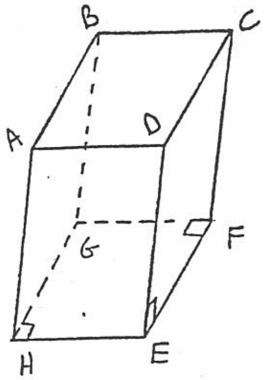
CHAPTER 11
AREAS
AND
VOLUMES
OF
SOLIDS

Unit 11 - 1 Right Prisms and Cylinders E.E. 6A(i)(iii), 6B, 7B(i), 7C



(square prism)

Name it by its bases.

ABCD is the upper base. HGFE is the lower base. } They are congruent.

CDEF, BCFG, BGHA, and ADEH are called lateral faces. } They are not always congruent. They are always rectangles.

$\overline{AB}$, $\overline{BC}$, $\overline{DC}$, $\overline{AD}$, $\overline{HG}$, $\overline{GF}$, $\overline{EF}$, and $\overline{HE}$ are called base edges } They are not always congruent

$\overline{CF}$, $\overline{BG}$, $\overline{AH}$ and $\overline{DE}$ are called lateral edges. They are the height in a right prism. } They are congruent.

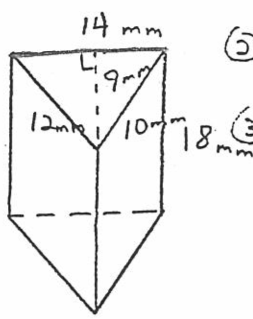
Formulas

$\boxed{\text{Lateral Area}}$ - (perimeter of bottom)(height of prism)

$\boxed{\text{Total Area}}$ - 2(area of bottom) + L.A.

$\boxed{\text{Volume}}$ - (area of bottom)(height of prism)

Example:



(triangular prism)

① $L.A. = (10+12+14)(18) = (36)(18) = 648 \text{ mm}^2$

② $T.A. = 2(\frac{1}{2}\cdot 14\cdot 9) + 648 = 2(63)+648 = 126+648$ = 774 mm^2

③ $V. = (\frac{1}{2}\cdot 14\cdot 9)(18) = (63)(18) = 1134 \text{ mm}^3$

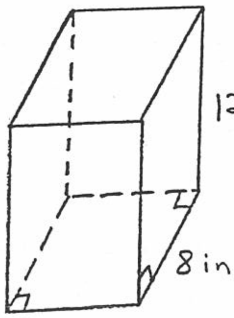
$V = $ $1 \text{ mm} = 10 \text{ cm}$, $1 \text{ mm}^3 = 10^3 \text{ cm}^3 = 1000 \text{ cm}^3$ $\quad \frac{1134}{1000} = 1.134 \text{ cm}^3$

(small to large divide)

Name: ______ Date: ______

Daily Work Unit 11-1 Geometry

Round to the nearest ten thousandth.
(Put answers in yards)



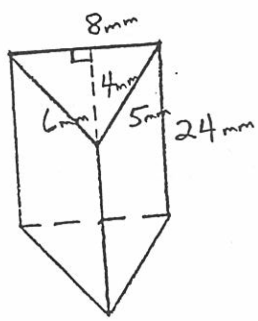
(square prism)

① L.A. =

② T.A =

③ V. =

Round to the nearest hundred thousandth.
(Put answers in cm)



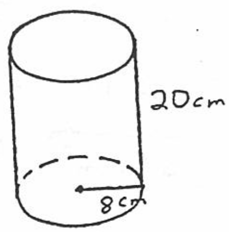
(triangular prism)

④ L.A. =

⑤ T.A. =

⑥ V. =

Round to the nearest tenth
(Put answers in mm)



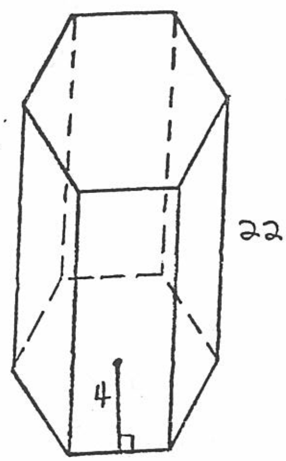
(cylinder)

⑦ L.A. =

⑧ T.A =

⑨ V. =

Round to the nearest thousandth



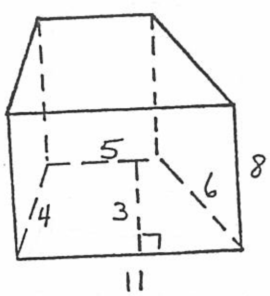
(regular hexagonal prism)

(10) L.A. =

(11) T.A. =

(12) V. =

Round to the nearest ten thousandth



(trapezium prism)

