**Patterns and Relations**

**(Patterns, Variable and Equations)**

**Grade 2**

**Rationale:**

This unit is designed to address SLO’s 1,2,3,4,5 from the patterns and relations strand in the program of study for Grade 2 students. It will help Students to develop their understanding of repeating patterns, increasing patterns, sort objects, demonstrate and explain the meaning of equality and inequality, and record equalities using the equal symbol and the not equal symbol. Mathematics is the study of patterns and relationships. Recognizing and exploring the inherent patterns in mathematics make it easier for students to see relationships and understand concepts. There are two GLOs and five SLOs associated with the unit, and the lesson is planned to take approximately two month. Students will work individually, in small and large groups on a variety of different assessments throughout the unit. Differentiation of learning will be implemented in every lesson in order to meet all students’ needs to maximize learning for every student.

**Mathematical Processes:**

***Communication*** will be used throughout the unit as students are asked to explain and justify their thinking.

Students will make ***connections*** from prior knowledge to new concepts in this unit, as well as connection to real life.

As student sort objects, they will use ***mathematical reasoning.***

Students will use a variety of mathematical tools to ***visualize*** various concepts such as repeating patterns, equality as a balance, inequality as an imbalance, and so on.

***Technology*** will be implemented throughout the unit as a tool to assist students’ learning.

Students will work on their ***problem-solving*** skills when working on mathematical questions throughout the unit.

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| **Established Goals:**  GLO 1: Use patterns to describe the world and to solve problems.  GLO 2: Represent algebraic expressions in multiple ways. | | |
| **Understandings:**  *Students will understand that…*   * Patterns show order in the world. * Patterns can be found in many different forms. * “equals” indicates equivalent sets. * Unknown quantities can be found by using the balance strategy. | **Essential Questions:**   * What is the repeating unit in the pattern? * Where can patterns be found? * How do you know the sets are equal? * How do you know the sets are not equal? * How is a number sentence like a balance scale? | |
| *Students will know…*  GLO 1:   1. Demonstrate an understanding of repeating patterns (three to five elements) by:   • describing  • extending  • comparing  • creating patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V]   1. Demonstrate an understanding of increasing patterns by:   • describing  • reproducing  • extending  • creating numerical (numbers to 100) and non-numerical patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V]  3. Sort a set of objects, using two attributes, and explain the sorting rule. [C, CN, R, V] | *Students will be able to do…*  GLO 2:  4. Demonstrate and explain the meaning of equality and inequality, concretely and pictorially. [C, CN, R, V]  5. Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V] | |
| **Resources Needed:**   * Paper * Scissors * Stapler * Exit Slip * Smartboard with access to internet * Grid paper * Pencil crayons or markers * Chart Paper | | * Math Manipulatives * Worksheets * Poster Paper Pencil crayons or markers * Test |

