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CERTIFICATE EXAMINATION FOR DAY VOCATIONAL COURSES, 1966

# MATHEMATICS

WEDNESDAY, 15th 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 $\frac{1}{10}$ 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.

1. (a) Given that $\sin A = \frac{4}{5}$, find values for (i) cos A and (ii) tan A.
   (b) Give the co-ordinates of any two points that lie on the line $2y = x + 3$.
   (c) Write by inspection the answers to the following (i) $\sqrt[5]{a^{10}}$, (ii) $(2n^2)^2$, (iii) $4^{\frac{3}{2}}$.
   (d) Write the factors of $a^2 - b^2$ and hence find the value of $(91{\cdot}5)^2 - (41{\cdot}5)^2$.
   (e) State the relationship between the three sides of any right-angled triangle.

(20 marks)

2. Simplify:-

(a) $\dfrac{2^5 + 3^2 + 2^3}{1\frac{2}{3} \times 1\frac{1}{8} - 1}$ (b) $\dfrac{x+2}{x-4} - \dfrac{x-2}{x+3} - \dfrac{42}{x^2 - x - 12}$

(12 marks)

3. What must be added to $x^2 + 8x$ in order that the resulting expression may be a perfect square ? Hence, solve the equation $x^2 + 8x = 60$, giving your answer to two significant figures.

(12 marks)

4. (a) If log 2 = 0·3010, what is the value of
   (i) log 8 and (ii) log $\sqrt{2}$.
   (b) Evaluate, $\sqrt[3]{\dfrac{(2{\cdot}57)^2}{0{\cdot}08 \times 4{\cdot}23}}$

(12 marks)

5. (a) Show that the perpendicular from the centre of a circle to any chord of the circle bisects the chord.
   (b) Construct a circle through any three points, A, B and C, which are not in the same straight line.

(12 marks)

6. The cross-section of a ring has an external radius R and and internal radius r.
   Write expressions for (i) the area of the cross-section, A, and (ii) the total perimeter of the cross-section, P, in terms of R and r.
   If the difference of the radii is 3 in. and P is 44 in., calculate A, the area of the cross-section. (Take $\pi = 3\frac{1}{7}$).

(12 marks)

7. (a) Simplify: $(2x - y)(x - 2y) - x(2x - 5y)$.
   (b) Solve for $x$: $\dfrac{3}{x+1} = 4$.
   (c) Solve for $x$ and $y$:

$$\frac{x}{2} + \frac{y}{5} = 4$$

$$8x - 2 = 3y$$

(14 marks)

OVER→

8. (a)

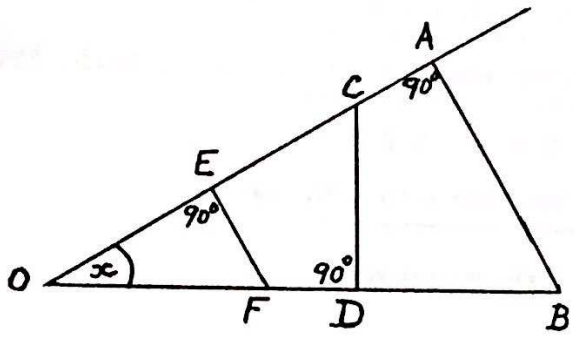


FIG. 1

The following represent either sin $x$, cos $x$ or tan $x$. By reference to Fig. 1, state which ratio is represented by each:-

(i) $\frac{EF}{OE}$, (ii) $\frac{CD}{OC}$, (iii) $\frac{OA}{OB}$, (iv) $\frac{AB}{OA}$.

(b) A pendulum 30 in. long is moved $15^{\circ}32'$ from the vertical. By what distance, to the nearest $\frac{1}{10}$ in., is the lower end of the pendulum raised above its original level ?

(14 marks)

9. On $\frac{1}{10}$th. in. graph paper, plot the points
A(3, 1) B(-2, 2) C(-3, -3).

Join these points to form a triangle and calculate the area of this triangle.

If D is the mid-pt. of AC and E the mid-pt. of BD write down the co-ordinates of D and E.

(14 marks)

10. The following table gives the results of an experiment on a certain machine to find the relationship between Load and Effort:

| Load in lbs. (L) | 10 | 16 | 20 | 24 | 26 |
|---|---|---|---|---|---|
| Effort in lbs. (E) | 3.7 | 5.2 | 6.2 | 7.2 | 7.7 |

Plot the graph of Effort against Load and from the graph determine (i) the law of the graph in the form $E = mL + C$, (ii) the Effort required to raise a Load of 4 lbs.

(14 marks)