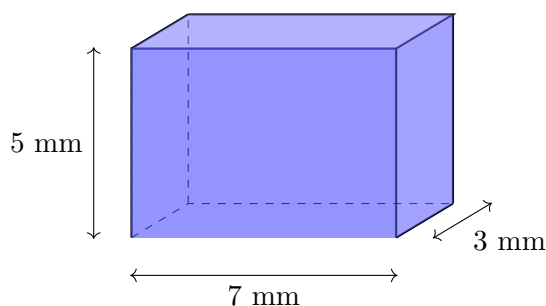


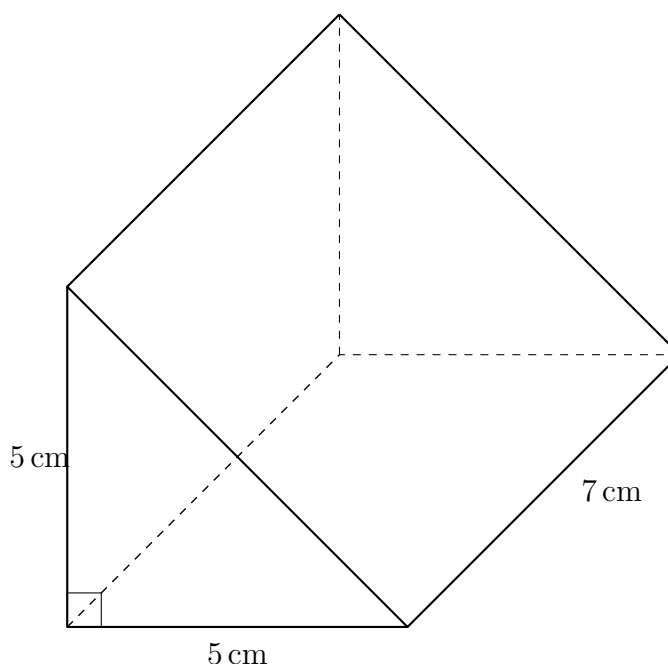
Problems in Three Dimensions 1

Solve the following problems.

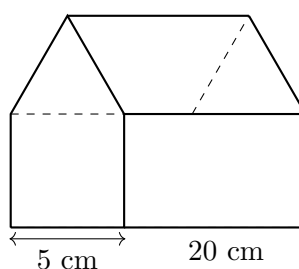
1. Find the surface area of the following cuboid.



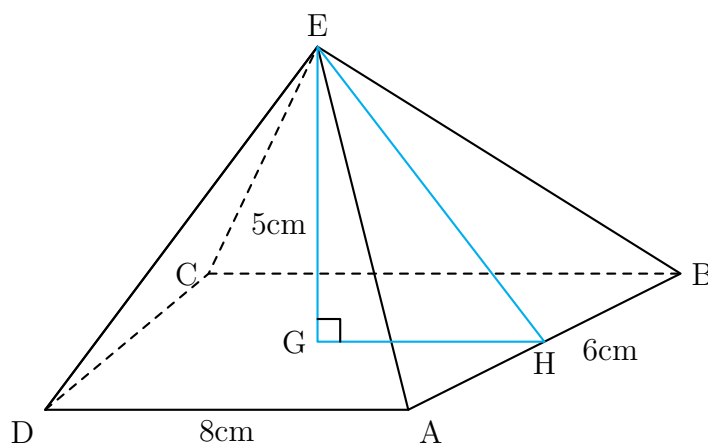
2. The cross-section of this prism is a right-angled isosceles triangle. Find the surface area of the prism.



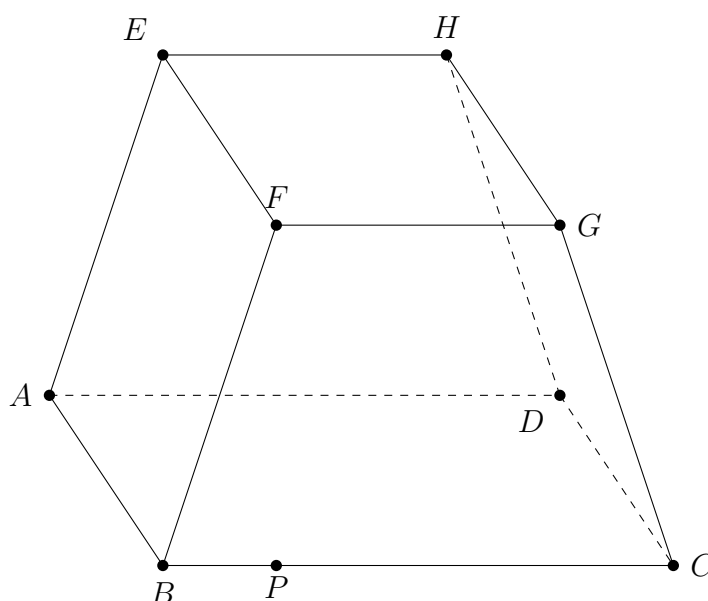
3. The cross-section of this prism is a square surmounted by an equilateral triangle. Find the surface area of the prism.



