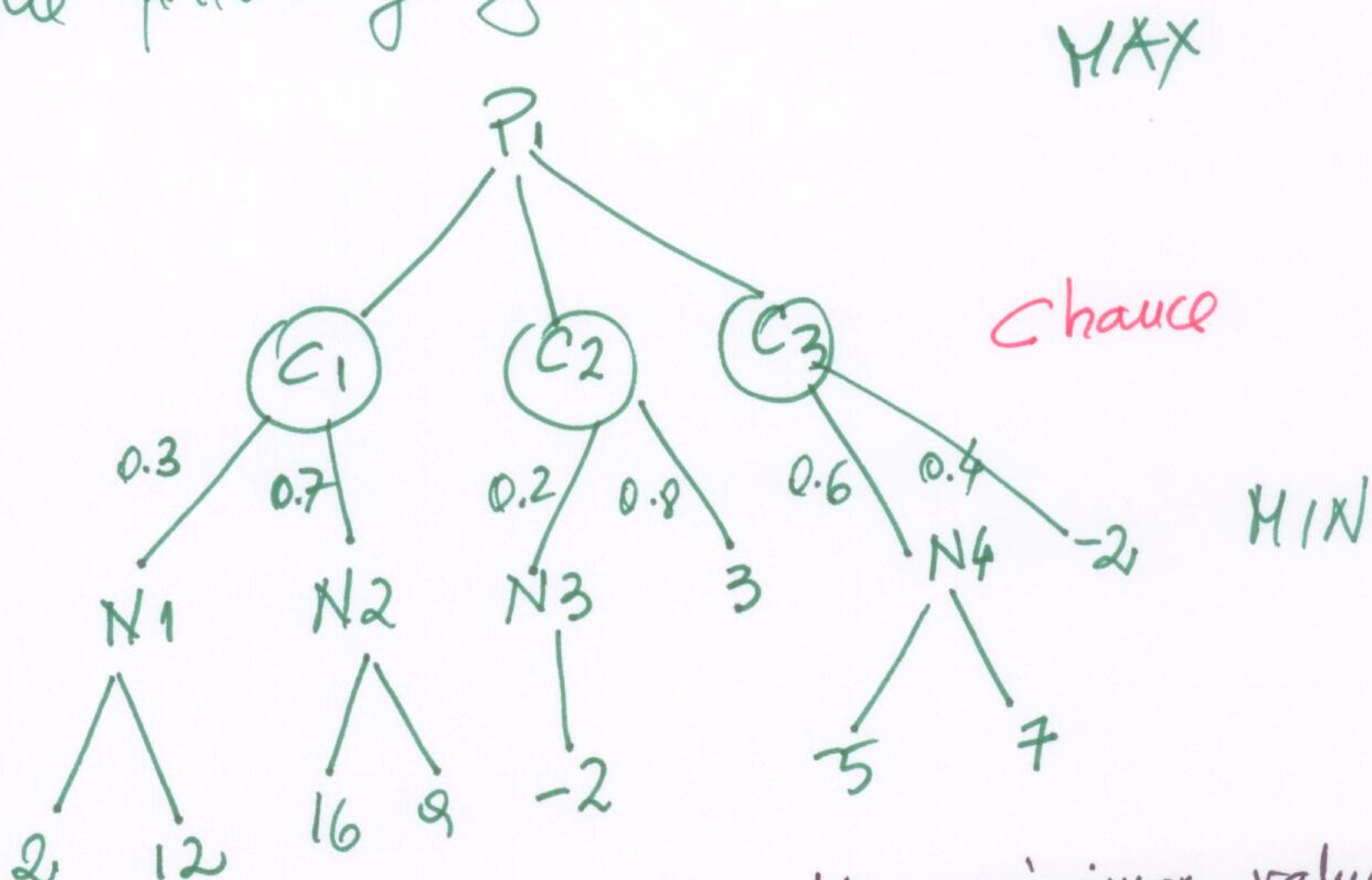
Chance Games

Example #1

What chance of winning does MAX have in the following game?



