MATHEMATICIAN : BHASKARACHARYA-II

Birth : 1114 AD - Death : 1185 AD

Place of Birth : Bijjal Bid, Dist. - Bijapur (Karnataka)

- Bhaskaracharya was a very bright mathematician and astrologer.
- His father and teacher was Maheshwar.
- His daughter was named Lilawati.
- Bhaskaracharya was very hard working. He was never tired of hard work. For inventions, he forgot hunger, thirst and even sleep. He was very enthusiastic and truthful. His observation skills were exceptional. He neither felt defeated nor feared failures. He had the power of penance like any yogi. He had a high level skill for analysis.
- 'Lilawati' is a book on Arithmetic. It includes tables, number system, zero, sequence, area etc.
- Bhaskaracharya has done extensive analysis on zero.
- In his book on Algebra, Bhaskaracharya has analytically studied equation, quadratic equation etc.
- The Government of India has named its satellite 'Bhaskar-2' in his honour.
- His contribution towards the proof of the value of π (pie) and the law of Pythagoras is immense.
- Bhaskaracharya has given the units to measure the area of circle, base of the hemisphere and the volume of the sphere.

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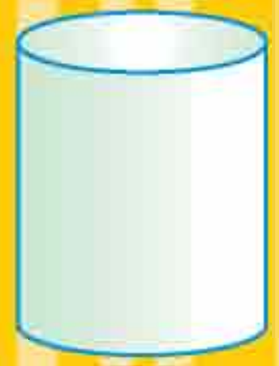
MATHEMATICS

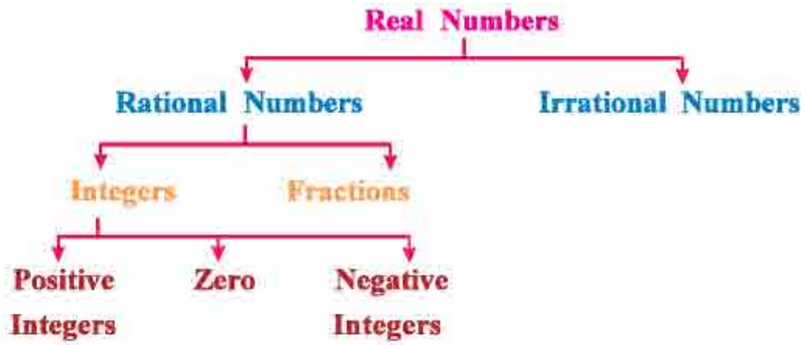
Standard 7

(Semester II)



Special Information

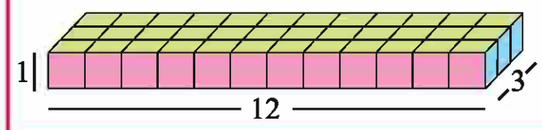
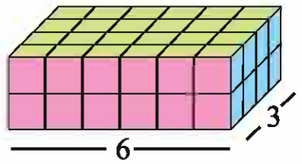
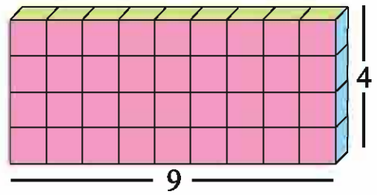
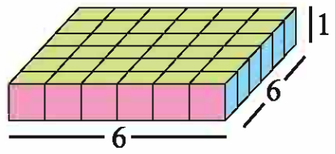
- The primary knowledge of the numbers begins with the natural numbers. We can represent these number as 1, 2, 3,... . By accepting these natural numbers, numbers are thought of. The structure of the mathematical analysis is based on the knowledge of the real numbers.



- **Set of Natural Numbers (N) :** Natural numbers 1, 2, 3
  N = {1, 2, 3,....}
- **Whole numbers (W) :** A set of whole numbers is made with Natural Numbers and Zero. It is denoted by W.
  W = {0, 1, 2, 3,.....}
- **Set of Integers (Z) :** Natural numbers, zero and negative integers unite to form a set of integers.
  Z = {...., –3, –2, –1, 0, 1, 2, 3,....}
- **Rational Numbers (Q) :** Positive and negative integers, zero, positive and negative fractions unite form a set of rational numbers.
  $Q = \{\frac{a}{b} \mid a, b \in Z, b \neq 0\}$
- **Set of Real Numbers (R) :** A set of real numbers is a set of rational and irrational numbers.
  Sets N, Z and Q are subsets of R.

Note : Here ∈ means 'belongs to'. More will be learnt about this in the further standards.

Take 36 cubes of same size. We can arrange these cubes in a variety of ways. Study the following table and fill in the blanks :

Cuboid	Length	Breadth	Height	$l \times b \times h$
	12	3	1	12 x 3 x 1 = 36
	.....	.....	.....	.....
	.....	.....	.....	.....
	.....	.....	.....	.....

You can see that, to make the above cuboids 36 cubes are used and the volume of each is 36 cubic units.

Take 16 cubes as above and find out in how many ways can they be arranged? Now arrange them. In the same way try to arrange 24 or 64 cubes. Will you be able to arrange them ?

ગુજરાત શૈક્ષણિક સંશોધન અને તાલીમ પરિષદ, ગાંધીનગરના પત્ર-ક્રમાંક
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A 'Teacher's book' has been prepared for teachers and parents (separately). Kindly use this.

MATHEMATICS

Standard 7

(Semester II)

PLEDGE

India is my country.
All Indians are my brothers and sisters.
I love my country and I am proud of its rich and varied heritage.
I shall always strive to be worthy of it.
I shall respect my parents, teachers and all my elders and treat everyone with courtesy.
I pledge my devotion to my country and its people.
My happiness lies in their well-being and prosperity.

Price : ₹ 29.00

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Preparation and Planning :

Dr T. S. Joshi — Haresh Chaudhari
Iqbal D. Vora — Chandresh Palia

Convener :

Dr Vijay Patel

Co-convener :

Dr Sanjay Shah — M. A. Shekh
Jagdish Patel — Rashmikant Patel
Jivan Ramani

Authors :

Prakash Prajapati — Dhirubhai Panchal
Hitesh Prajapati — Gaurangbhai Patel
Pratik Patel — Parimal Patel
Jignesh Shah — Suchit Prajapati
Sanjaybhai Patel — Dhruvkumar Desai
Diptiben Ghodasara — Sonuben Gohel
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Pankajgir Goswami — Chintankumar Shah
Pragnesh Upadhyay — Bharatkumar Prajapati
Radhaben Yadav — Suketukumar Yagnik
Nileshkumar Nathani — Ashok Parmar
Rajendrasinh Parmar — Ketan Patel

Translation :

Bhagyesh N. Thakkar

Reviewer :

R. S. Bisht — N. M. Jaloria
C. M. Darji — K. N. Sharma

Language Reviewer :

Omprakash Dave

Artist :

Jayant Pranami — Smitaben Rana
Kanjibhai Parmar — Gaurishankar Mehta
Jyoti Khatri — Manish Parekh

Title Design :

Dharmesh Chavada

Lay-out and Planning

Shri Haresh S. Limbachiya
(Dy. Director : Production)

PREFACE

The National Curriculum Framework (NCF) 2005 and the Right to Education Act (RTE) 2009 recommends connecting knowledge that is provided in school to the life outside the school. This principle marks a departure from the legacy of book is learning which continues to shape our education system and is creating removes a huge gap between the school, home and community.

The syllabi and textbook developed on the basis of above principle signify an attempt to implement it with a considerable change in the textbooks, teaching-learning methods, approaches etc. Such textbooks will provide the scope to the students to learn individually, in pair, in group and as a whole class and provide self-learning, improve the application and consolidation abilities of the children. In such a scenario, the teacher will be just an initiator, facilitator and guide and will create learner dominant classes.

During the process of designing and developing the textbooks, the core group personnel coordinators, writers and reviewers got a lot of inspiration and motivation from the Chief Secretary of Elementary Education.

Also, the guidance from IGNUS-erg and co-operation of UNICEF was easily and continuously available to the group during the entire process of developing the textbooks. After implementing the textbooks as a part of the pilot study, due efforts were done to make it faultless. Now, it is in the hands of the users and beneficiaries.

GCERT welcomes constructive and creative comments and suggestions which will be useful to undertake further revision and refinement.

M. T. Shah
Director
Gujarat Council of Educational Research and Training
Gandhinagar

H. K. Patel GAS
Director
Gujarat State Board of School Textbooks
Gandhinagar

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FUNDAMENTAL DUTIES

It shall be the duty of every citizen of India :

(a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;

(b) to cherish and follow the noble ideals which inspired our national struggle for freedom;

(c) to uphold and protect the sovereignty, unity and integrity of India;

(d) to defend the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;

(f) to value and preserve the rich heritage or our composite culture;

(g) to protect and improve the natural environment including forests, lakes, rivers and wild-life, and to have compassion for living creatures;

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(i) to safeguard public property and to abjure violence;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

INDEX

1 Power and Exponent

❖ Let us Remember :

(1) $3 \times 3 \times 3 \times 3$ is written in the exponential form as _____

(2) 5^3 is written in the repeated multiplication form as _____

(3) Write base and exponent of 4^7. _____

(4) Write 2^4 in words _____

(5) What is the value of 3^2 ? _____

(6) What is the value of 1^{15} ? _____

(7) Find the value of $2^3 \times 3^2$. _____

❖ Rules for positive integral exponents :

(1) Multiplication of exponential form :

Multiplication of exponential form	Repeated multiplication	Result
$2^2 \times 2^3$	$\underline{2 \times 2} \times \underline{2 \times 2 \times 2}$	$2^{2+3} = 2^5$
$x^2 \times x^4$	$\underline{x \times x} \times \underline{x \times x \times x \times x}$	$x^{2+4} = x^6$
$(-a)^3 \times (-a)^4$	$\underline{(-a) \times (-a) \times (-a)} \times \underline{(-a) \times (-a) \times (-a) \times (-a)}$	$(-a)^{3+4} = (-a)^7$

On the basis of the above table, we can say that, for multiplication of exponent form if bases are same then we have to add exponents.

It can be written in the form of a rule as under :

Rule : For positive integers m and n and for integer or fraction number a,

$$a^m \times a^n = a^{m+n}$$

Example 1 : Simplify :

(1) $2^5 \times 2^4$

$= 2^{5+4}$

$= 2^9$

(2) $x^6 \times x^4$

$= x^{6+4}$

$= x^{10}$

(3) $\left(-\frac{1}{2}\right)^2 \times \left(-\frac{1}{2}\right)^4 \times \left(-\frac{1}{2}\right)^3$

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

$= \left(-\frac{1}{2}\right)^9$

(2) Division of exponential form :

Division of exponential form	Repeated multiplication	Result
$3^6 \div 3^4$	$\frac{3^6}{3^4} = \frac{3\times3\times3\times3\times3\times3}{3\times3\times3\times3} = 3\times3$	$3^{6-4} = 3^2$
$x^3 \div x^5$ (Where $x \neq 0$)	$\frac{x^3}{x^5} = \frac{x \times x \times x}{x \times x \times x \times x \times x} = \frac{1}{x \times x}$	$\frac{1}{x^{5-3}} = \frac{1}{x^2}$
$\left(\frac{1}{2}\right)^3 \div \left(\frac{1}{2}\right)^3$	$\frac{\left(\frac{1}{2}\right)^3}{\left(\frac{1}{2}\right)^3} = \frac{\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)}{\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)\times\left(\frac{1}{2}\right)} = 1$	1

On the basis of the above table we can say that, for division of exponential form if bases are same then we have to subtract exponents. But if the exponent in the numerator is bigger than the exponent of the denominator, the subtraction of the exponents should be done in the numerator and vice versa. It can be written in the form of a rule as under.

Rule : For positive integers m and n and for non zero integer or fraction number a

(1) If $m > n$, then $a^m \div a^n = a^{m-n}$

(2) If $m < n$, then $a^m \div a^n = \frac{1}{a^{n-m}}$

(3) If $m = n$, then $a^m \div a^n = 1$

Example 2 : Simplify :

(1) $7^8 \div 7^5 = \frac{7^8}{7^5} = 7^{8-5} = 7^3$

(2) $m^2 \div m^4 = \frac{m^2}{m^4} = \frac{1}{m^{4-2}} = \frac{1}{m^2}$

(3) $(-3)^4 \div (-3)^4 = \frac{(3)^4}{(-3)^4} = 1$

Example 3 : Evaluate / Simplify :

(1) $a^{16} \times a^4 \div a^{18}$ $(a \neq 0)$

$= a^{16+4} \div a^{18}$

$= a^{20} \div a^{18}$

$= \frac{a^{20}}{a^{18}}$

$= a^{20-18}$

$= a^2$

(2) $(-6)^8 \div (-6)^2 \div (-6)^3$

$= \frac{(-6)^8}{(-6)^2} \div (-6)^3$

$= (-6)^{8-2} \div (-6)^3$

$= (-6)^6 \div (-6)^3$

$= \frac{(-6)^6}{(-6)^3}$

$= (-6)^{6-3}$

$= (-6)^3$

$= (-216)$

Example 4 : Simplify :

$(a^{10} \div a^3) \times a^8$

$= \frac{a^{10}}{a^3} \times a^8$

$= a^{10-3} \times a^8$

$= a^7 \times a^8$

$= a^{7+8}$

$= a^{15}$

Practice 1

1. Fill in the blanks :

(1) $3^2 \times 3^4 \times 3^3$ = _____

(2) $\left(\frac{3}{5}\right)^2 \times \left(\frac{3}{5}\right)^3$ = _____

(3) $9^2 \div 9^{18}$ = _____

(4) $(-4)^{10} \div (-4)^6$ = _____

(5) $(5^5 \times 5^5) \div 5^8$ = _____

2. Evaluate :

(1) $2^5 \times 2^8 \div 2^6$

(2) $(-3)^2 \div (-3)^4$

(3) $(-2)^6 \div (-2)^{12} \times (-2)^3$

(4) $8^6 \div 8^{10} \times 8^3$

(5) $5 \times 2^6 \div 2^4$

3. Simplify :

(1) $x^2 \times x^3 \times x^4 \div x^6$

(2) $(y^{12} \div y^8) \div y^3$

(3) $(x^2 \times x^6) \div (x^5 \times x)$

(4) $y^{12} \div (y^6 \times y^3 \times y)$

(5) $x^{10} \div (x^2 \times x^3 \div x)$

(6) $(y^6 \div y^4) \times (y^2 \times y^3)$

4. If $x = 2$, then find the value of the following :

(1) $x \times x^2 \times x^3$

(2) $x^8 \div x^7 \times x^2$

5. If $x = (-3)$, then find the value of the following :

(1) $x^{15} \div (x^{17} \div x^6)$ (2) $(x^6 \times x^4) \div (x^2 \times x^3)$

*

(3) Power of a power :

Power of a power	Repeated multiplication	Result
$(5^3)^3$	$5^3 \times 5^3 \times 5^3 = 5^{3+3+3}$	$5^{3\times3} = 5^9$
$(a^2)^5$	$a^2 \times a^2 \times a^2 \times a^2 \times a^2 = a^{2+2+2+2+2}$	$a^{2\times5} = a^{10}$
$[(-m)^3]^4$	$(-m)^3 \times (-m)^3 \times (-m)^3 \times (-m)^3 = (-m)^{3+3+3+3}$	$(-m)^{3\times4} = (-m)^{12} = m^{12}$
$\left[\left(\frac{2}{3}\right)^2\right]^3$	$\left(\frac{2}{3}\right)^2 \times \left(\frac{2}{3}\right)^2 \times \left(\frac{2}{3}\right)^2 = \left(\frac{2}{3}\right)^{2+2+2}$	$\left(\frac{2}{3}\right)^{2\times3} = \left(\frac{2}{3}\right)^6$

On the basis of the above table, we can say that in power of a power we have to multiply powers. It can be written in the form of a rule as under.

Rule : For integers m and n and for integer or fraction number a

$$(a^m)^n = a^{m\times n} = a^{mn}$$

Example 5 : Simplify :

(1) $(2^5)^3 = 2^{5\times3} = 2^{15}$ (2) $[(-p)^2]^6 = (-p)^{2\times6} = (-p)^{12} = p^{12}$

(3) $(x^2)^4 = x^{2\times4} = x^8$ (4) $\left[\left(\frac{1}{2}\right)^3\right]^5 = \left(\frac{1}{2}\right)^{3\times5} = \left(\frac{1}{2}\right)^{15}$

Example 6 : Simplify : x^{2^3}

Here base is x and exponent is $2^3 = 2 \times 2 \times 2 = 8$

So $x^{2^3} = x^8$

- **Do it yourself :**

a^{2^3} = _____ $(a^2)^3$ = _____

x^{3^2} = _____ $(a^3)^2$ = _____

(4) Power of a product :

Power of a Product	Repeated multiplication	Exponential form
$(2x)^2$	$2x \times 2x = 2 \times x \times 2 \times x = 2 \times 2 \times x \times x$	$2^2 \times x^2$
$(-4x)^3$	$(-4x)\times(-4x)\times(-4x) = (-4) \times x \times (-4) \times x \times (-4) \times x$ $= (-4) \times (-4) \times (-4) \times x \times x \times x$	$(-4)^3 \times x^3$
$(ab)^4$	$ab \times ab \times ab \times ab = a \times b \times a \times b \times a \times b \times a \times b$ $= a \times a \times a \times a \times b \times b \times b \times b$	$a^4 \times b^4$

On the basis of the above table, we can say that in power of a product, we have to write the power of each term of a bracket. It can be written in the form of a rule as under.

