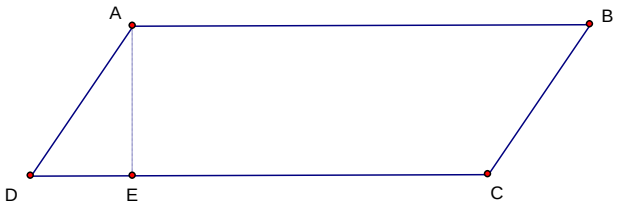
1. Find the area of parallelogram ABCD shown below if the measures of segments $\overline{AB}$, $\overline{BC}$, and $\overline{DE}$ are 6 units, 2 units, and 1 unit respectively and $\angle AED$ is a right angle.



(a) 5 square units

(b) 12 square units

(c) $5\sqrt{3}$ square units

(d) $6\sqrt{3}$ square units

(e) 16 square units

2. A square has vertices (–1, –1), (–1, 3), (3, –1), (3, 3) and a circle is inscribed in this square. Find the center and radius of this inscribed circle.

(a) Center: (0, 0) Radius: 1 unit

(b) Center: (0, 0) Radius: 2 units

(c) Center: (1, 1) Radius: 2 units

(d) Center: (1, 1) Radius: 1 unit

(e) Center: (2, 2) Radius: 1 unit

3. Find the area of a triangle whose vertices are (–2, –3), (1, 5), and (5, –3).

(a) 12 square units

(b) 20 square units

(c) 24 square units

(d) 28 square units

(e) 56 square units

4. One of the interior angles of a triangle is 30° and one of the exterior angles of the triangle is 115°. What is the measure of the largest interior angle of the triangle?

(a) 65° (b) 75° (c) 85° (d) 95° (e) cannot be determined

5. Two of the vertices of a triangle are (3, 5) and (2, 1). If the triangle is isosceles, which of the following could be the third vertex of the triangle?

   (a) (0, 4) (b) (4, 5) (c) (2, 5) (d) (4, 0) (e) (4, 1)

6. Who wrote the geometry book, "The Elements"?

   (a) Pythagoras

   (b) Euclid

   (c) Euler

   (d) Heron

   (e) Da Vinci

7. The length of the hypotenuse of a right triangle is 5 inches and the measure of one of the acute angles of the triangle is 60°. Which of the following is the length of one leg of the triangle?

   (a) $\frac{5}{3}$ inches

   (b) $\frac{5}{2}$ inches

   (c) $5\sqrt{3}$ inches

   (d) 3 inches

   (e) $\frac{9}{2}$ inches

8. Circle 1 has a circumference of 100π centimeters and Circle 2 has a circumference of 150π centimeters. The length of the diameter of Circle 2 exceeds the length of the diameter of Circle 1 by

   (a) 25 cm (b) 50 cm (c) 75 cm (d) 100 cm (e) 200 cm

9. A city wants to locate a hospital the same distance from three different fire stations. The fire stations are located at the vertices of a large triangle. Which of the following points is the best location for the hospital?

   (a) The intersection of the three medians of the triangle

   (b) The intersection of the three altitudes of the triangle

   (c) The intersection of the two midlines of the triangle

   (d) The intersection of the three angle bisectors of the triangle

   (e) The intersection of the three perpendicular bisectors of the sides of the triangle

10. Construct a segment and mark its midpoint. Now construct a second segment that is perpendicular to the first segment at the midpoint, is not bisected by the first segment, and has endpoints that are not on the first segment. The endpoints of the two segments are the vertices of a convex quadrilateral. Which of the following best describes this quadrilateral?

   (a) It is a rectangle.

   (b) It is a rhombus.

   (c) It is a parallelogram that is neither a rhombus nor a rectangle.

   (d) It is a kite.

   (e) It is a trapezoid.

11. The Pythagorean Theorem is a special case of which of the following results?

   (a) The Law of Sines

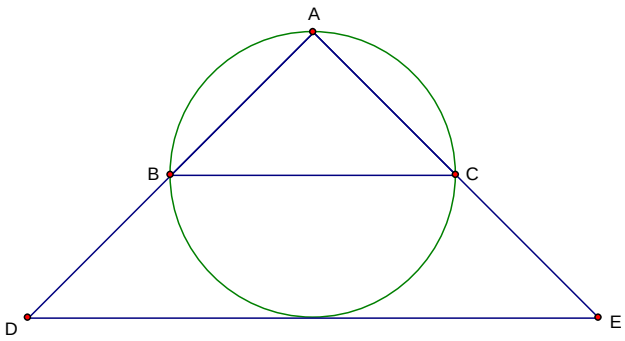
   (b) The Law of Cosines

   (c) The Law of Tangents

   (d) Heron's Formula

   (e) The Triangle Inequality

12. In the figure, $\overline{BC}$ is the base of isosceles triangle ABC. $\overline{BC}$ is a diameter of the circle, point A is on the circle, $\overline{BC} \perp \overline{DE}$, and $\overline{DE}$ is tangent to the circle. What is the ratio of the area of triangle ABC to the area of trapezoid BCED?



