



Malad Kandivli Education Society's

**NAGINDAS KHANDWALA COLLEGE (Autonomous)**

Reaccredited by NAAC with 'A' Grade (3rd Cycle) | ISO 9001:2015 Certified

**Program Code: UHCAS**

**Programme Name: Bachelor of Commerce (B.Com.) (Honours) in Actuarial Studies**

**Programme Outcome:**

This program of B. Com. (Honours) - Actuarial Studies is structured to provide graduates with practical skills required in international actuarial field. The main objective of B. Com. (Honours) - Actuarial Studies Program are :-

- To provide intensive theoretical & practical knowledge in all aspects of risk management.
- To provide an integrated perspective of management functioning along with a good amount of exposure to real life cases / technical knowhow on crucial aspects of Insurance products pricing
- To produce bachelors with a strong background in Mathematics, Statistics, Economics, Finance and Analytics to deal with Data Analysis in the areas of Financial Sector such as Insurance, Banking, Capital Market and other Financial Applications in view of sustained growth envisaged in Insurance Industry and KPO industry at large in the Financial sector.
- To develop students' competencies to identify the possibility of a bad event, or a catastrophe; evaluate a solution to minimize the possibility of said bad event, or catastrophe, from occurring and also analyze the losses, that the risk might bring about, and devise solutions to reduce its consequences to the economy.
- To make actuarial study students job-ready in the profession of actuaries and analytics.
- To provide expert's knowledge to undertake Actuarial profession and become a catalyst in the process of becoming actuary.

## Semester I

### 1.Foundation Course

#### Course Objective

- To make a student aware of
- Composition of Indian society from many facets and impact of globalization
- Impact of Politics and power changes on social and economic growth
- Actuarial profession and role of actuary, Constitution and Role of Institute of Actuaries of India
- Impact of Several Influential People (Indian and International)

#### Course Outcome

On successful completion of this course, student should be able to

- describe composition of Indian society
- describe impact of globalisation
- explain impact of Politics and power changes on social and economic growth
- state constitution and role of Institute of Actuaries of India
- describe role of actuary

- describe achievements of some famous people, analyse their strengths and describe the impact of their deeds on our lives

## 2. Actuarial Statistics 1A (Theory)

### Course Objective

- The aim of this course is to provide a grounding in mathematical and statistical techniques that are of particular relevance to actuarial work.

### Course Outcome

On successful completion of this course, student should be able to

- Calculate various statistical measures and Interpret them
- Summarise data using appropriate statistical analysis, descriptive statistics and graphical presentation
- Calculate probabilities of simple and compound events
- Define random variables and determine their distributions in various actuarial applications
- Describe the essential features of statistical distributions
- Determine generating functions
- Calculate probabilities and other measures from standard discrete and standard continuous distributions

## 3. Actuarial Statistics 1A (Practical)

### Course Outcome

On successful completion of this course, student should be able to use scientific calculator, spreadsheet software to

- Calculate various statistical measures and Interpret them
- Summarise data using appropriate statistical analysis, descriptive statistics and graphical presentation.
- Calculate probabilities of simple and compound events
- Calculate probabilities and other measures from standard discrete and standard continuous distributions
- Perform data analysis including principal component analysis A student should carry out practical exercises to achieve the above mentioned competence.

## 4. Actuarial Statistics 1B [Theory]

### Course Objective

- The aim of this course is to provide a grounding in mathematical and statistical techniques leading to inferences that are of particular relevance to actuarial work.

### Course Outcome

On successful completion of this subject, a student will be able to:

- describe and apply the principles of statistical inference
- calculate point estimate band interval estimates of parameters under different distribution environments
- calculate test statistic and perform a test of significance for various parameters under appropriate distributional environments
- describe, apply and interpret the results of the linear regression model and generalised linear models.

- explain the fundamental concepts of Bayesian statistics and use them to compute Bayesian estimators.

