Zero The Math Hero
Standard Mathematical Elements - Lesson 11

Lesson 11 shows how to find the lateral area and the surface area for a variety of 3-D figures, such as:

- Prisms

- Cylinders

- Cones

- Pyramids

Lesson 11 also describes how to identify the correct parts of the figures so the students will be able to substitute them into the formulas. The Pythagorean Theorem is also used in the process of finding lateral and surface areas. Students will also learn to find both exact and approximate answers for cylinders and cones when using the number pi.

Lesson 11 – Definitions

polyhedron - a 3-D figure formed by polygons

altitude (prisms and cylinders) - a segment that has both of its endpoints on the planes that contain the bases, and is perpendicular to the planes that contain the bases

altitude (cones and pyramids) - the perpendicular segment from the vertex to the plane of the base

prism - a polyhedron with 2 congruent parallel bases

cylinder - a 3-D shape that has 2 congruent circular bases that are parallel

cone - a 3-D figure with a circular base and a vertex point not in the plane of the base

pyramid - a 3-D figure with a polygonal base and a vertex point not in the plane of the base

slant height - the height of any lateral face of a regular pyramid. Also, the length of a segment from the vertex to the lateral edge of a right cone.

lateral area - for a prism, the sum of the areas of all of its lateral faces. For a cylinder, the area of its lateral surface.

surface area - for a prism, the sum of the lateral area and the area of the 2 bases. For a cylinder, the sum of the lateral area and the area of the 2 circular bases.

Lesson 11 – Formulas

$L.A. = Ph$ (lateral area of a prism)

$L.A. = \pi r \ell$ (lateral area of a cone)

$S.A. = L.A. + 2B$ (surface area of a prism)

$S.A. = L.A. + B$ (surface area of a cone)

$L.A. = 2\pi rh$ (lateral area of a cylinder)

$L.A. = \frac{1}{2} P\ell$ (lateral area of a pyramid)

$S.A. = 2\pi r (r + h)$ (surface area of a cylinder)
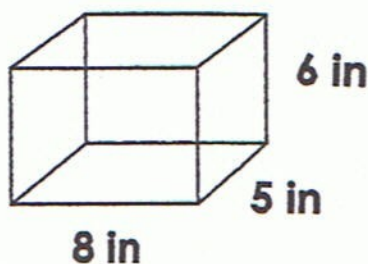
$S.A. = L.A. + B$ (surface area of a pyramid)
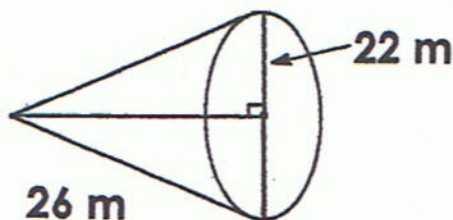
Lesson 11 - Practice Problems
Lateral Area and Surface Area

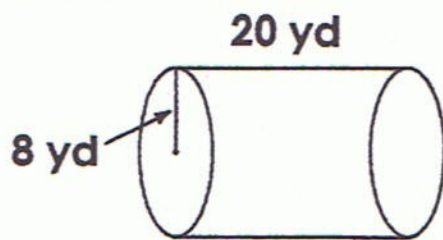1. Find the lateral area **and** the surface area.

6 in

5 in

8 in

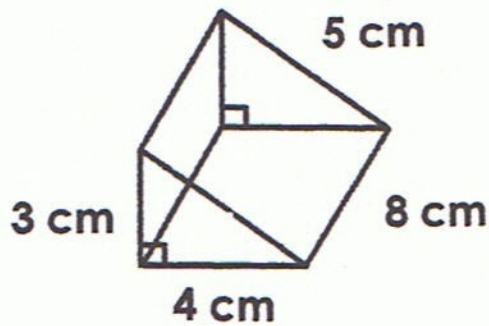1. L.A.=_____   S.A.=_____

2. Find the surface area in terms of pi.

22 m

26 m

2. S.A.=_____

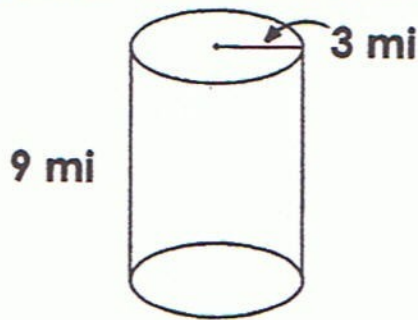3. Find the lateral area **and** the surface area to the tenths.

