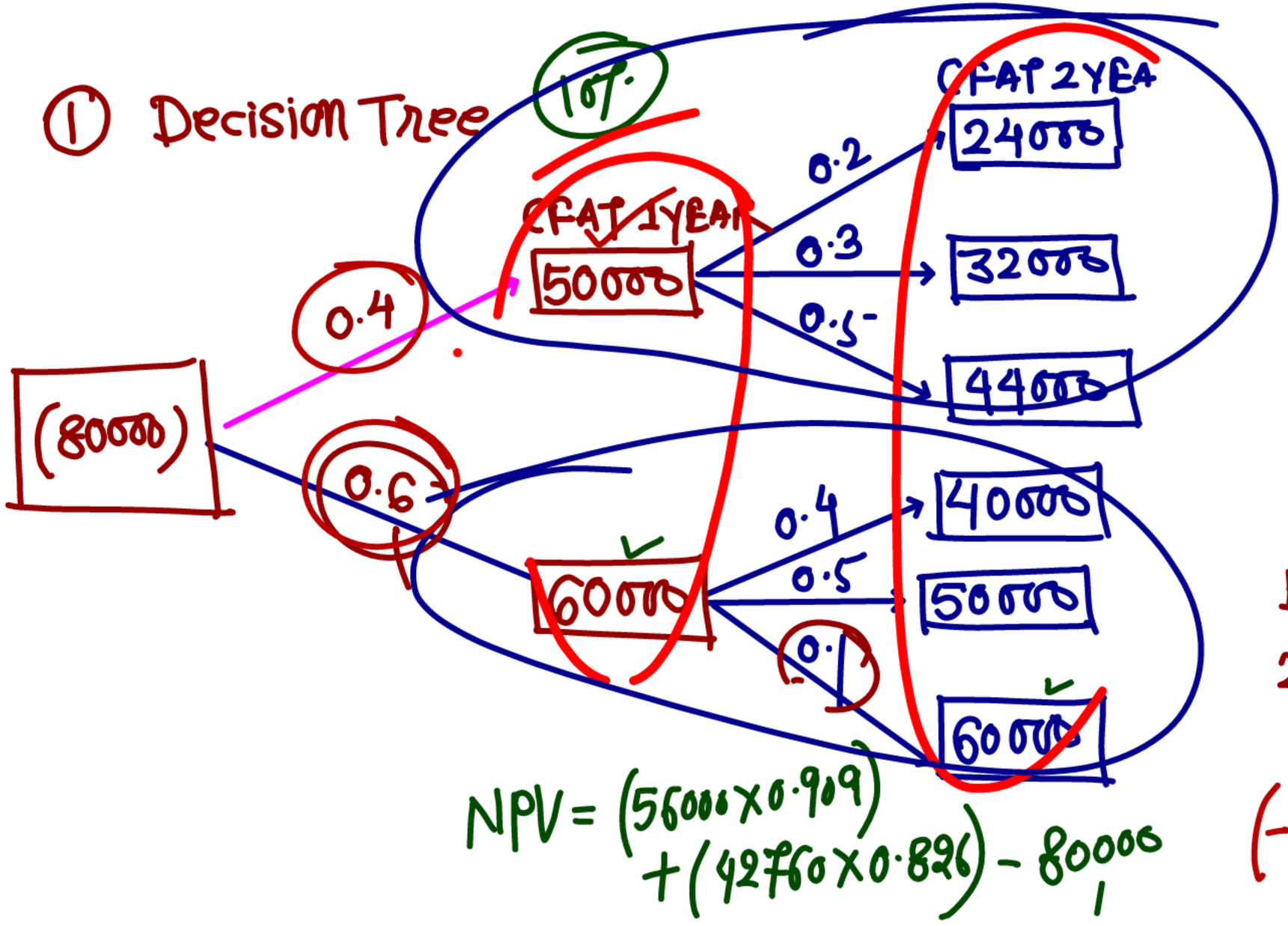
① Decision Tree



NPV = (56000 × 0.909) + (42760 × 0.826) − 80000

PATH 1

1 50,000 × 0.909

2 36400 × 0.826

− 80000 = (4484)

PATH 2

1 60000 × 0.909

2 47000 × 0.826

− 80000 = 13362

(−4484 × 0.4) + (13362 × 0.6)

Calculation of Expected NPV

Scenario	NPV = PVCI - PVCO	NPV	Joint prob.	NPV x J.P.
1	(50000 x 0.909) + (24000 x 0.826) - 80000 =	(14726)	0.08	(1178)
2	(50000 x 0.909) + (32000 x 0.826) - 80000 =	(8118)	0.12	(974)
3	(50000 x 6.909) + (44000 x 0.826) - 80000 =	1794	0.20	359
4	(60000 x 0.909) + (40000 x 0.826) - 80000 =	7580	0.24	1819
5	(60000 x 0.909) + (50000 x 0.826) - 80000 =	15840	0.30	4752
6	(60000 x 0.909) + (60000 x 0.826) - 80000 =	24100	0.06	1446
				0.20
		Expected NPV =		6224