### **5. Actuarial Statistics 1B [Practical]**

#### **Course Outcome**

On successful completion of this course, student should be able to use scientific calculator, spreadsheet software (if required) to

- calculate point estimate band interval estimates of parameters under different distribution environments
- calculate test statistic and perform a test of significance for various parameters under appropriate distributional environments
- interpret the results of the linear regression model and generalised linear models
- fit a linear regression model to a data set and interpret the output
- fit a generalised linear model to a data set and interpret the output
- compute Bayesian estimators

### **6. Actuarial Accounting 1 (Theory)**

#### **Course Objective**

The aim of this course is to

- provide a basic understanding of corporate finance
- provide knowledge of the instruments used by companies to raise finance

#### **Course Outcome**

On successful completion of this course, student should be able to

- understand how companies are governed and structured
- suggest
- appropriate ways to finance a company

### **7. R Programming and Analytics (Practical)**

#### **Course Objective**

- Gain a foundational understanding of business analytics using R programming
- Master the R programming and understand how various statements are executed in R

#### **Course Outcome**

On successful completion of this course, student should be able to

- Gain an in-depth understanding of data structure used in R and learn to import/export data in R
- Define, understand and use the various apply functions and DPLYR functions
- Understand and use the various graphics in R for data visualization
- Gain understanding of statistical concepts, hypothesis testing method and regression models.
- Learn and use clustering methods including K-means, DBSCAN, and hierarchical clustering

## Semester II

### 1.Environmental Studies

#### Course Objective

- To provide a basic understanding of environment around us in terms of natural resources, institutions and people around us, changes appearing in the environment, measuring their impact, assessment of risk and some methods of managing such risks.

#### Course Outcome

On successful completion of this course, a student shall be able to

- Describe what is importance of environmental study
- State the natural resources around us
- Describe ecosystems and their characteristics
- Describe biodiversity and its significance
- Describe different types of pollution and their impact
- Discuss social issues and environment
- Describe how human population is affected by environmental issues
- Describe actuarial and statistical models useful in assessing certain environmental risks and methods to deal with those risks

### 2.Actuarial Statistics 2A [Theory]

#### Course Objective

- The aim of this subject is to provide a strong background of mathematical and statistical modeling techniques that are of particular relevance to actuarial work, including time series analysis and its applications

#### Course Outcome

On successful completion of this subject, a student will be able to:

- describe and use statistical distributions for risk modeling
- describe the main concepts underlying the analysis of time series models
- describe and apply basic principles of machine learning

### 3.Actuarial Statistics 2A [Practical]

#### Course Outcome

On successful completion of this course, student should be able to use scientific calculator, spreadsheet software, R studio (if required) to

- calculate moments and cumulative probabilities for loss distributions
- calculate the estimates of the parameters of a failure time or loss distribution when the data is complete, or when it is incomplete, using maximum likelihood and the method of moments
- fit a statistical distribution to a dataset and calculate appropriate goodness of fit measures
- calculate various measures of tail weight and interpret the results to compare the tail weights
- calculate sample autocorrelation coefficients and use them for estimating parameters in a time series model
- calculate forecasts based on time series models
- use appropriate software to apply machine learning techniques

#### 4. Actuarial Statistics 2B [Theory]

##### Course Objective

- The aim of this subject is to provide a strong background of mathematical and statistical modeling techniques that are of particular relevance to actuarial work, including stochastic processes and survival models and their application.

##### Course Outcome

On successful completion of this subject, a student will be able to:

- describe and apply Markov chains and Markov processes
- describe and apply techniques of survival analysis

#### 5. Actuarial Statistics 2B [Practical]

##### Course Outcome

On successful completion of this course, student should be able to use scientific calculator, spreadsheet software, R studio (if required) to

- calculate probabilities pertaining to simple stochastic process like simple random walk
- calculate multistep and steady-state probabilities using Markov Chain model
- calculate probabilities, expected waiting time in a state, expected time to reach from one state to another and other measures for Markov model
- calculation of probability, mean pertaining to lifespan based on different lifetime patterns
- calculate the Kaplan-Meier (or product limit) estimate of the survival function in the presence of censoring and estimate its variance
- calculate the Nelson-Aalen estimate of the cumulative hazard rate in the presence of censoring and estimate its variance
- apply Cox regression model to estimate proportionate hazards of two dissimilar lives
- compute maximum likelihood estimators for the constant transition intensities in Markov models using transition frequency data
- obtain estimates of central exposed to risk and hence estimates of transition probabilities in single decrement models
- carry out graduation by different standard methods
- carry out statistical tests of graduated rates for smoothness and adherence including tests for overall fit, presence of bias
- use an appropriate computer software package to apply Lee- Carter, age-period-cohort and p-spline regression models

