AN ROINN OIDEACHAIS.

AN BRAINSE GAIRM-OIDEACHAIS.

CERTIFICATE EXAMINATIONS
for
DAY VOCATIONAL COURSES, 1951.

MATHEMATICS.

Monday, June 25th.—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. Simplify :

(*a*) $\dfrac{8\frac{4}{7} \times 2\frac{1}{8} - 7\frac{1}{2}}{1\frac{1}{7} \times 6\frac{1}{4}}$ and (*b*) $\dfrac{2{\cdot}5 - {\cdot}5625.}{{\cdot}125 - {\cdot}0625.}$

[10 marks.]

2. Of the 70 sheets of metal used in the construction of a water tank, 40 weigh 30 lbs. each, 20 weigh 25 lbs. each, and 10 weigh 20 lbs. each. Calculate (*a*) the average weight in lbs. of a metal sheet used, and (*b*) the weight of the completed tank in cwts., qrs. and lbs., allowing an additional 5 per cent. for the weight of the rivets.

[10 marks.]

3. Find the weight in lbs. of 30 yards of copper cable, $\frac{1}{2}$ inch in diameter.

($\pi = \frac{22}{7}$ and 1 cu. ft. copper=550 lb.)

[10 marks.]

4. The speed limit on a certain French road is 50 kilometres per hour. The speedometer of an Irish tourist motoring on this road reads in miles per hour. What reading in miles per hour must he not exceed to comply with the law ?

(1 Metre=39·37 ins.)

[10 marks.]

5. Solve the equations :

(*a*) $\frac{x+2}{7}-\frac{x-1}{4}=\frac{x-5}{3}$. (*b*) $13{\cdot}5x+163=1251{\cdot}1$.

[10 marks.]

6. From the formula $L=l\{1+a(T-t)\}$ (i) express a in terms of the other letters and (ii) calculate the value of a, correct to 6 places of decimals, when $L=100{\cdot}1344$, $l=100$, $T=90$, $t=10$.

[10 marks.]

7. (*a*) Given that logarithm $26{\cdot}23=1{\cdot}4188$, write down the numbers whose logarithms are $3{\cdot}4188$, $5{\cdot}4188$ and $\bar{1}{\cdot}4188$ respectively.

(*b*) The horse power of a motor-car engine may be calculated from the formula $\frac{ND^2}{2{\cdot}5}$, where N is the number of cylinders in the engine and D is the bore of the cylinder in inches. Use logarithms to calculate the horse power of an 8 cylinder engine of bore 2·623 inches.

[10 marks.]

8. The fixed expenses—including wages, rent, light, etc.—of a factory amount to £260 per week. The additional manufacturing costs amount to 4/- per article. Write down expressions showing in pounds (£) the total costs of producing (*a*) 1 score articles per week, (*b*) 100 score, (*c*) n score.

If the articles are sold directly to the wholesaler at £8 per score, what is the least number that must be sold in any one week in order that a loss may not be shown ?

[14 marks.]

9. What number must be added to x^2-18x in order to give an expression which is a perfect square ? Hence solve the equation $x^2-18x=495$.

[14 marks.]

10. Write down the theorem or rule used for finding the length of the longest side of a right angled triangle when the lengths of the other two sides are known.

The longest side of a 45° set square measures 14 inches : find the length of the other sides.

[14 marks.]

11. (*a*) What is meant by the cosine of an angle ?

(*b*) Write down the cosine of 72° 18′ and the angle whose cosine is 0·8121.

(*c*) Solve completely the triangle ABC, given A=72° 18′, B=90° and side AB=16 feet. [14 marks.]

12. A hosiery factory uses two types, A and B, of the same machine. A, which is automatic, takes an hour to set and then produces at the rate of 8 articles an hour. B is "hand-fed," takes no time to set and produces 6 articles an hour. On the same page, same axes and same scales, draw graphs to show the number of articles which each machine could produce from 8 a.m. to 5.30 p.m.

Use your graph to answer the following :—

(*a*) What is the total production of each machine from 8 a.m. to 5.30 p.m. ?

(*b*) Which machine produces the greater number of articles on a Saturday, when the machines stop at 11.30 a.m. ?

(*c*) At what time will the number of articles produced by each machine be the same ?

[14 marks.]