SOL HW 9.4

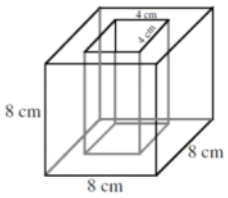
April 2, 2020 10:18 AM

Name:_____ Date:_____

HW Math 8 Section 9.4 Problem Solving with Volume:

1. Given each composite solid, find the volume

a)



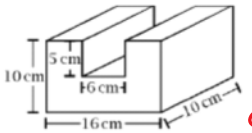
① FIND THE VOLUME OF THE BIG BOX THEN SUBTRACT THE PRISM INSIDE.

$Vol_{Big} = 8 \times 8 \times 8$
$= 512\ cm^3$.

$Vol_{small} = 4 \times 4 \times 8$
$= 128\ cm^3$

$Vol.\ solid = 512 - 128\ cm^3$
$= 384\ cm^3$ //

b)

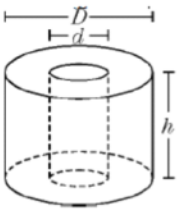


① DO THE SAME AS BEFORE
FIND VOL. OF BIG BOX.
$V_1 = 10 \times 16 \times 10$
$= 1600\ cm^3$ //

② THEN SUBTRACT THE BIG AT THE TOP
$V_2 = 5 \times 6 \times 10$
$= 300\ cm^3$

③ $V_{solid} = 1600 - 300$
$= 1300\ cm^3$ //

c) $D = 24cm,\ d = 6cm,\ h = 18cm$



① VOLUME OF A SPHERE IS
$V = \pi \times R^2 \times H$
WHERE "R" IS THE RADIUS
R^2 MEANS $R \times R = R^2$

② FIND VOL. OF BIG SPHERE THEN SUBTRACT INSIDE SPHERE:

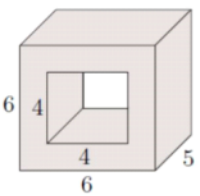
$V_1 = \pi \times R_1^2 \times H.$
$V_1 = \pi \times 12^2 \times 18$
$V_1 = 2592\pi\ cm^3$

$V_2 = \pi \times 3^2 \times 18$
$= \pi \times 9 \times 18$
$= 162\pi\ cm^3$ //

NOTE: KEEP YOUR ANSWERS IN TERMS OF π. π IS A IRRATIONAL NUMBER, NOT AN UNIT

$V_3 = 2592\pi - 162\pi$
$= 2430\pi\ cm^3$
OR
$= 7634.0637\ cm^3$ //

d)



① $V_{solid} = V_{Big} - V_{small}$.

② $Vol_{Big} = l \times w \times h$
$= 6 \times 6 \times 5$
$= 180\ units^3$

③ $Vol_{small} = 4 \times 4 \times 5$
$= 80\ units^3$

④ $V_{solid} = 180 - 80$
$= 100\ units^3$ //

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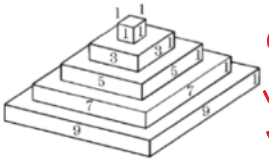
e)



① THIS PYRAMID IS JUST A STACK OF RECTANGULAR PRISMS

② $V_{solid} = V_1 + V_2 + \cdots V_5$

$V_1 = 1 \times 1 \times 1 = 1\,cm^3$

$V_2 = 3 \times 3 \times 1 = 9\,cm^3$

$V_3 = 5 \times 5 \times 1 = 25\,cm^3$

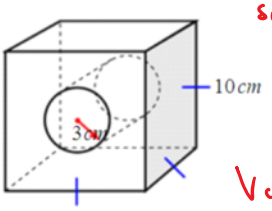
$V_4 = 7 \times 7 \times 1 = 49\,cm^3$

$V_5 = 9 \times 9 \times 1 = 81\,cm^3$

③ $V_{solid} = 1 + 9 + 25 + 49 + 81$

$= 165\ units^3$ //

f)



① THE VOLUME OF THIS SOLID IS THE CUBIC SUBTRACT THE CYLINDER IN THE MIDDLE.

