1. We have $(5\pi)^2\pi = 25\pi^3$, D.

2. It is well know that for a constant perimeter, a circle maximizes the area enclosed by this perimeter. You can also simply calculate the areas. A.

3. We want the hypotenuse of a triangle with legs 5 and 12. This is 13, B.

4. Angle bisector theorem:
$$\frac{7}{x} = \frac{6}{5-x} \Rightarrow 35 - 7x = 6x \Rightarrow x = \frac{35}{13} \text{ A}$$

5. We take the area of the square and subtract the area of the circle from it. Because the radius of the circle is 6/2=3, our answer is $6^2 - 3^2\pi = 36 - 9\pi$ B.

6. The circumference is 10π, so our answer is $\lfloor \frac{500}{10\pi} \rfloor \approx 15$. Notice we take the **whole** number of revolutions, B.

7. We have $2x + 3x + 4x = 180 \Rightarrow 9x = 180 \Rightarrow x = 20$. The smallest angle is $20 \cdot 2 = 40$ degrees, B.

8. When we have two figures with side length ratio r, the ratio of their areas is r^2. Thus, our answer is $\left(\frac{6}{7}\right)^2 = \frac{36}{49}$ C.

9. This is π. All of the answers are rounded off, so they are not exact. E.

10. We have triangle inequality. Let the third side be x. We either have $12 + x > 15 \Rightarrow x > 3$ or $12 + 15 > x \Rightarrow x < 27$. None of the answer choices satisfy either inequality. E.

11. The median has length 15 (take the average of the two parallel bases) and using a 45–45–90 triangle, the height is $\frac{6}{\sqrt{2}} = 3\sqrt{2}$. The answer is $45\sqrt{2}$. A.

12. We have $3x + 2y = 2(2x + y) \Rightarrow 3x = 4x \Rightarrow x = 0$. Substituting this back in, we have $y = 20$, so $x + y = 20$, C.

13. We want the other leg of a right triangle with hypotenuse 12 and one leg 8. We have $\sqrt{12^2 - 8^2} = 4\sqrt{5}$. The length of the whole chord is twice this, $8\sqrt{5}$ B.

14. For right triangles, the length of the circumradius is half the length of the hypotenuse (prove it!). The hypotenuse has length $6\sqrt{5}$, so the circumradius is $3\sqrt{5}$. C.

15. Let M be the midpoint of $\overline{CD}$. Now, draw right triangle EMC. One leg of this triangle is 2/2=1, while the other is the height of the triangle plus the side lenght of the square, or $2 + \sqrt{3}$. Pythagoren theorem results in $\sqrt{1^2 + (2\sqrt{3})^2} = 2\sqrt{2 + \sqrt{3}}$. A

16. Notice it is the same as the prior problem, but we are subtracting the height of the triangle rather than adding it. Our answer is $2\sqrt{2 - \sqrt{3}}$ C.

17. Using the formula for the interior angle of a regular n-gon, we have $\frac{180(13-2)}{13} = \frac{1980}{13}$, C. However, the question does not say that it is a regular 13-gon, so E is also acceptable. The intention of the question was C, but E is the more correct answer. C or E.

18. Substracting the north and south, we have a total displacement of 12 in the y direction and a total displacement of 5 in the x direction. Using Pythagorean, 13 is our answer. A.

19. This set of points is a circle with radius 5. The answer is 25π. D.

20. Notice this ratio is constant for any value of r. It is equal to $\frac{\pi r^2}{2\pi r \cdot r} = \frac{1}{2}$. B.

21. The side length of the cube is $\frac{4}{\sqrt{2}} = 2\sqrt{2}$. The space diagonal is simply $\sqrt{3}$ times this, or $2\sqrt{6}$. D.

22. The problem tells you the length of AC, so the answer is 3, A.

23. First notice this is a right triangle – then notice the hypotenuse is twice the length of one of the legs. This is indicative of a 30–60–90 triangle. Because BC is twice AC, $\angle ABC = 30$. A.

24. Pythagorean theorem results in $\sqrt{5^2 + 13^2} = \sqrt{194}$. C

25. Using the angle test, we have $3^2 + 7^2 < 8^2$. This triangle is obtuse. B.

26. Once you draw the diagram, you have $\angle BAE$ as half the measure of minor arc AB. This angle has measure 156/2=78. B.

27. Using the formula $rs = A$, we have $9s = 72 \Rightarrow s = 8$. A.

28. Take half the lengths of the diagonals, which is 3 and 4. The diagonals are perpendicular, so the hypotenuse is 5 (which is the side length). Take four times this, and our answer is 20. C.

29. At first, we have a 15–20–25 right triangle. Once the ladder slips, we have a 7–24–25 triangle. The answer is 24. D.

30. Use the formula $\frac{1}{2}ap = A$. The perimeter is 20, because an icosagon has 20 sides. $\frac{1}{2}20 * 2 = 20$ C.