MATHEMATICS

Standard V

Part - I

Government of Kerala
Department of Education

The National Anthem

Jana-gana-mana adhinayaka, jaya he
Bharatha-bhagya-vidhata.
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gahe tava jaya gatha.
Jana-gana-mangala-dayaka jaya he
Bharatha-bhagya-vidhata.
Jaya he, jaya he, jaya he,
Jaya jaya jaya, jaya he!

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 give respect to my parents, teachers and all elders and treat everyone with courtesy.

I pledge my devotion to my country and my people. In their well-being and prosperity alone lies my happiness.

Dear children,

We have learnt much about Numbers and Shapes

We'll now see larger numbers and fractions.

Work with them and see their peculiarities

Use them to solve problems

We'll also see new ideas in Geometry

And draw new shapes

Let's think logically, draw precisely

Find new connections

And move ahead with confidence.

Dr. P. A. Fathima
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1
Number World

Number game

"Do you like number games?", Zaina teacher asked.

"Oh! Yes!", said the children.

"I'll say a number; you give me the next number at once. Ready?"

"Ready!"

"Ten", teacher began.

"Eleven", said all the children.

"Forty three"

"Forty four"

The game went on.

"Four thousand ninety nine", teacher said.

"Five thousand", replied some one.

"Oh! No!... Four thousand and hundred", some caught on.

Such mistakes are common.

Try this on your friends.

First Day Fiesta

435268 children in Class 1.

First Day Fiesta

What is the number of children in class 1?

What is the largest number you can read?

What is the largest four-digit number?

What is the next number?

And the largest five-digit number? ▢

What is the next number?

How do we find this number?

How do we read it?

Look at the table of large numbers:

1	One
10	Ten
100	Hundred
1000	Thousand
10000	Ten thousand
100000	Lakh
1000000	Ten lakh
10000000	Crore
100000000	Ten crore

Giant number

If we are asked for a large number, we often say crore or hundred crore. Putting ten zeros after one makes thousand crore. Think about the size of the number with hundred zeros after one. This is called googol. This name was popularized by Edward Kasner in 1938.

In most countries, one lakh is named hundred thousand and ten lakh is named million.

You're always counting numbers! What's your goal?

Googol!

This continues with hundred crore, thousand crore, and so on.

Now can you say what we get when we add one to ninety nine thousand nine hundred and ninety nine?

$$99999 + 1 = 100000$$

How do we read this?

Look it up in the table.

Lakh has six digits.

That is, lakh is a six-digit number.

Can you write the largest six-digit number? ▢

Can you write the number we get when we add one to nine lakh ninety nine thousand nine hundred and ninety nine? ▢

How do we read it?

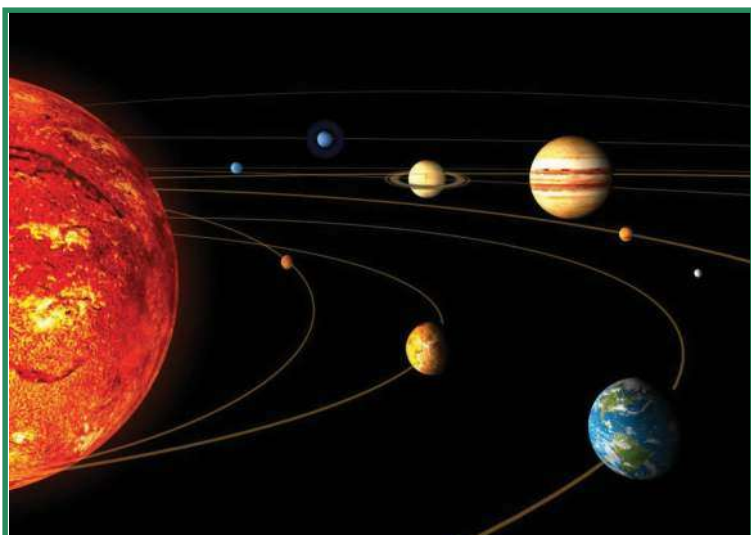That is, $999999 + 1 =$ ▢

- For each number below, find two numbers in the table between which it lies.

    3245;   435268;   26736;   43526720

- Write down a six-digit number. Between which two numbers of the table is it? How do you read it?

- Write down five numbers between a lakh and ten lakh. Read the numbers.

Distance of planets

The table gives the distances of the planets from the Sun.

Planets	Distance (km)
Mercury	57909175
Venus	108200000
Earth	149600011
Mars	227940000
Jupiter	778333000
Saturn	1429400000
Uranus	2870990000
Neptune	4504300000

What is the distance of the Earth from the Sun?

The table gives it as 149600011 kilometres. How do we read this number?

Fourteen crore, ninety six lakh and eleven.

What is the distance of Jupiter from the Sun?

What is the distance from the Sun to its nearest planet?

What is the distance from the Sun to its farthest planet?
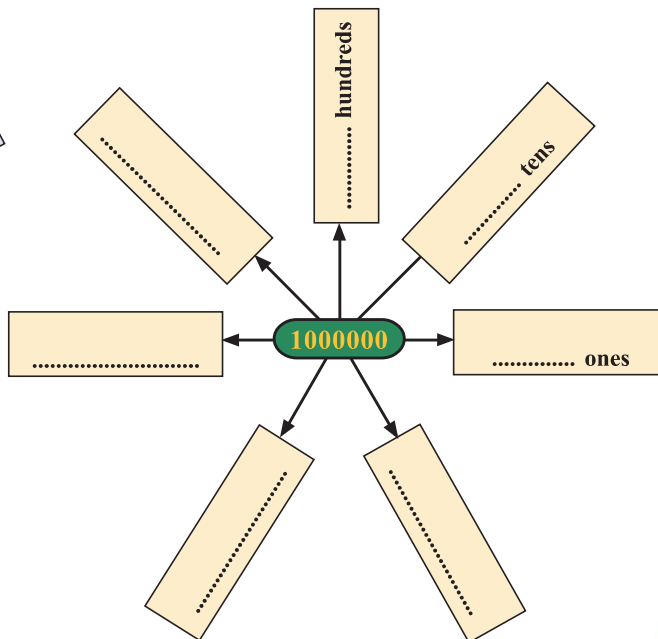
Read all these distances.

Many forms of ten thousand

See how 10000 is given in various forms:

```
                    100 hundreds

   1000 tens                        10000 ones

              10000

   10 thousands                     1 ten thousands
```

Now try this for 100000:

```
        ............ tens       ............ ones


   ............ hundreds   100000   ............ lakhs


        ............ thousands   ..... ten thousands
```

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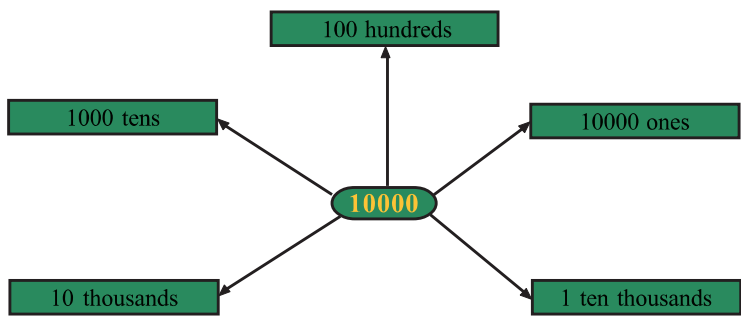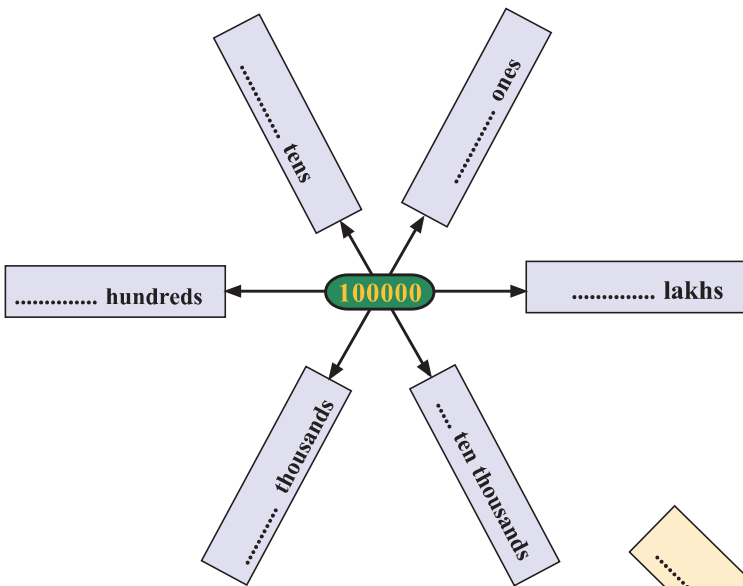
So many numbers

How many five-digit numbers can you make using 1, 2, 3, 4, 5 without repeating? It is not an easy task to write down all these.

Suppose we start with just two digits, say 3 and 4. The only two-digit numbers we can make with these (without repetition) are 34 and 43. Now try with three digits. We can make 6 three digit numbers.

Now can't you do this with four digits?

How about five?

</div>

And 1000000

```
                    ............ hundreds

        ............                        ............ tens


   ............          1000000          ............ ones


        ............                ............
```

One number, different forms

- See how 85492 is written in different forms.

.854.. hundreds ..9... tens ..2... ones

.... ones
.... tens
.... hundreds
.... thousands
.... ten thousands

85492

.... ones
.... tens
.... hundreds
.... thousands

.... tens .... ones
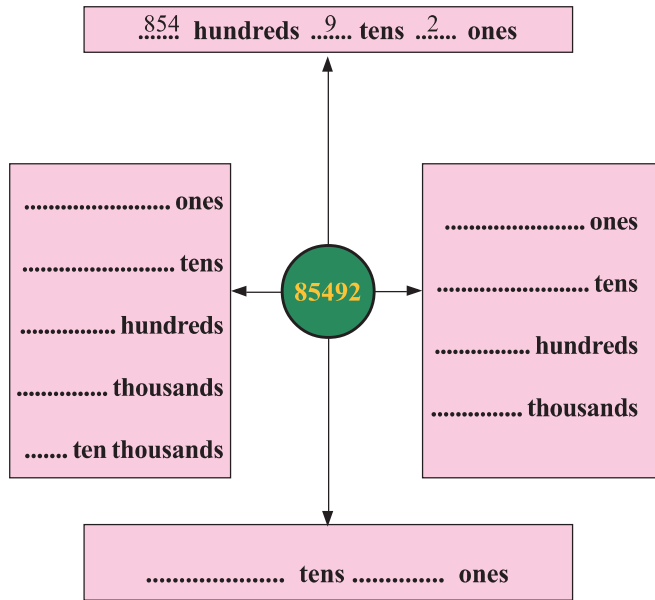
- Fill the blanks with suitable numbers:

Where are the remaining numbers, after you struck off what you didn't like?

...... ones ...... hundreds ...... ten thousands ...... lakh

6 ones

3 tens

48 hundreds

2 tens thousands

3 lakh

....

.... ones
.... tens
.... tens thousands
.... lakh

The remaining were those I didn't like at all!

.... tens .... ones
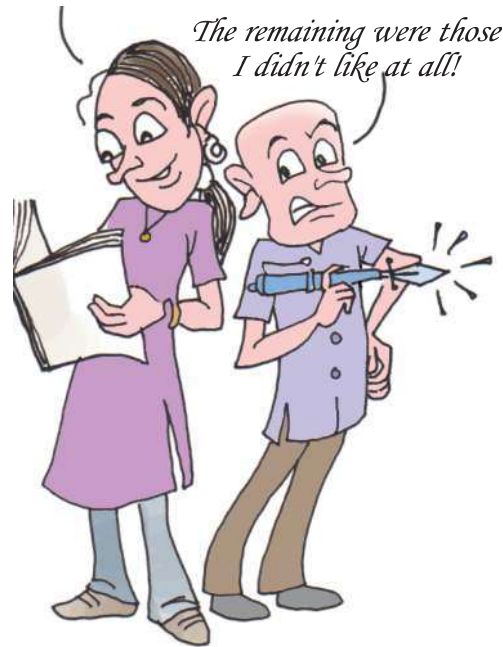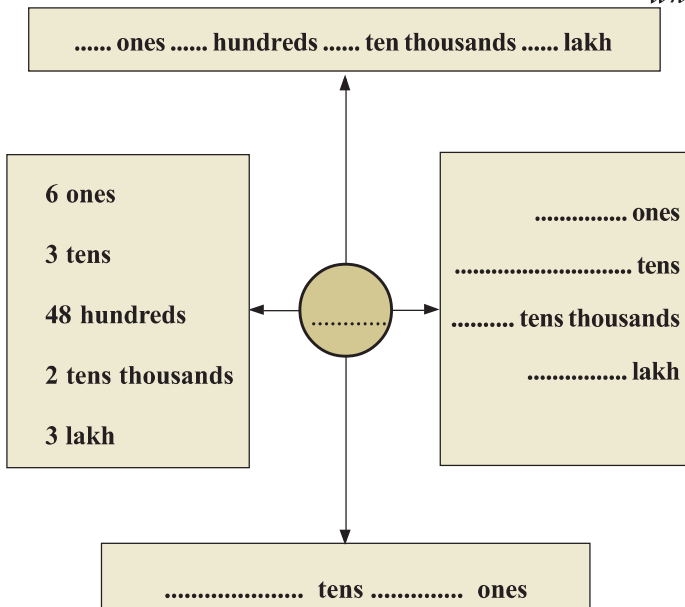
- Write 136749 in different forms.

Population

The population of some states of India, according to the 2011 census, is given below:

States	Population
Jammu-Kashmir	12548926
Himachal Pradesh	6856509
Uttarakhand	10116752
Haryana	25353081
Rajasthan	68621012
Uttar Pradesh	199581477
Bihar	103804637
Sikkim	607688
Kerala	33387677
Tamil Nadu	72138958
Karnataka	61130704
Goa	1457723
Punjab	27704236

- From the table, which is the state with least population? What is its population?

- Which is the state with largest population? What is its population?

- What is the difference in population between these two states?

- What is the total population of our neighbour states, Tamil Nadu and Karnataka?

- How much more is the population of Uttar Pradesh than Bihar?

- Order the states according to their population.

Make more questions based on the table and present in the class.

Palindromic number

Numbers which read the same both forward and backward, such as 36563, are called palindromic numbers.

Can we make a palindromic number, staring with any number? Take any number. Reverse its digits and add to the original. Reverse the digits of this number and add.

Continue till we get a palindromic number. See what happens when we start with 69.

4884 is a palindromic number, isn't it?

Try with other numbers.

$$
\begin{array}{r}
69 \ + \\
96 \\
\hline
165 \\
561 \\
\hline
726 \\
627 \\
\hline
1353 \\
3531 \\
\hline
4884
\end{array}
$$

It is not known whether this process will eventually reach a palindromic number every time. For example, it is found that starting with 196, this process does not gave a palindrome, even after seventy crore steps.

Let's make numbers

Ziad and Meera are making numbers with digit-cards. These are the cards they have:

| 4 | 0 | 7 | 8 | 5 | 6 |

- What is the largest number they can make with these cards?

- And the smallest?

- Find out the sum and differences of these.

