Balancing Point

ID: 11403

Time Required
45 minutes

Activity Overview

In this activity, students will explore the median and the centroid of a triangle. Students will discover that the medians of a triangle are concurrent. The point of concurrency is the centroid. Students should discover that a triangle's center of mass and centroid are the same.

Topic: Triangles & Their Centers

- *median*
- *centroid*

Teacher Preparation and Notes

- *This activity was written to be explored with the TI-84 using the Cabri™ Jr. application.*
- *This is an introductory activity for which students will need to know how to construct triangles, grab and move points, measure lengths, and construct segments.*
- ***To download the student worksheet and Cabri™ Jr. files, go to education.ti.com/exchange and enter "11403" in the keyword search box.***

Associated Materials

- *BalancingPoint_Student.doc*
- *Centroid.8xv*
- *Medial.8xv*
- *Midseg.8xv*
- *TriangleCentroid.doc*

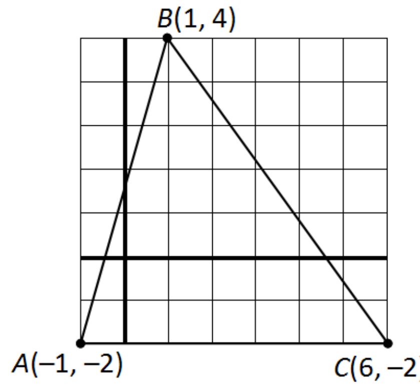
Suggested Related Activities

To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.

- *NUMB3RS - Season 3 - "Burn Rate" - Irregular Polygon Centroids (TI-84 Plus) — 7999*
- *NUMB3RS - Season 3 - "Burn Rate" - Regular Polygon Centroids (TI-84 Plus) — 8001*
- *Balancing Act (TI-Nspire™ technology) — 10122*

Problem 1 – Exploring the Centroid of a Triangle

Students are to cut out the triangle on their worksheet and attempt to balance it with their pencil. However, you may also use *TriangleCentroid.doc,* or cut out a triangle of your choice for students to use. Students will mark the balancing point on their triangle.

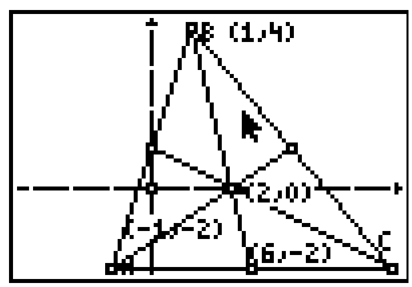


Students will then use their handhelds to find the point where the triangle will be balanced. They will be asked to compare their findings to see if their point was close to the point given by the calculator. Explain to the students that the balancing point for an object is called the center of mass.

Problem 2 – Exploring the Medians of a Triangle

Students will need to define the terms *median of a triangle* and *centroid* from either their textbook or another source.

Students will then create the three medians of the triangle given in *Centroid.8xv*. Students will need to find the midpoint of the three sides of a triangle. Students can access the **Midpoint** tool by selecting ZOOM **> Midpoint**. Then, students can click on a side of the triangle to place the midpoint.

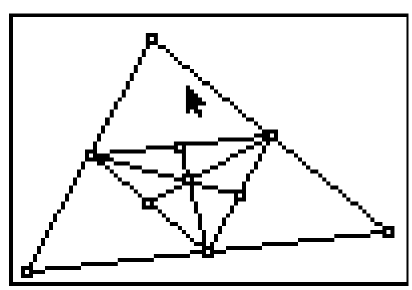


Next, students should construct the segment connecting point *A* and the opposite midpoint. Students can find the **Segment** tool by selecting WINDOW **> Segment**. They should repeat this for the other two medians.

Students are asked several questions on their accompanying worksheet. Students should be able to find the centroid of a triangle and understand that this point is the center of mass.

Problem 3 – Extending the Centroid

Students will extend the concept of the centroid in Problem 3. First, define the **medial triangle** to be the triangle formed by connecting the midpoints of the sides of a triangle.

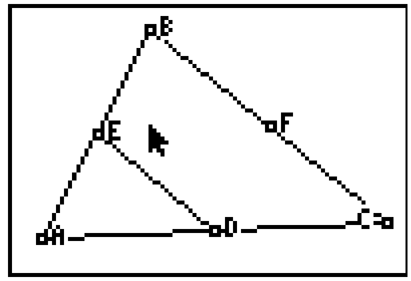


In *Medial.8xv*, students will see a triangle and its centroid. Student should construct the medial triangle and the centroid of the medial triangle.

Students will notice that the centroid of the original triangle and the centroid of the medial triangle are the same.

Problem 4 – Extending the Median

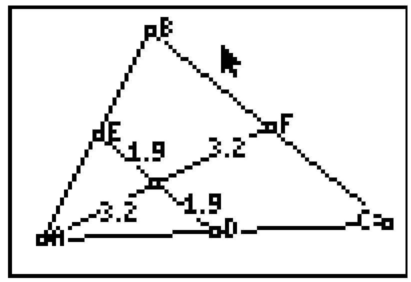
In Problem 4, students will extend the concept of the median. Tell students that the midsegment is a line segment joining the midpoints of two sides of a triangle.



In *Midseg.8xv*, students will see $\triangle ABC$ with midpoints *D*, *E*, and *F* of sides $\overline{AC}$, $\overline{AB}$, and $\overline{BC}$, respectively.

Students should then construct the median that extends from point *A* to point *F*. Next, they should construct the intersection point, *G*, of the median and the midsegment.

Students should find the lengths of $\overline{AG}$, $\overline{FG}$, $\overline{DG}$, and $\overline{EG}$.



Students can find the **Length** tool by selecting GRAPH **> Measure > D. & Length**.

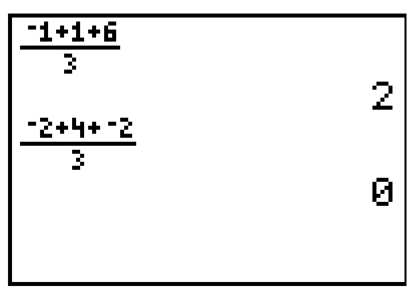
Students will notice that the median and midsegment bisect each other.

Student Solutions

1. Student solutions will vary. Students' balancing points should be close to **(2, 0)**.
2. The median of a triangle is **the segment joining the vertices of a triangle to the midpoint of the opposite side.**
3. **They are concurrent.**
4. **(2, 0)**
5. **They are close.**
6. $\left(\dfrac{-1+1+6}{3},\dfrac{-2+4+-2}{3}\right)=(2,0)$
7. Centroid is **the point of concurrency of the medians.**
8. **They are the same.**
9 **They bisect each other.**

If using Mathprint™ OS:

When calculating the averages in question 6, students can use the fraction template. To do this, they should press ALPHA [F1] and select **n/d**. Enter the value of the numerator, press ▼, and then enter the value of denominator.



Note: They do not need to use parentheses in either part of the fraction.