#### 6. Actuarial Accounting 2

##### Course Objective

The aim of this course is to

- provide a basic understanding of accounting principles
- provide the ability to interpret the accounts and financial statements of companies and financial institutions
- provide an understanding of how to manage financial risk

##### Course Outcome

On successful completion of this course, student should be able to

- analyse published accounts

- produce management information

## 7. Advanced Excel with Macros [Practical]

### Course Objective

- This course is aiming at providing grounding in Excel and its advanced features including various Excel functions useful in actuarial analytics and enable building Excel macros using visual basic.

### Course Outcome

- On successful completion of this course, student should be able to
- Demonstrate knowledge of Utility, Specifications
- Creating and Operating on worksheets: Entering data, editing data, Window view controls, working with cells and ranges, Introducing Tables, formatting worksheets, using and creating Templates, printing from worksheets
- Working with formats and functions: Introducing formulas and functions
- Creating formulas using functions useful for text manipulation, date and time related applications, counting and summing, formulas to LookUp values, useful for financial and statistical applications and formulas with array functions
- Creating charts and graphics: create and edit charts of the following types: Column, Bar, Line, Pie, XY charts
- Use Advanced Features: Creating and using outlines, linking and consolidating worksheets, sharing data with other applications, analyzing data using MS Query with external database files, performing what-if analysis, analyzing data using Goal Seek and Solver
- Demonstrate Programming Ability in EXCEL with VBA using VBA sub-procedures and VBA functions, Create VBA Macros, record actions to create them, write VBA Code.

## Semester III

### 1. Actuarial Mathematics 1A

#### Objective:

- The aim of this course is to provide a grounding in the principles of modelling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value known cashflows

#### Outcome:

On successful completion of this course, student should be able to

- describe the basic principles of data analysis in actuarial modeling
- calculate present value, real value of money
- modify financial values at different times by inflating/deflating them to compare
- describe, interpret and discuss the theories on interest rates
- use them for decision making in various actuarial applications
- Learner will apply the knowledge of pollutants to undertake research projects/studies.

### 2. Actuarial Mathematics 1B

**Objective:**

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value known cashflows as well as those which are dependent on death, survival, or other uncertain risks.

**Outcome:**

On successful completion of this course, student should be able to

- understand and apply equation of values by cashflow inflation/deflation approach
- describe, interpret and discuss mathematical techniques used to model and value cashflows which are contingent on mortality and morbidity risks [including single decrement models and multiple decrement models]

**3. Actuarial Mathematics 1C****Objective:**

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value known cashflows as well as those which are dependent on death, survival, or other uncertain risks.

**Outcome:**

On successful completion of this course, student should be able to

- Determine premiums for life insurance plans with or without profit
- Determine premiums/benefits for benefit plans for individual life coverage plans
- understand reserves and calculate reserves
- develop capability to perform profit testing to finalise premiums

**4. Actuarial Mathematics 1 [Practical]****Objective:**

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on deterministic models which can be used to model and value known cash flows as well as those which are dependent on death, survival, or other uncertain risks.

**Outcome:**

On successful completion of this course, student should be able to

- apply the basic principles of data analysis in actuarial modeling
- apply, interpret and discuss mathematical techniques used to model and value cashflows which are contingent on mortality and morbidity risks
- use spreadsheet software for a variety of calculations (including use of first principle and various software functions)

**5. Insurance Principles and Designing of Insurance Products (Theory)****Objective:**

- The aim of this course is to provide a grounding in the principles of insurance, underwriting process, sales process, claim process and types of life and non-life insurance products (including designing of products).

**Outcome:** After successful completion of this course, student should be able to

- Describe Purpose and Process of insurance
- Apply their understanding in designing insurance contract needs
- State the purpose and products of life insurance processes from acceptance of application till closure due to claim or otherwise
- Describe products of employee benefits
- Describe products of Non-life insurance
- Appraise Rating practices and premium calculations

## **6. Insurance Principles and Designing of Insurance Product (Practical)**

**Objective:**

- The aim of this course is to provide an insight into designing of insurance products.

