Modified and Animated By Chris Headlee
Dec 2011

CHAPTER 11-13 SOL PROBLEMS

SSM: Super Second-grader Methods

SOL Problems; not Dynamic Variable Problems

35 A fish tank in the shape of a rectangular prism has these dimensions:

- length = 20 inches
- width = 10 inches
- height = 12 inches

What is the volume of water in the tank when it is $\frac{4}{5}$ full?

A 1,120 cu in.
B 1,920 cu in.
C 2,400 cu in.
D 3,000 cu in.

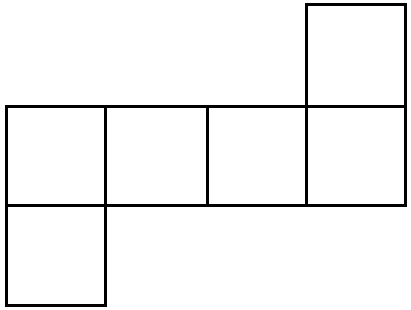
SSM:
- **Find formula (rectangular prism)**
- **find variables**
- **plug in and solve**

V = l×w×h
= 20×10×12 = 2400 cu in (when full)

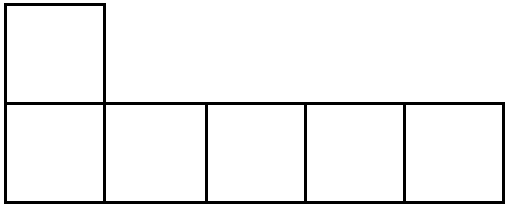
V = (4/5)(2400) = 1,920 cu in

36 Which of these nets would form a cube when folded?

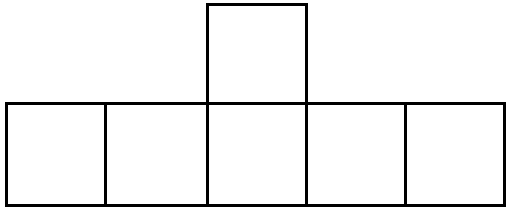
F



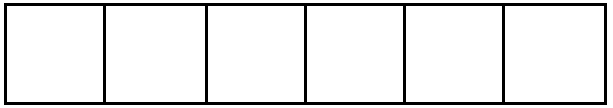
H



G



J



fold them up in your mind
no gaps or overlaps

SSM:

- **Label each part either**
  F(front)
  Bk (back)
  S (side)
  T (top)
  B (bottom)
- **all but one that has a missing ltr**

37 **If a cube with side length 6 inches has its dimensions divided in half, what will be the volume of the new cube?**

A 108 cubic inches

B 54 cubic inches

C 27 cubic inches

D 9 cubic inches

SSM:

- **Find formula ($V = s^3$)**
- **find variables**
- **plug in Volume and solve for sides**
- **compare answers**

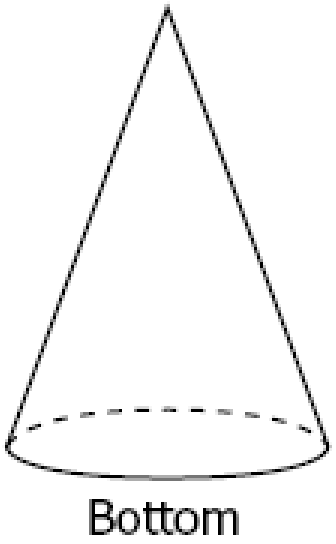
$V = l \times w \times h$

$= 3 \times 3 \times 3$ **(3 = ½ 6)**

$= 27$ cu in

1/8 times original volume

38 A right cone is placed on its circular base.



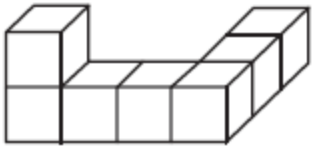
Which statement about the cone is *incorrect*?

F The view from the front is a triangle.
G The view from the bottom is a circle.
H The view from the top is a circle.
J The view from the left is a rhombus.

SSM:
- **see which one looks false**

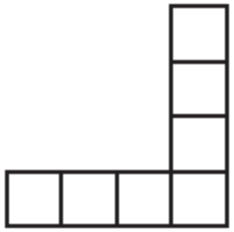
bottom and top views are circles
front (and side) view is a triangle
leaves J as incorrect

34 This solid figure is constructed with seven cubes.

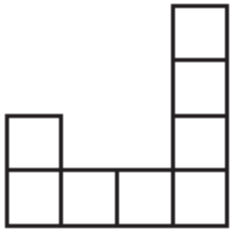


Which shape represents the top view of this three-dimensional solid?

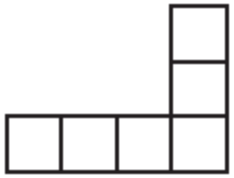
F



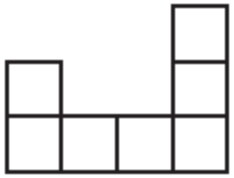
G



H



J



SSM:

- count outside edges
  4 across and 3 up

picture cubes from the top
number outside edges for dimensions

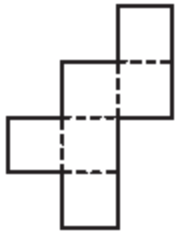
35 **Which is closest to the total surface area of a cylinder with a radius of 5 inches and a height that is equal to its diameter?**

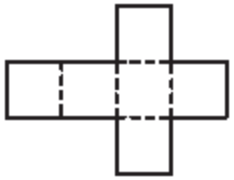
A 314 sq in.
B 471 sq in.
C 596 sq in.
D 785 sq in.

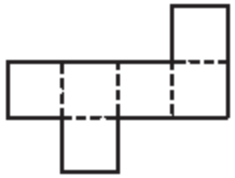
SSM:
- **Find formula**
- **find variables**
- **plug in and solve**

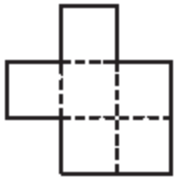
$V = \pi r^2 h$
$= \pi(5)^2(2\times5)$
$= \pi(25)(10)$
$= 250\pi$
≈ 785

36 Which of the following nets could *not* be folded along the dotted lines to form a cube?

F 

H 

G 

J 

fold them up in your mind

SSM:

- **Label each part either**
  - **F(front)**
  - **Bk (back)**
  - **S (side)**
  - **T (top)**
  - **B (bottom)**
- **one that has a missing ltr**

37 The radius of Sphere A is 2 inches, and the radius of Sphere B is 4 inches. How many times larger is the volume of Sphere B compared to the volume of Sphere A ?

A 2
B 3
C 4
D 8

SSM:
- **Find formula**
- **find variables**
- **plug in and solve for each radius**
- **compare answers**

$V = 4/3\pi r^3$
$= 4/3\pi(2r)^3$
$= 4/3\pi 8r^3$

$4/3\pi(2)^3$
$4/3\pi(8)$
$(32/3)\pi$

$4/3\pi(4)^3$
$4/3\pi(64)$
$(256/3)\pi$

8 times larger volume

38 **A cylinder has a diameter of 10 inches and a height four times its radius. What is its volume?**

F 500π cu in.
G $2{,}000\pi$ cu in.
H $4{,}000\pi$ cu in.
J $40{,}000\pi$ cu in.

