Funsize Cans

T1

The volume of a cylinder is

$$V = \pi r^2 h$$

The surface area of a cylinder is

$$S = 2\pi r^2 + 2\pi rh$$

The Fresha Drink Company is marketing a new soft drink.

The drink will be sold in a 'Fun Size' cylindrical can which holds 200 cm^3.

Here are two suggestions for the radius of the cylindrical can.

I'm designing a can with radius 2 cm.

My can has a radius of 5 cm.

1. Each of these cans holds 200 cm^3. Find the heights of these two cans.

$200 = \pi 4h$

$200 = 12.57h$

$15.91 = h$ cm.

for a radius of 2 cm

$200 = 25\pi h$

$200 = 78.54h$

$2.55 = h$ cm

For a radius of 5 cm

Are the dimensions of the cans suitable? Explain your answer.

Not the 5 cm. can because it's too short and fat

Yes for the 2 cm. can because it's easy to hold

T1

2. Find the surface area of the two cans. Show your work

$S = 2\pi 4 + 2\pi 2(15.91)$

$S = 8\pi + 63.64\pi$

$S = 71.64\pi$

$S = 225.06$ cm

$r = 2$

$S = 2\pi 25 + 2\pi 5(2.55)$

$S = 50\pi + 25.5\pi$

$S = 75.5\pi$

$S = 237.19$ cm

$r = 5$

3. In order to keep costs low, the Fresha Drink Company wants to sell the drink in cylindrical cans that use the smallest amount of aluminum.

Find the approximate radius and height of a can that holds 200 cm^3 and uses the smallest amount of aluminum. Show clearly how you figured out the size of the can.

Make your dimensions correct to the nearest 0.5 centimeter.
(You may find it helpful to use graph paper.)

r=1

$200 = \pi 1^2 h$

$200 = 3.14h$

$63.69 = h$

$S = 2\pi + 2\pi(63.69)$

$S = 2\pi + 127.38\pi$

$S = 129.38\pi$

$S = 406.45$ cm

r=6

$200 = \pi 36h$

$5.55 = \pi h$

$1.77 = h$ cm

$S = \pi 2(36) + 2\pi(6)1.77$

$S = 72\pi + 21.24\pi$

$S = 93.24\pi$

$S = 292.92$ cm

r=4

$200 = \pi(16)h$

$12.5 = \pi h$

$3.98 = h$ cm

$S = 2\pi(16) + 2\pi(4)(3.98)$

$S = 32\pi + 31.84\pi$

$S = 63.84\pi$

$S = 200.56$ cm

r=3

$200 = \pi(9)(h)$

$22.22 = \pi h$

$7.07 = h$

$S = 2\pi 9 + 2\pi(3)(7.07)$

$S = 18\pi + 42.42\pi$

$S = 60.42\pi$

$S = 189.82\ cm^2$

Radius ≈ 3 cm
Height ≈ 7.07 cm

check

r = 2.8

$200 = \pi(2.8)^2 h$

$25.5 = \pi h$

$8.11 = h$

$S = 2\pi(2.8)^2 + 2\pi(2.8)(8.11)$

$= 15.68\pi + 45.42\pi$

$= 61.1\pi$

$= 191.95$

r = 3.2

$200 = \pi(3.2)^2 h$

$19.53 = \pi h$

$6.21 = h$

$S = 2\pi(3.2)^2 + 2\pi(3.2)(6.21)$

$= 20.48\pi + 39.74\pi$

$= 60.22\pi$

$= 189.19$

Funsize Cans

T2

The volume of a cylinder is

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The surface area of a cylinder is

$$S = 2\pi r^2 + 2\pi rh$$

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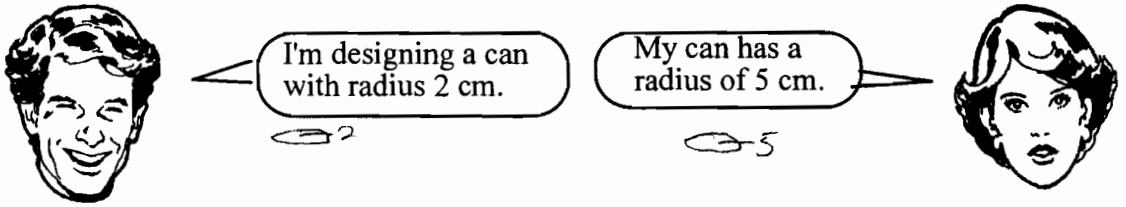
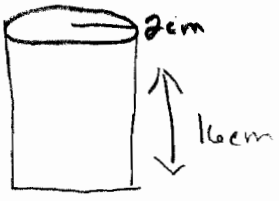
Here are two suggestions for the radius of the cylindrical can.

