

Mathematics: The Language of STEM
Running Around
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CONTENT AND TASK DECISIONS

Grade Level(s): 3rd

Description of the Task: Students will plan and sketch the shortest possible running route when given a constant area.

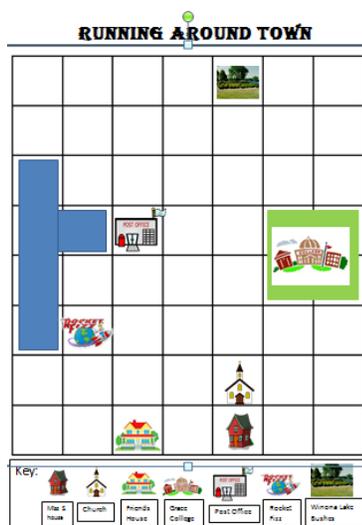
Indiana Mathematics Content Standards: 3.M.5: Find the area of a rectangle with whole-number side lengths by modeling with unit squares, and show that the area is the same as would be found by multiplying the side lengths. Identify and draw rectangles with the same perimeter and different areas or with the same area and different perimeters.

Indiana Mathematics Process Standards: Identify (by number) the Indiana mathematics process standard(s) that your lesson will address, and describe how students will be engaged in the process(es).
PS.1: Make sense of problems and persevere in solving them.
PS.2: Reason abstractly and quantitatively.
PS.3: Construct viable arguments and critique the reasoning of others.
PS.4: Model with mathematics.
PS.5: Use appropriate tools strategically.

Mathematics Content Goals: Students will understand what affects a perimeter to change while area remains the same.

Language Objectives: Students will explain through written language what determines perimeter and what allows perimeter to change when the area stay constant.

Materials: Video: homemade (alternative: a running video), square tiles, map on graph paper, and pull-a-part Twizzlers/ Wikki sticks. (Colored pencils for marking the route can be optional.)



THE LESSON

Before:

- Show homemade video. This video should include a real running situation.
- In this video, explain that you are going to go on a run. You want a good workout, so you want to run around twenty city blocks. You will keep the same pace the entire time. You are in a hurry though. Ask them to help you find the fastest route.
- Explain that they will need to start and end at the same place, such as your house.
- Explain that the grid lines are roads.

During:

- **Let go:** Split your class into small groups. Assign and instruct a runner to collect grids map from the tool table for each student in his/her group. (Explain that each person needs to make a route, but they will work together as a team.) This is student's exploration time without intervention from the teacher. Remind students that you will be running the same speed the entire time.
- **Listen actively:** Listen as students discuss which streets should be taken to run the quickest route.
- **Ask Questions such as:**
 - How did you decide to take that street?
 - How did you determine which route would be the fastest?
 - What observations did you make that helped you make that decision?
- **Extension:** Have students explore if there is another route that would just as quick as their previous route.

After:

- Have students share their route with someone from another group that has a different route.
- Have them share why they believe that their route is the shortest.
- Then have a couple of selected students to present their running routes in front of the class using the document camera. Have them share what helped determine their route and how long their route is.
- Compare each groups routes with each other.
- **Ask:**
 - Which route would be the most scenic?
 - Which route might be the hardest to run?
 - Which route was the quickest? Why? What determined the outcome?

(Marathon Extension-Day 2)

- Show a 2x2 square and an "L" shape with two squares in the first column and one square in columns two and three. (Each shape should contain 4 square tiles.)
- Have students make the same shapes using tiles. Have them find the lengths of these shapes using pull apart Twizzlers or Wikki Sticks. This allows students to stick the Twizzlers/Wikki sticks to a surface to prevent them from moving around.
- After students have edged the shapes with the Twizzlers/ Wikki Sticks, have them tear off the excess and unwrap the shapes carefully to compare the lengths side-by-side.
- **Ask:**
 - Are the lengths the same?
 - Why are the lengths different?
 - What determines the length around an object/ area?

- Explain the term perimeter. (Perimeter is the length around an object.)
- **Ask:**
 - How can perimeter grow or lessen?

Summary

- Explain that perimeter increases because the number of exterior sides increases while the number of tiles used stays the same. This means that the more sides exposed means the greater the distance will be.
- Show another video clip of you, the teacher, thanking your students for finding the quickest route.

ASSESSMENT

Observe:

I will walk around and take notes on each student. I will look to see if students understand how to find the shortest route/perimeter.

Ask: Give students an exit slip.

Miss S. and Mrs. G. took a walk to the same park to play. Both teachers walked at the same pace, but Mrs. G. got to the park first. How can this be?

What makes the perimeter of an object to increase or decrease?

Possible Answer: When more sides are showing or a person runs/ walks down more streets, the perimeter and distance increase. When fewer sides are showing or a person makes less turns and runs down a fewer number of streets, the perimeter and length decrease.