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|  | **Activities & Assessment Tool Overview** | | | | | | |
| **Assessment Tool Title** | | **Outcomes** | **Brief Description** | % | For | AS | OF |
| **Prior Knowledge**  **Assessment** | | P.R.1  P.R.2 | To assess students’ prior knowledge on patterns, students will work with a partner on a mini activity. I will draw different colored cubes on a piece of chart paper. Students will then make a pattern using those cubes, identify the pattern core, use the same cubes to make a different pattern, label the pattern with letters, and translate the pattern into an action or sound pattern. While students are working, I will be going around to observe and formatively assess their prior knowledge on patterns in order to come up with differentiated strategies to best apply to every student in the classroom. This can be an assessment for students learning as they are working together, helping one another to have a basic grasp of patterns. | N/A | ✔ |  |  |
| **Worksheets** | | P.R.1  P.R.2  P.R.3  P.R.4  P.R.5 | Worksheets will be given in specific lesson to help the students practice and gain a better understanding of different concepts in this unit. This type of worksheet will contain questions to help students understand the math concept both pictorially and symbolically. Examples of similar problems will also be provided on each worksheet to guide student learning. To differentiate students’ learning, I will vary the type and complexity of the worksheets that the students will work on to demonstrate their learning. These worksheets will serve as formative assessment for student learning. These will show what the students have learned, and what they need to improve on. | N/A | ✔ |  |  |
| **Exit Slips** | | P.R.1  P.R.2  P.R.3  P.R.4  P.R.5 | Students will be asked to fill out exit slips on selected lessons to provide information on what they already knew, have learned from the lesson, and questions or concerns they may have. This is an assessment as students’ learning because this gives students a chance to think about and reflect on their learning. This will also be taken as a formative assessment for students’ learning because with the information provided, as a teacher, I will be able to address common questions raised by students, and help form and direct future lessons. | N/A | ✔ | ✔ |  |
| **Detecting Different Patterns** | | P.R.1  P.R.2 | Have students identify and describe increasing patterns in a variety of contexts (e.g., hundred chart, number line, addition tables, calendar, a tiling pattern, or drawings). To differentiate students’ learning, those who grasp the material well can work on addition tables, those that are having difficulties can work on patterns on number lines. Patterns on a Number Line: Increasing patterns can be shown on the number line. Example: Skip counting by 2s. Patterns on the Hundred Chart: Possible increasing patterns include n for each row, left to right, numbers increase by 1 n for each column, top to bottom, numbers increase by 10 n numerous skip-counting patterns n on the diagonal from left to right numbers increase by 11 n on the diagonal from right to left numbers increase by 9. Patterns on the Calendar: Possible increasing patterns include n in each row numbers increase by 1 n in each column numbers increase by 7 n on the diagonal from left to right numbers increase by 8 n on the diagonal from right to left numbers increase by 6, and so on. | N/A | ✔ |  |  |
| **Storybook** | | P.R.1  P.R.2 | Read a book such as There Was an Old Lady Who Swallowed a Fly by Michael Twinn. Ask students to describe what is happening in the story/song (the number of animals swallowed increases by one each time). Reread the story. Represent the pattern in the story using cubes. Example: There was an old lady who swallowed a fly . . . (1 cube). There was an old lady who swallowed a spider . . . (2 cubes). There was an old lady who swallowed a bird . . . (3 cubes). Reading a story book like this gives students a brain break, however, at the same time, students are also learning about increasing patterns. |  |  |  |  |
| **Nifty Numbers** | | P.R.4  P.R.5 | Use a chart paper or part of a white board. Write a number between 0 and 100 at the top of the chart each day. Students take turns writing a number sentence to equal the number on the chart. Encourage students to try to write a sentence that is different from the ones already on the chart. Students will try to write a sentence that is different from the ones already on the chart. For example, if the number is 10, students can write: 12-2, 5+5, 2+2+2+2+2, 12-6+4, etc. This is an assessment for students learning, with what each students write on the board, I am able to observe who understood the material taught, and who still needs extra help and practice with it. | N/A | ✔ |  |  |
| **Performance Task: Pattern Posters.** | | P.R.1  P.R.2  P.R.3 | Students will work with a partner. I will match students with different peers according to their learning levels. Students will choose two different shapes. Use the shapes to create a repeating pattern with three repeats of the pattern core, explain the pattern rule, predict the 50th element in your pattern and explain your thinking. Students will also make an increasing pattern with four figures/terms, explain the pattern rule, and represent the pattern in another way. Put all this information on a poster paper, decorate it, and present it to the class. This is an assessment for student learning because I will be circulating around the classroom to guide students and answer any questions they may have without giving them the direct answers. Through observation, I will be able to find out how much each student have attained from my previous lessons and come up with ways to help them improve. | N/A | ✔ |  |  |
| **Pattern Game** | | P.R.1  P.R.2  P.R.3 | Divide the class into small groups of four, and each small group will have 2 groups of 2 play against each other. I will provide a set of cards with possible ways to represent a pattern (e.g., letters, sounds, actions, shape, color, size, numbers, people, attribute blocks, etc.), and another set of cards with different increasing patterns. Both set of cards will be placed in the middle. Shuffle the cards and place them face down. Teams take turns drawing a card from each set. The word on the one of the card describes how the team is to change the representation of the pattern on the other card. If correct, that team earns a point, if not then they don’t get a point, whichever team gets the most points wins the game. I will assign the groups, this way varying their levels of leaning, for those that are having difficulties, I will make cards with simpler instructions and questions.This is an assessment for students’ learning as students are practicing their skills on equalities. I will also be observing throughout the classroom to formatively assess students’ learning. | N/A | ✔ |  |  |
| **Performance task: true or False Game** | | P.R.4  P.R.5 | Game cards are placed face down on the table. Players take turns drawing a card, stating whether the number sentence/equation is true or false. Some example of the cards includes: 6+2 = 4+4, T, 5+6 = 3+7, F. Students will work in small groups of 3-4. If correct, the player gets a point, if false, the player doesn’t get a point. Whoever have the most point in the end gets a small price. This is an assessment for students’ learning as students are practicing their skills on equalities. I will also be observing throughout the classroom to formatively assess students’ learning. | N/A | ✔ |  |  |
| **Test** | | P.R.1  P.R.2  P.R.3  P.R.4  P.R.5 | A summative test will be given at the end of the unit. The test will cover all the materials learned in this unit. Different complexity of summative assessment will be given according to students’ learning levels. This is an assessment of students’ learning because it will be taken as a summative assessment counted towards students’ final grade. | ?% |  |  | ✔ |