Rule : For positive integer m and for integer or fraction number a and b.

$$(ab)^m = a^m b^m$$

Example 7 : Simplify :

(1) $(5 \times 7)^3 = 5^3 \times 7^3$

(2) $(a^2 \times b^3)^5 = (a^2)^5 \times (b^3)^5$

$= a^{10} \times b^{15} = a^{10}b^{15}$

(3) $(-3a)^2 = (-3)^2 \times a^2 = 9a^2$

(5) Power of a Quotient (Division) :

Power of a division	Repeated multiplication	Result
$\left(\frac{2}{3}\right)^3$	$\frac{2}{3}\times\frac{2}{3}\times\frac{2}{3}=\frac{2\times2\times2}{3\times3\times3}$	$\left(\frac{2}{3}\right)^3=\frac{2^3}{3^3}$
$\left(\frac{a}{b}\right)^2$ (Where $b\neq0$)	$\frac{a}{b}\times\frac{a}{b}=\frac{a\times a}{b\times b}$	$\left(\frac{a}{b}\right)^2=\frac{a^2}{b^2}$

On the basis of the above table, we can say that in power of a division we have to write the power of numerator as well as the power of denominator. It can be written in the form of a rule as under :

Rule : For positive integer m and for integer or fraction numbers a and b. $(b\neq0)$

$$\left(\frac{a}{b}\right)^m=\frac{a^m}{b^m}$$

Example 8 : Simplify :

(1) $\left(\frac{x}{2}\right)^4=\frac{x^4}{2^4}$

(2) $\left(\frac{2x}{3y}\right)^3=\frac{(2x)^3}{(3y)^3}=\frac{2^3\times x^3}{3^3\times y^3}$ (Where $y\neq0$)

Example 9 : Simplify and evaluate :

(1) $(3\times6)^2\div(3^3\times2^2)$

$=(3\times3\times2)^2\div(3^3\times2^2)$

$=(3^2\times2)^2\div(3^3\times2^2)$

$=\frac{3^{2\times2}\times2^2}{3^3\times2^2}=\frac{3^4}{3^3}\times1=3^{4-3}=3^1=3$

(2) $\left[\left(\frac{5}{7}\right)^2\right]^3 \times 7^4 \div (5^3)^2$

$= \left(\frac{5}{7}\right)^{2\times 3} \times 7^4 \div 5^{3\times 2}$

$= \left(\frac{5}{7}\right)^6 \times 7^4 \div 5^6$

$= \frac{5^6}{7^6} \times \frac{7^4}{5^6}$

$= 1 \times \frac{1}{7^{6-4}}$

$= \frac{1}{7^2}$

$= \frac{1}{49}$

(3) $\left(-\frac{2}{3}\right) \times \left(\frac{3}{2}\right)^3 \times \left(-\frac{4}{3}\right)^2$

$= (-1) \times \frac{2}{3} \times \frac{3^3}{2^3} \times \left(-\frac{2^2}{3}\right)^2$

$= (-1) \times \frac{2}{3} \times \frac{3^3}{2^3} \times \frac{2^4}{3^2}$

$= (-1) \times \frac{2^{1+4}}{2^3} \times \frac{3^3}{3^{2+1}}$

$= (-1) \times \frac{2^5}{2^3} \times \frac{3^3}{3^3}$

$= (-1) \times 2^{5-3} \times 1$

$= (-1) \times 2^2 \times 1$

$= (-1) \times 4$

$= (-4)$

(4) If $a = (-2)$, then find the value of

$(a^2)^3 \times \left(\frac{1}{a}\right)^5 \times a^2$

$(a^2)^3 \times \left(\frac{1}{a}\right)^5 \times a^2$

$= a^6 \times \frac{1^5}{a^5} \times a^2$

$= \frac{a^{6+2}}{a^5} = \frac{a^8}{a^5}$

$= a^{8-5}$

$= (a)^3 = (-2)^3 = (-8)$

(5) $\left(\frac{x}{y}\right)^6 \div \left[\left(\frac{x}{y}\right)^4 \div \left(\frac{x}{y}\right)^2\right]$

$= \left(\frac{x}{y}\right)^6 \div \left(\frac{x}{y}\right)^{4-2}$

$= \left(\frac{x}{y}\right)^6 \div \left(\frac{x}{y}\right)^2$

$= \left(\frac{x}{y}\right)^{6-2}$

$= \left(\frac{x}{y}\right)^4$

$= \frac{x^4}{y^4}$

Practice 2

1. Fill in the blanks to make each of the following statements true :

(1) $(5^2)^3 = 5^{\_\_}$

(2) $(20)^2 = 4^2 \times$ _____

(3) $\left(\frac{3}{5}\right)^7 = \frac{3^7}{\_\_}$

(4) $(3^2)^3 \times 3^5 =$ _____

(5) $(-x^2y^3z^4)^3 = -x^6 \times$ _____ $\times$ _____

(6) $(m^3n^2)^2 =$ _____

(7) $\left[\frac{(-a)^2}{b^3}\right]^2 =$ _____

(8) $2^{10} \div (2^3)^2 =$ _____

2. Simplify :

(1) $\left[\left(-\frac{1}{5}\right)^2\right]^4 \div \left(-\frac{1}{5}\right)^6$

(2) $2^6 \times 2^2 \times 2^5 \div 8^3$

(3) $(5^3 \times 2^3)^2 \div 10^4$

(4) $2^4 \div x^5 \times x^2 \div 2^3$

(5) $\left(\frac{m}{n}\right)^5 \div \left[\left(\frac{m}{n}\right)^5 \div \left(\frac{m}{n}\right)^2\right]$

Exercise

1. Complete the following table by using the rules of exponent :

Sr. No.	Form of exponent	Repeated multiplication	Result
(1)	$a^2 \times a^3$	.....	$a^{2+3} = a^5$
(2)	$2^5 \div 2^3$	.....	$2^2 = 4$
(3)	.....	$\frac{x \times x \times x}{x \times x \times x \times x}$	$\frac{1}{x}$
(4)	$(-2)^3 \div (-2)^3$	$\frac{(-2) \times (-2) \times (-2)}{(-2) \times (-2) \times (-2)}$	.....
(5)	$(m^2)^3$	$m^2 \times m^2 \times m^2$	.....
(6)	.....	$2x \times 2x \times 2x$	$2^3 \times x^3$
(7)	$\left(\frac{7}{b}\right)^3$	.....	$\frac{7^3}{b^3}$

2. Fill in the blanks :

(1) $[(-2)^2]^3 =$ _____

(2) $(-30)^5 = (-2)^5 \times$ _____ $\times 5^5$

(3) $\left(\frac{2}{3}\right)^4 =$ _____

(4) $(2^2)^3 \times 2^5 =$ _____

(5) $2^{10} \div (2^3)^2 =$ _____

(6) $(a^3b^3)^2 =$ _____

3. Simplify :

(1) $[(3^5)^3 \div (3^2)^2] \div 3^8$

(2) $(2 \times 6)^2 \div 2^4 \div 3^2$

(3) $(3c)^3 \times \left(\frac{c}{3}\right)^2$

(4) $[(ab)^3]^3 \div [(ab)^4 \times (ab)^8]$

(5) $m^5 \times (m^3)^2 \div (m^4)^3$

(6) $[(xy)^2]^2 \times x^3y^3 \div x^4y^5$

4. Evaluate the following :

(1) $(3^4)^2 \div [3^4 \times 3^5]$

(2) $12^2 \times 2 \times \left(-\frac{1}{2}\right)^3$

(3) $(8^3)^2 \div (2^6 \times 2^{10})$

(4) $\left(\frac{5}{3}\right)^2 \times \left(\frac{1}{5}\right)^2 \times (-15)^2$

(5) $[(-3)^5]^2 \div [(-3)^3]^2$

5. If $m = 2$, then find the value of $m^5 \div m^6 \times \left(\frac{1}{m}\right)^4$

6. If $a = (-2)$, then find the value of $(2a)^5 \times \left(\frac{a}{2}\right)^3 \div (a)^4$

7. If $x = (-3)$, then find the value of $(x^2)^3 \times \left(\frac{1}{x}\right)^4 \times x$

❖ **Rules for positive integral exponents :**

(1) Multiplication of exponential form : For positive integers as m and n and for integer or fraction number a

$a^m \times a^n = a^{m+n}$

(2) Division of exponential form : For positive integers m and n and for non zero integer or fraction number a

(i) If $m > n$, then $a^m \div a^n = a^{m-n}$

(ii) If $m < n$, then $a^m \div a^n = \frac{1}{a^{n-m}}$

(i) If $m = n$, then $a^m \div a^n = 1$

(3) Power of a power : For integers m and n and for integer or fraction number a

$(a^m)^n = a^{m \times n}$

(4) Power of product : For positive integer m and for integer or fraction number a and b.

$(ab)^m = a^m . b^m$

(5) Power of division : For positive integer m and for integer or fraction numbers a and b. $(b \neq 0)$

$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

Answers

Practice 1

1. (1) 3^9 (2) $\left(\frac{3}{5}\right)^5$ (3) $\frac{1}{9^{16}}$ (4) $(-4)^4$ (5) 5^2

2. (1) 128 (2) $\frac{1}{9}$ (3) $\left(-\frac{1}{8}\right)$ (4) $\frac{1}{8}$ (5) 20

3. (1) x^3 (2) y (3) x^2 (4) y^2 (5) x^6 (6) y^7

4. (1) 64 (2) 8

5. (1) 81 (2) (–243)

Practice 2

1. (1) 6 (2) 5^2 (3) 5^7 (4) 3^{11}

(5) y^9, z^{12} (6) m^6n^4 (7) $\frac{a^4}{b^6}$ (8) 2^4

2. (1) $\left(-\frac{1}{5}\right)^2$ or $\frac{1}{25}$ (2) 2^4 or 16 (3) 100 (4) $\frac{2}{x^3}$ (5) $\frac{m^2}{n^2}$

Exercise

1. (1) $(a \times a) \times (a \times a \times a)$ (2) $\frac{2\times2\times2\times2\times2}{2\times2\times2}$ (3) $x^3 \div x^4$

(4) 1 (5) m^6 (6) $(2x)^3$

(7) $\frac{7}{b} \times \frac{7}{b} \times \frac{7}{b}$

2. (1) 2^6 (2) 3^5 (3) $\frac{2^4}{3^4}$ (4) 2^{11} (5) 2^4

(6) $a^6\ b^6$

3. (1) 3^3 or 27 (2) 1 (3) $3c^5$ (4) $\frac{1}{a^3b^3}$ (5) $\frac{1}{m}$

(6) x^3y^2

4. (1) $\frac{1}{3}$ (2) (–36) (3) 4 (4) 25 (5) 81

5. $\frac{1}{32}$ **6.** 64 **7.** (–27)

2 Simple Interest

❖ Let us remember :

10% of 100	= 10
20% of 100	= 20
30% of 100	= _____
35% of 100	= _____
40% of 100	= _____
45% of 100	= _____
73% of 100	= _____
82% of 100	= _____
90% of 100	= _____
97% of 100	= _____

8% of 100	= 8
8% of 200	= 16
8% of 300	= 24
8% of 400	= _____
8% of 500	= _____
8% of 700	= _____
8% of 900	= _____
8% of 1000	= _____
8% of 1100	= _____
8% of 1200	= _____

❖ Read and proceed further :

Shivam : Riyadidi, I need ₹ 100. Would you please help me ?

Riya : Shivam, I will give you ₹ 100, but at the end of one year, you should give me ₹ 10 additional apart from Rs. 100.

Shivam : Yes, OK.

(After two years)

Shivam : Riyadidi, take your ₹ 100 and additional ₹ 20 at the rate of ₹ 10 per year.

Riya : Wow, Shivam ! You have understood it well.

Dear friends, Proceed further on the basis of this dialogue.

If Shivam,

- takes ₹ 100 for 1 year, he has to pay ₹ 10 additionally.
- takes ₹ 100 for 2 year, he has to pay ₹. _____ additional.
- takes ₹ 100 for 3 year, he has to pay ₹ _____ additional.
- takes ₹ 100 for 4 year, he has to pay ₹ _____ additional.
- takes ₹ 100 for 5 year, he has to pay ₹ _____ additional.

On the basis of the dialogue given ahead answer the following questions :

(1) How many rupees were needed to Shivam ? _____

(2) After how many years, Shivam returned back the money ? _____

(3) How much additional amount does Riya get at the end of one year, apart from ₹ 100 ? _____

(4) How much amount does Shivam pay back at the end of two years ? _____

- **Principal :** The amount, which is either borrowed or deposited is called principal.
- **Period :** The time interval for which the amount is deposited or borrowed on interest is called period.
- **Interest :** The extra amount paid or received along with the principal borrowed or deposited respectively is called the interest.
- **Amount :** The sum of principal and interest is called amount.
- **Rate of Interest :** The interest received on ₹ 100 for one year or for 12 months or for 365 days is called the Rate of interest.

Example 1 : Sarojben borrows ₹ 47,000 from the bank at the rate of 9.5% interest for 1 year. If she pays ₹ 4465 extra at the end of the term, write the principal, period, rate of interest, interest and amount.

Solution : Here,

Principal = ₹ 47,000

Period = 1 year

Rate of interest = 9.5 %

Interest = ₹ 4465

Amount = Principal + Interest

47,000 + 4465

Amount = ₹ 51,456

Let us remember

1. From the sums given below, find the principal, period, rate of interest, interest and amount.

(1) Hasmukhbhai borrows ₹ 35,000 from his friend for 6 months. For this he pays back ₹ 36,400 with Rs. 1400 additionally at the rate of 8%.

(2) A trader deposits ₹ 5000 in the bank for 146 days at the rate of 10%. At the end of this term, he receives a total ₹ 5200 with Rs. 200 additional.

(3) Radhaben deposits ₹ 17,000 in the bank for 1 year. At the end of 1 year, she gets ₹ 1190 extra at the rate of 7%.

- **Calculation of Simple Interest :**

Example 2 : Find the interest and amount of ₹ 2500 at the rate of 8 % for one year.

Solution : Principal = ₹ 2500, Period = 1 year, Rate of interest = 8 %

Interest of ₹ 100 for 1 year = ₹ 8

∴ Interest of ₹ 2500 for 1 year = ?

$$\text{Interest} = \frac{2500 \times 1 \times 8}{100 \times 1}$$

∴ Interest = ₹ 200

Amount = Principal + Interest

= 2500 + 200

∴ Amount = ₹ 2700

Example 3 : Find the interest and amount on ₹ 6000 at the rate of 6 % for 3 months.

Solution : Principal = ₹ 6000

Period = 3 months

Rate of interest = 6 %

Interest of ₹ 100 for 12 months = ₹ 6

∴ Interest of ₹ 6000 for 3 months = ?

$$\text{Interest} = \frac{6000 \times 3 \times 6}{100 \times 12}$$

∴ Interest = ₹ 90

Amount = Principal + Interest

= 6000 + 90

Amount = ₹ 6090

Example 4 : Find the interest and amount on ₹ 7300 at the rate of 6 % for 35 days.

Solution : Principal = ₹ 7300

Period = 35 days

Rate of interest = 6 %

Interest of ₹ 100 for 365 days = ₹ 6

∴ Interest of ₹ 7300 for 35 days = ?

$$\text{Interest} = \frac{7300 \times 35 \times 6}{100 \times 365}$$

∴ Interest = ₹ 42

Amount = Principal + Interest

= 7300 + 42

Amount = ₹ 7342

Practice - 1

1. Find the interest and amount :

Sr. No.	Principal (₹)	Rate of Interest	Period	Interest	Amount
(1)	1200	5%	1 year	.....	.....
(2)	3000	6%	6 months	.....	.....
(3)	3650	15%	60 days	.....	.....
(4)	8800	9%	2 years	.....	.....
(5)	7200	10%	11 months	.....	.....
(6)	9600	12%	1 year 3 months	.....	.....
(7)	4000	12%	73 days	.....	.....

- **Practical Puzzles :**

Example 5 : Nehaben borrows ₹ 6000 for 1 year at the rate of 7%. How much amount does she have to pay back at the end of 1 year ?

Solution : Principal = ₹ 6000, Period = 1 year, Rate of interest = 7 %

Interest of ₹ 100 for 1 year = ₹ 7

∴ Interest of ₹ 6000 for 1 year = ?

$$\text{Interest} = \frac{6000 \times 1 \times 7}{100 \times 1}$$

∴ Interest = ₹ 420

She has to pay total amount,

Amount = Principal + Interest

= 6000 + 420

Amount = ₹ 6420

Nehaben has to pay back ₹ 6420

Example 6 : Subhashbhai lends ₹ 12,000 to his friend Pratap for 9 months at the rate of 11%. How much amount does he get at the end of the term ?

Solution : Principal = ₹ 12,000, Period = 9 months, Rate of interest = 11 %

Interest of ₹ 100 for 12 months = ₹ 11

∴ Interest of ₹ 12,000 for 9 months = ?

$$\text{Interest} = \frac{12000 \times 9 \times 11}{100 \times 12}$$

∴ Interest = ₹ 990

Amount = Principal + Interest

= 12,000 + 990

Amount = ₹ 12,990

Subhashbhai gets ₹ 12,990

Example 7 : How much interest does Jayantibhai have to pay on ₹ 1460 for 150 days at the rate of 9% ?

Solution : Principal = ₹ 1460, Period = 150 days, Rate of interest = 9 %

Interest of ₹ 100 for 365 days = ₹ 9

∴ Interest of ₹ 1460 for 150 days = ?

$$\text{Interest} = \frac{1460 \times 150 \times 9}{100 \times 365}$$

∴ Interest = ₹ 54

Jayantibhai has to pay ₹ 54 as interest.

(1) A farmer borrows ₹ 8000 from a co-operative society for 2 years at the rate of 12 %. How much does the farmer have to pay at the end of two years ?

(2) Mitesh invests ₹ 700 for 5 years at the rate of 10%. How much amount would he get at the end of the term ?

(3) For higher education, Trusha borrows ₹ 9600 from the post-office for $2\frac{1}{2}$ years at the rate of 9%. How much interest and amount would she pay back at the end of the term ?

(4) For buying a house, Kishorbhai borrowed ₹ 29,200 from the bank for 227 days at the rate of 12.5%. How much amount would he pay back at the end of the term ?

(5) Girishbhai lends ₹ 47,000 to his friend Mohanbhai for 1 year and 3 months at the rate of 8%. How much amount would he get from Mohanbhai at the end of the term ?

- **Calculation using the formula :**

Formula for finding the interest $I = \frac{PRN}{100}$

Principle = P Period = No. of Years = N

Rate of Interest = R Interest = I

Amount = A

∴ **Amount = Principal + Interest**

Example 8 : Find the amount and interest on ₹ 6000 for 3 years at the rate of $6\frac{1}{4}$%.

Solution : P = ₹ 6000

R = $6\frac{1}{4}$ % = $\frac{25}{4}$ %

N = 3 years

$I = \frac{PRN}{100}$

∴ $I = \frac{6000 \times \frac{25}{4} \times 3}{100}$

∴ $I = \frac{6000 \times 25 \times 3}{100 \times 4}$

∴ I = ₹ 1125

A = P + I

= 6000 + 1125

Amount = ₹ 7125

Example 9 : Sagar invests ₹ 8000, for 1 year and 9 months at the rate of 6.5%. How much amount would sagar get at the end of the term ?

Solution : $P = ₹\ 8000$

$R = 6.5\ \% = \frac{65}{10}\ \%$

$N = 1$ years and 9 months

$= 12$ months + 9 months

$= 21$ months

$\therefore\ N = \frac{21}{12}$ year

$I = \frac{PRN}{100}$

$= \frac{8000 \times 65 \times 21}{100 \times 10 \times 12}$

$\therefore\ I = ₹\ 910$

$A = P + I$

$= 8000 + 910$

$\therefore A = ₹\ 8910$

Sagar gets ₹ 8910

Example 10 : Arvindbhai borrows ₹ 43,800 for 50 days at the rate of 12.5%. How much interest would he pay at the end of the term ?

Solution : $P = ₹\ 43{,}800$

$R = 12.5\% = \frac{125}{10}\ \%$

$N = 50$ days

$\therefore\ N = \frac{50}{365}$ year

$I = \frac{PRN}{100}$

$= \frac{43800 \times 125 \times 50}{100 \times 10 \times 365}$

$I = ₹\ 750$

Arvindbhai has to pay ₹ 750 interest.

- When the period is given in years, calculate the interest on the number of years given.
- When the period is in months, calculate the interest (converting into years) using $\frac{\text{given months}}{12}$ years.
- When the period is in days, calculate the interest (converting into years) using $\frac{\text{given days}}{365}$ years.

Practice 3

(1) Find the interest and amount in the table given below :

Sr.	Principal P (₹)	Rate of Interest (R)	Period N	$I = \frac{PRN}{100}$ (₹)	Interest (I) (₹)	Amount A = P + I (₹)
(1)	1600	$8\frac{1}{3}$ %	4.5 years	$I = \frac{1600 \times 25 \times 45}{100 \times 3 \times 10}$	I = 600	A = 1600 + 600 A = 2200
(2)	1000	10 %	2.5 years			
(3)	2000	$7\frac{1}{2}$ %	1 year 6 months			
(4)	4000	12.5 %	73 days			
(5)	8800	$13\frac{1}{2}$ %	2 years			

You have learnt to find out simple interest using formula to find out simple interest $I = \frac{PRN}{100}$. Now, let us know the formula to find P, R or N when simple interest is given.

- **Move forward yourself and get the information :**

Approach each and every teacher of your school and find out the amount lent or borrowed in bank, or any other firm by them, rate of interest, period, interest and amount. Make a table in your notebook as given below and fill the information.

