**A painter takes 4 hours less than his apprentice in painting a room. If they work together, they take 1 hour and a half. How long would it take for the apprentice to paint the room if he worked alone?**  
  
SOLUTION. Let "x" be the time, in hours, that the apprentice takes. Then, the boss takes (x - 4) hours.

Let’s express the amount of work each one does in an hour:  
  
BOSS ==> 1/(x - 4)  
  
APPRENTICE ==> 1/x  
  
TOGHETHER ==> 1/1.5 = 2/3  
  
If we add the boss’ part and the apprentice’s part, we get the part they complete in an hour.

. . 1 . . . . . .1 . . . . . 2  
——— + ——— = ——  
x - 4 . . . . . x . . . . .3  
  
  
. . 1 . . . . . .1 . . . . .2  
——— + ——— - —— = 0 . . . . . . Rearranging

x - 4 . . . . . x . . . . 3  
  
  
3x + 3·(x- 4) - 2x·(x - 4)   
——————————— = 0 . . . . . common denominator  
. . . .3x·(x - 4)  
  
  
-2x² + 14x - 12   
———————— = 0  
. . . .3x·(x - 4)  
  
  
The algebraic fraction is 0 when its numerator is 0..  
  
-2x² + 14x - 12 = 0  
  
Solving the quadratic equation:  
  
x = 6  
  
x = 1 (we discard it as it is nonsense  --- why?)  
  
  
ANSWER. The apprentice would take 6 hours.