# AN ROINN OIDEACHAIS

## AN BRAINSE GAIRM-OIDEACHAIS.

## CERTIFICATE EXAMINATIONS
for
DAY VOCATIONAL COURSES, 1952.

## MATHEMATICS.

*Monday, June 23rd.*—10 *to* 1 *p.m.*

INSTRUCTIONS.

(*a*) Not more than *eight* questions to be attempted.
(*b*) The marks allotted to each question are shown in brackets under.
(*c*) Mathematical Tables are supplied.
(*d*) Special credit will be given to candidates who display neatness and order in answering.
(*e*) All working must be shown in the answer book.

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1. (*a*) Simplify $\frac{\frac{3}{7}\times 12\frac{3}{5}-2\frac{2}{35}}{2\frac{3}{7}+\frac{11}{21}}$.

(*b*) Express $\frac{3}{7}$, $\frac{11}{12}$, $\frac{2}{35}$ and $\frac{11}{21}$ in decimal forms, each correct to two places. [10 marks.]

2. An E.S.B. customer's electricity consumption is as follows:—

360 units for lighting at 1·3 pence per unit.
360 units for water heating at a penny per unit.
651 units for water heating at ·7 pence per unit.

(*a*) Make out the account for the above.

(*b*) What is the average price per unit paid by the customer to the nearest $\frac{1}{100}$ of a penny? [10 marks.]

3. An advertisement for a German car gives its petrol performance as 14 kilometres per litre. What does this represent in miles per gallon?

(1 litre = 1·76 pints. 1 Metre = 39·37 ins.) [10 marks.]

[P.T.O.

4. A hut with a rectangular floor is 20 ft. long and 12 ft. wide. The roof is in the shape of half a cylinder, with a diameter the same as the width and running the full length of the hut. If the vertical side-walls are 10 ft. high, calculate the area of sheeting required for the walls and roof.

[10 marks.]

5. In his estimates a contractor calculates labour costs at 75% of the cost of materials. His profit is taken as 40% of the net cost of the job.

(*a*) What is his estimate for a job, the cost of materials for which are £780 ?

(*b*) If £E and £M represent the amount of the estimate and the cost of materials respectively, make out a formula connecting these symbols and express it in a simplified form.

[10 marks.]

6. (*a*) Write down the logarithm of 63·21 and the number whose logarithm is 0·7010.

(*b*) Use logarithms to evaluate $\frac{7364 \times 28{\cdot}13}{127{\cdot}5}$.

(*c*) If log 3=0·4771 find the logs of 9 and $\sqrt{3}$.

[10 marks.]

7. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ and $\frac{V}{A} = R$ are formulae which occur in electricity.

(i) Find the value of R from the first formula when $R_1=3{\cdot}15$ and $R_2=6{\cdot}3$.

(ii) Use this value of R to calculate A from the second formula when V=21.

[12 marks].

8 Solve the equations :

(*a*) $5(x+4)-6(2-x)=30$.

(*b*) $\frac{3x+10}{7} - \frac{2x+3}{5} = 1$.

(*c*) $2{\cdot}25\ (x+4{\cdot}5)-0{\cdot}25(2x+1{\cdot}5)=15$.

[12 marks.]

9. Find two values of $x$ which satisfy the equation :

$$10x^2=7(x+21).$$

[14 marks.]

10. Perpendiculars erected at the mid-points of the sides of a triangle ABC meet in O. Prove that OA=OB=OC. Hence, using ruler and compass only, circumscribe a circle about a $\triangle$ABC where AB=3·4″, BC=2·8″ and AC=4″ and measure its diameter.

(14 marks.]

11. (*a*) If $\tan A = \frac{35}{12}$ calculate as fractions cos A and sin A.

(*b*) Use your tables to write down tan 7° 12′ and the angle whose tangent is 1·1960.

(*c*) From an aeroplane flying directly over Dublin Airport at an altitude of 20,000 ft., it is observed that the angle of depression made by a County Louth river mouth is 7° 12′. Calculate the distance of the river mouth from Dublin to the nearest mile.

[14 marks.]

12. Experiments carried out on a coil gave the following values for its electrical resistance (R) in ohms and the corresponding temperature (T) in degrees centigrade.

| | | | | | |
|---|---|---|---|---|---|
| T .. | 20 | 60 | 100 | 140 | 180 |
| R .. | 11·35 | 12·45 | 13·54 | 14·65 | 15·75 |

Plot a graph showing the relation between R and T, using as large a scale as the paper permits.

From the graph find :

(i) for what value of R the graph cuts the axis of R,

(ii) the temperature of the coil when its resistance is 14 ohms,

(iii) the values of $a$ and $b$ for which the equation $R=aT+b$ represents the relation between R and T.

[14 marks.]