Sr. No.	Name of the teacher	Amount lent or borrowed from the bank or other firm	Rate of interest (R)	Period (N)	Interest (I)	Amount (A)

- When period, rate of interest and interest are given and principal has to be found.

$$I = \frac{PRN}{100}$$

$\therefore$ 100 I = PRN (by multiplying 100 on both the sides)

$\therefore$ $\frac{100\,I}{RN} = P$ (by divding R N on both the sides)

$\therefore$ $P = \frac{100\,I}{RN} = \frac{100 \times I}{R \times N}$

- Formula for finding Rate of interest $R = \frac{100\,I}{PN} = \frac{100 \times I}{P \times N}$

- Formula for finding period $N = \frac{100\,I}{PR} = \frac{100 \times I}{P \times R}$

Example 11 : Find the principal amount of which the interest for 73 days is ₹ 150 at the rate of $12\frac{1}{2}$ %.

Solution : P = ? $R = 12\frac{1}{2} = 12.5 = \frac{125}{10}$ %

N = 73 days = $\frac{73}{365}$ years

I = ₹ 150

$\therefore$ $P = \frac{100\,I}{RN}$

$= \frac{100 \times 150}{\frac{125}{10} \times \frac{73}{365}}$

$= \frac{100 \times 150 \times 10 \times 365}{125 \times 73}$ ($\therefore$ Denominator's of a denominator is in the numerator)

$\therefore$ P = ₹ 6000

Example 12 : For what number of years, at the rate of 6%, the interest is ₹ 192 on ₹ 800 ?

Solution : P = 800

R = 6 %

N = ?

I = 192

$N = \frac{100\,I}{PR}$

$= \frac{100 \times 192}{800 \times 6}$

∴ N = 4 years

Example 12 : Calculate the rate of interest on ₹ 1200 for 2.5 years when the interest is ₹ 210.

Solution : P = ₹ 1200

R = ?

N = 2.5 years

I = ₹ 210

$R = \frac{100\,I}{PN}$

$= \frac{100 \times 210 \times 10}{1200 \times 25}$

∴ R = 7 %

Practice 4

1. Calculate and fill the table :

Sr. No.	Principal (P)	Rate of Interest (R)	Period (N)	Interest (I)
(1)	_____	6 %	3 years	₹ 1260
(2)	_____	7 %	100 days	₹ 28
(3)	₹ 2500	_____	2 years	₹ 275
(4)	₹ 4400	_____	1 years 6 months	₹ 528
(5)	₹ 1250	6 %	_____	₹ 225
(6)	₹ 2500	8 %	_____	₹ 1200

Exercise

1. Write the answer in the following table after doing proper calculation :

Sr. No.	Principal P (₹)	Rate of Interest (R)	Period N	Interest I (₹)	Amount A (₹)
(1)	1100	6 %	4 years	_____	_____
(2)	3650	7 %	200 days	_____	_____
(3)	_____	7 %	3 months	35	_____
(4)	1200	_____	5.5 years	264	_____
(5)	1600	$2\frac{1}{2}$ %	_____	200	_____
(6)	15000	5.5 %	_____	2475	_____
(7)	_____	$4\frac{1}{2}$ %	2.5 years	450	_____
(8)	14600	_____	250 days	750	_____

2. Find the principal amount of which the interest for 6 months is ₹ 960, at the rate of 7.5 %.

3. Find the rate of interest if the interest ₹ 1323 is earned on ₹ 4200 for 3.5 years ?

4. Nisha borrows ₹ 28,000 at the rate of 4 % for some period of time. At the end of the term she pays ₹ 2240 interest. What is the period of time for which Nisha has to pay the interest ?

Answers

Practice 1

(1) Interest = ₹ 60, Amount = ₹ 1260
(2) Interest = ₹ 90, Amount = ₹ 3090
(3) Interest = ₹ 90, Amount = ₹ 3740
(4) Interest = ₹ 1584, Amount = ₹ 10,384
(5) Interest = ₹ 660, Amount = ₹ 7860
(6) Interest = ₹ 1440, Amount = ₹ 11,040
(7) Interest = ₹ 96, Amount = ₹ 4096

Practice 2

(1) Interest = ₹ 1920, has to pay ₹ 9920
(2) Interest = ₹ 350, gets amount ₹ 1050
(3) Interest = ₹ 2160, Trusha has to pay ₹ 11,760
(4) Kishorbhai has to pay interest ₹ 2270 and amount ₹ 31,470.
(5) Interest = ₹ 4700, Amount = ₹ 51,700.

Practice 3

(2) I = ₹ 250, A = ₹ 1250
(3) I = ₹ 225, A = ₹ 2225
(4) I = ₹ 100, A = ₹ 4100
(5) I = ₹ 2376, A = ₹ 11176

Practice 4

(1) P = ₹ 7000
(2) P = ₹ 1460
(3) R = 5.5 %
(4) R = 8 %
(5) N = 3 years
(6) N = 6 years

Exercise

1. (1) I = ₹ 264, A = ₹ 1364
(2) I = ₹ 140, A = ₹ 3790
(3) P = ₹ 2000, A = ₹ 2035
(4) R = 4 %, A = ₹ 1464
(5) N = 5 years, A = ₹ 1800
(6) N = 3 years, A = ₹ 17475
(7) P = ₹ 4000, A = ₹ 4450
(8) R = 7.5%, A = ₹ 15350

2. P = ₹ 25,600
3. R = 9 %
4. 2 years

3 Brackets

❖ Let us learn something new :

'( )' is the symbol of a bracket. We have studied the use of bracket '( )'. Prepare a list of the situations where we use the brackets in Mathematics.

e.g., (1) To denote the negative intergers like (–3), (–4)

(2) _____

(3) _____

(4) _____

❖ Requirement of brackets :

A teacher gives students a sum to solve. The sum is solved by four students in different ways.

(1) $4 + 4 \times 3 - 1$ $= 8 \times 2$ $= 16$	**(2)** $4 + 4 \times 3 - 1$ $= 8 \times 3 - 1$ $= 24 - 1$ $= 23$
(3) $4 + 4 \times 3 - 1$ $= 4 + 12 - 1$ $= 16 - 1$ $= 15$	**(4)** $4 + 4 \times 3 - 1$ $= 4 + 4 \times 2$ $= 4 + 8$ $= 12$

All the four students claim that their answer is correct. But what is the right answer ? (Ask your teacher.)

To clear such types of misunderstanding, brackets should be used. By using the brackets it is clearly understood, which calculation is to be given priority.

❖ Types of brackets :

Types of brackets and their symbols are given below :

(1) Bar(line) bracket ———

(2) Small bracket ( )

(3) Curly bracket or Middle bracket { }

(4) Big bracket [ ]

❖ Simplification of the brackets :

The process of simplifying the brackets is also known as the process of removing the brackets.

Example 1 : Simplify : $\overline{4+4} \times 3 - 1$

Solution : $\overline{4+4} \times 3 - 1$

$= 8 \times 3 - 1$ (Process of removing ' ——— ' bracket)

$= 24 - 1$

$= 23$

Example 2 : Simplify : $(4 + 4) \times (3 - 1)$

Solution : $(4 + 4) \times (3 - 1)$

$= 8 \times 2$ (Process of removing '( )' bracket)

$= 16$

Example 3 : Simplify : $\{ 4 + (4 \times 3) - 1\}$

Solution : $\{4 + (4 \times 3) - 1\}$

$= \{4 + 12 - 1\}$ (If there are more than one brakets the innermost

$= \{16 - 1\}$ bracked is resolved first.)

$= 15$

Example 4 : Simplify : $15 \div [13 - 2\ \{10 - (2 + \overline{6 - 3})\}]$

Solution : $15 \div [13 - 2\ \{10 - (2 + \overline{6 - 3})\}]$

$= 15 \div [13 - 2\ \{10 - (2 + 3)\}]$ (Simplification of innermost bracket)

$= 15 \div [13 - 2\ \{10 - 5\}]$ (Simplification of '( )' bracket)

$= 15 \div [13 - 2\ \{5\}]$ (Removing middle bracket)

$= 15 \div [13 - 2 \times 5]$ (If there is no sign between the number outside the bracket and the number inside the bracket, multiplication should be done to open the brackets.)

$= 15 \div [13 - 10]$

$= 15 \div 3$

$= 5$

Example 5 : Simplify : $\{17 - 3\ (2 + 7)\}$

Solution : $\{17 - 3\ (2 + 7)\}$

$= \{17 - 3(9)\}$

$= \{17 - 27\}$

$= \{-10\}$

Example 6 : $[3\{5 \times (32 \div 8)\} + 5] - 32$ (Write name of the process in given bracket.)

Solution : $[3\{5 \times (32 \div 8)\} + 5] - 32$

$= [3\ \{5 \times 4\} + 5] - 32$ (.....)

$= [3\ \{20\} + 5] - 32$ (.....)

$= [3 \times 20 + 5] - 32$ (.....)

$= [60 + 5] - 32$ (.....)

$= 65 - 32 = 33$ (.....)

(Information given beside the example is only for understanding example.)

- If there are more than one brackets, the innermost bracket is resolved first. Generally, the simplification is done in sequence, by opening the brackets in the following order. Bar bracket, Small bracket, Curly bracket and Big bracket.
- Generally, the use of brackets is also done in a sequential order.
  - If one bracket is needed either bar bracket or small bracket is used.
  - If two brackets are needed either '‾' and '( )' or '( )' and '{ }' are used.
  - If three brackets are needed either '‾', ( ) and { } or ( ), { } and [ ] are used.
- The Bar bracket is rarely used.
- If there is any known or unknown number outside the bracket and if there is no sign between them, in such cases the known or the unknown number should be mulplied by each and every term of the bracket.

Example 7 : Simplify : $5x + [3y + \{3x - (3x - 3y)\}]$

Solution : $5x + [3y + \{3x - (3x - 3y)\}]$

$= 5x + [3y + \{3x - 3x + 3y\}]$

$= 5x + [3y + \{3y\}]$

$= 5x + [3y + 3y]$

$= 5x + 6y$

If a bracket has '–' sign outside, while removing it, the positive term becomes negative and negative term becomes positive.

Example 8 : Simplify : $[6y^2 - 3\{9y^2 - 10y - 2(3y^2 - 5y) - y^2\}]$

Solution : $[6y^2 - 3\{9y^2 - 10y - 2(3y^2 - 5y) - y^2\}]$

$= [6y^2 - 3\{9y^2 - 10y - 6y^2 + 10y - y^2\}]$

$= [6y^2 - 3\{3y^2 - y^2\}]$

$= [6y^2 - 3\{2y^2\}]$

$= [6y^2 - 6y^2] = 0$

Practice 1

Simplify :

(1) $7 + \{3 + (5 - 3)\}$

(2) $10 - \{8 + (4 \div 2)\}$

(3) $19 - [30 - \{12 + (8 - 3)\}]$ (4) $5x - [- \{- (- 5x)\}]$

(5) $30 - [\{17 + (9 - 4)\} + 17]$ (6) $5 + [18 - \{27 - (12 - 3)\}] - 6$

(7) $\{(3x^2 - 6x + 5) + (2x - 2x^2 + 5)\} - (x^2 - 4x + 10)$

(8) $3m - \{m + 2\ (5 - m)\}$

(9) $[\{5x - (x + 3y)\} - \{x + (2x - y)\}]$

(10) $15 - [3x - \{x + (2x + 5) - (x + 3)\}]$

Example 9 : Prepare a representation using digits from 1 to 10 and ÷, × , +, –, { }, ( ), [ ] such a way that the result is 50. (Use the digits only once in one representation.)

Solution : (1) $2 \times \{(6 \times 4) + 1\} = 50$

(2) $[\{(6 + 4) \times 10\} \div 2] = 50$

(3) $[\{(7 + 5) + 1\} \times 4] - 2 = 50$

(4) _____ (you also write)

(5) _____ (you also write)

1. In the given questions, fill the '___' with any one digit between 1 and 10 and ☐ with ÷, +, –, × and prepare different five representation and expand each one :

[___ ☐ ___ {___ ☐ (___ ☐ ___)}] ☐ ___

e.g. [2 ☐ 3 { 4 ☐ (8 ☐ 5)}] ☐ 7

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

(7) _____

(8) _____

2. Simplify :

(1) $a - [a + \{a - (a + 2)\} + 2]$ (2) $3y - [2y - \{4 - (y - 2)\} - 5]$

(3) $3a - [\{3a - (y - 2y)\} - 3a] + y$ (4) $[3x^2 - \{4x - (2x^2 + 5x - 3)\}] - 5$

(5) $- x - [x - \{- (- x)\}]$

3. Prepare a representation using digits from 1 to 10 and ÷, +, –, ×, ( ), { }, [ ] such a way that the result is 100. (Use the digits only once in one representation.)

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

Answers

Practice 1

(1) 12 (2) 0 (3) 6 (4) $10x$ (5) (-9)

(6) (-1) (7) 0 (8) $4m - 10$ (9) $x - 2y$ (10) $17 - x$

Exercise

2. (1) 0 (2) 11 (3) $3a$ (4) $5x^2 + x - 8$ (5) $(-x)$

Revision : 1

1. Write the correct answer from the given alternatives to make the following statements true :

(1) $[(-5)^2]^3$ = ...

(a) $(-5)^5$ (b) $(-10)^3$ (c) 5^6

(2) $x^3 \times x^2$ = ...

(a) $(x^3)^2$ (b) x^5 (c) x^6

(3) $\left(\frac{a^2}{b}\right)^2$ .....

(a) $\frac{a^4}{b}$ (b) $\frac{b^2}{a^4}$ (c) $\frac{a^4}{b^2}$

(4) $(-12)^3 = (-6)^3 \times$ .....

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

(5) $7^{12} \div (7^3)^2$ = ...

(a) 7^6 (b) $\frac{1}{7^6}$ (c) 7^{18}

(6) $(a^4\ b^2\ c)^3$ = ...

(a) $a^7\ b^5\ c^3$ (b) $a^{12}\ b^6\ c^3$ (c) $a^4\ b^2\ c^3$

(7) $\left(\frac{3a}{5b}\right)^2$ = ...

(a) $\frac{3a}{5b}$ (b) $\frac{25a^2}{9b^2}$ (c) $\frac{9a^2}{25b^2}$

(8) $m^2n \times n^2m$ = ...

(a) m^2n^2 (b) m^3n^3 (c) m^4n^4

2. Simplify :

(1) $m^4 \times m^5 \div m^3$ $(m \neq 0)$

(2) $a^{10} \div a^{13} \times a$ $(a \neq 0)$

(3) $(xy)^3 \div [x^4 \times (y^2)^3]$ $(x \neq 0, y \neq 0)$

3. Find the value :

(1) $3^6 \times (3^3)^2 \div 3^{10}$

(2) $[(-5)^3]^3 \div [(-5)^2]^3$

(3) $\left(\frac{4}{5}\right)^2 \times \left(\frac{1}{4}\right)^2 \times 5^2$

(4) $(2^2)^6 \div (2^2 \times 2^4)$

4. Complete the following table :

Sr. No.	Principal P (₹)	Rate of Interest R	Period N	Interest I (₹)	Amount A (₹)
(1)	7800	8.5 %	3 years	.....	.....
(2)	5600	6 %	7 months	.....	.....
(3)	18,500	4.5 %	.....	4995	.....
(4)	65,200	.....	1 year 9 months	7987	.....
(5)	.....	6 %	2 year 4 months	1141	.....
(6)	.....	7.5 %	219 days	522	.....

5. Calculate as asked :

(1) How many rupees would Swapnil deposit in the bank for 6 months at the rate of 4.5%, so as to get an interest of ₹ 828 ?

(2) For how long period, should Rafikbhai invest ₹ 5800 at the rate of 6%, so as to earn an interest of ₹ 1392 ?

(3) What is the rate of interest on ₹ 92,800 for $3\frac{1}{2}$ years, the interest of which is ₹ 16240 ?

6. Simplify :

(1) $10 - \{10 + (6 \div 2)\}$

(2) $5 \times [7 + (4 \times 3)]$

(3) $7y - [- \{- (- 7x)\}]$

(4) $2a - \{a + 2\ (5 - b)\}$

(5) $[3y - (x + 2y)] - [x + (2x - y)]$

(6) $36 \div [3 \div (48 \div 8)]$

(7) $[3a - a\ (2 - a)] - a$

(8) $(10 \div 5) \div (45 \div 9)$

(9) $\{(7 \times 2) - 4\} - [8 - (10 \div 2)]$

(10) $m + [n + \{2m - (m + 2n)\}]$

Answers

1. (1) c (2) b (3) c (4) a (5) a (6) b (7) c (8) b

2. (1) m^6 (2) $\frac{1}{a^2}$ (3) $\frac{1}{xy^3}$

3. (1) 9 (2) (–125) (3) 1 (4) 64

4. (1) I = 1989, A = 9789 (2) I = 196, A = 5796

(3) N = 6 years A = 23495 (4) R = 7 %, A = 73187

(5) P = 8150, A = 9291 (6) P = 11600, A = 12122

5. (1) ₹ 36,800 (2) 4 years (3) 5 %

6. (1) (–3) (2) 95 (3) $7y + 7x$ (4) $a + 2b - 10$

(5) $2y - 4x$ (6) 72 (7) a^2 (8) $\frac{2}{5}$

(9) 7 (10) $2m - n$

4 Equation

❖ **GAME :**

Aarti : I have become a magician.

Vipul : Wow ! How ?

Aarti : Let me show you a magic trick.

Vipul : yes.

Aarti : Keep doing as I say.

Initially, assume any one number between 1 and 9.

Vipul : Okay, I've done that.

Aarti : Now, multiply that number with 8.

Vipul : Okay, done.

Aarti : Multiply the answer with 17.

Vipul : Okay, done.

Aarti : Multiply that with 8.

Vipul : Yes, done.

Aarti : Add the original number to it.

Vipul : Added.

Aarti : Tell me any one digit of the answer and tell its place.

Vipul : In my answer 3 is on the hundred place.

Aarti : Hmm..... Your answer is 4356.

Vipul : Wow ! Great ! How did you come to know ? You are really a magician.

1. If Δ = 50, □ = 100 and ★ = 1000, think and answer the following :

(1) Δ + □ = _____

(2) Δ × ★ = _____

(3) 2 Δ + □ = _____

(4) 3 ★ − □ = _____

(5) 5□ − 2Δ = _____

(6) _____ + _____ = 150

(7) _____ − _____ = 800

(8) _____ − _____ = 500

(9) _____ + _____ = 500

(10) _____ + _____ + _____ = 1550

2. Write the information in mathematical symbols (Symbolic form) :

(1) Adding five to a certain number _____

(2) Subtracting five from a certain number _____

(3) Multiplying a number with five _____

(4) Divide a certain number by two _____

(5) Subtracting five from a certain number yields 20 _____

(6) Subtracting x from ten, yields 4 _____

(7) Multiplying a certain number by five gives 20 _____

(8) Adding 3 to a certain number, yields 15 _____

3. Write the answer by substituting the variable with the given value :

(1) If $x = 5$, then $x + 15$ = _____

(2) If $p = 10$, then $p - 10$ = _____

(3) If $a = 15$, then $3a + 7$ = _____

(4) If $m = 17$, then m − _____ = 7

❖ **Let's learn something new :**

Sr. No.	Mathematical Statement	Symbolic form	Symbolic form : symbol from the given symbols =, +, < or >
(1)	Adding six to a certain number the result is 12	$x + 6 = 12$	_____
(2)	Subtracting five from three times of a certain number gives 13.	$3a - 5 = 13$	_____
(3)	Five times x is 10.	$5x = 10$	_____
(4)	Subtracting 5 from the double of m, the result is bigger than 10.	$2m - 5 > 10$	_____
(5)	Subtracting 7 from five times a number the result is not Zero.	$5y - 7 \neq 0$	_____
(6)	Adding 5 to ten times y, the result is less than 30.	$10y + 5 < 30$	_____

By studying the mathematical statements in the above table it is known that in Sr. no. (1), (2) and (3) '=' sign is used as mathematical symbol.

