(*f*) If $a, b, c, d \ldots$ be a series of quantities in G. P., show that the reciprocals of a^2-b^2, b^2-c^2, $c^2-d^2 \ldots$ are also in G. P.; and find the sum of n terms of this latter series in terms of a and b.

$$\frac{b}{a}=\frac{c}{b}=\frac{d}{c}, \text{ \&c.}, = r,$$

then in the series $\frac{1}{a^2-b^2}, \frac{1}{b^2-c^2}, \frac{1}{c^2-d^2}$

the ratio of the first two terms is

$$\frac{a^2-b^2}{b^2-c} = \frac{\frac{a^2}{b^2}-1}{1-\frac{c^2}{b^2}} = \frac{\frac{1}{r^2}-1}{1-r^2} = \frac{1}{r^2} =$$

the other ratios found similarly. Therefore the series is in G. P.

$$\text{The sum of } n \text{ terms} = \frac{1}{a^2-b^2} \times \frac{1-\left\{\frac{1}{r^2}\right\}^n}{1-\frac{1}{r^2}}$$

$$= \frac{1}{a^2-b^2} \times \frac{1-\left\{\frac{a^2}{b^2}\right\}^n}{1=\frac{a^2}{b^2}}$$

$$= \frac{b^2}{b^{2n}} \times \frac{a^{2n}-b^{2n}}{(a^2-b^2)^2}$$

$$= \frac{a^{2n}-b^{2n}}{(a^2-b^2)^2 \times b^{2n-2}}$$

(*g*) If a, b, c be in A. P., and b, c, d be in H. P., then $a, \frac{c^2}{d}, c$ are in H. P., and $b, \frac{ad}{b}, d$ are also in H. P.

Because $b : d = b - c : c - d$, and $b - c = a - b$, therefore $b : d = a - b : c - d$

$$a - b : b = c - d : d$$
$$a : b = c : d \text{ (Euc. V., 13)}$$
$$ad = bc$$

$\frac{c}{d} = \frac{a}{b}$, therefore $\frac{c^2}{d} = \frac{ac}{b}$, but because a, b, c are in A. P.

$$b = \frac{a+c}{2}$$

Therefore $\frac{c^2}{d} = \frac{ac}{\frac{a-c}{2}} = \frac{2ac}{a+c}$

" $a, \frac{c^2}{d}, c$ are in H. P. (Art. 333).

Again, $c = \frac{ad}{b}$, because $ad = bc$ and b, c, d are given in H. P.

Therefore $b, \frac{ad}{b}, d$ are in H. P.

(*h*) If g be the geometric mean and a the arithmetic mean between m and n, and if k^2 be the arithmetic mean between m^2 and n^2, prove that a^2 is the arithmetic mean between g^2 and k^2.

$$a = \frac{m+n}{2},\ g^2 = mn,\ k^2 = \frac{m^2+n^2}{2}$$

therefore $\frac{g^2+k^2}{2} = \frac{mn}{2} + \frac{m^2+n^2}{4}$

$$= \frac{m^2+2\,mn+n^2}{4} = a^2$$

Therefore a^2 is the arithmetic mean between g^2 and k^2.

(*i*) If a, b, c, d be in G. P., prove that $(a+d)(a-b)^2 : a(a-c)(a-d) = a - b + c : a + b + c$. $b^2 = ac$, $c^2 = bd$, $ad = bc$;

Therefore $a^2 - ac = a^2 - b^2 = (a-b)(a+b)$

$$\text{“} \quad \frac{(a+d)(a-b)^2}{a(a-d)(a-c)} = \frac{(a \times d)(a-b)}{(a-d)(a+b)}$$

$$= \frac{a^2+ad-ab-bd}{a^2-ad+ab-bd}$$

$$= \frac{a^1+bc-ab-c^2}{a^2-bc+ab-c^2}$$

$$= \frac{(a-b+c)(a-c}{(a+b+c)(a-c} = \frac{a-b+c}{a+b+c}$$

F. E. C.—Please work Ques. 5, Exam. Paper IV., p. 240, H. Smith's Arith. How many pounds of sugar, at 8, 13 and 14 cents per pound, may be mixed with three pounds at $9\frac{1}{4}$, two pounds at $8\frac{1}{2}$, and 4 pounds at 14 cents a pound, so as to gain 16 per cent. by selling the mixture at $14\frac{1}{2}$ cents per pound.

The cost price per pound of the mixture will $= \frac{100}{116}$ of $14\frac{1}{2}$ cents $= 12\frac{1}{2}$ cents.

Then using the form on page 227.

DIFF.	$12\frac{1}{2}$.	LBS.	
$4\frac{1}{2}$......	1 lb. at 8 cents	1 = $4\frac{1}{2}$	$22\frac{1}{4}$ gain.
$3\frac{1}{4}$......	3 " " $9\frac{1}{4}$ "	3 = $9\frac{1}{4}$	
4	2 " " $8\frac{1}{2}$ "	2 = 8	
	* * * * * *		
$\frac{1}{2}$......	1 " " 13 "	$8\frac{1}{2}$ = $4\frac{1}{4}$	$22\frac{1}{4}$ loss.
$1\frac{1}{2}$......	1 " " 14 "	8 = 12	
$1\frac{1}{2}$......	4 " " 14 "	4 = 6	

Therefore we have 1 lb. at 8 cents, $8\frac{1}{2}$ lbs. at 13 cents and 8 lbs. at 14 cents. It is probable that many other combinations might be made.

[Anonymous correspondents have no right to expect that any notice will be taken of their communications. We take it for granted that all our teachers understand that it is impolite to send letters without giving the correct name and address, and that it is dishonest, illegal and therefore dangerous to send as a circular what is really an ordinary letter. EDITORS].

In the figure of II. 11 (Hall & Stevens Euclid) show that

(1) If CH is produced to meet BF at L, CL is at right angles to BF:

(2) If BE and CH meet at O, AO is at right angles to CH:

(3) The lines BG, DF, AK are parallel:

(4) CF is divided in medial section at A.

On AB describe the square ACDB; bisect AC at E; join EB; produce CA to F, making EF = EB; on AF describe the square AFGH.