

## Number Theory (HD)

### Proof

prove:

Prove that if  $m =_{(n)} m'$ ,  $p =_{(n)} p'$  and  $q =_{(n)} q'$  then  $m + p * q =_{(n)} m' + p' * q'$ .

### proof

Let  $m = k_1 * n + m'$ ,  $p = k_2 * n + p'$  and  $q = k_3 * n + q'$ ,

Therefore,

$$\begin{aligned} m + p * q &= (k_1 * n + m') + (k_2 * n + p') * (k_3 * n + q') \\ &= k_1 * n + m' + k_2 * k_3 * n^2 + k_2 * q' * n + k_3 * p' * n + p' * q' \\ &= (k_1 + k_2 * k_3 * n + k_2 * q' + k_3 * p') * n + m' + p' * q' \end{aligned}$$

Let  $k_1 + k_2 * k_3 * n + k_2 * q' + k_3 * p' = k$ , so  $m + p * q = k * n + m' + p' * q'$ .

Therefore,  $m + p * q =_{(n)} m' + p' * q'$ .