

HANDOUT 1	Handout Overview
HANDOUT 2	Doing Math as a Mathematical Community
HANDOUT 3	Beliefs and Problem-Based Teaching and Learning
HANDOUT 4	Reasoning to Find Area
HANDOUT 5	Problem-Based Teaching and Learning Reflection
HANDOUT 6	Problem-Based Lesson Structure
HANDOUT 7	Learning Targets
HANDOUT 8	My Reflections
HANDOUT 9	Pre-Work for Part 2: Inviting Student Thinking
HANDOUT 10	Are You Ready for More?

Learning Goals

1. Let's explore how students learn math in a problem-based classroom.
2. Let's see how the lesson structure ensures students make their thinking visible.
3. Let's reflect on teacher moves that support problem-based learning.
4. Let's examine elements of a problem-based classroom community.

Teach and Learn Virtual Note Page Links

Part 1 | [Part 2](#) | [Part 3](#) | [Part 4](#)

HANDOUT 2

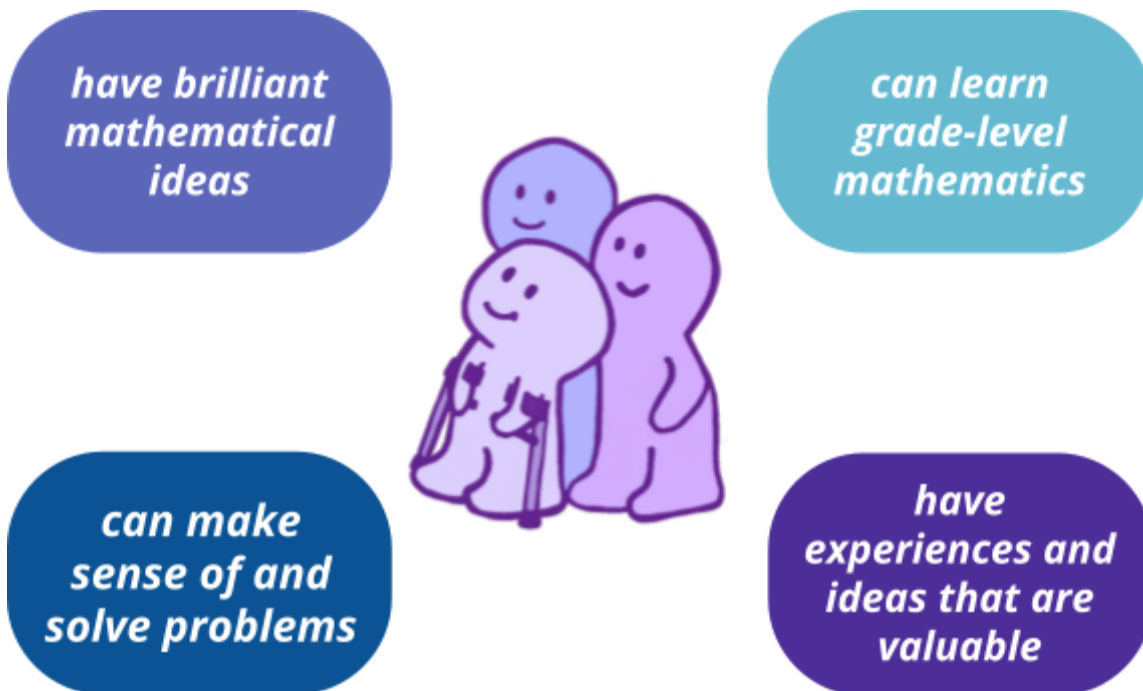
Doing Math as a Mathematical Community

Mathematical Community	
<i>Doing Math sounds like...</i>	<i>Doing Math looks like...</i>
• Students are encouraging each other • • Meaningful conversations about the problem/work. • • Connecting problems to real world • • Two-way conversation and thinking aloud • Students working together to solve various problems (real world, naked, etc...) • Some students speaking, others listening and quiet. • Students are using math terminology • • Putting the numbers together to get an outcome. • • Students are sharing ideas about next steps.	• Students are gathered around completing an activity and each student has a clear role. • Students working together and creating strategies to solve problems • Using or creating proper strategies • Students sitting in a small group and listening (eye contact) to one another share ideas. • Working in groups or individually sometimes • • Listening, eye contact, sharing ideas, whole group and small group activities • Students working together to solve real world problems • Students are actually engaged in trying to solve math problems • • • Showing your work to show how you got your solution(s) and checking to see it if it is correct • •