**Specific Outcomes that will be Covered throughout the entire Unit**

GLO 1: Use patterns to describe the world and to solve problems.

S.S.1 Demonstrate an understanding of repeating patterns (three to five elements) by:

• describing

• extending

• comparing

• creating patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V]

- Identify the core of a repeating pattern.

- Describe and extend a pattern with two attributes.

- Explain the rule used to create a repeating nonnumerical pattern.

- Predict an element in a repeating pattern using a variety of strategies.

- Predict an element of a repeating pattern, and extend the pattern to verify the prediction.

S.S.2 Demonstrate an understanding of increasing patterns by:

• describing

• reproducing

• extending

• creating numerical (numbers to 100) and non-numerical patterns using manipulatives, diagrams, sounds and actions. [C, CN, PS, R, V]

- Identify and describe increasing patterns in a variety of contexts (e.g., hundred chart, number line, addition tables, calendar, a tiling pattern, or drawings).

- Represent an increasing pattern concretely and pictorially.

- Identify errors in an increasing pattern.

- Explain the rule used to create an increasing pattern.

- Create an increasing pattern and explain the pattern rule.

- Represent an increasing pattern using another mode (e.g., colour to shape).

- Solve a problem using increasing patterns.

- Identify and describe increasing patterns in the environment (e.g., house/room numbers, flower petals, book pages, calendar, pine cones, leap years).

- Determine missing elements in a concrete, pictorial, or symbolic increasing pattern, and explain the reasoning.

S.S.3 Sort a set of objects, using two attributes, and explain the sorting rule. [C, CN, R, V]

GLO 2: Represent algebraic expressions in multiple ways.

S.S.4 Demonstrate and explain the meaning of equality and inequality, concretely and pictorially. [C, CN, R, V]

- Determine whether two quantities of the same object (same shape and mass) are equal by using a balance scale.

- Construct and draw two unequal sets using the same object (same shape and mass), and explain the reasoning.

- Demonstrate how to change two sets, equal in number, to create inequality.

- Choose from three or more sets the one that does not have a quantity equal to the others, and explain why.

S.S.5 Record equalities and inequalities symbolically, using the equal symbol or the not equal symbol. [C, CN, R, V]

- Determine whether two sides of a number sentence are equal (=) or not equal (¹). Write the appropriate symbol and justify the answer.

- Model equalities using a variety of concrete representations, and record.

- Model inequalities using a variety of concrete representations, and record symbolically.

**Possible Differentiation / Integration / Modifications Strategies**

(In my classroom in particular, there are students with AD/HD, gifted students, as well as ELL leaners.)

**ESL/ELL**

**Alberta Education Code**:

The code is 301 for foreign-born students, 303 for Canadian-born students, and 302 for International Students.

**Teaching Strategies & Resources:**

Provide differentiated assessment — varying the type and complexity of the product that the students create to demonstrate their learning. Journals & logs can be an example of a great opportunity to differentiate assessment. ELL students in this case can be allowed to record their ideas in their first language, short English words or sentences, or illustrations. It also gives them the opportunity to access their background knowledge, make connections to old and new learning, as well as reflect on what they have learned.

