

Water Jug Problem

Problem : We have 2 water jugs, one measure x Gallon and the other one measure y Gallon. But there is no measuring label mentioned on either of these jugs i.e we cannot know the exact amount of water filled in the jug. If we want to know \rightarrow how?

- i) There is infinite amount of water supply.
- ii) We can empty / fill the jugs completely.
- iii) We can transfer water from 1 jug to another.



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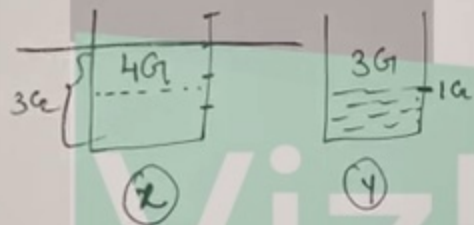
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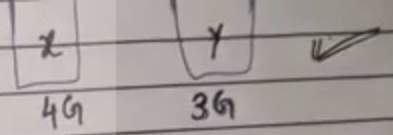


✓ \emptyset - Fill 2G of water into any one of this jug

$$\left. \begin{array}{l}
 x=0, y=0 \\
 x=0, y=3 \\
 x=3, y=0 \\
 x=3, y=3 \\
 \checkmark x=4, \boxed{y=2}
 \end{array} \right\}$$



State state : (0,0)
 Goal state : (2,0)



→ Production rules : ✓

Rule	State	Process
1	$(x, y / x < 4)$	$(4, y)$ Fill 4-gallon jug
2	$(x, y / y < 3)$	$(x, 3)$ Fill 3-gallon jug
3	$(x, y / x > 0)$	$(0, y)$ Empty 4-gallon jug
4	$(x, y / y > 0)$	$(x, 0)$ Empty 3-gallon jug
	$(x, y / x + y \geq 4)$	$(x + y, 0)$ Pour 4-gallon jug into 3-gallon jug
	$(x, y / y \geq 3)$	$(x - 3, y)$ Pour 3-gallon jug into 4-gallon jug

and the label men
 amount of



problem

$$6 \quad (x, y \mid x+y \geq 3 \\ \wedge x > 0)$$

$$(x - (3 - y), 3)$$

↳ Pour water from 4 to the other 3 gallon jug until 3-gallon jug is full & out of water

$$7 \quad (x, y \mid x+y \leq 4 \\ \wedge y > 0)$$

$$(x+y, 0)$$

↳ Pour all water from 3 to 4 gallon jug

$$8 \quad (x, y \mid x+y \leq 3 \\ \wedge x > 0)$$

$$(0, x+y)$$

↳ Pour all water from 4 to 3 gallon jug



Gallons in 4-gallon jug

Gallons in 3-gallon jug

Rule

0

0

1
6

4

3



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