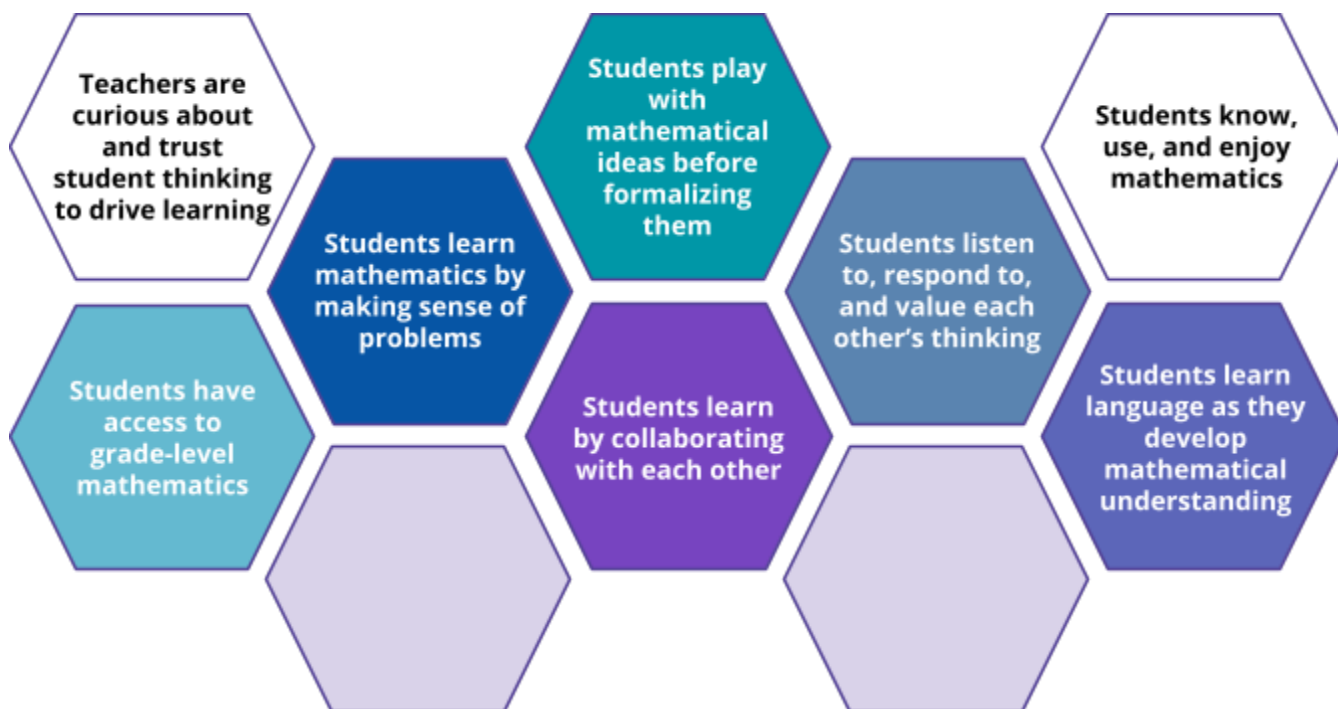
HANDOUT 3

Beliefs and Problem-Based Teaching and Learning

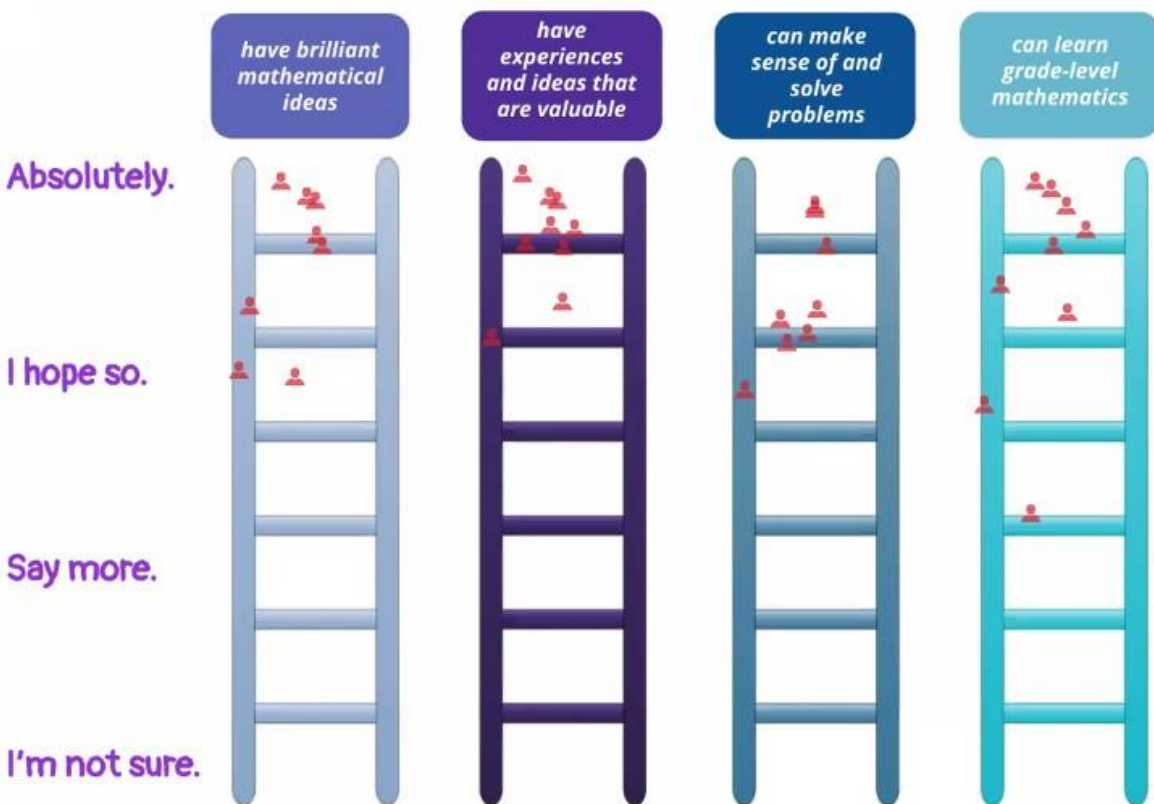
IM believes all students...



Problem-Based Teaching and Learning



I believe all students



HANDOUT 4

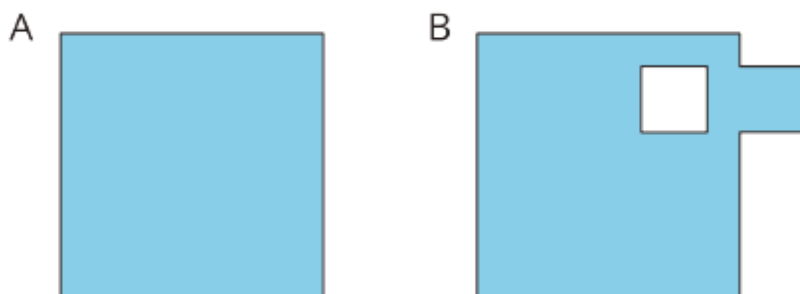
Reasoning to Find Area

Grade 6 Unit 1 Lesson 3: Reasoning to Find Area

Let's decompose and rearrange shapes to find their area.

