## CERTIFICATE EXAMINATIONS

### for

## DAY VOCATIONAL COURSES, 1962.

# MATHEMATICS.

### Wednesday, 20th June—10 a.m. to 1 p.m.

### INSTRUCTIONS.

(a) Attempt Question 1 and <u>six</u> others.

(b) The marks allotted to each question are shown in brackets.

(c) Mathematical Tables and $\frac{1}{10}$ in. graph paper are supplied.

(d) Special credit will be given to candidates who display neatness and order in answering.

(e) All the work must be shown in the answer book.

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1. (a) Express 858, 1,092 and 6,084 in prime factors. Using your results, reduce $\frac{858}{1,092}$ to its lowest terms and write down the square root of 6,084.

(b) Simplify: $\dfrac{\frac{7}{9}\left(2\frac{1}{6} + \frac{1}{2}\right)}{8\frac{1}{9} - 6\frac{1}{27}} - 1.$

(c) Without using logarithms, find the value of $\dfrac{3 \cdot 6^2 + 0 \cdot 18^2}{3 \cdot 6 + 0 \cdot 18}$ to <u>two</u> places of decimals.

(d) Find, to the nearest penny, the cost of 15 gals. 3 qts. 1 pt. of paint at £2 8s. 9d. per gal.

(e) If a car travels 40 miles on a gallon of petrol which costs 5/- per gallon, find the cost of petrol for a journey of 180 miles.

Putting M for miles per gallon, P for cost of petrol per gallon in shillings and D for distance travelled in miles, write down an expression for C, the cost of a journey in pounds (£).

(20 marks.)

2. Calculate the volume and weight of the steel block shown in Fig. 1. Steel weighs 0.28 lb. per cubic inch.
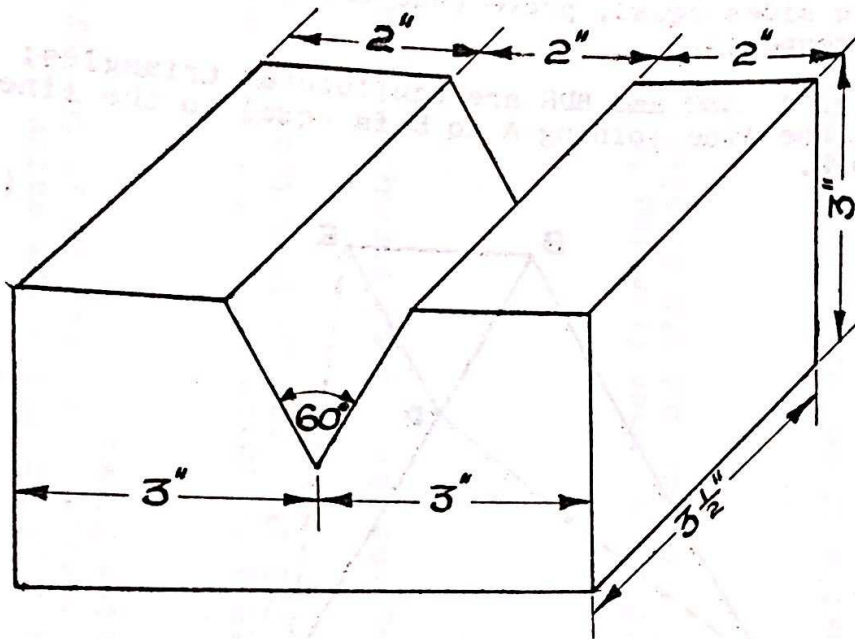
(12 marks.)



FIG. 1

3. Draw a graph on $\frac{1}{10}$ in. graph paper to convert pounds (£) to U.S. dollars ($) up to £20. Take £357 as the equivalent of $1,000.