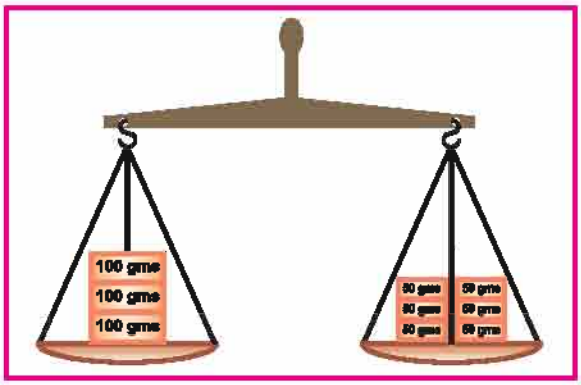
The '=' sign shows the equality between its left side and right side.

In this way, 'Symbolic form of a mathematical statement showing equality is called an equation.'

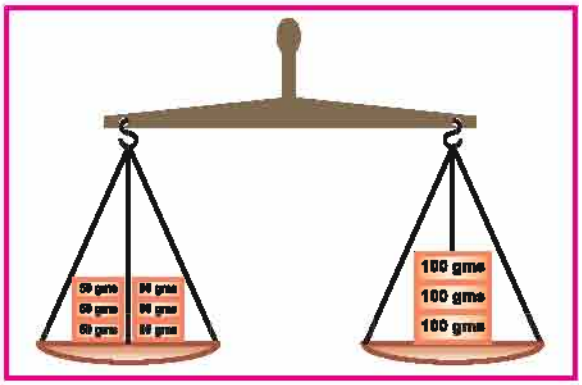
In Sr. No. (1), (2)and (3) '=' sign is used, so they are equations. But in Sr. No. (4), (5) and (6) '=' sign is not used, So they are not equations.

❖ Properties of Equality :

(1) For understanding the properties of equality perform the following activity :



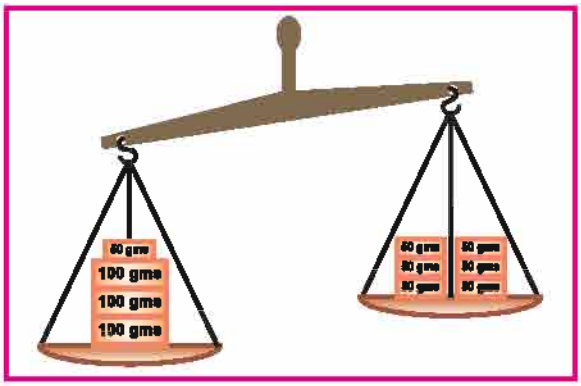
$3(100) = 6(50)$

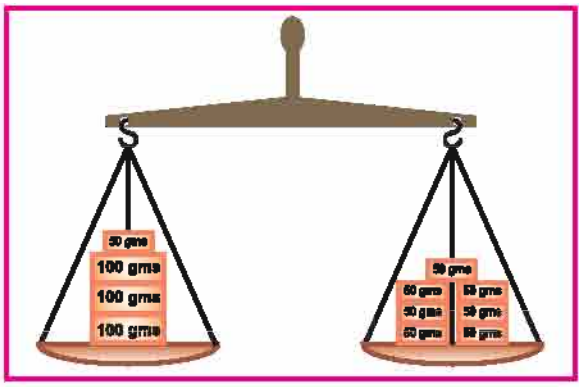


$6(50) = 3(100)$

Here, both the pans in the figure are in balance. By exchanging the sides, balance is maintained.

(2)

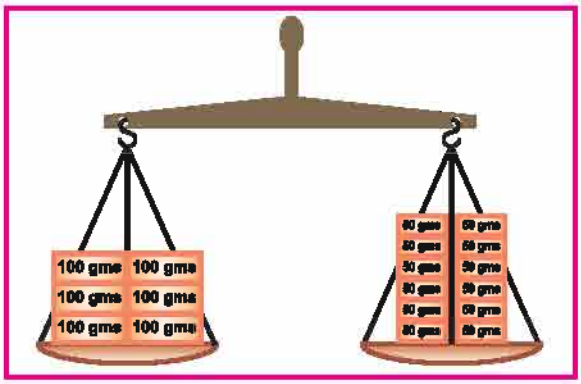




$3(100) + 50 = 6(50) + ...$

Here, in the above figure, 50 grams extra weight is kept in one pan. If 50 grams weight is kept on the other pan, both pans will be balanced.

(3)



In the figure, balance is maintained by keeping two groups of 3(100) on one pan and also two groups of 6(50) on the other.

$2[3(100)] = 2[6(50)]$

From the above activity, we can conclude that,

For integers a, b and c

(1) If $a = b$, then $b = a$ (Equality is maintained by changing sides)

(2) If $a = b$, then $a + c = b + c$ (Equality is maintained on adding same number on both the sides)

(3) If $a = b$, then $ac = bc$ (Equality is maintained by multiplying with same number on both the sides)

❖ Solution of the equation :

We have already learnt to find out the value of a polynomial by putting the value of the variable in the polynomial. In the same way, equality can be confirmed by putting the value of the variable.

e.g. In the equation $x + 5 = 15$ if $x = 2$ then L.H.S., $x + 5 = 2 + 5 = 7$ but, R.H.S. = 15. So, in this equation equality is not maintained if we take $x = 2$.

Now, check whether the equality of the equation is maintained or not by putting the value of the variable given in the table below :

Equation	Value of the variable	Is the equality of the equation maintained ? Yes / No
$x + 15 = 25$	$x = 1$	
$p + 37 = 50$	$p = 15$	
$2y + 10 = 30$	$y = 20$	
$z - 15 = 25$	$z = 40$	
$10 - 3b = 1$	$b = (-4)$	
$3a + 5 = 23$	$a = 6$	

Now, find out, from the given various values of variable for which value, equality of the equation is maintained ? :

Equation	Value of the variable	Is the equality of the equation maintained ? Yes / No
$2x + 7 = 17$	$x = (-2)$	
$2x + 7 = 17$	$x = (-5)$	
$2x + 7 = 17$	$x = 2$	
$2x + 7 = 17$	$x = 3$	
$2x + 7 = 17$	$x = 5$	
$2x + 7 = 17$	$x = 6$	
$2x + 7 = 17$	$x = 7$	
$2x + 7 = 17$	$x = 8$	
$2x + 7 = 17$	$x = 9$	

After completing the given table we come to know that by putting $x = 5$ in the equation $2x + 7 = 17$ equality of the equation is maintained. By putting other value of x, equality of the equation is not maintained.

In the same way, the value to be put at the place of variable in an equation, such that the result on the two sides of the equation are same, i.e. the balance of equation is maintained, this value is known as the solution of the given equation. The solution of the equation is also known as root of the equation.

For finding the solution of the equation by trial and error method, by putting various values of the variable in the equality the solution is not easily obtained. Also, calculation becomes long, tiresome and time consuming.

Therefore by using the properties of the equality, we can easily find the solution.

Example 1 : Find the solution of the equation : $x + 7 = 10$

Solution : $x + 7 = 10$

$\therefore \quad x + 7 + (-7) = 10 + (-7)$ (on adding the opposite value (-7) of 7 on both the sides)

$\therefore \quad x + 0 = 10 - 7$

$\therefore \quad x = 3$ In this way, $x = 3$ is a solution of the given equation.

In short it can also be written like this.

$\therefore\ x + 7 = 10$

$\therefore\ x = 10 - 7$

$\therefore\ x = 3$

Solution : $x = 3$

Example 2 : Find the solution of the equation : $y - 3 = (-2)$

Solution : $y - 3 = (-2)$

$\therefore\ y - 3 + 3 = (-2) + 3$ (On adding the oppsite value (3) of (–3) on both the sides)

$\therefore\ y + 0 = 1$

$\therefore\ y = 1$

In $y - 3$, only 3 is not considered but the sign of '–' is also considered, therefore –3 is considered as (–3).

[To check whether the answer is correct or not]

(Put the value of the variable on the left hand side)

LHS $= y - 3$

$= 1 - 3$

$= -2$

$=$ RHS

Therefore y = 1 is correct solution for the given equation.

Example 3 : Find the solution of the equation : $5 + a = 17$

Solution : $5 + a = 17$

$\therefore\ 5 + (-5) + a = 17 + (-5)$ (On adding the opposite (–5) of 5 on both the sides)

$\therefore\ 0 + a = 17 - 5$

$\therefore\ a = 12$

Solution of given equation is $a = 12$.

It can also be written in this way,

$5 + a = 17$

$\therefore\ a = 17 - 5$

$\therefore\ a = 12$

Solution : $a = 12$

Example 4 : Find the solution of the equation : $3x = 15$

Solution : $3x = 15$

$\therefore \quad 3x \times \frac{1}{3} = 15 \times \frac{1}{3}$ (Multiplying by inverse $\frac{1}{3}$ of 3 on both the sides)

$\therefore \quad x = 5$

So, Solution of given equation is $x = 5$.

Example 5 : Find the solution of the equation : $5b - 45 = 0$

Solution : $5b - 45 = 0$

$\therefore \quad 5b - 45 + 45 = 0 + 45$ (On adding the oppsite (45) of (–45) on both the sides)

$\therefore \quad 5b = 45$

$\therefore \quad 5b \times \frac{1}{5} = 45 \times \frac{1}{5}$ (Multiplying by inverse $\frac{1}{5}$ of 5 on both the sides)

$\therefore \quad b = 9$

Solution : $b = 9$

Example 6 : Solve the following equation : $\frac{x}{5} = 4$

Solution : $\frac{x}{5} = 4$

$\therefore \quad \frac{x}{5} \times 5 = 4 \times 5$ (Multiplying by inverse 5 of $(\frac{1}{5})$ on both the sides)

$\therefore \quad x = 20$

Another method : $\frac{x}{5} = 4$

$\therefore \quad x = 4 \times 5$

$\therefore \quad x = 20$

Solution : $x = 20$

Now, we will solve the equations by short method.

Example 7 : Solve the following equation : $5x + 8 = 28$

Solution : $5x + 8 = 28$

$\therefore \quad 5x = 28 - 8$

$\therefore \quad 5x = 20$

$\therefore \quad x = \frac{20}{5}$

$\therefore \quad x = 4$

Solution : $x = 4$

Example 8 : Solve the following equation : $\frac{9}{2} - x = \frac{7}{2}$

Solution : $\frac{9}{2} - x = \frac{7}{2}$

$\therefore \quad -x = \frac{7}{2} - \frac{9}{2}$

$\therefore \quad -x = \frac{7 \quad 9}{2}$

$\therefore \quad -x = \frac{-2}{2}$

$\therefore \quad -x = -1$

$\therefore \quad -x \times (-1) = (-1) \times (-1)$

$\therefore \quad x = 1$

Solution : $x = 1$

Example 9 : Solve the following equation : $8 - x = 10$

Solution : $8 - x = 10$

$\therefore \quad -x = 10 - 8$

$\therefore \quad -x = 2$

$\therefore \quad (-x)\ (-1) = 2 \times (-1)$

$\therefore \quad x = -2$

Solution : $x = -2$

Practice 1

1. Write the equation for the following statements using the given alternatives :

(1) Addition of x and 4 is 10.

(a) $x - 4 = 10$ (b) $x + 4 = 10$ (c) $x + 10 = 4$ (d) $4 - x = 10$

(2) Subtracting 3 from z gives 8.

(a) $z - 3 = 8$ (b) $z + 8 = 3$ (c) $z + 3 = 8$ (d) $3z = 8$

(3) Four times of m is 20.

(a) $\frac{4}{m} = 20$ (b) $m + 4 = 20$ (c) $4m = 20$ (d) $\frac{m}{4} = 20$

(4) Subtracting 3 from five times of x gives 22.

(a) $3x + 5 = 22$ (b) $\frac{x-3}{5} = 22$ (c) $5x + 3 = 22$ (d) $5x - 3 = 22$

(5) Third part of a is 12.

(a) $3a = 12$ (b) $\frac{a}{3} = 12$ (c) $a - 3 = 12$ (d) $a + 4 = 12$

2. Check whether the equality of the equation is maintained or not, by puting the value of the given variable written next to the equations given below.

(1) $x + 4 = 17$ $(x = 2)$ (2) $5m + 5 = 20$ $(m = -3)$

(3) $5m + 5 = 20$ $(m = 3)$ (4) $4y - 3 = 17$ (y = 2)

(5) $4y - 3 = 17$ $(y = 5)$

3. Find out which alternative among the given three is the solution for each given equation :

(1) $x + 5 = 0$	(a) $x = (-5)$	(b) $x = 0$	(c) $x = 5$
(2) $y - 3 = 2$	(a) $y = 2$	(b) $y = 1$	(c) $y = 5$
(3) $6m = 30$	(a) $m = 0$	(b) $m = 5$	(c) $m = \frac{1}{5}$
(4) $\frac{z}{8} = 3$	(a) $z = -24$	(b) $z = 0$	(c) $z = 24$

4. Solve the following equations :

(1) $x + 8 = 8$ (2) $a - 7 = 3$ (3) $3x - 10 = 2$

(4) $z - 9 = 0$ (5) $y + 5 = (-3)$ (6) $4x - 12 = 0$

(7) $5a - 5 = -5$ (8) $2 + 3b = 5$ (9) $4n - 5 = (-9)$

(10) $5x + 7 = 22$ (11) $2x - 8 = 16$ (12) $5p - 4 = (-24)$

*

❖ Practical Puzzles :

To solve a problem, generally we assume that the quantity which is to be found is an unknown (variables). This gives us an equation. Then the equation is to be solved.

Let's try to learn forming an equation from the given puzzle.

Example 10 : The age of Ramesh's father is two years more than three times the age of Ramesh. If the age of Ramesh's father is 35, form the equation to find the age of Ramesh.

Solution : We do not know the age of Ramesh.

Suppose, the age of Ramesh is x years.

Three times the age of Ramesh is $3x$.

The age of Ramesh's father is two years more than three times the age of Ramesh $(3x)$, therefore the age of Ramesh's father is $(3x + 2)$ years. Moreover the age of Ramesh's father is 35 years.

$\therefore \quad 3x + 2 = 35$

Solving this equation, we will get x which is the age of Ramesh.

Example 11 : Manish has three times more marble than Mehul. If both have got the total of 35 marbles, make the equation to find how many marbles each has got.

Solution : Here, we do not know how many marbles are with Manish and Mehul. (In this situation, it is easier if the value of the smaller value is supposed).

Suppose, Mehul has x marbles.

$\therefore$ Manish has three times more marbles than Mehul i.e. $3x$

Manish and Mehul has $x + 3x$ marbles.

Moreover both has total 35 marbles

$\therefore \quad x + 3x = 36$

$\therefore \quad 4x = 36$

Example 12 : Anjali has some pencils, Yasmina has two pencils more than Anjali. Ashok has one pencil more than Yasmina. If the total of all the pencils is 11, prepare an equation to find out the number of pencil each one owns.

Solution : Suppose, Anjali has 'x' pencils.

Yasmina has 2 more than x i.e. $x + 2$ pencils.

Ashok has 1 pencil more than what Yasmina has (i.e. $x + 2$)

This means $x + 2 + 1 = x + 3$ pencils.

Therefore, all three have $x + (x + 2) + (x + 3)$ pencils.

Moreover, all the three have 11 pencils.

$\therefore \quad x + (x + 2) + (x + 3) = 11$

$\therefore \quad x + x + 2 + x + 3 = 11$

$\therefore \quad 3x + 5 = 11$

Example 13 : Write statements with the help of equations : (Use the details given in the brackets.)

(1) $2x + 3 = 43$ (years) **(2)** $4x - 7 = 13$ (kg) **(3)** $8m + 5 = 101$ (₹)

Solution : (1) $2x + 3 = 43$ (years)

The age of Mahesh's father is 3 years more than twice of age of Mahesh.

The age of Mahesh's father is 43 years.

(2) $4x - 7 = 13$ (kg)

A trader has some kilograms of apples. If 7 kg apples out of four times the weight of the apple are sold of, 13 kg apples are left out.

(3) $8m + 5 = 101$ (₹)

Rahil has some amount of rupees. If ₹ 5 is added to the eight times of Rahil's amount, the amount would be ₹ 101.

Example 14 : The sum of the present age of Jenifer and her age 5 years later is 35 years. Then find her present age.

Solution : Here, the present age of Jenifer is to be found.

Suppose, the present age of Jenifer is 'x' years.

therefore, her age, five years later will be $x + 5$ years.

The total of her present age and the age five years later is $x + (x + 5)$, which is given 35 years.

$\therefore \quad x + (x + 5) = 35$

$\therefore \quad x + x + 5 = 35$

$\therefore \quad 2x + 5 = 35$

$\therefore \quad 2x = 35 - 5$

$\therefore \quad 2x = 30$

$\therefore \quad x = \frac{30}{2}$

$\therefore \quad x = 15$

$\therefore$ The present age of Jenifer is 15 years.

Example 15 : Salma is 3 years younger than Hetvi. If the sum of their present age is 27 years, find their present ages.

Solution : Suppose, the present age of Hetvi is 'y'.

Salma is 3 years yonger than Hetvi therefore the present age of Salma is $(y - 3)$ years. The sum of their present age is $y + (y - 3)$, which is 27 years.

$\therefore \quad y + (y - 3) = 27$

$\therefore \quad y + y - 3 = 27$

$\therefore \quad 2y - 3 = 27$

$\therefore \quad 2y = 27 + 3$

$\therefore \quad 2y = 30$

$\therefore \quad y = \frac{30}{2}$

$\therefore \quad y = 15$

$\therefore$ The present age of Hetvi is 15 years.

Therefore. the present age of Salma is $y - 3 = 15 - 3 = 12$ years.

$\therefore$ The present age of Hetvi is 15 yers and present age of Salma is 12 years.

Example 16 : Vanita bought pens worth some rupees. She bought notebooks worth three times more the worth of pens. For this she paid ₹ 80 to Shopkeeper. Find out how much amount she had spent for notebooks and pens ?

Solution : Suppose, Vanita bought pens worth 'x' rupees.

The amount of the notebooks, she bought is '$3x$' rupees.

The total amount of both pens and notebooks $(x + 3x)$ rupees is given ₹ 80.

$\therefore \quad x + 3x = 80$

$\therefore \quad 4x = 80$

$\therefore \quad x = \frac{80}{4}$

$\therefore \quad x = 20$

$\therefore$ She must have bought pens worth ₹ 20.

She must have bought notebooks worth ₹ $3x = 3\ (20) =$ ₹ 60.

Example 17 : Some quintals of wheat and some quintals of bajri are cultivated from the field of Lalbhai. The yield of bajri is 5 quintal less than double the yield of wheat. If the total yield of both, wheat and bajri is 115 quintal, find the individual yield of wheat and bajri.

Solution : Suppose, the yield of wheat is x quintals.

$\therefore$ Cultivation of bajri is 5 quintal less than double the yield of wheat i.e. $(2x - 5)$

Total yield of both, wheat and bajri $(x + (2x - 5))$ is 115 quintals.

$\therefore \quad x + (2x - 5) = 115$

$\therefore \quad x + 2x - 5 = 115$

$\therefore \quad 3x - 5 = 115$

$\therefore \quad 3x = 115 + 5$

$\therefore \quad 3x = 120$

$\therefore \quad x = \frac{120}{3}$

$\therefore \quad x = 40$

$\therefore$ The yield of wheat is 40 quintals.

$2x - 5 = 2(40) - 5$

$= 80 - 5$

$= 75$

$\therefore$ The yield of bajri must be 75 quintals.