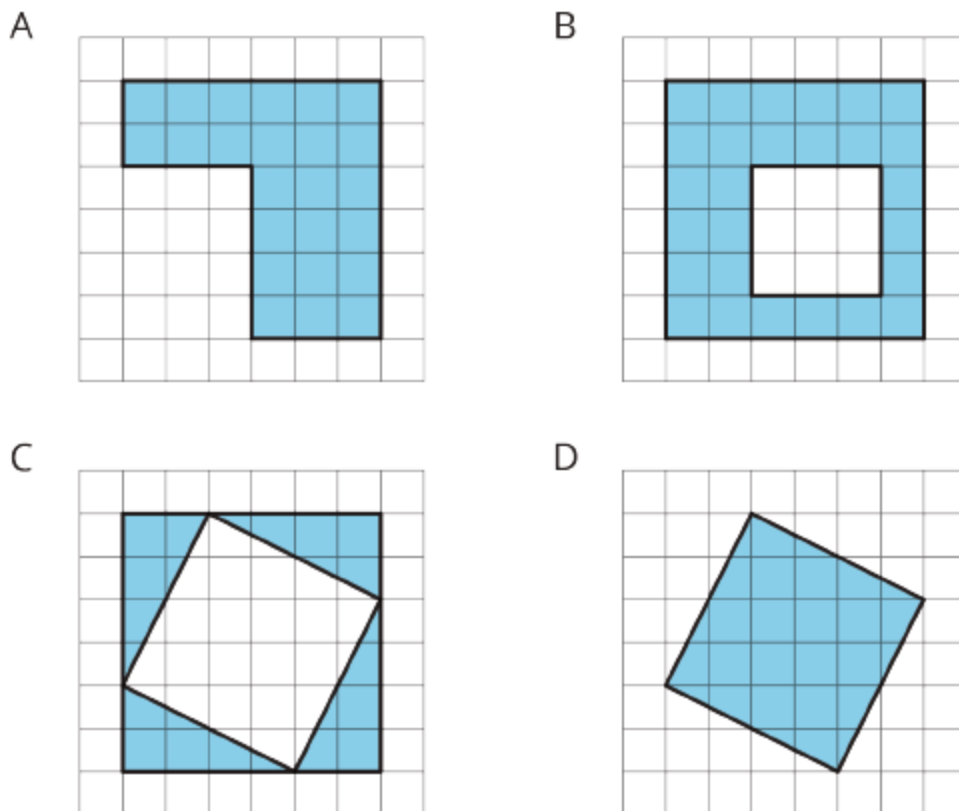
Warm-up 3.1: Comparing Regions

Is the area of Figure A greater than, less than, or equal to the area of the shaded region in Figure B? Be prepared to explain your reasoning.



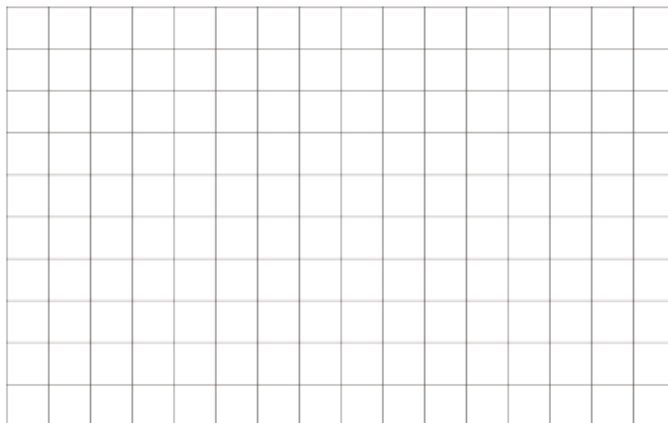
Activity 3.2: On the Grid

Each grid square is 1 square unit. Find the area, in square units, of each shaded region without counting every square. Be prepared to explain your reasoning.



