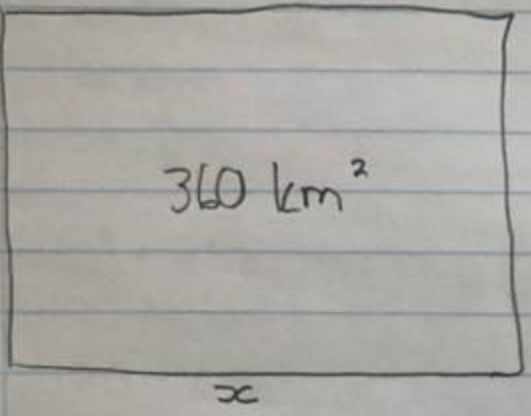
Memo → textbook
ex 3.9 p 131

1a)



$A = l \times b$

$360 = x \times w$

$\therefore$ width $= \frac{360}{x}$ km

b) $P = 2x + 2\left(\frac{360}{x}\right)$

$P = \frac{2x}{1} + \frac{720}{x}$

c) $P = 2x + 720x^{-1}$

$P' = 2 - 720x^{-2}$

$P' = 2 - \frac{720}{x^2}$

$0 = 2 - \frac{720}{x^2}$

$\frac{720}{x^2} = \frac{2}{1}$

$720 = 2x^2$

$360 = x^2$

$\therefore x = 6\sqrt{10}$

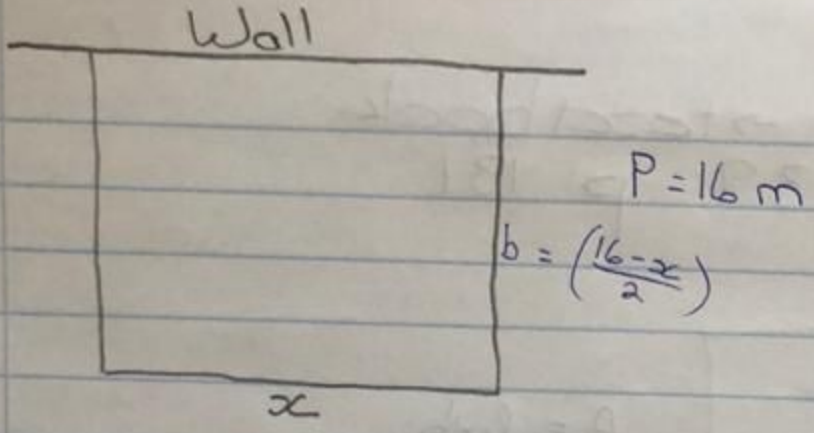
$\therefore$ length $= 6\sqrt{10} = 18,97$ km

width $= \frac{360}{6\sqrt{10}} = 18,97$ km

d) $\therefore$ length $= 18,97 \times 4$

$= 75,88$ km

2)



a) First, $P = x + 2b$

$16 = x + 2b$

$\frac{16 - x}{2} = b$

$\therefore A = x \times \left(\frac{16 - x}{2}\right)$

b) $A = \frac{16x}{2} - \frac{1x^2}{2}$

$A = 8x - \frac{1}{2}x^2$

$\therefore A' = 8 - 1x$

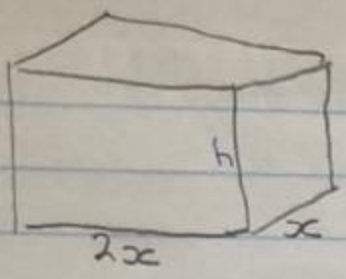
$0 = 8 - 1x$

$x = 8$

$\therefore$ length $= 8$ m

$\therefore$ width/breadth $= \left(\frac{16 - 8}{2}\right) = 4$ m

c) $A = 8 \times 4 = 32\ m^2$

3) 

$SA = 120\ cm^2$

a) width $= x$
length $= 2x$
height $= ?$

$SA = 2(2x \times x) + 2(xh) + 2(2xh)$
$120 = 4x^2 + 2xh + 4xh$
$120 - 4x^2 = 2x(h + 2h)$