Use ongoing assessments with frequent feedbacks to guide instruction — Ongoing, informal assessment is vitally important to matching instruction to students' changing needs. With ELL students, teacher can have ongoing formative assessment throughout the semester to record and keep track of their learning progression, identify their strength and weaknesses, as well as any learning needs. With the collected data, the teacher is able to come up with more effective strategies to help them improve and maximize their learning. Throughout these formative assessments, make sure to provide timely, relevant, and corrective feedbacks to the students because it can be an important way to help ELL students move to the next stage of language development.

Use flexible grouping — Small group instruction is a very effective way of making sure that all students can access important content, and keeping groups flexible allows teachers to match students with different peers for different types of activities. For example, when grouping students, organizing group containing both ELL students, and native English speakers to increase the opportunity for peer tutoring. The teacher can also consider grouping ELL students who have the same first language as one group when it is necessary to clarify content and discuss concepts at a deeper level.

Make content comprehensible for all students —matching learning contents to students' learning profiles and language proficiency ensures that every student has an opportunity to demonstrate what he/she knows. For example, providing resources at varying reading levels. Providing ELL students with content-specific material at a level they are able to read successfully allows them to gain information and key vocabulary that may provide scaffolding necessary for them to read more challenging texts. These resources can include a variety of text types, such as news articles, picture books, journal entries and web pages. If possible, provide books in the first language of the ELL students to further support learning and making connections to the English content.

Build a respectful and helpful classroom atmosphere — creating a classroom atmosphere where all students have respect for and responsiveness to cultural and personal diversity. It is important to teach all students about culture diversity, and to respect all kinds of cultural diversity. Teachers can incorporate students’ experiences into writing and language arts activities, as well as linking content to students’ lives and experiences to enhance understanding. The teacher can also set up useful resources around the classroom such as bilingual dictionaries, posting word banks around the classroom with frequently used or subject-specific vocabulary to provide ELL students with an easy-to-access reference.

**Gifted and Talented**

**Alberta Education Code**: 80

**Teaching Strategies & Resources:**

**Examples of Differentiation Strategies**

***Acceleration***- Allowing students to complete grades at their own (accelerated) pace (Winne 125)

***Telescoping***- Covering the same amount of materials or activities in less time, which allows for more time for enrichment activities and projects. (NAGC- Glossary of Terms)

***Mixed-abilities groups***- Assigning the student to a group with slower learners, where they can serve as an example and help their groupmates learn. Note: this is frequently ineffective, and probably shouldn’t be employed as a differentiation strategy! (Winne 126)

***Similar-ability groups/Congregated School Settings*** - Gifted students are often more engaged when paired with other highly intellectual peers, or attend schools set up to accommodate gifted students.

**Specific Strategies**

***Provide alternate subject-appropriate study materials* -** Allow the gifted student to study a novel that is at their own reading level if the class novel study is at a lower level. The novel should cover the same basic themes, but be a more challenging read or more challenging to pull the themes from.

***Compacting*** - Assessing prior knowledge excuses student from mastered material. Then, plans for learning what is not known, and further enrichment can be discussed with parents and students. Allow for student choice of enrichment. (Differentiated Learning and Teaching Accommodations for Students Who are Gifted, 130)

***Independent Projects*** - Student and teacher identify problems or areas of interest for student to investigate and then synthesize findings. Negotiate and document criteria, goals, and timelines. (Differentiated Learning and Teaching Accommodations for Students Who are Gifted, 130)

***Mentorships/Apprenticeships*** - Student works with a resource teacher, parent, community member, or specialist to develop a project. This can also work for building skills in an area of career interest/awareness. (Differentiated Learning and Teaching Accommodations for Students Who are Gifted, 131)

***Flexible Skills Grouping*** - Place students into groupings according to readiness and needs. Movement between groups happens with ability and growth in a given skill. Ensure that task is suitably complex, to provide more depth with fewer topics. (Differentiated Learning and Teaching Accommodations for Students Who are Gifted, 130)

