2021

OPTIMAL LEARNING GUIDELINES:

SECONDARY MATHEMATICS

MINISTRY OF EDUCATION
DIVISION OF CURRICULUM PLANNING AND DEVELOPMENT

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INTRODUCTION

LEARNING LOSS.

The term **learning loss** refers to any specific or general loss of knowledge and skills or to reversals in academic progress, most commonly due to extended gaps or discontinuities in a student's education. While learning loss can manifest in a wide variety of ways for a range of reasons, the following are a few representative examples of widely recognized forms of learning loss:

- **Significant vacation break**
- **Interrupted formal education**
- **Returning dropouts**
- **School absence**
- **Ineffective teaching**

https://www.edglossary.org/learning-loss/

For the last two academic years Learning Loss has progressively taken place as more than two thirds of total enrolled learners worldwide have experienced disrupted learning directly and indirectly due to the Covid-19 pandemic. The existing data reveals three possible ways in which learning loss due to this crisis can occur:

1. **Reduction in the level of learning**

Some researchers and practitioners have agreed that missing school impedes skill improvement, augments the disparity in learning, and therefore leads to the reduction in the learning levels of students

This phenomenon is not new and researchers argue that students' "growth trajectories" would either follow a "melt" path (wherein students "basically gained no ground during the school closures") or a "slide" path (wherein students "lost ground academically during the closures at rates similar to those seen over the long summer break"). Although this observation can be applied to the COVID-19 crisis, the effects from this situation may leave a more negative impact on many parents, who struggle to be breadwinners and teachers for their children while ensuring that they can cope with potential mental and health issues.

2. **Unequal levels of learning and exposure to learning opportunities**

Even if learning continued through distance modalities, learning loss is still inevitable as several national examinations have been postponed or rescheduled, thereby creating delays or information gaps on student learning advancement without recognising their efforts. This may lead to misinformed or biased decisions on learners' educational progression. Some learners can still obtain the certification or qualification, but their actual knowledge and skills level might not be equal to those of the previous cohorts during the pre-COVID-19 era, or those of the same cohorts who could access online learning facilities and resources.

3. Dropouts

Non-attendance during, and dropouts after, the school closures may cause further learning loss. This is worrying, particularly for the most marginalised or at-risk students, whose learning path is discontinued, leading to limited choices of work options. Even if some students manage to reintegrate into schooling and eventually graduate, they will expectantly plunge into underemployment and unemployment as they graduate into the pandemic.
https://www.ukfiet.org/2020/the-covid-19-induced-learning-loss-what-is-it-and-how-it-can-be-mitigated/

During the pandemic, face-to-face school in Trinidad and Tobago was closed in March 2020. Although some teachers continued teaching via online media, this did not become standardised practice until September 2020. Therefore, students would have lost approximately twelve (12) weeks of teaching time in 2020. In September 2020, remote learning was the prescribed mode of schooling with teachers using a combination of online teaching and preparing printed packages. At this time some students did not have access to devices and/or internet so they may have lost some teaching time due to these issues. Other factors may also be associated with a loss of learning time.

Factors Associated with Loss of Learning

- Students confined to their homes may spend less time in learning than when at school physically
- Students confined to their homes may be stressed and anxious and this may negatively affect their ability to concentrate on schoolwork
- Lack of in-person contact may cause students to be less externally motivated to engage in learning
- Switching to online learning may negatively affect students who have difficulty adapting to this new learning environment
- Switching to remote learning may exacerbate existing educational inequalities due to lack of access to adequate resources, unsuitable
- home environment and parental support
- Isolation from friends and teachers may result in unequal distribution of behavioural and psychological problems

REMEDIATION and INTERVENTION

Intervention and remediation (also commonly referred to as reteaching) have the same fundamental goal: supporting struggling students with focused learning opportunities to achieve academic success. But still, the differences between these two types of instruction are critical to determining what sort of environment, time, and approach might be required to best serve students.

Intervention

Intervention is often identified as a formal process for helping students who are struggling, where research-based instructional approaches are implemented around very specific skill deficits and where progress is regularly tracked. In practice, most schools use intervention to prevent learning gaps from widening in later grades and to identify students for special education referral.

Intervention frameworks are often divided into three sections, where about 80 percent of students are considered Tier 1 and receive core instruction and necessary remediation or reteaching. Tier 2 (5 to 15 percent of students) and Tier 3 (less than 5 percent of students) are then most directly involved in regular small-group or 1:1 interventions. To determine which students require intervention services, a formalised diagnostic assessment process is often used, during which specific strengths and needs are identified, growth targets are set, and a regimented plan for delivery and progress monitoring is outlined.

Remediation

At a basic level, remediation (or reteaching) means "teaching again" content that students previously failed to learn using a different strategy or resources from before. As a teacher recognises misconceptions or errors in understanding, he or she may quickly redirect students through explicit remediation of that concept. This is done early on and for the benefit of all learners during core instruction in the hope of preventing the majority of students from requiring more targeted, intensive interventions. Many teachers engage in remediation regularly as a natural part of instruction, without using a formal process or even explicitly recognising their actions as intentional reteaching.

Remediation is also often guided by some sort of formative assessment, whether formal or informal, in order to gather enough insight to recognise the large breakdown in knowledge that students are experiencing. For this approach to be impactful, teachers must use a different method to the one initially used—one that builds on previous learning and focuses on the specific omissions in student thinking experienced the first time around. Ideally, remediation or reteaching is done early in the learning process, before additional skills are layered in or more formal mastery tests or summative exams are administered.

When to Employ Each Approach

The best educators recognise both intervention and remediation as central to their day-to-day instructional practices. In between delivering core instruction for a specific standard aligned to their explicit scope and sequence, these educators are constantly pausing to reflect and reteach, while similarly banking in intentional intervention time for those who might be struggling with underlying skills or

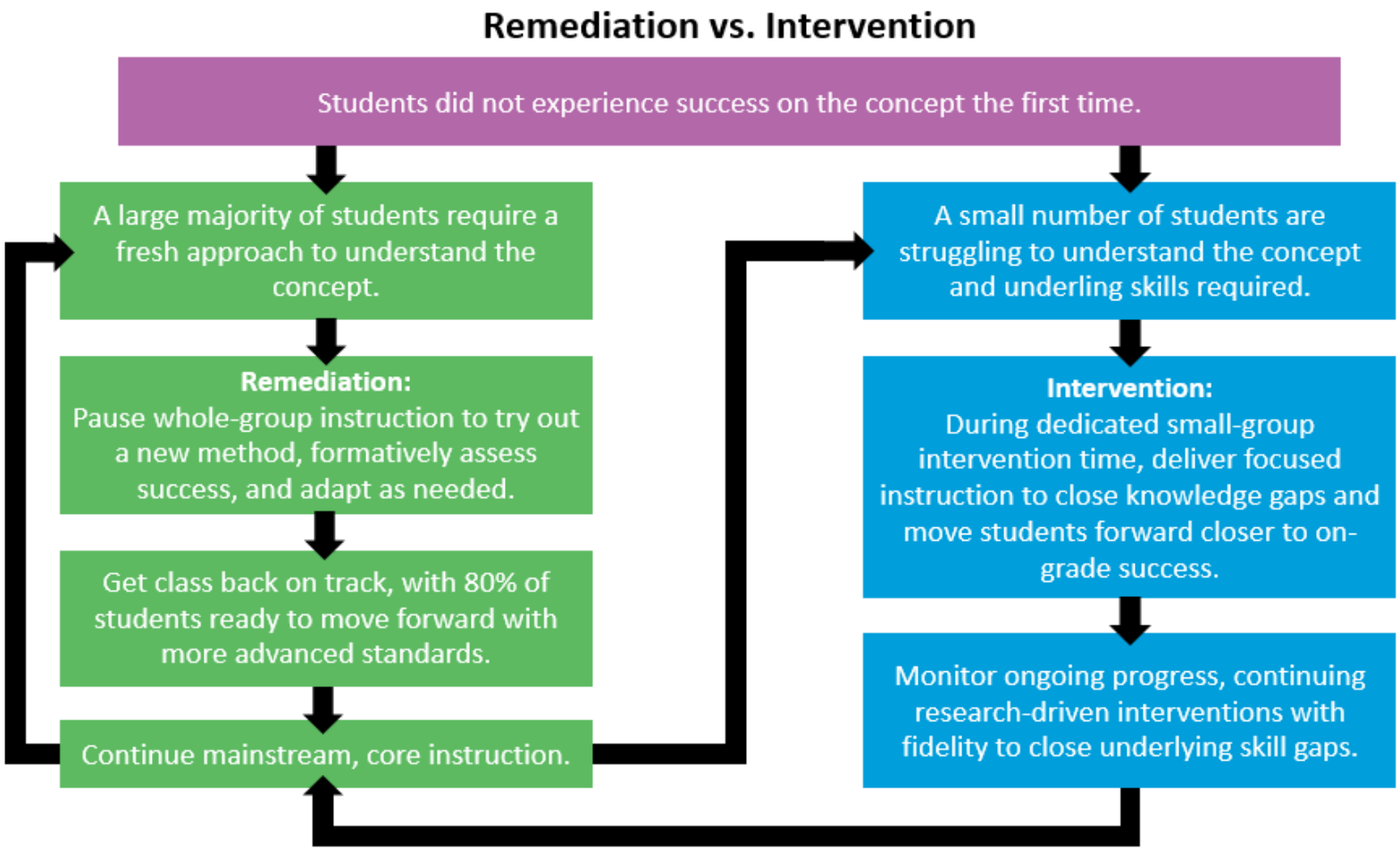
concepts. This balancing act can often feel like navigating a decision tree but for instruction. Look at the following graphic for one such example.

When you understand the key differences of these instructional approaches and, better yet, the value each one holds, your practices as an educator can become even more intentional. For example, don't spin your wheels organising all students into small groups for an intervention block when only 10 percent of them require this level of focused engagement. Also, don't stop to remediate a concept to the whole class when just a subset of learners would really benefit from a hands-on alternative instructional method to achieve understanding. Knowing what your students need and how to best meet student needs will make for a more balanced learning ecosystem where everyone is receiving the level of services they require at just the right time.

Summary:

Diagnose to determine deficiencies or gaps in planned learning outcomes

- Quantifying the significance of learning loss in terms of participation levels in each performance band: (suggest: less than 30%, between 31% – 60%, 61% and over.
- Determine approach required for each concept OR each student (significant challenge overall e.g. dropout, disabilities etc.): plenary and/or group sessions. Consider arrangements for intervention where needed.
- Plan for alternative instructional approaches: Review SOW with alternatives, infuse formative assessments, incorporate self-directed learning (use SLMS, repository, online self-directed programs)



https://blog.edmentum.com/intervention-vs-remediation-what%E2%80%99s-difference

ACCELERATED LEARNING

Accelerated learning is a multidimensional approach to learning that facilitates the learning of content in a shorter than conventional time taking into account the desired pace of the student. The purpose of this approach is to awaken learners to their full learning ability (Meyer, 2000). Although originally designed to nurture the talents of gifted students by focusing on instructional needs rather than age (Kulik & Kulik, 1984) this approach can be applied to any learner. In this brief acceleration refers to a wide variety of educational and instructional strategies used by educators to advance the learning progress of students who are struggling academically or who have fallen behind (The Glossary of Education Reform, 2013). It is being considered as an alternative approach to remediation for addressing learning gaps and helping students to perform at the expected level for their age and/or class.

Accelerating students as a method of boosting academic achievement is as much a shift in mind-set as it is in instruction. The goal is to review just the critical skills and concepts students need to be successful on learning new concepts. The acceleration approach increases the learning rate by using techniques and practices which seek to enhance the self-esteem of the learner, stimulate intrinsic motivation, and attaches meaning to the content to be learned (Boyes, Reid, Brain & Wilson, 2004).

Acceleration Model

A crucial aspect of the acceleration model is putting key prior knowledge into place so that students have something to connect with new information. Rather than focusing on everything students don't know about the concept, the acceleration model revisits basic skills which can be applied right away with the new content. To prepare for a new concept or lesson, students in an acceleration program receive: (1) instruction in prior knowledge and (2) remediation of prerequisite skills that, if missing, may create barriers to the learning process. This enriching experience includes the following steps:

Step 1: Generate Thinking, Purpose, Real-World Relevance, and Curiosity

One or two days before the regular class begins the concept, acceleration begins with a thought-provoking, hands-on activity that encompasses the big idea of the new topic. Working in small groups or pairs, students explore the new concept by generating their own formulas, developing ideas, discovering patterns, discussing observations, or examining the content's real-world relevance. These activities create value, relevance, and interest and foster both motivation and long-term retention of content.

Step 2: Clearly Articulate the Learning Goal and Expectations, Visualise Big Picture

Students are provided with the concept to be taught and the objectives to be achieved. This helps to clarify for students the progression of learning and how each objective contributes to understanding the big picture of a concept. Providing these patterns for learning allows students to build connections with other learning which leads to improved long-term memory and retrieval.

Step 3: Scaffold and Practice Essential Prerequisite Skills

Moving forward with students in an acceleration model requires teachers to carefully lay out the pieces of exactly what students need to know to learn the new concept at the desired pace. In this step start filling in the high-priority gaps identified by creating scaffolding devices (cheat sheets with examples, rule cards with pictures) to reinforce concepts and providing guided practice to assist students in learning the skills.

It's just as important not to provide too much scaffolding, however; keep tabs on each student's progress to get an idea of when you need to reduce or withdraw support. Scaffolding prerequisite skills in context allows students to realise success on new content.

Step 4: Introduce New Vocabulary and Review Prior Vocabulary

Vocabulary is developed over the course of time and is a key component of prior knowledge. Acceleration students benefit from rich vocabulary experiences which are memorable, hands-on and interactive. An effective strategy for learning vocabulary is to create a growing anchor wall chart that includes vocabulary terms, information on those terms, and pictures of the terms. The chart should start with prerequisite vocabulary and add words as they are introduced. This provides a constant reference point for students. Acceleration gives students a head start on the acquisition of vocabulary before the new concept is introduced.

Step 5: Introduction to the New Concept

Activities pertaining to the new concept are used with the acceleration class so students know something about the topic before it is introduced to the class. These activities will not be duplicated in the regular class because they would lead to boredom for the students from the accelerated class.

Step 6: Conduct Formative Assessment Frequently

The goal of acceleration is to help students learn content in their regular class the first time. It is therefore essential to collect ongoing data of student progress. There should be a continual flow of formative assessment information between the class teacher and the acceleration teacher. Instructional adjustments in acceleration classes are immediate and ongoing based on student data. Students targeted for acceleration have an urgent need for real success right now and as such feedback must be timely and detailed. For that to occur, teachers must use primarily "soft" formative assessment to provide immediate descriptive feedback.

Benefits of Acceleration Approach

- Increased student confidence- students have grasp core concepts and have attained success in classroom activities so they become more confident in their knowledge
- Increased class participation- student have the core concepts and therefore the odds of knowing the correct response to questions has increased so it is safer for them to raise their hands
- Increased interest in learning- student is now learning same materials as peers so they are curious about the new content

Considerations when Designing an Acceleration Program

There are a few logistics to address when implementing an acceleration program.

- Selecting a system for identifying students who would be good candidates for acceleration. Typically, this involves reviewing standardised test data and selecting students who have fallen behind peers in concepts considered to be important for achieving success at the next class-level.
- Deciding who teaches the acceleration classes. The teachers of acceleration classes may be either students' regular subject-area or class-level teachers or separate teachers. When students attend acceleration classes with their regular class teacher, this teacher can make the instructional moves during acceleration to facilitate student success in the regular class. When a separate teacher attends to the acceleration class then there must be continuous communication between the acceleration and class teacher to ensure that instructional moves are aligned with class instruction and the essential prerequisite skills identified.
- Allocating time for acceleration classes. Three options for scheduling acceleration classes:
  - scheduling a short time (around 45 minutes) at the beginning of each day in which all students receive acceleration or enrichment instruction
  - incorporating acceleration into electives, specials, or pullouts where students receive extra instruction in subjects they are experiencing problems
  - self-paced worksheets or online activities and guided practise
- Identifying the most important knowledge and skills students need to achieve class-level proficiency. This involves reviewing the curriculum to identify and prioritise key competencies and concepts that are required at different levels and in a variety of subject areas.

To support schools in addressing the various approaches to addressing Learning Loss as described, details on the following will be provided:

- **GENERAL GUIDELINES FOR DIAGNOSIS:** These guidelines provide an overview of how diagnosis may be conducted with specific reference to the core subjects taught at forms 1-3 at the secondary level.
- **SCHOOL-BASED DIAGNOSIS: CHECKLISTS (ALL SUBJECTS, FORMS 1-3) AND STRATEGIES:** Guidance is provided in the form of checklists, identifying for each core subject, the minimum outcomes students should have acquired in order to proceed to the next learning level. Along with the checklists, suggestions are provided on strategies that can be employed, specific to the subject at each learning level, by teachers in developing the diagnostics. Based on the data derived from the school-developed diagnostics, teachers can then identify gaps or deficiencies, observed for individual students or the entire class and plan accordingly for remediation or intervention, as is relevant.

- **CONDUCT OF DIAGNOSIS AT A NATIONAL LEVEL IN SELECTED SUBJECTS:** National, standardised diagnostics will be developed by the CPDD for English Language Arts and Mathematics but administered and scored by teachers. For secondary, these diagnostics may be administered to forms 1-4 and the ELA will focus on reading comprehension and writing.
- **EXEMPLARS OF CURRICULUM ADAPTATION:** Having identified the minimum learning outcomes that needs to be developed for students to move to the next learning level, the CPDD will provide an exemplar document which will guide how the curriculum may be adapted for each of the secondary (forms 1-3) levels. Thus, consistent with the minimum outcomes checklist, for each core subject at each learning level (form), guidance will be provided on adaptation of the curriculum, for students to be taught and assessed on, so they are prepared for the next learning level. The adaptations will focus on the minimum competencies for progress from one academic to the next academic year but does not limit the scope of what may be taught. Each teacher, armed with the knowledge of the competencies of the incoming cohort of students, can refer to the adaptations recommended for the current learning level, to prepare their workplans. They can confidently, amend their workplans to respond to the needs of their students and be assured that in the process, as they plan to ultimately have students cover the entire curriculum in readiness for exit examinations, they do so in a systematic and data-informed manner, realistic to their varying contexts but continuing to set high expectations for their students on a foundation of fundamental competencies.

