ગુજરાત શૈક્ષણિક સંશોધન અને તાલીમ પરિષદના પત્ર-ક્રમાંક
જીસીઈઆરટી/સીએન્ડઈ/2018/5808, તા.07/03/2018 થી મંજૂર

MATH-MAGIC

Standrad V

PLEDGE

India is my country.

All Indians are my brothers and sisters.

I love my country and I am proud of its rich and varied heritage.

I shall always strive to be worthy of it.

I shall respect my parents, teachers and all my elders and treat everyone with courtesy.

I pledge my devotion to my country and its people.

My happiness lies in their well-being and prosperity.

Price : ₹ 55.00

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

Gujarat State Board of School Textbooks
'Vidyayan', Sector 10-A, Gandhinagar-382010

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PREFACE

With a view to implementing 'Equal Curriculum Policy', Gujarat State Government and GCERT took a decision to implement directly the textbooks of NCERT, New Delhi, in Gujarat according to the proposal no. JSBH/121/Single file-62/N dated : 19-7-2017. Keeping this objective in view, this textbook of **Mathematics**, published by NCERT, is being implemented in **Class 5**. For this, the Gujarati translation of NCERT textbook was prepared first.

During the Gujarati translation process, minor changes have been made in proper nouns, numbers and chapters in accordance with present situation and Gujarat specific with NCERT's prior approval. Now, the changes made in Gujarati version have been mandatorily incorporated in this English medium Mathematics Textbook. For this, expertise and experience of Shri H. I. Sarvaiya and Shri Mrugesh Parekh have been secured by the Board. The Board is thankful to them for their noble contribution.

The Gujarat State Board of School Textbooks is also obliged to NCERT for their kind co-operation.

Creative suggestions for the enhancement of quality of the textbook are always welcomed by the Board.

P. bharathi (IAS)
Director

Date : 13-12-2019

Executive President
Gandhinagar

First Edition : 2019, Re-Print : 2020

Published by : P. Bharathi, Director, on behalf of Gujarat State Board of School Textbooks, 'Vidyayan', Sector 10-A, Gandhinagar

Printed by :

FOREWORD

The National Curriculum Framework (NCF), 2005, recommends that children's life at school must be linked to their life outside the school. This principle marks a departure from the legacy of bookish learning which continues to shape our system and causes a gap between the school, home and community. The syllabi and textbooks developed on the basis of NCF signify an attempt to implement this basic idea. They also attempt to discourage rote learning and the maintenance of sharp boundaries between different subject areas. We hope these measures will take us significantly further in the direction of a child-centred system of education outlined in the National Policy on Education (1986).

The success of this effort depends on the steps that school principals and teachers will take to encourage children to reflect on their own learning and to pursue imaginative activities and questions. We must recognise that given space, time and freedom, children generate new knowledge by engaging with the information passed on to them by adults. Treating the prescribed textbook as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. Inculcating creativity and initiative is possible if we perceive and treat children as participants in learning, not as receivers of a fixed body of knowledge.

These aims imply considerable change in school routines and mode of functioning. Flexibility in the daily time-table is as necessary as rigour in implementing the annual calendar so that the required number of teaching days are actually devoted to teaching. The methods used for teaching and evaluation will also determine how effective this textbook proves for making children's life at school a happy experience, rather than a source of stress or boredom. Syllabus designers have tried to address the problem of curricular burden by restructuring and reorienting knowledge at different stages with greater consideration for child psychology and the time available for teaching. The textbook attempts to enhance this endeavour by giving higher priority and space to opportunities for contemplation and wondering, discussion in small groups, and activities requiring hands-on experience.

National Council of Educational Research and Training (NCERT) appreciates the hard work done by the Textbook Development Committee responsible for this book. We wish to thank the Chairperson of the Advisory Committee, Professor Anita Rampal and the Chief Advisor for this book, Professor Amitabha Mukherjee for guiding the work of this committee. Several teachers contributed to the development of this textbook; we are grateful to their principals for making this possible. We are indebted to the institutions and organisations which have generously permitted us to draw upon their resources, material and personnel. We are especially grateful to the members of the National Monitoring Committee, appointed by the Department of Secondary and Higher Education, Ministry of Human Resource Development under the Chairpersonship of Professor Mrinal Miri and Professor G.P. Deshpande, for their valuable time and contribution. As an organisation committed to the systemic reform and continuous improvement in the quality of its products, NCERT welcomes comments and suggestions which will enable us to undertake further revision and refinement.

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ACKNOWLEDGEMENTS

National Council of Educational Research and Training (NCERT) thanks the following persons and institutions for their contribution towards this textbook. Special thanks are due to the Centre for Science Education and Communication (CSEC), Delhi University, for providing academic support and hosting all the textbook development workshops. The teams were fully supported by the staff, who put in tremendous effort through long working hours even on holidays.

The Council gratefully acknowledges the contributions of Sadiq Saeed *(DTP Operator)*, Inderjeet Jairath *(Proof Reader)* and Shakamber Dutt *(Computer Station Incharge)* in shaping this book.

The stories of the farmers in Vidarbha are adapted from reports by P. Sainath and Jaideep Hardikar. The support offered by K.K. Vashishtha, *Head*, Department of Elementary Education, NCERT is also gratefully acknowledged. The Council acknowledges the support of Eklavya, Bhopal for the children's drawings and some mathematical puzzles.

For the photographs the Council gratefully acknowledges the contribution of the following:

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Chapter 8 — Raghu Rai and Delhi Tourism Development Corporation, Karnail Singh, Bhavna

Chapter 9 — Anita Rampal, Bhavna, Preeti Chadha Sadh

Chapter 10 — Nan Moore, Tad Arensmeier

Chapter 11 — Bhavna, Hema Batra

Chapter 14 — Bhavna, Kalyani Raghunathan

The following are applicable to all the maps of India used in this book

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1. The responsibility for the correctness of internal details rests with the publisher.
2. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
3. The administrative headquarters of Chandigarh, Haryana and Punjab are at Chandigarh.
4. The interstate boundaries amongst Arunachal Pradesh, Assam and Meghalaya shown on this map are as interpreted from the "North-Eastern Areas (Reorganisation) Act.1971," but have yet to be verified.
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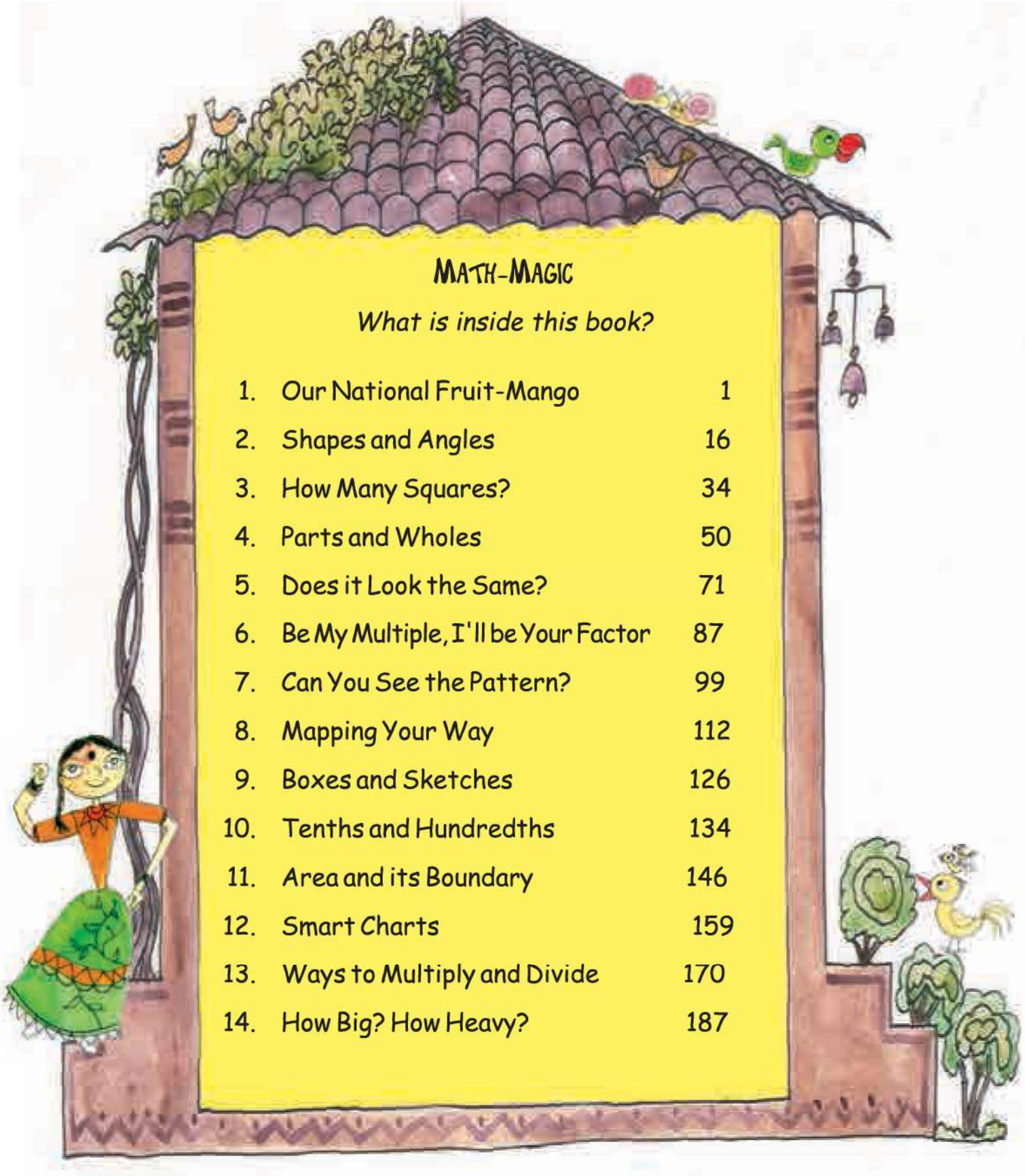
6. The state boundaries between Uttarakhand & Uttar Pradesh, Bihar & Jharkhand and Chhattisgarh & Madhya Pradesh have not been verified by the Governments concerned.
7. The spellings of names in this map, have been taken from various sources.



MATH-MAGIC

What is inside this book?

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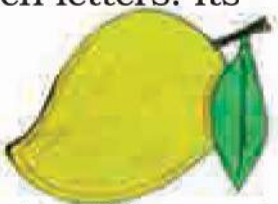
1 Our National Fruit-Mango

કાનજી સૂણે — *Kanji listens*
કોયલ કેરી કુંજ — *A Cuckoo coos*
કેરી બગીચે — *Mangoes in orchard*

Count total letters of this poem. (Gujarati).

There are five letters in the first row.
There are five letters in the last row.
Alongwith seven letters in the middle row, total seventeen letters are there.
This poem of three lines is called 'Haiku'.
It is a poetic form of Japan and it is written in just seventeen letters. Its formation is (5+7+5).



Here given below is another 'Haiku':

મીઠી સુગંધી
છું સોરઠની કેરી
હું છું કેસર.

I am sweet and fragrant
Mango from sorath
I am kesar.

- Do You know any poem or story about mangoes ?

Some pictures of mango given here are made by children.

- Which shapes come to your mind when you think about mangoes ? Draw a picture, as given below, using different shapes of mangoes you have thought about.

In Sanskrit, mango is called 'Amra'. Different shapes of the 'Amra' are often commonly seen in embroidery work, paintings or jewellery designs.

- Observe the pictures on curtains, mats or any other things and find mangoes of different colours and shapes.
- Draw mangoes of different types with different designs.

Talala taluka of Gir Somnath district is famous for its 'Kesar' mangoes world-wide. The quality of land ecology are suitable for growing mangoes. Talala can be called the capital of 'Kesar' mangoes. The plantations of mango are called 'Ambawadi'. They are life-line of this region.

You must have heard, ''આંબે આવ્યા મોર, વાર્તા કહેશું પોર.'' A mango-tree initially bears flowers (મોર-mor) in the season of spring. After that it bears mango fruits. Mangoes are picked from the trees and piled on the ground. Then, they are segregated and packed in different boxes as per their quality. These boxes are sent to the marketing yard.

- Bring similar number of mango boxes as the number of students in the class. Each box must contain 18 mangoes. If all the students will open the boxes and pile the mangoes in a single heap, what will be the total number of mangoes in that heap ? How many heaps of 10 mangoes each can be made from the big heap ?
- Guess, how many mango-trees will be there in a single mango orchard (Ambawadi)?

Well, if a farmer picks mangoes from one tree during the season which can fill 18 boxes of 12 kg in a quantity each, make an estimate of how many kg and how many boxes full of mangoes, the farmer would have picked up from all mango trees of the orchard.

- How many kilograms do you weigh? .....
- What is the approximate total weight of 12 students like you together? .....
- Compare the total weight of 12 students with the weight of total mangoes picked from this orchard, which one is less?
- If 5 kg mangoes are consumed at our home every week and if each kg will cost ₹ 75, how many kg of mangoes will be required for one month? What will be the cost of it?
- If the mango season continues for 3 months and you eat mangoes regularly, give an estimate of mangoes required and its cost during the season.

The way parrot bites the row mango, the village kids compete with each other for getting the mangoes from the tree by hitting stones during the vacation time. If they are able to get one mango, they become very happy. And, sometimes these mangoes are picked up with the spirit of competition among the children. But, sometime kids get hurt by stones too. Sometimes, emotions of people get hurt and mothers are constantly worried for their kids. This phenomenon is not visible in cities. If, such scenes are created, drama of 'Mahabharat' takes place under mango-trees. Noise of people go louder than cooing of a cuckoo bird.

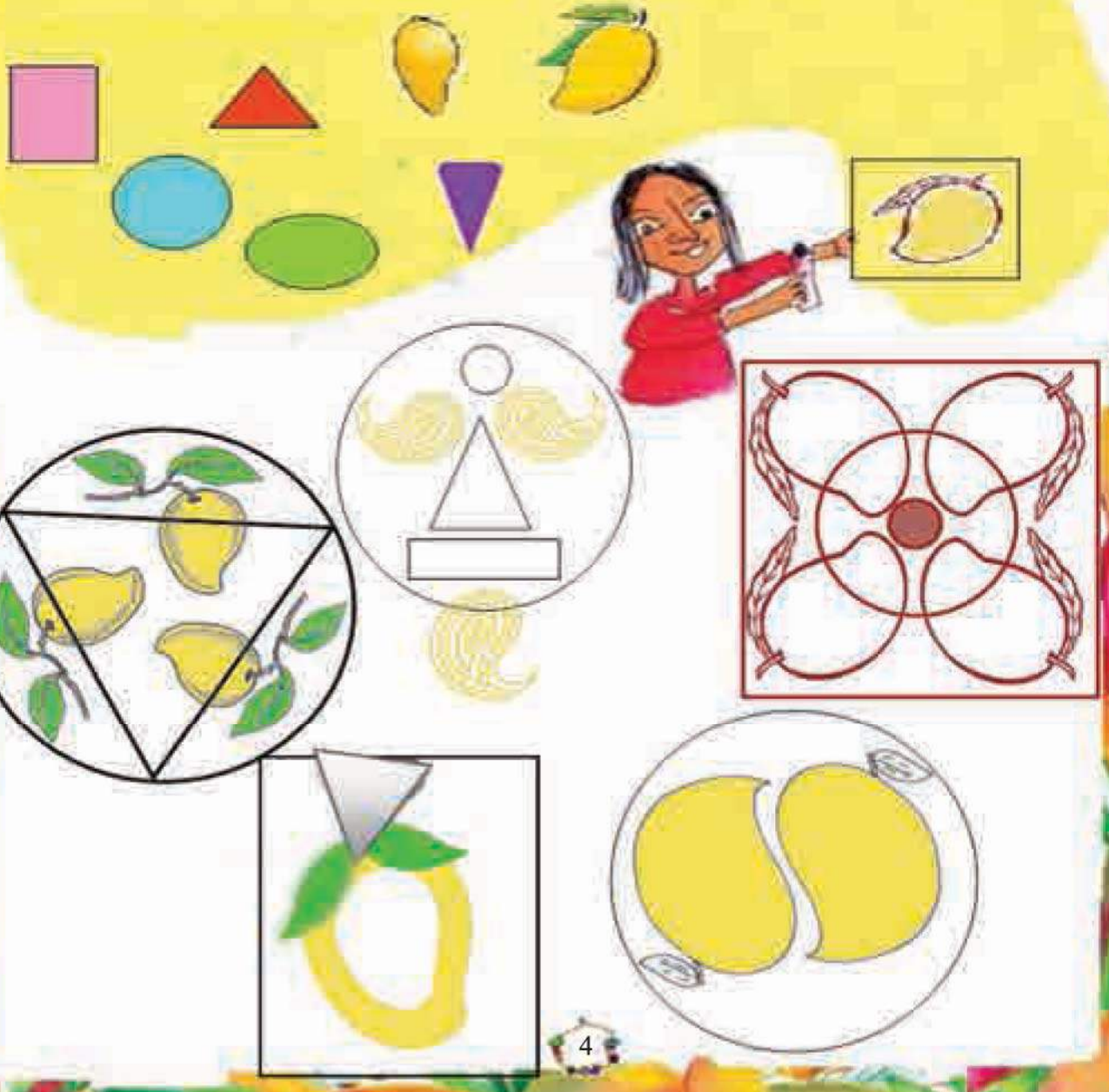
Look at the pictures of mangoes given below. Mango looks more beautiful with its leaves. Try to draw similar pictures of mangoes as given below :

This chapter is based on the subject mangoes. It introduces different types of mangoes to the students through the concept of marketing yard. Mathematical concepts like shapes, assumeptions, big numbers, general operations, speed and loan are presented here in real life context. It also creatively revises and strengthens the concept studied before.