20 yd

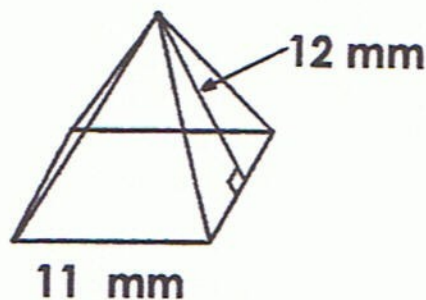8 yd

3. L.A.≈_____   S.A.≈_____

4. Find the surface area.

5 cm

3 cm

8 cm

4 cm

4. S.A.=_____

5. Find the surface area in terms of pi.

3 mi

9 mi

5. S.A.=_____

6. Find the lateral area.

12 mm

11 mm

6. L.A.=_____

Lesson 11 - Practice Problems - Continued
Lateral Area and Surface Area

7. Find the lateral area **and** the surface area.

6 cm

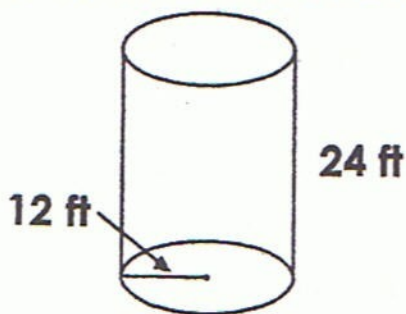**12 cm**

7. L.A.≈ _____   S.A.≈ _____

8. Find the surface area.

5 ft

4 ft

6 ft
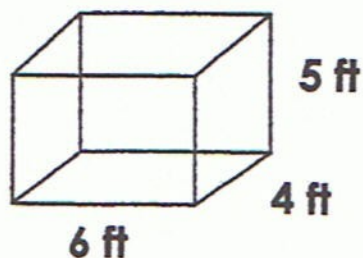
8. S.A.= _____

9. Find the lateral area to the tenths.

24 ft

12 ft

9. L.A.≈ _____

10. Find the lateral area **and** the surface area.

13 m

12 m

5 m

10 m
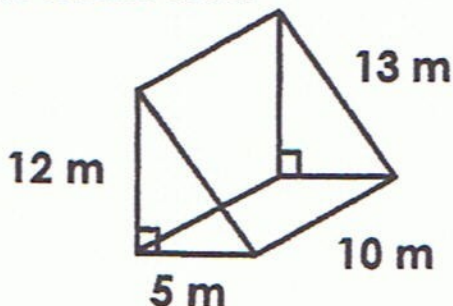
10. L.A.= _____   S.A.= _____

11. Find the surface area of the composite figure in terms of pi.

22 m

12 m

5 m

11. S.A.= _____

12. Find the lateral area **and** the surface area in terms of pi.
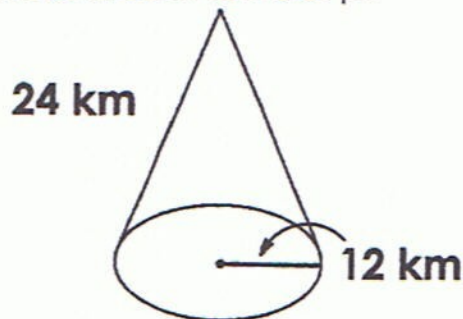
24 km

12 km

12. L.A.= _____   S.A.= _____

Quiz - Terms and Formulas
Zero the Math Hero – Lesson 11

Lesson 11 – Terms and Formulas

Directions: Fill in each blank with the letter that corresponds to the correct answer, A-J.

1. _____ a 3-D figure with a polygonal base and a vertex point not in the plane of the base

2. _____ for a prism, the sum of the lateral area and the area of the 2 bases. For a cylinder, the sum of the lateral area and the area of the 2 circular bases

3. _____ a polyhedron with 2 congruent parallel bases

4. _____ a 3-D figure formed by polygons

5. _____ a segment that has both of its endpoints on the planes that contain the bases, and is perpendicular to the planes that contain the bases

6. _____ the height of any lateral face of a regular pyramid. Also, the length of a segment from the vertex to to the lateral edge of a right cone.

7. _____ a 3-D figure with a circular base and a vertex point not in the plane of the base

8. _____ the perpendicular segment from the vertex to the plane of the base

9. _____ a 3-D shape that has 2 congruent circular bases that are parallel

10. _____ for a prism, the sum of the areas of all of its lateral faces. For a cylinder, the area of its lateral surface.

A. altitude (prisms & cylinders)

B. altitude (cones & pyramids)

C. cylinder

D. cone

E. slant height

F. prism

G. polyhedron

H. pyramid

I. lateral area

J. surface area

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Quiz - Terms and Formulas - Continued
Zero the Math Hero – Lesson 11

Directions: Fill in each blank with the letter that corresponds to the correct answer, K-Q.

