

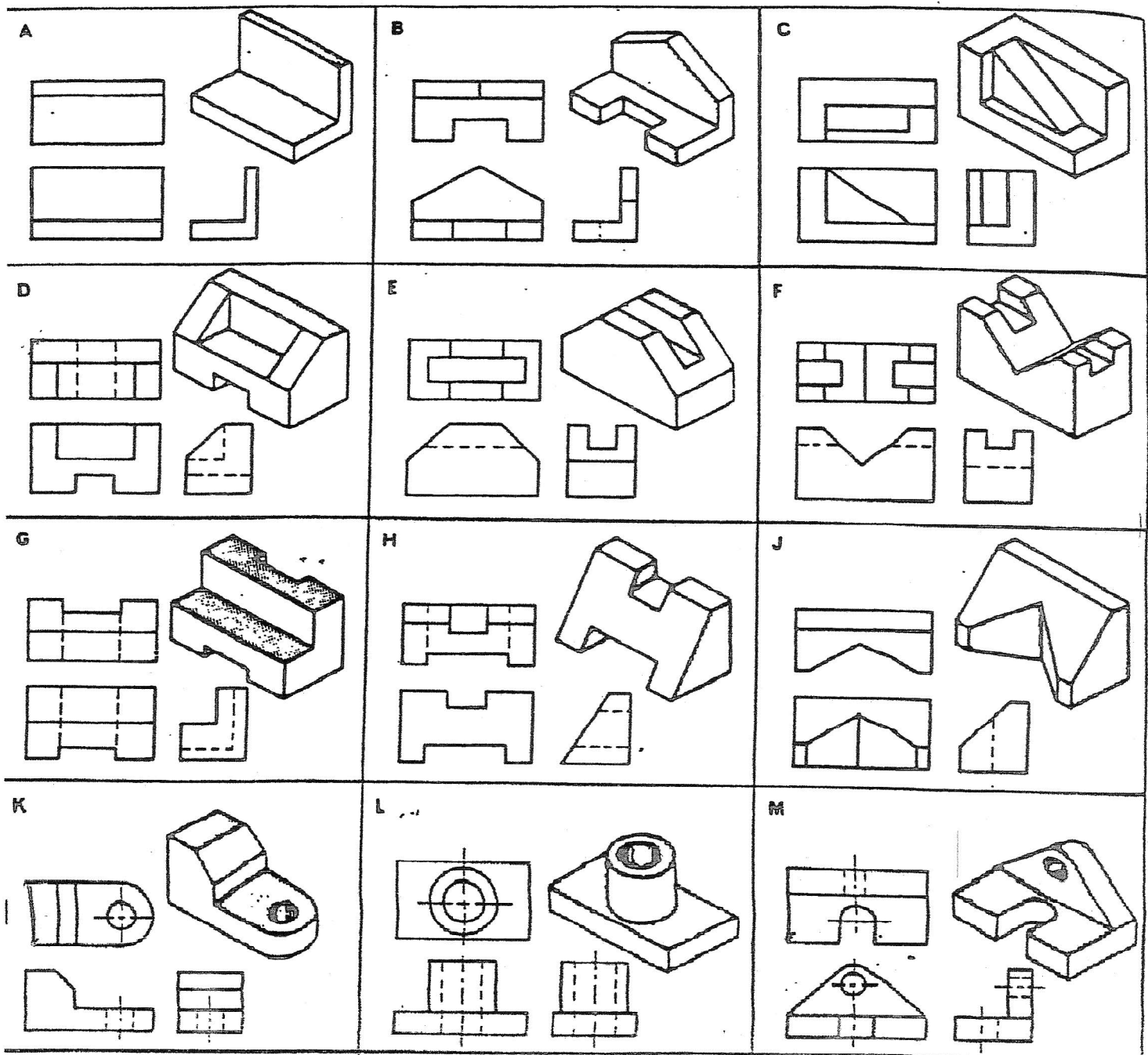
# 3D-Views & Surface Area

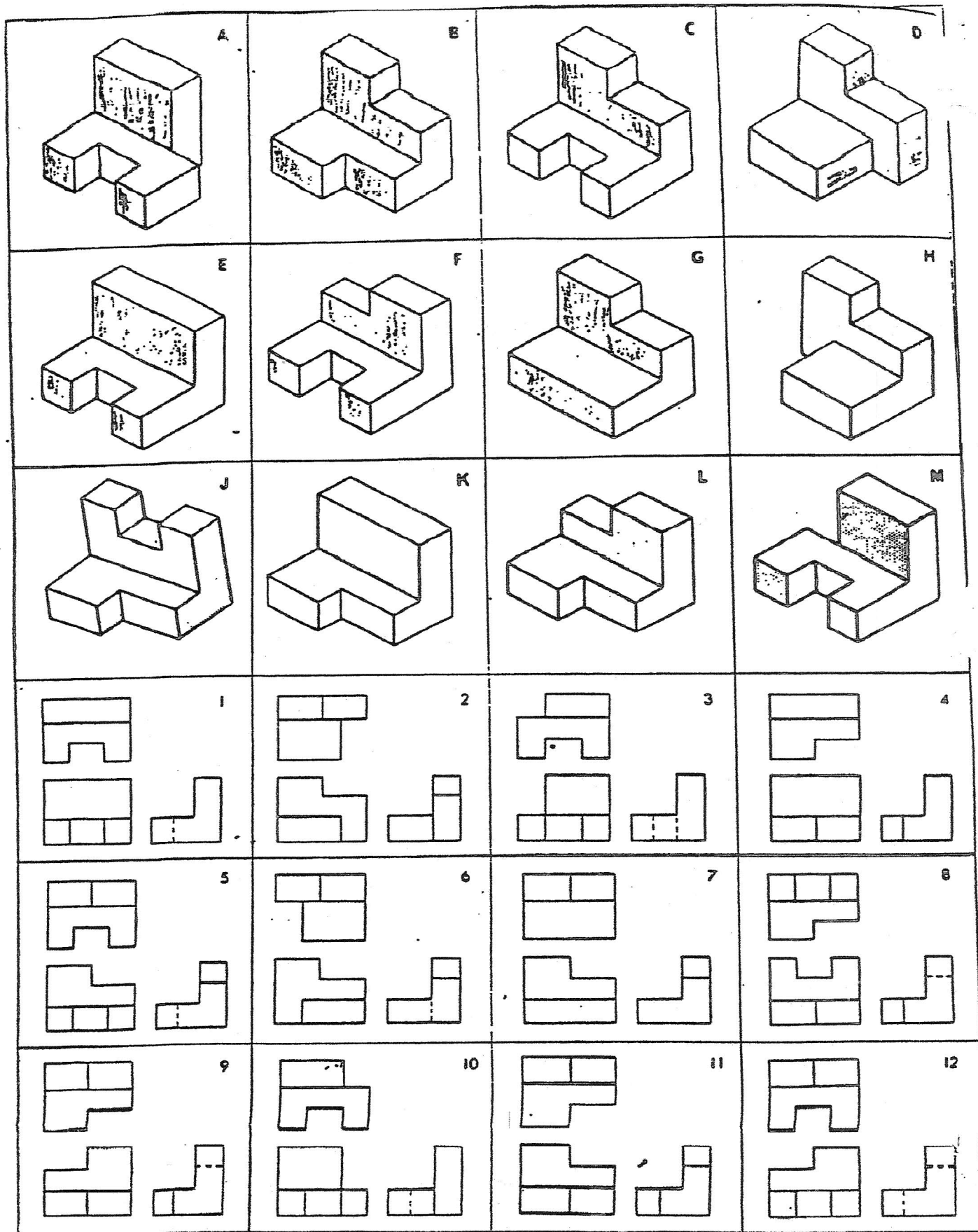
## Unit Schedule

Date	Topic	Assignment
Monday, March 25	1-2: Exploring Three-Dimensional Figures: Day 1	CW: Iso. & Orthographic Views WS (pg. 1-2) Exploring 3D Figures WS (pg. 3- 4) HW: p. 13 (1-9, 18-20, 35)
Tuesday, March 26	1-2: Nets	CW: Pattern Folding, Visualizing in 3D, Cube Flip and Turn (pg. 5-8) HW: p. 13 (11-16, 23-30, 34)
Wednesday, March 27	<b>QUIZ: Topics TBA</b> 11-1: Space Figures and Cross Sections	CW: Space Figures and Cross Sections (pg. 9-10) HW: p. 601 (1-19, 21-29, 36)
Thursday, March 28	<b>Area Unit Retention Quiz</b>	
Friday, March 29	<b>HOLIDAY</b>	NONE
<b>Monday-Thursday, April 1-4</b>	<b>EOC Testing; TBA</b>	<b>TBA</b>
Friday, April 5	11-2: Surface Area of Prisms & Cylinders	CW: Surface Area of Prisms and Cylinders (pg. 11-12) HW: p. 612 (5-12, 16, 19, 21, 22, 24, 27-30, 33-35) p. 253 (1-4)
Monday, April 8	11-3: Surface Area of Pyramids & Cones	CW: Notes: Surface Area of Pyramids & Cones (pg. 13-14) HW: p. 620 (1, 2, 4, 5, 9-11, 18, 19, 21, 23, 27-30)
<b>Tuesday, April 9</b>	<b>QUIZ: Topics TBA</b>	HW: WS 11:1-11:3 (pg. 15-16)
Wednesday, April 10	Practice	CW/HW: Surface Area of Pyramids WS Surface Area of Cones WS (pg. 17-18)
Thursday, April 11	Practice/Review	CW/HW: Review of 11.2 & 11.3 WS (pg. 19-20)
<b>Friday, April 12</b>	<b>TEST</b>	

