11.9.3.22

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QUESTION: If p^{th}, q^{th}, r^{th} term of a GP are a, b and c respectively Prove that

$$a^{q-r}b^{r-p}c^{p-q} = 1$$

Solution:

$$x(n) = (x(0)d^n)u(n) \tag{1}$$
$$a = x(p) = (x(0)d^p) \tag{2}$$
$$b = x(q) = (x(0)d^q) \tag{3}$$
$$c = x(r) = (x(0)d^r) \tag{4}$$
$$a^{q-r}b^{r-p}c^{p-q} = x(0)^{q-r}d^{p(q-r)}x(0)^{r-p}d^{q(r-p)}x(0)^{p-q}d^{r(p-q)} \tag{5}$$
$$= x(0)^{q-r+r-p+p-q}d^{p(q-r)+q(r-p)+r(p-q)} \tag{6}$$
$$= x(0)^0 d^0 \tag{7}$$
$$a^{q-r}b^{r-p}c^{p-q} = 1 \tag{8}$$

Variable	**Description**	**Value**
$x(n)$	n^{th} term of GP	none
d	common ratio between the terms of GP	none
$x(p)$	a	$x(0)d^p$
$x(q)$	b	$x(0)d^q$
$x(r)$	c	$x(0)d^r$

TABLE 0
INPUT PARAMETERS

Taking Z-Transform:

1) $\mathcal{Z}\{u(n)\}$

$$u(n) \longleftrightarrow Z\frac{1}{1-z^{-1}}\{|z| > 1\} \tag{9}$$

2) $\mathcal{Z}\{d^n u(n)\}$

$$nu(n) \longleftrightarrow Z\frac{z^{-1}}{(1-dz^{-1})}\{|z| > |d|\} \tag{10}$$

Taking Z-Transform of (**??**) using (**??**)and (**??**)

$$X(z) = \frac{x(0)}{1-dz^{-1}} \qquad |z| > |d| \tag{11}$$