Literal calculation

Friday 22 March, 2024
adapted from *Annales abc* p. 58 & 64

$\boxed{13}$ Let $\square$ be a number. Define $E := (\square - 2)(2\square + 3) - 3(\square - 2)$.

1. *Develop E.*
2. *Factor E. Find a number n such that $E = n \square (\square - 2)$.*
3. *Number E is assumed to be nil. What can we say about $\square$?*
4. *Determine the numbers a such that $(a - 2)(2a + 3) = 3(a - 2)$.*

$\boxed{11}$ We are interested in the following two calculation programs.

1. Program 1:
     (a) choose a number;
     (b) triple it;
     (c) add 1.

2. Program 2:
     (a) choose a number;
     (b) on the one hand subtract 1 from it, on the other add 2 to it;
     (c) multiply the difference and sum obtained in 2b.

Define A (resp. B) the application that assigns to each number t the result of program 1 (resp. 2) when t is chosen at the beginning.

Questions.

1. *When the number 5 is chosen at the start, what is the output of programs 1 and 2?*

2. (a) Let r be a number. *Express A(r) as a function of r.*
   (b) *Find the number(s) d such that, when d is chosen at the start, program 1 returns the value 0.*

3. *Develop & reduce the image B(x). What is the meaning of x? How do you give it meaning?*

4. (a) *Let s be a number. Show the equality $B(s) - A(s) = (s + 1)(s - 3)$.*
   (b) *Determine the number(s) m such that, when m is chosen at the start, both programs give the same result.*