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1 NUMBERS

POINTS TO REMEMBER

- A number that can be expressed in the form $\frac{a}{b}$ where a and b are integers and b≠0 is called a rational number.
- All natural numbers, whole numbers, integers and fractions are rational numbers.
- Every rational number can be represented on a number line.
- 0 is neither a positive nor a negative rational number.
- A rational number $\frac{a}{b}$ is said to be in the standard form, if its denominator b is a positive integer and HCF $(a,b)=1$
- There are unlimited numbers of rational numbers between two rational numbers.
- Subtracting two rational numbers is the same as adding the additive inverse of the second number to the first rational number.
- Multiplying two rational numbers is the same as multiplying their numerators and denominators separately and then writing the product in the standard form.
- Dividing a rational number by another rational number is the same as multiplying the first rational number by the reciprocal of the second rational number.
- The following table is about the properties of rational numbers($\mathbb{Q}$).

$\mathbb{Q}$	Closure	Commutative	Associative	Multiplication is distributive over +/–
+	✓	✓	✓	✓
–	✓	×	×	✓
×	✓	✓	✓	–
÷	×	×	×	–

- 0 and 1 are respectively the additive and the multiplicative identities of rational numbers.
- The additive inverse for $\frac{a}{b}$ is $\frac{-a}{b}$ and vice – versa.
- The reciprocal or the multiplicative inverse of a rational number $\frac{a}{b}$ is $\frac{b}{a}$ since $\frac{a}{b} \times \frac{b}{a} = 1$.
- A natural number n is called a square number, if we can find another natural number m such that $n = m^2$.
- The square root of a number n, written as $\sqrt{n}$ (or) $n^{\frac{1}{2}}$, is the number that gives n when multiplied by itself.
- The number of times a prime factor occurs in the square is equal to twice the number of times it occurs in the prime factorization of the number.
- For any two positive numbers a and b. we have

  (i) $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ and (ii) $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} (b \neq 0)$
- If you multiply a number by itself and then by itself again, the result is a cube number.
- The cube root of a number is the value that when cubed gives the original number.
- An expression that represents repeated multiplication of the same factor is called a power.
- The exponent corresponds to the number of times the base is used as a factor.
- Laws of Exponents: (i) $a^m \times a^n = a^{m+n}$ (ii) $\frac{a^m}{a^n} = a^{m-n}$ (iii) $(a^m)^n = a^{mn}$
- Other results: (i) $a^0 = 1$ (ii) $a^{-m} = \frac{1}{a^m}$ (iii) $a^m \times b^m = (ab)^m$ (iv) $\frac{a^m}{b^m} = \left(\frac{a}{b}\right)^m$

RECAP

1. **The simplest form of $\frac{125}{200}$ is _____.** [*Ans:* $\frac{5}{8}$]

Sol.

$$\frac{125}{200} = \frac{125 \div 25}{200 \div 25} = \frac{5}{8}$$

2. **Which of the following is not an equivalent fraction of $\frac{8}{12}$?**

(A) $\frac{2}{3}$ (B) $\frac{16}{24}$ (C) $\frac{32}{60}$ (D) $\frac{24}{36}$

[*Ans:* (C) $\frac{32}{60}$]

Sol.

$$\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

$$\frac{8}{12} = \frac{8 \times 2}{12 \times 2} = \frac{16}{24}$$

$$\frac{8}{12} = \frac{8 \times 3}{12 \times 3} = \frac{24}{36}$$

But $$\frac{32}{60} = \frac{32 \div 5}{60 \div 5} = \frac{6.4}{12}$$

$\therefore$ $\frac{32}{60}$ is not an equivalent fraction of $\frac{8}{12}$.

3. **Which is bigger $\frac{4}{5}$ or $\frac{8}{9}$?**

Sol. LCM of 5 and 9 = 45

$$\frac{4}{5} = \frac{4 \times 9}{5 \times 9} = \frac{36}{45}$$

$$\frac{8}{9} = \frac{8 \times 5}{9 \times 5} = \frac{40}{45}$$

$$\therefore \quad \frac{40}{45} > \frac{36}{45}$$

$$\therefore \quad \frac{8}{9} > \frac{4}{5}$$

$\Rightarrow$ $\frac{8}{9}$ is bigger than $\frac{4}{5}$.

4. **Add the fractions :** $\frac{3}{5}+\frac{5}{8}+\frac{7}{10}$.

Sol.

$$\text{LCM of } 5, 8, 10 = 5 \times 2 \times 4 = 40$$

$$\frac{3}{5}+\frac{5}{8}+\frac{7}{10} = \frac{(3\times8)+(5\times5)+(7\times4)}{40} = \frac{24+25+28}{40} = \frac{77}{40} = 1\frac{37}{40}$$

Hint:

5	5, 8, 10
2	1, 8, 2
4	1, 4, 1
	1, 1, 1

5. **Simplify :** $\frac{1}{8}-\left(\frac{1}{6}-\frac{1}{4}\right)$.

Sol.

$$\frac{1}{8}-\left(\frac{1}{6}-\frac{1}{4}\right) = \frac{1}{8}-\left[\frac{(1\times2)-(1\times3)}{12}\right] \quad [\because \text{LCM of } 6, 4 = 12]$$

$$= \frac{1}{8}-\left(\frac{2-3}{12}\right)$$

$$= \frac{1}{8}-\left(-\frac{1}{12}\right)$$

$$= \frac{1}{8}+\frac{1}{12} = \frac{(1\times3)+(1\times2)}{24} \quad [\because \text{LCM of } 8, 12 = 24]$$

$$= \frac{3+2}{24} = \frac{5}{24}$$

6. **Multiply** $2\frac{3}{5}$ **and** $1\frac{4}{7}$.

Sol.

$$2\frac{3}{5}\times1\frac{4}{7} = \frac{13}{5}\times\frac{11}{7} = \frac{143}{35} = 4\frac{3}{35}$$

7. **Divide** $\frac{7}{36}$ **by** $\frac{35}{81}$.

Sol.

$$\frac{7}{36}\div\frac{35}{81} = \frac{7}{36}\times\frac{81}{35} = \frac{9}{20}$$

8. **Fill in the boxes :** $\frac{\square}{66}=\frac{70}{\square}=\frac{28}{44}=\frac{\square}{121}=\frac{7}{\square}$.

Sol.

$$\frac{28}{44} = \frac{28\div4}{44\div4} = \frac{7}{11}$$

$$\frac{7}{11} = \frac{7\times4=28}{11\times4=44} = \frac{7\times6=42}{11\times6=66} = \frac{7\times10=70}{11\times10=110} = \frac{7\times11=77}{11\times11=121}$$

$$\therefore \frac{\boxed{42}}{66} = \frac{70}{\boxed{110}} = \frac{28}{44} = \frac{\boxed{77}}{121} = \frac{7}{\boxed{11}}.$$

9. **In a city, $\frac{7}{20}$ of the population is women and $\frac{1}{4}$ are children. Find the fraction of the population of men.**

Sol. Let the total population = 1

$$\text{Population of men} = \text{Total population} - \text{Women} - \text{Children}$$

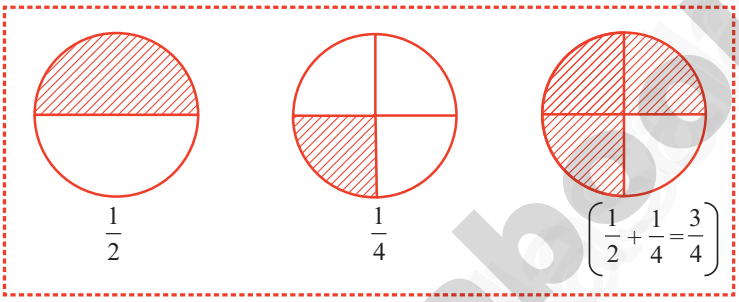
$$= 1 - \frac{7}{20} - \frac{1}{4} = \frac{20}{20} - \frac{7}{20} - \frac{5}{20}$$

$$= \frac{20-7-5}{20} = \frac{8}{20} = \frac{2}{5}$$

$$\text{Population of men} = \frac{2}{5}$$

10. **Represent $\left(\frac{1}{2}+\frac{1}{4}\right)$ by a diagram.**

Sol.



TRY THESE

Page No. 3

1. **Is the number – 7 a rational number ? Why?**

Sol. Yes – 7 is a rational number. Because $-7 = \frac{-14}{2} = \frac{p}{q}$

2. **Write any 6 rational numbers between 0 and 1.**

Sol. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}$

TRY THESE

Page No. 5

Write the decimal forms of the following rational numbers.

1. $\frac{4}{5}$ **2.** $\frac{6}{25}$ **3.** $\frac{486}{1000}$ **4.** $\frac{1}{9}$ **5.** $3\frac{1}{4}$ **6.** $-2\frac{3}{5}$

Sol. **1.** $\frac{4}{5} = \frac{4\times 20}{5\times 20} = \frac{80}{100} = 0.80$

2. $\frac{6}{25} = \frac{6\times 4}{25\times 4} = \frac{24}{100} = 0.24$

3. $\frac{486}{1000} = 0.486$

4. $\frac{1}{9} = 0.11\ldots$

$$\begin{array}{r} 0.11 \\ 9\overline{)\ 10} \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

5. $3\frac{1}{4} = \frac{13}{4} = 3.25$

$$\begin{array}{r} 3.25 \\ 4\overline{)\ 13} \\ \underline{12} \\ 10 \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

6. $-2\frac{3}{5} = \frac{-13}{5} = -2.6$

$$\begin{array}{r} 2.6 \\ 5\overline{)\ 13} \\ \underline{10} \\ 30 \\ \underline{30} \\ 0 \end{array}$$

TRY THESE Page No. 6

1. $\frac{7}{3} = \frac{?}{9} = \frac{49}{?} = \frac{-21}{?}$

$\frac{7}{3} = \frac{7\times3}{3\times3} = \frac{21}{9}$

$\frac{7}{3} = \frac{7\times7}{3\times7} = \frac{49}{21}$

$\frac{7}{3} = \frac{7\times(-3)}{3\times(-3)} = \frac{-21}{-9}$

$\therefore \frac{7}{3} = \frac{21}{9} = \frac{49}{21} = \frac{-21}{-9}$

2. $\frac{-2}{5} = \frac{?}{10} = \frac{6}{?} = \frac{-8}{?}$

$\frac{-2}{5} = \frac{-2\times2}{5\times2} = \frac{-4}{10}$

$\frac{-2}{5} = \frac{-2\times-3}{5\times-3} = \frac{6}{-15}$

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

$\therefore \frac{-2}{5} = \frac{-4}{10} = \frac{6}{-15} = \frac{-8}{20}$

TRY THESE Page No. 7

1. **Which of the following pairs represents equivalent rational numbers?**

(i) $\frac{-6}{4}, \frac{18}{-12}$ **(ii)** $\frac{-4}{-20}, \frac{1}{-5}$

(iii) $\frac{-12}{-17}, \frac{60}{85}$

(i) $\frac{-6}{4} = \frac{-6\times-3}{4\times-3} = \frac{18}{-12}$

$\therefore \frac{-6}{4}$ equivalent to $\frac{18}{-12}$

(ii) $\frac{-4}{-20} = \frac{-4\div(-4)}{-20\div(-4)} = \frac{1}{5} \neq -\frac{1}{5}$

$\therefore \frac{-4}{-20}$ not equivalent to $\frac{1}{-5}$

(iii) $\frac{-12}{-17} = \frac{-12\times-5}{-17\times-5} = \frac{60}{85}$

$\therefore \frac{-12}{-17}$ equivalent to $\frac{60}{85}$

2. **Find the standard form of :**

(i) $\frac{36}{-96}$ **(ii)** $\frac{-56}{-72}$ **(iii)** $\frac{27}{18}$

(i) $\frac{36}{-96} = \frac{36\div12}{-96\div12} = \frac{3}{-8} = -\frac{3}{8}$

(ii) $\frac{-56}{-72} = \frac{-56\div(-8)}{-72\div(-8)} = \frac{7}{9}$

(iii) $\frac{27}{18} = \frac{27\div9}{18\div9} = \frac{3}{2}$

Additional Questions and Answers

Very Short Answers (2 Marks)