SSM:
- **Find formula**
- **find variables**
- **plug in and solve**

$d = 10 = 2r$

$5 = r$

$h = 4r = 4(5) = 20$

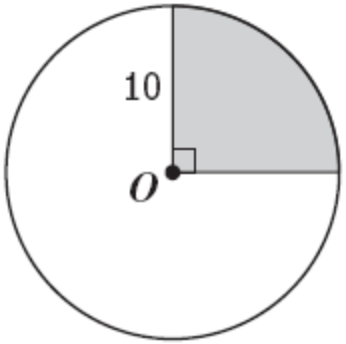
$V = \pi r^2 h$

$= \pi(5)^2(20)$

$= \pi(25)(20)$

$= 500\pi$

30



SSM:
- **quarter of a circle**
- **use formula sheet**

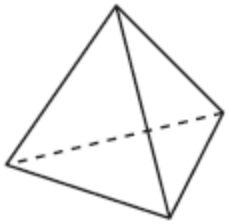
The area of the *shaded* sector of circle O is —

F 5π
G 20π
H 25π
J 50π

Area of a circle = πr^2 and r = 10
$A = \pi(10)^2$
$= 100\pi$

Area of sector is ¼(area of circle) = ¼ (100π) = 25π

33 The following drawing represents a tetrahedron.



Tetrahedron
4 Faces

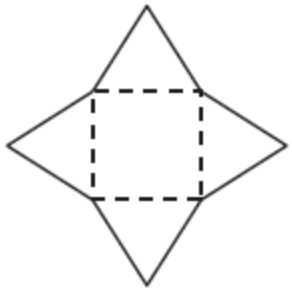
SSM:
- **4 faces**
- **count faces of the figures**
- **only D has 4 faces**

Which of the following nets could be folded on the dashed lines to form a tetrahedron?

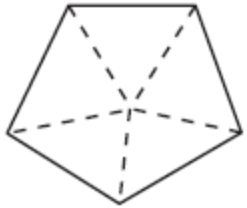
fold figures up to see what they make:

A. square pyramid
B. extra face
C. nothing
D. triangular pyramid

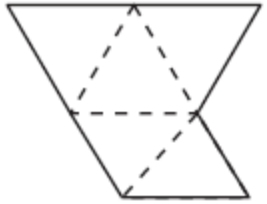
A



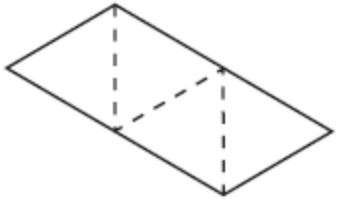
C



B

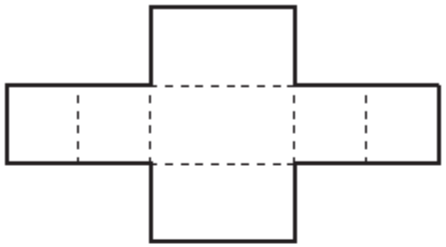


D

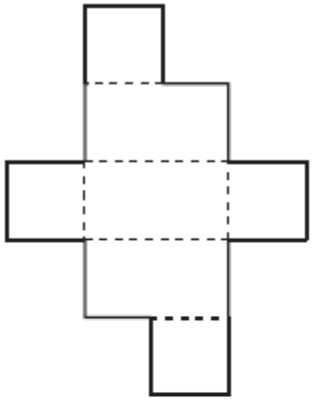


34 When folded on the dotted lines, which net will *not* form a rectangular prism?

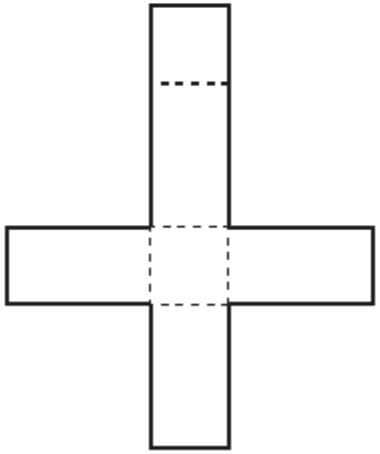
F



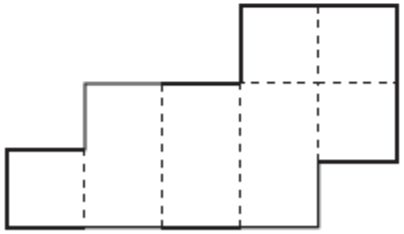
H



G



J

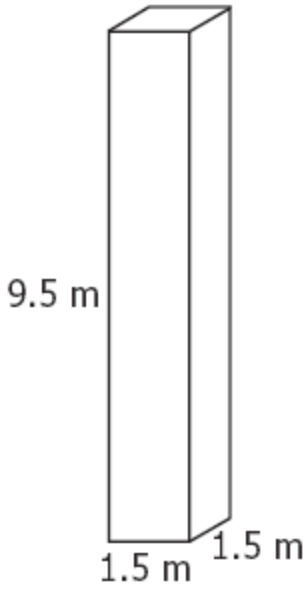


SSM:

- **no help**

fold figures up to see what they make:
J. has no front of box

35 **A concrete pillar shaped as a rectangular prism is designed as follows.**



SSM:
- **formula sheet**

Which is closest to the volume of concrete needed to fill the pillar?

A $12.5\ m^3$
B $14.3\ m^3$
C $21.4\ m^3$
D $28.5\ m^3$

$V = l \times w \times h$
$V = (1.5) \times (1.5) \times (9.5)$
$V = 21.4$

36 A right triangular pyramid has a height of 10 inches and a base area of 41.57 square inches. What is the volume, in cubic inches, of the pyramid?

F 138.56
G 207.85
H 277.13
J 415.69

SSM:
- **formula sheet**
- **B = base area**
- **h = height**

V = 1/3 Bh
V = 1/3 (41.57)(10)
V = 1/3 (415.7)
V = 138.56

37 The surface area of a plastic ball is 196π. A sponge ball has a radius twice that of the plastic ball. What is the surface area of the sponge ball?

A $9{,}604\pi$
B 993π
C 784π
D 546π

SSM:
- **Formula sheet**

$$SA_{pb} = 4\pi r^2 = 196\pi$$
$$4r^2 = 196$$
$$r^2 = 49$$
$$r = 7$$

$$SA_{sb} = 4\pi(2r)^2 = 16\pi r^2 = 16\pi(7)^2 = 16\pi(49) = 784\pi$$

33 **A pizza has a diameter of 16 inches. Which is closest to the area of one slice if the pizza is divided into 6 equal pieces?**

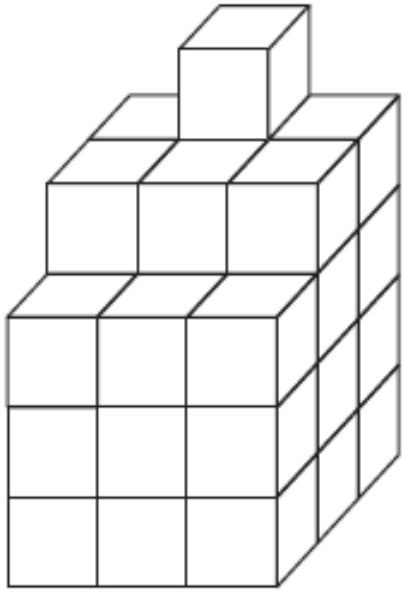
A 134.1 sq in.
B 117.1 sq in.
C 67.2 sq in.
D 33.5 sq in.