**Outcome:**

After successful completion of this course, student should be able to

- Understand the sources of ideas to design product
- Conduct a survey to know the available products and their features in the market
- Conduct a survey to understand need for different types of products, product features
- Demonstrate the understanding by designing the features of some innovative products in life insurance, annuities, non-life insurance and health insurance

## **Semester IV**

### **1. Actuarial Mathematics 2A**

**Objective:**

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on investors' mind frame and behaviour that may affect investment decisions. This will enhance ability to communicate with other financial professionals and critically evaluate modern financial theories.

**Outcome:**

On successful completion of this course, student should be able to

- describe, interpret and discuss the theories on the behaviour of financial markets (including models for interest rates)
- discuss the advantages and disadvantages of different measures of investment risk
- use them for decision making in various actuarial applications

### **2. Actuarial Mathematics 2B**

**Objective:**

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on stochastic asset models which can be used to make investment decisions. These skills are also required to communicate with other financial professionals and to critically evaluate modern financial theories.

**Outcome:**

On successful completion of this course, student should be able to



- describe, construct, interpret and discuss the models underlying asset valuations.

### 3. Actuarial Mathematics 2C

#### Objective:

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on deterministic and stochastic liability models and the valuation of financial derivatives. This will enhance ability to communicate with other financial professionals and critically evaluate modern financial theories.

#### Outcome:

On successful completion of this course, student should be able to

- describe, construct, interpret and discuss the models underlying liability valuations
- describe, construct, interpret and discuss the models underlying option pricing.

### 4. Actuarial Mathematics 2 [Practical]

#### Objective:

- The aim of this course is to provide a grounding in the principles of modeling as applied to actuarial work – focusing particularly on stochastic asset liability models and the valuation of financial derivatives. These skills are also required to communicate with other financial professionals and to critically evaluate modern financial theories

#### Outcome:

On successful completion of this course, student should be able to On successful completion of this subject, a student will be able to:

- apply the theories on the behaviour of financial markets
- calculate different measures of investment risk
- apply the models underlying asset valuations
- apply the models underlying liability valuations
- apply the models underlying option pricing

### 5. Data Analytics (Theory)

#### Objective:

- The aim of this course is to provide a grounding in the applications of R-programming, Excel and other softwares in business analytics

#### Outcome:

After successful completion of this course, student should be able to

- Demonstrate skills to analyse business problems and solve them with the help of various technological tools including R-Programming, Excel
- Appraise Big Data needs and techniques to tackle them

### 6. Data Analytics (Practical)

#### Objective:

- The aim of this course is to provide a grounding in the applications of R-programming, Excel and other softwares in business analytics

#### Outcome:

After successful completion of this course, student should be able to

- Demonstrate skills to analyse business problems and solve them with the help of various technological tools including R-Programming, Excel
- Appraise Big Data needs and techniques to tackle them

### **Semester V**

#### **1. Actuarial Economics 1**

##### **Objective:**

- The aim of this subject is to introduce students to the core economic principles and how they can be used in a business environment to help decision making and behavior.
- It provides the fundamental concepts of microeconomics that explain how economic agents make decisions and how these decisions interact.

##### **Outcome:**

On successful completion of this course, student should be able to

- show a systematic knowledge and critical awareness of economic theory in the areas of syllabus covered by the subject
- apply a range of techniques to solve problems in the areas of syllabus covered by the subject
- appreciate recent developments and methodologies in economics
- understand the relevance of economic theory to the business environment and the links between economic theory and its application in business
- apply basic microeconomic theory to business problems

#### **2. Actuarial Business Management**

- **Objective:** To provide students with an understanding of the wider business context in which Actuaries will work, integrating where appropriate the analysis of case studies to enhance the learning. The skills acquired should enable students to apply tools and techniques to assist strategic thinking and prepare for a role in wider management.