1. Add $\frac{3}{5}$ and $\frac{13}{5}$

Sol.
$$\frac{3}{5}+\frac{13}{5} = \frac{3+13}{5} = \frac{16}{5} = 3\frac{1}{5}$$

2. Add $\frac{7}{9}$ and $\frac{-12}{9}$.

Sol.
$$\frac{7}{9}+\frac{(-12)}{9} = \frac{7+(-12)}{9} = \frac{-5}{9}$$

3. Add $\frac{-3}{7}$ and $\frac{-17}{7}$.

Sol.
$$\frac{-3}{7}+\left(\frac{-17}{7}\right) = \frac{(-3)+(-17)}{7}$$
$$= \frac{-20}{7} = -2\frac{6}{7}$$

4. Add $\frac{4}{-13}$ and $\frac{7}{13}$.

Sol.
$$\frac{4}{-13}+\frac{7}{13} = \frac{-4}{13}+\frac{7}{13} = \frac{(-4)+7}{13} = \frac{3}{13}$$

5. Subtract $\frac{3}{4}$ from $\frac{7}{4}$.

Sol.
$$\frac{7}{4}-\frac{3}{4} = \frac{7-3}{4} = \frac{4}{4} = 1$$

6. Subtract $\frac{6}{17}$ from $\frac{7}{17}$.

Sol.
$$\frac{7}{17}-\frac{6}{17} = \frac{7-6}{17} = \frac{1}{17}$$

7. Multiply $\frac{3}{4}$ by $\frac{5}{7}$.

Sol.
$$\frac{3}{4}\times\frac{5}{7} = \frac{3\times5}{4\times7} = \frac{15}{28}$$

8. Divide 1 by $\frac{1}{2}$.

Sol.
$$1\div\frac{1}{2} = \frac{1}{1}\times\frac{2}{1} = \frac{1\times2}{1\times1} = 2$$

9. Divide $\frac{2}{3}$ by $\frac{-7}{12}$.

Sol.
$$\frac{2}{3}\div\frac{-7}{12} = \frac{2}{3}\times\frac{12}{-7} = \frac{2\times12}{3\times-7} = \frac{24}{-21} = \frac{8}{-7} = -1\frac{1}{7}$$

10. $\frac{-22}{27} \div \frac{-110}{18} = ?$

Sol.

$$\frac{-22}{27} \div \frac{-110}{18} = \frac{-22}{\cancel{27}_{3}} \times \frac{\cancel{18}^{2}}{\cancel{-110}_{55}} = \frac{22}{165}$$

11. **Verify addition of rational numbers is closed using $\frac{1}{4}$ and $\frac{2}{3}$.**

Sol. Let $a = \frac{1}{4}$ and $b = \frac{2}{3}$

$$a + b = \frac{1}{4} + \frac{2}{3} = \frac{(1\times3)+(2\times4)}{3\times4} = \frac{3+8}{12} = \frac{11}{12} \text{ is in Q.}$$

$\therefore$ Addition of rational numbers is closed.

12. **Is subtraction is commutative for rational numbers. Give an example.**

Sol. No, subtraction is not commutative for rational numbers.

Example: Let $a = \frac{1}{2}$ and $b = \frac{5}{6}$

$$a - b = \frac{1}{2} - \frac{5}{6} = \frac{(1\times3)-5}{6} = \frac{3-5}{6} = \frac{-2}{6} = \frac{-1}{3} \quad \text{....(1)}$$

$$b - a = \frac{5}{6} - \frac{1}{2} = \frac{5}{6} - \frac{3}{6} = \frac{5-3}{6} = \frac{2}{6} = \frac{1}{3} \quad \text{....(2)}$$

From (1) and (2) $a - b \neq b - a$ for rational numbers

13. **Show that multiplication of rational numbers is commutative for $a = \frac{3}{2}$ and $b = \frac{5}{7}$.**

Sol.

$$a \times b = \frac{3}{2} \times \frac{5}{7} = \frac{15}{14} \quad \text{... (1)}$$

$$b \times a = \frac{5}{7} \times \frac{3}{2} = \frac{15}{14} \quad \text{... (2)}$$

From (1) and (2) $a \times b = b \times a$ for rational numbers.

$\therefore$ Multiplication of rational numbers is commutative.

14. **Is division of rational numbers satisfy closure property? Why? What is the condition for the set to satisfy closure property?**

Sol. Division of rational numbers is not closed always. Because division by 0 is not possible. So if we take the set of all non-zero rational numbers, then the set satisfy the closure property.

Eg. Let $a = \frac{1}{3}$, $b = -\frac{2}{3}$

$$a \div b = \frac{1}{3} \div -\frac{2}{3} = \frac{1}{3} \times \frac{3}{-2} = -\frac{1}{2} \text{ is in Q.}$$

15. **Write the distributive law for rational numbers of multiplication over addition.**

Sol. If a, b and c be three rational numbers, then $a \times (b + c) = (a \times b) + (a \times c)$ is the distributive property of multiplication over addition.

16. **State the associative property for addition of rational numbers.**

Sol. If a, b and c be three rational numbers then $(a + b) + c = a + (b + c)$.

17. **Verify $x \times y = y \times x$ for $x = \frac{-1}{3}, y = \frac{2}{7}$.**

Sol.

$$x \times y = \frac{-1}{3} \times \frac{2}{7} = \frac{-2}{21} \quad \ldots(1)$$

$$y \times x = \frac{2}{7} \times \frac{-1}{3} = \frac{-2}{21} \quad \ldots.(2)$$

From (1) and (2), we have

$$x \times y = y \times x$$

18. **Verify commutative property of addition for $x = \frac{1}{3}, y = \frac{-7}{9}$.**

Sol. Given $x = \frac{1}{3}, y = \frac{-7}{9}$

$$x + y = \frac{1}{3} + \frac{-7}{9} = \frac{(1\times3)+(-7\times1)}{9} = \frac{3+(-7)}{9} = \frac{-4}{9} \quad \ldots.(1)$$

$$y + x = \frac{-7}{9} + \frac{1}{3} = \frac{-7+(1\times3)}{9}$$

$$= \frac{-7+3}{9} = \frac{-4}{9} \quad \ldots.(2)$$

From (1) and (2) $x + y = y + x$, i.e commutative property is true.

Short Answers (3 Marks)

1. **Add $\frac{4}{-3}$ and $\frac{8}{15}$.**

Sol.

$$\frac{4}{-3} + \frac{8}{15} = \frac{-4}{3} + \frac{8}{15}$$

LCM of 3 and 15 is 15

$$\frac{(-4\times5)+(8\times1)}{15} = \frac{-20+8}{15} = \frac{-\cancel{12}^{4}}{\cancel{15}_{5}} = \frac{-4}{5}$$

2. **Simplify $\frac{9}{-27} + \frac{18}{39}$.**

Sol.

$$\frac{9}{-27} + \frac{18}{39} = \frac{-\cancel{9}}{\cancel{27}_{3}} + \frac{^{6}\cancel{18}}{\cancel{39}_{13}}$$

$$= \frac{-1}{3} + \frac{6}{13} = \frac{(-1\times13)+(6\times3)}{3\times13} = \frac{-13+18}{39} = \frac{5}{39}$$

3. **What number should be added to $\frac{-7}{8}$ to get $\frac{5}{9}$?**

Sol. Let the number to be added be x

$$\frac{-7}{8} + x = \frac{5}{9}$$

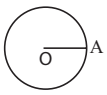
$$x = \frac{5}{9} + \frac{7}{8} = \frac{(5\times8)+(7\times9)}{9\times8} = \frac{40+63}{72} = \frac{103}{72} = 1\frac{31}{72}$$

$\therefore \frac{103}{72}$ should be added to get $\frac{5}{9}$.

2 MEASUREMENTS

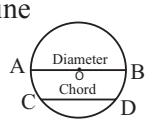
POINTS TO REMEMBER

- Value of the constant π is a non terminating and non-recurring decimal number.
- We use the approximate value of π as $\frac{22}{7}$ or 3.14.
- Exact value of $\pi = \frac{\text{Circumference of a circle}}{\text{Its diameter}}$
- Circumference of a circle = $2\pi r$ units (or) circumference = πd units.
- For quick calculations we can say that circumference of a circle is approximately slightly more than three times its diameter.
- **(A) Parts of a circle:**
  - A circle is the path traced by a moving point keeping its distance from a fixed point to be always a constant.
  - The fixed point of the circle is called its 'centre'.
  - The constant distance is called its 'radius'.

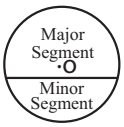


O - Center
OA - Radius

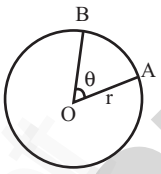
  - If any two points on a circle are joined by a line segment, the line segment is called 'chord'.
  - The chord which passes through the center of a circle is called as 'diameter'.



  - The diameter is the longest chord of a circle.
  - A diameter divides the circle into two equal parts.
  - A part of the circumference of a circle is called the circular arc.
  - The plane surface that is enclosed between two radii and the circular arc of a circle is called the 'sector'.
  - Each part of a circle which is divided by a chord is called segment.
  - The part which has a smaller arc is called as the minor 'segment'.
  - The part which has a larger arc is called as the major segment.



(B) Central Angle:



- The angle formed by a sector of a circle at its centre is called the central angle.
- The central angle of a circle = 360°.
- If a circle is divided into 'n' equal sectors, the central angle of each of the sector is $\theta^\circ = \frac{360^\circ}{n}$.
- Area of circle = πr^2 sq. units.
- Circumference of a circle = $2\pi r$ units.
- The length of a semicircular arc is half of the circumference of the circle.
- Length of the semicircular arc = $\frac{2\pi r}{2} = \pi r$ units.
- The area of the semicircle = $\frac{1}{2}\pi r^2$ sq.units.
- If we assume that the cenral angle of a sector of radius 'r' units as θº, then the ratio of the central angle θº to 360° is $\frac{\theta^\circ}{360^\circ}$.
- Length of the arc $l = \frac{\theta^\circ}{360^\circ} \times 2\pi r$ units.
- Area of the sector A = $\frac{\theta^\circ}{360^\circ} \times \pi r^2$ sq. units.
- If a circle of radius 'r' is divided into 'n' equal sectors then

  (i) length of the arc of each sector = $\frac{1}{n} \times 2\pi r$ units.

  (ii) Area of each of the sectors = $\frac{1}{n} \times \pi r^2$ sq.units.

- If length of the arc is given then area of the sector = $\frac{lr}{2}$ sq. units.

(C) Perimeter of a Sector:

- Perimeter of a sector P = $l + 2r$ units.
- Perimeter of a semicircle P = $(\pi + 2)\, r$ units.
- Perimeter of a circular quadrant = $\left(\frac{\pi}{2} + 2\right) r$ units.

THINK

Page No. 51

1. $\frac{22}{7}$ and 3.14 are rational numbers. Is 'π' a rational number? Why?

Sol. $\frac{22}{7}$ and 3.14 are rational numbers. π has non-terminating and non-repeating decimal expansion. So it is not a rational number. It is an irrational number.

2. When is the 'π' day celebrated? Why?

Sol. March 14th is the π day celebrated for every year. Because, approximately value of 'π' is 3.14.

THINK

Page No. 53

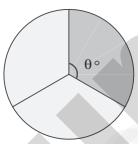
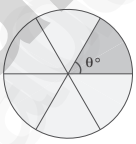
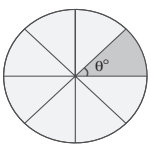
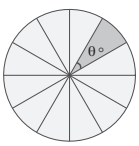
The given circular figure is divided into six equal parts. Can we call the equal parts as sectors? Why?

No, the equal parts are not sectors. Because a sector is a plane surface that is enclosed between two radii and the circular arc of the circle. Here the boundaries are not radii.

TRY THESE

Page No. 53

Fill the central angle of the shaded sector (each circle is divided into equal sectors)

Sector				
Central angle $\theta^\circ = \frac{360^\circ}{n}$	$\theta^\circ = 120^\circ$	$\theta^\circ = 60^\circ$	$\theta^\circ = 45^\circ$	$\theta^\circ = 30^\circ$

THINK

Page No. 54

1. Instead of multiplying by $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$, we shall multiply by $\frac{180^o}{360^o}$, $\frac{120^o}{360^o}$ and $\frac{90^o}{360^o}$ respectively. Why?

Sol. Because,

$$\frac{180^o}{360^o} = \frac{1}{2}$$

$$\frac{120^o}{360^o} = \frac{1}{3}$$

$$\frac{90^o}{360^o} = \frac{1}{4}$$

THINK

Page No. 57

If the radius of a circle is doubled, what will happen to the area of the new circle so formed?

