3. Simplify $8 + \cfrac{1}{2 + \cfrac{5}{7 + \frac{1}{2}}}$;

and $\cfrac{1 - \frac{4}{5}}{3\frac{1}{4} + 1\frac{1}{2} + \cfrac{1\frac{2}{3}}{6\frac{2}{3}}} \times \left\{\cfrac{1 + \frac{1}{2}}{1 - \frac{1}{2}}\right\}^2$.

4. If $\cdot 0583$ of 1cwt. cost $\cdot 428571$ of $3\frac{1}{2}$ guineas, what will be the cost of 38·5lb.?

5. A sum of £24 13s. 4d. is made up of half-sovereigns, half-crowns, and fourpenny-pieces. There are twice as many half-crowns as half-sovereigns, and the number of half-sovereigns bears to the number of fourpenny-pieces the ratio of 3 to 13. How many are there of each coin?

6. If I lose 16 per cent. by selling a horse for £21, how much did I give for it; and at what price should it have been sold to gain 12 per cent.?

7. If $\frac{3}{8}$ of a stack of hay sold for £15 2s. 6d. when hay was at £4·4 per ton, what would $\frac{1}{2\frac{1}{5}}$ of the same stack fetch, the price having risen to £7·5 a ton?

8. A passenger train starts from A towards B at 8 o'clock, and a goods train and a coal train from B towards A at 8·30 and 9 respectively. The goods train travels 30 and the coal train 20 miles an hour. The passenger train meets the goods train at $9{\cdot}55\frac{5}{7}$, and the coal train at 10·20. Find the rate per hour of the passenger train, and the distance between A and B.

9. A person received £5 5s. as interest for one year on two sums of money, one of which was double of the other, at the rate of 5 per cent. on the larger and 4 per cent. on the smaller sum. Find their amounts.

10. The breadth of a room is 16ft.; the cost of papering the walls at 6d. a square yard is £2 3s. 4d.; and that of carpeting the floor at 6s. a square yard is £9 6s. 8d.: find the height and length of the room.

11. Find the greatest number that will divide 638443 and 34093, leaving remainders 11 and 13 respectively.

12. Divide 73·8 by ·0018, and multiply the quotient by $\frac{3}{19}$ of ·0009747.

Arithmetic.—For Senior Civil Service. Time allowed: 3 hours.

1. What number must three hundred and seventy-one be multiplied by in order that the product may be the same as the quotient of one thousand and nine million ten thousand one hundred and eighty-four by nine thousand and ninety-six?

2. What is the cost of $4\frac{1}{4}$ dozen silver spoons, each weighing 3oz. 1dwt. 10gr., at 4s. 2d. per ounce?

3. Find, by Practice, the value of 36cwt. 3qr. 18lb. at £47 10s. per ton.

4. A rectangular block, which is twice as long as broad, contains 5 acres: if a person walks round it in $7\frac{1}{2}$ minutes, what is the rate of walking in miles per hour?

5. Find to five decimal places the value of—

$$3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1+\frac{1}{26}}}}.$$

6. Express $\cfrac{\cdot 09318}{\cdot 5681}$ of $5{\cdot}2083$ days as the decimal of 3 days 10 hours.

7. If 5 men or 8 women can do a piece of work in 10 days, how many days will 2 men and 4 women take to do the work?

8. Express a pressure of 1 ton per square foot in dynes per square centimetre. [1ft.=30·48cm.; 1lb.=453·6 grammes; weight of 1grm.=981 dynes.]

9. Extract the cube root of ·3 to three decimal places.

10. Define "interest" and "discount." Show that the interest on the discount is the same as the discount on the interest.

11. What sum will amount to £926 2s. in 3 years at 5 per cent., compound interest?

12. A merchant buys 30 hectolitres of Bordeaux wine at 1 franc 40 centimes the litre, and 50 hectolitres at 1fr. 92c. the litre, and mixes them; the freight is $14\frac{1}{2}$ francs per hectolitre, and the import duty 5s. per gallon. Find the price per gallon, in English money, at which he must sell the mixed wine to make a profit of 40 per cent. on his outlay. [1 hectolitre=100 litres; 1 litre=0·22gal.; £1=25·5 francs.]

Algebra.—For Senior Civil Service. Time allowed: 3 hours.

1. Find the value of $\frac{x}{y} - \sqrt{\frac{1+x}{1-y}}$ when $x = \frac{1}{4}$, $y = \frac{1}{5}$.

2. Multiply $x^m + y^n - 2z^p$ by $x^m - y^n + 2z^p$; and divide $a - 81b$ by $a^{\frac{1}{2}} - 3b^{\frac{1}{2}}$.

3. Find the highest common measure and the lowest common multiple of $3x^4 + 14x^3 + 9x + 2$ and $2x^4 + 9x^3 + 14x + 3$.

4. Simplify—

(*a.*) $\cfrac{a+b}{b} - \cfrac{2a}{a+b} + \cfrac{a^3 - a^2b}{b^3 - a^2b}$;

(*b.*) $\left\{\cfrac{1}{1+\sqrt{x}} + \cfrac{\sqrt{x}}{1-\sqrt{x}}\right\} \div \left\{\cfrac{1}{1-\sqrt{x}} - \cfrac{\sqrt{x}}{1+\sqrt{x}}\right\}$.