THE ILLUSTRATIONS BELOW SHOW A FIGURE AND ITS ORTHOGRAPHIC DRAWINGS. CLOCKWISE FROM THE UPPER RIGHT CORNER ARE THE FIGURE, ITS SIDE VIEW, ITS FRONT VIEW, AND ITS TOP VIEW. AFTER STUDYING EXAMPLES A THROUGH M CAREFULLY, WORK ON THE EXERCISES ON THE FOLLOWING PAGE.

INSTRUCTIONS: Match the pictorial drawings A - M to the corresponding orthographic drawings 1 - 12.

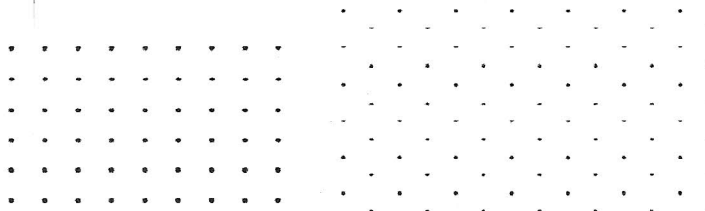
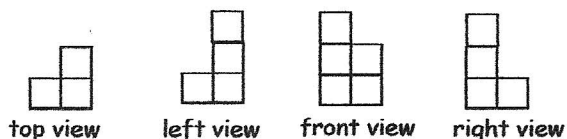




Match Pictorial Drawings A to M with Orthographic Drawings 1 to 12

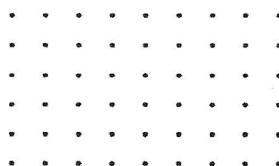
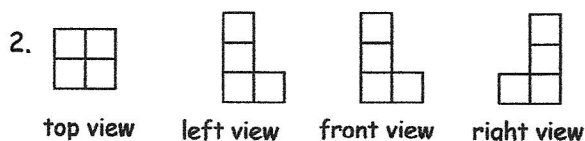
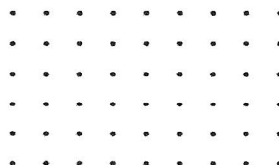
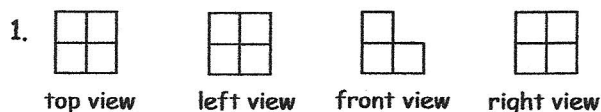
## 1-2 Exploring Three-Dimensional Figures

Example: Various orthographic views of a solid figure are shown below. The edge of one black line represents one unit of length. Draw the orthographic back view and then draw a front, right corner view.

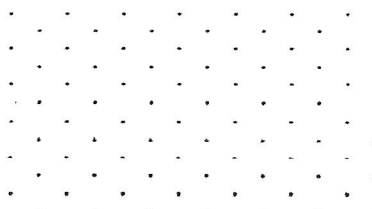
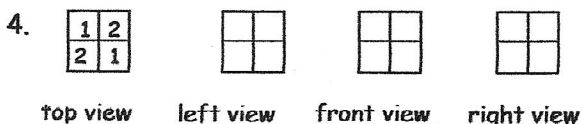
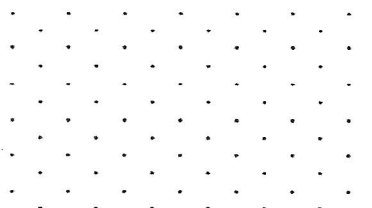
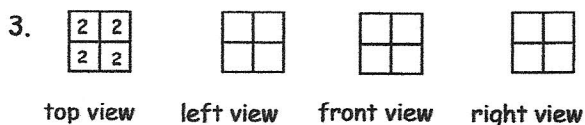


## 1-2 Worksheet

Various orthographic views of a solid figure are shown below. The edge of one black line represents one unit of length. Make a model of each figure. Then draw the orthographic back view of the figure.

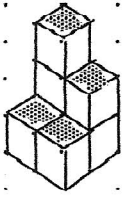


From the orthographic views of a solid figure given below, draw the front-right corner view.





