1. Find the area of a triangle whose sides are 10, 12, and 14.

A. 60   B. $96\sqrt{33}$ C. 30   D. $24\sqrt{6}$ E. NOTA

2. The legs of a right triangle are 5 and 10, while the hypotenuse of a similar triangle is 15. What is the area of the larger triangle?

A. 90   B. $15+9\sqrt{5}$ C. 45   D. 25   E. NOTA

3. The area of $\triangle ABC$ is 112 and its altitude to $\overline{AB}$ is 4. Find the length of the median to $\overline{AB}$ if its projection on $\overline{AB}$ is 3.

A. $112\sqrt{3}$ B. 5   C. $5\sqrt{7}$ D. 100   E. NOTA

4. $\triangle ABC$ has an area of 240 square inches. AB = 20 inches. Find the area of the trapezoid formed when a line is drawn parallel to $\overline{AB}$ and 8 inches from C.

A. $\dfrac{640}{3}$ B. $\dfrac{80}{3}$ C. 160   D. $20\sqrt{3}$ E. NOTA

5. The area of a circle circumscribed about an equilateral triangle is $196\,\pi$ square inches. Find the altitude of the triangle.

A. 14   B. 21   C. 36   D. 196   E. NOTA

6. In $\triangle ABC$, AB = 24 inches. $\overline{PQ}$ is drawn parallel to $\overline{AB}$ so that P and Q are on $\overline{AC}$ *and* $\overline{BC}$ respectively and the area of $\triangle CPQ$ is equal to one third the area of $\triangle ABC$. Find PQ.

A. 8   B. 16   C. $8\sqrt{3}$ D. $24\sqrt{3}$ E. NOTA

7. In a triangle whose sides are 6, 7, 8, determine the longer of the two segments into which the bisector of the largest angle divides the opposite side.

A. $\dfrac{16}{3}$ B. $\dfrac{48}{13}$ C. $\dfrac{8}{3}$ D. $\dfrac{56}{13}$ E. NOTA

8. $\triangle ABC$ has sides of length 4, 5, and 6. If $\triangle A'B'C'$ is similar to $\triangle ABC$ but has three times the area, find the perimeter of $\triangle A'B'C'$.

A. 21   B. $9\sqrt{3}$ C. $15\sqrt{3}$ D. 45   E. NOTA

9. In $\triangle ABC$, the measures of $\angle BAC$ and $\angle ABC$ are 44 and 58 degrees respectively. Find the measure of the largest of the (non-overlapping) angles formed by the intersection bisectors of the $\angle A$, $\angle B$, and $\angle C$.
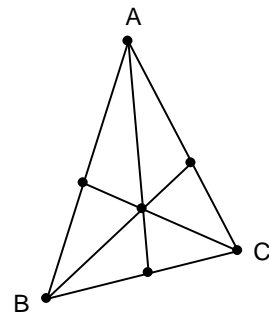
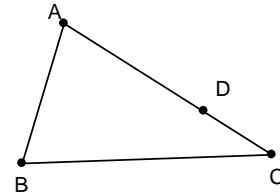A. $72°$ B. $36°$ C. $58°$ D. $68°$ E. NOTA

10. In isosceles $\triangle ABC$, AB = AC and measure of angle A is 30 degrees. From a point O within the triangle $\overline{OB}$ and $\overline{OC}$ are drawn such $m\angle CBO = m\angle ACO$. $m\angle BOC = ?$
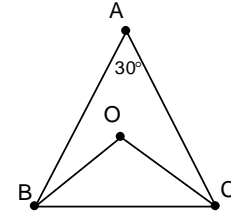
A. 90°   B. 100°   C. 105°   D. 110°   E. NOTA

11. In $\triangle ABC$, AC > AB. Point D is chosen on $\overline{AC}$ so that AD = AB. If $m\angle CBA - m\angle C = 20°$, then $m\angle CBD = ?$
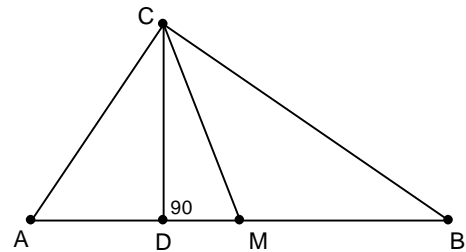
A. 10°   B. 15°   C. 20°   D. 25°   E. NOTA

12. If the legs of a right triangle are represented by a and b and the hypotenuse by c, and if c and a are consecutive integers, then b^2 is
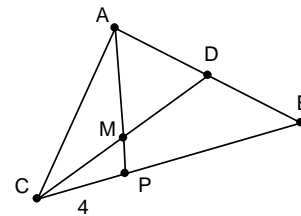
A. $c - a$ B. $c + a$ C. ca D. c/a E. NOTA

13. In right $\triangle ABC$, with median $\overline{CM}$ and altitude $\overline{CD}$, $m\angle MCD = \frac{1}{2}m\angle A$, $m\angle A > m\angle B$. $m\angle MCD = ?$
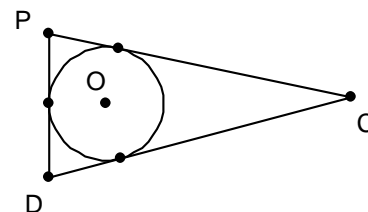
(Note: *A, B, C, D,* and *M* are all distinct points.)

