

Natalie has some red and white roses.

- 80% of the roses Natalie has are white.
- Natalie buys 76 more white roses and 48 more red roses.
- 75% of the roses Natalie has are now white.

How many roses did Natalie have in total at the start?

Mr. C's solution

At the start,

$$\text{White roses are } 80\% = \frac{8}{10} = \frac{4}{5}$$

$$\text{Red roses are } 20\% = \frac{2}{10} = \frac{1}{5}$$

Later

$$\text{White roses are } 75\% = \frac{3}{4}$$

$$\text{Red roses are } 25\% = \frac{1}{4}$$

Start

$$\frac{1}{5} \text{ Red } \boxed{\text{Red}}$$

$$\frac{4}{5} \text{ White } \boxed{\text{Red} \quad \text{Red} \quad \text{Red} \quad \text{Red}}$$

White roses are 4x Red roses.

$$W = 4R$$

Later

$$\frac{1}{4} \text{ Red} + 48 \quad \boxed{\text{Red} + 48}$$

Red roses now 48 more

$$\frac{3}{4} \text{ White} + 76 \quad \boxed{\text{Red} + 48 \quad \text{Red} + 48 \quad \text{Red} + 48}$$

White now 76 more.

White roses are now 3x Red roses.

White have 76 more, red 48 more.

$$W + 76 = 3 \times (R + 48)$$

$$W + 76 = 3 \times R + 3 \times 48 = 3R + 144$$

$$W + 76 - 76 = 3R + 144 - 76$$

$$W = 3R + 68$$

↑
from earlier, $W = 4R$.

so

$$4R = 3R + 68 \quad \text{so } 4R - 3R = 3R - 3R + 68$$

$$R = 68$$

At start, we have 68 red roses. At start, we have 4 x 68 white roses. so, at the start we have 68 red + 272 white → 340 roses