##### **Outcome:**

On successful completion of this subject, a student will be able to:

- analyse the key drivers of external and internal business environments
- apply the strategic tools and frameworks needed to assess the competitiveness of a business
- develop a coherent business strategy
- define a business's culture
- explain how a business's culture will impact on the implementation of a chosen strategy
- understand the role of values and behaviours in the long term success of a business
- understand how to manage change within an organisation
- understand the importance of leadership in an organisation
- understand the nature and dynamics of working in teams

#### **3. Actuarial Project-1**

##### **Objective:**

- To provide students an understanding of how to work in an actuarial office and to give an opportunity to acquire hands on experience of working on an actuarial problem under the guidance of an actuary.

**Outcome:**

- After successful completion of this course, student will be able to explore solutions for the real problems, encountered in a real life job, in the complete project execution from start to finish, by applying basic actuarial concepts, principles and skills.

[4] Any one subject from DSE Group A [3 Credits]

[5] Any one subject from DSE Group A [3 Credits]

**Group A****(A1) Security Laws****Objective:**

The aim of this subject is to create an awareness amongst students of a variety of laws mainly pertaining to securities of all kinds (including securities pertaining to different kinds of assets, investments and capital market).

**Outcome:** On successful completion of this course, student should be able to

- describe, explain, interpret and discuss the implications and significance of various laws pertaining to
  - consumer protection laws
  - anti-corruption laws
  - financial security
  - investment security
  - organisation/professional bodies
  - cyber security
  - other significant items
- describe role of relevant regulators such as
- Securities and Exchange Board of India

**(A2) Life Insurance****Objective:**

The aim of this subject is to use the technical and business skills learnt in the Actuarial Statistics, Actuarial Modeling and Business subjects to understand the real life working in a life insurance company to solve their problems.

**Outcome:**

On successful completion of this subject, a student will be able to:

- understand strategic concepts in the management of life insurance company and their products
- understand the risks faced both by individuals and groups who subscribe to their products and also the risks faced by life insurance companies
- explain the principles and techniques used to manage these risks
- understand the key techniques used by the life insurers to ensure that promised liabilities can be met

**(A3) Employee Benefits and Laws**

**Objective:**

The aim of this subject is to appraise a student of various employee benefits in India, pertinent laws and to develop skills to apply

- the mathematical and economic techniques, and
- the principles of actuarial planning and control needed for the financial management of pensions and other employee benefits

**Outcome:**

On successful completion of this subject, a student will be able to:

- describe features of employee benefits in India
- state the laws pertaining to employee benefits in India and explain their significance
- understand the main principles and techniques of actuarial management and control that are relevant to benefit provision
- apply these principles to simple situations within the context of pensions and other benefits
- analyse hypothetical scenarios, including using judgement to assess the implications of possible actions and to develop appropriate proposals or recommendations relating to the management of benefit arrangements

**(A4) Financial Reporting Standards****Objective:**

- The aim of this course is to provide an insight into the need and implications of various financial reporting standards (including their effect on actuarial valuation of liabilities).

**Outcome:**

On successful completion of this course, a student shall be able to

- describe and explain its significance and implication of various financial accounting standards (including their effect on actuarial valuation of liabilities)

**6. Actuarial Business Communication 1****Objective:**

The aim of this course is

- to identify appropriate forms of written communication
- to select appropriate language for a non-specialised audience
- to identify the key issues that need to be addressed and convey these in an effective way

**Outcome:**

On completion of this course, a successful candidate will be able to:

- draft an appropriate piece of communication as directed, to a standard expected of a newly qualified actuary without the need for significant re-drafting
- use an effective structure
- identify and use appropriate language that the intended recipient(s) will understand easily
- provide adequate and appropriate explanation of technical concepts
- incorporate appropriate communications tools to help convey meaning (e.g. graphs, tables and charts)
- reflect appropriately on their approach to a particular piece of communication

## Semester VI

### 1. Actuarial Economics 2

#### Objective:

The aim of this subject is to introduce students to

- the core economic principles and appraise them of how these can be used in a business environment to help decision making and behaviour
- the principles underlying macroeconomics that explain how the economic system works, where it fails and how decisions taken by economic agents affect the economic system

**Outcome:** On successful completion of this course, student should be able to

- show a systematic knowledge and critical awareness of economic theory in the areas of syllabus covered by the subject
- apply a range of techniques to solve problems in the areas of syllabus covered by the subject
- appreciate recent developments and methodologies in economics
- understand the relevance of economic theory to the business environment and the links between economic theory and its application in business
- apply basic macroeconomic theory to business problems

### 2. Insurance Laws

#### Objective:

- The aim of this subject is to create an awareness amongst students of a variety of laws pertaining to insurance (including life insurance, non-life insurance and health insurance) business.