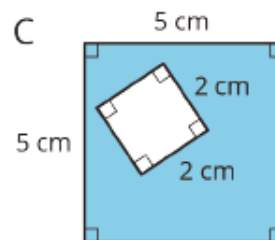
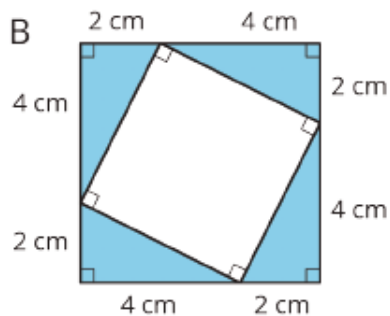
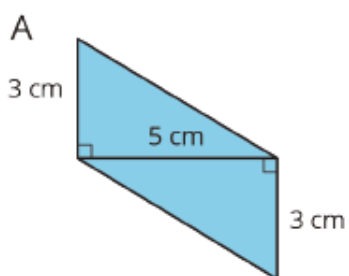
Are you ready for more?

Rearrange the triangles from Figure C so they fit inside Figure D. Draw and color a diagram of your work on the grid.



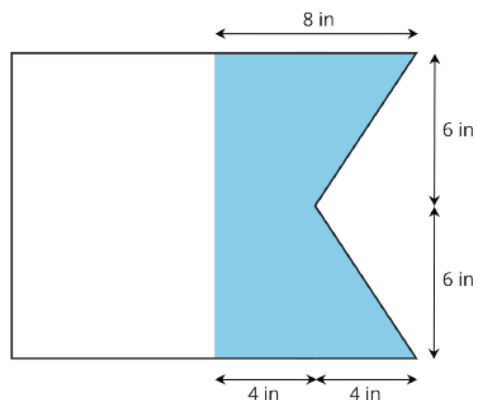
Activity 3.3: Off the Grid

Find the area of the shaded region(s) of each figure. Explain or show your reasoning.



Cool-down 3.4: Reasoning to Find Area

A maritime flag is shown. What is the area of the shaded part of the flag? Explain or show your reasoning.

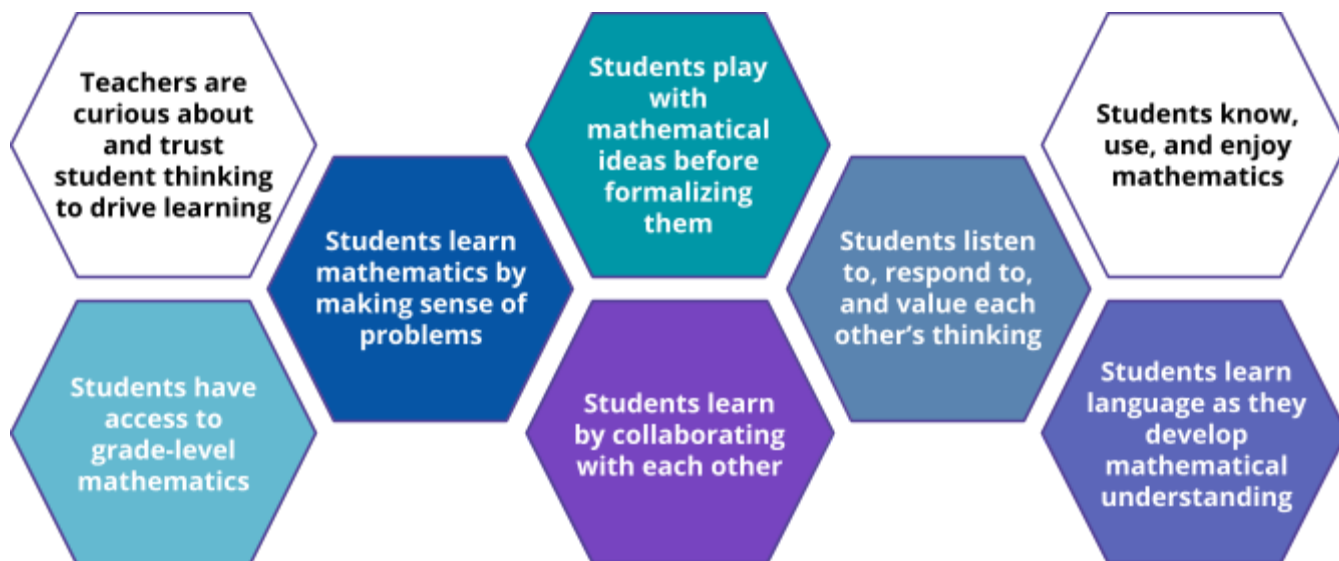


HANDOUT 5

Problem-Based Teaching and Learning Reflection

[Group 1](#) | [Group 2](#) | [Group 3](#) | [Group 4](#)

Problem-Based Teaching and Learning



Group 1

Where in the lesson did you experience these?

