
 - d) "Zero is a non-negative integer; π is a positive real number."
 - e) " $f(x)$ vanishes as x tends to $-\infty$, is not defined when $x = 0$, but takes positive values for sufficiently large x ."
- Know the representations and names of the letters of the Greek alphabet that are commonly used in mathematical, statistical and actuarial work, including in particular, the following letters:
 - ▶ lower-case: $\alpha, \beta, \gamma, \delta, \epsilon, \theta, \kappa, \lambda, \mu, \nu, \pi, \rho, \sigma, \tau, \phi, \chi, \psi, \omega$
 - ▶ upper-case: $\Gamma, \Delta, \Theta, \Pi, \Sigma, \Phi, \Omega$

$$\frac{+\lambda x_2}{+\lambda}, \gamma = \frac{\gamma_1 + \lambda \gamma_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, \gamma_1 = -4, x_2 = 0, \gamma$$



- Understand the meaning of the following commonly used conventions:
 - ▶ round brackets used to denote negative currency amounts,
 - ▶ K and m used as abbreviations for “thousand” and “million”
 - ▶ Δ used to denote the signed magnitude of a change in a quantity,
 - ▶ “iff” used as an abbreviation for “if and only if”.
- Understand the concept of a mathematical proof and the meaning of “necessary”, “sufficient” and “necessary and sufficient” as they are used in mathematical derivations.
- Evaluate numerical expressions using an electronic calculator with the following features: arithmetic functions (\cdot), powers (y^x) and roots ($\sqrt[y]{x}$), exponential (e^x) and natural log ($\ln x$) functions. (The following features are also useful but not essential: factorial function ($n!$), combinations (${}_n C_r$), hyperbolic tangent function
- And its inverse ($\tanh x$ and $\tanh^{-1} x$), fraction mode, at least one memory and an “undo” facility. (Statistical and financial functions are not required.) Students should be able to make efficient use of memories, brackets and/or the calculator stack.
- Estimate the numerical value of expressions without using a calculator and apply reasonableness tests to check the result of a calculation.
- Quote answers to a specified or appropriate number of decimal places or significant figures (using the British convention for representing numbers), and be able to assess the likely accuracy of the result of a calculation that is based on rounded or approximated data values.
- Be able to carry out consistent calculations using a convenient multiple of a standard unit (e.g. working in terms of £000s).
- Express answers, where appropriate, in the form of a percentage (%) or as an amount per mil (‰).
- Understand why changes in quantities that are naturally expressed as percentages, such as interest rates, are often specified in terms of “basis points”.
- Determine the units of measurement (dimensions) of a quantity.
- Be familiar with the mathematical constants π and e .
- Understand the distinction between “expression”/“equation”/“formula” and “term”/“factor”.

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Topic 1

Numerical methods

1

Indicative study and assessment weighting 10%

Learning objectives

- (i) Calculate the absolute change, the proportionate change or the percentage change in a quantity (using the correct denominator and sign, where appropriate).
- (ii) Calculate the absolute error, the proportionate error or the percentage error in comparisons involving “actual” versus “expected” values or approximate versus accurate values (using the correct denominator and sign, where appropriate).
- (iii) Use linear interpolation to find an approximate value for a function or the argument of a function when the value of the function is known at two neighbouring points.
- (iv) Apply simple iterative methods, based on trial and improvement, to solve non-linear equations.
- (v) Carry out simple calculations involving vectors, including the use of row/column vectors and unit vectors, addition and subtraction of vectors, multiplication of a vector by a scalar, determining the magnitude and direction of a vector, the scalar product of two vectors.
- (vi) Carry out calculations involving matrices, including transposition of a matrix, addition and subtraction of matrices, multiplication of a matrix by a scalar, multiplication of two appropriately sized matrices and calculating the determinant of a 2x2 matrix and calculating the inverse when such a matrix is non-singular.

