Math Forum Teacher Packet
TI Activity: Midpoint Quadrilateral

Focus Activity: I Notice, I Wonder

http://mathforum.org/mathtools/activity/159528/

Welcome!

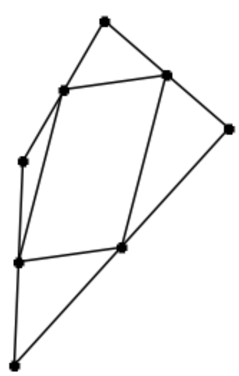
This packet contains a copy of the original problem used to create the activity, rationale and explanation behind the "I Notice, I Wonder" focal activity, and some thoughts on why this activity works well with TI-Nspire™ technology.

All of the problems and activities are samples of the Math Forum's Problems of the Week, paired with activities from the Problem Solving and Communication Activity Series. We are highlighting activities and problems that make good use of TI-Nspire™ handhelds.

Teachers and/or students are able to electronically access this and similar problems after setting up a login (free) available from the Math Forum @ Drexel. Sign up using the link on the Technology Problems of the Week (tPoW) login page, or use your existing KenKen® or Problems of the Week login–see this page for details: http://mathforum.org/tpow/about.html

The Scenario

Midpoint Quadrilateral



Standards

This problem presents an opportunity for students to think about properties of quadrilaterals, and also to work on confirming observations through geometric reasoning.

If your state has adopted the Common Core State Standards, this alignment might be helpful:

Geometry: Prove Geometric Theorems

G.CO.11. Prove theorems about parallelograms.

Mathematical Practices

3. Construct viable arguments and critique the reasoning of others.

7. Look for and make use of structure.

The Strategy

This activity focuses on the strategy: I Notice, I Wonder. The activity encourages students to use dynamic geometry software to notice and wonder, and then suggests the specific strategy of making structure visible to help students find more relationships.

The TI-Nspire

In this activity we use the TI-Nspire™ software's dynamic geometry software. Students notice and wonder about relationships in an interactive construction. They are encouraged to make and test conjectures and reason about them.

Students can use the TI-Nspire™ to measure their drawing as well as adding auxiliary lines to make structure more visible.

Join Us!

Do your students like to use their mathematical imaginations? Wonder about math all around them? Discover and invent new patterns? Here are some ways for them to share their ideas and learn about other students' and mathematicians' ideas!

http://mathforum.org/explorers/

Are you a **Math Explorer?**

Do you like to use your mathematical imagination? Wonder about math all around you? Discover and invent new patterns? Here are some ways to share your ideas and learn about other students' and mathematicians' ideas!

Problems of the Week

Drawing from the real world, our own math imaginations, or famous problems and puzzles, these bi-weekly challenges give you a chance to stretch your mind. Share your work with teachers, parents, Math Forum volunteers, and the world!

Wonderama

We share pictures and stories that make us wonder. What do you notice and wonder? Share in the comments and submit your own images!

KenKen

Do you like Sudoku puzzles? Try your hand at KenKen! These puzzles combine math reasoning with Sudoku-style logic to really stretch your brain! KenKen problems are free but they do require a registration.

Math Ideas for Science Fair Projects

Science fair projects in chemistry, physics, or biology can be messy, smelly, unpredictable, even downright dangerous! This year, try a mathematical science fair project. These tips and ideas can get you started, and the most dangerous things you'll encounter are a geometry compass and some radical ideas.

Technology Problems of the Week

How do aliens make change? Can you beat the balloon booth challenge? Technology Problems of the Week (tPoWs) are **free** problem-solving challenges complete with hints and answer checks so you can test yourself at many levels.

Ask Dr. Math

Mathematicians answer your questions... in ways that make you think! We're always looking for volunteer math doctors too!