SSM:
- **no real help**
- **use equation sheet**
- **r = 8**

area of a circle = πr^2
$= \pi 8^2$
$= 64\pi$

divided by 6 gives $10.67\pi = 33.5$

34



SSM:

- **count the blocks**

Assuming the solid is constructed from cubes measuring 1 unit on each edge and that the figure is completely solid, what is the volume of the cubic solid shown above?

F 12 cubic units

G 34 cubic units

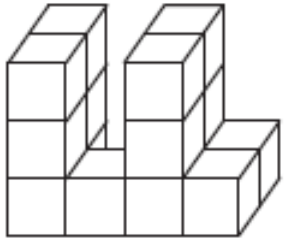
H 59 cubic units

J 68 cubic units

There are 9 blocks in the face and 3 deep = 27 and 7 blocks on top

34 blocks each are 1 cubic units each

35

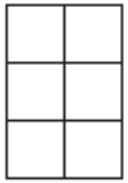


SSM:

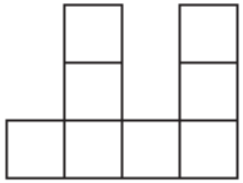
- **look at the tops of each block in picture**

Which could *not* be a two-dimensional view of the block of cubes shown above?

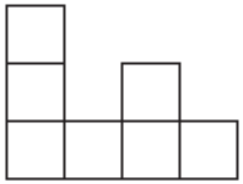
A



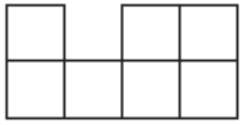
B



C



D



4 rows of blocks; all but the 2nd row has two blocks deep

36 **Which is closest to the volume of a sphere with a radius equal to 8 centimeters?**

F 267.9 cm^3

G 803.8 cm^3

H 1,607.7 cm^3

J 2,143.6 cm^3

SSM:

- **use formula sheet**
- **r = 8**

$$V = (4/3)\pi r^3$$
$$= (4/3)\ \pi 8^3$$
$$= (4/3)\ \pi\ 512$$
$$= 682.67\ \pi$$
$$= 2144.66$$

37 What is the total surface area of a rectangular prism box that measures 5 feet by 1 foot by 1 foot?

A 5 sq ft
B 20 sq ft
C 22 sq ft
D 30 sq ft

SSM:
- use formula sheet
- l = 5; w = 1; h = 1

$$SA = 2(lw + lh + wh)$$
$$= 2(5\times1 + 5\times1 + 1\times1)$$
$$= 2(5 + 5 + 1)$$
$$= 2(11)$$
$$= 22$$

34 **A swimming pool is being filled at the rate of 12 cubic yards per minute. If the pool is 18 yards long, 10 yards wide, and 3 yards deep, how many minutes will it take to fill the pool?**

F 45 minutes
G 101 minutes
H 540 minutes
J 1,233 minutes

SSM:

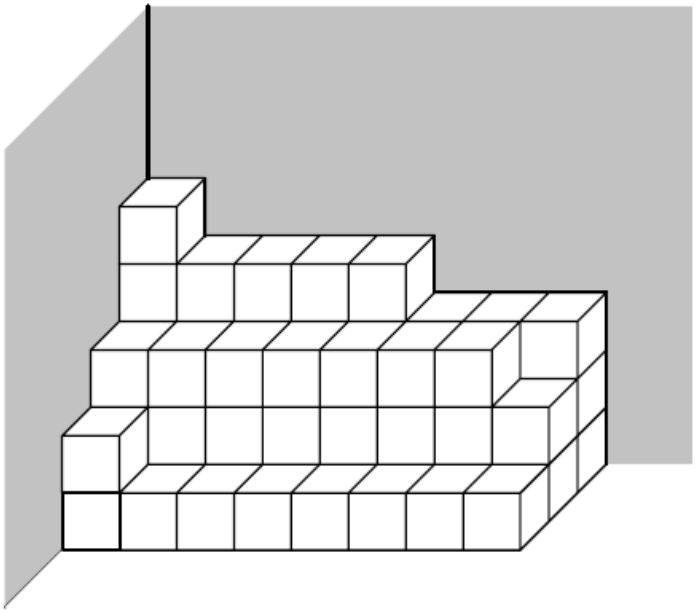
- **multiply each answer by 12 and see what answer makes sense**

Volume of swimming pool: l×w×h

18×10×3 = 540

540 ÷ 12 = 45 minutes

35 **This drawing shows cubic boxes stacked in the corner of a warehouse.**



If each box will hold 8 cubic feet, what is the total capacity of the stack of boxes?

A 488 cubic feet
B 496 cubic feet
C 504 cubic feet
D 512 cubic feet

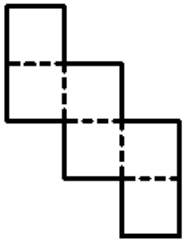
SSM:

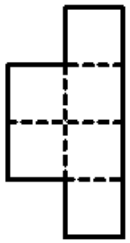
- **Count number of boxes**
- **divide each answer by 8 to give number of boxes**

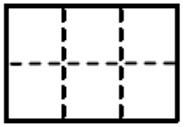
number of boxes: 62

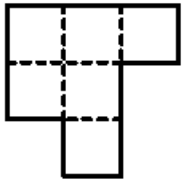
capacity: $62 \times 8 = 496$

36 Which of the following nets can be folded along the dashed lines to form a cube?

F 

H 

G 

J 

SSM:
- **no help**

Picture folding along dotted lines
Any figure that has overlaps or gaps is not a net

37 A machine for baling hay produces cylindrical bales that are 6 feet in diameter and $5\frac{1}{3}$ feet in height.

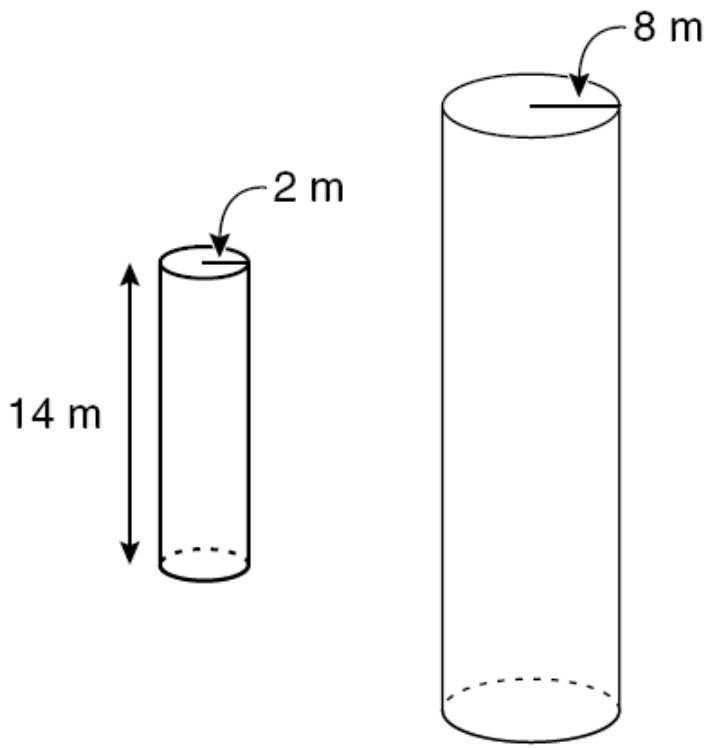
Which is closest to the number of cubic feet in each bale of hay the machine produces?

