Chapter - 38 Graphs - B

38. This chapter contains some problems and suggested activities. Students should have read the chapter on graphs before attempting to solve.

38.1 Activity:
Teachers! Show the students all possible types of graphs. Let the students bring many examples either by imagining or by looking up at newspapers, books etc (give homework). AFTER they bring the results, check whether some of the following are included:

a. Population growth with time.
b. Increase in weight, height etc from birth to adulthood.
c. Growth of microorganisms.
d. DC & AC voltage / current.
e. Pendulum oscillations.
f. Gold price over 50 years etc.

38.2 Activity: Same as 38.1 but different source.
Teachers, ask students to bring a few old newspapers. Discuss the graphs given there. If you are lucky, you will get 2 or more of the following:

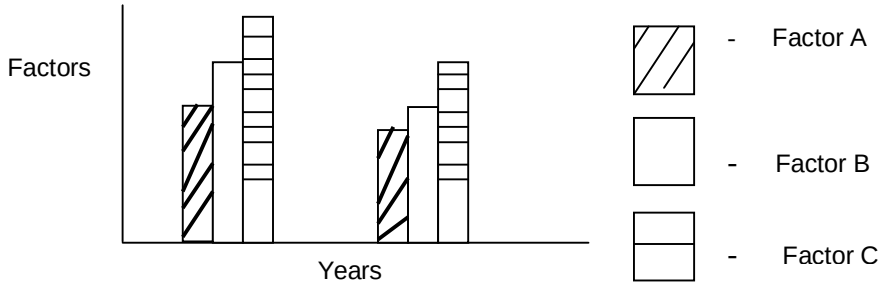
a. Different booths, voters list.
b. Different districts and their population.
c. Population of a city over the last decades.
d. Population of India.
e. Many census data.
f. Daily, monthly variation of stock markets.
g. Monthly variation of one company's share.
h. Prices of commodities.
i. Temperature data
j. Rainfall data.
k. Heights of water in reservoirs etc.

38.3 Exercise: State how (&which quantities) you will show the following in graphical form.

a. Stages of a building from site to finish.
b. Stages of a product from start to finish.
c. Students can make their own drawings.

38.4 Activity:
Take many factors about a city (E.g. Mysore) one can collect data about many items for the past years. Try.

Population, number of houses, number of schools, number of vehicles, number of sick persons (hospital), amount of pollution, amount of water consumption etc. Make a table and try to explain.
Now use the same data to make a multiple bar chart.



You can rightly claim that the graphical representation makes understanding the subject simpler and closer.

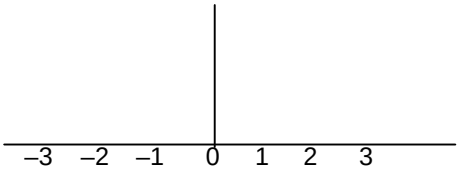
Qualitative nature of graph is shown here. Students should collect real data and draw. Only then he/she will get the total benefit.

38.5 Graph in two quadrants:

Introduce negative in the x-axis. Take a reference time as the 0 on X.
Go before also.

E.g.:

	Price or some variable
3 days ago	
2 days ago	
Yesterday	
Today	
Tomorrow	



38.6 Pictograph or Bar Charts or Pie Chart or Line Graph – decision making:

I. Population or some states of India: (all numbers in millions)
(Source Manorama year book 2001).

UP – 140
Maharashtra – 80
West Bengal – 70
Andra Pradesh – 66
Tamil Nadu – 56
Karnataka – 45
Kerala – 30
Nagaland – 1.2

Show these on a bar chart in the ascending order (can be pictograph also with number written there itself).

II. Some mother tongues (= languages) and the number of persons (in millions) given below (approximated).
(Source: year book 2001)

Hindi	500
Bengali	200
Urdu	100
Punjabi	100
Telugu	75
Tamil	75
Marathi	75
Kannada	50
Gujarathi	50

Put these in (a) a bar chart
(b) a pie chart

In making a pie chart we have made some assumption (i.e., we have neglected something) what is it?

III. Temperatures recorded by a nurse on a patient A's chart is as below:
7 am 98.6^{o}F, 10 am 98.4, 2 pm 99, 3 pm 99, 4pm 99.5, 6 pm 102, 7 pm 100, 8 pm 99^{o}F, 9 pm 98.6^{o}F. Draw them on a line graph.

IV. Blood pressure (BP) is recorded in mm of Hg as a set of two points at the same time. They are called systole and diastole.

Patient A

Time	BP	
	Systole	Diastole
7 am	120	80
10 am	110	70
2 pm	120	80
6 pm	145	90
8 pm	120	80
Plot these also on the same graph		

V. Student can make his own data and plot it to see his own progress.

Subject	Marks Obtained		
	8^{th} std	9^{th} std	10^{th} std
I	-	-	-
II	-	-	-
III	-	-	-
IV	-	-	-
V	-	-	-
VI	-	-	-

Fill in all the data and make 3 line graphs.

38.7 Variables and Equations on Graphs:

A. Draw the graph of $y = x^2$
B. Draw the graph of $y = 2x$
C. Draw the above on the same graph sheet.
D. The square of a number and double the number are equal. Which is that number? Find by graphical method or show that there is one number whose square and double the number are the same. [Clue: (C) is the same as (D)].
E. The sum of 2 numbers is equal to 3 and their difference is 1. Find the numbers (This can be solved by drawing graphs).
F. Solve graphically:
   a. $x + y = 5$ and $2x – 3y = 0$
   b. $x + y = 6$ and $x – y = 4$
G. Draw graphs of equations.
   a. $y = 0$
   b. $x = 0$
   c. $y = x$
   d. $y= 2x$
   e. $y = 2x + 1$
   f. $y = (x + 1)$; $(x+ 2)$; $(x + 3)$; $(x + 4)$
   g. Draw a line and find equation.
H. Using (a) and (b) and (f) above answer:
   1. What is the equation of x-axis?
   2. What is the equation of y –axis?
   3. What is the equation of horizontal line at a distance of 10 cm from x-axis?

