Discrete Assignment
EE1205 Signals and Systems

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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
$x(n)$	$x(0)+nd$	General term

TABLE 0
INPUT PARAMETERS

Now,

$$x(p)=x(0)+pd=a \tag{1}$$
$$x(q)=x(0)+qd=b \tag{2}$$
$$x(r)=x(0)+rd=c \tag{3}$$
$$(p-q)d=a-b \implies p-q=\frac{a-b}{d} \tag{4}$$
$$(q-r)d=b-c \implies q-r=\frac{b-c}{d} \tag{5}$$
$$(r-p)d=c-a \implies r-p=\frac{c-a}{d} \tag{6}$$

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

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

Hence proved