Number chain

In the picture on the right, write in the second row, the difference of two nearby numbers in the first row. Then in the third row, write the difference of nearby numbers in the second row. And finally, the difference of these two numbers in the bottom box.

| 475368 | 998838 | 470993 | 503213 |

| 523470 | | |
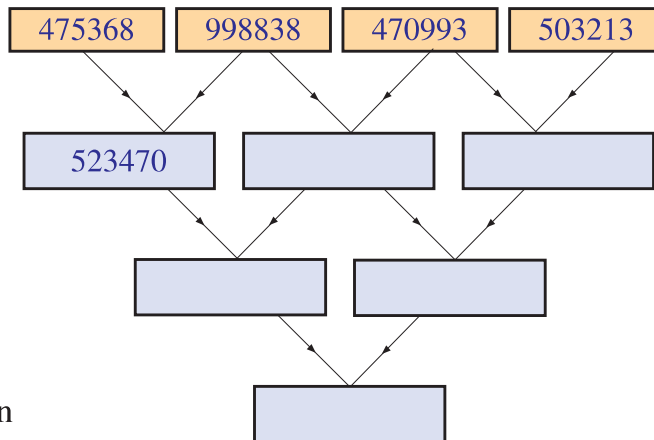
Budget

In the budget of a Panchayath, money allotted for various sectors are as shown in this table:

Sectors	Amount (Rs)
Health	1255000
Education	789000
Road Development	2060000
Drinking water	490000

- Which sector is allotted the largest amount?

- And the least amount?

- How much more is allotted to Road Development than Education?

- What is the total allotment?

- For the next year, the allotment is to be increased by 4 lakhs. Draw up a revised budget, in two different ways.

Multiple multiplication

A school decided to give pens to all children participating in the Onam festival. The price of a pen is 6 rupees; and there are 256 children. What would be the total cost?

How do we calculate this?

$256 \times 6 = $ ....

A panchayath decided to provide furniture for the primary school. The price of a desk is 3456 rupees. What would be the total cost for 85 desks?

We want to calculate 3456×85.

We can write it out like this:.

$3456 \times 85 \quad = \quad 3456 \times (5 + 80)$

$\qquad\qquad\quad = \quad (3456 \times 5) + (3456 \times 80)$

Now $\qquad\qquad 3456 \times 5 \ = $ ....

$\qquad\qquad\quad 3456 \times 80 = $ ....

So, $\qquad\qquad 3456 \times 85 = $ ....

Kaprekar constant

What is the largest number we can make with the digits 2, 3, 5, 6 without repetition? And the smallest?

What is their difference?

$\qquad 6532 - 2356 = 4176$

The digits in this number are 4, 1, 7, 6. If we repeat the above process with these, we get

$\qquad 7641 - 1467 = 6174$

Now repeat this process with this number. What do you see? Try other numbers.

This was discovered by D.R. Kaprekar, who was a school teacher in Maharashtra. The number 6174 is called the Kaprekar constant.

Start with any four digit number. Reverse the digits and find the difference of these numbers. Continue with this number. What do you see?

We can shorten it like this:

$$
\begin{array}{r}
3456 \times \\
85 \\
\hline
17280 \\
276480 \\
\hline
293760 \\
\hline
\end{array}
$$

Uniforms

There are 528 girls and 442 boys in a school. Uniform for a girl costs 210 rupees and for a boy, 160 rupees. What is the total cost for uniforms?

It's all the same

Rajeevan Master bought three packets of crayon, each for 12 rupees, as prize for the quiz. After the competition, two more children had to be given prizes and so he bought two more packets. How much did he spend in all?

First, he spent $=$ 12×3 $=$ 36 rupees

Then he spent $=$ 12×2 $=$ 24 rupees

So altogether he spent $=$ $36 + 24 =$ 60 rupees

This can be done in a different way:

He bought $3 + 2 = 5$ packets.

And the price of each packet is 12 rupees.

So he spent in all $12 \times 5 = 60$ rupees.

What do we see here?

$$(3 + 2) \times 12 = (3 \times 12) + (2 \times 12)$$

No computation!

The last digit of the product of the numbers 1 to 5 is 0.

Why?

Look at this:

$$1 \times 2 \times 3 \times 4 \times 5 = 1 \times 3 \times 4 \times 10.$$

What about the product of number upto 10? How many of the last digits are 0's? Can you find out without computing the actual product?

Number relations

Find the product of any four consecutive numbers and add 1 to it. Now find the product of the first and last of these numbers and add 1 to it. Do you see any relation between these two? Check it out for more numbers.

Doing in head

Do these without pen and paper:

- $(225 \times 98) + (225 \times 2)$
- $(45 \times 92) + (45 \times 8)$
- $(115 \times 88) + (115 \times 12)$
- $(132 \times 7) + (132 \times 993)$

Let's do it!

- In an educational district, there are 215 schools; and the district panchayath allotted 4850 rupees to each of these, for setting up Math Lab. And also 76500 rupees each for 36 schools for a Computer Lab. How much is the total allotment for labs?

- Under the Noon Meal Scheme, 150 grams of rice is allotted per day for each child. In a High School, 1240 children are in this scheme. How many kilograms of rice is needed per day?

- In an Upper Primary School, the PTA collected 236465 rupees to build a computer lab. It is in 1000, 500, 100, 50, 10 and 5 rupee notes. There are hundred 1000 rupee notes. What are the possible numbers of others? Write at least three different possibilities.

- It was decided to give 1221 books each to 587 selected libraries in the state during the *Reading Week*. How many books are to be bought in all?

- In an election, contested by two candidates, the winner got 374436 votes and his rival got 293760 votes. What is the winner's majority? 1436 votes were invalid. How many votes were polled?

Project

Write a four digit number and reverse the digits. Find the difference of these two. Do you note any speciality of the digital root of this number?

Looking back

Achievements	On my own	With teacher's help	Must improve
• Writing and reading large numbers like lakh, ten lakh and crore.			
• Interpreting place value as the ten fold increase in moving to the right.			
• Interpreting numbers in terms of ones, tens, hundreds, thousands and so on, depending on the context.			
• Finding appropriate methods to multiply by three digit numbers.			
• Describing various methods for multiplication.			
• Solving practical problems involving large numbers using the four basic operations.			

2
When Lines Join
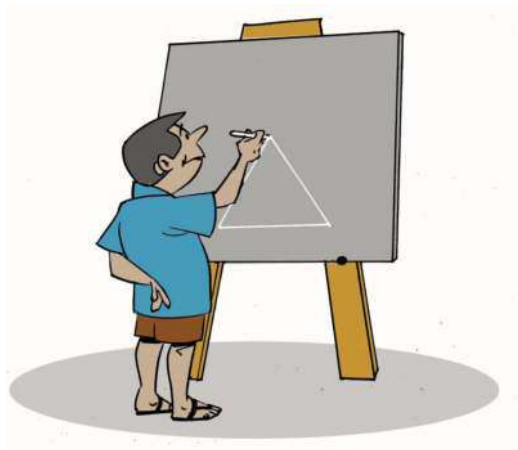
Straight and slanted

Malu came to the class with photos of her vacation tour. Appu looked at some of the photos for some time and said, "There's something common to all these."

These are the photos:

Leaning Tower

The photo shows a tower in the city of Pisa in Italy. It is famous as the *Leaning Tower of Pisa*.

Later the tower was found to lean slowly. Though the tower could have been strengthened, it was decided to maintain a slant, as a tourist attraction.

"What's it?", all his friends looking at the photos.

"In all these, there are things going upwards; some straight up, others slanted"

Did you note this in these photos?

Four sides

Shown below are some figures with four sides (called *quadrilaterals*).
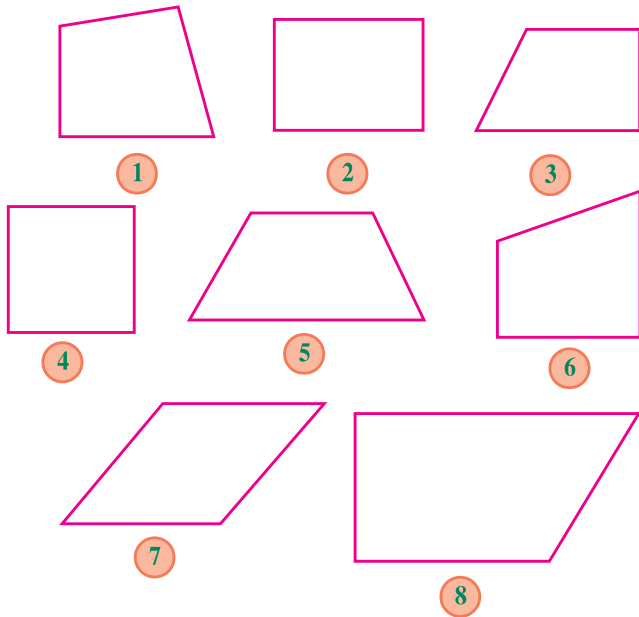
In these, some sides go straight up from the bottom line; and some are at a slant.

For example, look at the first one – left line goes straight up, while the right one is slanted to the left.

Look at the other figures and complete this table:

Figure	Upright	Slanted
1	Left line	Right line
2		
3		
4		
5		Left line, right line
6		
7		
8		

Polygons

Geometrical figures made up of lines are named according to the number of sides - those with four sides are quadrilaterals, those with five sides are pentagons, those with six sides are hexagons and so on.

Quadrilateral

Pentagon

Hexagon
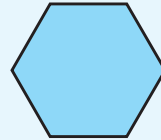
Septagon
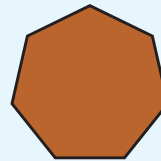
Octagon
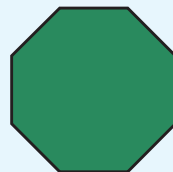
Set squares

Ramu is trying to cut out a rectangle from a wooden plank. See the tool he uses to make a side straight up from the other.

It is called a set square.

Your geometry box also has a pair of set squares.
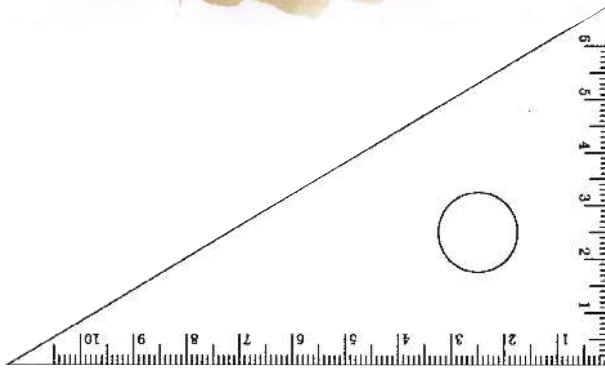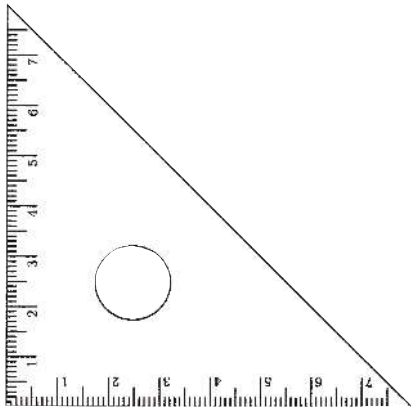
- What are their uses?

Let's check

Look at this Quadrilateral:

Are the left and right lines straight up from the bottom?

Not very sure, are you?

Let's check with a set square.
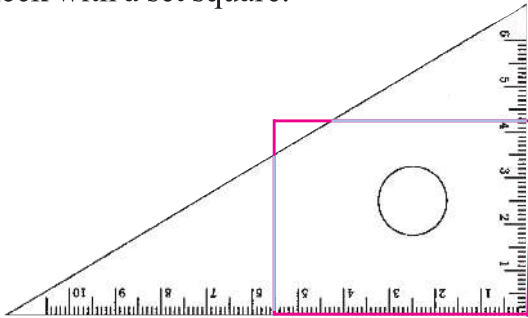
The right line is a bit slanted to the right.

Let's draw!

This figure shows a line with a small dot (point) on it.

We want to draw a line straight up to this line; and also through the point.

For this also, we can use a set square.
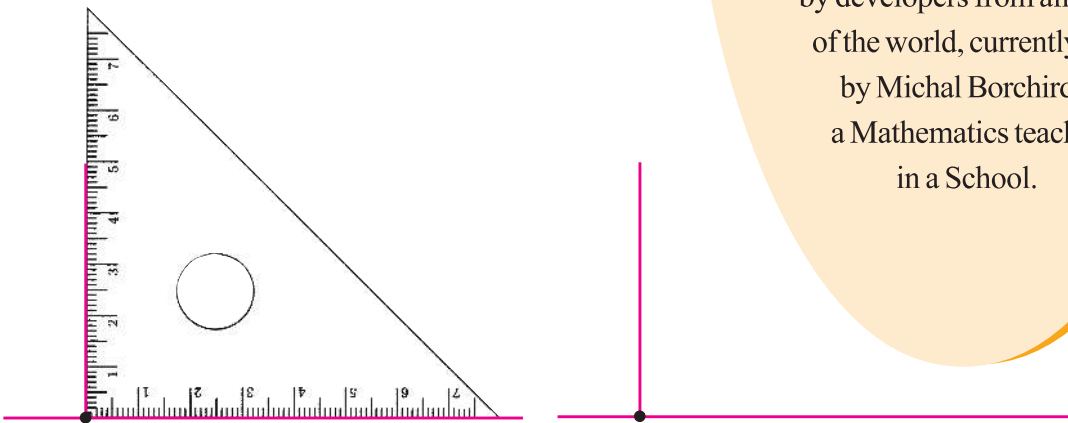
The line we draw now meets our needs.

The set square has three corners; and we used one of these to draw the line straight up. This corner of the set square is special. An edge through this corner is straight up from the other. It is called the square corner.

Now draw such a figure in your notebook.

Draw a line and two lines straight up from it.

How many such lines can you draw?

From the end point of a line, how do we draw an upright line?

Let's first see how we draw such a line through the left end point.
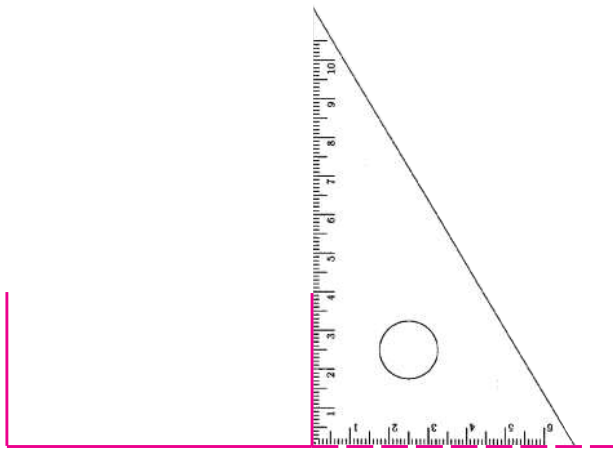
Now from the right end point.
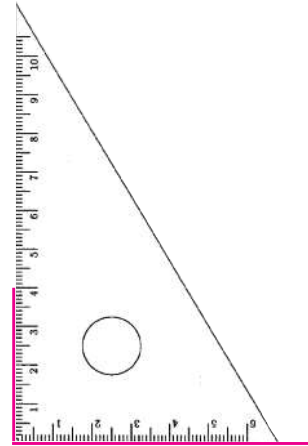
Do you see why we extend the line to the right?

