AN ROINN OIDEACHAIS M.46

LEAVING CERTIFICATE EXAMINATION, 1969

MATHEMATICS (PASS) - PAPER I (300 marks)

WEDNESDAY, 11th JUNE - Morning, 9.30 to 12

Six questions to be answered. All questions carry equal marks.
Mathematical Tables may be had from the Superintendent.

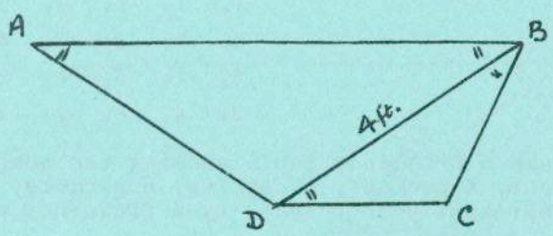
1. Water is drawn off at the rate of 99 gallons per hour from a vertical cylindrical storage tank whose diameter is 6 feet. By how much, to the nearest inch, will the level of the water be lowered in 42 minutes ?

(Assume 1 gallon occupies 280 cu. ins. Take $\frac{22}{7}$ as an approximation for π.)

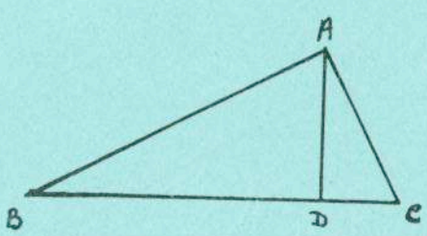
2. (a) Given a line segment of unit length use ruler and compass to construct segments of length $\sqrt{2}$ units and $\sqrt{3}$ units. Hence indicate on the numberline the 8 points $\pm\sqrt{2}$, $\pm\sqrt{3}$, ± 1, 0, 2.

(b) $k = 1{\cdot}1010010001000010....$ is a non-terminating decimal in which the observed pattern persists. Is k rational ? Explain your answer. Write down a rational number which differs from k by less than one-millionth.

3. ABCD is a quadrilateral
BD = 4 ft.
$\angle CBD = \angle CDB = \angle DBA = \angle BAD = 30°$.
Calculate:
(i) the length of the perimeter of ABCD,
(ii) the area of the quadrilateral.



4. ABC is a triangle such that $\angle A$ is a right angle.
AD is the perpendicular from A on BC.
(i) Prove $BD.CD = AD^2$.
(ii) Deduce that $\sin \angle BAD = \cos \angle DAC$.



5. (i) Use tables to evaluate:
$\sin 130°$, $\cos 250°$, $\tan 19°40'$.
(ii) Prove that $\cos^4\theta - \sin^4\theta = \cos 2\theta$.
(iii) If $\cos\frac{x}{2} = {\cdot}6$ find $\sin x$ without using tables.

6. (a) Which of the following relations is a function ? Explain your answer.
$h = \{(2,3), (3,2), (4,4), (1,2), (2,1)\}$
$g = \{(3,4), (4,3), (1,2), (2,1)\}$.
What is the minimum value of the function ?
(b) Sketch a rough graph of the function $f(x) = \sqrt{x}$, $x \geqslant 0$.
Hence prove that $f(x_1 + x_2) \leqslant f(x_1) + f(x_2)$.

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7. (i) Why is $\cos x$ said to be a <u>periodic function</u> ?

(ii) Graph the function $f(x) = 1 + \cos x$ where $0 \leq x \leq 4\pi$, and state its range.

(iii) Write down a function other than $f(x) = 1 + \cos x$ which is periodic and whose range is that of $f(x)$.

8. Find (i) the equation and (ii) the slope of the line containing the points (2,3) and (3,2).
Find the area of the triangle determined by this line, the y axis and the line $y = x$.

9. (a) Which of the following lines contains both of the points (5,-12) and (0,-2).

(i) $3x + y - 3 = 0$.

(ii) $4x + 2y + 4 = 0$.

(iii) $3y - x = 7$.

Prove that no two of the lines are parallel.
Prove that two of the lines are perpendicular.

(b) Show that the simultaneous equations $y = 2x - 1$ and $x + y = 2$ can be solved graphically, and find the graphical solution.

10. A packing machine in a biscuit factory is faulty. It is observed over 50 equal time intervals. The following table shows the number of packets of biscuits which have been unsatisfactorily packed in each one of those intervals:

5,	1,	2,	7,	1,	5,	3,	6,	5,	4,
1,	1,	1,	3,	5,	3,	2,	2,	4,	5,
3,	2,	4,	7,	4,	3,	2,	6,	1,	7,
5,	1,	3,	1,	2,	2,	5,	2,	3,	3,
2,	4,	6,	1,	2,	4,	4,	3,	2,	3.

Make a frequency table showing the number of intervals in which 1 packet, 2 packets, 3 packets, 4 packets, 5 packets, 6 packets, 7 packets were unsatisfactorily packed.
Represent your results by a frequency polygon.