PUNA INTERNATIONAL SCHOOL

- **CLASS – 9**
- **SUBJECT - MATHS**
- **CHAPTER - 1**

SAMPLE NOTE-BOOK

Class IX Chapter 1 – Number Systems Maths

Exercise 1.1

Q 1Is zero a rational number? Can you write it in the form $\frac{p}{q}$ **, where p and q are integer's ≠** 0?

Answer:

Yes. Zero is a rational number as it can be represented as $\frac{0}{1}$ or $\frac{0}{2}$ or $\frac{0}{3}$ etc.

Q 2. Find six rational number between 3 and 4.

Ans

3/1 = 30/10 and 4/1 = 40/ 10

∴ six rational numbers are

31/10 , 32/10 , 33/10, 34/10, 37/10

3. find six rational number between 3/5 and 4/5

$$\frac{3}{5}=\frac{3\times 6}{5\times 6}=\frac{18}{30}$$
$$\frac{4}{5}=\frac{4\times 6}{5\times 6}=\frac{24}{30}$$

Therefore, six rational number are

$\frac{19}{30}, \frac{20}{30}, \frac{21}{30}, \frac{22}{30}, \frac{23}{30}$

Question 4:

State whether the following statements are true or false. Give reasons for your answers.

(i) Every natural number is a whole number.

(ii) Every integer is a whole number.

(iii) Every rational number is a whole number.

(i) True; since the collection of whole numbers contains all natural numbers.

(ii) **False; as integers may be negative but whole numbers are positive. For example: −3** is an integer but not a whole number.

(iii) False; as rational numbers may be fractional but whole numbers may not be. For example: $\frac{1}{5}$ is a rational number but not a whole number.

Exercise 1.2

Question 1:

State whether the following statements are true or false. Justify your answers.

(i) Every irrational number is a real number.

(ii) Every point on the number line is of the form $\sqrt{m}$, where m is a natural number.

(iii) Every real number is an irrational number.

Answer:

(i) True; since the collection of real numbers is made up of rational and irrational numbers.

(ii) False; as negative numbers cannot be expressed as the square root of any other number.

(iii) False; as real numbers include both rational and irrational numbers. Therefore, every real number cannot be an irrational number.

Question 2:

Are the square roots of all positive integers irrational? If not, give an example of the square root of a number that is a rational number.

Answer:

If numbers such as $\sqrt{4} = 2,\ \sqrt{9} = 3$ are considered,

Then here, 2 and 3 are rational numbers. Thus, the square roots of all positive integers are not irrational.

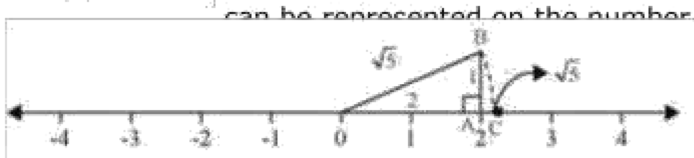
Question 3:

Show how $\sqrt{5}$ can be represented on the number line.

Answer:

We know that, $\sqrt{4} = 2$

And, $\sqrt{5} = \sqrt{(2)^2 + (1)^2}$



Mark a point 'A' representing 2 on number line. Now, construct AB of unit length perpendicular to OA. Then, taking O as centre and OB as radius, draw an arc intersecting number line at C.

C is representing $\sqrt{5}$.

EXERSICE 1.3

Q. 1Write the following in decimal form and say what kind of decimal expansion each has

has:

(i) $\frac{36}{100}$ (ii) $\frac{1}{11}$ (iii) $4\frac{1}{8}$

(iv) $\frac{3}{13}$ (v) $\frac{2}{11}$ (vi) $\frac{329}{400}$

Answer:

(i) $\frac{36}{100} = 0.36$

Terminating

(ii) $\frac{1}{11} = 0.090909...... = 0.\overline{09}$

Non-terminating repeating

(iii) $4\frac{1}{8} = \frac{33}{8} = 4.125$

Terminating

(iv) $\frac{3}{13} = 0.230769230769.... = 0.\overline{230769}$

Non-terminating repeating

(v) $\frac{2}{11} = 0.18181818........ = 0.\overline{18}$

Non-terminating repeating

(vi) $\frac{329}{400} = 0.8225$

Terminating

You know that $\frac{1}{7} = 0.\overline{142857}$ Question 2:

$\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$

Q 2 Write the following in decimal form and say what kind of decimal expansion each . Can you predict what the decimal expansion of are, without actually doing the long division? If so, how?

