LEAVING CERTIFICATE EXAMINATION, 1960.

APPLIED MATHEMATICS—PASS.

*TUESDAY*, 21*st 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.

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1. A mass of 5 lb. is supported by two strings. One of the strings makes an angle of 40° with the vertical and the tension in it is 2 lb. wt. Find the tension in the other string and the angle which it makes with the vertical, correct to two significant figures.

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

ABCDE is a plane lamina in which ABE is an equilateral triangle of side 6 in. and BCDE is a rectangle having BC=3 in. (see diagram). Show that the centre of gravity of the lamina is at the middle point of BE.
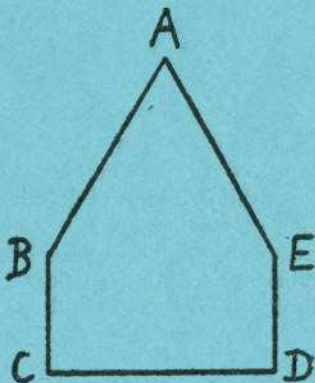
3. A 4 lb. wooden slab is lying at rest on a plane inclined at 30° to the horizontal. A force of 5 lb. wt., applied along the line of greatest slope, would just cause the slab to move up the plane. Find the coefficient of friction between the slab and the plane.

What is the greatest inclination the plane could have so that the slab would remain at rest on it ?

4. A mass of 150 gm. is suspended from a fixed peg P by a light string PB, 10 cm. in length, and a force F is acting upon it so as to keep it 8 cm. away from the vertical through P. Find the magnitude of F

    (i) if it is a horizontal force,

    (ii) if it is acting along the straight line BC, where PBC is an angle of 135°.

5. A stone is projected vertically upwards from ground level. If it reaches a height of 100 feet in 2 seconds, find

   (i) its initial velocity,

   (ii) in how many seconds more will it again be at a height of 100 feet,

   (iii) the greatest height it reaches.

6. In 2 seconds a particle travels from X to Y with a uniform acceleration and in a further 5 seconds it travels from Y to Z with a uniform retardation, the total distance XZ being 90 feet. The velocity of the particle at X is 10 ft. per sec. and its velocity at Y is 20 ft. per sec. Find the distance XY and the velocity of the particle at Z.

7. A cyclist is travelling due West at 10 m.p.h. and the wind is blowing at 6 m.p.h. from a direction 30° North of East. Find, graphically or otherwise, the velocity of the wind relative to the cyclist, in magnitude and direction.

8. (i) A car of mass one ton is ascending an incline of 1 in 112 at a steady speed of 30 m.p.h. If the frictional resistances to motion are equivalent to 40 lb. wt., find the horse-power at which the car is working.

   (ii) Find, in lbs. wt., the force required to give a body of mass 20 lbs. an acceleration of 4 ft. per sec.^{2}

9. Describe how you would show experimentally that the liquid pressure at a point in a liquid at rest is directly proportional to the depth of the point below the surface.

A solid cylinder, of diameter 2 cms. and 7 cms. in length, is suspended by a vertical string so that it is totally immersed in a liquid of specific gravity 0·9. The axis of the cylinder is vertical and the top of the cylinder is $3\frac{1}{2}$ cms. below the surface. Find the total thrust of the liquid (i) on the top and (ii) on the base of the cylinder.