Assessment of Grade 7 Students' Performance in Integer Operations: Implications for Remedial Programs

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ABSTRACT

This study examined the performance of Grade 7 learners in integer operations in the Schools Division of Tacloban City during School Year 2025–2026 as basis for a proposed remedial learning program. It responded to the continued difficulty of learners in solving problems involving positive and negative integers, especially as they move from elementary to secondary Mathematics. The study assessed learners' skills in addition, subtraction, multiplication, division, mixed operations, and problem-solving; identified their common errors; tested differences in performance when grouped by sex and previous Mathematics grade; and examined the relationship of performance with study habits and attitudes toward Mathematics. A quantitative method was used, particularly descriptive-correlational and descriptive-comparative designs. The respondents were 150 Grade 7 learners, 150 parents, and 28 Mathematics teachers from selected secondary schools. Data were gathered using a researcher-made achievement test and structured questionnaires on study habits, attitudes toward Mathematics, parental support, and school-related factors. The tools were checked by experts before use. Frequency, percentage, mean, standard deviation, Mean Percentage Score, t-test, ANOVA, and Pearson correlation were used to analyze the data. Results showed that learners performed better in addition and division but showed low mastery in subtraction and mixed operations. Their overall performance was at the Beginning level. The common errors were wrong interpretation of signs, confusion in choosing operations, double-negative errors, and wrong use of the order of operations. There were no significant differences in integer performance based on sex and previous Mathematics grade. There were also no significant relationships between integer performance, study habits, and attitudes toward Mathematics. Although learners had generally positive study habits, favorable attitudes, strong parental support, and available school resources, they still had difficulty with integer operations. The findings support the development of a remedial learning program focused on sign rules, conceptual understanding, step-by-step procedures, and correction of common errors.

Keywords: attitudes toward mathematics, integer operations, mathematics performance, remedial instruction, study habits.

INTRODUCTION

Mathematics plays a vital role in developing logical reasoning, analytical thinking, and problem-solving abilities needed in higher education, everyday decision-making, and the modern workforce. Among the foundational areas of mathematics, integer operations are particularly important because they support the learning of more advanced concepts, including algebraic expressions, equations, functions, and other topics that require accurate numerical reasoning. The Programme for International Student Assessment defines mathematical literacy as the capacity to formulate, employ, and interpret mathematics in different contexts through the appropriate use of concepts, facts, procedures, and reasoning (OECD, 2019). This perspective emphasizes that learners must not only memorize computational rules but also understand when and how mathematical procedures should be applied.

Despite their importance, integer operations remain challenging for many learners. International research has consistently shown that students experience operation-specific difficulties, particularly when negative numbers and subtraction are involved. Nurnberger-Haag et al. (2022), who developed and validated the Integer Test of Primary Operations among middle school students, found distinct patterns of difficulty across addition, subtraction, multiplication, and division of integers. Subtraction involving negative numbers emerged as an especially difficult area. Their findings demonstrate the value of examining performance separately across operations because an overall mathematics score may conceal specific computational weaknesses.

Studies examining learners' errors further indicate that difficulties in integer operations arise from both conceptual misunderstandings and procedural weaknesses. In a multi-site study involving Year 7 classes in Malaysia, Khalid and Embong (2020) identified carelessness, weak knowledge of whole-number facts, failure to assimilate integer concepts, overreliance on whole-number reasoning, and confusion caused by memorized sign rules as common sources of error. Learners particularly struggled with interpreting negative signs and subtracting negative numbers. Similarly, Makonye and Fakude (2016) found that a large proportion of the Grade 8 learners they studied demonstrated conceptual, strategic, logical, and procedural misconceptions in adding and subtracting directed numbers. These findings suggest that learners who depend primarily on memorized rules may perform familiar exercises but encounter difficulty when signs, operations, or problem structures are presented in unfamiliar or more complex forms.

Learner-related characteristics may also influence computational performance. Mathematics anxiety, for instance, can reduce the working-memory resources available for performing mathematical tasks, particularly those involving multiple steps (Ashcraft & Kirk, 2001). As the cognitive demands of a task increase, anxious learners may experience greater difficulty coordinating procedures and retrieving mathematical information accurately (Passolunghi, 2016). Mathematics self-concept is likewise associated with achievement. In the Philippine context, Peteros et al. (2019) found a significant positive relationship between mathematics self-concept and the mathematics performance of Grade 10 students. These findings indicate that computational difficulties may not be explained solely by a lack of mathematical knowledge. Learners' confidence, attitudes, anxiety, study habits, and willingness to persist may also affect how they approach and complete integer tasks.

The learning environment also contributes to the development of mathematical competence. Findings from the Trends in International Mathematics and Science Study underscore the importance of instructional opportunities, classroom practices, access to learning resources, and feedback-rich instruction in mathematics achievement (Mullis et al., 2020). In integer instruction, limited instructional time, insufficient representations, and an emphasis on memorizing rules may prevent learners from developing a meaningful understanding of positive and negative numbers (Khalid & Embong, 2020). Conversely, structured practice, appropriate learning materials, and interactive approaches can help strengthen computational fluency. Ballenas (2023), for example, found that technology-enhanced mathematics instruction using virtual manipulatives and Kahoot significantly improved Grade 7 learners' computational skills in integers, fractions, and decimals. Lopez (2022) similarly demonstrated the feasibility of using a numeracy mobile game to support junior high school learners experiencing difficulty with integer operations. These studies suggest that appropriately designed instructional and remedial activities can improve computational performance.

Mathematics learning is also shaped by conditions beyond the classroom. Meta-analytic evidence has shown that parental involvement is positively associated with academic achievement (Jeynes, 2007), while socioeconomic status has a substantial relationship with learners' educational outcomes across different contexts (Sirin, 2005). Parents' educational background, family income, the availability of learning materials at home, and the support provided for schoolwork may influence learners' opportunities to practice and reinforce mathematical skills. A study among Grade 7 learners in Iba, Zambales, found that family income influenced performance in integer operations, although no significant difference was observed according to sex (RSISI, 2024). The learners performed better in addition, multiplication, and division but continued to experience difficulty in subtraction. These results illustrate how computational performance may be associated with both the nature of the mathematical operation and the learner's broader home environment.

Philippine studies have documented similar weaknesses among Grade 7 learners. Harun et al. (2023) reported an overall mean percentage score of 50.56% in integer operations, interpreted as "Average Near Mastery."

Their participants demonstrated persistent misconceptions in subtracting integers, although performance did not significantly differ by sex. The study recommended targeted remedial activities to address the identified weaknesses. The findings of Harun et al. (2023) and RSISI (2024) are consistent with international evidence showing that subtraction is one of the most difficult integer operations for learners. However, these local investigations focused primarily on mastery levels, selected demographic differences, or the development of specific instructional materials. Other Philippine studies have evaluated particular interventions, such as technology-enhanced instruction and mobile learning tools (Ballenas, 2023; Lopez, 2022), but have not simultaneously examined the learner-, school-, and home-related factors associated with operation-specific performance.

