9. Solve the equations—

(i.) $\frac{x-1}{x-2}+\frac{x-6}{x-7}=\frac{x-5}{x-6}+\frac{x-2}{x-3}$

(ii.) $\sqrt{x+1}+\sqrt{x-2}-\sqrt{2x-5}=0$

(iii.) $\begin{cases} x^2+y^2+x+y=14 \\ xy=3 \end{cases}$

verify the results in each case.

10. Find formulæ for the n^{th} term and the sum of n terms of a geometrical progression.

From a cask of wine $\frac{1}{3}$ was drawn off, and the cask was filled by pouring in water: if this were done 6 times, show that the contents of the cask would be more than $\frac{2}{10}$ water.

11. Eight persons contributed £60 to buy a piano; one-half of the amount was contributed by women, and the other half by men, each man giving £4 more than each woman: what did each contribute?

No. 33.—Algebra.—For Completion of Class D, under Regulations now repealed.

Time allowed: Three hours.

1. Explain briefly the relation between arithmetic and algebra.

Two boys had together £1 1s: if the elder had twice as much as the younger, how much had each? Work this out (*a*) by arithmetic, (*b*) by algebra.

If $a=1$, $b=2$, $c=3$, $d=4$, $e=5$, find the numerical value of—

$$[\{(a+b)\times c\,(d+e)-a\}\,b]\div bd\,\sqrt{a+c}$$

2. State and prove the rules for adding and subtracting positive and negative quantities. Show by examples how the conception of negative quantities may arise in dealing with problems of daily life.

Simplify $a-b-c-(d+2a+\{3b-2c+d\}-4a-2b)$

3. Prove $(a+b)(a-b)=a^2-b^2$, and find the squares of $a+b$ and of $a+b-c+d$. Hence find the squares of 999 and of 97, and the product of 32 and 28.

4. In division the sign of any term of the quotient is + when the divisor and dividend have like signs, and − when they have unlike signs: why is this?

Divide $a^2+2bc-b^2-c^2$ by $a-b+c$; and a^5-b^5 by $(a^3+b^3)(a+b)+a^2b^3$

5. Factorise—

(i.) $8x^2+x-7$ (ii.) $x^2-b^2-2xy+y^2$

(iii.) $36ab-18ac-18b^2+9bc$ (iv.) $81x^4-64x^2y^2+4y^4$

6. Explain carefully the reasoning involved in the process of finding the highest common factor of two expressions by division. Find the H.C.F. of $3x^2+11x+6$ and $2x^2+11x+15$.

7. Solve the equations—

(i.) $\frac{4x-2}{11}+4-\frac{3x-5}{13}=5$

(ii.) $\frac{2x+8}{5}+\frac{x}{2}-8=\frac{x-\frac{4x-9}{3}}{6}-8\frac{5}{6}$

(iii.) $\begin{cases} 2x-3y=3 \\ 4x+5y=39 \end{cases}$

8. A lady distributed 252 shillings among the poor, giving the men 12s. each, the women 6s. each, and the children 3s. each; the number of women was two less than twice the number of men, and the number of children was four less than three times the number of women: how many poor were there?

9. If a certain rectangle were 1 ft. longer and 1 ft. broader it would contain 14 sq. ft. more area; if it were 1 ft. shorter and 6 in. broader its total area would be unchanged: find the dimensions of the rectangle.

No. 34.—Elementary Mathematics.—For Civil Service Junior.

Time allowed: Three hours.

1. (i.) Write down the squares of $3ab^3c^3$ and $-4a^2b^3c^5$ and the cube of $-7a^2b^5c^4$, find the product of the results, and divide it by the fifth power of $6a^2b^5c^5$.

(ii.) Divide $5x^5-12x^3y^3+16x^4y+17x^3y^2+18xy^4$ by $3xy^2-4x^2y+5x^3$.

2. Factorise—

(i.) x^3-2x^2-x+2 (ii.) $x^2-\left(a+\frac{1}{a}\right)x+1$ (iii.) x^4-16

Also find the H.C.F. of $x^4+3y^4+xy\,(x^2-y^2)+2x^2y^2$ and $x^5-3y^5+xy\,(x+y)$

3. (i.) Simplify—

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

(ii.) Draw the graph of $y=\frac{2x+5}{x-5}$