NCERT 11.9. Q2

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Question: If the sum of first p terms of an A.P. is equal to the sum of the first q terms, then find the sum of the first $(p+q)$ terms. Solution:
The sum of first p terms of an arithmetic progression (A.P) is given by

$$s_p = \frac{q}{2}[2a + (q)d]$$

If s_p=s_q,then:

$$\frac{p}{2}[2a + (p)d] = \frac{q}{2}[2a + (q)d]$$

simplifying the equation we get:

$$p * (2a + pd) = q * (2a + qd)$$

$$2ap + (p^2) * d = 2aq + (q^2) * d$$

$$2a(p-q) + (p-q)(p+q) * d = 0$$

$$(p-q)[2a + (p+q) * d] = 0$$

since p and q are not equal.We can eliminate the term $(p-q)$ Now the equation becomes :

$$2a + (p+q) * d = 0 \longrightarrow 1$$

Now to find the sum of the first $p+q$ terms S_{p+q},you can use the formula:

$$S_{p+q} = \frac{p+q}{2}[2a + (p+q) * d]$$

As we have seen in the equation $1 : 2a+(p+q)*d = 0$ is 0. Therefore S_{p+q} is 0.