Bestsize Cans

T1

$(\pi r^2)h = 200cm^3$ ✓

$2\pi r^2 + 2\pi r \times h$ = area of aluminium ✓

1
1

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a can that holds 200 cm^3.

In order to keep costs low, the company wants to use the smallest amount of aluminum.

Find the radius and height of a cylindrical can which holds 200 cm3 and uses the smallest amount of aluminum. radius = 3 ✓ height = 7.07 ✓ 1 1

Explain your reasons and show all your calculations

The volume of the drink's formula is $(\pi r^2)h = 200cm^3$. The area of aluminium is $2\pi r^2 + 2\pi r \times h$. The heights formula is $\frac{200}{\pi r^2}$ By using the formula of $2\pi r^2 + \frac{100}{r}$ I tried different varibles for r or the radius. Then found when the areas were at the smallest amount. 2

Bestsize Cans (continued)

$h = \frac{200}{\pi r^2}$

x = area of aluminum can

$2\pi r^2 + 2\pi r \times \left(\frac{200}{\pi r^2}\right) = x$

$2\pi r^2 + 2\left(\frac{200}{r}\right) = x$

$2\pi r^2 + \frac{400}{r} = x$

$h = \frac{200}{\pi 9}$

$= 7.07$

r	x
1	6.28 + 400 = 406.28
2	25.12 + 200 = 225.12 ✓
(3)	56.52 + 133 = 189.85 ✓
4	100.48 + 100 = 200.48 ✓
5	157 + 80 = 237
2.5	39.27 + 160 = 199.27 ✓
3.5	76.97 + 114 = 191.255 ✓

2

2

(10)

Bestsize Cans

T2

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a can that holds 200 cm^3.

In order to keep costs low, the company wants to use the smallest amount of aluminum.

Find the radius and height of a cylindrical can which holds 200 cm3 and uses the smallest amount of aluminum.

Explain your reasons and show all your calculations

$V = \pi r^2 h$ ✓ $200 = \pi r^2 h$ $h = \frac{200}{\pi r^2}$ 1

$S = 2\pi r^2 + 2\pi r h$ ✓ 1

$S = 2\pi r^2 + 2\pi r \left(\frac{200}{\pi r^2}\right)$ ✓ 2

$S = 2\pi r^2 + \frac{400\pi r}{\pi r r}$

$S = 2\pi r^2 + \frac{400}{r}$

$r \approx 3$ cm ✓ $h = \frac{200}{\pi 3^2} = \frac{200}{28} = 7$ $h \approx 7$ cm ✓ 2

1

1

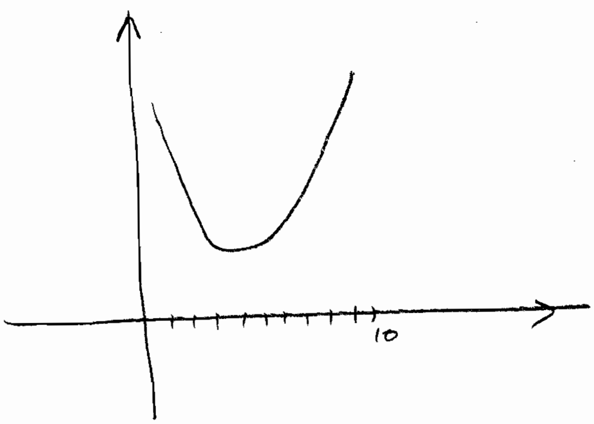
39,25

157 0

0

49

Bestsize Cans (continued)



s	406	225	190	200	237
r	1	2	3	4	5

8

Bestsize Cans

T3

Surface Area $= 2\pi r^2 + 2\pi r h$ ✓

Volume $= \pi r^2 h = 200$

$h = \frac{200}{\pi r^2}$ ✓

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a can that holds 200 cm^3.

In order to keep costs low, the company wants to use the smallest amount of aluminum.

Find the radius and height of a cylindrical can which holds 200 cm3 and uses the smallest amount of aluminum.

Explain your reasons and show all your calculations

Calculations:

$S.A = 2\pi r^2 + 2\pi r h = 2\pi r^2 + 2\pi r \frac{200}{\pi r^2} = 2\pi r^2 + \frac{400}{r}$ ✓ 2

$r = 2$ $SA = 8\pi + \frac{400}{2} = 225.13$ ✓ $h = \frac{200}{\pi r^2} = 15.91$

$r = 2.5$ $SA = 2\pi 2.5^2 + \frac{400}{2.5} = 199.27$ ✓ 2

$r = 3$ $SA = 18\pi + \frac{400}{3} = 189.88$ ✓ $h = \frac{200}{\pi r^2} = 7.07$

$r = 3.5$ $SA = 24.5\pi + \frac{400}{3.5} = 191.25$ ✓ 2

Smallest S.A is for $r = 3$ and $h = 7.07$ 1 1

(10)

Bestsize Cans

T4

Surface Area= $2\pi r^2 + 2\pi rh$ ✓

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a can that holds 200 cm^3.

