Clockwise Ant Puzzle

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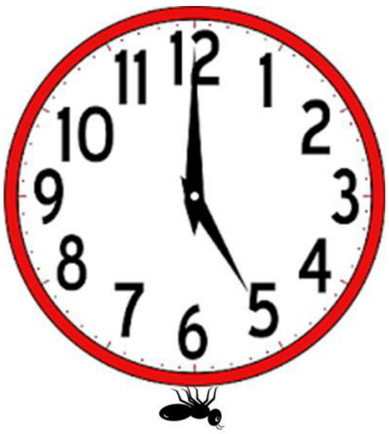

clipart-library.com

This is actually a travel problem masquerading as a clock puzzle[1] from Futility Closet.

A problem by Argentinian puzzlist Jaime Poniachik, from the February 1992[2] issue of *Games* magazine:

An ant crawls onto a clock face at the 6 mark just as the minute hand is passing 12. She begins crawling counterclockwise around the face's circumference at a uniform speed. When the minute hand passes her, she reverses course and crawls clockwise without changing her speed. Forty-five minutes after her first encounter with the minute hand, it passes her a second time and she departs. How much time did she spend on the clock face?

My Solution

This turned out to be a bit challenging. In trying to construct the space-time diagram I realized the ant could not be moving slower than the minute hand of the clock. When I thought about it, it made sense. If the ant were moving slower, then after the first moment they meet and the ant starts to move in the clockwise direction, the minute hand will always be ahead of the ant. When the minute hand makes a complete circuit (after 60 minutes) and arrives back at the first point of meeting, the ant will have moved on. So it would take the minute hand more than 60 minutes to pass the ant again. But it is supposed to meet the ant after 45 minutes, so the ant must be moving faster than the minute hand (which is moving at one clock minute mark per minute).

Figure 1 shows the situation. Let C_1 be the clock minute mark when the ant and minute hand meet the first time after T minutes. Let C_2 be the clock minute mark when they meet again after 45 more minutes. Let v_A be the ant's speed in clock minute marks per minute and $v_C = 1$ be the minute hand's speed.

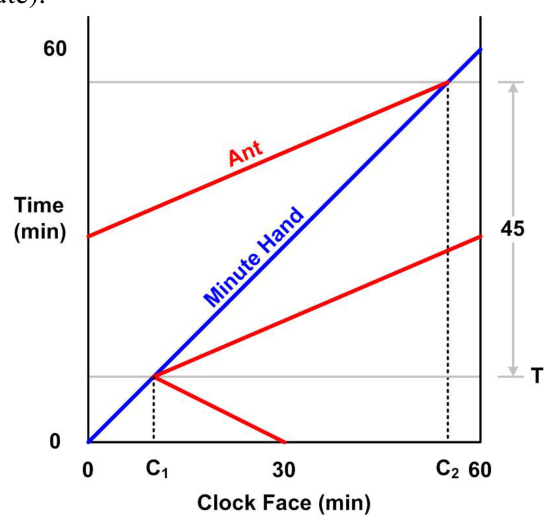

Figure 1

Then we have at the first meeting

$$C_1 = v_C\, T = T \quad \text{and} \quad 30 - C_1 = v_A\, T$$

which implies

$$30 = T\,(v_A + 1). \qquad (*)$$

Then at the second meeting

$$C_2 = v_C\,(T + 45) = T + 45 \quad \text{and} \quad (60 - C_1) + C_2 = v_A\,(45)$$

imply

$$(60 - T) + (T + 45) = 105 = 45\, v_A$$

[1] 26 March 2026 (https://www.futilitycloset.com/2026/03/26/the-clockwise-ant/)

[2] https://archive.org/details/Games-Magazine-February-1992-images/page/42/mode/2up

which means

$$v_A = 7/3.$$

Therefore, using this result and equation (*)

$$30 = T\,(v_A + 1) = T\,(7/3 + 1) \;\Rightarrow\; T = 9 \text{ min}$$

So the total time the ant is on the clock face is

$$T + 45 = 54 \text{ minutes.}$$

Futility Closet Solution

Futility Closet provides basically a verbal solution (shades of pre-symbolic algebra), which I confess I didn't quite follow.

54 minutes. Between the ant's two encounters with the minute hand, the hand passed over 45 minute marks. In that time, the ant passed over 105 minute marks (45 minutes plus one complete circumference).[3] The ratio of their speeds was thus 45/105, or 3/7. If x minutes elapsed before their first encounter, then in that time the minute hand advanced by x minutes while the ant crawled over $30 - x$ minute marks. So $x/(30 - x) = 3/7$, which gives $x = 9$ minutes, and the total time is 9 + 45 = 54 minutes.

I still prefer the powerful symbolic algebra method:

draw a picture
↓
quantify the picture from the problem statement
↓
with the aid of the picture translate the problem statement into equations
↓
solve the equations

It turns out to be a lot easier than trying to solve so much of the problem in your head. And it provides a uniform procedure that works in a huge number of cases. It does require mental effort, but that is in drawing the picture, assigning the variables, and formulating the equations. For example, once you have a space-time model, the steps are all similar. (That's where I had to realize the problem was really a travel problem.)

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[3] JOS: How do you know this without drawing a picture or knowing the relationship of the ant's speed to the minute hand's, especially after the way the problem is phrased suggests the minute hand is moving *faster* than the ant?

Just for the heck of it, I sought the original problem at the *Games Magazine*. Here is how it read:

Just as the minute hand of an accurate clock passes the 12, an ant crawls onto the clock at the 6 mark, and begins walking counterclockwise around the circumference of the clock at a uniform speed. When she runs into the minute hand, she turns around and proceeds in a clockwise path, still maintaining her original speed. Then, 45 minutes after her first encounter with the minute hand, she runs into the minute hand a second time. Frustrated, she crawls off the clock in search of safer ground. How long did the ant spend on the clock?

So the original problem suggested the ant was moving faster than the minute hand.