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## Discrete Assignment EE1205 Signals and Systems

Praful Kesavadas EE23BTECH11049

Question 11.9.5.15: The pth, qth and rth terms of an AP are a,b,c respectively. Show that

$$(q-r) a + (r-p) b + (p-q) c = 0$$

## **Solution:**

The AP has the following parameters

Term	Value	Description
x(0)	-	First term
d	-	Common Difference
x(n-1)	x(0) + (n-1)d	General term
x(p-1)	а	pth term
x(q-1)	b	qth term
x(r-1)	c	rth term

TABLE 0
INPUT PARAMETERS

Now,

$$x(p-1) = x(0) + (p-1)d = a$$
 (1)

$$x(q-1) = x(0) + (q-1)d = b$$
 (2)

$$x(r-1) = x(0) + (r-1)d = c$$
(3)

$$(p-q)d = a - b \implies p - q = \frac{a - b}{d} \tag{4}$$

$$(q-r)d = b-c \implies q-r = \frac{b-c}{d}$$
 (5)

$$(r-p)d = c - a \implies r - p = \frac{c - a}{d} \tag{6}$$

Now, adding (4),(5) and (6),

$$(q-r)a + (r-p)b + (p-q)c = \frac{b-c}{d}.a + \frac{c-a}{d}.b + \frac{a-b}{d}.c = 0$$
 (7)

Hence proved