DIAGNOSIS

- Exemplars of adapted curricula is provided for each subject from forms one to three based on minimum learning outcomes to be covered during each academic year
- The utility of the exemplars will depend on the data collected from the diagnostic assessments conducted for each subject.
- In the case of INCOMING form one students, one may refer to the standard five checklist for each subject, (see Appendix A) to prepare these diagnostics.
- The data collected would then guide teachers on how to adapt their workplans/scheme of work accordingly, with guidance provided in the exemplar of form 1 adapted curricula.
- In the case of INCOMING students of form two – form four, the preparation of the diagnostic, will be guided by the checklist of content of the previous learning level e.g. form 2 students will be diagnosed according to the subject checklist for form 1.
- As the year of instruction proceeds, teachers may then use the year level checklist to conduct ongoing diagnosis to inform remediation or intervention to ensure students are on track with their learning. Thus, for instance, during the year, the form 1 checklists may then be used to track the current form 1 students' (who came from primary) progress.
- Apart from the data collected from school-based diagnosis, which will be developed to match each school's learning experiences, NATIONAL DIAGNOSIS will be prepared by the Ministry of Education.
- National Diagnosis are planned for English Language Arts and Mathematics and are to be administered to students who have been promoted to forms 2 to 4 in September 2021.
- INCOMING Form 1 students may be assessed using the instruments designed for standard 5 at the primary level.

General Guidelines for Diagnosis

Determining Skills Gaps in Student Learning: Conduct diagnostic testing - this is to be done for each subject. Some examples listed below of each subject area, all of which can be done via any of the online platforms approved by the MOE.

Subject Area	General Diagnostic Strategies
Mathematics	❑ **Conceptual understanding:** • *Selected Response* filling-in a correct answer based on the correct understanding of a concept • *Performance Assessment* engaging in a class discussion or presenting an oral explanation of a concept • *Extended Written Response* solving a mathematics problem while explaining the concepts being used • *Personal Communication* recording an accurate understanding of concepts in a journal ❑ **Procedural fluency:** • *Selected Response* filling-in a correct answer based on the use of a correct process (or algorithm) • *Performance Assessment* carrying out the steps in a process (or algorithm) using a correct sequence • *Extended Written Response* describing a mathematical process correctly • *Personal Communication* providing a correct sequence of responses during an interview ❑ **Strategic competence:** • *Selected Response* filling-in a correct answer based on the use of a correct strategy • *Performance Assessment* solving a problem correctly using an appropriate strategy • *Extended Written Response* explaining the strategy used in producing a correct response • *Personal Communication* responding correctly to novel problems during class discussion ❑ **Adaptive reasoning:** • *Performance Assessment* creating a logical model based on accurate conjectures • *Extended Written Response* explaining a logical solution based on accurate conjectures • *Personal Communication* justifying a solution using logical assumptions

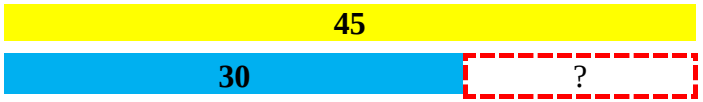
School-Based Diagnosis

Form 1

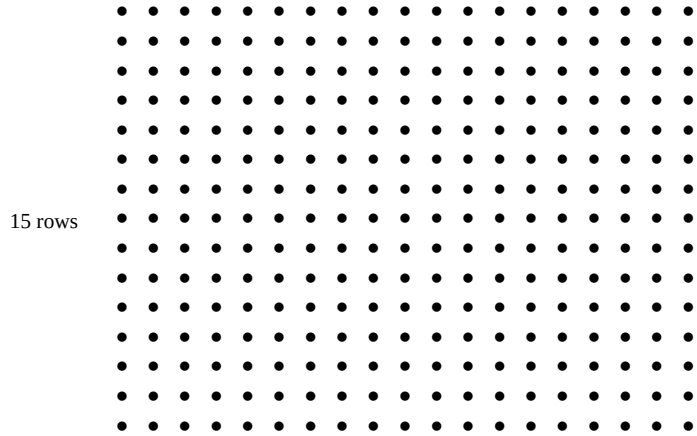
Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
Mathematics	❑ **Number** ❑ **Whole Number** • Create and solve problems using whole numbers involving the four operations • Solve one-step and multi-step problems involving whole numbers (including money transactions, bills, best buy, profit and loss) using the four operations and a variety of strategies • Solve real-world problems involving direct proportion • Demonstrate an understanding of algorithms, mental strategies and estimation strategies • Use estimation strategies (front-end rounding, compensation and compatible numbers) to check and justify answers in problem solving contexts and to determine the reasonableness of answers • Use the inverse operations to check the solutions to problems	The following represents a range of strategies to assess Mathematical knowledge and skills for diagnosis. • **Open-response activity** Assess the student's real-world understanding and analytical processes using, • a brief written statement • an oral statement • a mathematical solution • a drawing or a diagram • a table, chart or graph • a quiz • **Selected response activity** • Multiple choice • True and False • Matching • Cloze test (*assess literacy skills as well*) • Crossword puzzle • **Brief constructed response activity** • Fill in the blanks • Short Answer • Label a Diagram • Complete a table • Fill in a graphic organiser • **Constructed response activity**

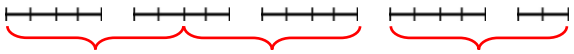
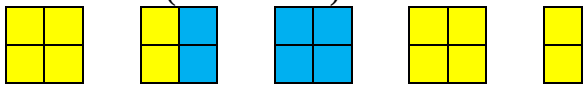
Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• Determine the approximate solution to a problem that does not requires an exact answer ❑ **Fractions** • Develop and apply procedures to add and subtract fractions and mixed numbers to solve problems • Solve problems involving addition and subtraction of fractions including mixed numbers • Develop and apply procedures to multiply a fraction by a whole number and multiply fractions and mixed numbers and to solve problems • Solve problems involving the multiplication of a fraction by a whole number, fraction by fraction and mixed numbers • Develop and apply procedures to divide whole numbers by fractions, fractions by whole numbers, and fractions to solve problems • Solve problems involving the division of: a whole number by a fraction, a fraction by a whole number, and a fraction by a fraction	• Collage • Acrostic • Oral Presentation • Demonstrate and explain procedures • Practical test • Create a drawing or poster • Make a model • **Portfolios (to assess over an extended period)** Track students' progress ***over time*** using their artifacts. Review any of the products below: • students' journals • past anecdotal records • artwork and diagrams • group projects • students' notes and outlines • rough drafts to finished work • Use information on ***how*** a student solves a problem to identify the level of understanding • Use assessments that distinguish between ***understanding of concepts*** and ***knowledge of procedures*** • Use criteria (mark scheme) to ***assess students' understanding*** of concepts rather than the strategy used, if no preferred strategy is required • Ensure that students understand the assessment framework as well as the assessment criteria • Teach students to self-assess in order to monitor and evaluate their own progress as they engage in reflection • Record students' oral assessments and review responses over time to track progress

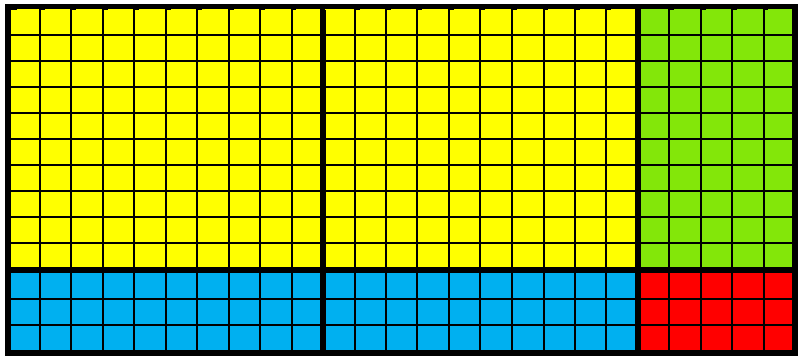
Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• Solve one-step and multi-step problems involving fractions (including money) using the four operations and a variety of strategies • Use estimation strategies to check and justify answers in problem solving contexts and to determine the reasonableness of answers ❑ **Decimals** • Solve real-world problems involving the addition and subtraction of decimals to hundredths using the algorithm • Develop and apply the procedures to multiply decimals by whole numbers and decimals (limited to tenths by tenths) and to divide a decimal by a whole number (up to hundredths) to solve problems • Solve one-step and multi-step problems involving decimals (including money) using the four operations and a variety of strategies • Use estimation strategies to check and justify answers in problem solving contexts and to	• Use peer assessments for students' improvement, but not for grades, as they compare and adapt their skills (performance) and products **Strategies to Check for Understanding** • https://www.utwente.nl/en/examination/faq-testing-assessment/60formativeassessment.pdf • https://www.duplinschools.net/cms/lib/NC01001360/Centricity/Domain/71/Formative%20Assessment%20Activities.pdf • http://eworkshop.on.ca/edu/pdf/Mod21_assessment_strgs.pdf **Mathematics Diagnostic Tests** • https://www.rainbowresource.com/pdfs/categories/cat02343_ptst0.pdf (number concepts) • https://www.mathmammoth.com/preview/tests/End_of_Year_Test_Grade4.pdf (adapt geometry questions on angles) • https://www.baschools.org/pages/uploaded_files/5th%20Grade%20Practice%20Test.pdf (select content to match curriculum outcomes) • https://drive.google.com/file/d/0B5-R28AdFXfoQTNvU041YWx0U0U/edit?resourcekey=0-Ks7ZDWaNNWTr5l_pHxzTdw (adapt geometry questions on angles) • http://det.wa.edu.au/stepsresources/detcms/navigation/first-steps-mathematics/ (pool of resources to support mathematics diagnoses)

Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	determine the reasonableness of answers ❑ **Per cent** • Develop an understanding of percent concretely, pictorially and symbolically • Demonstrate an understanding of the relationships between fractions and per cents • Calculate the percent of a quantity • Express a quantity as a percentage of another • Relate per cents to fractions (halves, quarters, fifths and tenths) and decimals • Compare and order fractions, per cents and decimals • Solve problems involving fractions, decimals and per cents ❑ **Problem Solving** • Create and solve one-step and multi-step problems involving whole numbers, fractions, mixed numbers, decimals, per cents and money (including profit and loss, discount, savings, salaries, wages, loans, simple interest, VAT) using algorithms, mental strategies, and other problem-solving strategies	**Diagnostic Assessment Approaches** • ***Cognitive Analysis***: Identify misconceptions to develop interventions • Vary the *level of difficulty* in problem solving to assess computational skill and knowledge of concepts. ○ Problem 1. Calculate the perimeter of a 10 cm square tile. ○ Problem 2. Calculate perimeter of square table tiled with thirty-six 10 cm square tiles. • ***Skills Analysis***: Identify skill deficiency to develop reinforcement activities • Assess verbal comprehension skills. E.g. ○ Use a *change problem*. (Change problems always include a time element. Students must decide whether to add or subtract by determining whether the change in the quantity is more or less) ▪ Problem 1. Peter farms watermelons. After harvesting 28 more melons, he had 111 melons. How many melons did he have before the harvest? ▪ Problem 2. Peter sells watermelons. After selling 28 of his melons, he had 83 melons left. How many melons did he have before the sale? ○ Use a *compare problem*. [Students add or subtract by determining whether they need to calculate the unknown difference (subtract), unknown compared amount (add), or unknown referent amount (subtract).] ▪ Problem: There are 45 cars and 30 truck in the carpark. How many more cars than trucks are in the carpark? 

Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• Solve problems involving unequal sharing • Use estimation strategies to check and justify answers in problem solving contexts and to determine the reasonableness of answers ❑ **Geometry** ❑ **Solids and Plane Shapes** • Describe solids in terms of their properties • Explore angles in solids • Explore and describe cross-sections of solids, base and height • Explore angles in plane shapes • Identify types of quadrilaterals • Classify and compare quadrilaterals according to their attributes (angles, sides, perpendicular and parallel) • Solve problems involving solids and plane shapes ❑ **Measurement** ❑ **Linear: Perimeter** • Develop and use proficiently the formulae to calculate the perimeter of squares and rectangles in problem- solving ❑ **Area**	○ Solve *different problems with the same strategy*. ▪ Problem 1. Ann wants to give each of her friends a chocolate. A box of chocolates contains 8 chocolates. How many boxes must she buy to give 1 chocolate to each of her 18 friends? ▪ Problem 2. Ann wants to put 3 chocolates in each party bag. A box of chocolates contains 8 chocolates. How many boxes must she buy to prepare 6 party bags? • ***Error Analysis***: Identify error patterns to design reteaching sequences • *Conceptual errors* occur when the students are not able to apply the concept • *Operational errors* occur when the students are not able to calculate numbers • *Principal errors* occur when the students are not able to answer the final answer that is caused by the previous error in the problem-solving. **Use different approaches to assess levels of student cognition** • ***Concrete***: Manipulatives for performance tasks • ***Pictorial***: Visualisations for scaffolding • ***Abstract***: Text and symbols for higher order assessments

Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• Demonstrate an understanding of measures of area. • Demonstrate an understanding of area of regular and irregular plane shapes • Develop and use proficiently formula to calculate area in problem solving. • Solve problems involving measures of area. ❑ **Mass/Weight** • Apply algebraic reasoning to calculate unknown values involving mass/weight • Solve problems involving mass/weight ❑ **Time** • Solve problems involving time ❑ **Capacity and Volume** • Demonstrate appropriate techniques • when measuring capacity. • Solve problems involving measures of capacity. • Demonstrate an understanding of the concept of volume • Understand conservation of volume. • Understand that capacity and volume are related.	• Use *visualisation*, basic *number sentences* and *word problems* with the same number values to assess computational skill and literacy. • *Visualisation* using an array with 15 rows and 19 columns How many Circles? 19 columns 15 rows  • Calculate using a *mental math strategy*: 15×19 → (20×15) – 19 • Solve a *word problem*: How many people can be seated in a room filled with 19 rows of chairs with 15 chairs in each row?

Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• Solve problems involving volume and capacity. ❑ **Statistics** • Interpret data from tables, charts and graphs • Apply findings from analysis of data to solve problems • Determine the mode for a given set of data and explain its importance in data analysis • Communicate findings and decisions by writing a report using language associated with statistics • Evaluate decisions made based on analysis of data represented in tables, charts and graphs • Develop the concept of mean/average • Solve problems involving mean/average	**Fractions** • Allow different representational modes to assess operations on fractions e.g. Students choose any model to **divide by 1½**. • ***Algorithm*** Use multiplication by the reciprocal: $4\frac{1}{2} \div 1\frac{1}{2} = \frac{9}{2} \times \frac{2}{3} = 3$ • ***Linear model*** (divide lengths): Dividend is 4½  • ***Area model*** (divide areas): Dividend is 4½  • ***Set model*** (divide sets): Dividend is 4½  **Decimals** • Allow different representational modes to assess operations on decimals e.g. Students choose any model to **multiply by 2.5** • ***Distributive law*** 1.3 × 2.5 = 1.3 × (2 + 0.5) = (1.3 × 2) + (1.3 × 0.5) = 2.6 + 0.65 = 3.25

Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
		• ***Area model*** (Identify wholes and decimal parts) **1.3 × 2.5** 2.5 1.3  **1 + 1 + 0.5 + 0.3 + 0.3 + 0.15 = 3.25** • ***Algorithm*** Use multiplication of whole numbers and adjust the position of the decimal point 1 3 × 2 5 2 6 0 + 6 5 3 2 5 Answer is 3.25 **Similar to a clinical diagnosis, more than one type of assessment may be required to better diagnose a particular skill. Therefore, <u>use a table of specifications, well-defined rubrics and item analyses</u>, to develop refined assessments which determine gaps in students' skill and content with higher accuracy.**

Subject	Checklist of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
		Other useful strategies are provided at the sites for the links below. **NUMBER** http://det.wa.edu.au/stepsresources/detcms/navigation/first-steps-mathematics/ (*diagnostic activities for number*) • Whole Numbers • Fractions • Decimals • Per cent **GEOMETRY** http://det.wa.edu.au/stepsresources/detcms/navigation/first-steps-mathematics/ (*diagnostic activities for geometry*) • Solids • Plane Shapes **MEASUREMENT** http://det.wa.edu.au/stepsresources/detcms/navigation/first-steps-mathematics/ (*diagnostic activities for measurement*) • Perimeter • Area • Mass/Weight • Time • Capacity and Volume **STATISTICS** http://det.wa.edu.au/stepsresources/detcms/navigation/first-steps-mathematics/ (*diagnostic activities for statistics*) • Data representation: Tables Charts and Graphs • Mean and Mode

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
Mathematics	❑ **1.1.1** **Number Operations and Number Theory** **Whole Numbers** • sequence the number names and numerals up to 999 999 999 • state the place value of each digit in a numeral up to 999 999 999 • round numbers to the nearest tens, hundreds, thousands and up to millions • estimate a given quantity of items using 100 as a benchmark (using 'mental grouping') and verify by counting • differentiate between or among (a) rectangular, triangular and square numbers (b) factors and multiples of numbers (c) odd and even numbers (d) prime and composite numbers (e) square numbers and their square roots • calculate the Lowest Common Multiple (LCM) and Highest	**1.1.1** **Number Operations and Number Theory** **Whole Numbers** • use technology tools to represent the position of numbers • explore activities involving reading and writing number names and numerals; matching number names and numerals; and comparing and ordering numerals in ascending and descending order • oral quiz • review/ check for prior knowledge of the rounding rule • discussion about real life application of estimations (e.g., the number of bricks for building a house, number of people in a large crowd) • performance task - use objects to display a known quantity and allow their peers to estimate and verify the amount • explore activities using manipulatives (e.g., counters to illustrate the geometric shape of different numbers) • use technology tools to conduct research • problem solving (use various strategies to solve real-life problems involving LCM and HCF) • mental quiz

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	Common Factor (HCF) of a set of numbers ❑ **1.1.2** **Number Operations and Number Theory** **Fractions** • name fractions using words and symbols • convert from improper fraction to mixed number and vice versa • create equivalent fractions • compare and order fractions in ascending and descending order using equivalent relationships • state the relationship between rational numbers and whole numbers • solve problem involving fractions ❑ **1.1.3** **Number Operations and Number Theory** **Directed Numbers** • represent positive and negative numbers on the number line • perform the four basic operations on directed numbers	**1.1.2** **Number Operations and Number Theory** **Fractions** • use of manipulatives • performance task - group presentations of fractions represented by different models • oral questioning • pop quiz • self-assessment using CAI • explore activities involving the relationship between fractions and the division of two whole numbers with answer less than one e.g., $3 \div 4 = \frac{3}{4}$ **1.1.3** **Number Operations and Number Theory** **Directed Numbers** • oral quiz • performance task - using negative numbers to measure quantities in real-world scenarios • simulation of games involving the number line (e.g., stepping backwards and forwards), two-coloured counters, puzzles, and number charts

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
		• discussion of videos related to directed numbers on YouTube and other Virtual Learning Environments
	❑ **1.1.4** **Number Operations and Number Theory** **Decimals** • match number names to decimal fractions and quantities • state the place value and value of digits in decimal fractions • compare and order decimal fractions in ascending and descending order • apply the 'rounding rule' to round decimal fractions to the nearest whole number, tenth or hundredth position of numbers • convert fractions to decimals identify (a) terminating (b) non-terminating (c) recurring decimals • solve problems involving decimals (add, subtract, multiply, divide)	**1.1.4** **Number Operations and Number Theory** **Decimals** • use manipulatives to represent base ten fractions • model by 'thinking aloud' the process of reading number names and numerals • performance task - use illustrations such as base ten materials and place value mats to represent fractions • oral report to communicate ideas use decimal notation as another form of writing base ten fractions e.g., 0.1 is the same as $\frac{1}{10}$ • teacher observation - observe how students write decimal notation and base 10 fractions in their notebooks • check for understanding by matching the number names (e.g., two and five tenths) and decimal fractions (e.g., 2.5), to the quantities they represent • guided practice to determine the place value and value of digits in numerals using base ten materials including place value mats
	❑ **1.1.5** **Number Operations and Number Theory** **Percentages**	**1.1.5** **Number Operations and Number Theory** **Percentages** • explore real-life situations involving percent