Quadrilaterals

Start GeoGebra selection by `Application` → `Education` → `Geogebra`. Then select `Tools` → `polygon tools` → `polygon`. Click at four positions and then the first position within the GeoGebra window. We get a quadrilateral. Make different quadrilaterals like this.

Click the **Move** tool from the tool bar and then drag the left and right sides to make them upright.

We can also draw it like this:

24
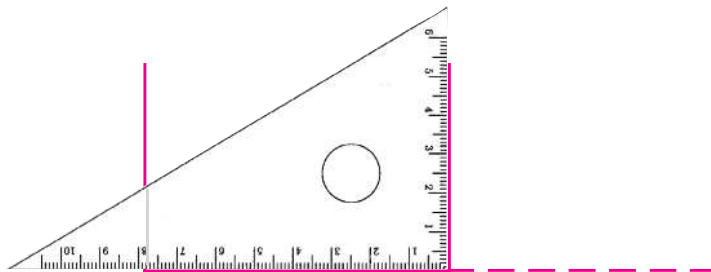
Now try these problems:

- Draw a line 6 centimetres long. From the left end point, draw an upright line, 3 centimetres high. From the right end point, draw an upright line, 4 centimetres high. Join the top ends of these lines.

- Draw a line 7 centimetres long and from each end point, draw upright lines, both 4 centimetres high. Draw a line joining the top ends of these lines. Measure its length.

Look at the figure you got. Isn't it a rectangle? What are its length and breadths?

Here are some things of rectangular shape:
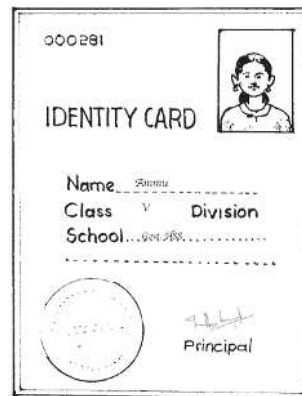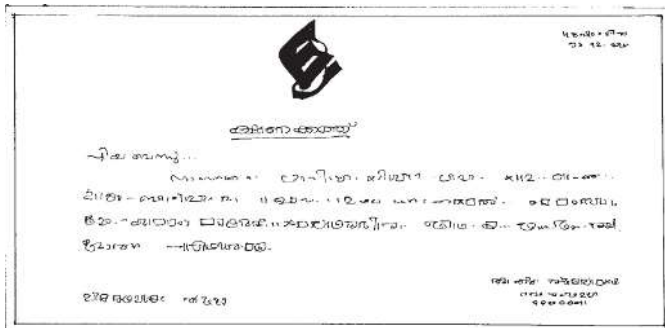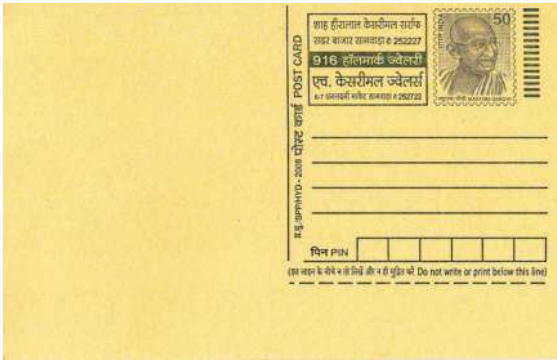
Measure the sides of some such objects.

Opposite sides of a rectangle have the same of length, right?

What can we say about the corners?

A rectangle has square corners.
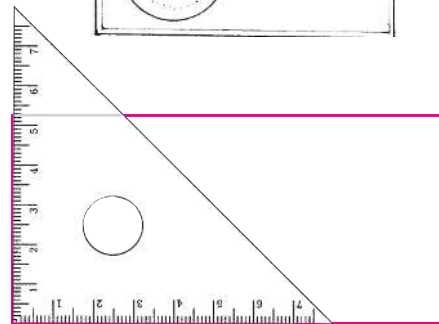
Let's draw rectangles!

- Draw a rectangle with nearby sides 6 and 5 centimetres long.

- Draw a rectangle with all sides 5 centimetre long

- The figure on the right is drawn using a ruler and a set square. Draw this figure in the same size.
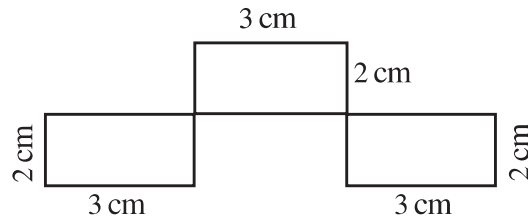
Tilting rectangle

Ammu draw some rectangles using a set square. Then she had a mischievous idea. Why not draw with another corner? This is how she drew:
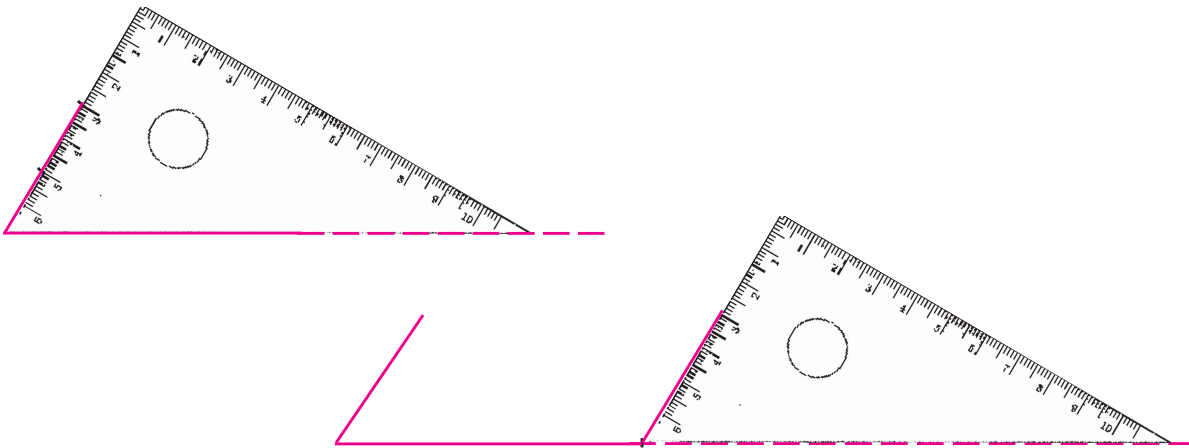
And this is what she got:

Seeing this, Rahim used the third corner to draw a figure like this.

In both of these, the left and right lines are slanted.

Are the slants the same?

New shapes

- The picture on the right is drawn using various corners of a set square. Can you draw it in your notebook?
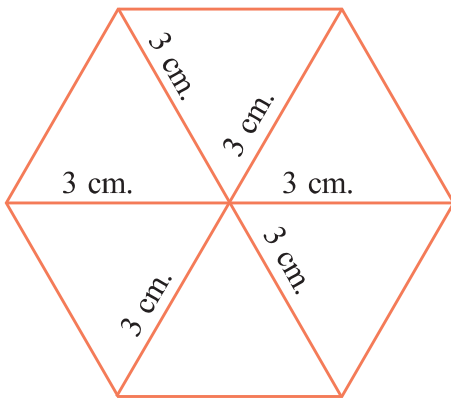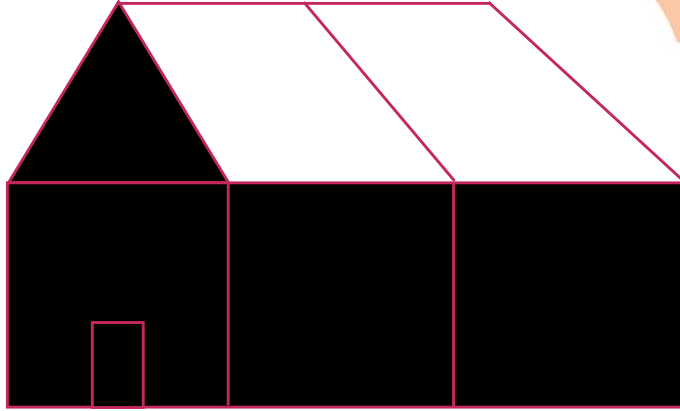
- Rahim put a dot on a paper and drew lines from it, using only one corner of a set square, to make this picture.

  How many sides does this figure have?

  Can you do this in your notebook?

- Using the other corners of a set square, draw similar figures around a point.

  How many sides does each of these figures have? a dot as in the above case. Find out

Upright and slanted

All these are drawn using different corners of a set square.
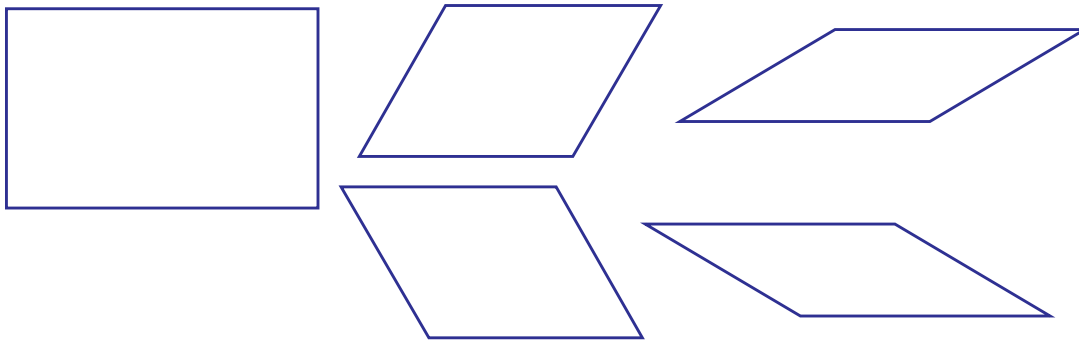
Measure the sides of each and write the lengths near them.

Note anything about the lengths of opposite sides?

Let's see how we can draw a rectangle of specified lengths for sides using GeoGebra. For example, a rectangle of sides 3 and 2 centimetres.
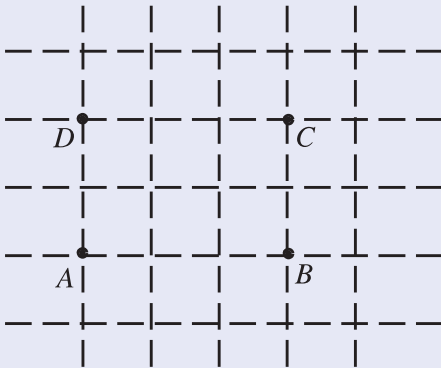
Click **view** and select **Grid**. We get cross-cross lines as above. Click **New point** and mark the points A, B, C, D. With the **Polygon** tool, click on A, B, C, D in that order. We get a rectangle. The lengths of the sides can be displayed using the **Distance** tool. Clicking the **Move** tool and dragging the sides, we can change the lengths.

Word and meaning

The word "angle" comes from the Greek word "ankylos" meaning "bent" or "not straight." The joint between the foot and the leg is called "ankle" and comes from the same root.

Do all figures look the same?

What are the differences?

In the rectangle, the left and right sides are straight up.

In the other figures, they are slanted.

Do they have the same slant in all figures?

Every figure has four corners.

A corner is made where two sides meet.

In the language of math, we say

Two lines meeting at a point, form an angle.

So we can say that each of these figures has four angles; and the angles are different.

Look at the various angles in some of the letters:

V E F W X Z Y

These letters are made using only straight lines.

Can you find the others?

How many angles does each have?

You can see angles in classroom, home and outside.

Draw them in your notebook.

Spread and angle

Look at these pictures of clocks.

They show different times.

The hands of a clock make an angle.

Look at the gap between the hands in both clocks; are they the same?

The hands of the second clock are spread more apart. That is the angle has increased a bit.

The second clock shows 10 : 10

What happens when the time is 10 : 15?
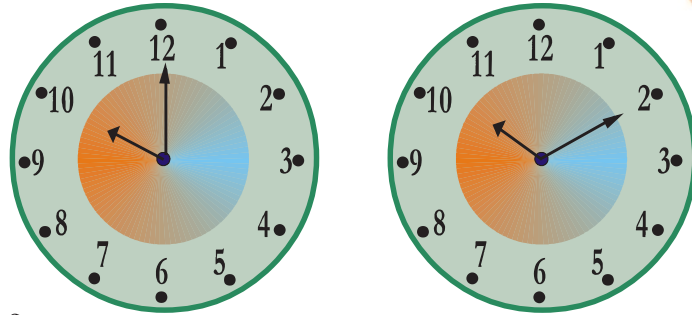
Joining angles

Look at this angle, drawn using a corner of a set square.
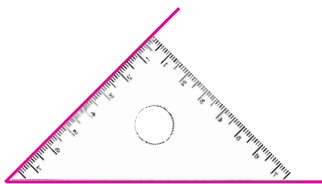
With the same corner again, draw another angle on the top like this.
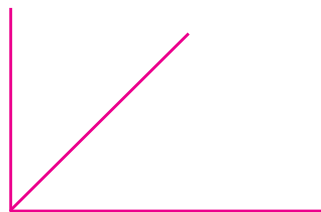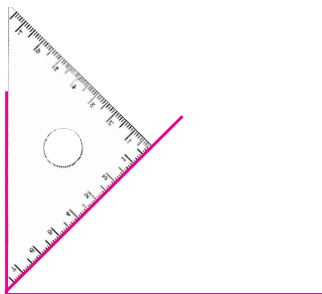
How many angles do we have now?

Two? Or Three?

Spreading angles

We can show the change in the spread of an angle using GeoGebra. Use the **Circle with Centre through Point** tool to draw a circle. The centre of the circle will be named A and a point on it B. Mark two other points C and D on the circle. Use the **Segment between Two Points** tool to join the points A and B . Now we hide the circle, point A and point B. For this, first right click on the circle and in the drop-down menu, unselect **Show Object**. In the same way, hide the points A and B. Now by dragging C or D, we can change the spread of the angles.

29
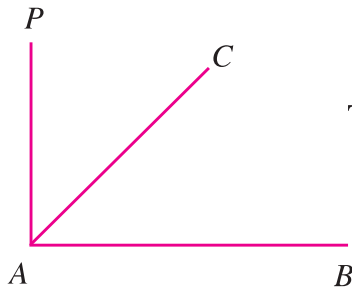
To talk about these three angles, let's give them names.

The first angle we draw can be called *CAB* or *BAC*; and the second one, *PAC* or *CAP*. We use the symbol ∠ to denote an angle. Thus the first angle can be written ∠*CAB* (read "angle *C*, *A*, *B*").

The second angle is ∠*PAC*.

What's the name of the third angle?

Which of these three is the largest?

And the smallest?

Two angles shown on the right are drawn using different corners of a set square.
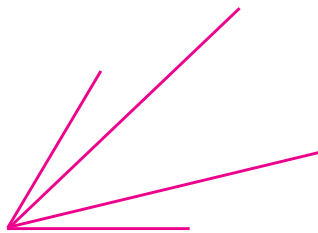
We can draw the first angle within the second.

So, the first one is smaller than the second.