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$



Topic 2 Mathematical constants & standard functions

2

Indicative study and assessment weighting 5%

Learning objectives

- (i) Apply the definitions and basic properties of the functions (where n may be negative or fractional), c^x (where c is a positive constant), $\exp(x) [= e^x]$, and $\ln x [= \log_e x$ or $\log x]$.
- (ii) Sketch graphs of simple functions involving the basic functions in 2 (i) above, by identifying key points, identifying and classifying turning points, considering the sign and gradient, and the behaviour near 0 , 1 , $\pm \infty$ or other critical values.
- (iii) Simplify and calculate expressions involving the functions $|x|$ (absolute value), $[x]$ (integer part), $\max(K)$ and $\min(K)$.
- (iv) Understand the concept of a limit of a function and the 'lim' notation.
- (v) Explain the concept of a bounded function. [The notation $(x - 100)^+$ will also be used as an abbreviation for $\max(x - 100, 0)$].

Topic 3 Algebra

3

Indicative study and assessment weighting 25%

Learning objectives

- (i) Use algebraic expressions involving powers, logs, polynomials and fractions.
- (ii) Solve simple equations, including simultaneous equations (not necessarily linear) by rearrangement, substitution, cancellation, expansion and factorisation.
- (iii) Solve an equation that can be expressed as a quadratic equation (with real roots) by factorisation, by "completing the square" or by applying the quadratic formula, and identify which of the roots is appropriate in a particular context.
- (iv) Solve inequalities ("inequations") in simple cases.

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- (v) Explain the concept of a “strict” or “weak” inequality.
- (vi) Apply the Σ and Π notation for sums and products, including sums over sets (eg $\sum_{i \geq 0}$) and repeated sums.
- (vii) Calculate the sum of a series involving finite arithmetic or geometric progressions or non-terminating geometric progressions using the formulae:

$$\Sigma AP = \frac{n}{2}(2a + (n-1)d) \text{ or } \frac{n}{2}(a+l),$$

$$\Sigma GP = \frac{a(1-r^n)}{1-r} \text{ and}$$

$$\Sigma_{\infty} GP = \frac{a}{1-r}.$$

- (viii) Determine when a non-terminating geometric series converges.
- (ix) Apply the formulae: $\sum_{k=1}^n k = \frac{1}{2}n(n+1)$ and $\sum_{k=1}^n k^2 = \frac{1}{6}n(n+1)(2n+1)$
- (x) Solve simple first or second order difference equations (recurrence relations), including applying boundary conditions, by inspection or by means of an auxiliary equation where the auxiliary equation has real roots.
- (xi) Apply the binomial expansion of expressions of the form $(a+b)^n$ where n is a positive integer, and $(1+x)^p$ for any real value of p and, in the latter case, determine when the series converges.

Topic 4 Calculus

Indicative study and assessment weighting 25%

4

Learning objectives

- (i) Determine a derivative by considering the rate of change of a function when its argument is varied (in particular, for functions dependent on t , the time measured from a specified reference point), including the interpretation of a derivative as the gradient of a graph.

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 =$$



- (ii) Differentiate the standard functions x^n , c^x , e^x and $\ln x$.
- (iii) Evaluate derivatives of sums, products (using the product rule), quotients (using the quotient rule) and "functions of a function" (using the chain rule).
- (iv) Apply the concept of a higher-order (repeated) derivative.
- (v) Apply differentiation to find the maximum or minimum value of a function over a specified range (including the application of a monotone function, such as the natural log function, to simplify the calculation).
- (vi) Identify the nature of stationary points.
- (vii) Apply the concept of an indefinite integral as the anti-derivative of a function and the meaning of a definite integral as the limit of a sum of infinitesimal elements, including the interpretation of a definite integral as the area under a graph.
- (viii) Explain the meaning of a partial derivative.
- (ix) Be able to express a partial derivative in standard mathematical notation.
- (x) Evaluate partial derivatives in simple cases.
- (xi) Determine the extreme values of functions of two variables.
- (xii) Integrate the standard functions x^n , c^x and e^x .
- (xiii) Solve indefinite and definite integrals by inspection, by identifying and applying an appropriate substitution, by integration by parts, by using simple partial fractions where the fractions initially have a quadratic denominator or by a combination of these methods.
- (xiv) Determine when a definite integral converges.
- (xv) State and apply Taylor series and Maclaurin series in their simplest form, including using these to determine the approximate change in a function when the argument is varied by a small amount. (Knowledge of the error terms is not required).
- (xvi) Apply the Taylor series expansions for e^x and $\ln(1+x)$ and, in the latter case, determine when the series converges.