Sol. If $r = 2r \Rightarrow$ Area of the circle $= \pi r^2 = \pi(2r)^2 = \pi 4r^2 = 4\pi r^2 = 4 \times (\pi r^2)$

$\therefore$ New Area $= 4 \times$ old area.

Exercise 2.1

1. Fill in the blanks:

(i) The ratio between the circumference and diameter of any circle is _____. **[Ans: π]**

(ii) A line segment which joins any two points on a circle is a _____. **[Ans: chord]**

(iii) The longest chord of a circle is _____. **[Ans: diameter]**

(iv) The radius of a circle of diameter 24 cm is _____. **[Ans: 12 cm]**

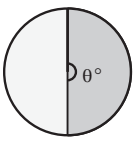
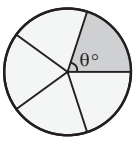
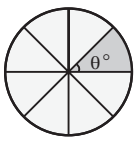
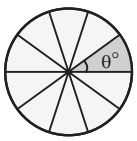
(v) A part of circumference of a circle is called as _____. **[Ans: an arc]**

2. Match the following:

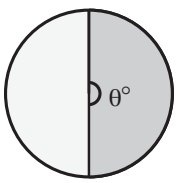
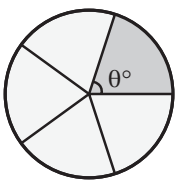
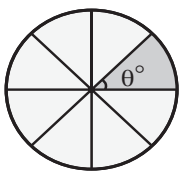
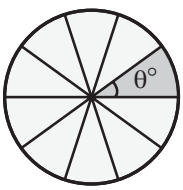
(i)	Area of a circle	a.	$\frac{1}{4}\pi r^2$
(ii)	Circumference of a circle	b.	$(\pi + 2)r$
(iii)	Area of the sector of a circle	c.	πr^2
(iv)	Circumference of a semicircle	d.	$2\pi r$
(v)	Area of a quadrant of a circle	e.	$\frac{\theta^\circ}{360^\circ} \times \pi r^2$

[Ans: (i)-c, (ii)-d (iii)-e, (iv)-b, (v)-a]

3. Find the central angle of the shaded sectors (each circle is divided into equal sectors).

Sectors				
Central angle of each sector (θ°)				

Sol.

Sector				

POINTS TO REMEMBER

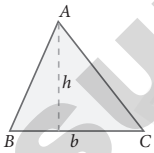
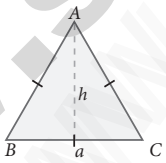
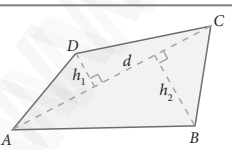
(A) Perimeter and Area of combined shapes

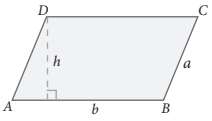
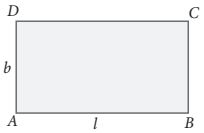
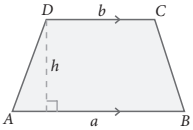
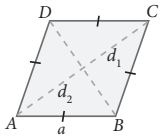
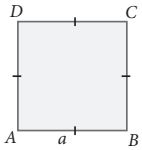
- The perimeter of a combined shape is the sum of all the lengths of the sides that form a closed boundary.
- The area of combined shapes is the sum of all areas of the simple shapes in it.
- A closed plane figure formed by three or more sides is called a 'polygon'.
- Some of the polygons and their number of sides are:

Triangle has	3 sides
Quadrilateral has	4 sides
Pentagon has	5 sides
Hexagon has	6 sides
Heptagon has	7 sides
Octagon has	8 sides
Nanagon has	9 sides
Decagon has	10 sides

- If all sides and all angles of a polygon are equal, then it is called as a regular polygon. E.g. Equilateral triangle, square etc
- Other polygons are irregular polygons. Eg. Scalene triangle, rectangle etc.

Recalling area and perimeter of some shapes:

S.No	Shape	Name	Area (*sq.units*)	Perimeter (*units*)
1		Triangle	$\frac{1}{2}\times b\times h$	Sum of all three sides
2		Equilateral triangle	$\frac{\sqrt{3}}{4}a^2\left(h=\frac{\sqrt{3}}{2}a\right)$	$3a$
3		Quadrilateral	$\frac{1}{2}\times d\times(h_1+h_2)$	Sum of all the four sides

4		Parallelogram	$b \times h$	$2(a+b)$
5		Rectangle	$l \times b$	$2(l+b)$
6		Trapezium	$\frac{1}{2} \times h \times (a+b)$	Sum of all the four sides
7		Rhombus	$\frac{1}{2} \times d_1 \times d_2$	4a
8		Square	a^2	4a

THINK

Page No. 61

All the sides of a rhombus are equal. Is it a regular polygon?

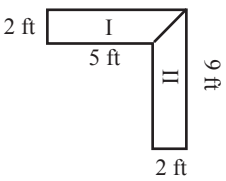
Sol. For a regular polygon all sides and all the angles must be equal. But in a rhombus all the sides are equal. But all the angles are not equal

$\therefore$ It is not a regular polygon.

TRY THIS

Page No. 64

In the above example split the given mat into two trapeziums and verify your answer.



Sol. Area of the mat = Area of I trapezium + Area of II trapezium

$$= [\frac{1}{2} \times h_1 \times (a_1 + b_1)] + [\frac{1}{2} \times h_2 \times (a_2 + b_2)] \text{ sq. units}$$

$$= [\frac{1}{2} \times 2 \times (7 + 5)] + \frac{1}{2} \times 2 \times (9 + 7) \text{ sq. feet}$$

$$= 12 + 16 = 28 \text{ sq.feet}$$

$\therefore$ Cost per sq.feet = ₹20

Cost for 28 sq. feet = ₹20 × 28 = ₹560

$\therefore$ Total cost for the entire mat = ₹560

Both the answers are the same.

3 ALGEBRA

POINTS TO REMEMBER

- Algebra is the study of mathematical symbols and rules for calculating these symbols.
- In arithmetic only numbers and their arithmetical operations (such as +, –, ×, ÷). occur
- In algebra numbers are often represented by symbols called variables.
- An algebraic expression may contain fractions, negative powers on their variables.
  Eg : $zy^2 + \frac{5}{y}$
- An expression which contains only one term is called a **monomial.**
  Eg. $4x$, $3x^2 y$, $-2y^2$
- An expression which contains only two terms is called a **binomial.**
  Eg. $2x + 3$, $5y^2 + 9y$, $a^2 b^2 + 2b$
- An expression which contains only three terms is called a **trinomial.**
  Eg. $2a^2 b - 8ab + b^2$, $m^2 - n^2 + 3$
- A polynomial contains only whole numbers as the powers of their variables
  Eg. $3x^2 - 5$

(A) MULTIPLICATION OF AGEBRAIC EXPRESSIONS

- To multiply or to find out the product of algebraic expressions follow the steps.
  (i) Multiply the signs of the terms.
  - Product of two like signs are positive
  - Product of two unlike signs is negative

  (ii) Multiply the corresponding co-efficients of the terms.
  (iii) Multiply the variable factors using laws of exponents.
  - $x^m \times x^n = x^{m+n}$
- Product of two terms is represented by the symbol ×, ( ), or '.'.
- If 'a' is a constant, x and y are variables then $a(x + y) = ax + ay$ states the **distributive law.**

RECAP

Page No. 74 & 75

Answer the following questions :

1. **Write the numbers of terms in the following expressions.**

   (i) $x + y + z - xyz$ **[Ans: 4 terms]**

   (ii) $m^2 n^2 c$ **[Ans: 1 term]**

   (iii) $a^2 b^2 c - ab^2c^2 + a^2 bc^2 + 3abc$ **[Ans: 4 terms]**

   (iv) $8x^2 - 4xy + 7xy^2$ **[Ans: 3 terms]**

2. **Identify the numerical co-efficient of each term in the following expressions.**

   (i) $2x^2 - 5xy + 6y^2 + 7x - 10y + 9$

   [Ans: Numerical co efficient in $2x^2$ is 2

   Numerical co efficient in $-5xy$ is -5

   Numerical co efficient in $6y^2$ is 6

   Numerical co efficient in $7x$ is 7

   Numerical co efficient in $-10y$ is -10

   Numerical co-efficient in 9 is 9]

   (ii) $\frac{x}{3} + \frac{2y}{5} - xy + 7$

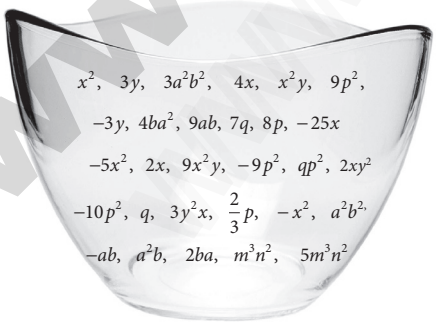
   [Ans: Numerical co efficient in $\frac{x}{3}$ is $\frac{1}{3}$

   Numerical co efficient in $\frac{2y}{5}$ is $\frac{2}{5}$

   Numerical co efficient in $-xy$ is -1

   Numerical co efficient in 7 is 7]

3. **Pick out the like terms from the following.**



Like Terms

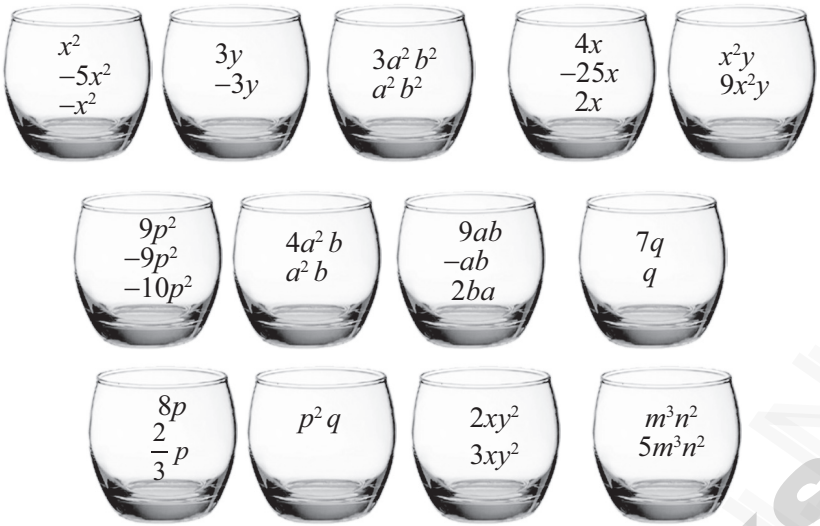
The variables of the terms along with their respective exponents must be same

Examples : $x^2, 4x^2$

$a^2b^2, -5a^2b^2$

$2m, -7m$

Sol.



4. **Add : $2x, 6y, 9x - 2y$**

Sol. $2x + 6y + 9x - 2y = 2x + 9x + 6y - 2y = (2 + 9)x + (6 - 2)y = 11x + 4y$

5. **Simplify : $(5x^3y^3 - 3x^2y^2 + xy + 7) + (2xy + x^3y^3 - 5 + 2x^2y^2)$**

Sol. $(5x^3y^3 - 3x^2y^2 + xy + 7) + (2xy + x^3y^3 - 5 + 2x^2y^2)$

$= 5x^3y^3 + x^3y^3 - 3x^2y^2 + 2x^2y^2 + xy + 2xy + 7 - 5$

$= (5 + 1)\, x^3y^3 + (-3 + 2)\, x^2y^2 + (1 + 2)\, xy + 2$

$= 6x^3y^3 - x^2y^2 + 3xy + 2$

6. **The sides of a triangle are $2x - 5y + 9$, $3y + 6x - 7$ and $-4x + y + 10$. Find the perimeter of the triangle.**

Sol. Perimeter of the triangle = Sum of three sides

$= (2x - 5y + 9) + (3y + 6x - 7) + (-4x + y + 10)$

$= 2x - 5y + 9 + 3y + 6x - 7 - 4x + y + 10$

$= 2x + 6x - 4x - 5y + 3y + y + 9 - 7 + 10$

$= (2 + 6 - 4)\, x + (-5 + 3 + 1)\, y + (9 - 7 + 10)$

$= 4x - y + 12$

$\therefore$ Perimeter of the triangle $= 4x - y + 12$ units.

