

Lesson 10.3

TEKS

7.9D

7.1E

Lateral and Total Surface Area

Q: How do you find the lateral and total surface area of rectangular and triangular prisms or pyramids?

A: Lateral area - Find the area of each _____.
Then _____ the areas to find the lateral area.

Total area - Find the area of each _____.
Then _____ to the lateral area.

Vocab

Lateral faces - _____
Lateral area - _____
Surface area - _____

Q: How can you use a net to find the lateral and the total surface areas of a prism or a pyramid?

A: _____ a net and _____ the dimensions. Find the area of the lateral faces to find the lateral surface area.
_____ the areas of the base(s) to the lateral area to find the total surface area.

LESSON
10-3

Lateral and Total Surface Area

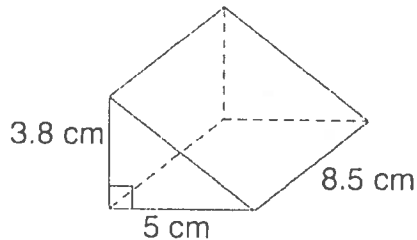
Reading Strategies: Follow a Procedure

To find the lateral or total surface area of a solid figure, follow a procedure. The procedures for a triangular prism and a triangular pyramid are different, but they share many of the same steps.

Step 1 The bases of the figure are right triangles, so one leg of the triangle is the base height, h , and the other leg is the base length, b :
 $h = 3.8$ centimeters and $b = 5$ centimeters

Example

Find the lateral and total surface area.



Step 2 The area of the triangular base can be computed with the formula

for the area, A , of a triangle, which is $A = \frac{1}{2}bh$. Substitute the

values for b and h : $A = \frac{1}{2}(5)(3.8) = 9.5$ square centimeters

Step 3 Next, find the areas of the lateral faces. The first two are easy:

- For the first face, multiply 5 times 8.5, the length of the prism:
 $5 \times 8.5 = 42.5$ square centimeters
- For the second face, multiply 3.8 times 8.5:
 $3.8 \times 8.5 = 32.3$ square centimeters

Step 4 The third face requires that the Pythagorean Theorem be used to find the third side of the triangular base: $(3.8)^2 + 5^2 = x^2$

This gives $x^2 = 39.44$, or x is about 6.3 centimeters.

Multiply 6.3 by 8.5 to get the area of the third face: $6.3 \times 8.5 = 53.6$.

Step 5 The lateral area is the sum of the areas in Steps 3 and 4:

$42.5 + 32.3 + 53.6 = 128.4$ square centimeters.

Step 6 To find the total area, add the areas of the bases to Step 5:

$9.5 + 9.5 + 128.4$, or about 147 square centimeters.

1. Modify the procedure above to find the total surface area of a pyramid with a square base of area 16 square inches and a triangular face height of 5 inches. Show your work.

LESSON
10-3

Lateral and Total Surface Area

Success for English Learners

Problem 1

How many faces?
Three faces.

$5 \times 4, 5 \times 3,$
 $5 \times 2,$ or
 $20 + 15 + 10$

Problem 2

Base area? $4 \times 4 = 16$
Face area?
Half of 4 times 4, or 8
How many faces? 4

Total surface area:
 $16 + 4 \times 8,$ or
 $16 + 32,$ or
48 square units

Lateral surface area? 45 square units

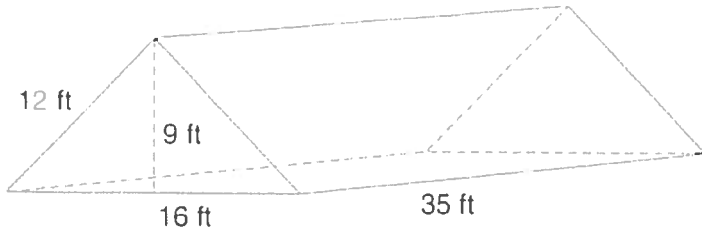
1. What measurements are needed to find the base area in Problem 1?

2. In Problem 2, how many lateral faces would there be if the base had two sides of length 3 inches and four sides of length 2 inches? Explain.

LESSON
10-3 **Lateral and Total Surface Area**
Practice and Problem Solving: D

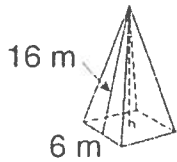
Find the total surface area of the figures by completing the steps.
The first one is done for you.

1.



Height of the base: 9 feet Length of the base: 16 feet
 Area of the base: $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times \underline{16} \times \underline{9} = \underline{72}$ square feet
 Number of bases \times area of a base = 2 \times 72 = 144 square feet
 Area of first face: 12 \times 35 = 420 square feet
 Area of second face: 12 \times 35 = 420 square feet
 Area of third face: 16 \times 35 = 560 square feet
 Lateral surface area: 420 + 420 + 560 = 1,400 square feet
 Total surface area: 1,400 + 144 = 1,544 square feet

2.