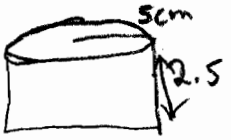


1. Each of these cans holds 200 cm^3. Find the heights of these two cans.

$200 = \pi 2^2 h$
$(200 = 12.5h) \div 12.5$
$16 = h$

$200 = \pi 5^2 h$
$(200 = 78.5h) \div 78.5$
$2.5 = h$





Are the dimensions of the cans suitable? Explain your answer.

no, one will be really tall and skinny and the other will be short and wide

2. Find the surface area of the two cans. Show your work

Male: $S = 2\pi r^2 + 2\pi rh$

$S = 2(\pi)2^2 + 2(\pi)(2)(15.92)$

$S = 25.13 + 200.06$

$SA = 225.19\ cm$

Female: $S = 2\pi r^2 + 2\pi rh$

$S = 2(\pi)5^2 + 2(\pi)(5)(2.55)$

$S = 157.08 + 80.11$

$SA = 237.19\ cm$

3. In order to keep costs low, the Fresha Drink Company wants to sell the drink in cylindrical cans that use the smallest amount of aluminum.

Find the approximate radius and height of a can that holds 200 cm^3 and uses the smallest amount of aluminum. Show clearly how you figured out the size of the can.

Make your dimensions correct to the nearest 0.5 centimeter.
(You may find it helpful to use graph paper.)

Radius = 3.75 cm

Height = 4.53 cm

Volume = approximately $200\ cm^3$ (200.13)

S.A. $\approx$ 195.09 cm

Suggnificantly less SA than 2 previous ideas.

Funsize Cans

T3

The volume of a cylinder is

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The surface area of a cylinder is

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Here are two suggestions for the radius of the cylindrical can.

I'm designing a can with radius 2 cm.

My can has a radius of 5 cm.

1. Each of these cans holds 200 cm^3. Find the heights of these two cans.

$200 = \pi(2)^2 h$

$200 = 4\pi h$

$h = \frac{200}{12.56637061}$

$h \approx 15.92$

$200 = \pi(5)^2 h$

$200 = \pi(25) h$

$h = \frac{200}{78.53981634}$

$h \approx 2.55$

Are the dimensions of the cans suitable? Explain your answer.

The guy's can is too long. 16 cm is too long and skinny

The lady's can is too short. 3cm is too short and fat

2. Find the surface area of the two cans. Show your work

1. $2\pi(2)^2 + 2\pi(2)(15.92) = S$

$2\pi 4 + 4\pi(15.92) = S$

$8\pi + 200.056 = S$

$S = 225.189\ cm^2$

2. $2\pi(5)^2 + 2\pi(5)(2.55) = S$

$50\pi + 25.5\pi = S$

$237.19\ cm^2 = S$

3. In order to keep costs low, the Fresha Drink Company wants to sell the drink in cylindrical cans that use the smallest amount of aluminum.

aprox radius 3cm height 7cm

Find the approximate radius and height of a can that holds 200 cm^3 and uses the smallest amount of aluminum. Show clearly how you figured out the size of the can.

Make your dimensions correct to the nearest 0.5 centimeter.
(You may find it helpful to use graph paper.)

$200 = \pi r^2 h$ ← restriction

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

$S = 2\pi r^2 + 2\pi r h$

$S = 2\pi r^2 + 2\pi r \frac{200}{\pi r^2}$

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

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

function

r	S
1	406.28
2.	225.132
3.	189.882
4.	200.53
3.5	204.293
2.7	193.953

smallest

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

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

Funsize Cans

T4

The volume of a cylinder is

$$V = \pi r^2 h$$

The surface area of a cylinder is

$$S = 2\pi r^2 + 2\pi rh$$

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The drink will be sold in a 'Fun Size' cylindrical can which holds 200 cm^3.

