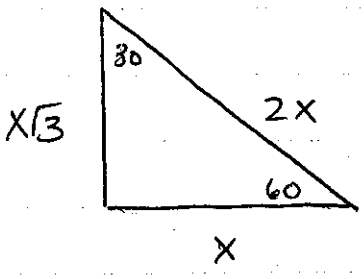
Solutions

1. 

$A = \frac{1}{2} \cdot X \cdot X \cdot \sqrt{3}$

$A = \frac{1}{2} \cdot \frac{h}{2} \cdot \frac{h}{2} \sqrt{3}$

$A = \frac{h^2\sqrt{3}}{8}$

$2X = h$

$\boxed{X = h/2}$

2. $\underset{4\text{ Km/h}}{n} \quad + \quad \underset{36\text{ Km/h}}{2n}$

$D = r \cdot t$

$D/r = t$

$n = 4 \cdot t_1 \qquad 2n = 36 t_2$

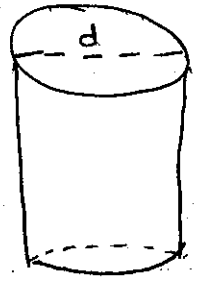
$t_1 = \frac{n}{4} \qquad t_2 = \frac{n}{18}$

$\text{Total Time} = \frac{n}{4} + \frac{n}{18}$

3. $\text{Profit} = \text{Purchase Price} - \text{Cost}$ $\qquad n = \text{one boat}$

$= .75(12n) - 3n$

$= 6n$

4. 

$h = 2d \text{ or } 4r \qquad r = h/4$

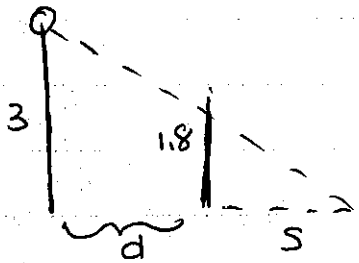
$\text{Surface Area} = \pi d h + 2\pi r^2$

$= \pi \cdot h/2 \cdot h + 2\pi \cdot (h/4)^2$

$= \pi \left(\frac{h^2}{2} + \frac{h^2}{8} \right)$

$= \pi \cdot \frac{5h^2}{8}$

$\text{or } \frac{5\pi h^2}{8}$

5. 

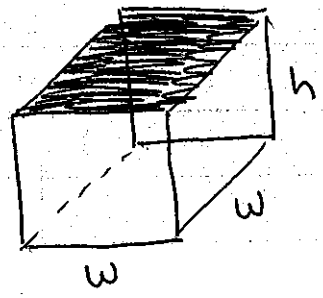
$\frac{s}{1.8} = \frac{d+s}{3}$

$1.8d + 1.8s = 3s$

$1.8d = 1.2s$

$1.5d = s$

Solutions

6. 

Surface Area $= w^2 + w^2 + 4wh$

$3 = 2w^2 + 4wh$

$\frac{3-2w^2}{4w} = h$

Volume $= w \cdot w \cdot h$

$= w^2 \left(\frac{3-2w^2}{4w}\right)$

$= \frac{w(3-2w)}{4}$

7. diameter $= t$

$C = \pi \cdot d$ so $C = \pi \cdot t$

$A = \pi r^2$

$2r = t \quad r = t/2$

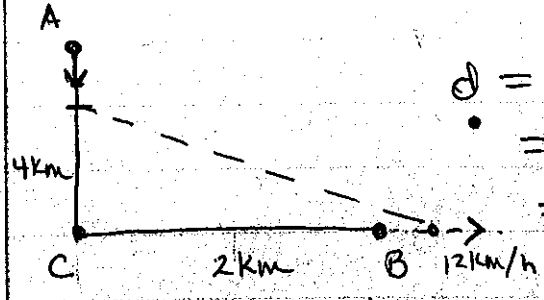
$A = \pi (t/2)^2 \qquad A = \pi/4 t^2$

8. $V = w^2 \cdot h \qquad h = 8/w^2$

$8 = w^2 \cdot h$

a) $C = 8w^2 + 192/w$

b) $126

9. 