A 100
B 151
C 301
D 603

SSM:
- use formula sheet
- radius = ½ diameter

$V = \pi r^2 h = \pi(3)^2 (5\frac{1}{3}) = 48\pi \approx 151$

39 **The cylinders shown are similar.**



What is the volume of the larger cylinder?

A 56π m^3

B 224π m^3

C 896π m^3

D $3{,}584\pi$ m^3

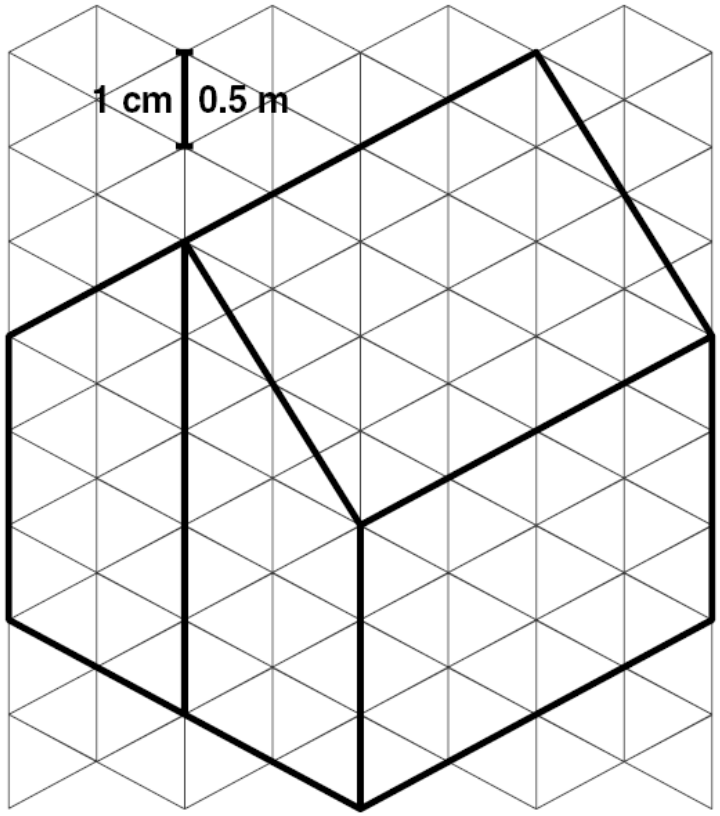
SSM:

- **use formula sheet**
- **scaling factor 8/2 = 4**

$V_s = \pi r^2 h = \pi(2)^2\,(14) = 56\pi$

$V_L = 4$ (scaling factor) $\times\ V_s = 224\pi$

34 This is a scale drawing of a tent where 1 centimeter represents 0.5 meter.



What is the height of the tent at its highest point?

F 10 m
G 5 m
H 3 m
J 2.5 m

SSM:

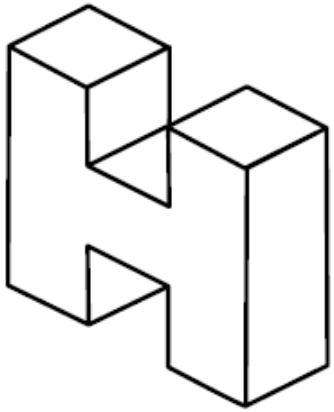
- count vertical lines from bottom to top
- think about meters ≈ 3 feet which answer could fit tents you have seen

5 vertical lines from bottom of the tent to the top

$5 \times 0.5 \text{ m} = 2.5 \text{ m}$

(slightly less than 8 feet)

35

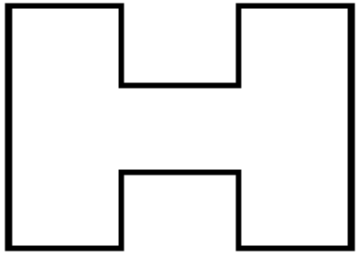


SSM:

- **picture figure from the top**
- **eliminate answers that don't fit**

Which represents a two-dimensional view from directly above the figure?

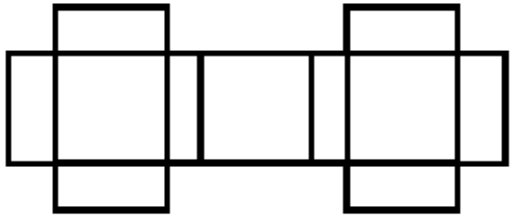
A



C

B

D



A is a front view
C and D don't fit picture

36 **To the nearest gallon, what is the volume of a cylindrical water heater 1.4 feet in diameter and 4 feet tall? (1 cubic foot = 7.48 gallons)**

F 34 gal

G 46 gal

H 59 gal

J 132 gal

SSM:

- **use formula sheet**
- **r = 0.7 and h = 4**
- **multiply answer by 7.48**

$V = \pi r^2 h$

$= \pi r^2 h$

$= \pi (0.7)^2 4$

$= 1.96 \pi$ cu feet

$= 1.96 (\pi) 7.48$

$= 46.06$

37 **A spherical paintball measures 1.5 centimeters in diameter. Approximately how much paint is in it?**

A $1.77\ cm^3$

B $7.07\ cm^3$

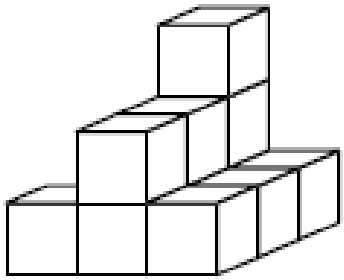
C $9.42\ cm^3$

D $14.13\ cm^3$

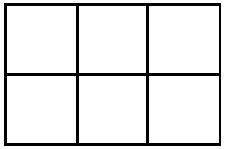
SSM:
- use formula sheet
- r = 0.75

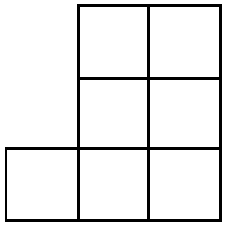
$V = (4/3)\pi r^3$
$= (4/3)\ \pi(0.75)^3$
$= (4/3)\ \pi\ (0.4219)$
$= 0.5625\ \pi$
$= 1.767$

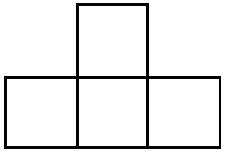
34

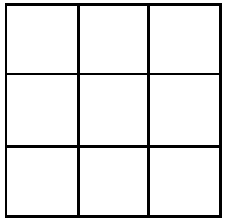


Which could be the view of this stack of cubes from directly above?