$V_{CUBE} = 10 \times 10 \times 10$

$= 1000\,cm^3$

$V_{cylinder} = \pi \times R^2 \times H$

$= \pi \times 3^2 \times 10$

$= 90\pi\ cm^3$ //

② $V_{solid} = V_{CUBE} - V_{cylinder}$

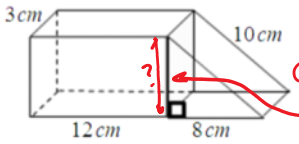
$= 1000\,cm^3 - 90\pi\,cm^3$

OR

$= 717.2566\ cm^3$ //

NOTE: GIVING YOUR ANSWER AS $1000 - 90\pi\ cm^3$ IS ACCEPTABLE.

g)



① THE VOL. OF THE SOLID IS A RECTANGULAR PRISM PLUS A TRIANGULAR PRISM.

② WE NEED THE HEIGHT OF THE SOLID

$a^2 + b^2 = c^2$

$a^2 + 8^2 = 10^2$

$a^2 = 100 - 64$

$a^2 = 36$

$a = 6$

③ $V_{solid} = 3 \times 12 \times 6$

$= 216\,cm^3$

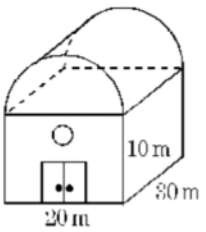
$V_{triangular\ prism} = \frac{6 \times 8 \times 3}{2}$

$= 72\,cm^3$

$V_{solid} = 216 - 72$

$= 144\ cm^3$ //

h)



① THE ROOF IS HALF A SPHERE

$V_{half\ sphere} = \frac{\pi \times R^2 \times H}{2}$ DIVIDE BY 2 B/C IT'S "HALF"

$= \frac{\pi \times 10^2 \times 30}{2}$

$= 1500\pi\ m^3$ //

② THE BASE IS A RECTANGULAR PRISM

$V = 20 \times 30 \times 10$

$= 6000\ m^3$ //

③ $V_{solid} = V_{half\ sphere} + V_{BASE}$

$= 1500\pi + 6000\ m^3$

OR

$= 10,712.38898\ m^3$ //

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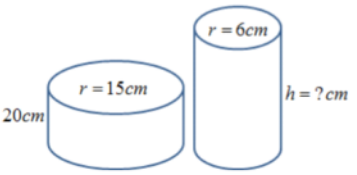
2h

2. If the volumes of the two cylinders are equal, then what is the height of the second cylinder?



① Find Vol. of the cylinder on the left.

$V_1 = \pi (15)^2 \times 20$

$= 4500\pi \text{ cm}^3$

② The Vol. of the cylinder on the right is also $4500\pi \text{ cm}^3$.

$V_2 = \pi \times (6)^2 \times H$

$4500\pi = \pi \times 36 \times H$ ← cancel out 'π' from both sides

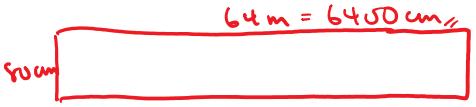
$4500 = 36 \times H$ ← divide both sides by 36.

$\frac{4500}{36} = H$

$125 \text{ cm} = H$

3. A rectangular sheet of metal 80cm by 64m is to be rolled into a cylinder. Which way should it be rolled to make a cylinder with the maximum volume? [This is probably the hardest question in this assignment]

① A 80cm × 64m sheet can be rolled into a cylinder in two ways.



The hardest part is finding the radius of the cylinder

i)

or ii)

② The circumference of the circle is 80cm

$C = 2 \times \pi \times R$

$80 = 2 \times \pi \times R$

$40 = \pi \times R$

$\frac{40}{\pi} = R$

$12.7324 = R$

$V = \pi \times R^2 \times H$

$= \pi \times 12.7324^2 \times 6400$

$= 3,259,493.23 \text{ cm}^3$

2nd method makes a cylinder with bigger volume!