(13) L.A. =

(14) T.A. =

(15) V. =

Round to the nearest whole number

(cylinder)

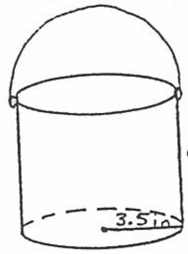
(16) L.A. =

(17) T.A. =

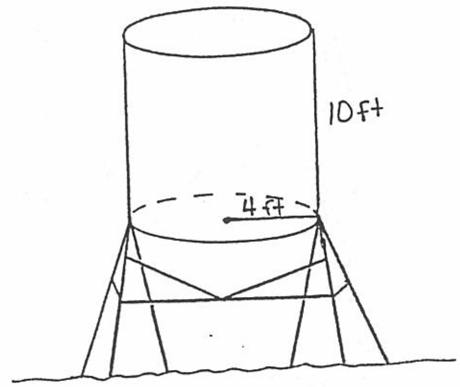
(18) V. =

(19) Bill is building a rectangular patio whose dimensions are 20 feet X 30 feet. If the slab is to be 6 inches thick, then how many yards of concrete, "(yards³)", will Bill need to pour the slab? ______

(20) John wanted to know how many gallons of gas his above ground tank would hold. Look at what John has to work with below and help him find the answer. ______ gallons



1 gallon bucket



Unit 11.2 Spheres E.E. 6A(ii),(iii), 6B, 6C, 7C(i),(ii), 7C

Formulas

$\boxed{\text{Total Area}}$ - $4\pi r^2$

$\boxed{\text{Volume}}$ - $\frac{4}{3}\pi r^3$

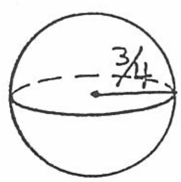
Examples -

(1)

$T.A. = 4 \cdot 3.14 \cdot 6^2 = 12.56 \cdot 36 = 452.16\ mm^2$

$V. = \frac{4}{3} \cdot 3.14 \cdot 6^3 = \frac{4 \cdot 3.14 \cdot 216}{3} = = 908.32\ mm^3$

(2)



$T.A. = \frac{4}{1} \cdot \frac{22}{7} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{792}{56} = 14.14$

$V = \frac{4}{3} \cdot \frac{22}{7} \cdot \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{2376}{1344} = 1.77$

Name: ______________________ Date: ____________

Daily Work Unit 11.2 Geometry

(put answers in cm)

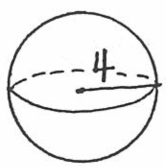
① T.A. =

② V. =

(put answers in feet)

③ T.A. =

④ V. =



⑤ T.A. =

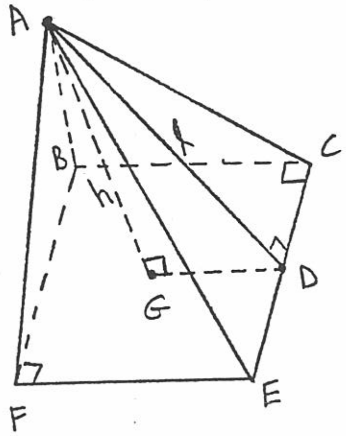
⑥ V. =

⑦ T.A. =

⑧ V. =

⑨ How many gallons of water will a water tower with a radius of 20 feet hold if a gallon of water takes up 346.2 in^3 of space? ________ gallons

Unit 11-3 Pyramids and Cones FE. 6A(i), (iii), 6C, 7B(i)



(square pyramid)

BCEF is the base

$\overline{BC}, \overline{CE}, \overline{EF}$, and $\overline{FB}$ are the base edges.

$\triangle AFB$, $\triangle ABC$, $\triangle ACE$ and $\triangle AEF$ are the lateral faces.

$\overline{AB}, \overline{AC}, \overline{AE}$, and $\overline{EF}$ are the lateral edges.

$\overline{AD}$ is the slant height or lateral height (ℓ).

$\overline{AG}$ is the height of the pyramid (h).

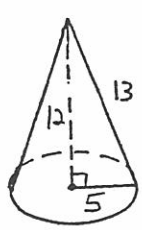
Formulas

$\boxed{\text{Lateral Area}}$ – $\frac{1}{2}$(perimeter of bottom)(slant height)

$\boxed{\text{Total Area}}$ – (area of bottom) + L.A.

