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(Department of Education.)

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(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1947.

APPLIED MATHEMATICS—PASS.

THURSDAY, 19th JUNE.—AFTERNOON, 4 TO 6.

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

Mathematical Tables may be obtained from the Superintendent.

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1. The distance s feet travelled by a body in time t secs. is given by the formula $s=4t^2$. Draw a graph showing the relation between s and t from $t=0$ to $t=4$. Show how the average velocity for the interval of time, (i) $t=2$ to $t=3$, (ii) $t=2$ to $t=2{\cdot}1$, can be found from the graph, and find from the graph, as accurately as you can, the velocity when $t=2$.

2. R is the resultant of two velocities A and B. If R and A are known in magnitude and direction, show by means of a diagram how to find B in magnitude and direction.
An aeroplane can travel 200 miles per hour in still air. When steering 30° north of east according to the compass it is diverted by a wind and at the end of two hours reaches a point which is 400 miles north-east of the starting point. Find, graphically or otherwise, the velocity of the wind in magnitude and direction.

3. A gun weighing 2,400 lb. fires a shot weighing 80 lb. with a velocity of 2,000 ft./sec. Find the velocity of recoil of the gun, and the constant force required to check the recoil in (i) 1/5 sec.; (ii) 2 feet.

4. Four horizontal wires are attached to a fixed point on a pole and exert the following tensions on it: 24 lb. wt. due north, 30 lb. wt. due east, 40 lb. wt. south-west and 60 lb. wt. 60° south of east. Calculate the resultant pull on the pole and find its direction.

5. APB and CQD are two light rods which can turn in the same vertical plane about A and C respectively. When a vertical force is applied at B and a 10 lb. wt. is suspended at D, the rods are maintained in a horizontal position, with AB above CD, by means of a vertical string connecting the rods at P and Q. Find the force at B and the reactions at A and C if AP=16″, PB=4″, CQ=4″, QD=16″.

6. ABCD is a rectangular lamina; AB=DC=24″; AD=BC=16″. P and Q are the middle points of DC, BC respectively. Find the distances of the c.g. of the remainder from AB, AD when the triangle PCQ is cut away.

7. Find the least *horizontal* force required to push a mass of 10 lb. up a smooth plane inclined at 30° to the horizontal. Find the acceleration if the horizontal force is doubled.

8. Two equal masses A, B, of 4 lb. each, are connected by a light inextensible string passing over a light smooth pulley. Another mass of 4 lb. is suspended from B by means of a string of length 1 ft. If the system is allowed to move freely, find its acceleration and the tension in each string.

9. A metal cube of side 8 cm. is suspended in a liquid of density 0·82 grm. per c.c. so that a pair of faces are horizontal and the upper face 6 cm. below the surface of the liquid. Find the total thrust due to the liquid (i) on the upper horizontal face of the cube; (ii) on the lower horizontal face. Verify that the resultant upward thrust on the cube due to the liquid is equal to the weight of the liquid displaced.