Pädagogische Hochschule Schwäbisch Gmünd

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The Geometric Creativity Test
(GCT)

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The Geometric Creativity Test

Directions

This geometric creativity test is a part of educational research aiming at assessing your creativity in geometry. So write freely all you think of without fear or hesitation of your responses, cause that will help you to express your creative personality which inside you and you may not know about it, and that also enables us to find how creative you are in geometry.

The items in the booklet provide you opportunities to think freely in geometry, produce mathematical relationships, new geometric proofs, and solve non-routine geometric problems which have various and different methods of solution as well as give you the opportunity to pose some relevant problems toward a geometric situation. So try to respond to each item by the greatest number of unusual, various, and different ideas – things no one else in your class will think of. Let your mind go far and deep in thinking up ideas.

This geometric creativity test contains 12 items. You will have … minutes to complete the test. Make good use of your time and work as fast as you can without rushing. If you run out of ideas for a certain item go on to the next item. Responds about those items mainly based upon your quick performance, recording your ideas, and use your mathematical knowledge in a creative (non-routine) fashion.

Record your ideas in the suitable place for each item. If you need more space to write, ask for extra copies of the question's paper. Do not erase any responses cause we need to know everything about your geometric thinking. Do your best!

Do you have any question?

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Student's Data

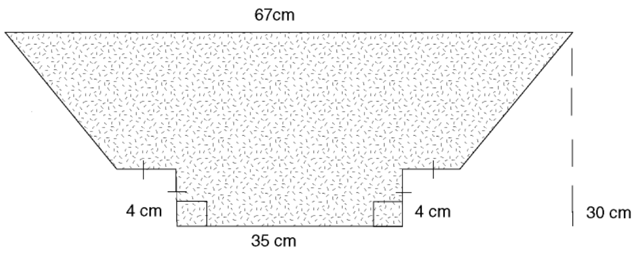
Name ………………………………. School ………………………………….
Teacher's Name …………………… Grade ..…..………………………………..
Your Birth date (D/M/Y) ……………. Boy/Girl? ………………………………..

1. Write down as many concepts and geometric terminologies as possible that start with letter p. For example: Polygon. If you need more space, write on the back of this page.

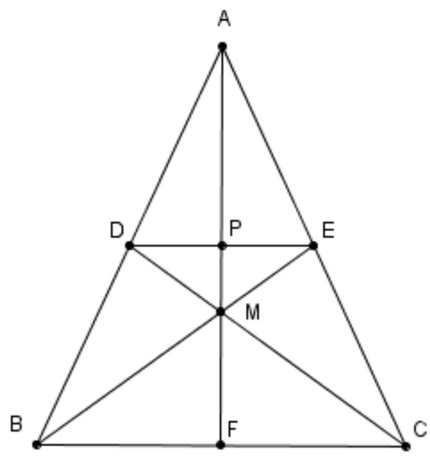
2. Write down as many generalizations (theorems, definitions, properties, and corollaries) as you can that are related to the right-angled triangle. For example: In the right-angled triangle, the length of the median from the vertex of the right angle is equal to half the length of the hypotenuse. If you need more space, write on the back of this page.

3. Suppose we (you and I) are playing a guessing game of determining the name of a geometric figure. In this game, I think of a geometric figure and you will ask me questions about the figure, I should answer, until you determine the figure. Your task is to list as many questions as you can which should be answered in order to determine the name of the figure. For example: Is it a plane figure such as rectangle or a solid figure such as a sphere? If you need more space, write on the back of this page.

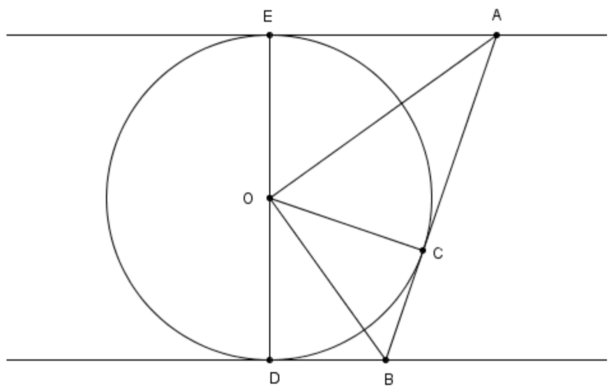
4. Find by all possible ways the area of the opposite figure. If you need more space, ask for extra papers of this test item.



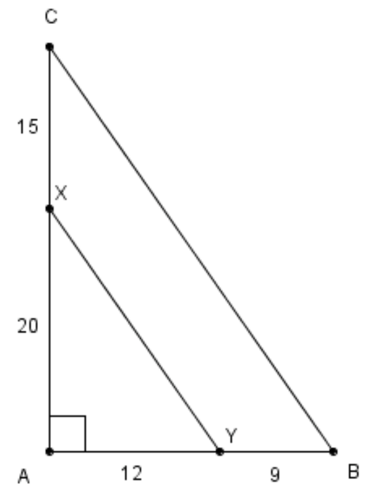
5. In the opposite figure, ABC is an isosceles triangle, D is the mid point of $\overline{AB}$, E is the midpoint of $\overline{AC}$ and $\overline{BE}$ intersects $\overline{CD}$ at M. $\overrightarrow{AM}$ is drawn to cut $\overline{BC}$ at F, and $\overline{DE}$ is drawn to cut $\overrightarrow{AM}$ at P. Imagine yourself a mathematician, try to pose the greatest number of various and different problems related to the opposite figure, which could be answered either in direct or indirect way using the given data. You do not need to solve the problems you write. For example: Prove that: $\triangle DMB \equiv \triangle EMC$; Show that DECF is a parallelogram. If you need more space to write problems, ask for extra papers of this test item.