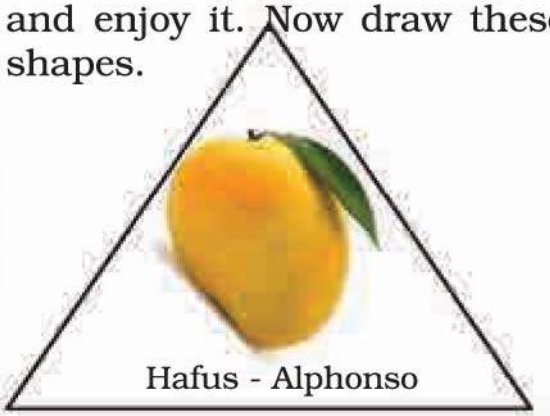
Do you know ? India produces approximately 1,60,00,000 tons (1 ton = 1000 kg) mangoes every year. India is the biggest producer of the mangoes in the world. Uttarpradesh does the largest production of mangoes in India.

What do you know about the biggest mango ? The biggest mango weighing 3.435 kg was displayed in philipines. It was 30.48 cm (12 inches) in length, 49.53 (19.5 inches) in circumference and 17.78 cm (7 inches) in breadth.

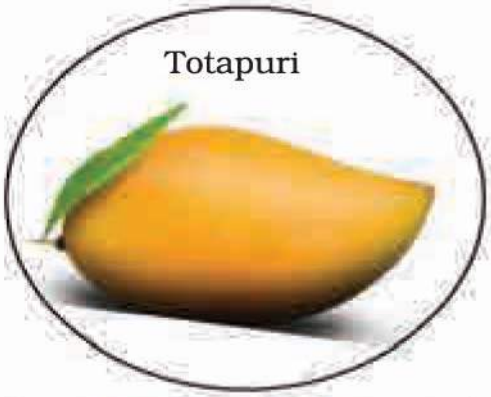
Jency has made pictures of mango in different shapes. Draw different shapes of mangoes.

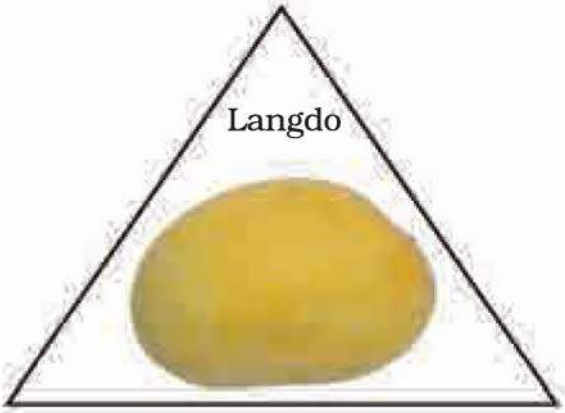


When you go to the market to buy mangoes, don't get confused to see so many different types of mangoes. Search yourself in the market for the following types of mangoes. Buy whichever type of mango you like and enjoy it. Now draw these mangoes on card paper of different shapes.


Hafus - Alphonso

Kesar


Totapuri


Langdo

Dasheri

Badam

Which type of mango, from the above given varieties, have you tasted ?

Mango orchard and its farmer

How many of you have seen a mango orchard ? Where have you seen it ? Have you seen it in real or on T.V. ? Are the mango trees tall and strong or short and weak ?

Do you know how to climb on a tree ? Are you afraid of climbing on a tall tree ?

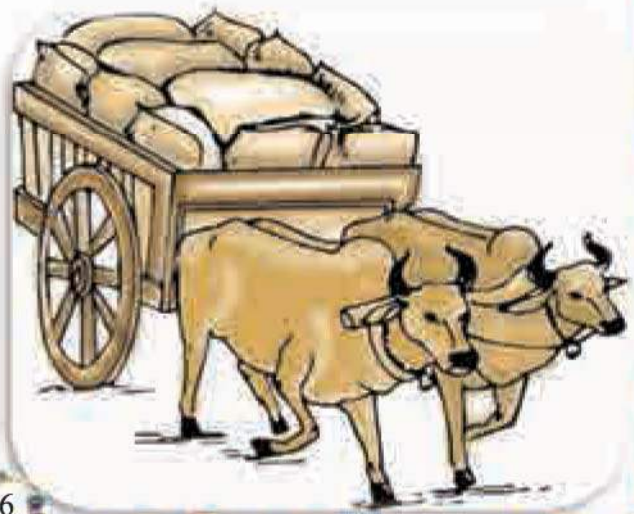
- Close your eyes and imagine that you are standing under a huge mango-tree.
- Can you think, how tall a mango-tree can be? .....

Imagine that, you have come to a mango orchard with a farmer. The leaves of the trees are making rustling sound in the gentle breeze. A cooing sound is heard from up the mango-tree. The mangoes on trees are swinging on branches because of the breeze.

The farmer starts his work in dark in early morning. Some farmers go to their field in bullock-carts. The farmers, growing mangoes face a difficult time when the strong wind is blowing.

We cannot go far in a bullock-cart. A bullock-cart can cover the distance of only 4 kilometers in an hour.

- How much time will it take to cover the distance of 10 kilometers?
- Guess, how much distance, do you cover in an hour by walking fast?



We can feel the wind and also the sun moving with us during a journey. If we forget the direction, we can figure it out with the help of position of the sun. Right !!

Find Out

Look at the sun and find out direction of its rising.

- Stand wherever you are, which interesting things do you find in your east ?
- Write name of any two things situated in your west direction.

Wow ! so many mangoes !!

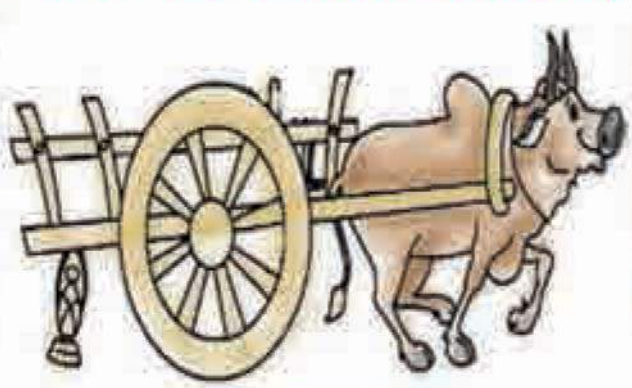
Farmers select a graft from a mango-tree which gives more mangoes and sow the plant and grow it in their own farms. A farmer has to wait for many years to grow a big mango-tree and to get mangoes on that tree.

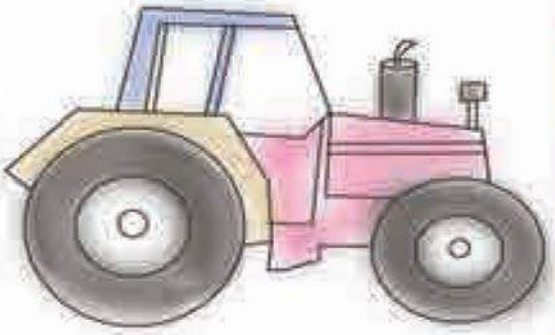
• Observe different types of vehicles

The mangoes which are ready for sale are carried to APMC (Agriculture Production Market Committee) or market yard or bazar in different ways. To supply the mangoes to market yard as early as possible, big or small vehicles are used. A tractor moves at the spped of 20 km per hour.

- How much distance can a tractor cover at the same speed in 3 hours ?
- How much time it will take to cover the distance of 85 kilometers ?

- **Draw the sketches following vehicles.**



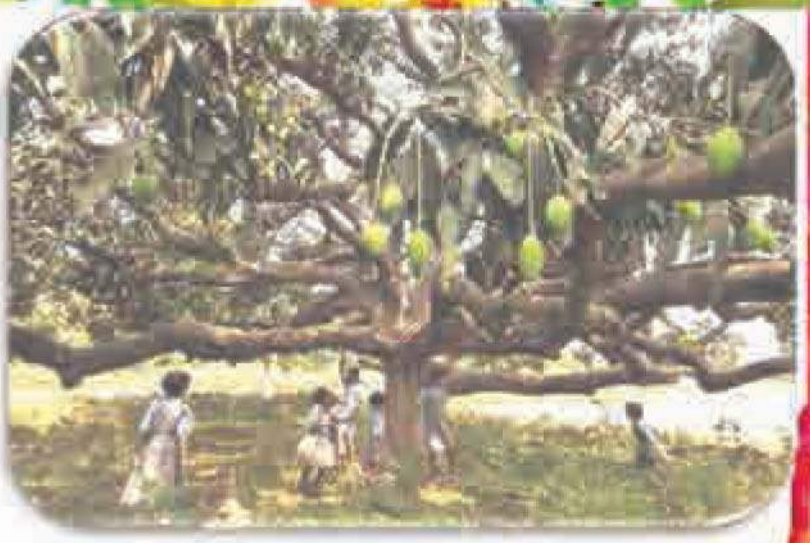


Now-a-days, the producers of mango are very happy, because this occupation is developed at national and international level. Our mangoes are exported to different states of our country and also to the foreign countries. Transportation of mangoes in a huge quantity is carried out by trucks and by airplanes.

It is a matter of concern for our environment and health that the use of fertilizers and pesticides have increased in mango orchards. Due to this the land quality is deteriorated and it is becoming infertile. Dangerous chemicals are used to ripen the mangoes quickly which harm our health.

At present, many farmers grow mangoes by organic method without using chemicals and keep our health as well as their land good.

Some people buy raw mangoes, get them ripen at their own home using dry grass, jute sacks, onion, paper or grain and enjoy them.



Many types of mangoes are in existance since many years. Earlier, huge native (Deshi) mango-trees were more in numbers. Commonly 3-4 mango-trees were seen in each farm. Now-a-days, farmers are growing grafted mangoes only. Native mango-trees are about to extinct. If there are no mango-trees where will we hear cooing of cuckoos ? How will we enjoy mangoes by climbing on mango-tree like our grandfathers when they were kids ? How will we enjoy visit of mango orchard ? Think...

- Write a report on 'Problems releated to existence of mango and mango-trees.'

Vehicles carrying mangoes

A wooden bullock cart can carry 200 kilograms of mangoes. But other vehicles carry mangoes or mango boxes as per shown in the table given below. The table also shows the speed of vehicles of each type. So that we can know about the distance of each type of vehicle can cover in one hour.

Look at the table and calculate :

(a) How many kg mangoes, each vehicle can transport in its seven trips ?

(b) How much distance is covered by a tractor in six hours ?

(c) How much time will be taken by a rikshaw-trailor to cover 60 kilometers ?

Type of vehicle	Transportation of mangoes in a trip	Speed of vehicle (distance covered in km in one hour)
Bullock-cart	200	4
Rickshaw-trailor	600	12
Tractor	800	20
Truck	6000	44

Some Big Numbers

You have learned about the number 'lakh' in your class IV mathematics textbook. You know that it is equal to 100 thousands. You also know that there are approximately one lakh bricklin in our country where bricks are made.

- Have you learned something else about the number lakh ?
- Write one thousand in number. Now write 100 thousands in number. How many zeroes are there in one lakh ?
- If there are 2 lakhs transportation vehicle in your area and half of them are trucks, write number of trucks in your area.
- If one fourth part of these vehicles are tractors, how many thousand of tractors are there ? Try and answer without writing.

You will be wondered to know that so many people are associated with business of mangoes. There may be one hundred lakh people in total, who grow mango-trees, grow mangoes and trasport the mangoes to the marketing yard, sell mangoes around us and work in small or big mango related industry. 100 lakhs is also known as one crore.

- Where have you heard about one crore ? How is this number used ?
- Write the number one crore. Don't make mistake to write zeroes.

Fruit Market

Have you ever visited a market yard, fruit or vegetable market? If yes, do you know why is this noisy place known as market ? The major fruit markets of the city are busy. A large stock of mangoes has arrived in many vehicles. The sellers are calling the customers are shouting. Speaking out the prices and praising their own mangoes.

Savjibhai - Come here ! Come here ! Buy this 'Valsadi Totapuri' at the rate of ₹ 40 per kg !

Mahipatbhai - Never so cheap ! Alphonso at the rate ₹ 60 per kg !

Madhuben is selling good quality 'Kesar' mango at rate ₹ 150 per kg.

Rajaram sells 'Langdo' mango at the rate of ₹ 50 per kg.

Look here..., this...side... Jaydeepsinh has brought fragrant raw kesar mangoes from Gir to be ripened at home in 8 kg box. He says that these mangoes will be ripened at your home in organic way and he will charge ₹ 1200/- per box.

Practice

(1) At what price per kg, does Jaydeepsinh sell his kesar mangoes ?

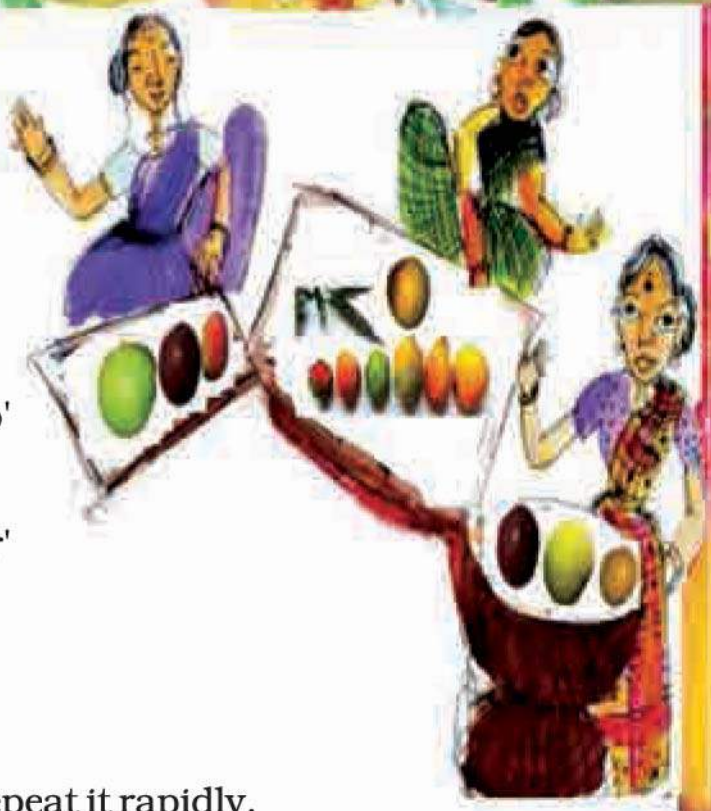
(2) Today Madhuben has sold 10 kg kesar mangoes. How much did she earn from that ?

(3) Mahipatbhai has sold 6 kg Alphonso mangoes. Savjibhai has earned the same amount as Mahipatbhai. How many kg of 'Totapuri' mangoes have been sold by Savjibhai ?