7. **Subtract $-2mn$ from $6mn$.**

Sol. $6\,mn - (-2mn) = 6mn + (+2mn)$

$= (6 + 2)\, mn = 8mn$

8. **Subtract $6a^2 - 5ab + 3b^2$ from $4a^2 - 3ab + b^2$.**

Sol. $(4a^2 - 3ab + b^2) - (6a^2 - 5ab + 3b^2)$

$= (4a^2 - 6a^2) + (-3ab - (-5ab)] + (b^2 - 3b^2)$

$= (4 - 6)\, a^2 + [-3ab + (+5ab)] + (1 - 3)\, b^2$

$= [4 + (-6)]\, a^2 + (-3 + 5)\, ab + [1 + (-3)]b^2$

$= -2a^2 + 2ab - 2b^2$

FACTORISATION :

POINTS TO REMEMBER

- Expressing an algebraic expression as the product of two or more expressions is called the factorization.
- A number which is divisible by 1 and itself is called a prime number.
- A number which has only 2 factors is a prime number. Example: 2, 3, 5. 7. 11, ...
- Composite number is a number which has more than 2 factors.
- 1 is neither prime nor composite.
- 2 is the only one even prime number.
- 1 is a factor for all numbers.
- A number which can be written in the form of $x \times x \times x$ is called perfect cube number.

TRY THESE

Page No. 94

Find the factors

Sol.

Factor 1	Factor 2	Product	Sum
7	5	35	12
– 8	+ 5	– 40	– 3
– 20	3	60	– 17
17	– 3	– 51	+ 14
– 8	4	– 32	– 4

THINK

Page No. 94

1. **$x^2 - 4(x - 2) = (x^2 - 4)(x - 2)$ Is this correct? If not correct it.**

Sol. No, it is not correct

Required correct equation is $x^2 - 4(x - 2) = x^2 - 4x + 8$

TRY THESE

Page No. 95

Factorize the following :

1) $3y + 6$
2) $10x^2 + 15y^2$
3) $7m(m - 5) + 1(5 - m)$
4) $64 - x^2$
5) $x^2 - 3x + 2$
6) $y^2 - 4y - 32$
7) $p^2 + 2p - 15$
8) $m^2 + 14m + 48$
9) $x^2 - x - 90$
10) $9x^2 - 6x - 8$

Sol. 1. $3y + 6$

$$3y + 6 = 3 \times y + 2 \times 3$$

Taking out the common factor 3 from each term we get $3(y + 2)$

$$\therefore 3y + 6 = 3(y + 2)$$

2. $10x^2 + 15y^2$

$$10x^2 + 15y^2 = (2 \times 5 \times x \times x) + (3 \times 5 \times y \times y)$$

Taking out the common factor 5 we have

$$10x^2 + 15y^2 = 5(2x^2 + 3y^2)$$

3. $7m\,(m-5) + 1\,(5-m)$

$$7m\,(m-5) + 1\,(5-m) = 7m\,(m-5) + (-1)(-5+m)$$
$$= 7m\,(m-5) - 1\,(m-5)$$

Taking out the common binomial factor $(m-5) = (m-5)\,(7m-1)$

4. $64 - x^2$

$$64 - x^2 = 8^2 - x^2$$

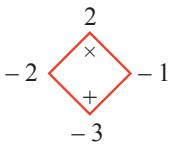
This is of the form $a^2 - b^2$

Comparing with $a^2 - b^2$ we have $a = 8$, $b = x$

$$a^2 - b^2 = (a+b)\,(a-b)$$
$$64 - x^2 = (8+x)\,(8-x)$$

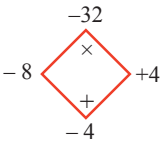
5. $x^2 - 3x + 2$

$$= x^2 - 2x - x + 2$$
$$= x(x-2) - (x-2)$$
$$= (x-2)\,(x-1)$$



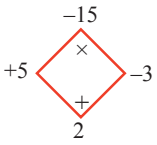
6. $y^2 - 4y - 32$

$$= y^2 - 8y + 4y - 32$$
$$= y(y-8) + 4(y-8)$$
$$= (y-8)\,(y+4)$$



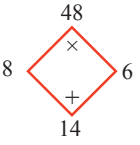
7. $p^2 + 2p - 15$

$$= p^2 + 5p - 3p - 15$$
$$= p(p+5) - 3(p+5)$$
$$= (p+5)\,(p-3)$$



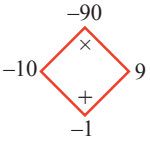
8. $m^2 + 14m + 48$

$$= m^2 + 8m + 6m + 48$$
$$= m(m+8) + 6(m+8)$$
$$= (m+6)\;\;(m+8)$$



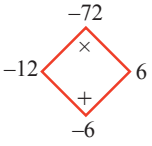
9. $x^2 - x - 90$

$$= x^2 - 10x + 9x - 90$$
$$= x(x-10) + 9(x-10)$$
$$= (x+9)\,(x-10)$$



10. $9x^2 - 6x - 8$

$$= 9x^2 - 12x + 6x - 8$$
$$= 3x(3x-4) + 2(3x-4)$$
$$= (3x+2)\,(3x-4)$$



4 LIFE MATHEMATICS

POINTS TO REMEMBER

- When the S.P is more than the C.P, then there is a gain or profit. *Profit/Gain* =S.P– C.P. When the S.P is less than the C.P, then there is a loss. Loss = C.P – S.P. The profit or loss is always calculated on the cost price.
- Selling price = Marked price – Discount.
- Profit or Gain % $= \left(\frac{Profit}{C.P} \times 100\right)\%$
- Loss % $= \left(\frac{Loss}{C.P} \times 100\right)\%$
- Selling Price, S.P$= \frac{(100 + Profit\%)}{100} \times$C.P (or) Cost of Price, C.P$= \frac{100}{(100 + Profit\%)} \times$ S.P
- Selling Price, S.P $= \frac{(100 - Loss\%)}{100} \times$C.P (or) Cost of Price, C.P $= \frac{100}{(100 - Loss\%)} \times$ S.P
- When the interest is compounded annually, A= P $\left(1 + \frac{r}{100}\right)^n$
- When the interest is compounded half yearly, A= P $\left(1 + \frac{r}{200}\right)^{2n}$
- When the interest is compounded quarterly, A = P $\left(1 + \frac{r}{400}\right)^{4n}$
- C.I = A−P (Amount − Principal).
- The simple interest and the compound interest remains the same for the first year.

  For 2 years, the difference in C.I and S.I is C.I − S.I = P $\left(\frac{r}{100}\right)^2$

  For 3 years, the difference in C.I and S.I is C.I − S.I = P $\left(\frac{r}{100}\right)^2 \left(3 + \frac{r}{100}\right)$
- x and y are said to vary directly if $y=kx$ always, where k is called the proportionality constant and $k > 0$

  x and y are said to vary inversely, if $xy = k$ always, where k is called the proportionality constant and $k > 0$.
- we can use the fact that the product of the extremes is equal to the product of the means to find the unknown *(x)* in the problem.
- By using the formula $\frac{P_1 \times D_1 \times H_1}{W_1} = \frac{P_2 \times D_2 \times H_2}{W_2}$, we can find the unknown *(x)*.
- We can also find the unknown *(x)* by Multiplicative Factor Method.

TRY THESE

Page No. 122

Find the indicated percentage value of the given numbers

% \ Number	60	240	660	852	1200
10%	$\frac{10}{100} \times 60 = 6$	$\frac{10}{100} \times 240 = 24$	$\frac{10}{100} \times 660 = 66$	$\frac{10}{100} \times 852 = 85.2$	$\frac{10}{100} \times 1200 = 120$
20%	$\frac{20}{100} \times 60 = 12$	$\frac{20}{100} \times 240 = 48$	$\frac{20}{100} \times 660 = 132$	$\frac{20}{100} \times 852 = 170.4$	$\frac{20}{100} \times 1200 = 240$
25%	$\frac{25}{100} \times 60 = 15$	$\frac{25}{100} \times 240 = 60$	$\frac{25}{100} \times 660 = 165$	$\frac{25}{100} \times 852 = 213$	$\frac{25}{100} \times 1200 = 300$
$33\frac{1}{3}\%$	$\frac{100}{3} \times \frac{60}{100} = \frac{6000}{300} = 20$	$\frac{100}{3} \times \frac{1}{100} = \frac{1}{3} = \frac{1}{3} \times 240 = 80$	$\frac{1}{3} \times 660 = 220$	$\frac{1}{3} \times 852 = 284$	$\frac{1}{3} \times 1200 = 400$

TRY THESE

Page No. 124

1. What percent of a day is 10 hours?

Sol. In a day, there are 24 hours

$\therefore$ 10 hrs out of 24 hrs is $\frac{10}{24}$

As a percentage, we need to multiply by 100

$$\therefore \text{Percentage} = \frac{10}{24} \times 100 = 41.67\%$$

2. Divide ₹ 350 among P, Q and R such that P gets 50% of what Q gets and Q gets 50% of what R gets.

Sol. Let R get x, Q gets 50% of what R gets

$$\therefore \quad \therefore \text{Q Amount} = \frac{50}{100} \times x = \frac{x}{2}$$

P gets 50% of what Q gets

$$\therefore \text{P Amount} = \frac{50}{100} \times \frac{x}{2} = \frac{x}{4}$$

Since 350 is divided among the three

$$\therefore 350 = x + \frac{x}{2} + \frac{x}{4}$$

$$350 = \frac{4x + 2x + x}{4} \Rightarrow \frac{7x}{4} = 350$$

$$x = \frac{350 \times 4}{7} = 200$$

$$\text{Q Amount} = \frac{x}{2} = \frac{200}{2} = 100, \text{ P Amount} = \frac{x}{4} = \frac{200}{4} = 50$$

$\therefore$ P = 50, Q = 100, **R = 200**

THINK

Page No. 124

With a lot of pride, the traffic police commissioner of a city reported that the accidents had decreased by 200% in one year. He came up with this number by stating that the increase in accidents from 200 to 600 is clearly a 200% rise and now that it had gone down from 600 last year to 200 this year should be a 200% fall. Is this decrease from 600 to 200, the same 200% as reported by him? Justify.

Sol. Increase from original value 200 to 600

$$\% \text{ increase} = \frac{\text{Change in value}}{\text{original value}} \times 100$$

$$= \frac{600-200}{200} = \frac{\cancel{400}^{\,2}}{\cancel{200}} \times 100 = 200 \text{ \% increase}$$

Decrease from original value 600 to 200

$$\% \text{ decrease} = \frac{\text{Change in value}}{\text{original value}} \times 100$$

Here original value is 600

$$\% \text{ decrease} = \frac{600-200}{600} \times 100 = \frac{400}{600} \times 100 = 66.67 \text{ \% decrease}$$

% Increase from 200 → 600 and % decrease from 600 → 200 are not the same

Exercise 4.1

1. Fill in the blanks:

(i) If 30% of x is 150, then x is _____. [*Ans:* **500**]

Hint. Given 30% of x is 150

$$\text{i.e } \frac{30}{100} \times x = 150$$

$$\therefore x = \frac{\cancel{150}^{\,5} \times 100}{\cancel{30}}$$

$$\therefore x = 500$$

(ii) 2 minutes is _____% to an hour. [*Ans:* $3\frac{1}{3}$ %]

Hint. Let 2 min be x % of an hour

and 1 hr = 60 min

$$x\% = \frac{2}{60} \times 100 = \frac{200}{60} = \frac{10}{3} = 3\frac{1}{3}$$

$$x = 3\frac{1}{3}\%$$

UNIT TEST

TIME: 1 HOUR **MAX MARKS : 25**

I. Fill in the blanks. 5 × 1 = 5

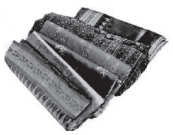
1. A can finish a job in 3 days whereas B finishes it in 6 days. The time taken to complete the job together is _____days.
2. If 5 persons can do 5 jobs in 5 days, then 50 persons can do 50 jobs in _____ days.
3. A can do a work in 24 days. If A and B together can finish the work in 6 days, then B alone can finish the work in _____ days.
4. A alone can do a piece of work in 35 days. If B is 40% more efficient than A, then B will finish the work in _____days.
5. A alone can do a work in 10 days and B alone in 15 days. They undertook the work for ₹200000. The amount that A will get is _____.

II. Answer the following question. 5 × 2 = 10

6. 48 is 32% of which number?
7. If a mattress is marked for ₹ 7500 and is available at two successive discount of 10% and 20%, find the amount to be paid by the customer.
8. Find the compound interest on ₹ 3200 at 2.5% p.a for 2 years, compounded annually.
9. P's income is 25% more than that of Q. By what percentage is Q's income less than P's?
10. If the numerator of a fraction is increased by 50% and the denominator is decreased by 20%, then it becomes $\frac{3}{5}$. Find the original fraction.

