# Word Problems 32: Another Neat Problem

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**Abstract**

In this algebra word problem note, we use the Scheme to solve more difficult word problems.

## 1 Introduction

More difficult word problems!

## 2 Word Problem #32.1

This problem is found at:

`https://www.youtube.com/watch?v=z-39mxlg94A`

▶ Wesley has a 15-page report due in two weeks. If he has written the first 3 pages in 9 days, how long can he continue to stall if he is sure he can write three times as fast as he has so far?

**Comment 1**

Bravo! Good problem. Very real-world stuff. However, Wesley could have less questionable reasons for taking some time off the project. For example, he might be sick and figure that he won't be able to write well for at least 2 days. Or, he may be invited to his sister's wedding in a different state and want to attend but he calculated that it will take a full two days of round-trip travel before he can return home and start on the assignment again in earnest. Nevertheless, I will solve the problem as though Wesley is a temporary slacker.

**Comment 2**

I solved this problem with Scheme before I watched the YouTube solution. I must admit, I had a hard time following the logic of the man's presentation. Apparently so too did most of those who watched the presentation and bothered to leave a comment on it.

One of the difficulties some of these commenters had on this problem was to correctly understand the timeline of Wesley's project. I admit that when I

sketch out my own solution, I took it for granted that my own readers would get the timeline right, but this was sloppy thinking on my part.

**Comment 3**

Therefore, this shall be my heuristics for solving this 'temporal' problem:

1) First, understand the timeline.
2) Look for totals and parts.
3) Look for rates of change.
4) Make your variables.
5) Draw a diagram!

It's not necessary to follow these steps in precise order, and you may need to cycle through the list more than once. And let's not forget to apply the *Zeroth Rule of Problem Solving* whenever it's necessary. The rule states this: Make any reasonable assumption necessary to solve the problem in a reasonable amount of time with a reasonable amount of effort.

**Solution:**

**Step 1**

Let's establish the timeline first: For all we know, Wesley's writing assignment could have been given to him two months ago. What we do know is that, prior to NOW, he apparently took 9 days (on which he wrote) to write only 3 pages. This immediately suggests we define an average production rate of $R =$ 3 pages/9 days, or,

$$R = \frac{1}{3}\,\text{page/day}\,. \tag{1}$$

We also know that from right NOW Wesley has two weeks to complete the assignment. We will **assume**, for the sake of definiteness, that two weeks equals 14 full days, and that right NOW is at the beginning of those 14 days.

We will also **assume** that the meaning of "how long can he continue to stall if he is sure he can write three times as fast as he has so far?" is equivalent to "starting from right NOW, how many days can Wesley afford to not work on the assignment at all, yet complete the assignment in the remaining days after that if he will succeed at writing at an average rate 3 times his prior rate?"

**Step 2**

Are there any totals? Yes, the first total is that the full report requires 15 pages. Part of that total is already done, i.e., the 3 pages already completed. That leaves $15 - 3 = 12$ pages to complete in the next 14 days.
Are there any other totals? Yes, the second total is the 14 days left to finish the assignment. In other words, the total time left can be divided into the slack time ($T_1$) and the work time ($T_2$).

Okay, time to make a diagram!

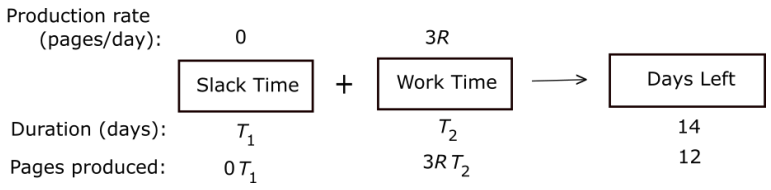


Figure 1. Think of 'Days Left' not only as a number but also as an interval of time that's partitioned into two subintervals: Slack Time and Work Time. $R$ is the old production rate and $3R$ is the new production rate of 1 page/day.

**Step 3**

Obviously, the easiest variable to solve for is $T_2$, since the total number of pages produced is the sum of those produced during the Slack Time plus those produced during the Work Time:

$$0T_1 + 3RT_2 = 12\,, \tag{2}$$

which gives us $T_2 = 12$ days.

Now, from the Duration line of Figure 1, we have that

$$T_1 + T_2 = 14\,, \tag{3}$$

which, together with the value of $T_2$

$$T_1 = 2\,. \tag{4}$$

So, if Wesley wants, he can take it easy for a couple days before he gets going in earnest. (Or, actually he can attend his sister's wedding, after all.)

# 3 Conclusion

To solve tricky problems, it helps to know the available tricks.

# References

[1] R. Blitzer. *Intermediate Algebra for College Students*, 3rd Ed. Prentice-Hall (2002), p. 169.

[2] H. Rolf. *Finite Mathematics*, 5th Ed. Brooks/Cole (2002), p. 57.