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(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS
(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1956.

APPLIED MATHEMATICS—PASS.

WEDNESDAY, 13th JUNE.—AFTERNOON, 2.30 TO 5.

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

Mathematical Tables may be obtained from the Superintendent.

1. Forces of 3, 4, 2 lb. wt. act along the sides BC, CA, BA, respectively, of an equilateral triangle ABC. If R is their resultant, find
(i) the components of R along BC and perpendicular to BC;
(ii) the magnitude of R, correct to one decimal place.

2. A uniform bar AB which weighs 12 lb. is smoothly hinged at A. It is maintained in a position making an angle of 45° with the horizontal by means of a force applied to it at B.

Find (i) the magnitude of the force if it is applied in the direction BC, where the angle ABC is 60° ; and (ii) in what direction the force at B should be applied so that it would have the least magnitude.

3. Prove that the centre of gravity of a triangular lamina is at the intersection of the medians.

A lamina, of mass $3m$, is in the shape of a triangle ABC, the perpendicular distance from A to BC being 6 inches. Masses of m , $2m$, $3m$, are attached to the lamina at the points A, B, C respectively. Find the perpendicular distance of the centre of gravity of the system from BC.

4. A train starts from rest and gathers speed. The following table gives the speed of the train at the corresponding times:—

Time (in seconds)	0	5	10	15	20	25	30
Speed (in feet per second) ..	0	12	21	26	29	31	33

Draw a speed-time curve and use it to find, approximately, the distance travelled by the train in the first 30 seconds.

5. A stone dropped from the top of a tower has a velocity of $32\sqrt{5}$ feet per second on reaching the ground. Find the height of the tower.

If a stone were thrown vertically downwards from the top of the tower with an initial velocity of 8 feet per second, how long would it take to reach the ground and what velocity would it have on reaching the ground?

6. A smooth inclined plane has a slant height of 10 feet and a vertical height of 6 feet. If a particle is projected up the line of greatest slope of the plane with an initial velocity of 12 ft. per sec., find how far it will travel up the plane and how long it will take to return to the point of projection.

7. A 20 lb. block is resting on a rough plane inclined to the horizontal at an angle of 30° . A force of 25 lb. wt., applied along the line of greatest slope, would just cause the block to move up the plane. Find the coefficient of friction between the block and the plane.

Find, also, the least force, applied along the line of greatest slope, that would cause the block to move down the plane.

8. A cyclist is travelling due East at 15 m.p.h. and the wind is blowing at 10 m.p.h. from a point 60° North of East; find, graphically or otherwise, the velocity of the wind relative to the cyclist, in magnitude and direction.

To a man walking due East the wind appears to be blowing from the North-East; at what speed is the man walking?

9. If a plane lamina be immersed horizontally in a liquid at rest, prove that the pressure of the liquid is the same at all points on the lamina.

A vessel in the shape of a right circular cone is filled with a liquid of specific gravity 0.8 and stands with its base on a horizontal table. The vertical height of the cone is 12 inches and the diameter of the base is 10 inches. Find the total thrust of the liquid on the base.

[One cubic foot of water weighs 62.5 lb.]