Math Tools

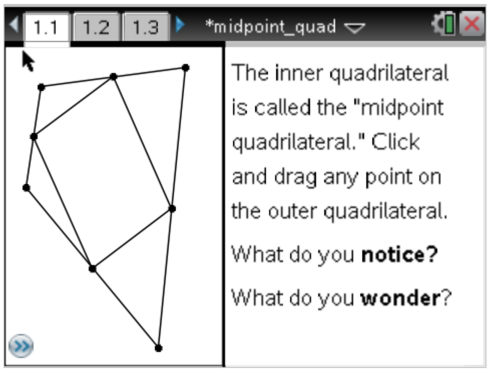
Looking for math you can really get your hands on? Math Tools is a library of online interactive math tools that use technology such as Java, Flash, spreadsheets, dynamic geometry software, graphing calculators, and more! Users can search for the tools and also can save favorites, rate items, and read and participate in discussions linked to each resource.

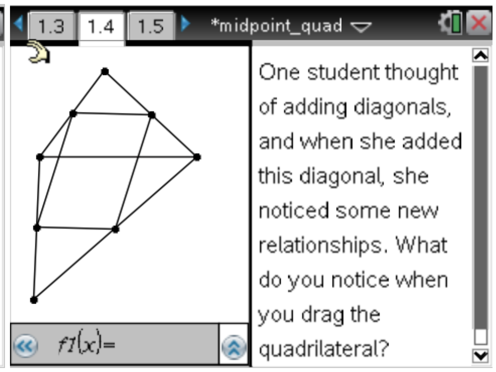
K-12 Math Problems, Puzzles, Tips & Tricks

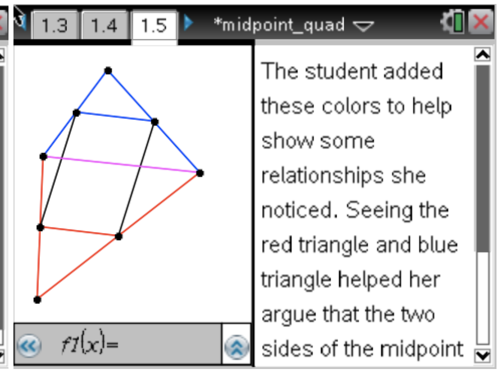
This page offers links to the Beat the Calculator archive of over 600 mental calculation tricks from the BEATCALC mailing list. Pages of Multiplication Tips and Divisibility Rules are also linked as well as Russian Math Olympiad problems and a variety of math puzzles including our popular Year Game!

The Activity

Key Screen Shots







Possible Responses

Noticings, Wonderings, and Conjectures	Argument for why the midpoint quadrilateral is a parallelogram
The outer quadrilateral can be lots of weird shapes The midpoint quadrilateral is more regular The midpoint quadrilateral is a parallelogram The midpoint quadrilateral's opposite sides are congruent The midpoitn quadrilateral's opposite sides are parallel You can make the midpoint quadrilateral a rectangle You can also make it a square The outer quadrilateral looks like a trapezoid when the midpoint quadrilateral is a rectangle The outer quadrilateral looks like a kite when the midpoint quadrilateral is a square.	When you draw either diagonal of the outer quadrilateral ABCD, it splits it into two triangles, ABD and CDB. Because we have connected the midpoints of adjacent sides, we've also connected the midpoints of adjacent sides of the triangles. Call the midpoint of AB, M and the midpoint of AD, N. AMN is similar to ABD by SAS~, since AM is half of AB, AN is half of AD, and angle A is congruent to itself. Therefore, angle AMN is congruent to angle ABD because corresponding angles in similar triangles are congruent. Therefore, MN is parallel to BD since corresponding angles congruent imply parallel lines. The same argument establishes that the line connecting the midpoints of triangle CDB is parallel to BD. Since the lines connecting both sets of midpoints are parallel to the same line, they are parallel to each other. Finally, the same series of arguments can be used to show that the other set of opposite sides of the midpoint quadrilateral are parallel to one another, and therefore the midpoint quadrilateral is a parallelogram. A similar argument could be made establishing that opposite sides are congruent, rather than parallel.