Rates with Fractions

Unit means one. Rate means how much of one thing for another. Per means for each. A unit rate is how much for one. Multiply the time by its reciprocal to get 1, and multiply the distance by the same number.

1 THE VOCABULARY
Words we use

Ratio a comparison of two amounts.
Rate how much of one thing for another (miles per hour).
Per for each.
Reciprocal the flip of a fraction; a fraction times its reciprocal is 1.
Unit rate how much for one.
Complex fraction a fraction over a fraction; it means divide.

- Watch out for these.
- Making the wrong amount into 1: the amount after per is the one that becomes 1.
- Multiplying only one amount. Both amounts get the same multiplier.
- Forgetting the units: 2 is not an answer, 2 miles per hour is.
- Using miles per hour when the question gives you miles and wants hours.

2 THE METHOD
Find a unit rate

1. ASK what do I multiply the per amount (the time, the wall) by to get 1? That is its reciprocal.
2. SAME NUMBER multiply the other amount by that same number.
3. SAY THE UNITS 2 miles per hour, 3 gallons per wall.
4. CHECK picture it: four quarter hours make an hour, so four half miles make the answer.

WHY THE RECIPROCAL

A fraction times its reciprocal is 1: $\frac{1}{4} \times 4 = 1$. Written as a fraction over a fraction, multiply top and bottom by that reciprocal; the bottom becomes 1 and disappears, and the top, $\frac{1}{2} \times 4 = 2$, is the answer.

3 JULIA'S WALK
$\frac{1}{2}$ mile every $\frac{1}{4}$ hour

$\frac{1}{4}$ hour $\times 4 = 1$ hour	what times the hours gives 1? the reciprocal, 4
$\frac{1}{2}$ mile $\times 4 = 2$ miles	the miles get the same multiplier
2 miles per hour	how much for one hour
$\frac{1}{2}$ mile $\times 2 = 1$ mile, so $\frac{1}{4}$ hour $\times 2 = \frac{1}{2}$ hour	make the miles 1 instead: hours per mile
in $1\frac{1}{3}$ hours: $2 \times \frac{4}{3} = 2\frac{2}{3}$ miles	know the hours, use miles per hour
5.2 miles: $5.2 \times \frac{1}{2} = 2.6$ hours	know the miles, use hours per mile

THE PAINT

$\frac{1}{2}$ gallon covers $\frac{1}{6}$ of a wall. $\frac{1}{6}$ wall $\times 6 = 1$ wall, so $\frac{1}{2}$ gallon $\times 6 = 3$ gallons per wall. Six sixths make a wall, six halves make 3.

SAY IT OUT LOUD

What do I multiply by to get 1? The reciprocal. Then the other amount gets the same number.