$\frac{120 - 4x^2}{2x} = 3h$

$\therefore h = \left[\frac{60}{x} - 2x\right] \div 3$

$h = \left(\frac{20}{x} - \frac{2}{3}x\right)$

b) $U = l \times b \times h$
$U = 2x \times x \times \left(\frac{20}{x} - \frac{2}{3}x\right)$
$U = 2x^2\left(\frac{20}{x} - \frac{2}{3}x\right)$
$U = 40x - \frac{4}{3}x^3$

c) $U' = 40 - 4x^2$
$0 = 40 - 4x^2$
$4x^2 = 40$
$x^2 = 10$
$x = \sqrt{10}$

$\therefore$ width $= \sqrt{10} = 3{,}16$ cm
length $= 2\sqrt{10} = 6{,}32$ cm
height $= \left(\frac{20}{\sqrt{10}} - \frac{2}{3}(\sqrt{10})\right) = 4{,}22$ cm

4)a) $U = \pi r^2 \times h$

$2000 = \pi r^2 \times h$

$\therefore h = \frac{2000}{\pi r^2}$

b) $SA = 2\pi r^2 + 2\pi r \times h$

$SA = 2\pi r^2 + 2\pi r \left(\frac{2000}{\pi r^2}\right)$

$SA = 2\pi r^2 + \frac{4000}{r}$

c) $SA = 2\pi r^2 + 4000 r^{-1}$

$SA' = 4\pi r - 4000 r^{-2}$

$0 = 4\pi r - \frac{4000}{r^2}$

$\frac{4000}{r^2} = \frac{4\pi r}{1}$

$4000 = 4\pi r^3$

$\therefore r = \sqrt[3]{\frac{4000}{4\pi}}$

$r = 6,8 \text{ cm}$

Memo → (textbook)
ex 3.10 , p 135

1)a) $s = 200(2) - 5(2)^2$
∴ height = 380 m after 2 sec

b) $s = 200t - 5t^2$
$s' = 200 - 10t$.

i) $s' = 200 - 10(2) = 180$ m/s
ii) $s' = 200 - 10(5) = 150$ m/s
iii) $s' = 200 - 10(10) = 100$ m/s

c) As time continues the velocity decreases, so it moves slower

d) $s' = 200 - 10t$
$0 = 200 - 10t$
$10t = 200$
$t = 20$ sec.

e) $s = 200(20) - 5(20)^2$
∴ max height = 2 000 m / 2 km

f) $0 = 200t - 5t^2$
$0 = 5t(40 - t)$
∴ $t = 0$ or $t = 40$ ∴ After 40 sec.

2a) $s = 3t + 5$

i) $s = 3(1) + 5 = 8$ m

ii) $s = 3(4) + 5 = 17$ m

b) $s' = 3$ m/s

c) There is constant/continuous velocity of 3 m/s

d) $s'' = 0$ m/s

e) constant/continuous acceleration of 0 m/s

[Since the velocity is constant, thus not changing, no acceleration takes place]

3a) $s = t^2 - 6t + 9$

i) $s = (0)^2 - 6(0) + 9 = 9$ m
ii) $s = (3)^2 - 6(3) + 9 = 0$ m
iii) $s = (6)^2 - 6(6) + 9 = 9$ m

b) Between 0 and 3 it motions downwards, since distance moves from 9 - 0 metres.
Between 3 and 6 it motions upwards, since distance increases from 0 to 9 metres.

c) $s' = 2t - 6$

d) i) $v = 2(1) - 6 = -4$ m/s
ii) $v = 2(3) - 6 = 0$ m/s
iii) $v = 2(5) - 6 = 4$ m/s

e) $s'' = 2$ m/s

f) acceleration is at constant of 2 m/s in negative direction between 0-3 sec. at 3 sec it changes directions and moves to positive direction at 2m/s.

4a) $V(t) = 1600 - 80t + t^2$

$V(0) = 1600$ ℓ
$V(11) = 841$ ℓ

$$\therefore \text{avg rate} = \frac{841 - 1600}{11 - 0}$$

$$= -69 \text{ ℓ/min.}$$

b) $V'(t) = -80 + 2t$

i) $V'(1) = -78$ ℓ/min
ii) $V'(5) = -70$ ℓ/min
iii) $V'(15) = -50$ ℓ/min

c) $0 = t^2 - 80t + 1600$

$$t = \frac{-(-80) \pm \sqrt{(-80)^2 - 4(1)(1600)}}{2(1)}$$

$t = 40$ or $t = 40$

∴ it will take 40 min.

5) $T(t) = 40 + 3t - 0.5t^2$

a) i) $T(1) = 42.5\,^\circ C$
ii) $T(2) = 44\,^\circ C$
iii) $T(10) = 20\,^\circ C$

b) $T'(t) = 3 - t$

c) max temp:
$0 = 3 - t$
$t = 3$
$\therefore$ from after $t = 3$ till $t = 10$
$\{\ 3 < t \leq 10\ \}$