Example 18 : If the sum of two consecutive numbers is 43, find these two numbers.

Solution : Suppose, the first number is x.

$\therefore$ The second consecutive number is $x + 1$

The total of these consecutive number $x + (x + 1)$ is 43

$\therefore$ $x + (x + 1) = 43$

$\therefore$ $2x + 1 = 43$

$\therefore$ $2x = 43 - 1$

$\therefore$ $2x = 42$

$\therefore$ $x = \frac{42}{2}$

$\therefore$ $x = 21$

Therefore. the first number is 21.

and the second consecutive number $x + 1 = 21 + 1 = 22$

First number = 21, second number = 22.

Practice 2

1. Prepare equation for the given situation :

(1) A Shopkeeper sells one big and one small type of boxes of orange. In the bigger box, there are 5 oranges more than that in smaller boxes. If there are 75 oranges in the bigger box. Prepare the equation to find the number of oranges in the smaller box. (Suppose 'a' is the number of oranges in the smaller box).

(2) Yash and Kirti has a certain number of tamarind seeds. Yash has 2 seeds less than that of Kirti. If yash has 28 seeds, prepare the equation to find, the number of seeds Kirti has. (Suppose 'm' is the number of seeds Kirti has).

(3) The age of Sonal's father is two years more than three times her age. If the age of Sonal's father is 47 years, prepare the equation to find out the age of Sonal.

(4) The weight of Raju is 5 kg less than double the weight of Vinod. If the total weight of both is 40 kg, prepare the equation to find out the weight of each one.

(5) A trader has two types of cloth, cotton and silk. Cotton cloth is 7 metre less than three times the silk. If he has 193 metres total cloth. Prepare the equation to find out the length of each type of cloth.

2. Make statements using the following equations :

(1) $7x - 2 = 348$ (₹)

(2) $4x + 11 = 291$ (Metre)

(3) $3p + 4 = 40$ (Kg)

(4) $p + 4 = 15$ (Years)

3. Solve the following puzzles using equations :

(1) The sum of the present age of Vaishali and her age 5 years later is 27 years, then find her present age.

(2) The total cost of one chair and one table is ₹ 900. If the cost of the table is double them the cost of chair, find the cost of both.

(3) The age of father is two years less than three times the age of his son. If the sum of their ages is 54 years, find the age of both.

(4) The weight of Ramesh is 10 kg less than three times the weight of Jayram. If the total weight of both is 70 kg, find the weight of each one of them.

(5) Nimesh has certain number of marbles. Mahesh has double number of marbles than Nimesh. Vishal has three marbles less than what Mahesh has. If total marbles are 122 then, how many marbles does each have ?

4. Draw a design in the given space and fill it with your favourite colours. You have to use the shapes like squares, rectangle, triangles and circles. Take one square more than the number of triangles. Take one rectangle more than the number of squares. Take one circle more than the number of rectangles. Use in total 10 shapes.

Exercise

1. Write the following statements in the form of equations :

(1) Adding 4 to the fourth part of x is 5.

(2) Subtracting 7 from the double of y is 19.

(3) Subtracting a certain number from 16, the result is 20.

(4) Subtracting three times of a from the double of 8 is 13.

(5) The sum of two consecutive number is 29.

2. Write whether the following symbolic representation are equations or not :

(1) $m + 3 > 9$ (2) $2x + 5 = (-3)$ (3) $3z + 4 < 9$

(4) $3n = 36$ (5) $7p + 4 = 12$ (6) $4b - 3 = 21$

3. Check which of the following equations has '2' as solution :

(1) $x - 4 = (-2)$ (2) $2x - 3 = 5$ (3) $3x - 6 = 0$

(4) $a + 3 = 5$ (5) $6 - m = 10$ (6) $-2b + 1 = (-3)$

(7) $14x = 28$ (8) $6y - 1 = 11$ (9) $5y + 4 = 20$

4. Solve the following equations :

(1) $3 + m = 8$ (2) $2x - 10 = 4$ (3) $3n - 12 = 0$

(4) $3x + 7 = 40$ (5) $3x - 8 = 31$ (6) $17 - 2y = 35$

(7) $3 + 2z = 7$ (8) $36 - 5p = 26$ (9) $x + 12 = (-7)$

5. Solve the following puzzles using the equations :

(1) The length of a rectangle is 10 cm. If the perimeter is 34 cm, find the breadth.

(2) Sahil has ₹ 12 less than three times what Sohan has. If both have a total of ₹ 88, how many rupees each must have got ?

(3) The present age of Beena is 2 years more than Reeta. The present age of Teena is 3 years more than Beena. If the sum of the ages of Reeta, Beena, and Teena is 79 years, find the present age of all the three of them.

(4) The weight of Rahul is 5 kg more than Sachin. The weight of Samir is 12 kg less than double the weight of Sachin. If the total weight of all the three is 93, find the weight of each one of them.

(5) In a village, the number of women is 89 more than the number of men. The number of children is 400 more than the number of men. If the total population of the village is 4989, find the number of men, women and children.

(6) Priyanshi has 5 chocolates less than Dhruv. If both have 15 chocolates, find the number of chocolates each has ?

(7) Find the solution of the puzzles given in Question 1 (1) to (5) in practice 2.

Answers

Practice 1

1. (1) b (2) a (3) c (4) d (5) b

2. (1) No (2) No (3) Yes (4) No (5) Yes

3. (1) a (2) c (3) b (4) c

4. (1) 0 (2) 10 (3) 4 (4) 9 (5) (– 8) (6) 3
(7) 0 (8) 1 (9) (– 1) (10) 3 (11) 12 (12) (– 4)

Practice 2

1. (1) $7a + 5 = 75$ (2) $5m - 2 = 28$ (3) $3y + 2 = 47$
(4) $3x - 5 = 40$ (5) $4y - 7 = 193$

3. (1) 11 years (2) table ₹ 600, chair ₹ 300
(3) Son 14 years, Father 40 years
(4) Jayram 20 kg, Ramesh 50 kg
(5) Nimesh 25 marbles, Mahesh 50 marbles, Vishal 47 marbles

Exercise

1. (1) $\frac{x}{4} + 4 = 5$ (2) $2y - 7 = 19$ (3) $16 - x = 20$ (4) $16 - 3a = 13$
(5) $x + (x + 1) = 29$

2. (1) No (2) Yes (3) No (4) Yes (5) Yes (6) Yes

3. Solution : (1), (3), (4), (6), (7), (8)

4. (1) 5 (2) 7 (3) 4 (4) 11 (5) 13 (6) (–9) (7) 2 (8) 2 (9) (–19)

5. (1) 7cm (2) Sohan ₹ 25, Sahil ₹ 63.
(3) Rita 24 years, Beena 26 years, Tina 29 years.
(4) Sachin 25 kg, Rahul 30 kg, Samir 38 kg.
(5) Men 1500, Women 1589, Children 1900.
(6) Priyanshi 5 chocolates, Dhruv 10 chocolates.

6. (1) 10 (2) 6 tamarind seeds (3) 15 years (4) Vinod 15 kg, Raju 25 kg,
(5) Silk 50 meter, Cotton 143 meter

5 Volume

- **Activity 1 :**

The objects shown in the above picture/chart can be found around you. Get them and other such things and measure their length and breadth and fill table given below :

Sr.	Name of an object	Length	Breadth	Area
1.	Match-box	4 cm	2 cm	8 sq cm

The above measured area is only for one surface. But if we want to know how much things can be put in a box, how can it be found out ? Let's play a game.

- Take one match-box. Fill it completely with sand. Now take a glass. Empty the sand of the match-box in the glass. How many such match-boxes of sand can be emptied in the glass ?

It can be said that the amount of sand completely filled in the glass is the volume of the glass. The number of match-boxes used to fill the glass completely with sand, the space occupied by number of match-boxes is considered to be the volume of the glass. Now perform the following activity.

- **Activity 2 :**

Take a big box to fill match-boxes. In that box, see how many match-boxes are kept. The space occupied by the number of match-boxes in this box is the volume of the box. This box is like a cuboid. It has length, breadth and height.

- **Activity 3 :**

Now draw the following figure on a chart-paper and cut it from the outline. Now fold it from the dotted lines. Now with the help of a cello-tape prepare a box open from one side.

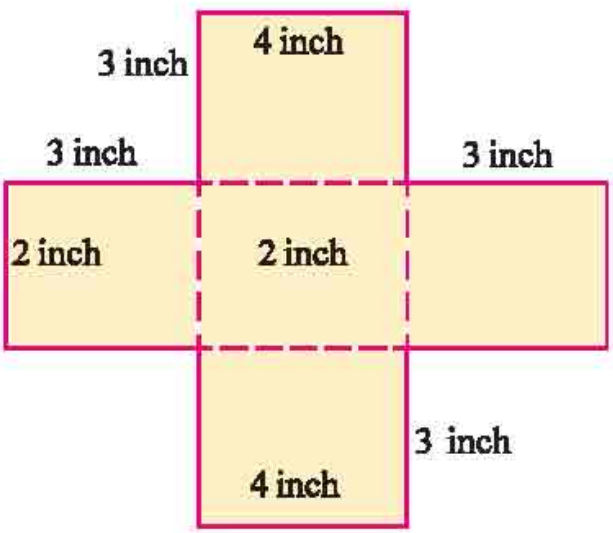


Figure No. 1

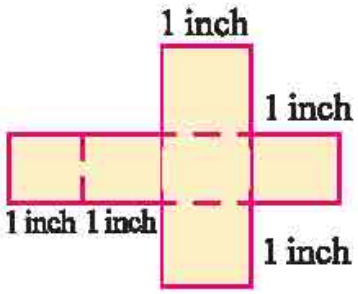


Figure No. 2

As shown above in figure 2 make a cube from a chart paper with length, breadth and height 1 inch.

Now, arrange these cubes as many as possible in the big box that you have made and answer the given questions.

(1) How many cubes can be arranged ?

(2) How many cubes will be at the base ?

(3) How many layers of cubes can be seen ?

• On putting 24 cubes in the box it becomes completely filled.	• At the base [in length 4 and in breadth 2] 8 cubes are arranged [4 × 2 = 8] Total 3 layers of 8 cubes. It means 8 × 3 = 24	• Now, we can say that cubes arranged in length × cubes arranged in breadth × cubes arranged in height = Total number of cubes means length × breadth × height = 4 × 2 × 3 = 24 So, volume of the box is equal to 24 cubes.

So, we can say that

Volume of a cube = length × breadth × height

= length × length × length

= length^3

Volume of cuboid = length × breadth × height = $l \times b \times h = lbh$

Volume of cube = $\text{length}^3 = l^3$

- **Relation among units of Volume :**
  - If measure of a cube or cuboid is given in the unit of cm, the unit of volume is cubic cm.
  - If measure of a cube or cuboid is given in the unit of meter, the unit of volume is cubic metre.
  - Volume of a cube having 1 cm length is 1 cubic centimetre. In the same way, volume of a cube having 1 meter length is 1 cubic metre.

Volume of a cube having

1 metre length $= (\text{length})^3$

$= (1 \text{ metre})^3$

$= 1 \text{ metre} \times 1 \text{ metre} \times 1 \text{ metre}$

$= 100 \text{ cm} \times 100 \text{ cm} \times 100 \text{ cm}$

$= 10,00,000$ cubic cm

OR

$= (1 \text{ metre})^3$

$= (100 \text{ cm})^3$

$= 100^3 \times \text{cm}^3$

$= 10,00,000$ cubic cm

$\therefore$ 1 cubic metre = 10,00,000 cubic cm

- **Activity 4 :**

Collect objects in the shape of cube or cuboid found arround you. Measure the length, breadth and height and write in the following table :

Sr. No.	Name of an object	length	breadth	height	(length × breadth × height) Volume

Example 1 : Lenght of a cube is 16 cm, find volume.

Solution : Volume of a cube $= l^3$

$= (16 \text{ cm})^3$

$= 16 \text{ cm} \times 16 \text{ cm} \times 16 \text{ cm}$

$= 4096$ cubic cm

$\therefore$ Volume of a cube = 4096 cubic cm

Example 2 : The length, breadth and height of a cuboid are 4m, 3m and 3m respectively, find the volume of a cuboid.

Solution : Volume of a cuboid $= l \times b \times h$

$= 4\text{m} \times 3\text{m} \times 3\text{m}$

$= 36\ \text{m}^3$ (cubic metre)

∴ volume of a cuboid = 36 cubic metre

Example 3 : The length of a tank is 6m, breadth is 2 m and height is 4 m. Find the volume of a tank.

Solution : length of a tank $l = 6$ m

breadth of a tank $b = 2$ m

height of a tank $h = 4$ m

volume of a tank $= l \times b \times h$

$= 6$ metre $\times 2$ metre $\times 4$ metre

$= 48$ cubic metre

∴ Volume of a tank = 48 cubic metre

(1) The length of a cube is 20 cm, find its volume.

(2) Find the volume of a box having measure 2 metre × 3 metre × 1 metre.

(3) Find the volume of a cuboid having length 12 cm.

(4) The length, breadth and height of a cuboid is 10 cm, 8 m and 6 m respectively, find the volume.

(5) The length of one side of a stone in the shape of cube is 40 cm, what is the volume of this stone ?

(6) The measurement of a brick is 24 cm × 10 cm × 8 cm, find the volume of a brick.

(7) The measurement of a compass-box is 16 cm × 4 cm × 2 cm, find the volume of a compass-box.

(8) The length, breadth and height of a tank is 3m, 2m and 6m respectively, what is the volume of a tank ?

Before solving the practical puzzles of cubes and cuboids, let's understand the relationship between the units of volume and units of measureing liquid.

- **Activity 5 :**

- Measure the length, breadth and height of the cubical container given to you. Based on the measurement, find its volume.

- Now, fill the cubical container with water using a 100 ml measuring device. How much times it was used to fill water in the container ? How much ml. of water was needed ?

- Now compare the volume of the container, you have found out and how many ml. water was filled into it.

- In a cubical container with 1000 cubic cm volume, 1000 ml water can be contained.

Therefore, 1000 cu cm = 1000 ml

$\therefore$ 1 cu cm = 1 millilitre

Earlier, we have seen that,

1 cu meter = 10,00,000 cu cm

$\therefore$ 1 cu m = 10,00,000 ml ($\because$ 1 cu cm = 1 ml)

$\therefore$ 1 cu m = 1000 litre ($\because$ 1000 ml = 1 litre)

$\therefore$ 1 cu m = 1 kilolitre ($\because$ 1000 litre = 1 kilolitre)

- 1 cu cm = 1 ml.
- 1000 cu cm = 1000 ml = 1 litre
- 1 cu m = 1 kilolitre
- 1 cu m = 1000 litre
- 1 kilolitre = 1000 litre
- 1 cu m = 10,00,000 cu cm

Example 4 : A water-tank is 6 m in length, 3 m in breadth and 4m in height. How much mililitre water can be stored in it ?

Solution : Length of a tank $l = 6$ m

Breadth of a tank $b = 3$ m

Height of a tank $h = 4$ m

Volume of a cuboidal tank $= l \times b \times h$

$= 6 \text{ m} \times 3 \text{ m} \times 4 \text{ m}$

$= 72$ cu metre

Volume of a cuboidal tank $= 72$ cu metre

1 cu m = 1000 litre

$\therefore$ 72 cu m = (72 × 1000) litre

= 72000 litre

$\therefore$ In the water tank, 72,000 litre water can be stored.

Example 5 : In the company making mineral water, there is a cuboidal tank. 10 m long, 6 m wide and 4 m high. This tank is completely filled with mineral water. How much water will be there in this tank ? How many bottles of 1 litre capacity can be filled with this water ?

Solution : Length of a tank $l = 10$ m

Breadth of a tank $b = 6$ m

Height of a tank $h = 4$ m

Volume of a cuboidal tank $= l \times b \times h$

$= 10 \text{ m} \times 6 \text{ m} \times 4 \text{ m}$

$= 240$ cu metre

Volume of a cuboidal tank $= 240$ cu metre

1 cu m = 1000 litre

$\therefore$ 240 cu m = (240 × 1000) litre

= 2,40,000 litre

No. of bottles filled by 1 litre of water = 1

∴ No. of bottles filled by 2,40,000 litres of water $= \frac{240000}{1}$

$= 2,40,000$

∴ 2,40,000 bottles can be filled

Example 6 : A cubical box is 1 m in length. In it, cubical boxes of chalks of 20 cm length are arranged. How many such boxes could be arranged ?

Solution : Length of cubical box = 1m

Volume of cubical box $= l^3$

$= (1)^3$

$= 1 \times 1 \times 1$

$= 1$ cu m

∴ Volume of cubical box = 1 cu m

1 cu m = 10,00,000 cu cm

Now length of chalkbox (l) = 20 cm

Volume of chalkbox $= l^3$

$= (20)^3$

$= 20 \times 20 \times 20$

$= 8000$ cu.cm.

∴ Volume of chalk-box = 8000 cu.cm.

Number of chalk-box arranged in space of 8000 cu.cm. = 1

∴ Number of chalk-box arranged in space of 10,00,000 cu.cm. $= \left(\frac{1000000}{8000}\right)$

= 125 chalk-box

∴ In the box, 125 chalk-boxes could be arranged.

Example 7 : Hansaben asks a labourer to digout a cesspit measuring 3m in length, 1 m wide and 5m deep. If the labour charge is ₹ 30 per 1 cubic meter, how much should Hansaben pay to the labourer ?

Solution : Length of cess-pit $l = 3$ m

Breadth of cess-pit $b = 1$ m

Height $h = 5$ m

Volume of cess-pit $= l \times b \times h$

$= 3 \times 1 \times 5 = 15$ cu m

$\therefore$ Volume of cess-pit = 15 cu m

The soil dug out from the cesspit is 15 cu m

Labour charge for 1 cu m = ₹ 30

$\therefore$ Labour charge for 15 cu m = (15 × 30) = ₹ 450

$\therefore$ Hansaben should pay ₹ 450 as labour charge

Example 8 : A water-tank measures 4m in length, 2 m in breadth and 50 cm in height. How many maximum litres of water can be filled in the tank ?

Solution :

Method 1 :

Length of water tank = 4 m

Breadth = 2 m

Height = 50 cm = $\frac{50}{100}$ m

Volume of water-tank $= l \times b \times h$

$= 4 \times 2 \times \frac{50}{100}$

$= 4$ cu m

$\therefore$ Volume of water-tank = 4 cu m

1 cu m = 1000 litre

4 cu m = (4 × 1000) litre

= 4000 litre

$\therefore$ Maximum 4000 litres of water can be stored in a tank

Method 2 :

Length of water tank = 4 m = 400 cm

Breadth = 2 m = 200 cm

Height = 50 cm

Volume of water tank $= l \times b \times h$

$= 400 \times 200 \times 50$

= 40,00,000 cu cm

$\therefore$ Volume of water tank = 40,00,000 cu cm

1000 cu cm = 1 litre

40,00,000 cu cm = $\frac{4000000}{1000}$

= 4000 litre

(1) A box measures 80 cm in length, 60 cm in breadth and 40 cm in height. How many cubical boxes of 20 cm length can be arranged in it ?

(2) How many bricks measuring 25 cm × 10 cm × 8 cm can be made from the earth dug out from a cubical pit measuring 2 m in length ?

(3) A tank measuring 3 m × 2 m × 2 m was made to store water in Gattu's bunglow. In this tank, how many litres of water can be stored ?

(4) A box measuring 51 cm × 36 cm × 18 cm. In this box, how many compass-boxes measuring 17 cm in length, 9 cm in width and 2 cm in height can be arranged ?

(5) A Kerosene trader has got an iron tank measuring 1 cm × 80 cm × 60 cm. If this tank is filled with Kerosene, how many litres of Kerosene would it contain ?

1. Fill in the blanks given below :

(1) 1 kilolitre = _____ litre

(2) 1000 cu cm = _____ mililitre

(3) 1 cu m = _____ litre

(4) 1 cu cm = _____ mililitre

(5) 1 litre = _____ cu cm

(6) 4 cu m = _____ cu cm

(7) 8 liter = _____ cu cm

(8) 1 cu m = _____ kilolitre

(9) Formula to find volume of a cube is _____ .

(10) Formula to find volume of cuboid is _____ .

2. Fill up the table given below :

Sr. No.	Length	Breadth	Height	Volume
(1)	15 cm	15 cm	15 cm	
(2)	20 cm	15 cm	10 cm	
(3)				1000 cu. m.
(4)	35 cm	15 cm	8 cm	
(5)	9 m	9 m	9 m	

3. If a cuboidal tank is 20 m in length, 1 m in breadth and 2 m in height, find the volume of the tank.

4. A cement block is 30 cm long, 23 cm wide and 10 cm high. Find the volume of this block.

5. The sea water gets filled up in the salt pan 30 m long, 10 m wide and 10 cm deep. How many litres of sea water is filled in this salt-pan ?

6. If a cubical tank is 3 m in length, how many litres of water can be stored in it ?

7. In a cuboidal box 30 cm × 20 cm × 10 cm, how many cubes of 5 cm length each can be arranged ?

8. A cuboidal shaped milk-tank measures 2 m × 50 cm × 40 cm. This tank is completely filled with milk. How many 200 ml milk packets can be filled with this milk ?

9. A box for putting medicines is 48 cm long, 30 cm wide and 20 cm high. In this box, how many boxes of 15 cm length, 6 cm breath and 4 cm height can be arranged ?

Answers

Practice 1

1. 8000 cm^3 **2.** 6 m^3 **3.** 1728 cm^3 **4.** 480 m^3

5. 64,000 cm^3 **6.** 1920 cm^3 **7.** 128 cm^3 **8.** 36 m^3

Practice 2

1. 24 boxes **2.** 4000 bricks **3.** 12000 litre **4.** 108 compass-boxes

5. 480 litre

Exercise 1

1. (1) 1000 (2) 1000 (3) 1000

(4) 1 (5) 1000 (6) 40,00,000

(7) 8000 (8) 1 (9) l^3

(10) $(l \times b \times h)$

2. (1) 3375 cm^3 (2) 3000 cm^3

(4) 4200 cm^3 (5) 729 cm^3

3. 600 m^3 **4.** 8280 cm^3 **5.** 30,000 litre **6.** 27000 litre

7. 48 cubes **8.** 2000 bags **9.** 75 boxes.

6 Construction of Triangle

❖ **Let us remember :**

(1) Construct $\overline{AB}$, where AB = 5 cm

(2) Construct $\overline{XY}$, where XY = 3 cm

(3) Construct ∠PQR, where $m\angle PQR = 110°$

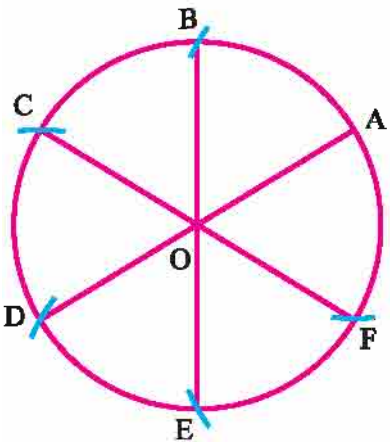
(4) Construct ∠DEF, where $m\angle DEF = 50°$

(5) Construct ∠XYZ , where $m\angle XYZ = 90°$

(6) Draw a circle of radius 4 cm using compass.

● **Activity 1 :**

- Draw a circle of radius 3.5 cm with centre O.
- Take a point A on the circle.
- Taking A as a centre and without changing the radius draw an arc, which intersect the circle. Name that point of intersection as B.
- Now, taking B as a centre without changing the radius draw an arc on the circle in the opposite side of A. Name the point of intersection of the arc and circle as point C. By the same way mark points D, E and F on the circle. Check that point F is at a distance of radius from point A.
- Draw $\overline{OA}$, $\overline{OB}$, $\overline{OC}$, $\overline{OD}$, $\overline{OE}$ and $\overline{OF}$.
- Measure angles ∠AOB , ∠BOC, ∠COD, ∠DOE, ∠EOF. and ∠FOA.

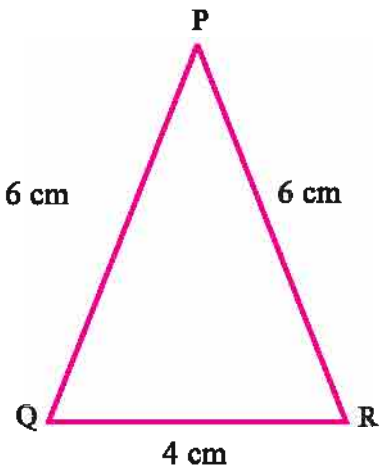


❖ Let us learn something new :

● Construction of a triangle when all three sides are given :

Construct ΔPQR in which PQ = 6 cm, QR = 4 cm and PR = 6 cm

Rough figure :

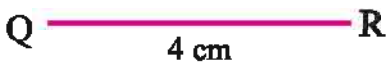


Step 1 :

Draw $\overline{QR}$ of length 4 cm

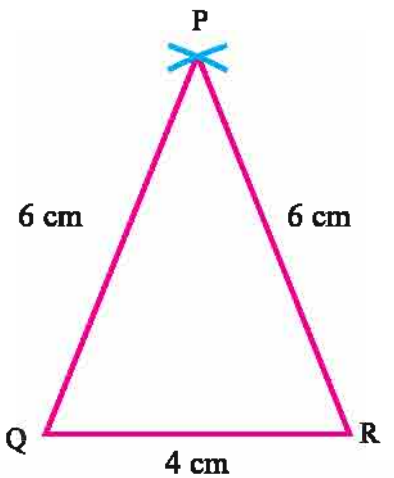
Step 2 :

Draw the arc of the circle with centre Q and radius 6 cm.



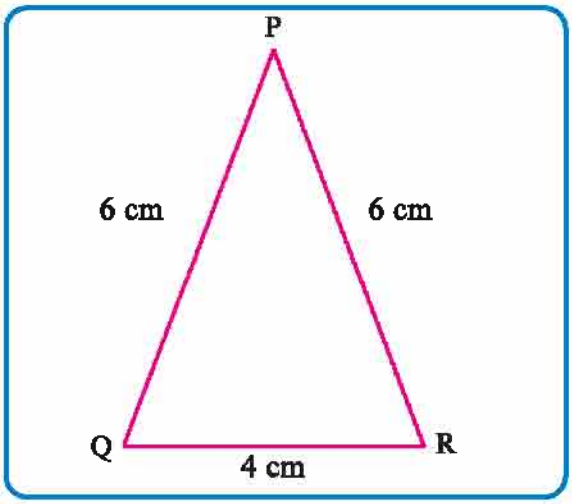
Step 3 :

Draw the arc of the circle with centre R and radius 6 cm. This arc will intersect the arc of the circle with centre Q. Name the point of intersection as P.



Step 4 :

Draw $\overline{PQ}$ and $\overline{PR}$



Δ PQR is the required triangle.

Note : Δ PQR is constructed after 4 steps. Steps 1 to 3 are given to understanding of construction of a triangle. It is not necessary to mention them separately at every time.

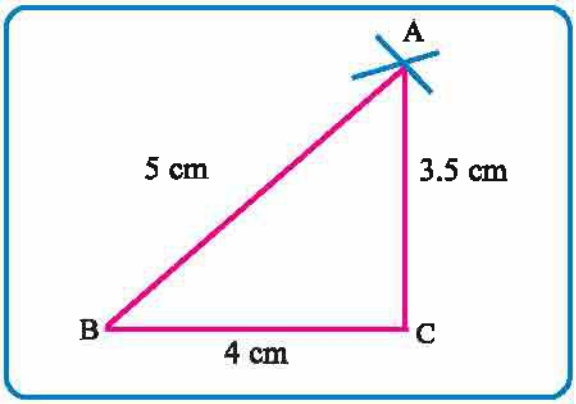
Example 1 : Construct Δ ABC with BC = 4 cm, AB = 5 cm and AC = 3.5 cm.

Method : (1) Draw $\overline{BC}$ of length 4cm.

(2) Draw the arc of the circle with centre B and radius 5 cm.

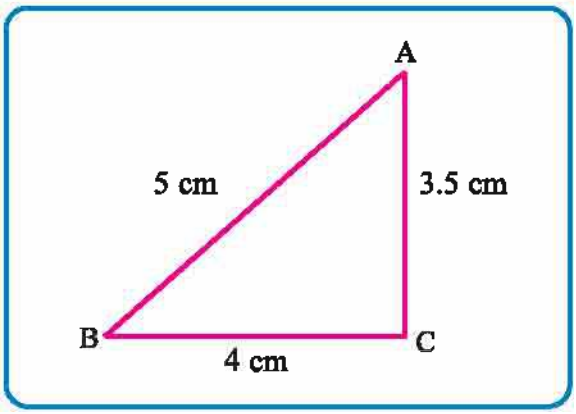
(3) Draw the arc of a circle with centre C and radius 3.5 cm. This arc will intersect the arc of the circle with centre B. Name point of intersection as A.

(4) Draw $\overline{AB}$ and $\overline{AC}$.



Δ ABC of required measure is constructed.

Note : It is not necessary to write the method of construction.



Practice 1

1. Construct ΔABC with AB = 3 cm, BC = 4 cm and AC = 5 cm.
2. Construct ΔXYZ with XY = 4 cm, YZ = 6 cm and XZ = 3 cm.

3. Construct ΔPQR with PQ = 4 cm, QR = 7 cm and PR = 8 cm.
4. Construct ΔDEF with EF = 4.5 cm, DE = 5 cm and DF = 3 cm.
5. Construct ΔUVW with UV = 6 cm, VW = 6 cm and UW = 6 cm.

- **Activity 2 :**
  - Construct a triangle with measure of sides 3 cm, 4 cm and 5 cm.
- **Activity 3 :**
  - Construct a triangle with measure of sides 3 cm, 6 cm and 2 cm.
  - Draw a line-segment of measure 6 cm.
  - Taking B as a centre draw a circle of radius 3 cm.
  - Taking C as a centre draw a circle of radius 2 cm.
  - Do the circles intersect eachother ?

- Sum of the measures of two sides of a triangle is more than the measure of its third side.

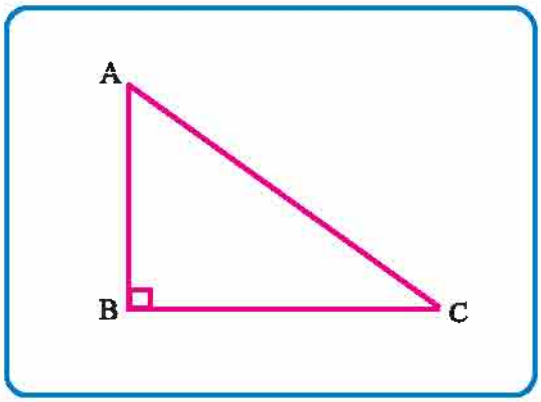
- **Activity 4 :**

Write measure of one of the side of triangle and ask your friend to write the measure of remaining two sides of the triangle in the table given below. Is the triangle constructed ? Yes or No, if No, then write the reason of it. If Yes, then construct the triangle in your notebook.

Sr. No.	Measure of one side of triangle	Measure of second side of triangle	Measure of third side of triangle	Is Δ constructed ? Yes / No	Reason
(1)					
(2)					
(3)					
(4)					

❖ Construction of a right triangle when its hypotenuse and one side are given :

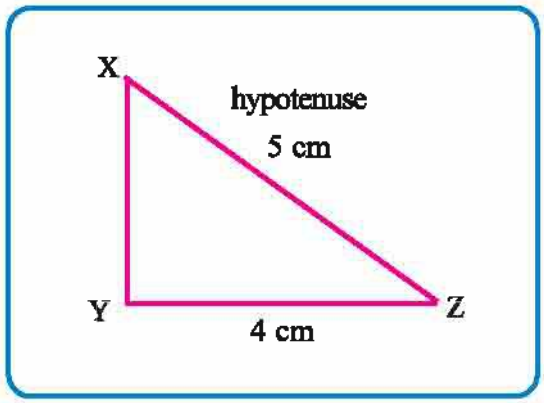
● See and understand :



- ∠B is a right angle in ΔABC, hence ΔABC is a right triangle.
- In a right triangle, the opposite side of the right angle is called hypotenuse.
- If ∠B is right angle, then $\overline{AC}$ is called hypotenuse.
- $\overline{AB}$ and $\overline{BC}$ are called sides of right triangle.

Construct the right triangle ΔXYZ with hypotenuse XZ = 5 cm and YZ = 4 cm.

Rough figure :

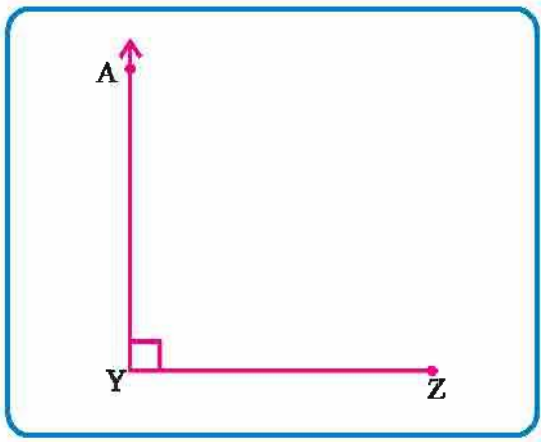


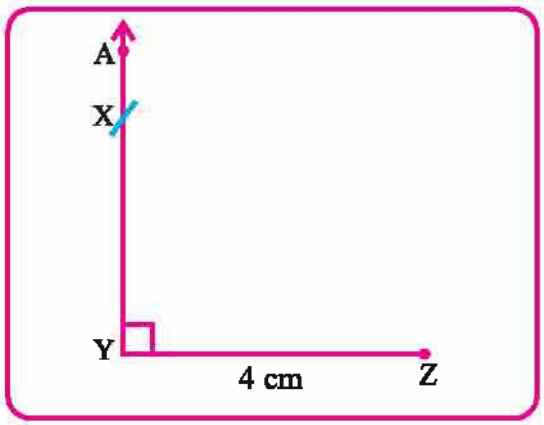
Step 1 :

Construct $\overline{YZ}$ of length 4 cm.

Step 2 :

Construct $\overrightarrow{YA}$ using either set square or protractor.



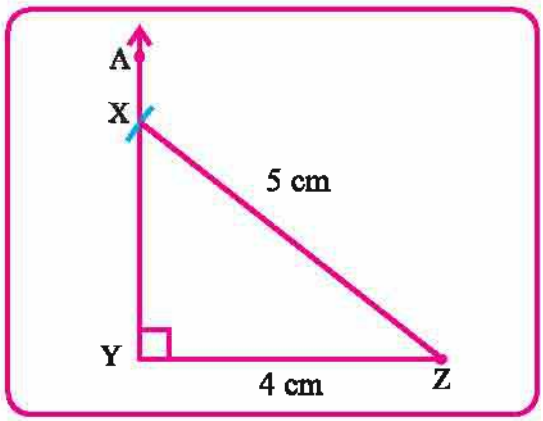


Step 3 :

Construct the arc of the circle with centre Z and radius 5cm. Name the point of intersection of this arc and $\overrightarrow{YA}$ as X.

Step 4 : Construct $\overline{XZ}$.

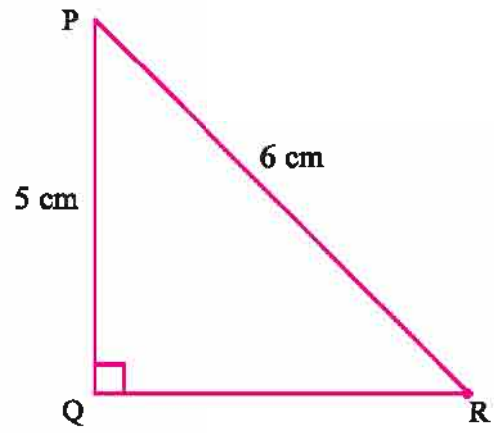
Thus ΔXYZ is the required right angled triangle.

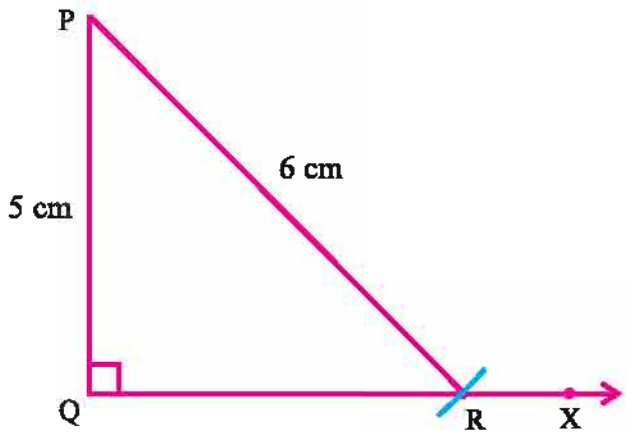


Note : Right triangle is constructed after completing 4 steps. Steps 1 to 3 are for understanding the construction of the triangle. It is not necessary to mention them separately at every time.

Example 2 : Construct a right angled triangle PQR with hypotenuse PR = 6 cm and PQ = 5cm.

Rough figure :





Method : (1) Construct $\overline{PQ}$ of length 5 cm.

(2) Construct $\overrightarrow{QX}$ using either setsquare or Protractor.

(3) Construct the arc of the circle with centre P and radius 6 cm. Name the point of intersection of this arc and $\overrightarrow{QX}$ as point R.

(4) Construct $\overline{PR}$

Thus, ΔPQR is the required right angled triangle.

1. Construct a right angled triangle ABC with hypotenuse BC = 8 cm and AB = 6 cm.
2. Construct a right angled triangle XYZ with XY = 4.5 cm and hypotenuse YZ = 6 cm.
3. Construct a right angled triangle PQR with hypotenuse PQ = 9 cm and RQ = 5 cm.
4. Construct a right angled triangle with measure of hypotenuse and one of the sides by asking your friend.

1. Construct Δ XYZ with YZ = 5 cm, XY = 4 cm and XY = 7 cm.
2. Construct Δ DEF with DE = 4 cm, EF = 5.5 cm and DF = 5 cm.
3. Construct a right angled triangle PQR with $m\angle Q = 90°$, hypotenuse PR = 7 cm and QR = 5 cm.
4. Construct a right angled triangle with hypotenuse YZ = 5 cm and XZ = 3 cm.
5. Construct Δ ABC with AB = 5 cm, BC = 5 cm and AC = 5 cm.
6. Construct Δ XYZ with YZ = 7 cm, XY = 5.5 cm and XZ = 5.5 cm.
7. Construct a right angled triangle with $m\angle Q = 90°$ hypotenuse PR = 13 cm and QR = 12 cm.