5. The front-right corner view of a figure is given below. Draw the orthographic top, left, front, right, and back views of the figure.



top view

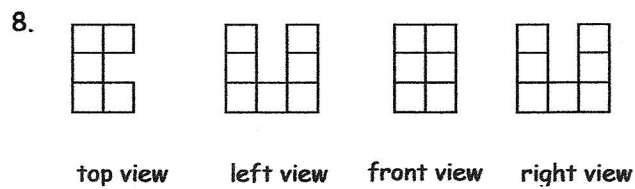
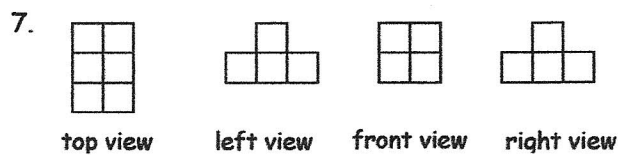
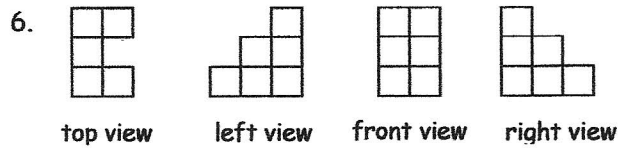
left view

front view

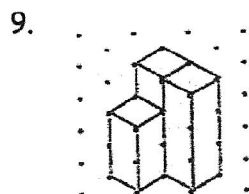
right view

back view

From the orthographic views of a solid figure given below, draw a front-right corner view.



The front-right corner view of a figure is given. Draw the orthographic top, left, front, right, and back views of the figure.



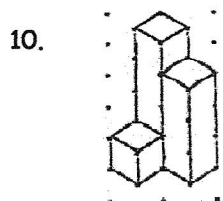
top view

left view

front view

right view

back view



top view

left view

front view

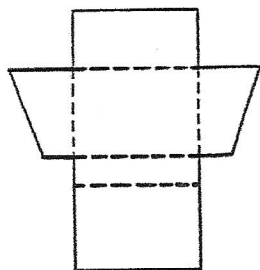
right view

back view

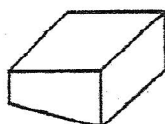
# PATTERN FOLDING—SELECT

Each pattern on the left is a wrapper for one of the solids on the right. Draw a circle around the correct solid.

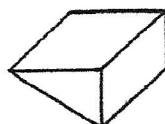
1.



a.



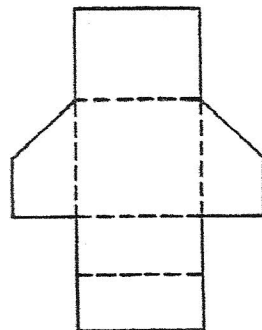
b.



c.



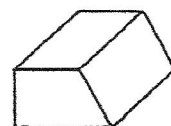
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a.



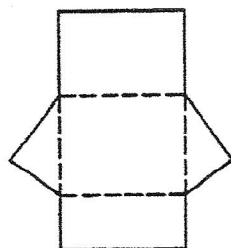
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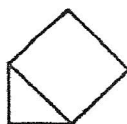
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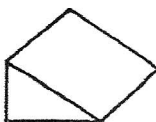
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a.



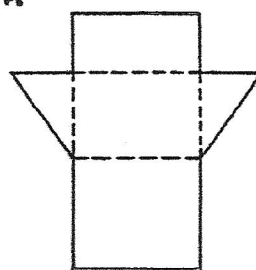
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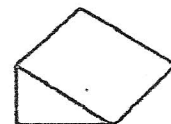
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4.



a.



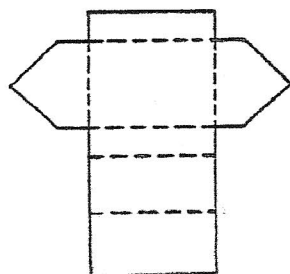
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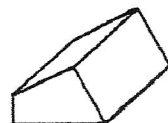
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5.



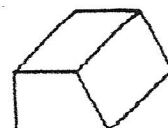
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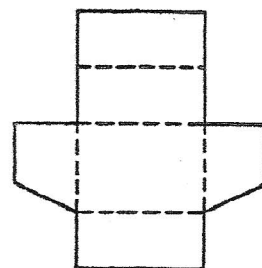
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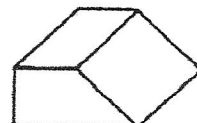
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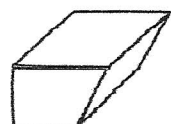
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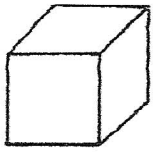


c.

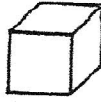


# PATTERN FOLDING—MATCHING

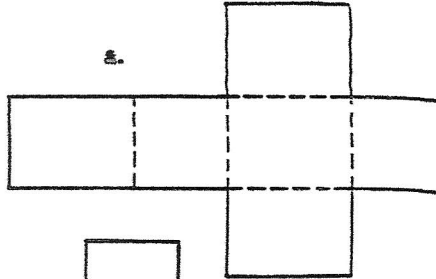
Each solid on the left can be covered by one of the wrappers on the right. Write the letter of the matching wrapper on the line by each solid.



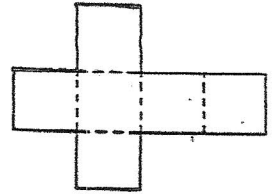
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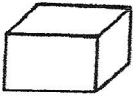
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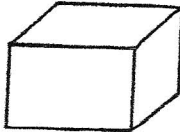
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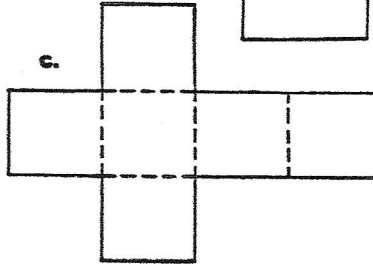
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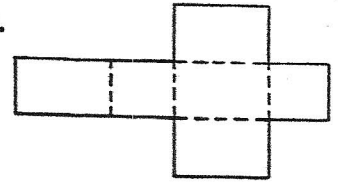
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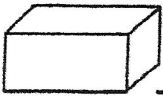
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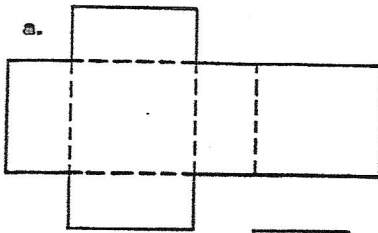
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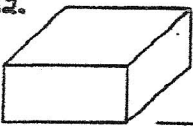
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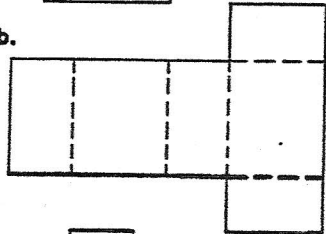
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12.