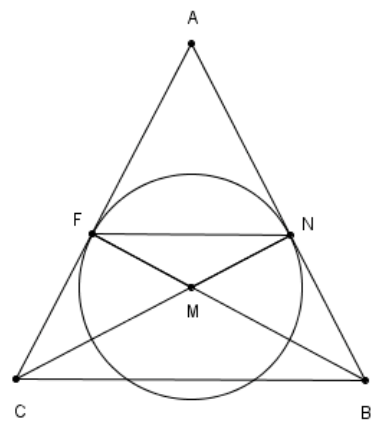
6. Two parallel lines are tangents to a circle O, and a third line, also tangent to the circle, meets the two parallel lines at points A and B and the circle at C. Pose as many various and different problems as possible that could be deduced from the given information. You do not need to solve the problems you write. For example: Prove that: ACOE is a cyclic quadrilateral. Show that AE = AC. If you need more space to write problems, ask for extra papers of this test item.



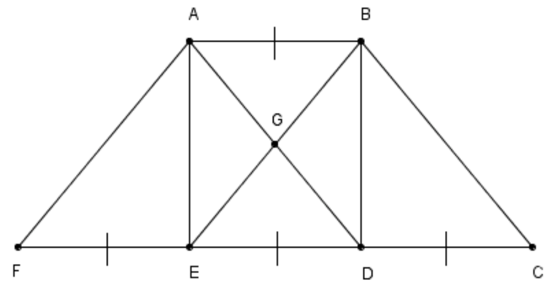
7. By using the information given on this figure, prove by all possible ways that: $\overline{XY} \parallel \overline{CB}$. You can construct any segment you think may help you to get the proof. If you need more space, ask for extra papers of this test item.



8. In the figure opposite, ABC is a triangle. $\overline{AB}$, $\overline{AC}$ touch circle M at N and F respectively, $\overline{BF} \cap \overline{CN} = \{M\}$. Prove by all possible ways that: $\triangle$ ANF ~ $\triangle$ ABC. If you need more space to write, ask for extra papers of this test item.

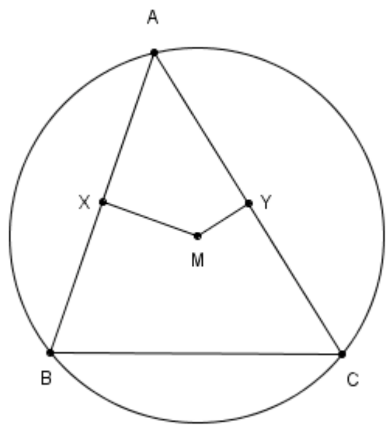


9. In the opposite figure, $\overline{AB} \parallel \overline{FC}$, and AB = CD = DE = EF. Write down, as many names of pairs of equivalent geometric figures – equal in area – as possible, which are included in the figure opposite and explain why they are equivalent. You do not need to show why the two figures, you write, are equivalent. For example: △AEF ≡ △BDC. If you need more space to write, ask for extra papers of this test item.



10. In the opposite figure:

$\overline{MX} \perp \overline{AB}$, Y is a mid-point of $\overline{AC}$. Prove that $\overline{XY} \parallel \overline{BC}$

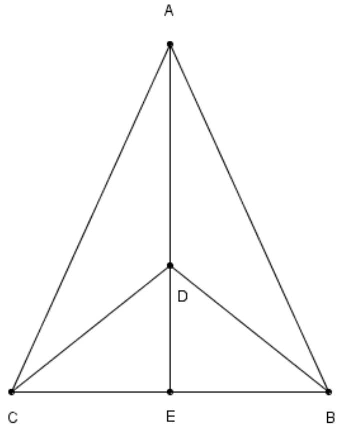


In this problem, It is not required to give a logical proof as usual but to pose as many problems as possible by elaborating – substituting, adapting, altering, expanding, eliminating, rearranging or reversing – the aspects that govern the given problem. You do not need to solve the problems you write. For example: In the opposite figure, given that: Y is a mid-point of $\overline{AC}$, and $\overline{XY} \parallel \overline{BC}$. Prove that: $\overline{MX} \perp \overline{AB}$. If you need more space to write problems, ask for extra papers of this test item.

11. In the figure opposite:

AB = AC, $m(\angle DCB) = m(\angle DBC)$

Prove that $\overleftrightarrow{AE}$ is the axis of $\overline{BC}$.



In this problem, it is not required to give a mathematical proof. Your task is to think carefully upon the particular aspects that govern the problem, elaborate one or more of these aspects by substituting, adapting, altering, expanding, eliminating, rearranging or reversing to make up as many problems or situations as you can. You do not need to solve the problems you write. For example: In the figure opposite, given that: $\overleftrightarrow{AE}$ is the axis of $\overline{BC}$. Prove that: $m(\angle DCB) = m(\angle DBC)$. If you need more space to write problems, ask for extra papers of this test item.

12. Write down as many ideas as you can which could be happened as a result of doing Euclidean geometry on the spherical surface instead of doing it on a plane surface. For example: If we start drawing two intersecting lines on the spherical surface, we will eventually end up with two intersecting points as shown in the accompanying figure. Let your mind go far and deep in thinking up possible ideas for this situation. If you need more space to write ideas, write on the back of this page.