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• convert among fractions, decimals, and percent • compare and order fractions, decimals, and percent • solve problems involving percent	• use technology tools to verify solutions • teacher observation - observe how students convert among fractions, decimals, and percent in their notebooks
	❑ **1.1.6** **Number Operations and Number Theory** **Consumer Arithmetic** • state the combinations of $5, $10, $20, $50 and $100 bills equivalent to $1000 • determine the best buy from a choice of similar items with respect to price • solve problems involving percentage (calculate profit and loss, percentage profit and loss, sales tax, and discount) • solve problems involving simple interest	**1.1.6** **Number Operations and Number Theory** **Consumer Arithmetic** • performance task - tabulate the number of $5, $10, $20, $50, $100 bills equivalent to $1000 • performance task - illustrate the equivalence of money by using 'play money' • performance task - create a shop/store and determine 'best buys', using role play • simulation of a bank scenario, to carry out transactions involving loans and savings
	❑ **1.2.1** **Sets, Relations and Functions** **Sets** • define sets by listing the elements or describing them in words • distinguish among empty, equal, equivalent, finite, and infinite sets	**1.2.1** **Sets, Relations and Functions** **Sets** • oral questioning • performance task - use illustrations to describe and list subsets from a given set • performance task - illustrate the different types of sets using objects in the real world

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• describe the concepts of universal sets, complement of a set, union of sets, intersecting sets, subsets, and disjoint sets ❑ **1.3.1** **Statistics and Probability** **Statistics** • collect discrete data to address the problem • construct pictographs and block graphs, to represent data collected (using appropriate scale factors) • interpret pictographs and block graphs • find the mode for data taken from frequency table ❑ **1.4.1** **Geometry** **Solids and Plane Shapes** • classify the different solids according to their properties draw the net of a solid • classify polygons according to their properties • create patterns involving the tessellation of plane shapes	**1.3.1** **Statistics and Probability** **Statistics** • discussion to cite examples of discrete data and their sources (e.g., newspaper, internet, magazines, books) • guided practice to collect data using techniques such as counting, direct observation, interviews, surveys, research, questionnaires, experiments, and databases **1.4.1** **Geometry** **Solids and Plane Shapes** • explore/investigate the properties of solids using manipulatives/models • performance task - compile a portfolio of solids, their drawings, and a description of their properties • performance task - group presentations displaying nets of solids (e.g., using multimedia)

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	❑ **1.4.3** **Geometry** **Angles** • compare and order angles using direct comparison (no unit) • express whole turns, half turns, and quarter turns in degrees • classify angles according to type (acute, right, obtuse, straight, and reflex) • measure angles in the range 0° to 360° using protractors • solve problems involving angles ❑ **1.4.4** **Geometry** **Triangles** • deduce that the sum of the interior angles in a triangle is equal to 180o • deduce the relationship between the size of the angle and the length of the side opposite the angle • classify triangles based on their properties as acute angled, right angled, obtuse angled, isosceles, equilateral, and scalene • draw triangles given (a) given the lengths of two sides and included angle	**1.4.3** **Geometry** **Angles** • explore/investigate turns in the environment, such as opening and closing of doors and the movement of hands in clocks • performance task - demonstrate different turns using geo-strips whole turn, half turn, quarter turn • performance task- group presentation to explain the difference among the types of angles • games/ pop quiz • performance task- demonstrate and explain how to measure angles using a protractor **1.4.4** **Geometry** **Triangles** • performance task - group presentations on findings from investigation • performance task - use illustrations of triangles and classify them • performance task - group presentations of the triangles drawn and explanations of procedures for drawing triangles

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	(b) given the length of one side and two angles • solve problems involving triangles	
	❑ **1.4.5** **Geometry** **Quadrilaterals** • classify quadrilaterals according to their attributes • draw quadrilaterals given measurements of sides and angles given lengths of sides and sizes of angles • solve problems involving quadrilaterals	**1.4.5** **Geometry** **Quadrilaterals** • investigate the sum of the interior angles in quadrilaterals using manipulatives • performance task - compile a portfolio of quadrilaterals, their drawings, and a description of their properties • check for understanding by creating models of quadrilaterals, to be drawn, using manipulatives e.g., straws • performance task - group presentations of the quadrilaterals drawn and explanations of procedures for drawing quadrilaterals
	❑ **1.4.6** **Geometry** **Transformations** • identify lines of symmetry in shapes and letters • create (a) symmetrical shapes (b) patterns using reflection • solve problems involving translation and reflection	**1.4.6** **Geometry** **Transformations** • engage in practical activities involving the translation of objects (using manipulatives) • performance task - use illustrations such as patterns or pictures to show translations • oral report to describe the translation of an object to its image
	❑ **1.5.2** **Measurement** **Linear Measure**	**1.5.2** **Measurement** **Linear Measure**

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	• distinguish between standard and non-standard units of measures • compare the metric system with the denary system to determine the relationships between the sub-units of the metric system • convert linear measure from one unit to the other (using the different units of measure - millimetres, centimetres, metres, kilometres)	• performance task - students demonstrate how to estimate length and verify by measuring e.g., measure height using a metre rule • teacher observation (checklist) • oral report on recording measurements using a combination of linear units and using whole numbers (e.g., 3m and 10cm), fractions (e.g., $3\frac{1}{10}$ m) or decimals (e.g., 3.1 m)
	❑ **1.5.3** **Measurement** **Perimeter** • calculate the perimeter of plane shapes • solve problems involving perimeter (write answers to a specified degree of accuracy) • measure surface area • calculate the area of triangles, squares, and rectangles	**1.5.3** **Measurement** **Perimeter** • explore/investigate the concept of 'distance around' using manipulative • teacher observation of notebook entries • performance task - draw various shapes with the same perimeter
	❑ **1.5.4** **Measurement** **Area** • explain the concept of area • calculate the area of triangles, squares and rectangles	**1.5.4** **Measurement** **Area** • explore/investigate the concept of 'area' using manipulatives • oral quiz • performance task - measure area of objects in the environment • performance task - draw various shapes with the same area

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing concept acquisition
	❑ **1.6.1** **Algebra** **Introducing Algebra** • distinguish between constants and variables • identify an expression • substitute whole numbers for variables in expressions • simplify algebraic expressions involving the four operations • simplify algebraic expressions using the distributive law	**1.6.1** **Algebra** **Introducing Algebra** • questioning to develop the concept of a constant and a variable • model by 'thinking aloud' the process • pop quiz
	❑ **1.6.2** **Algebra** **Expressions** • create an expression to represent the nth term in a sequence • calculate the n^{th} term of a sequence	**1.6.2** **Algebra** **Expressions** • pop quiz • use technology tools to obtain examples of patterns and sequences (e.g., dance; use geometrical shapes to create patterns) • guided practice to determine rules about patterns and sequences e.g., make squares by joining matchsticks (e.g., 4 matchsticks will make 1 square, 7 matchsticks will make 2 squares etc.)
	❑ **1.6.6** **Algebra** **Algebraic Equations** • translate word problems into algebraic equations • solve linear equations with one variable	**1.6.6** **Algebra** **Algebraic Equations** • performance task - illustration of how strips of coloured cut-outs are used to represent equations • oral report to summarize ideas Resources are available on the **School Learning Management System**.

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
Mathematics	❑ **1.1.4** **Number Operations and Number Theory** **Decimals** • match number names to decimal fractions and quantities • state the place value and value of digits in decimal fractions • compare and order decimal fractions in ascending and descending order • apply the 'rounding rule' to round decimal fractions to the nearest whole number, tenth or hundredth position of numbers • convert fractions to decimals • identify (a) terminating (b) non-terminating (c) recurring decimals • solve problems involving decimals (add, subtract, multiply, divide) ❑ **1.1.5** **Number Operations and Number Theory** **Percentages**	**1.1.4** **Number Operations and Number Theory** **Decimals** • use manipulatives to represent base ten fractions • model by 'thinking aloud' the process of reading number names and numerals • performance task - use illustrations such as base ten materials and place value mats to represent fractions • oral report to communicate ideas use decimal notation as another form of writing base ten fractions e.g. 0.1 is the same as $\frac{1}{10}$ • teacher observation - observe how students write decimal notation and base 10 fractions in their notebooks • check for understanding by matching the number names (e.g. two and five tenths) and decimal fractions (e.g. 2.5), to the quantities they represent • guided practice to determine the place value and value of digits in numerals using base ten materials including place value mats **1.1.5** **Number Operations and Number Theory** **Percentages** • explore real-life situations involving percent

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	• convert among fractions, decimals and percent • compare and order fractions, decimals and percent • solve problems involving percent	• use technology tools to verify solutions • teacher observation - observe how students convert among fractions, decimals and percent in their notebooks
	❑ **1.1.6** **Number Operations and Number Theory** **Consumer Arithmetic** • state the combinations of $5, $10, $20, $50 and $100 bills equivalent to $1000 • determine the best buy from a choice of similar items with respect to price • solve problems involving percentage (calculate profit and loss, percentage profit and loss, sales tax and discount) • solve problems involving simple interest	**1.1.6** **Number Operations and Number Theory** **Consumer Arithmetic** • performance task - tabulate the number of $5, $10, $20, $50, $100 bills equivalent to $1000 • performance task - illustrate the equivalence of money by using 'play money' • performance task - create a shop/store and determine 'best buys', using role play • simulation of a bank scenario, to carry out transactions involving loans and savings
	❑ **1.6.6** **Algebra** **Algebraic Equations** • translate word problems into algebraic equations • solve linear equations with one variable	**1.6.6** **Algebra** **Algebraic Equations** • performance task - illustration of how strips of coloured cut-outs are used to represent equations • oral report to summarize ideas

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	❑ **2.1.1** **Number Operations and Number Theory** **Integers** • Order integers • Perform the four basic operations on integers • Solve simple problems involving integers • Differentiate between natural numbers, whole numbers and integers ❑ **2.1.2** **Number Operations and Number Theory** **Laws and Properties of Numbers** • Apply the commutative, associative and distributive laws • Explain the concept of (a) closure (b) the identity element (c) and inverse operator • Express a value (a) to a given number of significant figures (b) using standard form (c) in scientific notation • Perform the four operations on the numbers expressed in index	**2.1.1** **Number Operations and Number Theory** **Integers** • Use spreadsheet to order integers • Compare and order integers using a number line • Use virtual manipulatives to order integers • Use spreadsheet to add, subtract, multiply and divide integers • Solve simple computational problems from real world situations • Compare and contrast activities using a graphic organizer • Create number lines, number trees and Venn diagrams to display numbers **2.1.2** **Number Operations and Number Theory** **Laws and Properties of Numbers** • Use situations where the laws of arithmetic apply • Apply appropriate domain specific vocabulary to communicate concepts • Investigate and discuss the properties of the identity element, inverse operator and closure using closed and open number systems • Provide examples to help transfer of learning • Use spreadsheet or calculator for practice and reinforcement • Develop automaticity with drill and practice • Guide practice using modelling and coaching

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	form, having positive indices only	
	❑ **2.2.2** **Sets, Relations & Functions** **Relations, Mappings and Functions** • Explain the concept of an arrow diagram • Use arrow diagrams to illustrate relationships between sets • Explain the concept of a relation and a function • Differentiate among a relation, a mapping and a function	**2.2.2** **Sets, Relations and Functions** **Relations, Mappings and Functions** • Use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representation • Discuss and state relationships that exist in real world situations which represent groups as sets • Provide examples of arrow diagrams to explore/ investigate attributes of different types of relations • Compare and contrast activities using a graphic organizer to distinguish between relations, mapping and functions
	❑ **2.2.4** **Sets, Relations & Functions** **Graphical Representations of Linear Equations and Linear Inequalities** • Interpret linear relations as graphs on the Cartesian plane • Draw graphs on the Cartesian plane • Define linear relationships • Draw graphs of simple linear inequalities	**2.2.4** **Sets, Relations & Functions** **Graphical Representations of Linear Equations and Linear Inequalities** • Use technology tools to investigate models • Use graphing calculator to create models • Use questioning strategies that require students to manipulate concepts and ideas through language to describe models • Integrate skills and concepts: Treat the x and y axes as number lines then associate solutions on the number line with regions on the cartesian plane • Solve simple linear inequalities in one variable only, and represent them on the Cartesian plane
	❑ **2.3.1** **Statistics and Probability**	**2.3.1** **Statistics and Probability**

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	Statistical Analysis • Interpret a frequency distribution • Calculate the mean, median and mode from a frequency distribution of ungrouped data • Identify data types in terms of nominal, ordinal, interval, ratio	**Statistical Analysis** • Use questioning strategies that require students to manipulate concepts and ideas through language to describe models. • Guided instruction using frequency distributions to calculate the mean, median and the mode. • Independent practice with the use of technology tools e.g. spreadsheets for checking • Present situations to analyse the characteristics of different types of data
	❑ **2.3.2** **Statistics and Probability** **Data Displays** • Construct statistical charts (a) Pie charts (b) bar charts (c) histograms (d) line graphs • Interpret information from pie charts, bar graphs, histograms, and line graphs	**2.3.2** **Statistics and Probability** **Data Displays** • Activate prior knowledge of block graphs and scales • Students self-assess (self-monitor) using a customised math error self-correction checklist. • Engage students in discussion for deeper understanding to develop inference skills
	❑ **2.4.1** **Geometry** **Coordinate Geometry** • Locate points on a Cartesian plane using a system of coordinates • Plot points on a Cartesian plane	**2.4.1** **Geometry** **Coordinate Geometry** • Investigate reference system for locating points on a grid/ atlas • Use google map to print a map of the school on a grid and allow students to locate rooms given specific coordinates • Review the concept of positive and negative numbers (integers) and model the placement of integers on the large scale number line

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
		• Reinforce associated terminology when discussing position relative to the x and y axes e.g. o Right/ "Positive" o Left/ "Negative" o Up/ "Positive" o Down/ "Negative" • Plot points to form/ complete familiar shapes or symmetrical designs so that students can easily self-monitor their own progress.
	❑ **2.4.3** **Geometry** **Angles, Triangles and Parallel Lines** • Calculate the size of an exterior angle given the size of the interior angle • Classify the angles formed when parallel lines are cut by a transversal	**2.4.3** **Geometry** **Angles, Triangles and Parallel Lines** • Problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa • Engage students in activities to develop their spatial skills
	❑ **2.4.4** **Geometry** **Geometric Drawings and Constructions** • Bisect a line segment • Use a pair of compasses and a straight edge to bisect an angle • Draw angles using a protractor • Use a ruler and a pair of compasses only to construct angles which are multiples of 30 degrees	**2.4.4** **Geometry** **Geometric Drawings and Constructions** • Practice using measuring instruments with accuracy • Provide examples to help develop relational understanding • Present opportunities to build on students' inherent sense of curiosity and discovery.

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	❑ **2.5.2** **Measurement** **Circle** • Identify the parts of a circle and their relations • Derive the numerical value of pi • Derive the formula for the circumference of a circle • Use the formula for the circumference of a circle • Use the formula for the area of a circle • Estimate the area of a circle • Solve problems involving circles	**2.5.2** **Measurement** **Circles** • Complete a chart, defining the parts of the circle • Develop the formula for the circumference of a circle: o Measure the circumference o Measure the diameter o Calculate the ratio $\frac{C}{D} = \pi$ o State the relation between circumference, diameter, and pi, with circumference as the subject • Apply substitution skills to the formula C = Dπ or C = 2 πr to calculate the unknown value of the circumference, diameter, or radius of a circle • Apply substitution skills to the formula A = πr^2 to calculate the unknown value of the area, radius or diameter of a circle • Practice using the calculator for computation
	❑ **2.5.3** **Measurement** **Area and Perimeter of Compound Shapes** • Represent compound shapes as the union of plane shapes • Calculate the area of compound shapes involving triangles, quadrilaterals, circles and circle quadrants • Calculate the perimeter of compound shapes involving	**2.5.3** **Measurement** **Area and Perimeter of Compound Shapes** • Design and sketch compound shapes: cut out plane shapes from compound shapes; calculate the area of each shape; add up the areas • Collaborate in groups to derive possible solutions to problem situations • Identify the actual edges of the compound shape by tracing the length of each edge of the compound shape • Explore strategies to determine unknown lengths of sides

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	triangles, quadrilaterals, circles and circle quadrants • Solve problems involving estimates of perimeter and area, including finding the dimensions of a shape, given its perimeter	
	❑ **2.5.4** **Measurement** **Volume and Capacity of Prisms** • Calculate the volume of solids • Recognise the relationship between the concepts of volume and capacity	**2.5.4** **Measurement** **Volume and Capacity of Prisms** • Stack cubes to form cubes and cuboids • Explore the properties of solids to generate a rule to finding the volume of a cylinder and other prisms • Use a variety of containers to measure capacity • Read a scale to determine capacity
	❑ **2.5.6** **Measurement** **Consumer Arithmetic** • Calculate the total Hire Purchase price • Apply the terminology of salary and wage • Explain the concept of percent • Increase or decrease by a given percent • Convert currency using rates • Solve problems involving rates; foreign exchange, salary, wages and utility bills.	**2.5.6** **Measurement** **Consumer Arithmetic** • Review how hire purchase is calculated • Conduct role play allowing students to virtually sell items on hire purchase • Questioning to elicit the advantages and disadvantages of purchasing with hire purchase • Students role play to create a payroll for their virtual employees • Allow students to create a glossary of terms daily, monthly, yearly, fortnight, basic wage, double time, triple time, time and a half, commission, duration of work, incentive bonus • Distinguish between percent and percentage • Investigate percent

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
		○ between 0% and 1% ○ greater than 100% ○ equivalence with fractions • Interpret a foreign currency exchange rate table and discuss strategies for converting different currencies.
	❑ **2.6.1** **Algebra** **Substitution** • Translate between word statements and mathematical statements involving two basic operations • Substitute integers for unknown quantities in mathematical statements	**2.6.1** **Algebra** **Substitution** • Organize and consolidate Mathematical thinking through communication • Present examples to transfer learning • Use concrete, pictorial and verbal representations to develop an understanding on invented and conventional symbolic notations
	❑ **2.6.2** **Algebra** **Simplification of Algebraic Expressions** • Identify like and unlike terms • Differentiate between the coefficient and operational sign • Perform operations on terms represented concretely, pictorially and symbolically • Simplify algebraic equations	**2.6.2** **Algebra** **Simplification of Algebraic Expressions** • Compare and contrast activities using manipulative, pictograph, symbols • Use the language of Mathematics to express Mathematical ideas precisely • Present models for students to analyse and evaluate • Collaborate in groups for scaffolding and sharing of ideas • Perform activities to model operations using algebra tiles, pictographs and symbols • Develop and analyse algorithms to perform simple computations using: ○ The four basic operations

Subject	CHECKLIST of Outcomes/Competencies/Standards	Strategies for Diagnosing
	❑ **2.6.3** **Algebra** **Solutions of Linear Equations** • Differentiate between expressions and equations • Solve linear equations of increasing level of difficulty with variables on both sides • Solve linear equations involving the use of the distributive law using a variety of representations	○ The order of operations ○ Commutativity, associativity, and distributivity **2.6.3** **Algebra** **Solutions of Linear Equations** • Use questioning strategies that require critical analysis of concepts • Use flow charts to explain the processes used to solve the equation • Explore problems in a real-world context to include fractions with denominators having natural numbers but no variable Resource are available on the **School Learning Management System**.