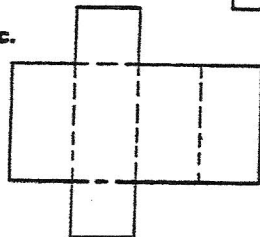
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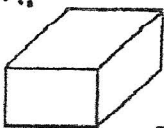
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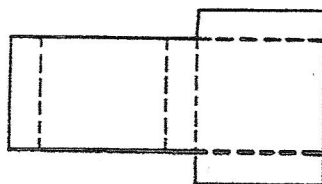
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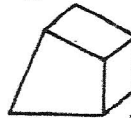
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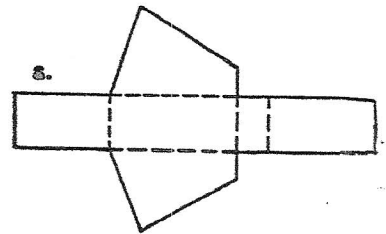
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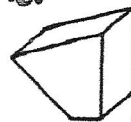
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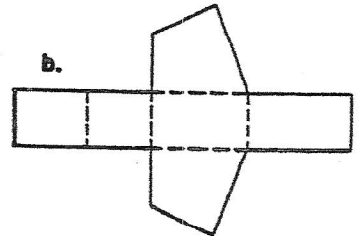
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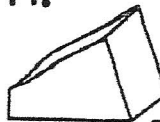
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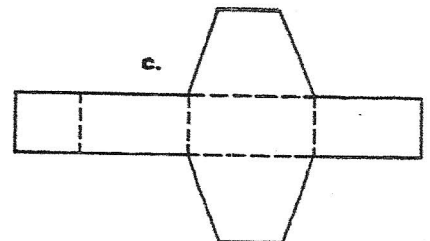
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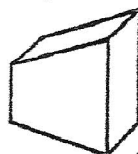
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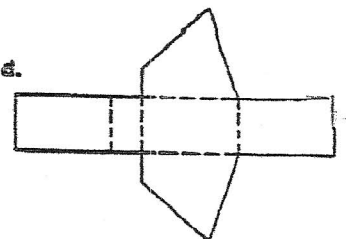
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18.



d.



# EXTENSION

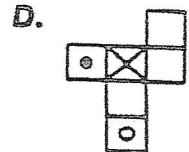
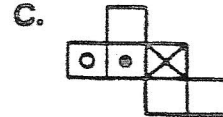
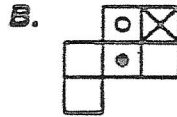
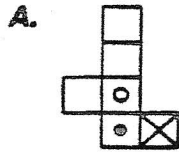
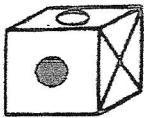
Lesson

12 - 9

Name \_\_\_\_\_

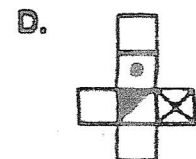
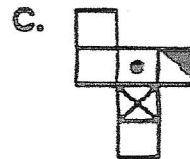
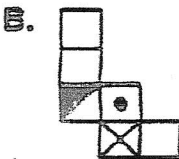
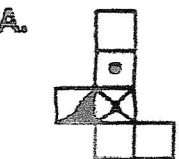
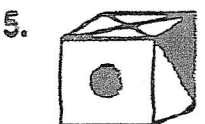
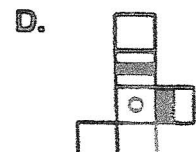
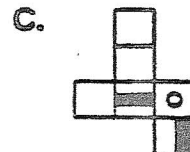
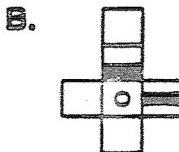
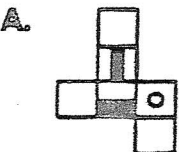
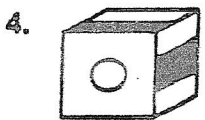
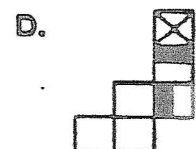
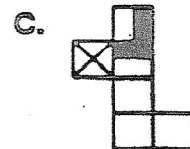
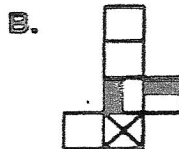
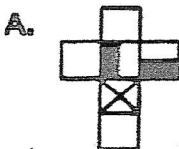
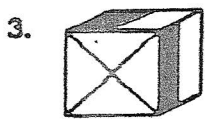
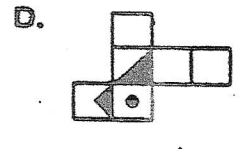
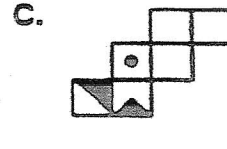
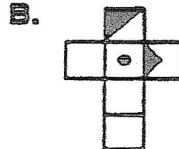
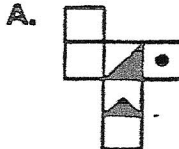
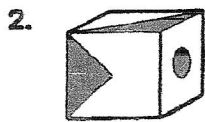
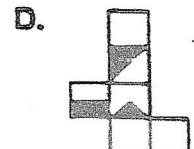
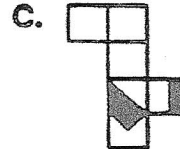
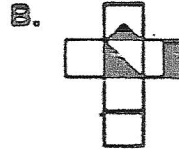
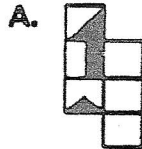
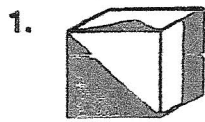
## Visualizing in Three Dimensions

On some aptitude tests you will find questions which ask you to visualize three-dimensional constructions. For instance, you might be asked to "fold" patterns in your mind. In the example below, see if you can guess which pattern, when folded, would produce the box on the left.



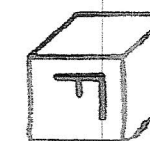
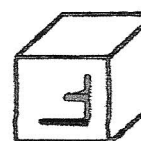
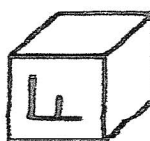
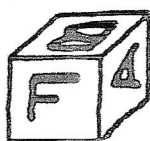
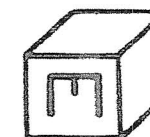
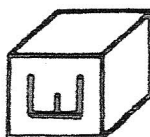
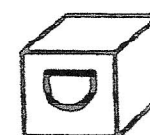
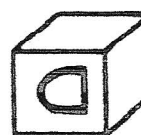
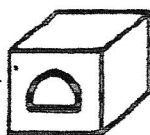
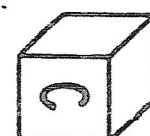
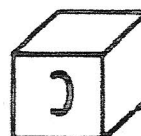
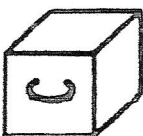
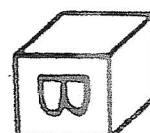
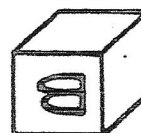
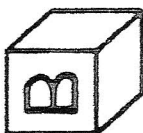
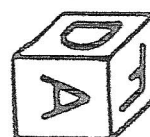
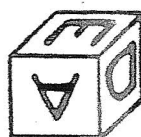
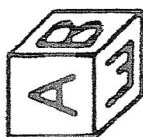
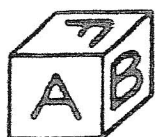
The correct answer is A.

