1. Is the following statement always, sometimes, or never true? For your answer, write always, sometimes, or never—whichever is correct.

In a circle with center at point $O$, if $\overline{AC}$ is a diameter of the circle and point $B$ is in the interior of the circle, then $OA < OB$.

2. Which of the following is not a property of every parallelogram? For your answer, write the capital letter that corresponds to the statement that is not true for every parallelogram.

A. The opposite sides are congruent.
B. The opposite angles are congruent.
C. Any two consecutive angles are supplementary.
D. The diagonals are perpendicular.
E. The diagonals bisect each other.

3. Find the degree measure of the obtuse angle formed by the minute hand and hour hand of a clock at 1:30.

4. The ratio of the degree measure of the supplement of an angle to the degree measure of the complement of the angle is 7:2. Find the degree measure of the angle.

5. Find the area of a triangle with vertices at $(1, 2)$, $(3, 71)$, and $(99, 102)$.

6. In the diagram of two intersecting straight lines and with angle measures as shown, find the largest possible value for $x$.

   $30^\circ$  
   $x^2 - x^\circ$

7. Find the sum of the degree measures of the interior angles of a convex decagon.

8. In Triangle $ABC$, $\overline{CD}$ is the median to $\overline{AB}$. If $CD = 13$, $AB = 20$, and the area of Triangle $ABC$ is 120, then the perimeter of Triangle $ABC$, in simplest radical form, is $k + p + w$. Find the value of $k + p + w$.
9. Pentagon ABCDE is inscribed in a circle. \( \angle ABC = 90^\circ \), \( AB = 8 \), \( BC = 6 \), \( CD = 5 \), \( DE = 5 \), and \( EA = 5 \). The area of Pentagon ABCDE, in simplest radical form, is \( k + w\sqrt{3} \). Find the value of \( k + w \).

10. Points B and C are the trisection points of \( AD \) with \( A(8, 14) \) and \( D(38, -46) \). Point E has coordinates of \((22, -38)\). Find the sum of the slopes of \( BE \) and \( CE \).

11. Given the 6 angles with degree measures as shown below. If two of the angles are selected at random, find the probability that the two angles are either complementary or supplementary. Express your answer as a common fraction reduced to lowest terms.

12. In the figure below with lengths as shown, \( \triangle ABC \sim \triangle DEF \).

Find the value of \( x \).

13. In the isosceles trapezoid shown below, the degree measure of \( \angle B \) is twice the degree measure of \( \angle D \), and lengths are as shown. Find the area of the trapezoid.
14. In a circle with center at \( O \), chords \( AB \) and \( CD \) intersect at \( E \), the midpoint of \( AB \). \( CD \) is the diameter of a second circle, and \( F \) lies on that second circle such that \( EF \perp CD \). If \( AB = 12 \) and \( CE = 9 \), find the area of Triangle \( CFD \).

15. In Triangle \( ABC \), median \( AF \) is perpendicular to median \( BE \) at \( D \). If \( AC = 6 \) and \( BC = 4 \), then the area of \( CEDF \), in simplest radical form, is \( \frac{8\sqrt{k}}{w} \). Find the value of \( k + w \).

16. \( TRAP \) is a trapezoid with \( TR \parallel RA \). \( \angle TRA = 90^\circ \), \( RP = 12 \), and \( \angle A = 60^\circ \). It is also known that \( RP \) is one of the trisectors of \( \angle TRA \). Based on this information, Pat and Amy each calculated the area of trapezoid \( TRAP \). Although each of their answers could have been correct based upon all the known information, their answers differed by \( k\sqrt{3} \) where \( k > 0 \). Find the value of \( k \).

17. Find the volume of a rectangular solid with dimensions of 11, 15, and 17.

18. In the triangle shown below with lengths as given, find the length of a radius of the circumcircle of the triangle.

```
      104
     /   \
112 /     \
   /       \
  /120\      \
```

19. Standing in the sun, a 6 foot girl casts a 9.6 meter shadow, while nearby a 5 foot boy casts a shadow of \( k \) meters. Find the value of \( k \).

20. In simplest radical form, the distance from the incenter to the circumcenter of a triangle with sides of 9, 40, and 41 is \( \frac{5\sqrt{k}}{p} \). Find the value of \( k + p \).
Geometry

1. Never
2. D
3. 135 (degrees optional)
4. 54 (degrees optional)
5. 3281
6. 6
7. 1440 (degrees optional)
8. 77
9. 42.75 or 42\frac{3}{4} or \frac{171}{4}
10. -6
11. common fraction
12. 31
13. 64\sqrt{3}
14. 39
15. 29
16. 12
17. 2805
18. 65
19. 8 (meters optional)
20. 43

Note: All answers must be written legibly in simplest form, according to the specifications stated in the Contest Manual. Exact answers are to be given unless otherwise specified in the question. No units of measurement are required.

\[ \frac{1}{5} \text{ (must be this reduced) } \]