F 

H 

G 

J 

SSM:

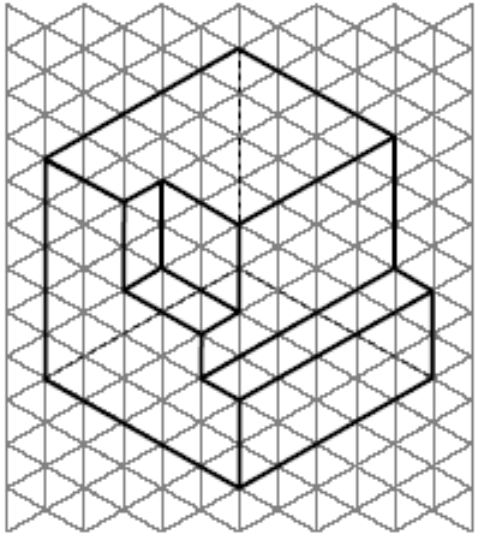
- **block on left front has nothing behind it!**

Picture figure from above

possible 3 × 3 shape, but

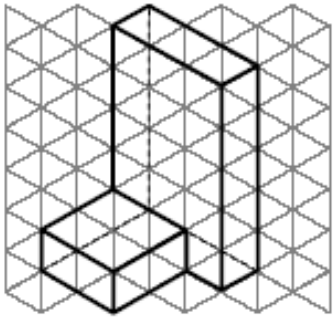
block on left front has no block behind it

35

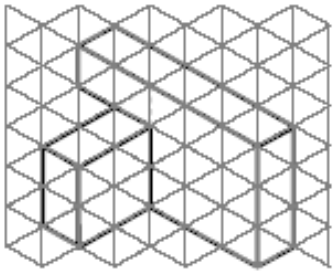


Which piece completes this cube?

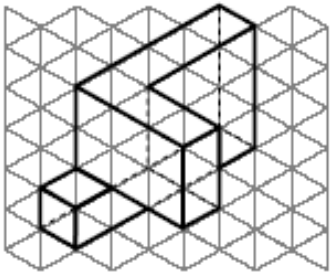
A



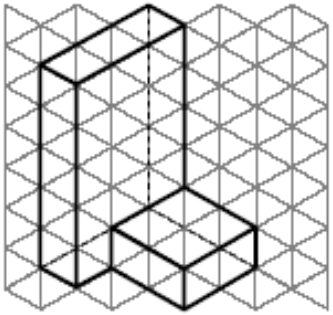
B



C



D



SSM:

- **examine pictures and see which fits**
  choices boil down to A or D

Picture missing piece

2 × 2 knob facing right at top

3 × 5 block

36 A tepee in the shape of a right cone has a slant height of 18.5 feet and a diameter of 20 feet. Approximately how much canvas would be needed to cover the tepee?

F 581 sq ft
G 116 sq ft
H 89 sq ft
J 58 sq ft

SSM:
- **use formula sheet**
- **l = 18.5 and r = ½ 20 = 10**

Surface area of a cone:

$SA = \pi r(r + l)$
$= \pi (10) (10+18.5)$
$= 285\pi$
$= 895.35$

Tepees don't have canvas floors!

We subtract off the area of the circle (floor)
$A(circle) = \pi r^2 = \pi(10)^2 = 314.16$

$895.35 – 314.16 = 581.19$

37 **The Great Pyramid at Giza has a square base with sides of length 230 meters and a height of 146.7 meters. Approximately what is the volume of the Great Pyramid?**

A 1,650,000 m^3

B 2,590,000 m^3

C 4,950,000 m^3

D 7,760,000 m^3

SSM:

- **use formula sheet**
- **s=230 and h = 146.7**
- **square base**

V = 1/3 B h
= 1/3 (230×230) (146.7)
= 1/3 (7760430)
= 2,586,810

B is area of the square base!

38 The ratio of the circumference of two circles is $\frac{3}{2}$. The radius of the smaller circle is 8 inches. What is the radius of the larger circle?

F $5\frac{1}{3}$ inches

G 6 inches

H 9 inches

J 12 inches

SSM:

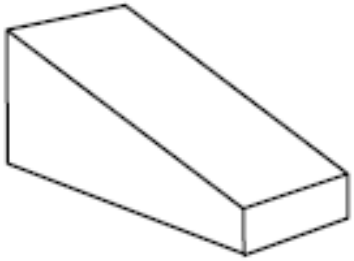
- larger circle radius is bigger than 8

ratios of circumferences ($2\pi r$) is same as the ratio of the radii

if scaling factor (ratio) is 3:2 then

3/2(8) = 12 (radius of the larger circle)

34

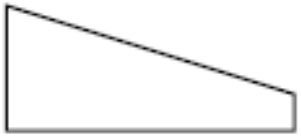


Which is a two-dimensional representation of the view from directly above the figure?

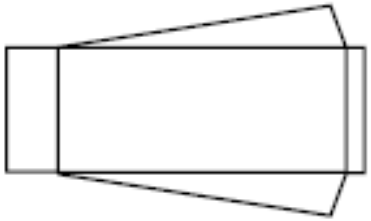
F

H

G



J

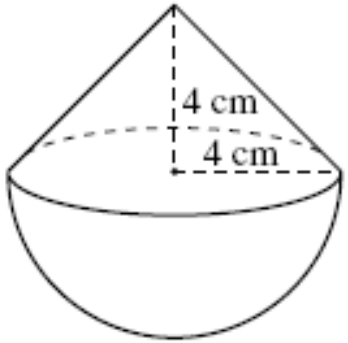


SSM:

- **top side is a rectangle**
- **eliminates G and J**

Picture figure from the top
top side is a rectangle
only H is just a rectangle

35 The figure shows a right circular cone on top of a hemisphere with the same radius.



SSM:

- use formula sheet
- hemisphere = ½ sphere
- r = 4 and h = 4

To the nearest whole number, what is the volume of this solid?

A 201 cm^3
B 256 cm^3
C 278 cm^3
D 309 cm^3

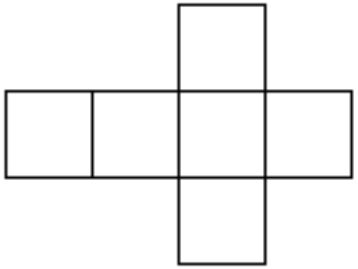
$$\text{Volume} = \text{Volume}_{\text{cone}} + \text{Volume}_{\text{hemisphere}}$$
$$= \frac{1}{3}\pi r^2 h + \frac{1}{2}\left(\frac{4}{3}\right)\pi r^3$$
$$= \frac{1}{3}\pi(4)^2(4) + \frac{1}{2}\left(\frac{4}{3}\right)\pi(4^3)$$
$$= \frac{64}{3}\pi + \frac{128}{3}\pi$$
$$= \frac{192}{3}\pi$$
$$= 201.06$$

36 Which of the following patterns could *not* be folded into a cube?

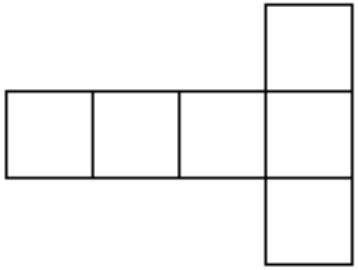
SSM:

- **3 can be and one can't**

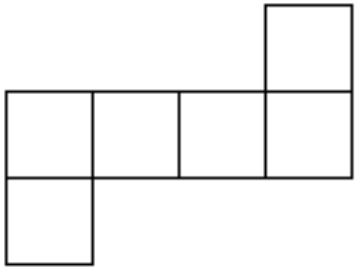
F



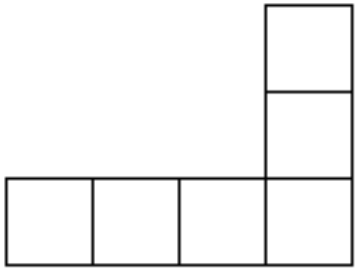
H



G



J



Picture folding them into a die (cube)

answer J overlaps two pieces

37 A cylindrical water container is 1.2 meters high and has a diameter of 4.6 meters. Approximately how many cubic meters of water will the container hold when it is *half full*?

