

# MBMT Geometry Round – Pascal

April 1, 2017

Full Name \_\_\_\_\_

Team Number \_\_\_\_\_

**DO NOT BEGIN UNTIL YOU ARE  
INSTRUCTED TO DO SO.**

This round consists of **8** questions. You will have **30** minutes to complete the round. Each question is *not* worth the same number of points. Questions answered by fewer competitors will be weighted more heavily. Please write your answers in the simplest possible form.

\_\_\_\_\_ 1 Angle  $X$  has a degree measure of 35 degrees. What is the supplement of the complement of angle  $X$ ?

The complement of an angle is 90 degrees minus the angle measure. The supplement of an angle is 180 degrees minus the angle measure.

\_\_\_\_\_ 2 A car that always travels in a straight line starts at the origin and goes towards the point  $(8, 12)$ . The car stops halfway on its path, turns around, and returns back towards the origin. The car again stops halfway on its return. What are the car's final coordinates?

\_\_\_\_\_ 3 Let  $ABC$  be an isosceles triangle such that  $AB = BC$  and all of its angles have integer degree measures. Two lines,  $l_1$  and  $l_2$ , trisect  $\angle ABC$ .  $l_1$  and  $l_2$  intersect  $AC$  at points  $D$  and  $E$  respectively, such that  $D$  is between  $A$  and  $E$ . What is the smallest possible integer degree measure of  $\angle BDC$ ?

\_\_\_\_\_ 4 In rectangle  $ABCD$ ,  $AB = 9$  and  $BC = 8$ .  $W$ ,  $X$ ,  $Y$ , and  $Z$  are on sides  $AB$ ,  $BC$ ,  $CD$ , and  $DA$ , respectively, such that  $AW = 2WB$ ,  $CX = 3BX$ ,  $CY = 2DY$ , and  $AZ = DZ$ . If  $WY$  and  $XZ$  intersect at  $O$ , find the area of  $OWBX$ .

\_\_\_\_\_ 5 Consider a regular  $n$ -gon with vertices  $A_1A_2 \dots A_n$ . Find the smallest value of  $n$  so that there exist positive integers  $i, j, k \leq n$  with  $\angle A_iA_jA_k = \frac{34^\circ}{5}$ .

\_\_\_\_\_ 6 In right triangle  $ABC$  with  $\angle A = 90^\circ$  and  $AB < AC$ ,  $D$  is the foot of the altitude from  $A$  to  $BC$ , and  $M$  is the midpoint of  $BC$ . Given that  $AM = 13$  and  $AD = 5$ , what is  $\frac{AB}{AC}$ ?

\_\_\_\_\_ 7 An ant is on the circumference of the base of a cone with radius 2 and slant height 6. It crawls to the vertex of the cone  $X$  in an infinite series of steps. In each step, if the ant is at a point  $P$ , it crawls along the shortest path on the exterior of the cone to a point  $Q$  on the opposite side of the cone such that  $2QX = PX$ . What is the total distance that the ant travels along the exterior of the cone?

\_\_\_\_\_ 8 There is an infinite checkerboard with each square having side length 2. If a circle with radius 1 is dropped randomly on the checkerboard, what is the probability that the circle lies inside of exactly 3 squares?