6. What value of y will make $(2y^2+y)x^2+(11y-z)x+4$ and $2(y^3+y^2)x^3+(11y^2-2y)x^2+(y^2+5y)x+5y-1$ commensurable?

7. Shew that $x^4+px^3+qx^2+rx-s^2$, can be resolved into rational quadratic factors, if $s^2=\frac{r^2}{p^2-4q}$.

8. If the equation $x^2+px+q=o$, have equal roots, shew that the equation $ax^2+p(a+b)x+q(a+2b)=o$, has one of them, and find the other.

9. Eliminate x, y, z, from the equations

$$\left.\begin{aligned} x^2(y+z)&=a^3\\ y^2(z+x)&=b^3\\ z^2(x+y)&=c^3\\ xyz&=abc \end{aligned}\right\}$$

10. Eliminate x between the equations

$$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=m\,;\quad x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=n.$$

11. Shew that if $x^2+py^2+qz^2$ is exactly divisible by $x^2(ay+bz)x+ab\,yz$, then

$$\frac{p}{a^2}+\frac{q}{b^2}+1=o.$$

12. If a, b, c are in Harmonic Progression. prove $a^2+c^2>2b^2$.

13. Sum to infinity $1^2x+2^2x^2+3^2x^3+4^2x^4$, and hence find the sum of

$$\frac{1^2}{2}+\frac{2^2}{2^2}+\frac{3^2}{2^3}+\ldots$$

14. The difference between the $(n-1)$th and nth terms of an H.P. is $\frac{1}{an^2+bn+c}$, find the relation between a, b and c.

15. Shew that the sum of the products of n quantities c, c^2, c^3, etc., taken m, and m together is

$$c^{\frac{m(m+1)}{2}}\times\frac{(c^n-1)\,(c^{n-1}-1)\ldots(c^{n-m+1}-1)}{(c-1)\,(c^2-1)\ldots\ldots\,(c^m-1)}$$

16. There are $(p+q)$ numbers, a, b, c, of which p are even and q odd. Shew that the sum of the products taken 3 and 3 together of the quantities $(-1)^a$, $(-1)^b$, $(-1)^c$ is $\frac{1}{6}$ of $\left\{(q-p)^3-3(q^2-p^2)+2(q-p)\right\}$

17. If $(1+x)^n=1+A_1x+A_2x^2+A_3x^3$ &c., and $(1+x)^{-n}=1+B_1x+B_2x^2+B_3x^3$ &c., shew that $A_3+A_2B_1+A_1B_2+B_3=o$.

ARITHMETIC SOLUTIONS.—DEC. 1878.

1. Book-work. £7 7s. 7d.

2. Book-work. 121, 13728.

3. Book-work. $224\times\frac{1}{7}=32$ lbs. of chicory; $\therefore$ 192 lbs. of coffee. Again, $192\times\frac{1}{6}=30\frac{2}{6}$ lbs.; $\therefore$ $38\frac{2}{6}$ lbs.$-32=6\frac{2}{6}$ lbs. of chicory to be added.

4. $5\times3\frac{1}{3}=\frac{50}{9}$ ft. in bottom: $5\times2\frac{1}{3}\times2=\frac{70}{3}$ ft. in sides: $3\frac{1}{3}\times2\frac{1}{3}\times2=\frac{140}{9}$ ft. in ends; $\therefore$ total area of inside $\frac{600}{9}$ ft. $=\frac{600}{81}$ yds. at 90c. a yd. $=\$5\frac{6}{9}$. Ans.

5. ·0025168+; ·341246+. For *contracted* method, see Robinson's or Brooke Smith's Arithmetic.

6. A note for \$730 drawn at 90 days at 8 %, will be worth 90 days hence, \$744.40.

If discounted 45 days before maturity, its present value at 10 % will be \$744.40 $+\$7\frac{30}{39}$ or $\$734\frac{40}{39}$ Ans. ($\$7\frac{30}{39}$ is P. W. of \$1 due 45 days hence @ 10 %).

7. $\$(52-4)=\$48$ P.W. $\therefore$ \$4 int. on \$48, or int. $\frac{4}{48}$ or $\frac{1}{12}$ of principal for 8 months. Again, $\$(75-5)=\$70$ P.W. $\therefore$ \$5 int. on \$70 or $\frac{5}{70}$ or $\frac{1}{14}$ of principal for unknown time. $\therefore$ time will be $8\times\frac{1}{14}\div\frac{1}{12}$ or $6\frac{6}{7}$ months.

8. $28c.\times\frac{115}{100}=32\frac{1}{6}c.$ selling price of 1st kind to gain 15 %; $42c.\times\frac{120}{100}=50\frac{2}{6}c.$ selling price of 2nd kind to gain 20 %. But average price 35c. $\therefore$ gain 1st kind $(35-32\frac{1}{6})=2\frac{5}{6}c.$ a lb., and $50\frac{2}{6}-35=15\frac{2}{6}c.$ a lb. loss on 2nd kind. To gain 1c. we will have to take $\frac{6}{14}$ lb. 1st.; and to lose 1c. $\frac{6}{7}$ lb. of 2nd; $\therefore$ mix in proportion of $\frac{6}{14}$ of 1st to $\frac{6}{7}$ of 2nd, or 11 : 2.

9. $4\times3\times\frac{3}{4}=9$ c. ft. Again, $2700\times3\times2\frac{1}{2}\times.004\times\frac{1}{12}=6\frac{3}{4}$ c. ft. $\therefore$ loss $(9-6\frac{3}{4})$ c. ft. $=2\frac{1}{4}$ c. ft., or 25 %. Ans.