[Hint: Study the remainders while finding the value of $\frac{1}{7}$ carefully.] Answer:

Yes. It can be done as follows.

$$\frac{2}{7} = 2 \times \frac{1}{7} = 2 \times 0.\overline{142857} = 0.\overline{285714}$$
$$\frac{3}{7} = 3 \times \frac{1}{7} = 3 \times 0.\overline{142857} = 0.\overline{428571}$$
$$\frac{4}{7} = 4 \times \frac{1}{7} = 4 \times 0.\overline{142857} = 0.\overline{571428}$$
$$\frac{5}{7} = 5 \times \frac{1}{7} = 5 \times 0.\overline{142857} = 0.\overline{714285}$$
$$\frac{6}{7} = 6 \times \frac{1}{7} = 6 \times 0.\overline{142857} = 0.\overline{857142}$$

Question 3:

Express the following in the form $\frac{p}{q}$, where p and q are integers and q $\neq$ **0.**

(i) $0.\overline{6}$ (ii) $0.4\overline{7}$ (iii) $0.\overline{001}$

Answer:

(i) $0.\overline{6} = 0.666...$

Let x = 0.666...

10x = 6 + x

9x = 6

$$x = \frac{2}{3}$$

(ii) $0.4\overline{7} = 0.4777.....$

$$= \frac{4}{10} + \frac{0.777}{10}$$

Let x = 0.777...
10x = 7.777...

10x = 7 + x

$$x = \frac{7}{9}$$

$$\frac{4}{10} + \frac{0.777...}{10} = \frac{4}{10} + \frac{7}{90} = \frac{36+7}{90} = \frac{43}{90}$$

(iii) $0.\overline{001} = 0.001001...$

Let x = 0.001001...

1000x = 1.001001...

1000x = 1 + x

999x = 1

$x = \frac{1}{999}$

Question 4:

Express 0.99999…in the form $\frac{p}{q}$. Are you surprised by your answer? With your teacher and

classmates discuss why the answer makes sense.

Answer:

Let x = 0.9999…
10x = 9.9999…

10x = 9 + x

9x = 9 x =

1

Question 5:

What can the maximum number of digits be in the repeating block of digits in the decimal expansion of $\frac{1}{17}$? Perform the division to check your answer.

Answer:

It can be observed that,

$$\frac{1}{17} = 0.\overline{0588235294117647}$$

There are 16 digits in the repeating block of the decimal expansion of $\frac{1}{17}$.

Question 6:

Look at several examples of rational numbers in the form $\frac{p}{q}$ **(q ≠ 0), where p and q are** integers with no common factors other than 1 and having terminating decimal representations (expansions). Can you guess what property q must satisfy?

Answer:

Terminating decimal expansion will occur when denominator q of rational number $\frac{p}{q}$ is

either of 2, 4, 5, 8, 10, and so on…

$$\frac{9}{4} = 2.25$$

$$\frac{11}{8} = 1.375$$

$$\frac{27}{5} = 5.4$$

It can be observed that terminating decimal may be obtained in the situation where prime factorisation of the denominator of the given fractions has the power of 2 only or 5 only or both.

Question 7:

Write three numbers whose decimal expansions are non-terminating non-recurring.
Answer:

3 numbers whose decimal expansions are non-terminating non-recurring are as follows.

0.505005000500005000005…

0.72072007200072000072000000… 0.0800800080000800000800000008…

Question 8:

Find three different irrational numbers between the rational numbers $\frac{5}{7}$ and $\frac{9}{11}$.
Answer:

$\frac{5}{7} = 0.\overline{714285}$

$\frac{9}{11} = 0.\overline{81}$

3 irrational numbers are as follows.

0.73073007300073000073…

0.75075007500075000075… 0.79079007900079000079…

Question 9:

Classify the following numbers as rational or irrational:

(i) $\sqrt{23}$ (ii) $\sqrt{225}$ (iii) 0.3796

(iv) 7.478478 (v) 1.101001000100001…

(i) $\sqrt{23} = 4.79583152331\ ...$

As the decimal expansion of this number is non-terminating non-recurring, therefore, it is an irrational number.

(ii) $\sqrt{225} = 15 = \frac{15}{1}$

It is a rational number as it can be represented in $\frac{p}{q}$ form.