Revision : 2

1. Fill in the blanks :

(1) $[(-3)^2]^5$ = _____

(2) $m^3 \times m^4$ = _____

(3) $\left(\frac{c^2}{d}\right)^2$ = _____

(4) $(-18)^3 = (-1)^3 \times$ _____ $\times$ _____

(5) $(x^2 y z^3)^3$ = _____

(6) $\left(\frac{5m}{7n}\right)^2$ = _____

2. Calculate and fill the table :

Sr. No.	Principal P (₹)	Rate of Interest R (%)	Period N	Interest I (₹)	Amount A (₹)
(1)	4500	8 %	73 days	_____	_____
(2)	12,800	5.5 %	_____	2816	_____
(3)	9500	_____	146 days	342	_____
(4)	15,400	6.5 %	_____	5005	_____
(5)	26,000	_____	18 months	2340	_____
(6)	_____	6.5 %	30 months	1105	_____

3. In the given questions, fill the '_____' with any one digit between 1 to 5 and □ with +, –, × and prepare five different representation and expand each one :

[_____ □ _____ {_____ □ _____(_____ □ _____)}]

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

4. Simplify :

(1) $y^8 \times y^5 \div y^{10}$ $(y \neq 0)$

(2) $c^8 \div c^5 \times c^4$

(3) $(mn)^2 \div [m^2 \times (n^2)^3]$

(4) $x - [x - \{5 - (2x + 3)\} + 15]$

(5) $a - 2\ [a - 3\ \{a - (5 - 2a)\} - 10]$

(6) $4m^2 - 3\ [m - 2\ \{3m - (m^2 - 5)\}]$

(7) $4y - [y - 2\ (y - 8) + 7]$

5 (A) Solve the following equations :

(i) $2x + 10 = 20$ (ii) $3y + 5 = 10$ (iii) $3a - 5 = 10$

(iv) $20b + 20 = 20$ (v) $4x - 5 = 15$ (vi) $6a + 5 = 15$

(vii) $\left(\frac{x}{5}\right) + 4 = 5$ (viii) $\frac{2x}{3} + 4 = 14$ (ix) $x - \frac{7}{3} = \frac{8}{3}$

5 (B) Solve the following equations :

(i) $2x + 6 = 18$ (ii) $9x + 5 = 13$ (iii) $x + \frac{5}{2} = \frac{5}{2}$

(iv) $\frac{x}{5} + \frac{1}{5} = \frac{6}{5}$ (v) $7x - 3 = 46$ (vi) $5x - 3 = 22$

6. Calculate the following examples :

(1) Nishant deposits ₹ 35,000 in a bank for 3 years on a certain rate of interest. If he gets an interest of ₹ 7875, what is the rate of interest ?

(2) What principal amount should Reema take at the rate of 10.5 % for 3 years and 4 months, to pay the interest of ₹ 4200 ? How much amount would Reema have to pay ?

(3) Length of a rectangle is three times its breadth. If the perimeter of the rectangle is 32 cm, find its length and breadth.

(4) Raman and Magan are friends. Raman says to Magan, "I have 25 rupees more than you". If both have total of ₹ 125, what amount of money does Raman have ? How many rupees does Magan have ?

(5) If the sum of three consecutive numbers is 42, find these numbers.

(6) Dashrath and Naresh are friends, Naresh is 2 years younger than Dashrath. If the sum of their age is 56 years, find their present age.

(7) If the length of a cubical box is 4cm, what is its volume ?

(8) Find the volume of a cube in cubic cm having length 1.5 metre.

(9) The length of a cuboidal room is 6 metre, breadth is 4 metre and height is 3 metre. In this room how many cubic boxes of 1 metre length can be arranged ?

(10) In a cuboid having the measurement of 60 cm × 54 cm × 30 cm, how many cubes of 6 cm length can be arranged ?

(11) Salma bought a tank measuring 3 m × 2 m × 2 m for storing water. How many liters of water can be stored in it ?

7. Construct the following :

(1) In Δ ABC, AB = 4 cm, BC = 5 cm and AC = 6 cm.

(2) Construct a Δ XYZ such that XY = 4.5 cm, YZ = 7 cm and XZ = 4.5 cm.

(3) Construct a right angled Δ PQR such that the hypotenuse PQ = 8 cm and RQ = 5.5 cm.

(4) Construct a right angled Δ DEF such that the hypotenuse DF = 7.5 cm and EF = 5.5 cm.

8. Find the values :

(1) $2^5 \times (2^3)^2 \div 2^{10}$ (2) $\left(\frac{3}{5}\right)^2 \times \left(\frac{1}{3}\right)^2 \div \left(\frac{1}{5}\right)^2$

Answers

1. (1) $(-3)^{10}$ (2) m^7 (3) $\frac{c^4}{d^2}$

(4) $2^3 \times 3^6$ (5) $x^6 y^3 z^9$ (6) $\frac{25m^2}{49n^2}$

2. (1) I = ₹ 72 A = ₹ 4572 (2) N = 4 years A = ₹ 15,616

(3) R = 9 % A = ₹ 9842 (4) N = 5 years A = ₹ 20,405

(5) R = 6 % A = ₹ 28,340 (6) P = ₹ 6800 A = ₹ 7905

4. (1) y^3 (2) c^7 (3) $\frac{1}{n^4}$ (4) $-2x - 13$

(5) $17a - 10$ (6) $-2m^2 + 15m + 30$ (7) $5y - 23$

5. (A) (i), (iii), (v), (vii), (ix)

(B) (i) $x = 6$ (ii) $x = \frac{8}{9}$ (iii) $x = 0$ (iv) $x = 5$ (v) $x = 7$ (vi) $x = 5$

6. (1) 7.5 % (2) ₹ 12,000, ₹ 16,200 (3) length = 12 cm, breath = 4 cm.

(4) Raman = ₹ 75, Magan = ₹ 50 (5) 13, 14, 15

(6) Naresh = 27 years, Dashrath = 29 years

(7) 64 cubic cm (8) 33,75,000 cubic cm (9) 72 boxes (10) 450 cubes

(11) 18,000 litres

8. (1) 2

(2) 1

7 Introduction to Computer - 2

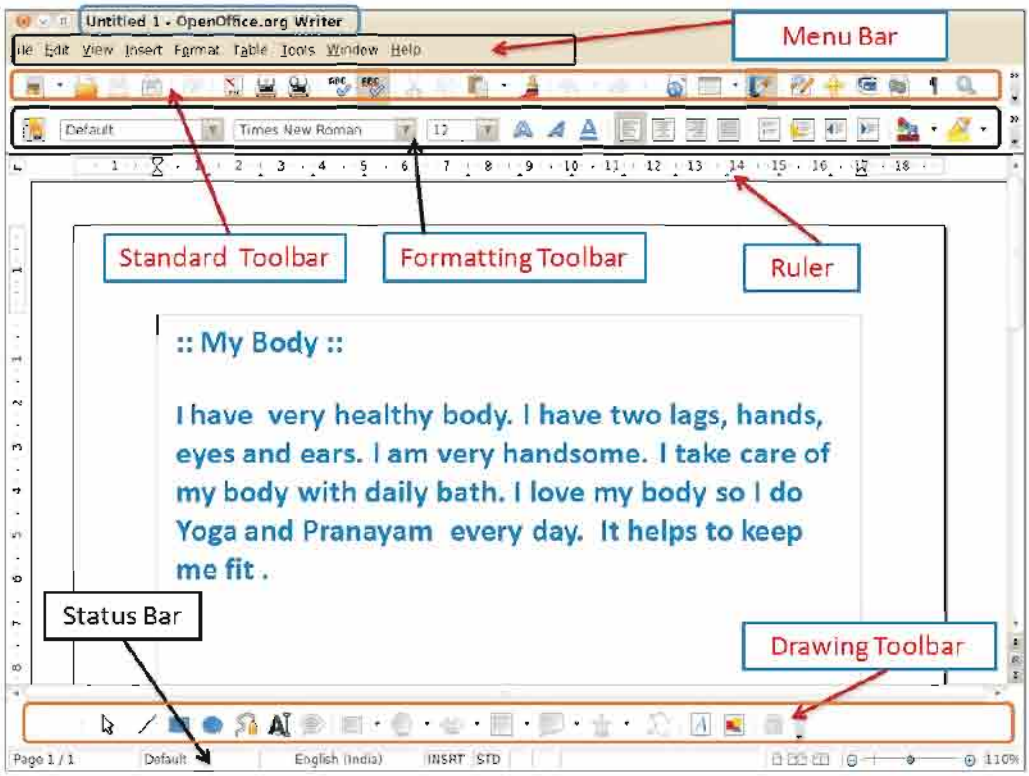
• Openoffice.org Word-Processor :

'Openoffice.org' package is a combination of free source software, which includes application software, word-processor, presentation and spreadsheet etc. 'Openoffice.org' is enabled/By default free with Linux Ubuntu operating system, so it cannot be installed differently.

• Word-processor (Writer) :

With the help of this application software typing, editing, formatting and printing can be easily done.

Application Menu → office → openoffice.org → word processor :

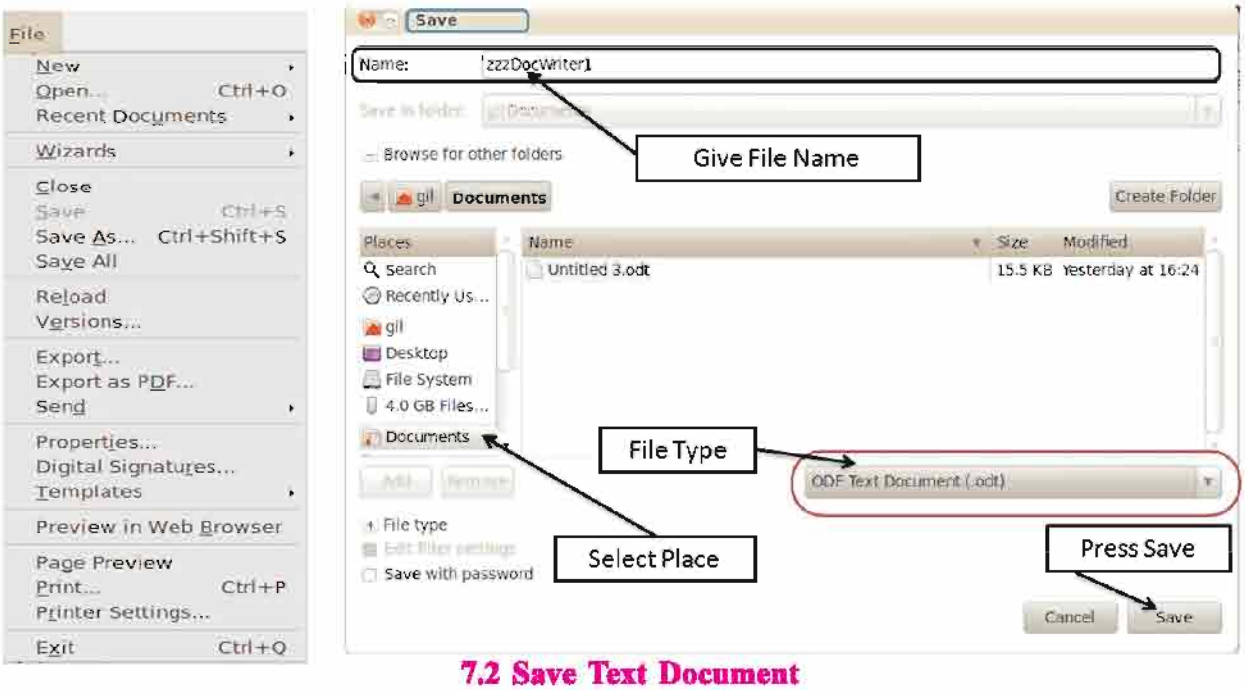


7.1 Word-Processor

In the working area of the open window, type the paragraph as shown in the figure or type any one paragraph from your textbook, with help of a key-board.

Save / Save as :

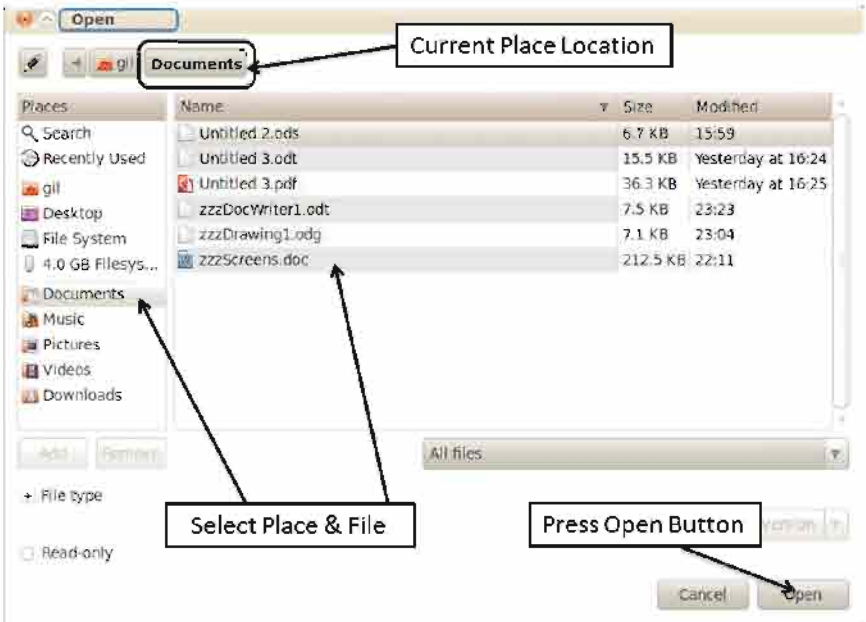
Save the given document by clicking on File Menu → Save As. By following the process as shown in the figure 7.2, Working with Openoffice text document will be saved with file extension '.odt'.



7.2 Save Text Document

Open :

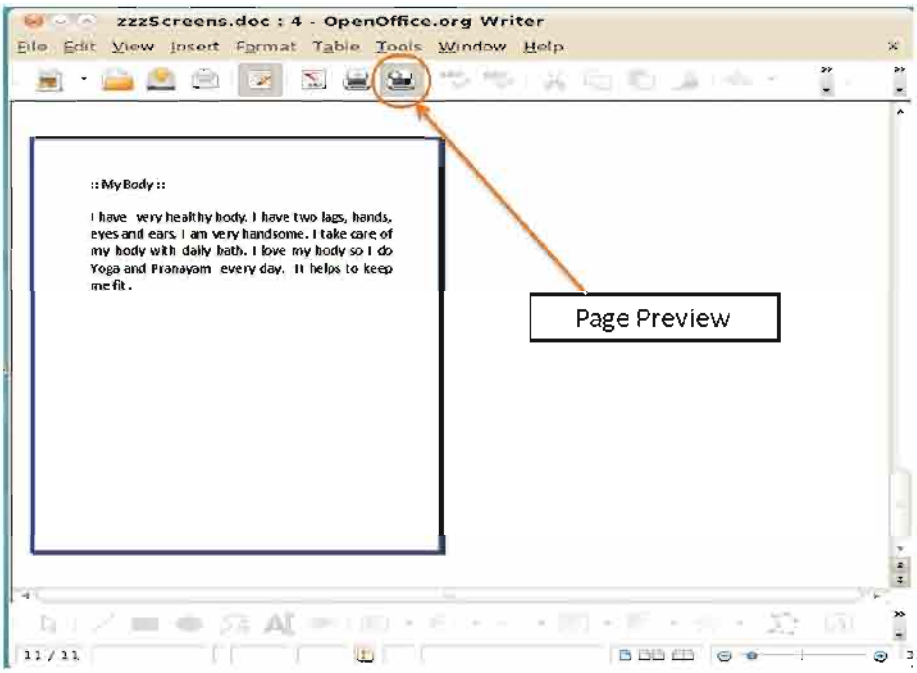
In future to open the saved file click on File Menu → Open. The Dialog Box will open. Select the necessary file and click on Open Button. That file will open.



7.3 Open the Document

- **Page preview :**

We can see how the document will be printed on the paper with the help of File Menu → Page Preview.



7.4 Page Preview

- **Close :**

A file which is open/activate can be closed with the Close Button. It is asked to save the latest changes.

- **Exit :**

With the "Exit" Button option 'Openoffice.org' written programme can quit after closing down.

- **Print :**

To take the print on paper with the help of a printer attached in networking.

- **Standard Toolbar :**

Tools like File Open, Save, Print, Page Preview, Cut, Copy, Paste, Undo, Redo, etc are included in the Standard Toolbar.

- **Formatting Toolbar :**

Formatting Toolbar

On the Formatting Toolbar Font Name, Size, Bold, Italic, Underline, Alignment, Bullets and Numbering etc tools are given.

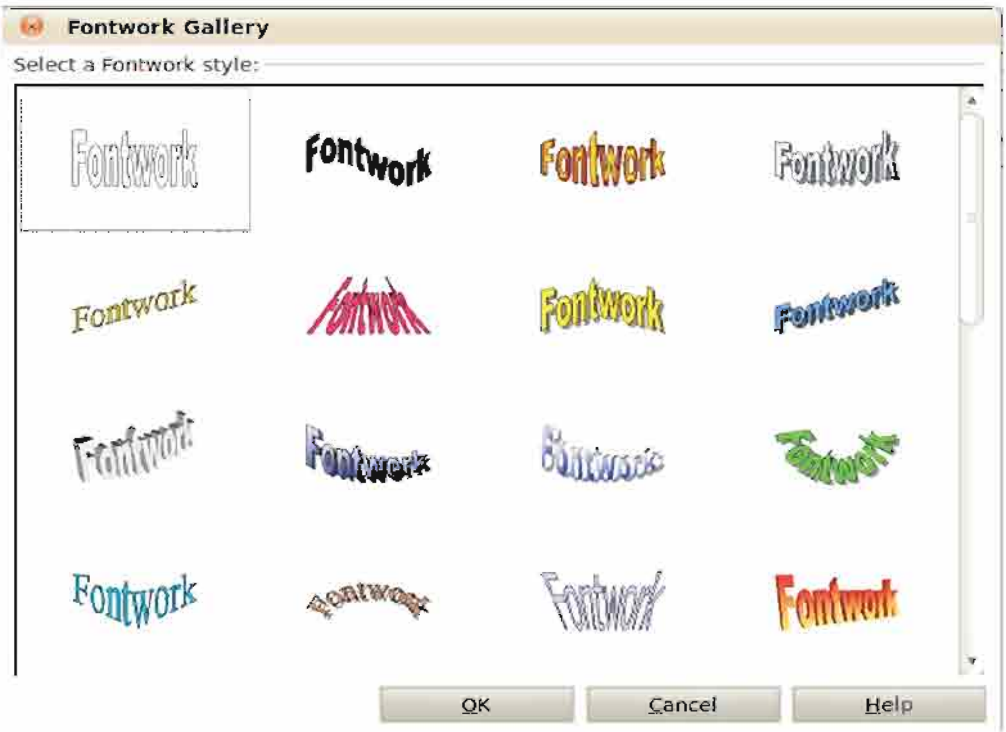
- **Drawing Toolbar :**

On the Drawing Toolbar drawing tools like Line, Arrow, Shapes, Fill etc are given.

Drawing Toolbar

With the help of the Font work tool given here a very good banner can be made very well. In the font work the following styles are seen.

- **Edit Menu :**



7.5 Fontwork

Undo : Removes the effect of the action done last.

Restore : To bring back what was changed with undo ?

Copy : Copy the chosen text/object at another place.

Cut : To remove the selected text/object from the active document and place it at another place.

Paste : Insert the content of the text/object to some other place.

Select All : To select all the data (and graphics) in the active window.

Find & Replace : To search for specified text in the active document. Replaces specified text in the place of selected text.

7.6 Edit - Menubar

7.7 Find & Replace

- **View Menu :**

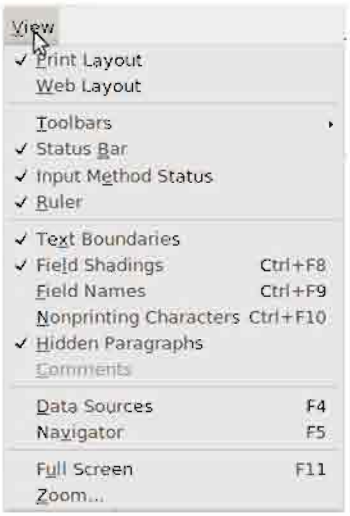
The following tools are seen in the view menu.