A 4.33
B 9.97
C 29.93
D 39.87

SSM:
- **use formula sheet**
- **$r = \frac{1}{2}(4.6) = 2.3$**
- **$h = 1.2$**

$$V = \pi r^2 h$$
$$= \pi(2.3)^2(1.2)$$
$$= 6.348\pi$$
$$= 19.94$$

half full → $\frac{1}{2}(19.94) = 9.97$

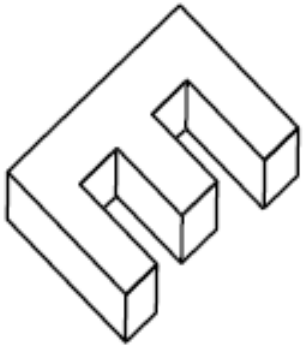
38 What is the volume of a right square pyramid with a height of 3 centimeters and a base that measures 8 centimeters by 8 centimeters?

F $64\ cm^3$
G $72\ cm^3$
H $144\ cm^3$
J $225\ cm^3$

SSM:
- **use formula sheet**
- **h=3 and B=8×8 = 64**

V = 1/3 Bh
= 1/3 (8×8)(3)
= 64

34



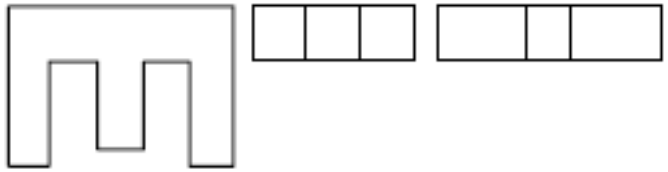
SSM:

- **count outside edges**
  5 across the front

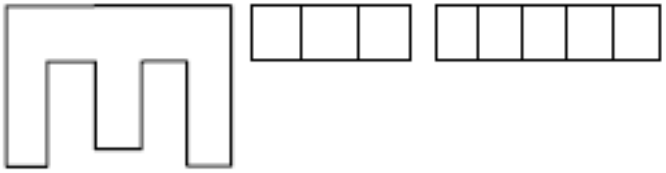
Which are the top, side, and front views of the object shown above?

F

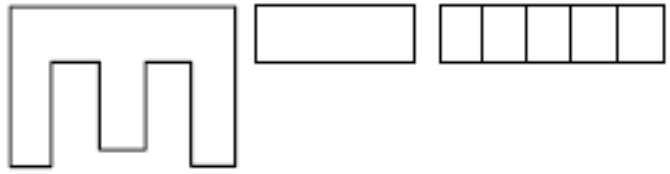
H



G

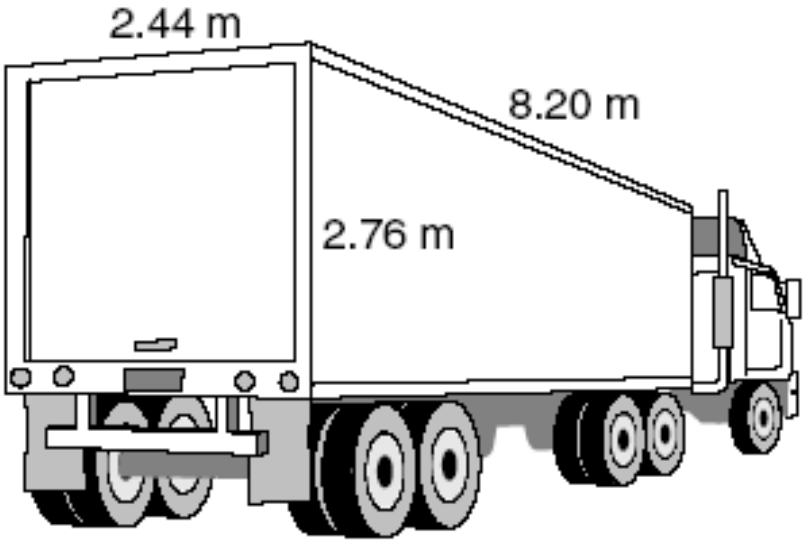


J



picture cubes from the top, side and from front
number outside edges for dimensions

35



The cargo space of the truck is 2.44 meters wide, 2.76 meters high, and 8.20 meters long. How many cubic meters of cargo space does the truck have?

A 26.80
B 55.22
C 98.75
D 110.44

SSM:

- use formula sheet
- find variables: w = 2.44, h=2.76, l=8.20
- plug in and solve

$V = lwh$
$= (8.2)(2.44)(2.76)$
$= 55.22$

36 What is the approximate volume of a can that is 5 inches tall and has a 2.5 inch diameter?

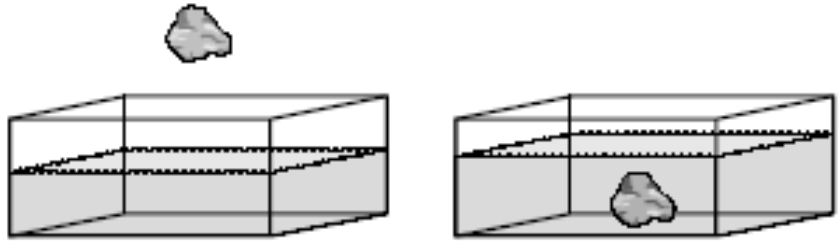
F 19.6 cu in.
G 24.5 cu in.
H 39.3 cu in.
J 98.1 cu in.

SSM:
- Use formula sheet
- find variables: h = 5 and r = 1.25
- plug in and solve

$d = 2.5 = 2r$
$1.25 = r$

$V = \pi r^2 h$
$= \pi(1.25)^2(5)$
$= \pi(1.5625)(5)$
$= 24.54$

37



The water level in a rectangular prism tank 40 centimeters by 20 centimeters is 12 centimeters high. A rock submerged in the tank raises the water level 0.4 centimeters. What is the volume of the rock?

A $320\ cm^3$
B $960\ cm^3$
C $2{,}000\ cm^3$
D $9{,}920\ cm^3$

SSM:
- **use formula sheet**
- **find variables: w=20, h=12, l=40**
- **plug in and solve**

$V_B = lwh$
$= (40)(20)(12)$
$= 9600$

$V_A = lwh$
$= (40)(20)(12.4)$
$= 9920$

volume of rock is 9920 – 9600 = 320

38 The ratio between the volumes of two spheres is 27 to 8. What is the ratio between their respective radii?

F 81:64
G 27:16
H 9:8
J 3:2

SSM:
- **use formula sheet**

$V = (4/3)\pi r^3$

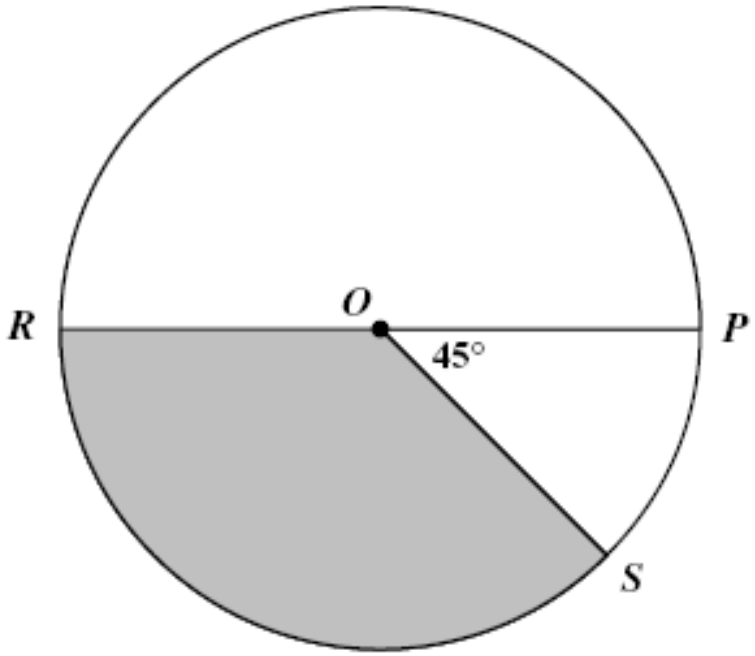
so cubic relationship between radii

$(27)^{1/3} \rightarrow (8)^{1/3}$

$(3^3)^{1/3} \rightarrow (2^3)^{1/3}$

$3 \rightarrow 2$

30



A circle for a game spinner is divided into 3 regions as shown. $\overline{RP}$ is a diameter. What is the area of the shaded sector ROS if $RP = 8$?