11. _____ L.A. = ½Pℓ   **K.** surface area of a prism

12. _____ L.A. = Ph   **L.** lateral area of a prism

13. _____ L.A. = πrℓ   **M.** surface area of a cone *or* pyramid

14. _____ L.A. = 2πrh   **N.** lateral area of a cone

15. _____ S.A. = L.A. + B   **O.** lateral area of a cylinder

16. _____ S.A. = L.A. + 2B   **P.** surface area of a cylinder

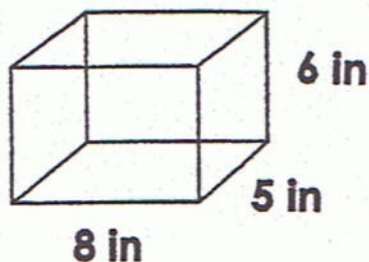17. _____ S.A. = 2πr (r + h)   **Q.** lateral area of a pyramid

Lesson 11 - Practice Problems
Lateral Area and Surface Area

1. Find the lateral area **and** the surface area.

6 in
5 in
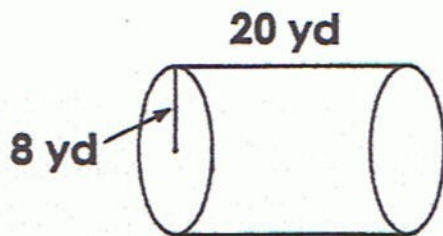**8 in**

1. L.A.= 156 in²   S.A.= 236 in²

2. Find the surface area in terms of pi.

22 m
26 m
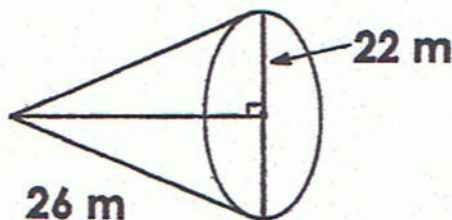
2. S.A.= 407 π m²

3. Find the lateral area **and** the surface area to the tenths.

20 yd
8 yd

3. L.A.≈1,004.8 yd² S.A.≈ 1,406.7 yd²

4. Find the surface area.

5 cm
3 cm
8 cm
4 cm
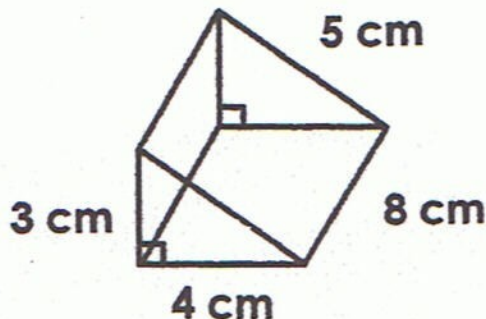
4. S.A.= 108 cm²

5. Find the surface area in terms of pi.

3 mi
9 mi
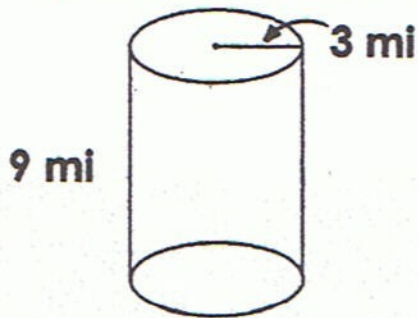
5. S.A.= 72 π mi²
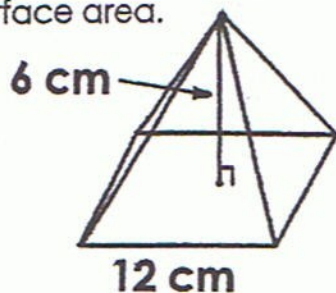
6. Find the lateral area.

12 mm
11 mm
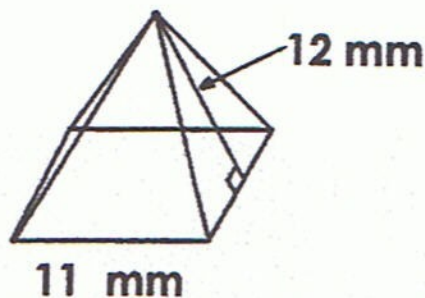
6. L.A.= 264 mm²

Lesson 11 - Practice Problems - Continued
Lateral Area and Surface Area
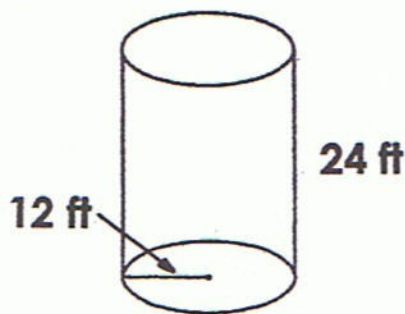
7. Find the lateral area **and** the surface area.