Choose the one pattern from each set that could be folded into the box shown.



# CUBE FLIP AND TURN

A CUBE CAN OCCUPY A SPACE IN 24 DIFFERENT WAYS.  
CAN YOU FILL IN THE MISSING LETTERS?

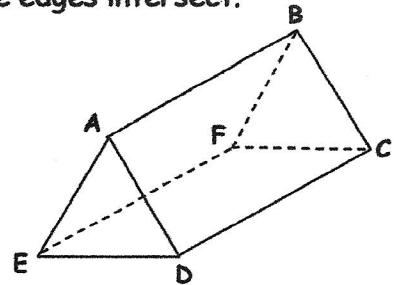


MAKE A MODEL !!

## 11-1 Space Figures and Cross Sections

- Polyhedron**
- \* 3D figure whose surfaces are \_\_\_\_\_
  - \* each polygon is a \_\_\_\_\_
  - \* an \_\_\_\_\_ is a segment where two faces intersect.
  - \* a \_\_\_\_\_ is a point where three or more edges intersect.

Example 1: List the vertices, edges, and faces of the polyhedron.



Leonhard Euler (1707-1783), a Swiss mathematician, discovered a relationship among the numbers of faces, vertices, and edges of any polyhedron.

**Euler's Formula:**  $F + V = E + 2$  where  $F = \#$  of faces  
 $V = \#$  of vertices  
 $E = \#$  of edges

Example 2: Find the number of edges of a polyhedron with 6 faces and 8 vertices.

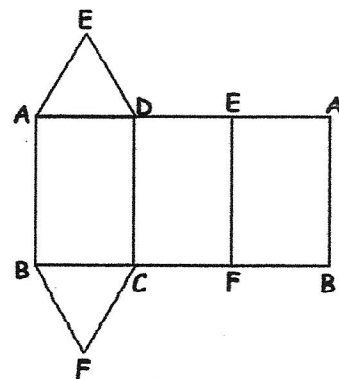
**Note:** In two-dimensions, Euler's formula reduces to  $F + V = E + 1$   
 where  $F$  is the number of regions formed by  $V$  vertices linked by  $E$  segments.

Consider a net for the polyhedron in Example 1.

Regions = \_\_\_\_\_

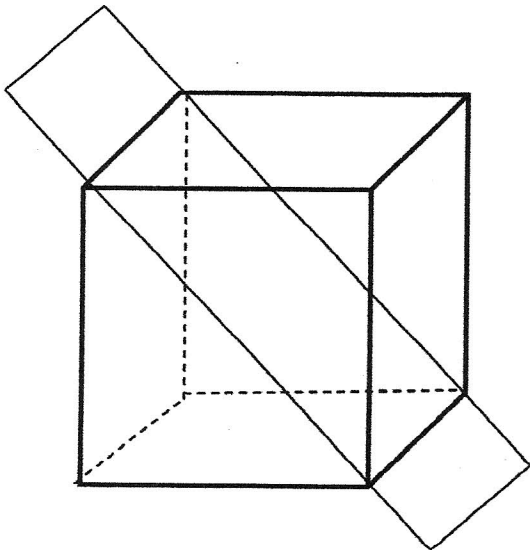
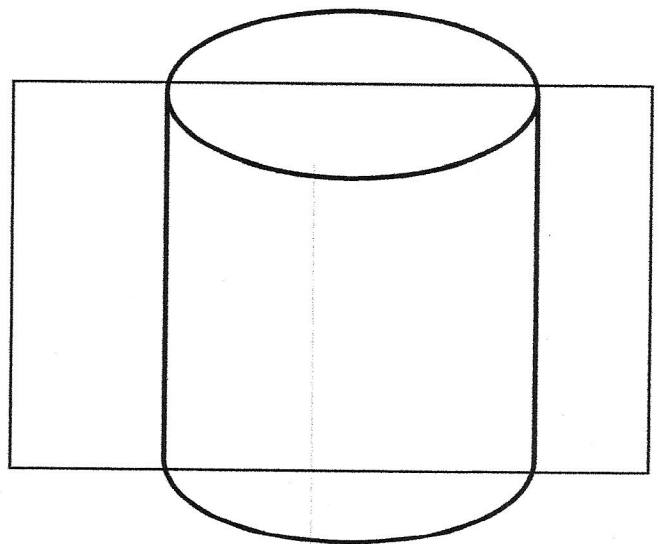
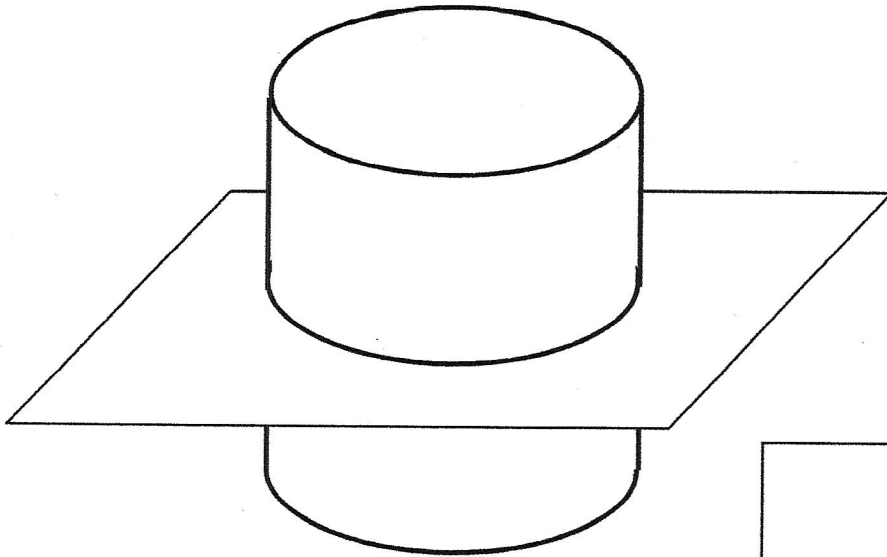
Vertices = \_\_\_\_\_

Segments = \_\_\_\_\_



A **cross section** is the intersection of a solid and a plane. You can think of a cross section as a very thin slice of a solid.