(4) Raj has ₹ 100. He spent fourth part of the amount to buy Langdo mango. He spent rest of three fourth amount to buy kesar mangoes.

(a) How many kg 'Langdo' mango he had bought ?

(b) How many kg 'kesar' mango he had bought ?



Try to speak rapidly

Here a tongue twister is given. Repeat it rapidly.

Raw mango, ripe mango, mango sour, mango sweet.

Raw mango, ripe mango, sour mango, sweet mango.

Sour mango, sweet mango, raw mango, ripe mango

mango sour, mango sweet, mango raw, mango ripe.

Women Amra Bank of Mango Producers

The meeting of women Amra Bank has just started. Madhuben is its chairman. This bank is established by 20 members. Every member saves ₹ 25 per month and deposit in the bank.

- How many rupees are collected by this group in every month ?
- How many rupees will be collected in 10 years ?

Practice

(a) Rekha borrowed a loan of ₹ 4000/-. She paid ₹ 345 to bank every month for a year. How many rupees did she pay to the bank ? How many rupees are yet to be paid ?

(b) Mira and her brother borrowed a loan of ₹ 21,000/- to buy new plants of grafted mango-trees. They paid back ₹ 23,520/- in a year. How many rupees they would have paid every month ?

Earlier, women were not active in mango business. But now Madhuben and other women are engaged in mango business. Things are changing now. Their bank also helps them in that. These women are given employment oriented, business oriented, small scale industry at home releated trainings to help them become self reliant and contribute to economic development of the family.

Why don't we start the business of preparing mango-pulp ?

Some women associated with women Amra Bank want to start a small scale industry of preparing mango-pulp at home. They have acquired a place from 'Panchayat' for it. They have saved ₹ 74,000/- last year. They made calculation of the amount of investment required to startup this new industry.

Madhuben prepared a list of required items before starting this work. These items should be purchased in the beginning of the work. The cost and number of items of these things are given in the following table. Find total expenditure.

Item	Cost for item	No.of items	Expense
Mixer-Grinder	₹ 3000	1	
Thermocol-ice-box for preserving and transporting Mango-pulp	₹ 2000	20	
Big pots	₹ 1000	4	
Tray and knife	₹ 300	20	
Bucket	₹ 75	20	

Total expenditure to start a business =

- When they extract pulp from mango, it weighs $\frac{1}{3}$ of a mango.
- They have planned to extract pulp from 6000 kg mangoes in a month.
- How much mango pulp will be prepared in a month ? .....

Madhuben-Let's calculate for first 6 kg mangoes.

For purchase of mangoes	₹ 15 per kg
For sale of mango-pulp	₹ 70 per kg

- If we extract mango-pulp from 6 kg mangoes, we get ..... kg pulp.
- The total amount to be paid for 6 kg mangoes 6 × ..... = ₹ 90.
- Amount received by selling 2 kg mango-pulp 2 × ..... = ₹ .....
- Therefore, the amount by selling the pulp prepared from 6 kg mangoes ₹ ..... – ₹ 90 = ₹ .....
- If we prepare mango-pulp of 6000 kg mangoes, the amount we earn ..... × ₹ 1000.

All women are very happy for this plan. Every women will get good profit and will get wages for the work done by them.

Anita - I have found out by another calculation that 1500 kg ice will be required every month. Its cost is ₹ 2 per kg. Therefore,

Monthly expense

(A) Ice 1500 × ₹ 2 = ₹ .....

(B) Packaging charge and rickshaw fare = ₹ 3000

So, the total monthly expense of buying mangoes and selling mango pulp is ₹ .....

Madhuben - Oh ! How nice ! From this calculation, we know that our bank will earn ₹ 44,000/- per month.

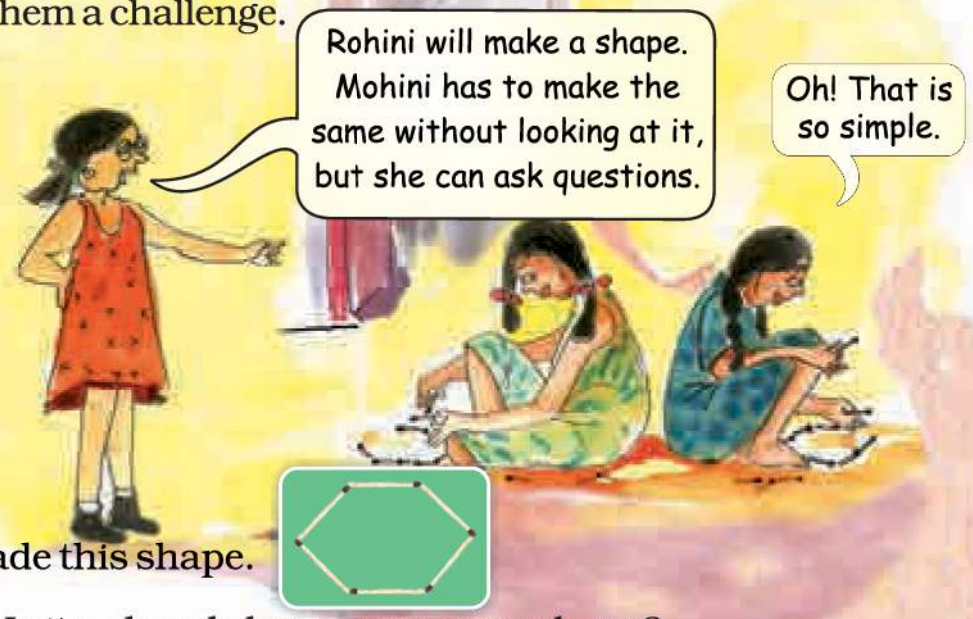
- Check, do you get the same answer ?

Find out

There are many beautiful songs about mangoes. Get words and tunes of such songs.

2 Shapes and Angles

Rohini and Mohini are twin sisters. They love doing the same things. One day when they were making shapes with matchsticks, Shaila gave them a challenge.



Rohini made this shape.

Mohini — Is it a closed shape or an open shape?

Rohini — It is a closed shape.

Mohini — How many sides are there?

Rohini — It has 6 sides.

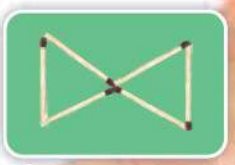
Mohini made this.

Now you give the answers.

Is it a closed shape? _____. Does it have 6 sides? _____.

But it is not the same as the one made by Rohini. So Mohini tried again.

This is what she made.



Is it a closed shape with 6 sides? _____

Is it the same as the one made by Rohini? _____

Is there some way to say in what way these shapes are different?

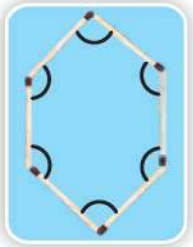
* Mohini tried again but got different shapes. Guess and make two more shapes Mohini could have made.

Mohini is now tired of trying and asks Shaila what to do.

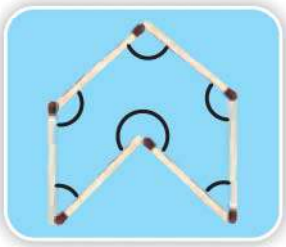
If you ask for the angles that the matchsticks make at the corners, you can do it.

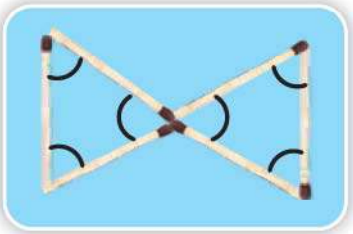
Oh! So let us look for the angles.

* Look at the angles marked in these shapes. Can you see the difference?



Rohini





Mohini

See, how the matchsticks make a small angle , a big angle , and a bigger angle .

Wow! When the angle changes the shape changes so much.

It is important to encourage children to think about the way in which shapes can differ even when the number of sides is the same. This will help them to get a sense of how angles determine the shape of a polygon.

Practice Time

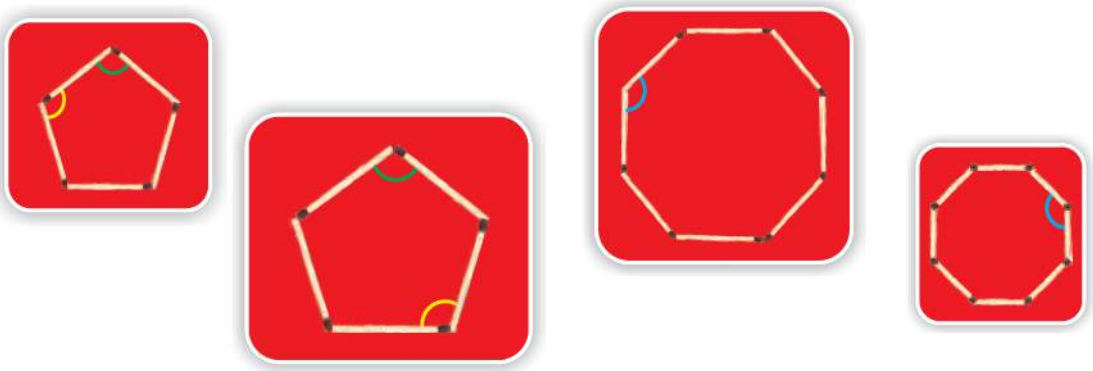
1) Look at the shape and answer.

* The angle marked in _____ colour is the biggest angle.

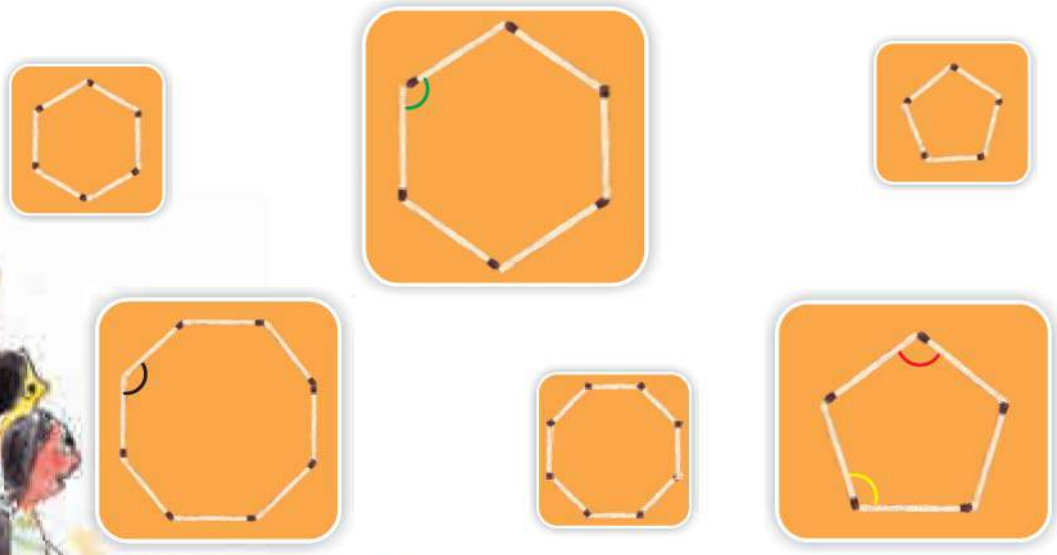
2 (a) Are the angles marked with yellow equal? _____

b) Are the angles marked with green equal? _____

c) Are the angles marked with blue equal? _____



3) Four different angles are marked in four colours. Can you find other angles which are the same as the one marked in red? Mark them in red. Do this for the other colours.



4) How many different shapes can you make by changing the angle between the matchsticks in each of these? Try.

a)

4 matchsticks

b)

8 matchsticks

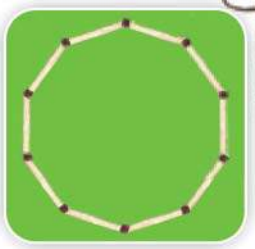
c)

5 matchsticks

d)

7 matchsticks

e)



10 matchsticks

Matchstick Puzzles

1) Make 8 triangles using 6 matchsticks. Try!

2) Take 8 matchsticks and make a fish like this. Now pick up any 3 matchsticks and put them in such a way that the fish now starts swimming in the opposite direction. Did it?

3) Using 10 matchsticks make this shape. Pick up 5 matchsticks and put them in such a way that you get the shape of a house.

If you have not been able to solve these then look for the answers on page 29.

Angle Tester

- Cut two strips from a cardboard sheet.
- Fix them with a drawing pin or such that both the strips can move around easily.

Rohini and Mohini went all around with the angle tester to look for different angles in their class.

Rohini tested the angle of the Maths book and the pencil box.

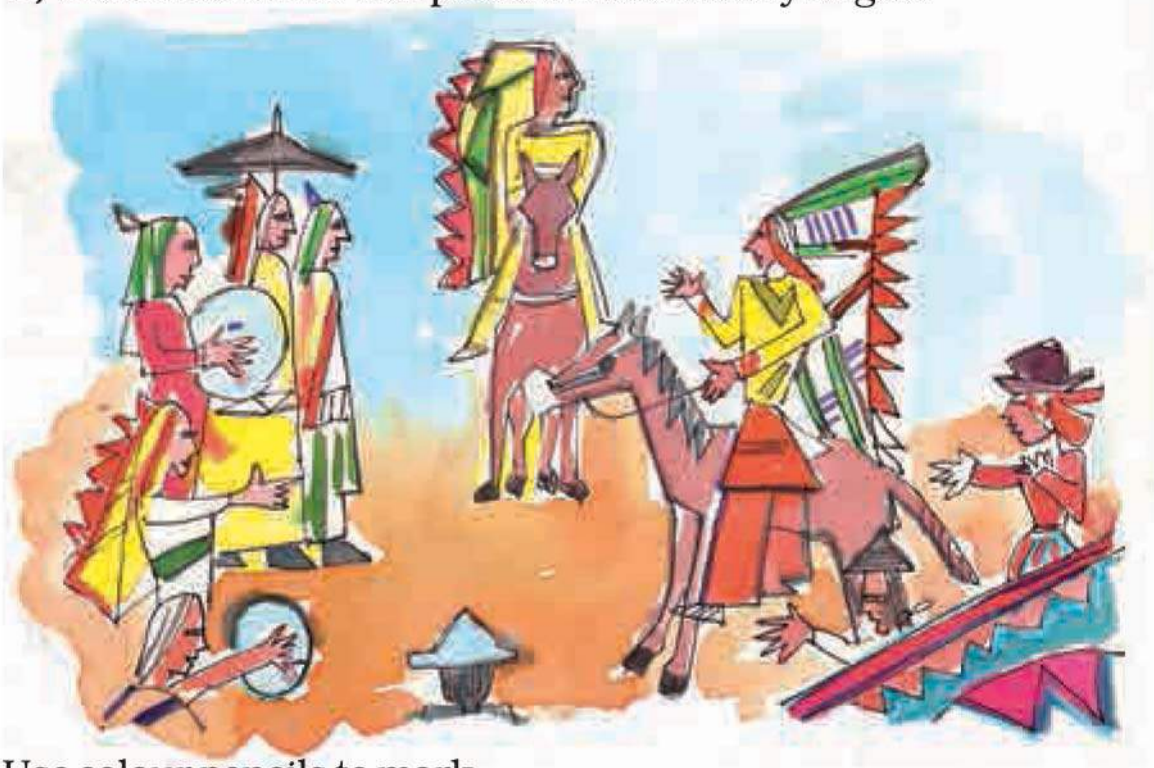
* Go around with your tester and draw here those things in which the tester opens like the letter L. Are you sure they are all right angles?

Practice time

1) Look at the angles in the pictures and fill the table.

Angle	*Right angle*	*More than a right angle*	*Less than a right angle*
			✓

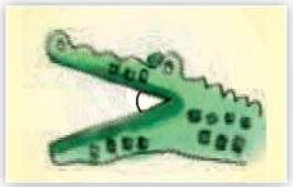
2) Sukhman made this picture with so many angles.



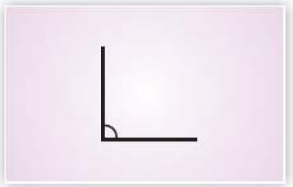
Use colour pencils to mark.

