
Engaging in Reading: Visualizing

MATHEMATICS

Unseen text is the information that resides inside the reader's head: ideas, opinions, essential background knowledge. The unseen text is unique to each reader. (Cris Tovani, 2002)

Visualizing text is a crucial skill for students because if they can get a picture, often they've got the concept. When students don't get those pictures in their heads, the teacher may need to think aloud and talk them through the ideas in the text, explaining the pictures that come to mind. Visualization can help students to focus, remember, and apply their learning in new and creative situations. It is an invaluable skill in subjects such as Math, Science, and Design & Technology, where understanding spatial relationships can be a key to solving complex problems.

Purpose

- Promote comprehension of the ideas in written texts by forming pictures in the mind from the words on the page.

Payoff

Students will:

- reread and reflect on assigned readings.
- develop skills for independent reading.
- improve focus and attention to detail.

Tips and Resources

- Words on a page can be a very abstract thing for some students. They might not immediately inspire pictures in the mind or create other types of sensory images. Teaching students to visualize or create sensory images in the mind helps them to transform words into higher-level concepts.
- Students develop skills of visualization and improve comprehension when they integrate information presented visually e.g., in pictures, diagrams, drawings, models etc. with text. Consider photocopying the instructions for a task such as the grade 7 exemplars task: <http://www.edu.gov.on.ca/eng/document/curricul/elementary/exemplars/math/grade7/measure1.pdf>. Cut apart the text from the pictures. Ask students to match the pictures to the text (see the Student/Teacher Resource, *Visualizing – Sample Matching Activity*).
- Students may interpret the sample picture in a glossary as the only example of the word e.g., a polygon.
- Challenge students to make a visual glossary by finding a way to communicate the meaning of a mathematical word visually e.g.

frac		
tion	s	lope
- Simple warm-up exercises can help students develop mental images of mathematics. For example, project a geometric drawing, a representation of a slope, or a picture of two-coloured tiles modeling an integer on an overhead projector for a few seconds and then ask students to draw what they saw. Compare the drawings of the students. For further information about this strategy and two samples go to: <http://www.learnnc.org/index.nsf/doc/quickdraw>
- Problem solving strategies such as Make a Model, Draw a Picture or Diagram and Act it Out provide students with opportunities to develop skills in visualizing.
- See Teacher Resource, *Visualizing – Sample Text to Read Aloud*. Also see Student Resource, *Visualizing – Practice*.
- See Student/Teacher Resource, *Visualizing – Sample Matching Activity*.

Further Support

- Learning to visualize takes practice. Model the strategy of visualizing for your students, using a variety of mathematical texts..



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What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> • Read a story problem or the assigned text to students, asking them to try and “see” in their minds what the words are saying. • Model the strategy of visualizing by sharing some mind pictures derived from the text through Think Aloud See Teacher Resource, <i>Visualizing – Sample Text to Read Aloud</i>, which includes a think-aloud script. Invite students to sketch or share the pictures they have in their heads. • Engage students in a class discussion about the connections that they made between their experiences and the text through the pictures in their minds and how these connections enable them to understand the text. • Give students an example of the importance of the mental pictures by sharing or modeling the use of a picture or concrete model as a problem solving strategy. 	<ul style="list-style-type: none"> • Try to create pictures in your mind as the text is read. Record the pictures as sketches or labeled diagrams; or represent the pictures with concrete materials.
<p>During</p> <ul style="list-style-type: none"> • Provide additional text samples. See Student Resource, <i>Practise Visualizing from Text</i> or a selection of problems or text from a textbook or test. • Ask students to work individually to create mind pictures from the text. • In small groups, ask each student to compare their mind pictures with other students. 	<ul style="list-style-type: none"> • Make notes, sketches, or concrete models of the mind pictures that emerge as they read the additional text sample. • Compare and discuss their mental images. • Ask questions to understand why the mental images may differ.
<p>After</p> <ul style="list-style-type: none"> • Engage students in whole-class discussion about the kinds of things that may have triggered their mind pictures or mental images e.g., understanding of a specific word, personal experience, a problem from a previous lesson or even a previous grade. • Identify ways in which the various experiences of individuals result in different connections to the text. Identify the importance of making connections to understand the mathematics in the text. • Remind students that textbook features (such as diagrams, pictures, or a glossary) may help them create more accurate and detailed mind pictures. 	<ul style="list-style-type: none"> • Identify the ways in which personal experiences are used to make connections to the text. • Identify ways in which the features of text may help them create pictures in their minds from the text. Identify ways in which pictures could be incorporated when note-taking.

Notes


Visualizing – Sample Text to Read Aloud

TIPS: Section 2 – Patterning to Algebraic Modelling, Grades 7, 8, and 9
<http://www.curriculum.org/occ/tips/index.shtml#section2>

Text	Think-aloud Script
<div data-bbox="207 577 779 1039" style="border: 1px solid black; padding: 10px;"> <p>The picture shows 4 stages in the construction of a walkway. The walkway starts with a hexagon and continues with squares.</p> <div data-bbox="470 693 730 871" style="text-align: center;"> <p>1 2 3 4</p> </div> <p>Determine the perimeter of the walkway when it has one hexagon and 352 squares.</p> <p>Show your work.</p> </div>	<p>When I read the first sentence I remembered the walkway between the houses to get to the park. There wasn't a street or road but only a place for walking. The walkway in the picture in my head is made of rectangles. The walkway in this problem has squares but first there is a hexagon. I wonder if it is a regular hexagon. I can use the picture to answer this question.</p> <p>The text says that the picture shows 4 stages in the construction of a walkway. At first I was confused because I thought of a stage for acting but that didn't make sense. The picture of the shapes and the numbers under them helped me understand that the 4 stages showed the sequence for building the walkway like when you are following instructions so you know what is happening first, second and so on. Now I imagine each "stage" as being in a box on a page of instructions for how to make the walkway.</p> <p>This reminds me of the problems that we solved about growing patterns. The picture I have in my mind has a pattern made with equilateral triangles. We didn't have enough materials to keep extending the pattern so we made a table, and looked for relationships in the numbers in the table to make predictions and generalize the pattern. I plan to make a table to solve the problem.</p> <p>(The teacher can use an overhead, blackboard, manipulatives, or chart paper to model making pictures, diagrams, constructions, and sketches of the mind pictures that emerge from making connections with the text e.g., a walkway between houses, a series of rectangles in a sidewalk, a piece of paper divided into boxes with one stage of the walkway in each box, pictures of a growing pattern using equilateral triangles etc.)</p>