(iii) 0.3796

As the decimal expansion of this number is terminating, therefore, it is a rational number.

(iv) **7.478478 …** $= 7.\overline{478}$

As the decimal expansion of this number is non-terminating recurring, therefore, it is a rational number.

(v) **1.10100100010000 …**

As the decimal expansion of this number is non-terminating non-repeating, therefore, it is an irrational number.

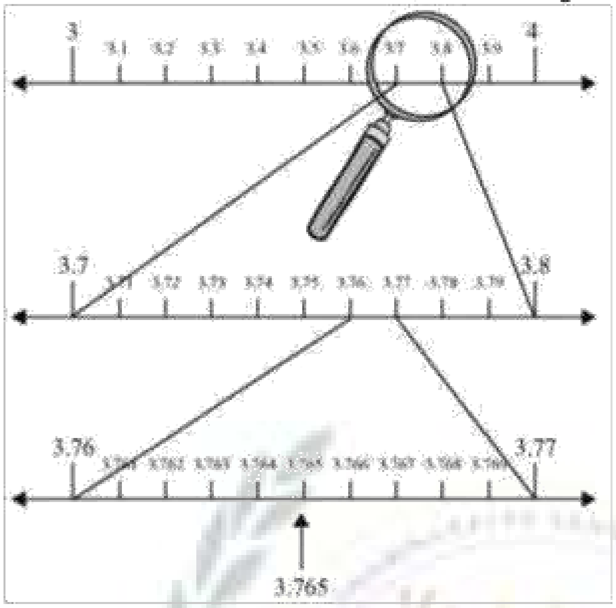
Exercise 1.4

Question.1:

Visualise 3.765 on the number line using successive magnification.

Answer:

3.765 can be visualised as in the following steps.



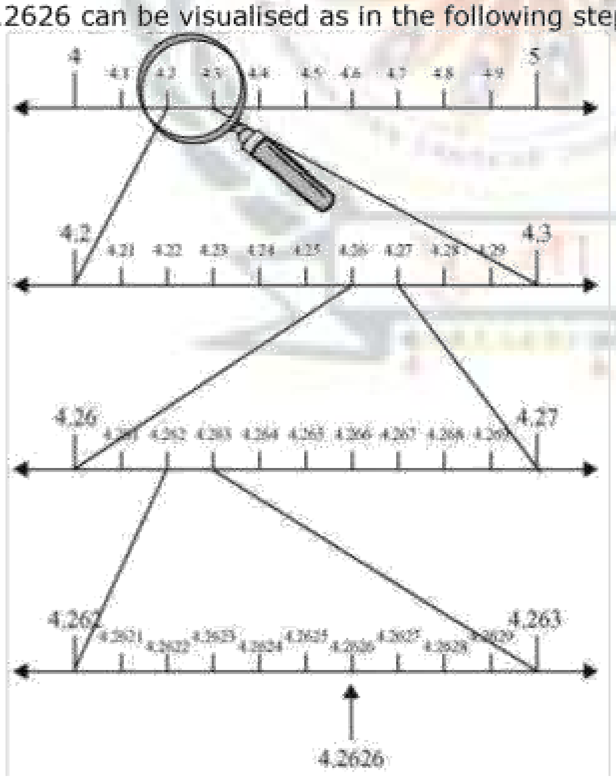
Question 2:

Visualise $4.\overline{26}$ on the number line, up to 4 decimal places.

Answer:

$4.\overline{26}$ = 4.2626…

4.2626 can be visualised as in the following steps.



Exercise 1.5

Question 1:

Classify the following numbers as rational or irrational:

(i) $2-\sqrt{5}$ (ii) $\left(3+\sqrt{23}\right)-\sqrt{23}$ (iii) $\frac{2\sqrt{7}}{7\sqrt{7}}$

(iv) $\frac{1}{\sqrt{2}}$ (v) 2π

Answer:

(i) $2-\sqrt{5}$ = 2 − 2.2360679…

= − 0.2360679…

As the decimal expansion of this expression is non-terminating non-recurring, therefore, it is an irrational number.

(ii) $\left(3+\sqrt{23}\right)-\sqrt{23}=3=\frac{3}{1}$

(iii)

As it can be represented in $\frac{p}{q}$

$\frac{2\sqrt{7}}{7\sqrt{7}}=\frac{2}{7}$.

As it can be represented in $\frac{p}{q}$ therefore, it is a rational number.

(iv) $\frac{1}{\sqrt{2}}=\frac{\sqrt{2}}{2}=0.7071067811...$ therefore, it is a rational number

(v) 2π = 2(3.1415 …)

= 6.2830 …

As the decimal expansion of this expression is non-terminating non-recurring,

therefore, it is an **irrational number.**

Question 2:

Simplify each of the following expressions:

(i) $\left(3+\sqrt{3}\right)\left(2+\sqrt{2}\right)$ (ii) $\left(3+\sqrt{3}\right)\left(3-\sqrt{3}\right)$

(iii) $\left(\sqrt{5}+\sqrt{2}\right)^2$ (iv) $\left(\sqrt{5}-\sqrt{2}\right)\left(\sqrt{5}+\sqrt{2}\right)$

Answer:

(i) $\left(3+\sqrt{3}\right)\left(2+\sqrt{2}\right)=3\left(2+\sqrt{2}\right)+\sqrt{3}\left(2+\sqrt{2}\right)$

$=6+3\sqrt{2}+2\sqrt{3}+\sqrt{6}$

(ii) $\left(3+\sqrt{3}\right)\left(3-\sqrt{3}\right)=(3)^2-\left(\sqrt{3}\right)^2$

= 9 − 3 = 6

(iii) $\left(\sqrt{5}+\sqrt{2}\right)^2=\left(\sqrt{5}\right)^2+\left(\sqrt{2}\right)^2+2\left(\sqrt{5}\right)\left(\sqrt{2}\right)$

$=5+2+2\sqrt{10}=7+2\sqrt{10}$

(iv) $\left(\sqrt{5}-\sqrt{2}\right)\left(\sqrt{5}+\sqrt{2}\right)=\left(\sqrt{5}\right)^2-\left(\sqrt{2}\right)^2$

= 5 − 2 = 3

Question 3:

Recall, π is defined as the ratio of the circumference (say c) of a circle to its diameter (Say d). That is, $\pi=\frac{c}{d}$. This seems to contradict the fact that π is irrational. How will you resolve this contradiction?

Answer:

There is no contradiction. When we measure a length with scale or any other instrument, we only obtain an approximate rational value. We never obtain an exact value. For this reason, we may not realise that either c or d is irrational. Therefore, the $\frac{c}{d}$ **fraction is irrational. Hence, π is irrational.**

Question 4:

Represent $\sqrt{9.3}$ on the number line.

Answer:

Mark a line segment OB = 9.3 on number line. Further, take BC of 1 unit. Find the midpoint

D of OC and draw a semi-circle on OC while taking D as its centre. Draw a

(i) $\frac{1}{\sqrt{7}}$ (ii) $\frac{1}{\sqrt{7}-\sqrt{6}}$

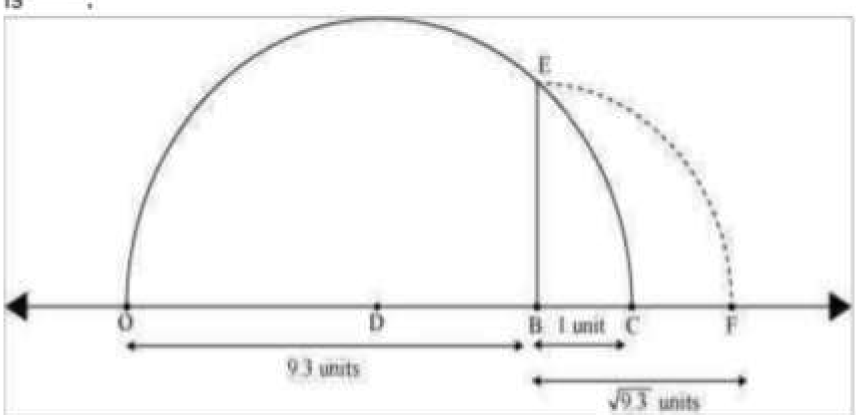
(iii) $\frac{1}{\sqrt{5}+\sqrt{2}}$ (iv) $\frac{1}{\sqrt{7}-2}$

Answer:

(i) $\frac{1}{\sqrt{7}} = \frac{1\times\sqrt{7}}{1\times\sqrt{7}} = \frac{\sqrt{7}}{7}$

perpendicular to line OC passing through point B. Let it intersect the semi-circle at E.

Taking B as centre and BE as radius, draw an arc in tersecting number line at F. BF is $\sqrt{9.3}$.



Question 5:

Rationalise the denominators of the following:

(ii)

$$\frac{1}{\sqrt{7}-\sqrt{6}} = \frac{1}{(\sqrt{7}-\sqrt{6})}\frac{(\sqrt{7}+\sqrt{6})}{(\sqrt{7}+\sqrt{6})}$$

$$= \frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7})^2-(\sqrt{6})^2}$$

$$= \frac{\sqrt{7}+\sqrt{6}}{7-6} = \frac{\sqrt{7}+\sqrt{6}}{1} = \sqrt{7}+\sqrt{6}$$

(iii)

$$\frac{1}{\sqrt{5}+\sqrt{2}} = \frac{1}{(\sqrt{5}+\sqrt{2})}\frac{(\sqrt{5}-\sqrt{2})}{(\sqrt{5}-\sqrt{2})}$$

$$= \frac{\sqrt{5}-\sqrt{2}}{(\sqrt{5})^2-(\sqrt{2})^2} = \frac{\sqrt{5}-\sqrt{2}}{5-2}$$

$$= \frac{\sqrt{5}-\sqrt{2}}{3}$$

(iv)

$$\frac{1}{\sqrt{7}-2} = \frac{1}{(\sqrt{7}-2)}\frac{(\sqrt{7}+2)}{(\sqrt{7}+2)}$$

$$= \frac{\sqrt{7}+2}{(\sqrt{7})^2-(2)^2}$$

$$= \frac{\sqrt{7}+2}{7-4} = \frac{\sqrt{7}+2}{3}$$

Exercise 1.6

Question 1:

Find:

(i) $64^{\frac{1}{2}}$ (ii) $32^{\frac{1}{5}}$ (iii) $125^{\frac{1}{3}}$

Find:

(i) $9^{\frac{3}{2}}$ (ii) $32^{\frac{2}{5}}$ (iii) $16^{\frac{3}{4}}$

(iv) $125^{\frac{-1}{3}}$

Answer:

Answer:

(i)

$$64^{\frac{1}{2}} = \left(2^6\right)^{\frac{1}{2}}$$
$$= 2^{6\times\frac{1}{2}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= 2^3 = 8$$

(ii)

$$32^{\frac{1}{5}} = \left(2^5\right)^{\frac{1}{5}}$$
$$= (2)^{5\times\frac{1}{5}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= 2^1 = 2$$

(iii)

$$(125)^{\frac{1}{3}} = \left(5^3\right)^{\frac{1}{3}}$$
$$= 5^{3\times\frac{1}{3}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= 5^1 = 5$$

Question 2:

(i)

$$9^{\frac{3}{2}} = \left(3^2\right)^{\frac{3}{2}}$$
$$= 3^{2\times\frac{3}{2}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= 3^3 = 27$$

(ii)

$$(32)^{\frac{2}{5}} = \left(2^5\right)^{\frac{2}{5}}$$
$$= 2^{5\times\frac{2}{5}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= 2^2 = 4$$

(iii)

$$(16)^{\frac{3}{4}} = \left(2^4\right)^{\frac{3}{4}}$$
$$= 2^{4\times\frac{3}{4}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= 2^3 = 8$$

(iv)

$$(125)^{\frac{-1}{3}} = \frac{1}{(125)^{\frac{1}{3}}} \qquad \left[a^{-m} = \frac{1}{a^m}\right]$$
$$= \frac{1}{\left(5^3\right)^{\frac{1}{3}}}$$
$$= \frac{1}{5^{3\times\frac{1}{3}}} \qquad \left[\left(a^m\right)^n = a^{mn}\right]$$
$$= \frac{1}{5}$$

Question 3:

PUNA INTERNATIONAL SCHOOL

- **CLASS – 9**
- **SUBJECT - MATHS**
- **CHAPTER - 3**

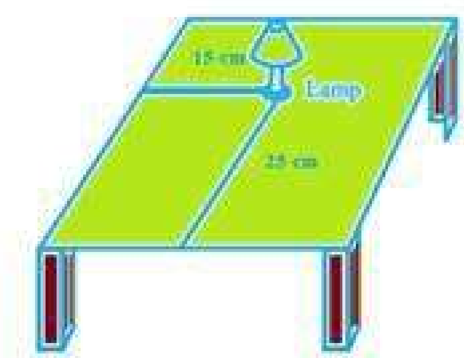
SAMPLE NOTE-BOOK

CHAPTER 3

Coordinate Geometry (Ex. 3.1)

1. **How will you describe the position of a table lamp on your study table to another person?**

Ans. Let us consider the given below figure of a study stable, on which a study lamp is placed.



Let us consider the lamp on the table as a point and the table as a plane. From the figure, we can conclude that the table is rectangular in shape, when observed from the top. The table has a short edge and a long edge.

Let us measure the distance of the lamp from the shorter edge and the longer edge. Let us assume that the distance of the lamp from the shorter edge is 15 cm and from the longer edge, its 25 cm.

Therefore, we can conclude that the position of the lamp on the table can be described in two ways depending on the order of the axes as $(15,25)$ or $(25,15)$.

2. **(Street Plan): A city has two main roads which cross each other at the centre of the city. These two roads are along the North-South direction and East-West direction.**

All the other streets of the city run parallel to these roads and are 200 m apart. There are 5 streets in each direction. Using 1cm = 200 m, draw a model of the city on your notebook. Represent the roads/streets by single lines.

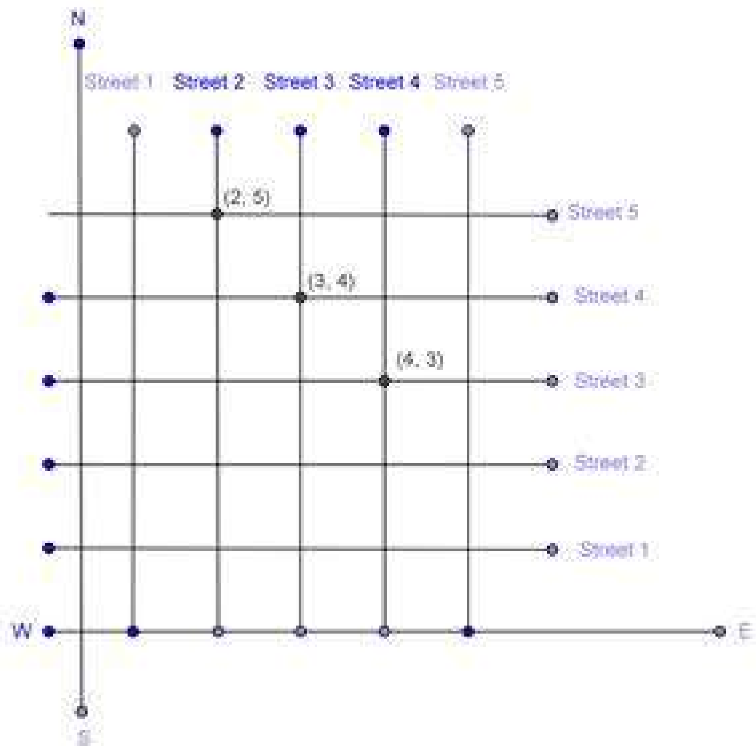
There are many cross- streets in your model. A particular cross-street is made by two streets, one running in the North - South direction and another in the East – West direction. Each cross street is referred to in the following manner: If the 2nd street running in the North - South direction and 5th in the East - West direction meet at some crossing, then we will call this cross-street (2, 5). Using this convention, find:

(i) how many cross - streets can be referred to as (4, 3).

(ii) how many cross - streets can be referred to as (3, 4).

Ans. We need to draw two perpendicular lines as the two main roads of the city that cross each other at the centre and let us mark it as N-S and E-W. Let us take the scale as 1 cm = 200m.

We need to draw five streets that are parallel to both the main roads, to get the given below figure.



(i) From the figure, we can conclude that only one point have the coordinates as (4, 3). Therefore, we can conclude that only one cross - street can be referred to as (4, 3).

(ii) From the figure, we can conclude that only one point have the coordinates as (3, 4). Therefore, we can conclude that only one cross - street can be referred to as (3, 4).

(Ex. 3.2)

1. Write the answer of each of the following questions:

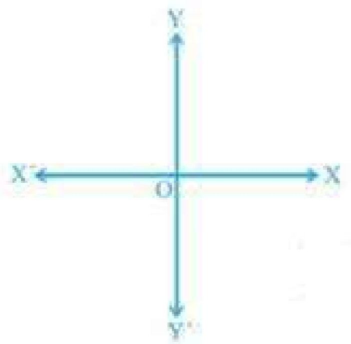
(i) What is the name of horizontal and the vertical lines drawn to determine the position of any point in the Cartesian plane ?

(ii) What is the name of each part of the plane formed by these two lines ?

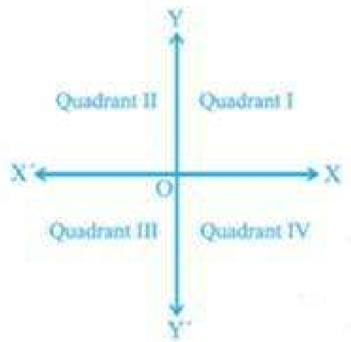
(iii) Write the name of the point where these two lines intersect.

Ans. (i) The horizontal line that is drawn to determine the position of any point in the Cartesian plane is called as ***x*-axis**.

The vertical line that is drawn to determine the position of any point in the Cartesian plane is called as ***y*-axis**.



(ii) The name of each part of the plane that is formed by x-axis and y-axis is called as **quadrant**.



(iii) The point, where the x-axis and the y-axis intersect is called as **origin**.

2. See Fig.3.14, and write the following:

(i) The coordinates of B.

(ii) The coordinates of C.

(iii) The point identified by the coordinates (–3, –5)

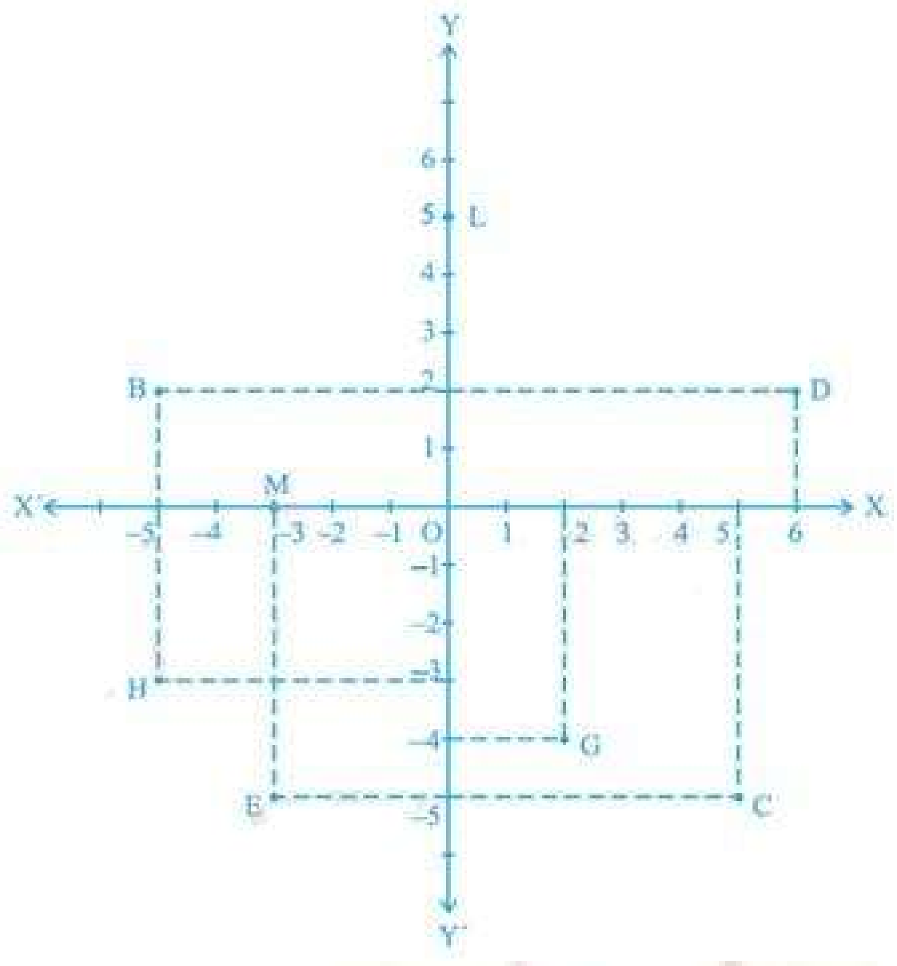
(iv) The point identified by the coordinates (2, – 4).

(v) The abscissa of the point D.