Some angles are shown below:
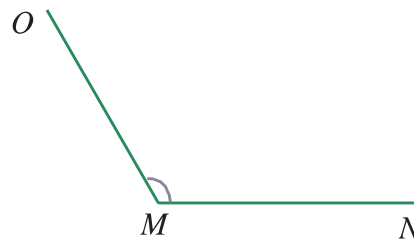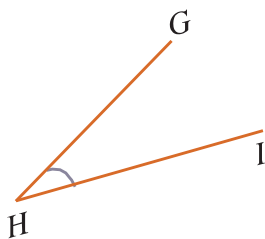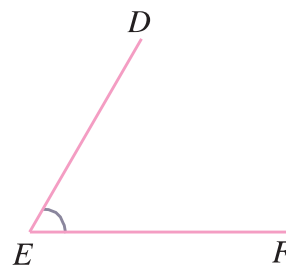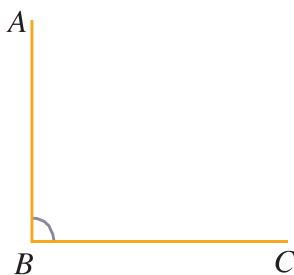
Which is the smallest among these?

And the largest?

Write the names of all these in order of their sizes.

Let's do it!

- How many angles are there in this picture?

The picture shows two set squares of the same type put together. What is the speciality of this rectangle?
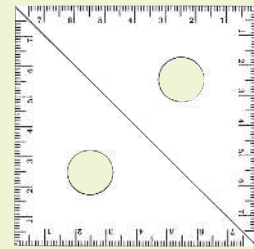
Two set squares of the other kind can be put together like this. What is the speciality of this triangle?
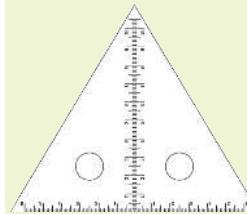
Try to make other shapes using set squares.

- The floor plan of a house is as shown on the right.

  2 metres in the actual floor is taken as 1 centimetre in this plan.

  Can you draw it in your notebook, taking 1 centimetre for 1 metre?

Looking   back

Achievements	On my own	With teacher's help	Must improve
• Recognizing peculiarities of sides and angles of rectangle and square and solving problem based on them.			
• Recognizing angles in objects seen around.			
• Drawing angles using necessary tools.			
• Recognizing shapes, naming them and describing peculiarities.			
• Describing angles and rectangles using GeoGebra.			

3

Equal Sharing
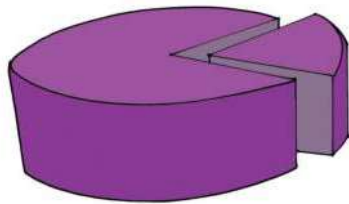
Let's share

For the Independence Day celebration, the children in class V-A of Ramanujan Memorial UP School were divided into six groups and each given some task. The teacher gave some sweets to Meenu for distributing equally among the groups. Meenu counted them: 48 in all.

How do we divide 48 sweets equally among 6 groups?

First set apart one for each group.

Can you continue this with the remaining?

Finished?

How many does each group get?

Instead of doing one by one like this, can we directly find out how many sweets we have to give each group?

What's the total number of sweets?

So, the number of sweets for each group, added 6 times must give 48.

What number multiplied by 6 gives 48?

Can't we put this differently?

48 divided by 6 gives 8.

That is, $48 \div 6 = 8$

Now, when 56 sweets were distributed among the groups of class V – B, each group got 8 sweets. How many groups were there?

To calculate the number of groups, what should we do?

Let's split 56 sweets into sets of 8.

How many sets of sweets? ☐

So class V – B is divided into how many groups? ☐

Any idea to find out the number of groups, without actually splitting the sweets as above.

It is 56 sweets that has to be split into sets of 8. So 8 added as many as the number of groups gives 56. That is, 8 multiplied by this number must be 56.

8 multiplied by what number gives 56? ☐

So, what number do we get on doing 56 by 8? ☐

$56 \div 8 = 7$

Thus we find out the number of groups in class V-B.

● The table below shows the number of groups some classes were divided into, and the number of sweets given to these classes. Fill in the missing details.

Class	Number of sweets	Number of groups	Number of sweets for each group
5C	70	5	-
6A	96	-	8
6B	84	6	-
6C	-	7	12

35

- The total price of 7 pens is 98 rupees, all of the same prices. What is the price of one pen?

- Amal bought 6 notebooks, all of the same price. He gave one hundred rupee note and the shopkeeper gave him 4 rupees back. What is the price of a notebook?

- 96 children came for volleyball practice and they were divided into groups of 8. How many groups would be there?

- Some cars and autorickshaws are parked in a ground. Nandu says, there are 100 wheels in all. Riaz says there are 12 autorickshaws. How many cars are there?

- 8 rolls of cloth, each of 76 meters, are bought for boys' uniform in a school. Each boy is to be given 4 metres. Using one roll, how many boys can be given cloth? How many boys, using all the 8 rolls?

No pen or paper!

108 gooseberries are to be divided among 4 children.

Suppose we divide 100 berries first.

How much would each get?

Which number multiplied by 4 gives 100?

So, 100 divided among 4 gives 25 to each.

Now 8 more berries remain. If those are also divided, each would get 2 more.

Altogether each gets, 25 + 2 = 27

What do we see here?

To divide 108 by 4, we can divide 100 and 8 separately by 4 and add.

Now try to do these problems also in your head:

- If 168 rupees is divided among 8, how much would each get?

- If 175 pens are packed into 7 packets, how many pens would each packet have?

- 189 notebooks are to be divided among some children, so that each gets 9 books. How many children are there?

- A 72 centimetre long string is used to make a square. What is the length of a side of this square?

Book distribution

735 notebooks are in a school and these are to be divided equally among five classes.

How many books would each class get?

There are 7 bundles of 100 notebooks each, 3 bundles of 10 each, and then 5 more.

Let's first take up the bundles of 100.

How many such bundles can be given to each of the 5 classes? ☐

How many left? ☐

How do we divide this among 5 classes?

Let's see. Each of these bundles contain 10 bundles of 10 notebooks.

So, how many bundles of 10 do we get from 2 bundles of 100? ☐

In the calendar of any month, mark off 9 numbers in a square.

3	4	5
10	11	12
17	18	19

Add all these numbers and divide the sum by 9. Take other 9 numbers like this and do this. Is there any relation between the quotient and the middle number? And with the first number?

How many bundles of 10 were already there? ☐

So, altogether how many bundles of 10? ☐

If these 23 bundles are divided among the 5 classes, how many would each get? ☐

How many bundles are left? ☐

If these 3 bundles of 10 are untied and the 5 loose books already there are added, how many notebooks would be there in all?

If these 35 books are divided among 5 classes, how many would each get? ☐

We can write the number of notebooks each class got; like this:

$$\text{Bundles of } 100 \quad = \quad \text{.................}$$

$$\text{Bundles of } 10 \quad = \quad \text{.................}$$

$$\text{Loose} \quad = \quad \text{.................}$$

Total number of books is,

$$= \quad (1 \times 100) + (4 \times 10) + 7$$

$$= \quad 100 + 40 + 7$$

$$= \quad 147$$

Let's write down these computations in shorthand like this:

	Hundreds	Tens	Ones
	1	4	7
5	7	3	5
$1 \times 5 = 5$	5		
	2 ($2 \times 100 = 20 \times 10$)	3	5
		20	
		23	5
$4 \times 5 = 20$		20	
		3 (3×10)	5
			30
			35
$7 \times 5 = 35$			35

We can shorten this further:

```
        1             1              14
  5 | 735      5 | 735           | 735
1×5 | 5      1×5=5 | 5         1×5=5 | 5
    | 2            | 23              | 23
                             4×5=20 | 20
```

```
          14              14                147
      | 735          5 | 735           5 | 735
1×5=5 | 5        1×5=5 | 5         1×5=5 | 5
      | 23             | 23              | 23
4×5=20| 20       4×5=20| 20        4×5=20| 20
      | 3              | 35              | 35
                                        | 35
                                 7×5=35 | 35
```

Thus, $735 \div 5 = 147$

Magic square

8	1	6
3	5	7
4	9	2

This is a magic square of 3 rows and 3 columns. What is the sum of all numbers in this?

Divide the sum by 9. What number did you get?

Check this out for other magic squares of three rows and three columns.

39

How's the cap problem?

I've had enough problem with appeals and to cap it all, now a math problem!

Let's do it!

- Raju, Rahim and Benny did a job together and got 860 rupees. How much would each get if this is equally divided?

- The perimeter of a square garden is 884 meters. What is the length of a side?

- 856 rupees was spent by 4 friends for a trip. If this is to be equally shared, how much should each give?

- James bought 5 each of two kinds of CFL bulbs for 100 rupees. The price of the cheaper lamp is 85 rupees a piece. What is the price of one of the costlier kind?

- In a government school, 6 clocks of the same price are bought for 924 rupees. How much is needed to buy 7 more such clocks?

- Under the milk distribution scheme, each child is to be given 150 millilitres. How much milk is needed for 20 children?

- In a school, 54 litres of milk is needed each day. How many children are given milk there?

Cap problem

- 693 rupees was spent to buy caps for all 11 players of a cricket team. What is the price of a cap?

How do we compute the price of a cap?

693 rupees is to be divided into 11 equal parts.

That is, divide 693 by 11.

Let's think of the 693 rupees as 6 hundred rupee notes, 9 ten rupee notes and 3 one rupee coins.

How do we divide 6 hundred rupee notes into 11 equal parts?

It cannot be done; so let's change them into 10 rupee notes.

6 hundred rupee notes = ……… ten rupee notes.

Hundreds	Tens	Ones
11	6 $\;\;6 \times 100 = 60 \times 10$	9	3
	60	3
	69	

Total number of ten rupee notes = ☐

If 69 ten rupee notes are divided into 11 equal parts, how many would be in each part? ☐

How many are left? ☐

Let's change these remaining ten rupee notes into one rupee coins.

How many one rupee coins? ☐

		6	
	Hundreds	Tens	Ones
11	6 $\;6 \times 100 = 60 \times 10$	9	3
		60	
		69	3
$11 \times 6 = 66$		66	
		3 $\;3 \times 10 = 30$	3
			30

The total number of one rupee coins is ⬚

			6	3
	Hundred	Tens		Ones
11	6	9		3
		60		
11 × 6 = 66		69		3
		66		
		3		3
				30
				33
11 × 3 = 33				33

If 33 one rupee coins are divided into 11 equal parts, how many would be in each part?

So, the price of one cap is

6 ten rupee notes + 3 one rupee coins

= 63 rupees

Let's shorten this computation a bit more.

$$11 \overline{)693} \quad 63$$

	63
11	693
11 × 6 = 66	66
	33
11 × 3 = 33	33

That is, 693 ÷ 11 = 63

Scholarships

● The school office got 16425 rupees to distribute equally among 15 students as scholarship. How much should be given to each?

Here, let's think of the 16425 rupees as 16 thousand rupee notes, 4 hundred rupee notes, 2 ten rupee notes and 5 one rupee coins. Let's first divide 16 thousand rupee notes equally among the 15 students.

How many does each get? ☐

How many are left? ☐

	1			
	Thousands	Hundres	Tens	Ones
15	16	4	2	5
	15			
	1	4	2	5

Now let's change the one remaining thousand rupee note into hundreds.

One thousand rupee note = …….... hundred rupee notes.

Together with the 4 hundred rupee notes already at hand, this makes how many in all? ☐

	1				
	Thousands		Hundreds	Tens	Ones
15	16		4	2	5
	15				
	1	$1 \times 1000 = 10 \times 100$	4	2	5
			10		
			14	2	5

Gram and sovereigns

Anu saw an advertisement that the first prize is one kilogram of gold. She was puzzled. Weight of gold is not usually said in terms of kilograms. She had heard mother saying that sister's necklace weighs two sovereigns.

What is the relation between grams and sovereigns? A gold sovereign weighs 8 grams.

One kilogram is 1000 gram. So how many sovereigns in one kilogram of gold?

We can't divide 14 hundred rupee notes equally among 15. Thus none gets a hundred rupee note.

Let's change them into tens.

14 hundred rupee notes = …….... ten rupee notes.

Together with the 2 ten rupee notes at hand, this makes how many ten rupee notes in all? ☐

If these 142 ten rupee notes are divided equally among 15, how many would each get? ☐

	1	0	9	
	Thousands	Hundreds	Tens	Ones
15	16 15	4	2	5
	1 $1 \times 1000 = 10 \times 100$ →10	4	2	5
$15 \times 0 = 0$		14 $14 \times 100 = 140 \times 10$ 0 →140	2	5
			142	5
$15 \times 9 = 135$			135	4
			7	5

How many are left? ☐

If these ten rupee notes are changed into one rupee coins, how many would we have? ☐

Together with 5 one rupee coins already at hand, how many one rupee coins in all? ☐

If 75 one rupee coins are divided equally among 15, how many would each get? ☐

Let's consider all these computations like this:

		1	0	9	
		Thousands	Hundred	Tens	Ones
15		16	4	2	5
$15 \times 1 = 15$		15			
		1 $\;(1000 = 10 \times 100)$	4	2	5
			10		
			14 $\;(14 \times 100 = 140 \times 10)$	2	5
$15 \times 0 = 0$			0	140	
				142	5
$15 \times 9 = 135$				135	
				7 $\;(7 \times 10 = 70)$	5
					70
					75
$15 \times 5 = 75$					75

We can shorten this further:

$$
\begin{array}{r|l}
 & \;\;1095 \\
15 & 16425 \\
15 \times 1 = 15 & 15 \\
 & 14 \\
15 \times 0 = 0 & 0 \\
 & 142 \\
15 \times 9 = 135 & 135 \\
 & 75 \\
15 \times 5 = 75 & 75 \\
\end{array}
$$

Thus, $16425 \div 15 = 1095$

- If 2460 rupees is divided among 12, how much would each get?

Calendar math

In the calendar of any month, mark off 16 numbers in a square.

5	6	7	8
12	13	14	15
19	20	21	22
26	27	28	29

Add all these numbers and divide the sum by 16. Any relation with the first number? Draw other squares and check.

Left overs

If 175 rupees is divided among 7, how much would each get?

To find this, let's divide 175 by 7.

Each gets 25 rupees.

Suppose 180 rupees is to be divided among 7?

180 rupees is 5 more than 175 rupees.

$$
\begin{array}{r}
 & 25 \\
7\,\big)\,175 \\
7\times 2=14 \quad 14 \\ \hline
 35 \\
7\times 5=35 \quad 35 \\ \hline
\end{array}
$$

And 175 rupees can be divided equally among 7, each getting 25 rupees.

The remaining 5 rupees cannot be equally divided among 7. Thus if 180 rupees is divided among 7, each gets 25 rupees and 5 rupees is left over.

$$
\begin{array}{r}
 & 25 \\
7\,\big)\,180 \\
7\times 2=14 \quad 14 \\ \hline
 40 \\
7\times 5=35 \quad 35 \\ \hline
 5 \\
\end{array}
$$

In the language of numbers, we say that, on dividing 180 by 7, the quotient is 25 and the remainder is 5. This we write as on the left

We first saw that $175 = 7 \times 25$

Now we note that $180 = 175 + 5 = (7 \times 25) + 5$

Thus, the divisor multiplied by the quotient, with the remainder added gives the dividend.

Let's do it!

