AN ROINN OIDEACHAIS
(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1933.

PASS.

APPLIED MATHEMATICS.

THURSDAY, 22nd JUNE.—AFTERNOON, 4 TO 6 P.M.

Not more than *six* questions may be answered. All questions are of equal value.

Mathematical Tables may be obtained from the Superintendent.

1. How is the speed at any instant estimated from the distance time graph ?

The following table gives the distance and time of an electric train from a station A when travelling between two stations A and B, 4800 feet apart.

Distance in Feet ..	0	350	1200	2100	2600	2900	3600	4200	4700	4800
Time in Seconds	0	20	40	60	70	80	100	120	140	143

What is the average speed (in feet per sec.) for the whole journey ? Estimate as accurately as you can from the distance-time graph the maximum speed attained between A and B.

2. One end AB of a rectangular platform ABCD is attached to a wall by means of two hinges at equal distances from A, B respectively. The platform is supported in a horizontal position by means of two chains attached to points in the sides AD, BC and to points in the wall vertically above A, B respectively. A cask weighing 3 cwt. stands on the platform symmetrically placed with respect to A, B, and its Centre of Gravity is at a horizontal distance of 3 feet from the wall. Each chain is 6 feet long and is inclined at 50° to the horizontal. Find the tension in each chain and the reaction at each hinge in magnitude and direction.

3. A cyclist A at cross-roads, starts to cycle due north at a speed of 12 miles per hour, and at the same time a rider B moving eastwards starts towards the cross-roads at a speed of 8 miles per hour. Find the velocity of B relative to A and how long it will be before they are closest together.

4. A particle is projected with a horizontal velocity of 100 ft. per second from a point 150 ft. above a horizontal plane. Neglecting the resistance of the air, find the horizontal distance travelled before it meets the plane and the velocity in magnitude and direction just before it strikes the plane.

5. What is the principle of conservation of momentum ?

A truck of weight 6 tons moving at 8 miles per hour overtakes a truck of weight 4 tons moving at 2 miles per hour on a straight track and both move on together. Find their common velocity.

6. Two bodies A and B each of weight 2 lb. are connected by a light string passing over a small smooth pulley at the top of a smooth plane, inclined at 28° to the horizontal. A rests on the plane and B is allowed to hang vertically. If the system be free to move, find the acceleration and the tension in the string.

7. (*a*) A body of weight W is suspended by means of a string. A second string knotted to the first one is pulled horizontally until the upper portion of the latter is inclined at an angle α to the vertical. Find the horizontal pull required.

(*b*) Two strings making 38° and 47° with the vertical support 28 lb. Find graphically (or otherwise) the tension in each string.

8. A uniform sheet of cardboard is in the form of a square of side 8″ and a triangular portion is removed by cutting along the line joining the middle points of two adjacent sides. Find the distance of the Centre of Gravity of the remainder from the centre of the square.

9. A uniform beam 10 ft. long and weighing 20 lb. is suspended by means of two vertical cords attached at distances of one foot from the ends of the beam respectively. The greatest load which either of the cords can bear is 100 lb. Find the shortest distance from one of the cords at which a load of 140 lb. may be suspended without breaking the cord.

10. A train weighing 200 tons is moving at a certain instant with a speed of 15 miles per hour and at a subsequent instant with a speed of 30 miles per hour. The accelerating force during the interval is one ton. Find the time between the instants in seconds and the distance travelled in feet.