III. Answer the following question. 2 × 5 = 10

11. A fruit vendor bought some mangoes of which 10% were rotten. He sold $33\frac{1}{3}$% of the rest. Find the total number of mangoes bought by him initially, if he still has 240 mangoes with him
12. Vaidegi sold two sarees for ₹ 2200 each. On one she gains 10% and on the other she loses 12%. Find her total gain or loss percentage in the sale of the sarees.



ANSWERS

1. 2 days 2. 5 3. 8 4. 25 5. ₹1,20,000
6. Refer Exercise 4.1 Q.No. 3
7. Refer Exercise 4.2 Q.No. 10
8. Refer Exercise 4.3 Q.No. 3
9. Refer Exercise 4.5 Q.No. 4
10. Refer Exercise 4.5 Q.No. 9
11. Refer Exercise 4.5 Q.No. 1
12. Refer Exercise 4.5 Q.No. 5

5 GEOMETRY

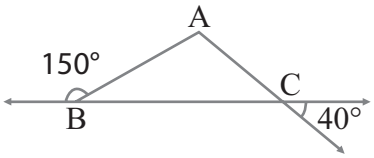
POINTS TO REMEMBER

- Congruent figures are exactly the same in shape and size.
- Similar figures have the same shape but different sizes.
- In a right angled triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides. This is known as Pythagoras theorem.
- The three medians of any triangle are concurrent. The point of concurrence of the three medians in a triangle is called its Centroid, denoted by the letter G.
- The three altitudes of any triangle are concurrent. The point of concurrence of the three altitudes of a triangle is called as its Orthocentre, denoted by the letter H.
- The three perpendicular bisectors of the sides of any triangle are concurrent. The point of concurrence of the three perpendicular bisectors of a triangle is called as its Circumcentre, denoted by the letter S.
- The three angle bisectors of any triangle are concurrent. The point of concurrence of the three angle bisectors of a triangle is called as its Incentre, denoted by the letter I.
- A trapezium is a quadrilateral in which a pair of opposite sides are parallel.
- A parallelogram is a quadrilateral in which the opposite sides are parallel.
- Rhombus is a parallelogram in which all its sides are congruent.
- Rectangle is a parallelogram whose all its angles are right angles.
- Square is a parallelogram in which all its sides and angles are equal.

Page No. 156

Answer the following questions by recalling the properties of triangles:

1. The sum of the three angles of a triangle is _____ . [*Ans:* **180°**]
2. The exterior angle of a triangle is equal to the sum of the _____ angles to it. [*Ans:* **interior opposite**]
3. In a triangle, the sum of any two sides is _____ than the third side. [*Ans:* **greater**]
4. Angles opposite to equal sides are _____ and vice – versa. [*Ans:* **Equal**]
5. What is ∠A in the triangle ABC?



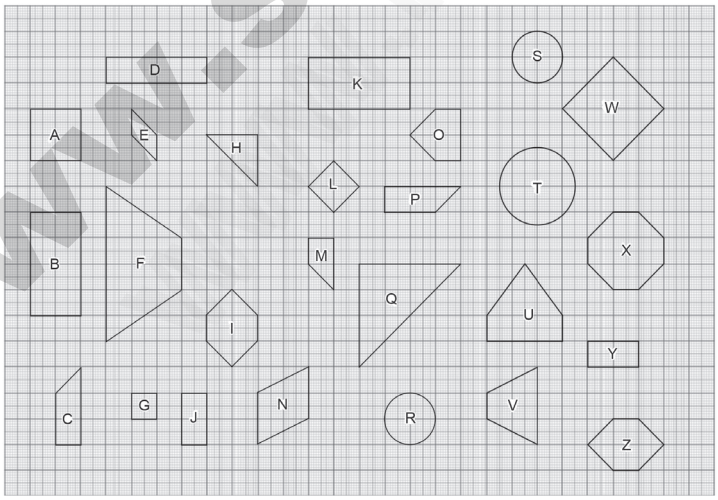
Sol. The exterior angle = sum of interior opposite angles.

$$\begin{aligned} \therefore \angle A + \angle C &= 150^\circ \text{ in } \Delta ABC \\ \text{But } \angle C &= 40^\circ \quad [\because \text{Vertically opposite angles are equal}] \\ \therefore \angle A + \angle C &= 150^\circ \\ \Rightarrow \angle A + \angle 40^\circ &= 150^\circ \\ \angle A &= 150^\circ - 40^\circ \\ \angle A &= 110^\circ \end{aligned}$$

TRY THESE

Page No. 157

Identify the pairs of figures which are similar and congruent and write the letter pairs.



OBJECTIVE TYPE QUESTIONS

11. **Two similar triangles will always have _____angles**

(A) acute (B) obtuse (C) right (D) matching

[*Ans:* **(D) matching**]

12. **If in triangles PQR and XYZ, $\frac{PQ}{XY}=\frac{QR}{YZ}$ then they will be similar if**

(A) $\angle Q = \angle Y$ (B) $\angle P = \angle Y$ (C) $\angle Q = \angle X$ (D) $\angle P = \angle Z$

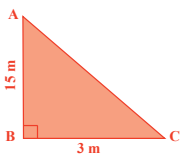
[*Ans:* **(a) $\angle Q = \angle Y$**]

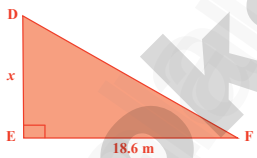
13. **A flag pole 15 m high casts a shadow of 3m at 10 a.m. The shadow cast by a building at the same time is 18.6 m. The height of the building is**

(A) 90 m (B) 91 m (C) 92 m (D) 93 m

[*Ans:* **(D) 93 m**]

Hint.





$$\therefore \frac{AB}{DE} = \frac{BC}{EF}$$

$$\frac{15}{x} = \frac{13}{18.6} \Rightarrow x = \frac{15\times 18.6}{3} = 93 \text{ m}$$

14. **If $\Delta ABC \sim \Delta PQR$ in which $\angle A = 53°$ and $\angle Q = 77°$, then $\angle R$ is**

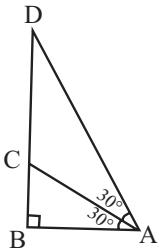
(A) 50° (B) 60° (C) 70° (D) 80°

[*Ans:* **(A) 50°**]

Hint. By CPCT, angles in SPQR would be same as angles in Δ ABC

$$\therefore \angle R = 180° - (53° + 77)$$
$$= 180° - 130°$$
$$= 50°$$

15. **In the figure, which of the following statements is true?**



(A) AB = BD (B) BD < CD

(C) AC = CD (D) BC = CD [*Ans:* **(C) AC = CD**]

Hint. In Δ DBA, $\angle B = 90°$, $\angle A = 30° + 30° = 60°$

Sum of angles in a triangle is 180°

$\therefore$ In Δ DBA, $\angle B + \angle A + \angle D = 180°$

$$90° + 60° + \angle D = 180°$$
$$\angle D = 180° - (90° + 60°)$$
$$= 180° - 150°$$
$$\angle D = 30°$$

$\therefore \angle D = \angle A = 30°$

$\Rightarrow$ AC = CD (Since two angles are equal in triangle, then side opposite to them are equal)

ACTIVITY

Page No. 169

1. **We can construct sets of Pythagorean triplets as follows. Let m and n be any two positive integers ($m > n$):**

(a, b, c) is a Pythagorean triple if $a = m^2 - n^2$, $b = 2mn$ and $c = m^2 + n^2$ (Think, why?) Complete the table.

Sol:

m	n	$a = m^2 - n^2$	$b = 2mn$	$c = m^2 + n^2$	Pythagorean triplet
2	1	$a = 2^2 - 1^2$ $= 4 - 1$ $= 3$	$b = 2 \times 2 \times 1$ $= 4$	$c = 2^2 + 1^2$ $= 5$	(3, 4 , 5)
3	2	$a = 3^2 - 2^2$ $= 9 - 4$ $= 5$	$b = 2 \times 3 \times 2$ $= 12$	$c = 3^2 + 2^2$ $= 13$	(5, 12, 13)
4	1	15	8	17	(15, 8, 17)
7	2	45	28	53	(45, 28, 53)

2. **Find all integer-sided right angled triangles with hypotenuse 85.**

Sol. $(x + y)^2 - 2xy = 85^2$

13, 84, 85
36, 77, 85
40, 75, 85
51, 68, 85

} Pythagorean triplets with hypotenuse 85.

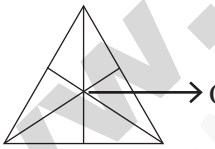
THINK

Page No. 173

1. **In any acute angled triangle, all three altitudes are inside the triangle. Where will be the orthocentre? In the interior of the triangle or in its exterior?**

Altitude of an acute triangle

Sol: Orthocentre lies in interior of the triangle.



2. **In any right angled triangle, the altitude perpendicular to the hypotenuse is inside the triangle; the other two altitudes are the legs of the triangle. Can you identify the orthocentre in this case?**

Altitude of a right triangle

Sol: Vertex containing 90°

3. **In any obtuse angled triangle, the altitude connected to the obtuse vertex is inside the triangle, and the two altitudes connected to the acute vertices are outside the triangle. Can you identify the orthocentre in this case?**

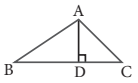
Altitude of an obtuse triangle

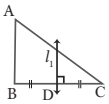
Sol: Orthocentre lies in the Exterior of the triangle.

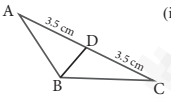
TRY THESE

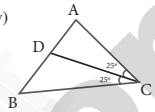
Page No. 177

Identify the type of segment required in each triangle:
(median, altitude, perpendicular bisector, angle bisector)

(i) 

(ii) 

(iii) 

(iv) 

Sol: (i) AD = **Altitude** (ii) l_1 = **Perpendicular bisector**

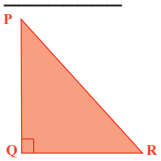
(iii) BD = **Median** (iv) CD = **Angular bisector**

Exercise 5.2

1. Fill in the blanks:

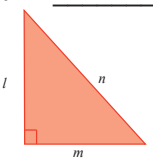
(i) If in a Δ PQR, $PR^2 = PQ^2 + QR^2$, then the right angle of ΔPQR is at the vertex _____ [*Ans:* Q]

Hint.



(ii) If '*l* ' and '*m*' are the legs and '*n*' is the hypotenuse of a right angled triangle then, l^2 = _____ [*Ans:* $n^2 - m^2$]

Hint.



(iii) If the sides of a triangle are in the ratio 5:12:13 then, it is _____

[*Ans:* a right angled triangle.]

Hint.

$13^2 = 169$

$5^2 = 25$

$12^2 = 144$

$169 = 25 + 144$

$\therefore 13^2 = 5^2 + 12^2$

(iv) The medians of a triangle cross each other at _____. [Ans: Centroid]

(v) The centroid of a triangle divides each medians in the ratio _____. [Ans: 2:1]

2. Say True or False.

(i) 8, 15, 17 is a Pythagorean triplet. [*Ans:* True]

Hint.

$17^2 = 289$

$15^2 = 225$

$8^2 = 64$

$64 + 225 = 289 \Rightarrow 17^2 = 15^2 + 8^2$

6 STATISTICS

POINTS TO REMEMBER

- Data is a collection of facts such as numbers, words, measurements and observations.
- A frequency distribution is the arrangement of the given data in the form of the table showing frequency with which each variable occurs.
- In the class-intervals, if the upper limit and lower limit are included in that class interval then it is called inclusive series.
- In the class intervals, if the upper limit of one class interval is the lower limit of the next class interval then it is called exclusive series.
- A pie chart is a circular graph which shows the total value with its components.
- A histogram is a graph of a continuous frequency distribution.
- A frequency polygon is a line graph for the graphical representation of the frequency distribution.

TRY THESE

Page No. 212

1. Arrange the given data in ascending and descending order:

9,34,4,13,42,10,25,7,31,4,40

Sol. Ascending order : 4, 4, 7, 9, 10, 13, 25, 31, 34, 40, 42.

Descending order : 42, 40, 34, 31, 25, 13, 10, 9, 7, 4, 4

2. Find the range of the given data : 53, 42, 61, 9, 39, 63, 14, 20, 06, 26, 31, 4, 57

Sol. Ascending order of the given data :

4, 6, 9, 14, 20, 26, 31, 39, 42, 53, 57, 61, 63

Here largest value = 63

Smallest value = 4

∴ Range = Largest value – smallest value

= 63 – 4 = 59

TRY THESE

1. Prepare a frequency table for the data : 3, 4, 2, 4, 5, 6, 1, 3, 2, 1, 5, 3, 6, 2, 1, 3, 2, 4

Sol. Ascending order of the given data.

1, 1, 1, 2, 2, 2, 2, 3, 3, 3, 3, 4, 4, 4, 5, 5, 6, 6

The distribution table :

Data	Tally marks	Frequency
1	|||	3
2	||||	4
3	||||	4
4	|||	3
5	||	2
6	||	2
	Total	18

∴ Frequency Table :

Data	1	2	3	4	5	6
Frequency	3	4	4	3	2	2

2. Prepare a grouped frequency table for the data :
10, 9, 3, 29, 17, 34, 23, 20, 39, 42, 5, 12, 19, 47, 18, 19, 27, 7, 13, 40, 38, 24, 34, 15, 40

Sol.

Largest value = 47

Smallest value = 3

Range = Largest value – Smallest value

= 47 – 3 = 44

Suppose we take class size as 10, then number of class intervals possible

$$= \frac{\text{Range}}{\text{Class size}} = \frac{44}{10} = 4.4$$

$$\simeq 5$$

Class intervals	Tally marks	Frequency
1 – 10	|||\	5
10 – 20	|||\ |||	8
20 – 30	||||	4
30 – 40	|||\ |	6
40 – 50	||	2
Total		25

Exercise 6.1

1. Fill in the blanks

(i) Data has already been collected by some other person is _____ data. **[Ans:** Secondary**]**

(ii) The upper limit of the class interval (25-35) is _____. **[Ans:** 35**]**

(iii) The range of the data 200, 15, 20, 103, 3, 196, is _____. **[Ans:** 197**]**

(iv) If a class size is 10 and range is 80 then the number of classes are _____. **[Ans:** 8**]**

(v) Pie chart is a _____ graph. **[Ans:** circular**]**

2. Say True or False

(i) Inclusive series is a continuous series. **[Ans:** False**]**

(ii) Comparison of parts of a whole may be done by a pie chart. **[Ans:** True**]**

(iii) Media and business people use pie charts. **[Ans:** True**]**

(iv) A pie diagram is a circle broken down into component sectors. **[Ans:** True**]**

3. Represent the following data in ungrouped frequency table which gives the number of children in 25 families.

1, 3, 0, 2, 5, 2, 3, 4, 1, 0, 5, 4, 3, 1, 3, 2, 5, 2, 1, 1, 2, 6, 2, 1, 4

Sol. The data given is raw data.

Ascending order : 0,1,2,3,4,5,6

Number of children	Tally marks	Frequency
0	||	2
1	𝍸 |	6
2	𝍸 |	6
3	|||	4
4	|||	3
5	|||	3
6	|	1
Total		**25**

∴ Tabulating in frequency distribution table we get

Number of children in family	0	1	2	3	4	5	6
Frequency	2	6	6	4	3	3	1

4. Form a continuous frequency distribution table for the marks obtained by 30 students in a X std public examination.

328, 470, 405, 375, 298, 326, 276, 362, 410, 255, 391, 370, 455, 229, 300, 183, 283, 366, 400, 495, 215, 157, 374, 306, 280, 409, 321, 269, 398, 200.

Sol.

Maximum mark obtained = 495

Minimum marks obtained = 157

Range = Maximum value – Minimum value

Range = 495 – 157

= 338

If we take the class size as 50 then the number of class intervals possible

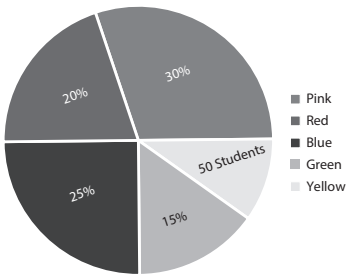
$$= \frac{\text{Range}}{\text{Class size}}$$

$$= \frac{338}{50} = 6.76$$

$$\simeq 7$$

Class Intervals	Tally Marks	Frequency
150 – 200	||	2
200 – 250	|||	3
250 – 300	|||| |	6
300 – 350	||||	5
350 – 400	|||| ||	7
400 – 450	||||	4
450 – 500	|||	3
Total		**30**

5. A paint company asked a group of students about their favourite colours and made a pie chart of their findings. Use the information to answer the following questions.



(i) What percentage of the students like red colour?

(ii) How many students liked green colour?

(iii) What fraction of the students liked blue?

(iv) How many students did not like red colour?

(v) How many students liked pink or blue?

(vi) How many students were asked about their favourite colours?

Sol.

Total percentage of students = 100 %

$\therefore$ 50 students = 100 % – (30% + 20% + 25% + 15%)

= 100 % – 90%

50 students = 10%

10% of total students = 50

$\therefore \frac{10}{100}$ (Total students) = 50

Total students = $\frac{50 \times 100}{10} = 500.$

Total students = 500.

i) 20% of the students like red colour.

ii) 15% of the students liked green colour.

$\frac{15}{100} \times 500$ = 75 students liked green colour.

Additional Questions and Answers

1. The following information shows the number of students opting different subjects in a college.

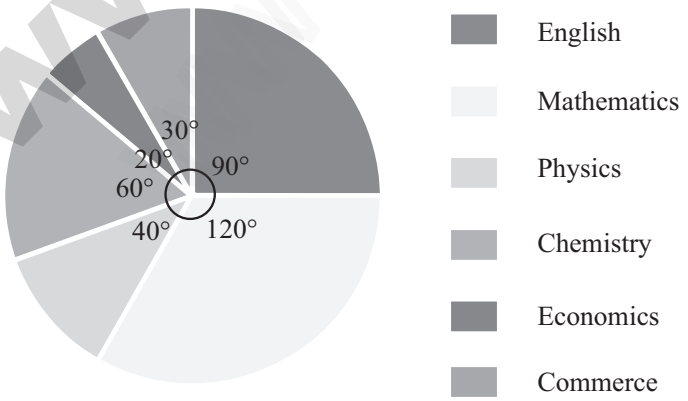
Subject	English	Maths	Physics	Chemistry	Economics	Commerce
No.of students	45	60	20	30	10	15

Draw a pie-chart to represent the information.

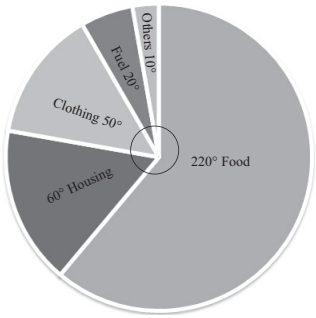
Sol.

Subject	No. of students	Central angle
English	45	$\frac{45}{180}\times 360^\circ = 90^\circ$
Mathematics	60	$\frac{60}{180}\times 360^\circ = 120^\circ$
Physics	20	$\frac{20}{180}\times 360^\circ = 40^\circ$
Chemistry	30	$\frac{30}{180}\times 360^\circ = 60^\circ$
Economics	10	$\frac{10}{180}\times 360^\circ = 20^\circ$
Commerce	15	$\frac{15}{180}\times 360^\circ = 30^\circ$
Total	**180**	**360°**

Students opting different subjects.



2. The pie chart represents the expenditures of a family on different items. Find the percentage expenditures on different items by reading the pie-chart.



Sol. Percentage value of the component = $\frac{\text{Central angle of the component}}{360^\circ} \times 100$

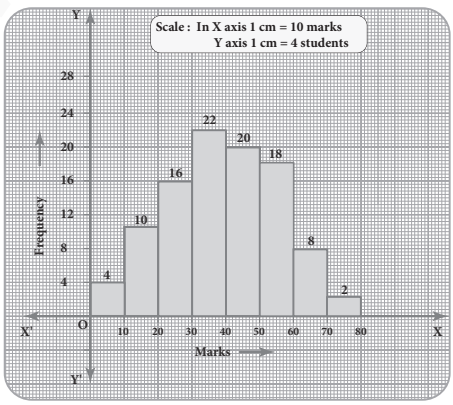
∴ Percentage expenditures on various items are given as :

Items	Central angles	Percentage expenditure
Food	220°	$\frac{220^\circ}{360^\circ} \times 100\% = 61\%$
Housing	60°	$\frac{60^\circ}{360^\circ} \times 100\% = 16.7\%$
Clothing	50°	$\frac{50^\circ}{360^\circ} \times 100\% = 13.9\%$
Fuel	20°	$\frac{20^\circ}{360^\circ} \times 100\% = 5.6\%$
Others	10°	$\frac{10^\circ}{360^\circ} \times 100\% = 2.8\%$

3. The following table gives the marks of 100 students Represent the marks in the form of a histogram.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	10	16	22	20	18	8	2

Sol. We take marks on X axis and frequency on Y axis.



Unit Test

Time: 1 Hour **Max Marks : 25**

I. Fill in the blanks. $5 \times 1 = 5$

1. Data has already been collected by some other person is _____ data.
2. The area of the rectangles are proportional to the _____ given.
3. The number of times an observation occurs in the given data is called _____.
4. Pie chart is a _____ graph.
5. If a class size is 10 and range is 80 then the numbers of classes are _____.

II. Answer all the questions. $4 \times 5 = 20$

6. Draw a pie chart for the following information.

Ocean	Pacific	Atlantic	Indian	Arctic	Antarctic
Water	46%	24%	20%	4%	6%

7. Form a continuous frequency distribution table for the marks obtained by 30 students in a X std public examination.
328, 470, 405, 375, 298, 326, 276, 362, 410, 255, 391, 370, 455, 229, 300, 183, 283, 366, 400, 495, 215, 157, 374, 306, 280, 409, 321, 269, 398, 200.

8. Draw a histogram for the following data.

Class interval	0-10	10-20	20-30	30-40	40-50	50-60
No. of students	5	15	23	20	10	7

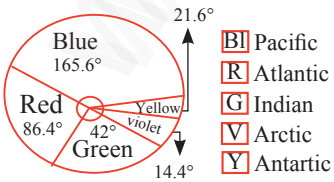
9. The data on modes of transport used by the students to come to school are given below. Draw a pie chart for the data.

Mode of Transport	Bus	Cycle	Walking	Scooter	Car
Percentage of students	40%	30%	15%	10%	5%

10. Draw a histogram for the following data.

Mid value (x)	15	25	35	45	55	65	75
Frequency (f)	12	24	30	18	26	10	8

Answers

1. Secondary 2. frequency 3. frequency 4. circular
5. 8
6. 

7. Refer Sura's Guide Exercise No. 6.1, Q.No. 4
8. Refer Sura's Guide Exercise No. 6.2, Q.No. 4
9. Refer Sura's Guide Exercise No. 6.3, Q.No. 2
10. Refer Sura's Guide Exercise No. 6.3, Challenging problem Q.No. 7

7 INFORMATION PROCESSING

POINTS TO REMEMBER

- Principles of Counting:
  - **(i)** **Addition principle:** If there are two selections such that they can be done independently in m ways and n ways respectively, then either of the two selections can be done in (m + n) ways.
  - **(ii)** **Multiplication principle:** If a selection can be performed in *m* ways, following which another selection can be performed in *n* ways, and both the selections are dependent on each other then, the two selections together can be performed in exactly *(m × n)* different ways.
- Fibonacci Numbers:

Let us tabulate the Fibonacci sequence and find a rule.

Term (n)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	...
F (n)	1	1	2	3	5	8	13	21	34	55	89	144	233	377	610	...

We observe that the **3rd term** of the Fibonacci sequence is the sum of **2nd term** and the **1st term**.

F(1)	F(2)	F(3)	F(4)	F(5)	F(6)	F(7)	...
1	1	2	3	5	8	13	...

F(3) = F(2) + F(1)

That is, **F(3) = F(2) + F(1)** and so we can extend and write the rule is **F(n)= F(n–1) + F(n–2)**

- Methods to find HCF (Highest Common Factor):
- Repeated Division Method:

STEP 1: Divide the larger number by the smaller number.

STEP 2: The remainder from Step 1 becomes the new divisor, and divisor of Step 1 becomes the new dividend.

STEP 3: Repeat this division process till remainder becomes zero. The divisor of the last division (when remainder is zero) is the HCF.