CURRICULUM ADAPTATION

- Exemplars of adapted curricula are provided for each subject from forms one to three.
- These exemplars are a guide to allow for identification of MINIMUM learning outcomes that must be covered for a student to move on to the next learning level. Of course, this will vary by school and even by student.
- The utility of the exemplars will depend on the data collected from the diagnostic assessments conducted for each subject.
- Based on the data collected from diagnostic assessments, the curriculum could be adapted generally for ensuring
  - minimum learning outcomes of the previous learning level is completed,
  - preparation for the next learning level is on track
- Also, specific workplans can be developed for intervention and remediation. Individual or small groups of students can be assigned, specifically for Math and ELA, self-paced and guided practise sessions/breakout activities. This applies for both students who are struggling and those who maybe more advanced.

Mathematics

Form 1

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
1	**1.1.1 WHOLE NUMBERS** **1.1.1.1** **Explain the historical development of the denary system** **1.1.1.2** **Sequence the number names and numerals up to 999 999 999** **1.1.1.3** **State the place value of each digit in a numeral up to 999 999 999** **1.1.1.4** **Round numbers to the nearest tens, hundreds, thousands and up to millions**	**1.1.1 WHOLE NUMBERS** **1.1.1.1** https://www.youtube.com/watch?v=cZH0YnFpjwU **1.1.1.2** https://www.youtube.com/watch?v=lHyiRVQGqpc https://www.youtube.com/watch?v=Gx3V2nLXfsA **1.1.1.3** https://www.youtube.com/watch?v=eLRMI2ZX5Qw **1.1.1.4** https://www.youtube.com/watch?v=w2M5CzTFYfI https://www.youtube.com/watch?v=3jBfLaLrk6I https://www.youtube.com/watch?v=_qzs1zozTBo https://www.youtube.com/watch?v=19yOv4P2ccw https://www.youtube.com/watch?v=_H64VpzpxR4 https://www.youtube.com/watch?v=jvp0mtr1kFM https://www.youtube.com/watch?v=Hixy7TX-Nwo https://www.youtube.com/watch?v=Gg-GD5QfbB4

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Term	**Outcomes**	**Online tools and resources**
	1.1.1.5 **Estimate a given quantity of items using 100 as a benchmark (using 'mental grouping') and verify by counting** **1.1.1.6** **Differentiate between or among** **(a) rectangular, triangular and square numbers,** **(b) factors and multiples of numbers,** **(c) odd and even numbers,** **(d) prime and composite numbers, and** **(e) square numbers and their square roots**	**1.1.1.5** https://www.youtube.com/watch?v=CZuYBGBClG0 https://www.youtube.com/watch?v=de2aad2y03g **1.1.1.6** https://www.youtube.com/watch?v=twi2fLanvp0 https://www.youtube.com/watch?v=BYHIXrwe5U8 https://www.youtube.com/watch?v=50YUslKfTEo https://www.youtube.com/watch?v=vcn2ruTOwFo https://www.youtube.com/watch?v=KcKOM7Degu0 https://www.youtube.com/watch?v=5xe-6GPR_qQ https://www.youtube.com/watch?v=S7CLLRHe8ik https://www.youtube.com/watch?v=SFRTTUtAjg4 https://www.youtube.com/watch?v=mIStB5X4U8M https://www.youtube.com/watch?v=3h4UK62Qrbo https://www.youtube.com/watch?v=jpMYfW9XziU https://www.youtube.com/watch?v=41eVMYPCWTQ https://www.youtube.com/watch?v=ZKKDTfHcsG0 https://www.youtube.com/watch?v=PDyyvPdi1tI https://www.youtube.com/watch?v=TLTNLcEn7w0 https://www.youtube.com/watch?v=-zUmvpkhvW8

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Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=mbc3_e5lWw0 https://www.youtube.com/watch?v=ROIfbUQrSY4
	1.1.1.7 **Calculate the Lowest Common Multiple (LCM) and Highest Common Factor (HCF) of a set of numbers**	**1.1.1.7** https://www.youtube.com/watch?v=znmPfDfsir8 https://www.youtube.com/watch?v=jFd-6EPfnec https://www.youtube.com/watch?v=qwh3VH5rnGA
	1.1.1.8 **Solve problems involving whole numbers (write answers to a specified degree of accuracy)**	**1.1.1.8** https://www.youtube.com/watch?v=HKjKhuVAVKs https://www.youtube.com/watch?v=q0nFHM22_0E https://youtu.be/1SBwQSOV9wk https://www.youtube.com/watch?v=dAgfnK528RA https://www.youtube.com/watch?v=yhNLO6fSiac https://www.youtube.com/watch?v=KgZ-GbtCLu0
	1.3.1 STATISTICS (1)	**1.3.1 STATISTICS (1)**
	1.3.1.1 **Formulate a problem to be investigated or formulate questions that can be addressed via statistical data**	**1.3.1.1** https://www.youtube.com/watch?v=OjzfQDFf7Uk https://www.youtube.com/watch?v=h8EYEJ32oQ8 https://www.youtube.com/watch?v=SGG1JbD3ojk&t=107s
	1.3.1.2 **Collect discrete data to address the problem**	**1.3.1.2** https://www.youtube.com/watch?v=g30cI4Kbhb4 https://www.youtube.com/watch?v=7bsNWq2A5gI https://www.youtube.com/watch?v=dwFsRZv4oHA

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Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=5rUVYWfZOb8 https://www.youtube.com/watch?v=_yAQb8gWBpU
	1.3.1.3 **Tally ungrouped discrete data into a frequency table**	**1.3.1.3** https://www.youtube.com/watch?v=_xXJSDxRZP4 https://www.youtube.com/watch?v=mukk8Zaettg https://www.youtube.com/watch?v=R6m8OQAQzPk
	1.3.1.4 **Construct pictographs and block graphs, to represent data collected (using appropriate scale factors)** **1.3.1.5** **Interpret pictographs and block graphs** **1.3.1.6** **Draw conclusions from pictographs and block graphs**	**1.3.1.4/1.3.1.5/1.1.1.6** https://www.youtube.com/watch?v=fNpvOwM6K5c https://www.youtube.com/watch?v=qrVvpYt3Vl0&list=PL1C68557896CFABA8 https://www.youtube.com/watch?v=IjcLW7Y7Ndk https://www.youtube.com/watch?v=T0A2c5Y_NNY https://www.youtube.com/watch?v=4sMtOfNa5H8
	1.3.1.7 **Find the mode for data taken from a frequency table**	**1.3.1.7** https://www.youtube.com/watch?v=IxqpbaN3FSY https://www.youtube.com/watch?v=lyRbCwDDnJo&list=PL0o_zxa4K1BVsziIRdfv4Hl4UIqDZhXWV&index=8 Mean, Median and Mode https://www.youtube.com/watch?v=B1HEzNTGeZ4
	1.4.1 SOLIDS AND PLANE SHAPES	**1.4.1 SOLIDS AND PLANE SHAPES**

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Term	**Outcomes**	**Online tools and resources**
	1.4.1.1 **Classify the different solids according to their properties** **1.4.1.2** **Draw the net of a solid** **1.4.1.3** **Create a solid using its net**	**1.4.1.1/1.4.1.2/1.4.1.3/** https://www.youtube.com/watch?v=3-CxG85wwEs https://www.youtube.com/watch?v=e5TNRU_t-fM https://www.youtube.com/watch?v=hlD_j3AtxGs https://www.youtube.com/watch?v=Cn3QiGlklRI https://www.youtube.com/watch?v=Cn3QiGlklRI&list=RDCMUC4a-Gbdw7vOaccHmFo40b9g&index=1
	1.4.1.4 **Classify polygons according to their properties** **1.4.1.5** **Create patterns involving the tessellation of plane shapes** **1.4.1.6** **Solve problems involving solids and plane shapes**	**1.4.1.4/1.4.1.5/1.4.1.6** https://www.youtube.com/watch?v=zI3rUMrRLF8 https://www.youtube.com/watch?v=0OW2bU0So-4 https://www.youtube.com/watch?v=5CeBlu260Rw https://www.youtube.com/watch?v=k6G-MBQQ_co https://www.youtube.com/watch?v=MyPag8h-m5E https://www.youtube.com/watch?v=mLeNaZcy-hE https://www.youtube.com/watch?v=yiREqzDsMP8 https://www.youtube.com/watch?v=IaoZhhx_I9s https://www.youtube.com/watch?v=k5etrWdIY6o https://www.youtube.com/watch?v=KLhf81NZJV0 https://www.youtube.com/watch?v=qz9kIgbGZ3U https://www.youtube.com/watch?v=XjeFvFUWPOk https://www.youtube.com/watch?v=XF-geNjYU68
	1.2.1 SETS (1)	**1.2.1 SETS (1)**
	1.2.1.1 **Classify a set by describing and naming the set**	**1.2.1.1/1.2.1.2** https://www.youtube.com/watch?v=l3-A0O42Lyo https://www.youtube.com/watch?v=fes92vSBTg4

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Term	**Outcomes**	**Online tools and resources**
	1.2.1.2 **Define sets by listing the elements or describing them in words**	https://www.youtube.com/watch?v=DfFBEnwmx80 https://www.youtube.com/watch?v=LumU80IN748
	1.2.1.3 **Apply the knowledge of classification to divide a set into a given number of subsets**	**1.2.1.3** https://www.youtube.com/watch?v=xotLg-oLboY https://www.youtube.com/watch?v=_9Wvu-R04go
	1.2.1.4 **Distinguish among empty, equal, equivalent, finite, and infinite sets**	**1.2.1.4** https://www.youtube.com/watch?v=UClsMpLG_mg https://www.youtube.com/watch?v=N_fZwQjsZvs
	1.2.1.5 **Describe the concepts of universal sets, complement of a set, union of sets, intersecting sets, subsets, and disjoint sets**	**1.2.1.5** https://www.youtube.com/watch?v=BhFgcf0VSYc https://www.youtube.com/watch?v=8innwDI1bv8 https://www.youtube.com/watch?v=YEsBbAGqkZw
	1.2.1.6 **Use Venn diagrams to represent the relationships between two sets**	**1.2.1.6** https://www.youtube.com/watch?v=KoS1y8xridY https://www.youtube.com/watch?v=YEsBbAGqkZw
	1.6.1 INTRODUCING ALGEBRA	**1.6.1 INTRODUCING ALGEBRA**

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Term	**Outcomes**	**Online tools and resources**
	1.6.1.1 **Investigate varying quantities** **1.6.1.2** **Distinguish between constants and variables** **1.6.1.3** **Use symbols to represent unknown quantities (variables)** **1.6.1.4** **Translate word statements into mathematical expressions** **1.6.1.5** **Identify an expression** **1.6.1.6** **Substitute whole numbers for variables in expressions** **1.6.1.7** **Identify like and unlike terms**	**1.6.1.1** https://www.youtube.com/watch?v=5Q0FlxcEEIw **1.6.1.2** https://www.youtube.com/watch?v=go9b2LPXTuA https://www.youtube.com/watch?v=mFqEIC_vjOc **1.6.1.3** https://www.youtube.com/watch?v=NybHckSEQBI&list=PL4mRaHZim4UQPTOTHTe6uKnRoGSo5GuP4&index=1 **1.6.1.4** https://www.youtube.com/watch?v=QEnFIgN8UBw https://www.youtube.com/watch?v=KmuWR_LriQU https://www.youtube.com/watch?v=lq-2gX3NKCM **1.6.1.5** https://www.youtube.com/watch?v=X7LMvlboXW4 https://www.youtube.com/watch?v=0sq2PMQ_Nak **1.6.1.6** https://www.youtube.com/watch?v=GOCZxBXQZro https://www.youtube.com/watch?v=d9BdbdFRZF4 **1.6.1.7** https://www.youtube.com/watch?v=Jw-toLAUqPg https://www.youtube.com/watch?v=Jw-toLAUqPg

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Term	**Outcomes**	**Online tools and resources**
	1.6.1.8 **Simplify algebraic expressions involving the four operations** **1.6.1.9** **Simplify algebraic expressions using the distributive law** **1.5.2 LINEAR MEASURE** **1.5.2.1** **Measure length using appropriate units and using different instruments (e.g. rulers, measuring tape, trundle wheel)** **1.5.2.2** **Convert linear measure from one unit to the other (using the different units of measure - millimetres, centimetres, metres, kilometres)** **1.5.2.3** **Solve problems involving length** **1.5.3 PERIMETER** **1.5.3.1**	**1.6.1.8** https://www.youtube.com/watch?v=8BIqDD0luHc https://youtu.be/4PLJGCwpZr4 **1.6.1.9** https://www.youtube.com/watch?v=v-6MShC82ow&t=31s https://www.youtube.com/watch?v=gw893STHN9w **1.5.2 LINEAR MEASURE** **1.5.2.1/1.5.2.2/1.5.2.3** https://www.youtube.com/watch?v=I3kQJvR7ZIg&list=PLafpPv7yifMCmuKRNLqFbvQrS8Bl-mUxK&index=11 https://www.youtube.com/watch?v=cKbmvLv-FRo&list=PLafpPv7yifMCmuKRNLqFbvQrS8Bl-mUxK&index=10 https://www.youtube.com/watch?v=ZNX-a-5jGeM https://www.youtube.com/watch?v=cKbmvLv-FRo https://www.youtube.com/watch?v=dNcJ4-JVN5M https://www.youtube.com/watch?v=cKbmvLv-FRo&list=PLafpPv7yifMCmuKRNLqFbvQrS8Bl-mUxK&index=9 **1.5.3 PERIMETER** **1.5.3.1/1.5.3.2/1.5.3.3** https://www.youtube.com/watch?v=g4rkjj_PNWg

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Term	**Outcomes**	**Online tools and resources**
	Identify perimeter of plane shapes **1.5.3.2** **Calculate the perimeter of plane shapes** **1.5.3.3** **Solve problems involving perimeter (write answers to a specified degree of accuracy)** **1.5.4 AREA** **1.5.4.1** **Explain the concept of area** **1.5.4.2** **Identify the unit for area** **1.5.4.3** **Measure surface area** **1.5.4.4** **Calculate the area of triangles, squares and rectangles**	https://www.mathsisfun.com/definitions/perimeter.html https://www.youtube.com/watch?v=xCdxURXMdFY https://www.youtube.com/watch?v=LoaBd-sPzkU https://www.youtube.com/watch?v=LoaBd-sPzkU&list=RDCMUC4a-Gbdw7vOaccHmFo40b9g&start_radio=1 https://www.youtube.com/watch?v=_e7j6rE7_Pg https://www.youtube.com/watch?v=kqqmJiJez6o https://www.youtube.com/watch?v=KgR25y5ag-w https://www.youtube.com/watch?v=WlGuG_VZl5c https://www.youtube.com/watch?v=vWXMDIazHjA **1.5.4 AREA** **1.5.4.1/1.5.4.2/1.5.4.3/1.5.4.4** https://www.youtube.com/watch?v=YA7ZrKcbteA https://www.youtube.com/watch?v=oL9iF9Se6lc https://www.youtube.com/watch?v=MamrTJ7V_Vg
2	**1.1.2 Fractions** **1.1.2.1** **Represent fractions using area, linear and set models**	**1.1.2 Fractions** **1.1.2.1** https://www.youtube.com/watch?v=ucmyg_1zJfA https://www.youtube.com/watch?v=zQqfPwWuv7w https://youtu.be/MkFs11eEu9o

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Term	**Outcomes**	**Online tools and resources**
	1.1.2.2 **Name fractions using words and symbols**	**1.1.2.2** https://youtu.be/pNUNi19Lqhc https://youtu.be/yT1WuyxTCmo
	1.1.2.3 **Classify fractions as proper fractions, improper fractions and mixed numbers**	**1.1.2.3** https://youtu.be/RNt8CKGnPko https://www.youtube.com/watch?v=N3__8MmaiLE
	1.1.2.4 **Convert from improper fraction to mixed number and vice versa**	**1.1.2.4** https://www.youtube.com/watch?v=KEmCZGbd4R8 https://www.youtube.com/watch?v=03HE-sUu6RU https://www.youtube.com/watch?v=EY4jtszKmGE
	1.1.2.5 **Create equivalent fractions**	**1.1.2.5** https://www.youtube.com/watch?v=qcHHhd6HizI https://www.youtube.com/watch?v=TLGw53eDTe0 https://www.youtube.com/watch?v=4xFwkDSMVw4 https://www.youtube.com/watch?v=AfIWgwDqNeQ https://www.youtube.com/watch?v=ItYAlt33IoY&list=PLoPH9JUqy7ESHmrz4YGtlyPAnvdNfu7Gf&index=4 https://www.youtube.com/watch?v=GMGxG8inf6E
	1.1.2.6 **Compare and order fractions in ascending and descending order using equivalent relationships**	**1.1.2.6** https://www.youtube.com/watch?v=KNdUJQ_qd4U https://www.youtube.com/watch?v=8y2ZMTU2yCc https://www.youtube.com/watch?v=Ysv2pRWMTlo

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Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=7cBaH6V0Doo https://www.youtube.com/watch?v=nH7s9SIjwus https://www.youtube.com/watch?v=-8s_Bm2cXP4&list=PLoPH9JUqy7ESHmrz4YGtlyPAnvdNfu7Gf&index=6 https://www.youtube.com/watch?v=UCZCWvPr86c&list=PLoPH9JUqy7ESHmrz4YGtlyPAnvdNfu7Gf&index=7 https://www.youtube.com/watch?v=qyW2mWvvtZ8
1.1.2.7 **State the relationship between rational numbers and whole numbers**		**1.1.2.7** https://www.youtube.com/watch?v=SQ4cB9yXkHM https://youtu.be/RPVu3pYDUFI https://www.youtube.com/watch?v=KLW5OfV2MzQ
1.1.2.8 **Solve problems involving fractions**		**1.1.2.8** https://www.youtube.com/watch?v=HCcIM7N8QIU&t=42s https://www.youtube.com/watch?v=mtM0ODX6s3k https://www.youtube.com/watch?v=hwGo6wAreVc https://www.youtube.com/watch?v=ZRHvs5S_Z0A https://youtu.be/BOHmREWwu-Q https://www.youtube.com/watch?v=wPuiV5rFqFQ https://www.youtube.com/watch?v=dNEgQUcnbh8 https://www.youtube.com/watch?v=F0EOkIFAyN4
1.4.3 Angles		**1.4.3 Angles**
1.4.3.1 **Describe an angle as a measure of turn**		**1.4.3.1** https://www.youtube.com/watch?v=xzAGoErwAxg https://www.youtube.com/watch?v=zQLm7eedYIY