③ $C = 2 \times \pi \times R$

$6400 = 2 \times \pi \times R$

$3200 = \pi \times R$

$\frac{3200}{\pi} = R$

$1018.59 \text{ cm} = R$

$V = \pi \times 1018.59^2 \times 80$

$= 260,759,458.8 \text{ cm}^3$

4. A large water tank in the shape of a rectangular prism is 14m by 20m by 6m. Jim and his team need to fill this tank with water using cylindrical buckets that are 30cm tall with a radius of 15cm. How many buckets of water does he need to fill the tank up?

① Get Vol. of the big tank

$V = 14\text{m} \times 20\text{m} \times 6\text{m}$

$= 1400\text{cm} \times 2000\text{cm} \times 600\text{cm}$

$= 1,680,000,000 \text{ cm}^3$

[Note 100 cm = 1m]

② Get Vol. of a bucket

$V = \pi \times 15^2 \times 30\text{cm}$

$V = 6750\pi \text{ cm}^3$

$V \approx 21,205.75 \text{ cm}^3$

③ Divide Vol. of big tank by Vol of little buckets to get the number of buckets needed.

$n = \frac{1,680,000,000}{21,205.75}$

$= 79,223.79.$

You will need 79,224 buckets.

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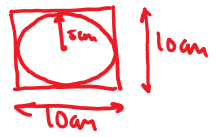
3h

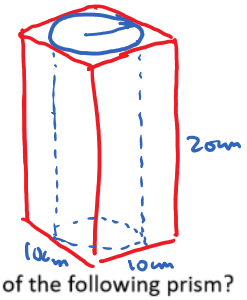
5. A cylinder with a radius of 5cm and a height of 20cm is placed inside a rectangular prism that fits perfectly in it.

What is the amount of space inside the rectangular prism that is not occupied by the cylinder?

① Top View:



②



③ Get vol. of the Rectang. Prism subtract the vol of the cylinder

$V_{space} = V_{prism} - V_{cylinder}$

$= 10 \times 10 \times 20 - \pi \times 5^2 \times 20$

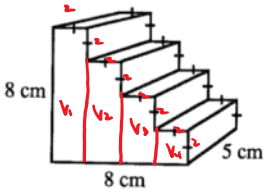
$= 2000\ cm^3 - 500\pi\ cm^3$

$= 2000 - 500\pi\ cm^3$

or

$= 429.2037\ cm^3$ //

6. What is the volume of the following prism?



① Cut the solid into smaller rectangular prism

$V_1 = 8 \times 2 \times 5$
$= 80 cm^3$

$V_2 = 6 \times 2 \times 5$
$= 60 cm^3$

$V_3 = 4 \times 2 \times 5$
$= 40 cm^3$

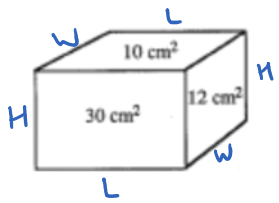
$V_4 = 2 \times 2 \times 5$
$= 20 cm^3$

② $Vol = V_1 + V_2 + V_3 + V_4$

$= 80 + 60 + 40 + 20$

$= 200\ cm^3$ //

7. The areas of three of the faces of the rectangular box shown are 10cm2, 12cm2, and 30cm2. What is the volume of the box?



① $W \times H = 12$

$W \times L = 10$

$H \times L = 30$

② You can guess & check.

$2 \times 6 = 12$

$2 \times 5 = 10$

$6 \times 5 = 30$

So $W = 2$, $H = 6$, $L = 5$ //

OR

$(W \times H) \times (W \times L) \times (H \times L) = 12 \times 10 \times 30$

$W^2 \times H^2 \times L^2 = 3600$

$\sqrt{W^2 \times H^2 \times L^2} = \sqrt{3600}$

$W \times H \times L = 60$.

$(W \times H) \times L = 60$

$12 \times L = 60$

$L = 5$

$W \times L = 10$ $\quad$ $H \times L = 30$

$W \times 5 = 10$ $\quad$ $H \times 5 = 30$

$W = 2$ $\quad$ $H = 6$

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