38.8 Drawing and Areas

1. Using the method of joining points, whose (x, y) coordinates are to found, give set of points, which will make some figure. For this, draw first:
   a. a outline of a building (elevation)
   b. a flag (alone or on a pole)
   c. a series of hills
   d. any drawing like fish, saw

2. Using scale drawing method find the area of:
   a. a bench

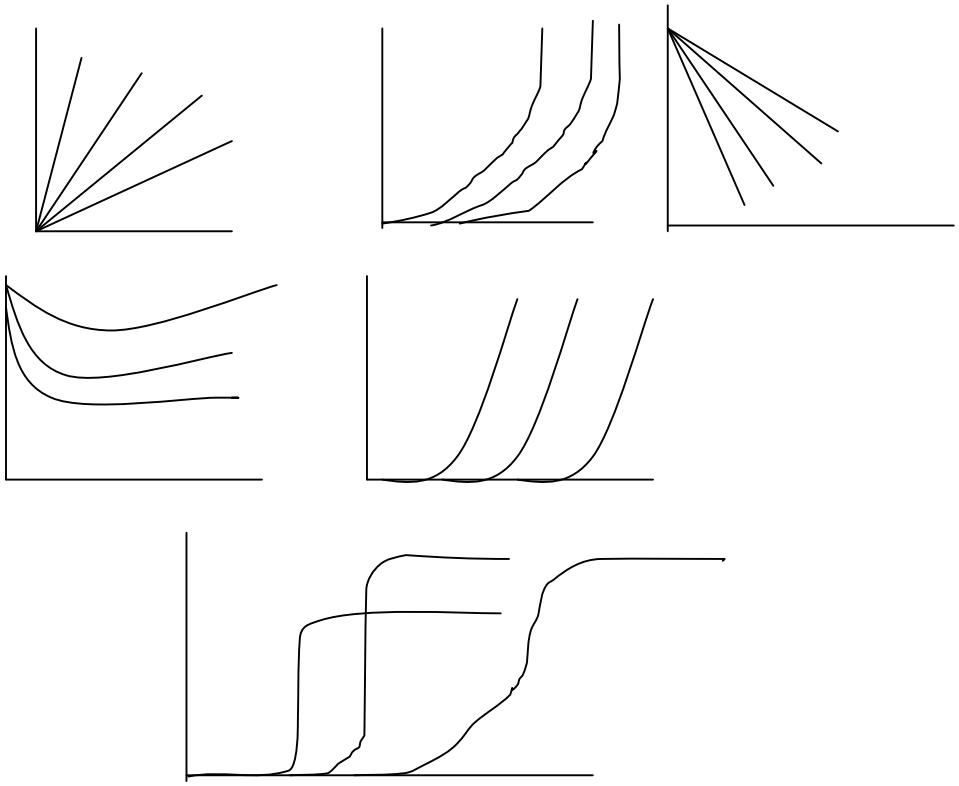
b. a blackboard
c. plan of a site
d. plan of a building
e. area of Karnataka (you need a map with scale given).

3. A. Four points are given O(0,0), P(2,2), Q(4,2), R(2,0). Join OPQR and say what kind of figure you got.
B. O(0,0), P'(-2,2), Q'(-4,2), R'(-2,0). These are 4 points of a quadrilateral (=Four sided shape). Draw this area on the same graph.
C. A(1,1), B(-1,1), C(-1,-1), D(1,-1) join ABCD and say what shape?
D. Count the areas of (A), (B) and (C) which is the biggest? (or, are they equal?

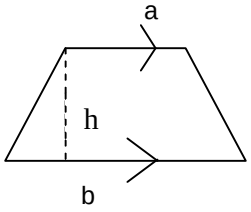
38.9 For studious students

A. Draw and show ascending, descending, saturation etc.

Clue: Examine different shapes of curves and then decide which is what, and then draw your own.



B. Show a waveform (Clue: Waves go up and down. Therefore we need top and bottom of x-axis to show a wave).
C. Just show how $y = x^2$ will look like (clue: $(+x)^2$ is +ve; also $(-x)^2$ is +ve. So, y-axis will be +ve, x-axis will have +ve and –ve].
D. Area of a trapezium is given by the formula.]



$$A = \frac{1}{2} h\,(a + b).$$

1. Show this formula is true for a trapezium of a = 4 b= 6 and h = 5 cm

(Graphical method).

2. Prove by graphical method that this formula is generally true (i.e, for any values of a, b & h).

E. Square Roots:

$\sqrt{1}$ = 1=1

$\sqrt{2}$ = 1.414 ≈ 1.4

$\sqrt{3}$ = 1.732 ≈ 1.7

$\sqrt{4}$ = 2 =2

$\sqrt{5}$ = 2.236 ≈ 2.2

$\sqrt{6}$ = 2.449 ≈ 2.5

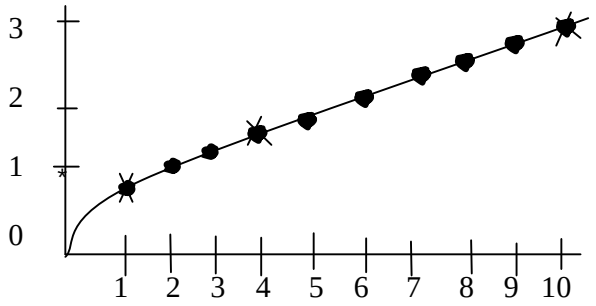
$\sqrt{7}$ = 2.646 ≈ 2.6

$\sqrt{8}$ = 2.828 ≈ 2.8

$\sqrt{9}$ = 3 =3

$\sqrt{10}$ = 3.162 ≈ 3.2

Students can plot these on a graph sheet and use these for future $\sqrt{\ }$ calculations.