Read from your graph the equivalent of £8 4s. 0d. in dollars and the equivalent of 42 dollars in pounds.
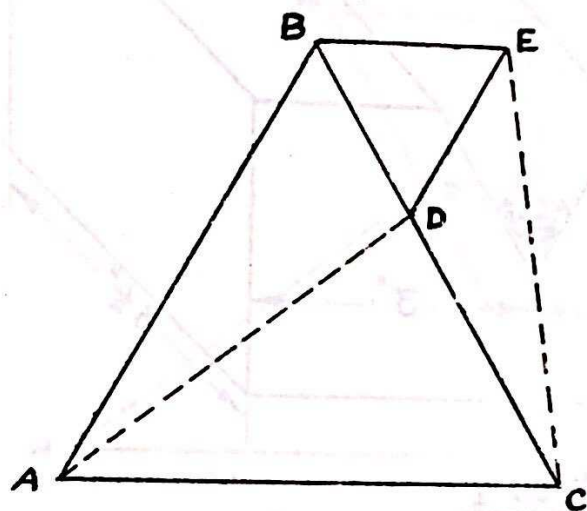
(12 marks.)

4. (a) Using the tables, write down the logarithms of 1,001 and 0.003723, and the anti-logarithms of $\overline{2}$.5492 and 0.0027.

(b) If $\log 2 = p$ and $\log 3 = q$, write down the logarithms of 1.5, 6 and 12 in terms of $p$ and $q$.

(c) Evaluate using logarithms:

$$\sqrt[3]{\frac{24 \cdot 36 \times 0 \cdot 318}{0 \cdot 0034 \times 785 \cdot 4}} \ .$$

(12 marks.)

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5. (a) If two triangles have two sides of one equal to two sides of the other, respectively, and the angles contained by those sides equal, prove that the triangles are equal in all respects.

(b) In Fig. 2, ABC and BDE are equilateral triangles; prove that the line joining A to D is equal to the line joining C to E.

(12 marks.)



FIG. 2

6. Solve the equations:-

(i) $\dfrac{2x - 1}{0 \cdot 3} - \dfrac{2x + 8}{1 \cdot 2} = 15.$

(ii) $\begin{cases} x - \dfrac{2}{5}y = 14 \\[2mm] 3x + \dfrac{1}{3}y = 19 \end{cases}$

(iii) $6x^2 + 5x - 6 = 0.$

(12 marks.)

7. Two pumps, A and B, are connected to a tank. A alone can fill the tank in 2 hours and B alone can fill it in 3 hours. How long will it take the two pumps together to fill the tank?

Owing to a leak in the tank, the two pumps actually take 18 minutes longer than the calculated time. Find how long it would take the leak to empty the full tank.

(14 marks.)

8. On $\frac{1}{10}$ in. graph paper, plot the points (5, 4), (-3, 2) and (1, -3). Join these three points to form a triangle and draw a perpendicular from the point (5, 4) to the opposite side.

Make the appropriate measurements and calculate the area of the triangle.

(14 marks.)

9. Fig. 3 shows a triangle ABC, with a perpendicular AD on BC.

If CA = 6 in., BD = 5 in. and the angle ABC = 42°, calculate the lengths of AB and BC and the values of the angles BCA and CAB.
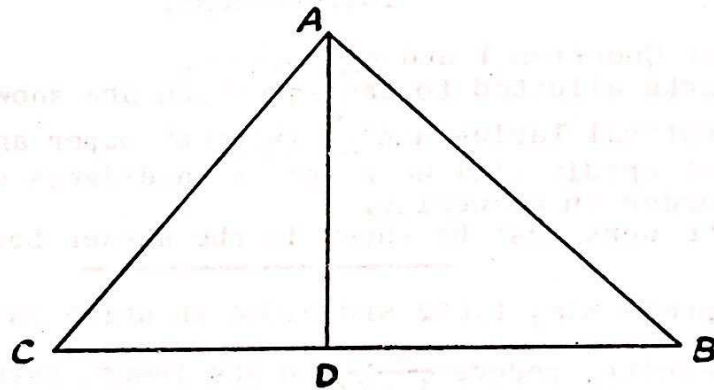
(14 marks.)



FIG. 3

10. The following table gives the results of an experiment on a lifting machine:-

| Load in lbs. (W) | 13·5 | 28·0 | 45·5 | 64·0 | 86·0 |
|---|---|---|---|---|---|
| Effort in lbs. (E) | 10·5 | 14·3 | 18·8 | 23·6 | 29·5 |

Plot a graph on $\frac{1}{10}$ in. graph paper to show the relationship between E and W.

From the graph, find (a) the effort required to lift a load of $\frac{1}{2}$ cwt. and (b) the law of the machine in the form E = mW + c.

(14 marks.)