DAY GROUP CERTIFICATE EXAMINATIONS, 1968

MATHEMATICS (NEW SYLLABUS)
PAPER I

TUESDAY, 11th JUNE – 10 to 12 noon

Answer **four** questions

1. (a) Multiply 101_{two} by 101_{two} and give your answer in the denary scale (scale of 10)

   (b) Express the following in scientific rotation, giving your answer in the form $a \times 10^n$ where $n \in Z$ (an integer) and $1 \leqslant a < 10$.

   (i) The mean distance from the moon to the earth is 238,000 miles.

   (ii) The surface area of the moon is 14,660,000 sq. miles.

   (iii) The coefficient of linear expansion of invar is ·0000009.

   (iv) $\dfrac{34,800 \times 0\cdot00216}{0\cdot012}$.

2. (a) Using your tables write down the values of the following:

   (i) $\log 428\cdot6$; (ii) $\log 0\cdot004$; (iii) Antilog $2\cdot8716$; (iv) Antilog $\bar{2}\cdot1006$.

   (b) If $m = k\sqrt[3]{\dfrac{b^2}{n}}$

   then $\log m = \ldots\ldots$

   (c) Evaluate, using **either** logarithms **or** the slide-rule $\dfrac{68\cdot49 \times 0\cdot003842}{(0\cdot0586)^2}$.

3. (a) Use your tables to find the values of each of the following:

   Sin $46° 21'$; Cos $24° 32'$; tan $68° 43'$.

   If Sin $x° = 0\cdot8865$, find x.

   (b) From a lighthouse window 100 ft. up, the angle of depression of a small boat on the sea is $28°$. How far is the boat from the foot of the lighthouse ?
   If the boat is rowed towards the lighthouse until the angle of elevation of the window, as seen from the boat, is $43°$, find how far the boat has travelled from its first position.

4. (a) This figure shows part of a mathematical pattern which is repeated indefinitely both to the left and to the right:

   Which of the following translations would carry the pattern on to itself again ?

   (i) $\overrightarrow{AB}$ (ii) $\overrightarrow{AD}$ (iii) $\overrightarrow{ED}$ (iv) $\overrightarrow{CE}$.

   (b) XY is a reflection axis: $A^|$ is the image of a point A and $B^|$ is the image of B. State the images of (i) $B^|$; (ii) $AA^|$; (iii) AB; (iv) $A^|B$; (v) $AB^|$; (vi) $A^|B^|$.

   (c) State the number of axes of symmetry of each of the following figures illustrating each case with a diagram:

   (i) Rectangle (ii) Square (iii) Isosceles triangle (iv) Equilateral triangle.

   State also whether any of these figures have rotational symmetry about a point within them.

5. (a) Prove that the exterior angle of any triangle is equal to the sum of the two interior and opposite angles.

   (b) p, q and r represent straight lines. Are the following conclusions correct ?

   (i) p is $\parallel$ to q

         q is $\parallel$ to r

   $\therefore p$ is $\parallel$ to r

   (ii) p is $\perp$ to q

         q is $\perp$ to r

   $\therefore p$ is $\perp$ to r

   Use diagrams to illustrate.

6. (a) Complete the following statements:

   (i) The set of points each of which is equidistant from two given points is

   ....

   (ii) The set of points each of which is equidistant from two given intersecting straight lines is...

   (iii) In a triangle ABC if $\angle C$ is a right angle then ....

   (b) In a triangle ABC, AD is the perpendicular from A on BC.
   Prove that $AB^2 - AC^2 = BD^2 - CD^2$.

7. (a) Prove that the perpendicular from the centre of a circle to a chord of the circle bisects the chord.

   (b) AB is a chord of a circle of centre O. The perpendicular from O to AB meets AB at C. If X is any point in CO prove that XA = XB.