A. 18°   B. 36°   C. 30°   D. 34°   E. NOTA

14. In $\triangle ABC$, the median from C meets $\overline{AB}$ in D. $\overline{AM}$ is drawn through M, the midpoint of $\overline{CD}$, and intersects $\overline{CB}$ at P. If CP = 4, then CB is
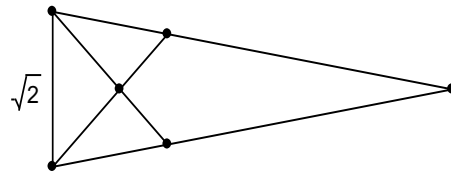
A. 6   B. 8   C. 10   D. 12   E. NOTA

15. $\triangle PCD$ is formed by three tangents to circle O. If $m\angle P = 30°$, then $m\angle COD = ?$

A. 105°   B. 75°   C. 150°   D. 60°   E. NOTA

16. The base of an isosceles triangle is $\sqrt{2}$; medians to the legs intersect at right angles. The area of the given triangle is

A. 1.5   B. 5   C. 2.5   D. 3   E. NOTA

17. The medians of a triangle are 30 inches, 30 inches and 48 inches. The area of the triangle is
A. 524   B. 554   C. 576   D. 596   E. NOTA

18. If the hypotenuse of an isosceles right triangle is 10 find the length of the altitude to the hypotenuse.
A. $5\sqrt{2}$ B. $5\sqrt{3}$ C. $2\sqrt{2}$ D. $3\sqrt{2}$ E. NOTA

19. The hypotenuse of a right triangle is 25. If the altitude from the right angle to the hypotenuse is 12, what is the length of the longest segment it forms on the hypotenuse?
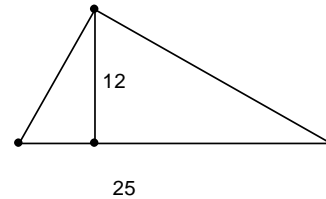
A. 8   B. 15   C. 16   D. 20   E. NOTA

20. The triangle with vertices (-2, 1), (2,4), and (3,1) is
A. scalene   B. equilateral   C. isosceles   D. right   E. NOTA

21. In $\triangle ABC$, AB = 7, BC = 8, and AC = 5. Find the projection of $\overline{BC}$ upon $\overline{CA}$.
A. 2   B. 4   C. 6   D. 8   E. NOTA

22. Two sides of a triangle are 6 ft and 10 ft with an included angle of $120°$. Find its area.
A. $\dfrac{39\sqrt{3}}{2}$ B. $\dfrac{55\sqrt{3}}{2}$ C. $45\sqrt{3}$ D. $15\sqrt{3}$ E. NOTA

23. What is the radius of a circle inscribed in a triangle whose sides measure 50, 30, and 40?
A. 25   B. 20   C. 15   D. 10   E. NOTA

24. Right $\triangle ABC$ has legs of 3" and 4". The locus of points equidistant from the sides of the triangle is a point whose distance from the sides is
A. 1"   B. 2"   C. 2.5"   D. 3"   E. NOTA

25. The angle bisectors of a triangle are concurrent in a point know as the
A. incenter   B. circumcenter   C. orthocenter   D. point of Euler   E. NOTA

26. $\triangle ABC$ has an area of 40 sq. in. Side AB = 10" and is fixed in position. The locus of *C* is a
A. $\perp$ bisector   B. $\angle$bisector   C. line ∥ to $\overline{AB}$ D. set of lines ∥ to   E. NOTA
$\overline{AB}$

27. The radius of a circle inscribed in equilateral $\triangle ABC$ whose side is 6 inches is equal to
A. $\dfrac{2}{3}\sqrt{3}$ B. $\dfrac{1}{3}\sqrt{3}$ C. $\sqrt{3}$ D. $\dfrac{1}{2}\sqrt{3}$ E. NOTA

28. Fixed points *A* and *B* are 10" apart. Point P moves so that $\overline{PA} \perp \overline{PB}$. The locus of P is a
A. $\odot$ radius 10"   B. $\odot$ radius 5"   C. $\angle$bisector   D. $\perp$ bisector   E. NOTA

29. In the adjacent sketch, $m\angle CDE$ = 20º. Find $m\angle A$
if CB = CA; *P* is any point on $\overline{AB}$; $\overline{CB}$ is extended
to *D* so that BD = BP and $\overline{DP}$ extended meets $\overline{AC}$
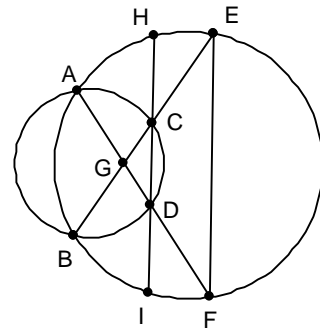in *E*.
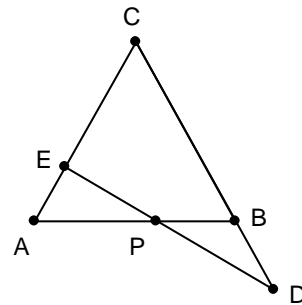
A. 100°   B. 80 °   C. 60 °   D. 40 °   E. NOTA

30. In $\triangle ABC$ b = 10, c = 6, and $m\angle A$ = 150º, find a.
A. $2\sqrt{21}$ B. $\dfrac{61}{3}$ C. $\dfrac{97}{10}$ D.   16   E. NOTA

Tiebreaker #1
Quadrilateral ABCD has its vertices on a circle. $m\angle B$ = 3x + 25; $m\angle D$ = 3x + 35; $m\angle D$ = 7x + 15;
Find the measure of the largest angle in triangle $\triangle BCD$.

Tiebreaker#2
Given that $\overline{HI}$ ∥ $\overline{EF}$; m arc EF = 160º; $\overline{GC} \cong \overline{GD}$,
m arc HI = 150º and $m\angle ECD$ =142º, find $m\angle AGE$

Tiebreaker#3

$\overline{AF}, \ \overline{BD}, \ and \ \ \overline{CE}$ are concurrent line segments in the given figure. Find the value of $\frac{x}{y}(z)$.