WHAT DOES IT ALL ADD UP TO?

- $5+6+7+8 = 26$
- $6+7+8+9 = 30 = (5+6+7+8) + (9-5)$
  $= 26 + 4$

Let the consecutive numbers be $a, a+1, a+2, a+3$.

$(a)+(a+1)+(a+2)+(a+3) = 80$

$4a + 6 = 80$

$4a = 74$

$a = 18.5$ but a is an integer. So, no.

Forms of such number are: $4a+6 = \boxed{4(a+1)+2}$

Here we can see that $4a+6 = 2(2a+3)$, an even number. But, it is $4(a+1)+2$, so not a multiple of 4 though.

EXTENSION

- Numbers be $a, (a+1), (a+2), (a+3), (a+4)$.

So sum is $5a+10 = 5(a+2) \longrightarrow$ Multiple of 5

- Numbers be $a, (a+1), (a+2), (a+3), (a+4), (a+5)$

So sum is $6a+15 = 3(2a+5) \longrightarrow$ odd multiple of 3
$= 6(a+2)+3 \longrightarrow$ Not a multiple of 6

CHALLENGING EXTENSION

Numbers are $a, a+1, a+2, \ldots\ldots a+(n-1)$

Sum is $\underbrace{(a+a+\ldots-a)}_{n \text{ times}} + (0+1+2+\ldots\ldots n-1)$

$$= n(a) + \frac{n}{2}(2(0)+n-1)$$

$$= \frac{2na}{2} + \frac{n}{2}(n-1)$$

$$\text{Sum} = \frac{n}{2}\left[2a + n-1\right]$$

- If n is odd, $n = 2m+1$

$$\text{Sum} = \frac{(2m+1)}{2}\left[2a + (2m+1) - 1\right] = \frac{2m+1}{\cancel{2}}\left[\cancel{2}(a+m)\right] = (2m+1)(a+m)$$

$\therefore$ A multiple of n $\longrightarrow$ $= n(a+m)$

- If n is even, $n = 2m$

$$\text{Sum} = \frac{2m}{2}\left[2a+2m-1\right] = \frac{n}{2}\left[2a+2m-1\right] = n\left[\frac{2a+2m-1}{2}\right] = n\left[a+m-0.5\right]$$

multiple of $\frac{n}{2}$

NOT a multiple of n (because $a+m-0.5$ isn't integer)