Height of a face: _____ meters Base of a face: _____ meters
 Area of a face: $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ square meters
 Number of faces \times area of a face = _____ \times _____ = _____ square meters
 Lateral surface area: _____ square meters
 Area of the base: _____ \times _____ = _____ square meters
 Total surface area: _____ + _____ = _____ square meters

Complete.

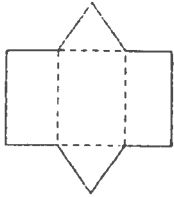
3. The total surface area is the _____ of the lateral surface area
 and the area of the _____.

LESSON
10-3 **Lateral and Total Surface Area**

Practice and Problem Solving: A/B

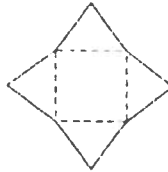
Find the surface area of each net.

1. Each square is one square meter.



_____ square meters

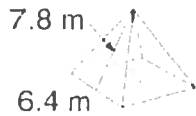
2. Each square is one square yard



_____ square yards

Calculate the lateral and total surface areas for each figure.

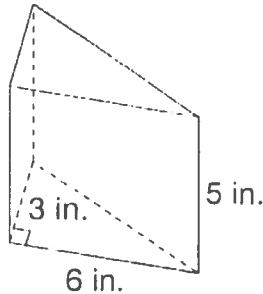
3. The base is a square.



Lateral surface area:

Total surface area:

4.



Lateral surface area:

Total surface area:

5. The top of the Washington Monument is a triangular pyramid with a square base. Each triangular face is 58 feet tall and 34 feet wide and covered with white marble. About how many square feet of marble cover the faces of the pyramid?

6. A glass triangular prism for a telescope is 5.5 inches long. Each side of the prism's triangular bases is 4 inches long and 3 inches high. How much glass covers the surface of the prism?

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A: Lateral area - Find the area of each Face.
Then add the areas to find the lateral area.

Total area - Find the area of each base.
Then add to the lateral area.

Vocab

Lateral faces - parallelograms that connect the bases

Lateral area - the sum of areas of all lateral faces

Surface area - sum of areas of all the surfaces of a figure expressed in units²

Q: How can you use a net to find the lateral and the total surface areas of a prism or a pyramid?

A: Draw a net and label the dimensions. Find the area of the lateral faces to find the lateral surface area.
add the areas of the base(s) to the lateral area to find the total surface area.

LESSON
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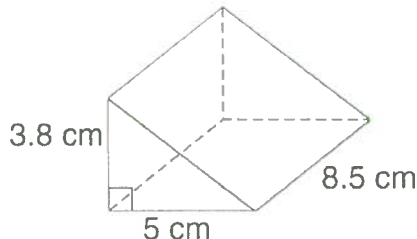
Lateral and Total Surface Area

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1. Modify the procedure above to find the total surface area of a pyramid with a square base of area 16 square inches and a triangular face height of 5 inches. Show your work.

1 the base the pyramid is a square, so its length of each side is the square root of 16 or 4

2 so the faces of the triangle each have a height of 5 in + a base of 4 which gives each face an area of 10in^2

3 since there are 4 faces, the lateral surface area is $4 \times 10\text{in}^2$ or 40in^2

4 total surface area is the sum of the base area, 16 + the surface area 40 total 56in^2

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10-3

Lateral and Total Surface Area
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Lateral surface area? 45 square units

1. What measurements are needed to find the base area in Problem 1?

the height & length of the base 4x5

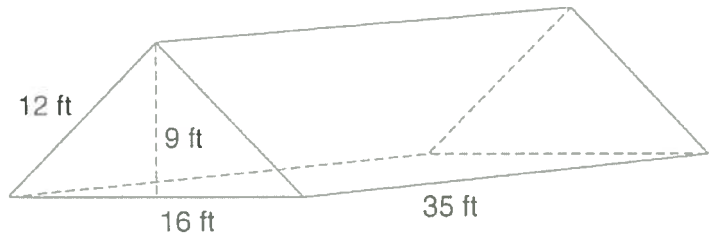
2. In Problem 2, how many lateral faces would there be if the base had two sides of length 3 inches and four sides of length 2 inches? Explain.

6 2 sides + 4 sides

LESSON
10-3 **Lateral and Total Surface Area**
Practice and Problem Solving: D

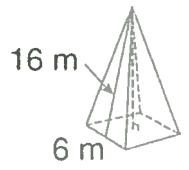
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 Total surface area: 1,400 + 144 = 1,544 square feet

2.



Height of a face: 16 meters Base of a face: 6 meters
 Area of a face: $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times \underline{16} \times \underline{6} = \underline{48}$ square meters
 Number of faces \times area of a face = 4 \times 48 = 192 square meters
 Lateral surface area: 192 square meters
 Area of the base: 6 \times 6 = 36 square meters
 Total surface area: 36 + 192 = 228 square meters

Complete.

3. The total surface area is the Sum of the lateral surface area
and the area of the base(s).