

Knapsack Problem using Branch & Bound Algorithm.

Formula: $z = \sum_{i=1}^n c_i x_i$ subject to $\sum_{i=1}^n w_i x_i \leq W$

$$U_b = v + (w - w) (v_{i+1}) / (w_{i+1})$$

Node 3: $v = 0, w = 0, i = 1$

$$U_b = 0 + (10) (6) \\ = 60$$

Node 5:

$$v = 40 \quad w = 4 \quad i = 2$$

$$U_b = 40 + (6) (v_3) / (w_3)$$

$$= 40 + 6(5)$$

$$= 40 + 30 = 70$$

Node 6: $v = 65 \quad w = 9 \quad i = 3$

$$65 + (10 - 9) (v_4) / (w_4)$$

$$65 + (1) (4)$$

$$= 69$$

Node 7

$$v = 40 \quad w = 4 \quad i = 3$$

$$40 + (10 - 4) (v_4) / (w_4)$$

$$40 + (6) (4)$$

$$40 + 24 = 64$$

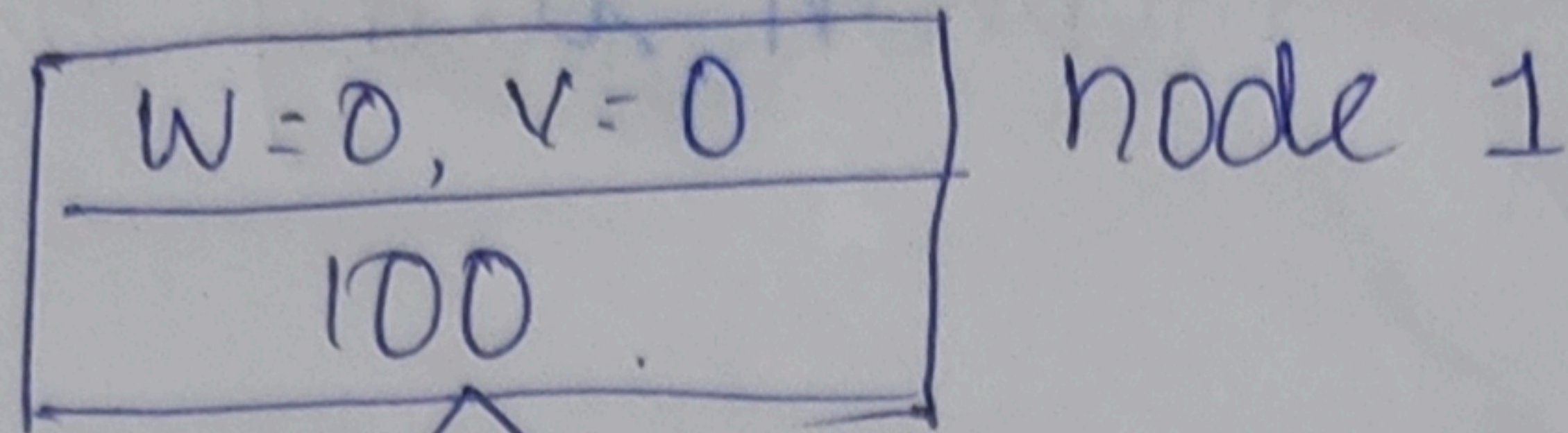
Node 9

$$w = 9 \quad v = 65 \quad i = 4$$

$$65 + (1) (0)$$

$$= 65$$

State space tree

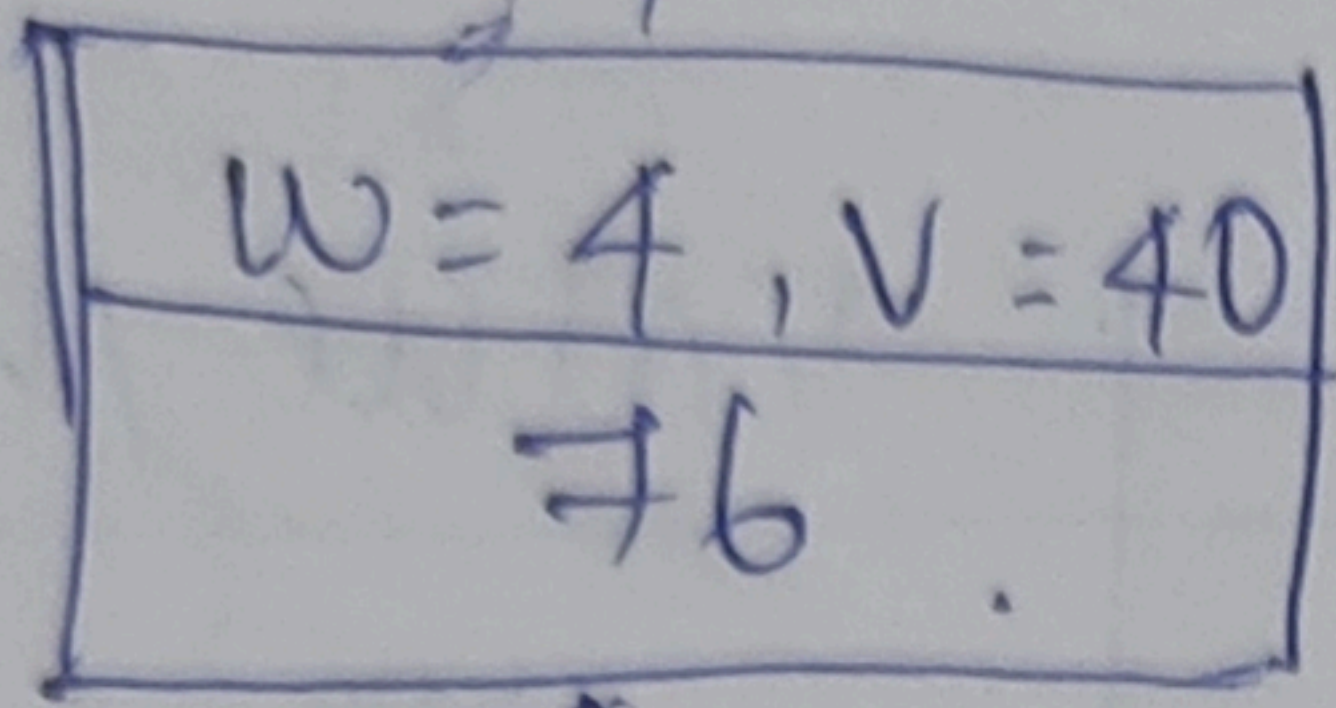


Row (0)
 $i=0$

with
①

