Inquiry & Assessment: Blending the IB MYP and Florida Standards
Mathematics

Network: TW
Password: guest5500

David Weber
webersent@hotmail.com
**Aims of today's session**

- Experience and design inquiry-based activities for Florida Standards for mathematics
- Design authentic MYP tasks that assess Florida Standards
- Develop SOI and inquiry questions from these elements

**Part 1**

*Inquiry in mathematics*

**“Survival on the Moon”**
Perform AT LEAST two of the activities, answering all questions.

So...
• What do you think?
• How long would these take?
• What kinds of topics/skills lend themselves to being learned in this way?
• Questions? Comments?

“Tell me and I forget, show me and I remember, involve me and I understand”

Confucius, BC 450
Students can use the Inquiry cycle to...

- Make connections between previous learning and current learning
- Experiment and play with various possibilities
- Make predictions and take action to see what happens
- Collect data and report findings
- Clarify existing ideas and reappraise perception of events

Students can use the inquiry cycle to...

- Deepen their understanding through the application of a concept
- Make and test theories
- Research and seek information
- Take and defend a position
- Solve problems in a variety of ways
Methods

Constructivist based learning
Resource-based learning
Problem-based learning
Project-based learning
Collaborative learning

Inquiry Based Learning

"If you envisioned images of children actively posing questions, seeking answers to questions that they care about, demonstrating a strong interest in outcomes, and discussing their theories and ideas with others, you’ve shared a glimpse of what makes educators so excited about the possibilities of inquiry-based learning. At its best, inquiry-based learning makes excellent educational sense.

If, on the other hand, you envisioned a chaotic classroom where children were doing things, but weren’t clear about what they were doing, or what could be understood from it, or what could really be learned from what they found out, you’ve shared a glimpse of what gives some educators pause about taking the plunge into inquiry-based learning. At its worst, inquiry-based learning can result in miseducation. Either vision is possible. So what can you, as teachers, do to enable the first vision?"


www.desmos.com

GIZMOS

www.explorelearning.com

General Form of a Rational Function

Compose the equation of a rational function by 1/square, multiply or divide the numerator and denominator graph in explorer.
Now you try...

Select content that you will actually teach this year and design one or more NEW inquiry-based activities.
The justification...

1. Do you have a theory? Verbalize it to someone.
2. Verify with another try.
3. Can you guess the next symbol without picking a number?
4. Justify MATHEMATICALLY why it works.
5. What Global Context does this explore?

In this part, we’re going to...

- extend the understanding of key concepts and how they may ground interdisciplinary teaching and learning
- consolidate understanding of key and related concepts by framing a conceptual understanding of a new unit of work
**Topic vs. Concept vs. Fact**

With the people around you, describe the difference(s) between them.

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**Teaching Beyond the Facts**

*Trying to teach in the 21st century without conceptual schema for knowledge is like trying to build a house without a blueprint.*

-H. Lynn Erickson

Concept-Based Curriculum and Instruction

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**SCHEMA/SCHEMATA**

How people organize information in their minds

Categories we use to group phenomena and establish relationships among experiences

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**A Concept is...**

...broad and abstract
1 → 2

...usually represented by a word or two

(Pneumonoultramicroscopicsilicovolcanoconiosis?)

…universal

...represented by different examples that have common characteristics

...timeless
Key concepts

- Broad, organising, powerful ideas
- Transcend the subject groups
- Subject groups do not have to use all of the key concepts listed in MYP: From principles into practice

Key concepts: Mathematics

<table>
<thead>
<tr>
<th>Key Concepts</th>
<th>Aesthetics</th>
<th>Change</th>
<th>Communication</th>
<th>Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections</td>
<td>Creativity</td>
<td>Culture</td>
<td>Development</td>
<td></td>
</tr>
<tr>
<td>FORM</td>
<td>Global interactions</td>
<td>Identity</td>
<td>LOGIC</td>
<td></td>
</tr>
<tr>
<td>Perspective</td>
<td>RELATIONSHIPS</td>
<td>Time, place and space</td>
<td>Systems</td>
<td></td>
</tr>
</tbody>
</table>
Key Concepts (cont...p.19)

FORM:
- Representation, structure

RELATIONSHIPS:
- Connections

LOGIC:
- Process

Related concepts
- While the key concepts provide breadth, the related concepts provide depth to the programme.
- Related concepts emerge from the discipline and provide conceptual focus and depth to understanding related to disciplinary content.
- Definitions of related concepts can be found in the guide on p. 52 (or 62/66).