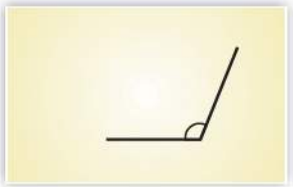
- right angles with black colour.
- angles which are more than a right angle with green.
- angles which are less than a right angle with blue.

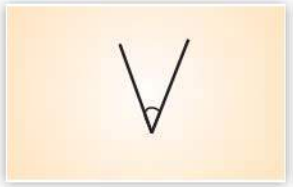
3) Draw anything of your choice around the angle shown. Also write what kind of angle it is. The first one is done.



Less than a right angle







Activity

a) Take a square sheet of paper.

b) Fold it in half.

c) Fold it once more and press it.

d) Open the last fold so that the sheet is folded in half.

e) Take one corner and fold it to meet the dotted line.

On the paper you will find lines making a right angle, an angle less than a right angle and an angle more than a right angle.

Look for each of the angles and mark them with different colours.

Activity — Angles with your body

Can you make these angles?

a) A right angle with your hand?

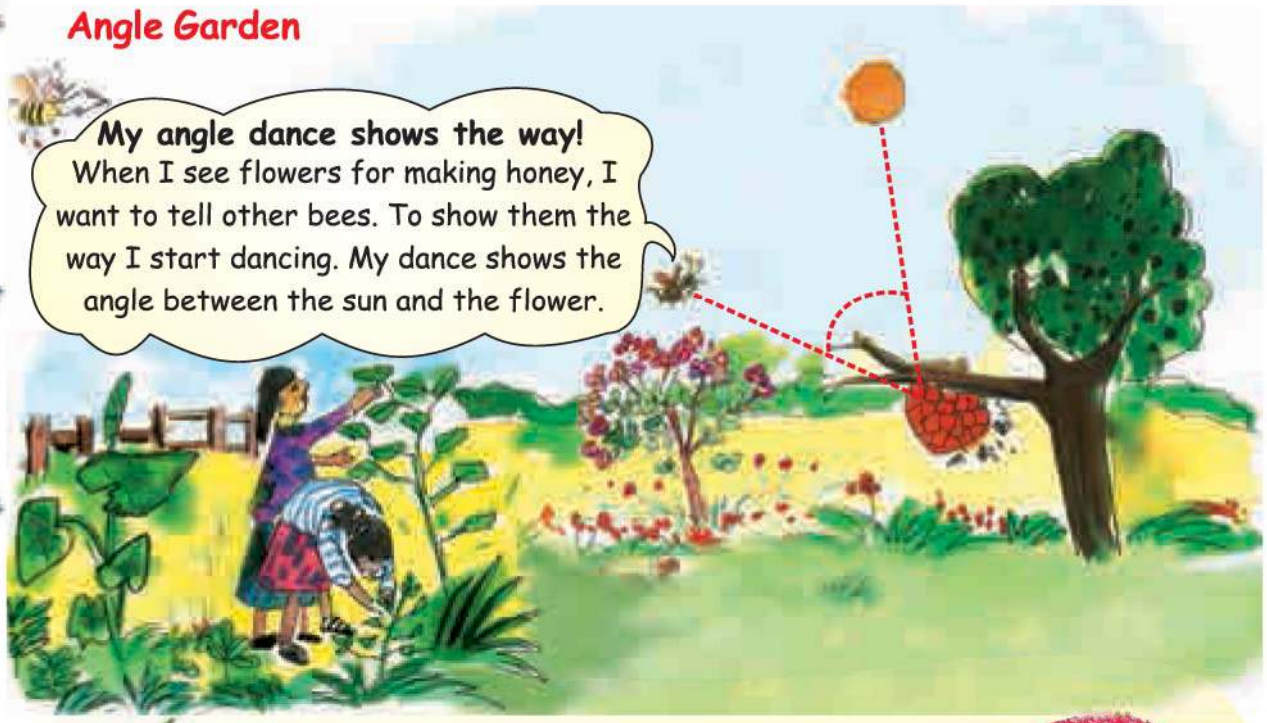
b) An angle less than a right angle with your leg?

c) An angle more than a right angle with your arm?

d) An angle more than a right angle with your body?

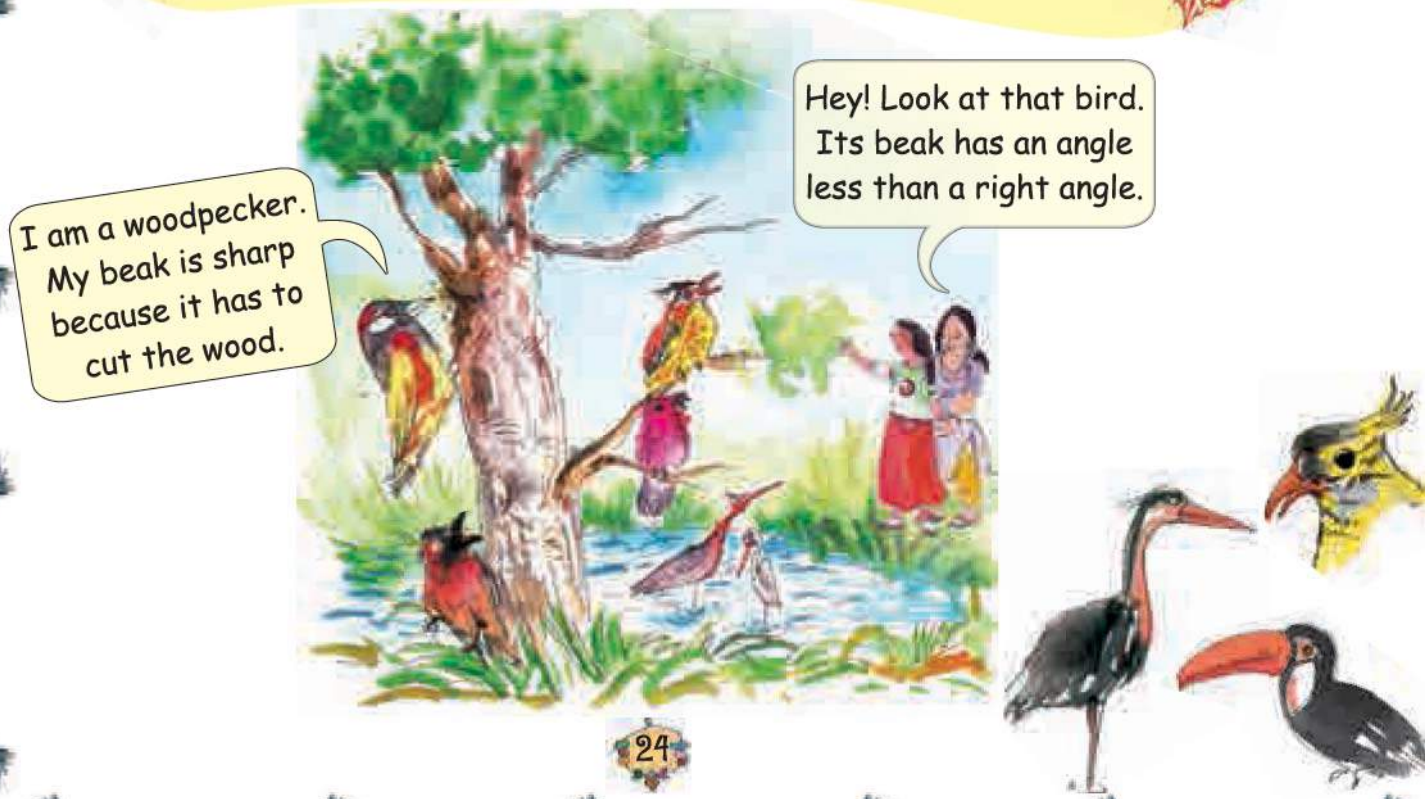
Try them out. It's fun! Draw them in your notebook using stick drawings like these.

Angle Garden



Activity

Collect some leaves from the garden. Colour each leaf and print it. Look at the angles on the leaves. Which of them are more/less than a right angle?



❊ Look for the birds which have beaks with small angles.

❊ In the picture mark angles between the two branches. Which two branches have the biggest angle?

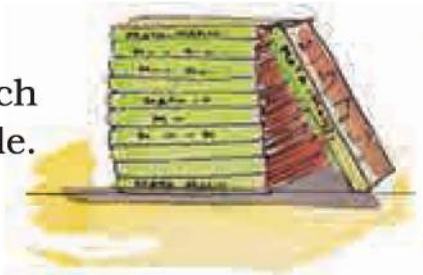
Angles in Names

In my name there are 11 right angles. There are also 10 angles less than a right angle.

❊ Write 3 names using straight lines and count the angles.

Name	*Number of right angles*	*Number of angles more than a right angle*	*Number of angles less than a right angle*

Activity



a) Put 10 Math-Magic books on top of each other. Keep one book slanting to make a slide.

b) Now do this with six books.

❊ Roll a ball from the top. From which slide does the ball roll down faster?

❊ Which slide has the smaller angle?

These are two slides in a park.

* Which slide has a larger angle?

* Which slide do you think is safer for the little boy? Why?

Changing Shapes

* Things you need — used (or new) matchsticks. Piece of rubber tube used in cycle valves.

i) Clean the black end of the matchsticks.

ii) Cut small pieces of the tube (about 1 cm long).

iii) Push two matchsticks into each end of a tube piece.

iv) Add more matchsticks to form a triangle.

Now make these 4, 5, 6 sided shapes by using tube pieces and matchsticks.

a)

b)

c)

* Find out how many angles are there in each of these shapes. Mark them.

Now push each shape downwards with the tip of your finger.

Does the angle change when pushed down by the finger?

* Find out and write your results in the table given.

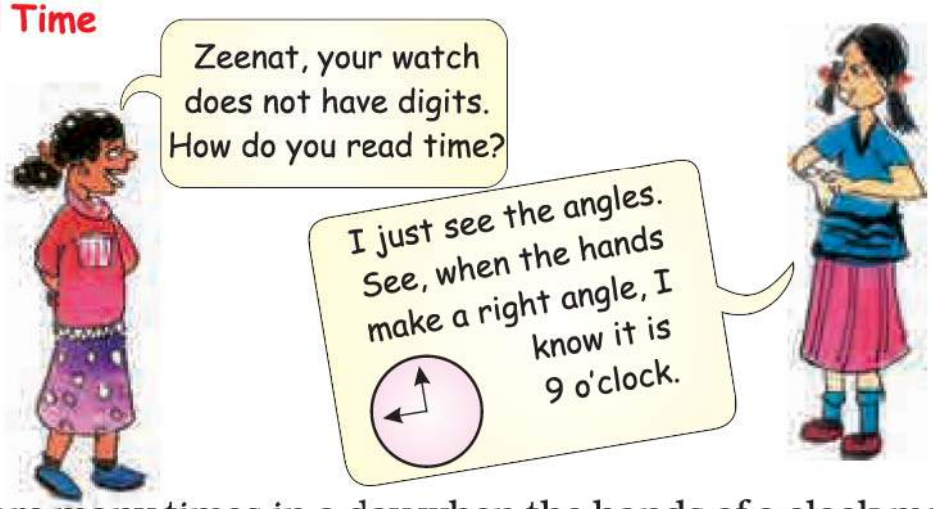
Shape	*Change in angle Yes/no*

Shapes and Towers

Look for triangles in the pictures below.

* From the activity 'Changing Shapes' can you guess why triangles are used in these towers, bridges etc?
* Look around and find out more places where triangles are used.

Angle and Time



* There are many times in a day when the hands of a clock make a right angle. Now you draw some more.

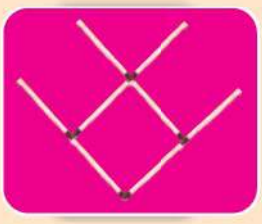
Triangles are shapes which are strong and do not change easily when pressed. In fact, children can also observe how different shapes are made stronger by using diagonal beams (like in the bridge) which divide shapes into triangles.

❋ Write what kind of angle is made by the hands at these times. Also write the time.

❋ Draw the hands of the clock when they make an angle which is less than a right angle. Also write the time.

Answers: Matchstick Puzzles (page 19)

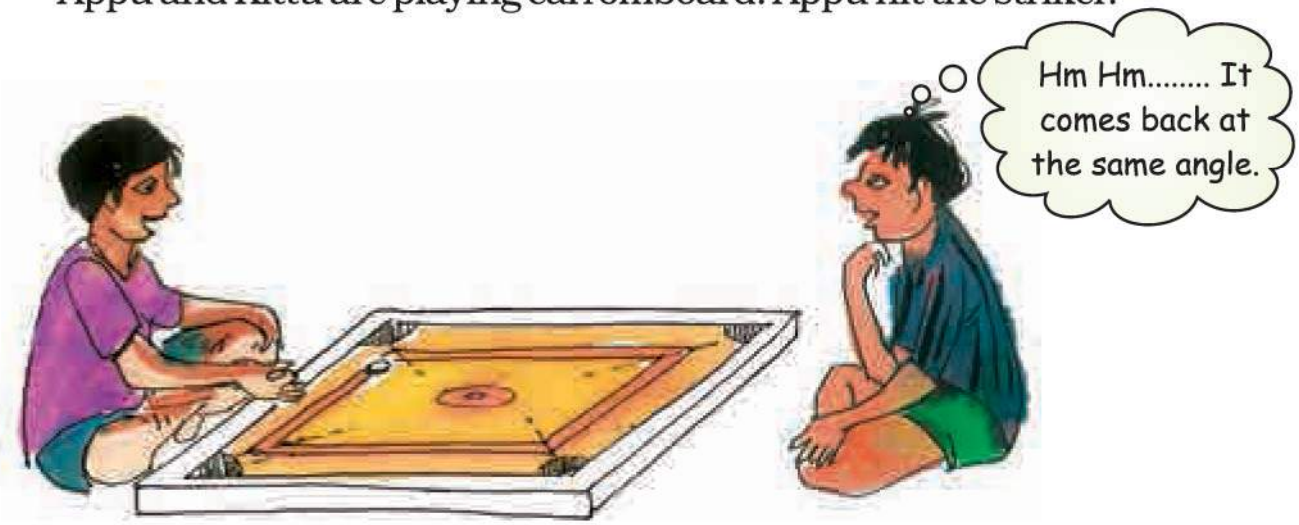
1.

2. 

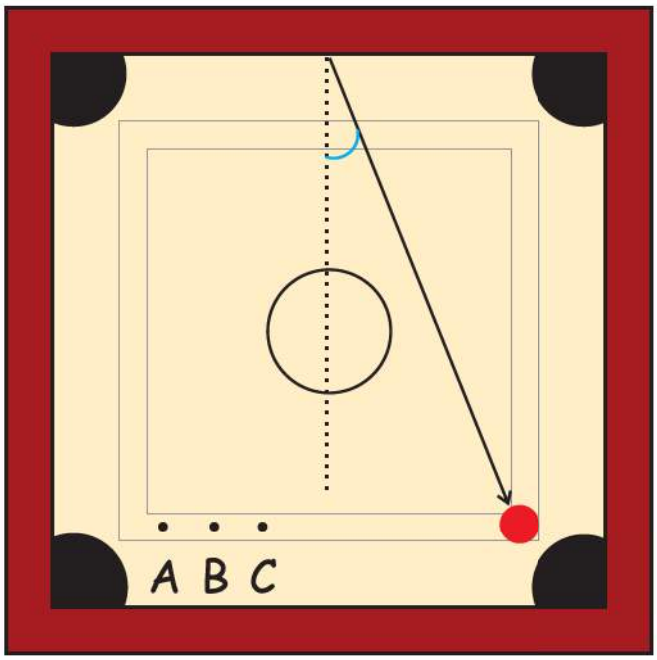
3.

Degree Clock

Appu and Kittu are playing carromboard. Appu hit the striker.

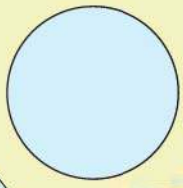


* In the picture three points A, B and C are shown. Draw a line to show from which point Kittu should hit to get the queen. _____

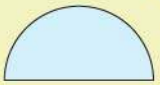


Activity: Making a degree clock

1. Cut a circle out of paper.



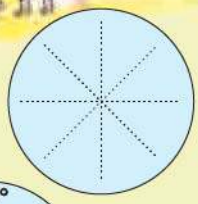
2. Fold it into half.



