# AN ROINN OIDEACHAIS
## (Department of Education.)

### BRAINNSE AN MHEADHON-OIDEACHAIS
#### (Secondary Education Branch).

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### INTERMEDIATE CERTIFICATE EXAMINATION, 1939.

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## MATHEMATICS (Algebra).

*MONDAY, 19th JUNE.*—Afternoon, 3.30 P.M. TO 6 P.M.

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The total number of questions answered should not exceed *seven.*

Mathematical Tables may be obtained from the Superintendent.

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1. If $\dfrac{1}{u}+\dfrac{1}{v}=\dfrac{2}{f}$, express the value of $f$ in simplest form in terms of $u, v$. Check your result when $u=3$, $v=2$.

[25 marks.]

2. Solve the equation :

$$\frac{6}{x-5}-\frac{3x+1}{2x-3}=1.$$

[25 marks.]

3. If $a=\dfrac{x}{y+z}$, $b=\dfrac{y}{z+x}$, $c=\dfrac{z}{x+y}$, prove that

$$\frac{a}{1+a}+\frac{b}{1+b}+\frac{c}{1+c}=1.$$

[25 marks.]

4. A grocer mixed three kinds of tea. In the mixture he put :

  $x$ lbs. which cost $(x+4)$ pence per lb., $(x-8)$ lbs. which cost $(x+8)$ pence per lb., and $(x+4)$ lbs. which cost $(x-7)$ pence per lb. He sold the entire mixture at $(x+10)$ pence per lb., thereby making a profit of £3 11s.

  (i) Find, in terms of $x$, the total cost price of the mixture ;

  (ii) Calculate the value of $x$.

[25 marks.]

5. Factorise fully the following expressions :

    (i) $(x+y)^3-(x-y)^3$,

    (ii) $(x^2+x)^2-14(x^2+x)+24$,

    (iii) $x^3-3a^2x+2a^3$.  [Use Remainder Theorem.]

                                        [25 marks.]

6. A military officer wished to form the men of his regiment into a square. If he formed them into a solid square of side $x$ men there would be nine men left over. If he formed them into a hollow square ten men deep and $(x+2)$ men in side there would be ten men left over. Find how many men were in the regiment.

                                        [30 marks.]

7. Prove that $\log_a \dfrac{P}{Q}=\log_a P-\log_a Q$.

Find two whole numbers, $x$, $y$ such that $\log_{10}(x-y)=0\cdot8451$, approximately, and $\log_{10}x-\log_{10}y=0\cdot1426$, approximately.

                                        [30 marks.]

8. A motor car did a journey of $y$ miles at a speed of $x$ miles per hour. If the speed had been 4 miles per hour greater, the time would have been $18\frac{3}{4}$ minutes less, but if the speed had been 2 miles per hour less the time taken would have been $11\frac{1}{4}$ minutes more. Calculate the values of $x$ and $y$.

                                        [30 marks.]

9. If $a+b+c=0$, prove that $a^3+b^3+c^3=3abc$.

    (i) Solve the equation :

$$\sqrt[3]{x-1}+\sqrt[3]{x-2}+\sqrt[3]{x+3}=0.$$

                                        [30 marks.]

10. ABC is a right-angled triangle in which AB=AC=6 inches. Points D, E are taken on AB, AC respectively such that AD=AE=$x$ inches. Through D, E lines DF, EG are drawn parallel to AC, AB respectively, meeting each other at M and meeting CB at F, G respectively. Express in terms of $x$ the sum [S] of the areas of ADME and FMG.

Draw a graph showing how S changes while $x$ is increasing from 0 to 4.

What is the least value which S can have ?

                                        [30 marks.]