Related Concepts in MYP Mathematics
- Change
- Equivalence
- Generalization
- Justification
- Measurement
- Model
- Pattern
- Quantity
- Representation
- Simplification
- Space
- System

Let’s see how this works...
Based on the group of key and related concepts, decide the mathematical content (topic) of the unit. Is there more than one possibility?

a) FORM, measurement
b) LOGIC, simplification, operation
c) RELATIONSHIPS, pattern, change, model
d) LOGIC, simplification, equivalence
Now you try...

Choose a key concept and one or more related concepts for each topic:

- fractions, decimals and percents
- similar triangles
- statistics

Slope: fact or concept?

“Slope” can be taught as either a “fact” or a “concept”. What does teaching each of those look like?

Which leads to “understanding”? Can you have one without the other? Would you want to?

Has this ever happened to you?

\[ 6 (2x - 5) = 12x - 30 \] (the distributive property)

Which inevitably leads to…

\[ \log(x + 5) = \log(x) + \log(5) \]
\[ \sin(45 + 120) = \sin(45) + \sin(120) \]
\[ (x + 5)^2 = x^2 + 5^2 \]
\[ \sqrt{a^2 + b^2} = a + b \]

These are the world’s brightest young minds…
What are these students missing?

- a skill?
- a fact?
- a topic?
- a concept?

The Rest of the Year in Concepts...

- In course/class groups, list the units you have left to teach this year

- Determine the key concept and related concepts for each unit

Related Concepts in MYP Mathematics

- Change
- Equivalence
- Generalization
- Justification
- Measurement
- Model

- Pattern
- Quantity
- Representation
- Simplification
- Space
- System
Related Concept(s)

Conceptual Understanding

“Relationships can be represented in a variety of forms.”

Try It...

Write a conceptual understanding (concept statement) for one or more units.

“Relationships can be represented in a variety of forms.”

“Relationships between measurements can be generalized.”

“Simplification leads to equivalent forms.”

To develop the intellect and increase motivation for learning, curriculum and instruction must create a “synergy” between the lower (factual) and higher (conceptual) levels of thinking.
As a group, write down the list of 15 items from the NASA activity as well as their ranking.

MYP FLIBS Edmodo
www.edmodo.com
Join Edmodo (it’s free!)
Group “+” then select JOIN
CODE: t k r n y u

Part 3
Teaching in a context

Session objectives
• Consolidate the role of MYP global contexts as they relate to both the unit and international mindedness
Let's do some math!
The classic questions...

NAME: ______________________ DATE: ____________

Area of Shaded Region Worksheet
Find the area of the shaded region in each of the following figures:

1. [Diagram of a shaded region]

2. [Diagram of a shaded region]

Taken one step further...

What percentage of the octagon is NOT shaded (r = 30ft)?

How can we make this task more interesting or even motivating?

The city of Sacramento has an ordinance that states that any new parking lot must be at least 50% shaded within 15 years of its construction.

Does this parking lot meet that guideline?

Better yet...

The city has a “recommended tree” list from which you can select the trees to shade the parking lot. You have narrowed it down to the following trees, most of which are at least moderately fast-growing and also native to California.

<table>
<thead>
<tr>
<th>TREE</th>
<th>DIAMETER</th>
<th>COST ($/tree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valley Oak</td>
<td>35</td>
<td>85</td>
</tr>
<tr>
<td>Southern Magnolia</td>
<td>30</td>
<td>77</td>
</tr>
<tr>
<td>California Bay</td>
<td>25</td>
<td>65</td>
</tr>
<tr>
<td>Cherry Plum</td>
<td>20</td>
<td>62</td>
</tr>
</tbody>
</table>

You may place the trees anywhere you like, but you must ensure that at least 50% of the parking lot is shaded while also trying to provide as much parking as possible to customers. Your total budget is $35,000. Draw up plans for where to place the trees, calculate your overall budget and justify that it meets the 50% shade requirement.
Global contexts further develop global learning from PYP transdisciplinary themes

<table>
<thead>
<tr>
<th>PYP transdisciplinary theme</th>
<th>MYP global context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who we are</td>
<td>identifies and relationships</td>
</tr>
<tr>
<td>Where we are in place and time</td>
<td>orientation in space and time</td>
</tr>
<tr>
<td>Forms of expression</td>
<td>personal and cultural expression</td>
</tr>
<tr>
<td>How the world works</td>
<td>scientific and technical innovation</td>
</tr>
<tr>
<td>How we organize ourselves</td>
<td>globalization and sustainability</td>
</tr>
<tr>
<td>Shaping the planet</td>
<td>filmmaking and development</td>
</tr>
</tbody>
</table>

Introducing the global context

Global Context  Related Concept  Key Concept

Statement of inquiry

Inquiry questions

The power of a context...