- Some divisions are shown on the right. Fill in the missing digits.

$$
\begin{array}{r}
 & 1\ \ldots\ 6 \\
12\,\big)\,1\,7\,5\,2 \\
\cdots \\ \hline
 \cdots\cdots \\
 4\ \ 8 \\ \hline
 \cdots\cdots \\
 \cdots\cdots \\ \hline
 0 \\
\end{array}
$$

$$
\begin{array}{r}
 & 2\ \ldots\ 9 \\
14\,\big)\,2\,9\,2\,6 \\
\cdots \\ \hline
 \cdots \\
 \cdots \\ \hline
 \cdots \\
 \cdots \\ \hline
 0 \\
\end{array}
$$

Fill in the missing numbers:

Dividend	Divisor	Quotient	Remainder
56	8	7	0
369	3	....	....
486	4	....	....
448	....	7	....
948	12	....	....
....	16	23	8
4736	15	....	....
....	35	48	0
....	62	74	13
8365	23	....	....
527	....	20	7

- 1825 notebooks are to be bought for the school store. How many bundles of 25 should be bought?

- It was decided to give a ladoo to each of the 768 children in school, to celebrate the victory in Math Fair. There are 24 ladoos in one kilogram. How many kilograms should be bought?

- Abu decided to deposit 35 rupees in the bank each week. He has 1505 rupees in his account now. For how many weeks has he been saving?

- A panchayath allotted 325500 rupees for renovating the libraries of 14 schools. If this is equally divided, how much would each school get?

Remainder

Among how many people can 20 litres of milk be distributed, if each is to be given 3 litres?

6 persons, right?

And 2 litres would be left.

That is, $20 = (3 \times 6) + 2$

If each is to be given 6 litres?

Then 3 persons can be given and, the left over would again be 2 litres.

If it is 7 liters for each?

Then the leftover becomes 6 litres.

That is, $20 = (7 \times 2) + 6$

Thus the amount left is determined by how much each is given.

In terms of pure numbers, the remainder in a division depends on the divisor. The remainder is always less than the divisor.

Sir, I tried the problem by a new method. Two more auditorium must be build!

- In an auditorium, 864 chairs are arranged in 24 rows. All rows have the same number of chairs. 1260 chairs more are to be put in without adding chairs to any row. How many more rows have to be added?

- How many weeks are there in a leap year? How many more days are there?

- On the right, the divisions of a four-digit number by 13 is shown. Fill in the missing digits.

```
          2 □ 7
      ┌─────────
  13  │ 3 □ 7 □
      │ 2 6
      ├─────
      │   8 □
      │   □ □
      ├─────
      │     □ □
      │     □ □
      └─────
              5
```

- The bill Thomas got for his purchases is shown below:

Item	Weight (kg.)	Price (rupees)
Rice	15	480
Sugar	4	136
Mung beam	5	360
Chick pea	6	276
Total		1252

No division

What are the remainders got on dividing the numbers 366, 425 and 499 by 15?

Is their sum divisible by 15? Can we divide without actually dividing the sum? How?

From the same shop, Kannan bought these:

    Rice   - 12 kg.

    Sugar   - 3 kg.

    Mung bean - 2 kg.

    Chick pea - 5 kg.

How much should Kannan pay?

- 216 children are arranged in lines, 12 in each line. How many lines are there?

   Some more children join. Each line now has 25 children and the number of lines is the same. How many came in later?

- Look at the way numbers are written below:

0	1	2	3	4	5
6	7	8	9	10	11
12	13	14	15	16	17

   (a) What is the relation between the quotient on dividing the number in each column by 6? And between the remainders?

   (b) What is the relation between the quotients on dividing each row by 6? Between the remainders?

   (c) What would be the first and last number in the 10th row?

   (d) What would be the 4th number in the 18th row?

   (e) In which row and column would the number 345 occur?

Project

Write down any eight numbers and find the differences of every two of them. Is at least one such difference divisible by 7?

Check for other eight numbers.

Why does this happen?

When a number is divided by 7, what are the possible remainders?

0, 1, 2, 3, 4, 5, 6 are the 7 possible remainders.

So, when 8 numbers are divided by 7, at least two of the remainders must be the same; and when their difference is divided by 7, the remainder is zero.

For example both 67 and 109, on division by 7, leaves the same remainder 4.

What is the remainder on dividing their difference by 7?

Now write any 13 numbers and check whether the difference of some pair is divisible by 12.

Do this, starting with different number of numbers.

Looking back

Achievements	On my own	With teacher's help	Must improve
● Explaining division in terms of grouping and equal distribution.			
● Describing the process of long division.			
● Describing different methods of division and finding own method.			
● Doing simple division in head.			
● Relating the dividend, divisor, quotient and remainder.			
● Solving practical problems using four arithmetical operations.			
● Assembling the details for solving a problem and using relevant operations to solve the problem.			

4

Circles

Razia is getting ready to draw some geometric figures.

What shape is she now drawing?

Using rims of glasses and bangles, can't you also draw circles?

Look at these:
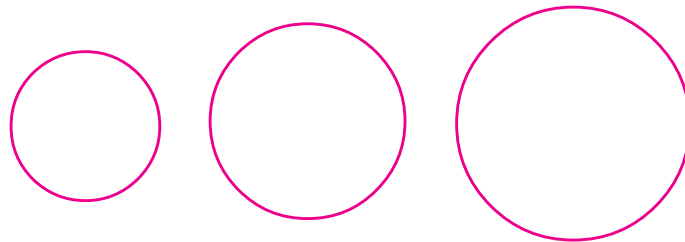
Three circles; different sizes.

How do we draw such circles?

We have to find circular things of these sizes.

Is it easy?

Out of box

Fathima is drawing a picture.

What is she trying to draw?

She is using a tool for this; you can also find such a tool in your geometry box – it is called a compass.

See if you can draw a circle using a compass, as Fathima has done.

How did you draw?

Fix the pointed end of the compass at one spot and then the compass around.

Now spread the compass a bit more and draw another circle. A bigger circle, right?

This fixed point is called the centre of the circle.

Look at the picture:
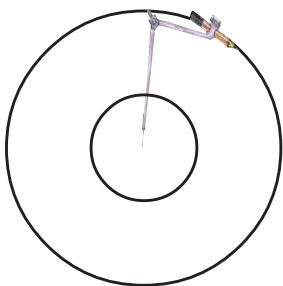
What can we say about these circles?

The centre is the same for both; but the outer circle is larger.

Spin a top

A cardboard circle with a stick through it makes a top.
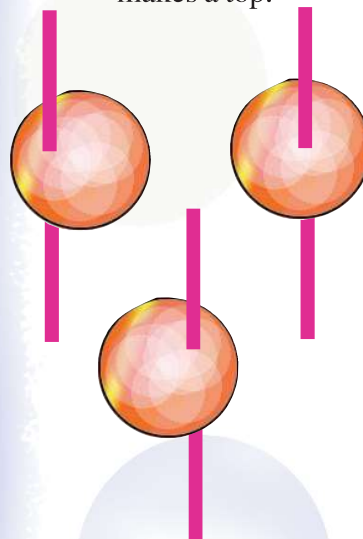
Which of the above tops will spin properly?

Why?

To make a good top, where should the stick pierce the circle?

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The larger circle is got by spreading the compass more.

We can put it this way also; when we increase the distance from the centre, we get a larger circle.

That is, the size of the circle increases with the distances from the centre.

The distance from the centre to the circle is called the radius of the circle.

To draw a circle, we spread the compass. The distance between the pointed end of the compass and the tip of the pencil is the radius.

Hope you have a better turnover this time!
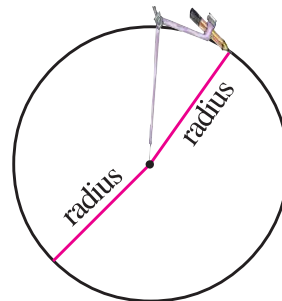
Measure and draw

How do we draw a circle of radius 3 centimetres?
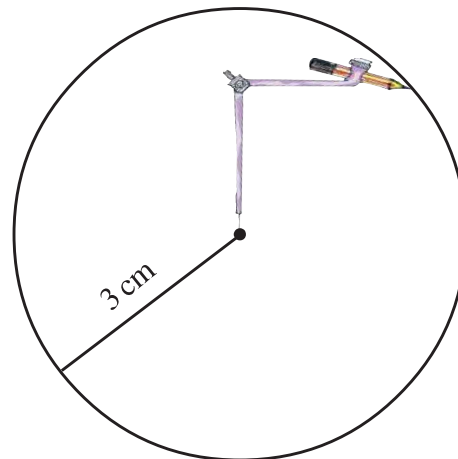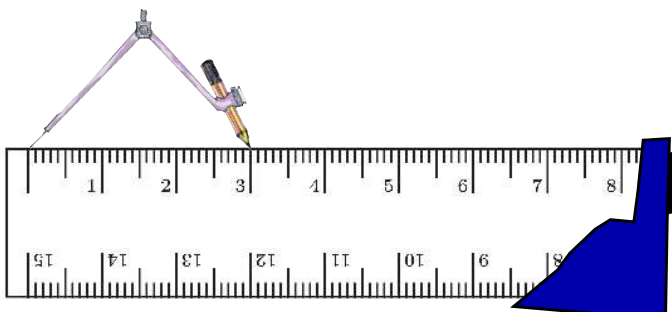
- Measure the radius of this circle.
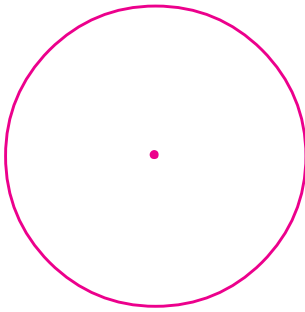
- Draw a circle of radius 5 centimetres.

- Draw a circle of radius 3 centimetres. If a point is 5 centimetres away from the centre, would it be inside or outside this circle?

- All circles in the picture below are of same radius
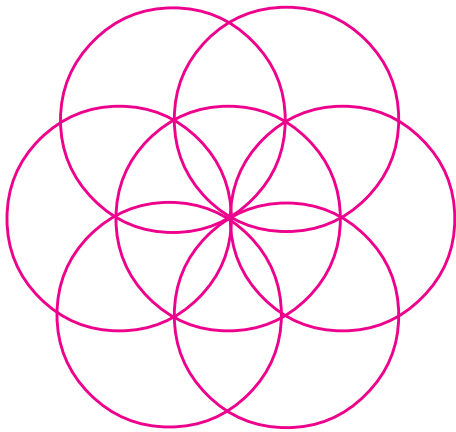
Can you draw this in your notebook with circles of radius 3 centimetres?

- Draw circles of radius 3 centimetres, 4 centimeters and 5 centimetres.

Triangle from circles

- Draw a line 2 centimetres long. Draw two circles each of radius 2 centimetres, centred at the end points.

2 cm
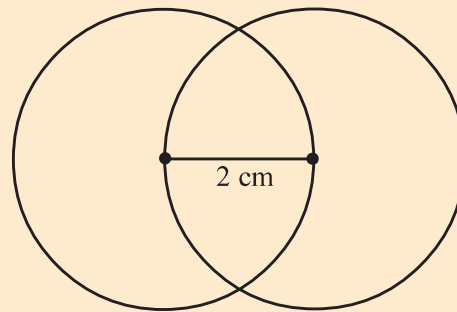
Now draw a triangle like this.

2 cm
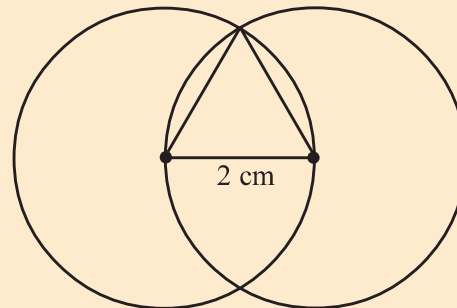
What are the lengths of the other two sides of this triangle?
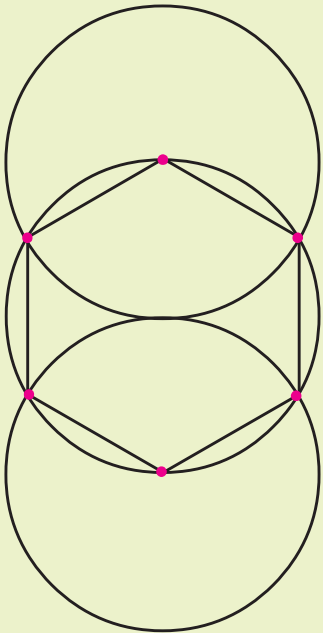
Diameter

Look at this circle:
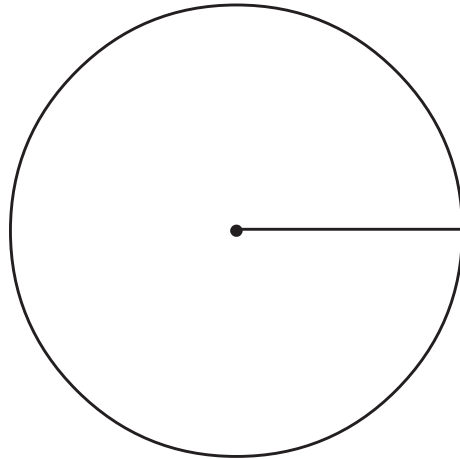
Measure its radius.

See this picture:
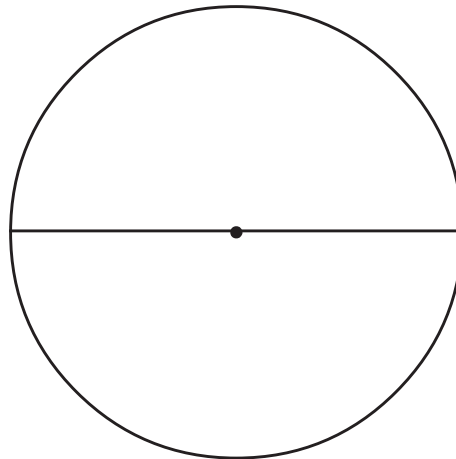
The radius is extended.

What is the length of this line? ▢

Can you draw other lines of the same length within the circle?

How many such lines can we draw?

Can we draw a longer line within the circle?

So, the lines through the centre are the longest.

Such a line is called a diameter.

So, a diameter is the longest line that we can draw within a circle.

The length of such a line is also called diameter.

Thus diameter is twice the radius; or radius is half the diameter.

$$\text{diameter} = 2 \times \text{radius}$$

- Measure the diameter of this circle.
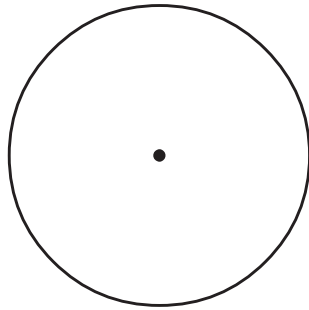
Equal parts

Draw a circle and a diameter.
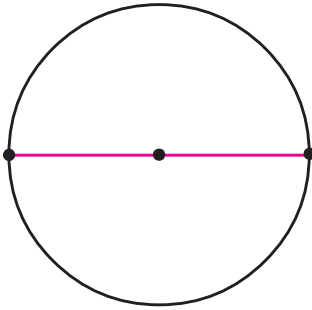
How do we draw another diameter which is straight up to this?