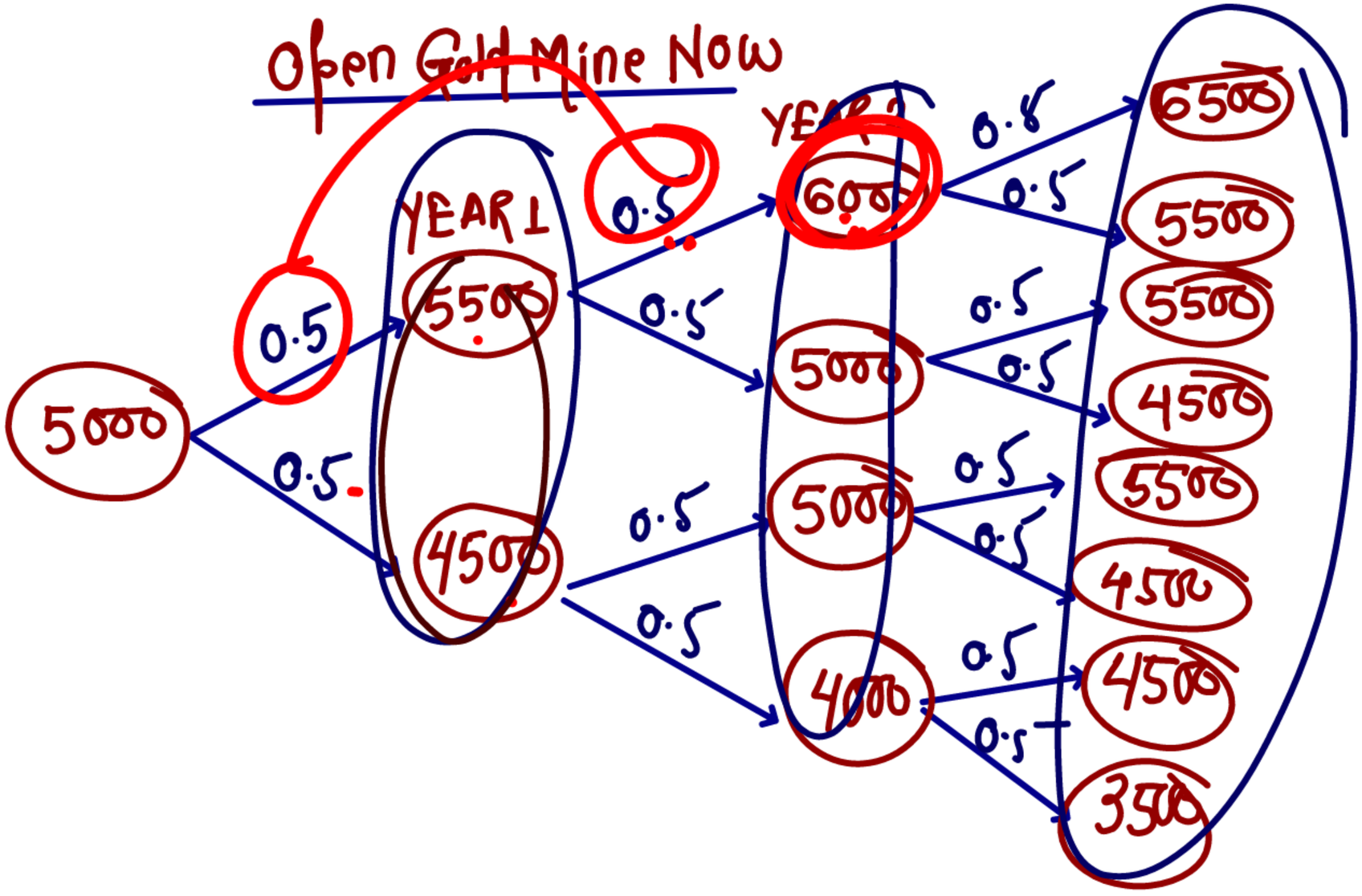
Question – 27

You own an unused Gold mine that will cost ₹10,00,000 to reopen. If you open the mine, you expect to be able to extract 1,000 ounces of Gold a year for each of three years. After that the deposit will be exhausted. The Gold price is currently ₹5,000 an ounce, and each year the price is equally likely to rise or fall by ₹500 from its level at the start of year. The extraction cost is ₹4,600 an ounce and the discount rate is 10 per cent.

Required:

(a) Should you open the mine now or delay one year in the hope of a rise in the Gold price?

(b) What difference would it make to your decision if you could costlessly (but irreversibly)shut down the mine at any stage? Show the value of abandonment option.