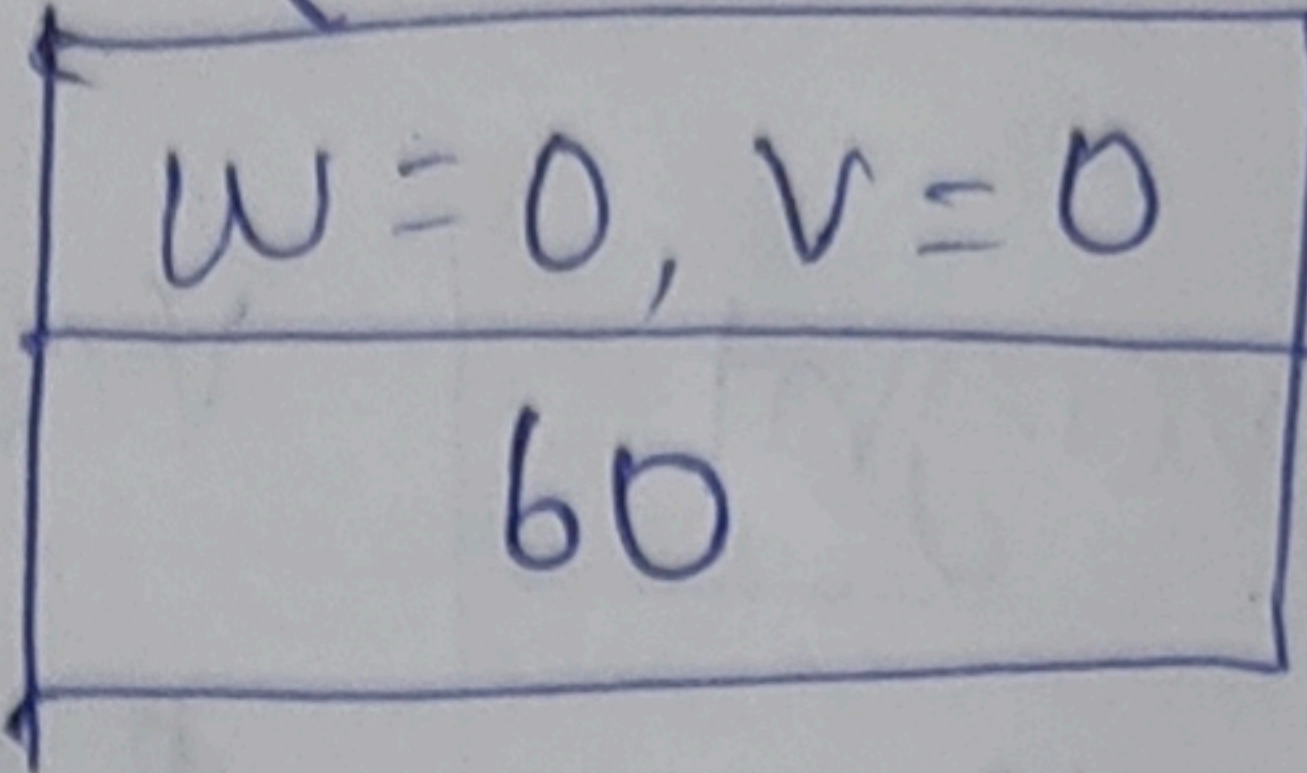
without ①

node 2



Row (1)
 $i=1$

node 3

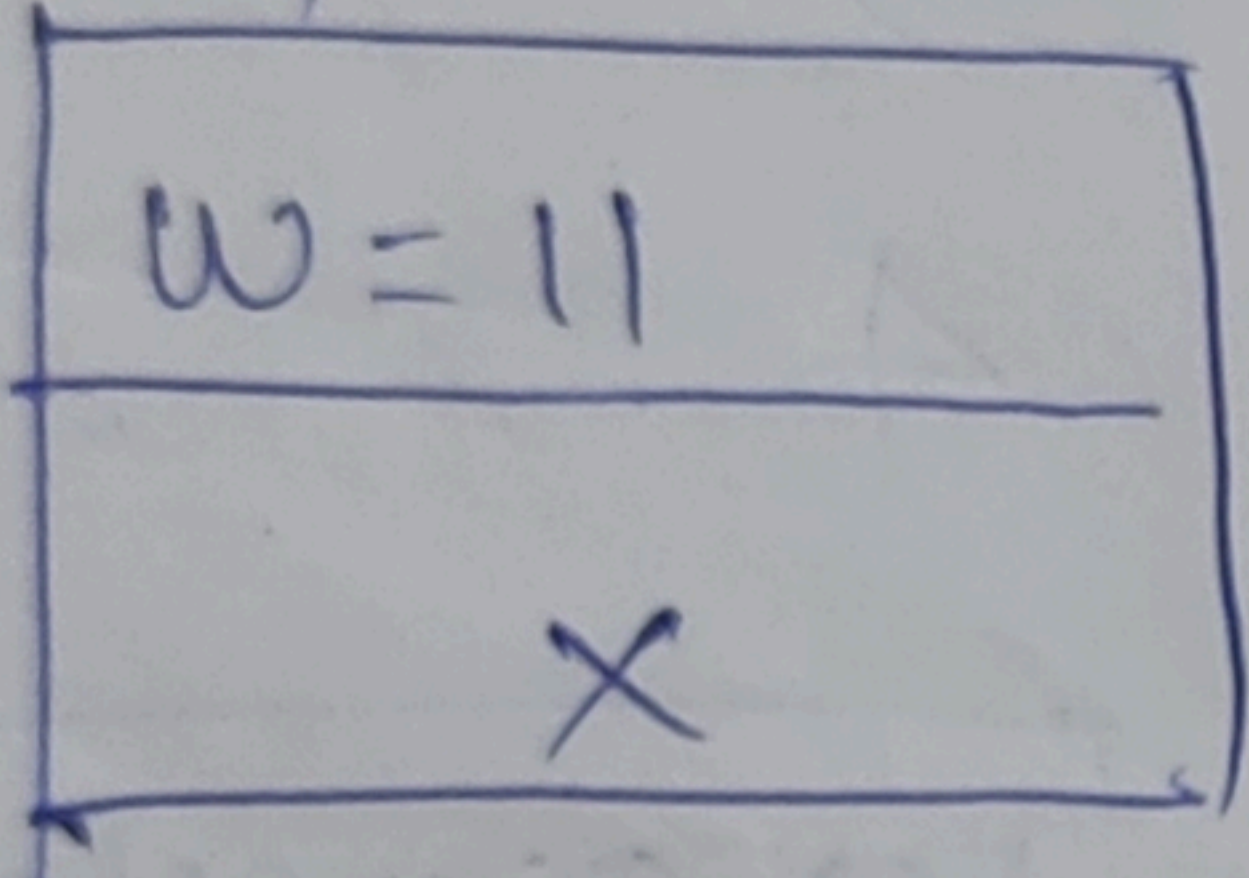


with
②

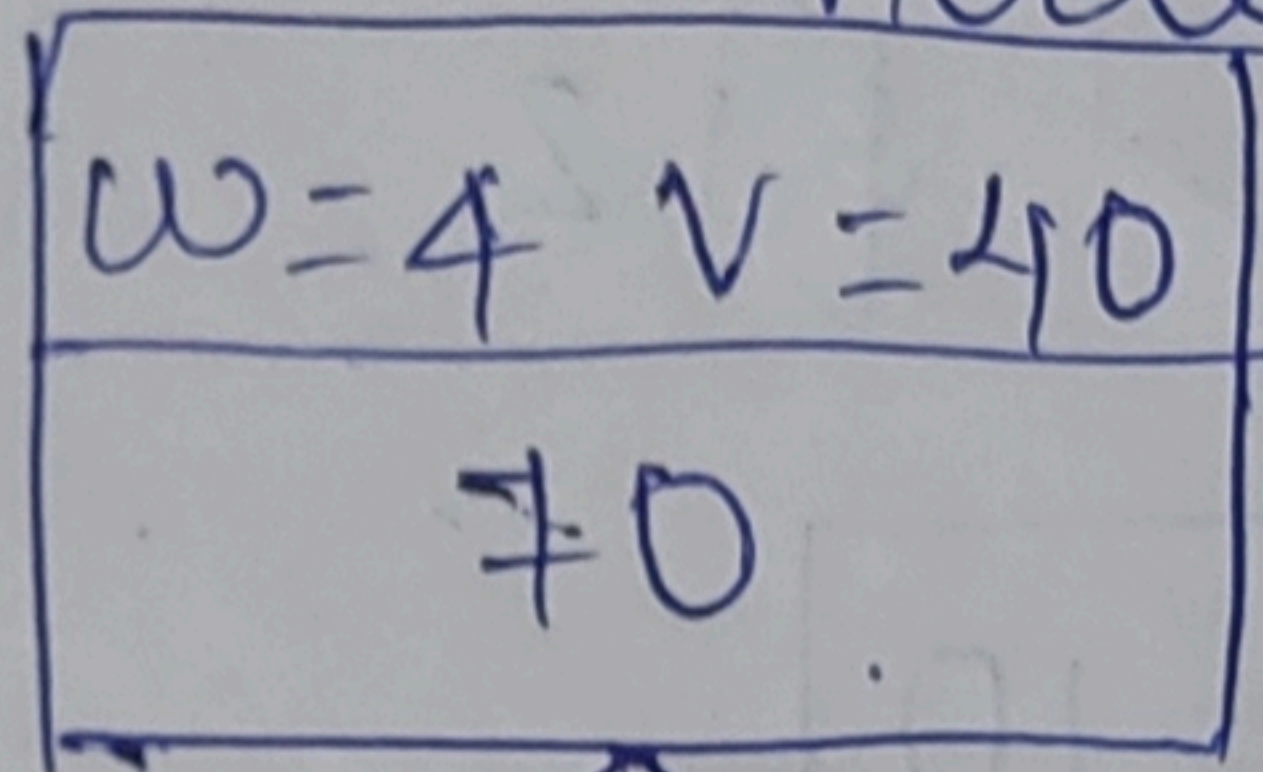
without
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Row (2)
 $i=2$