F. Graph in (e) above has its limited use. The student can extend it to $\sqrt{20}$ =.... $\sqrt{30}$ = ... up to $\sqrt{100}$ = 10. Plot all these on one graph. This graph (plus graph in (e) above) together could be used to find square root of any number.

Try: $\sqrt{3}$, $\sqrt{5}$, $\sqrt{10}$ using (E) above.

$\sqrt{30}$, $\sqrt{50}$, $\sqrt{40}$, $\sqrt{88}$ using (f) above.

G. Studious student can do the reverse i.e., plot $y = x^2$ using the data given below and use that graph to find square root.
Fill up:

x	1	2	3	4	5	6	7	8	9	10
Y	1	..	..	..	..	..	..	..	..	100
(x, y)	(1,1)	..	..	..	..	..	..	..	..	(10, 100)

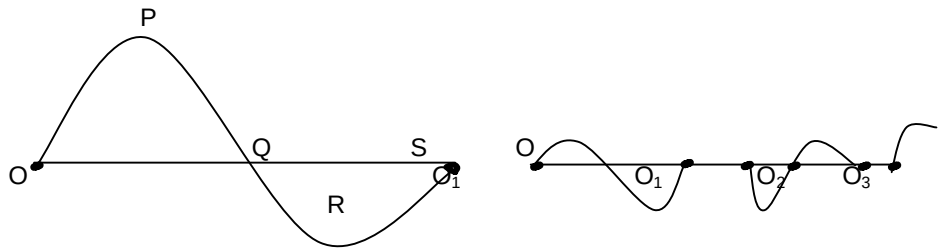
Fill up this table:

Plot the (x, y) coordinates and get 10 points on the graph. Draw a smooth curve passing through ALL the 10 points.

H. Using the above graph i.e., $y = x^2$, find $\sqrt{3}$, $\sqrt{5}$, $\sqrt{10}$. Verify your answer with (a) calculator (b) graph of (E) above.

I. Using (G) find $\sqrt{50}$, $\sqrt{40}$, $\sqrt{88}$ etc. Verify using (f) above and a calculator.

J.



This figure is a WAVE. S is another O (say O_1). From S the wave repeats itself. In the next figure O_1, O_2, O_3 are shown. Some portions are missing. Can you fill it?

38.10 For all students making of pie charts:
A. Students create their own data and draw:

S. No.	Subject	Marks Obtained
1	-	-
2	-	-
3	-	-
4	-	-
5	-	-
6	-	-
	Total	

Which is the subject in which you are:
a. Strong [Clue: Largest area: Sector with angle more than 60^0 to 90^o
b. Very weak [Clue: Sector angle < 60^o (is 40^o & Less)]
c. So – so, average [clue = sector angle around 60^o]

B. Students can find the total income of the family and make one pie graph. Average expenditure by different categories in another pie graph.

Income

S. No.	Earning Member	Rs.
1	A	-
2	B	-
3	C	-
4	Others	-

Expenditure

S. No.	Category	Rs.
1	Rent	–
2	Food	-
3	-	-
4	-	-
⋮		

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Chapter - 39 Problems in Geometry

39. Given below are questions, activities, problems, worked examples, demonstrations – based on the earlier chapters on geometry. Some new content also is introduced in a very simple format.
[Note for teachers: please treat this chapter also as equally important. If some problems appear to be difficult, not in sync with the general simplicity of this whole manual please help the students. Clues, hints etc are given everywhere].

39.1 Construction of triangles

39.1.1 Draw a triangle having sides 5 cm 8 cm and 3 cm.
[Hint: take 8 cm as base. Use compass & cut arcs. This will look easier to do than taking the smaller ones. But in principle anything can be the base].

39.1.2 Same as above, but sides 5, 4, 3.
[Hint: Try smaller one of the sides as base. You will see some special angle].

Calculate the area in the above [Hint: you have to draw a perpendicular and measure height. 39.1.2 can be done in 2 ways, one as above and the other without a perpendicular].

39.1.3 Draw a triangle of base 8 cm and height 5 cm.
[Clue: you can draw as many as you can (=infinite number). Help: Height 5 cm can be obtained by any point on a line parallel to the base line (at distance of 5 cm)].

39.1.4 In the above another side is 5 cm. Draw the triangle.

39.1.5 a. Construct an equilateral triangle (= all sides equal) of side 6 cm.
b. 12 cm
c. Measure their areas. Find the ratio of areas.

39.1.6 a. Construct an isosceles triangle (=two sides equal) with base (third unequal side) 10 cm. How many can you draw?
b. In (a) above the other sides are 8 cm.
c. In (a) above one angle is 45^0.

39.1.7 Construct right angled triangle:
a. Sides 6 cm, 8 cm, and 10 cm.
b. 3 cm, 5 cm, one right angle
c. 3 cm, 4 cm, one right angle.
d. One 90^o, second 30^o, one side 4 cm.
e. How will you draw a triangle whose hypotenuse (=side opposite to the right angle) is given? In all the above, the method and how many are important.

39.2 Squares and Circles

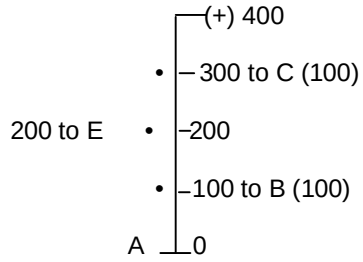
39.2.1 Fold a paper to make a square and cut off a square. How many lines of symmetry could you see?
[Line of symmetry: If you fold one portion over another and it exactly overlap (=covers up), the crease (=Line seen, groove made) is called the line of symmetry].

39.2.2 a. Given the area of a square, is there a unique figure (unique = only One)? Or, can these be many?
b. In (a) above, how about a rectangle.
c. In (a) above, how about a circle?

