4. If $5{\cdot}65\dot{3}\dot{1}$ cwt. of lead cost £2·87, what must be given for $3{\cdot}9\dot{5}4$ lb.? (Answer to three places of decimals of a penny.)

5. If 144 lb. of one tea is mixed with 54 lb. of another tea valued at 2s. $0\frac{3}{4}$d. a pound more, and if the mixture is worth 1s. $11\frac{1}{4}$d. a pound, how much a pound is each tea worth?

6. If, when the bank rate is five per cent. per annum, the difference between the true discount and the banker's discount on a bill due six months hence is £1 5s., what is the amount of the bill?

7. The outside diameter of a circular bicycle track 5 yards wide is 190 yards: what will it cost to asphalt the track at 2s. 6d. a square metre? (Answer to the nearest penny.)

8. A and B working together can get through a task in $4\frac{2}{7}$ days, A and C can do the same work in $3\frac{3}{4}$ days, and B and C in 6 days: in what time ought each man to get through it working by himself?

9. A goods train is 18 miles ahead of an express train which travels at the rate of 75 miles an hour and overtakes it in 25 minutes: find the speed of the goods train.

10. A corn merchant bought 2100 quarters of wheat, which he sold so as to gain 30 per cent. on 925 quarters and $12\frac{1}{2}$ per cent. on the remainder. He had previously tried to sell the whole at a uniform advance of 25 per cent., which would have brought him in £176 1s. $10\frac{1}{2}$d. more than he actually received. How much a quarter did the wheat cost him?

11. If the total surface of a cube of coal amounts to 937·5 square decimetres, find its value, in decimal money, at £1 6 florins 2 cents a cubic metre.

Arithmetic and Algebra.—For Civil Service Senior. Time allowed: Three hours.

1. Find the number of pounds in a kilogramme (1000 grammes), given that a gramme is the mass of a cubic centimetre of water, that the mass of a cubic foot of water is 1000 ounces, and that 1 centimetre = 0·3937 inch.

2. If the mean velocity of a rifle bullet over a range of 1000 yards is 1342 feet a second, and that of sound is 1122 feet a second, what time will elapse between the moment when the bullet strikes the target and the moment when the report of the rifle reaches the target?

3. In 1888 an investor bought £10,000 of New Zealand 4 % stock at $96\frac{1}{4}$. In 1898 he sold out at $116\frac{7}{8}$ and invested the proceeds in $3\frac{1}{2}$-per-cents at 103. Find the alteration in his income.

4. A merchant took from a customer a bill for £56 10s., dated 3rd March, due in 100 days (without grace), at 6 %, and his banker discounted the bill on 1st June. How much did the merchant get from the banker?

5. A man wrote to London for a suit of clothes. The postage for his letter and for the parcel cost him 3s. 1d., and he paid a duty of 25 % *ad valorem*. How much did the tailor get if his customer paid £7 10s. in all?

6. Find the quotient and the remainder when $x^6 + \frac{1}{4}x^5 + \frac{3}{5}x^4 + 1$ is divided by $x^2 + \frac{1}{3}x + 2$; and find m so that $2x^4 - 3x^3 + mx^2 - 9x + 1$ may be exactly divisible by $x - 3$

7. Simplify:—

(i.) $$\frac{a+x}{(m+n)^3} \times \frac{x^2-y^2}{12} \div \left\{\frac{m-n}{(m+n)^3} \times \frac{x+y}{6(m^2-n^2)}\right\}$$

(ii.) $$\frac{a^2}{(c-a)(a-b)} + \frac{b^2}{(a-b)(b-c)} + \frac{c^2}{(b-c)(c-a)}$$

8. Solve—

(i.) $x^2 - x + \sqrt{x^2 - 7x + 8} = 5x - 6$ (explain the introduction of extraneous roots)

(ii.) $3x^4 - 20x^3 - 94x^2 - 20x + 3 = 0$

(iii.) $$\begin{cases} x^2 + xy = 2y^2 \\ x^2 + 2xy + 3y^2 + 4x + 5y = 15 \end{cases}$$

and find what condition must be fulfilled in order that the equations $px + q = rx + p$ and $qx + p = px + r$ may be satisfied by the same value of x.

9. Find the relations between the roots and the coefficients of a quadratic equation, and the condition that must be fulfilled in order that the equation may have equal roots.

If x_1 and x_2 are the roots of $x^2 - x - 1 = 0$, form the equation whose roots are $(x_1^2 + x_2^2)$ and $\left(\frac{1}{x_1^2} + \frac{1}{x_2^2}\right)$

Show that the pair of equations $y^2 = 4ax$ and $y = mx + \frac{a}{m}$ has equal roots whatever be the value of m.

10. A man's net income, after paying income-tax of 6d. on every pound over £300, is £700: what would be his net income if the tax were raised to $6\frac{1}{2}$d.?

11. A swimming-bath is 44 feet longer than it is broad. There is a distance of 9 feet from the edge to the dressing-rooms, which are all round the bath, and are themselves 9 feet deep. The whole floor space, together with the space occupied by the bath, has an area of 928 square yards. What are the dimensions of the bath?

Algebra.—For Class D. Time allowed: Three hours.

1. Find the value of—

$$\left(\frac{p}{sy} - \frac{y}{p}\right)\left(\frac{p}{zs} - \frac{z}{p}\right) + \left(\frac{p}{zs} - \frac{z}{p}\right)\left(\frac{p}{xs} - \frac{x}{p}\right) + \left(\frac{p}{xs} - \frac{x}{p}\right)\left(\frac{p}{ys} - \frac{y}{p}\right)$$

where $s = x + y + z$, $p^2 = xyz$, and $x = -1$, $y = 2$, $z = -4$.

2. Multiply the sum of $m^2 - 3mn + 2n^2$, $3n^2 - m^2$, and $5mn - 3n^2 + 2m^2$ by $m - n$.