Solve the system:

\[ y = 1121x + 21 \]
\[ y = 841x + 24 \]
How can we get this kid to stop crying?!

Make the data meaningful!
Put it in a context!

Better yet, let the students come up with the equations:

You have decided to buy a Honda Civic but aren’t sure whether you should get the Civic EX model or the Civic Hybrid model. Based on the information below, answer the questions that follow, showing all of your working steps.

<table>
<thead>
<tr>
<th></th>
<th>CIVIC EX</th>
<th>CIVIC HYBRID</th>
</tr>
</thead>
<tbody>
<tr>
<td>price ($)</td>
<td>21,000</td>
<td>24,000</td>
</tr>
<tr>
<td>gas mileage (mpg)</td>
<td>33</td>
<td>44</td>
</tr>
<tr>
<td>miles driven every year (miles)</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>price of gas ($/gallon)</td>
<td>$3.70</td>
<td></td>
</tr>
</tbody>
</table>

Space shuttle...

Other applications of mathematics...
**The Bermuda Triangle**

The corners of The Bermuda Triangle are Bermuda (32.2N, 64.45W), San Juan, Puerto Rico (18.5N, 66.9W) and Miami, Florida (25.48N, 80.18W).

What kind of a triangle is the Bermuda Triangle? How do you know?

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**The Devil’s Sea or Dragon’s Triangle**

The corners of The Dragon’s Triangle are Honshu, Luzon and Guam.

Is it really similar to the Bermuda Triangle? Prove it.

Classify the Dragon’s Triangle in as many ways as you can.

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**Other creepy triangles…(really…)**

Michigan Triangle (Lake Michigan)
Bennington Triangle (VT)
Bridgewater Triangle (MA)
In April 25th 2006, the Spanish party in the opposition presented in the Congress 4,000,000 signatures against a new law promoted by a regional government.

All Spanish newspapers published pictures with the big boxes and the 10 vans needed to transport the sheets of paper with the signatures to the Congress. Do you think there was a political intention behind this staging or all these boxes and vans were really necessary to transport the 4000000 signatures?

What standard(s) does each of the following involve?
What could you do with it?
What role(s) do the “global contexts” play?

- Exploring the MYP global contexts
  - identities and relationships
  - orientation in space and time
  - personal and cultural expression
  - scientific and technical innovation
  - globalization and sustainability
  - fairness and development

The Global Contexts (p. 23)

<table>
<thead>
<tr>
<th>Global Context</th>
<th>Exploration Opportunities</th>
<th>Conceptual Explorations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identities and relationships</td>
<td>Who are we? Who are we? Students will explore identity, both personal and spiritual, and how it affects human relationships including family, friends, communities and cultures, which means to be human</td>
<td>Possible explorations to develop competition and cooperation, ethical reasoning and decision making, uniting identity formation, self-awareness, values and key concepts</td>
</tr>
</tbody>
</table>
## Possible explorations

<table>
<thead>
<tr>
<th>Global Context</th>
<th>Possible exploration</th>
</tr>
</thead>
</table>
Select a global context...

Look at the following assessments and select a context that is potentially being explored. Be ready to justify your choice:

Global contexts

- allow for relevance, engagement and a direct route for inquiry into next millennium perspectives. All effective learning is contextual.
- help answer the question, “Why are we learning this?”
- celebrate our common humanity and encourage responsibility for our shared guardianship of the planet
- comprise a range of ideas and issues that can be personally, locally, nationally, internationally and globally significant

Diet Assignment

<table>
<thead>
<tr>
<th></th>
<th>Price ($)</th>
<th>Gas Mileage (mpg)</th>
<th>Miles Driven Every Year (miles)</th>
<th>Price of Gas ($/gallon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIVIC EX</td>
<td>23,000</td>
<td>33</td>
<td>10,000</td>
<td>$3.70</td>
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<tr>
<td>CIVIC HYBRID</td>
<td>25,000</td>
<td>44</td>
<td>10,000</td>
<td>$3.70</td>
</tr>
</tbody>
</table>

IS A HYBRID CAR WORTH THE MONEY?