(a) 1:4

(b) 1:5

(c) 2:5

(d) 1:3

(e) 3:4

13. If the line through the points (0, 3) and (3, 7) is perpendicular to the line through the points (3, 5) and (7, k), then the value of k is

(a) 2 (b) 8 (c) $\frac{31}{3}$ (d) –1 (e) 1

14. Which of the following has the largest area?

(a) A circle with a radius of 1 unit

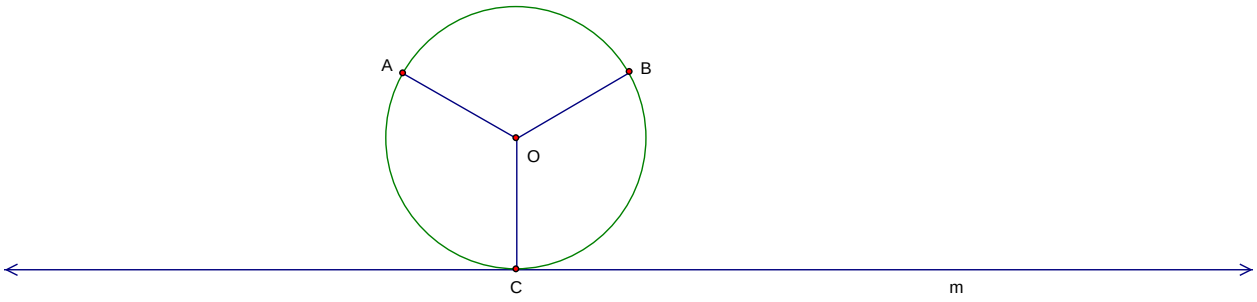
(b) A square with a side of 1 unit

(c) A square with a diagonal of 2 units

(d) A regular hexagon with longest diagonal of 2 units

(e) A circle with a circumference of 2 units

15. In the diagram below O is the center of the circle, points A, B, and C are equally spaced around the circle, the circle has radius 1 unit, and line m is tangent to the circle at point C. Think of this circle as a wheel that can be rolled along line m. How many times will point A touch line m if the circle is rolled 92 units to the right along line m?



(a) 12 (b) 13 (c) 14 (d) 15 (e) 16

16. Construct a segment and mark its midpoint. Now construct a second segment that is perpendicular to the first segment at the midpoint, is bisected by the first segment, and is congruent to the first segment. The endpoints of the two segments are the vertices of a quadrilateral. Which of the following best describes this quadrilateral?

(a) It is a square.

(b) It is a rhombus that is not a square.

(c) It is a rectangle that is not a square.

(d) It is a parallelogram that is neither a rhombus nor a square

(e) It is a trapezoid.

17. A vertical wall 20 feet high casts a shadow 8 feet wide on level ground. If Alex is 5 feet, 5 inches tall, how far away from the wall can he stand and still be entirely in the shade?

(a) 2 feet, 4 inches

(b) 3 feet, 9 inches

(c) 4 feet, 3 inches

(d) 5 feet, 10 inches

(e) 6 feet, 2 inches

18. Quadrilateral ABCD is congruent to quadrilateral BCDA. What else can you say about quadrilateral ABCD?

(a) It is a parallelogram that is not a rectangle nor a rhombus.

(b) It is a rectangle that is not a square.

(c) It is a square.

(d) It is a rhombus that is not a square.

(e) No conclusion can be reached concerning quadrilateral ABCD.

19. If the interior angle of a regular polygon is greater than 100°, then which of the following statements is true?

(a) The polygon has exactly 4 sides.

(b) The polygon has at most 4 sides.

(c) The polygon has exactly 5 sides.

(d) The polygon has at most 5 sides.

(e) The polygon has at least 5 sides.

