

Activity 10

OBJECTIVE

To plot the graphs of $\sin x$, $\sin 2x$, $2\sin x$ and $\sin \frac{x}{2}$, using same coordinate axes.

MATERIAL REQUIRED

Plyboard, squared paper, adhesive, ruler, coloured pens, eraser.

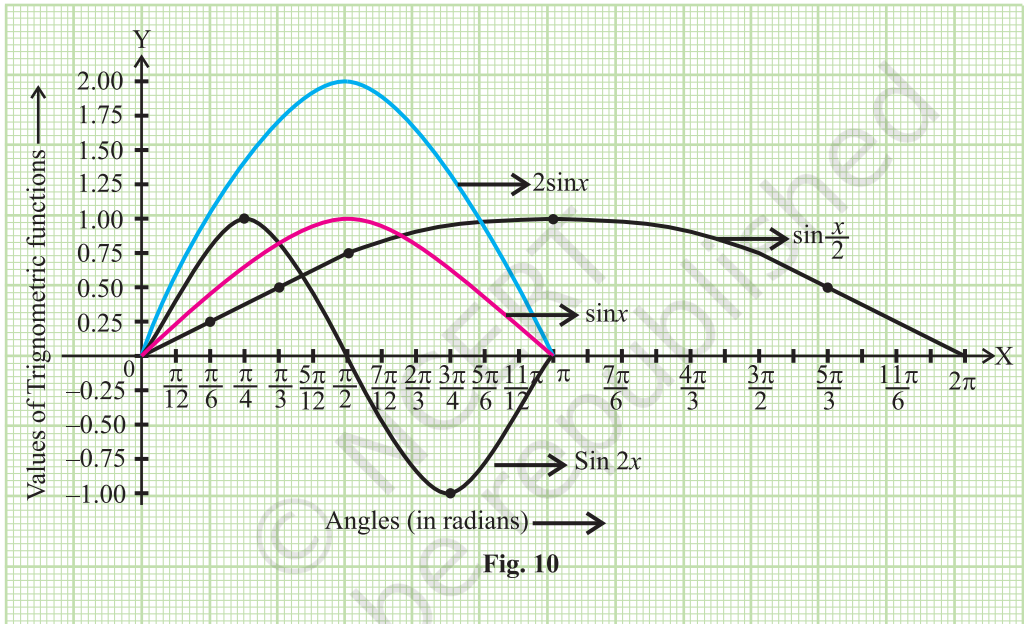
METHOD OF CONSTRUCTION

1. Take a plywood of size 30 cm × 30 cm.
2. On the plywood, paste a thick graph paper of size 25 cm × 25 cm.
3. Draw two mutually perpendicular lines on the squared paper, and take them as coordinate axes.
4. Graduate the two axes as shown in the Fig. 10.
5. Prepare the table of ordered pairs for $\sin x$, $\sin 2x$, $2\sin x$ and $\sin \frac{x}{2}$ for different values of x shown in the table below:

T. ratios	0°	$\frac{\pi}{12}$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{5\pi}{12}$	$\frac{\pi}{2}$	$\frac{7\pi}{12}$	$\frac{2\pi}{3}$	$\frac{9\pi}{12}$	$\frac{5\pi}{6}$	$\frac{11\pi}{12}$	π
$\sin x$	0	0.26	0.50	0.71	0.86	0.97	1.00	0.97	0.86	0.71	0.50	0.26	0
$\sin 2x$	0	0.50	0.86	1.00	0.86	0.50	0	-0.5	-0.86	-1.0	-0.86	-0.50	0
$2 \sin x$	0	0.52	1.00	1.42	1.72	1.94	2.00	1.94	1.72	1.42	1.00	0.52	0
$\sin \frac{x}{2}$	0	0.13	0.26	0.38	0.50	0.61	0.71	0.79	0.86	0.92	0.97	0.99	1.00

DEMONSTRATION

- Plot the ordered pair $(x, \sin x)$, $(x, \sin 2x)$, $(x, \sin \frac{x}{2})$ and $(x, 2\sin x)$ on the same axes of coordinates, and join the plotted ordered pairs by free hand curves in different colours as shown in the Fig.10.



OBSERVATION

- Graphs of $\sin x$ and $2 \sin x$ are of same shape but the maximum height of the graph of $\sin x$ is _____ the maximum height of the graph of _____.
- The maximum height of the graph of $\sin 2x$ is _____. It is at $x =$ _____.
- The maximum height of the graph of $2 \sin x$ is _____. It is at $x =$ _____.

4. The maximum height of the graph of $\sin \frac{x}{2}$ is _____. It is at $\frac{x}{2} =$ _____.
5. At $x =$ _____, $\sin x = 0$, at $x =$ _____, $\sin 2x = 0$ and at $x =$ _____, $\sin \frac{x}{2} = 0$.
6. In the interval $[0, \pi]$, graphs of $\sin x$, $2 \sin x$ and $\sin \frac{x}{2}$ are _____ x -axes and some portion of the graph of $\sin 2x$ lies _____ x -axes.
7. Graphs of $\sin x$ and $\sin 2x$ intersect at $x =$ _____ in the interval $(0, \pi)$
8. Graphs of $\sin x$ and $\sin \frac{x}{2}$ intersect at $x =$ _____ in the interval $(0, \pi)$.

APPLICATION

This activity may be used in comparing graphs of a trigonometric function of multiples and submultiples of angles.