The present study is theoretically informed by Piaget's Constructivist Theory of Learning, Skinner's Behaviorist Theory, and Bronfenbrenner's Ecological Systems Theory. Piaget (1972) proposed that learners actively construct knowledge by connecting new experiences with their existing cognitive structures. At approximately 11 years of age, learners begin developing formal operational thought, which enables them to engage in abstract and logical reasoning. This ability is essential for understanding integers because negative numbers cannot always be represented through direct experiences in the same way as whole numbers. From this perspective, misconceptions may develop when learners fail to connect prior numerical knowledge with the abstract relationships and rules governing integer operations.

Skinner's (1953) Behaviorist Theory complements this cognitive perspective by emphasizing the role of practice, feedback, and reinforcement in skill development. Repeated and purposeful practice can help learners achieve greater accuracy and fluency, while immediate corrective feedback can prevent errors from becoming established habits. Teachers' instructional practices, classroom feedback, and parents' encouragement may therefore reinforce learners' effort and persistence in performing integer operations. However, practice is most productive when it is accompanied by conceptual understanding; otherwise, learners may memorize sign rules without knowing why they work.

Bronfenbrenner's (1979) Ecological Systems Theory further explains that learners' development occurs within multiple interacting environmental systems. The microsystem includes immediate settings such as the family and school, while the mesosystem involves the relationships between these settings. The exosystem encompasses community conditions and resources that indirectly influence the learner, whereas the macrosystem includes broader cultural values, socioeconomic structures, and educational policies. Applied to mathematics learning, this theory suggests that computational performance is not merely an individual cognitive outcome. It may also be influenced by teaching strategies, instructional materials, classroom conditions, parental involvement, family resources, and the connections between home and school. Together, the three theories provide a multidimensional explanation of how learners construct mathematical understanding, develop computational fluency through reinforcement, and experience contextual influences on their achievement.

In the Schools Division of Tacloban City, the researcher's classroom observations and diagnostic assessments have shown that a considerable number of learners struggle with adding, subtracting, multiplying, and dividing integers. Errors frequently occur when negative numbers, multiple signs, and mixed operations are involved. Some learners depend on guessing or memorized rules rather than explaining the logic behind their answers. These weaknesses become increasingly evident when learners encounter algebraic topics that require accurate and flexible computational skills. Low confidence, frustration, mathematics anxiety, and reduced participation have also been observed among learners who repeatedly experience difficulty with numerical tasks.

These concerns are particularly important among Grade 7 learners because they are transitioning from elementary mathematics to secondary-level topics requiring greater abstract and numerical reasoning. Although previous studies have established recurring difficulties in integer operations and demonstrated the potential value of remedial interventions, few of the reviewed studies have simultaneously examined learners' performance across specific integer operations, the errors they commonly commit, and the learner-, school-, and home-related factors associated with their performance. Evidence specific to Grade 7 learners in the Schools Division of Tacloban City also remains limited. This contextual and explanatory gap makes it difficult to determine which skills and contributing conditions should be prioritized in a locally responsive remedial program.

Accordingly, this study aimed to assess the computational performance of Grade 7 learners in integer operations in the Schools Division of Tacloban City during School Year 2025–2026. Specifically, it examined learners' performance in addition, subtraction, multiplication, division, mixed operations, and problem-solving; identified the common errors they committed; and determined the learner-, school-, and home-related factors associated with their computational performance. The findings were intended to provide an empirical basis for developing a remedial learning program that addresses specific computational weaknesses, strengthens learners' foundational mathematical skills, and improves their readiness for more advanced mathematical concepts.

Research Questions

1. What is the profile of the Grade 7 learners in terms of sex and previous grade in Mathematics?
2. What is the level of performance of the Grade 7 learners in addition, subtraction, multiplication, division, mixed operations, and problem-solving involving integer operations?
3. What common errors do the Grade 7 learners commit when solving problems involving integer operations?
4. Is there a significant difference in learners' performance on integer operations when grouped by sex and previous grade in Mathematics?
5. Is there a significant relationship between the learners' performance in integer operations and their study habits and attitudes toward Mathematics?
6. What student-related factors, particularly study habits and attitudes toward Mathematics; home-related factors, particularly parental support; and school-related factors, particularly the availability of instructional materials and the instructional strategies used by teachers, contribute to the learners' performance and difficulties in integer operations?
7. What remedial learning program may be proposed to improve the learners' performance in integer operations?

METHODOLOGY

Research Design

The study employed a descriptive-correlational and descriptive-comparative research design, a non-experimental approach that examines variables as they naturally occur without manipulation (Bhandari, 2023). The descriptive component was used to summarize the learners' profiles, performance in integer operations, common errors, and student-, home-, and school-related factors. These included study habits, attitudes toward Mathematics, parental support, availability of instructional materials, and instructional strategies. Frequencies, percentages, Mean Percentage Score (MPS), and weighted mean were used to summarize the data (Shields & Rangarajan, 2006). The comparative component was used to determine whether significant differences existed in learners' performance when grouped according to selected profile variables. In contrast, the correlational component examined the relationships between learners' performance and selected contributing factors. Comparative designs help identify variations across groups that may inform targeted instructional strategies (Fraenkel, Wallen, & Hyun, 2019). Descriptive-correlational research observes variables in their natural setting and determines their degree of association without establishing causal relationships (Barooah, 2025; Bhandari, 2023).

Research Locale

The study was conducted in the Schools Division of Tacloban City under the Department of Education (DepEd) in Region VIII, Eastern Visayas. As the regional center, Tacloban City serves as a hub for educational, cultural, and socio-economic activities, with schools serving learners from diverse socio-economic backgrounds. The study focused on public junior high schools offering Grade 7 classes because Grade 7 is a crucial transition from elementary to secondary education, where foundational Mathematics skills, particularly integer operations, are expected to be developed. This transition to a more advanced curriculum may also reveal gaps in learners' computational skills. The selection of public schools in Tacloban City provided a view of learners' computational performance across urban and semi-urban settings, including differences in resource availability, instructional practices, and home environments. The locale was also considered significant because it provided information on the Mathematics performance of Grade 7 learners and the student-related factors within the specific context of Tacloban City. The findings served as local evidence for the development of a remedial learning program tailored to the needs of learners in the division.

Research Respondents

The study involved three groups of respondents: 28 teacher-respondents, 150 student-respondents, and 150 parent-respondents, selected from a total population of 4,829 Grade 7 learners in the participating schools. Leyte National High School contributed the largest number of respondents, with 47 students, 47 parents, and six teachers from a population of 1,520 learners. This was followed by Sagkahan National High School, which contributed 19 students, 19 parents, and three teachers from 612 learners. Tacloban City National High School contributed 14 students and 14 parents from 438 learners, while Northern Tacloban City National High School contributed 13 students, 13 parents, and three teachers. Cirilo Roy Montejo National High School and San Jose National High School each contributed 12 students and 12 parents. Smaller schools, including North Hill Arbours Integrated School, Marasbaras National High School, and Tacloban National Agricultural School, each contributed five students and five parents. Kapuso Village Integrated School, Guadalupe Heights Integrated School, Scandinavian National High School, Ridge View Park Integrated School, V & G National High School, and Greendale Residences Integrated School contributed between two and four student and parent respondents each. Overall, the distribution represented schools with different student population sizes and provided a broader view of learners' performance in integer operations across public secondary schools in Tacloban City.

