3. 4 times one part + 4 times other part $=4$ times fraction $=\frac{24}{5}$, 4 times one part + $5\frac{1}{2}$ times other part $=1\frac{1}{2}$.

$\therefore$ $1\frac{1}{2}$ times one part $=-\frac{23}{5}$.

$\therefore$ one part $=-\frac{23}{15}$, etc.

4. When a vulgar fraction is to be reduced to a decimal, show how to determine (*a*) whether the result will be a finite decimal or a pure circulating decimal, or a mixed circulating decimal; (*b*) the number of non-repeating digits in each case.

4. Book-work.

5. A man barters 120 yards of silk, which cost \$1.50 a yard, and sells at \$2.50, giving nine months' credit, for cloth which sells at \$2 on six months' credit. How much cloth ought he to receive?

5. \$1 profit arises from 9 mos. credit,

$\therefore$ \$8 profit will arise from 6 mos. credit on \$1.50, *i.e.*, \$4 on \$9 invested; $\therefore$ the prime cost of second material is $\frac{9}{13}$ of \$2. Hence the number of yards which buyer should receive $= 120 \times \frac{8}{9} \times \frac{13}{9} \times \frac{1}{2} = 130$ yds.

6. *A*, *B*, *C* and *D* together do a work for which *A* by himself would require two hours less than *B*. *A* and *B* together could do it in $\frac{88}{91}$ of the time *C* and *D* together would take, and *B* and *C* in $\frac{88}{91}$ of the time *A* and *D* would take. Find the time each person singly would require to do the work.

6. *A*, *B*, *C*, *D* together would do $1\frac{88}{91}$ of the work which *A* and *B* would do in same time, $\therefore$ *A* and *B* would do $\frac{88}{181}$ of whole work if all were working. Similarly, it may be shown that *A* and *C* would do $\frac{78}{181}$ of whole work, *C* and *D* $\frac{80}{181}$ of whole work, and *B* and *D* $\frac{85}{181}$ of whole work. $\therefore$ *A* does $\frac{48}{181}$, *B* $\frac{33}{181}$, *C* $\frac{30}{181}$, and *D* $\frac{20}{181}$ of whole work. $\therefore$ *A* will require 8 hrs., *B* 10 hrs., *C* 12 hrs., and *D* 16 hrs. to finish the work.

7. Two trains whose lengths are 420 ft. and 460 feet respectively, pass each other in 30 seconds when moving in the same direction, and in $7\frac{1}{2}$ seconds when moving in opposite direction. Find the rate of each train in miles per hour.

7. The sum of the rates at which trains are going is a rate of 420 feet + 460 feet $=\frac{1}{8}$ mile.

$\frac{1}{8}$ mile in 30 mins. $=$ 20 miles per hour,

$\frac{1}{8}$ " $7\frac{1}{2}$ " $=$ 80 "

80 miles per hour $=$ combined speed,

20 " $=$ difference of speeds,

$\therefore$ 50 miles and 30 miles per hour respectively.

8. The circumference of one circle is $27\frac{1}{2}$ feet longer than that of another, and 11 times the diameter of the first is equal to 5 times the circumference of the second. Find the diameter of each, π being assumed $= 3\frac{1}{7}$.

8. From the question the diameter of first circle is $\frac{7}{22}$ of $27\frac{1}{2}$ ft. $=\frac{35}{4}$ ft. longer than *diameter of second. But 11 times diameter* of first $=\frac{11}{7}$ of diameter of second; $\therefore$ first diameter $=\frac{11}{7}$ second diameter; $\therefore$ $\frac{3}{7}$ second diameter $=\frac{35}{4}$ ft.; $\therefore$ second diameter $= 20\frac{5}{12}$ ft., etc.

9. Find the square root of ·00013 to within less than a millionth, and the value of $\sqrt{[(2+\sqrt{})(2+\sqrt{2})]}$ to within less than a *ten-thousandth*.

9. (1) ·011401, (2) 1·9422.

10. The length of an iron cylindrical vessel with closed ends is four feet, and its outside circumference is 40 inches, and the thickness of the metal one inch. Find the entire weight when the cylinder is filled with water, iron being $7\frac{1}{2}$ times heavier than water, and water weighing $62\frac{1}{2}$ lbs. per cubic foot.

10. Radius of cylinder $= \frac{7}{11}$ inches.

$\therefore$ weight of water $=$

$$\frac{22}{7} \text{ of } \left(\frac{59}{11}\right)^2 \times 48 \times \frac{125}{2} \times \frac{1}{1728} \text{ lbs.}$$

The weight of iron $=$

$$\frac{22}{7}\left\{\left(\frac{70}{11}\right)^2 - \left(\frac{59}{11}\right)^2\right\} \times 48 \times \frac{62\frac{1}{2}}{1728} \times 7\frac{1}{2} \text{ lbs.}$$

11. I hold some 3 per cent. stock; on receiving my first half year's dividend I invest it in the same stock at $93\frac{3}{4}$, and my next half year's dividend is \$1905. What amount of stock had I at first?

11. Half year's dividend $+\frac{1\frac{1}{2}}{93\frac{3}{4}}$ of half year's dividend $=$ \$1905; $\therefore$ half year's dividend $=$ \$1875; $\therefore$ he held 1250 shares at first.