node 4



node 5



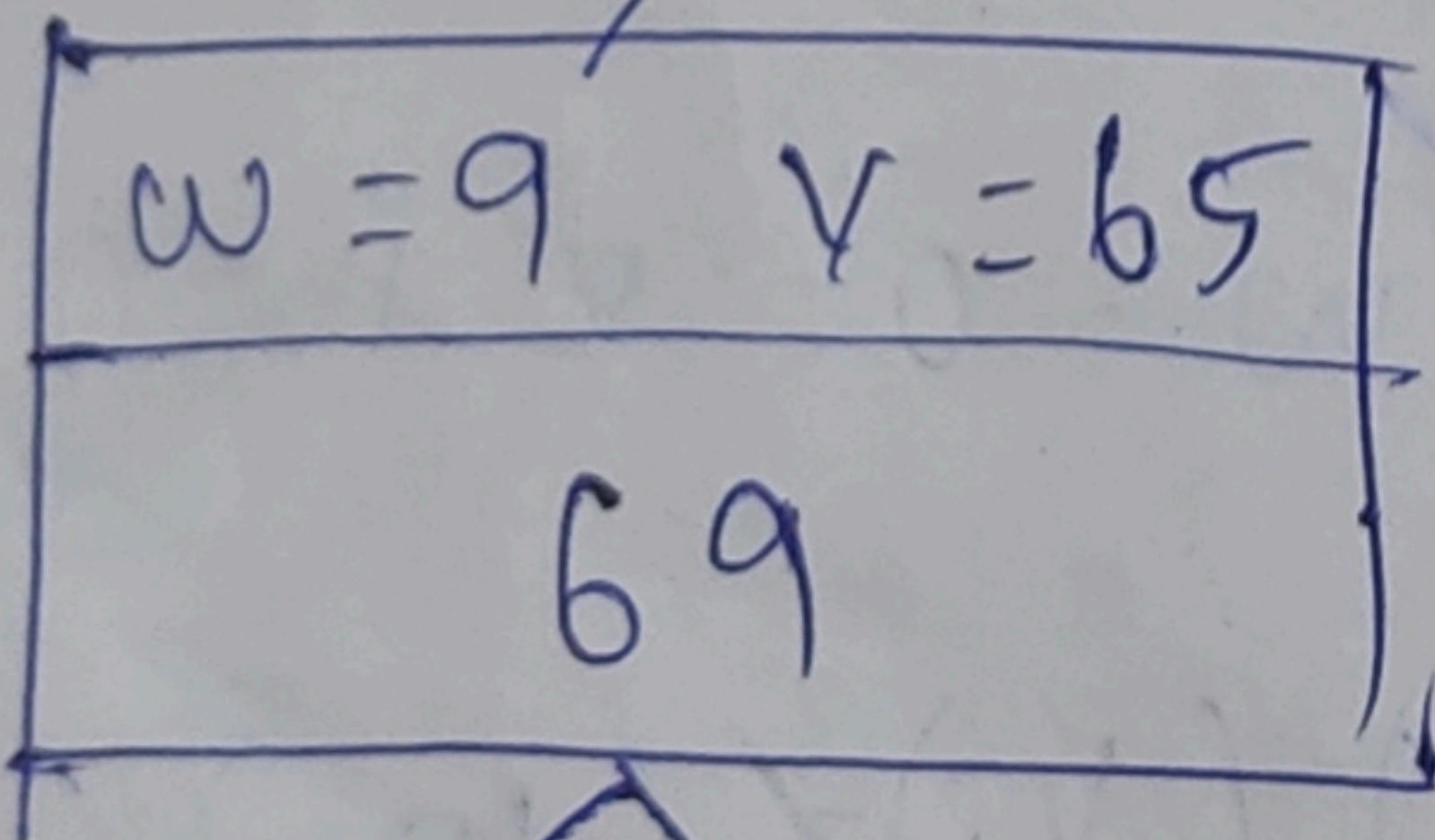
40
25
65

with
③

without
③

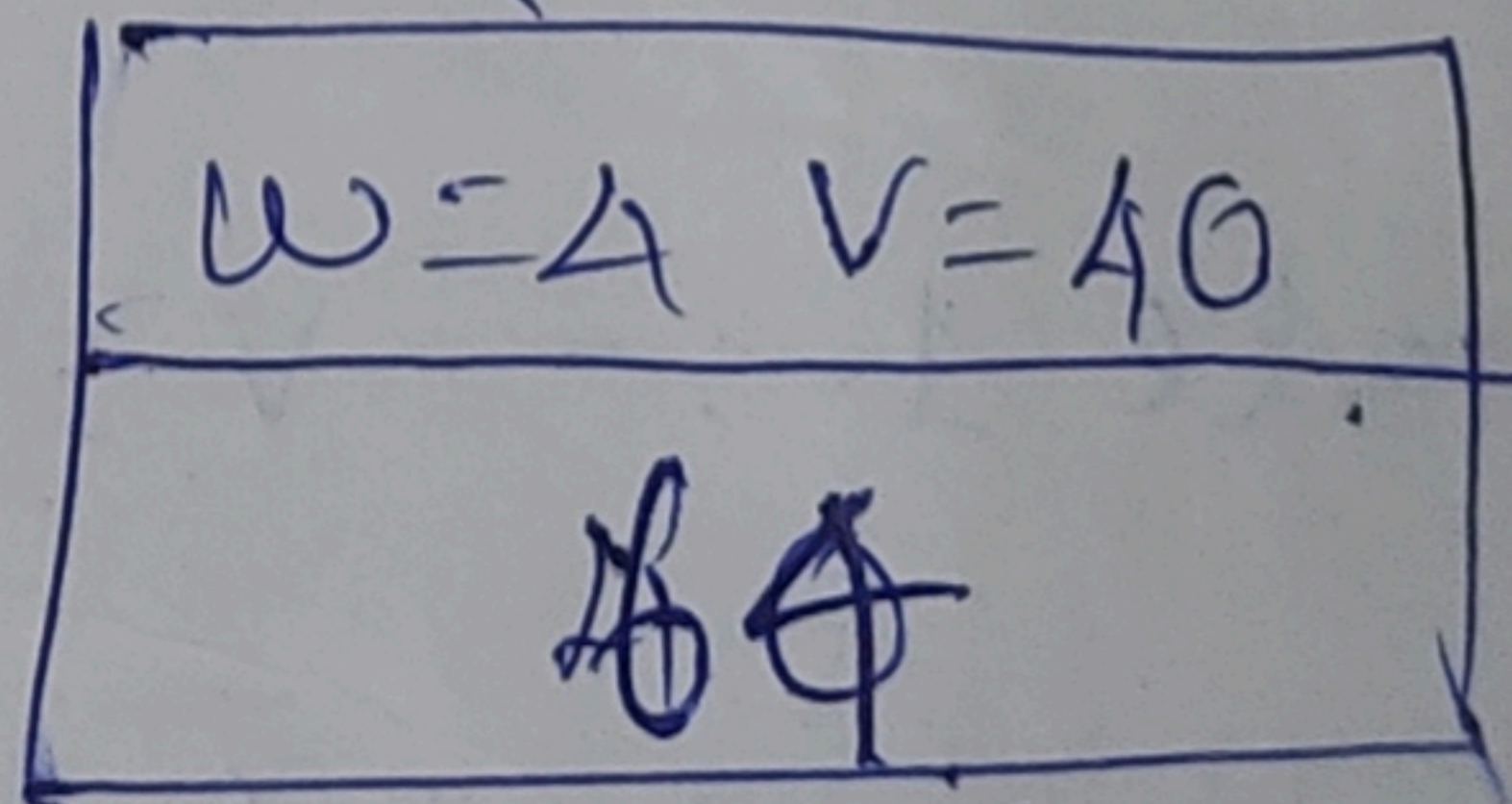
Row (3)