$\boxed{\text{Volume}}$ – $\frac{1}{3}$(area of bottom)(height of pyramid)

Example –

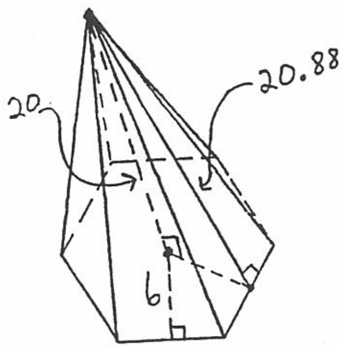


(cone)

① L.A. $= \frac{1}{2}(3.14 \cdot 10)(13) = \frac{1}{2}(31.4)(13) = (15.7)(13) = 204.1$

② T.A $= (3.14 \cdot 25) + \underline{204.1} = 78.5 + 204.1 = 282.6$

③ V. $= \frac{1}{3}(3.14 \cdot 25)(12) = \frac{1}{3}(78.5)(12) = (78.5)(4) = 314$



(regular hexagonal pyramid)

① $L.A. = \frac{1}{2}(6+6+6+6+6+6)(20.88) = \frac{1}{2}(36)(20.88) = 18(20.88) =$

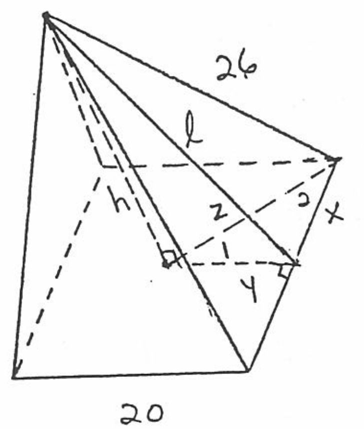
375.84

② $T.A. = (\frac{1}{2} \cdot 6 \cdot 36) + \underline{375.84} = 108 + 375.84 =$

483.84

③ $V. = \frac{1}{3}(\frac{1}{2} \cdot 6 \cdot 36)(20) = \frac{1}{3}(108)(20) = (36)(20)$

720



(square pyramid)

① $\angle 1 = 45°$ (radius bisects cent ∠)(cent∠ = $\frac{360}{n}$)

② $\angle 2 = 45°$ (radius bisects int ∠)(Int∠ = $\frac{(n-2)180}{n}$)

③ $x = 10$ (½ side)(apothem bisects side)

④ $y = 10$ (legs are = in 45°-45°-90°)

⑤ $z = 10\sqrt{2}$ ($h = l \cdot \sqrt{2}$ in 45°-45°-90°)

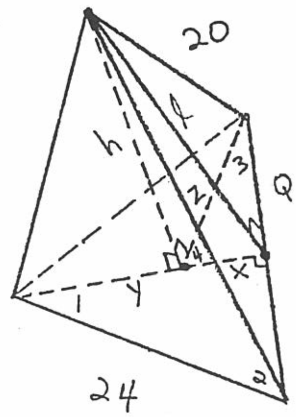
⑥ $h = 2\sqrt{119}$ ($26^2 = z^2 + h^2 \rightarrow 26^2 = (10\sqrt{2})^2 + h$

⑦ $l = 24$ ($26^2 = x^2 + l^2 \rightarrow 26^2 = 10^2 + l^2$

⑧ $L.A. = 960$ $\frac{1}{2}(20+20+20+20)(24)$

⑨ $T.A. = 1360$ $20^2 + 960$

⑩ $V. = 266.\overline{6}\sqrt{119}$ $\frac{1}{3}(20^2)(2\sqrt{119})$



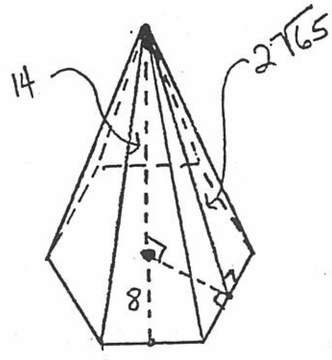
(equilateral triangular pyramid)

1. $\angle 1 = 30°$ (Radius bisects int∠) (all ∠s 60°)
2. $\angle 2 = 60°$ (each angle of equi. △ = 60°)
3. $\angle 3 = 30°$ (Radius bisects int.∠) (all ∠s 60°)
4. $\angle 4 = 60°$ (Radius bisects cent.∠) (cent ∠ = $\frac{360}{n}$)
5. $Q = 12$ (½ side) (apothem bisects side)
6. $x = 4\sqrt{3}$ ($\ell\ell$ = $s\ell \cdot \sqrt{3}$ in 30°-60°-90° △)
7. $y = 8\sqrt{3}$ (medians ∩ at ⅔ pt) (radii are =)
8. $z = 8\sqrt{3}$ (medians ∩ at ⅔ pt) (= radii) (h = sℓ·2
9. $h = 4\sqrt{13}$ ($20^2 = z^2 + h^2 \rightarrow 20^2 = (8\sqrt{3})^2 + h$
10. $\ell = 16$ ($20^2 = \ell^2 + Q^2 \rightarrow 20^2 = \ell^2 + 12^2$)
11. $L.A. = 576$ $\frac{1}{2}(24+24+24)(16)$
12. $T.A. = 576 + 144\sqrt{3}$ $(\frac{1}{2} \cdot 24 \cdot \overset{(y+4)}{12\sqrt{3}}) + L.A.$
13. $V. = 192\sqrt{39}$ $\frac{1}{3}(\frac{1}{2} \cdot 24 \cdot 12\sqrt{3})(4\sqrt{13})$

Name: Date:

Daily Work Unit 11-3 Geometry

Round to the nearest hundredth.