- Activities 3.2 (one the grid) 3.3 (off the grid)
- Whole group discussion
- Independent activities

What did your *teacher* do to create these opportunities for students?

- Ran a collaborative discussion
- Set a timer for our own thinking time
- Displayed multiple strategies

Group 2

Where in the lesson did you experience these?

- All through the lesson from start to finish
- Starting with the activity
-

What did your *teacher* do to create these opportunities for students?

- Referred to how others completed it
- Showed multiple versions of how to find minutes
-

Group 3

Where in the lesson did you experience these?

- Access to grade level material.
-
-

What did your *teacher* do to create these opportunities for students?

- Discussion on student thinking.
-
-

Group 4

Where in the lesson did you experience these?

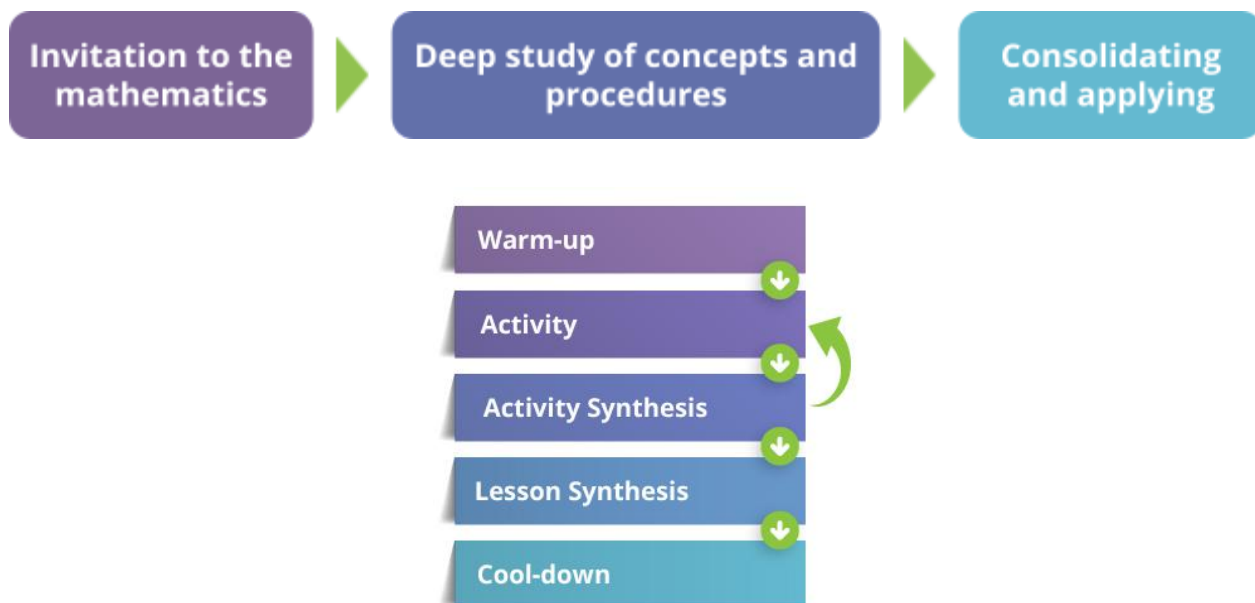
-
-
-

What did your *teacher* do to create these opportunities for students?

-
-
-

HANDOUT 6

Problem-Based Lesson Structure



Warm-up: The first event in every lesson is a ~5–10 minute warm-up.

Purposes:

- Invite students to get ready for the day's lesson.
- Give students an opportunity to strengthen their number sense or procedural fluency.
- Strengthen students' skills in listening and speaking about mathematics.

Activity: One to three classroom activities per lesson. The heart of the mathematical experience and the bulk of the time spent in class.