- Repeated Subtraction Method:

STEP 1: Check whether m = n

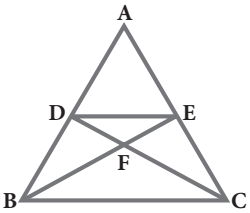
STEP 2: m > n perform m – n repeat the process till m = n or m < n perform n – m repeat the process till m = n

STEP 3: When m and n values are equal then that equal value will be the HCF (m, n).

- Cryptology
  - **(i)** **Plain text:** The original message is called plain text.
  - **(ii)** **Cipher text or Cipher number:** The encrypted output (converted message into code) is called Cipher text or Cipher number.
  - **(iii)** **Encryption and Decryption:** The process of converting the plain text to the Cipher text is called encryption and the vice versa is called decryption.

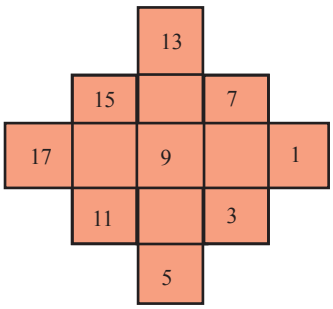
RECAP

1. Find the number of all possible triangles that can be formed from the triangle given below.



Ans: Single Triangles ⇒ 5
Combination of 2 ⇒ 4
Combination of 3 ⇒ 2
Big triangle ⇒ 1
Total 12

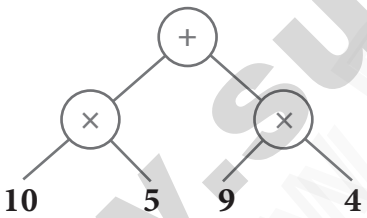
2. Use the numbers given in the figure to form a 3 x 3 magic square.



Ans:

15	7	5
1	17	9
11	3	13

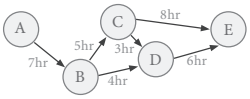
3. Convert the tree diagram into a numeric expression



Ans: (10 × 5) + (9× 4)

4. (i) Find the total time taken by the bus to reach from A to E via B , C and D.
(ii) Find which is the shortest route from A to E.

Sol. **(i)** Route ⇒ A → B → C → D → E



Time taken ⇒ (7 + 5 + 3 + 6) hrs = 21 hrs

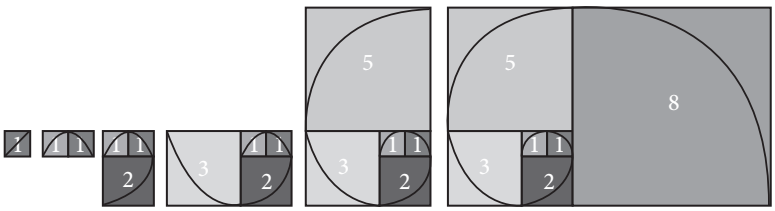
(ii)

Available routes	**Time taken**
(a) A → B → C → D → E	7 + 5 + 3 + 6 = 21 hrs
(b) A → B → D → E	7 + 4 + 6 = 17 hrs
(c) A → B → C → E	7 + 5 + 8 = 20 hrs

Shortest route ⇒ A → B → D → E

5. Connect the Fibonacci squares through diagonals by curve from corner to corner across each square to draw a Golden Spiral.

Sol.



FIBONACCI SQUARES

6. When you plan to buy a shirt, one shop offers a discount of ₹200 on MRP ₹1000 and another shop offers 15% discount on the same MRP. Where would you buy?

Sol.

Price in Ist shop = ₹1000 – ₹200 = ₹800

Price in IInd shop = $\frac{15}{100} \times 1000 = ₹150 \Rightarrow 1000 - 150 = ₹850$

∴ Shop 1 has low price compared to shop 2.

7. Amazing park is offers a package deal of 5 entrance passes for ₹130. If one entrance pass normally costs ₹30, how much will you save by taking advantage of this special deal?

Sol.

Cost of one entrance pass = ₹ 30

∴ Cost of 5 entrance passes = 5 × 30

= ₹ 150

But special deal price = ₹ 130

Amount of saving = 150 – 130 = ₹ 20

ACTIVITY

Page No. 237

1. Determine the number of two digit numbers that can be formed using the digits 1, 3 and 5 with repetition of digits allowed.

The activity consists of two parts

(i) Choose a one's digit. (ii) Choose a ten's digit.

Complete the table given beside

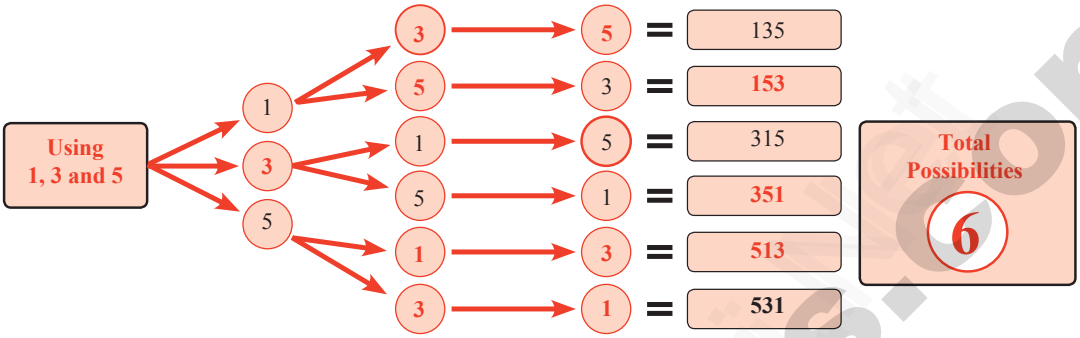
Sol.

		One's Digit		
		1	3	5
Ten's Digit	1	11	13	15
	3	31	33	35
	5	51	53	55

2. **Find the three digit numbers that can be formed using the digits 1, 3 and 5 without repetition of digits.**

Complete the tree diagram given below to the numbers

Sol.

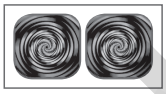


ACTIVITY

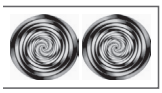
Page No. 242

Choose the correct card to complete the perfect SET. One is done for you.

1. 

(i)  (ii)  (iii)  [*Ans:* **(iii)** ]

2. 

(i)  (ii) 

(iii)  [*Ans:* **(ii)** ]

3. 

(i)  (ii) 

(iii)  [*Ans:* **(ii)** ]

Objective Type Questions

11. In a class there are 26 boys and 15 girls. The teacher wants to select a boy or a girl to represent a quiz competition. In how many ways can the teacher make this selection?

(A) 41 (B) 26 (C) 15 (D) 390 **[Ans: (A) 41]**

Hint. Number of possible ways = 26 boys or 15 girls
= 26+15 = 41

12. How many outcomes can you get when you toss three coins once?

(A) 6 (B) 8 (C) 3 (D) 2 **[Ans: (B) 8]**

Hint. Number of outcomes = $2^n = 2^3 = 8$ ways

13. In how many ways can you answer 3 multiple choice questions, with the choices A,B,C and D ?

(A) 4 (B) 3 (C) 12 (D) 64

[Ans: (D) 64]

Hint. Number of possible ways = $4^3 = 64$ ways

14. How many 2 digit numbers contain the number 7 ?

(A) 10 (B) 18 (C) 19 (D) 20

[Ans: (B) 18]

Hint. Required numbers are 7, 17, 27, 37, 47, 57, 67, 71, 72, 73, 74, 75, 76, 77, 78, 79, 87, 97

Activity

Page No. 250

Using the given Table I, find the pattern, answer the following questions and colour the values in the given Table II. One is done for you.

Table I

Term (n)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	...
F(n)	1	1	2	3	5	8	13	21	34	55	89	144	233	377	610	

Sol. 1. Where are the even Fibonacci Numbers?
Colour both the term n and where F(n) is even in **yellow**.
Do you find any pattern?
Every Third Fibonacci number is a multiple of 2(even).

2. Where there are Fibonacci numbers which are multiple of 3 ?
Colour both the term n and where F(n) is multiple of 3 in **red.**
Write down the pattern you find
Every **4th** Fibonacci number is **a multiple of 3**.

3. What about the multiple of 5?
Colour both the term n and where F(n) is multiple of 5 in **blue.**
Write down the pattern you find.
Every **5th Fibonacci number is multiple of 5.**

(iii) 6765 and 610

Sol.

$$610\overline{)6765}(11$$
$$6710$$
$$55\overline{)610}(11$$
$$605$$
$$5\overline{)55}(11$$
$$55$$
$$0$$

5 is the last divisor & hence the HCF

$\therefore$ **HCF = 5**

(iv) 184, 230 and 276

Sol. First let us take 184 & 230

$$184\overline{)230}(1$$
$$184$$
$$46\overline{)184}(4$$
$$184$$
$$0$$

Last divisor is the HCF

$\therefore$ **46 is the HCF of 184, and 230.**

Now the HCF of the first two numbers is the divisor for the third number.

$$46\overline{)276}(6$$
$$276$$
$$0$$

Last divisor it is the HCF

$\therefore$ **Ans:** HCF of 184, 230 & 276 is 46

2. Using repeated subtraction method, find the HCF of the following:
(i) 42 and 70 (ii) 36 and 80 (iii) 280 and 420 (iv) 1014 and 654

(i) 42 and 70

Sol.

42 and 70	$m = 70$,	$n = 42$	
$70 - 42 = 28$,	Now $m = 42$,	$n = 28$	
$42 - 28 = 14$,	Now $m = 28$,	$n = 14$	
$28 - 14 = 14$,	Now $m = 14$,	$n = 14$;	we stop here as $m = n$

$\therefore$ HCF of 42 & 70 is 14

(ii) 36 and 80

Sol.

36 and 80	$m = 80$,	$n = 36$
$80 - 36 = 44$,	Now $n = 44$,	$m = 36$

Since $n > m$, we should do $n - m$

$44 - 36 = 8$,	Now $n = 8$,	$m = 36$
$36 - 8 = 28$	Similarly, processing, proceeding, we do repeated subtraction till $m = n$	
$28 - 8 = 20$		
$20 - 8 = 12$		
$12 - 8 = 4$		
$8 - 4 = 4$	Now $m = n = 4$	$\therefore$ HCF is 4

Exercise 7.3

1. Fill in the blanks (Use Atbash Cipher that is given in code 3)

Hint. For this question, we need to use Atbash cipher. For Atbash cipher, first we write the alphabets from A to Z and then in reverse from Z to A below that.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Z Y X W V U T S R Q P O N M L K J I H G F E D C B A

(i) **G Z N R O = _____** **[*Ans:* TAMIL]**

Hint. Now to solve, we look up the corresponding letter from the table to replace in code to get the actual word.

So, for G Z N R O, from table,

for G, it is T
for Z, It is A
for N, it is M
for R, it is I
for O, it is L

So , the actual word is **TAMIL**

(ii) **V M T O R H S = _____** **[*Ans:* ENGLISH]**

Hint. V M T O R H S

To solve, we look up the corresponding letter from table to replace in code to get the actual word.

For V, it is E
for M, it is N
for T, it is G
for O, it is L
for R, it is I,
for H, it is S
for S, it is H
Therefore we get E N G L I S H = **ENGLISH**

(iii) **N Z G S V N Z G R X H = _____** **[*Ans:* MATHEMATICS]**

Hint. Similarly as above for

N Z G S V N Z G R X H
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
M A T H E M A T I C S = MATHEMATICS

(iv) **H X R V M X V = _____** **[*Ans:* SCIENCE]**

Hint. For H X R V M X V
↓ ↓ ↓ ↓ ↓ ↓ ↓
S C I E N C E

(v) **H L X R Z O H X R V M X V = _____** **[*Ans:* SOCIAL SCIENCE]**

Hint. For H L X R Z O H X R V M X V
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
S O C I A L S C I E N C E

2. Match the following (a = 00…… Z= 25).

(i) mathematics - (a) 18 20 01 19 17 00 02 19 08 14 13
(ii) addition - (b) 03 08 21 08 18 08 14 13
(iii) subtraction - (c) 12 00 19 07 04 12 0019 08 02 18
(iv) multiplication - (d) 00 03 03 08 19 08 14 13
(v) division - (e) 12 20 11 19 08 15 11 15 02 00 19 08 14 13

[*Ans:* **i - c, ii - d, iii - a, iv - e, v - b**]

Sol. Given that the code is

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Hint. **(i) Mathematics is**

m	a	t	h	e	m	a	t	i	c	s
12	00	19	07	04	12	00	19	08	02	18

So matching option is c

(ii) addition is

a	d	d	i	t	i	o	n
00	03	03	08	19	08	14	13

Matching option is d

(iii) Subtraction is

s	u	b	t	r	a	c	t	i	o	n
18	20	01	19	17	00	02	19	08	14	13

Matching option is a

(iv) multiplication is

m	u	l	t	i	p	l	i	c	a	t	i	o	n
12	20	11	19	08	15	11	08	02	00	19	08	14	13

Matching option is e

however instead of 25, it should be 08

(v) division is

d	i	v	i	s	i	o	n
03	08	21	08	18	08	14	13

Matching option is b

3. Frame Additive cipher table (key = 4).

Sol.

Step 1 : write all alphabets

Step 2 : Assign numbers to each alphabet starting from 00 till 25.

Step 3 : add key value (here it is 4) to the numbers assigned in step 2 to form cipher table

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Cipher	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	00	01	02	03

4. **A message like "Good Morning" written in reverse would instead be "Doog Gninrom". In the same way decode the sentence given below:**

"Ot dnatsrednu taht scitamehtam nac eb decneirepxe erehwreve ni erutan dna laer efil."

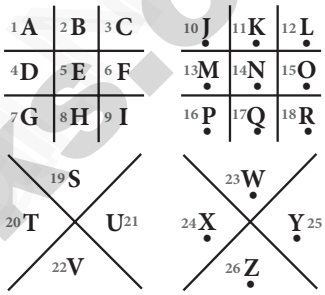
Sol. Given that good morning written in reverse is doog gninrom.

We have to decode the below by reversing, so,

Ot dnatsrednu taht scitamehtam nac eb decneirepxe erehwreve ni erutan dna laer efil.

Ans: To understand that mathematics can be experienced everywhere in nature and real life.

5. **Decode the given Pigpen Cipher text and compare your answer to get the Activity 3 result.**



I. The room number in which the treasure took place :

II. Place of the treasure :

III. The name of the treasure :

Sol. (i) The room in which the treasure took place = 28

(ii) The place of treasure = CHAIR

(iii) Identity of treasure = GIFT VOUCHER.

6. **Praveen recently got the registration number for his new two-wheeler. Here, the number is given in the form of mirror-image. Encode the image and find the correct registration number of praveen's two-wheeler.**

(a) 

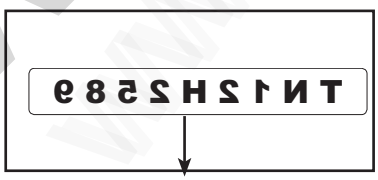
(b) 

(c) 

(d) 

Sol. The mirror image is 

When we place an imaginary mirror & visualize the image seen in the mirror, we will get the below.



Mirror image

∴ The answer is Option c

OBJECTIVE TYPE QUESTIONS

7. In questions (i) and (ii), there are four groups of letters in each set. Three of these sets are alike in some way while one is different. Find the one which is different.

(i). (A) C R D T (B) A P B Q (C) E U F V (D) G W H X

(ii). (A)H K N Q (B) I L O R (C) J M P S (D) A D G J

Hint. A. The four groups of letters are [**Ans:** **(i).(A) C R D T (ii). (D) A D G J**]

CRDT APBQ EUFV GWHX

The above can be written as

$C_R D_T$ $A_P B_Q$ $E_U F_V$ $G_W H_X$

We find that when we take 1st & 3rd letter & 2nd & 4th letter as 2 pairs, the 3rd letter is the next letter alphabetically to the 1st letter.

Similarly the 4th letter is alphabetically the next letter of the 2nd letter.

i.e CD, AB, EF, GH & PQ, UV, WX

Only in CRDT, we have T instead of 'S'

So, Ans: **in CRDT ⇒ Option (A)**

B. The four groups of letters are

HKNQ ILOR JMPS ADGI

If we notice, we find that 2 letters are missing in the sequence. ie.

$H_{IJ}K_{LM}N_{OP}Q$ $I_{JK}L_{MN}O_{PQ}R$

$J_{KL}M_{NO}P_{QR}S$ $A_{BC}D_{EF}G_{H}I$

We find that only in ADGI, the difference is only one letter between G & I.

Hence it is the odd one out.

8. A group of letters are given. A numerical code has been given to each letter. These letters have to be unscrambled into a meaningful word. Find out the code for the word so formed from the 4 answers given.

L I N C P E

1 2 3 4 5 6

(A) 2 3 4 1 5 6 (B) 5 6 3 4 2 1 (C) 6 1 3 5 2 4 (D) 4 2 1 3 5 6

Hint. Given code is [**Ans:** **(B) 5 6 3 4 2 1**]

L I N C P E

1 2 3 4 5 6

Option (a) is 234156. When we substitute number for each letter from code, we get,

2 3 4 1 5 6

↓ ↓ ↓ ↓ ↓ ↓

I N C L P E

Option (b) is 563421, similarly, we get

5 6 3 4 2 1

↓ ↓ ↓ ↓ ↓ ↓

P E N C I L = PENCIL

Option (c) is 6 1 3 5 2 4

↓ ↓ ↓ ↓ ↓ ↓

E L N P I C

8th STD

COMMON ANNUAL EXAMINATION - 2022

MATHEMATICS (with answers)

Reg. No.

TIME ALLOWED : 2.30 Hours] [MAX. MARKS : 100

PART - A

I. Choose the correct answer $10 \times 1 = 10$

1. $\frac{-5}{4}$ is a rational number which lies between_____

(A) 0 and $\frac{-5}{4}$ (B) –1 and 0

(C) –1 and – 2 (D) –4 and –5

2. The Square of 43 ends with the digit _____

(A) 9 (B) 6 (C) 4 (D) 3

3. The radius of a circle of diameter 24 cm is _____

(A) 10 cm (B) 12 cm

(C) 6 cm (D) 18 cm

4. If $x^2 - y^2 = 16$ and $(x + y) = 8$ then $(x - y)$ is _____

(A) 8 (B) 3 (C) 2 (D) 1

5. If the area of square is $36x^4y^2$ then, it side is _____

(A) $6x^4y^2$ (B) $8x^2y^2$

(C) $6x^2y$ (D) $-6x^2y$

6. The single discount in % which is equivalent to two successive discount of 20% and 25% is _____

(A) 40% (B) 45%

(C) 5% (D) 22.5%

7. Two similar triangles will always have _____ angles.

(A) acute (B) obtuse

(C) right (D) matching

8. The hypotenuse of a right angled triangle of sides 12 cm and 16 cm is _____

(A) 28 cm (B) 20 cm

(C) 24 cm (D) 21 cm

9. The difference between the largest value and the smallest value of the given data is _____

(A) range (B) frequency

(C) variable (D) none of these

10. Common Prime factors of 30 and 250 are

(A) 2×5 (B) 3×5

(C) $2 \times 3 \times 5$ (D) 5×5

II. Fill in the blanks **$5 \times 1 = 5$**

11. The multiplicative inverse of –1 is _____

12. The longest chord of a circle is _____

13. Loss or gain percentage is always calculated on the _____

14. The centroid of a triangle divides each medians in the ratio _____

15. The upper limit of the class interval (25 - 35) is _____

III. Say True or False. **$5 \times 1 = 5$**

16. The average of two rational numbers lies between them.

17. The standard form of 2×10^{-4} is 0.0002.

18. $7x^{-2} + 5x - 6$ is a polynomial.

19. 8, 15, 17 is pythagorean triplet.

20. Inclusive series is a continuous series.

IV. Match the following **5 × 1 = 5**

21. a^0 - $a^2 - b^2$

22. Circumference of a semicircle - Origin

23. $(a + b)(a - b)$ - I

24. (0, 0) - Inverse Proportion

25. Speed - Time - $(\pi + 2)r$

PART - B

V. Answer any 10 of the following (Q. No. 40 is compulsory) **10 × 2 = 20**

26. Write the decimal form of the rational number $1\frac{2}{5}$.

27. Evaluate : $\frac{9}{132} \times \frac{-11}{3}$

28. Find the sum : $\frac{6}{5} + \left(\frac{-14}{15}\right)$

29. Find the square root of 17956.

30. Evaluate : $(2^{-5} \times 2^7) \div 2^{-2}$

31. A is thrice as fast as B. If B can do a piece of work in 24 days, then find the number of days they will take to complete the work together.

32. A circle of radius 70 cm is divided into 5 equal sectors. Find the area of each of the sectors.

33. Length of the arc = 48 m, r = 10 m find the area of the sector.

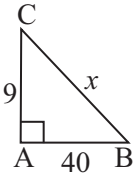
34. Expand : $5x(2y - 3)$.

35. Factorise : $x^2 + 8x + 15$.

36. Solve : $2x + 5 = 9$

37. Find the area of the trapezium whose measures are h = 6 cm, a = 7cm, b = 5 cm.

38. Find the unknown side of the given triangle.



39. Using repeated subtraction method, find the HCF of 280 and 420.

40. Find the cube root of 27000

(OR)

Represent the following data in ungrouped frequency table which gives the number of children in 25 families. 1, 3, 0, 2, 5, 2, 3, 4, 1, 0, 5, 4, 3, 1, 3, 2, 5, 2, 1, 1, 2, 6, 2, 1, 4.

PART - C

VI. Answer any 7 questions: (Question No. 50 is compulsory) **7 × 5 = 35**

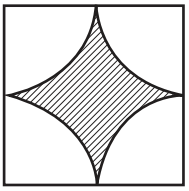
41. Write the following rational numbers in ascending and descending order :

$\frac{-3}{5}, \frac{7}{-10}, \frac{-15}{20}, \frac{14}{-30}, \frac{-8}{15}$

42. Evaluate : $\sqrt[3]{\frac{1728}{729}}$

43. The radius of a sector is 21 cm and its central angle is 120°. Find (i) the length of the arc. (ii) area of the sector. $\left(\pi = \frac{22}{7}\right)$

44. Find the area of the shaded part in the following figure. (π = 3.14)



10 cm

45. Using the identity find the value of $(103)^3$

46. The Price of a rain coat was slashed from ₹1060 to ₹901 by a shopkeeper in the rainy season to boost the sales. Find the rate of discount given by him.

47. A cement factory makes 7000 cement bags in 12 days with the help of 36 machines. How many bags can be made in 18 days using 24 machines?

48. A 20 feet ladder leans against a wall at height of 16 feet from the ground. How far is the base of the ladder from the wall?

49. Monthly expenditure of Kumaran's family is given below. Draw a suitable Pie chart.

Particulars	Food	Education	Rent	Transport	Miscelleneous
Expenses (in %)	50%	20%	15%	5%	10%

51. Solve for x : $\frac{2^{2x-1}}{2^{x+2}} = 4$

(OR)

The sum of three consecutive odd numbers is 75. Which is the largest among them?

VII. Answer the following questions $1 \times 10 = 10$

52. Construct a quadrilateral DEAR with DE = 6 cm, EA = 5 cm, AR = 5.5 cm, RD = 5.2 cm and DA = 10 cm. Also find its area.

(OR)

Construct a rectangle HAND with HA = 7 cm and AN = 4 cm. Also find its area.

VIII. Answer the following questions $1 \times 10 = 10$

53. Draw the graph of Y = 5x

(OR)

Draw a frequency polygon for the following data using histogram.

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Number of students	5	8	10	18	25	22	20	13	6	3

★ ★ ★

Answers

PART - A

I.

1. (C) –1 and – 2
2. (A) 9
3. (B) 12 cm
4. (C) 2
5. (C) $6x^2y$
6. (A) 40%
7. (D) matching
8. (B) 20 cm
9. (A) range
10. (A) 2 × 5

II.

11. –1
12. diameter
13. cost price
14. 2 : 1
15. 35

III.

16. True
17. True
18. False
19. True
20. False

IV.

21. a^0 - 1
22. Circumference of a semicircle - $(\pi + 2)r$
23. $(a + b)(a - b)$ - $a^2 - b^2$
24. (0, 0) - Origin
25. Speed - Time - Inverse Proportion

PART - B

V.

26. $1\frac{2}{5} = \frac{7}{5} = \frac{14}{10} = 1.4$

27. $\frac{\cancel{9}^{3}}{\cancel{132}_{44}} \times \frac{-\cancel{11}}{\cancel{3}} = \frac{-1}{4}$

28. $\frac{6}{5} + \left(\frac{-14}{15}\right) = \frac{(6 \times 3) + (-14)}{15} = \frac{18 + (-14)}{5} = \frac{4}{5}$