

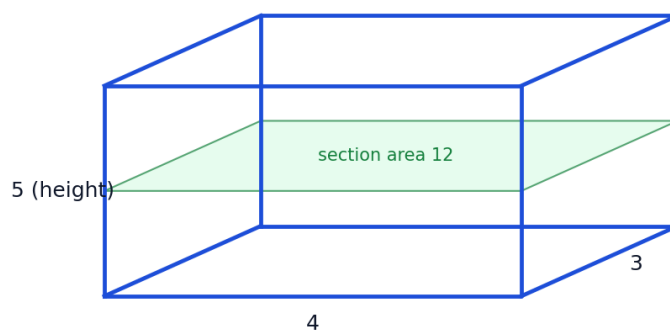
Solutions

7.1 Volume and Surface Area

7.1.1. Find the volume and surface area of a closed rectangular box of dimensions 3, 4, 5.

Solution. Volume is 60 cubic units; surface area is $2(3 \cdot 4 + 3 \cdot 5 + 4 \cdot 5) = 94$ square units.

Rectangular prism: 3 by 4 by 5



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A horizontal section has area 12. Volume = 60 and closed-box surface area = 94.

7.1.2. A cone has radius 3 and perpendicular height 8. Find its volume.

Solution. $V = (1/3)\pi(9)(8) = 24\pi$ cubic units.

7.1.3. A sphere has radius 2. Find volume and surface area.

Solution. $V = (4/3)\pi(2^3) = 32\pi/3$ cubic units and $SA = 4\pi(2^2) = 16\pi$ square units.

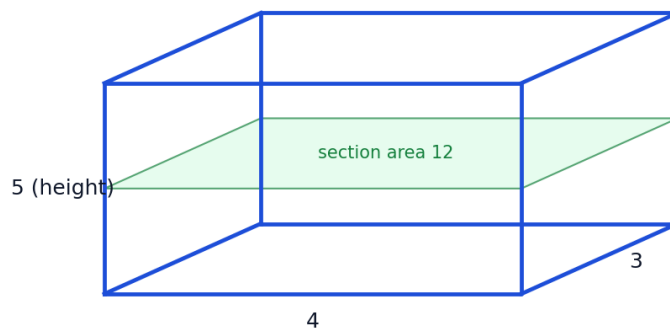
Solutions

7.2 Cross Sections and Scale

7.2.1. A 3 by 4 by 5 rectangular prism is cut parallel to its 3 by 4 base halfway up. Give the cross-section area.

Solution. The section is a 3 by 4 rectangle, so its area is 12 square units.

Rectangular prism: 3 by 4 by 5



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A horizontal section has area 12. Volume = 60 and closed-box surface area = 94.

7.2.2. Similar solids have volume ratio 64 : 27. Find the length ratio.

Solution. Take cube roots to get 4 : 3.

7.2.3. A sphere of radius 5 is cut by a plane 3 units from its center. Find the cross-section radius.

Solution. A right triangle gives $r = \sqrt{25 - 9} = 4$.

Solutions

7.3 Axiomatic Systems

7.3.1. Identify the assumption in: Through two distinct points there is exactly one line.

Solution. This is an incidence postulate in Euclidean geometry, accepted as a starting fact rather than proved from a picture.

7.3.2. Can the sum of triangle angles be assumed to be 180° in every geometry?

Solution. No. The Euclidean result depends on the geometric system. Spherical triangles can have larger angle sums.

7.3.3. Why is using a conclusion as a premise invalid in a proof?

Solution. It is circular: it assumes the very fact that the argument is supposed to establish.