Research Instrument

The study used four structured research instruments, including survey questionnaires and an achievement test. The first instrument was a Grade 7 learner questionnaire with three parts covering the learners' profile, study habits in Mathematics, and attitudes toward Mathematics. The profile included sex and previous Grade 6 Mathematics grade, while the study habits covered time spent studying, assignment completion, lesson review, and use of learning resources. The attitudes section examined interest, confidence, perceived usefulness, and feelings toward Mathematics learning. Parts II and III used a five-point Likert scale from 1 (Never/Strongly Disagree) to 5 (Always/Strongly Agree). The second instrument was a teacher-made 30-item multiple-choice achievement test covering addition, subtraction, multiplication, division, mixed operations, and problem-solving involving integers. It was used to determine learners' performance levels and common errors. The third instrument was a Mathematics teacher questionnaire that assessed the availability of instructional materials, including textbooks, visual aids, manipulatives, ICT tools, and supplementary worksheets, as well as the use of instructional strategies such as lecture-discussion, cooperative learning, inquiry-based learning, ICT integration, and remediation sessions. Responses used a five-point scale from "Always" to "Never." The fourth instrument was a parent questionnaire that assessed parental support through activities such as monitoring homework, providing a conducive study environment, attending parent-teacher conferences, and encouraging positive attitudes toward learning. The items were presented in English and Waray and used a five-point Likert scale from "Always" to "Never.

To ensure the reliability, clarity, and appropriateness of the instruments, content validation and pilot testing were conducted before the actual data gathering. The questionnaires and achievement test were evaluated by the research adviser, a statistician, and a Master Teacher specializing in Mathematics to determine the relevance, clarity, and alignment of the items with the study objectives and conceptual framework. Necessary revisions were made based on their evaluation. Pilot testing was then conducted among 20 learners, 20 teachers, and 20 parents who were not included in the actual study. The pilot test helped identify unclear instructions, ambiguous items, and possible difficulties in completing the instruments. The responses were also used to examine the consistency of the questionnaire items and the suitability of the achievement test items for measuring learners' performance in integer operations.

Data Gathering Procedure

The data were gathered from three groups of respondents: Grade 7 learners, their Mathematics teachers, and their parents. Before data collection, the researcher secured the necessary permits and approval from the Schools Division Office of Tacloban City and the principals of the selected public schools. After approval, the administration of the questionnaires and achievement test was scheduled in coordination with school administrators and Mathematics teachers. The learners answered a survey questionnaire on their profile, study habits, and attitudes toward Mathematics. They took a 30-item researcher-made achievement test on addition, subtraction, multiplication, division, mixed operations, and problem-solving involving integers under standardized testing conditions. Mathematics teachers completed a questionnaire on the availability of instructional materials and instructional strategies, while parents answered a questionnaire on parental support and involvement in their child's learning. The parent questionnaire was also translated into Waray for better understanding and was distributed and retrieved through the learners for completion at home.

After all instruments were retrieved, the responses were checked for completeness and accuracy before data encoding. The learners' achievement test scores were recorded as raw scores and converted into percentages to determine the Mean Percentage Score (MPS) and level of performance in integer operations. Responses from the Likert-scale questionnaires were tabulated, and weighted means were computed for study habits, attitudes toward Mathematics, availability of instructional materials, instructional strategies, and parental support to support the interpretation and analysis of the data.

Data Analysis Procedure

The data were organized, tabulated, and analyzed using appropriate descriptive and inferential statistical tools. Frequency counts and percentages were used to describe the learners' profile in terms of sex and previous grade in Mathematics and to identify the common errors in solving integer operations. The Mean Percentage Score (MPS) was used to determine the learners' performance in addition, subtraction, multiplication, division, mixed operations, and problem-solving involving integers. Weighted mean was used to determine the extent of student-related factors, including study habits and attitudes toward Mathematics; home-related factors, particularly parental support; and school-related factors, including the availability of instructional materials and instructional strategies. The t-test and Analysis of Variance (ANOVA) were used to determine significant differences in learners' performance when grouped according to profile variables. In contrast, the Pearson Product–Moment Correlation Coefficient (Pearson r) was used to determine the degree and direction of the relationship between learners' performance and the identified contributing factors. These statistical procedures provided a basis for interpreting the data and drawing conclusions and recommendations. For the interpretation of learners' performance, MPS scores of 96–100 were interpreted as Advanced Mastery, 86–95 as Proficient, 76–85 as Approaching Mastery, 66–75 as Developing, and below 65 as Beginning. For the factors contributing to learners' performance and difficulties in integer operations, mean scores of 4.21–5.00 were interpreted as Very High/Always/Strongly Agree; 3.41–4.20 as High/Often/Agree; 2.61–3.40 as Moderate/Sometimes/Neutral; 1.81–2.60 as Low/Rarely/Disagree; and 1.00–1.80 as Very Low/Never/Strongly Disagree.

Ethical Considerations

In conducting this study, ethical principles were strictly observed to protect the rights, dignity, and welfare of all participants. Prior to data collection, the researcher secured approval from the Dean of the Graduate School of HIC, the Schools Division Office of Tacloban City, and the principals of the selected public schools. This ensured that the study complied with institutional and division-level research protocols. Informed consent was obtained from all respondents. For the Grade 7 learners, parental consent forms were distributed and collected to ensure that parents were fully informed and agreed to their child's participation in the study. The learners, teachers, and parents were informed of the purpose of the study, the voluntary nature of their participation, and their right to withdraw from the study at any time without penalty. Clear instructions were provided to all respondents, and the parents' questionnaire was translated into Waray to ensure better understanding. Confidentiality and anonymity were maintained throughout the research process. The questionnaires did not require respondents to indicate their names, and codes were used to identify the data. The researcher ensured that individual responses were not disclosed and that all findings were presented in aggregate form only.

All collected data were securely stored and used solely for academic and research purposes related to the study. The researcher also observed the principle of non-maleficence, ensuring that no harm was caused to the participants. The administration of the achievement test and questionnaires was conducted in a manner that did not disrupt regular classes or cause unnecessary stress to the respondents. Participation in the study did not involve any risk, cost, or discomfort to the participants. Instead, their involvement contributed to the development of a remedial learning program intended to improve learners' performance in integer operations. Finally, honesty and integrity in research reporting were strictly maintained. The findings of the study were presented truthfully without fabrication, falsification, or misrepresentation of data. Proper acknowledgment was given to all sources of information and to the experts and stakeholders who contributed to the validation and completion of the study.

RESULTS AND DISCUSSION

Profile of the Grade 7 Learners

Table 1 presents the profile of the Grade 7 learners in terms of sex and previous grade in Mathematics. These variables describe the basic characteristics of the respondents and provide a contextual basis for interpreting their performance in integer operations. Understanding the learners' background, particularly their demographic characteristics and prior mathematics achievement, is important in explaining patterns of performance and in identifying the need for appropriate instructional support and remedial interventions.

