AN ROINN OIDEACAIS

M.47.

LEAVING CERTIFICATE EXAMINATION, 1962.

APPLIED MATHEMATICS — PASS.

TUESDAY, 19th JUNE — Morning, 10 to 12.30.

Not more than six questions may be answered. All questions are of equal value. Mathematical Tables may be obtained from the Superintendent.

1. A particle travels with uniform acceleration from A to B, a distance of 6 feet, in one second. Its speed at B is 7 ft. per sec. and it travels with a uniform retardation of 4 ft. per sec. per sec. from B to C, its speed at C being 5 ft. per sec.
Find (i) the speed of the particle at A, and (ii) the distance BC.

2. A car starts from rest and gathers speed. The following table gives the distances travelled by the car from its starting point in the corresponding times:-

Time (in seconds)	5	10	15	20	25
Distance (in feet)	12	42	81	160	300

Show that the acceleration of the car is not uniform.
Draw a distance-time curve and use it to estimate the speed of the car after 15 seconds.

3. A boat which travels at 5 m.p.h. in still water is to cross a river 500 yards wide which is flowing at 2 m.p.h. (i) If the boat is headed at right angles to the flow of the river, how far down will it reach the other side? (ii) At what angle to the flow of the river must the boat be headed so that it will reach a point directly across the river?

4. Assuming that the earth is a sphere of radius 4,000 miles and that it rotates about its axis once in 24 hours, (i) find its angular velocity in degrees per hour and in radians per hour, (ii) find the linear speed, in miles per hour, of each of two points on the surface of the earth, one at the equator and the other at latitude 60°.

5. ABC is a triangular lamina in which AB = AC = 5" and BC = 8". If the lamina is suspended at B so that it hangs freely, what angle will BC make with the vertical?

6. Forces of 12, 4, 6 lb. wt. act along the lines OA, OB, OC, respectively, where $\angle AOB = 60^\circ$ and $\angle BOC = 60^\circ$. Find their resultant and find the angle which its line of action makes with OA.

7. State the theorem of the Triangle of Forces.
A uniform bar AB which weighs 5 lb. is supported by two strings AC, BC attached to a fixed peg C. If AC = 8", BC = 4", CD = 3" where D is the middle point of AB, find the tensions in the strings.

8. An engine raises 500 lb. of water per minute from a depth of 10 feet and discharges it with a velocity of 8 ft. per sec. Find the work done per minute (i) in raising the water, (ii) in giving it the velocity of 8 ft. per sec.

Find, also, the horse-power at which the engine is working.

9. State the Principle of Archimedes, and describe briefly how you would test it by experiment.

A uniform object suspended by a vertical string is lowered into a liquid of specific gravity 0·8 until half of its volume is below the surface. If the tension in the string is then one third of the weight of the object, find the specific gravity of the object.