Visualizing – Practice

Read and think about each of the samples below.
Then record in your notebook the pictures that come into your mind based on the words you read.

#	Text Sample – Grade 9 EQAO Release Material www.eqao.com
1.	<p>A group of 4 friends is going bowling at Bowling Bonanza.</p> <p>Bowling Bonanza charges</p> <ul style="list-style-type: none"> • \$2.50 for each player to rent shoes plus • \$20/h for a group of 4 to bowl. <p>This group of friends wants to spend \$80. How many hours can they bowl at Bowling Bonanza? Give reasons for your answer or show your work.</p>
2.	<p>William and his 3 friends are going bowling. He finds an advertisement in the newspaper for a new bowling alley, Super Bowl. William and his friends will play 6 games in 3 hours.</p> <p>Determine whether William and his friends should go bowling at Bowling Bonanza or Super Bowl. Use the information given in the advertisement and in the hint box.</p> <p>Give reasons for your answer.</p> <div data-bbox="293 1215 522 1480" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><i>Super Bowl</i></p> <ul style="list-style-type: none"> • Free bowling shoes • Each player pays \$3.00 per game  </div> <div data-bbox="266 1486 602 1579" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Hint: Bowling Bonanza charges</p> <ul style="list-style-type: none"> • \$2.50 for each player to rent shoes and • \$20/h for a group of 4 to bowl </div>
3.	<p>A survey is taken at a secondary school to determine the number of minutes per week that students spend reading for leisure.</p> <p>Aaron surveys 10 students from a Grade 10 boys' phys. ed class. Aaron's teacher says, "That's not a good sample of the entire school population, because you only asked Grade 10 students." List other reasons why Aaron's sample does not represent the entire school population.</p>

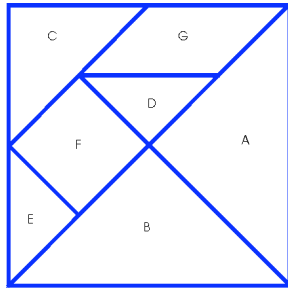
Visualizing – Sample Matching Activity

TIPS: Section 3 – Grade 7, Days 1 - 4

<http://www.curriculum.org/occ/tips/index.shtml#section2>

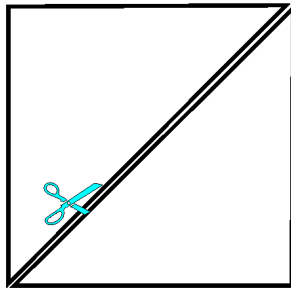
Cut the text instructions from the pictures. Ask students to match the pictures to the text instructions.

2.1: Constructing a Tangram from a Square

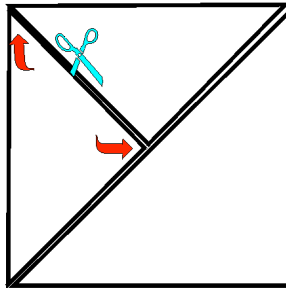


The seven tangram pieces can be geometrically constructed from a square.

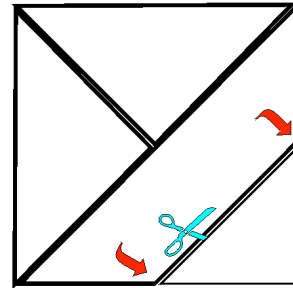
Use paper folding and scissors to cut along the folds and create the seven tangram pieces.



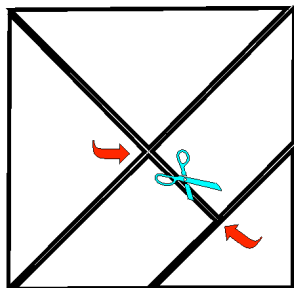
Fold along the **diagonal** of the square. Cut.



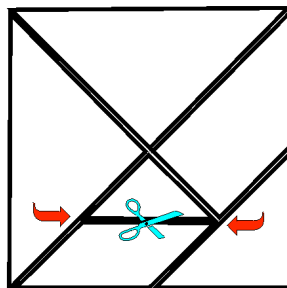
Fold the **perpendicular bisector** of one of the **right isosceles triangles**. Cut along the bisector.



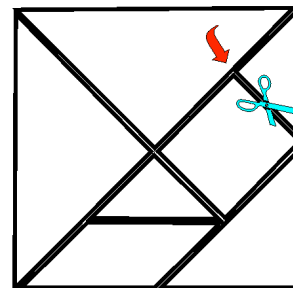
Crease the **midpoints** of the two sides of the large right isosceles triangle. Fold the line joining the midpoints. Cut.



Crease the **midpoints** of the two **parallel sides** of the **trapezoid**. Cut along the line that joins the midpoints.



Crease the **midpoint** of the longest side of the **right trapezoid**. Fold a line joining the midpoint to the opposite vertex. Cut.



Crease the **midpoint** of the longest side of the trapezoid. Fold an **altitude** from the midpoint. Cut.