(vi) The ordinate of the point H.

(vii) The coordinates of the point L.

(viii) The coordinates of the point M.



Ans. We need to consider the given below figure to answer the following questions.

(i) The coordinates of point B in the above figure is the distance of point B from x-axis and y-axis.

Therefore, we can conclude that the coordinates of point B are (-5, 2).

(ii) The coordinates of point C in the above figure is the distance of point C from x-axis and y-axis.

Therefore, we can conclude that the coordinates of point C are (5, -5).

(iii)The point that represents the coordinates (-3, -5) is *E*.

(iv)The point that represents the coordinates (2, - 4) is *G*.

(v) The abscissa of point *D* in the above figure is the distance of point *D* from the *y*-axis. Therefore, we can conclude that the abscissa of point *D* is 6.

(vi) The ordinate of point *H* in the above figure is the distance of point *H* from the *x*-axis. Therefore, we can conclude that the abscissa of point *H* is -3.

(vii) The coordinates of point *L* in the above figure is the distance of point *L* from *x*-axis and *y*-axis. Therefore, we can conclude that the coordinates of point *L* are (0, 5).

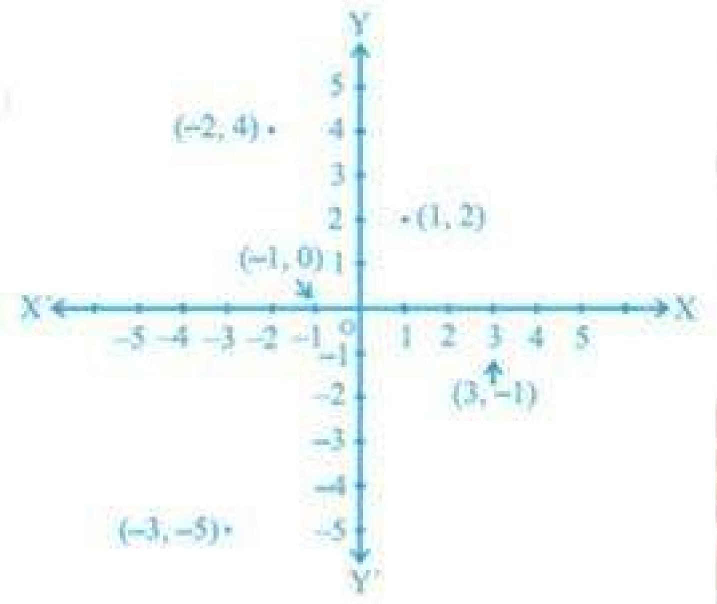
(viii) The coordinates of point *M* in the above figure is the distance of point *M* from *x*-axis and *y*-axis. Therefore, we can conclude that the coordinates of point *M* are (-3, 0).

Coordinate Geometry
(Ex. 3.3)

1. **In which quadrant or on which axis do each of the points (- 2, 4), (3, - 1), (- 1, 0), (1, 2) and (- 3, - 5) lie? Verify your answer by locating them on the Cartesian plane.**

Ans. We need to determine the quadrant or axis of the points (- 2, 4), (3, - 1), (- 1, 0), (1, 2) and (- 3, - 5).

First, we need to plot the points (- 2, 4), (3, - 1), (- 1, 0), (1, 2) and (- 3, - 5) on the graph, to get



We need to determine the quadrant, in which the points (- 2, 4), (3, - 1), (- 1, 0), (1, 2) and (- 3, - 5) lie.

From the figure, we can conclude that the point (- 2, 4) lie in II^nd^ quadrant.

From the figure, we can conclude that the point (3, - 1) lie in IV^th^ quadrant.

From the figure, we can conclude that the point (-1, 0) lie on *x*-axis.

From the figure, we can conclude that the point (1, 2) lie in I^st^ quadrant.

From the figure, we can conclude that the point (- 3, - 5) lie in III^rd^ quadrant.

3. **Plot the points (*x*, *y*) given in the following table on the plane, choosing suitable units of distance on the axes.**

X	-2	-1	0	1	3
y	8	7	-1.25	3	-1

Ans. We need to plot the given below points on the graph by using a suitable scale.
I

X	-2	-1	0	1	3
y	8	7	-1.25	3	-1

Therefore, we can conclude that the desired result is proved.

7. **Why is axiom 5, in the list of Euclid's axioms, considered as a 'universal truth'? (Note that the**