412/2
ORD. LEVEL
MATH.
(ALT. B)
PAPER 2)

Wednesday
4 JULY 1962
$2\frac{1}{2}$ *hours*
Afternoon

UNIVERSITY OF CAMBRIDGE
LOCAL EXAMINATIONS SYNDICATE
GENERAL CERTIFICATE OF EDUCATION

MATHEMATICS

ORDINARY LEVEL, ALTERNATIVE B

PAPER 2

(*Two hours and a half*)

Answer **all** *the questions in Section I and any* **four** *in Section II.*

All working must be clearly shown; it should be done on the same sheet as the rest of the answer.

Mathematical tables, squared paper and drawing paper are provided.

SECTION I [52 marks]

1. **Mathematical tables must not be used in this question.**

(i) Simplify $\dfrac{16\frac{1}{3} \times 13\frac{5}{7}}{4\frac{4}{5} - 1\frac{3}{10}}$.

(ii) Express £1. 11*s*. 6*d*. as a percentage of £3. 10*s*.

(iii) A train travels non-stop for 70 miles. It travels the first 38 miles in 50 min. and the remainder at an average speed of 40 m.p.h. Calculate its average speed in m.p.h. for the whole journey.

2. (i) Given that $$t = 4\sqrt{\frac{h}{32}},$$
calculate the value of h when $t = 12$.

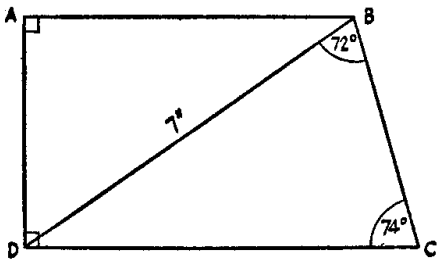
(ii) Solve the equations
$$7x+5y = 3, \quad 5x-2y = 4.$$

(iii) Simplify $$\frac{9x^2-4}{6x-4}.$$

3. (i) D is the point on the hypotenuse BC of a right-angled triangle ABC such that $DB = DA$. Prove that D is the mid-point of BC.

(ii) Each exterior angle of a regular polygon of n sides exceeds by 6° each exterior angle of a regular polygon of $2n$ sides. Form an equation for n and solve it.

4.



In the trapezium $ABCD$ the angle $DBC = 72°$, the angle $BCD = 74°$, $BD = 7$ in. and the angles BAD and ADC are right angles.

Calculate

(i) the angle ABD;

(ii) the length AB;

(iii) the length CD.

5. (i) Solve the equation
$$2x^2-7x-3 = 0,$$
giving your answers correct to two places of decimals.

(ii) Two sides of a triangular field are 40 yd. and 30 yd. long and the angle between these sides is 120°. Calculate the total length of fencing which would be required to enclose the field completely.

SECTION II. [48 marks]

Answer any **four** *questions in this section.*

6. (i) A cylindrical tube with open ends and of uniform thickness is made of copper whose density is 8·93 gm. per cu. cm. The tube has external diameter 10 cm., internal diameter 7 cm. and is 25 cm. long. Calculate its weight in kilograms.

[Take π to be 3·142.]

(ii) A sample of brass is made by mixing together 7 parts by volume of copper (density 8·93 gm. per cu. cm.) and 3 parts by volume of zinc (density 7·13 gm. per cu. cm.). Calculate the density of the brass.

7. (i) Find the value of x if x is an acute angle and

$$\cos x = \sqrt{\frac{2{\cdot}541}{3{\cdot}876}}.$$

(ii) If, in the formula $L = h + hxT$, $L = 100{\cdot}198$, $h = 100$ and $T = 165$, find the value of x, giving your answer in the form $k \times 10^{-n}$, where n is a whole number and the value of k is between 1 and 10.

8. Draw the graph of $y = x^2$ by plotting points for which $x = -2, -1\frac{1}{2}, -1, -\frac{1}{2}, 0, \frac{1}{2}, 1, 1\frac{1}{2}, 2$. (Scale for both x and y, 1 in. = 1 unit.)

With the same axes, draw the graph of

$$y = \tfrac{1}{2}(x+5).$$

State the quadratic equation in x that these two graphs enable you to solve. Use your graphs to solve it, giving your solutions to two decimal places.

9. Prove that the angles in the same segment of a circle are equal.

$ABCD$ is a quadrilateral inscribed in a circle and BD is a diameter. The diagonals AC and BD intersect at E. The angle DEC is 69°, the angle $DBC = x°$ and $AC = CB$.

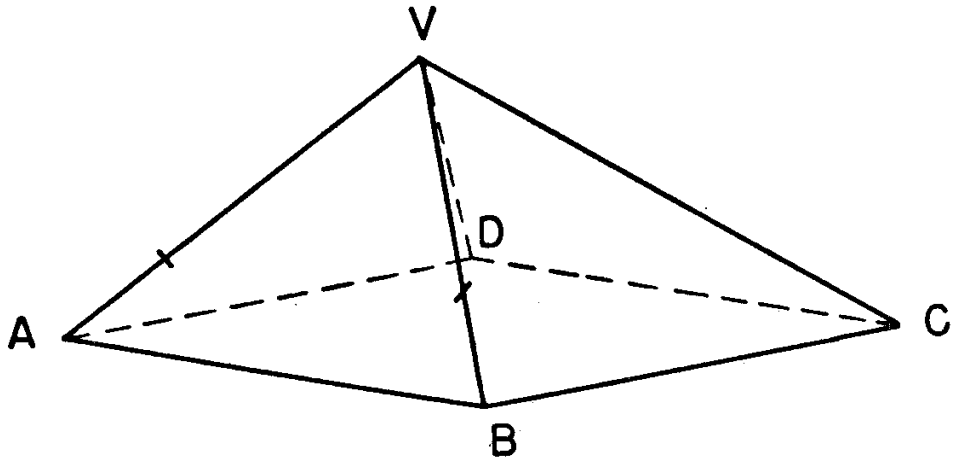
Express the angles EAB and EBA in terms of x and hence calculate the value of x.

10. An aircraft flies from an airfield in latitude 36° S., longitude 138° E. due north to an airfield in latitude 36° N., longitude 138° E. at an average speed of 300 m.p.h. Calculate the time of flight in hours.

If the aircraft now flies due west at the same average speed, determine its position 2 hr. 30 min. later.

[Take the earth to be a sphere of radius 3960 miles, and the value of π to be 3·142.]

11. (*The drawing paper provided must be used for this question.*)



The figure shows a pyramid with a horizontal square base $ABCD$ of side 3 in. whose vertex V is 2 in. above the base. The face VAB is inclined at 60° to the horizontal and has $VA = VB$. (*Note*: the vertex of the pyramid is **not** above the centre of the base.)

Draw, full size, (i) the elevation of this pyramid on a vertical plane parallel to BC, (ii) the plan.

Use this plan and elevation to draw the true shape of the triangle VNC where N is the point of the base vertically below V. Hence find the inclination of the edge VC to the horizontal.