# Assignment

# 11.9.2 - 11

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## Question

Sum of the first p, q and r terms of an A.P. are a, b and c, respectively.
Prove that $\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$

## Solution

| Symbol | Value | Description |
|---|---|---|
| $x(n)$ | $\frac{n}{2}(2a+(n-1)d)$ | Sum of n terms of an A.P |
| $n$ | $p,q,r$ | $n^{th}$ term of the sequence |
| $a$ | $x(0)$ | first term of the sequence |
| $d$ | $x(n+2)-2x(n+1)+x(n)$ | common difference |

TABLE 0
Variable description

$$a=\frac{p}{2}(2x(0)+(p-1)d) \tag{1}$$

$$b=\frac{q}{2}(2x(0)+(q-1)d) \tag{2}$$

$$c=\frac{r}{2}(2x(0)+(r-1)d) \tag{3}$$

Back substituting values into the term $\frac{a}{p}(q-r)$ it can be rewritten as $\frac{p}{2}\times\frac{1}{p}(q-r)(2x+(p-1)d)$
On further simplification it can be rewritten as

$$\frac{(q-r)}{2}(2x(0)-d+pd) \tag{4}$$

Assuming $2x(0)-d$ as a constant $k$

$$\frac{a}{p}(q-r)=\frac{(q-r)}{2}(k+pd) \tag{5}$$

$$\frac{(q-r)}{2}(k+pd)=\frac{kq+pqd-rk-prd}{2} \tag{6}$$

$$\frac{(r-p)}{2}(k+qd)=\frac{kr+qrd-pk-pqd}{2} \tag{7}$$

$$\frac{(p-q)}{2}(k+rd)=\frac{kp+prd-qk-qrd}{2} \tag{8}$$

Upon on addition of (6), (7) and (8) the total sum adds up to 0.