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(Department of Education)

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INTERMEDIATE CERTIFICATE EXAMINATION, 1934.

MATHEMATICS (Algebra).

MONDAY, 18*th* *JUNE*.—Afternoon, 3.30 p.m. to 6 p.m.

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

(Candidates should see that answers to questions in excess of *seven* are cancelled.)

Mathematical Tables may be obtained from the Superintendent.

1. Find the value of

$$\left(\frac{x-a}{x-b}\right)^3-\left(\frac{x-2a+b}{x+a-2b}\right)$$

when $x=\frac{1}{2}(a+b)$. [25 marks.]

2. Solve the equations :

(i) $2\frac{1}{2}x-5\ (\frac{1}{6}x+1)=\frac{8}{9}x+5.$

(ii) $\left.\begin{array}{l}\frac{1}{2}x=\frac{1}{3}y+1\\ \frac{1}{3}x=\frac{1}{2}y-1\end{array}\right\}$

Verify your results in both (i) and (ii). [25 marks].

3. A rectangular picture, including the frame, measures a ins. by b ins., and the frame is c ins. wide. Express in terms of a, b, c, the area of the frame (i) in sq. ins. ; (ii) as a percentage of the area of the whole (picture and frame).

Assuming that $a=28$, $b=20$, find the value of c, correct to $\frac{1}{10}$ inch so that the result in (ii) may be 20. [25 marks].

4. An officer wished to form his men into a solid square. At the first attempt there were 56 men left over, and on increasing the side of the square by one man he found that he was 33 men short. How many men had he ?

Show that he could have formed them into a hollow square, three deep. [27 marks.]

5. State and prove the *Remainder Theorem*.

Find the numerical values of p and q so that the expression $x^3+px^2+qx+24$ may be divisible by $(x+4)\ (x-3)$. [27 marks.]

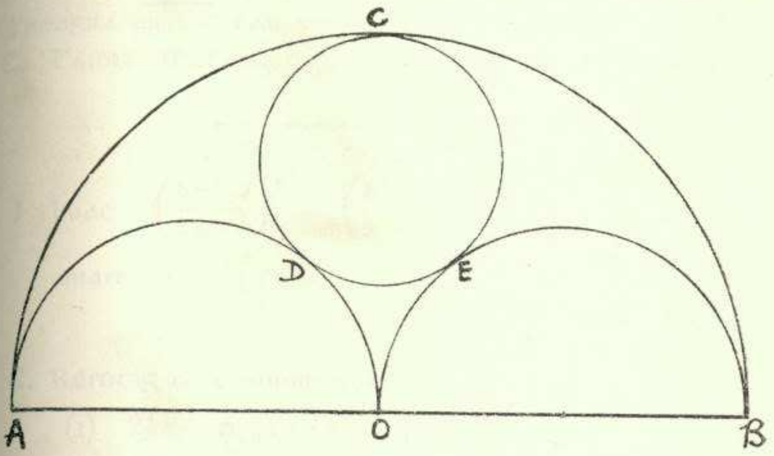
6. The length of a rectangle is 34 feet longer than the breadth, and the square on the diagonal exceeds the area of the rectangle by 1,828 square feet. Find the dimensions of the rectangle.

[28 marks.]

7. AB is the diameter of the semicircle ACB whose centre is O. ADO and OEB are semicircles, and the circle DCE touches the three semicircles.

Prove that the sum of the areas of the semicircles ADO and OEB is half the area of semicircle ACB, and calculate the length of the radius of the circle DCE as a fraction of AB. [Assume AB$=4a$ units].

[28 marks.]



8. Express $\dfrac{1}{\sqrt{(3+x)}+\sqrt{3}}$ as a fraction with a rational denominator.

Solve
$$\frac{1}{\sqrt{(3+x)}+\sqrt{3}}+\frac{1}{\sqrt{(3-x)}+\sqrt{3}}=\frac{\sqrt{6}}{x}$$
and verify your solution.

[30 marks.]

9. Express in simplest form, free from logarithms, the relation :
$$k=\log_a a^5+a^{\log_a c}$$
Solve the equation :
$$\frac{2}{3-\log x_{10}}+\frac{5}{4+\log x_{10}}=2.$$

[30 marks.]

10. Draw the graphs of
$$y=2x-1 \text{ and } y=\frac{6-5x}{x-3},$$
from $x=-3$ to $x=2\cdot6$,
using the same axes and the same scales in each case.

Write down the equation in x whose roots can be found by the points of intersection of these graphs, and use the graphs to find approximate values of its roots.

[30 marks.]