20. Which of the following is not a platonic solid?

(a) tetrahedron

(b) pentahedron

(c) octahedron

(d) dodecahedron

(e) icosahedron

21. A closed, right, circular cylinder has a radius of one unit and a height of three units. Its total surface area is

(a) 4π square units

(b) 6π square units

(c) 8π square units

(d) $3\pi^2$ square units

(e) $6\pi^2$ square units

22. In the figure shown below, $\overline{AB} \parallel \overline{CD}$, $\overline{AB} \perp \overline{BC}$, the measure of $\overline{BC}$ is 5 units, the measure of $\overline{AD}$ is 8 units, and the perimeter of quadrilateral ABCD is 37 units. What is the area of quadrilateral ABCD?

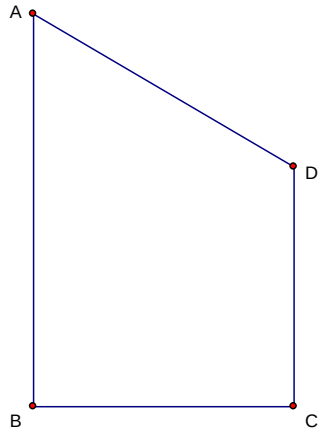
(a) 6.5 square units

(b) 12 square units

(c) 60 square units

(d) 120 square units

(e) 370 square units



23. ABCD is a square, E is the midpoint of $\overline{AB}$, and the measure of $\overline{DE}$ is $\sqrt{5}$ units. What is the area of square ABCD?

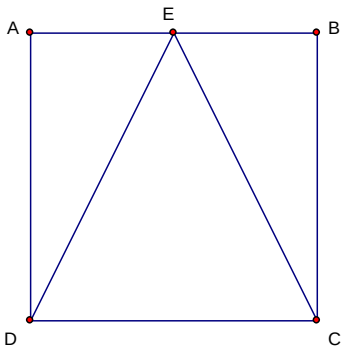
(a) 1 square unit

(b) 2 square units

(c) 4 square units

(d) 5 square units

(e) 6 square units



24. Four circles of radius r are mutually tangent inside a circle of radius one unit. The radius r is

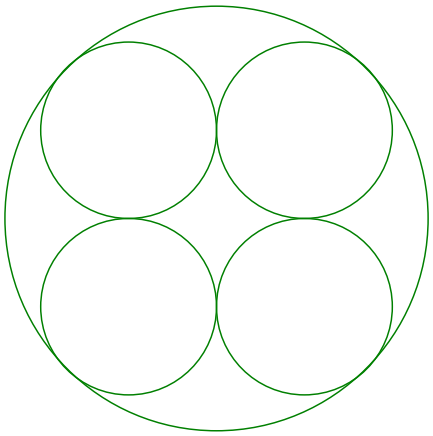
(a) 1 unit

(b) $\frac{1}{2}$ unit

(c) $\sqrt{2}-1$ unit

(d) $\frac{1}{4}$ unit

(e) $\frac{\sqrt{5}}{5}$ unit



25. A sphere has radius one meter. In terms of numerical values, which of the following is largest?

(a) The surface area of the sphere in square meters

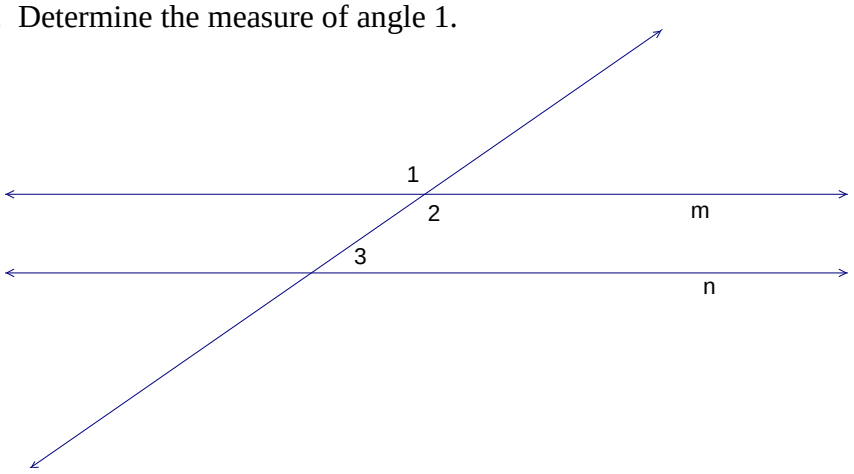
(b) The volume of the sphere in cubic meters

(c) The radius of the sphere in meters

(d) The diameter of the sphere in meters

(e) The circumference of a great circle of the sphere in meters

26. In the figure lines m and n are parallel, the measure of angle 2 is 10x, and the measure of angle 3 is 8x. Determine the measure of angle 1.