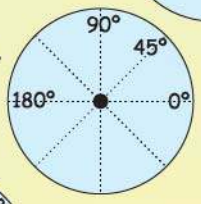
3. Fold it once again into a quarter.

4. Fold it once more.

5. Open the paper. You will see lines like this.

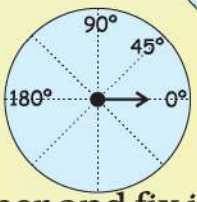


6. Now mark 0°, 45°, 90° and 180° as shown.

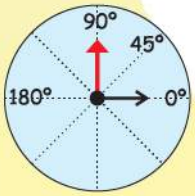


7. Paste it on an old card.

8. From the centre draw one hand.



9. Make a red hand with a thick paper and fix it to the centre with a drawing pin, so that it is free to move.



Your degree clock is ready.

- Use your degree clock to measure the right angle of your pencil box. _____ is the measure of the right angle.
- Can you guess how many degrees is the angle which is —
  - $\frac{1}{2}$ of a right angle _____
  - $\frac{1}{3}$ of a right angle _____
  - 2 times of a right angle _____

- Measure the angle from where Kittu should hit the striker on page 30.

Angles in a Paper Aeroplane

1. Take a square sheet of paper.

2. Fold it in half and open it.

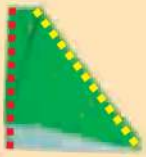
3. Fold the corners to the centre. Your paper looks like this.

4. Fold the green triangle such that P touches Q.

5. Fold the top two corners of this rectangle along the dotted lines.

6. Your paper will look like this. There is a small triangle in the picture which has to be folded up.

7. Turn it over and fold it in half along the dotted line.

8. Now, to make a wing fold the yellow edge over the red edge. 

9. Turn it and do the same on the other side as well.

Your plane is ready to fly. How well does it fly?

* Find the angles of 45° and 90° when you open your plane.

In the aeroplane there are folds of 45°, 90° and other angles. The cut-outs of 30° and 60° are on the last page of the book. Children can be encouraged to measure various angles around them.

Angles with Yoga

Rahmat is doing Yoga. These are the pictures of different 'Asanas' he does everyday.

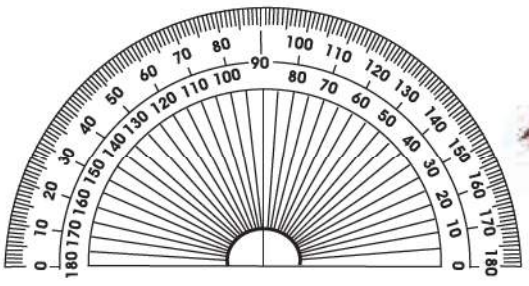
* Estimate the measure of many angles as you can made by different parts of the body while doing 'Asanas'.

The D Game

You can play the 'D' game with your friends. You draw an angle. Your friend will guess the measure of that angle. Then you use your 'D' to measure it. The difference between the measured angle and the guess will be your friend's score. The one with the lowest score will be the winner.

Come on, play!

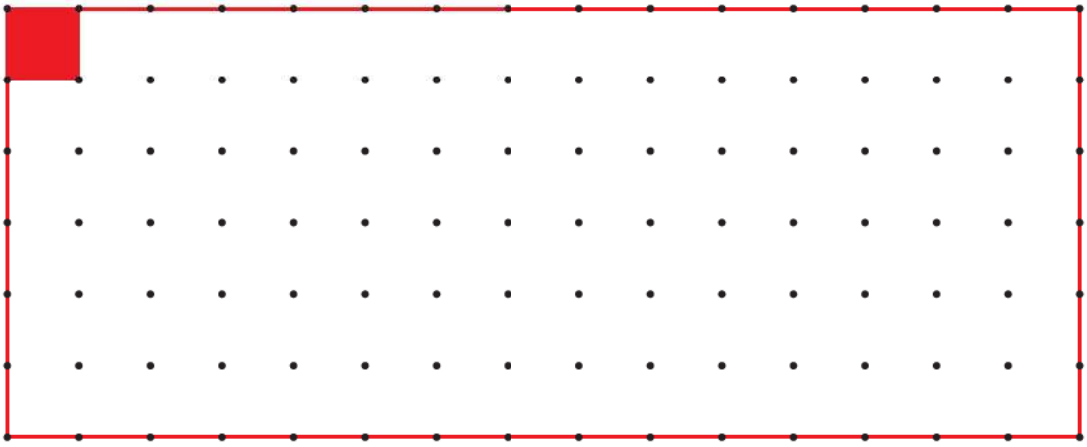
Draw Angle	*Guess*	*Measure*	*Score*



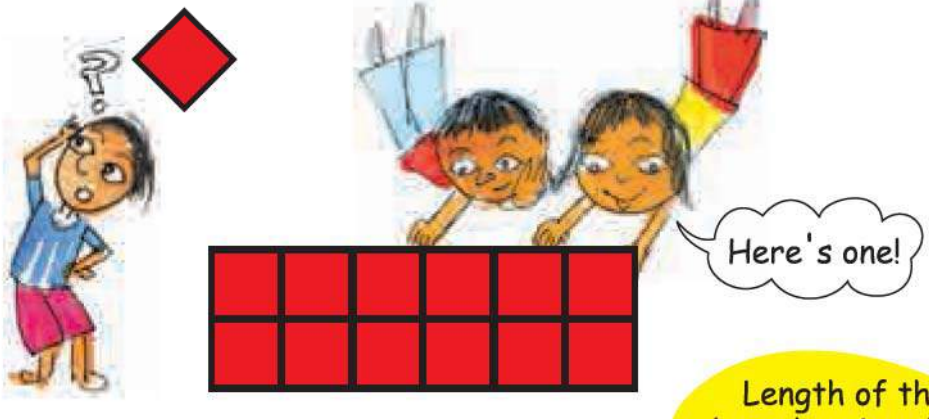
You can find this 'D' in your geometry box. Measure the angle on my head fan.

Take this opportunity to introduce the 'D' (protractor). Children will need some help to read the measure of the angle, but they need to do so only approximately.

3 How Many Squares?



* Measure the side of the red square on the dotted sheet. Draw here as many rectangles as possible using 12 such squares.
* How many rectangles could you make? _____



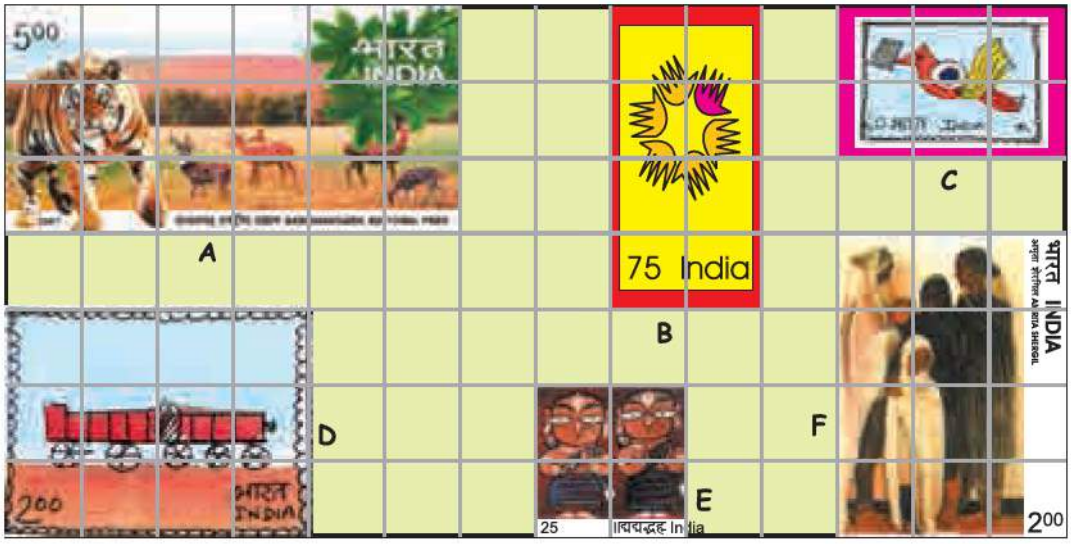
Each rectangle is made out of 12 equal squares, so all have the same area, but the length of the boundary will be different.

Length of the boundary is called **perimeter**.

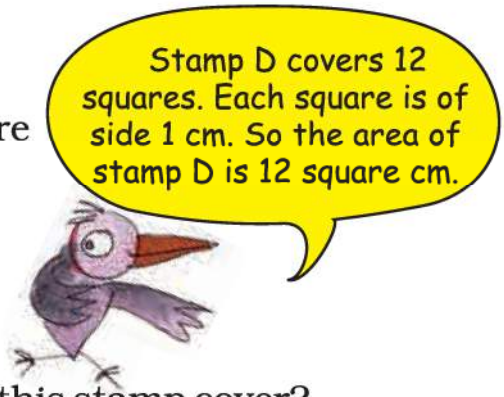
* Which of these rectangles has the longest perimeter?
* Which of these rectangles has the smallest perimeter?

Children are not expected to learn the definition of the term 'area', but develop a sense of the concept through suitable examples. Give them many opportunities in the classroom to compare things in terms of area and guess which is bigger. Things like stamps, leaves, footprints, walls of the classroom etc. can be compared.

Measure Stamps



Look at these interesting stamps.



a) How many squares of one centimetre side does stamp A cover? _____

And stamp B? _____

b) Which stamp has the biggest area?

How many squares of side 1 cm does this stamp cover?

How much is the area of the biggest stamp? _____ square cm.

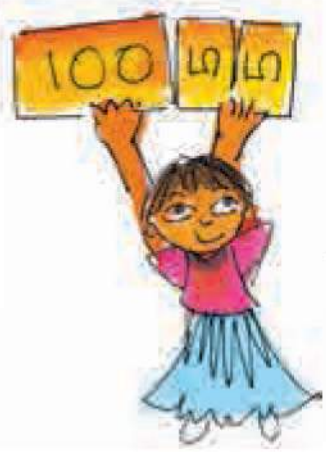
c) Which two stamps have the same area? _____

How much is the area of each of these stamps? ____ square cm.

d) The area of the smallest stamp is _____ square cm.

The difference between the area of the smallest and the biggest stamp is _____ square cm.

Collect some old stamps. Place them on the square grid and find their area and perimeter.



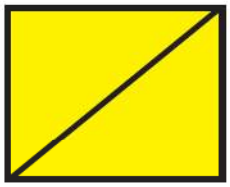
Guess

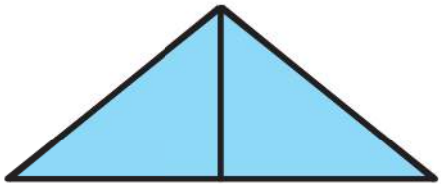
a) Which has the bigger area — one of your footprints or the page of this book?

b) Which has the smaller area—two five-rupee notes together or a hundred-rupee note?

c) Look at a 10 rupee-note. Is its area more than hundred square cm?

d) Is the area of the blue shape more than the area of the yellow shape? Why?





e) Is the perimeter of the yellow shape more than the perimeter of the blue shape? Why?

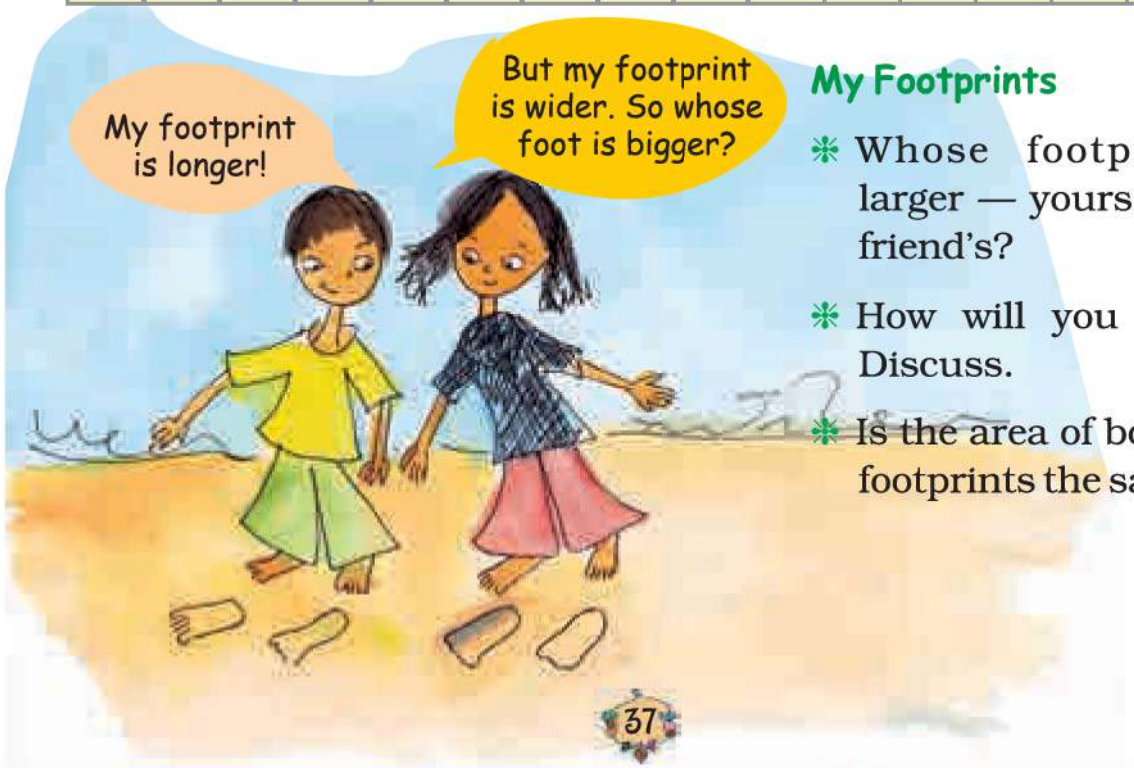
How Big is My Hand?

Trace your hand on the squared sheet on the next page.

How will you decide whose hand is bigger — your hand or your friend's hand?

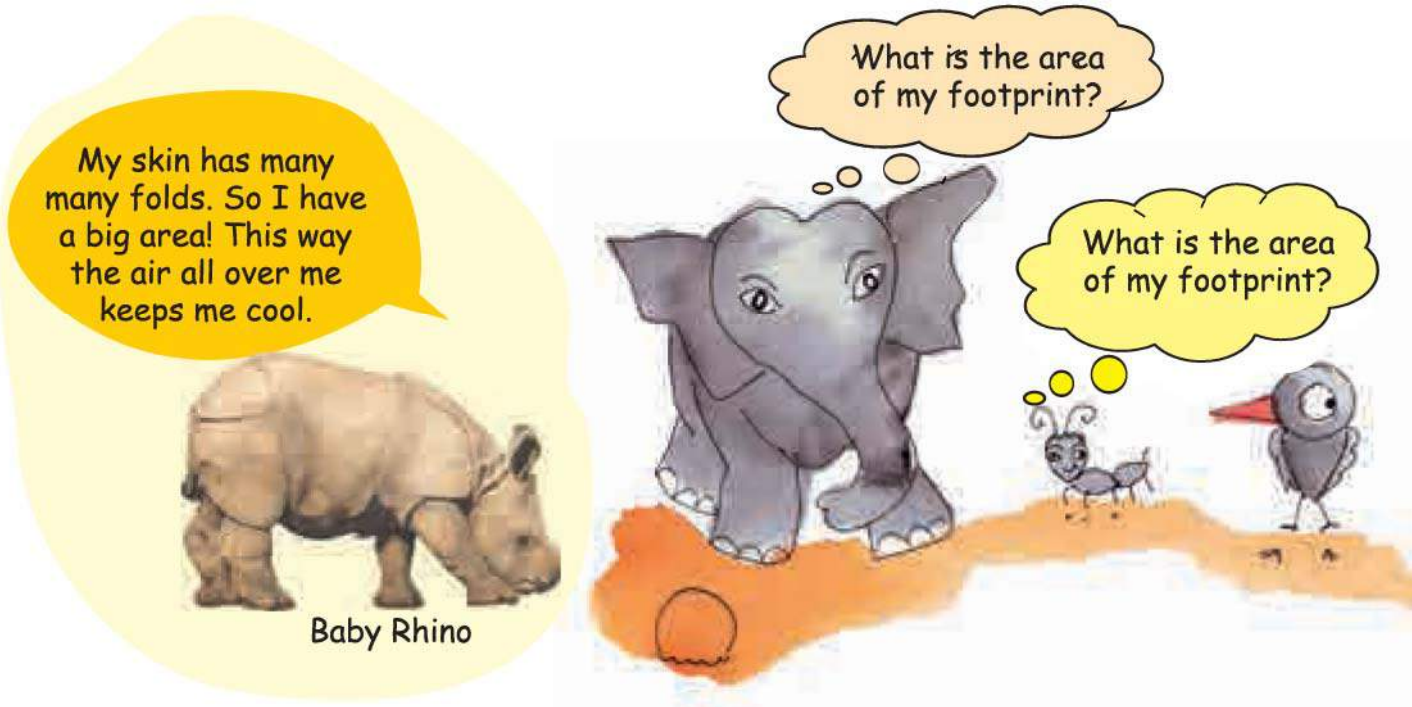
What is the area of your hand? _____ square cm.