39.2.3 a. Draw concentric circles of 1 cm apart, the last one having 5 cm radius.
b. In (a) above 4 persons run on tracks (created by the annular space= space between an outer circle & inner circle). They have the same speed. How many times the inner most runner go around, in the time taken by the last runner to make one round.
c. In long distance running race (eg: 10 km race) all runners run in a bunch (= group, close together). In short distance races (eg: 100 metre dash) each one is given a track. Even in 400 m. race in an oval path, tracks are allotted? Why this difference?

39.3 Drawing

39.3.1 Scale Drawing:
a. Mysore to Bangalore distance is 150 km (assume). Mysore to Mandya 60 km. Mandya to Maddur 20 km. Bidadi in only 10 km from Bangalore. Draw a scale map of the road assuming the road is a straight road.
b. In (a) above assume Mysore to Maddur is direct East and Maddur to Bangalore is Northeast. Draw a new scale maps.
c. Given below is a scale map of a land. If the land – cost is Rs. 1000 per sq. m. Find the total market value of this land.



All in meters.
Draw to scale 1 cm = 10 meters and from the drawing find the total area of the land.

d. Draw a map of any of the rooms of your building to scale; including windows and doors.

39.4 a. What is a line of symmetry? Can you use symmetry to simplify area measurement.
b. Calculate the area of a "Sector" and hence find the total area circle.

39.5 Lines and solving for X:
a. Draw any line on a graph sheet. Do some measurements. Find the

Equation? [Hint: y = mx + c. m is slope = $\frac{y}{x}$, c is when x = 0].

b. Solve using graph: 2x – y = 2; x + 2y = 21
c. A number plus 10 is equal to the square of the number minus 10. Solve this by algebra and by graph.

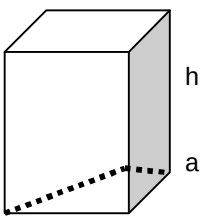
39.6 Coordinates:
a. On a map A is (0, 0) B is (4, 4). In what direction is B, with reference to A?
b. In (A) above, place C is exactly the same distance as AB but in the opposite direction. What is the direction of C w.r.t A and its coordinates?
c. Point (D) is 8 units north of C, what are the coordinates of D.

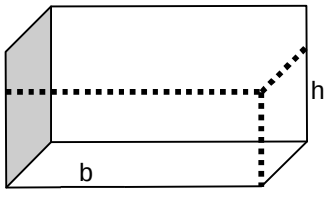
39.7 Types of Graphical Representation:
A. Many options are there to represent the given data. What are your options?
B. Get answer to (A) first. Then, decide which option is best suited for the following:
1. Budget proposal of India under different categories of income.
2. Same of expenditure.
3. Budget allotment for education over the past 10 years.
4. Rainfall per day in August of a year and the level of water in a dam during the same time.

39.8 Volumes: Box (=Parallelopiped), tank

a. Volume of a cube $V = a^3$
A pit of 2 m x 2 m square was dug up to 2 m depth. How much mud came out? If this mud is loaded on a truck of width 1.6 m and length 5 m, will it be enough?
If yes, how many pits can the lorry take?
If no, how many lorries a pit will need?
b. A water tank is a cube of 1 m x 1 m x 1m. How much water, in liters, it will store. If the family needs 200 liters / day how many days a tank full will supply?
c. A syntax water tank is almost cylindrical in shape? A small tank is 1 m dia and 1.2 m height. What is its capacity?
d. Which is bigger, capacity – wise, (B) or (C)?

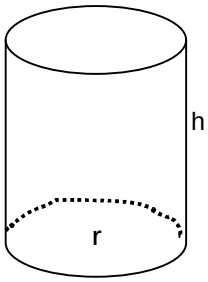
Help: Cube: $V = a^2h$ Box, Tank: $V = lbh$





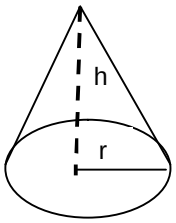
a l

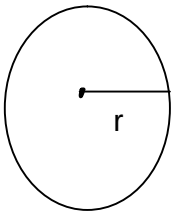
Cylinder: $V = \Pi r^2 h$ $\Pi = \frac{22}{7}$ or 3.14



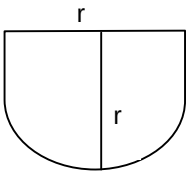
39.9 Volume:

Cone: $V = \frac{1}{3}\Pi r^2 h$ Sphere: $V = \frac{4}{3}\Pi r^3$





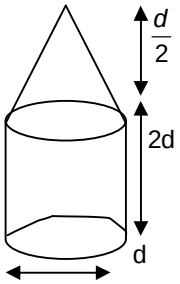
Hemisphere: $V = \frac{2}{3}\Pi r^3$



a. When sand is unloaded from a lorry it falls into a cone shape. A truck of 1-5 m width and 4 m length and 1 m height of sand unloads. What are the dimensions of the cone of sand on the ground?
[Help: Assume diameter of cone is 3 m and calculate height using formula:
lbh = $\frac{1}{3}\Pi r^2 h$ where l = 4 m, b = 1.5m, h = 1m, 2r = 3m, h =?].

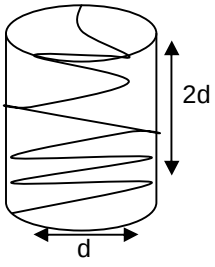
b. In (A) above assume the cone of sand finally takes the shape where the height is half the diameter. Now, find the height?

c. Traditionally solids (eg rice, sugar etc) used to be given in a cylinder measure. It used to be up to the height it will take.



Now smart fellow give only up to the top level.

How much more profit the smart seller gets?



[Hint: Take same assumption as in (B) above]

% profit is independent of the radius but depends on heights. Assume the height is double the diameter].