Assignment

You have decided to buy a Honda Civic but aren’t sure whether you should get the Civic EX model or the Civic Hybrid model. Based on the information below, answer the questions that follow, showing all of your working steps.
GRASPS

G = Goal "Your task is..."
R = Role "You are a..."
A = Audience "Your audience is..."
S = Situation "The challenge involves dealing with..."
P = Product, Performance and Purpose "You will create a ________ in order to ________ in order to ________.
S = Standards and Criteria for Success "Your performance needs to..."

A suggested structure to develop depth and complexity for the assessment task

Your turn...

Choose a unit and...
- select key and related concepts
- design an authentic summative task
- select the global context

Repeat as necessary!
All Along the Watchtower...

While visiting Natural Bridge Caverns, a cave in Texas, the tour guide said that columns form at a rate of approx. 1 cubic inch every 100 years.

If the Watchtower column is 50 feet tall and has a circumference of 8 feet, how long did it take for the column to form?

What goes into a statement of inquiry?

“Generalizing relationships between measurements has allowed humans to apply their scientific principles to the world around them.”

“Representing data and statistics in the most effective form can help us better understand and evaluate health issues on a local and global scale.”

“Understanding the relationships between quantities can help improve access to equal opportunities.”
What are the Key and Related Concepts and the Global Context in this Statement of Inquiry? What content is being taught?

Key Concept  |  Related Concept(s)  |  Context
---|---|---
Relationships between variables can be modelled in order to make generalizations and predictions about the impact of human activity on the environment.

The Statement of Inquiry

- Is a clear statement about the relationships between two or more concepts, in context
- Facilitates synergistic thinking
- Transfers through time and across cultures
- Can provide universal understandings
- Frames the focus of the unit
Putting concepts in context

**Global Context**

Statement of inquiry

Key: Form

Related: pattern, space

**Global context:** Personal and cultural expression

SOI: Artistry can be expressed by finding interesting ways of arranging forms in space.

Diet Assignment

Table of Eastern spice

<table>
<thead>
<tr>
<th>Spice</th>
<th>Quantity</th>
<th>Time</th>
<th>Add</th>
<th>Cook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumin</td>
<td>1 tsp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coriander</td>
<td>1 tsp</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ginger</td>
<td>1 tsp</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SOI: A logical process of simplification can help us improve our health and well-being.
**Tips:**
The statement of inquiry:

- Can refer implicitly or explicitly to the relevant key and related concepts
- Describes an important idea that’s worthy of understanding (what)
- Explains the context that makes learning meaningful (so what)
- Has potential for transferring to other contexts and connecting with other significant content (so that, in order to– why)
- May use a qualifier (often, may, can) to preserve room for varying perspectives and the possibility of revisable, partial knowledge

**Write a statement of inquiry for the following...**

Relationships  |  quantity  |  Fairness and development

What, if anything, makes the writing of the Statement of Inquiry easier?

**Try this one...**

For this task, select:

- Key concept
- Related concepts
- Global Context

and write a statement of inquiry.

**KEY and RELATED CONCEPTS**
combined with a **GLOBAL CONTEXT**
(translation)
form the **STATEMENT OF INQUIRY**
Your turn...

- Write a statement of inquiry for the unit(s) you have been developing.
- When done, design at least one inquiry-based lesson to deliver some of the content.

Quick think...

How would you sequence the following actions?

a) Writing a Statement of Inquiry
b) Designing a summative task
c) Selecting key and related concepts
d) Selecting a global context
e) Designing an inquiry lesson
f) Selecting content

Inquiry questions
Inquiry questions are drawn from and inspired by the statement of inquiry

Inquiry questions...

- shape and scope a unit of study
- promote student-initiated inquiries
- satisfy curiosity and deepen understanding
- scaffold objectives that students should strive to achieve

Factual  Conceptual  Debatable

Factual, conceptual or debatable? Why?

<table>
<thead>
<tr>
<th>Question</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the order of operations?</td>
<td>What is fair?</td>
</tr>
<tr>
<td>What is more natural, order or chaos?</td>
<td>How is volume related to area?</td>
</tr>
<tr>
<td>What is a unit rate?</td>
<td>What is the quadratic formula?</td>
</tr>
<tr>
<td>Why is the vertical line test an appropriate tool to decide if a relation is a function?</td>
<td>What does is mean to be “linear”?</td>
</tr>
</tbody>
</table>