6 cm

12 cm

7. L.A.≈ 203.6 cm² S.A.≈ 347.6 cm²

8. Find the surface area.

5 ft

4 ft

6 ft
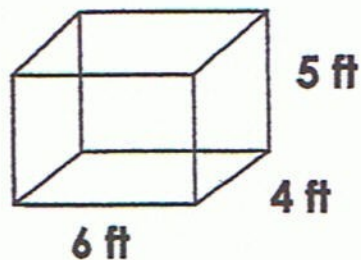
8. S.A.= 148 ft²

9. Find the lateral area to the tenths.

24 ft

12 ft

9. L.A.≈ 1808.6 ft²

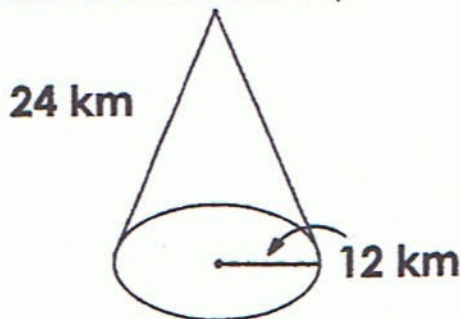10. Find the lateral area **and** the surface area.

13 m

12 m

5 m

10 m
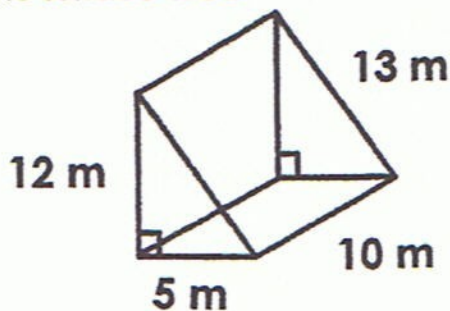
10. L.A.= 300 m²   S.A.= 360 m²

11. Find the surface area of the composite figure in terms of pi.

22 m

12 m

5 m

11. S.A.= 310 π m²

12. Find the lateral area **and** the surface area in terms of pi.

24 km

12 km

12. L.A.= 288 π km²   S.A.= 432 π km²

Quiz - Terms and Formulas
Zero the Math Hero – Lesson 11

Lesson 11 – Terms and Formulas

Directions: Fill in each blank with the letter that corresponds to the correct answer, A-J.

1. __H__ a 3-D figure with a polygonal base and a vertex point not in the plane of the base

2. __J__ for a prism, the sum of the lateral area and the area of the 2 bases. For a cylinder, the sum of the lateral area and the area of the 2 circular bases

3. __F__ a polyhedron with 2 congruent parallel bases

4. __G__ a 3-D figure formed by polygons

5. __A__ a segment that has both of its endpoints on the planes that contain the bases, and is perpendicular to the planes that contain the bases

6. __E__ the height of any lateral face of a regular pyramid. Also, the length of a segment from the vertex to to the lateral edge of a right cone.

7. __D__ a 3-D figure with a circular base and a vertex point not in the plane of the base

8. __B__ the perpendicular segment from the vertex to the plane of the base

9. __C__ a 3-D shape that has 2 congruent circular bases that are parallel

10. __I__ for a prism, the sum of the areas of all of its lateral faces. For a cylinder, the area of its lateral surface.

A. altitude (prisms & cylinders)

B. altitude (cones & pyramids)

C. cylinder

D. cone

E. slant height

F. prism

G. polyhedron

H. pyramid

I. lateral area

J. surface area

(Continued on next page...)

Quiz - Terms and Formulas - Continued
Zero the Math Hero – Lesson 11

Directions: Fill in each blank with the letter that corresponds to the correct answer, K-Q.

11. __Q__ L.A. = ½Pℓ K. surface area of a prism

12. __L__ L.A. = Ph   L. lateral area of a prism

13. __N__ L.A. = $\pi r \ell$ M. surface area of a cone *or* pyramid

14. __O__ L.A. = 2πrh   N. lateral area of a cone

15. __M__ S.A. = L.A. + B   O. lateral area of a cylinder

16. __K__ S.A. = L.A. + 2B   P. surface area of a cylinder

17. __P__ S.A. = 2πr (r + h)   Q. lateral area of a pyramid