Open Gold Mine Now
5000
0.5
0.5
YEAR 1
5500
4500
0.5
0.5
0.5
0.5
6000
5000
5000
4000
0.5
0.5
0.5
0.5
0.5
0.5
6500
5500
5500
4500
5500
4500
4500
3500

Expected price of Gold

YEAR 1 = $(5500 + 4500) \times 0.5$ = ₹ 5000

YEAR 2 = $(6000 + 5000 + 5000 + 4000) \times (0.5)^2$ = ₹ 5000

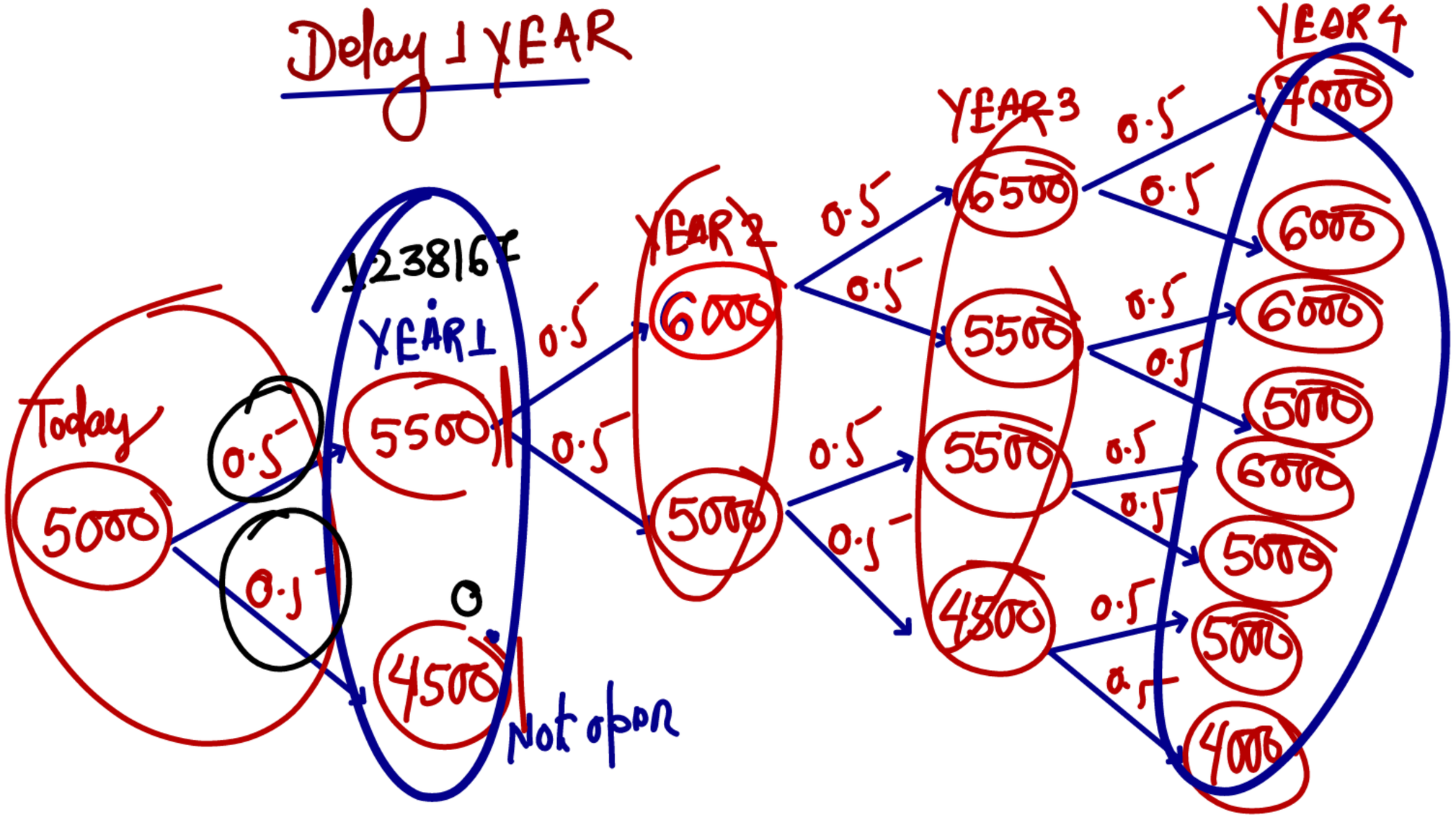
YEAR 3 = $\times (0.5)^3$ = ₹ 5000

Calculation of NPV

Gold price	₹ 5000
(-) Extration cost	₹ 4600
Cash Inflow	₹ 400 per ounce
(x) Quantity	1000 / 400000

$$NPV = \frac{400000}{(1.10)^1} + \frac{400000}{(1.10)^2} + \frac{400000}{(1.10)^3} - 1000000$$

$$= (5260)$$


Delay 1 YEAR
Today
5000
0.5
0.5
YEAR1
5500
4500
Not open
123816F
0.5
0.5
YEAR2
6000
5000
0.5
0.5
0.5
0.5
YEAR3
6500
5500
5500
4500
0.5
0.5
0.5
0.5
0.5
0.5
YEAR4
7000
6000
6000
5000
6000
5000
5000
4000