What is the area of your friend's hand? _____ square cm.

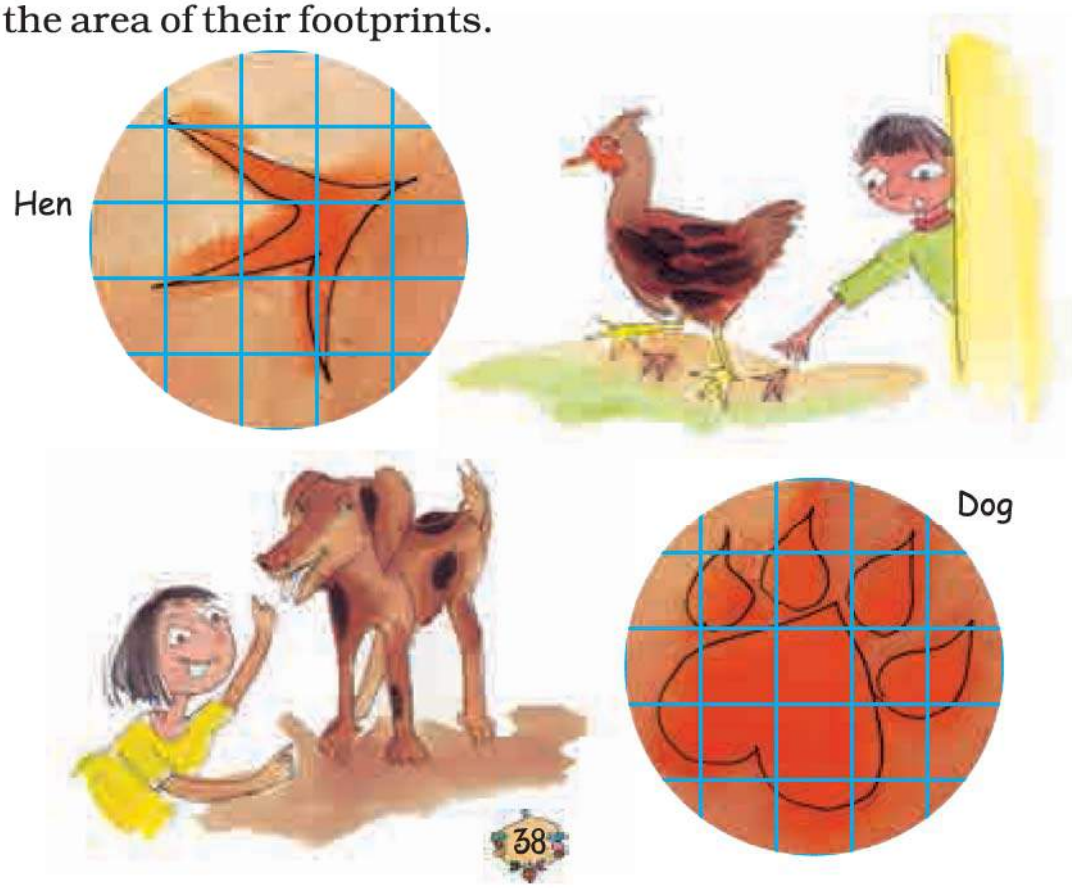


My Footprints

- Whose footprint is larger — yours or your friend's?
- How will you decide? Discuss.
- Is the area of both your footprints the same?



- Guess which animal's footprint will have the same area as yours. Discuss.
- Here are some footprints of animals — in actual sizes. Guess the area of their footprints.

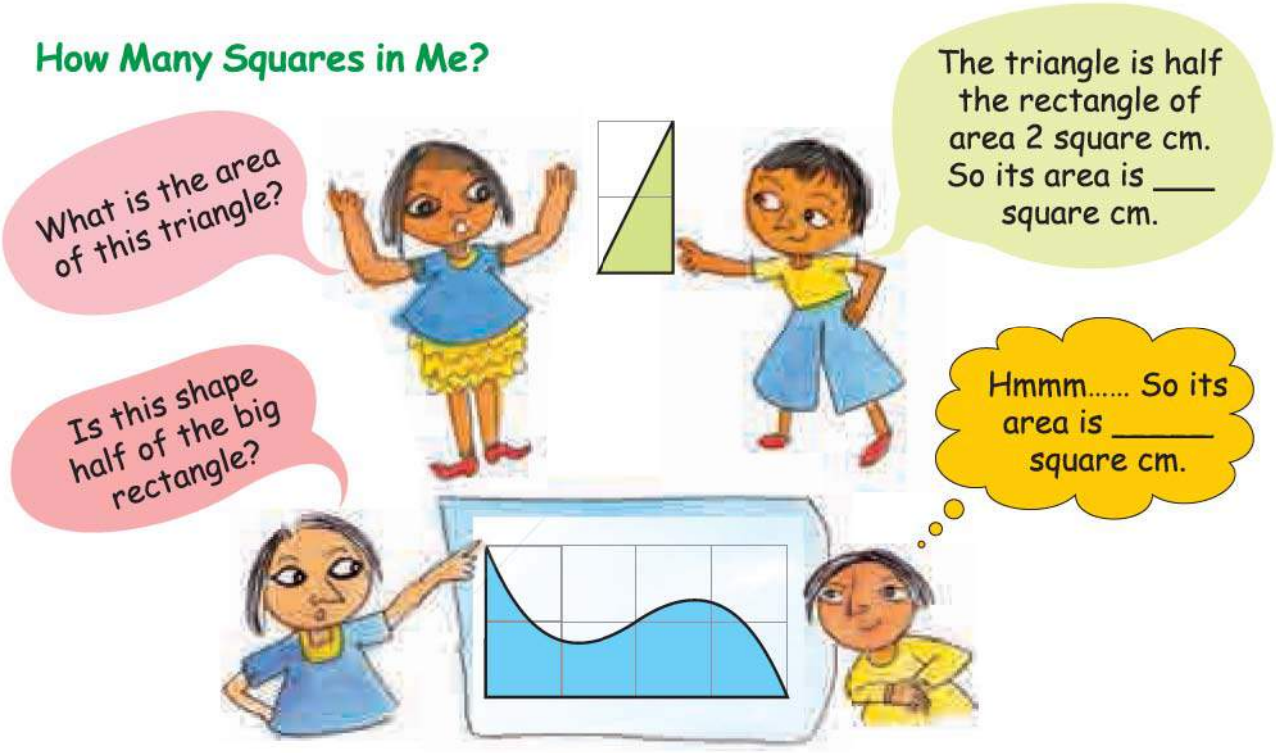


Make big squares and rectangles like this to find the area faster.

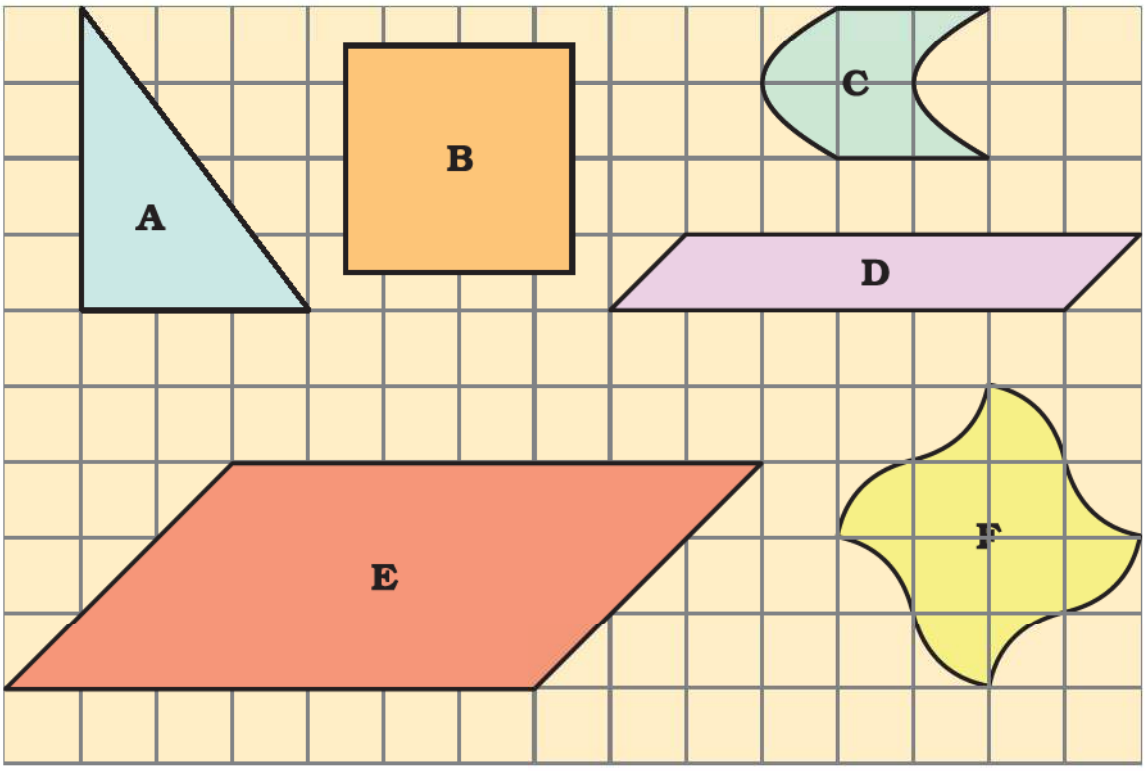
Tiger

At this stage children need not count each square. Encourage them to identify the largest squares and rectangles within a footprint to know their area and then count small squares for irregular shapes. Though area of a rectangle will be done in chapter 11, some children may discover themselves that they can find the area faster through multiplication.

How Many Squares in Me?

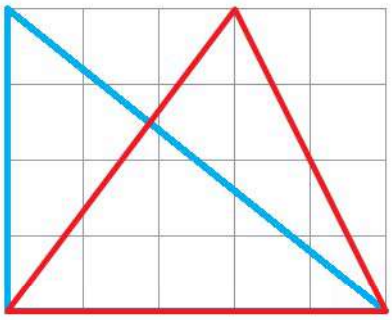


❋ Write the area (in square cm) of the shapes below.



In this exercise children are expected to notice the geometrical symmetry of the shapes to find out their area. Encourage children to evolve their own strategies. Rounding off is not needed in these examples.

Try Triangles



Both the big triangles in this rectangle have the same area.

Sameena

But these look very different.

Sadiq

The blue triangle is half of the big rectangle. Area of the big rectangle is 20 square cm. So the area of the blue triangle is _____ square cm.

And what about the red triangle?

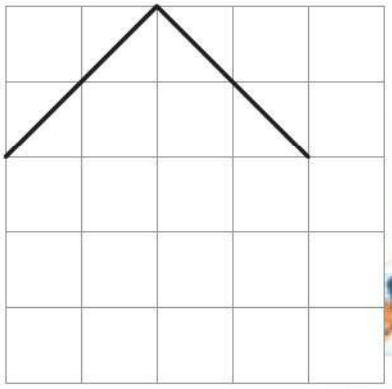
Ah, in it there are two halves of two different rectangles!

Now you find the area of the two rectangles Sadiq is talking about. What is the area of the red triangle? Explain.

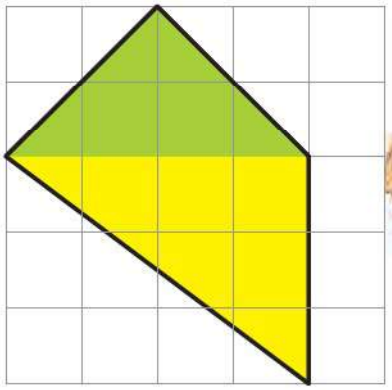
Help Sadiq in finding some more such triangles. Draw at least 5 more.

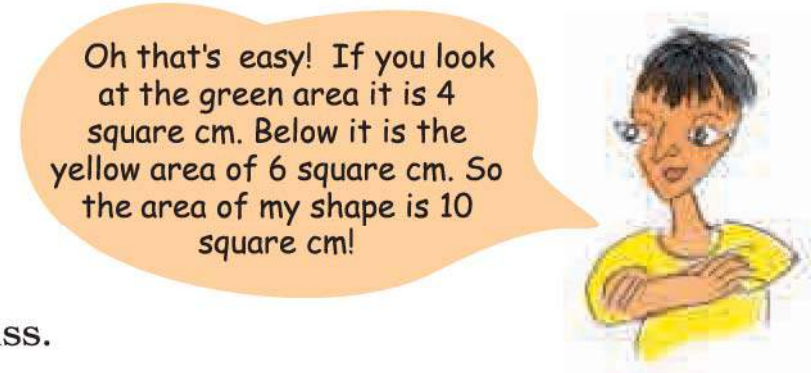
Complete the Shape

Suruchi drew two sides of a shape. She asked Asif to complete the shape with two more sides, so that its area is 10 square cm.



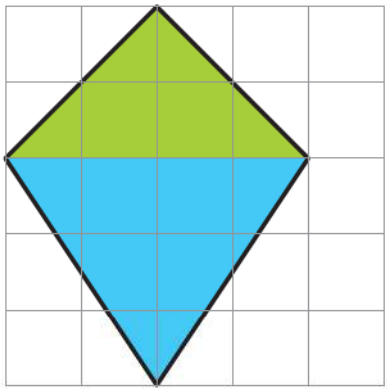
He completed the shape like this.





- Is he correct? Discuss.
- Explain how the green area is 4 square cm and the yellow area is 6 square cm.

Oh, I thought of doing it differently! If you draw like this, the area is still 10 square cm.

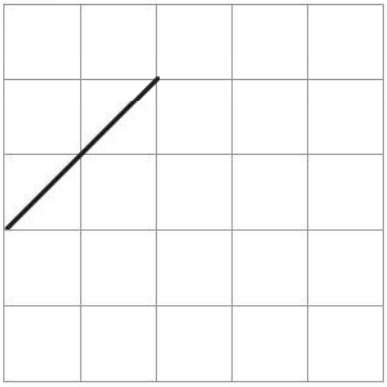


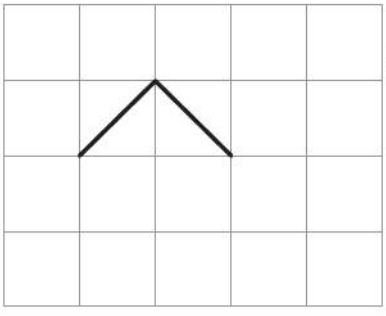
- Is Suruchi correct? How much is the blue area? Explain.
- Can you think of some other ways of completing the shape?
- Try some other ways yourself.
- Now ask your friends at home to solve these.

Every time guests come home, I ask them to do this. But why do they run away!

Practice time

1) This is one of the sides of a shape. Complete the shape so that its area is 4 square cm.

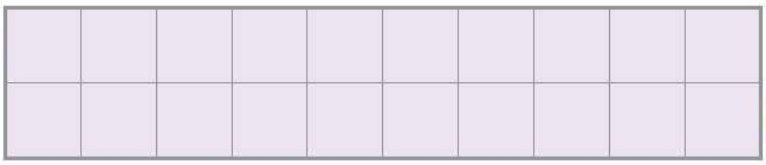




2) Two sides of a shape are drawn here. Complete the shape by drawing two more sides so that its area is less than 2 square cm.