Table 1 Profile of the Grade 7 Learners

Variables		**f**	**%**
Sex	Male	87	58.0
	Female	63	42.0
Previous Grade in Math	90 – above (Outstanding)	86	57.3
	85 – 89 (Very Satisfactory)	47	31.3
	80 – 84 (Satisfactory)	14	9.30
	75 – 79 (Fair/Passing)	3	2.00

In terms of sex, 87 (58.0%) of the respondents were male, and 63 (42.0%) were female, indicating a slightly higher proportion of male learners and reflecting the actual class composition during the school year. Regarding previous grades in Mathematics, most respondents demonstrated relatively high prior achievement, with 86 learners (57.3%) earning grades of 90 and above (Outstanding), 47 (31.3%) obtaining grades of 85–89 (Very Satisfactory), 14 (9.3%) receiving grades of 80–84 (Satisfactory), and only 3 (2.0%) earning grades of 75–79 (Fair or Passing). Overall, the data suggest that most learners entered Grade 7 with generally strong reported academic performance in Mathematics. This finding aligns with that of ten Braak et al. (2022), who emphasized the predictive role of prior achievement in future mathematics performance, noting that learners with strong foundational skills in earlier grade levels tend to perform better in subsequent mathematics learning tasks requiring conceptual understanding and procedural fluency.

Performance in Integer Operations

Addition of Integers. Table 2 shows the performance of Grade 7 learners in adding integers, using the Mean Percentage Score (MPS) and its corresponding qualitative rating to describe mastery levels. In DepEd assessment reporting, the MPS is commonly used to summarize group performance as the average of learners' percentage scores, making it a useful indicator for identifying strengths, gaps, and remediation priorities at the classroom or group level.

Table 2. Level of Performance in Addition of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		
96 – 100	Advanced Mastery	65	43.3
86 – 95	Proficient	0	0.00
76 – 85	Approaching Mastery	45	30.0
66 – 75	Developing	0	0.00
Below – 65	Beginning	40	26.7
Mean = 77.00 (Approaching Mastery); *SD* = 27.80			

The results reveal a polarized performance pattern in integer addition, with 65 learners (43.30%) achieving Advanced Mastery (96–100). In contrast, 40 (26.60%) remained at the Beginning level (below 65), suggesting persistent misconceptions or weak application of rules for signed numbers. This pattern is consistent with Ryberg, Ingerman, and Wester (2025) and Ünal et. al. (2024), who noted that learners often struggle with negative numbers because these require conceptual understanding of direction, magnitude, and sign, particularly when learners rely on rote rules without strong mental models such as number lines or contextual representations. Meanwhile, 45 learners (30.00%) reached Approaching Mastery (76–85), indicating partial proficiency that may remain vulnerable in more complex tasks. No learners were classified as Proficient (86–95) or Developing (66–75), suggesting that learners clustered at the high and low ends rather than progressing gradually across mastery levels. This split pattern is also described by Jalandoni and Futalan (2024) and Bouck et al. (2022), who emphasized the importance of robust representations, such as number lines, counters, and structured visuals, together with timely feedback in developing integer understanding.

The group's mean MPS of 77.00 (Approaching Mastery) indicates that learners are close to mastery but still have notable gaps that may affect later competencies involving integer fluency, including equations, rational numbers, and algebraic reasoning. The large standard deviation (*SD* = 27.80) further indicates substantial variability in competence, suggesting that learners have different instructional needs and that a one-size-fits-all approach may leave advanced learners unchallenged and beginning learners unsupported. In this regard, Nurnberger-Haag and Courtney (2025) highlighted the strategic use of varied tools and representations, including chips or counters, number lines, and real-life contexts, to address diverse learner needs, particularly during and after disruptions to instructional continuity in recent years.

Subtraction of Integers. Table 3 illustrates the performance level of the Grade 7 learners in subtracting integers. The distribution of scores across mastery levels provides insight into the extent to which learners have developed competence in subtracting integers, a fundamental prerequisite for more advanced mathematical topics such as algebraic expressions and equations.

Table 2.1. Level of Performance in Subtraction of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		
96 – 100	Advanced Mastery	36	24.0
86 – 95	Proficient	0	0.00
76 – 85	Approaching Mastery	23	15.3
66 – 75	Developing	0	0.00
Below – 65	Beginning	91	60.6
Mean = 57.00 (Beginning); *SD* = 33.70			

The results show that 91 learners (60.60%) were classified at the Beginning level (below 65), indicating very limited mastery of integer subtraction, while only 36 learners (24.00%) reached Advanced Mastery (96–100). The overall mean score of 57, corresponding to the Beginning level, reflects generally low performance. At the same time, the large standard deviation (*SD* = 33.70) indicates wide variation in learners' abilities, with some having mastered the competency while many continue to struggle. The predominance of learners at the Beginning level suggests that integer subtraction is particularly challenging, especially when negative numbers and sign rules are involved. This finding is consistent with Aquiler (2023) and Mawaddah and Wardana (2025), who reported that learners often confuse the subtraction symbol with the negative sign, resulting in incorrect procedures and misconceptions. Similarly, Alviar et al. (2024) identified integer subtraction as one of the most difficult competencies for learners to master and emphasized conceptual misunderstandings about negative numbers and sign rules as common sources of error.These findings suggest that Grade 7 learners need stronger conceptual support in understanding integer subtraction through number lines, real-life contexts, and visual representations, complemented by diagnostic assessments and targeted remedial programs to identify misconceptions and provide appropriate scaffolding. Harun et aI. (2023) and Alviar et al. (2024) suggest that structured interventions, such as strategic intervention materials and activity-based learning approaches, can significantly improve mastery of integer operations and reduce persistent misconceptions. Strengthening these instructional strategies may therefore enhance learners' mathematical understanding and prepare them for more advanced mathematics topics.

Multiplication of Integers. Table 2.2 summarizes the performance levels of Grade 7 learners in multiplying integers. The distribution of learners across mastery levels indicates how well students understand and apply the rules governing the multiplication of positive and negative integers, an essential competency for solving algebraic expressions and higher-level mathematical problems. The results reveal a bimodal distribution, with 59 learners (39.30%) achieving Advanced Mastery (96–100), indicating strong understanding of integer multiplication rules, while 34 (22.70%) reached Approaching Mastery (76–85), suggesting partial understanding with occasional errors in sign rules or computation. Meanwhile, 57 learners (38.00%) were at the Beginning level (below 65), showing that a substantial group continues to experience difficulty with integer multiplication. The mean score of 75, corresponding to the Developing level, indicates that overall mastery remains insufficient and requires improvement. At the same time, the relatively high standard deviation (*SD* = 25.60) reflects wide variability in learners' performance and conceptual understanding.

Table 2.2. Level of Performance in Multiplication of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		

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96 – 100	Advanced Mastery	59	39.3
86 – 95	Proficient	0	0.00
76 – 85	Approaching Mastery	34	22.7
66 – 75	Developing	0	0.00
Below – 65	Beginning	57	38.0
Mean = 75.00 (Developing); *SD* = 25.60			

The large Beginning group may be attributed to persistent misconceptions and procedural confusion, as learners often struggle with multiplying positive and negative integers when relying on memorized rules rather than conceptual understanding (Aquiler, 2023). Similarly, Harun et al. (2023) found that misconceptions and confusion about sign rules commonly lead to errors in multiplication and other integer operations. International research further indicates that learners often struggle with integer arithmetic because negative numbers differ significantly from their prior experiences with whole numbers, resulting in conceptual conflicts during learning (Nurnberger-Haag & Courtney, 2025). These findings emphasize the need to strengthen learners' conceptual foundations in integer multiplication rather than relying solely on procedural instruction.