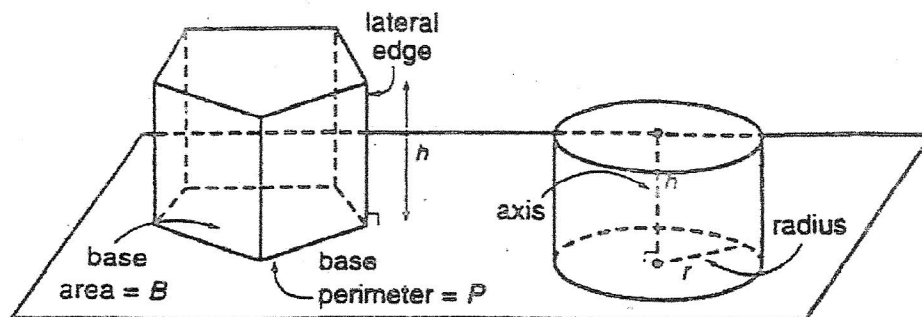
Describe each cross section:





## 11-2 Surface Area of Prisms and Cylinders

**Prisms** are polyhedrons with congruent polygonal bases in parallel planes. **Cylinders** have congruent and parallel circular bases. An **altitude** is a perpendicular segment joining the planes of the bases. The length of an altitude is the height of the figure. **Right prisms** have lateral edges that are altitudes. The lateral faces of a right prism are rectangles. An **oblique prism** is a prism whose edges are not altitudes. The lateral faces of an oblique prism are parallelograms. A **right cylinder** is one whose axis (segment joining the centers of the two circular bases) is an altitude. An **oblique cylinder** is one whose axis is not an altitude.



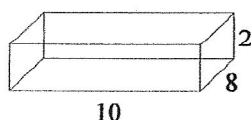
In the following formulas,  $L$  is lateral and  $SA$  is total surface area.

Prisms:  $L = Ph$   
 $SA = Ph + 2B$

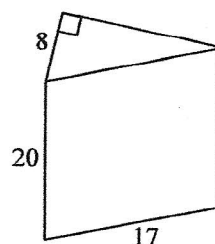
Cylinders:  $L = Ph$   
 $SA = Ph + 2B$

Where  $P$  is the perimeter of the base,  $h$  is the height of the solid, and  $B$  is the area of the base.

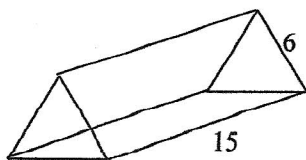
1. Base is a rectangle



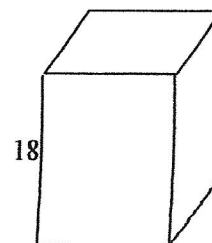
2. Base is a right triangle



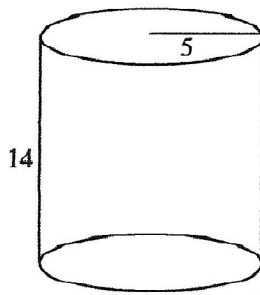
3. Base is an equilateral triangle



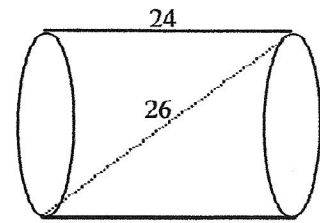
4. Base is a rhombus with diagonals 10 and 24



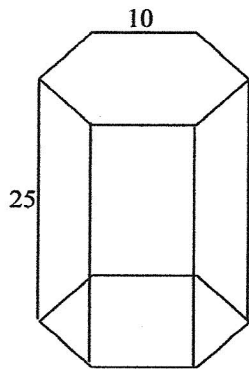
5. Cylinder



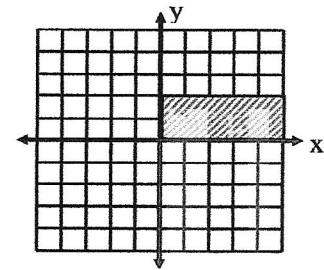
6. Cylinder



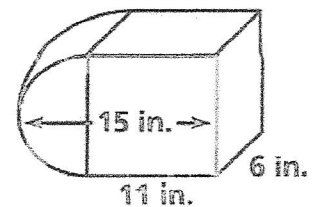
7. Base is a regular hexagon



8. The plane region is revolved completely about the line  $y = 2$  to sweep out a solid of revolution. Describe the solid and find its surface area in terms of  $\pi$ .

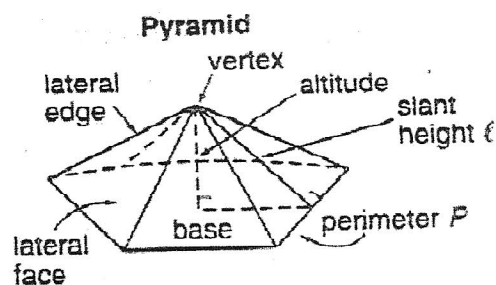


9. Judging by appearances, what is the surface area of the solid pictured?



**PYRAMID:**

- All faces except one intersect at the \_\_\_\_\_.
- \_\_\_\_\_ - face that doesn't intersect at vertex.  
Is always a \_\_\_\_\_
- \_\_\_\_\_ faces – faces that intersect at vertex  
always triangles.
- \_\_\_\_\_ edges – edges that have the vertex as an endpoint.
- \_\_\_\_\_ - segment from the vertex perpendicular to the base.



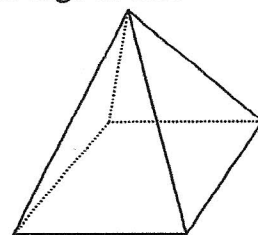
**REGULAR PYRAMID** – base is a regular polygon and segment from vertex to center of base is an \_\_\_\_\_

- all lateral faces are congruent \_\_\_\_\_
- \_\_\_\_\_ height ( $l$ ) – height of each lateral face.

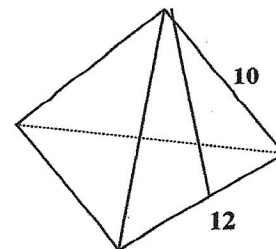
Lateral Area of Regular Pyramid =  $\frac{1}{2} Pl$  where  $P$  is the perimeter of the base and  $l$  is the slant height.

Surface Area of Regular Pyramid =  $\frac{1}{2} Pl + B$

(1) Find the lateral area and surface area of the regular pyramid with altitude 15 cm. and edge of base 16 cm.



(2) Find the lateral area and surface area of the regular triangular pyramid below.

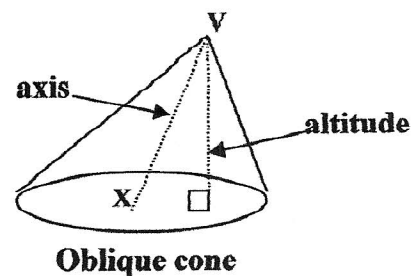


(3) Find the altitude of a regular square pyramid with base edge 12 cm. and lateral area of  $240 \text{ cm}^2$ .

**CIRCULAR CONE** – Base is a circle.

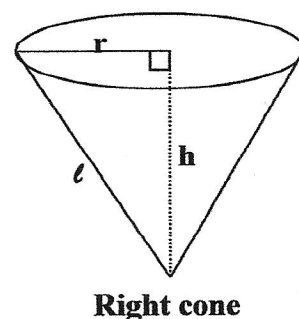
A cone whose \_\_\_\_\_ is also an altitude is called a **right cone**.

- Slant height ( $l$ ) – any segment joining vertex to edge of base.
- Height ( $h$ ) – measure of altitude.

