ABSTRACT

SARIP, AIRAH D. 2024. On the Calibration of Item Parameters of an Examination in the Mathematics in the Modern World using 2PL Model. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 64 pp

Adviser: **JONALD L. PIMENTEL, PhD**

This study aims to calibrate and estimate the item parameters of the Mathematics in the Modern World midterm examination using the Item Response Theory Two Parameter Logistic Model (2PLM). The calibration process involved estimating item difficulty and discrimination parameters for the 50 multiple-choice questions of the examination based on the responses of 934 students. The objectives of the study included classifying the items by difficulty and its discrimination, establishing a calibrated item bank, and constructing an offline automated test. The result of the analysis identified that of the total items, 34% of the items were of average difficulty, and with 20 items were deemed suitable for inclusion in the item bank. The study underscores the importance of rigorous item calibration to ensure fair and reliable student assessments and provides a framework that can be replicated in other educational settings to enhance the quality and standardization of examinations.

Keywords: Item bank, item calibration, item difficulty, item discrimination, and item response theory.

ABSTRACT

MATULIK, JALANIE T. 2024. On the Calibration of Item Parameters Characteristics of the University of Southern Mindanao - College Entrance Exam Using 2PL Model: A Case for Mathematics Items BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 54pp

Adviser: **JONALD L. PIMENTEL, PhD**

This thesis focuses on the calibration of item parameter characteristics of the Mathematics section of the University of Southern Mindanao - College Entrance Exam (USM-CEE) under the Item Response Theory (IRT) Two-Parameter Logistic (2PL) model.

The study involves a detailed statistical estimation based from USMCEE examinees responses to a multiple choice test for item parameters, particularly item difficulties and discriminations of the fifty items (50). These estimates are essential for understanding how well each item differentiates between students of varying ability levels and how challenging each item is for the test-takers.

The results provide insights into the performance of individual items, identifying those items that function well and those that require revision. Items with poor discrimination or inappropriate difficulty levels are highlighted for further review and potential modification.

The fifty items (50) for mathematics are fitted under the 2PL model and estimation was handled by marginal maximum likelihood estimation method.

ABSTRACT

CALAWIGAN, MARGIELYN C. 2024. On the Calibration of Item Parameters of the University of Southern Mindanao-College Entrance Examination Using 2PL model: A case for English Items. 50 pp

Adviser: **JONALD L. PIMENTEL, PhD**

This study aims to calibrate and estimate the item parameters of the University of Southern Mindanao-College Entrance Examination Using 2PL model, a case for English Items.The calibration process involved estimating item discrimination and difficulty parameters for the 50 multiple-choice questions of the USMCEE examination based on the responses of 10,672 students. The objectives includes classification of the items by discrimination and its difficulty, which can be put in an item bank of these calibrated items that of the total items, 66% of the items were of average difficulty and 90% of the items have very low to moderate discrimination, and with 21 items were deemed suitable for inclusion in the item bank. In terms of fit , there are some items that do not fits well under the 2PL model, It is then recommended that those items should be recalculated using other alternative IRT models to estimate the item characteristics.

Keywords: Item bank, item calibration, item discrimination , item difficulty, and item response theory.

ABSTRACT

UTI, HAMIDA K. 2024. Item Parameter Calibration on The USMCEE using Two Parameter Logistic: A Case for Abstract Reasoning Items BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 53pp.

Adviser: **JONALD L. PIMENTEL, PhD**

This study focuses on calibrating the University of Southern Mindanao College Entrance Examination (USMCEE) using the two-parameter logistic model under the framework of item response theory. Focusing on the abstract reasoning section on the 2022 exam, this data was taken from the University Test Development Center (UTDC). Using the model and the binary responses of the examinees, the Marginal Maximum Likelihood Estimation (MMLE) was used to estimate the difficulty and discrimination. Results revealed that most of the items are in the average category with few in difficult and very difficult categories, and many items indicate moderate discrimination under the 2PL model, the items did not effectively differentiate between the high and low ability of the examinees to response correctly. A recommendation suggested considering alternative models for better estimates of item parameters. This insight is important for enhancing the good quality of USMCEE and ensuring it accurately and effectively assesses students' academic potential.

Keywords: University of Southern Mindanao College Entrance Examination, item response theory, two logistics parameter model, marginal maximum likelihood estimation.

ABSTRACT

CAMANO, JOLINA A. 2024. On the Calibration of Item Parameters of the University of Southern Mindanao-College Entrance Examination using 2PL model: A Case for Science Items BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 55 pp.