Division of Integers. Table 2.3 presents the performance level of the Grade 7 learners in the division of integers. The distribution of learners across the mastery levels provides an overview of how well students understand and apply the rules governing division of integers. This skill is also essential for solving algebraic expressions, equations, and other higher-level mathematical problems.

Table 2.3 Level of Performance in Division of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		
96 – 100	Advanced Mastery	57	38.0
86 – 95	Proficient	0	0.00
76 – 85	Approaching Mastery	47	31.3
66 – 75	Developing	0	0.00
Below – 65	Beginning	46	30.7
Mean = 78.00 (Approaching Mastery); *SD* = 22.60			

The results indicate that 57 learners (38.00%) achieved Advanced Mastery (96–100), demonstrating strong competence in integer division. In contrast, 46 (30.70%) remained at the Beginning level (below 65), showing that a significant group still experiences difficulty with the operation. The mean score of 78, interpreted as Approaching Mastery, suggests that overall performance is moderately satisfactory but still requires improvement. At the same time, the standard deviation (*SD* = 22.60) indicates variability in learners' mastery, with some demonstrating strong competence and others struggling with the concept. The relatively balanced distribution across the Advanced, Approaching, and Beginning levels further reflects varying degrees of conceptual understanding. Research indicates that difficulties in integer operations often result from confusion about positive and negative number rules, particularly when learners rely on memorization rather than conceptual understanding (Khalid & Embong, 2020). Similarly, Pariño et al. (2025) found that confusion in applying integer rules significantly affects performance in solving problems involving integer operations. The findings imply that although many learners demonstrate satisfactory mastery of integer division, a substantial number still require instructional support to strengthen their understanding of sign rules and conceptual relationships among integers. Teachers should therefore employ concept-based and differentiated instructional strategies, including visual representations and contextualized activities, to address misconceptions and improve learners' mastery of integer division.

Mixed Operations of Integers. Table 2.4 describes the performance level of Grade 7 learners in solving mixed operations involving integers.

Table 2.4 Level of Performance in Mixed Operations of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		
96 – 100	Advanced Mastery	3	2.00
86 – 95	Proficient	15	10.0
76 – 85	Approaching Mastery	0	0.00
66 – 75	Developing	18	12.0
Below – 65	Beginning	114	76.0
Mean = 45.00 (Beginning); *SD* = 25.10			

The results reveal that 114 learners (76.0%) were classified at the Beginning level (below 65), indicating very limited mastery of mixed operations involving integers. Only 3 learners (2.00%) achieved Advanced Mastery (96–100), while 15 (10.00%) reached Proficient (86–95), 18 (12.00%) were at Developing (66–75), and none reached Approaching Mastery (76–85). The mean score of 45, corresponding to the Beginning level, indicates very low overall performance. At the same time, the standard deviation (*SD* = 25.10) reflects considerable variability, with a few learners able to solve complex expressions correctly while most struggle with the required procedures and concepts. This low performance may be attributed to difficulties in applying the order of operations when multiple arithmetic processes are involved. Tan et al. (2021) explained that expressions involving several operations require adherence to a hierarchy, such as parentheses, multiplication or division, and addition or subtraction (PEMDAS or BODMAS). Similarly, Tan et al. (2021) and Study.com (2023) emphasized that failure to apply this hierarchy correctly often results in incorrect sequencing and solutions. This is consistent with Hanifa, Prabawanto, and Fatimah (2024) and Tabak (2019), who identified misconceptions about the order of operations as common sources of errors in arithmetic expressions, even among learners who have already acquired basic integer skills.

Furthermore, learners may experience confusion when integrating multiple operations because they tend to apply rules mechanically without fully understanding the conceptual relationships among operations (Harun et al., 2023). Pariño et al. (2025) likewise found among junior high school students in the Philippines that misconceptions and computational errors become more pronounced when solving multi-step integer problems than single-operation tasks. These findings suggest that difficulties in mixed operations stem from insufficient conceptual understanding of integers and their operational relationships. Grade 7 learners therefore need stronger instructional support emphasizing conceptual understanding of the order of operations, structured practice, visual models, guided examples, and scaffolded activities to improve computational accuracy and readiness for more advanced mathematical concepts.

Problem-Solving Involving Operations of Integers. Table 7 presents the performance level of Grade 7 learners in problem-solving involving operations on integers.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue VIII August 2026

Table 2.5 Level of Performance in Problem-Solving Involving Operations of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		
96 – 100	Advanced Mastery	51	34.0
86 – 95	Proficient	0	0.00
76 – 85	Approaching Mastery	0	0.00
66 – 75	Developing	59	39.3
Below – 65	Beginning	40	26.7
Mean = 67.00 (Developing); *SD* = 30.50			

The data show that 59 learners (39.30%) were at the Developing level (66–75), representing the largest group, while 51 (34.00%) achieved Advanced Mastery (96–100), indicating strong competence in solving problems involving integer operations. Meanwhile, 40 learners (26.70%) were at the Beginning level (below 65), showing that more than one-fourth still experience significant difficulty. No learners reached the Proficient (86–95) or Approaching Mastery (76–85) levels. The mean score of 67, classified as Developing, indicates moderately satisfactory overall performance that still requires improvement, while the large standard deviation (*SD* = 30.50) reflects substantial variability in problem-solving abilities. The difficulties experienced by learners at the Beginning level may stem from the need to integrate conceptual understanding, procedural knowledge, and reasoning when solving mathematical problems (Aquiler, 2023). Aquiler (2023) further noted that weak conceptual understanding of integers can lead to errors in translating real-life situations into mathematical expressions and selecting appropriate operations. Similarly, Harun et al. (2023) found that misconceptions about sign rules and operational procedures frequently contribute to difficulties in solving contextualized mathematical problems.

Research in the Philippine context also indicates that confusion in performing integer operations significantly affects learners' ability to solve mathematical problems involving integers, particularly when learners rely on memorized procedures rather than conceptual understanding in multi-step tasks (Pariño et al., 2025). Moreover, Harun et al. (2023) and Alviar et al. (2024) reported that problem-solving difficulties are associated with limited conceptual understanding and persistent misconceptions about negative numbers, which, when unaddressed, may hinder learners' ability to apply mathematical concepts to more complex situations. Thus, although many learners demonstrate high competence in solving integer problems, others require stronger support through conceptual instruction, contextualized problem-solving activities, and guided practice to improve their ability to translate real-life situations into mathematical expressions and apply appropriate integer operations.

Overall Performance in the Operations of Integers. Table 2.6 presents the overall performance of the Grade 7 learners in operations on integers. The table summarizes the learners' general mastery of integer operations, including addition, subtraction, multiplication, division, and mixed operations.