Answer: let us compute the minimax values in

~~EXPECTI~~ EMINIMAX(N2) = 9

~~EXPECTI~~MINIMAX(N1) = 2

EX-MINIMAX(N4) = -5

~~EXPECTI~~MINIMAX(N3) = -2

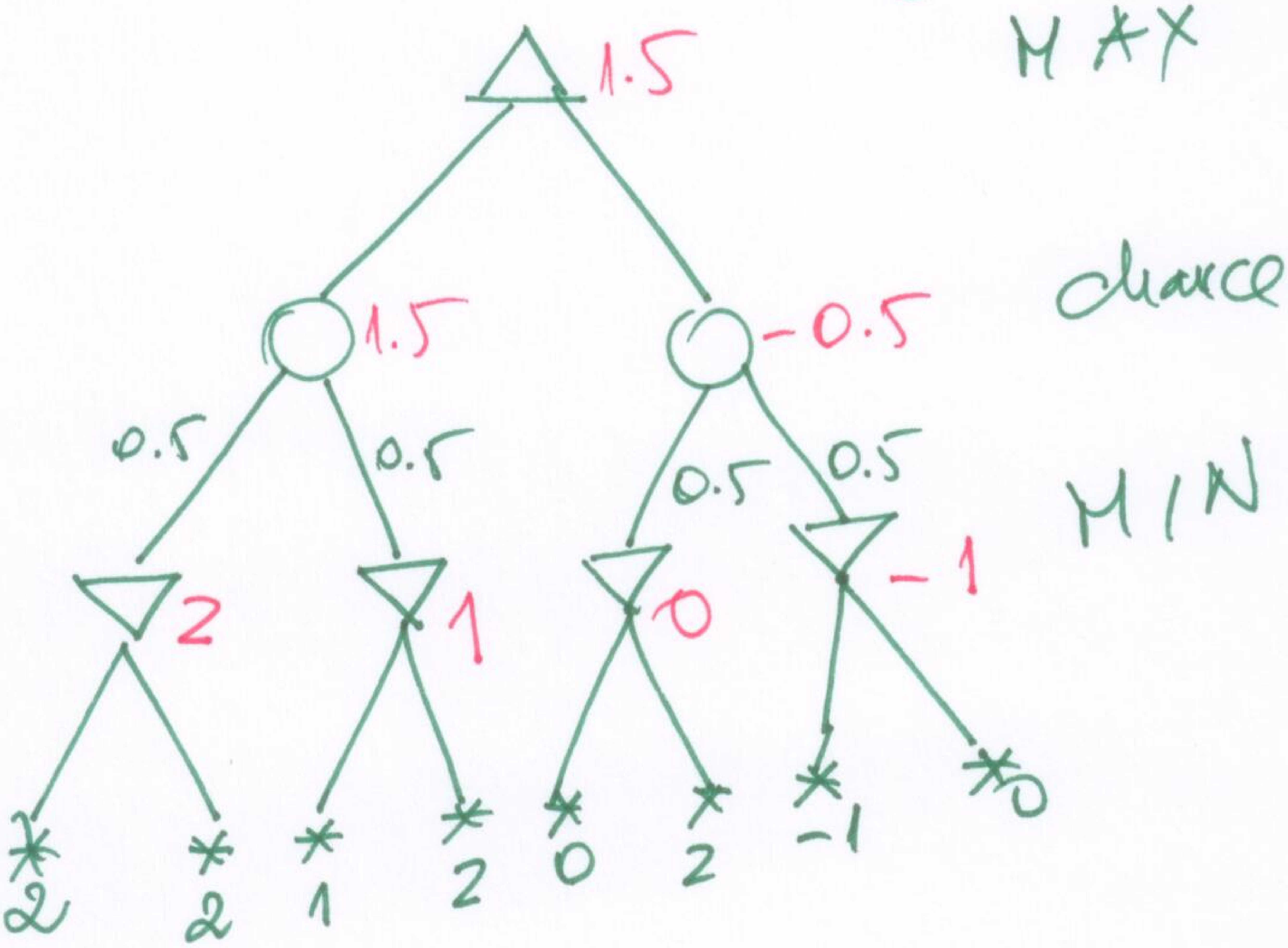
EX-MINIMAX(C1) = 0.3×2 + 0.7×9 = 0.6 + 6.3 = 6.9