F 1.5π

G 6π

H 24π

J 72π

SSM:

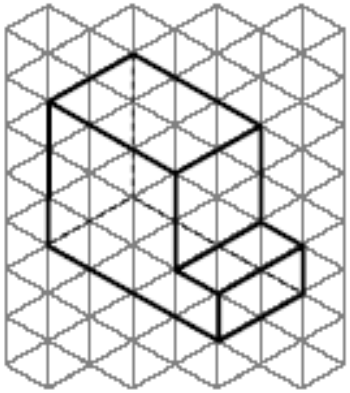
- use formula sheet
  $r = \frac{1}{2} RP = \frac{1}{2}(8) = 4$
- answer is less than 16π
  eliminates H and J

shaded area is 135° central angle ($\angle SOR$)

$135 \div 360 = 0.375$ (shaded part of the circle)

$$\text{Area}_{\text{shaded}} = 0.375 \times \text{Area}_{\text{circle}}$$
$$= 0.375 \times \pi r^2$$
$$= 0.375 \times \pi\, 4^2$$
$$= 6\pi$$

34 This is one view of a 3-dimensional object.

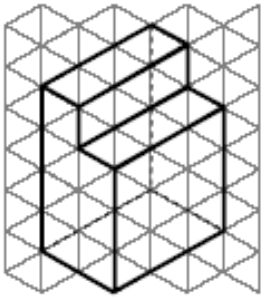


SSM:

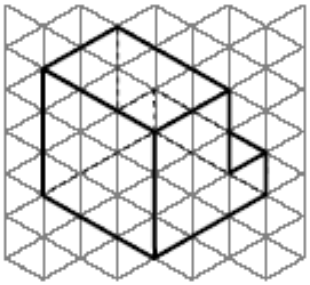
- **count dimensions of object and answers**
  object: 3×3×2 main with a 2×1 knob

Which is a different view of the same object?

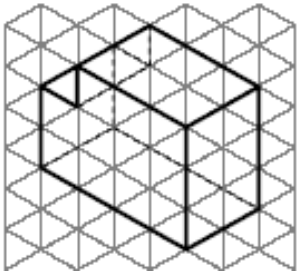
F



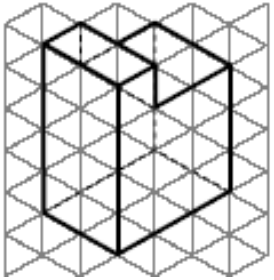
H



G



J



F and H: has a 3 × 1 knob

G has a 2 × 2 knob

36 What is the volume in cubic feet of a refrigerator whose interior is 4.5 feet tall, 2.5 feet wide, and 2 feet deep?

F 15 cu ft

G 19 cu ft

H 22.5 cu ft

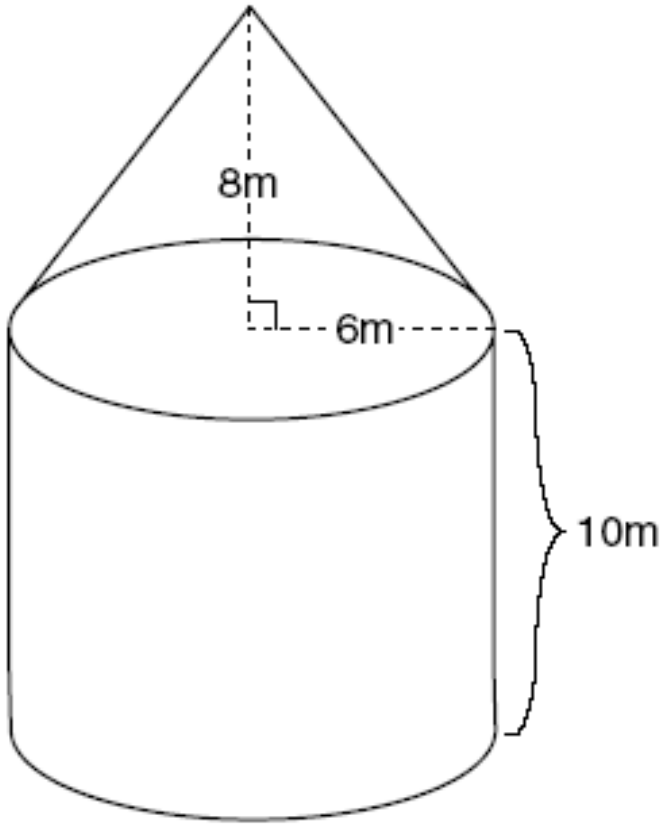
J 25 cu ft

SSM:

- **use formula sheet**
- **h = 4.5, w = 2.5, l = 2**

$$V = lwh$$
$$= (2)(2.5)(4.5)$$
$$= 22.5$$

37



Rounded to the nearest hundred cubic meters, what is the total capacity (cone and cylinder) of the storage container?

A 1,400
B 2,000
C 5,700
D 8,100

SSM:

- use formula sheet
- h = 8, r = 6 for cone
- and h = 10, r = 6 for cylinder

$V = V_{cone} + V_{cylinder}$

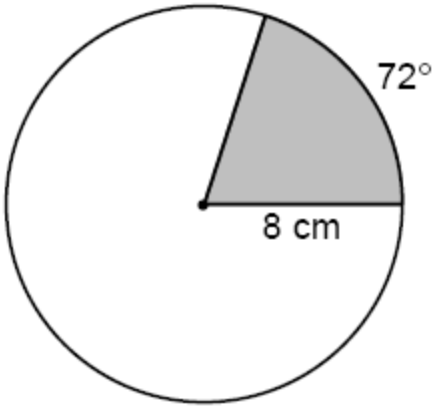
$V = 1/3\pi r^2 h + \pi r^2 h$

$= 1/3\pi(6^2)(8) + \pi(6^2)(10)$

$= 96\pi + 360\pi$

$= 456\pi = 1432.57$

30



A circle has a radius of 8 centimeters. The measure of the arc of the shaded section is 72°. Which is *closest* to the area of the shaded section of the circle?

