NCERT Mathematics 10.5.2 Q10

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Question: The 17th term of an AP exceeds its 10th term by 7.Find the common difference.

Solution:

Parameter	Value
x(16) - x(9)	7

Let $(x(n-1))$ represent the (n)th term of an arithmetic progression (AP) with common difference d. Given that the 17th term $(x(16))$ exceeds the 10th term $(x(9))$ by 7, we can express this as:

$$x(16) - x(9) = 7 \tag{1}$$

Using the formula for the nth term of an AP $(x(n-1) = x(0) + (n-1)d)$, we substitute and simplify:

$$(x(0) + 16d) - (x(0) + 9d) = 7 \tag{2}$$

This simplifies to:

$$7d = 7 \tag{3}$$

Therefore, the common difference is $d = 1$.

$$x(n) = x(0) + (n)d \tag{4}$$

Now,

$$u(n) = x(n) = x(0) + (n)d \tag{5}$$

The z-transform of u(n) is given by

$$U(z) = \sum_{n=-\infty}^{\infty} u(n)z^{-n} \tag{6}$$

$$U(z) = u(0) \cdot \frac{1}{1 - zd} + d \cdot \frac{z}{(1 - zd)^2} \tag{7}$$