$$\frac{3)^2 + (0,7-4)^2}{m_1 + m_2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad z \approx 11,3 \quad x = \frac{x_1}{1}$$



Topic 5 Probability and statistics

3

Indicative study and assessment weighting 35%

Learning objectives

- (i) Describe a set of data using a table or frequency distribution, and display it graphically using a line plot, a box plot, a bar chart, histogram, stem and leaf plot, or other appropriate elementary device.
- (ii) Describe the level/location of a set of data using the mean, median, mode, as appropriate.
- (iii) Describe the spread/variability of a set of data using the standard deviation, range, interquartile range, as appropriate.
- (iv) Explain what is meant by symmetry and skewness for the distribution of a set of data.
- (v) Explain the concepts of probability:
 - (a) Explain what is meant by a sample space for an experiment and an event
 - (b) Define probability as a collection of events, stating basic axioms
 - (c) Define basic properties satisfied by the probability of occurrence of an event, and calculate probabilities of events in simple situations
 - (d) Define the addition rule for the probability of the union of two events, and use the rule to calculate probabilities
 - (e) Define the conditional probability of one event given the occurrence of another event, and calculate such probabilities
 - (f) Define Bayes' Theorem for events, and use the result to calculate probabilities
 - (g) Define independence for two events, and calculate probabilities in situations involving independence.
- (vi) Apply permutations and combinations to the calculation of probabilities.
- (vii) Explain what is meant by a discrete random variable, define the distribution function and the probability function of such a variable, and use these functions to calculate probabilities.

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2$$



- (viii) Explain what is meant by a continuous random variable, define the distribution function and the probability density function of such a variable, and use these functions to calculate probabilities.
- (ix) Define the expected value of a function of a random variable, the mean, the variance, the standard deviation, the coefficient of skewness and the moments of a random variable, and calculate such quantities.

END OF SYLLABUS

$$\sqrt{3)^2 + (0,7 - 4)^2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad \bar{z} \approx 11,3 \quad x = \frac{x_1}{1}$$



Appendix 2

Specimen Examination Paper - Module 0

This module must be passed before a candidate can continue to take the remaining exams.

Please note:

- This Specimen exam paper provides an example of the type of questions that will appear in the Module 0 exam paper.
- Although only 20 sample questions are listed in this specimen paper, there will be a total of 60 questions in the actual Module 0 exam.
- The questions found in this Specimen exam paper will not be included in the actual Module 0 examination.

- 1 On 31 December 2012 an investment fund was valued at £31,425. The value of the fund on 31 December 2011 was £39,040. By what percentage had the fund changed during 2012?
- A. + 19.5%
- B. 19.5%
- C. + 24.2%
- D. 24.2%

Answer: B
[Topic 1]

- 2 For a particular model of motorcycle the stopping distance at 50 miles per hour is measured at 144 feet and the stopping distance at 70 miles per hour is 296 feet.