F $10.1\ cm^2$
G $40.2\ cm^2$
H $50.3\ cm^2$
J $160.8\ cm^2$

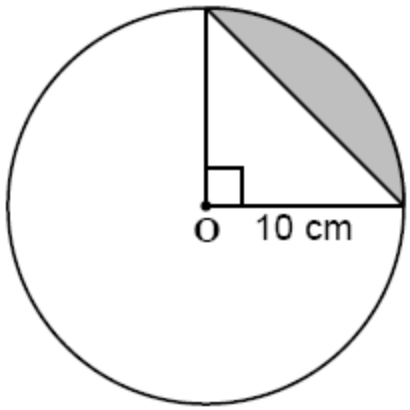
SSM:
- **use formula sheet**
- **r = 8**
- **72/360 part of circle**

$A = \pi r^2 = \pi (8)^2 = 64\pi$ (for entire circle)

shaded piece = 72/360 = 1/5

A(shaded) = (1/5) 64 π = 40.21

31 Point O is the center of the circle.



SSM:
- use formula sheet
- r = 10
- b = h = 10 for triangle
- 1/4 part of circle

What is the area of the shaded portion of the circle?

A $28.5\ cm^2$
B $34.2\ cm^2$
C $50\ cm^2$
D $78.5\ cm^2$

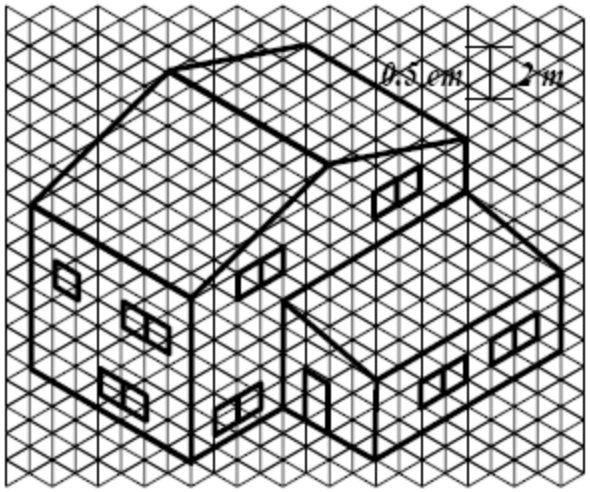
$A = \pi r^2 = \pi (10)^2 = 100\pi$ (for entire circle)

shaded piece = 90/360 = 1/4

A(sector) = (1/4) 100 π = 25π
A(triangle) = ½ bh = ½ (10)(10) = 50

A(shaded) = A(sector) – A(triangle)
A(shaded) = 25π – 50 = 28.54

34 This is an architect's scale drawing of a house that was built, where 0.5 cm represents 2 m.



How tall is the house at its highest point?

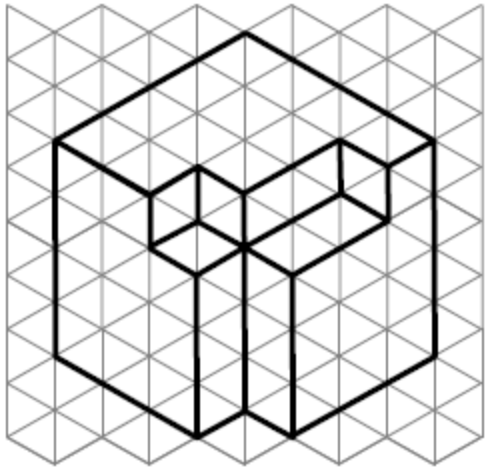
F 6 m
G 8 m
H 12 m
J 16 m

SSM:

- **use your eyes**

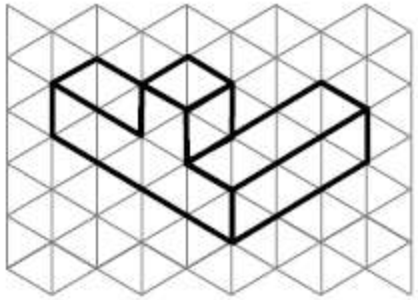
each vertical block is a meter
house corner is 6 blocks tall
and from corner to the top of
the roof is 2 more blocks

35

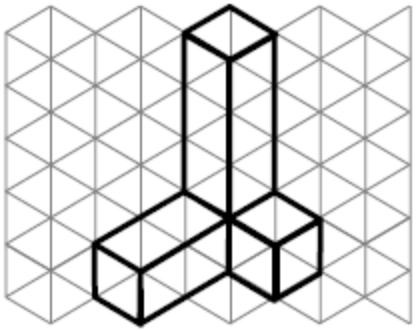


Which piece could complete this cube?

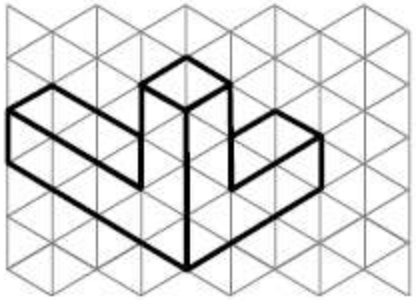
F



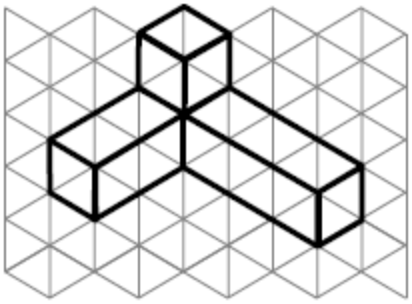
H



G



J



SSM:

- **use your eyes**

need a piece 4 block tall
1 block beyond the corner on one side
2 blocks beyond the corner on the other side

36 An aquarium tank is 3 feet long, 1 foot wide, and 2 feet high. How many gallons of water would it take to fill the tank two-thirds full? (A cubic foot is about 7.5 gallons)

F 30
G 40
H 86
J 4,860

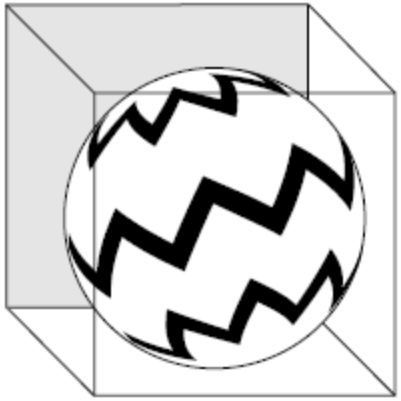
SSM:
- formula sheet
- l=3, w=1 and h=2

Volume of tank
V = $l \times w \times h$
V = (3)×(1)×(2)
V = 6

2/3V = 2/3(6) = 4 cubic feet

7.5 × 4 = 30 gallons

37



A sphere with a 2-inch radius is packed in a cube so that all sides touch. How much empty space is left in the cube?

A 17.8 cu in.
B 30.5 cu in.
C 33.5 cu in.
D 47.25 cu in.

SSM:
- formula sheet
- r=4 and l=w=h=4

Volume of cube – Volume of sphere

$V = l \times w \times h$ $\quad V = 4/3\pi r^3$

$V = (4)\times(4)\times(4)$ $\quad V = (4/3)\pi 2^3$

$V = 64$ $\quad V = 32\pi/3$

$V = 64 - 33.51 = 30.49$

39 **A cylindrical paint can has a capacity of one gallon. For another size can, the height is doubled. What is the capacity of the larger size?**

A 2 gal.
B 4 gal.
C 8 gal.
D 16 gal.

SSM:
- **use formula sheet**

$V = \pi r^2 h = 1$ gallon if h is doubled then

$V = \pi r^2(2h) = 2\pi r^2 h = 2(1 \text{ gallon}) = 2$ gallons