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LEAVING CERTIFICATE EXAMINATION, 1958.

APPLIED MATHEMATICS—PASS.

WEDNESDAY, 18*th 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.

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1. Forces of 4, 2, 1 lb. wt. act along the lines OA, OB, OC, respectively, where $\angle AOB = 60°$, $\angle BOC = 30°$ and $\angle AOC = 90°$.   Find the components of their resultant along OA and along OC.

Find also, correct to the nearest degree, the angle which the line of action of the resultant makes with OA.

2. A mass of 6 lb. is suspended from a fixed point C by a light string 5 in. in length, and a force P is acting upon it so as to keep it 4 in. away from the vertical through C.   Find the magnitude of P

    (i) if it is a horizontal force,

    (ii) if it is acting in the direction in which the least force will suffice.

3. A stone is thrown vertically upwards from ground level with an initial velocity of 60 ft. per sec.   Find

    (i) how long the stone takes to return to ground level,

    (ii) the greatest height it reaches,

    (iii) for how many seconds it is 36 feet or more above ground level.

4. ABCD is a quadrilateral lamina in which AB=AD and BC=CD. The diagonals intersect at O and AO=6 cm., CO=3 cm.   Find the position of the centre of gravity of ABCD.

5. A smooth plane is inclined to the horizontal at an angle whose sine is $\frac{1}{4}$.   A particle is projected with an initial velocity of 20 ft. per sec. up the line of greatest slope of the plane.   What will be its velocity one second after projection, and how many seconds later again will it have the same velocity *down* the plane ?

How far will the particle be from the point of projection when its velocity is 16 ft. per sec. ?

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6. A ship is travelling due West at 3 knots and a second ship is travelling at 4 knots on a course 30° East of North. Find, graphically or otherwise, the velocity of the second ship relative to the first, in magnitude and direction.

7. Explain the term " limiting friction."

When a railway carriage is accelerating at 10 ft. per sec^2., on a level track, a box on the floor is just about to slide backwards. Find the coefficient of friction between the box and the floor.

If the box weighs 12 lb., what is the frictional force acting on the box when the carriage is accelerating at 5 ft. per sec.^{2} ?

8. An engine raises 750 lb. of water per minute from a depth of 20 feet and discharges it with a velocity of 16 ft. per sec. Find

   (i) the work done per minute in raising the water,

   (ii) the work done per minute in giving the water the velocity of 16 ft. per sec.,

   (iii) 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.

How is it that a ship made of steel can float ?

A piece of metal, of relative density 7 and weighing 50 gms., is suspended by a vertical string so that it is totally immersed in brine, of relative density 1·05. Find the tension in the string.