Sl. No.	Symbol	Meaning	How to read
1	+	Addition	a + b a plus b
2	-	Subtraction	a – b a minus b
3	X	Multiplication	a x b a into b
4	÷	Division	a ÷ b a divided by b
			a/b a by b
[Caution: Do not read a/b as a over b or b over a. Misunderstanding is possible]			
5	=	Equal to	a= b a equal to b
6	>	Greater than	a > b a greater than b
7	<	Less than	a < b a less than b
8	$\approx$	Approximately equal	a $\approx$ b
9	$\geq$	Greater than or equal to	a $\geq$ b
	$\not\leq$	Not less than	a $\not<$ b
10	$\leq$	Less than or equal to	a $\leq$ b
	$\not>$	Not greater than	a $\not>$ b
11	$\neq$	Not equal to	a $\neq$ b
12	$\sqrt{}$	Square root of	$\sqrt{a}$ Root a, Square root a, root of a
13	$\sqrt[n]{}$	nth root	$\sqrt[n]{a}$ nth root of a
14	$\sqrt[3]{}$	Cube root	$\sqrt[3]{a}$ cube root of a
15	$\pm$	2 values	$\pm a$ Plus or minus a
16	( )^n	Index n times multiplication	a$^{n;}$ a to the power n; a raised to n
17	$\sum$	Serial addition $\sum_n$ = n +(n-1)+….+3+2+1	$\sum_n$ Sigma n
18	$\angle$ or !	Serial Multiplication $\angle n$ = n!= n x (n – 1) x … x 3 x 2 x 1	$\angle n$ or n! Factorial n
Computer Version			
1	+	Addition	a + b
2	-	Subtraction	a - b
3	*	Multiplication	a * b
4	/	Division	a/b
5	**	Exponent	a**n =a^n

Commonly Used Symbols

Roman Numerals

This is the old system of writing numbers. This is the Roman system, before the use of zero (0). Roman system is used even today for numbering pages, chapters of a book, writing the year in some buildings, to show sub section etc. In these situations they are used as cardinal numbers (Eg: integers). Other wise they have gone out of use i.e. they are not useful any more for arithmetical operations. Like addition, multiplication etc. But they are very much in use as ordinal numbers.
(i.e, numbers to show rank, position etc).

Eg: I = first, 1st
II = second, 2nd
III = third, 3rd
IV = fourth, 4th
XXV = twenty fifth, 25th

Roman Numbers:
I = 1, one

V = 5, five
X = 10, ten
L = 50, fifty
C = 100, hundred
D = 500, five hundred
M = 1000, thousand

A bar over a letter shows the value multiplied by 1000. Thus D = 500 x $1\overline{000}$
2 rules of writing Roman numbers:

1. If a letter is immediately followed by a letter of equal or lower value. The two values are added.
2. If a letter is immediately followed by one of greater value, the first is subtracted from the second.

Thus	II = 1 + 1 = 2	(by rule 1)	III	=1 + 1 +1 = 3	(by rule 1)
	IV =5 – 1 = 4	(by rule 2)	VI	=5 + 1 = 6	(by rule 1)
	VII =5 + 2 = 7	(by rule 1)	VIII	=5 + 3= 8	(by rule 1)
	IX =10 – 1 = 9	(by rule 2)	XI	=10 + 1 = 11	(by rule 1)

XX = 20	XL = 40	CXVI = 116	MCMXLVII=1949
XV = 15	CM = 900	MCXX = 1120	MMX = 2010
VI = 6	XLVIII = 48	MCMXIV = 1914	MMIX =2009

$\overline{M}\ \overline{C}\ \overline{X}$ = (1000 x 1000) + (10 x 1000) + (100 x 1000)
= 1000000
+ 10000
+ 100000

1110000

Usually capital letters (upper case) are used. Sometimes smaller letters (lower case) used mean the same. Cardinal or Ordinal meaning depends on the context**.**

Source: Random House Dictionary of the English Language.

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Chapter - 40 Random Assorted Problems

40.1 a. Write in words: 1, 11, 111, 101, 1001, 1011, 9909
b. Write in words both in Indian System and International System: 101001, 110010, 987654321, 87654321, 7654321, 706050403

c. Fill in the blank:

MERA BANK

Pay Self Rs. 22033450……..
In words ……
……

XXXXXXXXXXXXX

40.2 a. Write in Roman number system: 5, 15, 50, 55, 95, 90
b. Write in modern system: II-X-MDCCCLXIX, XV-VIII-MCMXLVII, XIV-VI- MMIX.
[Hint: Go to appendix of this manual]
c. Write the ordinal number: Eg: Rank VI = 6th Rank: I Prize, III Place, XXII Person

40.3 a. Expand as in Eg: 1234 = 1 x 1000 + 2 x 100 + 3x 10 + 4 x 1

$= 1 \times 10^3 + 2 \times 10^2 + 3 \times 10^1 + 4 \times 10^o$

1. 89, 789, 6789, 56789, 456789
2. 809, 7008, 60709, 50601, 406100

b. Expand as in Eg.

$.987 = \frac{9}{10} + \frac{8}{100} + \frac{7}{1000}$

$= 9 \times (.1) + 8 \times (.01) + 7x (.001)$

$= 9 \times 10^{-1} + 8 \times 10^{-2} + 7 \times 10^{-2}$

1) .123, 0.103, .045, .9805

Example $123.45 = 1 \times 10^2 + 2 \times 10^1 + 3x\ 10^o + 4 \times 10^{-1} \times 5 \times 10^{-2}$

2) 8.75, 78.75, 608.07, 608.107

40.4 a. 123 + 456 =? b. 123 + 456a =? c. 1+ 2 + 3 + 5 =?
d. a + 2 + 3 + 5 =? e. a + 2 + 3a + 5 =? f. 456 – 123 =?
g. 456a – 123a =? h. 1 – 2 – 3 + 5 =? i. –a –2 -3 + 5a =?
j. a – 2 – 3a – 5 =?

