**WHISKAS CAT FOOD USES THE IDEAL CAN.**

**(Volume V = πr2h Surface area S = 2πr2 + 2πrh)**

***The problem is, “What are the values of r and h so that the surface area S is as small as possible but the volume is still 708.8 cm3?”***

***r If the radius is r and the height is h***

***h then V = πr2h = 708.8***

***so that h = 708.8***

***πr2***

***The surface area S = 2πr2 + 2πrh***

***= 2πr2 + 2πr×708.8 d***

***πr2***

***= 2πr2 + 2×708.8 r – 1***

***dS = 4πr – 2×708.8 r – 2  = 0 for min S***

***dr***

***4πr – 2×708.8 = 0 h***

***r2***

***4πr = 2×708.8***

***r2***

***r3 = 2×708.8***

***4π***

***So r = 4.83 and h = 708.8 = 9. 7***

***π×3.9932***

***rounding sensibly:***

***r ≈ 4.83 cm and h = 708.8 ≈ 9.7 cm***

***π4.832***

**The ideal can which uses the least amount of metal**

**has the same HEIGHT as its DIAMETER!**

**Note: A lot of money could be saved by manufacturers because they could use less metal to hold the same volume.**

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***EXTENSION 1***

***GENERALLY : If the volume to be used is V then:***

***V = πr2h so h = V***

***πr2***

***The surface area S = 2πr2 + 2πrh***

***= 2πr2 + 2πr×V***

***πr2***

***= 2πr2 + 2V r – 1***

***dS = 4πr – 2Vr – 2  = 0 for min S***

***dr***

***4πr – 2V = 0***

***r2***

***4πr = 2V***

***r2***

***r3 = V***

***2π***

***So r = V ⅓ and diameter = 2r = 2× V ⅓ = = V ⅓ ×2⅔***

***(2π)⅓  (2)⅓ (π)⅓ π⅓***

***and h = V***

***πr2***

***= V × (2π)⅔***

***π V⅔***

***= V ⅓ ×2⅔***

***π⅓***

**The ideal can which uses the least amount of metal**

**has the same HEIGHT as its DIAMETER!**