An activity can serve many purposes:

- Give students experience with a new context.
- Introduce a new concept and associated language.
- Introduce a new representation.
- Formalize a definition of a term for an idea they have encountered informally.
- Identify and resolve common mistakes and misconceptions that people make.
- Practice using mathematical language.
- Work toward mastery of a concept or procedure.
- Provide an opportunity to apply mathematics to a modeling or other application problem.

Are You Ready for More?:

Some activities have associated optional extension problems, made available to all students.

Activity Synthesis: The last portion of each lesson activity

- Students synthesize what they have learned in that particular activity.
- Each activity includes flexible options for teachers to support students in solidifying topics from the activity, often including questions to ask students.

Lesson Synthesis: After the lesson activities, the teacher summarizes the day's activities for ~5–10 minutes.

- Teachers ask students questions about the day's activities that enable students to synthesize what they have learned.
- Each lesson includes synthesis questions that a teacher might pose.
- Teachers can use this time in any number of ways, including providing an opportunity for students to think about their learning using the learning targets.

Cool-down: The last piece of every lesson is a ~5 minute cool-down.

- Students are given a brief formative assessment.
- Students work independently and turn in to the teacher.
- Responses can be used to guide further instruction.
- One cool-down is provided for every lesson, except the culminating lesson in the unit and the lessons in the culminating units (6–8) or modeling prompts (9–12).

Notes to Self

What is one thing you understand better after having read the *Problem-Based Lesson Structure* summary?

- Identify and resolve issues students may be having
- Make sure to allow students time to work on problems and lead discussions about their problem solving.
- Give students experience with new context.
- I want to make sure to share student work during each lesson and give students opportunities to explain their thinking to the class.
- Remember to do lesson synthesis discussing what has been discussed
- Have students complete cool down and use the results to guide future learning
- Allow students opportunity to explore and share their thinking.
- All ideas are good ideas.
- Facilitate student learning by allowing students to learn from each other.
- Allow the students time to work with each other and share their ideas
- Be sure to allow students to lead and give them the opportunities to share their learning experience.
- teacher had very little direct instruction and used the student thinking to drive the lesson.
-
-

What is the one most important thing you want to remember about the *Problem-Based Lesson Structure* as you prepare to teach?

- Give students experience with new context.
- Give students the opportunity to work with different shapes and explore the concepts.
- Give students the chance to experiment with different techniques to solve problems before they formally decide how to solve it
- Give students time to work with concepts and try to solve using different techniques.
- Give the students an opportunity to work with each other and “play around” with the problems to come up with their response. Once they have worked with each other allow them time to come up with a solution together.
-
-
-
-
-
-
-
-

Overarching Design Structure



In the activity after the Warm-up, where do students experience the

Invitation?

- In the actual activities
- Introducing the concept and language
-
-
-
-
-
-

Deep Study?

- Activity synthesis
-
-
-
-
-
-
-

Consolidate and Apply?

- Cool Down
-
-
-
-
-
-
-

HANDOUT 7

Learning Targets

1. I can identify opportunities for students to learn mathematical ideas through the experience of solving problems.
2. I can describe the structure of a lesson and the purpose of each component.
3. I can recognize teacher moves that support problem-based learning.
4. I can describe teacher moves that build a positive inclusive mathematical community.

HANDOUT 8

My Reflections

Experiencing Problem-Based Instruction	E = Excited What are you excited about? Getting to learn the strategies and methods to use when teaching from IM. I am excited about using IM as a teaching tool – giving it another shot, since I didn't quite understand the usefulness of the parts of each lesson. I am excited to try to use the lessons again with my self-contained classroom getting them to lead some parts of the lessons. W = Worry What are you worried about? Using the notebook and the other apps used during the instruction. Making sure the students are able to follow along; worried about how this would work in a classroom of less than 5 students. Worried that my students will become overwhelmed with the different parts of a lesson since there are only 3 students in each of my classes. N = Need to Know What do you need to know? How to best get students with special needs to get interested in doing the problems when they don't like math or struggle with the concepts Gaining students interest from the beginning, when most say they don't like math. How can I get my students interested in the word problems. They can barely read and it causes a barrier to completing the math work. S = Stance or Step What is your current stance? How might you move
--	---

forward?

