DAILY TEST SERIES FOR IIT-JEE 2009 FROM VIDYA DRISHTI

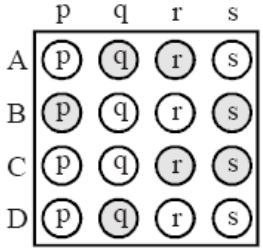
22.03.2009

Total time: 20 min

Matrix Match Type Questions

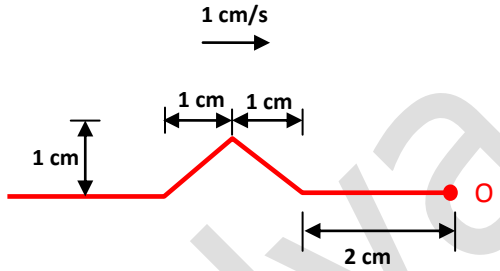
Each question contains statements given in two columns which have to be matched. Statements in **Column I** are labeled as a, b, c and d whereas statements in **Column II** are labeled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example.

If the correct matches are a-q, a-r, b-p, b-s, c-r, c-s and d-q, then the correctly bubbled matrix will look like the following:



Physics

A wave pulse on a string has dimensions as shown in figure. The wave speed is v = 1 cm/s.



Match the charge distribution in column I with the correct proportionality relation in column II.

	Column I		**Column II**
a	Total wave on the string at t = 3s when point O is fixed	p	
b	Total wave on the string at t = 3s when point O is free end	q	

c	Total wave on the string at t = 4s when point O is fixed	r	
d	Total wave on the string at t = 4s when point O is free end	s	

Chemistry

Match molecules of column I with column II.

	Column I		**Column II**
a	HCOOH	p	Effervescences of CO_2 with $NaHCO_3$
b	CH_3COOH	q	Colour with $FeCl_3$
c	Salicyclic acid	r	Decolorizes Br_2 water
d	Cinnamic acid	s	Gives silver mirror with tollen's reagent

Mathematics

Consider the function f defined by

f (x) = x – [x]

when x is a positive variable and [x] denotes the integral part of x.

Match column I with column II

	Column I		Column II
a	Period of f (x)	p	0
b	f (x) is discontinuous at	q	1
c	f (x) has minimum value at	r	2
d	Minimum value of f (x)	s	3

SOLUTION:

Physics

a → s; b → p; c → q; d → r

Hint: Use the concept of hard and soft reflection.

Chemistry

a → p, s; b → p, q; c → p, q; d → p, r

Mathematics

a → q; b → p, q, r, s; c → p, q, r, s; d → p

The given function f (x) may be defined as

$$f(x)=\begin{cases} x-(n-1), & if\ \ (n-1)<x<n \\ 0, & if\ \ x=n \\ x-n, & if\ \ n<x<n+1 \end{cases}$$

$where\ n \in I$

To test continuity at x = n

We have

$$f(n-0)=\lim_{h\to 0} f(n-h)$$
$$=\lim_{h\to 0}[(n-h)-(n-1)]$$
$$=1$$

$$f(n+0)=\lim_{h\to 0} f(n+h)$$
$$=\lim_{h\to 0}[(n+h)-n]$$
$$=0$$

And $f(n)=0$

$\therefore\ f(n-0)\neq f(n+0)$

Therefore, the function f(x) is discontinuous for integral values of x and is continuous for all other values of x. Hence, we note that

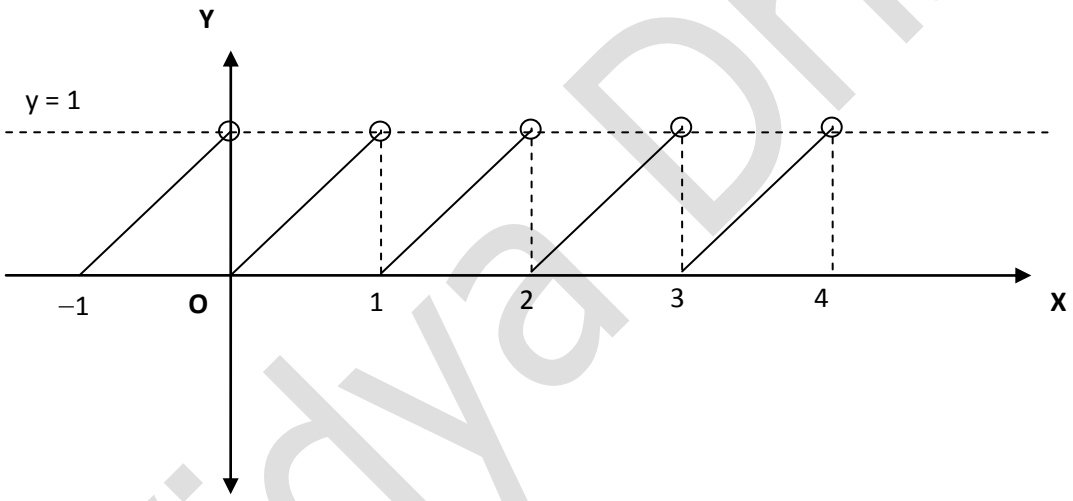
$$f(x) = f(x+1) = f(x+2) = \ldots$$

Hence f (x) is periodic with period T = 1.

Let us draw the graph of this function. We are going to draw the graph of f (x) from x = 0 to x = 4. Taking f (x) = y, the graph of the function f (x) from x = 0 to x = 4 consists of the following:

y = x, when $0 \le x < 1$
y = 0, when x = 1
y = x – 1, when $1 \le x < 2$
y = 0, when x = 2
y = x – 2, when $2 \le x < 3$
y = 0, when x = 3
y = x – 3, when $3 \le x < 4$
y = 0, when x = 4

Hence the graph of the function is shown by thick lines in the following diagram



The points enclosed in small circles do not lie on the graph.

Clearly, given function has minimum value zero at all integers.