Table 2.6 Overall Level of Performance in Operations of Integers

Level of Performance		**f**	**%**
MPS	**Qualitative Rating**		
96 – 100	Advanced Mastery	5	3.30

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue VIII August 2026

86 – 95	Proficient	22	14.7
76 – 85	Approaching Mastery	23	15.3
66 – 75	Developing	33	22.0
Below – 65	Beginning	67	44.7
Mean = 65.00 (Developing) *SD* = 18.90			

The results show that 67 learners (44.70%) were classified at the Beginning level (below 65), indicating that nearly half of the respondents demonstrated limited mastery of integer operations. In comparison, only 5 learners (3.30%) achieved Advanced Mastery (96–100). The mean score of 65, interpreted as Developing, indicates that overall performance remains below the desired mastery level, while the standard deviation (*SD* = 18.90) reflects variability in learners' competence and understanding of integer concepts and operational procedures. The high proportion at the Beginning level suggests that many learners continue to struggle with fundamental integer concepts. Harun et al. (2023) explained that misconceptions about negative numbers and sign rules commonly lead to errors, particularly when learners rely primarily on procedural rules without sufficient conceptual understanding. Alviar et al. (2024) similarly emphasized that difficulties in understanding integers may affect performance in more advanced mathematical topics because integer operations serve as foundational skills for algebraic reasoning and problem solving. Furthermore, Nurnberger-Haag & Courtney (2025) highlighted the importance of using varied instructional tools and representations, such as chips or counters, number lines, and real-life contexts, to address diverse learner needs, particularly during and after disruptions to instructional continuity in recent years. These approaches may help strengthen learners' conceptual understanding and improve their mastery of integer operations.

Summary. Table 2.7 summarizes the learners' performance levels in the different operations of integers, including addition, subtraction, multiplication, division, mixed operations, and problem-solving. The table shows the Mean Percentage Score (MPS), standard deviation, and corresponding qualitative interpretation for each competency area.

The results indicate that the learners performed relatively better in division (*M* = 78.00) and addition (*M* = 77.00), both interpreted as Approaching Proficiency, followed by multiplication (*M* = 75.00) and problem-solving (*M* = 67.00) at the Developing level. However, the lowest performances were observed in subtraction (*M* = 57.00) and mixed operations (*M* = 45.00), both interpreted as Beginning, indicating considerable difficulty in these areas. The overall performance (*M* = 65.00) was also interpreted as Beginning, suggesting that many learners still struggle to master integer operations. Likewise, Harun et al. (2023) and Alviar et al. (2024) noted that misconceptions about negative numbers and operational rules often lead to persistent difficulties in integer operations, particularly in multi-step tasks. These difficulties highlight the need for stronger conceptual instruction and systematic practice in teaching integers.

Table 2.7 Summary of the Level of Performance in the Operations of Integers

Operation	**Mean (MPS)**	***SD***	**Interpretation**
Addition	77.00	27.80	Approaching Mastery
Subtraction	57.00	33.70	Beginning
Multiplication	75.00	25.60	Developing
Division	78.00	22.60	Approaching Mastery
Mixed Operations	45.00	25.10	Beginning

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue VIII August 2026

Problem-Solving	67.00	30.50	Developing
Overall Performance	**65.00**	**18.90**	**Beginning**

Common Errors Committed in Integer Operations

Table 3 presents the common errors committed by the Grade learners in solving problems involving integer operations. The table identifies the specific type of error, description, indicators, and the corresponding frequency and percentage of learners who exhibited these mistakes. The results show that the most frequent errors were Sign Errors (66.70%) and Lack of Understanding the Rules in Adding and Subtracting Integers (64.70%), indicating that learners' greatest difficulties involve the basic conventions of integer operations. These errors suggest persistent foundational misconceptions, particularly in applying sign rules and distinguishing addition from subtraction, and fall under the process skills and comprehension stages of Newman's Error Analysis (NEA), highlighting the need for targeted remediation focused on rule internalization and encoding. Moderately frequent errors involved double negatives (50.00%) and order of operations (40.70%), reflecting difficulties in procedural fluency when multiple rules interact. Learners often misinterpreted double negatives or failed to follow PEMDAS/BODMAS conventions. Tabak (2019) noted that misunderstanding the order of operations is a common difficulty because learners tend to apply procedures mechanically without recognizing structural relationships among operations, while Tan et al. (2021) emphasized that students often struggle with multi-step expressions when they fail to internalize the conceptual basis of operational hierarchy.

Less frequent but still significant were contextual misconceptions, including misinterpreting negative depth (18.70%), treating debt payments as complete resets (21.30%), and confusing directional changes such as rise and decrease (24.00%). These errors reveal gaps in applying integer concepts to real-world contexts, particularly in connecting abstract rules with contextual meaning and symbolic representations. Nurnberger-Haag and Courtney (2025) pointed out that learners often struggle to interpret signed quantities in contextual problems because they have difficulty conceptualizing integers as representations of direction and magnitude. Similarly, Alviar et al. (2024) emphasized that these difficulties arise when learners cannot connect symbolic procedures with meaningful real-world contexts. The findings therefore suggest strengthening conceptual instruction on order of operations, sign interpretation, and real-life representations of integers through visual models, number lines, contextual problem scenarios, and structured problem-solving activities to reduce misconceptions.

Table 3. Common Errors in Solving Problems involving Integer Operations

Common Error Type	**Description**	**Type of Indicator**	**Item Numbers**	***n***	**%**	**NEA Stage**
Absolute Value Comparison Errors	Failure to compare magnitudes before deciding the sign	Correct magnitude, wrong sign	1, 4	48	32.00	Process Skills
Lack of understanding the rules in adding and subtracting integers	Using the wrong operation (addition instead of subtraction, etc.)	Subtraction treated as addition, or vice versa	2, 6, 9	97	64.70	Comprehension / Transformation
Sign Errors	Incorrect interpretation or use of positive and negative signs	Final answer has incorrect sign	3, 5, 10, 11, 12, 13, 14, 16, 17,	100	66.70	Process Skills/Encoding

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue VIII August 2026

			18, 20			
Double-Negative Errors	Misinterpretation of double negatives	Negative sign retained incorrectly	7, 8	75	50.00	Transformation/Process Skills
Problems with zero rules	Misinterpreting multiplication or division involving zero; failure to apply zero-product or zero-division rules	Treating zero as neutral or reversing the operation instead of applying zero rules	15, 19	37	24.70	Comprehension / Transformation
Mixed Operation Error: Incorrect Order of Operations (PEMDAS/BODMAS Misapplication)	Learners perform operations sequentially from left to right without prioritizing multiplication/division before addition/ subtraction or fail to process parentheses correctly.	Procedural Indicator (rule application error)	22	61	40.70	Transformation/Process Skills
Mixed Operation Error: Sign Misinterpretation in Multi-Step Expressions	Learners confuse subtraction symbols with negative signs, mis-handle double negatives, or incorrectly apply sign rules during computation.	Conceptual/ Procedural Indicator (symbol misinterpretation)	21	43	28.70	Comprehension / Transformation
Mixed Operation Error: Misclassification / Incorrect Interpretation of Multiple Operations (Multiplication Groups)	Learners fail to recognize multiplication as grouping or repeated addition, misinterpret distributive structure, or treat expressions as independent operations rather than structured units.	Conceptual Indicator (structural misunderstanding)	25	34	22.70	Comprehension
Problem-Solving Misconception: Ignored negative depth, treated as subtraction of positives	Learners interpret “below sea level” or negative depth as simple subtraction rather than directional quantity; ignore signed magnitude.	Conceptual/ Representation Indicator (misunderstanding signed quantities in context)	28	49	18.70	Comprehension
Problem-Solving Misconception:	Learners misinterpret directional change (increase/decrease), applying incorrect operational model to	Strategic: Conceptual Indicator	29	36	24.00	Transformation