Adviser: **JONALD L. PIMENTEL, PhD**

A calibration to estimate the item parameters using the two-parameter logistic (2PL) model of the University of Southern Mindanao College Entrance Examination (USMCEE). Focusing on the science section of the 2022 exam, the data was taken from the University Testing and Data Center (UTDC). Using the model and the binary responses of the examinees, the Marginal Maximum Likelihood Estimation (MMLE) was used to estimate item difficulty and discrimination. Results revealed that most items are very difficult, with few in the moderate to easy range, and many items exhibit poor discrimination under the 2PL model, hindering the exam's effectiveness in differentiating students' ability to response to the items correctly. A recommendation is suggested considering alternative models for better estimates of the item parameters. These insights are crucial for enhancing the quality of the USMCEE and ensuring it accurately assesses students' academic potential.

Keywords: University of southern mindanao-college entrance examination, item response theory, two parameter logistic model, marginal maximum likelihood estimation.

ABSTRACT

TONIACAO, MIKEE V. 2024. Domination in the Join of Graphs. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 52 pp

Adviser: **LEONARD M. PALETA, PhD**

This paper discusses the concept of domination number in the join product of graphs and presents some known results. It determines the domination number in join of some special graphs. Additionally, it explores some conditions under which the domination number of the join product of some special graphs is equal or not equal. This study also presents the minimum number of patrol guards on duty specially during special occasions in the academy to be deployed to secure all the premises/streets of Matutum View Academy.

Keywords: concept of domination, domination number, join of graph

ABSTRACT

ABDULLATIP, AMIRA Y. 2024. Predicting Wins and Losses in Tournaments Using Various Rating Methods. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 64 pp

Adviser: DEBBIE MARIE B. VERZOSA, PhD

As rivals compete for supremacy, supporters and wagerers look for better rating systems in an effort to predict future outcomes. Massey Rating Method was created in 1997 to rank sports which employ least squares mathematical theory, meanwhile, Colley Rating Method was created in 2002 for ranking sports team wherein this method relied on win-loss data. The study aimed to describe the mathematical foundation of the two methods, rank each team based on different parameters and assess the methods' accuracy in comparison to the final season rankings. The Massey rating method, offers versatile parameters for sport analysis, proves adaptable for various sports, offering insights into team strengths. The Colley rating method provides bias-free ratings based solely on win-loss records, facilitating manual calculation without advanced technology. Despite limitations, the Massey method's flexibility makes it superior for assessing teams comprehensively.

Keywords: Colley rating method, Massey rating method, Parameters, Sports Tournament

ABSTRACT

FAHAD E. PIANG 2024. Hop Domination in the Join of Graphs. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 34 pp

Adviser: **SANDRA A. NANDING, MS**

This study focuses mainly on the concept of hop dominating sets in the join of two graphs. It intends to determine the hop dominating sets and the hop domination number in the join of two graphs and illustrations are provided to easily understand the results.

The study in hop domination in graph is the concept with applications in several fields is highlighted from the significance of this research. This is study deals with the hop dominating set of graphs resulting from joining of two graphs.

This paper presents the characterizations of the hop dominating sets in the join of two graphs. It also discusses the corresponding hop domination numbers of the form mentioned graph

Keywords: Hop Domination, Join of Graphs, Dominating sets, Graphs.

ABSTRACT

ZAHERA S. KADIL 2024. Analysis of Scoring Schemes for Multiple-Choice Examinatios. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 64 pp

Adviser: **DEBBIE MARIE B. VERZOSA, PhD**

This study investigates the effectiveness of four scoring schemes for multiple-choice examinations in assessing student knowledge and understanding while lessening the effects of guessing. The scoring schemes evaluated were Dichotomous Scoring (DS), Confidence Weighting (CW), Partial Credit Scoring (PCS), and Negative Marking (NM). The research involved applying these schemes to a 6-item multiple-choice test administered to 80 students enrolled in the Bachelor of Science in Applied Mathematics program at the University of Southern Mindanao for the academic year 2023-2024. The study revealed that the effectiveness of scoring schemes for multiple-choice examination depends on the question type. The dichotomous scoring scheme and confidence weighting is more effective for difficult items, whereas students cannot really guess the correct answer for the challenging questions. This method presents a favourable to traditional scoring method, fostering a more positive and effective evaluation of students learning. Partial credit scoring is fair to evaluate the student understanding. This scoring is advantageous to students who give an incorrect answer but have some idea

about the topic. Also, for items that are not too difficult, the negative marking scheme may be applied. Because of the possibility of penalties, students may hesitate to guess as this may result in negative score. Further, teachers may choose to apply the confidence weighting if they intend to penalize wrongfully confident answers.