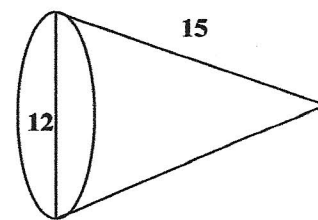


Lateral Area of right Circular Cone =  $\frac{1}{2} Pl = \frac{1}{2}(2\pi r)l = \pi rl$

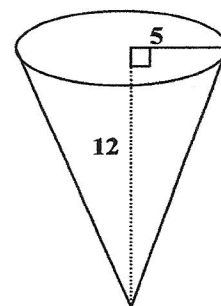
Surface Area of right Circular Cone =  $\frac{1}{2} Pl + B = \frac{1}{2}(2\pi r)l + \pi r^2 = \pi rl + \pi r^2$



(1) Find the lateral area and surface area of the right circular cone at the right.



(2) Find the lateral area and surface area of the right circular cone at the right.

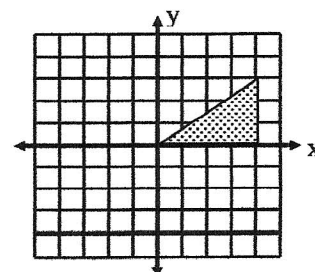


(3) The plane region is revolved completely about the given line to sweep out a solid of revolution.

Describe the solid and then find its surface area in terms of  $\pi$ .

(a) about the x-axis

(b) about the y-axis



Determine whether each of the following statements is *always*, *sometimes*, or *never* true.

\_\_\_\_\_ 1. A triangular prism has 3 lateral faces.

\_\_\_\_\_ 2. A pentagonal prism has 5 vertices.

\_\_\_\_\_ 3. An octagonal prism has 24 edges.

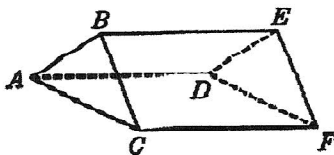
\_\_\_\_\_ 4. It is possible to calculate the surface area of any right cylinder given only the height and radius of a base.

\_\_\_\_\_ 5. The total surface area of a prism is equal to the sum of the areas of its lateral faces and its two bases.

\_\_\_\_\_ 6. What is the surface area of a cube with edges of 7?

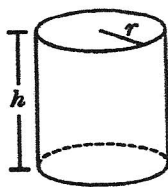
\_\_\_\_\_ 7. What is the total surface area of a right square prism with base edges of 5 cm and lateral edges of 8 cm?

\_\_\_\_\_ 8. A triangular right prism is shown. If  $AB = BC = 5$ ,  $AC = 8$ , and  $CF = BE = AD = 10$ , what is the surface area of the prism?

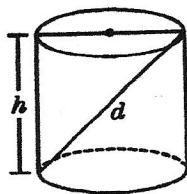


13. Each base of a right prism is a regular hexagon with an area of  $24\sqrt{3}\text{ cm}^2$ . If the lateral area of the prism is  $120\text{ cm}^2$ , what is the height of the prism?

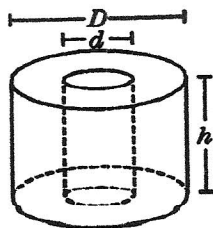
14. In the right cylinder shown,  $h = 12$  and  $r = 2$ . What is the total surface area of this cylinder?



15. In the right cylinder shown,  $h = 3$  and  $d = 5$ . What is the total surface area of the cylinder?



16. A right cylindrical solid is shown with a smaller cylindrical hole bored through it. If  $D = 8\text{ cm}$ ,  $d = 2\text{ cm}$ , and  $h = 6\text{ cm}$ , what is the total surface area of the solid?

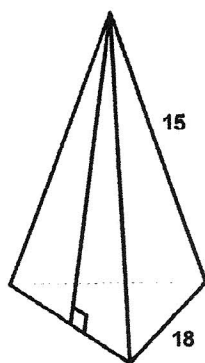


Name: \_\_\_\_\_  
 Period: \_\_\_\_\_ Date: \_\_\_\_\_

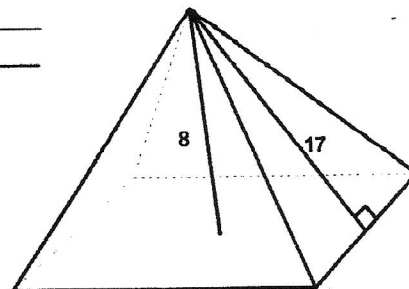
## Surface Area of Pyramids Worksheet

Find the lateral area and surface area of each regular pyramid.

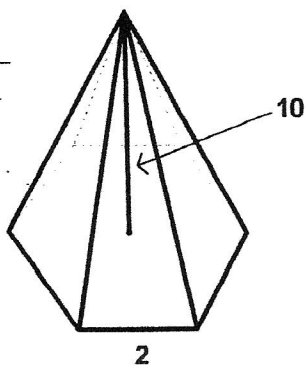
1. LA = \_\_\_\_\_  
 SA = \_\_\_\_\_



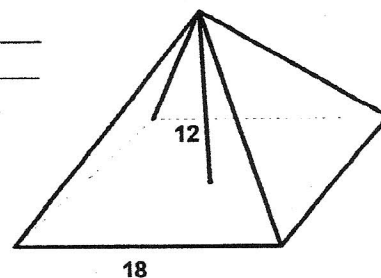
2. LA = \_\_\_\_\_  
 SA = \_\_\_\_\_



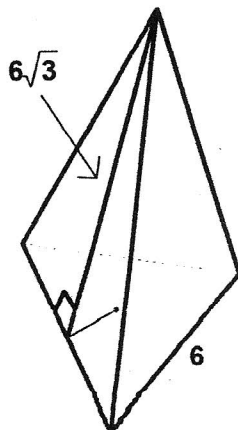
3. LA = \_\_\_\_\_  
 SA = \_\_\_\_\_



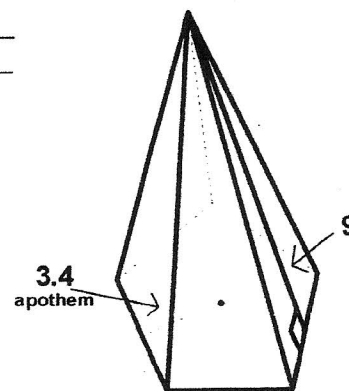
4. LA = \_\_\_\_\_  
 SA = \_\_\_\_\_



5. LA = \_\_\_\_\_  
 SA = \_\_\_\_\_



6. LA = \_\_\_\_\_  
 SA = \_\_\_\_\_



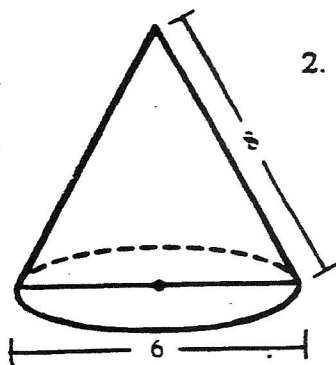


# Surface Area of Cones Worksheet

Find the lateral area and the surface area of each right cone.