Added incorrectly, treated rise as further decrease	contextual movement problems.					
Problem-Solving Misconception: Ignored negative balance, treated payment as full reversal	Learners treat payment toward debt as complete reset to zero rather than incremental change; fail to model additive inverse properly.	Conceptual Indicator (misunderstanding additive inverse & integer model)	30	32	21.30	Comprehension/Transformation

Difference of Learners' Performance in Math as Grouped According to Profile Variables

Table 4 presents the differences in learners' mathematics performance when grouped according to selected profile variables, specifically sex and previous grade in Mathematics. Analyzing these differences provides insights into whether demographic characteristics and prior academic achievement influence learners' ability to perform mathematical tasks involving integers.

Table 4. Differences in Learners' Performance in Math as Grouped According to Profile Variables

Grouping Variable	***t/F*- value**	***p*-value**	**Decision**	**Interpretation**
Sex	.89	.374	Do not reject H_0	Not Significant
Previous Grade in Math	1.11	.348	Do not reject H_0	Not Significant

As shown in Table 11, the computed *t*-value for sex was .89 with a *p*-value of .374, which is greater than the 0.05 level of significance, indicating no significant difference in learners' mathematics performance when grouped according to sex and leading to the decision not to reject the null hypothesis. This suggests that male and female learners demonstrated comparable performance in integer operations. Wang et al. (2023) support this finding, noting that gender differences in mathematics achievement are often minimal and influenced more by contextual factors such as learning environment, motivation, and instructional support than by inherent ability. Similarly, the Organisation for Economic Co-operation and Development (OECD, 2023) reports that gender gaps in mathematics performance vary across countries and are often small when learners receive similar learning opportunities.

For previous grade in Mathematics, the analysis yielded an *F*-value of 1.11 and a p-value of .348, also exceeding the 0.05 significance level. Thus, no significant difference was found in learners' performance in integer operations when grouped according to their previous Mathematics grade, and the null hypothesis was not rejected. Although prior academic achievement is generally considered a predictor of future performance, learners with different previous grades may demonstrate similar performance in specific competencies such as integer operations. Bernardo (2022) explained that prior grades do not always reflect mastery of particular mathematical concepts because learners may retain misconceptions despite satisfactory classroom performance. Furthermore, ten Braak et al. (2022) emphasized that conceptual understanding and instructional approaches may play a more significant role in mathematics success than prior achievement alone.

Relationship between the Learners' Performance in Integer Operations, Study Habits, and Attitudes

Table 5 presents the relationship between learners' performance in integer operations and their study habits and attitudes toward mathematics. The correlation analysis was conducted to determine whether these learner-related factors are significantly associated with students' performance in integer operations. As shown in Table 12, no significant relationship was found between learners' performance in integer operations and their study habits, with a correlation coefficient of $r = -.021$ and a *p*-value of .797, which is greater than the 0.05 level of significance. Similarly, learners' attitudes toward mathematics were not significantly related to their

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performance, with r = -.118 and a p-value of .150. Thus, the null hypothesis was not rejected for either variable. These findings suggest that performance in integer operations may not be influenced by reported study habits or attitudes toward mathematics alone.

Table 5. Relationship between the Learners' Performance in Integer Operations, Study Habits, and Attitudes towards Mathematics

Variables		***r***	***p*-value**	**Decision**	**Interpretation**
Learners' Performance in Integer Operations	Study Habits	- .02	.797	Do not reject H_0	Not Significant
	Attitudes towards Math	- .12	.150	Do not reject H_0	Not Significant

Hermano and Gaudicos (2025) and Kozan et al. (2025) reported that although study habits may be positively associated with academic achievement, the relationship is often weak or context-dependent. Likewise, Alemany-Arrebola et al. (2025) and Xu (2024) found mixed results regarding attitudes toward mathematics, noting that positive attitudes may support engagement and confidence but do not consistently produce statistically significant relationships with achievement across contexts or subjects. The findings further indicate that improving learners' performance in integer operations should not rely solely on enhancing study habits or attitudes toward mathematics. Instead, greater emphasis should be placed on strengthening conceptual understanding, employing effective instructional strategies, and providing targeted remediation to address specific difficulties in integer operations.

Factors Contributing to Learners' Performance and Difficulties in Integer Operations

Student-related influences. Table 6 presents the factors that contribute to students' performance and difficulties with integer operations, focusing on student-related factors (study habits and attitudes).

Table 6. Student-related Factors Contributing to Students' Performance and Difficulties in Integer Operations

Student-Related Factors	**Mean**	**Interpretation**
Study Habits Indicators		
1. I allot specific time at home to study Mathematics.	3.09	Moderate
2. I review my Math notes regularly, even without assignments or exams.	3.04	Moderate
3. I complete my Math homework on time.	4.21	Very High
4. I practice solving extra Math problems aside from what is given in class.	3.55	High
5. I ask my teacher or classmates when I do not understand a Math lesson.	3.88	High
6. I prepare for quizzes and exams in Mathematics in advance.	3.59	High
7. I avoid being absent in Mathematics classes as much as possible.	4.62	Very High
8. I use learning resources (books, internet, videos) to improve my Math skills.	3.69	High
Overall Mean	**3.71**	**High**
Attitudes Indicators		
1. I enjoy learning Mathematics.	4.09	High

2. Mathematics is important in my daily life.	4.23	Very High
3. I feel confident when solving Math problems.	3.81	High
4. I believe I can get good grades in Mathematics if I study well.	4.35	Very High
5. I get nervous whenever I have a Mathematics test.*	3.75	High
6. I think Mathematics is a difficult subject.*	3.28	Moderate
7. I am motivated to learn Mathematics because it will be useful in the future.	4.10	High
8. I prefer Mathematics compared to other subjects.	3.44	High
Overall Mean	**3.89**	**High**

*Scoring was reversed for the negative statements.