**AD/HD**

**Alberta Education Code**: 42

**Teaching Strategies & Resources:**

For students with AD/HD, it is important to be proactive in establishing routines and expectations early in the year that maintain consistency between home and school. This can be accomplished in the following ways:

***Meet with parents early in the school year to find out:***

-Interests and areas of need

-Specific symptoms

-Successful strategies used at home

***Develop a system of open communication to establish a solid home-school partnership early on.***

This requires a method of communication that is convenient for both parents and teacher

***Clearly establish rules, behavior expectations and routines that maintain consistency both at home and at school. In the classroom, plan for the use of monitoring strategies to minimize opportunities for off-task or disruptive behaviour***

This requires willingness from both parents and teacher to adapt previously established routines

***Structure transition times*** (i.e. establish auditory clues for transitions; establish how, with whom and where the student will walk for example)

***Create opportunities for students to engage in regular physical activity, exercise and movement within lessons***

This may require additional supervision and access to other environments or time set aside in lessons for exercise.

***Teach strategies of what to do when waiting for help or further direction***

***Engage the student with his/her interests***

Needs to find out what the student’s interests are and them how to incorporate them into their coursework.

**Research has shown that the following in-classroom strategies are effective for student learning for students with AD/HD:**

1. Give clear, brief instructions with visuals or written directions
2. Provide direct instruction for skills such as listening, note-taking, responding to oral prompts
3. Break tasks into short, manageable steps
4. Give feedback to each segment of the task
5. Help students make a plan for the task and organize their work
6. Encourage self-talk
7. Provide checklists or visual referents (i.e. graphic organizers)
8. Encourage students to make their own checklists for areas they need to work on
9. “Self-monitoring”
10. Provide extra time or reduce the amount of work required
11. Provide opportunities for repetition of concepts
12. If note-taking becomes difficult, explore the option of using a word-processor
13. Reduce distractions in the classroom
14. Keep student away from doors and windows
15. Seat student close to teacher (quick access to help if needed)
16. Seat student away from rowdy students
17. Help to maintain organization for the student (school supplies, lockers, belongings, etc.)

**Students with AD/HD require differentiation to varying degrees, depending on the traits they possess.**

1. For those AD/HD students who experience hyperactivity: provide outlets for movement

***Specific strategy for classroom implementation:*** provide or allow certain fidget toys to be used in class or to be brought from home (i.e. stress balls, exercise balls to sit on)

***Assessment practice:*** consider dividing tests into shorter sections to be completed at several different time periods or conducting assessments after a bout of physical activity

2. For those AD/HD students who experience distraction and impulsivity: rearrange classroom environment

***Specific strategy for classroom implementation:*** seat AD/HD students at the front of the room

When creating/rearranging students, keep AD/HD students in the front row, but still move their seat to ensure that they are not singled out

***Assessment practice:*** avoid multiple choice questions - try fill in the blank or short answer instead; draw boxes around individual questions to separate them and ensure adequate white space to avoid unnecessary distractions on the test itself; use color to help students focus on important features (i.e. highlight operation signs in basic facts questions)

3. For those AD/HD students who experience feelings of anxiety: allow students to respond to their feelings and seek help

***Specific strategy for classroom implementation***: give students notes/instructions in advance so that the student may read and follow along with the class better

***Assessment practice***: provide an alternate distraction-free space for writing tests or completing assignments (such as a “reading corner” or an individual study desk outside the classroom)

4. For those AD/HD students who experience learning difficulties (reading, writing, numeracy, etc.): provide extra time and/or assistance and/or alternate formats of assignments

***Specific strategy for classroom implementation***: break down assignments into smaller pieces with an associated checklist

***Assessment practice***: provide extra room for written work; allow students to complete written assessments using word processors or other technologies; allow the student to complete oral assessments; give additional time to complete assignments

5. For those AD/HD students who experience disorganization: provide direct instruction on how to organize themselves and provide assistance

***Specific strategy for classroom implementation:*** checklists are also helpful for self-monitoring

Tape a checklist to the student’s desk that prompts the them to complete daily routines (provide a small reward every time the checklist is completed, such as a sticker, to create incentive)

***Assessment practice:*** provide organizational strategies for written work (i.e. graphic organizers, mind maps, charts for the student to fill in)