PLANAR CROSS SECTIONS

When a plane intersects a solid figure, the result of the intersection can be a point, a line or line segment, or a plane figure such as a circle or polygon.

If the plane is parallel to the base of the solid, the plane figure formed will be similar or congruent to the base of the solid.

For the FCAT, you should be able to analyze the shape and apply geometric properties to solve a problem involving a planar cross section.
**Example:** Find the area, in square meters, of the plane figure formed by the cross section of the cube in the diagram shown here.

The plane figure formed is a rectangle. One side of the rectangle matches the cube and is 6 meters long. The other side of the rectangle is found using the Pythagorean Theorem or using properties of 45-45-90 right triangles. It is $6\sqrt{2}$ meters long. To find the area, multiply: $6 \times 6\sqrt{2} = 36\sqrt{2} \approx 50.9$ m$^2$. 
Sample Questions
1. A plane intersects a triangular prism parallel to the base. The prism has a base of 4 inches and a height of 5 inches. What is the area of the figure formed by the intersection?

2. Find the area of the figure formed by the intersection of a plane and a cone if the plane is parallel to the base of the cone.
1. In the figure, the shaded region is a planar cross-section of the rectangular solid. What is the area of the cross-section to the nearest square inch?

![Rectangle Diagram]

- a. 220 square inches
- b. 3,225 square inches
- c. 57,612 square inches
- d. 112,000 square inches

2. A right circular cone with diameter of base 8 centimeters and height 12 centimeters is shown. What is the radius of the cross-section that occurs 6 centimeters from the vertex, parallel to the base?

![Cone Diagram]

- a. 2 centimeters
- b. 4 centimeters
- c. 6 centimeters
- d. 8 centimeters

3. A planar cross-section of a right circular cylinder is shown. What is the area of the cross-section?

![Cylinder Diagram]

- a. $10\pi$ square inches
- b. $20\pi$ square inches
- c. $100\pi$ square inches
- d. $400\pi$ square inches
4. The cross-section of a right circular cone formed by a plane parallel to the base and 16 millimeters above the base is shown. What is the radius of the cross-section?

a. 5 millimeters  c. 13 millimeters  
b. 10 millimeters  d. 78 millimeters

5. A right circular cone is 8 inches tall and the radius of its base is 9 inches. Which is the best approximation of the perimeter of the planar cross-section that passes through the apex of the cone and is perpendicular to the base of the cone?


6. A right circular cone is 10 inches tall and the radius of its base is 8 inches. Which is the best approximation of the perimeter of the planar cross-section that passes through the apex of the cone and is perpendicular to the base of the cone?


7. In the figure below, the shaded areas show the intersection of two planar cross-sections that divide the large rectangular solid into four identical rectangular solids. (The figure may not be drawn to scale.)
If the four smaller rectangular solids formed by the cross-sections are pulled apart, what is the total surface area of the four solids?

[A] 1536 cm²  
[B] 1280 cm²  
[C] 256 cm²  
[D] 1664 cm²

8. The shaded area of the figure below is a planar cross-section of a sphere that has a radius of \( r \) centimeters. (The figure may not be drawn to scale.)

![Diagram of a sphere with a cross-section shaded](image)

The cross-section is perpendicular to a radius of the sphere and intersects the radius one-fourth of the way from the center of the sphere to its surface. If the radius of the sphere, \( r \), is 18 centimeters, which is the best approximation of the area of the cross-section? Use 3.14 as an approximation for \( \pi \).

[A] 109 cm²  
[B] 906 cm²  
[C] 954 cm²  
[D] 445 cm²

9. Which is NOT a possible shape for a planar cross-section of a regular square pyramid?

[A] triangle  
[B] trapezoid  
[C] square  
[D] hexagon

10. The shaded area in the figure below is a planar cross-section of the pyramid. The pyramid’s edges are all 16 centimeters long and the base of the pyramid is a square. (The figure may not be drawn to scale.)
What is the perimeter of the cross-section? Round your answer to the nearest tenth of a centimeter.

11. In the figure below, the shaded area is a planar cross-section that is perpendicular to the bases of the right cylinder. (The figure may not be drawn to scale.)

What is the area, in square centimeters, of the cross-section?