Here are two suggestions for the radius of the cylindrical can.

I'm designing a can with radius 2 cm.

My can has a radius of 5 cm.

1. Each of these cans holds 200 cm^3. Find the heights of these two cans.

$200 = \pi 2^2 h$

$200 = \pi 4h$

$50 = h\pi$

$h = 15.91549431$

$h \cong 16$ cm

$200 = \pi 5^2 h$

$200 = \pi 25h$

$8 = h\pi$

$h = 2.546479089$

$h \cong 2.5$ cm

Are the dimensions of the cans suitable? Explain your answer.

The 5-cm radius can is not reasonable. It is too wide and short. The 2-cm radius can is more reasonable. It has a proper circumference and a proper height.

2. Find the surface area of the two cans. Show your work

$S = 2\pi(2)^2 + 2\pi(2)16$

$S = 8\pi + 64\pi$

$S = 72\pi$

$S = 226.1946711$

$S \cong 226.2\ cm$

$S = 2\pi(5)^2 + 2\pi(5)2.5$

$S = 50\pi + 25\pi$

$S = 75\pi$

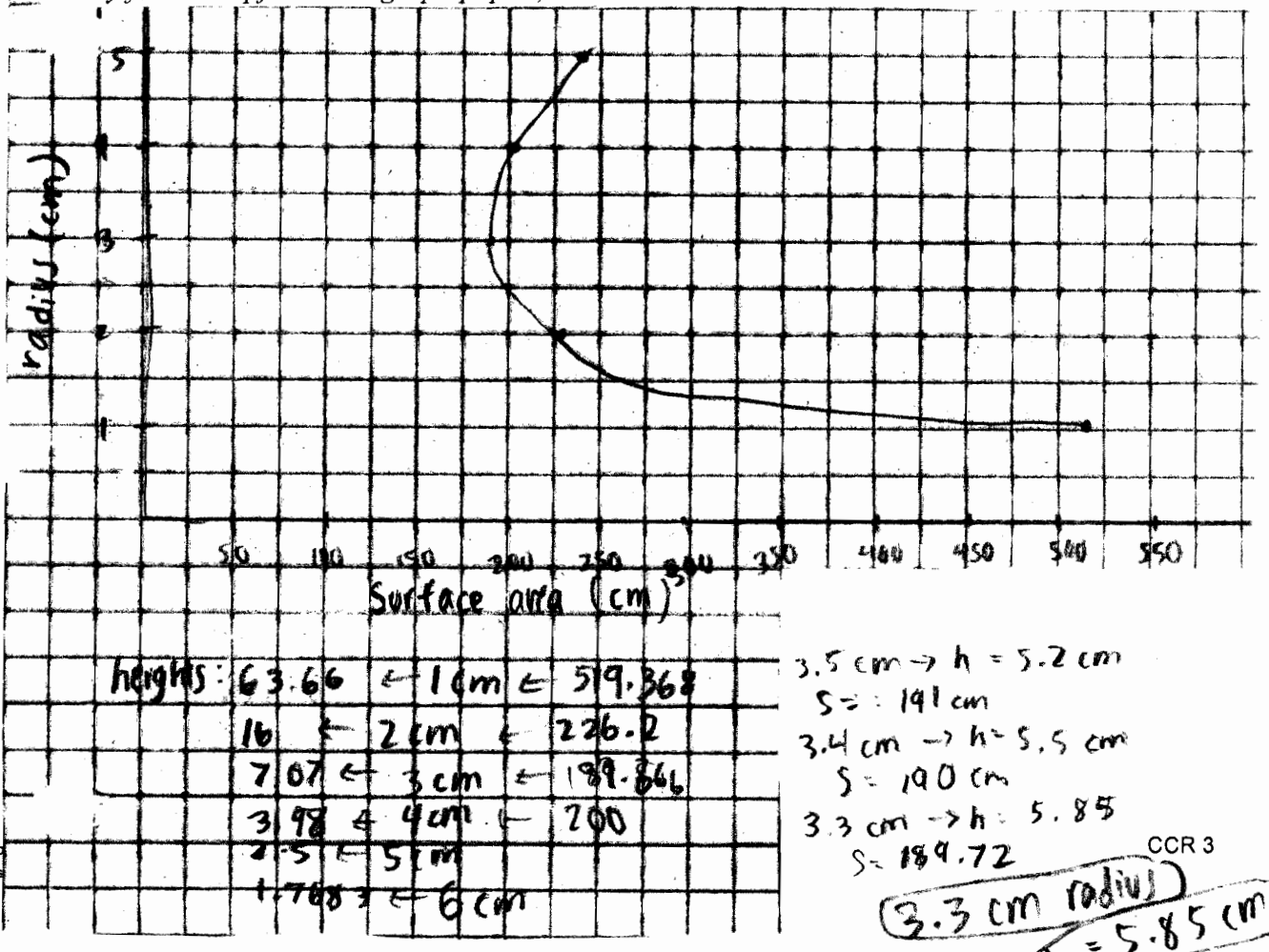
$S = 235.619449$

$S \cong 235.6\ cm$

3. In order to keep costs low, the Fresha Drink Company wants to sell the drink in cylindrical cans that use the smallest amount of aluminum.

Find the approximate radius and height of a can that holds 200 cm^3 and uses the smallest amount of aluminum. Show clearly how you figured out the size of the can.

Make your dimensions correct to the nearest 0.5 centimeter.
(You may find it helpful to use graph paper.)



3.5 cm → h = 5.2 cm
S = 191 cm
3.4 cm → h = 5.5 cm
S = 190 cm
3.3 cm → h = 5.85
S = 189.72

CCR 3

3.3 cm radius
h = 5.85 cm

Funsize Cans

T5

The volume of a cylinder is

$$V = \pi r^2 h$$

The surface area of a cylinder is

$$S = 2\pi r^2 + 2\pi rh$$

$2\pi(r^2 + rh)$

4 4

4 16 24 h 8

201.061

The Fresha Drink Company is marketing a new soft drink.

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Here are two suggestions for the radius of the cylindrical can.

I'm designing a can with radius 2 cm.

My can has a radius of 5 cm.

