x0	female (x1)	read (x2)	write (x3)	hon (y)
1	0	57	52	0
1	1	68	59	0
1	0	44	33	0
1	1	60	62	1

Initialize $\theta 0$: = 0, $\theta 1$: = 0, $\theta 2$: = 0, $\theta 3$: = 0; and set $\propto$= 0.5

$\boldsymbol{\theta}.\boldsymbol{x} = \theta 0 + \theta 1 \bullet x1 + \theta 2 \bullet x2 + \theta 3 \bullet x3$

$\hat{y} = logistic\ (\boldsymbol{\theta}.\boldsymbol{x}) = \frac{1}{1+e^{-\boldsymbol{\theta}.\boldsymbol{x}}}$

Iteration 1:

$\boldsymbol{\theta}.\boldsymbol{x}(1) = 0 + 0 \bullet 0 + 0 \bullet 57 + 0 \bullet 52 = 0$; $\boldsymbol{\theta}.\boldsymbol{x}(2) = 0$; $\boldsymbol{\theta}.\boldsymbol{x}(3) = 0$; $\boldsymbol{\theta}.\boldsymbol{x}(4) = 0$;

$logistic\ (\mathbf{0}) = \frac{1}{1+e^{-\mathbf{0}}} = 0.5$

$\hat{y}(1) = 0.5$; $\hat{y}(2) = 0.5$; $\hat{y}(3) = 0.5$; $\hat{y}(4) = 0.5$

s0 = (0.5 - 0) + (0.5 - 0) + (0.5 - 0) + (0.5 - 1) = 1

s1 = 0(0.5 - 0) + 1(0.5 - 0) + 0(0.5 - 0) + 1(0.5 - 1) = 0

s2 = 57(0.5 - 0) + 68(0.5 - 0) + 44(0.5 - 0) + 60(0.5 - 1) = 54.5

s3 = 52(0.5 - 0) + 59(0.5 - 0) + 33(0.5 - 0) + 62(0.5 - 1) = 41

$\boldsymbol{\theta}0$ = 0 – 0.5 (1/4) (1) = -0.125

$\boldsymbol{\theta}1$ = 0 – 0.5 (1/4) (0) = 0

$\boldsymbol{\theta}2$ = 0 – 0.5 (1/4) (54.5) = -6.8125

$\boldsymbol{\theta}3$ = 0 – 0.5 (1/4) (41) = -5.125

Iteration 2:

$\boldsymbol{\theta}.\boldsymbol{x}(1)$ = -0.125 + 0(0) + -6.8125(57) + -5.125(52) = -654.9375

$\boldsymbol{\theta}.\boldsymbol{x}(2)$ = -0.125 + 0(1) + -6.8125(68) + -5.125(59) = -765.75

$\boldsymbol{\theta}.\boldsymbol{x}(3)$ = -0.125 + 0(0) + -6.8125(44) + -5.125(33) = -469

$\boldsymbol{\theta}.\boldsymbol{x}(4)$ = -0.125 + 0(1) + -6.8125(60) + -5.125(62) = -726.625

$\hat{y}(1) = 3.6665512388\times10^{-285}$ ∴ round to 0 because less than 0.5

$\hat{y}(2) = 0$

$\hat{y}(3) = 2.0696074897\times10^{-204}$ ∴ round to 0 because less than 0.5

$\hat{y}(4) = 0$

$s0 = (3.6665512388\times10^{-285} - 0) + (0 - 0) + (2.0696074897\times10^{-204} - 0) + (0 - 1) = -1$

$s1 = 0(3.6665512388\times10^{-285} - 0) + 1(0 - 0) + 0(2.0696074897\times10^{-204} - 0) + 1(0 - 1) = -1$

$s2 = 57(3.6665512388\times10^{-285} - 0) + 68(0 - 0) + 44(2.0696074897\times10^{-204} - 0) + 60(0 - 1) = -60$

$s3 = 52(3.6665512388\times10^{-285} - 0) + 59(0 - 0) + 33(2.0696074897\times10^{-204} - 0) + 62(0 - 1) = -62$

$\boldsymbol{\theta}0$ = -0.125 – 0.5 (1/4) (-1) = 0

$\boldsymbol{\theta}1$ = 0 – 0.5 (1/4) (-1) = 0.125

$\boldsymbol{\theta}2$ = -6.8125 – 0.5 (1/4) (-60) = 0.6875

$\boldsymbol{\theta}3$ = -5.125 – 0.5 (1/4) (-62) = 2.625

Iteration 3:

$\boldsymbol{\theta}.\boldsymbol{x}(1) = 0 + 0.125(0) + 0.6875(57) + 2.625(52) = 175.6875$

$\boldsymbol{\theta}.\boldsymbol{x}(2) = 0 + 0.125(1) + 0.6875(68) + -2.625(59) = -108$

$\boldsymbol{\theta}.\boldsymbol{x}(3) = 0 + 0.125(0) + 0.6875(44) + 2.625(33) = 116.875$

$\boldsymbol{\theta}.\boldsymbol{x}(4) = 0 + 0.125(1) + 0.6875\ (60) + 2.625(62) = 204.125$

$\hat{y}(1) = 1$

$\hat{y}(2) = 1.2479464629\times10^{-47}$ ∴ round to 0 because less than 0.5

$\hat{y}(3) = 1$

$\hat{y}(4) = 1$

$s0 = (1 - 0) + (1.2479464629\times10^{-47} - 0) + (1 - 0) + (1 - 1) = 2$

$s1 = 0(1 - 0) + 1(1.2479464629\times10^{-47} - 0) + 0(1 - 0) + 1(1 - 1) = 1.2479464629\times10^{-47}$

$s2 = 57(1 - 0) + 68(1.2479464629\times10^{-47} - 0) + 44(1 - 0) + 60(1 - 1) = 101$

$s3 = 52(1 - 0) + 59(1.2479464629\times10^{-47} - 0) + 33(1 - 0) + 62(1 - 1) = 85$

$\boldsymbol{\theta}0 = 0 – 0.5\ (1/4)\ (2) = -0.25$

$\boldsymbol{\theta}1 = 0.125 – 0.5\ (1/4)\ (1.2479464629\times10^{-47}) = 0.125$

$\boldsymbol{\theta}2 = 0.6875 – 0.5\ (1/4)\ (101) = -11.9375$

$\boldsymbol{\theta}3 = 2.625 – 0.5\ (1/4)\ (85) = -8$