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Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=5vwvfAjFLdw&t=44s https://www.youtube.com/watch?v=2JSk0DC5q4g
	1.4.3.2 **Compare and order angles using direct comparison (no unit)**	**1.4.3.2** https://www.youtube.com/watch?v=mKSLU31K8HQ https://www.youtube.com/watch?v=LSsv5lEvjuk
	1.4.3.3 **Express whole turns, half turns and quarter turns in degrees**	**1.4.3.3** https://www.youtube.com/watch?v=lxkqJc3P40E https://my.homecampus.com.sg/Learn/Primary4/Geometry/Angles-Turns-and-Directions#concept-1
	1.4.3.4 **Classify angles according to type (acute, right, obtuse, straight and reflex)**	**1.4.3.4** https://www.youtube.com/watch?v=L-jh5fVhKuQ https://www.youtube.com/watch?v=abxR4dpNrEg
	1.4.3.5 **Measure angles in the range 0° to 360° using protractors** **1.4.3.6** **Draw angles of various sizes**	**1.4.3.5/1.4.3.6** https://www.youtube.com/watch?v=9RTM418qfdI https://www.youtube.com/watch?v=cehqgTk-r24 https://www.youtube.com/watch?v=xNaq4kBiE5I https://www.youtube.com/watch?v=ABgR-QaMrSU https://www.youtube.com/watch?v=bGm3wtmUz3w
	1.4.3.7 **Solve problems involving angles**	**1.4.3.7** https://www.youtube.com/watch?v=Qpq_XEeBBZw https://www.youtube.com/watch?v=SltwGpH_6E8 https://www.youtube.com/watch?v=f7qxRMHttRk https://www.youtube.com/watch?v=0-spl_xqu5w

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Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=74wFkZJZ3Sg https://www.youtube.com/watch?v=i7i8sECCX5o
	1.4.4 Triangles	**1.4.4 Triangles**
	1.4.4.1 **Deduce that the sum of the interior angles in a triangle is equal to 180º**	**1.4.4.1** https://www.youtube.com/watch?v=_PnPM8VVHBA https://www.youtube.com/watch?v=RUBnW1wmZ04
	1.4.4.2 **Deduce the relationship between the size of the angle and the length of the side opposite the angle**	**1.4.4.2** https://www.youtube.com/watch?v=yW5oz6fBwRI https://www.youtube.com/watch?v=0OYJKIQ8zw0
	1.4.4.3 **Classify triangles based on their properties as acute angled, right angled, obtuse angled, isosceles, equilateral, and scalene**	**1.4.4.3** https://www.youtube.com/watch?v=1k0G-Y41jRA https://www.youtube.com/watch?v=AuJQZ8Pusdg https://www.youtube.com/watch?v=mLeNaZcy-hE&t=46s https://youtu.be/MyPag8h-m5E https://youtu.be/zneP1Q7IjgQ https://youtu.be/H62faKsyemc https://youtu.be/gMOWydu3CyA
	1.4.4.4 **Draw triangles given** **(a) the lengths of two sides and included angle**	**1.4.4.4** https://www.youtube.com/watch?v=Lb1JsS5q9pc https://www.youtube.com/watch?v=NzcTKGxwCCE&t=184s https://www.youtube.com/watch?v=K1yGEyPv6vs

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Term	**Outcomes**	**Online tools and resources**
	(b) given the length of one side and two angles	https://www.youtube.com/watch?v=Lb1JsS5q9pc&t=63s
	1.4.4.5 **Solve problems involving triangles**	**1.4.4.5** https://www.youtube.com/watch?v=bp5UxYKPie8 https://www.youtube.com/watch?v=BM1B5v7tjho https://www.youtube.com/watch?v=IWMSQu2mmW4 https://www.youtube.com/watch?v=OdFcU37KqZY
	1.4.5 Quadrilaterals	**1.4.5 Quadrilaterals**
	1.4.5.1 **Deduce that the sum of the interior angles in a quadrilateral is equal to 360º**	**1.4.5.1** https://www.youtube.com/watch?v=1V90Z_Zites https://www.youtube.com/watch?v=F1lse-kTMxs https://www.youtube.com/watch?v=7ab-MItpDHc https://youtu.be/O94fwp1E6Lg
	1.4.5.2 **Classify quadrilaterals according to their attributes**	**1.4.5.2** https://youtu.be/tbkBFD8wgJs https://www.youtube.com/watch?v=CkbClyVxRIU https://www.youtube.com/watch?v=0OW2bU0So-4 https://www.youtube.com/watch?v=XjeFvFUWPOk&t=121s https://www.youtube.com/watch?v=EZkgIf6fY1I
	1.4.5.3 **Draw quadrilaterals given measurements of sides and angles given lengths of sides and sizes of angles**	**1.4.5.3** https://www.youtube.com/watch?v=Pz64J1hJV8E https://www.youtube.com/watch?v=xiocuX0QSP0 https://www.youtube.com/watch?v=ln00kzO7aLM https://www.youtube.com/watch?v=B5EB2jwnopE

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Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=y5l6DAm_Njc https://www.youtube.com/watch?v=BQdTGjXQX_U https://www.youtube.com/watch?v=knVj1O0L2TM
	1.4.5.4 **Solve problems involving quadrilaterals**	**1.4.5.4** https://www.youtube.com/watch?v=knVj1O0L2TM https://www.youtube.com/watch?v=nW0BDJwhqJc https://www.youtube.com/watch?v=fjzXLMD7yy0 https://www.youtube.com/watch?v=6ApegKO75d0
	1.3.2 Statistics (2)	**1.3.2 Statistics (2)**
	1.3.2.1 **Construct bar graphs using appropriate scale factors**	**1.3.2.1** https://youtu.be/J2DKgCf353k https://www.youtube.com/watch?v=2a5OuENTZUg&t=68s https://www.youtube.com/watch?v=YIb-JyLLxwQ https://www.youtube.com/watch?v=ReW4MPqXTvA
	1.3.2.2 **Interpret data from bar graphs**	**1.3.2.2** https://www.youtube.com/watch?v=oQ7NEGBeIfM https://www.youtube.com/watch?v=vL5JPwM2bq4
	1.3.2.3 **Solve problems involving mode, median and mean**	**1.3.2.3** https://www.youtube.com/watch?v=oatwXlZBPw0 https://www.youtube.com/watch?v=B1HEzNTGeZ4&t=191s https://www.youtube.com/watch?v=k3aKKasOmIw&t=24s https://www.youtube.com/watch?v=0ifDuw-Qgvo https://www.youtube.com/watch?v=6DYtC7lrVuY https://www.youtube.com/watch?v=40x0NjdmbTg

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=BYMA9QEnvVM https://www.youtube.com/watch?v=HThpvMP50m8 https://www.youtube.com/watch?v=II7VlGBWDpY
	1.1.3 Directed Numbers	**1.1.3 Directed Numbers**
	1.1.3.1 **Demonstrate an understanding of the concept of directed numbers** **1.1.3.2** **Represent positive and negative numbers on the number line**	**1.1.3.1/1.1.3.2** https://www.youtube.com/watch?v=yGBAHPjPwe0 https://www.youtube.com/watch?v=6U1kCOuNpR4 https://www.youtube.com/watch?v=3i2i9nmkG24 https://www.youtube.com/watch?v=o3kIi8g3mwI https://www.youtube.com/watch?v=_sh9Wqjkhfs
	1.1.3.3 **Perform the four basic operations on directed numbers**	**1.1.3.3** https://www.youtube.com/watch?v=U2zLoTG6VFY https://youtu.be/mlNHIzV4x8Y https://www.youtube.com/watch?v=_y6y-k4Yv7Q https://www.youtube.com/watch?v=jwMBfOUvPmc https://www.youtube.com/watch?v=9RAfwkiIgK8 https://www.youtube.com/watch?v=NUqAsCgdArM https://www.youtube.com/watch?v=FsKNeU7EFl0 https://www.youtube.com/watch?v=4dEIL4F3jA4 https://www.youtube.com/watch?v=eYX4fvzJro4 https://www.youtube.com/watch?v=efQ1XPqw0s0 https://www.youtube.com/watch?v=icwXJ-R1rk8 https://www.youtube.com/watch?v=AeZqsO8N4mY

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
	1.5.5 Mass and Weight **1.5.5.1** **Measure the mass and weight of objects in kilograms and grams** **1.5.5.2** **Convert units of measure (grams to kilograms and vice versa)** **1.5.5.3** **Solve problems involving mass and weight** **1.5.6 Time** **1.5.6.1** **Measure the duration of events using appropriate units** **1.5.6.2**	**1.5.5 Mass and Weight** **1.5.5.1** https://www.youtube.com/watch?v=GNcA-bD7F68 https://www.youtube.com/watch?v=z-iSpbO3eU0 https://www.youtube.com/watch?v=xK6j5BnVIdo http://www.bbc.co.uk/schools/mathsfile/shockwave/games/animal.html **1.5.5.2** https://www.youtube.com/watch?v=ptrKThVQwh4 https://www.youtube.com/watch?v=-PiCElxDp68&t=25s https://www.youtube.com/watch?v=u6SX-BjU2Wg https://www.youtube.com/watch?v=TY4Yoyur3X4 **1.5.5.3** https://www.youtube.com/watch?v=zsmPBdVnEUw https://www.youtube.com/watch?v=yjBLMfbb-Lo https://www.youtube.com/watch?v=lzy3b__0yec https://www.youtube.com/watch?v=4HnyNMhkBs0 **5.6 Time** **1.5.6.1** https://www.youtube.com/watch?v=UhMM68fq9FA https://www.youtube.com/watch?v=7PkpCDrDVHs http://www.mathsisfun.com/time-clocks-analog-digital.html **1.5.6.2** https://www.youtube.com/watch?v=ImVe0ed4fVM

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
	Convert measures of time from one form to the other (using the different units of measure - seconds, minutes, hours, days, weeks, years) **1.5.6.3** **Solve problems involving time**	https://www.youtube.com/watch?v=4Vo_W2rp87c https://www.youtube.com/watch?v=zjz_rcia79Yhttps://www.youtube.com/watch?v=zjz_rcia79Y https://www.youtube.com/watch?v=gGo6t6Z0rCg **1.5.6.3** http://www.maths-games.org/time-games.html http://www.teachingideas.co.uk/maths/convertingtime.htm http://www.teachingideas.co.uk/maths/files/digitalanalogueconversion.pdf
3	**1.1.4 Decimals** **1.1.4.1** **Represent decimals (up to thousandths) concretely on a place value mat, pictorially and symbolically** **1.1.4.2** **Match number names to decimal fractions and quantities** **1.1.4.3** **State the place value and value of digits in decimal fractions** **1.1.4.4** **Compare and order decimal fractions in ascending and descending order**	**1.1.4 Decimals** **1.1.4.1/1.1.4.2/1.1.4.3** https://www.youtube.com/watch?v=AuD2TX-90Cc https://www.youtube.com/watch?v=T5Qf0qSSJFI Decimal Place Value https://www.youtube.com/watch?v=KG6ILNOiMgM https://www.youtube.com/watch?v=x-Dqe5U1TXA https://www.youtube.com/watch?v=BItpeFXC4vA **1.1.4.4** https://www.youtube.com/watch?v=lR_kUUPL8YY https://www.youtube.com/watch?v=2kj7n0KvVzw https://www.youtube.com/watch?v=trTS_KfkqtI

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=YWzVA5h94T0
	1.1.4.5 **Apply the 'rounding rule' to round decimal fractions to the nearest whole number, tenth or hundredth position of numbers**	**1.1.4.5** https://www.youtube.com/watch?v=fd-E18EqSVk https://www.youtube.com/watch?v=LGRoPAPMZhA https://www.youtube.com/watch?v=IcmAxkEImtI https://www.youtube.com/watch?v=LGRoPAPMZhA&t=57s
	1.1.4.6 **Express a decimal fraction in rational form $\frac{a}{b}$, (where *a* and *b* are whole numbers and $b \neq 0$)**	**1.1.4.6** https://youtu.be/w9Pj48Pn2XU https://www.youtube.com/watch?v=21M_I_3XnkM
	1.1.4.7 **Convert fractions to decimals**	**1.1.4.7** https://www.youtube.com/watch?v=do_IbHId2Os https://www.youtube.com/watch?v=Mst8iZjIpFE https://www.youtube.com/watch?v=do_IbHId2Os&t=57s https://www.youtube.com/watch?v=Mst8iZjIpFE&t=4s https://www.youtube.com/watch?v=Tceuvg9vjyc&t=190s https://www.youtube.com/watch?v=_jcW-ZgpRbM&t=263s
	1.1.4.8 **Identify (a) terminating, (b) non-terminating and (c) recurring decimals**	**1.1.4.8** https://www.youtube.com/watch?v=rVhU8Vyhz7c https://www.youtube.com/watch?v=oDSx2pihgJ0
	1.1.4.9	**1.1.4.9** https://www.youtube.com/watch?v=tsOibhsgYoQ

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
	Solve problems involving decimals (add, subtract, multiply, divide) **1.1.5 Percentages** **1.1.5.1** **Convert among fractions, decimals and percent** **1.1.5.2** **Compare and order fractions, decimals and percent**	https://www.youtube.com/watch?v=44RVduSjrzY https://www.youtube.com/watch?v=Sah_q6YkF5o **1.1.5 Percentages** **1.1.5.1** https://www.youtube.com/watch?v=Lvr2YsxG10o https://www.mathsisfun.com/percentage.html https://www.youtube.com/watch?v=FaDtge_vkbg https://www.youtube.com/watch?v=lCNZE8E48TA https://www.youtube.com/watch?v=-Xt4UDk7Kzw https://www.youtube.com/watch?v=DhcM-oe1ZyQ https://www.youtube.com/watch?v=PZDg0_djUtE https://www.youtube.com/watch?v=rR95Cbcjzus **1.1.5.2** https://www.youtube.com/watch?v=CA9XLJpQp3c https://www.youtube.com/watch?v=AtBUQH8Tkqc https://www.youtube.com/watch?v=17IgK9b6P2M https://www.youtube.com/watch?v=KNdUJQ_qd4U https://www.youtube.com/watch?v=qDc_-GTipBk https://www.youtube.com/watch?v=3xwDryouw6o https://www.youtube.com/watch?v=Mst8iZjIpFE https://www.youtube.com/watch?v=do_IbHId2Os&t=57s https://www.youtube.com/watch?v=Mst8iZjIpFE&t=4s https://www.youtube.com/watch?v=Tceuvg9vjyc&t=190s https://www.youtube.com/watch?v=_jcW-ZgpRbM&t=263s

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
		https://www.youtube.com/watch?v=kmVfZ9o-2gg&t=31s https://www.youtube.com/watch?v=rR95Cbcjzus&t=34s https://www.youtube.com/watch?v=JeVSmq1Nrpw https://www.youtube.com/watch?v=kmVfZ9o-2gg https://www.youtube.com/watch?v=Uf-Rl1e2I4Q&t=155s https://www.youtube.com/watch?v=HxEQxS0QSwg&t=12s
	1.1.5.3 **Solve problems involving percent**	**1.1.5.3** https://www.youtube.com/watch?v=rR95Cbcjzus https://www.youtube.com/watch?v=Uf-Rl1e2I4Q https://www.youtube.com/watch?v=HxEQxS0QSwg https://www.youtube.com/watch?v=Uf-Rl1e2I4Q&t=136s https://www.youtube.com/watch?v=KewfKIXRRtI
	1.4.6 Transformations	**1.4.6 Transformations**
	1.4.6.1 **Describe the properties of a translation**	**1.4.6.1** https://youtu.be/EXjgvxP64_4 https://www.youtube.com/watch?v=j87gj_KH9pA https://www.youtube.com/watch?v=oxSzkIftog8 https://youtu.be/KbNFTUgNJw4 https://www.youtube.com/watch?v=216PtoDvu8o&list=PLiKvlzaGm8oQL708DcZBdfa5lFKyeV8zP&index=6
	1.4.6.2 **Identify lines of symmetry in shapes and letters**	**1.4.6.2** https://youtu.be/_Xs56r9o3Tw https://www.youtube.com/watch?v=MtqtIiJsfiE https://www.youtube.com/watch?v=W4oPWaNxp14 https://www.youtube.com/watch?v=0mWq45973ok

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
	1.4.6.3 **Describe the reflection of an object in a line**	**1.4.6.3** https://youtu.be/qps0eSvDl34 https://youtu.be/j1X_UIOvEwA https://www.youtube.com/watch?v=0Od42lcPe20&list=PLiKvlzaGm8oQL708DcZBdfa5lFKyeV8zP&index=7
	1.4.6.4 **Create** **(a) symmetrical shapes and** **(b) patterns using reflection**	**1.4.6.4** https://youtu.be/MW0kDNHS6lo https://www.youtube.com/watch?v=-FyyH_y0CV0
	1.4.6.5 **Solve problems involving translation and reflection**	**1.4.6.5** https://youtu.be/vQ2-o2Oj3WQ https://www.onlinemath4all.com/reflection-transformation.html https://www.khanacademy.org/math/geometry/hs-geo-transformations/hs-geo-translations/v/determing-a-translation-between-points
	1.6.6 Algebraic Equations	**1.6.6 Algebraic Equations**
	1.6.6.1 **Translate word problems into algebraic equations**	**1.6.6.1** https://www.youtube.com/watch?v=QEnFIgN8UBw https://www.youtube.com/watch?v=6-Lanc2wOpg https://youtu.be/VjPX-XlN7Ok https://youtu.be/6-Lanc2wOpg https://youtu.be/DfbQjiSooOo
	1.6.6.2	**1.6.6.2** https://www.youtube.com/watch?v=DfbQjiSooOo

