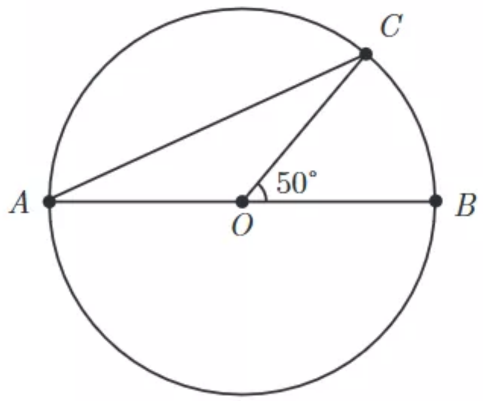
3

2D NEED FORMULA

2010B

6. **Answer (B):** Note that $\angle AOC = 180^\circ - 50^\circ = 130^\circ$. Because $\triangle AOC$ is isosceles, $\angle CAB = \frac{1}{2}(180^\circ - 130^\circ) = 25^\circ$.



OR

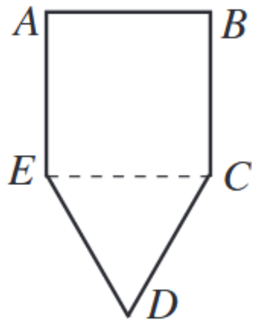
By the Inscribed Angle Theorem, $\angle CAB = \frac{1}{2}(\angle COB) = \frac{1}{2}(50^\circ) = 25^\circ$.

2003A

7. (B) The longest side cannot be greater than 3, since otherwise the remaining two sides would not be long enough to form a triangle. The only possible triangles have side lengths 1–3–3 or 2–2–3.

2007B

7. **Answer (E):** Because $AB = BC = EA$ and $\angle A = \angle B = 90°$, quadrilateral $ABCE$ is a square, so $\angle AEC = 90°$.



Also $CD = DE = EC$, so $\triangle CDE$ is equilateral and $\angle CED = 60°$. Therefore

$$\angle E = \angle AEC + \angle CED = 90° + 60° = 150°.$$

2010B

7. **Answer (D):** Let the triangle be ABC with $AB = 12$, and let D be the foot of the altitude from C. Then $\triangle ACD$ is a right triangle with hypotenuse $AC = 10$ and one leg $AD = \frac{1}{2}AB = 6$. By the Pythagorean Theorem $CD = \sqrt{10^2 - 6^2} = 8$, and the area of $\triangle ABC$ is $\frac{1}{2}(AB)(CD) = \frac{1}{2}(12)(8) = 48$. The rectangle has length $\frac{48}{4} = 12$ and perimeter $2(12 + 4) = 32$.

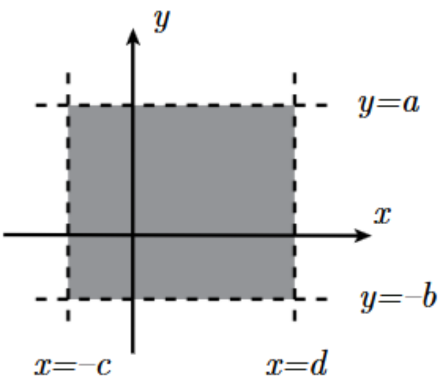
2004B

9. **(B)** The areas of the regions enclosed by the square and the circle are $10^2 = 100$ and $\pi(10)^2 = 100\pi$, respectively. One quarter of the second region is also included in the first, so the area of the union is

$$100 + 100\pi - 25\pi = 100 + 75\pi.$$

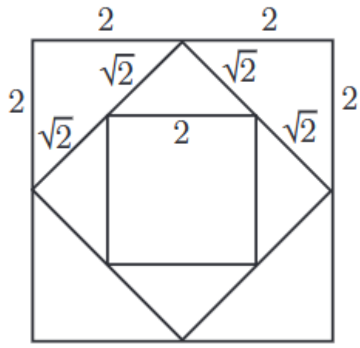
2011A

9. **Answer (A):** Because a, b, c, and d are positive numbers, $a > -b$ and $d > -c$. Therefore the height of the rectangle is $a + b$ and the width is $c + d$. The area of the region is $(a + b)(c + d) = ac + ad + bc + bd$.



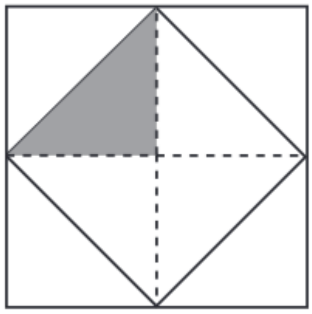
2008A

10. **Answer (E):** The sides of S_1 have length 4, so by the Pythagorean Theorem the sides of S_2 have length $\sqrt{2^2 + 2^2} = 2\sqrt{2}$. By similar reasoning the sides of S_3 have length $\sqrt{(\sqrt{2})^2 + (\sqrt{2})^2} = 2$. Thus the area of S_3 is $2^2 = 4$.



OR

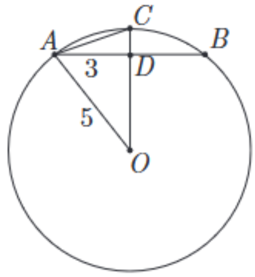
Connect the midpoints of the opposite sides of S_1. This cuts S_1 into 4 congruent squares as shown. Each side of S_2 cuts one of these squares into two congruent triangles, one inside S_2 and one outside.



Thus the area of S_2 is half that of S_1. By similar reasoning, the area of S_3 is half that of S_2, and one fourth that of S_1.

2008B

10. **Answer (A):** Let O be the center of the circle, and let D be the intersection of $\overline{OC}$ and $\overline{AB}$. Because $\overline{OC}$ bisects minor arc AB, $\overline{OD}$ is a perpendicular bisector of chord $\overline{AB}$. Hence $AD = 3$, and applying the Pythagorean Theorem to $\triangle ADO$ yields $OD = \sqrt{5^2 - 3^3} = 4$. Therefore $DC = 1$, and applying the Pythagorean Theorem to $\triangle ADC$ yields $AC = \sqrt{3^2 + 1^2} = \sqrt{10}$.



2012A

10. **Answer (C):** Let a be the initial term and d the common difference for the arithmetic sequence. Then the sum of the degree measures of the central angles is

$$a + (a + d) + \cdots + (a + 11d) = 12a + 66d = 360,$$

so $2a + 11d = 60$. Letting $d = 4$ yields the smallest possible positive integer value for a, namely $a = 8$.

2017A

10. **Answer (B):** Four rods can form a quadrilateral with positive area if and only if the length of the longest rod is less than the sum of the lengths of the other three. Therefore if the fourth rod has length n cm, then n must satisfy the inequalities $15 < 3+7+n$ and $n < 3+7+15$, that is, $5 < n < 25$. Because n is an integer, it must be one of the 19 integers from 6 to 24, inclusive. However, the rods of lengths 7 cm and 15 cm have already been chosen, so the number of rods that Joy can choose is $19 - 2 = 17$.

2017B

10. **Answer (E):** Because the lines are perpendicular, their slopes, $\frac{a}{2}$ and $-\frac{2}{b}$, are negative reciprocals, so $a = b$. Substituting b for a and using the point $(1, -5)$ yields the equations $b + 10 = c$ and $2 - 5b = -c$. Adding the two equations yields $12 - 4b = 0$, so $b = 3$. Thus $c = 3 + 10 = 13$.