Cross-Sections of Three-Dimensional Figures

Explore ideas and representations

Name _____ **Date** _____ **Score** _____ / 6

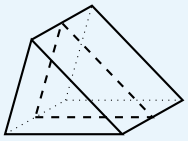
QUICK REVIEW

A cross-section is the flat region where a plane cuts a solid. Identify where the plane meets the solid, then use only the lengths in that plane. A cylinder cut parallel to its base gives a circle of area πr^2. Figures are schematic.

Worked example

A plane cuts a right triangular prism parallel to its triangular ends. The ends have perpendicular legs 4 and 5 cm. Name the section and find its area.

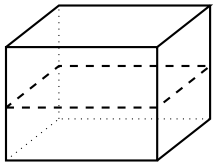
1. The plane is parallel to an end, so the cross-section has the same 3-sided outline.
2. Its perpendicular legs are the original 4 cm and 5 cm.
3. Use the triangle area formula: $(1/2)(4)(5) = 10$ cm^2.
Answer: Right triangle; area 10 cm^2.



Practice Problems

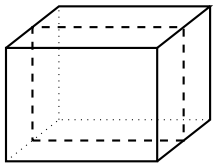
Show your thinking.

1. Slice a right rectangular prism 6 cm long, 4 cm wide, and 3 cm high parallel to its length-by-width base. Name the section, give its dimensions, and find its exact area.



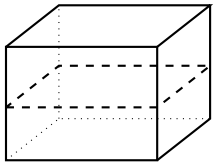
schematic cut

2. Slice a right rectangular prism 8 cm long, 3 cm wide, and 5 cm high parallel to its length-by-height face. Name the section, give its dimensions, and find its exact area.



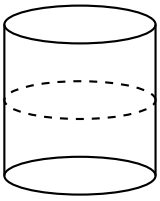
schematic cut

3. Slice a cube of side 4 cm parallel to a face. Name the section, give its dimensions, and find its exact area.



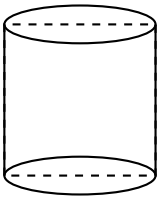
schematic cut

4. Slice a right cylinder with radius 3 cm and height 7 cm parallel to its circular base. Name the section, give its dimensions, and find its exact area.



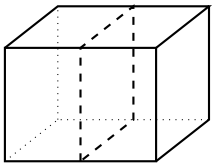
schematic cut

5. Slice a right cylinder with radius 2 cm and height 6 cm with a plane through its axis. Name the section, give its dimensions, and find its exact area.



schematic cut

6. Slice a right rectangular prism 7 cm long, 2 cm wide, and 4 cm high parallel to its width-by-height face. Name the section, give its dimensions, and find its exact area.



schematic cut

Answer Key

1. Rectangle, 6 cm by 4 cm; area 24 cm^2.
2. Rectangle, 8 cm by 5 cm; area 40 cm^2.
3. Square, 4 cm by 4 cm; area 16 cm^2.
4. Circle, radius 3 cm; area 9π cm^2.
5. Rectangle, 4 cm by 6 cm; area 24 cm^2.
6. Rectangle, 2 cm by 4 cm; area 8 cm^2.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The section matches the face parallel to the cut, so it is a rectangle.

2. Within that plane, the two perpendicular sides measure 6 cm and 4 cm.

3. Area $= 6(4) = 24$ cm^2.

Problem 2

1. The section matches the face parallel to the cut, so it is a rectangle.

2. Within that plane, the two perpendicular sides measure 8 cm and 5 cm.

3. Area $= 8(5) = 40$ cm^2.

Problem 3

1. The section matches the face parallel to the cut, so it is a square.

2. Within that plane, the two perpendicular sides measure 4 cm and 4 cm.

3. Area $= 4(4) = 16$ cm^2.

Problem 4

1. A cut parallel to the base has the same circular outline as the base.

2. Its radius is 3 cm. The height 7 cm is perpendicular to the cut.

3. Area $= \pi(3)^2 = 9\pi$ cm^2.

Problem 5

1. The plane contains a base diameter and the perpendicular height, so the section is a rectangle.

2. The diameter is $2(2) = 4$ cm and the height is 6 cm.

3. Area $= 4(6) = 24$ cm^2.

Problem 6

1. The section matches the face parallel to the cut, so it is a rectangle.

2. Within that plane, the two perpendicular sides measure 2 cm and 4 cm.

3. Area $= 2(4) = 8$ cm^2.

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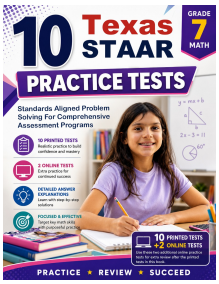

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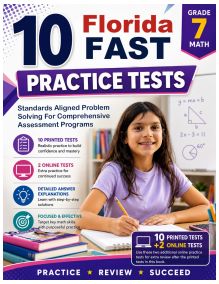

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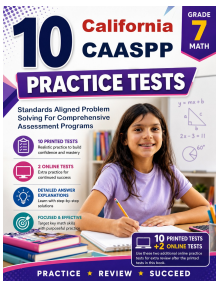

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