(a) 95° (b) 100° (c) 105° (d) 110° (e) 120°

27. The diameter of circle A is twice the length of the diameter of circle B. How are the circumferences of the two circles related?

(a) The circumference of circle A is twice the circumference of circle B.

(b) The circumference of circle B is twice the circumference of circle A.

(c) The circumference of circle A is four times the circumference of circle B.

(d) The circumference of circle B is four times the circumference of circle A.

(e) The circumference of circle A is 2π units more than the circumference of circle B.

28. One of the exterior angles of a regular polygon is 9°. How many sides does the polygon have?

(a) 10 (b) 20 (c) 30 (d) 40 (e) 80

29. Which of the following statements about two non-obtuse angles cannot be true?

(a) The angles are complementary.

(b) The angles are supplementary.

(c) The angles are two of the interior angles of an obtuse triangle.

(d) The angles are two of the interior angles of a parallelogram.

(e) The angles are the exterior angles at two different vertices of a triangle.

30. The sum of the measures of all but one of the interior angles in a convex polygon is 1020°. How many sides does this polygon have?

(a) 5 (b) 6 (c) 7 (d) 8 (e) cannot be determined

31. The length of the diagonal of a computer monitor is 19 inches and the height and width of the monitor are in a 3:4 ratio. The length of the diagonal of another monitor is 24 inches and the height and width of the second monitor are in a 10:16 ratio. To the nearest tenth of an inch, how much wider is the second monitor than the first?

(a) 1.3 inches

(b) 3.8 inches

(c) 4.1 inches

(d) 5.2 inches

(e) 7.3 inches

32. The area of the circle inscribed in an equilateral triangle is 27π square units. What is the area of the triangle?

(a) $108\sqrt{3}$ square units

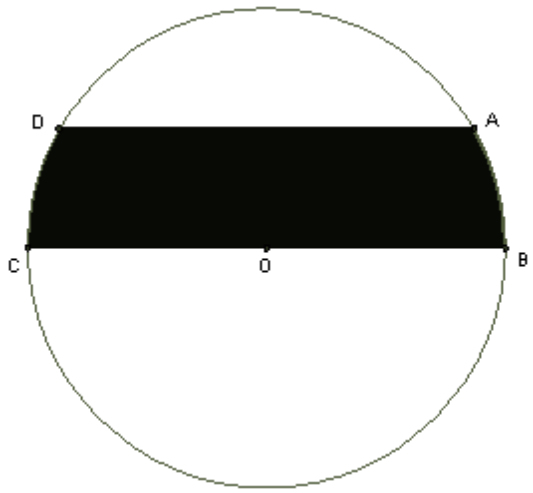
(b) $81\sqrt{3}$ square units

(c) $27\sqrt{3}$ square units

(d) 40.5π square units

(e) 36π square units

33. In the figure, O is the center of the circle, $m\angle AOB = 30^\circ$, and $\overline{DA} \parallel \overline{CB}$. If the diameter of the circle is 8 units, what is the area of the shaded region?



(a) $\frac{32}{3}\pi + 8\sqrt{3}$ square units

(b) $\frac{8}{3}\pi + 8\sqrt{3}$ square units

(c) $\frac{32}{3}\pi + 4\sqrt{3}$ square units

(d) $\frac{8}{3}\pi + 4\sqrt{3}$ square units

(e) $4\pi + 4\sqrt{3}$ square units

34. In the figure, O is the center of the circle, points A, B, C are on the circle, m $\angle BAC = 30^\circ$, and the radius of the circle is 8 units. What is the area of triangle ABC?

