JUNIOR LEAVING ARITHMETIC.

(Continued from last issue.)

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1. Find the least number which is a multiple of $1\frac{11}{14}$, $4\frac{2}{7}$ and $\frac{48}{49}$, explaining fully the process.

The product of the fractions is $\frac{5^2}{2.7} \cdot \frac{2\ 3\ 5}{7} \cdot \frac{2^4.3}{7^2}$; and this product will be least when the numerator is the L. C. M. of the three numerators and the denominator is the G. C. M of the three denominators.

$\therefore \frac{5^2.2^4.3}{7}$ or $\frac{1200}{7}$ or $171\frac{3}{7}$ is the required number if the word " number " includes fractional number, or 7 times this if whole numbers are meant.

2. Show that the remainder from dividing any whole number by 9 isthe same as the remainder from dividing the sum of the digits by 9.

Theorems of this kind are best proved algebraically, although a sufficient arithmetical proof can be given.

1st. If 10 be divided by 9, 1 remains, and a cipher put to the right of this gives 10 again. Hence if 100 . . ., with any numbered of ciphers, be divided by 9, 1 remains. Hence, if a denotes any number from 1 to 9, $a000$. . . divided by 9 gives a remainder a.

2nd. But a number, such as 47523 say, is the same as $40000 + 7000 + 500 + 20 + 3$, and the remainders from dividing by 9 is $4 + 7 + 5 + 2 + 3$, *i.e.*, the sum of the digits. Therefore we have the theorem reduced to the identity, " the remainder from dividing the sum of the digits by 9 is equal to the remainder from dividing the sum of the digits by 9."

The algebraical proof is much more concise. Any number may be represented as $ar^n + br^{n-1} + cr^{n-2} + \dots yr + z$ where r is the radius and a, b, c, etc. the digits. The remainder, upon dividing this by $r - 1$ is found by substituting 1 for r, thus giving $a + b + c + \dots + y + z$, or the sum of the digits. $\therefore$ etc.

3. A grocer, by selling 12 pounds of sugar for a certain sum, gained 20%. If sugar advances 10% in the wholesale market, what per cent. will the grocer then make by selling 10 pounds for the same sum?

As the sum for which he sells the 12 pounds is immaterial, suppose he sells the 12 pounds for \$12.

Then 12 pounds cost \$10 before the advance,
And 12 " " \$11 after " "
$\therefore$ 10 " " $\frac{5}{6} \times 11 = \$9\frac{1}{6}$ after the advance
And 10 " sells for \$12 after the advance
$\therefore$ He gains $\$2\frac{5}{6}$ on an expenditure of $\$9\frac{1}{6}$.

$\therefore$ He gains $\frac{17}{55} \times \frac{100}{1}\%$, or $30\frac{10}{11}\%$