

## Mediators of a triangle

### Teacher Notes

#### Introduction

The aim of this activity is for students to investigate where the mediators of a triangle meet and to make and test theories for different situations and types of triangles.

The activity demonstrates the power of the dynamic geometry features of TI-Nspire to investigate a geometrical situation more quickly and accurately than would be possible using pencil and paper.

**11-14:** Reinforces ideas about properties of different types of triangles, acute and obtuse angles, perpendicular bisectors and introduces constructions.

**14-16:** Introduces the circumscribed circle and gives opportunities for proof.

#### Resources

Tracing (or reasonably transparent) paper.

One computer with TI-Nspire software and data projector.

TI-Nspire handhelds or laptops with software.

Two alternative TI-Nspire documents: MediatorsA.tns and MediatorsB.tns.

Student handout.

#### Skills required

Three possible versions are provided depending on the level of students' experience with using TI-Nspire.

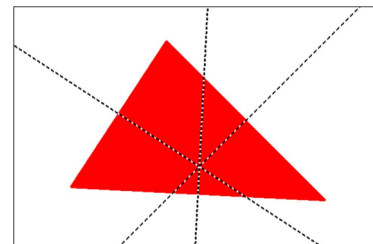
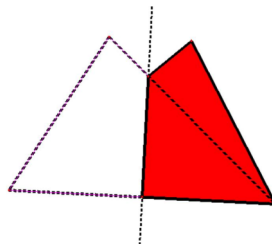
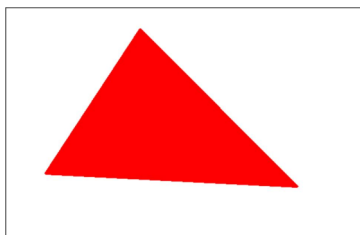
**Version 1:** Students with some experience of using TI-Nspire can open a new blank document and construct the triangle and mediators themselves. There are separate notes with instructions for students.

**Version 2:** A prepared TI-Nspire document, MediatorsA.tns, contains ready-drawn, draggable triangles. Students try out the Constructions menu and do single-stage constructions on the triangle.

**Version 3:** Students with little experience with TI-Nspire can use the fully prepared TI-Nspire document, MediatorsB.tns. They just need to be able to open the document and can then drag points on a prepared figure consisting of a triangle and its mediators.

#### The activity

Students are told to start by drawing a triangle on a piece of reasonably transparent paper (eg tracing paper). They are asked to fold each **side** of the triangle exactly in half (corner to corner) and to crease along the fold. Open the triangle out again and repeat for the other two sides.



**Questions:**

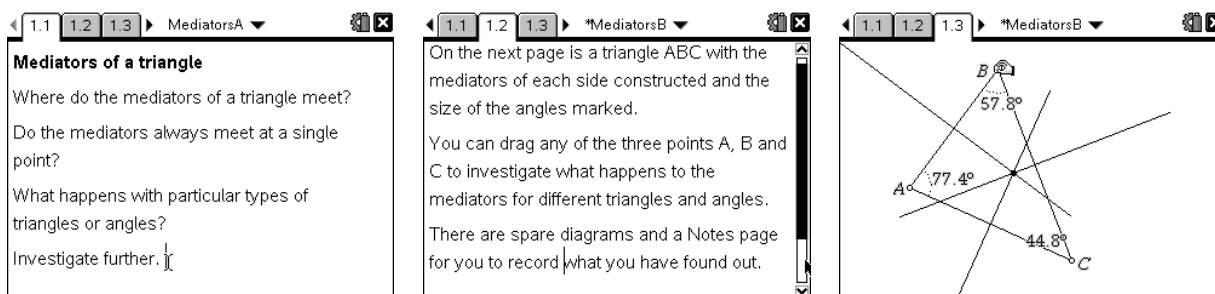
- Where do the folds meet? (Inside or outside the triangle?)
- Do the folds meet at a single point? Does this always happen?
- What happens with particular types of triangles or angles?
- Investigate further.
- How could TI-Nspire help with this investigation?

**Version 1.** Students open a new document themselves and insert a blank Geometry. They construct their own triangle and explore the Construction menu to find the particular construction that performs the same role as the folds that they made. They then manipulate the triangle to see what happens in different situations and make and test theories, writing notes on paper or using a TI-Nspire notes page. Separate Student Notes explain how to do this.

**Version 2.** Students use the document MediatorsA.tns, which has triangles with measured angles whose vertices can be dragged. They need to construct the mediators themselves and then proceed as in version 1.

**Version 3.** Students use the document MediatorsB.tns. This is a prepared tns file that has both triangles and their mediators already drawn. The vertices of the triangles can be dragged and they can then proceed as in version 1.

All students could use a TI-Nspire Notes page to record their findings.

**Extension questions:**

- What happens if you construct the circle whose centre is at the point where the mediators meet and which goes through one vertex of the triangle?
- Does it always go through the other vertices?
- Does this circle help to explain any of the observations that you made earlier?
- Can you explain your findings and your reasoning to someone else? You could also use a notes page to explain your findings.

**Rationale for using this activity**

**Use of technology:** This activity requires very little experience of using TI-Nspire and introduces the geometrical construction menu. The use of the software and dragging points is visually satisfying and speeds up the investigation and makes generalisation easier.

**Mathematical:** Students can make use of the software to investigate the intersection of the mediators of a triangle for different triangles and to make and test hypotheses and look for explanations and proof.

**Personal learning and thinking skills:** This activity requires students to be able to communicate their ideas and reasoning and can be used to encourage discussion.

**Further information**

The pencil and paper activity 'Mediators of triangles' appeared in the West Sussex Institute of Higher Education (now Chichester University) publication 'Generating Mathematical Activity in

the Classroom' by Marion Bird. Initially the class shared the results of their first practical triangle and examples of their further writing and reasoning are given in the publication.

This version was produced by Linda Tetlow.