1) A

The triangle formed is an equilateral triangle with side lengths 20.

Area = $\frac{20^2\sqrt{3}}{4}$ = $100\sqrt{3}$

2) E

Half the diagonal = radius of the circle = $2\sqrt{2}$

$(2\sqrt{2})(\sqrt{3}) = 2\sqrt{6}$ = half the length of a side of the triangle==> length = $4\sqrt{6}$

$\frac{s^2\sqrt{3}}{4} = \frac{(4\sqrt{6})^2\sqrt{3}}{4} = 24\sqrt{3}$

3) B

$4x = 8(6x^2) = 48x^2$

$1 = 12x$ ==> $x = \frac{1}{12}$

4) B

$V = \frac{4\pi r^3}{3}$ $\quad V_{new} = \frac{4\pi(3r)^3}{3} = 27(V) = V + 26(V)$

5) A

$\pi(4^2 + 2^2 + 1^2 + ...) = \pi(\frac{16}{1-(1/4)}) = \frac{64\pi}{3}$

6) A

$\pi r^2 = x^2$ ==> $\frac{x^2}{r^2} = \pi$ ==> $\frac{x}{r} = \sqrt{\pi}$ ==> $\frac{x}{2r} = \frac{\sqrt{\pi}}{2}$

7) D

Octahedron = 2 square pyramids put together

$\text{Volume}_{\text{square pyramid}} = \frac{\text{(base)(height)}}{3} = \frac{4^2\text{(height)}}{3}$

To find the height, we have to make a right triangle using the center point of the square base, one of the corners and the top point. The hypotenus will be one of the edges that is connected to the top point, which has length 4. One leg is half the diagonal of the square. Therefore, we can find the height by the pythagorean theorem.

$\sqrt{4^2 - (2\sqrt{2})^2} = 2\sqrt{2}$

$\frac{4^2(2\sqrt{2})}{3} = \frac{32\sqrt{2}}{3}$ ==> $2(\frac{32\sqrt{2}}{3}) = \frac{64\sqrt{2}}{3}$

8) E $x^2 + y^2 + 6x + 4y = 12$ ==> $(x + 3)^2 + (y + 2)^2 = 25$ ==> 25π

9)A Area = (product of diagonals)/2 = 40

10)C

$\frac{6(\frac{r^2\sqrt{3}}{4})}{\pi r^2} = \frac{3\sqrt{3}}{2\pi}$

11) A
The figure is a cone with a radius of 2 and a height of 3.

$$V = \frac{2^2\pi(3)}{3} = 4\pi$$

12) B
The length of the box is 10 (14 – 2 – 2) and the width is 8 (12 – 2 – 2).
The surface area does not include the top face of a regular rectangular prism, since it is an open box.
SA = 2(8) + 2(8) + 2(10) + 2(10) + 10(8) = 152

13) E

$$\frac{\pi(4^2 - 3^2)}{\pi(4^2)} = \frac{7}{16}$$

14) D
To find the side of the length of square A, we make a right triangle from the radius, one side of the square that is perpendicular to the diameter of the semicircle, and half of the side of the square that is on the diameter. Let's say 2x is the length of the side of square A.

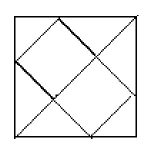
$$4^2 = (x)^2 + (2x)^2 \implies x = \frac{4\sqrt{5}}{5}.$$

We can find out the length of a side of square B by making a 45-45-90 triangle in the corner of square A. These triangles are made with half the sides of square A, which is x.

$$x\sqrt{2} = \frac{4\sqrt{10}}{5}$$

$$\frac{4^2\pi}{2} - \left(\frac{4\sqrt{10}}{5}\right)^2 = 8\pi - \frac{32}{5}$$

15) C



First, we draw another square that is congruent to square B in the other half of the square, using the same conditions. Thus, we have a rectangle that is now in the square, with length twice as long as the width. Let's say that the width of square B is x. Therefore, the dimensions of the rectangle is x and 2x. Look at one length of the rectangle. It forms a 45-45-90 triangle with one of the corners of square A. The length is the hypotenuse, and therefore one of the legs is $\frac{2x}{\sqrt{2}} = \sqrt{2}x$. The same format can be used with the width of the rectangle, as it forms a 45-45-90 triangle with its respective corner. Thus the leg in this triangle is $\frac{x}{\sqrt{2}} = \frac{\sqrt{2}x}{2}$. The two legs make up one side of square A. Thus we can write the equation: $\frac{\sqrt{2}x}{2} + \sqrt{2}x = 8 \implies x = \frac{8\sqrt{2}}{3}$

16) C This difference is the sum of the areas of the bases $2(4^2)\pi = 32\pi$

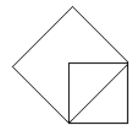
17) A

18) B

$$\frac{600 \text{ m}}{2 \text{ m/s} + 4 \text{ m/s}} = 100 \text{ sec}$$

19) A

Area = sum of the areas of the squares minus the intersection. The intersection is half the square (in the shape of a triangle) that has length 4.



$$(4\sqrt{2})^2 + (4)^2 - \frac{(4 \text{ x } 4)}{2} = 40$$

20) C $2(4) + 3(4\sqrt{2}) = 8 + 12\sqrt{2}$

21) B $\pi(6^2 - 4^2) = 20\pi$

22) D

semiperimeter = 14

area = $\sqrt{(14)(14 - 12)(14 - 9)(14 - 7)} = \sqrt{(14)(2)(5)(7)} = 14\sqrt{5}$

23) C

(semiperimeter)(radius of inscribed circle) = area

(14)(radius) = $14\sqrt{5}$. Radius = $\sqrt{5}$

24) B

Area = (8)(6) / 2 = 24. Hypotenuse = 10.

10(height)/2 = 24. height = $\frac{24}{5}$

25) A $4(\sqrt[3]{8})(\sqrt[3]{27}) = 24$

26) E

$$\frac{4\pi r^3}{3} = 36\pi \implies r = 3, d = 6$$

27) D

The answer is $\frac{1}{2}$ because all corresponding linear measures are in a ratio equal to the square root of the area ratio.

28) A

ab = 20, bc = 24, ac = 30

$(20)(24)(30) = \sqrt{a^2b^2c^2} = abc = 120$

29) C

Maximum area is the square. 120 feet is the perimeter, so one side of the square is 120/4 = 30. Area = (30)(30) = 900 feet^2

30)A

Since one side of the cube is 6, the diameter of the sphere is 6.

$$6^3 - \frac{4\pi(3)^3}{3} = 216 - 36\pi$$