**THE REMAINDER THEOREM EXPLAINED.**

This could be written as:

63 = 15 + **3**

4 **4**

OR

63 = 4 × 15 + **3**

We say that **3** is the REMAINDER

Consider this ***long division:***

***15***

***4 63***

4

23

20

**3**

Consider this ***long division:***

This could be written as:

***x3 + x2 + x + 4***  = ***x2 + 3x + 7 + 18***

***(x – 2)***  ***(x – 2)***

OR

***x3 + x2 + x + 4 = (x – 2)( x2 + 3x + 7) + 18***

We say that ***18*** is the REMAINDER

***x2 + 3x + 7***

***x – 2 x3 + x2 + x + 4***

***x3 – 2x2***

***3x2 + x***

***3x2 – 6x***

***7x + 4***

***7x – 14***

***0 + 18***

Consider these two versions of ***f(x)*** :

***(a) f(x)*** = ***x3 + x2 + x + 4***

***(b) f(x) = (x – 2)( x2 + 3x + 7) + 18***

***If we substitute x = 2 in (a) we get f(2) = 8 + 4 + 2 + 4 = 18***

***If we substitute x = 2 in (b) we get f(2) = (0)×(4 + 6 + 7) + 18 = 18***

Clearly the remainder after dividing by ***(x – 2)*** is simply ***f(2)*** = 18

If we were to divide the same function by ***(x – 1) we could write it as:***

***f(x)*** = ***x3 + x2 + x + 4 = (x – 1)( something) + R***

Substituting ***x = 1: 1 + 1 + 1 + 4 = (0)×(something) + R***

The remainder ***R*** would be ***f(1) = 1 + 1 + 1 + 4 = 7***

Generally, if ***f(x)*** is divided by ***(x – a)***

Then ***f(x) = (x – a)( something) + R*** where ***R*** is the remainder.

so on substituting ***x = a*** we would get ***f(a) = (0)(something) + R***

***The REMAINDER THEOREM states:***

***If f(x) is divided by (x – a) then the remainder is f(a)***

These would make nice POSTERS for frequent reinforcement of WHY.



