

Math Challenge

Student Edition



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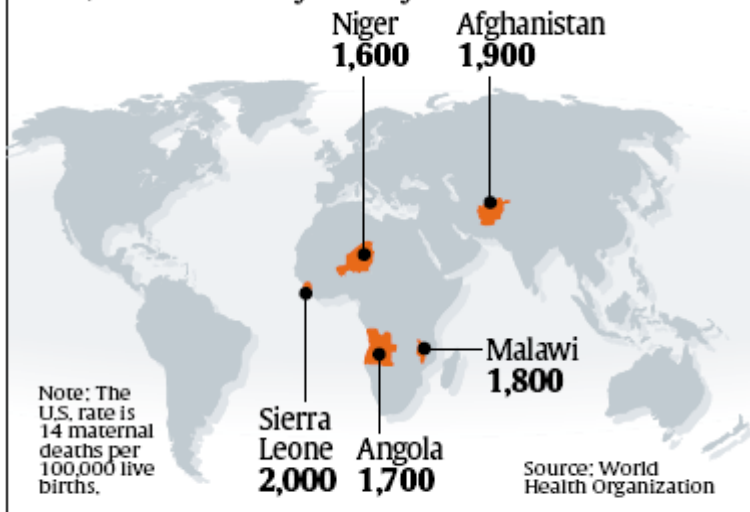
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Dangerous births

USA TODAY Snapshots®

Dangerous births

Complications during pregnancy and childbirth are a leading cause of death among women in developing countries. Highest maternal mortality rate per 100,000 live births by country:



By David Stuckey and Karl Gelles, USA TODAY

Activity Overview

You will explore the geometric relationships with triangles using perpendicular bisectors of the sides, bisectors of the angles and medians of the triangle. You will explore the three concurrent lines formed that pass through a single point. In turn, you will apply the relationships to determine a solution to a real-world problem.

Focus Questions

Q. Doctors want to build a medical center in the triangular region formed by Niger, Afghanistan and Angola that would be convenient for all three. Explain why you would build the medical center at that location.

Q. How would you find the location of the incenter of the triangular region formed by Niger, Sierra Leone and Malawi?

Q. How would you determine the balance point (center of gravity) for the region formed between Niger, Malawi and Angola?

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This activity was created for use with Texas Instruments handheld technology.

Dangerous births

Procedure:

Activity 1: You will explore the geometric relationships with triangles using perpendicular bisectors of the sides, bisectors of the angles and medians of the triangle. Complete Activity 1 before answering the Focus Questions.

Cabri Jr. Directions

- Press **[APPS]**, select Cabri Jr. and press **[ENTER]**.
- Press **[Y=]** (**[F1]**), select Open . . . , and press **[ENTER]**. Highlight **INCENTER** and press **[ENTER]**. The angle bisectors are included for the triangle.
- Determine the length of AB, AC, and AD. Press **[GRAPH]** and select Measure and D & Length.
- When all segments are measured, use the hand cursor to grab one of the vertices of the triangle and change the shape of the triangle.

Q. List any observations below about what happens to the lengths AB, AC, and AD as the triangle changes.

Cabri Jr. Directions

- Press **[Y=]** (**[F1]**), select Open . . . , and press **[ENTER]**. Highlight **CIRCUM** and press **[ENTER]**. The lines going through E, F, and G are the perpendicular bisectors of the sides of the triangle and A is the intersection of these three lines.
- Measure the segments AD, AC, and AB. Press F5 and select Measure and D & Length.
- Use the hand cursor to grab and move one of the vertices to a different location and answer the question below. Move the other vertices and answer the same question.

Q. List any observations below about what happens to the lengths AD, AC, and AB.

Cabri Jr. Directions

- Press **[Y=]** (**[F1]**), select Open . . . , and press **[ENTER]**. Highlight **CENTROID** and press **[ENTER]**. The lines GB, ED, and FC are the medians of the triangle. The point of concurrency, A, is the intersection of these three lines.
- Measure the area of triangles AGE, AFG, and AFE. Press F5 and select Measure and Area. Use the hand cursor to move these values to the appropriate triangle.

Data Source:

- World Health Organization.

Materials:

- TI-83 Plus family or TI-84 Plus family
- Graph paper
- Small straightedge

Additional Information:

- <http://www.mapsofworld.com/utilities/world-latitude-longitude.htm>
- <http://www.ed.arizona.edu/ward/Latitude/lat-explain.html>

Dangerous births

Q. Use the hand cursor (**ALPHA**) to grab one of the vertices of triangle GFE and list any observations about what happens to the areas. The centroid is called the balance point for the region.

Activity 2 Use the information from Activity 1 and the Snapshot “Dangerous births” to answer the focus questions.

Q. Doctors want to build a medical center in the triangular region formed by Niger, Afghanistan and Angola that would be convenient for all three. Explain why you would build the medical center at that location.

Step 1 Draw the diagram representing the triangular region formed by Niger, Afghanistan and Angola on graph paper. To assist in the drawing, use the following information about the longitude and latitude for the capitals of each country.

	Longitude	Latitude
Afghanistan:	69.11E	34.28N
Niger:	02.06E	13.27N
Angola:	13.15E	08.50S
Malawi:	33.48E	14.00S
Sierra Leone:	13.17W	08.30N

Note: Latitude is measured North or South of the Equator. Any point on the globe below the equator has a negative value for latitude, while points above the equator have positive latitude. Longitude is measured East or West of Greenwich, and in this activity West is negative and East is positive.

Step 2 Label your diagram and explain how and why you this location for the medical center in your diagram.

Q. How would you find the location of the incenter of the triangular region formed by Niger, Sierra Leone and Malawi?

Step 3 Draw the diagram representing the triangular region formed by Niger, Sierra Leone and Malawi on graph paper. Use the longitude and latitude information from above.

Step 4 Label your diagram and explain how and why you selected this location.

Student Notes:

Q. How would you determine the balance point (center of gravity) for the region formed between Niger, Malawi and Angola?

Step 5 Draw the diagram representing the triangular region formed by Niger, Malawi and Angola on graph paper. Use the longitude and latitude information from above.

Step 6 Label your diagram and explain how and why you selected this location.

Student Notes: