Holiday Homework

CLASS –IX

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Subject English

SUBJECT ENRICHMENT ACTIVITIES

(in subject enrichment copy for the written work)

1. Write three stories
2. Write two poems that you like the most
3. Write an experience of your visit to a place
4. Write ten amazing facts about BROOK
5. Paste/draw the picture of different types of dogs,write a paragraph on DOBERMAN PINSCHER
6. Write the THREE VERB FORMS of any 30 verbs
7. Read English newspapers, magazines,comics, story books every day.
8. Listen to English news for at least ten to twenty minutes.

IN HOMEWORK COPY

1.Which part of the story,"HOW I TAUGHT MY GRANDMOTHER TO READ" do you like the most and why?
2.Write a paragraph on "FIRM DETERMINATION AND STRONG WILLPOWER CAN ACHIEVE EVEN THE IMPOSSIBLE "
3.Write an article on "NEW EDUCATION SYSTEM OF INDIA"
4.Write the best ten quotes of DR.APJ ABDUL KALAM
5. Write ten amazing
POINTS OF "THE BROOK"
THE STUDENTS WHO HAVE PARTICIPATED IN "YUVA BHAGIDARI - G20"VISITED IIT/KIIT/IIMT,HAVE TO PREPARE THE DOCUMENT IN 5000 WORDS

विषय - हिंदी

पाठ – 1

1. 'ध्वनि, लाख की चूड़ियां और अहमद नगर का क़िला के सभी प्रश्नोत्तर याद करें ।

2. कोई भी एक हिंदी कविता तथा कोई एक हिंदी कहानी याद करें । (कविता 1-3 मिनट और कहानी 2-3 मिनट)

3. अनुच्छेद लिखें :- क. विद्यार्थी जीवन और अनुशासन

ख. भारत के विकास में युवाओं का योगदान । (150 शब्द)

4. पर्यावरण संरक्षण को लेकर दो मित्रों के बीच कम से कम 30 वाक्यों में संवाद लिखिए ।

5. अपने छोटे भाई या बहन को कोरोना से किस प्रकार सतर्क रहें कि सीख देते हुए पत्र लिखिए ।

6. आपकी छुट्टियों के केवल 15 दिनों की डायरी लिखिए । (कोई भी 15 दिन)

7. निम्नलिखित फ़िल्में देखिए और उनसे मिलने वाली पाँच प्रमुख शिक्षाएँ लिखिए :—

i :- https://youtu.be/gZy4vIGf7MY

I am kalam

ii :- https://youtu.be/CPXkijYI9Y0

Chalk n duster

iii :- https://youtu.be/a1G1Sg3-g2g

Taare zameen par

iv :- https://youtu.be/l3Sqdk88gH4

Baghban

8. 120 शब्दों में कोई एक मौलिक / स्वरचित कहानी लिखिए ।

9. समास की परिभाषा , भेदों के नाम लिखिए ।

10. उपसर्ग और प्रत्यय के दस -दस उदाहरण लिखिए ।

SUBJECT- SANSKRIT

KENDRIYA VIDYALAYA NO.2 CUTTACK

ग्रीष्मकालीन अवकाश गृह कार्य

कक्षा - नवमी **विषयः – संस्कृत**

निर्देश:-सभी विद्यार्थी ग्रीष्मकालीन अवकाश कार्य संस्कृत कॉपी में करेंगे।

1. दिन द्वयस्य अवकाशार्थं प्राचार्यं प्रति पत्रं लिखत।

2. खाद्, क्रीड धातुः च पञ्चलकाराणां रूपाणि लिखत।(लट्, लृट्, लोट्,लड्, च विधिलिङ्ग)

3.संधि विच्छेदं कुरुत – विद्यालयं, सदैव, परोपकार, गिरीश, स्वागतम्।

4 प्रकृति प्रत्ययं विभज्य लिखत – विहस्य, पातुम्, पठित्वा , विहाय, कर्तुम्, दृष्टवा।

5. "किम्" , "तत्" च ' शब्दरूपाणि लिखत।

6. निम्नोक्तेषु विषयेषु द्वयोः विषयोः चित्रवर्णनं कुरुत-

1.उद्यानस्य चित्रं 2. वनस्य चित्रं 3. रक्षाबंधनपर्वस्य चित्रं

7. अधोलिखितं अनुच्छेदं पठित्वा प्रश्नान् उत्तरत ।

रवीन्द्रनाथठाकूर: कवीश्वर: आसीत् । स: न केवलं बङ्गदेशस्य अपि तु विश्वस्य प्रसिद्ध: कवि: आसीत् । अनेन विरचित: " गीताञ्जलि: " इति कवितासङ्ग्रह: अतिप्रसिद्ध: । अस्य कवितासङ्ग्रहस्य कृते कविरेष: परमसम्मानितं " नोबल् " पुरस्कारं प्राप्तवान् । अस्माकं राष्ट्रीयगानस्य रचयिता अपि रवीन्द्र: एव । महापुरुषोऽयं " विश्वभारती " नामकं विश्वविद्यालयं अपि अस्थापयत् । एतादृशानां महापुरुषाणां जन्मदात्री भारतभूमि: वस्तुत: धन्या एव ॥

(I)एकपदेन उत्तरत । 1.क: कवीश्वर: आसीत् ?

2.स: कस्य प्रदेशस्य कवि: आसीत् ?

(II) पूर्णवाक्येन उत्तरत। 1.अनेन विरचित: " गीताञ्जलि: " इति कवितासङ्ग्रह: कीदृश: ?

2. अस्माकं राष्ट्रीयगानस्य रचयिता क: ?

(III) निर्देशानुसारं उत्तरत । 1." अधन्या " इति पदस्य विलोमपदं किं प्रयुक्तम् ?

2." लोकस्य " इति अर्थे किं प्रयुक्तम् ?

SUBJECT- SCIENCE

1. Extra Questions

1. Complete the NCERT exemplar Questions of Matter in our surroundings. (Only answers).
2. Intext questions of Ch 1

2. CCT QUESTIONS

Complete the test items(Competency based questions) shared by CBSE and sent in whats app group(Only write down the answers)

3. Assertion- Reason questions

Directions: In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements, given below, mark the correct answer as:

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both Assertion and Reason are false.

Q.1. Assertion : A gas can easily be compressed by applying pressure.

Reason : Since the inter-particle spaces between gases are very large, they can decrease by applying pressure.

Q.2. Assertion : Gases exert pressure on the walls of the container.

Reason : The intermolecular force of attraction is very strong in gases.

Q.3. Assertion : It is easier to cook food at sea level as compared to higher altitudes.

Reason : The boiling point of water increases at high altitudes.

Q.4. Assertion : When a solid melts, its temperature remains the same.

Reason : The heat gets used up in changing the state by overcoming the forces of attraction between the particles.

Q.5. Assertion : Ice floats on water.

Reason : Liquids have lower density than solids.

Q.6. Assertion : The rate of evaporation increases with increase in temperature.

Reason: Increase in temperature decreases the kinetic energy of the particles.

Q.7. Assertion : There is a change in the temperature of the substance when there it undergoes a change in state through it is still being heated.

Reason : The heat supplied is either absorbed as a latent heat of fusion or a latent heat of vapourisation.

4. Question Bank:

Prepare a question bank of 20 questions from Matter in our surroundings chapter and write the answers.

Subject - Social science

Q1 Make a project file on the topic: French Revolution

Q2 on the outline map of India mark the following:

B. Neighbouring countries of India

C. States lying on of tropic of cancer.

D. States and capitals of India and union Territories

Q.3 Prepare 10-10 MCQS from French revolution , Village of Palampur

Q4.Liberals were not democrats . explain.

Q5.How did bad harvest affect people?

SUBJECT: ART

1. Make any five 3D craft work

Reference Link:
https://www.youtube.com/shorts/P2yhWk51zXI
youtube.com/watch?v=pDkUlrJFVaE

2. Draw any five potraits ,2D (colour or shading)

Reference Link :
https://www.youtube.com/shorts/FndjSSmij3s
https://www.youtube.com/shorts/WNEgdUxlXO4

SUBJECT: WE

KENDRIYA VIDYALAYA NO.2 CUTTACK (2023-2024)

HOLIDAY HOME ASSIGNMENTS FOR SUMMER VACATION

SL NO	CLASS	TOPIC/THEME	ASSIGNMENT	TLO/Skill
01	IX	Cover design, Best out of waste, origami(geometrical) Electrical Symbols	Origami work(04) Best out of waste(04) Chart for Symbols	To make various models Awareness Creativity

SUBJECT: AI

A. Prepare a 1000 words write-up or a 5 slide presentation on **How insects Inspire ArtificialIntelligence.**

B. **Complete the exercise of chapter self management skill & ICT Skill.**

Submit homework on very first day after reopening of Vidyalaya

आप सभी स्वस्थ रहें , मस्त रहें , ख़ुश रहें , सीखते रहें , पेरेंट्स की सहायता करते रहें ।

बहुत बहुत

आशीर्वाद सभी विद्यार्थियों को।

----------Wish you all a very happy vacation, take care----------

CHAPTER 1

NUMBER SYSTEMS

(A) Main Concepts and Results

Rational numbers

Irrational numbers

Locating irrational numbers on the number line

Real numbers and their decimal expansions

Representing real numbers on the number line

Operations on real numbers

Rationalisation of denominator

Laws of exponents for real numbers

- A number is called a rational number, if it can be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
- A number which cannot be expressed in the form $\frac{p}{q}$ (where p and q are integers and $q \neq 0$) is called an irrational number.
- All rational numbers and all irrational numbers together make the collection of real numbers.
- Decimal expansion of a rational number is either terminating or non-terminating recurring, while the decimal expansion of an irrational number is non-terminating non-recurring.

- If r is a rational number and s is an irrational number, then $r+s$ and $r-s$ are irrationals.

  Further, if r is a non-zero rational, then rs and $\frac{r}{s}$ are irrationals.

- For positive real numbers a and b :

  (i) $\sqrt{ab} = \sqrt{a}\sqrt{b}$ (ii) $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

  (iii) $(\sqrt{a}+\sqrt{b})(\sqrt{a}-\sqrt{b}) = a-b$ (iv) $(a+\sqrt{b})(a-\sqrt{b}) = a^2-b$

  (v) $(\sqrt{a}+\sqrt{b})^2 = a+2\sqrt{ab}+b$

- If p and q are rational numbers and a is a positive real number, then

  (i) $a^p \cdot a^q = a^{p+q}$ (ii) $(a^p)^q = a^{pq}$

  (iii) $\frac{a^p}{a^q} = a^{p-q}$ (iv) $a^p b^p = (ab)^p$

(B) Multiple Choice Questions

Write the correct answer:

Sample Question 1 : Which of the following is not equal to $\left[\left(\frac{5}{6}\right)^{\frac{1}{5}}\right]^{-\frac{1}{6}}$?

(A) $\left(\frac{5}{6}\right)^{\frac{1}{5}-\frac{1}{6}}$ (B) $\frac{1}{\left[\left(\frac{5}{6}\right)^{\frac{1}{5}}\right]^{\frac{1}{6}}}$ (C) $\left(\frac{6}{5}\right)^{\frac{1}{30}}$ (D) $\left(\frac{5}{6}\right)^{-\frac{1}{30}}$

Solution : Answer (A)

EXERCISE 1.1

Write the correct answer in each of the following:

1. Every rational number is

(A) a natural number (B) an integer

(C) a real number (D) a whole number

2. Between two rational numbers

(A) there is no rational number

(B) there is exactly one rational number

(C) there are infinitely many rational numbers

(D) there are only rational numbers and no irrational numbers

3. Decimal representation of a rational number cannot be

(A) terminating

(B) non-terminating

(C) non-terminating repeating

(D) non-terminating non-repeating

4. The product of any two irrational numbers is

(A) always an irrational number

(B) always a rational number

(C) always an integer

(D) sometimes rational, sometimes irrational

5. The decimal expansion of the number $\sqrt{2}$ is

(A) a finite decimal

(B) 1.41421

(C) non-terminating recurring

(D) non-terminating non-recurring

6. Which of the following is irrational?

(A) $\sqrt{\frac{4}{9}}$ (B) $\frac{\sqrt{12}}{\sqrt{3}}$ (C) $\sqrt{7}$ (D) $\sqrt{81}$

7. Which of the following is irrational?

(A) 0.14 (B) $0.14\overline{16}$ (C) $0.\overline{1416}$ (D) 0.4014001400014...

8. A rational number between $\sqrt{2}$ and $\sqrt{3}$ is

(A) $\frac{\sqrt{2}+\sqrt{3}}{2}$ (B) $\frac{\sqrt{2}\cdot\sqrt{3}}{2}$ (C) 1.5 (D) 1.8

9. The value of 1.999... in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is

(A) $\frac{19}{10}$ (B) $\frac{1999}{1000}$ (C) 2 (D) $\frac{1}{9}$

10. $2\sqrt{3}+\sqrt{3}$ is equal to

(A) $2\sqrt{6}$ (B) 6 (C) $3\sqrt{3}$ (D) $4\sqrt{6}$

11. $\sqrt{10}\times\sqrt{15}$ is equal to

(A) $6\sqrt{5}$ (B) $5\sqrt{6}$ (C) $\sqrt{25}$ (D) $10\sqrt{5}$

12. The number obtained on rationalising the denominator of $\frac{1}{\sqrt{7}-2}$ is

(A) $\frac{\sqrt{7}+2}{3}$ (B) $\frac{\sqrt{7}-2}{3}$ (C) $\frac{\sqrt{7}+2}{5}$ (D) $\frac{\sqrt{7}+2}{45}$

13. $\frac{1}{\sqrt{9}-\sqrt{8}}$ is equal to

(A) $\frac{1}{2}\left(3-2\sqrt{2}\right)$ (B) $\frac{1}{3+2\sqrt{2}}$

(C) $3-2\sqrt{2}$ (D) $3+2\sqrt{2}$

14. After rationalising the denominator of $\frac{7}{3\sqrt{3}-2\sqrt{2}}$, we get the denominator as

(A) 13 (B) 19 (C) 5 (D) 35

15. The value of $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ is equal to

(A) $\sqrt{2}$ (B) 2 (C) 4 (D) 8

16. If $\sqrt{2}$ = 1.4142, then $\sqrt{\frac{\sqrt{2}-1}{\sqrt{2}+1}}$ is equal to

(A) 2.4142 (B) 5.8282
(C) 0.4142 (D) 0.1718

17. $\sqrt[4]{\sqrt[3]{2^2}}$ equals

(A) $2^{-\frac{1}{6}}$ (B) 2^{-6} (C) $2^{\frac{1}{6}}$ (D) 2^6

18. The product $\sqrt[3]{2} \cdot \sqrt[4]{2} \cdot \sqrt[12]{32}$ equals

(A) $\sqrt{2}$ (B) 2 (C) $\sqrt[12]{2}$ (D) $\sqrt[12]{32}$

19. Value of $\sqrt[4]{(81)^{-2}}$ is

(A) $\frac{1}{9}$ (B) $\frac{1}{3}$ (C) 9 (D) $\frac{1}{81}$

20. Value of $(256)^{0.16} \times (256)^{0.09}$ is

(A) 4 (B) 16 (C) 64 (D) 256.25

21. Which of the following is equal to x?

(A) $x^{\frac{12}{7}} - x^{\frac{5}{7}}$ (B) $\sqrt[12]{\left(x^4\right)^{\frac{1}{3}}}$ (C) $\left(\sqrt{x^3}\right)^{\frac{2}{3}}$ (D) $x^{\frac{12}{7}} \times x^{\frac{7}{12}}$

(C) Short Answer Questions with Reasoning

Sample Question 1: Are there two irrational numbers whose sum and product both are rationals? Justify.

Solution : Yes.

$3+\sqrt{2}$ and $3-\sqrt{2}$ are two irrational numbers.

$\left(3+\sqrt{2}\right)+\left(3-\sqrt{2}\right)=6$, a rational number.

$\left(3+\sqrt{2}\right)\times\left(3-\sqrt{2}\right)=7$, a rational number.

So, we have two irrational numbers whose sum and product both are rationals.

Sample Question 2: State whether the following statement is true:

There is a number x such that x^2 is irrational but x^4 is rational. Justify your answer by an example.

Solution : True.

Let us take $x = \sqrt[4]{2}$

Now, $x^2 = \left(\sqrt[4]{2}\right)^2 = \sqrt{2}$, an irrational number.

$x^4 = \left(\sqrt[4]{2}\right)^4 = 2$, a rational number.

So, we have a number x such that x^2 is irrational but x^4 is rational.

EXERCISE 1.2

1. Let x and y be rational and irrational numbers, respectively. Is $x + y$ necessarily an irrational number? Give an example in support of your answer.

2. Let x be rational and y be irrational. Is xy necessarily irrational? Justify your answer by an example.

3. State whether the following statements are true or false? Justify your answer.

(i) $\frac{\sqrt{2}}{3}$ is a rational number.

(ii) There are infinitely many integers between any two integers.

(iii) Number of rational numbers between 15 and 18 is finite.

(iv) There are numbers which cannot be written in the form $\frac{p}{q}$, $q \neq 0$, p, q both are integers.

(v) The square of an irrational number is always rational.

(vi) $\frac{\sqrt{12}}{\sqrt{3}}$ is not a rational number as $\sqrt{12}$ and $\sqrt{3}$ are not integers.

(vii) $\frac{\sqrt{15}}{\sqrt{3}}$ is written in the form $\frac{p}{q}$, $q \neq 0$ and so it is a rational number.

4. Classify the following numbers as rational or irrational with justification :

(i) $\sqrt{196}$ (ii) $3\sqrt{18}$ (iii) $\sqrt{\frac{9}{27}}$ (iv) $\frac{\sqrt{28}}{\sqrt{343}}$

(v) $-\sqrt{0.4}$ (vi) $\frac{\sqrt{12}}{\sqrt{75}}$ (vii) 0.5918

(viii) $\left(1+\sqrt{5}\right)-\left(4+\sqrt{5}\right)$ (ix) 10.124124... (x) 1.010010001...

(D) Short Answer Questions

Sample Question 1: Locate $\sqrt{13}$ on the number line.

Solution : We write 13 as the sum of the squares of two natural numbers :

$13 = 9 + 4 = 3^2 + 2^2$

On the number line, take OA = 3 units.

Draw BA = 2 units, perpendicular to OA. Join OB (see Fig.1.1).

By Pythagoras theorem, OB = $\sqrt{13}$

Using a compass with centre O and radius OB, draw an arc which intersects the number line at the point C. Then, C corresponds to $\sqrt{13}$.

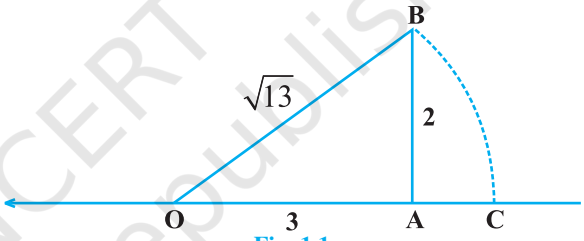


Fig. 1.1

Remark : We can also take OA = 2 units and AB = 3 units.

Sample Question 2 : Express $0.12\overline{3}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

Solution :

Let $x = 0.12\overline{3}$

so, $10x = 1.2\overline{3}$

or $10x - x = 1.2\overline{3} - 0.12\overline{3} = 1.2333 \ldots - 0.12333 \ldots$

or $9x = 1.11$

or $x = \frac{1.11}{9} = \frac{111}{900}$

Therefore, $0.12\overline{3} = \frac{111}{900} = \frac{37}{300}$

Sample Question 3 : Simplify : $\left(3\sqrt{5} - 5\sqrt{2}\right)\left(4\sqrt{5} + 3\sqrt{2}\right)$.

Solution : $\left(3\sqrt{5} - 5\sqrt{2}\right)\left(4\sqrt{5} + 3\sqrt{2}\right)$

$$= 12 \times 5 - 20\sqrt{2} \times \sqrt{5} + 9\sqrt{5} \times \sqrt{2} - 15 \times 2$$

$$= 60 - 20\sqrt{10} + 9\sqrt{10} - 30$$

$$= 30 - 11\sqrt{10}$$

Sample Question 4 : Find the value of a in the following :

$$\frac{6}{3\sqrt{2} - 2\sqrt{3}} = 3\sqrt{2} - a\sqrt{3}$$

Solution : $\frac{6}{3\sqrt{2} - 2\sqrt{3}} = \frac{6}{3\sqrt{2} - 2\sqrt{3}} \times \frac{3\sqrt{2} + 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}}$

$$= \frac{6\left(3\sqrt{2} + 2\sqrt{3}\right)}{\left(3\sqrt{2}\right)^2 - \left(2\sqrt{3}\right)^2} = \frac{6\left(3\sqrt{2} + 2\sqrt{3}\right)}{18 - 12} = \frac{6\left(3\sqrt{2} + 2\sqrt{3}\right)}{6}$$

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

Therefore, $3\sqrt{2} + 2\sqrt{3} = 3\sqrt{2} - a\sqrt{3}$

or $a = -2$

Sample Question 5: Simplify : $\left[5\left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$

Solution :

$$\left[5\left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}} = \left[5\left((2^3)^{\frac{1}{3}} + (3^3)^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$$

$$= \left[5(2+3)^3\right]^{\frac{1}{4}}$$

$$= \left[5(5)^3\right]^{\frac{1}{4}}$$

$$= [5^4]^{\frac{1}{4}} = 5$$

EXERCISE 1.3

1. Find which of the variables x, y, z and u represent rational numbers and which irrational numbers :

(i) $x^2 = 5$ (ii) $y^2 = 9$ (iii) $z^2 = .04$ (iv) $u^2 = \frac{17}{4}$

2. Find three rational numbers between

(i) -1 and -2 (ii) 0.1 and 0.11

(iii) $\frac{5}{7}$ and $\frac{6}{7}$ (iv) $\frac{1}{4}$ and $\frac{1}{5}$

3. Insert a rational number and an irrational number between the following :

(i) 2 and 3 (ii) 0 and 0.1 (iii) $\frac{1}{3}$ and $\frac{1}{2}$

(iv) $\frac{-2}{5}$ and $\frac{1}{2}$ (v) 0.15 and 0.16 (vi) $\sqrt{2}$ and $\sqrt{3}$

(vii) 2.357 and 3.121 (viii) .0001 and .001 (ix) 3.623623 and 0.484848

(x) 6.375289 and 6.375738

4. Represent the following numbers on the number line :

7, 7.2, $\frac{-3}{2}$, $\frac{-12}{5}$

5. Locate $\sqrt{5}$, $\sqrt{10}$ and $\sqrt{17}$ on the number line.

6. Represent geometrically the following numbers on the number line :

(i) $\sqrt{4.5}$ (ii) $\sqrt{5.6}$ (iii) $\sqrt{8.1}$ (iv) $\sqrt{2.3}$

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

(i) 0.2 (ii) 0.888... (iii) $5.\overline{2}$ (iv) $0.\overline{001}$

(v) 0.2555... (vi) $0.1\overline{34}$ (vii) .00323232... (viii) .404040...

8. Show that $0.142857142857... = \frac{1}{7}$

9. Simplify the following:

(i) $\sqrt{45} - 3\sqrt{20} + 4\sqrt{5}$ (ii) $\frac{\sqrt{24}}{8} + \frac{\sqrt{54}}{9}$

(iii) $\sqrt[4]{12} \times \sqrt[7]{6}$ (iv) $4\sqrt{28} \div 3\sqrt{7} \div \sqrt[3]{7}$

(v) $3\sqrt{3} + 2\sqrt{27} + \frac{7}{\sqrt{3}}$ (vi) $\left(\sqrt{3} - \sqrt{2}\right)^2$

(vii) $\sqrt[4]{81} - 8\sqrt[3]{216} + 15\sqrt[5]{32} + \sqrt{225}$ (viii) $\frac{3}{\sqrt{8}} + \frac{1}{\sqrt{2}}$

(ix) $\frac{2\sqrt{3}}{3} - \frac{\sqrt{3}}{6}$

10. Rationalise the denominator of the following:

(i) $\frac{2}{3\sqrt{3}}$ (ii) $\frac{\sqrt{40}}{\sqrt{3}}$ (iii) $\frac{3+\sqrt{2}}{4\sqrt{2}}$

(iv) $\frac{16}{\sqrt{41}-5}$ (v) $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ (vi) $\frac{\sqrt{6}}{\sqrt{2}+\sqrt{3}}$

(vii) $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ (viii) $\frac{3\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ (ix) $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

11. Find the values of a and b in each of the following:

(i) $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a - 6\sqrt{3}$

(ii) $\frac{3-\sqrt{5}}{3+2\sqrt{5}} = a\sqrt{5} - \frac{19}{11}$

(iii) $\frac{\sqrt{2}+\sqrt{3}}{3\sqrt{2}-2\sqrt{3}} = 2 - b\sqrt{6}$

(iv) $\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}b$

12. If $a = 2+\sqrt{3}$, then find the value of $a - \frac{1}{a}$.

13. Rationalise the denominator in each of the following and hence evaluate by taking $\sqrt{2} = 1.414$, $\sqrt{3} = 1.732$ and $\sqrt{5} = 2.236$, upto three places of decimal.

(i) $\frac{4}{\sqrt{3}}$ (ii) $\frac{6}{\sqrt{6}}$ (iii) $\frac{\sqrt{10}-\sqrt{5}}{2}$

(iv) $\frac{\sqrt{2}}{2+\sqrt{2}}$ (v) $\frac{1}{\sqrt{3}+\sqrt{2}}$

14. Simplify :

(i) $\left(1^3+2^3+3^3\right)^{\frac{1}{2}}$ (ii) $\left(\frac{3}{5}\right)^4 \left(\frac{8}{5}\right)^{-12} \left(\frac{32}{5}\right)^6$

(iii) $\left(\frac{1}{27}\right)^{\frac{-2}{3}}$ (iv) $\left((625)^{-\frac{1}{2}}\right)^{-\frac{1}{4}^2}$

(v) $\frac{9^{\frac{1}{3}} \times 27^{-\frac{1}{2}}}{3^{\frac{1}{6}} \times 3^{-\frac{2}{3}}}$ (vi) $64^{-\frac{1}{3}} \left(64^{\frac{1}{3}} - 64^{\frac{2}{3}}\right)$

(vii) $\frac{8^{\frac{1}{3}} \times 16^{\frac{1}{3}}}{32^{-\frac{1}{3}}}$

(E) Long Answer Questions

Sample Question 1 : If $a = 5 + 2\sqrt{6}$ and $b = \frac{1}{a}$, then what will be the value of $a^2 + b^2$?

Solution : $a = 5 + 2\sqrt{6}$

$$b = \frac{1}{a} = \frac{1}{5+2\sqrt{6}} = \frac{1}{5+2\sqrt{6}} \times \frac{5-2\sqrt{6}}{5-2\sqrt{6}} = \frac{5-2\sqrt{6}}{5^2-(2\sqrt{6})^2} = \frac{5-2\sqrt{6}}{25-24} = 5-2\sqrt{6}$$

Therefore, $a^2 + b^2 = (a + b)^2 - 2ab$

Here, $a + b = (5 + 2\sqrt{6}) + (5 - 2\sqrt{6}) = 10$

$ab = (5 + 2\sqrt{6})(5 - 2\sqrt{6}) = 5^2 - (2\sqrt{6})^2 = 25 - 24 = 1$

Therefore, $a^2 + b^2 = 10^2 - 2 \times 1 = 100 - 2 = 98$

EXERCISE 1.4

1. Express $0.6 + 0.\overline{7} + 0.4\overline{7}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

2. Simplify : $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$.

3. If $\sqrt{2} = 1.414$, $\sqrt{3} = 1.732$, then find the value of $\frac{4}{3\sqrt{3}-2\sqrt{2}} + \frac{3}{3\sqrt{3}+2\sqrt{2}}$.

4. If $a = \frac{3+\sqrt{5}}{2}$, then find the value of $a^2 + \frac{1}{a^2}$.

5. If $x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ and $y = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$, then find the value of $x^2 + y^2$.

6. Simplify : $(256)^{-\left(4^{\frac{-3}{2}}\right)}$

7. Find the value of $\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}}$

CHAPTER 2

POLYNOMIALS

(A) Main Concepts and Results

Meaning of a Polynomial

Degree of a polynomial

Coefficients

Monomials, Binomials etc.

Constant, Linear, Quadratic Polynomials etc.

Value of a polynomial for a given value of the variable

Zeroes of a polynomial

Remainder theorem

Factor theorem

Factorisation of a quadratic polynomial by splitting the middle term

Factorisation of algebraic expressions by using the Factor theorem

Algebraic identities –

$(x + y)^2 = x^2 + 2xy + y^2$

$(x - y)^2 = x^2 - 2xy + y^2$

$x^2 - y^2 = (x + y)\ (x - y)$

$(x + a)\ (x + b) = x^2 + (a + b)\ x + ab$

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 = x^3 + y^3 + 3xy\ (x + y)$

$(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3 = x^3 - y^3 - 3xy\ (x - y)$

$x^3 + y^3 = (x + y)\ (x^2 - xy + y^2)$

$x^3 - y^3 = (x - y)\ (x^2 + xy + y^2)$

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)\ (x^2 + y^2 + z^2 - xy - yz - zx)$

(B) Multiple Choice Questions

Sample Question 1 : If $x^2 + kx + 6 = (x + 2)\ (x + 3)$ for all x, then the value of k is

(A) 1 (B) -1 (C) 5 (D) 3

Solution : Answer (C)

EXERCISE 2.1

Write the correct answer in each of the following :

1. Which one of the following is a polynomial?

(A) $\frac{x^2}{2} - \frac{2}{x^2}$ (B) $\sqrt{2x} - 1$

(C) $x^2 + \frac{3x^{\frac{3}{2}}}{\sqrt{x}}$ (D) $\frac{x-1}{x+1}$

2. $\sqrt{2}$ is a polynomial of degree

(A) 2 (B) 0 (C) 1 (D) $\frac{1}{2}$

3. Degree of the polynomial $4x^4 + 0x^3 + 0x^5 + 5x + 7$ is

(A) 4 (B) 5 (C) 3 (D) 7

4. Degree of the zero polynomial is

(A) 0 (B) 1 (C) Any natural number

(D) Not defined

5. If $p(x) = x^2 - 2\sqrt{2}x + 1$, then $p(2\sqrt{2})$ is equal to

(A) 0 (B) 1 (C) $4\sqrt{2}$ (D) $8\sqrt{2} + 1$

6. The value of the polynomial $5x - 4x^2 + 3$, when $x = -1$ is

(A) -6 (B) 6 (C) 2 (D) -2

7. If $p(x) = x + 3$, then $p(x) + p(-x)$ is equal to

(A) 3 (B) $2x$ (C) 0 (D) 6

8. Zero of the zero polynomial is

(A) 0 (B) 1

(C) Any real number (D) Not defined

9. Zero of the polynomial $p(x) = 2x + 5$ is

(A) $-\frac{2}{5}$ (B) $-\frac{5}{2}$ (C) $\frac{2}{5}$ (D) $\frac{5}{2}$

10. One of the zeroes of the polynomial $2x^2 + 7x - 4$ is

(A) 2 (B) $\frac{1}{2}$ (C) $-\frac{1}{2}$ (D) -2

11. If $x^{51} + 51$ is divided by $x + 1$, the remainder is

(A) 0 (B) 1 (C) 49 (D) 50

12. If $x + 1$ is a factor of the polynomial $2x^2 + kx$, then the value of k is

(A) -3 (B) 4 (C) 2 (D) -2

13. $x + 1$ is a factor of the polynomial

(A) $x^3 + x^2 - x + 1$ (B) $x^3 + x^2 + x + 1$

(C) $x^4 + x^3 + x^2 + 1$ (D) $x^4 + 3x^3 + 3x^2 + x + 1$

14. One of the factors of $(25x^2 - 1) + (1 + 5x)^2$ is

(A) $5 + x$ (B) $5 - x$ (C) $5x - 1$ (D) $10x$

15. The value of $249^2 - 248^2$ is

(A) 1^2 (B) 477 (C) 487 (D) 497

16. The factorisation of $4x^2 + 8x + 3$ is

(A) $(x + 1)(x + 3)$ (B) $(2x + 1)(2x + 3)$

(C) $(2x + 2)(2x + 5)$ (D) $(2x - 1)(2x - 3)$

17. Which of the following is a factor of $(x + y)^3 - (x^3 + y^3)$?

(A) $x^2 + y^2 + 2xy$ (B) $x^2 + y^2 - xy$ (C) xy^2 (D) $3xy$

18. The coefficient of x in the expansion of $(x + 3)^3$ is

(A) 1 (B) 9 (C) 18 (D) 27

19. If $\frac{x}{y} + \frac{y}{x} = -1$ $(x, y \neq 0)$, the value of $x^3 - y^3$ is

(A) 1 (B) –1 (C) 0 (D) $\frac{1}{2}$

20. If $49x^2 - b = \left(7x+\frac{1}{2}\right)\left(7x-\frac{1}{2}\right)$, then the value of b is

(A) 0 (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$

21. If $a + b + c = 0$, then $a^3 + b^3 + c^3$ is equal to

(A) 0 (B) abc (C) $3abc$ (D) $2abc$

(C) Short Answer Questions with Reasoning

Sample Question 1 : Write whether the following statements are **True** or **False**. Justify your answer.

(i) $\frac{1}{\sqrt{5}}x^{\frac{1}{2}}+1$ is a polynomial (ii) $\frac{6\sqrt{x}+x^{\frac{3}{2}}}{\sqrt{x}}$ is a polynomial, $x \neq 0$

Solution :

(i) False, because the exponent of the variable is not a whole number.

(ii) True, because $\frac{6\sqrt{x}+x^{\frac{3}{2}}}{\sqrt{x}} = 6 + x$, which is a polynomial.

EXERCISE 2.2

1. Which of the following expressions are polynomials? Justify your answer:

(i) 8 (ii) $\sqrt{3}x^2 - 2x$ (iii) $1-\sqrt{5x}$

(iv) $\frac{1}{5x^{-2}}+5x+7$ (v) $\frac{(x-2)(x-4)}{x}$ (vi) $\frac{1}{x+1}$

(vii) $\frac{1}{7}a^3 - \frac{2}{\sqrt{3}}a^2 + 4a - 7$ (viii) $\frac{1}{2x}$

2. Write whether the following statements are **True** or **False**. Justify your answer.

(i) A binomial can have atmost two terms

(ii) Every polynomial is a binomial

(iii) A binomial may have degree 5

(iv) Zero of a polynomial is always 0

(v) A polynomial cannot have more than one zero

(vi) The degree of the sum of two polynomials each of degree 5 is always 5.

(D) Short Answer Questions

Sample Question 1 :

(i) Check whether $p(x)$ is a multiple of $g(x)$ or not, where

$p(x) = x^3 - x + 1, \quad g(x) = 2 - 3x$

(ii) Check whether $g(x)$ is a factor of $p(x)$ or not, where

$$p(x) = 8x^3 - 6x^2 - 4x + 3, \quad g(x) = \frac{x}{3} - \frac{1}{4}$$

Solution :

(i) $p(x)$ will be a multiple of $g(x)$ if $g(x)$ divides $p(x)$.

Now, $g(x) = 2 - 3x = 0$ gives $x = \frac{2}{3}$

Remainder $= p\left(\frac{2}{3}\right) = \left(\frac{2}{3}\right)^3 - \left(\frac{2}{3}\right) + 1$

$$= \frac{8}{27} - \frac{2}{3} + 1 = \frac{17}{27}$$

Since remainder $\neq 0$, so, $p(x)$ is not a multiple of $g(x)$.

(ii) $g(x) = \frac{x}{3} - \frac{1}{4} = 0$ gives $x = \frac{3}{4}$

$g(x)$ will be a factor of $p(x)$ if $p\left(\frac{3}{4}\right) = 0$ (Factor theorem)

Now, $p\left(\frac{3}{4}\right) = 8\left(\frac{3}{4}\right)^3 - 6\left(\frac{3}{4}\right)^2 - 4\left(\frac{3}{4}\right) + 3$

$$= 8\times\frac{27}{64} - 6\times\frac{9}{16} - 3 + 3 = 0$$

Since, $p\left(\frac{3}{4}\right) = 0$, so, $g(x)$ is a factor of $p(x)$.

Sample Question 2 : Find the value of a, if $x - a$ is a factor of $x^3 - ax^2 + 2x + a - 1$.

Solution : Let $p(x) = x^3 - ax^2 + 2x + a - 1$

Since $x - a$ is a factor of $p(x)$, so $p(a) = 0$.

i.e., $a^3 - a(a)^2 + 2a + a - 1 = 0$

$a^3 - a^3 + 2a + a - 1 = 0$

$3a = 1$

Therefore, $a = \frac{1}{3}$

Sample Question 3 : (i)Without actually calculating the cubes, find the value of $48^3 - 30^3 - 18^3$.

(ii)Without finding the cubes, factorise $(x - y)^3 + (y - z)^3 + (z - x)^3$.

Solution : We know that $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$.

If $x + y + z = 0$, then $x^3 + y^3 + z^3 - 3xyz = 0$ or $x^3 + y^3 + z^3 = 3xyz$.

(i) We have to find the value of $48^3 - 30^3 - 18^3 = 48^3 + (-30)^3 + (-18)^3$.

Here, $48 + (-30) + (-18) = 0$

So, $48^3 + (-30)^3 + (-18)^3 = 3 \times 48 \times (-30) \times (-18) = 77760$

(ii) Here, $(x - y) + (y - z) + (z - x) = 0$

Therefore, $(x - y)^3 + (y - z)^3 + (z - x)^3 = 3(x - y)(y - z)(z - x)$.

EXERCISE 2.3

1. Classify the following polynomials as polynomials in one variable, two variables etc.

(i) $x^2 + x + 1$ (ii) $y^3 - 5y$

(iii) $xy + yz + zx$ (iv) $x^2 - 2xy + y^2 + 1$

2. Determine the degree of each of the following polynomials :

(i) $2x - 1$ (ii) -10

(iii) $x^3 - 9x + 3x^5$ (iv) $y^3 (1 - y^4)$

3. For the polynomial

$\frac{x^3 + 2x + 1}{5} - \frac{7}{2}x^2 - x^6$, write

(i) the degree of the polynomial

(ii) the coefficient of x^3

(iii) the coefficient of x^6

(iv) the constant term

4. Write the coefficient of x^2 in each of the following :

(i) $\frac{\pi}{6}x + x^2 - 1$ (ii) $3x - 5$

(iii) $(x - 1)(3x - 4)$ (iv) $(2x - 5)(2x^2 - 3x + 1)$

5. Classify the following as a constant, linear, quadratic and cubic polynomials :

(i) $2 - x^2 + x^3$ (ii) $3x^3$ (iii) $5t - \sqrt{7}$ (iv) $4 - 5y^2$

(v) 3 (vi) $2 + x$ (vii) $y^3 - y$ (viii) $1 + x + x^2$

(ix) t^2 (x) $\sqrt{2}x - 1$

6. Give an example of a polynomial, which is :

(i) monomial of degree 1

(ii) binomial of degree 20

(iii) trinomial of degree 2

7. Find the value of the polynomial $3x^3 - 4x^2 + 7x - 5$, when $x = 3$ and also when $x = -3$.

8. If $p(x) = x^2 - 4x + 3$, evaluate : $p(2) - p(-1) + p\left(\frac{1}{2}\right)$

9. Find $p(0), p(1), p(-2)$ for the following polynomials :

(i) $p(x) = 10x - 4x^2 - 3$ (ii) $p(y) = (y + 2)(y - 2)$

10. Verify whether the following are **True** or **False** :

(i) -3 is a zero of $x - 3$

(ii) $-\frac{1}{3}$ is a zero of $3x + 1$

(iii) $\frac{-4}{5}$ is a zero of $4 - 5y$

(iv) 0 and 2 are the zeroes of $t^2 - 2t$

(v) -3 is a zero of $y^2 + y - 6$

11. Find the zeroes of the polynomial in each of the following :

(i) $p(x) = x - 4$ (ii) $g(x) = 3 - 6x$

(iii) $q(x) = 2x - 7$ (iv) $h(y) = 2y$

12. Find the zeroes of the polynomial :

$p(x) = (x - 2)^2 - (x + 2)^2$

13. By actual division, find the quotient and the remainder when the first polynomial is divided by the second polynomial : $x^4 + 1; x - 1$

14. By Remainder Theorem find the remainder, when $p(x)$ is divided by $g(x)$, where

(i) $p(x) = x^3 - 2x^2 - 4x - 1, \quad g(x) = x + 1$

(ii) $p(x) = x^3 - 3x^2 + 4x + 50, \quad g(x) = x - 3$

(iii) $p(x) = 4x^3 - 12x^2 + 14x - 3, \quad g(x) = 2x - 1$

(iv) $p(x) = x^3 - 6x^2 + 2x - 4, \quad g(x) = 1 - \frac{3}{2}x$

15. Check whether $p(x)$ is a multiple of $g(x)$ or not :

(i) $p(x) = x^3 - 5x^2 + 4x - 3, \quad g(x) = x - 2$

(ii) $p(x) = 2x^3 - 11x^2 - 4x + 5, \quad g(x) = 2x + 1$

16. Show that :

(i) $x + 3$ is a factor of $69 + 11x - x^2 + x^3$.

(ii) $2x - 3$ is a factor of $x + 2x^3 - 9x^2 + 12$.

17. Determine which of the following polynomials has $x - 2$ a factor :

(i) $3x^2 + 6x - 24$ (ii) $4x^2 + x - 2$

18. Show that $p - 1$ is a factor of $p^{10} - 1$ and also of $p^{11} - 1$.

19. For what value of m is $x^3 - 2mx^2 + 16$ divisible by $x + 2$?

20. If $x + 2a$ is a factor of $x^5 - 4a^2x^3 + 2x + 2a + 3$, find a.

21. Find the value of m so that $2x - 1$ be a factor of $8x^4 + 4x^3 - 16x^2 + 10x + m$.

22. If $x + 1$ is a factor of $ax^3 + x^2 - 2x + 4a - 9$, find the value of a.

23. Factorise :

(i) $x^2 + 9x + 18$ (ii) $6x^2 + 7x - 3$

(iii) $2x^2 - 7x - 15$ (iv) $84 - 2r - 2r^2$

24. Factorise :

(i) $2x^3 - 3x^2 - 17x + 30$ (ii) $x^3 - 6x^2 + 11x - 6$

(iii) $x^3 + x^2 - 4x - 4$ (iv) $3x^3 - x^2 - 3x + 1$

25. Using suitable identity, evaluate the following:

(i) 103^3 (ii) 101×102 (iii) 999^2

26. Factorise the following:

(i) $4x^2 + 20x + 25$

(ii) $9y^2 - 66yz + 121z^2$

(iii) $\left(2x + \frac{1}{3}\right)^2 - \left(x - \frac{1}{2}\right)^2$

27. Factorise the following :

(i) $9x^2 - 12x + 3$ (ii) $9x^2 - 12x + 4$

28. Expand the following :

(i) $(4a - b + 2c)^2$

(ii) $(3a - 5b - c)^2$

(iii) $(-x + 2y - 3z)^2$

29. Factorise the following :

(i) $9x^2 + 4y^2 + 16z^2 + 12xy - 16yz - 24xz$

(ii) $25x^2 + 16y^2 + 4z^2 - 40xy + 16yz - 20xz$

(iii) $16x^2 + 4y^2 + 9z^2 - 16xy - 12yz + 24\,xz$

30. If $a + b + c = 9$ and $ab + bc + ca = 26$, find $a^2 + b^2 + c^2$.

31. Expand the following :

(i) $(3a - 2b)^3$ (ii) $\left(\frac{1}{x} + \frac{y}{3}\right)^3$ (iii) $\left(4 - \frac{1}{3x}\right)^3$

32. Factorise the following :

(i) $1 - 64a^3 - 12a + 48a^2$

(ii) $8p^3 + \frac{12}{5}p^2 + \frac{6}{25}p + \frac{1}{125}$

33. Find the following products :

(i) $\left(\frac{x}{2} + 2y\right)\left(\frac{x^2}{4} - xy + 4y^2\right)$ (ii) $(x^2 - 1)(x^4 + x^2 + 1)$

34. Factorise :

(i) $1 + 64x^3$ (ii) $a^3 - 2\sqrt{2}b^3$

35. Find the following product :

$(2x - y + 3z)(4x^2 + y^2 + 9z^2 + 2xy + 3yz - 6xz)$

36. Factorise :

(i) $a^3 - 8b^3 - 64c^3 - 24abc$ (ii) $2\sqrt{2}\,a^3 + 8b^3 - 27c^3 + 18\sqrt{2}\,abc$.

37. Without actually calculating the cubes, find the value of :

(i) $\left(\frac{1}{2}\right)^3 + \left(\frac{1}{3}\right)^3 - \left(\frac{5}{6}\right)^3$ (ii) $(0.2)^3 - (0.3)^3 + (0.1)^3$

38. Without finding the cubes, factorise

$(x - 2y)^3 + (2y - 3z)^3 + (3z - x)^3$

39. Find the value of

(i) $x^3 + y^3 - 12xy + 64$, when $x + y = -4$

(ii) $x^3 - 8y^3 - 36xy - 216$, when $x = 2y + 6$

40. Give possible expressions for the length and breadth of the rectangle whose area is given by $4a^2 + 4a - 3$.

(E) Long Answer Questions

Sample Question 1 : If $x + y = 12$ and $xy = 27$, find the value of $x^3 + y^3$.

Solution :

$$\begin{aligned} x^3 + y^3 &= (x + y)(x^2 - xy + y^2) \\ &= (x + y)[(x + y)^2 - 3xy] \\ &= 12[12^2 - 3 \times 27] \\ &= 12 \times 63 = 756 \end{aligned}$$

Alternative Solution :

$$\begin{aligned} x^3 + y^3 &= (x + y)^3 - 3xy\,(x + y) \\ &= 12^3 - 3 \times 27 \times 12 \\ &= 12\,[12^2 - 3 \times 27] \\ &= 12 \times 63 = 756 \end{aligned}$$

EXERCISE 2.4

1. If the polynomials $az^3 + 4z^2 + 3z - 4$ and $z^3 - 4z + a$ leave the same remainder when divided by $z - 3$, find the value of a.

2. The polynomial $p(x) = x^4 - 2x^3 + 3x^2 - ax + 3a - 7$ when divided by $x + 1$ leaves the remainder 19. Find the values of a. Also find the remainder when $p(x)$ is divided by $x + 2$.

3. If both $x - 2$ and $x - \frac{1}{2}$ are factors of $px^2 + 5x + r$, show that $p = r$.

4. Without actual division, prove that $2x^4 - 5x^3 + 2x^2 - x + 2$ is divisible by $x^2 - 3x + 2$. [**Hint:** Factorise $x^2 - 3x + 2$]

5. Simplify $(2x - 5y)^3 - (2x + 5y)^3$.

6. Multiply $x^2 + 4y^2 + z^2 + 2xy + xz - 2yz$ by $(-z + x - 2y)$.

7. If a, b, c are all non-zero and $a + b + c = 0$, prove that $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = 3$.

8. If $a + b + c = 5$ and $ab + bc + ca = 10$, then prove that $a^3 + b^3 + c^3 - 3abc = -25$.

9. Prove that $(a + b + c)^3 - a^3 - b^3 - c^3 = 3(a + b)\,(b + c)\,(c + a)$.

CHAPTER 3

COORDINATE GEOMETRY

(A) Main Concepts and Results

Cartesian system

Coordinate axes

Origin

Quadrants

Abscissa

Ordinate

Coordinates of a point

Ordered pair

Plotting of points in the cartesian plane:

- In the Cartesian plane, the horizontal line is called the x-axis and the vertical line is called the y-axis,
- The coordinate axes divide the plane into four parts called quadrants,
- The point of intersection of the axes is called the origin,
- Abscissa or the x-coordinate of a point is its distance from the y-axis and the ordinate or the y-coordinate is its distance from the x-axis,
- (x, y) are called the coordinates of the point whose abscissa is x and the ordinate is y,
- Coordinates of a point on the x-axis are of the form $(x, 0)$ and that of the point on the y-axis is of the form $(0, y)$,

- The coordinates of the origin are (0, 0),
- Signs of the coordinates of a point in the first quadrant are (+, +), in the second quadrant (–, +), in the third quadrant (–, –) and in the fourth quadrant (+, –).

(B) Multiple Choice Questions

Write the correct answer :

Sample Question 1: The points (other than origin) for which abscissa is equal to the ordinate will lie in

(A) I quadrant only (B) I and II quadrants
(C) I and III quadrants (D) II and IV quadrants

Solution : Answer (C)

EXERCISE 3.1

Write the correct answer in each of the following :

1. Point (–3, 5) lies in the
(A) first quadrant (B) second quadrant
(C) third quadrant (D) fourth quadrant

2. Signs of the abscissa and ordinate of a point in the second quadrant are respectively
(A) +, + (B) –, – (C) –, + (D) +, –

3. Point (0, –7) lies
(A) on the x –axis (B) in the second quadrant
(C) on the y-axis (D) in the fourth quadrant

4. Point (– 10, 0) lies
(A) on the negative direction of the x-axis
(B) on the negative direction of the y-axis
(C) in the third quadrant
(D) in the fourth quadrant

5. Abscissa of all the points on the x-axis is
(A) 0 (B) 1
(C) 2 (D) any number

6. Ordinate of all points on the x-axis is
(A) 0 (B) 1
(C) – 1 (D) any number

7. The point at which the two coordinate axes meet is called the

(A) abscissa (B) ordinate (C) origin (D) quadrant

8. A point both of whose coordinates are negative will lie in

(A) I quadrant (B) II quadrant

(C) III quadrant (D) IV quadrant

9. Points (1, – 1), (2, – 2), (4, – 5), (– 3, – 4)

(A) lie in II quadrant (B) lie in III quadrant

(C) lie in IV quadrant (D) do not lie in the same quadrant

10. If y coordinate of a point is zero, then this point always lies

(A) in I quadrant (B) in II quadrant

(C) on x - axis (D) on y - axis

11. The points (–5, 2) and (2, – 5) lie in the

(A) same quadrant (B) II and III quadrants, respectively

(C) II and IV quadrants, respectively (D) IV and II quadrants, respectively

12. If the perpendicular distance of a point P from the x-axis is 5 units and the foot of the perpendicular lies on the negative direction of x-axis, then the point P has

(A) x coordinate = – 5 (B) y coordinate = 5 only

(C) y coordinate = – 5 only (D) y coordinate = 5 or –5

13. On plotting the points O (0, 0), A (3, 0), B (3, 4), C (0, 4) and joining OA, AB, BC and CO which of the following figure is obtained?

(A) Square (B) Rectangle (C) Trapezium (D) Rhombus

14. If P (– 1, 1), Q (3, – 4), R(1, –1), S(–2, –3) and T (– 4, 4) are plotted on the graph paper, then the point(s) in the fourth quadrant are

(A) P and T (B) Q and R (C) Only S (D) P and R

15. If the coordinates of the two points are P (–2, 3) and Q(–3, 5), then (abscissa of P) – (abscissa of Q) is

(A) – 5 (B) 1 (C) – 1 (D) – 2

16. If P (5, 1), Q (8, 0), R (0, 4), S (0, 5) and O (0, 0) are plotted on the graph paper, then the point(s) on the x-axis are

(A) P and R (B) R and S (C) Only Q (D) Q and O

17. Abscissa of a point is positive in

(A) I and II quadrants (B) I and IV quadrants

(C) I quadrant only (D) II quadrant only

18. The points whose abscissa and ordinate have different signs will lie in

(A) I and II quadrants
(B) II and III quadrants
(C) I and III quadrants
(D) II and IV quadrants

19. In Fig. 3.1, coordinates of P are

(A) (– 4, 2) (B) (–2, 4)
(C) (4, – 2) (D) (2, – 4)

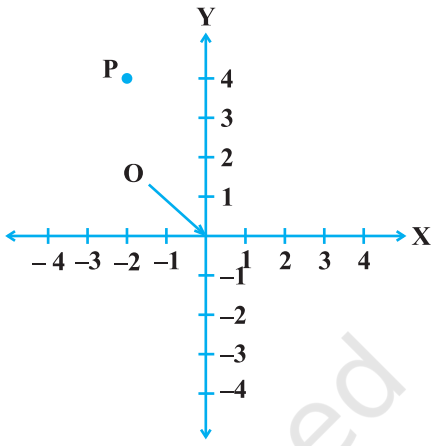


Fig. 3.1

20. In Fig. 3.2, the point identified by the coordinates (–5, 3) is

(A) T (B) R
(C) L (D) S

21. The point whose ordinate is 4 and which lies on *y*-axis is

(A) (4, 0) (B) (0, 4)
(C) (1, 4) (D) (4, 2)

22. Which of the points P(0, 3), Q(1, 0), R(0, – 1), S(–5, 0), T(1, 2) do not lie on the *x*-axis?

(A) P and R only
(B) Q and S only
(C) P, R and T
(D) Q, S and T

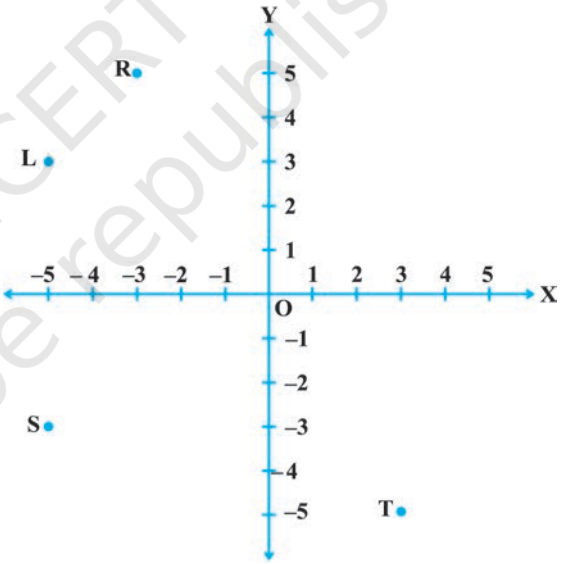


Fig. 3.2

23. The point which lies on *y*-axis at a distance of 5 units in the negative direction of *y*-axis is

(A) (0, 5) (B) (5, 0)
(C) (0, – 5) (D) (– 5, 0)

24. The perpendicular distance of the point P (3, 4) from the *y*-axis is

(A) 3 (B) 4
(C) 5 (D) 7

(C) Short Answer Questions with Reasoning

Sample Question 1 : Write whether the following statements are **True** or **False**? Justify your answer.

(i) Point (0, –2) lies on *y*-axis.

(ii) The perpendicular distance of the point (4, 3) from the *x*-axis is 4.

Solution :

(i) True, because a point on the *y*-axis is of the form (0, *y*).

(ii) False, because the perpendicular distance of a point from the *x*-axis is its ordinate. Hence it is 3, not 4.

EXERCISE 3.2

1. Write whether the following statements are True or False? Justify your answer.

(i) Point (3, 0) lies in the first quadrant.

(ii) Points (1, –1) and (–1, 1) lie in the same quadrant.

(iii) The coordinates of a point whose ordinate is $-\frac{1}{2}$ and abscissa is 1 are $-\frac{1}{2}, 1$.

(iv) A point lies on *y*-axis at a distance of 2 units from the *x*-axis. Its coordinates are (2, 0).

(v) (–1, 7) is a point in the II quadrant.

(D) Short Answer Questions

Sample Question 1 : Plot the point P (– 6, 2) and from it draw PM and PN as perpendiculars to *x*-axis and *y*-axis, respectively. Write the coordinates of the points M and N.

Solution :

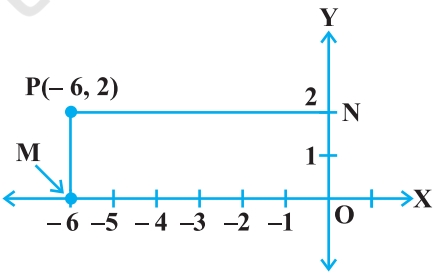


Fig. 3.3

From the graph, we see that M(– 6, 0) and N(0, 2).

Sample Question 2 : From the Fig. 3.4, write the following:

(i) Coordinates of B, C and E

(ii) The point identified by the coordinates (0, – 2)

(iii) The abscissa of the point H

(iv) The ordinate of the point D

Solution :

(i) B = (–5, 2), C(–2, –3), E = (3, –1)

(ii) F

(iii) 1

(iv) 0

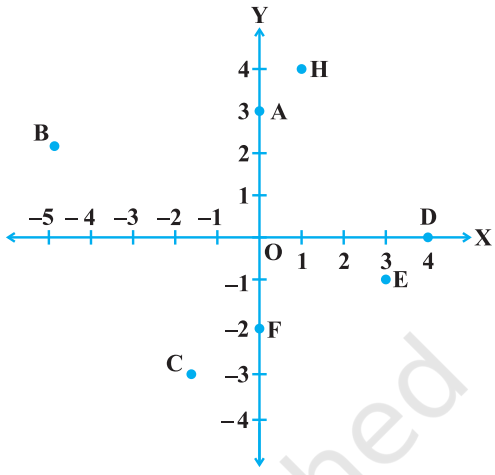


Fig. 3.4

EXERCISE 3.3

1. Write the coordinates of each of the points P, Q, R, S, T and O from the Fig. 3.5.

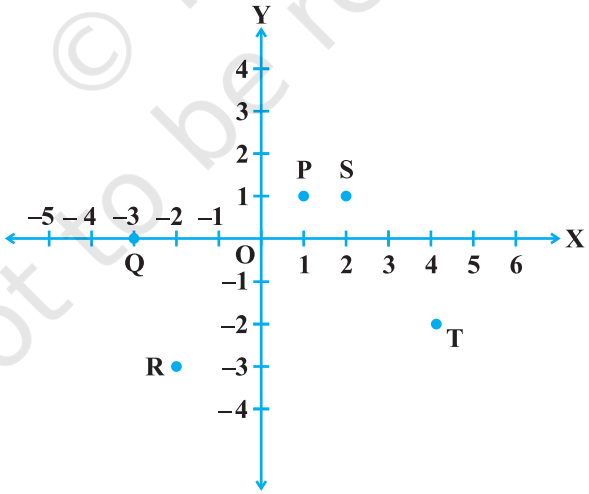


Fig. 3.5

2. Plot the following points and write the name of the figure obtained by joining them in order:

P(– 3, 2), Q (– 7, – 3), R (6, – 3), S (2, 2)

3. Plot the points (x, y) given by the following table:

x	2	4	– 3	– 2	3	0
y	4	2	0	5	– 3	0

4. Plot the following points and check whether they are collinear or not :

(i) (1, 3), (– 1, – 1), (– 2, – 3)

(ii) (1, 1), (2, – 3), (– 1, – 2)

(iii) (0, 0), (2, 2), (5, 5)

5. Without plotting the points indicate the quadrant in which they will lie, if

(i) ordinate is 5 and abscissa is – 3

(ii) abscissa is – 5 and ordinate is – 3

(iii) abscissa is – 5 and ordinate is 3

(iv) ordinate is 5 and abscissa is 3

6. In Fig. 3.6, LM is a line parallel to the y-axis at a distance of 3 units.

(i) What are the coordinates of the points P, R and Q?

(ii) What is the difference between the abscissa of the points L and M?

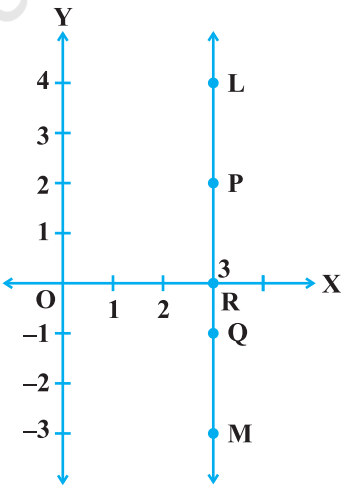


Fig. 3.6

7. In which quadrant or on which axis each of the following points lie?

(– 3, 5), (4, – 1), (2, 0), (2, 2), (– 3, – 6)

8. Which of the following points lie on y-axis?

A (1, 1), B (1, 0), C (0, 1), D (0, 0), E (0, – 1), F (– 1, 0), G (0, 5), H (– 7, 0), I (3, 3).

9. Plot the points (x, y) given by the following table. Use scale 1 cm = 0.25 units

x	1.25	0.25	1.5	– 1.75
y	– 0.5	1	1.5	– 0.25

10. A point lies on the x-axis at a distance of 7 units from the y-axis. What are its coordinates? What will be the coordinates if it lies on y-axis at a distance of –7 units from x-axis?

11. Find the coordinates of the point

(i) which lies on x and y axes both.

(ii) whose ordinate is – 4 and which lies on y-axis.

(iii) whose abscissa is 5 and which lies on x-axis.

12. Taking 0.5 cm as 1 unit, plot the following points on the graph paper :

A (1, 3), B (– 3, – 1), C (1, – 4), D (– 2, 3), E (0, – 8), F (1, 0)

(E) Long Answer Questions

Sample Question 1 : Three vertices of a rectangle are (3, 2), (– 4, 2) and (– 4, 5). Plot these points and find the coordinates of the fourth vertex.

Solution : Plot the three vertices of the rectangle as A(3, 2), B(– 4, 2), C(– 4, 5) (see Fig. 3.7).

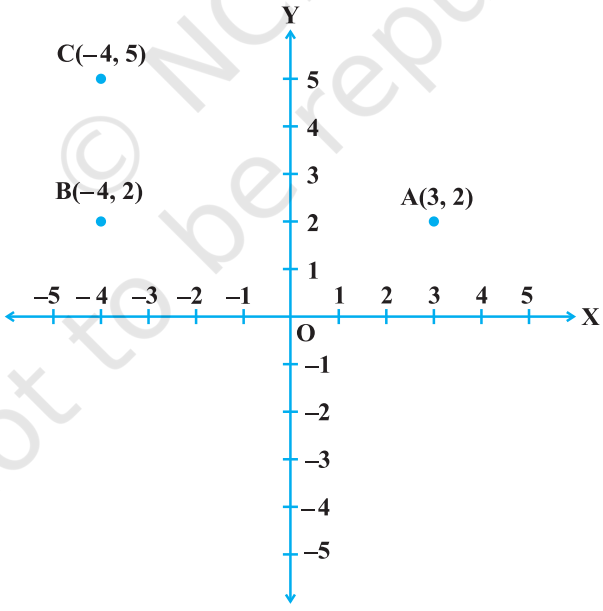


Fig. 3.7

We have to find the coordinates of the fourth vertex D so that ABCD is a rectangle.

Since the opposite sides of a rectangle are equal, so the abscissa of D should be equal to abscissa of A, i.e., 3 and the ordinate of D should be equal to the ordinate of C, i.e., 5.

So, the coordinates of D are (3, 5).

EXERCISE 3.4

1. Points A (5, 3), B (– 2, 3) and D (5, – 4) are three vertices of a square ABCD. Plot these points on a graph paper and hence find the coordinates of the vertex C.

2. Write the coordinates of the vertices of a rectangle whose length and breadth are 5 and 3 units respectively, one vertex at the origin, the longer side lies on the *x*-axis and one of the vertices lies in the third quadrant.

3. Plot the points P (1, 0), Q (4, 0) and S (1, 3). Find the coordinates of the point R such that PQRS is a square.

4. From the Fig. 3.8, answer the following :

(i) Write the points whose abscissa is 0.

(ii) Write the points whose ordinate is 0.

(iii) Write the points whose abscissa is – 5.

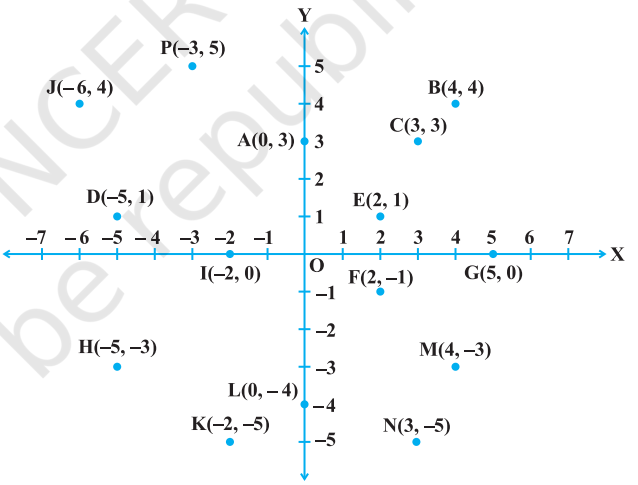


Fig. 3.8

5. Plot the points A (1, – 1) and B (4, 5)

(i) Draw a line segment joining these points. Write the coordinates of a point on this line segment between the points A and B.

(ii) Extend this line segment and write the coordinates of a point on this line which lies outside the line segment AB.

CHAPTER 4

LINEAR EQUATIONS IN TWO VARIABLES

(A) Main Concepts and Results

An equation is a statement in which one expression equals to another expression. An equation of the form $ax + by + c = 0$, where a, b and c are real numbers such that $a \neq 0$ and $b \neq 0$, is called a linear equation in two variables. The process of finding solution(s) is called solving an equation.

The solution of a linear equation is not affected when

(i) the same number is added to (subtracted from) both sides of the equation,

(ii) both sides of the equation are multiplied or divided by the same non-zero number.

Further, a linear equation in two variables has infinitely many solutions. The graph of every linear equation in two variables is a straight line and every point on the graph (straight line) represents a solution of the linear equation. Thus, every solution of the linear equation can be represented by a unique point on the graph of the equation. The graphs of $x = a$ and $y = a$ are lines parallel to the y-axis and x-axis, respectively.

(B) Multiple Choice Questions

Write the correct answer:

Sample Question 1 : The linear equation $3x - y = x - 1$ has :

(A) A unique solution (B) Two solutions

(C) Infinitely many solutions (D) No solution

Solution : Answer (C)

Sample Question 2 : A linear equation in two variables is of the form $ax + by + c = 0$, where

(A) $a \neq 0, b \neq 0$ (B) $a = 0, b \neq 0$ (C) $a \neq 0, b = 0$ (D) $a = 0, c = 0$

Solution : Answer (A)

Sample Question 3 : Any point on the y-axis is of the form

(A) $(x, 0)$ (B) (x, y) (C) $(0, y)$ (D) (y, y)

Solution : Answer (C)

EXERCISE 4.1

Write the correct answer in each of the following :

1. The linear equation $2x - 5y = 7$ has

(A) A unique solution (B) Two solutions

(C) Infinitely many solutions (D) No solution

2. The equation $2x + 5y = 7$ has a unique solution, if x, y are :

(A) Natural numbers (B) Positive real numbers

(C) Real numbers (D) Rational numbers

3. If (2, 0) is a solution of the linear equation $2x + 3y = k$, then the value of k is

(A) 4 (B) 6 (C) 5 (D) 2

4. Any solution of the linear equation $2x + 0y + 9 = 0$ in two variables is of the form

(A) $(-\frac{9}{2}, m)$ (B) $(n, -\frac{9}{2})$

(C) $(0, -\frac{9}{2})$ (D) $(-9, 0)$

5. The graph of the linear equation $2x + 3y = 6$ cuts the y-axis at the point

(A) $(2, 0)$ (B) $(0, 3)$ (C) $(3, 0)$ (D) $(0, 2)$

6. The equation $x = 7$, in two variables, can be written as

(A) $1 . x + 1 . y = 7$ (B) $1. x + 0. y = 7$

(C) $0 . x + 1 . y = 7$ (D) $0 . x + 0 . y = 7$

7. Any point on the x-axis is of the form

(A) (x, y) (B) $(0, y)$ (C) $(x, 0)$ (D) (x, x)

8. Any point on the line $y = x$ is of the form

(A) (a, a) (B) $(0, a)$ (C) $(a, 0)$ (D) $(a, -a)$

9. The equation of x-axis is of the form

(A) $x = 0$ (B) $y = 0$ (C) $x + y = 0$ (D) $x = y$

10. The graph of $y = 6$ is a line

(A) parallel to x-axis at a distance 6 units from the origin

(B) parallel to y-axis at a distance 6 units from the origin

(C) making an intercept 6 on the x-axis.

(D) making an intercept 6 on both the axes.

11. $x = 5$, $y = 2$ is a solution of the linear equation

(A) $x + 2y = 7$ (B) $5x + 2y = 7$ (C) $x + y = 7$ (D) $5x + y = 7$

12. If a linear equation has solutions $(-2, 2)$, $(0, 0)$ and $(2, -2)$, then it is of the form

(A) $y - x = 0$ (B) $x + y = 0$

(C) $-2x + y = 0$ (D) $-x + 2y = 0$

13. The positive solutions of the equation $ax + by + c = 0$ always lie in the

(A) 1st quadrant (B) 2nd quadrant

(C) 3rd quadrant (D) 4th quadrant

14. The graph of the linear equation $2x + 3y = 6$ is a line which meets the x-axis at the point

(A) $(0, 2)$ (B) $(2, 0)$ (C) $(3, 0)$ (D) $(0, 3)$

15. The graph of the linear equation $y = x$ passes through the point

(A) $\left(\frac{3}{2}, \frac{-3}{2}\right)$ (B) $\left(0, \frac{3}{2}\right)$ (C) $(1, 1)$ (D) $\left(\frac{-1}{2}, \frac{1}{2}\right)$

16. If we multiply or divide both sides of a linear equation with a non-zero number, then the solution of the linear equation :

(A) Changes

(B) Remains the same

(C) Changes in case of multiplication only

(D) Changes in case of division only

17. How many linear equations in x and y can be satisfied by $x = 1$ and $y = 2$?

(A) Only one (B) Two (C) Infinitely many (D) Three

18. The point of the form (a, a) always lies on :

(A) x-axis (B) y-axis

(C) On the line $y = x$ (D) On the line $x + y = 0$

19. The point of the form $(a, -a)$ always lies on the line

(A) $x = a$ (B) $y = -a$ (C) $y = x$ (D) $x + y = 0$

(C) Short Answer Questions with Reasoning

Sample Question 1 : Write whether the following statements are **True** or **False**? Justify your answers.

(i) $ax + by + c = 0$, where a, b and c are real numbers, is a linear equation in two variables.

(ii) A linear equation $2x + 3y = 5$ has a unique solution.

(iii) All the points (2, 0), (–3, 0), (4, 2) and (0, 5) lie on the x-axis.

(iv) The line parallel to the y-axis at a distance 4 units to the left of y-axis is given by the equation $x = -4$.

(v) The graph of the equation $y = mx + c$ passes through the origin.

Solution :

(i) False, because $ax + by + c = 0$ is a linear equation in two variables if both a and b are non-zero.

(ii) False, because a linear equation in two variables has infinitely many solutions.

(iii) False, the points (2, 0), (–3, 0) lie on the x-axis. The point (4, 2) lies in the first quadrant. The point (0, 5) lies on the y-axis.

(iv) True, since the line parallel to y-axis at a distance a units to the left of y-axis is given by the equation $x = -a$.

(v) False, because $x = 0$, $y = 0$ does not satisfy the equation.

Sample Question 2 : Write whether the following statement is **True** or **False**? Justify your answer.

The coordinates of points given in the table :

x	0	1	2	3	4
y	2	4	6	8	10

represent some of the solutions of the equation $2x + 2 = y$.

Solution : True, since on looking at the coordinates, we observe that each y-coordiante is two units more than double the x-coordinate.

EXERCISE 4.2

Write whether the following statements are True or False? Justify your answers :

1. The point (0, 3) lies on the graph of the linear equation $3x + 4y = 12$.

2. The graph of the linear equation $x + 2y = 7$ passes through the point (0, 7).

3. The graph given below represents the linear equation $x + y = 0$.

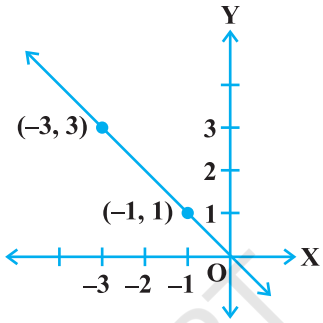


Fig. 4.1

4. The graph given below represents the linear equation $x = 3$ (see Fig. 4.2).

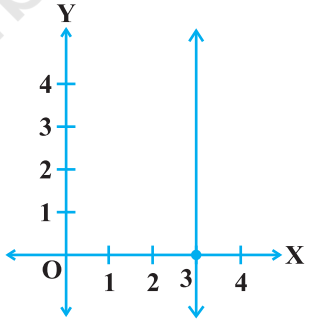


Fig. 4.2

5. The coordinates of points in the table:

x	0	1	2	3	4
y	2	3	4	–5	6

represent some of the solutions of the equation $x - y + 2 = 0$.

6. Every point on the graph of a linear equation in two variables does not represent a solution of the linear equation.

7. The graph of every linear equation in two variables need not be a line.

(D) Short Answer Questions

Sample Question 1 : Find the points where the graph of the equation $3x + 4y = 12$ cuts the x-axis and the y-axis.

Solution : The graph of the linear equation $3x + 4y = 12$ cuts the x-axis at the point where $y = 0$. On putting $y = 0$ in the linear equation, we have $3x = 12$, which gives $x = 4$. Thus, the required point is (4, 0).

The graph of the linear equation $3x + 4y = 12$ cuts the y-axis at the point where $x = 0$. On putting $x = 0$ in the given equation, we have $4y = 12$, which gives $y = 3$. Thus, the required point is (0, 3).

Sample Question 2 : At what point does the graph of the linear equation $x + y = 5$ meet a line which is parallel to the y-axis, at a distance 2 units from the origin and in the positive direction of x-axis.

Solution : The coordinates of the points lying on the line parallel to the y-axis, at a distance 2 units from the origin and in the positive direction of the x-axis are of the form $(2, a)$. Putting $x = 2$, $y = a$ in the equation $x + y = 5$, we get $a = 3$. Thus, the required point is (2, 3).

Sample Question 3 : Determine the point on the graph of the equation $2x + 5y = 20$ whose x-coordinate is $\frac{5}{2}$ times its ordinate.

Solution : As the x-coordinate of the point is $\frac{5}{2}$ times its ordinate, therefore, $x = \frac{5}{2}y$.

Now putting $x = \frac{5}{2}y$ in $2x + 5y = 20$, we get, $y = 2$. Therefore, $x = 5$. Thus, the required point is (5, 2).

Sample Question 4 : Draw the graph of the equation represented by the straight line which is parallel to the x-axis and is 4 units above it.

Solution : Any straight line parallel to x-axis is given by $y = k$, where k is the distance of the line from the x-axis. Here $k = 4$. Therefore, the equation of the line is $y = 4$. To draw the graph of this equation, plot the points (1, 4) and (2, 4) and join them. This is the required graph (see Fig. 4.3).

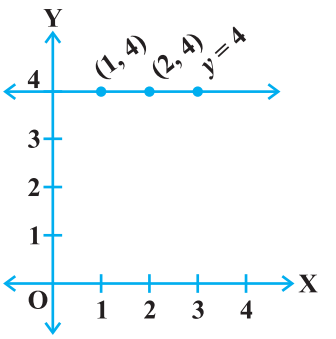


Fig. 4.3

EXERCISE 4.3

1. Draw the graphs of linear equations
$y = x$ and $y = -x$ on the same cartesian plane.
What do you observe?

2. Determine the point on the graph of the linear equation $2x + 5y = 19$, whose ordinate is $1\frac{1}{2}$ times its abscissa.

3. Draw the graph of the equation represented by a straight line which is parallel to the x-axis and at a distance 3 units below it.

4. Draw the graph of the linear equation whose solutions are represented by the points having the sum of the coordinates as 10 units.

5. Write the linear equation such that each point on its graph has an ordinate 3 times its abscissa.

6. If the point (3, 4) lies on the graph of $3y = ax + 7$, then find the value of a.

7. How many solution(s) of the equation $2x + 1 = x - 3$ are there on the :

(i) Number line (ii) Cartesian plane

8. Find the solution of the linear equation $x + 2y = 8$ which represents a point on

(i) x-axis (ii) y-axis

9. For what value of c, the linear equation $2x + cy = 8$ has equal values of x and y for its solution.

10. Let y varies directly as x. If $y = 12$ when $x = 4$, then write a linear equation. What is the value of y when $x = 5$?

(E) Long Answer Questions

Sample Question 1 : Draw the graph of the linear equation $2x + 3y = 12$. At what points, the graph of the equation cuts the x-axis and the y-axis?

Solution : The given equation is $2x + 3y = 12$. To draw the graph of this equation, we need at least two points lying on the graph.

From the equation, we have $y = \frac{12 - 2x}{3}$

For $x = 0, y = 4$, therefore, (0, 4) lies on the graph.

For $y = 0, x = 6$, therefore, (6, 0) lies on the graph.

Now plot the points A (0, 4) and B (6, 0) and join them (see Fig 4.4), to get the line AB. Line AB is the required graph.

You can see that the graph (line AB) cuts the x-axis at the point (6, 0) and the y-axis at the point (0, 4).

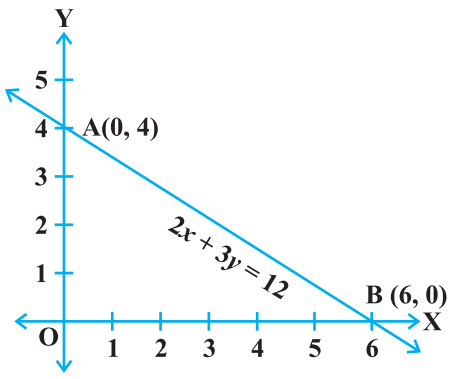


Fig. 4.4

Sample Question 2 : The following values of x and y are thought to satisfy a linear equation :

x	1	2
y	1	3

Draw the graph, using the values of x, y as given in the above table.

At what point the graph of the linear equation

(i) cuts the x-axis. (ii) cuts the y-axis.

Solution : From the table, we get two points A (1, 1) and B (2, 3) which lie on the graph of the linear equation. Obviously, the graph will be a straight line. So, we first plot the points A and B and join them as shown in the Fig 4.5.

From the Fig 4.5, we see that the graph cuts the x-axis at the point $\left(\frac{1}{2}, 0\right)$ and the y-axis at the point $(0, -1)$.

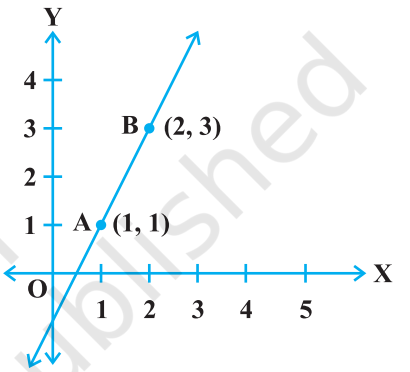


Fig. 4.5

Sample Question 3 : The Autorikshaw fare in a city is charged Rs 10 for the first kilometer and @ Rs 4 per kilometer for subsequent distance covered. Write the linear equation to express the above statement. Draw the graph of the linear equation.

Solution : Let the total distance covered be x km and the fare charged Rs y. Then for the first km, fare charged is Rs 10 and for remaining $(x - 1)$ km fare charged is Rs 4 $(x - 1)$.

Therefore, $y = 10 + 4(x - 1) = 4x + 6$

The required equation is $y = 4x + 6$. Now, when $x = 0$, $y = 6$ and when $x = -1$, $y = 2$. The graph is given in Fig 4.6.

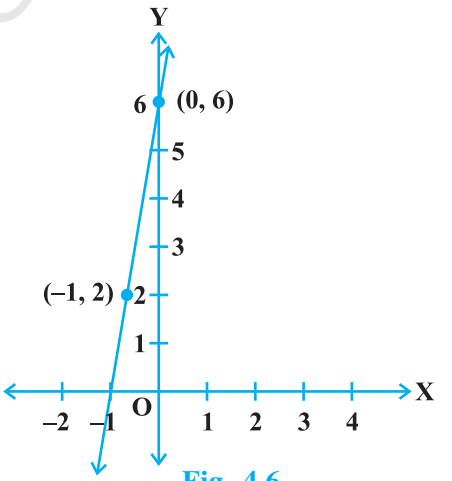


Fig. 4.6

Sample Question 4 : The work done by a body on application of a constant force is the product of the constant force and the distance travelled by the body in the direction of force. Express this in the form of a linear equation in two variables and draw its

graph by taking the constant force as 3 units. What is the work done when the distance travelled is 2 units. Verify it by plotting the graph.

Solution: Work done = (constant force) × (distance)

= 3 × (distance),

i.e., $y = 3x$, where y (units) is the work done and x (units) is the distance travelled. Since $x = 2$ units (given), therefore, work done = 6 units. To plot the graph of the linear equation $y = 3x$, we need at least two solutions of the equation. We see that $x = 0$, $y = 0$ satisfies the given equation also $x = 1$, $y = 3$ satisfies the equation.

Now we plot the points A (0, 0) and B (1, 3) and join AB (see Fig. 4.7). The graph of the equation is a straight line. [We have not shown the whole line because work done cannot be negative].

To verify from the graph, draw a perpendicular to the x-axis at the point (2, 0) meeting the graph at the point C. Clearly the coordinates of C are (2, 6). It means that the work done is 6 units.

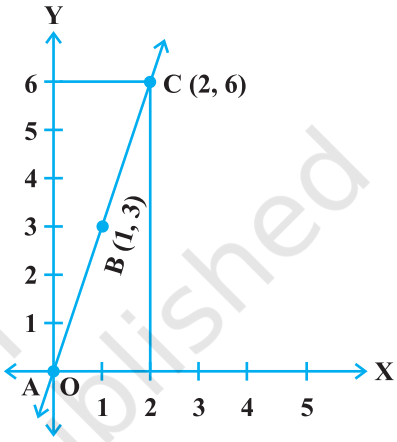


Fig. 4.7

EXERCISE 4.4

1. Show that the points A (1, 2), B (– 1, – 16) and C (0, – 7) lie on the graph of the linear equation $y = 9x – 7$.

2. The following observed values of x and y are thought to satisfy a linear equation. Write the linear equation :

x	6	–6
y	–2	6

Draw the graph using the values of x, y as given in the above table.

At what points the graph of the linear equation

(i) cuts the x-axis (ii) cuts the y-axis

3. Draw the graph of the linear equation $3x + 4y = 6$. At what points, the graph cuts the x-axis and the y-axis.

4. The linear equation that converts Fahrenheit (F) to Celsius (C) is given by the relation

$$C=\frac{5F-160}{9}$$

(i) If the temperature is 86°F, what is the temperature in Celsius?

(ii) If the temperature is 35°C, what is the temperature in Fahrenheit?

(iii) If the temperature is 0°C what is the temperature in Fahrenheit and if the temperature is 0°F, what is the temperature in Celsius?

(iv) What is the numerical value of the temperature which is same in both the scales?

5. If the temperature of a liquid can be measured in Kelvin units as x°K or in Fahrenheit units as y°F, the relation between the two systems of measurement of temperature is given by the linear equation

$$y = \frac{9}{5}(x - 273) + 32$$

(i) Find the temperature of the liquid in Fahrenheit if the temperature of the liquid is 313°K.

(ii) If the temperature is 158° F, then find the temperature in Kelvin.

6. The force exerted to pull a cart is directly proportional to the acceleration produced in the body. Express the statement as a linear equation of two variables and draw the graph of the same by taking the constant mass equal to 6 kg. Read from the graph, the force required when the acceleration produced is (i) 5 m/sec^2, (ii) 6 m/sec^2.

Following hand written questions are a must for class 9th and 10 students for Summer vacation HW. Rest are class wise questions where the students have to solve as many questions of their ability. (All to be done in usual HW copy):

1) $(a+b)^2-(a-b)^2 = \ldots\ldots$

2) $(a+b)^2-4ab = \ldots\ldots$

3) $\left(x+\frac{1}{x}\right)^2 = \ldots\ldots$

4) $(x^2-y^2) \div (x-y) = \ldots\ldots$

5) Factorize x^3+x^2+x.

6) Factorize $3x^2-243$.

7) Factorize x^2+5x+6

8) Factorize x^2-x-6

9) Solve: $3x-8 = x+6$

10) Find y if $3y-6=0$

11) What is the degree of zero polynomial?

12) Find the degree of the polynomial x^3-3x+6.

13) Locate the point on the x-axis for $\sqrt{3}$.

14) Locate the points $(-3,2)$, $(3,-2)$, $(-3,-2)$ and $(3,2)$ on the co-ordinate plane.

15) $3x+2y=8$. Find y if $x=2$.

16) If $a+b=9$ and $a^2+b^2=39$, find ab.

17) Find the LCM of x^2-y^2 and $x+y$.

18) Simplify: $(x^2-y^2) \times \left(\frac{9x+9y}{3x-3y}\right)$

19) Find $\frac{1}{x-y} + \frac{1}{x+y}$

20) Solve: $\frac{3x}{3x+1} = \frac{x-1}{x+1}$

21) Prime factorize 540.

22) Find HCF of 39 and 17.

23) Find the HCF of 54 and 150.

24) Find the LCM of 17 and 19.

25) Find the LCM of 24 and 108.

26) Express $\frac{1}{3}$ into decimal number.

27) Change $\frac{1}{5}$ into percent.

28) Change 0.75 into rational number in $\frac{p}{q}$ form.

29) Multiply : $(-6)^3 \times \left(\frac{1}{-3}\right)^4 \times \frac{2}{8}$.

30) Multiply $\sqrt{8} \times \sqrt{18}$

31) Rationalize : $\frac{1}{3-2\sqrt{2}}$

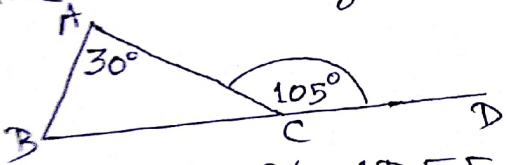
32) How many lines can pass through a point in a plane?

33) How many lines can pass through two points in a plane?

34) What is the sum of the three angles (interior) of a triangle?

35) In a right triangle, if one angle is 46°, what are the other angles.

36)

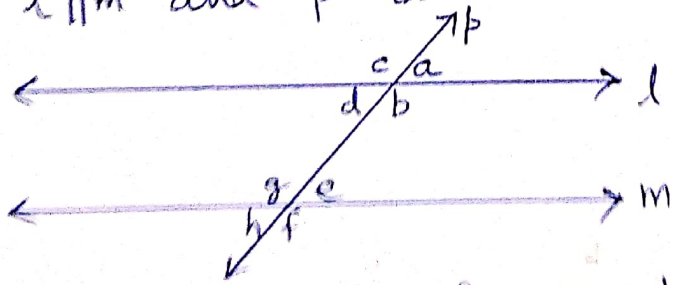


Find $\angle B$.

37) If $\triangle ABC \cong \triangle DEF$ and $AB = 13$ cm, $\angle B = 22°$, find DE and $\angle E$.

38) The angles of a triangle are in ratio 3 : 4 : 5. Find the angles.

39) $l \parallel m$ and p is transversal



i) Write the pairs of corresponding angles.

ii) Write the pairs of alternate interior angles.

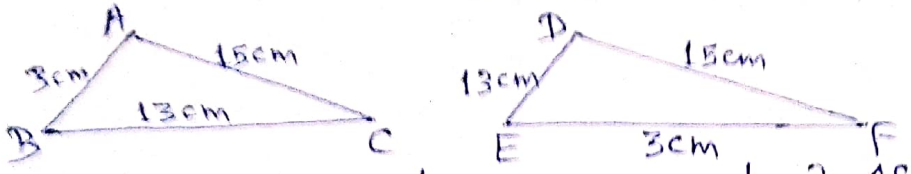
iii) Find e + b.

iv) Write all angles equal to f.

40) If $(x, 12, 13)$ is a Pythagorean triplets, find x.

41) In $\triangle DEF$, $DE = DF$ and $\angle E = 57°$. Find $\angle F$.

42)



i) Are the triangles congruent? If yes, write their properties.

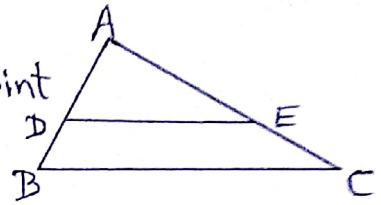
ii) Which one will be true:

a) $\triangle ABC \cong \triangle FDE$,

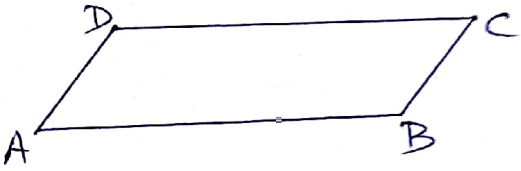
b) $\triangle ABC \cong \triangle DFE$,

c) $\triangle CAB \cong \triangle EFD$

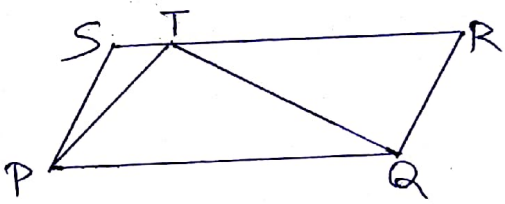
43) In $\triangle ABC$, $DE \parallel BC$ and D is mid-point of AB. $AC = 16$cm. Find AE and justify your answer.



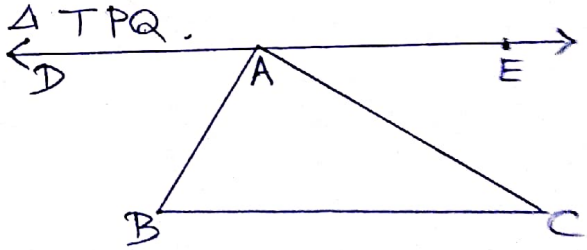
44) In the parallelogram ABCD, if $\angle A = 45°$ then find $\angle C$ and $\angle D$. Justify.



45) In the figure, PQRS is a parallelogram and it's area is $212\ cm^2$. Find the area of $\triangle TPQ$.



46) $DE \parallel BC$ in $\triangle ABC$. If $\angle DAB = 52°$ and $\angle BAC = 30°$, find $\angle ABC$ and $\angle ACB$.

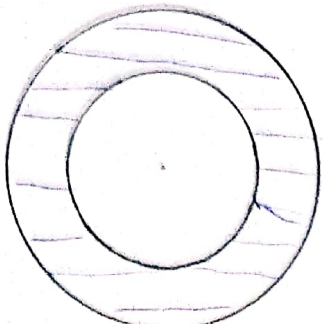


47) i) If radius of a circle is 7cm, find the area of the circle.

ii) If the radius of the above circle is doubled, then how much is the area of the circle?

48) If the diameter of a circle is 42cm, find the perimeter of the corresponding semi-circle.

49) In a circular ring, the width of the ring is 3cm and the outer radius is 5cm. Find the area of ring.



50) If the ratio of radii of two circles are 3:15, find the ratio of their areas.

51) If the circumference of a circle is 44cm, find the radius of the circle.

52) Find the mean of first 10 natural numbers.

53) Find the median of first 14 natural numbers.

54) Find the range of 1st 14 natural numbers.

55) $x\%$ of 400 is 28. Find x.

—x—