In order to keep costs low, the company wants to use the smallest amount of aluminum.

Find the radius and height of a cylindrical can which holds 200 cm3 and uses the smallest amount of aluminum.

Explain your reasons and show all your calculations

Calculations:

Volume = 200 $cm^3 = \pi r^2 h$ ✓ Surface Area = $2\pi r^2 + 2\pi rh$ ✓ 1 1

$\frac{200}{\pi} = r^2h \Rightarrow \frac{49773}{7819} = r^2h \approx 63.66197724$ 2

r=2, h=16 ✓ 2x2=4 4x16=64 $2\pi(2)^2+2\pi(32) \approx 25.1 + 201.1 \approx 226.2$ ✓

r=1, h=64 ✓ 1x1=1 1x64=64 $2\pi(1)^2+2\pi(64) \approx 6.3 + 402.1 \approx 408.4$ ✓

r=3, h=$7\frac{1}{9}$ ✓ 3x3=9 9x$7\frac{1}{9}$=64 $2\pi(3)^2+2\pi\left(\frac{64}{3}\right) \approx 56.5 + 134.0 \approx 190.5$

So, radius larger → surface area smaller! Now, try find largest radius (smallest surface area)

r=8, h=1 8x8=64 64x1=64 $2\pi(8)^2+2\pi(8) \approx 402.1 + 50.2 \approx 452.3$ 2

Wait... What!?

r=5, h=2.56 5x5=25 25x2.56=64 $2\pi(5)^2+2\pi(12.8) \approx 157.1 + 80.4 \approx 237.5$

r=4, h=4 ✓ 4x4=16 16x4=64 $2\pi(4)^2+2\pi(16) \approx 100.5 + 100.5 \approx 201$ ✓

r=6, h=$\frac{16}{9}$ 6x6=36 36x$\frac{16}{9}$=64 $2\pi(6)^2+2\pi\left(\frac{32}{3}\right) \approx 226+67 \approx 293$

T4

Bestsize Cans (continued)

Explanation:

I kind of did a "guess and check" problem solving method. At first, I thought that the larger the radius, the smaller the surface area. The goal of this task is to find the smallest surface area for a can that can hold 200 cm^3 in volume. After many "guess and check" trials, I came to a conclusion that a radius of 3✓ and a height of $7\frac{1}{9}$✓ in a can, can have a volume of about 201. That means it can hold 200 cm^3 of liquid. And, it uses the smallest amount of aluminum possible, which is about 190.5 cm^2. ✓

1
1
0
0

8

Bestsize Cans

T5

2 2 2 5 5 2
2 2
5 5
10 20
10 10 2
5 5 8

$2\times2\times2\times5\times5\times5$
1000 $10\times10\times10$
$4\times25\times10$ 100
100 250 600
100 250 780
40+40

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a can that holds 200 cm^3.

In order to keep costs low, the company wants to use the smallest amount of aluminum.

Find the radius and height of a cylindrical can which holds 200 cm3 and uses the smallest amount of aluminum.

Explain your reasons and show all your calculations

$200 = \pi r^2 h \Rightarrow h = \frac{200}{\pi r^2}$ 1

$SA = 2\pi r^2 + 2\pi r h$ 1

$SA = 2\pi r^2 + 2\pi r\left(\frac{200}{\pi r^2}\right)$

$SA = 2\pi r^2 + \frac{400}{r}$ 2

If $r=2$

$SA = 2\pi(2)^2 + \frac{400}{2} = 8\pi + 200 \approx 225.13274$

If $r=3$

$SA = 2\pi(3)^2 + \frac{400}{3} = 18\pi + \frac{400}{3} \approx 189.882$

If $r=4$

$SA = 2\pi(4)^2 + \frac{400}{4} = 32\pi + 100 \approx 200.530$ 2

If $r=3.1$ $SA = 2\pi(3.1)^2 + \frac{400}{3.1} \approx 189.414$ 1

1

Bestsize Cans (continued)

If r = 3.2 SA = $2\pi(3.2)^2 + 400/3.2 = 189.34$ ✓

If r = 3.3 SA = $2\pi(3.3)^2 + 400/3.3 = 189.636$. 2

$h = \frac{200}{\pi(3.2)^2} \approx 6.217$

Radius = 3.2 ✓

Height = 6.217 ✓

10