#### Outcome:

On successful completion of this course, student shall be able to

- describe, understand, interpret and analyse the implications of various laws pertaining to insurance sector. This in turn, would equip them to make better decisions regarding product design, pricing and reserve needed.

### 3. Actuarial Project-2

#### Objective:

- To provide students an understanding of how to work in an actuarial office and to give an opportunity to acquire hands on experience of working on an actuarial problem under the guidance of an actuary.

#### Outcome:

- After successful completion of this course, student will be able to explore solutions for the real problems, encountered in a real life job, in the complete project execution from start to finish, by applying basic actuarial concepts, principles and skills.

[4] Any one subject from DSE Group B [3 Credits]

[5] Any one subject from DSE Group B [3 Credits]

## **Group B**

### **(B1) Social Insurance**

#### **Objective:**

- To provide a student an insight into various social security / insurance schemes available in India which may enable them for creating awareness among community at large and in financial advisory role.

#### **Outcome:**

- On successful completion of this course, a student shall be able to describe the features, understand the usefulness and compare different social security/insurance schemes.

### **(B2) Non-life Insurance**

#### **Objective:**

- The aim of this subject is to use the technical and business skills learnt in the Actuarial Statistics, Actuarial Modeling and Business subjects to understand the real life working in a non-life insurance company to solve their problems.

#### **Outcome:**

On successful completion of this subject, a student will be able to:

- understand strategic concepts in the management of non-life insurance company and their products
- understand the risks faced both by individuals and groups who subscribe to their products and also the risks faced by non-life insurance companies
- explain the principles and techniques used to manage these risks
- understand the key techniques used by the non- life insurers to ensure that promised liabilities can be met

### **(B3) Health Insurance**

#### **Objective:**

- The aim of this subject is to use the technical and business skills learnt in the Actuarial Statistics, Actuarial Modeling and Business subjects to understand the real life working in a health insurance company to solve their problems.

**Outcome:** On successful completion of this subject, a student will be able to:

- understand strategic concepts in the management of health insurance company and their products
- understand the risks faced both by individuals and groups who subscribe to their products and also the risks faced by health insurance companies
- explain the principles and techniques used to manage these risks
- understand the key techniques used by the health insurers to ensure that promised liabilities can be met

**Program Code: UHCAS**

**Programme Name: Bachelor of Commerce (B.Com.) (Honours) in Actuarial Studies  
(B4) Finance and Investments**

**Objective:**

- The aim of this subject is to provide a basic understanding of financial and investment skills, options to invest for individuals and institutions and how to make investment and disinvestment decisions.

**Outcome:**

- After successful completion of this unit, student will be able to
- Understand the need to invest
- Explain role of regulators for financial markets
- Outline functions of financial intermediaries in investment process
- Discuss various Investment Options available and their characteristics
- Suggest Financial Plans based on Individuals' needs
- Explain and apply fundamental analysis
- Explain and apply technical analysis
- Explain effect of taxes on Investment Options and levels
- Describe different types of mutual funds
- Explain role of Fund managers and how would they handle this

## **6. Actuarial Business Communication 2**

**Objective:**

The aim of this course is

- to identify appropriate forms of written communication
- to select appropriate language for a non-specialised audience
- to identify the key issues that need to be addressed and convey these in an effective way
- to acquire soft skills required to be well prepared to write a good resume and take on an interview for a relevant job

**Outcome:**

On completion of this course (and using inputs from Actuarial Business Communication 1 course), a successful candidate will be able to:

- redraft a write-up involving a lot of financial/actuarial jargon terms into a language that a person without actuarial background can understand
- preparing a shorter write-up from a long write-up involving a lot of financial/actuarial jargon terms
- write an impressive resume suitable for a related job
- demonstrate ability to take on an interview very well



**PRINCIPAL.**

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