a. $\frac{246}{123} - \frac{456}{278} = ?$ b. $\frac{24a}{12} - \frac{45a}{15} + a = ?$ c. $\frac{24a}{12a} - \frac{45}{15} + 1 = ?$ d. $\frac{4abc}{2ab} - \frac{9c}{3} + C = ?$

e. $\frac{1}{(x+a)(x+b)}[\frac{15(x+a)(x+b)}{5} - 4(x+a)(x+b) + \frac{(x+a)^2(x+b)}{(x+a)}] = ?$

40.4 Work with fractions:

a. $\frac{2}{3} = \frac{?}{6} = \frac{10}{?} = \frac{?}{33x}$ b. $\frac{3}{7} = \frac{3+7}{7+3}$ True or False c. $\frac{3}{7} = \frac{3 \times 7}{7 \times 3}$ True or False

d. $\frac{3}{7} + \frac{4}{7} = \frac{7}{14}$ True or False e. $\frac{3}{7} + \frac{4}{7} = \frac{7}{7}$ True or False

f. $\frac{3+4}{7 \times 2} = \frac{3}{7} + \frac{4}{2}$ True or False g. $\frac{3a}{7a} + \frac{4b}{7b} - \frac{5c}{7c} = ?$

h. $\frac{3a(x+y)}{7a} + \frac{4b(x+y)}{7b} - \frac{5c(x+y)}{7c} = ?$ i. $\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} = ?$

j. $\frac{a}{2b} \times \frac{2b}{3c} \times \frac{3c}{4d} \times \frac{4d}{5a} = ?$ k. $(\frac{a}{2b} \times \frac{2b}{3c} \times \frac{3c}{4a}) - (\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4}) = ?$

40.5 Codes:

a. If A =1, Z = 26 Find the name: (4)(18). (18)(1)(10) (11)(21)(13)(1)(18) Famous film personality in Kannada!
b. If A = 2, Z = 27 find the name given below? Who is a good type setter and office worker: (15) (10) (19) (14) (2) (18) (2)
c. Given that "Taj Mahal" is in (26) (19)(8)(26)" write a coded message to read "MEET ME AT TEN".
d. There is a sentence written in code. Code is: Instead of a, e, i, o, u code is u a e i o. Solve: "MARU UBBU TARU NUNU". For those who still need help:

Another code a e i o u → e i o u a makes the same as.

Now try "MIRE EBBE TIRE NENE"

e. Substitute in place of 'A', the letter 'B' and similarly others."VHKK XNT AD LX EQHDMC?"

f. Make your own code: Eg: Z = 1 ….. A = 26 or A → C B → D etc. Write in code: "ENGLISH IS EASY. I LOVE ENGLISH"

40.7 Substitution:

a. "15 years ago, Raja was a baby. Today Raja is a boy. Tomorrow Raja will be an engineer". In these sentences, substitute your name instead of Raja. If you like replace "an engineer" by a/an "☐"

b. Essay on ☐

☐ was a great person. He/She was born in ◯. Even in childhood, his/her parents and teachers saw his/her future greatness. He / she became the best in his / her chosen field. Even today ☐ is remembered.

Substitute ☐ by a big person's name.

◯ by a place. You got an essay.

Make a similar "pattern" for history (Eg: A great king) or for a leave letter.

c. 1. If x = 23 2x=? 2x - 23=?
2. If x = 4 x^2 - 4x =? $2x^2$ - 5x=?
3. If a = 2, b = 5 5a + 2b =? 5a – 2b =?
4. If a =1, b = 4, c = 3, ax^2 – bx + c =?
5. If a= 1, b = 4, c = 3 and x = 1 ax^2 – bx + c =?
6. If a =1, b = 4, c = 3 and x = 3 ax^2 – bx + c =?

40.8 Rule of Three:

a. Basava has 2 acres and 20 guntas of land. If land cost is Rs. 5 lakhs / acre. How much will he get? [Clue: 40 guntas = 1 acre].
b. 1 sq ft land in a big city goes for Rs. 1000. If a person wants to buy a site 30' x 40', how much money?
c. If 10a = 60, a =?
If x + 2x = 34, x =?
If x = 5, x^2 =? x^3 =?
d. If a box of 10 pencils cost Rs. 22. What is the cost of each pencil? What is, for 4 pencils? If 10 pens cost Rs. 60, each pen's cost =? In 1 hour chakri cycled 8 km. She rested for a while. Again cycled for 2 hours. What is the total distance traveled?
e. A worker finished a job in 5 days. In how many days will 5 workers finish the same job?
f. A microorganism (bacterial cell etc) splits into 2 cells in 1 hour. Each one of these splits into 2 cells in 1 hour. How many in 8 hours? If there were 100 bacteria at night in a person's mouth, how many in the morning (say after 8 hours).
g. Pagoda tree is very special. It gives 2 new branches at every branching point. This happens every 3 months. How many branches in 3 years?

40.9 Fractions, Decimals, Percent:

a. Express fractions into decimals and percent:
$\frac{1}{2}, \frac{1}{4}, \frac{3}{8}, \frac{1}{3}, \frac{3}{4}, \frac{8}{9}, \frac{22}{7}$
b. Express into decimals and fractions:

10%, 50%, 80%, 100%, 120%, 500%, $8\frac{1}{3}$%, 12½%, 18%, $33\frac{1}{3}$%, 75%.

c. Express decimals into % and fractions:
.1, .01, .15, .5, .8, .9, .75, .125, .33, .66, .05, 1.5, 1.125, 5.0
d. Let us share this 50/50. The vote was split into 50/50. There is a 50/50 chance of getting it. Express these in more mathematical terms.
e. Some admissions were shared 60/40 between 2 colleges P (private) and G (Government). If there were a total of 1200 seats, how many each one of P & G got?

f. In a test the maximum marks was 10. Maximum obtained in class was 8. Basava got 2. What is the % of the top student? What % did Basava get? If the same were evaluated for 25 what were the percentages?

