

Euler Line

Guided Investigation

Teacher Notes & Answers

7 8 9 10 11 12



Introduction

The three triangle centres: orthocentre, centroid and circumcentre have many amazing properties, however there is one super property that connects them all! In this activity you will combine your learning from the three activities:

- Circumcentre
- Centroid
- Orthocentre



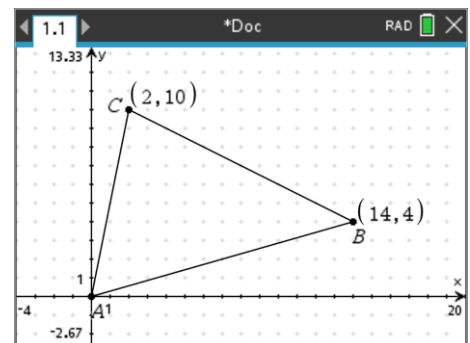
Spoiler alert: You can scan the QR code to watch a video and review the three centres and see what happens when all three centres are determined.

Geometry

Open a New TI-Nspire Document and insert a **Graphs Application**.

Draw a triangle with vertices:

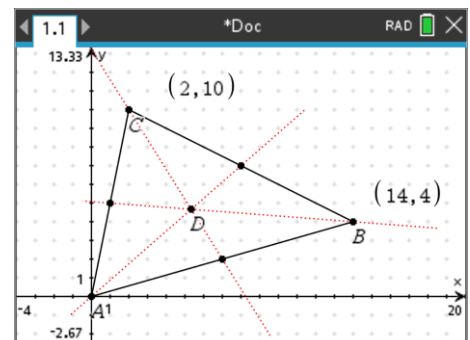
$$A:(0, 0) \quad B:(14, 4) \quad C:(2, 10)$$



Question: 1.

Construct and determine equation for the three median lines and hence their point of intersection. (Centroid)

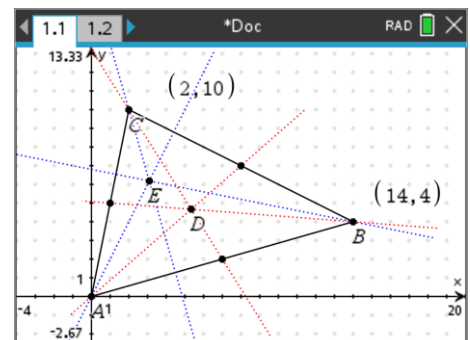
Note: In the diagram shown opposite the median lines have been changed to red dotted lines using the attributes and colour options. The centroid is at point D.



Question: 2.

Construct and determine the equation for the three altitudes and hence determine their point of intersection. (Orthocentre)

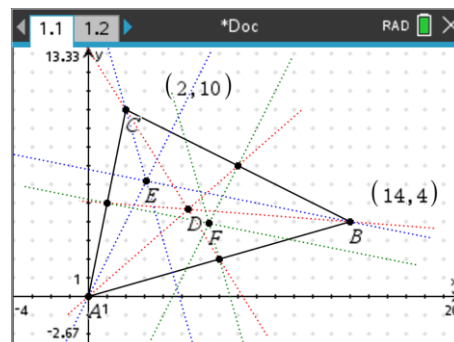
Note: In the diagram shown opposite the altitudes have been changed to blue dotted lines using the attributes and colour options. The orthocentre is at point E.



Question: 3.

Construct and determine the equation for the three perpendicular bisectors and hence determine their point of intersection.
(Circumcentre)

Note: In the diagram shown opposite the perpendicular bisectors have been changed to green dotted lines using the attributes and colour options. The circumcentre is at point F.

**Question: 4.**

Determine the equation to the line passing through points D (centroid) and E (orthocentre).

Question: 5.

Determine the equation to the line passing through points E (orthocentre) and F (circumcentre) and comment on the result.

Question: 6.

The triangle vertices are dynamic. Explore what happens to points D, E and F when the original triangle vertices are changed.

Question: 7.

Change vertex C on the original triangle to: (5, 9). Describe what happens to points D, E & F.

Question: 8.

Let m_1 = Gradient of line AB; m_2 = Gradient of line BC and m_3 = Gradient of line AC.

Determine the following:
$$-\frac{m_1 m_2 + m_2 m_3 + m_1 m_3 + 3}{m_1 + m_2 + m_3 + 3m_1 m_2 m_3}$$