

Math TODAY

Teacher Edition

USA TODAY

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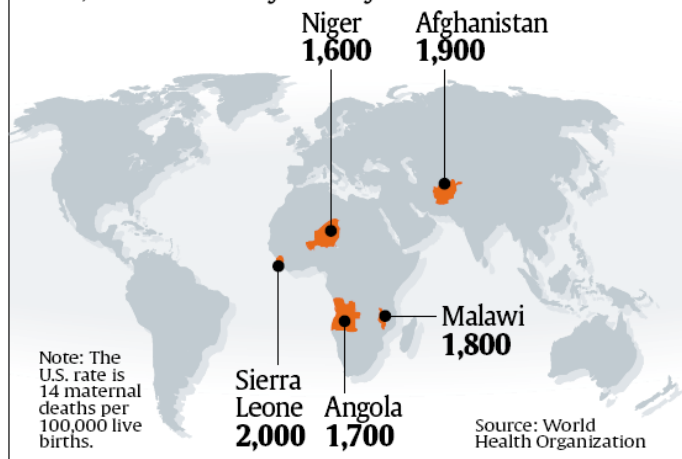
Dangerous births

by: Bob Tower

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:

In this activity students will explore the geometric relationships with triangles using perpendicular bisectors of the sides, bisectors of the angles and medians of the triangle. They will explore the three concurrent lines formed that pass through a single point. In this activity, students will graph by using latitude and longitude coordinates to represent the location of capitals of countries. Applying the relationships to a real-world problem will help students understand how geometry is used to solve problems.

Activity at a Glance:

- Grade level:9-12
- Subject: Geometry
- Estimated time required:50 minutes

Materials:

- TI-83 Plus family or TI-84 Plus family
- Overhead view screen calculator for instruction/demonstration
- Student handout
- Transparency
- USA TODAY newspapers (recommended)

Prerequisites:

Students should:

- know how to use Cabri Jr.
- have prior knowledge about medians of a triangle, perpendicular bisectors of an angle, and perpendicular bisector of a side of a triangle

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Concepts:

- Concurrent lines of a triangle
- Circumcenter of a triangle
- Incenter of a triangle
- Centroid of a triangle

Objectives:

Students will:

- identify properties of the circumcenter, incenter and centroid of a triangle.
- use longitude and latitude to graph the location of a particular city.

Background:

The purpose of this lesson is to help students to develop a better understanding of concurrent lines and properties of triangles. Students will apply the properties of medians, angle bisectors, and perpendicular bisectors of sides of a triangle to solve a real-world problem. Solutions to problems will be shown using a graph of longitude and latitude.

Preparation:

- Provide one graphing calculator for each student.
- Each student should have a copy of the corresponding student activity sheet.
- Provide each student with the following AppVars: CENTROID, CIRCUM, and INCENTER.

Classroom Management Tips:

- Have the students link the AppVars as part of the class period on the previous day or during the beginning of the class period when you are going to use this activity.
- Review opening an AppVars using Cabri Jr with your class before starting the activity.
- Students can work individually or in groups to assist each other during the activity.
- Have students discuss their discoveries while they work to better understand the relationships.
- Before starting the AppVars, remind students to carefully read the opening screen and the activity pages.

Data Source:

World Health Organization.

National Council of Teachers of Mathematics (NCTM) Standards:

Geometry Standard

- Use visualization, spatial reasoning, and geometric modeling to solve problems.
- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

Problem Solving Standard

- Solve problems that arise in mathematics and in other contexts.

Connections Standard

- Recognize and apply mathematics in contexts outside of mathematics.

TI Technology Guide, for information on the following:

- TI-83 Plus family or TI-84 Plus family
- Cabri Jr.

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Activity Extension:

- Challenge the students to find and bring in other examples of this type of graph from USA TODAY. Use these as additional problems for students to continue working on this topic or use as a review for an exam.
- Additional information about longitude and latitude can be found at <http://www.mapsofworld.com/utilities/world-latitude-longitude.htm>. Encourage students to find additional information and write a one-page summary.

Curriculum Connection:

- World Geography-world locations
- Algebra-equations of lines
- Physics-centroid

Teacher Notes:



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Assessment and Evaluation:

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.

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

A. The points D, C, and B are equidistant from the point of concurrency A.. The values AB, AC, and AD should remain constant but due to rounding these values may vary slightly.

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

A. The points B, C, and D are equidistant from the point of concurrency A. The values AD, AC, and AB should remain constant but may vary slightly due to rounding.

Q. Use the hand cursor to grab one of the vertices of triangle GFE and list any observations about what happens to the areas.

A. The area of triangles AGE, AFG, and AFE remains constant as the GFE changes. This means that A is the balance point of the triangle. If GFE were of uniform thickness and density the triangle would balance at the point of concurrency A.

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.

A. Find the perpendicular bisectors of the sides of the triangle formed by Niger, Afghanistan, and Angola. The point of concurrency would be equidistant from the three capital cities. This would place the medical center at a point most convenient for everyone to reach. Look at the student graph for more details.

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

A. The incenter would be found by determining the point of concurrency using the angle bisectors of the triangular region formed between Niger, Sierra Leone and Malawi. Look at the student graph for more details.

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

A. The balance point (centroid) would be found by determining the point of concurrency for the medians of the triangle formed between Niger, Malawi, and Angola. Look at the student graph for more details.