Hints for designing inquiry questions

<table>
<thead>
<tr>
<th>Question</th>
<th>How... or Why...</th>
</tr>
</thead>
</table>
| Factual  | Can use starters 'What...'  
Open question that students might be able to Google but find many variations  
E.g.: What are the fundamental trigonometric ratios?  
What is the Sine Law?  
E.g.: What is a pattern? |
| Conceptual | Can use starters 'How...' or 'Why...'  
Open ended questions which unpack a concept or a relationship between concepts  
E.g.: How are the trigonometric ratios related to similar triangles? |
| Debatable | Can use starters that provoke debate  
Do... ‘Can... ‘Should... ‘Or ‘Ns...’, etc.  
Debatable questions provoke discussion  
E.g.: How do we measure the immeasurable? |
For this task, write inquiry questions to go along with the Statement of Inquiry that you wrote yesterday. (linear functions unit)

<table>
<thead>
<tr>
<th>Eruption</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1991</td>
</tr>
<tr>
<td>1</td>
<td>1991</td>
</tr>
<tr>
<td>1</td>
<td>1991</td>
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<td>1991</td>
</tr>
<tr>
<td>1</td>
<td>1991</td>
</tr>
</tbody>
</table>

Your turn...

Write 3-5 inquiry questions for the unit you are developing.

The Assessment Criteria
Mathematics assessment criteria

- Criterion A: Knowing and understanding (max 8)
- Criterion B: Investigating patterns (max 8)
- Criterion C: Communicating (max 8)
- Criterion D: Applying mathematics in real-life contexts (max 8)
### Criterion A— Knowing & understanding

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8</td>
<td>The student is able to:</td>
</tr>
<tr>
<td></td>
<td>i. select appropriate mathematics when solving challenging problems in both familiar and unfamiliar situations</td>
</tr>
<tr>
<td></td>
<td>ii. apply the selected mathematics successfully when solving these problems</td>
</tr>
<tr>
<td></td>
<td>iii. generally solve these problems correctly</td>
</tr>
</tbody>
</table>

### Criterion B— Investigating patterns

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8</td>
<td>The student is able to:</td>
</tr>
<tr>
<td></td>
<td>i. select and apply mathematical problem-solving techniques to discover complex patterns</td>
</tr>
<tr>
<td></td>
<td>ii. describe patterns as relationships and/or general rules consistent with correct findings</td>
</tr>
<tr>
<td></td>
<td>iii. verify and justify these relationships and/or general rules</td>
</tr>
</tbody>
</table>

### Criterion C— Communicating

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 - 8</td>
<td>The student is able to:</td>
</tr>
<tr>
<td></td>
<td>i. consistently use appropriate mathematical language</td>
</tr>
<tr>
<td></td>
<td>ii. use different forms of mathematical representation to consistently present information correctly</td>
</tr>
<tr>
<td></td>
<td>iii. move effectively between different forms of mathematical representation</td>
</tr>
<tr>
<td></td>
<td>iv. communicate through lines of reasoning that are complete and coherent</td>
</tr>
<tr>
<td></td>
<td>v. present work that is consistently organized using a logical structure</td>
</tr>
</tbody>
</table>

### Criterion D: Applying mathematics in real-life contexts

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>7–8</td>
<td>The student is able to:</td>
</tr>
<tr>
<td></td>
<td>i. identify the relevant elements of the authentic real-life situation</td>
</tr>
<tr>
<td></td>
<td>ii. select appropriate mathematical strategies to model the authentic real-life situation</td>
</tr>
<tr>
<td></td>
<td>iii. apply the selected mathematical strategies to reach a correct solution</td>
</tr>
<tr>
<td></td>
<td>iv. explain the degree of accuracy of the solution</td>
</tr>
<tr>
<td></td>
<td>v. explain whether the solution makes sense in the context of the authentic real-life situation</td>
</tr>
</tbody>
</table>
So...in a nutshell...

Criterion A: Knowing and Understanding (tests)
Criterion B: Investigating (investigations)
Criterion D: Applying (real-world problems)
Criterion C: Communicating (in combination with others)

Task specific clarifications

Developing task-specific clarifications requires teachers to study the assessment criteria (objective strands) and to *redraft the value statements* within the level descriptors in terms of the specific assessment task in the MYP unit.

Task-specific clarifications may be achieved by at least one of the following:

- Changing some wording to match the task
- An oral discussion of student expectations
- A separate task sheet that explains student expectations

Mt. Vesuvius
Which criteria could have been used for the Mt. Vesuvius task?

**CRITERION C: 7-8**

The student is able to:

1. consistently use appropriate mathematical language
2. use different forms of mathematical representation to consistently present information correctly
3. move effectively between different forms of mathematical representation
4. communicate through lines of reasoning that are complete and coherent
5. present work that is consistently organized using a logical structure.

The student always uses appropriate math terminology. The student is able to effectively use and move between a graph, a table and an equation to represent the data. The student shows clear working steps when finding the equation of the lines and the resulting predictions. The work is organized and easy to follow.
Arriving at and recording achievement levels
At the end of a period of learning teachers must:

- make judgments on their students’ achievement levels at least twice for each objective strand in each subject group criterion each year.
- gather sufficient evidence of achievement from a range of learning experiences and assessments.
- ensure that this evidence comes from student performance over the duration of the units taught.
Approaches to learning is concerned with:
- intellectual disciplines, attitudes, strategies and skills “learning how to learn”
- awareness of thought processes and their strategic use

Approaches to learning results in:
- critical, coherent and independent thinking
- capacity for problem solving and decision making

Approaches to learning is a shared responsibility:
- core of all curriculum development and all teaching
- logical progression over time

Choosing the ATL skills for your unit
- Examine an objective strand from your own unit. Determine what cognitive skills or affective skills are inherent in the objective strand?
- In order to master this objective strand, what skill or skills will the student be expected to demonstrate?

Note: The corresponding achievement levels determine the level of mastery (achievement) of those skills.

Math Objectives (p. 67 in the workbook, or page 10 in the GUIDE)

<table>
<thead>
<tr>
<th>Objective: Investigating patterns</th>
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<tbody>
<tr>
<td>i. apply mathematical problem-solving techniques to recognize patterns</td>
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<td>ii. describe patterns as relationships or general rules consistent with correct findings</td>
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<td>iii. verify whether the pattern works for other examples</td>
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<tr>
<td>i. select and apply mathematical problem-solving techniques to discover complex patterns</td>
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<tr>
<td>ii. describe patterns as relationships and/or general rules consistent with findings</td>
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<td>iii. verify and justify relationships and/or general rules</td>
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ATL skills aligned with objectives...

In order for a student to (objective strand)__________

students must (ATL skill indicator)

ATL Category: ________, Skill Cluster ________
Criterion C: Communicate complete, coherent and concise mathematical lines of reasoning (Mathematics, Year 5).

In order for a student to communicate complete, coherent and concise mathematical lines of reasoning, students must organize and depict information logically.

(ATL Category: Communication, Skill Cluster: Communication)

Your turn. Ready? Go!
Practice with one of your own objectives strands:

Criterion (?): _____________________________ (year ?),

In order for a student to (objective strand)______________
students must (ATL skill indicator)____________________

ATL Category: _________, Skill Cluster ________________

Unit: Linear Functions
Summative task: Space Shuttle Challenger
ATL Category: ________________
ATL Cluster: Critical thinking
Skill indicator: Gather and organize relevant information to formulate an argument.

Application to the summative task: Students will have to present a persuasive argument for their proposed safety budget for the Space Shuttle Challenger given the likelihood of success.
Your turn…

Select an ATL skill related to your summative task and write a description of how students will be developing that skill.

What’s achieved with the tilt?

<table>
<thead>
<tr>
<th>Content</th>
<th>Learning experiences and teaching strategies</th>
<th>Formative assessment</th>
<th>Differentiation</th>
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<tr>
<td>$y = mx + c$, $x$-intercept</td>
<td>All students work in pairs and groups through the activities provided by the teacher. There is an investigation on “How do you know it’s a line?” as well as on gradient-intercept form. Direct instruction will take place on concepts and skills that students may need to review (intercepts, graphing, etc.)</td>
<td>All students answer questions on a slip of paper before they exit the class, providing feedback to the teacher on their level of understanding.</td>
<td>All the activities are scaffolded so that students who experience difficulty will be led through the discovery of linear functions. The teacher can provide additional support where necessary and/or pair students so that a stronger student can help one who may struggle.</td>
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<tr>
<td>1) Parallel and perpendicular lines and the relationships between their gradients</td>
<td>2) Investigation activity (criterion 2): Students will investigate the relationship between the gradients of parallel and perpendicular lines.</td>
<td>3) Discussion with students as they hand in their investigation. Checking of their work as they complete practice exercises leading up to the investigation.</td>
<td>4) Envelope hints are provided for the task with the following suggestions (in order): 1) Graph the lines 2) Is anything the same? 3) When do you notice about their gradients/slopes? 5) ( m_1 \times m_2 = _ _ )</td>
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