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# MATHEMATICS

N-211

## Chapter wise Reference Book
## Including Many Solved Sample Papers

*Based on*

## N.I.O.S. *Class – X*
## National Institute of Open Schooling

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# MATHEMATICS-X

*Based on:* **NATIONAL INSTITUTE OF OPEN SCHOOLING – X**

■■

# Sample Preview of the Solved Sample Question Papers

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# Solved Sample Paper - 1

## Based on NIOS (National Institute of Open Schooling)

# Mathematics - X

**Time : 3 Hours ]** **[ Maximum Marks : 100**

***Note:*** *(i)* Question Numbers (1-14) are Multiple Choice Questions. Each question carries one mark. For each question, four alternative choices A, B, C, D are given, of which only one is correct. You have to select the correct alternative and indicate it in the answer-book by writing (A), (B), (C) or (D) as the case may be.

*(ii)* Question Numbers (15-24) carry 2 marks each.

*(iii)* Question Numbers (25-33) carry 5 marks each.

*(iv)* Question Numbers (34-36) carry 7 marks each.

*(v)* All questions are compulsory.

**Q. 1. 0.0625 can be written in the form $\frac{p}{q}$ as:**

*(a)* $\frac{1}{8}$ *(b)* $\frac{5}{8}$

*(c)* $\frac{5}{16}$ *(d)* $\frac{1}{16}$

**Ans.** *(b)* $\frac{5}{8}$.

**Q. 2. If $x = 1$ is a zero of the polynomial $F(x) = x^2 - 5x + k$, then the value of k is :**

*(a)* 4 *(b)* – 4

*(c)* 6 *(d)* – 6

**Ans.** *(a)* 4.

**Q. 3. 5 gm is what per cent of a kilograme?**

*(a)* 10 *(b)* 5

*(c)* 0.5 *(d)* 0.05

**Ans.** *(c)* 0.5.

**Q. 4. Marked price of a shirt is Rs. 500. A customer buys the shirt for Rs. 400, the rate of discount is:**

*(a)* 20% *(b)* 22%

*(c)* 25% *(d)* 30%

**Ans.** *(a)* 20%.

**Q. 5. In a triangle, the point of intersection of perpendicular bisectors is called:**

*(a)* Incentre *(b)* Orthocentre

*(c)* Circumcentre *(d)* Centroid

**Ans.** *(c)* Circumcentre.

**Q. 6. The length of the tangent from a point *A* to a circle, of radius 3 cm, is 4 cm. The distance (in cm) of *A* from the centre of the circle is:**

*(a)* $\sqrt{7}$ *(b)* 7

*(c)* 5 *(d)* 25

**Ans.** *(c)* 5.

**Q. 7. *ABCD* is a cyclic quadrilateral in which $\angle BCD = 100^\circ$ and $\angle ABD = 70^\circ$. The $\angle ADB$ is:**

*(a)* $100^\circ$ *(b)* $70^\circ$

*(c)* $30^\circ$ *(d)* $15^\circ$

**Ans.** *(c)* $30^\circ$.

**Q. 8. If 5 tan A = 4, than the value of $\frac{5 \sin A - 4 \cos A}{5 \sin A + 4 \cos A}$ is:**

*(a)* $\frac{5}{3}$ *(b)* $\frac{5}{6}$

*(c)* $\frac{1}{6}$ *(d)* 0

**Ans.** *(d)* 0.

**Q. 9. If $\tan^2 45^\circ - \cos^2 30^\circ = x \sin 45^\circ . \cos 45^\circ$, then the value of *x* is:**

*(a)* –2 *(b)* $-\frac{1}{2}$

*(c)* $\frac{1}{2}$ *(d)* 2

**Ans.** *(c)* $\frac{1}{2}$.

**Q. 10. The value of $\text{cosec}^2 67^\circ - \tan^2 23^\circ + 1$ is:**

*(a)* –1 *(b)* 0

*(c)* 1 *(d)* 2

**Ans.** *(d)* 2.

**Q. 11. The value of $(\sin^2 A - 1) . \text{cosec}^2 (90^\circ - A)$ is:**

*(a)* –1 *(b)* 0

**(c) 1** **(d)** $\sqrt{2}$

**Ans.** *(c)* 1.

**Q. 12. If the arithmetic mean of 5, 8, 6, 7, *x* and 4 is 6, then the value of *x* is:**

**(a) 4** **(b) 6**
**(c) 1** **(d) 12**

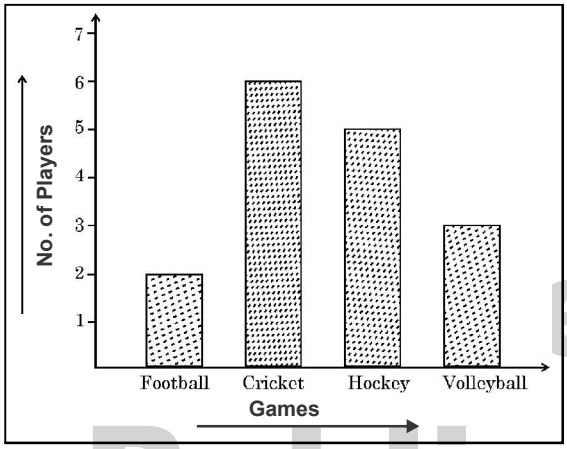
**Ans.** *(b)* 6.

**Q. 13. The median of first six prime numbers is:**

**(a) 7** **(b) 6**
**(c) 5** **(d) 4.6**

**Ans.** *(b)* 6.

**Q. 14. In the bar graph given below, which game is played by the maximum number of students?**




**(a) Football** **(b) Volleyball**
**(c) Cricket** **(d) Hockey**

**Ans.** *(c)* Cricket.

**OR**

**(For Visually impaired learners only)**
**A Histogram consists of :**

**(a) Triangles** **(b) Rectangles**
**(c) Squares** **(d) Sectors**

**Ans. *(b)*** Rectangles.

**Q. 15. Simplify the following:**

$\sqrt{12} + 2\sqrt{27} - 5\sqrt{48}$

**Ans.** $\sqrt{12} + 2\sqrt{27} - 5\sqrt{48}$

$= \sqrt{2\times2\times3} + 2\sqrt{3\times3\times3} - 5\sqrt{4\times4\times3}$

$= 2\sqrt{3} + 6\sqrt{3} - 20\sqrt{3}$

$= -12\sqrt{3}$.

**Q. 16. Multiply $2x^2 - x + 1$ by $x + 1$.**

**Ans.** $(2x^2 - x + 1)(x + 1)$

$= 2x^3 - x^2 + x + 2x^2 - x + 1$

$= 2x^3 + x^2 + 1$.

**Q. 17. By selling a shirt to a customer for Rs. 360 a shopkeeper makes a profit of 20%. For how much should he sell it to make a profit of 30%?**

**Ans.** Price $= 360 \times \frac{130}{100}$

$= 480$.

**Q. 18. Find the centroid of a triangle ABC whose vertices are A (3, – 1), B (10, 7) and C (5, 3).**

**Ans.** Co-ordinates of the centroid

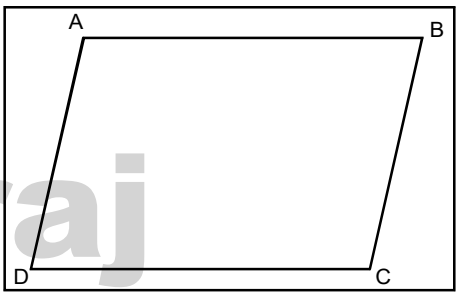
$= \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$

$= \left(\frac{3 + 10 + 5}{3}, \frac{-1 + 7 + 3}{3}\right)$

$= (6, 3)$.

**Q. 19. Two adjacent angles of a rhombus are in the ratio 4:5. Find all the angles of the rhombus.**

**Ans.** Let the rhombus be ABCD and the common multiple be *x*




$\angle B = 4x$

$\angle C = 5x$

$\angle B + \angle C = 180$

$4x + 5x = 180$

$9x = 180$

$x = 20$

$\angle B = 4x = 4 \times 20 = 80^\circ$

$\angle C = 5x = 5 \times 20 = 100^\circ$

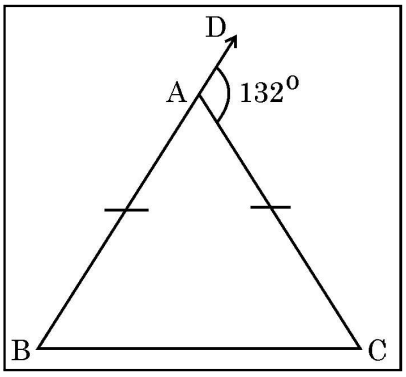
So that

$\angle A = \angle C = 100^\circ$

[Opposite angles of a rhombus]

$\angle B = \angle D = 80^\circ$.

**Q. 20. In the figure given below AB = AC and $\angle DAC = 132^\circ$. Find the angles of the triangle.**



# Sample Preview of The Chapter

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# MATHEMATICS

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**MODULE – 1** **ALGEBRA**

## Number Systems

1

### SUMMARY

When a child starts saying, ''I will eat a chapati'', he has started using his knowledge of numbers. Man is always curious by nature. He is always questioning ''How?'' This born eagerness was the starting of the number systems.

**Natural Numbers:** The numbers 1, 2, 3, ..... used for counting the objects are called *Natural Numbers*.

**Whole Numbers:** If 0 is added to natural numbers, the system is known as *Whole Numbers*, i.e. 0, 1, 2, 3, .....

**Integers:** – 4, – 3, – 2, – 1, 0 , 1, 2, 3, 4 ..... are known as *Integers.*

..... – 4, – 3, – 2, – 1 are known as *Negative Integers* and 1, 2, 3, 4.....are known as *Positive Integers.*

**Even Numbers:** The numbers which are divisible by 2 are known as *Even Numbers* e.g. 2, 4, 6, 8 .....

**Odd Numbers:** The numbers which are not divisible by 2 are called *Odd Numbers,* e.g. 1, 3, 5, 7 .....

**Prime Numbers:** The numbers which have no factors other than one and the numbers themselves are called the *Prime Numbers,* e.g. 2, 3, 5, 7, 11, 13 ..... .

***Note:*** Remember 1 is not a Prime Number.

**Rational Numbers:** A number of the form $\frac{p}{q}$, where $p$ and $q$ are integers and $q \neq 0$ is called a *Rational Number.*

$p$ is called *numerator* and $q$ is called *denominator.*

**Irrational Numbers:** All the real numbers which are not rational numbers are known as *irrational numbers,* e.g. $\sqrt{2}$ , .3121231234 .....

**Operations on Rational Numbers:** For two positive rational numbers, the result after operation is a positive rational number. This law is known as *Closure Property.*

The result is unchanged even after the places of the numbers are interchanged. This law is known as *Cummutative Property,* e.g.

$a + b = b + a$ Or $ab = ba$.

**For Three Numbers:** If the order of operation is changed, there is no change in result. This is called *Associative Property,* e.g.

$(a + b) + c = (a + (b + c)$ Or $a\,(bc) = (ab)\,c$.

**Positive and Negative Rational Numbers:** If numerator and denominator of a rational number are positive or negative, it is called *Positive Rational Number* and if either numerator or denominator is negative, it is called a *Negative Rational Number.*

**The Lowest Form of a Rational Number:** The rational number $\frac{a}{b}$ is said to be in its lowest form or simplest form, if $a$ and $b$ have no common factors other than one.

**Highest Common Factor (H.C.F.):** The largest number by which the given numbers are fully divided is known as H.C.F. of the numbers.

**Lowest Common Multiplication (L.C.M.):** The smallest number which is divisible by the given numbers is known as L.C.M. of the numbers.

**Example: Find the H.C.F. and L.C.M. of 24 and 30.**

**Sol.** ***(i)*** The H.C.F. $24 = 2 \times 2 \times 2 \times 3$

$30 = 2 \times 3 \times 5$

The H.C.F. of 24 and 30 is $2 \times 3 = 6$

*Second Method:*

$$\begin{array}{r} 24\overline{)30}(1 \\ \underline{24} \\ 6)\,24\,(4 \\ \underline{24} \\ \times \end{array}$$

Hence, H.C.F. is 6.

***(ii)*** The L.C.M. of 24 and 30.

$24 = 2 \times 2 \times 2 \times 3$

$30 = 2 \times 3 \times 5$

L.C.M. of 24 and 30 is $2 \times 2 \times 2 \times 3 \times 5 = 120$

• *Formula:*

H.C.F. × L.C.M. = First Number × Second Number.

**Operations on Rational Numbers**

**Addition:** The addition of positive numbers is positive and of negative numbers is negative.

If zero (0) is added to any number the sum is equal to that number.

$$a + 0 = a$$

If $\frac{a}{b}$ is a rational number, the rational number $-\frac{a}{b}$ is called the *negative* or *opposite* of $\frac{a}{b}$, because

$$\frac{a}{b} + \left(\frac{-a}{b}\right) = 0$$

**Subtraction:** To subtract one rational number from another rational number, add the *negative* of the first rational number to the second rational number.

**Multiplication:** To multiply two rational numbers we multiply the numerators of both the numbers to get the numerator of the product and denominators of both the numbers to get the denominator of the product.

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

where $a, b, c$ and $d$ are integers and $b, d \neq 0$

$1 \times a = a$ for every rational number $a$, $-1 \times a = -a$ the opposite of every rational number $a$.

The rational number $\frac{b}{a}$ is the reciprocal of the rational number $\frac{a}{b}$, if $a \neq 0$, because $\frac{a}{b} \times \frac{b}{a} = 1$.

**Division:** To divide a rational number by a non-zero rational number, we multiply the first rational number by the reciprocal of the second number.

***Division by zero (0) is not defined.***

**Number Line:** The real numbers can be represented on a line is called the *Number Line.*

A line is drawn and zero (0) point is made in the middle. The negative points are taken on left side of zero, while positive points are taken on right side of the zero.

**Decimal Representation of Rational Numbers:** All the rational numbers can be represented in the decimal form.

**Real Numbers:** Rational numbers with irrational numbers form the system of real numbers.

**Approximation of Irrational Numbers:** The process of counting a decimal upto a specific number of places is called *rounding off.*

*Method:* To round off a decimal upto three places, we look at the digit in the fourth place and

*(i)* If this digit is less than 5, we ignore it and all digits after it, and write the remaining number i.e. the number upto 3 decimal places.

*(ii)* If the digit is 5 or more than 5, we add one to the digit in the third place and write the new number upto the three decimal places.

## CHECK YOUR PROGRESS 1.1

**Q. 1. Identify rational numbers and integers from the following:**

$$\mathbf{4, \frac{-3}{4}, \frac{5}{6}, -36, \frac{12}{7}, \frac{3}{-8}, \frac{15}{7}, -6}$$

**Sol.** Integers 4, –36, – 6

Rational numbers

$$4, \frac{-3}{4}, \frac{5}{6}, -36, \frac{12}{7}, \frac{-3}{8}, \frac{15}{7}, -6$$

**Q. 2. From the following identify those which are not:**

**(*i*) natural numbers**

$$\mathbf{-\frac{7}{4}, 16, \frac{-3}{7}, -15, 0, \frac{5}{17}, \frac{3}{-4}, -\frac{4}{3}}$$

**Sol.** *(i)* Following are not natural numbers:

$$\frac{-7}{14}, \frac{-3}{7}, 15, 0 - \frac{5}{17}, \frac{-3}{4}, \frac{-4}{3}$$

**(*ii*) whole numbers**

**Sol.** Following are not natural numbers:

$$\frac{-7}{14}, \frac{-3}{7}, -15, \frac{5}{17}, \frac{-3}{4}, \frac{-4}{3}$$

**(*iii*) integers**

**Sol.** Following are not integers:

$$\frac{-7}{14}, \frac{-3}{7}, \frac{5}{17}, \frac{-3}{4}, \frac{-4}{3}$$

**(*iv*) rational numbers**

**Sol.** All are rational numbers.

**Q. 3. By making the following rational numbers with same denominator, simplify the following and specify whether the result in each case is a natural number, whole number, integer or a rational number:**

**(*i*)** $\mathbf{3+\frac{7}{3}}$

**Sol.** $3+\frac{7}{3}=\frac{3}{1}+\frac{7}{3}=\frac{3\times3+7}{3}=\frac{9+7}{3}$

$=\frac{16}{3}$, rational number

**(*ii*)** $\mathbf{-3+\frac{10}{4}}$

**Sol.** $-3+\frac{10}{4}=\frac{-3\times4+10}{4}=\frac{-12+10}{4}=\frac{-2}{4}$

$=-\frac{1}{2}$, rational number.

**(*iii*)** **– 8 –13**

**Sol.** – 8 –13 = –21, integer and rational number.

**(*iv*)** **12 – 12**

**Sol.** 12 – 12 = 0, whole number, integer and rational number.

**(*v*)** $\frac{9}{2}-\frac{1}{2}$

**Sol.** $\frac{9}{2}-\frac{1}{2}=\frac{9-1}{2}=\frac{8}{2}=4$, All.

**(*vi*)** $\mathbf{2\times\frac{5}{7}}$

**Sol.** $2\times\frac{5}{7}=\frac{10}{7}$, rational number.

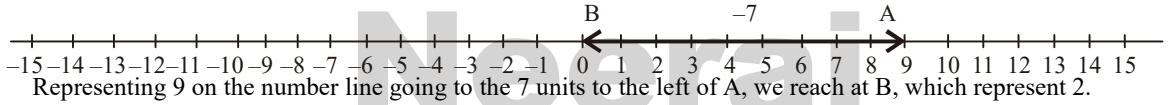
**(*vii*)** $8\div3$

**Sol.** $8\div3=\frac{8}{3}$, rational number.

**Q. 4. Use the number line to add the following:**

**(*i*) 9 + (–7)** **(*ii*) (–5) + (–3)** **(*iii*) (–3) + (4)**

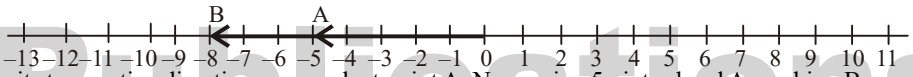
**Sol. (*i*)** 9 + (–7)




Representing 9 on the number line going to the 7 units to the left of A, we reach at B, which represent 2.

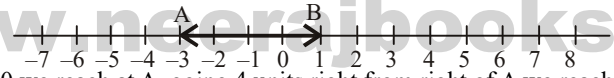
i.e. 9 + (–7) = 2

**(*ii*)** (–5) + (–3)




Going 3 units to negative direction, we reach at point A. Now going 5 uints ahead A reaching B on number line we get –8 i.e. (–5) + (–3) = –8

**(*iii*)** (–3) + (4)




Going 3 units left from 0 we reach at A, going 4 units right from right of A we reach a B at 1 on number line.

i.e. (–3) + 4 = 1

**Q. 5 Which of the following are rational numbers in lowest term?**

$$\mathbf{\frac{8}{12},\frac{5}{7},\frac{-3}{12},\frac{-6}{7},\frac{2\sqrt{3}}{\sqrt{27}},\frac{15}{24}}$$

**Sol.** $\frac{8}{12},\frac{5}{7},\frac{-3}{12},\frac{-6}{7},\frac{2\sqrt{3}}{\sqrt{27}},\frac{15}{24}$ rational number in lowest terms are

$$\frac{5}{7},\frac{-6}{7}$$

**Q. 6. Which of the following rational numbers are integers?**

$$\mathbf{-10,\frac{15}{5},\frac{-5}{15},\frac{13}{5},\frac{27}{9},\frac{7\times3}{14},\frac{-6}{-2}}$$

**Sol.** $-10,\ \frac{-15}{5},\frac{5}{15},\frac{13}{5},\frac{27}{9},\frac{7\times3}{14},\frac{-6}{-2}$

Rational number in integers are

–10,

$\frac{15}{5}=\frac{5\times3}{5}=3$,

$\frac{27}{9}=\frac{9\times3}{9}=3$,

$\frac{-6}{-2}=\frac{-3\times2}{-2}=3$

**Q. 7. Write 3 rational numbers equivalent to given rational numbers:**

**(*i*)** $\mathbf{\frac{2}{5}}$

**Sol.** $\frac{2}{5} = \frac{2\times2}{5\times2} = \frac{4}{10}$

$\frac{2}{5} = \frac{2\times3}{5\times3} = \frac{6}{15}$

$\frac{2}{5} = \frac{2\times4}{5\times4} = \frac{8}{20}$

$\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{10}$

**(*ii*)** $\frac{-5}{6}$

**Sol.** $\frac{-5}{6} = \frac{-5\times2}{6\times2} = \frac{-10}{12}$

$\frac{-5}{6} = \frac{-5\times3}{6\times3} = \frac{-15}{18}$

$\frac{-5}{6} = \frac{-5\times4}{6\times4} = \frac{-20}{24}$

$\frac{-5}{6} = \frac{-10}{12} = \frac{-15}{18} = \frac{-20}{24}$

**(*iii*)** $\frac{17}{3}$

**Sol.** $\frac{17}{3} = \frac{17\times2}{3\times2} = \frac{34}{6}$

$\frac{17}{3} = \frac{17\times3}{3\times3} = \frac{51}{9}$

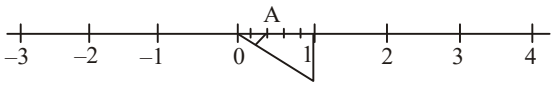
$\frac{17}{3} = \frac{17\times4}{3\times4} = \frac{68}{12}$

$\frac{17}{3} = \frac{34}{6} = \frac{51}{9} = \frac{68}{12}$

**Q. 8. Repersent the following rational numbers on the number line:**

**(*i*)** $\frac{2}{5}$

**Sol.** $\frac{2}{5}$

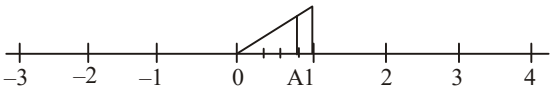



$0 < \frac{2}{5} <$; divide 5 equal parts of 1.

A is $\frac{2}{5}$.

**(*ii*)** $\frac{3}{4}$

**Sol.** $\frac{3}{4}$

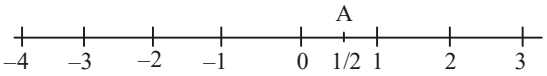



$0 < \frac{3}{4} < 1$ ; divide 4 equal parts of 1;

i.e. A is 3/4.

**(*iii*)** $\frac{1}{2}$

**Sol.** $\frac{1}{2}$



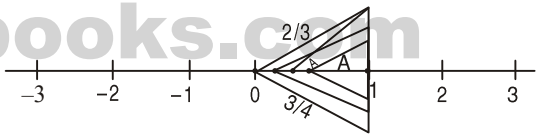

1/2 <1; divide 2 equal parts of 1

i.e. A in 1/2.

**Q. 9. Compare the following rational numbers by (*i*) changing them to rational numbers in equivalent forms (*ii*) using number line:**

**(*a*)** $\frac{2}{3}$ **and** $\frac{3}{4}$

**Sol.** $\frac{2}{3}$ and $\frac{3}{4}$




$0 < \frac{2}{3} < 1$ ; divide 3 equal parts of 1 and pick second part; i.e. A

$0 < 0 < \frac{3}{4} < 1$ divide 4 equal parts of 1 and pick third part; i.e. B

A < B

$\frac{2}{3} < \frac{3}{4}$; $\frac{3}{4} > \frac{2}{3}$

**(*b*)** $\frac{3}{5}$ **and** $\frac{7}{9}$

**Sol.** $\frac{3}{5}$ and $\frac{7}{9}$