Solving with Algebra in ETP Calculations

Here is one algebraic solution for figuring out the "equal time point" as noted in the caption for Figure 7-3 (Chapter 7, Page 149 in the textbook):

$$\frac{X}{345} = \frac{1,080 - X}{445} + \frac{720}{350}$$

First, find the LCD (least common denominator) which is the smallest whole number that will produce a whole number when the denominators are all divided by it. Clearly, the LCD here is **5**.

Then, divide each denominator by the LCD:

345 ÷ 5 = 69

445 ÷ 5 = 89

350 ÷ 5 = 70

Then, multiply each numerator item by (69 x 89 x 70):

$$\frac{(\cancel{69} \times 89 \times 70)\, X}{\cancel{69}} = \frac{(69 \times \cancel{89} \times 70)\,(1080 - X)}{\cancel{89}} + \frac{(69 \times 89 \times \cancel{70})\,(720)}{\cancel{70}}$$

...then the denominators and the matching LCD cancel each other, thus eliminating the denominators from the equation.

Now, clean it up:

6,230 X = 5,216,400 − 4,830 X + 4,421,520

Now, move the X value that is on the right side of the equation to the left side, where it becomes a plus value:

6,230 X + 4,830 X = 9,637,920

Cleaning up more:

11,060 X = 9,637,920 ÷ 11,060

X = 871.42