

CERTIFICATE EXAMINATION

for

DAY VOCATIONAL COURSES, 1963.

M A T H E M A T I C S .

WEDNESDAY, 19th JUNE—10 a.m. to 1 p.m.

INSTRUCTIONS.

- (a) Attempt Question 1 and six others.
 (b) The marks allotted to each question are shown in brackets.
 (c) Mathematical Tables and $\frac{1}{16}$ 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.

1. (a) Write down the prime factors of 3,969 and 13,824. Use these factors to reduce $\frac{3,969}{13,824}$ to its lowest terms and to find the value of $\sqrt{3,969}$.

(b) Without using logarithms, find the value of $\frac{(3 \cdot 9)^2 - (1 \cdot 3)^2 + (2 \cdot 6)^2}{(3 \cdot 9)^2 + (2 \cdot 6)^2}$.

(c) Find the cost of 12 miles 5 furlongs 24 perches of wire at £7 16s. 8d. per mile.

(d) Find the factors of $9ac - 6bc + 6ad - 4bd$ and find also its value when $a = 1, b = 1.5, c = 2, d = 3$.

(e) Simplify $\left[\frac{2\frac{5}{16} - 1\frac{3}{5}}{\frac{3}{8}} - 1 \right] \times 1\frac{1}{9}$. (20 marks.)

2. Fig. 1 shows the cross-section of a strip of plastic which is 10 metres long. Find the area of the cross-section in square centimetres and the weight of the strip in grammes. The plastic weighs 19 Kilogrammes per cubic metre. (12 marks.)

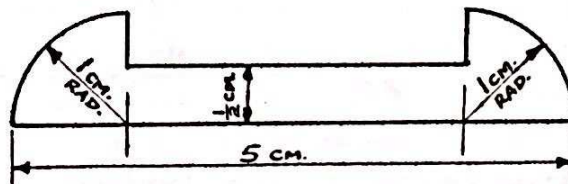


FIG. 1

3. The readings on Centigrade and Fahrenheit thermometers are related as follows: $0^\circ\text{C} = 32^\circ\text{F}$ and $100^\circ\text{C} = 212^\circ\text{F}$. Use these readings to draw a straight-line graph.

From the graph, read the equivalent of 98°F in $^\circ\text{C}$ and the equivalent of 71°C in $^\circ\text{F}$. Mark each reading on the graph. (12 marks.)

4. (a) The logarithm of 20 to base 10 is 1.3010 : what exactly does this mean?

(b) Using logarithms, find the value of $\sqrt{\frac{1}{0.4832}}$.

(c) If $\log 2 = x$ and $\log 5 = y$, show that $x + y = 1$. (12 marks.)

5. (a) State the relationship between the three sides of any right-angled triangle.

(b) Construct a triangle whose angles are $30^\circ, 60^\circ, 90^\circ$, with its longest side 4 inches long. Calculate the length of the perpendicular from the 90° angle to the opposite side. (12 marks.)

6. Solve the equations:-

$$(i) \frac{2x}{0.7} = \frac{3(x - 1.5)}{2} + 7$$

$$(ii) \begin{cases} \frac{x}{3} + \frac{2y}{5} = 6 \\ 5x - 3y = 0 \end{cases}$$

$$(iii) 15x^2 = 19x - 6$$

(12 marks.)

7. Change the formula $V = \pi h(R^2 - r^2)$ so as to give R in terms of the other symbols.

If $V = 1,000$, $h = 10$, $r = 5$ and $\pi = 3.14$, find the value of R correct to one decimal place.

(14 marks.)

8. It is estimated that 100 men will do a certain job in 60 days working 8 hours per day, but after 30 days only $\frac{1}{3}$ of the job is done. How many more men should now be employed to complete the job on time?

If it is decided instead to work overtime with the staff of 100 men, how many hours of overtime must each man work?

(14 marks.)

9. (a) From the table of tangents, write down $\tan 31^\circ 48'$. Now, using ruler and set-square, draw this angle.

(b) The area of the triangle in Fig. 2 is 70 square feet: calculate (i) the length of the perpendicular BN, (ii) the length of AN and (iii) the size of the angle at C in degrees ($^\circ$) and ($'$).

(14 marks.)

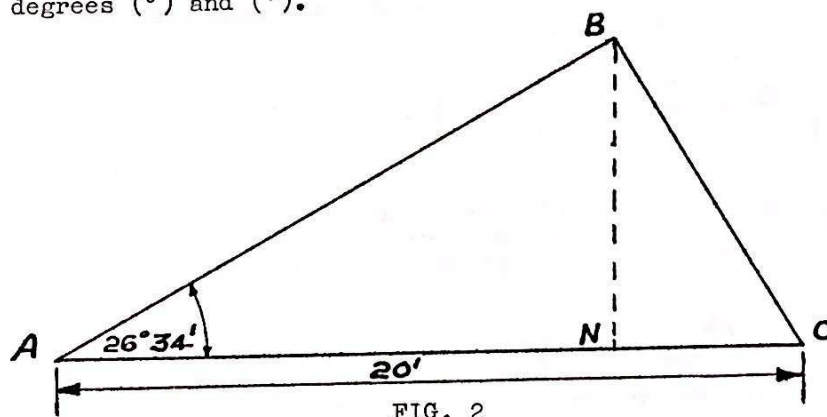


FIG. 2

10. An experiment with a spring gave the following results:-

Load on spring in gm. (W)	20	40	80	100	160
Length of spring in cm. (L)	51.6	53.2	56.4	58.0	62.8

Set out these results in the form of a graph and read off the length of the spring for a load of 125 gm.

If $L = mW + c$, use readings from the graph to find the values of m and c .

(14 marks.)