This class is going to help immensely.

Keeping a new positive mindset about IM.

Keep being positive with the Kiddom curriculum and try to find ways to get my students interested in it.

HANDOUT 9

Pre-Work for Part 2: Inviting Student Thinking

The following Pre-Work will help prepare you for Part 2: Inviting Student Thinking so that the time you spend with us is relevant and productive.

- Navigate to <https://im612.org/TandLprework> to make your own editable copy of the Pre-Work for Parts 2-4.
- In your copy, complete the Pre-Work for Part 2 activities. In Part 2, you will navigate to a lesson on your own. If you're short on time, plan to focus on the Exploring a Lesson section after logging in. You can save the rest of the tour for after Part 2.
- Take a Tour of Kiddom's Online Platform.
- **Kiddom:** <https://app.kiddom.co/classes>
- Username: plevents@illustrativemathematics.org
- password: enjoymathematics

[PDF to print or save](#) **OR** [Make a copy for your own Google Drive](#)

- Explore the Unit Titles for your grade level or course within your platform.
 - What do you notice?
 - What do you wonder?
- Plan time for the remaining Pre-Work. There is Pre-Work for Parts 2-4.
- Use any remaining time to explore the **Are You Ready For More?** activities and resources on the next handout.

HANDOUT 10

Are You Ready for More?

We value reflection and consolidation as an important part of learning. To that end, we offer the following set of carefully chosen activities to help deepen your understanding of Problem-Based Teaching and Learning.

Finding Opportunities to Build Mathematical Community

In the Teacher Materials: Kiddom: <https://app.kiddom.co/classes>

Navigate to a lesson (suggestions below) to explore how the teacher materials provide opportunities for students and teachers to build a positive and inclusive mathematical community for problem-based teaching and learning.

Where in the lesson do you see opportunities for the teacher and students to:

- be curious about and trust student thinking to drive learning
- learn by collaborating with each other
- learn math by making sense of problems
- listen to, respond to, and value each other's thinking?

Lessons from Unit 1	Lessons from Unit 2
• Grade 6 Lesson 6: Area of Parallelograms • Grade 7 Lesson 4: Scaled Relationships • Grade 8 Lesson 2: Naming the Moves • Algebra 1 Lesson 4: The Shape of Distributions	• Grade 6 Lesson 3: Recipes • Grade 7 Lesson 1: One of These Things Is Not Like the Others • Grade 8 Lesson 1: Projecting and Scaling • Algebra 1 Lesson 5: Equations and Their Graphs

Subscribe to the IM Blog

Once you have clicked on a blog post, subscribe to the blog by entering your email address on the right sidebar. Subscribing will ensure you receive email notifications of future blog posts.

Blog Posts on Problem-Based Learning:

- [What Is Problem-based Instruction?](#)
- [How Do Students Perceive Problem-based Learning?](#)
- [Inviting Students to the Mathematics](#)
- [Concrete Representations that Give Student a Way to Get Started](#)

Copyright Information: All curriculum excerpts are under the following licenses.

IM 6–8 Math™ was originally developed by Open Up Resources and authored by Illustrative Mathematics®, and is copyright 2017-2019 by Open Up Resources. It is licensed under the Creative Commons Attribution 4.0 International License ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)). OUR's 6–8 Math Curriculum is available at <https://openupresources.org/math-curriculum/>.

Adaptations and updates to IM 6–8 Math are copyright 2019 by Illustrative Mathematics®, and are licensed under the Creative Commons Attribution 4.0 International License ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).

Adaptations to add additional English language learner supports are copyright 2019 by Open Up Resources, and are licensed under the Creative Commons Attribution 4.0 International License ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).

Adaptations and additions to create IM 6–8 Math Accelerated are copyright 2020 by Illustrative Mathematics®, www.illustrativemathematics.org, and are licensed under the Creative Commons Attribution 4.0 International License ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).