Implementation of software geogebra on triangles

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Abstract. Mathematics teaching is a learning process gives an understanding of mathematical concepts for students. The basic concepts of mathematics must be embedded well in each student so that understanding concepts at an advanced level can be easily mastered. Mathematics teachers play an important role regarding the problems faced by students when learning mathematics in class. A math teacher in addition to having the ability to master mathematical concepts well, is also required the ability to manage the class so that students can understand the concept well and learning achievement is in the high category. Mathematics is a subject consisting of great ideas that are connected to each other so that understanding cannot be separated because each concept will contribute to the other concepts. Most students still say that mathematics is a difficult and uninteresting lesson, therefore, a teacher needs to apply specific strategies used in the mathematics learning process so that it can change students’ perceptions of mathematics into an interesting and easy lesson. The use of technology can help teachers and students learn mathematics, for example the use of GeoGebra software. GeoGebra software has the benefit of being able to make geometric paintings that are fast and precise compared to using paper and pencil and the existence of animation facilities provides a clear visual experience for students and teachers. One of the geometry concepts is to construct a flat triangle, in this study the discussion is to determine the special lines on the triangle using GeoGebra software and then determine the intersection of the special lines of the triangle.

1. Introduction
Mathematics is a subject that must be mastered by students at both elementary and secondary levels. The subject matter in mathematics as a basis for understanding can be used in other disciplines such as physics, chemistry and economics. Mathematics has an important role in everyday life because in mathematics there are concepts can be used to solve real life problems [1]. Solving problems requires the ability to see useful information and use the knowledge students have as well as possible of students are trained to be students who have good problem solving skills [2].
The learning process in mathematics trains students to think critically and be able to reason logically. Learning mathematics is not only limited to the delivery of material, but also includes other processes such as familiarizing students to be able to communicate mathematically and do problem solving. The process will create student independence and motivation to influences student learning outcomes [3]. However, most students argue that mathematics is an uninteresting lesson because students are always faced with complicated numerical calculations. Besides that, in the classroom learning process there are still many mathematics teachers who deliver material with conventional methods without using media or learning aids other than books. Teachers should be able to use technology in each learning process as a support to learning objectives can be achieved to the fullest. Teachers will more easily convey material to students by displaying pictures or learning videos [4].

In today's digital era, technology has an important role on every side of life, especially in the field of education. Technology provides ease and accuracy of data so that it can improve the quality of classroom learning. However, most teachers do not use technology when learning in class so students feel bored and cannot understand the material as a whole [5]. The main causes of teachers lacking use of information and communication technology (ICT) because of the ability to operate information and communication technology that is not qualified, besides the lack of supporting facilities and infrastructure such as projectors is also the cause [6]. However, seeing the benefits of using ICT that is good for the teaching and learning process would be a motivation for teachers to develop pedagogical skills, especially in terms of technology utilization.

The use of ICT in mathematics learning can help provide understanding for students, especially on abstract subjects such as geometric objects and drawing graphs of functions. One way to use ICT in mathematics learning is the use software of geogebra. Software of Geogebra provides help to visualize, construct and discover mathematical concepts[7]. Software Geogebras a computer application that can be obtained for free by downloading it at www.geogebra.org. Software of Geogebra can help teachers to deliver material to be more meaningful and more interesting. The facilities / menus contained in software Geogebra are so simple that anyone can easily use them. In addition to teachers, students can also easily use software geogebra because the appearance and features are easy to understand because the languages in geogebra software can be adjusted to the user's language, so students can do simple construction to more complex ones.

2. Material and Method
Method used in this study is a literature study method that is a method of collecting data by searching for information through books, magazines, newspapers, and other literature that aims to form a theoretical basis.

2.1. GeoGebra
GeoGebra comes from the words geometry (geometry) and algebra (algebra). GeoGebra was first developed by Markus Hohenwarter a mathematician from Austria and made as software open-source and it can be used free of charge and free to be developed in mathematics learning [8].
In GeoGebra there are 11 construction menus namely Move, Point, Line, Perpendicular Line, Polygon, Circle With Center Through Point, Ellipse, Angle, Reflect About Line, Slider and Move Graphics View. GeoGebra can be operated in several languages, including Indonesian. The steps to change the language according to the user's wishes, namely click the Option menu, select Language, select the last EI section select Indonesia/Indonesian.

2.2. Triangle
Polygons are closed flat builds which are limited by the sides of a line segment. Triangles are polygons that have three sides. The Angular Point (Vertex) is the point where two of the sides of the triangle meet, the point is generally named points A, B and C and it can be called the ABC triangle.

Based on the length of the side, the triangle consists of any triangle, isosceles triangle and equilateral triangle.
- Any triangle : Triangle An arbitrary triangle is a triangle whose three sides have different lengths.
• Isosceles Triangle: An isosceles triangle is a triangle that has two equal sides while the other side has a different length.

• Equilateral triangles: Equilateral triangles are triangles with three equal lengths.

Based on the size of the angle, the triangle consists of right triangle, acute triangle and blunt triangle.

• Right triangle: A right triangle is a triangle that has a large angle of 90° at one of its vertices.
Taper triangle: Taper triangle is a triangle which has three angles less than $90^\circ$.

Blunt triangle: Blunt triangle is a triangle where one of the angles is greater than $90^\circ$ and the other two angles are less than $90^\circ$. 
3. Result and Discussion

In this section we will use the program GeoGebra to make special lines on triangles, namely [9]

- The high line on one side of a triangle is a line drawn from a vertex of a triangle and perpendicular to the side in front of it.
- The bisector of a triangle is a line drawn from the vertex of a triangle and dividing the angle into two equal magnitudes.
- The axis line on one side of a triangle is a line perpendicular to and through the midpoint of that side.
- The weight line on one side of a triangle is the line that connects the vertex before that side with the midpoint of that side.

How to make a triangle using GeoGebra, select Polygon then click on the page Graph as many as three different points and not in line.

![Figure 9. Triangle.](image)

3.1. High Line

Steps to make a high line on a triangle are to make a perpendicular line through the vertex with the side in front of it using Perpendicular Line.
3.2. **Dividing Line**

The steps to make a line on a triangle are to make a line that divides the two angles at the same triangle point using Angle Bisector, how to click on the three vertices of this ABC which means to divide the angle of point B into two equal equal parts.
3.3. Axis Lines
Steps to make an axis on the triangle are to make the midpoint of each side of the triangle using MidPoint or Center.
Then make a perpendicular line through the midpoint of the triangle using **Perpendicular Bisector**.
3.4. Axis Lines

The steps to make the axis in the triangle are to make the midpoint of each side of the triangle using \textbf{MidPoint or Center}, then out the light through the vertex with the midpoint on the side in front of it using \textbf{Ray}.

After the special lines are found, then it can be determined that the intersection of the special line.

3.5. Orthocenter

Orthocenter is the intersection of the high line.
3.6. **Incenter**

Incenter is the intersection of the dividing line.

3.7. **Circumcenter**

Circumcenter is the intersection of the axis line.
Figure 20. Point G is circumcenter

3.8. Centroid
Centroid (center of the triangle) is the intersection of the heavy line.

Figure 21. Point G is centroid

4. Conclusion
Triangles are flat shapes that have special properties, namely on a triangle, special lines can be made, namely dividing lines, height lines, axis lines and heavy lines.

GeoGebra makes it easy for students to be able to construct triangle lines. GeoGebra also provides a visual display that can train students to solve mathematical problems.
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