Student-related influences reveal generally strong study habits (overall mean = 3.71, High), with learners showing commitment through regular attendance (*M* = 4.62, Very High) and timely homework completion (*M* = 4.21, Very High). These behaviors reinforce classroom engagement and practice opportunities, echoing Swiderski et al. (2025) on the importance of attendance and Guo et al. (2024) on the role of homework in building fluency. However, weaker routines such as limited home study (*M* = 3.09, Moderate) and irregular note review (*M* = 3.04, Moderate) suggest gaps in self-regulation, consistent with Hermano and Gaudicos (2025), who emphasize time management and consistent review as critical supports. Learners also expressed a generally positive attitude toward Mathematics (overall mean = 3.89, High). Confidence in their ability to succeed (*M* = 4.35, Very High) and recognition of its relevance to daily life (*M* = 4.23, Very High) reflect a constructive mindset. Alemany-Arrebola et al. (2025) note that such attitudes foster persistence and engagement, while OECD (2023) reports similar links in international assessments. However, perceptions of difficulty (*M* = 3.28, Moderate) and lower preference compared to other subjects (*M* = 3.44, High but lowest) reveal lingering challenges, aligning with Wang et al. (2023), who caution that anxiety and perceived difficulty can undermine confidence and problem-solving.

Home-related factors. Table 6.1 presents the factors that contribute to students' performance and difficulties with integer operations, focusing on home-related factors (parental support).

Table 6.1. Home-related Factors Contributing to Students' Performance and Difficulties in Integer Operations

Home-Related Factors	**Mean**	**Interpretation**
Parental Support Indicators		
1. I provide a quiet and well-lit place at home for my child to study.	4.93	Very High
2. I check or supervise my child's homework in Mathematics.	3.75	High
3. I regularly monitor my child's school attendance.	4.44	Very High
4. I encourage my child to review lessons in Mathematics daily.	4.15	High
5. I attend parent-teacher conferences to discuss my child's progress.	4.19	High
6. I provide necessary school supplies and learning materials for my child.	4.71	Very High
7. I motivate my child by praising or rewarding good performance in school.	4.46	Very High

8. I assist my child in using learning resources (books, internet, educational videos).	4.27	Very High
9. I communicate with my child's teacher when academic difficulties arise.	3.96	High
10. I encourage my child to develop a positive attitude toward Mathematics.	4.57	Very High
Overall Mean	**4.30**	**Very High**

Home-related factors were rated very high overall (mean = 4.30), with parents providing conducive study environments (*M* = 4.93, Very High), resources (*M* = 4.71, Very High), and motivational support (*M* = 4.57, Very High). These results affirm Castro et al (2015) and Tan et al (2023), who highlight the impact of parental involvement on engagement and achievement. Still, less consistent practices such as checking homework (*M* = 3.75, High) and communicating with teachers (*M* = 3.96, High) point to areas for improvement, echoing Wilder (2014) and Castro et al (2015) on the importance of monitoring and collaboration.

School-related factors. Table 6.2 presents the factors that contribute to students' performance and difficulties with integer operations, focusing on school-related factors (availability of instructional materials and instructional strategies).

Table 6.2. School-related Factors Contributing to Students' Performance and Difficulties in Integer Operations

School-Related Factors	**Mean**	**Interpretation**
Instructional Materials		
1. Mathematics textbooks aligned with the K–12 Curriculum	4.39	Very High
2. Teacher's guides and lesson exemplars	4.75	Very High
3. Visual aids (charts, number lines, flash cards)	3.96	High
4. Manipulatives (counters, blocks, integer chips, algebra tiles)	3.43	High
5. ICT resources (laptops, projectors, calculators)	3.75	High
6. Online resources (DepEd Commons, videos, apps, websites)	4.18	High
7. Supplementary activity sheets/worksheets	4.21	Very High
8. Access to printed modules for remediation	4.18	High
Overall Mean	**4.11**	**High**
Instructional Strategies		
1. Lecture–discussion with examples and exercises	4.79	Very High
2. Use of problem-solving method (heuristics, real-life problems)	4.68	Very High
3. Cooperative/peer learning (group activities, pair work)	4.61	Very High
4. Inquiry-based learning (exploration, discovery activities)	4.07	High
5. Use of manipulatives and visual aids to explain concepts	4.14	High

6. ICT-based strategies (multimedia presentations, online tools)	4.11	High
7. Remediation or tutoring sessions for struggling learners	4.00	High
8. Differentiated instruction to address learner diversity	4.43	Very High
9. Think–Pair–Share or other interactive techniques	4.43	Very High
10. Performance tasks and project-based learning	4.46	Very High
Overall Mean	**4.37**	**Very High**

School-related factors also played a significant role. Instructional materials were generally available (mean = 4.11, High), with teacher's guides (*M* = 4.75, Always Available) and textbooks (*M* = 4.39, Always Available) ensuring structured instruction. Hattie (2023) and OECD (2023) emphasize that such resources enhance lesson organization and clarity. Supplementary tools like visual aids, manipulatives, ICT, and online resources were often accessible, supporting conceptual understanding as noted by Akyüz and Güveli (2025) and OECD (2023). Instructional strategies were consistently utilized (mean = 4.37, Very High), particularly lecture–discussion (*M* = 4.79, Always Utilized) and real-life problem-solving (*M* = 4.68, Always Utilized), which foster both fluency and understanding (Hattie, 2023; OECD, 2023). However, remediation sessions (*M* = 4.00, Often Utilized) were less frequent, despite Wilder (2014) and Tan et al. (2020) stressing the importance of individualized support for struggling learners.

Summary of Results of the Factors. Table 6.3 summarizes the factors contributing to the students' performance and difficulties in performing integer operations. The table shows the Overall Mean and corresponding qualitative interpretation for each factor.

Table 6.3 Summary of the Factors Contributing to the Students' Performance and Difficulties in Performing Integer Operations

Factor	**Overall Mean**	**Interpretation**
Study Habits	3.71	High
Attitudes toward Math	3.89	High
Instructional Materials	4.11	High
Parental Support	4.30	Very High
Instructional Strategies	4.37	Very High
Overall Mean	**4.08**	**High**

The results show that the overall mean of 4.08 (High) indicates students generally receive strong support in learning integer operations. The highest factors were Instructional Strategies 4.37 and Parental Support 4.30, both interpreted as Very High, highlighting the importance of effective teaching and active home involvement. Instructional Materials 4.11 (High) were consistently available. In comparison, Attitudes toward Math 3.89 (High) and Study Habits 3.71 (High) were relatively lower than the other factors, suggesting that learners need more encouragement in independent study routines and confidence-building.

CONCLUSION

The findings indicate that Grade 7 learners in the Schools Division of Tacloban City still experience difficulties in integer operations despite generally favorable personal, home, and school conditions. Learners performed relatively better in addition and division but showed lower performance in subtraction and mixed operations, resulting in an overall Beginning level of performance. Common difficulties included sign interpretation, confusion of operations, double-negative errors, incorrect use of the order of operations, and misconceptions in contextual problem-solving. Although learners generally had high study habits and positive attitudes toward Mathematics, parental support was very high, and instructional materials and strategies were consistently available and utilized, these conditions were not significantly related to learners' performance in integer operations. There was also no significant difference in performance when learners were grouped according to sex and previous grade in Mathematics. The respondents were predominantly male, and most had high previous grades in Mathematics, particularly at the Outstanding and Very Satisfactory levels. Overall, the findings show that learners receive adequate support from personal, home, and school environments, yet difficulties in mastering integer operations continue to persist. Therefore, there is a need to strengthen learners' conceptual understanding through targeted instructional interventions and enhanced teaching strategies to improve their mastery of integer operations.

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