<u>Cola Can</u>

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Let: r be the radius of the can
h be the height
V be the volume
S be the surface area

The can is a cylinder so $V= \pi r^2 h$

$S=2\pi r^2+ 2\pi rh= 2\pi r(r+h)$

Because $V=330ml= 330cm^3$ so if h or r is given, the other variable is fixed.

① $r_1 = 3cm$

$h_1= V/\pi r_1^2= 330/9\pi=110/3\pi$

$S_1= 6\pi(3+110/3\pi) = 18\pi+220 \approx 276.52\ cm^2$

② $h_2= 10\ cm$

$r_2^2= 33/\pi$

$r_2=\sqrt{(33/\pi)}$

$S_2= 2\pi\cdot\sqrt{(33/\pi)}\ [\sqrt{(33/\pi)}+10]= 66+\sqrt{13200\pi} \approx 269.59\ cm^2$

$S_1 \approx 276.52\ cm^2$
$S_2 \approx 269.59\ cm^2$

$\therefore S_1 > S_2$

③ To find the minimum surface area:

In $S=2\pi r(r+h)$, we can replace r in terms of h

$h= V/\pi r^2=330/\pi r^2$

We therefore get:

$S(r) = 2\pi r(r+330/\pi r^2) = 2\pi r^2+660/r$

We require the surface area to be its minimum value.

Because the function S(r) is not quadratic, we use trial and error to determine r= 3.745 (3 decimal places), h= 7.490 (3 d.p.) and S_{min} = 264.312 (3 d.p.).