Toolbars : To open other toolbars available in the writer.

Full screen : To see/view the given document according to the size of the monitor screen.

- **Insert Menu :**

In insert menu the tools are as shown in the adjoining diagram. This tool can be used in the writer.



7.8 View-Menu

Header : Used to insert common text at the top of each page of the document.

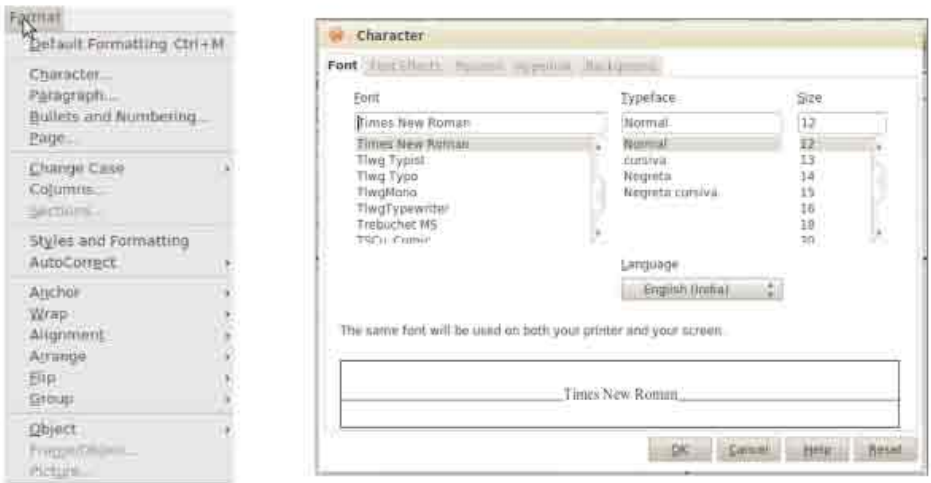
Footer : Used to insert common text at the bottom of each page of the document.

Picture : Any picture object from the object from the computer in the document.

7.9 Insert Menu

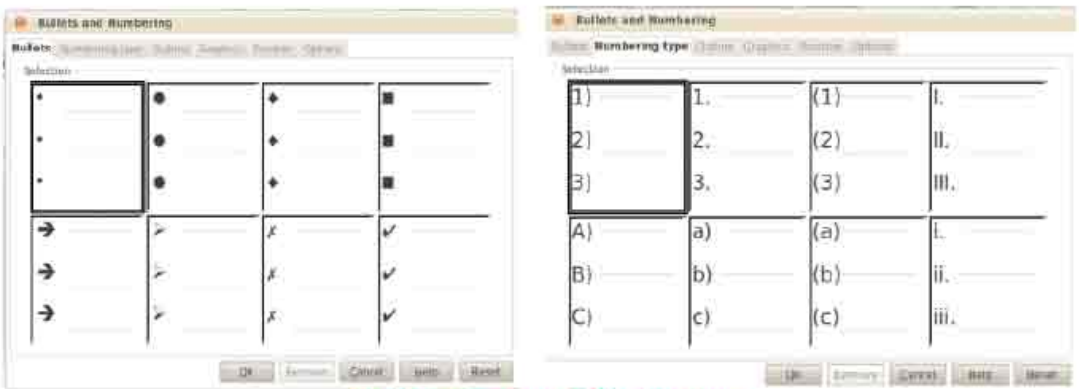
- **Format Menu :**

Character : By choosing this option with the help of the following dialog box, the selected text could be formatted.



7.10 Format - Character

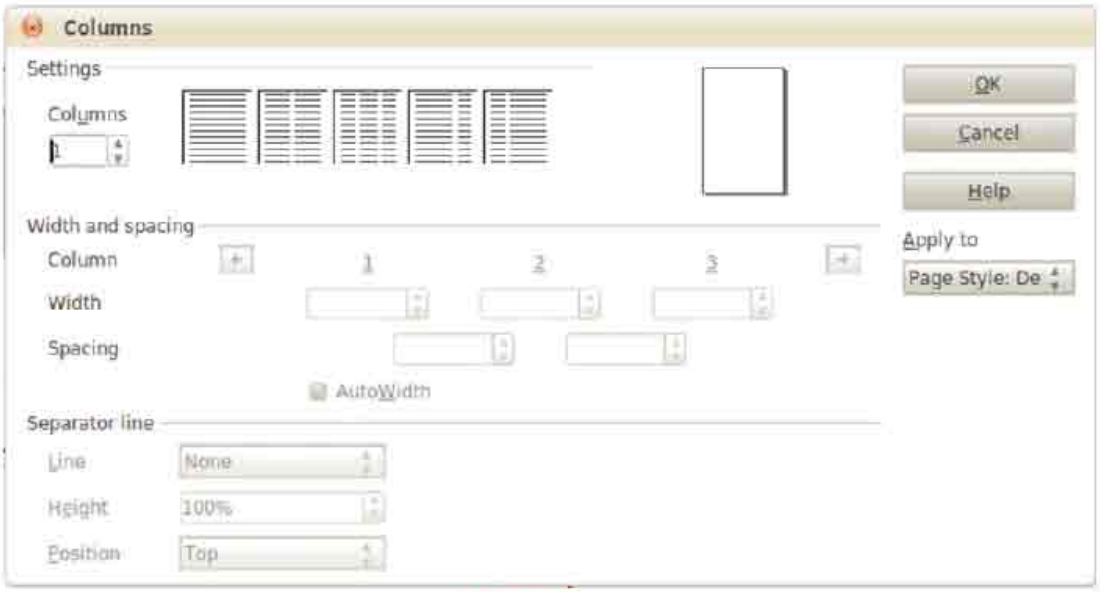
Bullets and Numbering : This tool is used to arrange the information point wise.



7.11 Bullets and Numbering

Change case : To convert the given information into capital (upper case) ABCD or small abcd (Lower Case).

Columns : This tool is used to arrange the selected paragraphs like the column in a newspaper.



7.12 Columns

- **Table-Menu :** This option of the menu is used to change the information of the document in the tabular form.

7.13 Table-Menu

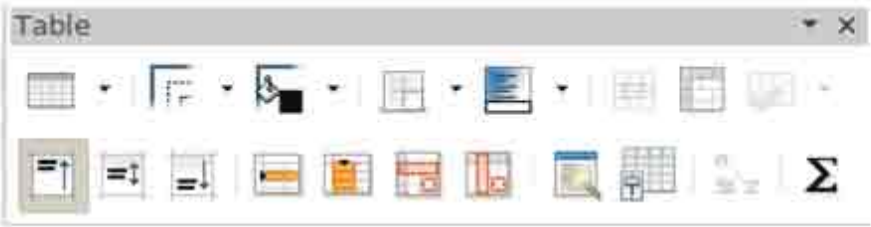
Insert : New table can be created with the help of this option. The necessary number of rows or columns can be created with this diaglogue box.

To insert a new row or column in the table that can be seen with the insert row or insert column as shown in the figure 7.13.

Delete : This option is used to delete the selected row or column of the given table.

Select : This option is used to selecte the table, row or the column of the table.

With the help of this option different operations are done of the table.



7.14 Table Toolbar

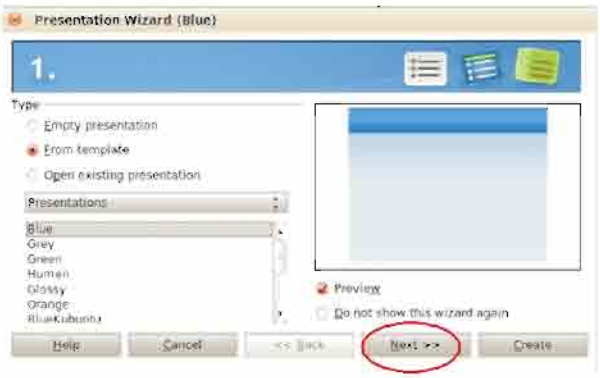
- **Activities : Perform the activities as instructed by the teacher.**
  (1) Type any one paragraph from your text book.
  (2) Using the various tools of Standard, Edit and Drawing make the above paragraph attractive.
  (3) Insert any photo of a school function and write/prepare a short report.
  (4) Prepare any list using Bullets & Numbering.
  (5) Prepare the time table of your class using table.
  (6) Prepare a banner for your classroom using font work gallery.

- **Openoffice.org Presentation (Impress) :**

Impress software is for presentation with the help of Power Point, Presentations can be made based on the slide show quickly and effectively, that means, in this presentation, one slide or more slides can be added. In each slide combination of text and images will make a better presentation.

Application Menu → Office → Openoffice.org presentation :

Presentation wizard will open. In this Wizard, Information is to be filled in different steps resulting into the first slide

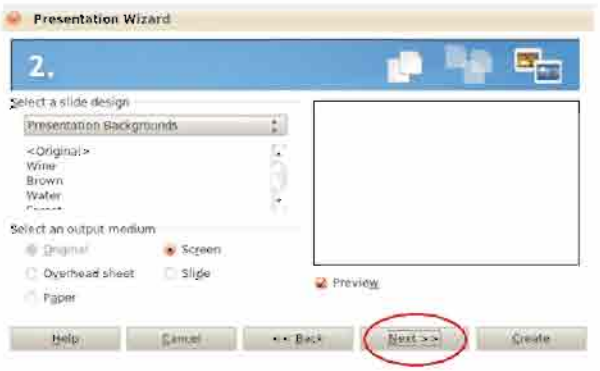


1. Slide Type in Presentation

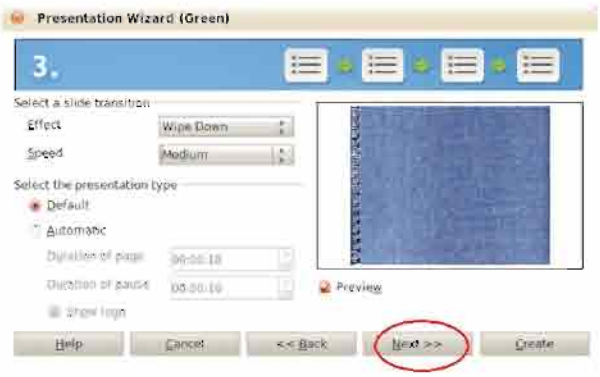
(1) Empty

(2) Templete

(3) Confirm the Open existing



2. To decide the design of the Presentation slide and output medium.

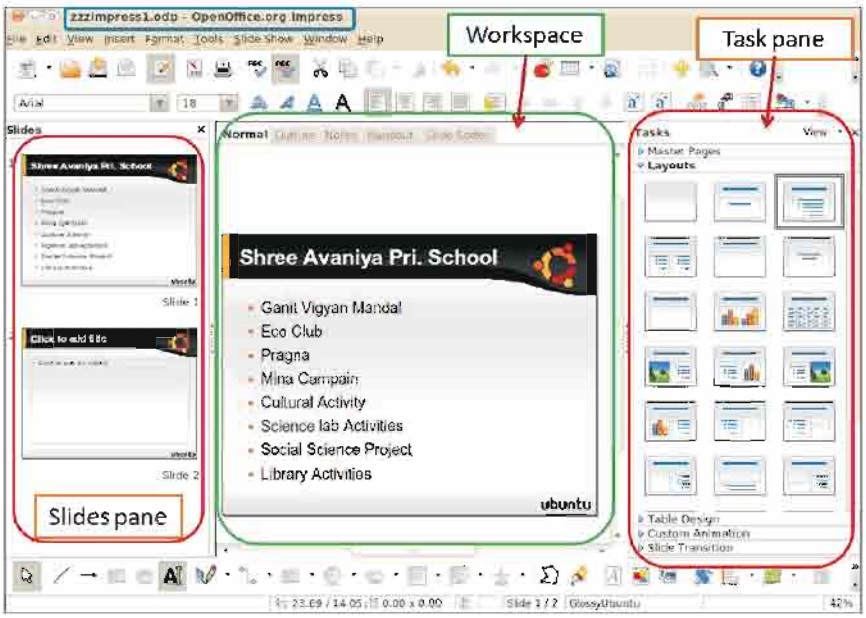


3. To set the speed and effect of the slide transition. To choose the type of the presentation either automatic or default.

4. To give a suitable title to the presentation and to give general information according to the figure.

At the end by clicking on the create option the wizard will open with the slide according to the selected design.

7.15 Presentation Wizard



7.16 Presentation First Slide

Impress screen is basically divided into three part.

(1) Slide Pane : All the small slides that made/prepared during the presentation can be seen here as thumbnails. Any slide from this can be selected and seen in the work space. All the slides are displayed according to the sequence in the slide pane.

(2) Work space : This space is used for working on a slide selected in the slide pane.

(3) Task Pane : Task pane is divided into four different group according to the function, i.e. type of presentation (master page design), reconstruction (slide layout), animation (custom animation) and transition (slide transition).

- **Master Pages :** A page design which can be used for the entire presentation is given in this section. In impress program, by selecting any one of the background designs all the slides are set with the predefined background design.

7.17 Master Pages

7.18 Layouts

- **Slide layouts :** Any layout can be converted into original form as per our requirement. Different layouts can be set to every slide.
- **Insert slides :** A new slide can be inserted by selecting slide option from the insert menu.

Activity : Prepare a presentation on any education program of your school.

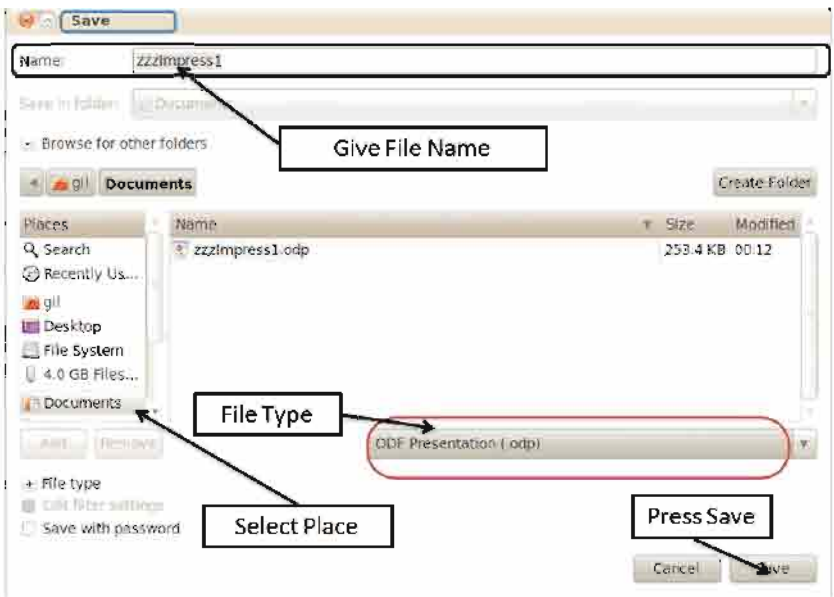
- **Slide show :** To start the slide show select any option from the following.

(1) Slide Show Menu → Slide show (2) Press F5 key.

If the timing is applied to the slide transition, slide show will run automatically. Otherwise slide transition can be run with the help of mouse click, key-board arrow key or the space bar.

To stop slide show in between use 'Esc' key.

- **Save presentation :** To save the prepared presentation choose save as option from the menu, the following diaglog box will be seen filling the necessary information on the presentation will be saved with .odp extension.



7.19 Save Presentation

Vedic Mathematics

Vedic Mathematics is a very ancient literature. This literature is based on formulae which cover all the aspects of human life. 'Veed' means 'to know' and 'Ved' means something that we should know, that which we call 'knowledge', which is above all the religions. In vedas there are about 12,000 mantras. In vedic mathematics, calculations and that too oral calculations are performed in an unusual way for establishing formulae. Vedic mathematics is the method of fast calculations. It is based on ancient Indian principles. It is matchless in its field. It helps students for quick calculations without taking any help of computer or calculator.

In mathematics, out of four fundamental operations, addition, subtraction, multiplication and division, we will study multiplication.

(1) First formula : The one who wants to study 'magical methods' of quick calculations should begin from here.

- Multiplication of a two digit number :

Example 1 : $65 \times 65 = 4225$

Solution :

$6 + 1 = 7$ $\quad$ 65 $\quad$ 5

$\times 6$ $\quad$ 65 $\quad$ $\times 5$

42 $\quad$ 25

4225

Steps : Here, multiply 5 with 5 and write the product 25 on the right side of answer.

Adding 1 to the above left digit 6, we get 7. Then after, multiply it (namely 7) with left digit 6. The number 42 is obtained. This is placed on the left side of answer.

Thus, we get the correct answer 4225.

Example 2 : $66 \times 64 = 4224$

Solution :

$6 + 1 = 7$ $\quad$ 66 $\quad$ 6

$\times 6$ $\quad$ 64 $\quad$ $\times 4$

42 $\quad$ 24

4224

Example 3 : $91 \times 99 = 9009$

Solution :

$9 + 1 = 10$ $\quad$ 91 $\quad$ 1

$\times 9$ $\quad$ 99 $\quad$ $\times 9$

90 $\quad$ 09

9009

From the above examples we can say that, the above method is applicable to multiply two digit numbers only if tens digit of both numbers are same and sum of their unit digit is 10.

- **Multiply :**

(1) 35 × 35 (2) 75 × 75 (3) 43 × 47 (4) 82 × 88

(2) Speedy (Quick) formula : After studing first formula we should learn a quick formula. This formula of multiplying two digit numbers is based on sutra 'Nikhilam' of vedic mathematics.

- Multiplication of the numbers near to 100 :

Example 4 : 87 × 89 = 7743

Solution :

87 − 11 = 76
89 − 13 = 76

87 → −13
× 89 → −11

76 143

143 ((−13) × (−11) = 143)

7600 + 143 = **7743**

Steps :

- Our base is 100.
- 87 is 13 less than 100, so we write 87/−13.
- 89 is 11 less than 100, so we write 89/−11.
- Cross subtracting (87−11 or 89−13), we get the same result 76. Now, place number 76 on the left side of the answer.
- For the right side of the answer, we multiply (−13) with (−11) and obtain (+143). But we can keep only two digits on right side. Since our base is 100. Rest of the digits will be added to left side.
- We get 76/143. Adding 1 to left side (76) the number is 7743.

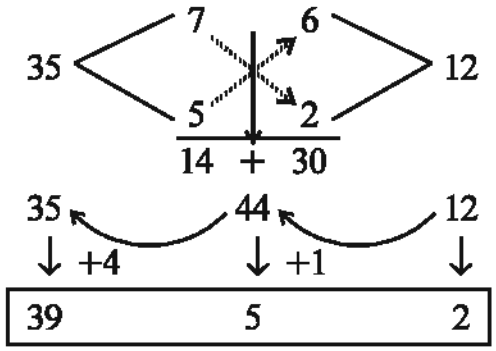
- **Multiply :**

(1) 89 × 92 (2) 99 × 93 (3) 87 × 76

(3) Method of cross multiplication :

Example 5 : 76 × 52 = 3952

Solution :



Steps :

- First, multiplying digits of right side (6 and 2), we get 12. place 2 as a digit of answer and 1 shall be carried forward.
- Then, cross multiply the digits and add 14 + 30 = 44. Now add 1 to 44 and we get 45. Place 5 as a digit of answer and 4 shall be carried forward.
- Multiplying the digits of left side (7 and 5), we get 35. Adding 4 to it we get 39. Place it on the left side of the answer.

Thus, the product 3952 is obtained.

- **Multiply :**

(1) 76 × 19 (2) 86 × 27 (3) 66 × 68

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