Just use a set square like this:
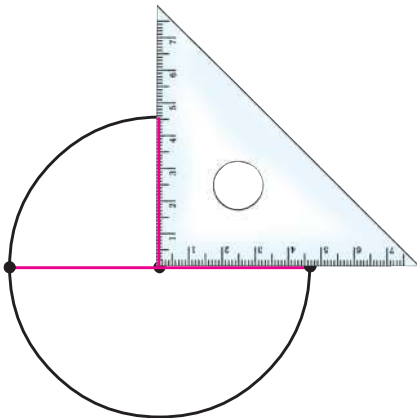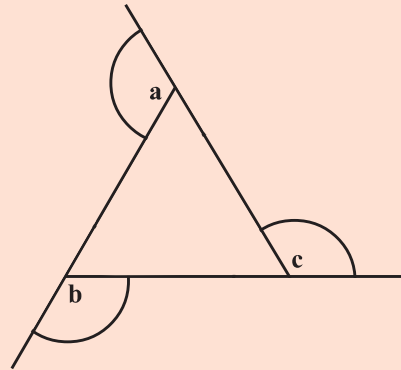
57
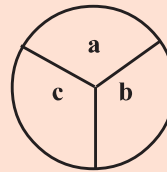
Achu draw a circle using a bangle. He wants to draw a diameter. But he can't find the centre.

See how it is done using a set square.
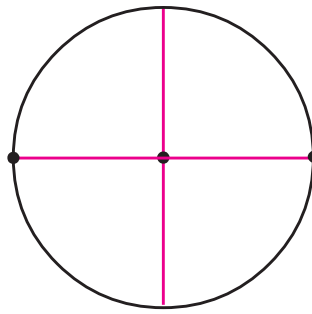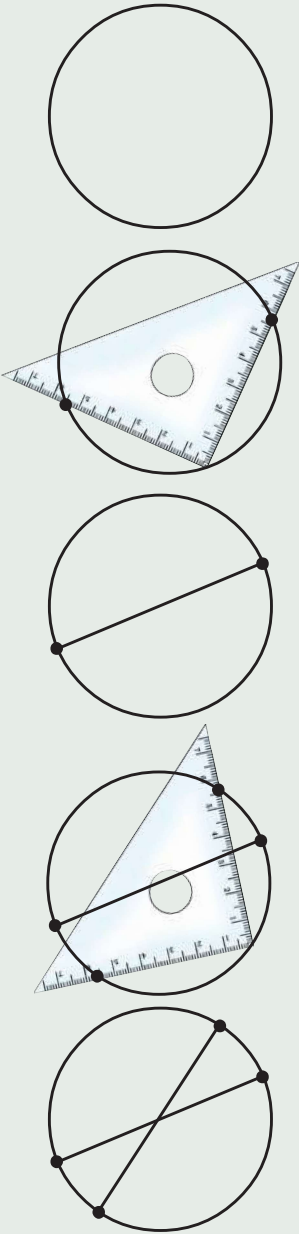
To how many equal parts did the circle get divided into?

Let's join the ends of these diameters:
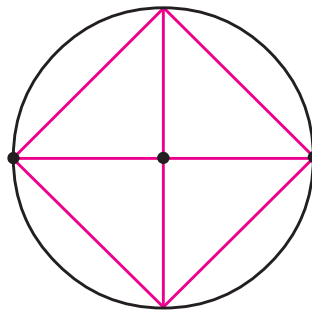
What shape do we get?

Now draw any other two diameters and join their ends.

Do we always get the same?

- Using different corners of set squares, draw other shapes.

-
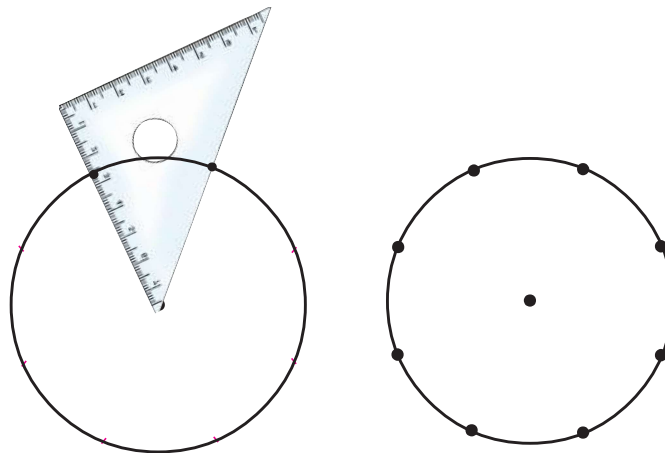
What shape do we get here by joining the points?

How many sides does it have?

- Using a set square as in this picture, how many equally spaced dots can be marked on the circle?
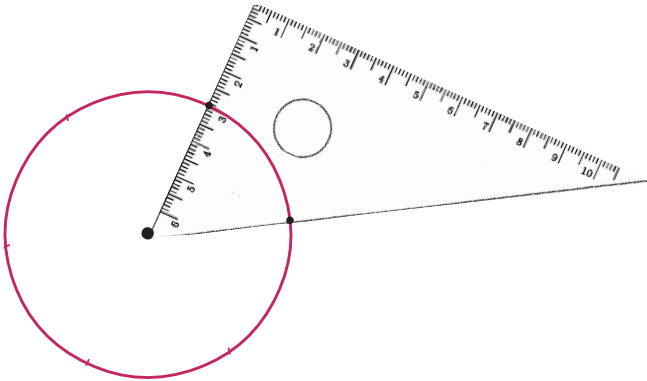
These are joined to make a polygon. How many sides does it have?

- How many equally spaced points can be marked in the circle, using a set square as above? If we join these to draw a polygon, how many sides would it have?
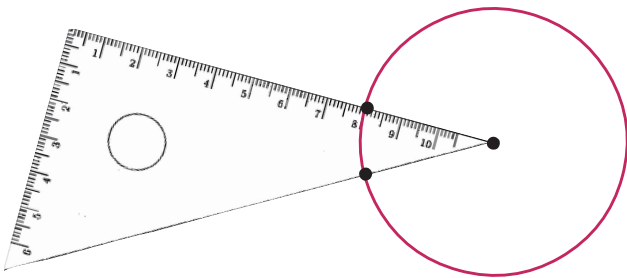
Let's do it!

Use a set square to draw a 24 sided polygon within a circle.
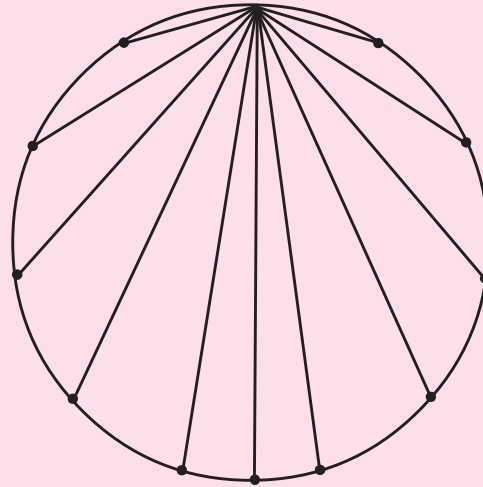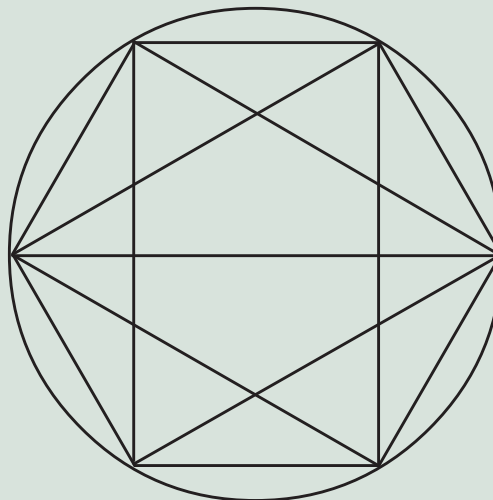
Looking back

Achievements	On my own	With teacher's help	Must improve
● Drawing circles of specified size using compass.			
● Drawing geometric shapes and patterns by combining other shapes.			
● Describing the relation between diameter and radius of a circle.			

5
Part Number

Half means...

After eating two dosas, Mini said, "Not a full dosa, Mom! I want only half".

Half a dosa means, cutting a dosa into two equal parts, right?

Look at this picture:
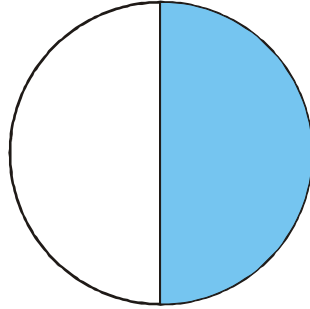
Half the circle is coloured.

What about this line?

Half the line is blue, half is red.

Think of such a line, 1 metre long.

We say, half a metre for half of one metre. So the blue part is half a metre and the red part is also half a metre.

1 litre of milk is divided equally among two kids. How much did each get?

Half means one of two equal parts. In math, we write it as $\frac{1}{2}$.

Thus we can write

- Mini wants only $\frac{1}{2}$ of a dosa.

- $\frac{1}{2}$ of the circle is coloured.
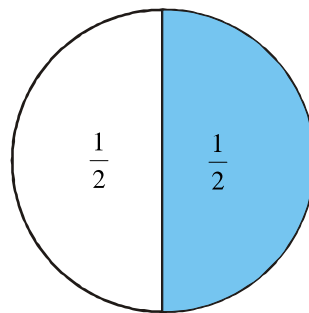
- Half of 1 metre is $\frac{1}{2}$ metre.

- Half of 1 litre is $\frac{1}{2}$ litre.

Now look at this picture:
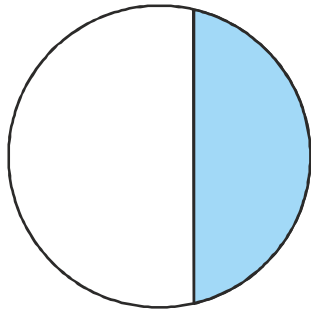
Is the coloured part $\frac{1}{2}$ of the circle?

Why do you say, "No"?

Look at these pictures:
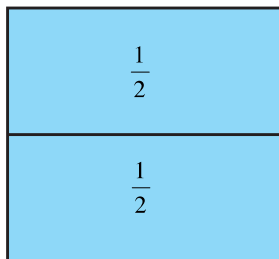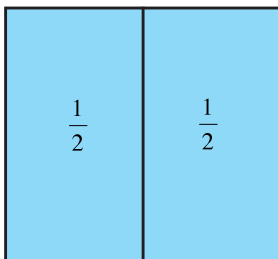
A square is divided into halves in two different ways:

Can you halve a square in any other way?

Three parts

Using a set square, we can mark six equally spaced points on a circle.
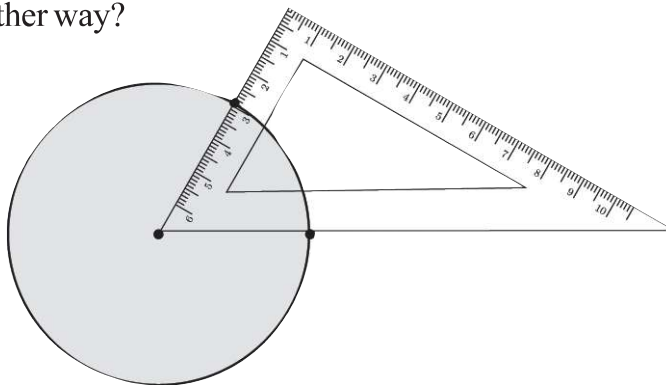
63
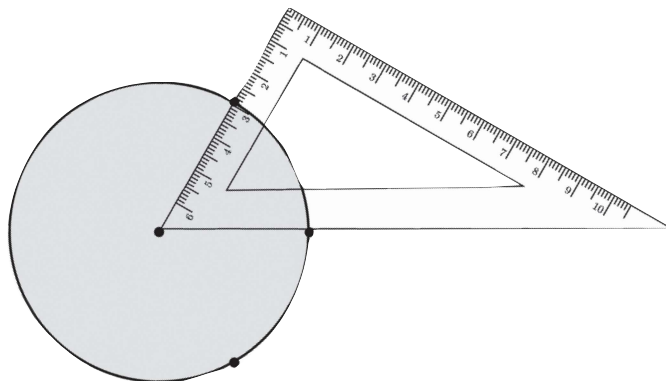
Suppose we join only the alternate points to the centre.
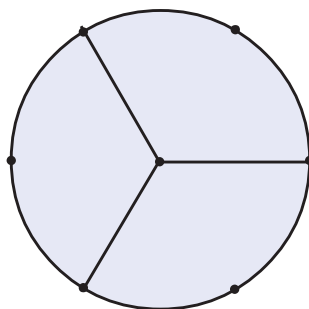
Egyptian fractions

In Egypt, fractions were denoted by special symbols around 3200 BC.

For example, they write $\frac{1}{3}$ as

Some other Egyptian fractions:

$\frac{1}{2}$ =

$\frac{2}{3}$ =

$\frac{3}{4}$ =

$\frac{1}{10}$ =
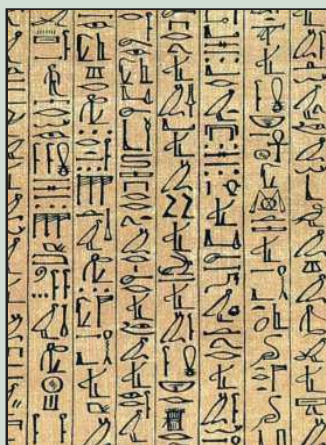
Draw this in a cardboard and cut out the pieces.

Aren't they all the same?

So, we can say each piece is one-third of the circle.

And we write,

$\frac{1}{3}$ of the circle.

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$
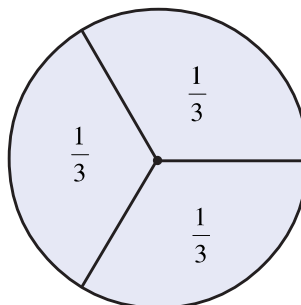
If a string of length 1 metre is cut into three equal pieces, each is of length $\frac{1}{3}$ metre.

If one litre of milk is divided equally among three, how much would each get?

Father brought a cake and mother cut it like this:
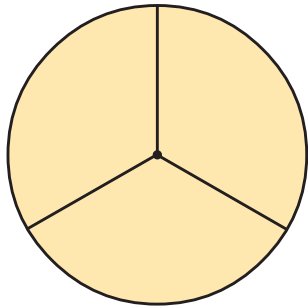
Father gave his share to Abu; so he got two pieces.

That means, 2 of 3 equal pieces.

We say two-thirds of a cake and write this as $\frac{2}{3}$ of a cake.

How do we write mother's share?
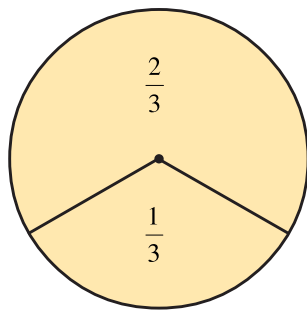
On a string 1 metre long, three equal parts are marked; and one piece cut off:
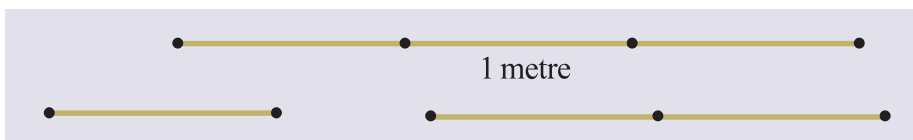
What is the length of the smaller piece?

And the longer one?

Draw a square of side 3 centimetres.

Mark points on the top and bottom sides,
1 centimetre from the left.
Join these points.

The square is now split into two rectangles, right?

How much of the square is the smaller rectangle?

And the larger?

Colour the $\frac{1}{3}$ part red, and the $\frac{2}{3}$ part green.