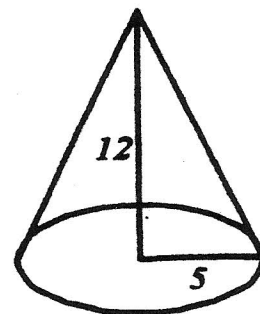
1. LA = \_\_\_\_\_

SA = \_\_\_\_\_



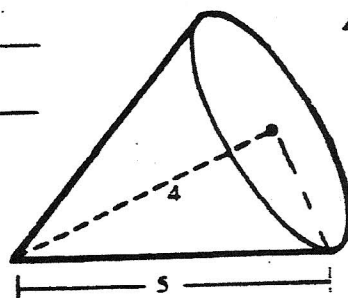
2. LA = \_\_\_\_\_

SA = \_\_\_\_\_



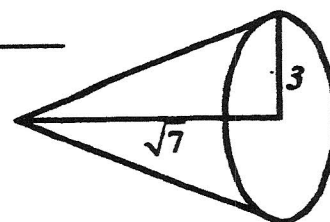
3. LA = \_\_\_\_\_

SA = \_\_\_\_\_



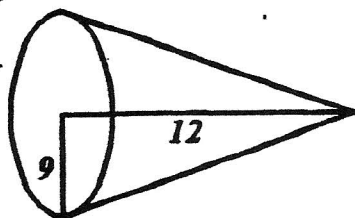
4. LA = \_\_\_\_\_

SA = \_\_\_\_\_



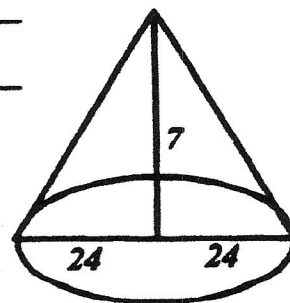
5. LA = \_\_\_\_\_

SA = \_\_\_\_\_

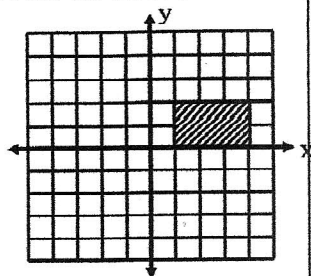


6. LA = \_\_\_\_\_

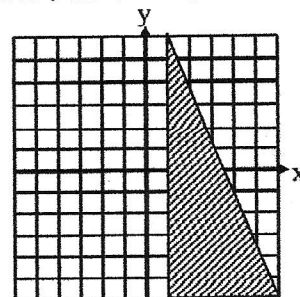
SA = \_\_\_\_\_



1. The plane region is revolved completely about the y-axis. Describe the solid and find its surface area.



2. The plane region is revolved completely about the line  $x = 1$ . Describe the solid and find its surface area.



3. Find the surface area of a regular pyramid with equilateral triangular faces (base included) if all edges are 5 inches.

4. A pyramid has a rectangular base that is 80 inches by 28 inches. Its lateral edges are congruent and have length of 50 inches. What is its lateral area?

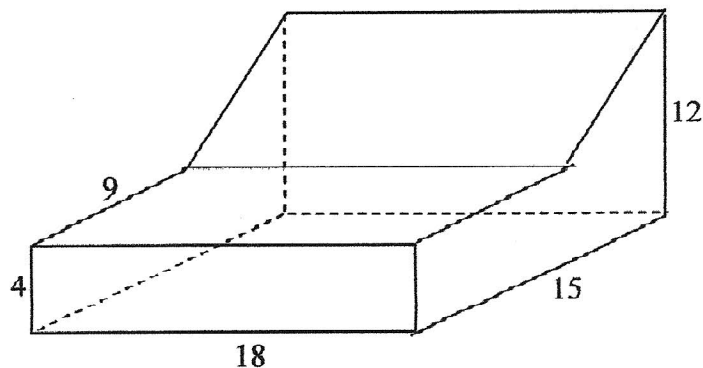
5. The total surface area of a cylinder is  $40\pi$  and the height is 8. Find the radius of this cylinder.

6. A cylinder and a cone have congruent bases with radius 7. Both have a height of 24. What is the difference in their total surface areas?

7. Find the lateral area of a regular square pyramid with base perimeter of 40 and a lateral edge of length 13.

8. The radius of a cone is 8 and the height is 6. What is its lateral area?

9. Find the lateral area of this right prism.

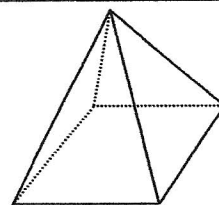


10. Find the total surface area of the prism in problem 9.

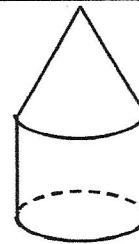
11. After installing the right prism in problems 9 and 10 as a cover for outdoor machinery, it was found that the machinery was overheating. In order to correct the problem of overheating, it was determined that a tight-fitting tent-like cover made of reflective material was to be made. This reflective material comes in sheets that are 4 by 8. The contractor who is to make it doesn't care where or how many seams he makes. If each sheet of reflective material costs \$68, how many sheets will he need and how much will the reflective material cost?

12. Find the lateral area and surface area of a regular hexagonal right prism if the base edges are 10 and the height is 12.

13. Find the lateral area and surface area of the regular pyramid with slant height 17 cm. and altitude 8 cm.



14. The height of the cone and the cylinder are both 12 ft. The diameter of the cylinder is 18 ft. Find the surface area of the figure.



15. Suppose the figure in problem 14 was a metal building that required all of the exterior metal (exposed to air) to be coated with "Rustoleum". Rustoleum comes in gallon cans and one gallon covers  $250 \text{ ft}^2$ . How many gallons of Rustoleum should be bought?

16. A regular pentagonal pyramid has slant height 10 in and lateral area  $90 \text{ in}^2$ . Find the length of a base edge.

**Review Answers:**

- |                              |                                   |  |
|------------------------------|-----------------------------------|--|
| 1. $50\pi \text{ u}^2$       | 6. $210\pi \text{ units}^2$       | 12. $LA=720 \text{ u}^2$ ;<br>$SA=(720+300\sqrt{3})\text{u}^2$ |
| 2. $90\pi \text{ u}^2$       | 7. $240 \text{ units}^2$          | 13. $LA=1020 \text{ cm}^2$ ; $SA=1920 \text{ cm}^2$            |
| 3. $25\sqrt{3} \text{ in}^2$ | 8. $80\pi \text{ units}^2$        | 14. $432\pi \text{ ft}^2$                                      |
| 4. $3744 \text{ in}^2$       | 9. $900 \text{ units}^2$          | 15. 5 gallons  |
| 5. $r = 2 \text{ units}$     | 10. $1068 \text{ units}^2$        | 16. 3.6 in   |
|                              | 11. 25 sheets at a cost of \$1700 |  |