Keywords: Confidence weighting, dichotomous scoring, negative marking, multiple-choice, partial credit, and scoring schemes.

ABSTRACT

ORBISTA, LUWALHATI, M. 2024. Comparison of Newton's, Secant, Bisection, and Fixed-Point Iteration Methods in the Solution of Non-Elementary Equations. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 75 pp

Adviser: **ENGR. ARNEL B. TOLEDO**

This study conducts a comprehensive comparison of four widely used iterative methods for solving non-elementary equations: Newton's method, Secant method, Bisection method, and Fixed-Point iteration method. The study aims to evaluate the efficiency, accuracy, and convergence properties of each method across various types of non-elementary equations. The findings provide valuable insights into determining which among the four methods is best to employ in the given equations.

Keywords: Non-elementary equations, newton's method, secant method, bisection method, and fixed-point method.

ABSTRACT

CAMPOS, FLORABELLE L. 2024. Domination in the Corona of Graphs. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 65 pp.

Adviser: **LEONARD M. PALETA, PhD**

This paper discusses the concept of domination number in the corona product of graphs and presents some known results. It determines the domination number in corona of some special graphs. Additionally, it explores some conditions under which the domination number of the corona product of some special graphs is equal or not equal. This study also presents the minimum number of patrol guards on duty especially during special occasions in the university to be deployed to secure all the premises/streets of USM Main campus.

Keywords: Corona of graphs, domination, graph theory

ABSTRACT

TORMIS, JANNA FIE A. 2024. Domination in the Edge Corona of Graphs. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 78 pp

Adviser: **LEONARD M. PALETA, PhD**

A set $D \subseteq V(G)$ is said to be a dominating set of a graph G if every vertex in $V(G) \setminus D$ is adjacent to at least one vertex in D. The cardinality of a minimum dominating set of D is called the domination number of G and is denoted by $\gamma(G)$. Any dominating set of cardinality $\gamma(G)$ is referred to as a γ-set of G.

This paper discusses the concepts of dominating sets of graphs obtained by edge corona and its domination number. It also determines the vertex-set and edge-set, as well as calculates the vertex cardinality and edge cardinality. It also presented an exploration on when the domination number of the edge corona becomes equal and or not.

Keywords: Graphs, edge corona of graphs, domination, domination number.

ABSTRACT

PUTONG, NORMAILA M. 2024. An Expository Study on the Panel Regression Modelling on Coffee Production among the top five Producers in the Philippines. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 70 pp.

Adviser: **DARYL MAE C. MAMON, MAS**

This study employs panel data regression analysis, a crucial tool across various disciplines, to investigate factors influencing coffee production among the top five producers in the Philippines. Recognizing the limitations of traditional OLS methods, the research leverages panel data regression to consider both time-series and cross-sectional variations. The focus is on coffee production in SOCCSKSARGEN, Davao Region, BARMM, Northern Mindanao, and Western Visayas from 2010 to 2021, employing both Pooled Ordinary Least Squares (OLS) and Fixed-Effect models to analyze the impact of these factors. Results demonstrate that both the area planted and the number of bearing trees significantly influence coffee production in both models. However, the Fixed-Effect model was found to be more suitable, as indicated by the F-test, which highlights the presence of unobserved heterogeneity and the inadequacy of the pooled OLS model for this dataset. This study highlights the importance of employing panel regression models to

ABSTRACT

ORBISTA, LUWALHATI M. 2024. Comparison of Newton's , Secant, Bisection, and Fixed- Point Iteration Methods in the Solution of Non – Elementary Equations. BSAM Thesis. College of Science and Mathematics, University of Southern Mindanao, Kabacan, Cotabato. 73 pp

Adviser: **ENGR. ARNEL B. TOLEDO**

This research conducts a comprehensive comparison of four widely used iterative methods for solving non-elementary equations: Newton's method, Secant method, Bisection method, and Fixed- Point iteration method. The study aims to evaluate the efficiency, accuracy, and convergence properties of each method across various types of non-elementary equations. The findings provide valuable insights into determining which among the four methods is best to employ in the given equations.

Keywords: Non-elementary equations, newton' method, secant method, bisection method, and fixed-point method.