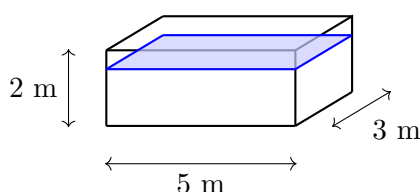
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4. An open box is a cube whose edges are 20 cm long. Find the length of the longest stick that will fit inside the box.
 5. A cuboid has length 12 cm, width 5 cm, and height 4 cm. Find the length of the longest rod that can fit entirely inside the cuboid.
 6. A rectangular room measures 8 m by 6 m with a height of 3 m. Find the distance from one bottom corner to the opposite top corner of the room.
 7. The base of a rectangular prism is 9 mm by 12 mm. If the height of the prism is 8 mm, find the length of the space diagonal.
 8. A solid has 8 faces and 6 vertices. How many edges would you expect it to have?
 9. A triangular prism has 5 faces and 6 vertices. How many edges does it have?
 10. A square-based pyramid has 8 edges and 5 vertices. How many faces does it have?
 11. An open cone has a base radius of 6 cm and a height of 10 cm.
 - (a) Find the slant height of the cone.
 - (b) Find the surface area of the cone.
 12. A cone-shaped container has a slant height of 13 cm and a base radius of 5 cm.
 - (a) Find the perpendicular height of the cone.
 - (b) Find the volume of the cone, correct to one decimal place.
 13. A rectangular prism has sides of 9 cm, 12 cm, and 15 cm.
 - (a) Find the length of the space diagonal.
 - (b) Find the volume of the prism.
 14. ABCDE is a right pyramid on a rectangular base, 8 cm by 6 cm. The height of the pyramid is 5 cm. H is the midpoint of AB.
 - (a) Find the length of EH.
 - (b) Find the surface area of the pyramid.
 - (c) Find the angle $\angle EHG$.
 - (d) Find the length of DB.



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15. The cross-section of a right prism is an isosceles triangle ABC with $AB = AC = 15$ cm and $BC = 18$ cm. The length of the prism is 20 cm. M is the midpoint of BC .
- Find the height AM of the triangular cross-section.
 - Find the volume of the prism.
 - Find the length of the longest diagonal on one of the rectangular faces (e.g., BE if the prism is $ABCDEF$).
 - Find the angle $\angle ABM$.
16. The diagram shows the frustum of a pyramid (i.e. a pyramid with its top sliced off). $ABCD$ and $EFGH$ are both horizontal squares. $EA = FB = GC = HD = 6$ cm, $AB = 10$ cm and $EF = 6$ cm.
- Sketch the face $FBCG$. What shape is it?
 - P is the point on BC such that $\angle FPB = 90^\circ$. Calculate the length of FP .
 - Find the surface area of the frustum.

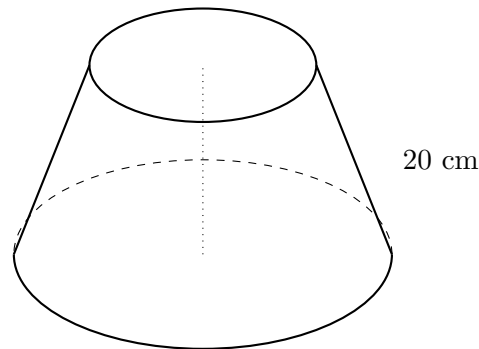


17. A water tank is in the shape of a cuboid with dimensions $5\text{ m} \times 3\text{ m} \times 2\text{ m}$. Find the volume of the tank.
- Find the volume of the tank.
 - If the tank is currently $\frac{3}{4}$ full, what is the height of the water in the tank?



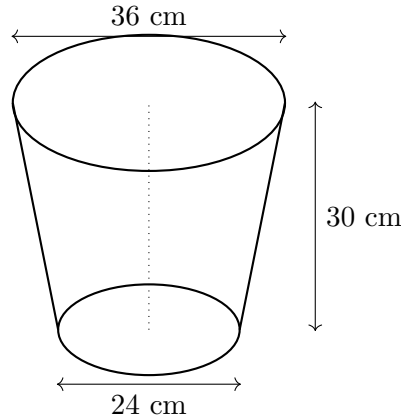
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18. The curved surface of a lampshade is in the shape of a frustum of a cone. The radius of the circle forming the lower edge is 16 cm and the radius of the circle forming the upper circle is 8 cm. The slant height is 20 cm.

- (a) Sketch the net for making the curved surface.
(b) Find the surface area of the curved surface.



19. A bucket is in the shape of a frustum of a cone. The base diameter is 24 cm and the top diameter is 36 cm. The perpendicular height of the bucket is 30 cm.

- (a) Find the slant height of the bucket.
(b) Find the volume of the bucket, correct to three significant figures.



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20. A metal lampshade is shaped as a frustum of a cone. It has a slant height of 15 cm. The radii of the top and bottom edges are 5 cm and 10 cm respectively. The base of the lampshade is covered with a circular piece of plastic.

- (a) Find the area of the plastic covering the base.
- (b) Find the total external surface area of the lampshade (curved surface area plus the base).