 $i=3$

node 6



$i=3$

node 7

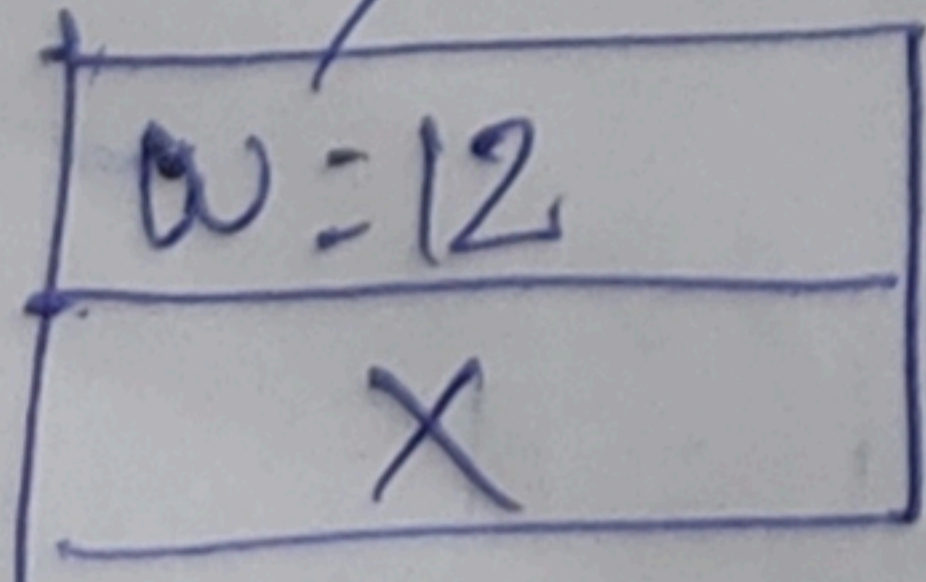


with
④

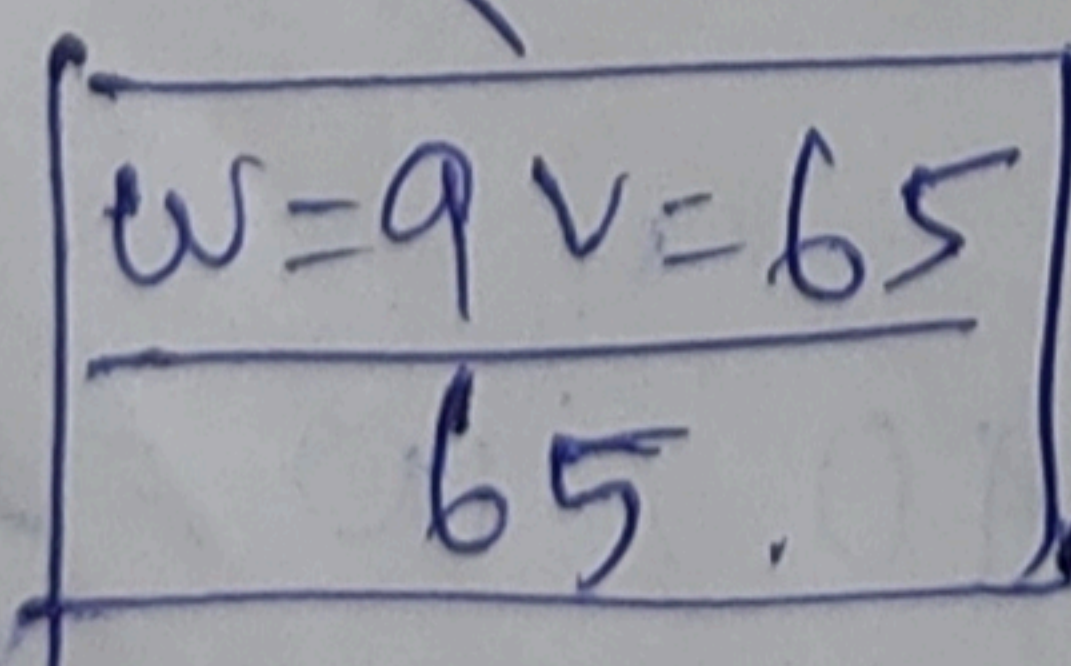
without
④

Row (4)
 $i=4$

node 8



$i=4$



node 9

Unoosed Nodes: -

w_1, w_3

$\therefore \cdot 10 \mid 0$

weight: $4 + 5 = 9$

value: $210 + 25 = 65$