Example 9: **The sum of four consecutive integers is 146. What is the value of the smallest integer subtracted from the largest?**

Remember – the most important part to solving word problems is transcribing the words into an equation that we can solve. Here, we don't know what any of the four variables are.

1. What we can do is set the smallest of the four equal to ***x***. Because these are *consecutive* integers, our remaining variables must look something like this:

$$x, (x+1), (x+2), (x+3)$$

2. We also know that the four variables add up to 146:

$$\begin{aligned} x+(x+1)+(x+2)+(x+3) &= 146 \\ 4x+6 &= 146 \\ 4x &= 140 \\ x &= 35 \end{aligned}$$

3. We're not quite done yet, because the question asks us to subtract the smallest integer from the largest:

$$38-35=\boxed{3}$$

Example 10: **A group of friends wants to split the bill for lunch equally. If each friend pays $25 dollars, they will have $15 to little. If each friend pays $30, they will have $10 too much. How much did lunch cost in total?**

1. From the start, we have two unknowns in this problem: how many friends there were, and how much lunch cost. We'll let the number of friends in the group be ***x*** and the cost of lunch be ***y***. From this, we can come up with two equations:

$$\begin{aligned} 25x+15 &= y \\ 30x-10 &= y \end{aligned}$$

2. In the first equation, ***25x*** represents the total that the friends pay, but because it's 15 dollars too little, we need to add 15 to arrive at ***y***. In the second equation, ***30x*** represents the total that the friends pay, but this time, it's 10 dollars too much, so we must subtract 10 dollars to arrive at ***y***. If we set the equations equal to one another, we get:

$$\begin{aligned} 30x-10 &= 25x+15 \\ 5x &= 25 \\ x &= 5 \end{aligned}$$

3. So, now we know that there are five friends in the group. Thus:

$$\begin{aligned} 25x+15 &= y \\ 25(5)+15 &= y \\ \boxed{140 = y} \end{aligned}$$

4. The five friends paid a total of $140 for lunch.

Example 11: John and Kelly have 240 trading cards. Kelly gives John one third of her cards and then 20 more. John now has 5 times as many cards as Kelly does. How many cards did Kelly have originally?

This question is very tricky, and it brushes the upper limit of difficulty on SAT word problems. There are two ways we can attack this problem:

Solution 1: Let's work backwards to see if we can make sense of this.

1. If ***x*** is the amount of cards that Kelly ends up with, then John must have ***5x*** cards. We also know that there are 240 cards in total. With this information, we can write an equation:

$$\begin{aligned} x + 5x &= 240 \\ 6x &= 240 \\ x &= 40 \end{aligned}$$

2. At the end, Kelly has 40 cards and John has 200 cards. Let's move back one step further. Kelly had given John 20 cards. Before this happened, Kelly must have had **(20 + 40 = 60)** cards. Next, we see that Kelly had given away a third of her cards to get down to 60. If she had given away a third, then 60 must have represented two thirds of her original cards. Let ***y*** be the number of cards Kelly had at the start:

$$\begin{aligned} \frac{2}{3}y &= 60 \\ 2y &= 180 \\ y &= 90 \end{aligned}$$

3. If Kelly had 90 cards at the start, then John must have had (**240 - 90 = 150)** cards.

Solution 2: When Kelly gives John some of her cards, Kelly loses the same amount that John gains. We can set up a variable for Kelly, and another for John. This solution is a bit more complicated, but it works all the same.

1. Let ***x*** be the number of cards Kelly starts with and ***y*** be the number of cards that John starts with. Here are the equations:

$$\begin{aligned} x + y &= 240 \\ y + \frac{1}{3}x + 20 &= 5\left(x - \frac{1}{3}x - 20\right) \end{aligned}$$

2. We can multiply the bottom equation by 3 to clear the denominators:

$$\begin{aligned} x + y &= 240 \\ 3y + x + 60 &= 15x - 5x - 300 \end{aligned}$$

3. Moving things over:

$$\begin{aligned} x + y &= 240 \\ 9x - 3y &= 360 \end{aligned}$$

4. Now, we can use substitution or elimination to solve for one of the variables. Here's what a substitution looks like:

$$\begin{aligned} 9(240 - y) - 3y &= 360 \\ 2160 - 12y &= 360 \\ -12y &= -900 \\ y &= \boxed{75} \end{aligned}$$

Word problems on Official practice tests:

Practice Test	Section	Questions
1	3: No Calculator 4: Calculator	3, 4, 6 4, 19, 20, 32
2	3: No Calculator 4: Calculator	3, 14, 16 1, 6, 8, 9, 12, 31, 23, 34, 35, 37, 48
3	3: No Calculator 4: Calculator	1, 4, 15, 19 8, 17, 22, 24, 31, 35, 37, 38
4	3: No Calculator 4: Calculator	7, 12, 20 1, 2, 3, 5, 6, 16, 17, 31, 32, 34, 35, 37, 68
5	3: No Calculator 4: Calculator	7, 8, 13, 15, 16 6, 7, 25, 35
6	3: No Calculator 4: Calculator	1, 2, 14, 19 2, 3, 4, 9, 10, 18, 19, 23, 29, 31, 33, 37, 38