Children can be encouraged to make shapes with either straight edges or curved edges to cover the given area. This exercise can be extended by asking children to draw on squared paper as many shapes as they can of a given area and making guesses for the largest or the smallest perimeter. They can also be asked to check their guesses by measuring the dimensions of the shapes. In case of curved edges, thread can be used for measuring the perimeter.

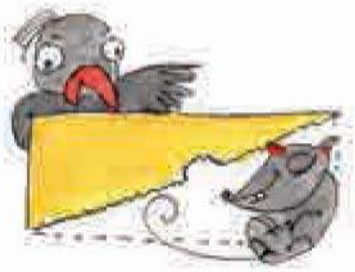
3) Here is a rectangle of area 20 square cm.

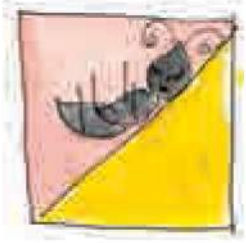


a) Draw one straight line in this rectangle to divide it into two equal triangles. What is the area of each of the triangles?

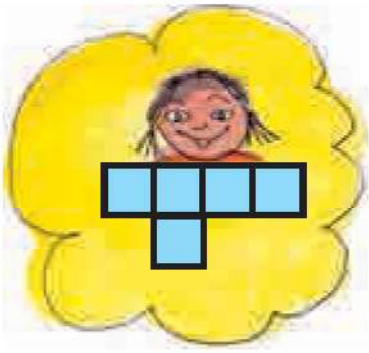
b) Draw one straight line in this rectangle to divide it into two equal rectangles. What is the area of each of the smaller rectangles?

c) Draw two straight lines in this rectangle to divide it into one rectangle and two equal triangles.



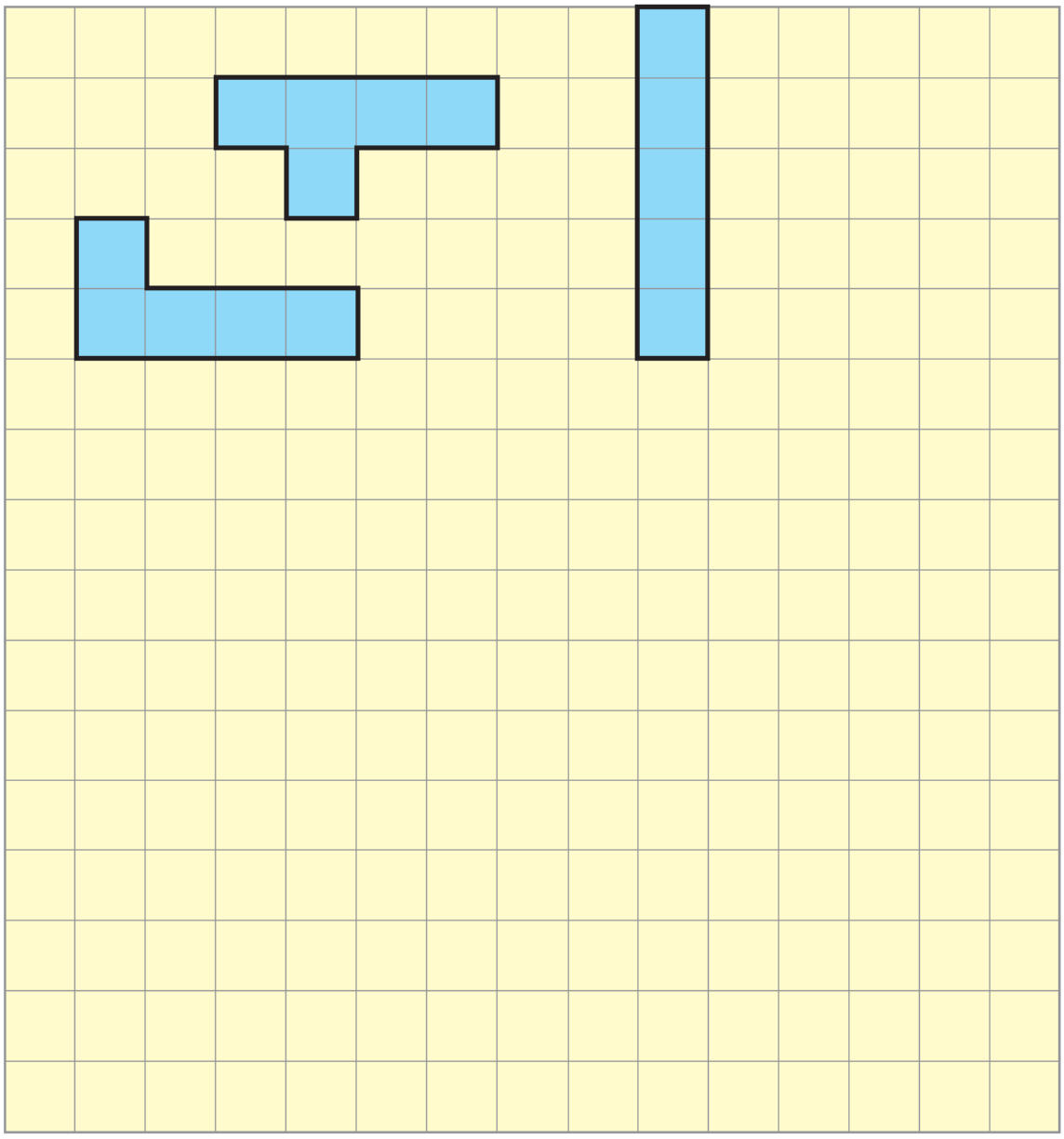


- What is the area of the rectangle?
- What is the area of each of the triangles?



Puzzles with Five Squares

Measure the side of a small square on the squared paper on page 45. Make as many shapes as possible using 5 such squares. Three are drawn for you.

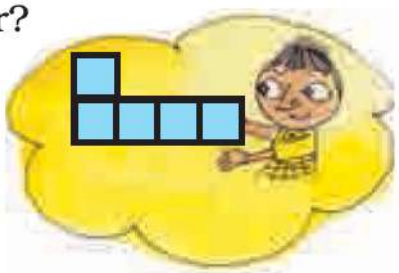


a) How many different shapes can you draw? _____

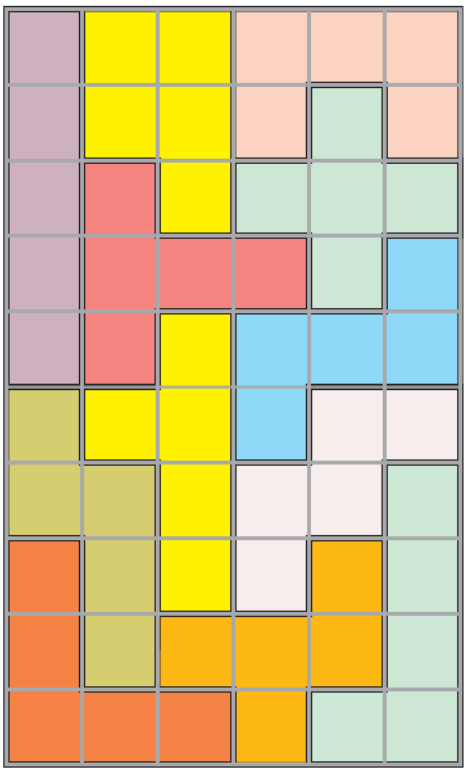
b) Which shape has the longest perimeter? How much? _____ cm

c) Which shape has the shortest perimeter? How much? _____ cm

d) What is the area of the shapes? _____ square cm. That's simple!



Did you get all the 12 shapes using 5 squares?



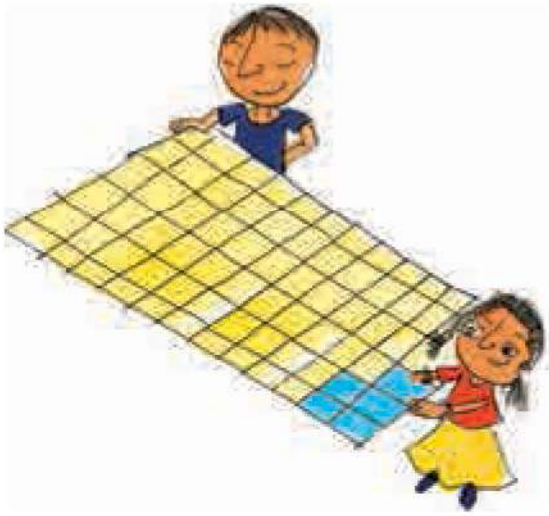
All 12 shapes are arranged here to make a rectangle.

This is a 10 X 6 rectangle as there are 10 rows and 6 columns.

You will be surprised to know that there are more than 2000 ways in which these shapes make a 10 X 6 rectangle.

Draw all the 12 shapes on a sheet of cardboard and cut them.

Try to arrange your 12 shapes in some other way to make a 10×6 rectangle. Could you do it?

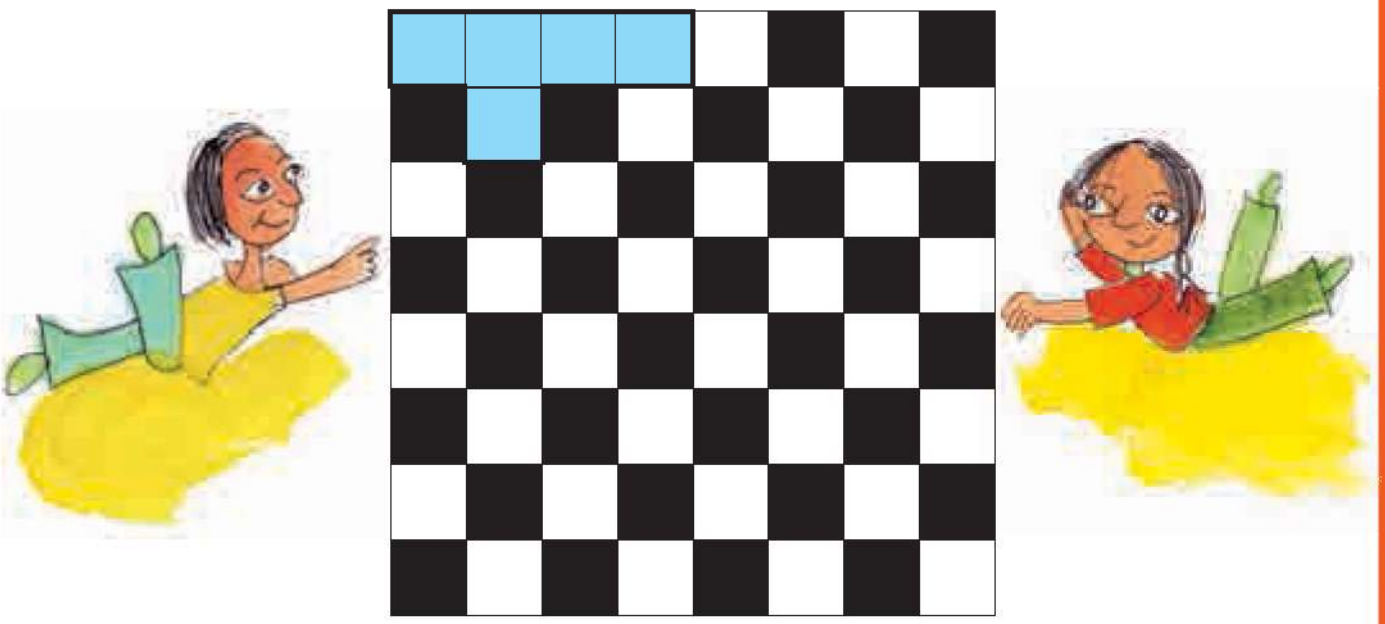


Try another puzzle

You have to make a 5×12 rectangle with these 12 shapes. There are more than 1000 ways to do it. If you can find even one, that's great!

Game Time

Here is a chessboard. Play this game with your partner, with one set of 12 shapes.



The first player picks one shape from the set and puts it on the board covering any five squares.

The other player picks another shape and puts it on the board, but it must not overlap the first shape.

Keep taking turns until one of you can't go any further.

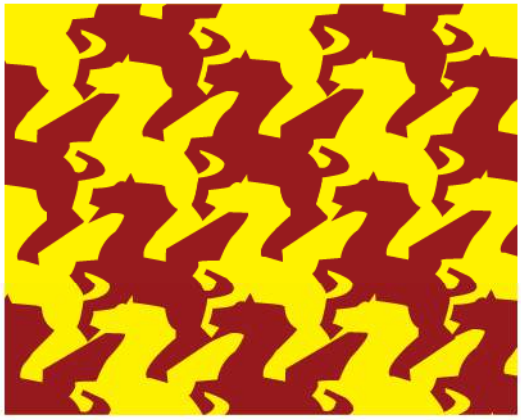
Whoever puts the last piece wins!

Make Your Own Tile

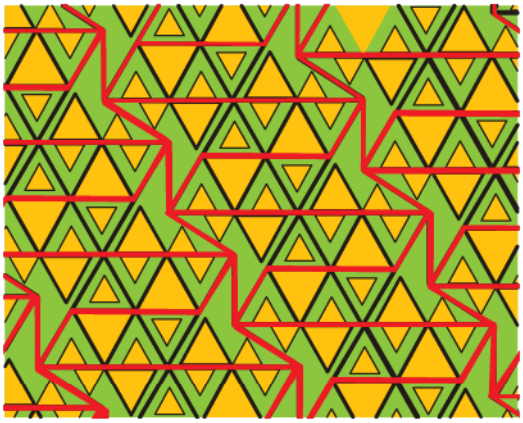
Remember the floor patterns in Math-Magic Book 4 (pages 117-119). You had to choose the correct tile which could be repeated to make a pattern so that there were no gaps left.

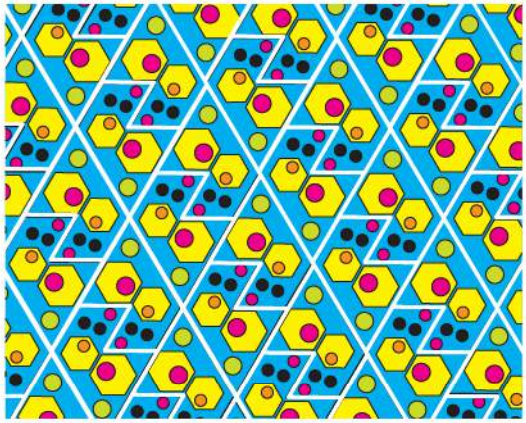
Encourage children to try to do these 'pentomino' puzzles at home. Such exercises can be designed for shapes with 6 squares (hexominoes) in which case there will be 35 different shapes possible.

Ziri went to a shop and was surprised to see the different designs of tiles on the floor. Aren't these beautiful!



* Can you find the tile which is repeated to make each of these floor patterns? Circle a tile in each pattern.

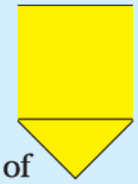




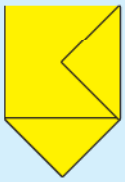
After looking at the patterns Ziri wanted to make her own yellow tile. You too make a tile this way.

Step 1: Take a piece of cardboard or thick paper. Draw a square of side 3 cm on it.

Step 2: Draw a triangle on any one of the sides of this square.

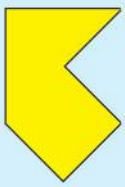


Step 3: Draw another triangle of the same size on another side of the square. But this time draw it inside the square.



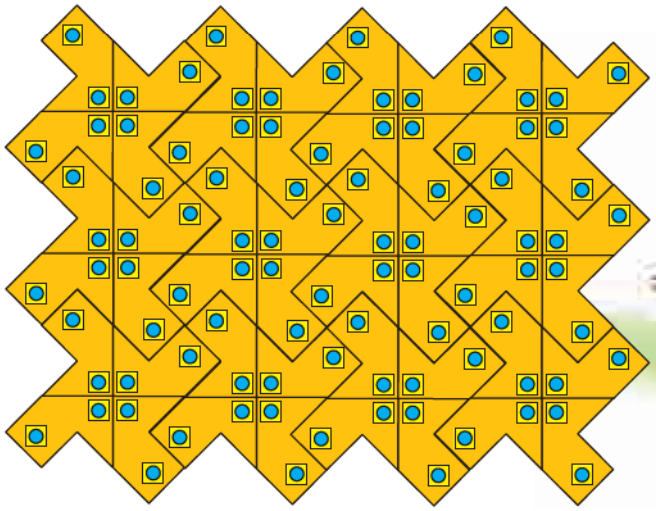
Step 4: Cut this shape from the cardboard. Your tile is ready!