EX-MINIMAX(C2) = 0.2×(−2) + 0.8×3 = −0.4 + 0.24 = −0.16

EX-MINIMAX(C3) = 0.6×(−5) + 0.4(−2) = −0.3 − 0.8 = −1.1

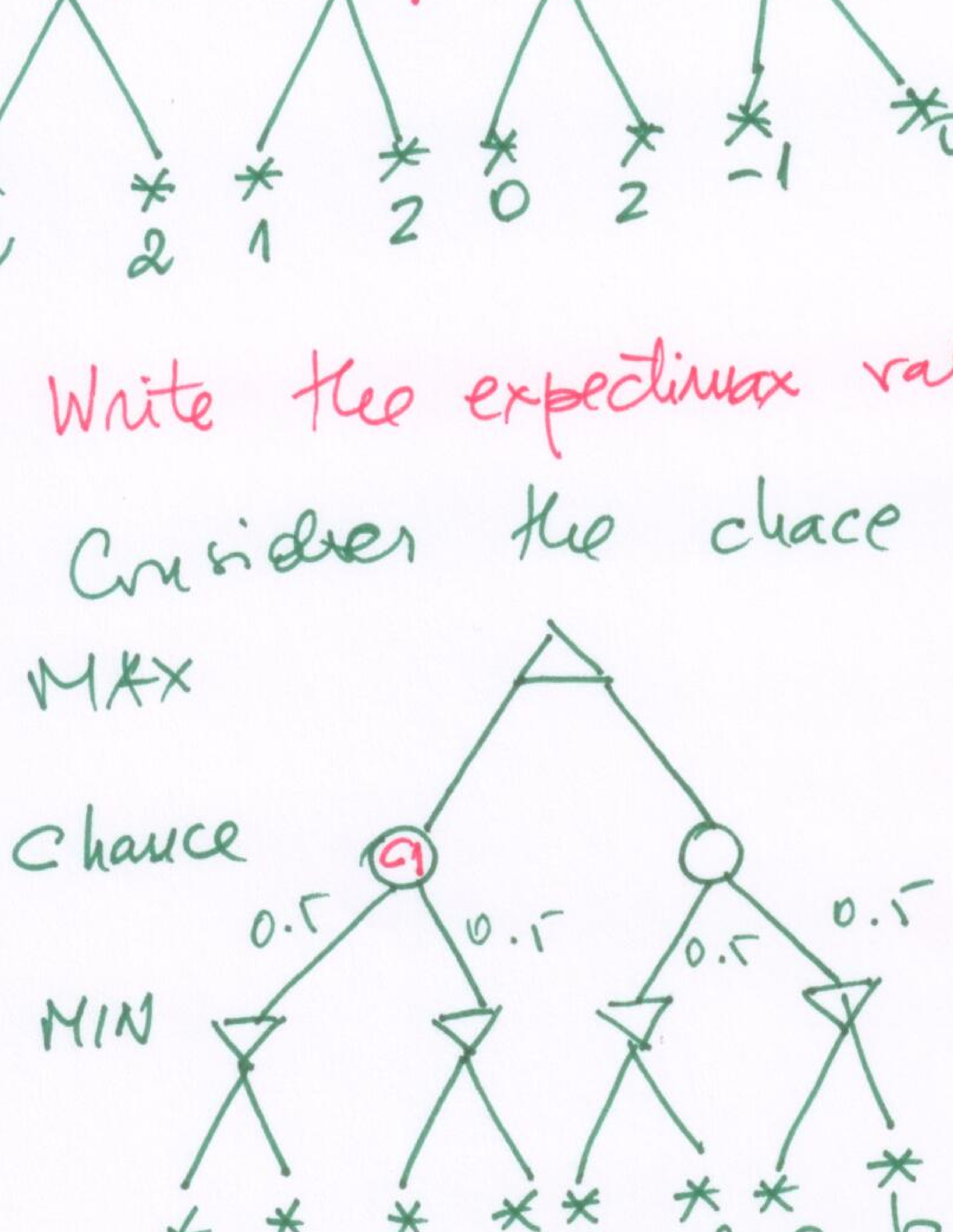
EX-MINIMAX(P1) = max(EXMINIMAX(C1), EXMINIMAX(C2), EXMINIMAX(C3)) = 6.9

Given the chance game:



a) Write the expectimax values in the nodes.

b) Consider the chace game again



Suppose that $a, b, c, d, e, f, g, h \in [-2, 2]$

After evaluating a and b, what is the value of c1?