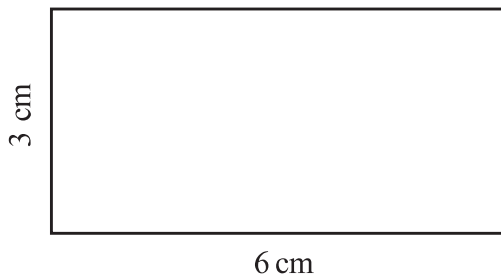Can you split the square into $\frac{1}{3}$ and $\frac{2}{3}$ in any other way?
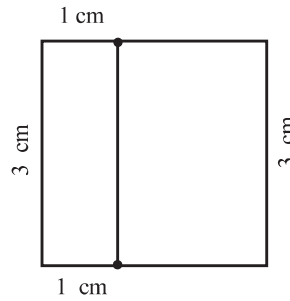
• In the picture below, what part of the rectangle is coloured?
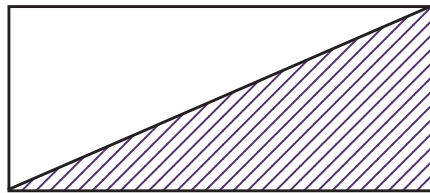
• Colour $\frac{2}{3}$ of the square below.
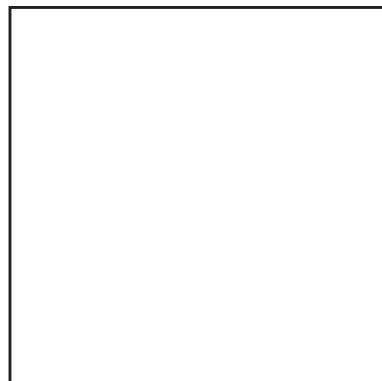
- Colour $\frac{2}{3}$ of the rectangle below blue, and the remaining green.

3 cm

6 cm

What part is coloured green?

- One metre long string is made into a square. What is the length of one side?
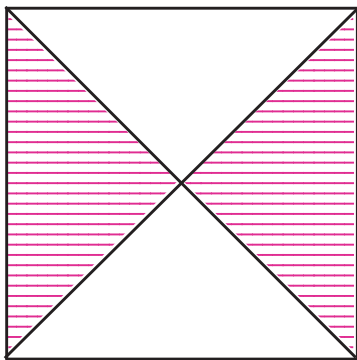
What part of the square above is coloured?

- In the line below, equally spaced dots are marked?

A   B   C   D   E   F   G

What part of the whole line is the length AD?
What about the length AC?
And AE?

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- In 20 minutes, the minute hand of a clock turns through how much of a circle?
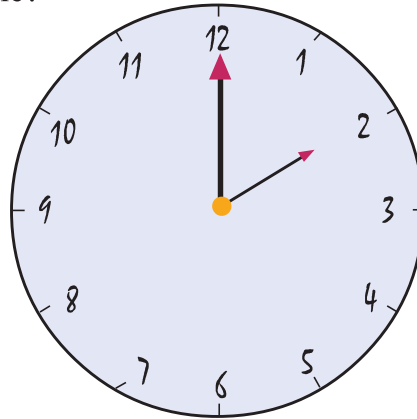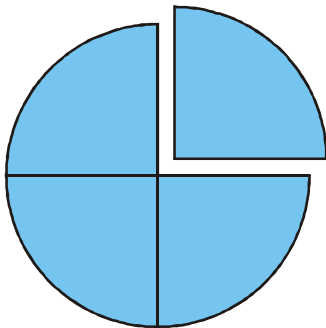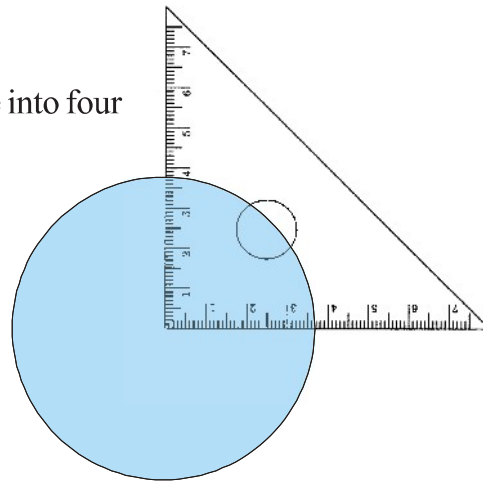

In 4 hours, how much of a circle does the hour hand turn?

When the minute hand moves from 1 to 9, how much of the circle does it turn?

Parts of different forms

We know how to divide a circle into four equal parts, using a set square.

Draw a circle in cardboard and cut out a piece like this.

The piece cut off can be called one-fourth of the circle.
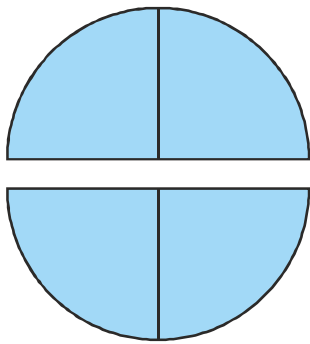
And we can write as $\frac{1}{4}$.

What about the larger piece?

It is made up of three of the four equal parts.

We call it three-fourth, and write it as $\frac{3}{4}$.

We often say "quarter" for $\frac{1}{4}$ and "three-quarter" for $\frac{3}{4}$.

Let's cut out one more small piece from the larger piece and paste it to the smaller.

Both pieces are now half the circle, right?

That is, $\frac{1}{2}$ of the circle.

Laila says, "Each of these pieces is made up of two parts of four equal parts; so each is two-fourths".

She is right: two-fourth is also half; that is two-fourths and one half are both halve the whole.

In math, $\frac{2}{4} = \frac{1}{2}$

Four equal parts are marked on a one-metre long string:

1 metre

How long is each part?

Let's cut out two pieces as shown below:

What is the length of each piece?

Each is made up of 2 parts of 4 equal divisions of 1 metre; so we can say $\frac{2}{4}$ metre. Or we can say $\frac{1}{2}$ metre, since it is half of 1 metre. (And this is easier to understand, right?)

Now cut out two circles of the same size and mark six equally spaced points in each. In one of these, join the alternate points to the centre; in the other, joining all points to the centre. Each part of the first circle is $\frac{1}{3}$ of it.

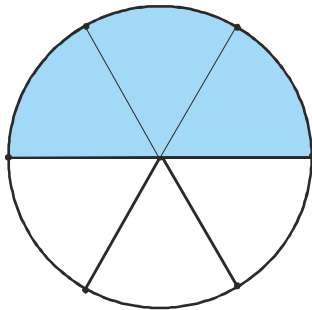What about the second circle?
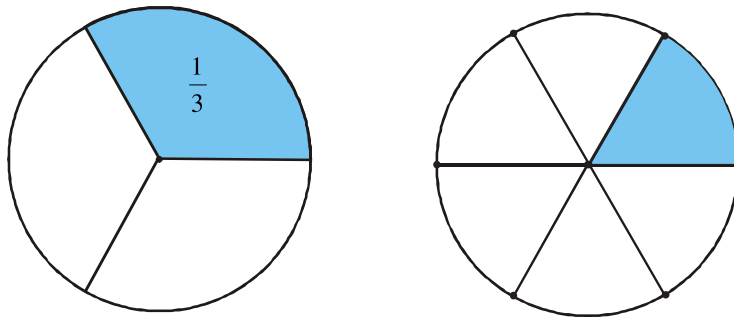
Suppose we colour two parts of the second circle:
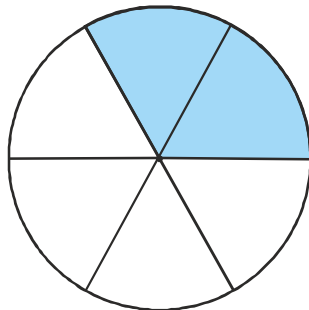
It is 2 of 6 equal parts and so we can say it is $\frac{2}{6}$; but this is equal to the coloured $\frac{1}{3}$ of the first circle. (If you want, you can cut out these two pieces of the second circle and put it over one part of the first circle to check).
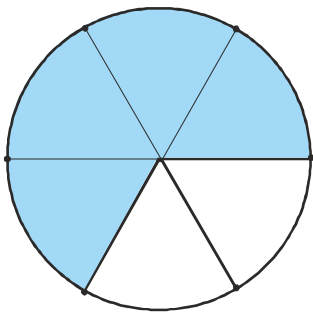
That is, $\frac{1}{3}$ and $\frac{2}{6}$ mean the same thing.

Now let's colour one more part of the second circle:

What do we see?

$$\frac{3}{6} = \frac{1}{2}$$

Dividing circles

Open GeoGebra and select **Circle with Centre through Point.** Click on two positions to draw a circle.

Now select **Line through Two Points** and click on the centre of the circle to draw a line.

Next take **Perpendicular Line** and click on this line and the centre of the circle to draw another line.
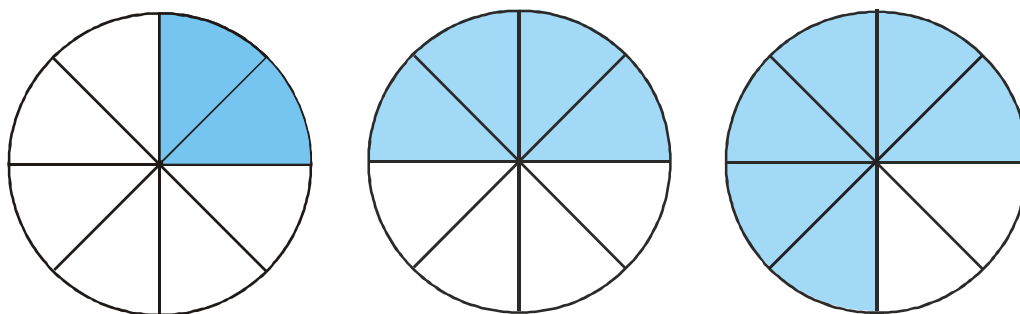
Into how many parts is the circle now divided?

How much of the circle is each part?

How about one more part?
Compare this with two parts of the first circle.

What do we get?

$$\frac{4}{6} = \frac{2}{3}$$

Now draw a circle and split it into eight equal parts using a set square as below:
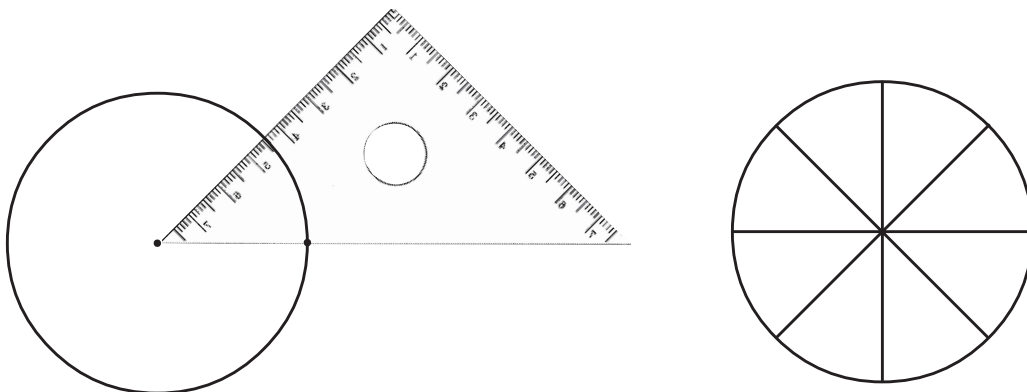
These pictures show the parts coloured two at a time:

_ _ _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _

Below each, write the part coloured as a fraction in two different ways.

A 1 metre long strip is cut into 12 equal pieces.

What is the length of each piece?

Let's join them in pairs:

What is the length of each pair?

It is 2 of 12 equal parts of 1 metre, and so we can say $\frac{2}{12}$ metre.

If we look at each pair as a single piece, it is 1 of 6 equal parts of 1 metre and so is $\frac{1}{6}$ metre.

$$\frac{2}{12} \text{ metre} = \frac{1}{6} \text{ metre}$$

What if we join the 12 pieces three at a time?

What is the length of each triple?

What do we see from this?

$$\frac{3}{12} \text{ metre} = ... \text{ metre}$$

If we join four at a time?

The length of each is

.... metre = ... metre

Now suppose we join the 12 pieces as below to make two parts.

Length of larger piece is

.... metre = ... metre

Length of smaller piece is

.... metre = ... metre

What if we join like this?

Length of larger piece is

.... metre = ... metre

Length of the shorter piece is

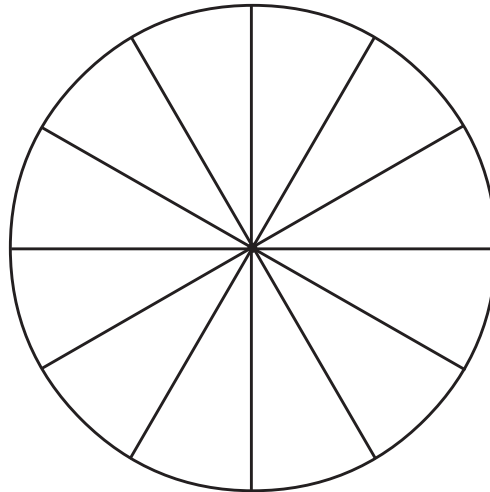............ metre = ... metre

Colour it

$\frac{1}{4}$ Part
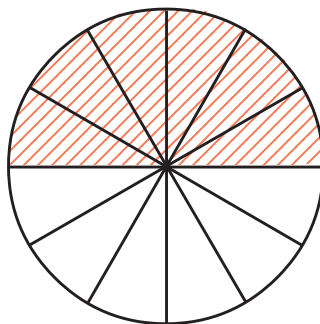
$\frac{1}{3}$ Part
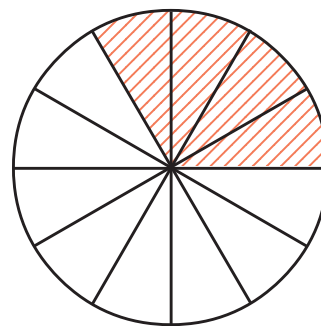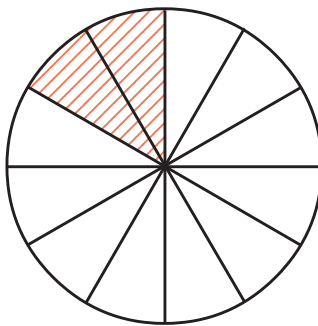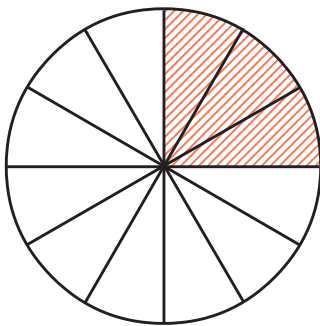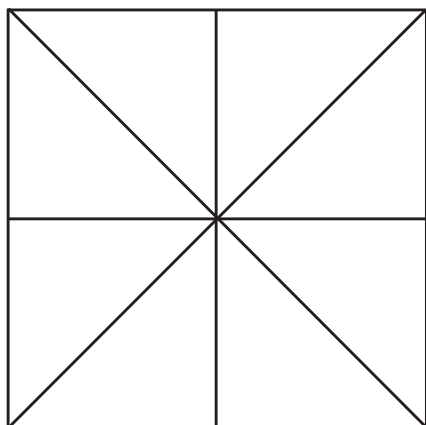
$\frac{1}{8}, \frac{1}{16}$ Part

73

Lets' do it!