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
	Solve linear equations with one variable	https://www.youtube.com/watch?v=lDOYdBgtnjY https://www.youtube.com/watch?v=8MNNWrIO5to https://www.youtube.com/watch?v=7DPWeBszNSM https://youtu.be/Q-0XwhSs_4M
	1.1.6 Consumer Arithmetic	**1.1.6 Consumer Arithmetic**
	1.1.6.1 **State the combinations of $5, $10, $20, $50 and $100 bills equivalent to $1000**	**1.1.6.1** https://youtu.be/6Oo8xwi8TIQ https://youtu.be/dwuUHMuoxSU https://youtu.be/UP0h9x-czrA https://youtu.be/iJ5SUiOyzLs
	1.1.6.2 **Determine the best buy from a choice of similar items with respect to price**	**1.1.6.2** https://youtu.be/03JX5c2AY8M https://youtu.be/TSaivwREeAk https://youtu.be/G2ATzNBGDQ8 https://youtu.be/liW_ALj4Qj8 https://youtu.be/530WaPcCLqo https://youtu.be/D7IAHD62cC4
	1.1.6.3 **Solve problems involving percentage (calculate profit and loss, percentage profit and loss, sales tax and discount)**	**1.1.6.3** https://www.youtube.com/watch?v=4zvjGgaE3KI https://www.youtube.com/watch?v=tHF2bXCQ3y4 https://www.youtube.com/watch?v=zhlXOAM_f0o https://youtu.be/4zvjGgaE3KI
	1.1.6.4	**1.1.6.4** https://youtu.be/8edPzh71RIQ

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online tools and resources**
	Solve problems involving simple interest	https://youtu.be/GHHesANT6OM https://www.youtube.com/watch?v=vIPhIi9KzAQ https://youtu.be/vIPhIi9KzAQ https://youtu.be/djBJmRH9lDo

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
Term 1	**2.1.1.2** **Order integers**	**2.1.1.2** https://www.youtube.com/watch?v=-ritO76VqrA https://www.youtube.com/watch?v=BgrRG3sMHRE Use spreadsheet to order integers Compare and order integers using a number line Use virtual manipulatives to order integers Develop meaning for integers to represent and compare quantities using STREAM approach
	2.1.1.3 **Perform the four basic operations on integers**	**2.1.1.3** https://www.youtube.com/results?search_query=Solve+simple+problems+involving+integers https://www.youtube.com/results?search_query=Perform+the+four+basic+operations+on+integers Use pattern to develop operations Represent addition, subtraction, multiplication and division concretely and symbolically Use spreadsheet to add, subtract, multiply and divide integers
	2.1.1.5 **Solve simple problems involving integers**	**2.1.1.5** https://www.youtube.com/results?search_query=Solve+simple+problems+involving+integers Solve simple computational problems from real world situations Develop an evidence-based opinion or argument
	2.1.1.1	**2.1.1.1** https://www.youtube.com/watch?v=6ptpoI4E-vA Explore integers in the real world context

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	Differentiate between natural numbers, whole numbers and integers **2.1.2.1** **Apply the commutative, associative and distributive laws** **2.1.2.2** **Explain the concept of** (a) **closure** (b) **the identity element** (c) **and inverse operator** **2.1.2.3** **Express a value** (a) **to a given number of significant figures** (b) **using standard form** (c) **in scientific notation** **2.1.2.5** **Perform the four operations on the numbers expressed in index form, having positive indices only**	Compare and contrast activities using a graphic organizer Use computer drawing tools to create concept maps Create number lines, number trees and Venn diagrams to display numbers **2.1.2.1** https://www.youtube.com/watch?v=oXlU2qKT72A Use situations where the laws of arithmetic apply **2.1.2.2** https://www.youtube.com/watch?v=TiO4DchCxZ0 Apply appropriate domain specific vocabulary to communicate concepts Investigate and discuss the properties of the identity element, inverse operator and closure using closed and open number systems Identify situations where the laws and properties of numbers may be used **2.1.2.3** https://www.youtube.com/watch?v=eCJ76hz7jPM https://www.youtube.com/watch?v=VsbpBrOmr18 https://www.youtube.com/watch?v=ZtB0vJMGve4 Provide examples to help transfer of learning Use spreadsheet or calculator for practice and reinforcement Develop automaticity with drill and practice **2.1.2.5** https://www.youtube.com/watch?v=XHds0Uf1zHA Guide practice using modelling and coaching

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	2.1.3.1 **State the place value of a digit in relation to its number base**	**2.1.3.1** **h**ttps://www.youtube.com/watch?v=JSHQZekQnLg https://www.youtube.com/watch?v=COGReJhFJY8 Activate prior knowledge of the denary system Introduce the concept of number bases using time Provide examples to help transfer learning Oral questioning to determine understanding Explore different number base systems re: digits and place value Develop a glossary of terms for number bases: base, binary, denary, digit, index
	2.1.3.2 **Convert a numeral given in any base to a base 10 numeral**	**2.1.3.2** https://www.youtube.com/watch?v=QCsjf1suBH4 https://www.youtube.com/watch?v=VUg6O0tlFcA https://www.youtube.com/watch?v=U_1Wbw5Jokc Practice following an algorithm
	2.1.3.4 **Write the value of numerals in expanded notation for any number base system**	**2.1.3.4** https://www.youtube.com/watch?v=iK0y39rjBgQ&t=6s Engage in critical reading and writing of technical information
	2.1.3.6 **Convert numbers to a single base in order to perform operations**	**2.1.3.6** https://www.youtube.com/watch?v=h_eudXb_VnE https://www.youtube.com/watch?v=nm6wmLD5F9s Engage in critical thinking to derive an efficient solution Students collaborate to devise a strategy

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	2.6.1.2 **Translate between word statements and mathematical statements involving two basic operations**	**2.6.1.2** https://www.youtube.com/watch?v=KmuWR_LriQU https://www.youtube.com/watch?v=9ETeA_Rlxfo Organize and consolidate Mathematical thinking through communication Use the language of Mathematics to express Mathematical ideas precisely
	2.6.1.4 **Substitute integers for unknown quantities in mathematical statements**	**2.6.1.4** https://www.youtube.com/watch?v=DOKiZfX9ePk https://www.youtube.com/watch?v=8KcKztNNU2c https://www.youtube.com/watch?v=DOKiZfX9ePk Present examples to transfer learning Use concrete, pictorial and verbal representations to develop an understanding on invented and conventional symbolic notations
	2.6.2.3 **Identify like and unlike terms**	**2.6.2.3** https://www.youtube.com/watch?v=GrUZxsNmrFs https://www.youtube.com/watch?v=aKLjO8My-qY Present examples to transfer learning Compare and contrast activities using: manipulative, pictograph, symbols Use the language of Mathematics to express Mathematical ideas precisely
	2.6.2.4 **Differentiate between the coefficient and operational sign**	**2.6.2.4** https://www.youtube.com/watch?v=-GcYuysACc0 https://www.youtube.com/watch?v=-Z6ANpa10lQ https://www.youtube.com/watch?v=5jl4m3_U52w Present models for students to analyse and evaluate Compare and contrast activities Small group (break out rooms) discussion to verify concepts using supporting information from alternative sources for corroboration

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Apply differentiation skills to perform computations in graded exercises
	2.6.2.5 **Perform operations on terms represented concretely, pictorially and symbolically**	**2.6.2.5** Collaborate in groups for scaffolding and sharing of ideas Guide practice to represent knowledge using a network of interrelated Mathematical ideas Perform activities to model operations using algebra tiles, pictographs and symbols
	2.6.2.6 **Simplify algebraic equations**	**2.6.2.6** https://www.youtube.com/watch?v=honqw6r8uQY https://www.youtube.com/watch?v=honqw6r8uQY https://www.youtube.com/watch?v=0Xs7XwjOuUs Present examples to transfer learning Develop and analyse algorithms to perform simple computations using: The four basic operations The order of operations Commutativity, associativity, and distributivity
	2.6.3.1 **Differentiate between expressions and equations**	**2.6.3.1** https://www.youtube.com/watch?v=ImHNMFhxf8g https://www.youtube.com/watch?v=QvxWrYtzrtM Use questioning strategies that require critical analysis of concepts Compare and contrast activities to differentiate structures
	2.6.3.2 **Solve linear equations of increasing level of difficulty with variables on both sides**	**2.6.3.2** https://www.youtube.com/watch?v=tHm3X_Ta_iE https://www.youtube.com/watch?v=f15zA0PhSek https://www.youtube.com/watch?v=fDMxOiS5g7k

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Use flow charts to explain the processes used to solve the equation
	2.6.3.3 **Solve linear equations involving the use of the distributive law using a variety of representations**	**2.6.3.3.** https://www.youtube.com/watch?v=YZBStgZGyDY https://www.youtube.com/watch?v=zjCvp9f1Q1o Explore problems in a real world context to include fractions with denominators having natural numbers but no variable
	2.6.4.4 **Identify the set of numbers to which the solution of an inequality belongs**	**2.6.4.4** https://www.youtube.com/watch?v=tm49BYGw_Sg https://www.youtube.com/watch?v=nif2PKA9bXA Review the subsets of the real number system (excluding irrational numbers) Discuss how solutions to inequalities incorporate a range of values Integrate concepts: Use the number line to represent the range for a solution
	2.6.4.6 **Represent linear inequalities on the number line**	**2.6.4.6** https://www.youtube.com/watch?v=g-wfDxwj3t4 https://www.youtube.com/watch?v=nif2PKA9bXA&t=19s https://www.youtube.com/watch?v=jrWmqEJjhLY Independent practice to develop proficiency
	2.6.4.7 **Represent solutions to linear inequalities on the number line**	**2.6.4.7** https://www.youtube.com/watch?v=g-wfDxwj3t4 https://www.youtube.com/watch?v=nNT4Q--Zkho https://www.youtube.com/watch?v=3UUDyPOyKyc Model the process before they begin to work independently Review the concept of integers and model the placement on the large scale number line Use the balance method to solve simple inequalities

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Understand the meaning of equivalent forms of an inequality Integrate and apply strategies used in 2.6.4.6
	2.6.4.8 **Write solutions to inequalities using set builder notation**	**2.6.4.8** https://www.youtube.com/watch?v=VgDe_D8ojxw&list=PL7AF1C14AF1B05894&index=7 Present models for students to analyse and evaluate Use questioning strategies that require critical analysis of concepts Discuss coding and syntax
	2.2.1.1 **Interpret information relating to subsets, disjoint and intersecting sets**	**2.2.1.1** https://www.youtube.com/watch?v=fNHLKhzEmVg https://www.youtube.com/watch?v=fNHLKhzEmVg https://www.youtube.com/watch?v=FzANqMn3Czc Investigate and discuss the attributes of a subset, disjoint set and the intersection of sets Use manipulative to demonstrate conceptual understanding of key concepts
	2.2.1.3 **Represent information for sets on the appropriate Venn Diagram**	**2.2.1.3** https://www.youtube.com/watch?v=uR70knMr2Hg https://www.youtube.com/watch?v=b6t0994ZZDA Investigate the attributes of a Venn diagram which characterize its structure Use a checklist to accurately complete a Venn diagram Provide real world situations for students to complete Venn diagrams
	2.2.1.4 **Count the elements in the union of two sets, intersecting and disjoint**	**2.2.1.4** https://www.youtube.com/watch?v=3UmtTQNn3sY https://www.youtube.com/watch?v=xZELQc11ACY Practice using real world situation for union and intersection of sets/ subsets

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Discuss double counting in relation to the universal set, a set and any subset of the Venn diagram Derive the rule for counting the elements in the union of two sets
	2.2.2.2 **Explain the concept of an arrow diagram**	**2.2.2.2** https://www.youtube.com/watch?v=iXEaAwLkpF4 https://www.youtube.com/watch?v=Icy1NLJG1-w Use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representation Discuss rooted misconceptions, coding issues, unfamiliar terms/ phrases
	2.2.2.3 **Use arrow diagrams to illustrate relationships between sets**	**2.2.2.3** https://www.youtube.com/watch?v=MT6KLalVVkc https://www.youtube.com/watch?v=y_jECF0CAt0 Discuss and state relationships that exist in real world situations which represent groups as sets Use arrow diagrams to show relationships that exist in everyday situation involving sets of people, places, and objects
	2.2.2.6 **Explain the concept of a relation and a function**	**2.2.2.6** https://www.youtube.com/watch?v=RlOe5sgtRn0 https://www.youtube.com/watch?v=Uz0MtFlLD-k https://www.youtube.com/watch?v=OxZ0JL4Bjzk Provide examples of arrow diagrams to explore/ investigate attributes of different types of relations Small group discussion to classify relations according to their attributes
	2.2.2.7	**2.2.2.7** https://www.youtube.com/watch?v=V2C-wU5-7NY

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	Differentiate among a relation, a mapping and a function	https://www.youtube.com/watch?v=sTya32qvsUA Compare and contrast activities using a graphic organizer to distinguish between relations, mapping and functions
	2.2.3.1 **Explain the concept of an ordered pair**	**2.2.3.1** https://www.youtube.com/watch?v=uNYuIjanyRA Introduce the concept embedded in a context Use concrete representation to introduce the concept then reinforce with verbal, pictorial and symbolic representation
	2.2.3.5 **Verify whether or not an ordered pair satisfies a given relation**	**2.2.3.5** https://www.youtube.com/watch?v=UWKWjfZGSgQ Integrate topics and concepts using substitution in Mathematical statements
	2.2.3.6 **Write ordered pairs to satisfy a given relation**	**2.2.3.6** https://www.youtube.com/watch?v=6MfdfNtDCbs **h**ttps://www.youtube.com/watch?v=92-0ZcAVO9g Use technology tools as an instructional support to explain, model, scaffold and guide practice
	2.2.3.7 **Represent relations on the Cartesian plane, given as a set of ordered pairs**	**2.2.3.7** https://www.youtube.com/watch?v=ntzgiu7Ta0s https://www.youtube.com/watch?v=C1mxTdxHRPY https://www.youtube.com/watch?v=bkFb1GZjBYA&t=3Guide practice using modelling and coaching Engage students in activities to relate what they know from past experiences to the current learning, so that they can associate what they learn with the larger concept

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Use technology tools as a virtual manipulative for reinforcement
	2.4.1.4 **locate points on a Cartesian plane using a system of coordinates**	**2.4.1.4** https://www.youtube.com/watch?v=d-m2pA8rJZM Investigate reference system for locating points on a grid/ atlas Guide discussion on reference systems and their universal convention(s) Discuss how an ordered pair can be interpreted in a Cartesian system Use google map to print a map of the school on a grid and allow students to locate rooms given specific coordinates
	2.4.1.6 **Plot points on a Cartesian plane**	**2.4.1.6** https://www.youtube.com/watch?v=pl9nSVzRWvA https://www.youtube.com/watch?v=s7NKLWXkEEE https://www.youtube.com/watch?v=-N6JdEAn8qM Model the process before students begin to work independently Review the concept of positive and negative numbers (integers) and model the placement of integers on the large scale number line Reinforce associated terminology when discussing position relative to the x and y axes e.g. • Right/ "Positive" • Left/ "Negative" • Up/ "Positive" • Down/ "Negative" Plot points to form/ complete familiar shapes or symmetrical designs so that students can easily self monitor their own progress.
Term 2	**2.2.4.1** **interpret linear relations as graphs on the Cartesian plane**	**2.2.4.1** https://www.youtube.com/watch?v=9Uc62CuQjc4 https://www.youtube.com/watch?v=MXV65i9g1Xg

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Term	**Outcomes**	**Online Tools and Resources**
	2.2.4.2 **Draw graphs on the Cartesian plane**	**2.2.4.2** Use technology tools to investigate models
	2.2.4.3 **Define linear relationships**	**2.2.4.3** Investigate real world factors that are associated using a linear relationship Use graphing calculator to create models Use questioning strategies that require students to manipulate concepts and ideas through language to describe models
	2.2.4.5 **Draw graphs of simple linear inequalities**	**2.2.4.5** https://www.youtube.com/watch?v=hLWeHfGemBU https://www.youtube.com/watch?v=8JIiM9vbIwI Integrate skills and concepts: Treat the x and y axes as number lines then associate solutions on the number line with regions on the cartesian plane Solve simple linear inequalities in one variable only, and represent them on the Cartesian plane
	2.4.2.3 **Represent a translation on a coordinate plane**	**2.4.2.3** https://www.youtube.com/watch?v=Ob3Kzl_tDH0 https://www.youtube.com/watch?v=ippYlIRkcPg https://www.youtube.com/watch?v=AInFyyoJvgw Locate the coordinates of the object or the image given the “translation direction” and the coordinates of the image or the object respectively
	2.4.2.4 **Describe a translation using a vector**	**2.4.2.4** https://www.youtube.com/watch?v=R1org4Q66X8 https://www.youtube.com/watch?v=JVjapm_884Y

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Provide examples to help develop relational understanding between the form of a vector $\begin{pmatrix} x \\ y \end{pmatrix}$ and the coordinates of a point (x, y)
	2.4.2.7 **Reflect an object in the coordinate plane using horizontal and vertical mirror lines**	**2.4.2.7** https://www.youtube.com/watch?v=ouNp8FtgiEE https://www.youtube.com/watch?v=DerrI1FstO4 Provide examples to scaffold students in the application of strategies during guided practice
	2.5.1.1 **Identify the most appropriate unit for measuring a given quantity**	**2.5.1.1** https://www.youtube.com/watch?v=AsWv4M1FqAw Visit the science laboratory and investigate the different types of measuring instruments Use a STREAM approach to explore phenomena in the environment and discuss their measurable attributes Differentiate among instruments used for measuring a unique quantity e.g. length- ruler, tape measure, Vernier Calliper, micrometre screw gauge, Trundle wheel
	2.5.1.6 **Convert quantities from one system of measure to another using the unitary method**	**2.5.1.6** https://www.youtube.com/watch?v=HRe1mire4Gc https://www.youtube.com/watch?v=GvGDmIK82t8 Review the importance of standardized measure Compare measures using measuring instruments graduated in metric and imperial systems Collaborate using instruments to create a conversion chart for measure e.g. degree - revolution centimetre - inch

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		metre - yard kilometre - mile gram - ounce kilogram - pound litre - gallon
	2.5.1.7 **Convert the units for area**	**2.5.1.7** https://www.youtube.com/watch?v=YdaWjrtHwWM https://www.youtube.com/watch?v=nv26rIqbc4g Collaborate in groups to develop an algorithm for conversion
	2.5.2.1 **Identify the parts of a circle and their relations**	**2.5.2.1** https://www.youtube.com/watch?v=F8g1u8e278s https://www.youtube.com/watch?v=OJ_og9dCQh8 https://www.youtube.com/watch?v=-KC3AhyhefQ Complete a chart, defining the parts of the circle Describe the parts of the circle using Mathematics terminology
	2.5.2.2 **Derive the numerical value of pi**	**2.5.2.2** https://www.youtube.com/watch?v=Sxkg-joErHM https://www.youtube.com/watch?v=DLcjed7qy4I Measure the circumference and diameter of different circles with string and ruler, then investigate the relationship between the circumference and the diameter
	2.5.2.3 **Derive the formula for the circumference of a circle**	**2.5.2.3** https://www.youtube.com/watch?v=riNAA-jx0u8 https://www.youtube.com/watch?v=2fC6vxszhHk Develop the formula for the circumference of a circle:

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Term	**Outcomes**	**Online Tools and Resources**
		• Measure the circumference • Measure the diameter • Calculate the ratio • State the relation between circumference, diameter, and pi, with circumference as the subject
	2.5.2.4 **Use the formula for the circumference of a circle**	**2.5.2.4** https://www.youtube.com/watch?v=1XFkAZW-rWg https://www.youtube.com/watch?v=SzlGPN3eZcA Apply substitution skills to the formula $C = D\pi$ or $C = 2\pi r$ to calculate the unknown value of the circumference, diameter, or radius of a circle Practice estimation skills
	2.5.2.7 **Use the formula for the area of a circle**	**2.5.2.7** https://www.youtube.com/watch?v=dFr9X0MlruQ https://www.youtube.com/watch?v=JC2kRM3jTOo Apply substitution skills to the formula $A = \pi r^2$ to calculate the unknown value of the area, radius or diameter of a circle Practice using the calculator for computation
	2.5.2.8 **Estimate the area of a circle**	**2.5.2.8** https://www.youtube.com/watch?v=3brzyzc9HOg Use a variety of techniques to approximate the area of a circle Estimate the area of circle using a grid to count squares and half squares Show that squaring a diameter is an approximation for area
	2.5.2.9 **Solve problems involving circles**	**2.5.2.9** Use group activities to solve problems which will develop reasoning skills involving area and circumference of a circle

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	2.5.3.1 **Represent compound shapes as the union of plane shapes** **2.5.3.5** **Calculate the area of compound shapes involving triangles, quadrilaterals, circles and circle quadrants** **2.5.3.6** **Calculate the perimeter of compound shapes involving triangles,** **quadrilaterals, circles and circle quadrants** **2.5.3.7** **Solve problems involving estimates of perimeter and area, including finding the dimensions of a shape, given its perimeter** **2.5.4.4** **Calculate the volume of solids**	**2.5.3.1** Design and sketch compound shapes: cut out plane shapes from compound shapes; calculate the area of each shape; add up the areas **2.5.3.5** https://www.youtube.com/watch?v=E2jdL9I_hBc https://www.youtube.com/watch?v=oUxVpmrRZCk https://www.youtube.com/watch?v=eDicNaX_kU8 Collaborate in groups to derive possible solutions to problem situations **2.5.3.6** https://www.youtube.com/watch?v=r-2qYgYCYHw&t=26s https://www.youtube.com/watch?v=_e7j6rE7_Pg Identify the actual edges of the compound shape by tracing the length of each edge of the compound shape Differentiate between the actual edges of the compound shape versus the edges of its combined parts Explore strategies to determine unknown lengths of sides **2.5.3.7** Refer to strategies below **2.5.4.4** https://www.youtube.com/watch?v=RxkRlIAucMk&t=137s https://www.youtube.com/watch?v=0BS9cgTGpKE&t=115s

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		https://www.youtube.com/watch?v=qJwecTgce6c&t=65s Guide students to generate a rule for calculating volume of cube and cuboids Stack cubes to form cubes and cuboids Explore the properties of solids to generate a rule to finding the volume of a cylinder and other prisms
	2.5.4.3 **Recognise the relationship between the concepts of volume and capacity**	**2.5.4.3** https://www.youtube.com/watch?v=CgGhm8afoGc&t=2s https://www.youtube.com/watch?v=TCgIz40XQEw Use standard solids of various sizes to fill empty vessels Use a variety of containers to measure capacity Read a scale to determine capacity Demonstrate the relationships in a variety of ways
	2.5.5.6 **Solve problems involving volume and capacity**	**2.5.5.6** https://www.youtube.com/watch?v=OanPzjf2EYY Develop a worksheet with graded activities and model answers
	2.5.5.2 **Use proportional techniques**	**2.5.5.2** https://www.youtube.com/watch?v=JOZSFwuyqok https://www.youtube.com/watch?v=USmit5zUGas Provide examples of problem solving in real world context using ratio and proportion techniques Work with pairs to investigate and analyze situations in real world context involving ratio and proportion Guide students in activities with the application of proportion
	2.5.5.3	**2.5.5.3** https://www.youtube.com/watch?v=KZ_M5RWaP6A

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	Develop the relationship between time, speed and distance	https://www.youtube.com/watch?v=zAo2dyOChYc Engage in practical activities measuring distances Measure time using stopwatches to record time in seconds or minutes Develop the concept of speed as a rate Collect real data and discuss situations involving speed, comparing the distance covered with time taken Use questioning strategies to derive a unit for speed
	2.5.5.7 **Solve a variety of problems involving time, distance and speed**	**2.5.5.7** https://www.youtube.com/watch?v=wdL8KpF5Ov0 https://www.youtube.com/watch?v=9F3O4ldHleA Use real world context to create problems
	2.5.6.1 **Calculate the total Hire Purchase price**	**2.5.6.1** https://www.youtube.com/watch?v=m-XMukx0zGM **https://www.youtube.com/watch?v=NP0AGOSlzkQ** Guide discussion with megastore advertisements with items for sale for hire purchase Discuss how hire purchase is calculated Conduct role play allowing students to virtually sell items on hire purchase Discuss the advantages and disadvantages of purchasing with hire purchase
	2.5.6.2 **Apply the terminology of salary and wage**	**2.5.6.2** https://www.youtube.com/watch?v=59uSHdgdLZE https://www.youtube.com/watch?v=8o88zO1M1iw Discuss different careers and their terms of remuneration Students role play to create a payroll for their virtual employees

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Term	**Outcomes**	**Online Tools and Resources**
		Engage students in activities which guide them to distinguish among the terms: wages, hourly rate, minimum wage, overtime, basic salary, piece work, salary and commission Allow students to create a glossary of terms daily, monthly, yearly, fortnight, basic wage, double time, triple time, time and a half, commission, duration of work, incentive bonus Discuss the advantages and disadvantages of working for: • wages with tips • salary with commission • fixed salary
	2.5.6.3 **Explain the concept of percent**	**2.5.6.3** https://www.youtube.com/watch?v=JeVSmq1Nrpw https://www.youtube.com/watch?v=Lvr2YsxG10o https://www.youtube.com/watch?v=WYWPuG-8U5Q Develop percent as a ratio by comparing a quantity to 100 Distinguish between percent and percentage Investigate percent • between 0% and 1% • greater than 100% • equivalence with fractions
	2.5.6.4 **Increase or decrease by a given percent**	**2.5.6.4** https://www.youtube.com/watch?v=HlX3O9vDzlc https://www.youtube.com/watch?v=T6-0MwmCpE8 Discuss with students how to increase or decrease a number by a certain percent Construct ready reckoners Use numeracy strategies to develop skills in performing calculations

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	2.5.6.5 **Convert currency using rates** **2.5.6.7** **Solve problems involving rates; foreign exchange, salary, wages and utility bills.**	**2.5.6.5** Interpret a foreign currency exchange rate table and discuss strategies for converting different currencies. **2.5.6.7** Attempt graded activity sheet with real world scenarios on consumer arithmetic **h**ttps://www.youtube.com/watch?v=otzb_GkRiqQ https://www.youtube.com/watch?v=HBSGRBxweUoPaired problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa
Term 3	**2.4.3.2** **Calculate the size of an exterior angle given the size of the interior angle** **2.4.3.4** **Classify the angles formed when parallel lines are cut by a transversal** **2.4.4.2** **Bisect a line segment**	**2.4.3.2** Problem-solving: one student talks through the problem, describing his thinking processes while his partner listens and asks questions to help clarify thinking and vice versa **2.4.3.4** https://www.youtube.com/watch?v=6RMN5Pf1fHU https://www.youtube.com/watch?v=H-E5rlpCVu4 Engage students in activities to develop their spatial skills **2.4.4.2** https://www.youtube.com/watch?v=QAMOFWrKEUA Differentiate instruction using CAI to cater for heterogeneous levels of a student ability and skill

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Term	**Outcomes**	**Online Tools and Resources**
	2.4.4.3 **Use a pair of compasses and a straight edge to bisect an angle**	**2.4.4.3** https://www.youtube.com/watch?v=LvKOtzWU52w https://www.youtube.com/watch?v=s81r4aG3Nu8 Practice skills repeatedly applying customised rubrics for sub-tasks
	2.4.4.5 **draw angles using a protractor**	**2.4.4.5** https://www.youtube.com/watch?v=3NHnTHhnv8g https://www.youtube.com/watch?v=_erF7VM5-zI https://www.youtube.com/watch?v=qXU7ZY1i9Sk Practice using measuring instruments with accuracy Differentiate instruction to address the variety of learning styles
	2.4.4.6 **Use a ruler and a pair of compasses only to construct angles which are multiples of 30 degrees**	**2.4.4.6** https://www.youtube.com/watch?v=5l8bltVe_IE https://www.youtube.com/watch?v=Iy8LwYNIMgc https://www.youtube.com/watch?v=K1yGEyPv6vs Provide examples to help develop relational understanding Present opportunities to build on students' inherent sense of curiosity and discovery.
	2.3.1.1 **Interpret a frequency distribution**	**2.3.1.1** https://www.youtube.com/watch?v=ukgdDAcIdUE https://www.youtube.com/watch?v=A8nIY_BThQo Guide practice in the use of language to provide the bridge between the concrete representations and the more abstract and symbolic forms. Use questioning strategies that require students to manipulate concepts and ideas through language to describe models.

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	2.3.1.2 **Calculate the mean, median and mode from a frequency distribution of ungrouped data**	**2.3.1.2** https://www.youtube.com/watch?v=zjHfAhcU6kE https://www.youtube.com/watch?v=685uW5o5Gao https://www.youtube.com/watch?v=WS6mbSgC73I Guided instruction using frequency distributions to calculate the mean, median and the mode. Independent practice with the use of technology tools e.g. spreadsheets for checking
	2.3.1.4 **Identify data types in terms of nominal, ordinal, interval, ratio**	**2.3.1.4** https://www.youtube.com/watch?v=hZxnzfnt5v8 https://www.youtube.com/watch?v=KIBZUk39ncI Present situations to analyze the characteristics of different types of data
	2.3.2.3 **Construct statistical charts** **(a) Pie charts** **(b) bar charts** **(c) histograms** **(d) line graphs**	**2.3.2.3** https://www.youtube.com/watch?v=rllw15xkmUU https://www.youtube.com/watch?v=KCH_ZDygrm4 Practice using measuring instruments with accuracy Activate prior knowledge of block graphs and scales Students self-assess (self-monitor) using a customised math error self-correction checklist.
	2.3.2.5 **Interpret information from pie charts, bar graphs, histograms and line graphs**	**2.3.2.5** https://www.youtube.com/watch?v=pSQYn4c2MyM https://www.youtube.com/watch?v=7Y99eCe9hfI Engage students in discussion for deeper understanding to develop inference skills Independent practice to demonstrate proficiency using real world data collected from their environment

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
Term 1	**3.1.1.1** **Solve problems with real numbers involving the four operations**	**3.1.1.1** https://www.youtube.com/watch?v=OwJhZYfKDYU https://www.youtube.com/watch?v=pZD5jxgHit0 https://www.youtube.com/watch?v=peil0Dxo_Zw Provide examples using a variety of problem-solving strategies Cooperative learning to design and solve problems involving real life scenarios
	3.1.1.4 **Identify the subsets of real number: rational numbers, integers, whole numbers, natural numbers, and irrational numbers** **3.1.1.5** **Represent the relationship between subsets of the set of real numbers:** **(a) on a number line** **(b) using a number tree** **(c) using a Venn Diagram**	**3.1.1.4/ 3.1.1.5** https://www.youtube.com/watch?v=vbPUS-0Wbv4 https://www.youtube.com/watch?v=TWpcVZMlhFI https://www.youtube.com/watch?v=Iex_ACGMJN4 https://www.youtube.com/watch?v=4mKlomasyrY Model the desired outcome Students use an activity to categorize numbers into subsets according to common properties and name each subset Use computer graphing software to construct a visual representation of the relationships among subsets Draw Venn diagrams to represent the relationships between different sets of numbers
	3.1.1.6 **Calculate the sums and differences of numbers in base 2 and base 3**	**3.1.1.6** https://www.youtube.com/watch?v=C5EkxfNEMjE Activate prior knowledge of the denary system (base 10) Demonstrate a variety of techniques for addition and subtraction Students collaborate in small groups to practice adding and subtracting numbers

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.5.1.2 **Apply formulae related to the circle:** **(a) to calculate the length of an arc of a circle** **(b) to calculate the area of a sector of a circle**	**3.5.1.2** https://www.youtube.com/watch?v=Wcv0f5PpTv0 https://www.youtube.com/watch?v=wlu4NDJcLxU https://www.youtube.com/watch?v=D9xX8ip7kRc&t=97s Activate prior knowledge: Parts of a circle, calculation of circumference, and area of a circle, operations with fractions, subtraction Use questioning techniques accompanied by manipulatives and models to develop the formula Engage students in discussion for deeper understanding to develop inference skills
	3.5.1.3 **Apply formulae to determine measures of compound shapes involving parts of a circle:** **(a) perimeter of a compound shape** **(b) area of a compound shape**	**3.5.1.3** https://www.youtube.com/watch?v=r-2qYgYCYHw https://www.youtube.com/watch?v=8hYWnG3lSL0 Active prior knowledge: Formulae for perimeter and area of plane shapes Present 2D drawings of compound shapes from real world and have the students divide the shapes into the least number of known simple shapes including sectors
	3.5.2.1 **Calculate surface area of** **(a) prisms (cube, cuboid, triangular prism)** **(b) pyramids (cone included)**	**3.5.2.1** https://www.youtube.com/watch?v=_hvK95wReis https://www.youtube.com/watch?v=llrOWOaKsHo https://www.youtube.com/watch?v=FhiY10RgSNU https://www.youtube.com/watch?v=OY2RRlPPT7A https://www.youtube.com/watch?v=vCf2yK4tzkk https://www.youtube.com/watch?v=NGunDMoHdks Use models and nets of solids to develop the formulae

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Provide a variety of examples for cooperative learning using virtual manipulative
	3.5.2.2 **Calculate the volume of:** **(a) prisms** **(b) pyramids** **3.5.2.3** **Solve problems involving** **(c) surface area** **(d) volume**	**3.5.2.2/ 3.5.2.3** https://www.youtube.com/watch?v=P72Jfnr66Ac https://www.youtube.com/watch?v=qJwecTgce6c https://www.youtube.com/watch?v=H4vh0HizQsw https://www.youtube.com/watch?v=e7-am8JtREI Activate prior knowledge for volume Provide a variety of examples for cooperative learning using virtual manipulative Problem solving activities (including Polya's problem solving strategies) Cooperative learning using virtual learning environments
	3.5.3.1 **Determine distances on maps and models in accordance with a given scale**	**3.5.3.1** https://www.youtube.com/watch?v=K3aM0H7j_Jg https://www.youtube.com/watch?v=sgxwk6M-WiE Activate prior knowledge: Scale factor Use questioning strategies to determine students' understanding Investigate situations involving a scale on a map, located in real world context Cooperative learning to engage in practical activities involving scales, using virtual learning environments
	3.5.3.2 **Create accurate 2-D drawings of simple geometric figures, charts, and graphs, given a specific scale requirement.**	**3.5.3.2** https://www.youtube.com/watch?v=0y6ZbW5Fj40 To activate prior knowledge: Congruency and similarity Teacher demonstration using manipulatives Collaborative learning: student work in small groups to produce 2D drawings from teacher designed activity

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.4.1.2 **Prove the congruency of triangles using the minimum conditions:** **(a) all corresponding sides are equal in length (SSS)** **(b) corresponding sides and the included angle are equal (SAS)** **(c) pair of corresponding angles and included side are equal (ASA)** **(d) pair of corresponding angles and a non-included side are equal (AAS)** **(e) right angle triangle: hypotenuse and one side are equal (HS)** **3.4.1.3** **Apply the properties of congruency in triangles** **(a) to explain simple shapes and patterns** **(b) to solve problems**	Guided practice using virtual learning environments Independent practice using grid paper **3.4.1.2/3.4.1.3** https://www.youtube.com/watch?v=EFCp_pxV1sU https://www.youtube.com/watch?v=6saYBeHzArE https://www.youtube.com/watch?v=j9RwCBv-600 Discussion of the properties of real-life objects which are equal Use manipulatives/ models to identify properties of congruent triangles Demonstrate in a variety of ways with a variety of examples

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.4.2.2 **Determine the conditions required for a set of triangles to be similar** **(a) all 3 pairs of corresponding angles are the same (AAA)** **(b) pairs of corresponding sides are in the same proportion (SSS in the same proportion)** **(c) two pairs of the sides in the same proportion and the included angle equal (SAS)**	**3.4.2.2** https://www.youtube.com/watch?v=8h-BeLqfa3E https://www.youtube.com/watch?v=YiFwvAFk-xs https://www.youtube.com/watch?v=gcOzJiacc0M Use manipulatives/ models to investigate properties of similar triangles Guided discussion using compare and contrast activities Provide a variety of examples for students to identify similar triangles, working in small groups (include non-examples as well)
	3.4.2.5 **Explain the concept of a scale factor**	**3.4.2.5** https://www.youtube.com/watch?v=fA2EZoYgMgA https://www.youtube.com/watch?v=P1f3sJpIYGI Activate prior knowledge: ratio, conversion of units of measure Explore real world situations where scale factors are used: maps, drawing plan, microscopes, cameras, copiers etc. Compare and contrast activities with lengths, similar and plane figures, and solids Working cooperatively students state the definition of a scale factor
	3.4.2.6 **Explain the concept of an enlargement**	**3.4.2.6/ 3.4.2.7** https://www.youtube.com/watch?v=jy9Hs3KI-Rk https://www.youtube.com/watch?v=7362afSFdtw

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.4.2.7 **Apply the properties of enlargement of plane geometrical figures to solve problems (positive scale factors only)**	https://www.youtube.com/watch?v=IrSNu6tqbak https://www.youtube.com/watch?v=esdrT40WBnY https://www.youtube.com/watch?v=pd331nTd-gE Activate prior knowledge: scale factor, similarity, transformation Compare and contrast activities with reflections, translations and enlargements Students investigate the concept in real life situations e.g., using magnifying lens, projector, font size in word processing and zoom features in a copier Associate terminology with the concept: • enlargement about a point • Centre of enlargement Use graph paper for representation of models of plane figures Use simple plane shapes for students to investigate the relationship between the areas of object and image under an enlargement Use simple examples of enlargements, double and triple, to relate to a scale factor Use graded activity sheets with guided instruction for students to investigate instances where scale factors are whole numbers or fractions Students solve a variety of problems involving enlargements, using similar triangles
	3.4.3.2 **Apply Pythagoras theorem to determine lengths of sides in the right-angled triangle** **3.4.3.3** **Model real world situations using Pythagoras theorem in order to solve problems**	**3.4.3.2/3.4.3.3** https://www.youtube.com/watch?v=YompsDlEdtc https://www.youtube.com/watch?v=_e6w5GtkcGI https://www.youtube.com/watch?v=JH9V3bWA1T0 https://www.youtube.com/watch?v=dQCf7_kN9r0 https://www.youtube.com/watch?v=gOP_16cRAaI https://www.youtube.com/watch?v=BQA6yTJQKX8 https://www.youtube.com/watch?v=tnF7Ezd6qaI Activate prior knowledge: hypotenuse, congruency, similarity