(not drawn to scale)

$d = \sqrt{(4-16t)^2 + (2+12t)^2}$

$= -16 - 128t + 256t^2 + 4 + 48t + 144t^2$

$= \sqrt{400t^2 - 80t + 20}$

minimum $(.1, 4)$

time ↑ minimum distance

$.1 \times 60 \text{ min} = 6 \text{ mins}$ 4 Km

Solutions

10. $V = \frac{1}{3}\pi r^2 h$ $\quad h = 4r \quad r = h/4$

$= \frac{1}{3}\pi \cdot (h/4)^2 \cdot h$

$= \frac{\pi}{48} h^3$

b) $5t = \frac{\pi h^3}{48}$

$240t = \pi h^3$

$\sqrt[3]{\frac{240t}{\pi}} = h$

11. $d = \sqrt{(x-0)^2 + (-2x+10)^2}$

$d = \sqrt{4x^2 - 10x + 100 + x^2}$

$d = \sqrt{5x^2 - 40x + 100}$

Domain: $5x^2 - 40x + 100 \geq 0$

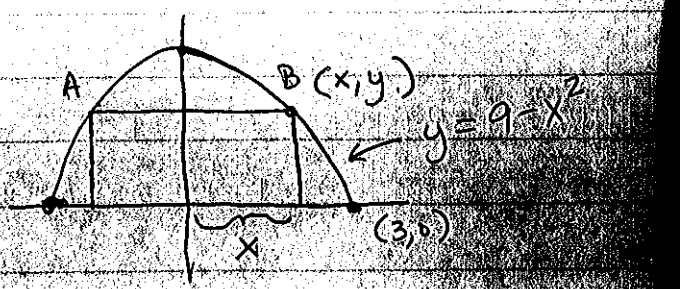
$5(x^2 - 8x + 20) \geq 0$

$(x^2 - 8x + 16) + 20 - 16$ Vertex $(4, -4)$

Domain $(-\infty, \infty)$ Range

12. $P = 4x + 2(9 - x^2)$

$= -2x^2 + 4x + 18$



b) Domain $0 < x < 3$

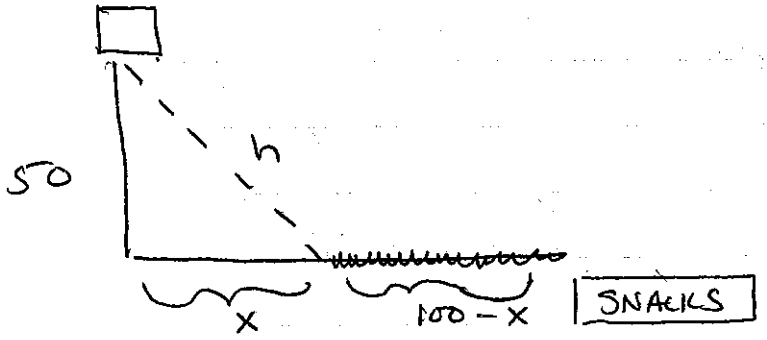
c) $-2(x^2 - 2x \quad) + 18$

$-2(x^2 - 2x + 1) + 18 + 2$

$-2(x-1)^2 + 20$ $\quad \max(1, 20)$

Solutions

13



$D = r \cdot t$

$D/r = t$

$h^2 = x^2 + 50^2$

$h^2 = x^2 + 2500$

$h = \sqrt{x^2+2500}$ ← swimming distance

Total time = swimming time + running time.

a) $t(x) = \dfrac{\sqrt{x^2+2500}}{1\,m/s} + \dfrac{100-x}{3\,m/s}$

b) $\approx 80,5$ secs.