Answer

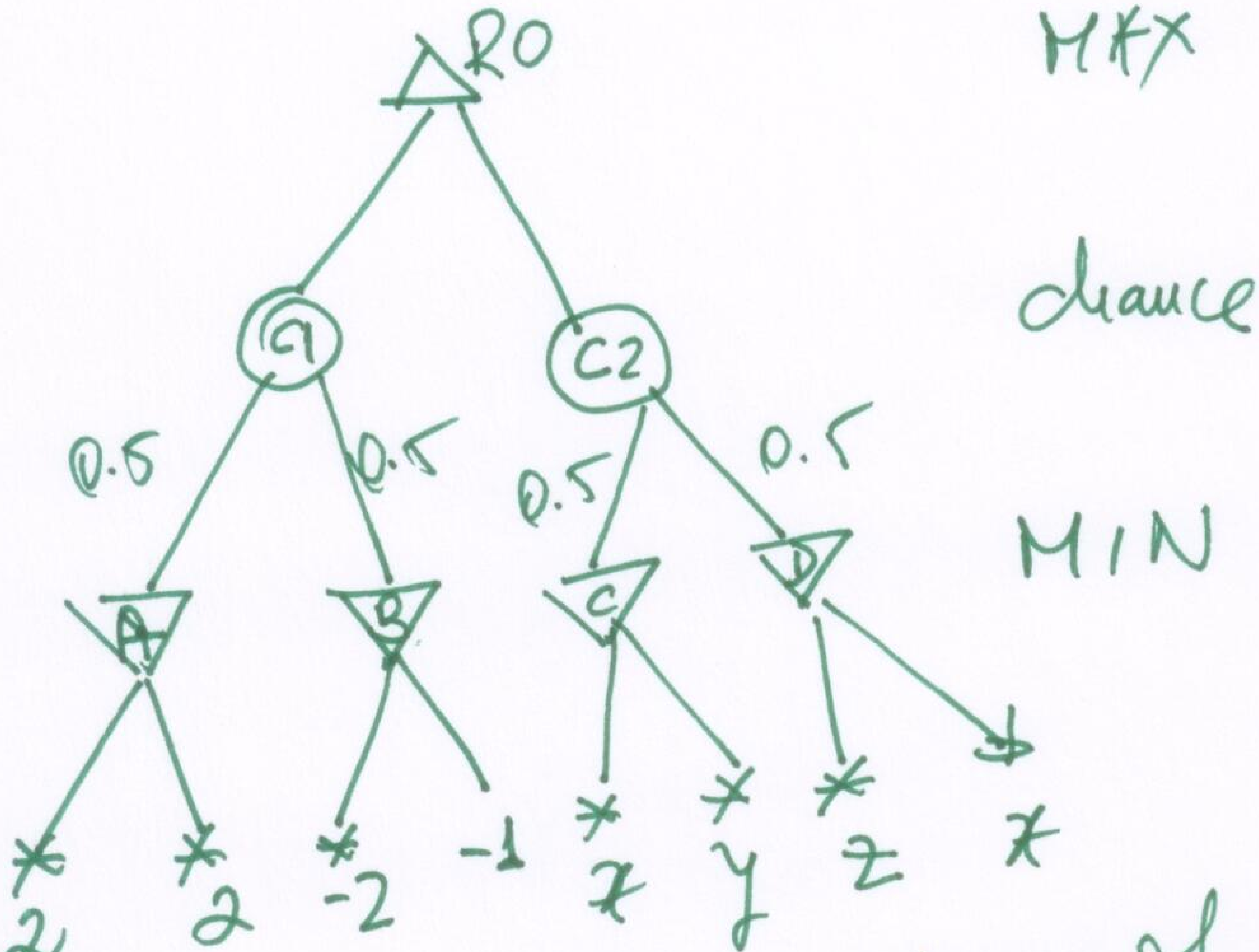
$2 \geq x_1 = \min(a,b) \geq -2$

$2 \geq y_1 = \min(c,d) \geq -2$

$c_1 = x_1 \cdot 0.5 + y_1 \cdot 0.5 = 0.5(x_1 + y_1) \geq 0.5[(-2)+(-2)] = -2$

Also $c_1 \leq 0.5(2+2) = 2$ $\quad c_1 \in [-2, 2]$

In the following chance game tree:



what are the values of x, y and z such that the $\text{EXPECTIMINMAX}(R0) = 1.5$? if $x, y, z \in [-2, 2]$

Solution

$\text{Expectiminmax}(A) = 2$

$\text{Expectiminmax}(B) = -2$

$\text{Expectiminmax}(C) = \min(x, y) = a$

$\text{Expectiminmax}(D) = \min(x, z) = b$

$\text{Expectiminmax}(C_1) = 0.5(2 - 2) = 0$

$\Rightarrow \text{Expectiminmax}(C_2) = 1.5 = 0.5(a + b)$

$\Rightarrow a + b = 3$

Because $\min(x,y)=a$ we can infer that either $\boxed{a=x}$ or $\boxed{a=y}$

Because $\min(x,z)=b$ we can infer that either $\boxed{b=x}$ or $\boxed{b=z}$

We have therefore 4 possible cases:

Case 1	Case 2	Case 3	Case 4
$a=x$	$a=x$	$a=y$	$a=y$
$b=x$	$b=z$	$b=x$	$b=z$

let us first consider: but $a+b=3$

Case 1 $\quad$ $x=a$, $x=b$ $\Rightarrow a=b$ $\quad 2a=3 \Rightarrow a=b=1.5$

$x=1.5$ $\quad$ y, z can take any value.

Case 2 $\quad$ $x=a$, $z=b$ $\quad a+b=3$

$$\frac{\begin{array}{c} x=a \\ z=b \end{array}}{x+z=3} \Rightarrow z=3-x$$

x, y can take any value!

Case 3

$$\frac{\begin{array}{c} x=b \\ y=a \end{array}}{x+y=3} \Rightarrow y=3-x$$

x and z can take any value

Case 4

$$\frac{\begin{array}{c} y=a \\ z=b \end{array}}{x+z=3} \Rightarrow z=3-x$$

x and y can take any value.