# AN ROINN OIDEACHAIS
(Department of Education).

## BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

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**LEAVING CERTIFICATE EXAMINATION, 1928.**

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### HONOURS

## APPLIED MATHEMATICS.

*WEDNESDAY, 20th JUNE.*—Afternoon, 4 to 6 P.M.

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*Five* questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. If a particle is moving in a straight line with constant acceleration $f$, prove that $s = ut + \frac{1}{2} ft.^2$

A stone A is projected vertically upwards with velocity 48 ft. per second and 2 seconds later a stone B is projected vertically upwards from the same place at 144 ft. per sec. Find the distance from the point of projection of their meeting point.

[44 marks].

2. What is a " couple " ?

Show that a couple has the same moment about any point in the plane and deduce that forces that are represented completely by the sides of a polygon taken the same way round may also be represented by a couple.

[44 marks].

3. Prove that if particles start at the same instant from a given point and slide down smooth straight paths of different slopes, their positions reached :—(i) when each has attained a given speed lie on a straight line, (ii) after the lapse of a given time lie on a circle.

Find the straight path of quickest descent from a given point to a given circle.

[44 marks].

4. Find for small oscillations an expression for the period of a simple pendulum in terms of its length.

A faulty seconds-pendulum loses 5 seconds per hour : find the required alteration in its length so that it may keep correct time.

[48 marks].

5. Given that the distance, from the centre of the circle, of the centre of gravity of a circular arc which subtends an angle $2a$. at the centre of the circle is $(a \sin a) / a$, where $a$ is the radius, find the centres of gravity of the corresponding (i) sector, (ii) segment of the circle.

[48 marks].

6. A mass of 10 lbs. is supported on a rough plane by a force P applied in a direction making an angle $\theta$ with the plane which is inclined at angle 40 degrees to the horizontal. If the coefficient of friction is equal to tan $10°$, express the value of P in terms of $\theta$ and hence find the minimum value of P and the corresponding value of $\theta$.

[48 marks].

7. Explain what is meant by "coefficient of restitution." A ball of coefficient of restitution $e$ falls from height $h$ to a horizontal plane. To what height will it rise after the first rebound ? If $c = \frac{7}{12}$, find what time will elapse from the moment the ball is dropped from a height of 10 feet till it comes to rest permanently ?

[48 marks].

8. A string one metre long can support a body whose weight is not greater than 10 kilogrammes. A mass of 100 grammes is tied to one end and whirled in a horizontal circle : find the greatest number of revolutions per second that can be given to the mass without breaking the string and calculate the kinetic energy of the mass when moving at the greatest possible speed.

[48 marks].