40.10 Business

a. In a small scale buying and selling activity, how will you calculate percent gain or loss? [Help: make any reasonable assumptions].

b. Describe a few situations of 'No gain No loss'. Many times, even if the selling price is the same as buying price, there is loss. Why is it so?

c. Students of a certain age innately understand profit and loss. It is unfortunate that our mathematics textbooks introduce these ideas even before children reach the age of ten. At that age it is difficult to introduce the concept of buying bulk quantities at wholesale price and selling smaller quantities at retail price.
Students of this manual, the author hopes, understand some simple business transactions (=trading, selling and buying). Such students can ask their relatives and friend about their trade (=small business). Write about profit & loss. Some hints:

Name / nature of business: _____
How much bought: _____
Buying price: _____
Any other expenditure: _____
Total money put in this: _____
Selling price: _____
Total sales money: _____

Therefore
Profit = Total sales – Total Expenditure
Loss = Total Expenditure – Total Sales

40.11 Percent

1. Student A passed SSLC with 330 marks. Assuming total maximum marks is 600, calculate his average % marks. What is the minimum % marks for a pass and the total? If the mother tongue is for maximum of 125, what are the new numbers?

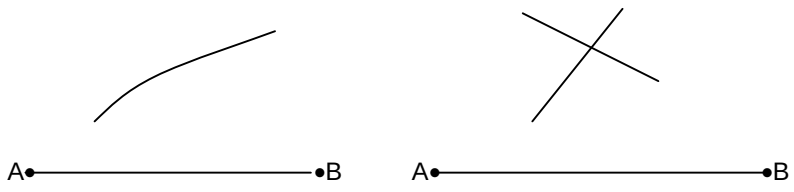
2. A department store had announced 10% discount on all items. A customer bought the following: Textiles Rs. 800, provisions Rs. 700, electronic items Rs. 4000, others Rs. 500. Calculate how much he had saved. Tax (vat) is charged on the final billed amount. If tax is 10%, did he save anything at all?

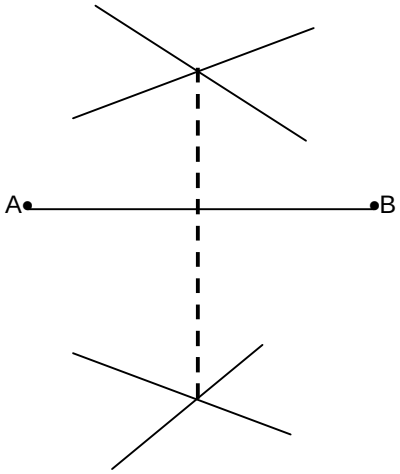
3. A person started with a capital of Rs. 1000. If he wants to get a profit of 20%. What should be his sales? He gives a commission of 10% to a seller. What will be the vendor's prices?

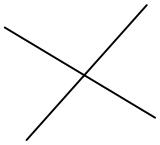
4. A saree in Surat costs Rs. 200. It comes to Mumbai. From there it comes to a wholesale dealer at Mysore. From him a retailer buys and sells. At every stage 10% profit margin is available. What is the final retail price of one saree at Mysore?

40.12 Constructions

40.12.1

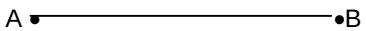






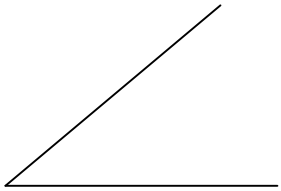
Describing the construction given above. Say what have achieved. [Can you PROVE your statement? Prove means showing what you have done is correct].

40.12.2



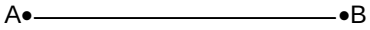
Angle of 90^o is needed at points A & B. Describe how you will do it (using only compass).

40.12.3



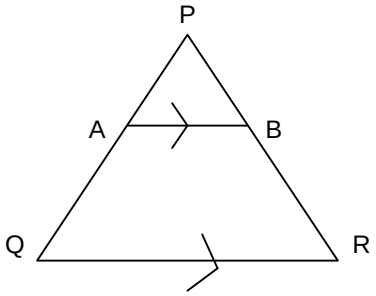
An angle is given. Show how you can bisect it (i.e., make it into 2 equal parts).

40.12.4



How will you divide the line AB into 3 equal parts, 7 equal parts, n equal parts?

Hint: Theorem says $\frac{PA}{PQ} = \frac{PB}{PR}$ if AB ıı QR. Use this property].



40.13 Business

1. Bought a quintal of something for ___ . Sold at ____ per kg. Profit or loss and percent? Make many examples. Let the students make the questions.
2. Add an extra factor of transport cost (and sellers salary if you like). Make questions. In the above, instead of assuming any selling price, turn the questions in to: If the seller wants a profit of 10% what should be the sale price? Let students work in groups. Let different groups take different percent profit margin starting from 10% to 20, 30 and even 100%. Let them work out.
3. Take any two of the items discussed above and add many other factors mentioned. Work out the sale price if a profit of 20% is to be achieved.
4. To (3) above, add retail dealers margin. He will get 10%, not on the cost price, but on his cost price. Teachers, try to work out this.
5. Take a vegetable vendor. Fill in the blanks:

Cost of a basket of 100 kg ------
Auto charges ------
Total Expenses ------

Cost of 1 kg (buying price) = $\frac{\square}{100}$

Selling price = $\frac{\square}{KG}$

Profit =?

6. In (5) above, if the vendor wants to have 25% profit. What will be sale Price/kg?
7. In (6) above, if 20% is wasted (i.e., 20 kg lost) what should be per kg selling price?