Using linear interpolation, the stopping distance at 62 miles per hour, in feet, rounded to the nearest foot would be:

- A. 193 feet
- B. 205 feet
- C. 233 feet
- D. 235 feet

Answer: D
[Topic 1]

$\frac{+ \lambda x_2}{+ \lambda}$, $\frac{- \lambda y_2}{1 + \lambda}$ $-2, 4$ $m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 1$



3 If $a = (2 \ -1 \ 0)$ and $b = (5 \ 3 \ -2)$ then $2a - 4b =$

A. $(16 \ 14 \ 8)$

B. $\begin{pmatrix} 16 \\ 14 \\ 8 \end{pmatrix}^T$

C. $(16 \ -14 \ 8)$

D. $\begin{pmatrix} -16 \\ -14 \\ 8 \end{pmatrix}^T$

Answer: **D**

[Topic 1]

4 Determine values for $\lfloor 5.9 \rfloor$ and $\lceil 5.9 \rceil$

A. $\lfloor 5.9 \rfloor = 5.9$ and $\lceil 5.9 \rceil = 5$

B. $\lfloor 5.9 \rfloor = 5$ and $\lceil 5.9 \rceil = 5.9$

C. $\lfloor 5.9 \rfloor = 5.9$ and $\lceil 5.9 \rceil = 5.9$

D. $\lfloor 5.9 \rfloor = 6$ and $\lceil 5.9 \rceil = 6$

Answer: **A**

[Topic 2]

5 For the function $f(x)$, if there exists a real number M such that $|f(x)| \leq M$ then the function $f(x)$ is said to be:

A. real

B. unbounded

C. bounded

D. continuous

Answer: **C**

[Topic 2]

$$\sqrt{3^2 + (0.7 - 4)^2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad \bar{z} \approx 11.3 \quad x = \frac{x_1}{1}$$



6 Which of the following expressions about the exponential function $\exp(x)$ is/are TRUE?

I $\exp(x) = \lim_{n \rightarrow \infty} \left(1 + \frac{x}{n}\right)^n$

II $\exp(x) = \sum_{n=1}^{\infty} \frac{x^n}{n!}$

III $\exp(x) = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^x$

- A. I and II only
B. II and III only
C. I only
D. III only

Answer: **C**

[Topic 2]

7 The following product

$$10 \times (1.095) \times (1.095)^2 \times \dots \times (1.095)^{11}$$

can be expressed as:

A. $10 \prod_{j=0}^{10} (1.095)^j$

B. $\prod_{j=0}^{11} 10(1.095)^j$

C. $\prod_{j=1}^{11} 10(1.095)^j$

D. $10 \prod_{j=1}^{11} (1.095)^j$

Answer: **D**

[Topic 3]

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2$$



8 The geometric series $a + ar + ar^2 + ar^3 + \dots$ converges when

- A. $r \neq 1$
- B. $|r| < 1$
- C. $r < 1$
- D. $r > 1$

Answer: **B**

[Topic 3]

9 Factorize the following inequality $30 > 16x^2 + 28x$

- A. $(8x - 6)(2x + 5) < 0$
- B. $(4x + 6)(4x - 5) < 0$
- C. $(3 - 16x)(x + 10) > 0$
- D. $(16x + 30)(x - 1) < 0$

Answer: **A**

[Topic 3]

10 Determine the derivative of $(e^x + 2x)(x^2 - 2x)$

- A. $2xe^x - 2e^x + 4x^2 - 4x$
- B. $2xe^x - 2e^x + 4x^2 - 4$
- C. $x^2e^x - 2e^x + 6x^2 - 8x$
- D. $x^2e^x - 2xe^x + 2x^2 - 4x$

Answer: **C**

[Topic 4]

11 Determine the turning points of the function $4x^3 + 7x^2 - 20x + 11$

- A. minimum at $x = -2$ and maximum at $x = 0.833$
- B. minimum at $x = 0.833$ and maximum at $x = -2$
- C. minimum at $x = -2$ and maximum at $x = 0$
- D. minimum at $x = 0.833$ and maximum at $x = 0$

Answer: **B**

[Topic 4]

$$\frac{3)^2 + (0,7 - 4)^2}{2} = \frac{m_2x_1 + m_1x_2}{m_1 + m_2} \quad y = \frac{m_2y_1 + m_1y_2}{m_1 + m_2} \quad \bar{z} \approx 11,2 \quad x = \frac{x_1}{1}$$