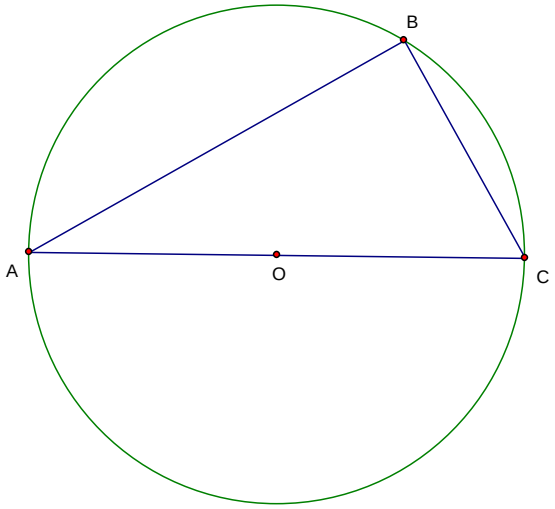
(a) 48 square units

(b) $16\sqrt{3}$ square units

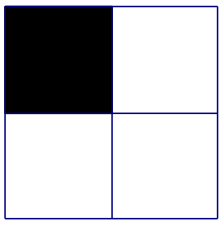
(c) 24 square units

(d) $32\sqrt{3}$ square units

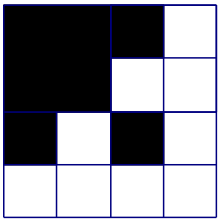
(e) $64\sqrt{3}$ square units



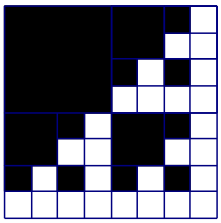
35. In Picture 1 one fourth of the square has been shaded. Picture 2 was obtained by shading one fourth of each of the smaller white squares in Picture 1. Picture 3 was obtained by shading one fourth of each of the smaller white squares in Picture 3. If this series of pictures is continued, the proportion, p, of the square that will be shaded in Picture 10 will satisfy which of the following inequalities?



Picture 1



Picture 2



Picture 3

(a) $0.25 < p < 0.50$

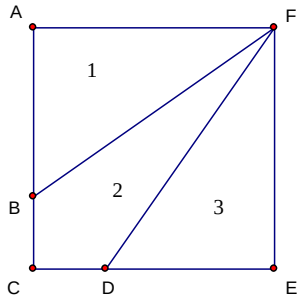
(b) $0.50 < p < 0.65$

(c) $0.65 < p < 0.80$

(d) $0.80 < p < 0.90$

(e) $0.90 < p < 1.00$

36. In the figure, ACEF is a square, $\overline{AB}$ is twice as long as $\overline{CD}$, and $\overline{BF} \cong \overline{DF}$. Which of the following statements is true about the areas of regions 1, 2, and 3?



(a) Area 1 > Area 2

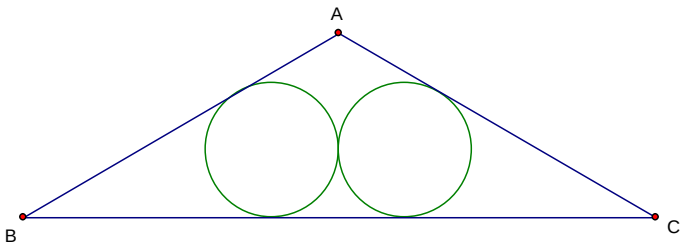
(b) Area 2 > Area 1

(c) Area 1 > Area 3

(d) Area 3 > Area 1

(e) Area 2 = Area 1

37. In the figure, $m\angle ABC = 30^\circ$, $\angle BAC = 120^\circ$, and $m\overline{AB} = 4$ units. The two congruent circles are tangent to each other and tangent to the sides of the triangle. What is the area of one of these circles?



(a) $(4-2\sqrt{3})\pi$ square units

(b) $\frac{\pi}{9}$ square units

(c) $\frac{3\pi}{4}$ square units

(d) $(4\sqrt{3}-4)\pi$ square units

(e) $\frac{(2-\sqrt{3})\pi}{2}$ square units

38. The lengths of the sides of a triangle are all distinct whole numbers. If the perimeter of the triangle is 15 cm, what is the maximum area of the triangle?

(a) $\frac{3}{4}\sqrt{65}$ cm^2

(b) $\frac{15}{4}\sqrt{33}$ cm^2

(c) $\frac{15}{4}\sqrt{3}$ cm^2

(d) $\frac{15}{4}\sqrt{7}$ cm^2

(e) $\frac{25}{4}\sqrt{3}$ cm^2

39. A square-based pyramid has volume V and height h. A right, circular cylinder has volume V and the area of its base is the same as the area of the base of the pyramid. What is the height of the cylinder?

(a) h (b) $\frac{1}{3}$h (c) 3h (d) 2h (e) $\frac{1}{2}$h

40. Determine the area of the polygon drawn below on centimeter dot paper.

(a) 15 cm^2

(b) 16 cm^2

(c) 16.5 cm^2

(d) 17.5 cm^2

(e) 18.5 cm^2