

Math 403
Mathematics and Technology
The Geometer's Sketchpad Projects

Part I: There are 10 problems worth 10 points each. If you work alone, you are to work 50 points worth of problems. If you work in a group, then you are required to work an additional 10 points worth of problems for each group member after the first one (i.e., a group of two needs 60 points; a group of three needs 70 points, etc.) *Do not collaborate in any way* unless you work in a declared group; doing so will reduce your score by at least 50%. Your grade will be based on the percentage correct out of the total number of points you worked.

Your solutions should use the GSP exclusively; that is, *NO work should be done by hand*. Your solution should include all information give in the problem, and make no assumptions other than those given. Your answer should be completely determined by your sketch (that is, no lengths or angles should be variable in your sketch—variables will result in a loss of *at least* half credit). Your answer choice (A, B, C, D, E) should be clearly indicated in a text box in your sketch.

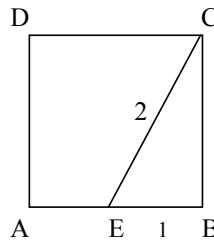
Each group member's name should be in a textbox inside the file. The solution files, names with the problem number, inside a folder with the last names of the group members, are to be turned in on the flash drive.

1. Segment AB is both a diameter of a circle of radius 1 and a side of an equilateral triangle ABC. The circle also intersects AC and BC at points D and E, respectively. The length of AE is

- a. $\frac{3}{2}$ b. $\sqrt{3}$ c. $\frac{\sqrt{3}}{2}$ d. $\frac{2+\sqrt{3}}{2}$

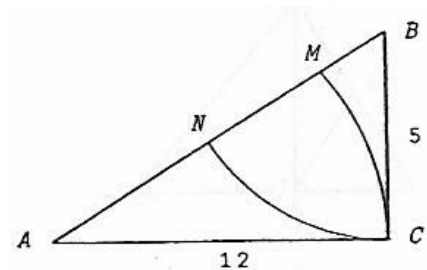
2. Point E is on side AB of square ABCD. If EB has length one and EC has length two, then the area of the square is

- a. $\sqrt{3}$
 b. $\sqrt{5}$
 c. 3
 d. $2\sqrt{3}$
 e. 5



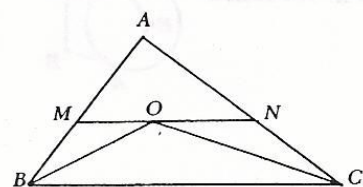
3. In right $\triangle ABC$ with legs 5 and 12, arcs of circles are drawn, one with center A and radius 12, the other with center B and radius 5. They intersect the hypotenuse in M and N. Then MN has length

- a. 2 d. 4
 b. $\frac{13}{5}$ e. $\frac{24}{5}$
 c. 3



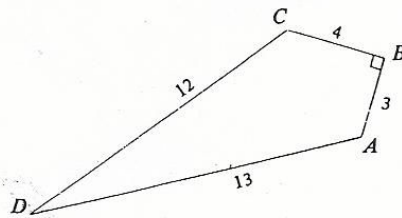
4. In the adjoining diagram, BO bisects $\angle CBA$, CO bisects $\angle ACB$, and MN is parallel to BC. If $AB = 12$, $BC = 20$, and $AC = 18$, then the perimeter of $\triangle AMN$ is

- a. 30
 b. 33
 c. 36
 d. 39
 e. 42



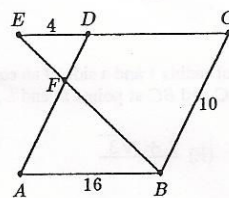
5. Sides AB, BC, CD, and DA of convex quadrilateral ABCD have lengths 3, 4, 12, and 13, respectively, and $\angle CBA$ is a right angle. The area of the quadrilateral is

- 32
- 36
- 39
- 42
- 48



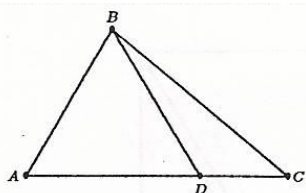
6. Let ABCD be a parallelogram with $\angle ABC = 120^\circ$, $AB = 16$ and $BC = 10$. Extend \overline{CD} through D to E so that $DE = 4$. If \overline{BE} intersects \overline{AD} at F, then FD is closest to

- 1
- 2
- 3
- 4
- 5



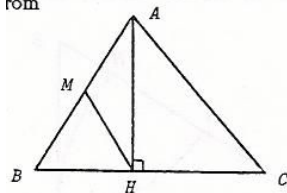
7. In $\triangle ABC$, $AB = 5$, $BC = 7$, $AC = 9$ and D is on \overline{AC} with $BD = 5$. Find the ratio $AD : DC$.

- 4 : 3
- 7 : 5
- 11 : 6
- 13 : 5
- 19 : 8



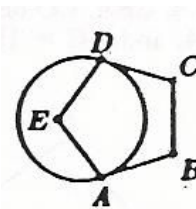
8. In $\triangle ABC$, $AB = 13$, $BC = 14$ and $CA = 15$. Also, M is the midpoint of side AB and H is the foot of the altitude from A to BC. The length of HM is

- 6
- 6.5
- 7
- 7.5
- 8



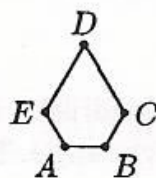
9. Given regular pentagon ABCDE, a circle can be drawn that is tangent to \overline{DC} at D and to \overline{AB} at A. The number of degrees in minor arc AD is

- 72
- 108
- 120
- 135
- 144



10. The convex pentagon ABCDE has $\angle A = \angle B = 120^\circ$, $EA = AB = BC = 2$ and $CD = DE = 4$. What is the area of ABCDE?

- 10
- $7\sqrt{3}$
- 15
- $9\sqrt{3}$
- $12\sqrt{5}$



Part II:

For an individual or group of two, complete one activity as described below. For a group of three or four, complete two activities as described below.

Develop a classroom exploration activity based on one of the following activities or projects from the text *Geometry Activities for Middle School Students*. Cite the Texas Essential Knowledge and Skills addressed in the activity and discuss how you would use and what knowledge students will gain from the experience. Create a Sketchpad file with general figures for students to use in the exploration phase of the activity.

1. Exploring Angles Formed by Parallel Lines and a Transversal pp. 42-43
2. Exploring Properties of Triangles pp. 67-68
3. Exploring Types of Triangles pp. 69-70
4. Exploring the Pythagorean Theorem pp. 71-73
5. Pythagoras Plus p.79
6. Triangles—A Look Inside p. 80
7. Exploring Quadrilaterals pp. 93-95
8. Exploring Translations and Exploring Rotations, pp. 145-148