- A circle is divided into 12 equal parts, using a set square.

In each picture below, some of these are coloured. Write under each, the part colured as a fraction in two different ways:

_ _ _ _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _ _   _ _ _ _ _ _ _ _ _ _

- A square is divided into pieces as below:

Colour $\frac{1}{8}$ part of the square red, $\frac{1}{4}$ of it blue and $\frac{1}{2}$ of it green.

How much of the square is left uncoloured?

Whole and part

We often say one and a half litres of milk, one and a quarter metres of cloth, two and a half kilograms of beans and so on.
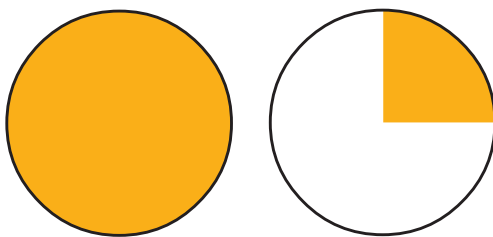
What do they mean?

Suppose we pour into a can, first one litre of milk and then half of one litre; how much milk do we get altogether?

One litre together with half a litre makes one and a half litre; and we write $1\frac{1}{2}$ litres.

Likewise, two litres and quarter of a litre make two and a quarter litre.
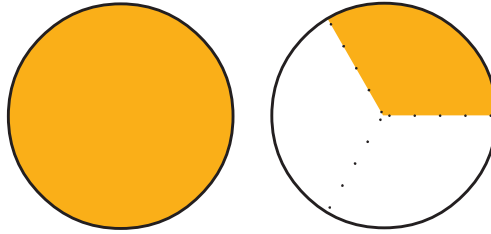
Written $2\frac{1}{4}$ litres.

Look at this picture:

The first circle is fully coloured.

What part of the second circle is coloured?

So, we can say $1\frac{1}{4}$ circles are shaded.

What about this figure?

One and one-third, written $1\frac{1}{3}$.

In each picture below, say how many circles are coloured. Also write it in box alongside.
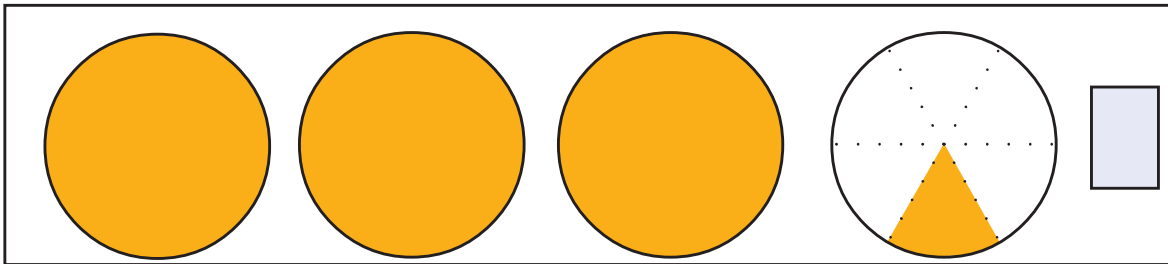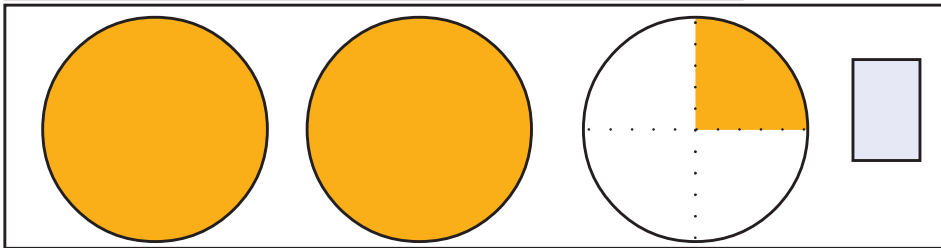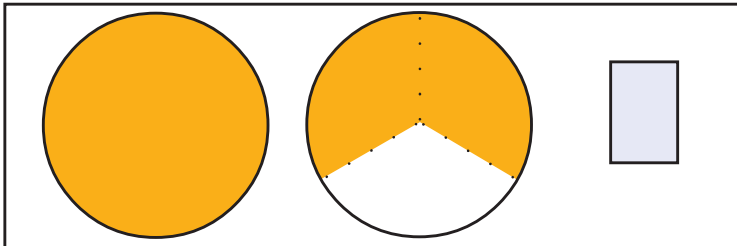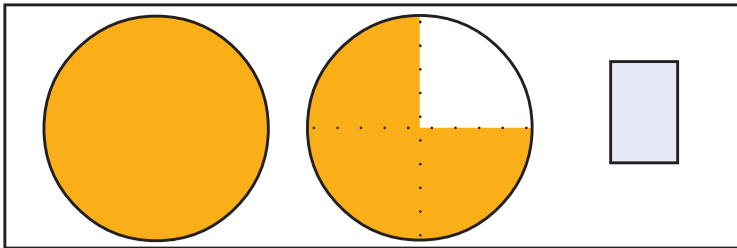
Sharing

If 6 cakes are divided among 3 children, how many would each get?

What if there are only 3 cakes?

Now if 2 cakes are to be equally divided among 3?
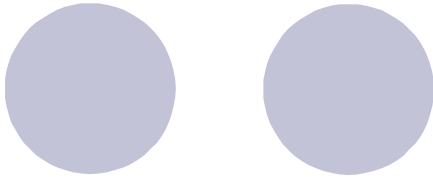
How do we divide?

First cut one cake into three equal parts and give a piece to each.

Do the same with the other cake.
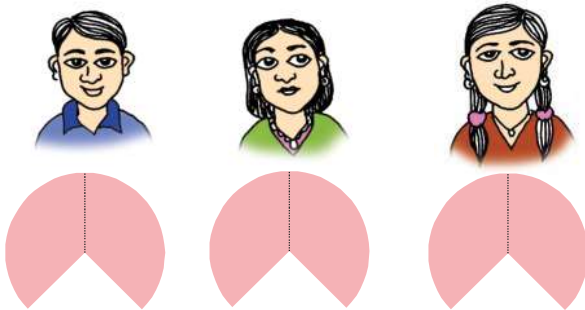
So each gets $\frac{2}{3}$ of a cake.

Now if 3 cakes are divided equally among 4 children, how much of a cake would each get? Think about it:

Measuring parts

If a 2 metre long ribbon is cut into 3 equal parts, what would be the length of each piece?

Let's first imagine each metre divided into three equal parts.
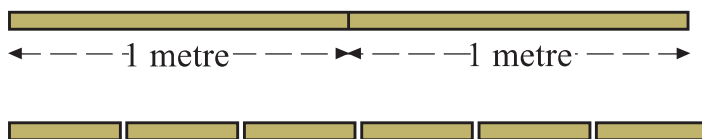
Now we have 6 equal parts; and we need only 3.

Let's join them in pairs:

What is the length of each of these three pieces?

Each is made up of 2 pieces and each piece is one of 3 equal parts of 1 metre. That is $\frac{2}{3}$ metre.

So what do we see?

If 2 metres is divided into 3 equal parts, the length of each piece is $\frac{2}{3}$ metre.

Names of measures

1 metre is 100 centimetre, righy? So a centimetre is $\frac{1}{100}$ of a metre; and a millimetre is $\frac{1}{10}$ of a centimetre.

How much of a litre is a millilitre?

How much of a kilogram is a gram?

"Half of half is a third of three quarters."

Do you agree?
Cut a circle into pieces and check.

Let's do it!

- A 2 metre long ribbon is equally divided among 5 girls. How much of a metre would each get? How many centimetres is it?

- If 3 litres of milk is divided equally among 4, how much of a litre would each get? How many millilitres is it?

- 6 kilograms of sugar is to be made into 8 packets of equal weight. How much of a kilogram should go into each packet? How many grams is it?

- The picture shows two ribbons of length one and two metres.

1 metre

2 metre

Mark $\frac{2}{5}$ of the 1 metre ribbon.

Mark $\frac{1}{5}$ of the 2 metre ribbon.

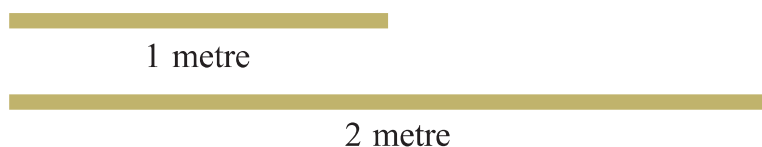What relation do you see between $\frac{2}{5}$ of 1 metre and $\frac{1}{5}$ of 2 metres?

- Anu and Priya need ribbons, $\frac{3}{4}$ metre long. Anu has a 1 metre long ribbon and Priya has a 3 metre long ribbon. How do they cut off a $\frac{3}{4}$ metre long piece from their ribbons?

Draw a line using the tool **Segment between two points** from Geogebra software. Can you divide this line into two equal parts? Use the **Mid Point or Center** Tool. Each piece is what part of the total length?

Likewise, into how many equal parts can you divide a line? 4, 8, 16.... right?

Remainder and fraction

When 2 cakes are divided among 3 children, each gets $\frac{2}{3}$ of a cake.

What if it's the other way round?

How do we divide 3 cakes equally among 2?

First, we can give one whole cake to each. Then divide the remaining cake into two and a give a piece to each.

So, each gets $1\frac{1}{2}$ cakes.

If there are 5 cakes?

First give 2 cakes to each; then halve the remaining cake and give a piece to each.

So, each gets $2\frac{1}{2}$ cakes.

What about dividing 9 litres of milk among 4 children?

If one litre is given to each, 5 litres would be left.

So one more litre can be given to each and 1 litre is left.

Instead of subtracting 4 again and again like this, we can first divide by 4, right?

9 divided by 4 gives 2, and remainder 1.

So each can be given 2 litres and 1 litre is left. How about dividing this also?

Each gets $\frac{1}{4}$ litre more.

So altogether, each gets $2\frac{1}{4}$ litres.

A 20 metre long wire is cut into three pieces of equal lengths.

What is the length of a piece?

20 divided by 3 gives 6, and remainder 2.

That is, if we cut into 6 metre pieces, we would be left with a 2 metre piece.

Suppose we cut that also into three equal pieces.

Each piece would be $\frac{2}{3}$ metre long.

So, altogether, $6\frac{2}{3}$ metres.

Let's do it!

- If a ribbon 8 metres long is divided equally among 5, how many metres would each get? Can you say this in metres and centimetres?

- 15 litres of kerosene is used to fill 4 bottles of the same size. How many litres does each bottle contain? Can you say it in litres and milliliters?

- 30 kilograms of sugar is divided equally among 8 people. How many kilograms does each get?

  Say in kilograms and grams.

Fractions and divisions

When 2 metres is divided into 3 equal parts, the length of each piece is written $\frac{2}{3}$ metre.

When 3 metre length is divided into 2 equal parts, the length is usually written $1\frac{1}{2}$ metres.

As in the first case, we can also write this as $\frac{3}{2}$ metres (read "three-halves").

That is,

$$\frac{3}{2} = 1\frac{1}{2}$$

Likewise, if 5 is divided into 2 equal parts, each can be written $\frac{5}{2}$.

In fact, if 5 litres of milk is divided equally between 2 persons, how many litres of milk would each get?

$$\frac{5}{2} = 2\frac{1}{2}$$

So, if 9 is divided into 4 equal parts, how can each part be written?

And how do we write this in the usual way, as a natural number and a fraction?

$$\frac{9}{4} = 2\frac{1}{4}$$

Now another question: if a 6 metre long string is cut into 2 equal parts, what would be the length of each piece?

How do we write this, as above?

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

Mental Math

- How many sticks of length is $1\frac{1}{4}$ metre placed end to end make 5 metres?

- How many sticks of length $1\frac{2}{3}$ metres placed end to end make 5 metres?

- How many $\frac{3}{4}$ litre bottles can be filled with $4\frac{1}{2}$ litres of water?

We usually write 6 ÷ 2 for dividing 6 into 2 equal parts.

That is,

$$\frac{6}{2} = 6 \div 2 = 3$$

Similarly,

$$\frac{6}{3} = 6 \div 3 = 2$$

What about cutting a 6 metre long string into 6 equal parts?

The length of each piece is $\frac{6}{6} = 6 \div 6 = 1$

5 divided by 5 also gives 1, right? So,

$$\frac{5}{5} = 1$$

How do we split $\frac{7}{3}$?

7 divided by 3 gives 2, and remainder 1. If this remainder is also divided by 3, we get $\frac{1}{3}$. So,
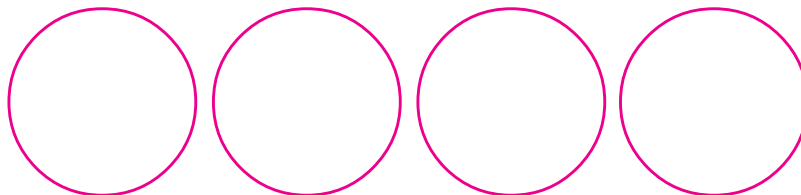
$$\frac{7}{3} = 2\frac{1}{3}$$

Like this, write each fraction below in the form of a natural number and a fraction:

$$\frac{17}{2} , \frac{17}{3} , \frac{17}{4} , \frac{17}{5} , \frac{17}{6} , \frac{16}{6}$$

- If 7 metres of cloth is divided equally among 4 persons, how many metres of cloth would each get?

- If 34 rupees is divided equally among 4 persons, how many rupees would each get? How do we write this in rupees and paisa?

-

Riyaz, Rajesh and Ragesh bought four cakes and divided this equally among them. Ragesh took his share first. Draw a picture of the remaining. Then Riaz also took his share. Draw a picture of the remaining.

- In the table below, each number in the second column is equal to a number in the first, but not in order. Write them in the correct order.

Column 1	Column 2
$\dfrac{6}{8}$	$1\dfrac{1}{2}$
$\dfrac{8}{3}$	$\dfrac{2}{3}$
$\dfrac{15}{4}$	$\dfrac{3}{4}$
$\dfrac{12}{8}$	$\dfrac{16}{10}$
$\dfrac{8}{5}$	$2\dfrac{2}{3}$
$\dfrac{4}{6}$	$3\dfrac{3}{4}$

- Can we cut out from a 1 metre ribbon a piece $\dfrac{4}{3}$ metres long? How do we cut out such a piece from a 4 metre long ribbon? And from a 2 metre long ribbon?

In the picture below, find out how much of the square each colour is used on:

$\dfrac{1}{4}$
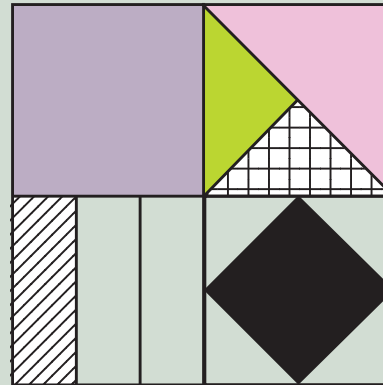
Looking back

Achievements	On my own	With teacher's help	Must improve
• Interpreting fractions as parts of a whole.			
• Writing a division as a fraction			
• Writing division involving remainder as a fraction.			
• Expressing relation between large and small measures in terms of fraction.			
• Explaining the fact that the same fraction has different forms.			