40.14 Borrowing

1. Go to a bank. Find out how much rate of interest on money kept in (a) Current account (b) Saving bank account.
2. In (1) above, do some more work. Find about FD and RD (FD fixed deposit, RD recurring deposit).
3. Loan of 10 rupees. Every week 1 rupee interest. How much do you pay at the end of 1 year? What is the rate of interest? Anything more than 50% (interest / annum) is called exorbitant (= too much, very bad). Is this exorbitant or not. Do such things happen in your area?
4. Bank gives loan for home-building at 18%. Maximum of 10 lakhs. How much interest should be paid per month?
5. In (4) above, you can only pay maximum of Rs. 1000 per month. How much loan amount can you take?

40.15 Puzzles:

1. A mother's age is 3 times daughter's age. After 10 years this ratio will become 2. What are their ages?
2. Mr. G had some money. Doubled it by gambling.
   Gave away Rs. 2. Again doubled it by gambling.
   Gave away Rs. 2. Again doubled it by gambling.
   Gave away Rs. 2. He had Rs. 10 left
   What did he have in the beginning?
3. Mr. H did the same thing. But he gave away Re. 1 every time. What did he start with? (He had Rs. 18 at the end).
4. Ajji is twice mummy's age. Mummy is twice beti's age. Beti is twice Beta's age. Beta is twice Munni's age. Munni is 5 times baby's age. If baby is just one year old, what is Ajji's age.
5. In 20 years time Ajji will be a grand old lady. At that time and now: Fill up

	Now	**Later**
Ajji's age/ Beti's age		
Ajji's age/ Beta's age		
Ajji's age/ Munni's age		
Ajji's age/ Baby's age		

40.16 Equations

1. $x + y = 22$ $y = 10$ x =?
2. $x + y = 24$ $x - y = 4$ x =? y = ?
3. $2x + y = 35$ $2y + x = 40$ Solve
4. $x^2 - y^2 = 9$ $y = 4$ x =?

5. $x^2 - y^2 = 9$ $x^2 + y^2 = 41$ Solve
6. Find x, given that x - 4 = 0
7. Find x, given that x - 3 = 0
8. Find x, given that (x - 4) (x - 3) = 0
9. Find x, given that x (x - 4) = 0
10. Find x, given that x (x - 4) (x - 3) = 0
11. $\frac{2x}{7} = 22$ x =?
12. $\frac{7x}{2} = 98$ x =?
13. $\frac{2x}{7} + \frac{7x}{2} = 120$ x =?

14. $x^2 + 7x + 2 = x^2 - 7x + 16$ x =?
15. $x^2 + xy + y^2 + 7x + 2 = x^2 + xy + y^2 - 7x + 16$ x =?
16. $x^2 + abc + a^2b + 7x + 2 = x^2 + abc + a^2b - 7x - 1$ x =?

40.17
1. Using setsquare draw an angle of 45^0
2. Do (1) above using only compass.
3. Draw 90^0 angle and bisect it. Bisect this also.
4. Draw an equilateral triangle whose
   a. Sides (are equal, of course) are 10 cm.
   b. Angles are 60^0

   [Show that question (b) was set up by a person who wants to pull your leg (=make fun of you)].
5. 4(b) examiner wrote some more questions:
   a. Draw a triangle whose sides are 10, 5, 5 cms.
   b. Draw a triangle whose sides are 8, 4, 3 cms.
   c. Draw a right angled triangles whose angles are 90^0, 70^0, 30^0
   d. Draw a right angled triangle whose sides are 5 cm, 5 cm and 8 cm.
6. A friend of the examiner above (let us call him Mr. Khota Sikka) had set up some questions of his own.
   a. Draw a rectangle of sides 3, 4, 5, 6 cms.
   b. Draw a rectangle of sides 10, 5, 10, 8 cm
   c. Draw a square of side 10cm inside a circle of diameter 10 cm.
   d. Draw a circle of radius 5 cm inside an equilateral triangle of side 10 cm.

40.18 a. Prove (or just say with some reason and confidence) that the following questions are asked by Mr. Khota Sikka:

1. Solve $x + y = 5$ and $2x + 2y = 10$
2. Solve $x + y = 0$ and $x - y = 0$
3. Solve $x^2 - y^2 = 0$ and $x = 2y$
4. a + b + c + 2 = a + b + c – 2; (a + b + c) =?

b. Mr. Khota sikka's student is chhota sikka. Obviously his notebooks are full of mistakes. Some are here: can you correct him?

a. $\frac{15}{5} = ?$

$$5\overline{)15}\ \begin{matrix}21\\ 10\\ \hline 5\\ 5\\ \hline 0\end{matrix}$$

$\therefore \frac{15}{5} = 21$

b. 15 x 25 = 0

```
  15
x 25
------
  75
  30
-----
 105
-----
```

$\therefore$ 15 x 25 = 105

c. x - 10 = 15 find x

x - 10 = 15

x =15 – 10 =5

d. $\frac{x}{10}$ =10 x =? $\frac{x}{10}$ = 10 $x = \frac{10}{10}$ =1

40.19 Shri. Andazwala does not mind approximate answers to some difficult problems.

1. Given $\sqrt{25}$ = 5; $\sqrt{49}$ = 7; $\sqrt{37}$ =? ; $\sqrt{30}$ =?
2. $\sqrt{10} \approx$ 3.0 and $\sqrt{3} \approx$ 1.8, $\sqrt{30}$ =?
3. $(10)^2$ = 100 and $(11)^2$ = 121, $(10.5)^2$ =?
4. a. Give the formula $(a + b)^2$ =
   b. Find $(102)^2$, $(401)^2$, $(1001)^2$
5. a. $(a – b)^2$ =?
   b. Find $(49)^2$, $(98)^2$, $(999)^2$
6. a. (a+b) (a-b) =?
   b. (105) x (95); (147) x (53); (99 x (101)
7. Given that 1234 x 12 = 14808
   Find (1) 1235 x 12
   (2) 1234 x 13
   (3) 1235 x 14
8. Those who find (7) above quite tough try this first and then go back.
   Given that 13 x 7 = 91
   Find 14 x 7 =?
   13 x 8 =?
   14 x 9 =?