1. Each of these cans holds 200 cm^3. Find the heights of these two cans.

$r = 2$

$\frac{200}{\pi(2^2)} = \sim 15.91549431$

height ~ 15.92 cm

$r = 5$

$\frac{200}{\pi(5^2)} = \sim 2.546479089$

height ~ 2.55 cm

Are the dimensions of the cans suitable? Explain your answer.

no, who would drink a can that is 15 cm high? or one that has a 10 cm diameter and 2 cm height? The males design is slightly more realistic, but 15 cm is a bit higher than what consumers are used to

2. Find the surface area of the two cans. Show your work

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

$= \sim 25.13274123 + 200$

$= \sim 225.1327412$

$S = \sim 225.13\ cm^2$

$S = 2\pi(5^2) + 2\pi(5)\left(\frac{200}{\pi(5^2)}\right)$

$= \sim 157.0796327 + 80$

$= \sim 237.0796327$

$S = \sim 237.08\ cm^2$

3. In order to keep costs low, the Fresha Drink Company wants to sell the drink in cylindrical cans that use the smallest amount of aluminum.

Find the approximate radius and height of a can that holds 200 cm^3 and uses the smallest amount of aluminum. Show clearly how you figured out the size of the can.

Make your dimensions correct to the nearest 0.5 centimeter.
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smallest 3 #s that multiply to 200
the numbers must be the same to reduce surface area,
but it must also have a volume of 200 cm^3

so r=h (#'s must be same)

$V = \pi r^2 h \rightarrow V = \pi r^2(r) \rightarrow V = \pi r^3 \rightarrow 200 = \pi r^3$

$= \frac{200}{\pi} = r^3$

$\sim 63.66197724 = r^3$

$r = \sim 3.99$

radius: 4 cm, height: 4 cm

Surface area

$\sim 201.06\ cm^2$

if $2r = h$

$V = \pi r^2 h \rightarrow V = \pi(r^2)(2r) \rightarrow V = \pi 2r^3$

$\rightarrow 200 = \pi 2r^3$

$\frac{200}{2\pi} = r^3$

alternative method → $\sim 31.83098862 = r^3$

$r = \sim 3.169202884$

radius: 3 cm, height: 6 cm

$\sim 169.64\ cm^2$

LOWER, so right answer