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Investigate Pythagoras' Theorem using technology tools for simulation, documentation and reporting Explore squared relationships by placing squared cut-outs on each side of the triangle and deduce the relationship among the sides of a right-angled triangle Discuss the meaning of a squared length as a measure of area Use guided discovery for students to deduce the theorem Use practical situations for students to create and solve problems, finding missing lengths of sides of right-angled triangles Use of calculator to simplify complex calculations, and approximations
	3.4.4.2 **Calculate a trigonometric ratio for an angle, in a right-angled triangle** - **sine α** - **cosine α** - **tangent α** **3.4.4.4** **Apply trigonometric ratios to calculate the length of a side in a right-angled triangle**	**3.4.4.2/3.4.4.4** https://www.youtube.com/watch?v=zU94BB9aUgE https://www.youtube.com/watch?v=Jsiy4TxgIME https://www.youtube.com/watch?v=zbB_SddM6Gs https://www.youtube.com/watch?v=pvM6YIaggPg Students explore the words opposite and adjacent as they apply to real life and through discussion relate them to the angles and sides of the triangle Students create a series of examples of triangles with fixed angles and identify the adjacent and opposite sides Activate prior knowledge: solving equations, substitution Guided practice to demonstrate application of the ratios Independent practice using "maths error" checklist for reinforcement
	3.4.4.6 **Apply trigonometric ratios to solve for angles of elevation and depression**	**3.4.4.6** https://www.youtube.com/watch?v=1okhBnvuuck https://www.youtube.com/watch?v=bmU40g_mIwc ttps://www.youtube.com/watch?v=3H28-wzsF3s https://www.youtube.com/watch?v=bwvI2LJZjdM https://www.youtube.com/watch?v=_9nmTFSrTZM

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Provide problems in real world context involving angles of elevation and depression to simulate the students' inherent sense of curiosity Provide exemplars to guide students
	3.4.5.1 **Use logic and reasoning to make and support conjectures about geometrical shapes**	**3.4.5.1** https://www.youtube.com/watch?v=JzCPff7eQ2w https://www.youtube.com/watch?v=Sprm5NO7Sk4 https://www.youtube.com/watch?v=L-Fdpv_I5Qw Teacher designed activities for the recall of facts and algorithms Teacher designed tasks to allow students to collaborate and investigate properties so as to scaffold the development of their understanding and reasoning
	3.4.5.2 **Construct triangles when given:** **(a) the lengths of three sides** **(b) the length of two sides and the included angle**	**3.4.5.2** https://www.youtube.com/watch?v=JmwRBPtLbhc https://www.youtube.com/watch?v=urivXd755y8 https://www.youtube.com/watch?v=WQFF7R8mDoo https://www.youtube.com/watch?v=UzNWf737nNk Discussion involving the use of manipulatives (e.g. straws) to model triangles to be constructed Cooperative learning using virtual learning environments
	3.4.5.3 **Construct** **(a) parallel** **(b) perpendicular lines**	**3.4.5.3** https://www.youtube.com/watch?v=im81vHIhZS8 https://www.youtube.com/watch?v=5bZLpHVIUyE Use manipulatives to demonstrate parallel and perpendicular lines Guided practice using technology tools Cooperative learning to demonstrate the procedure for their peers Teacher demonstration

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Students use online tutorial- Computer Aided Instruction (CAI) Students peer assess using a prepared template
	3.4.5.4 **Use lines, angles, and the axes of references to describe and represent direction (e.g., using a navigational compass)**	**3.4.5.4** https://www.youtube.com/watch?v=lHVwLiAyCFs https://www.youtube.com/watch?v=v1WPpSxE0nA Research/ investigate using the World Wide Web Use technology tools to provide information Project-based learning
	3.4.5.6 **Construct a circle,** **(a) given the radius** **(b) given two/three chords**	**3.4.5.6** https://www.youtube.com/watch?v=8fcTSAkH3tM https://www.youtube.com/watch?v=lm-7L0smRfE https://www.youtube.com/watch?v=0mDVQy7VVwo https://www.youtube.com/watch?v=UdvPYzKypwc Teacher demonstration Students use online tutorial- CAI Teachers observe students with a checklist while the students perform the task
	3.4.5.7 **Construct squares, rectangles and parallelograms using given information**	**3.4.5.7** https://www.youtube.com/watch?v=ya6lIjCbnoA https://www.youtube.com/watch?v=-ELNDgbRQi4 https://www.youtube.com/watch?v=GhD9smOKqfc https://www.youtube.com/watch?v=iKFjS3wY89w
	3.5.4.1 **Solve problem involving rates:** **(a) Salaries** **(b) Wages**	**3.5.4.1** https://www.youtube.com/watch?v=8o88zO1M1iw https://www.youtube.com/watch?v=yHRuXVipIU0 https://www.youtube.com/watch?v=0UIx6G2hFds

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	(c) Overtime **(d) Utility bills (electricity and telephone)** **3.5.4.4** **Solve problems involving compound interest**	https://www.youtube.com/watch?v=-PcSIsngL-M Investigation of calculations in real world scenarios (e.g. T&TEC determines the amount that is to be paid for electricity used) Guided discussion (use findings from investigations to develop algorithms for calculations) **3.5.4.4** https://www.youtube.com/watch?v=wf91rEGw88Q https://www.youtube.com/watch?v=B3IdfBcXrLA https://www.youtube.com/watch?v=JDXMlq8B9Yg Research/ investigate how returns are calculated in real world scenarios (e.g., interest calculated on credit union loans, bank deposits, stock units, etc.) Cooperative learning to develop and practice the algorithms Problem-based learning: students determine the "best" investment option from a given selection
Term 2	**3.6.1.1** **Solve linear equations involving algebraic fractions, where:** **(a) numerator contains a single variable** **(b) numerator contains a binomial of degree one with whole numbers only in the denominator**	**3.6.1.1** https://www.youtube.com/watch?v=GYNK6NDNEFk https://www.youtube.com/watch?v=F-aqjOfs_Cw https://www.youtube.com/watch?v=v-9KqoSEq64 https://www.youtube.com/watch?v=kaIqgpKV4Cc https://www.youtube.com/watch?v=v-9KqoSEq64&t=876s https://www.youtube.com/watch?v=DiUzSTm330U Activate prior knowledge: order of operations; inverse operations; solutions of simple linear equations Guided practice for higher order thinking Provide "wait time" for independent practice

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Cooperative learning
	3.6.2.2 **Represent solutions of linear inequalities involving algebraic fractions** **(a) on a number line** **(b) on the Cartesian plane** **3.6.2.3** **Solve problems on linear inequalities from real world scenarios**	**3.6.2.2/ 3.6.2.3** https://www.youtube.com/watch?v=nif2PKA9bXA&t=289s https://www.youtube.com/watch?v=hRVo8XOSQw0 https://www.youtube.com/watch?v=GH7oxQ3JxIw https://www.youtube.com/watch?v=0jyEi0F9FNE https://www.youtube.com/watch?v=FFLMa5qIO4o Activate prior knowledge: number line, and cooperative learning Problem solving activities (including Polya problem solving strategies)
	3.6.3.3 **Solve simultaneous equations by methods of calculation:** **(a) elimination** **(b) substitution** **3.6.3.4** **Solve problems using simultaneous equations from real world scenarios**	**3.6.3.3/ 3.6.3.4** https://www.youtube.com/watch?v=O-rrOPPmFgM https://www.youtube.com/watch?v=d6vyYvx8URw https://www.youtube.com/watch?v=pCZNkVxWVXE https://www.youtube.com/watch?v=7Ja_H6a8ltY https://www.youtube.com/watch?v=ZSJ32Bq9sbQ https://www.youtube.com/watch?v=r59oLimduIM https://www.youtube.com/watch?v=9tqlzouVQfs https://www.youtube.com/watch?v=MynlGmwhm78 Demonstrate the processes using appropriately sequenced examples Provide a variety of examples for guided practice Cooperative learning using algorithms to determine an ordered pair that satisfies two linear functions simultaneously

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.2.1.1 **Display using Venn diagrams, the relationship among the subsets of real numbers** **3.2.1.2** **Solve problems involving set notation for subsets of the universal set in the Venn diagram**	**3.2.1.1/ 3.2.1.2** https://www.youtube.com/watch?v=DcQkw6n3aP4 https://www.youtube.com/watch?v=mKfsrn9WE7U https://www.youtube.com/watch?v=HoKtn3z2vPY Activate prior knowledge: Venn diagram, number theory Explore the real number system using the Venn diagram as a concept map Activate prior knowledge: set notation Guided demonstration to represent information accurately on Venn diagrams Cooperative learning to investigate the relationships among sets, both visually and algebraically Graded worksheets with Venn Diagrams involving two sets, with regions to shade, or with shaded regions to identify
	3.2.1.3 **Solve problems involving two subsets of the universal set using Venn diagrams to reflect** **(a) intersection of sets(review)** **(b) subsets** **(c) disjoint sets**	**3.2.1.3** https://www.youtube.com/watch?v=WSS5EiJ2gew https://www.youtube.com/watch?v=0h8a3POgKxU https://www.youtube.com/watch?v=GbmDi6JQ8cE https://www.youtube.com/watch?v=JbyPv3szcDE https://www.youtube.com/watch?v=rbQsyF8zVBw https://www.youtube.com/watch?v=HGzpCIdroJU https://www.youtube.com/watch?v=VDSiLEhVIVc Activate prior knowledge: sets, subsets, intersection of sets, disjoint sets, number of elements in a set, double counting Guided demonstration on the application of the formula $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Problem based learning: students construct and solve problems involving real world scenarios
	3.2.2.2 **Calculate the gradient of a line segment with end points A(x_1, y_1) and B(x_2, y_2)**	**3.2.2.2** https://www.youtube.com/watch?v=HxTkMsfWkME https://www.youtube.com/watch?v=dspYtArOUnQ https://www.youtube.com/watch?v=mCWvprzBh5w https://www.youtube.com/watch?v=QW2yT-AtsA0 Activate prior knowledge: ratio, directed numbers, substitution Guided practice to develop the formula: $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$
	3.2.2.3 **Identify the slope of a straight line:** **(a) positive slope** **(b) negative slope**	**3.2.2.3** https://www.youtube.com/watch?v=EQoNfxToez0 https://www.youtube.com/watch?v=VIuPtmpOK98 https://www.youtube.com/watch?v=uYDrgrSjVoI Cooperative learning for compare and contrast activities with straight lines Independent practice using software to generate straight lines with positive and/or negative slopes
	3.2.2.6 **State the equation of a straight line given the gradient and the intercept of the line in the form y = mx + c**	**3.2.2.6** https://www.youtube.com/watch?v=pyAFnb4QQNk https://www.youtube.com/watch?v=t3u4EscUHq0 https://www.youtube.com/watch?v=86wfkG3XxS4 Guided practice representing the equation in the form y = mx + c
	3.2.2.7	**3.2.2.7** https://www.youtube.com/watch?v=oiiItf1Yjfs

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	Represent linear relations as graphs on the Cartesian plane, written in any form **3.2.3.1** **Represent a pair of linear relations on the same Cartesian plane** **3.2.3.2** **Apply graphical methods to determine an ordered pair that satisfies two linear functions simultaneously** **3.2.3.3** **Apply knowledge of the point of intersection to solve a pair of linear simultaneous equations**	https://www.youtube.com/watch?v=vGNSMUKEQ9c https://www.youtube.com/watch?v=2VWhJBjv5J8 https://www.youtube.com/watch?v=g05cCdn1OdI Activate prior knowledge: relations on the Cartesian plane Students practice rewriting equations of the form $ax + by = k$ in the form $y = mx + c$ **3.2.3.1/ 3.2.3.2/ 3.2.3.3** https://www.youtube.com/watch?v=_EW9AUEUFb8 https://www.youtube.com/watch?v=NPzlCNDEJqA https://www.youtube.com/watch?v=KvSs4MS8AwU Activate prior knowledge: relations, ordered pairs, Cartesian plane Activate prior knowledge: simultaneous equations Use of graphing calculators for scaffolding tasks Independent practice on graph paper
Term 3	**3.6.4.2** **Evaluate expressions of the form b^a**	**3.6.4.2** https://www.youtube.com/watch?v=g4N102CMicM https://www.youtube.com/watch?v=fBuquPk2k24 https://www.youtube.com/watch?v=czJ8IMfjSug Activate prior knowledge of directed numbers using games (e.g. tic-tac-toe, what do you know?)

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.6.4.4 **Apply the laws of indices to solve problems**	**3.6.4.4** https://www.youtube.com/watch?v=BUJKEDqGp1U https://www.youtube.com/watch?v=ARLS2TmFT94 https://www.youtube.com/watch?v=ozuXy8_NZcg Problem solving activities (including Polya's problem solving)
	3.6.5.1 **Evaluate binary expressions**	**3.6.5.1** https://www.youtube.com/watch?v=1ncvoAclgqE https://www.youtube.com/watch?v=rJjrQ0ORWyQ https://www.youtube.com/watch?v=fgr2eceD7Ow https://www.youtube.com/watch?v=QXE8W-AD8pw Activate prior knowledge: order of operations, substitution technique, directed numbers. Collaborate to peer-assess/peer-monitor using a customised checklist for math error corrections
	3.6.5.2 **Identify the HCF of two algebraic expressions**	**3.6.5.2** https://www.youtube.com/watch?v=EGbe-4Huhow https://www.youtube.com/watch?v=KOfM5Psen3Q&t=287s Activate prior knowledge: LCM concept
	3.6.5.3 **Multiply binomial expression**	**3.6.5.3** https://www.youtube.com/watch?v=d0gKPnKy6YQ https://www.youtube.com/watch?v=Oocc_EArdg0 Activate prior knowledge of the distributive law discussion to develop the "First, Outer, Inner, Last" (F.O.I.L) technique

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.6.5.4 **Simplify a product when factors contain algebraic expressions with common bases**	**3.6.5.4** https://www.youtube.com/watch?v=wr5TSV0BK88 https://www.youtube.com/watch?v=wSa33FOtSfY https://www.youtube.com/watch?v=fLxvYrFj-a8 Activate prior knowledge using index form in base 10 Provide a variety of examples using concrete and symbolic representations
	3.6.5.5 **Simplify a quotient when numerator and denominator contain algebraic expressions with common factors:** **(a) denominator is a monomial** **(b) denominator is a binomial**	**3.6.5.5** https://www.youtube.com/watch?v=uVpsz-xpnPo https://www.youtube.com/watch?v=J9A-JlTXnsQ https://www.youtube.com/watch?v=OEN9kENpvtU https://www.youtube.com/watch?v=wNpTWSg-GEA Teacher demonstrates how rational algebraic expressions can be simplified using techniques as applied in arithmetic Provide a variety of examples using concrete and symbolic representations independent practice for reinforcement
	3.6.6.2 **Factorise algebraic expressions involving two, three and four terms**	**3.6.6.2** https://www.youtube.com/watch?v=p1ZxU8a0UCc https://www.youtube.com/watch?v=lZdbeTWd5u4&t=34s https://www.youtube.com/watch?v=jAQWlN56cFA https://www.youtube.com/watch?v=3RJlPvX-3vg Teacher demonstrates how the strategies for finding H.C.F. of a set of numbers can be applied to algebra Students use the H.C.F. method to factorise expressions in two and three terms (not quadratic).

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
		Guided instruction to group terms and apply the distributive law an appropriate number of times, with four terms
	3.6.7.2 **Factorise quadratic expressions of the form:** **(a) $x^2 + bx + c$** **(b) $a^2 – b^2$**	**3.6.7.2** https://www.youtube.com/watch?v=r7DtjXPhmxg https://www.youtube.com/watch?v=ZQ-NRsWhOGI https://www.youtube.com/watch?v=U6FndtdgpcA https://www.youtube.com/watch?v=_qyVzH3e1dY https://www.youtube.com/watch?v=upBa_BGkP5E Activate prior knowledge: factor, binomial Engage in hand-on activities with cut-out manipulative and algebra tiles for concrete representation of the concept Guided instruction to extend the distributive law to factorise expressions provide a variety of examples for students to use ‘guess and check’ technique
	3.6.7.4 **Solve quadratic equations, using the method of factorisation, in the form** **(a) $x^2 + bx + c = 0$;** **(b) $x^2 – k^2 = 0$, $k \in N$, k is constant**	**3.6.7.4** https://www.youtube.com/watch?v=-lWVpoPaPBc https://www.youtube.com/watch?v=HeqamkPRdlQ https://www.youtube.com/watch?v=m-qyV6C56ec https://www.youtube.com/watch?v=ZyvVcRRhDo4 https://www.youtube.com/watch?v=Jgw3Mf21IfA Activate prior knowledge: solution of equations, factors, zero products Students collaborate to discover the form of the factorisation for the difference of two squares Use the STREAM approach to model the concept e.g., height, h, at time, t, along the path of a projectile

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	3.4.6.2 **Solve simple geometric problems involving polygons**	**3.4.6.2** https://www.youtube.com/watch?v=qG3HnRccrQU https://www.youtube.com/watch?v=WH6RsZrSOUg https://www.youtube.com/watch?v=PlXzEVuat5Q https://www.youtube.com/watch?v=V8N1yrKKkEU https://www.youtube.com/watch?v=m-ORunWK1MU https://www.youtube.com/watch?v=AAiOCe-mO_4 Engage students in activities to develop spatial skills to support their reasoning Derive the formula to calculate the sum of the interior angles of a polygon of n sides Solve simple problems involving missing angles in polygons Apply properties of straight lines, regular figures and the sum of all interior angles, to determine the size of each interior/exterior angle in a regular polygon
	3.3.1.1 **Investigate the outcome of an experiment** **3.3.1.4** **Apply the probability formula** **3.3.1.5** **Calculate the probability of an event:** **(a) that is certain to take place** **(b) that will not take place** **3.3.1.9**	**3.3.1.1/ 3.3.1.4/ 3.3.1.5/ 3.3.1.9** https://www.youtube.com/watch?v=KzfWUEJjG18 https://www.youtube.com/watch?v=yUaI0JriZtY https://www.youtube.com/watch?v=vGcmjINp1x8 Conduct an experiment to investigate the possible outcomes Discuss and record results Use dice, spinners, coins, random selection to generate experimental data Understand concepts of certainty, fairness Explore real world situations which can be measured using a ratio: Probability of an event = No. of favourable outcomes /Total number of possible outcomes

For Academic Year 2021 to 2022		
Term	**Outcomes**	**Online Tools and Resources**
	Solve simple problems involving theoretical probability, experiments, and simulations.	Compare the occurrence of events using a ratio expressed in the form of a rational number Present opportunities to build on students' inherent sense of curiosity and discovery e.g., the design of experiments Work in groups to investigate phenomenon and analyse data Use of technology tools for simulations, documentation, and reporting

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