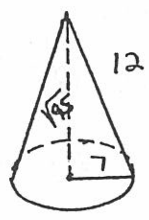


(regular hexagonal pyramid)

① L.A. =

② T.A. =

③ V. =

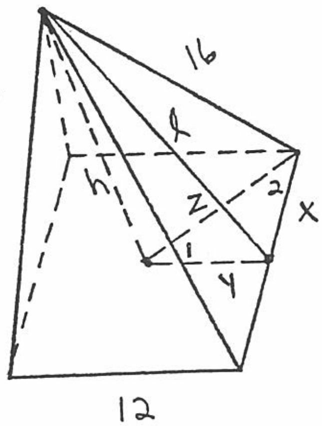


(cone)

④ L.A. =

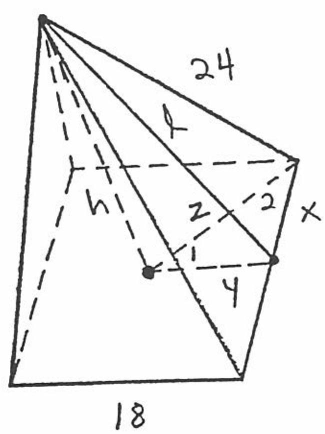
⑤ T.A. =

⑥ V. =



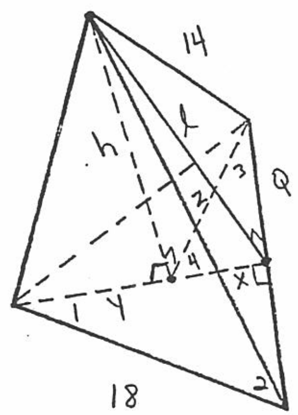
(square pyramid)

(7) ∠1 =
(8) ∠2 =
(9) x =
(10) y =
(11) z =
(12) h =
(13) l =
(14) L.A. =
(15) T.A. =
(16) V. =



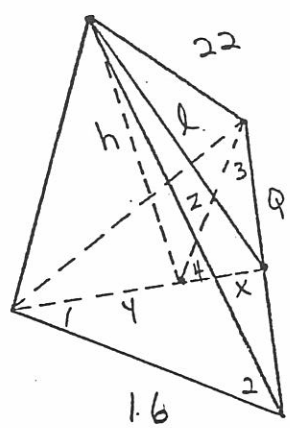
(square pyramid)

(17) ∠1 =
(18) ∠2 =
(19) x =
(20) y =
(21) z =
(22) h =
(23) l =
(24) L.A. =
(25) T.A. =
(26) V. =



(equilateral triangular pyramid)

27. ∠1 =
28. ∠2 =
29. ∠3 =
30. ∠4 =
31. Q =
32. X =
33. Y =
34. Z =
35. h =
36. l =
37. L.A. =
38. T.A. =
39. V. =



40. ∠1 =
41. ∠2 =
42. ∠3 =
43. ∠4 =
44. Q =
45. X =
46. Y =
47. Z =
48. h =
49. l =
50. L.A =
51. T.A =
52. V. =

Unit 11.4 Ratios of Perimeters, Areas, and Volumes of Similar Figures E.E. 6A(i), 6A(iii), 6A(ii), 6C 7B(i) 7B(ii), 7C

Formulas

If the Scale Factor is - $A : B$

then the ratio of Perimeters is - $A : B$

the ratio of Areas is - $A^2 : B^2$

and the ratio of Volumes is - $A^3 : B^3$

Example:

① In a pair of similar figures the scale factor is 3:5.

Ratio of Perimeters = $3 : 5$

Ratio of Areas = $3^2 : 5^2 = 9 : 25$

Ratio of Volumes = $3^3 : 5^3 = 27 : 125$

② In a pair of similar figures the ratio of Areas is 16 : 49. → $\underset{16}{A^2} : \underset{49}{B^2}$

Scale Factor = $4 : 7$ ← $\begin{cases} A = \sqrt{16} = 4 \\ B = \sqrt{49} = 7 \end{cases}$

Ratio of Perimeters = $4 : 7$

Ratio of Volumes = $4^3 : 7^3 = 64 : 343$