12 Find $\frac{dy}{dx}$ given that $3x^2 - 5xy + 2y^2 = 6$

[Hint: consider y as a function of x]

A. $\frac{6x-5y}{5x-4y}$

B. $\frac{6x-5y}{4y-5x}$

C. $6x-5y$

D. $4y-5x$

Answer: **A**

[Topic 4]

13 The stem and leaf diagram below shows the value of 40 claim amounts from a group of health insurance policies. The stem unit is \$10,000 and the leaf unit is \$1,000

0	
1	3
2	0259
3	1578
4	279
5	1223556
6	01244889
7	14566778
8	0114
9	1

Determine the median claim amount of this sample

A. \$60,000

B. \$60,500

C. \$63,000

D. \$65,000

Answer: **B**

[Topic 5]



-
- 14 Suppose A and B are events with $P(A) = 0.5$, $P(B) = 0.75$ and $P(A \cup B) = 0.80$.

Calculate the probability

- A. 0.375
- B. 0.4
- C. 0.45
- D. 0.6

Answer: **C**

[Topic 5]

- 15 Suppose A and B are events with $P(A) = 0.4$, $P(B) = 0.6$ and $P(A \cap B) = 0.25$.

Calculate the probability $P(\bar{A} \cup B)$ where \bar{A} is the complement of A

- A. 0.25
- B. 0.65
- C. 0.75
- D. 0.85

Answer: **D**

[Topic 5]

- 16 Suppose A and B are events with $P(A) = 0.8$, $P(B) = 0.5$ and $P(A \cap B) = 0.45$.

Calculate the probability $P(A \cap \bar{B})$ where \bar{B} is the complement of B

- A. 0.35
- B. 0.40
- C. 0.45
- D. 0.85

Answer: **A**

[Topic 5]

$$\sqrt{3^2 + (0.7 - 4)^2} = x = \frac{m_2 x_1 + m_1 x_2}{m_1 + m_2} \quad y = \frac{m_2 y_1 + m_1 y_2}{m_1 + m_2} \quad \bar{z} \approx 11.3 \quad x = \frac{x_1}{1}$$



-
- 17 The number of claims, X , on an extended warranty policy for a particular model of sandwich toaster has the following probability distribution:

x	0	1	2	3	4	5
P(X=x)	0.08	0.16	0.22	0.35	0.17	0.02

Calculate $P(X > 2)$

- A. 0.22
- B. 0.24
- C. 0.54
- D. 0.76

Answer: **C**

[Topic 5]

- 18 If $E[X] = 5$ and $\text{Var}[X] = 45$ then $E[X^2]$ is:

- A. 20
- B. 40
- C. 50
- D. 70

Answer: **D**

[Topic 5]

- 19 X is a random variable. If $\text{Var}[X] = 5$ calculate $\text{Var}[2X+5]$

- A. 10
- B. 15
- C. 20
- D. 25

Answer: **C**

[Topic 5]

$$\frac{+\lambda x_2}{+\lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2$$



20 For a given set of data the mean is 10.5 and the mode is 9. What can we deduce about the skewness of the data?

- A. The data is positively skewed
- B. The data is negatively skewed
- C. The data is symmetrical
- D. We cannot deduce anything about the skewness

Answer: **D**

[Topic 5]

$$\frac{x_1 + \lambda x_2}{1 + \lambda}, y = \frac{y_1 + \lambda y_2}{1 + \lambda} \quad -2, 4 \quad m_1 = 2, m_2 = 3, x_1 = 6, y_1 = -4, x_2 = 0, y_2 = 4$$





US OFFICE

475 N. Martingale Road
Suite 600
Schaumburg, IL 60173
USA

Tel: +1-847-273-8890
1-844-839-1679 (Toll Free)

UK OFFICE

7th Floor, Holborn Gate,
326 - 330 High Holborn,
London, WC1V 7PP
United Kingdom

Tel: +44 01865 268266

E: enquiries@caa-global.org

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