What is it's area?



Make a pattern using your tile. Trace the shape to repeat it on a page, but remember there must be no gaps between them.

Ziri made a pattern using her yellow tiles. (You know the area of her tile.)

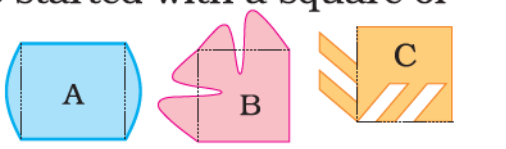


Answer these —

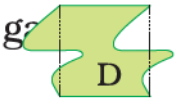
- How many tiles has she used?
- What is the area of the floor pattern Ziri has made here?

Practice time

Ziri tried to make some other tiles. She started with a square of 2 cm side and made shapes like these.



Look at these carefully and find out:



- Which of these shapes will tile a floor (without any ga Discuss. What is the area of these shapes?
- Make designs in your copy by tiling those shapes.
- Now you create your own new tiles out of a square. Can you do the same with a triangle? Try doing it.

In Class III and IV basic shapes like squares, rectangles, hexagons, triangles, circles etc were used to examine which of those can tile and which do not tile to make floor patterns. Children must now be able to modify basic shapes to create different tiling shapes. In the exercise above they may create new shapes out of a square that do not tile even though their area remains the same as that of the square from which they are made.

4 Parts and Wholes

Our Flag

You must have seen the flag of our country. Do you know how to draw the flag?

Draw a rectangle of length 9 cm and width 6 cm. Divide it into three equal parts and complete the flag.

The top one-third of our flag is saffron (or orange). What is the colour of the middle one-third of the flag? Where will you draw the Ashoka chakra?

How much of the flag will you colour green?

Is the white colour now less than $\frac{1}{3}$ of the flag? Why?

Now look at this flag. How much of it is black? _____

The green part of the flag can be written as _____

Is red less than one-third of the flag? Why?

The flag of Afghanistan

This is the flag of Myanmar, our neighbour.

Is blue more than one-fourth of the flag or less ?

Guess how much of the flag is red. Is it more than $\frac{1}{2}$? Is it more than three-fourths?

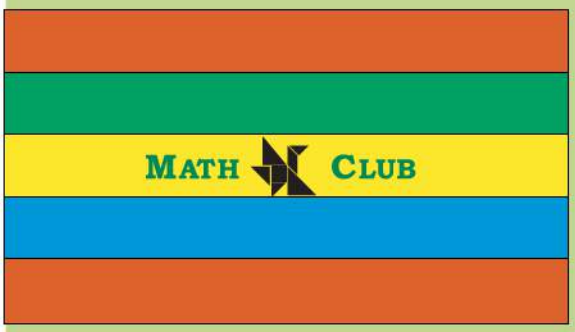
Because of the blue chakra in the white part of the Indian flag, the white colour is a little less than 1/3. There can be some discussion on this point.

Find out

Collect as many flags as you can.

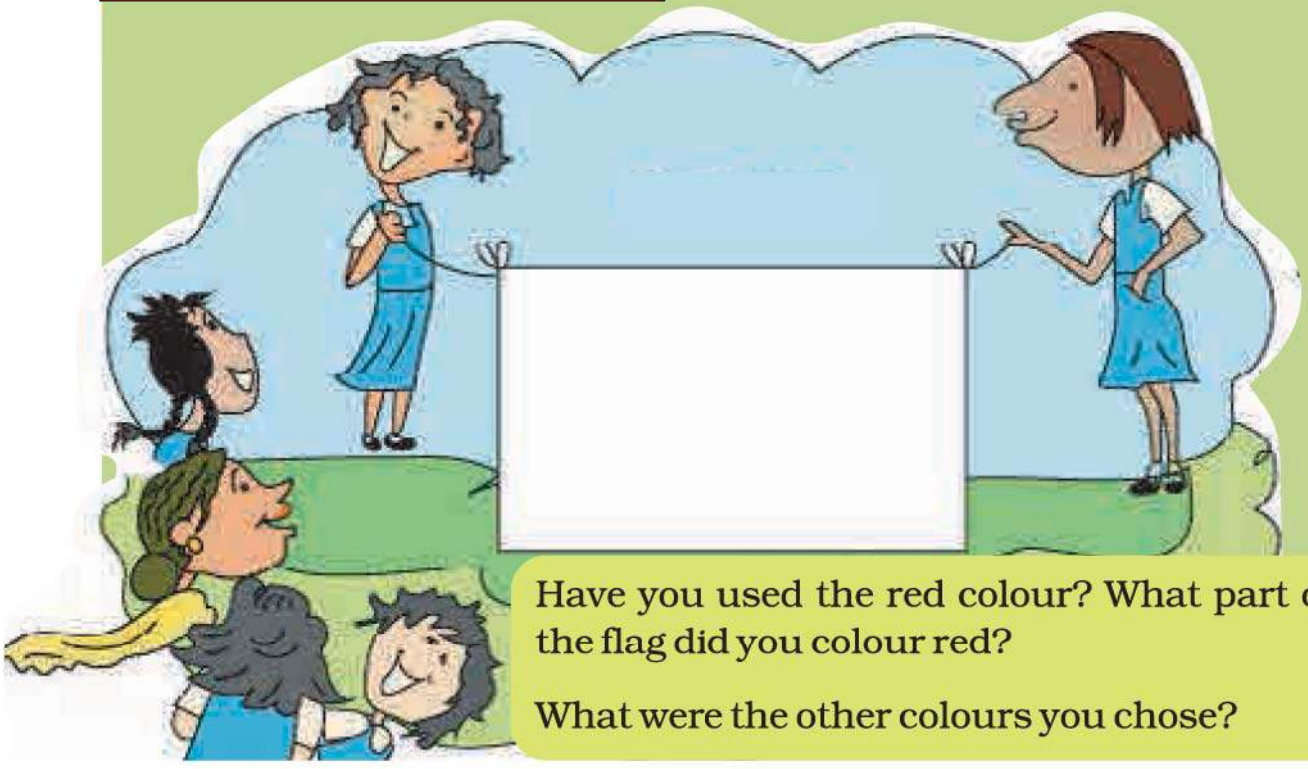
How many flags have three colours? Are all the coloured parts equal in these flags?

This is the flag of the Math Club in a school in Kerala. What part of the flag is coloured red? What part is green?



See this black logo. Draw it.

Is there a Math Club in your school? If not, ask your teacher how to set it up. Design a flag for your Math Club. Draw it here.



Have you used the red colour? What part of the flag did you colour red?

What were the other colours you chose?

Math Club can be set up in the school in which interesting activities can be taken up like making puzzles, shapes with tangrams, maps of buildings, looking for different geometrical shapes and angles in the environment, calculating area and perimeter of a school ground, etc.

Magic Top

Let us make a magic top.

Take a cardboard piece.

Draw a circle of radius 3 cm and cut it out.

Divide the circle into 8 equal parts. Now each part is $\frac{1}{8}$ of the circle.

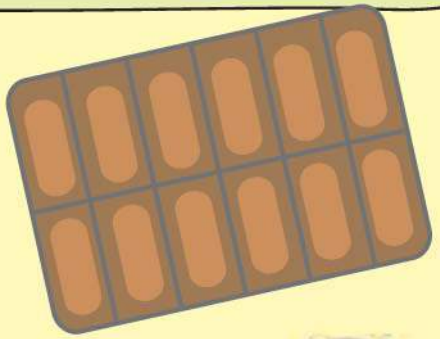
Colour $\frac{2}{8}$ red, $\frac{1}{8}$ orange, $\frac{1}{8}$ yellow etc. as shown here. Push a matchstick through the centre of the circle .

Your magic top is ready. Spin it fast!

What do you see? Can you see all the colours? Write what you see in your notebook.

Practice time

A) Chocolate bar



Manju had a chocolate. She gave one-fourth of it to Raji, one-third to Sugatha and one-sixth to Sheela. She ate the remaining part. How many pieces of chocolate did each get? Write here.

Raji

Sugatha

Sheela

Manju

What part of the chocolate did Manju eat?

B) Colour the hats

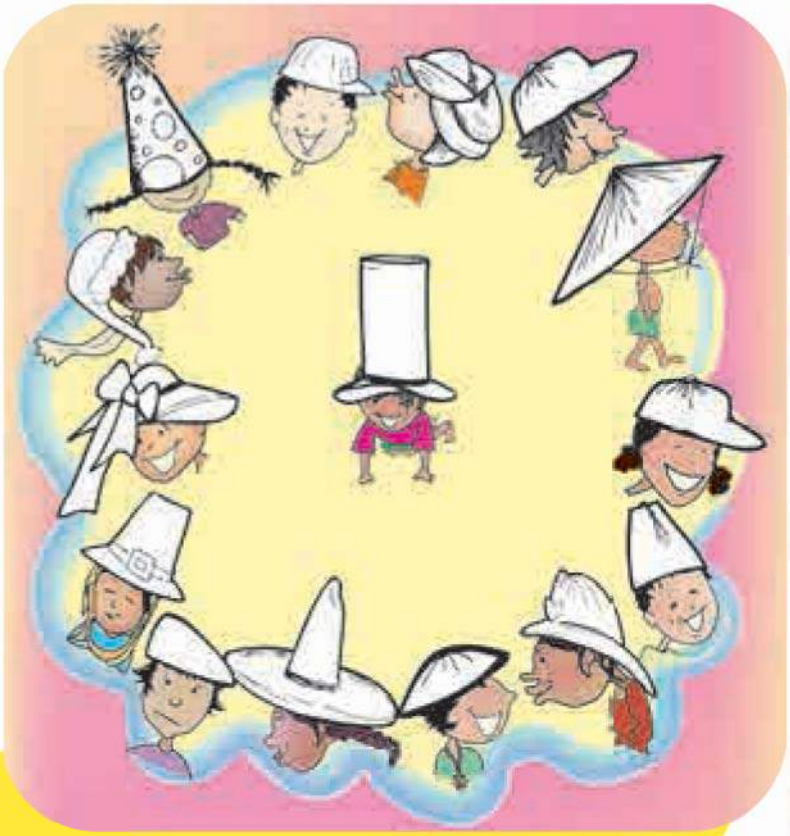
Colour $\frac{1}{3}$ of the hats red.

Colour three-fifth hats blue.

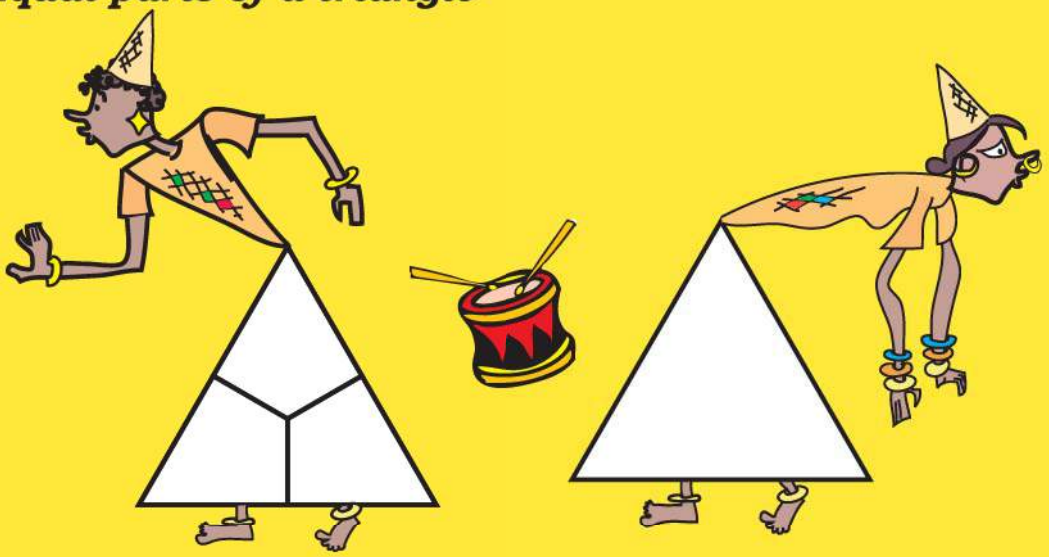
How many hats did you colour red?

How many hats did you colour blue?

What part of the hats are not coloured?



C) Equal parts of a triangle

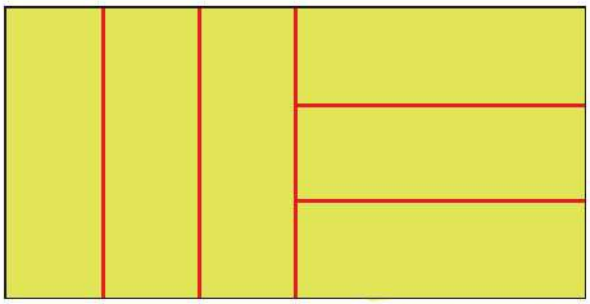


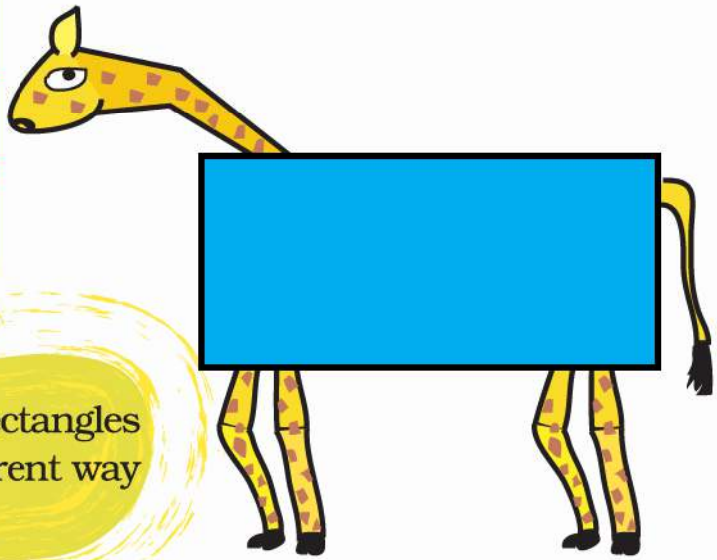
The white triangle is divided into three equal parts. Fill each one-third part with a different colour. Can you show that these parts are equal? Think how.

Now try to make three equal parts of this triangle in a different way. Colour each one-third with a different colour.

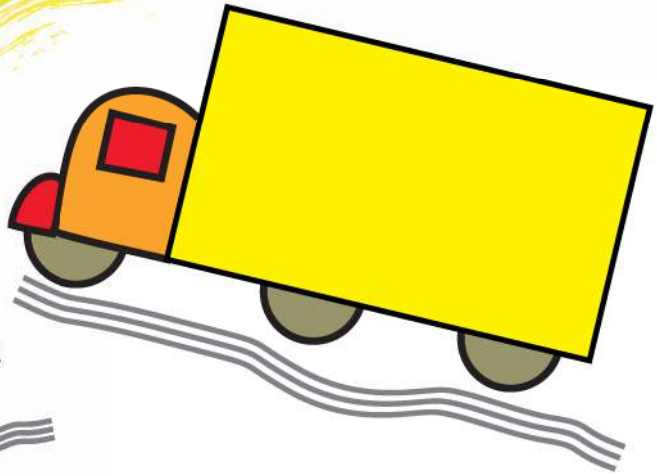
D) *Six parts of a rectangle*

Rani has divided a green rectangle into six equal parts like this.





❋ Now you divide each of these rectangles into six equal parts. Use a different way for each of the three rectangles.



Discuss

❋ How will you check that each part is really one-sixth of that rectangle?

❋ The green rectangle is bigger than the blue one. Can we say that $\frac{1}{6}$ of the green rectangle is bigger than $\frac{1}{6}$ of the blue rectangle?

Greedy Gatekeepers

Remember Birbal, the clever minister of King Akbar? (Math-Magic Class IV, page 14) Do you know how he became a minister?

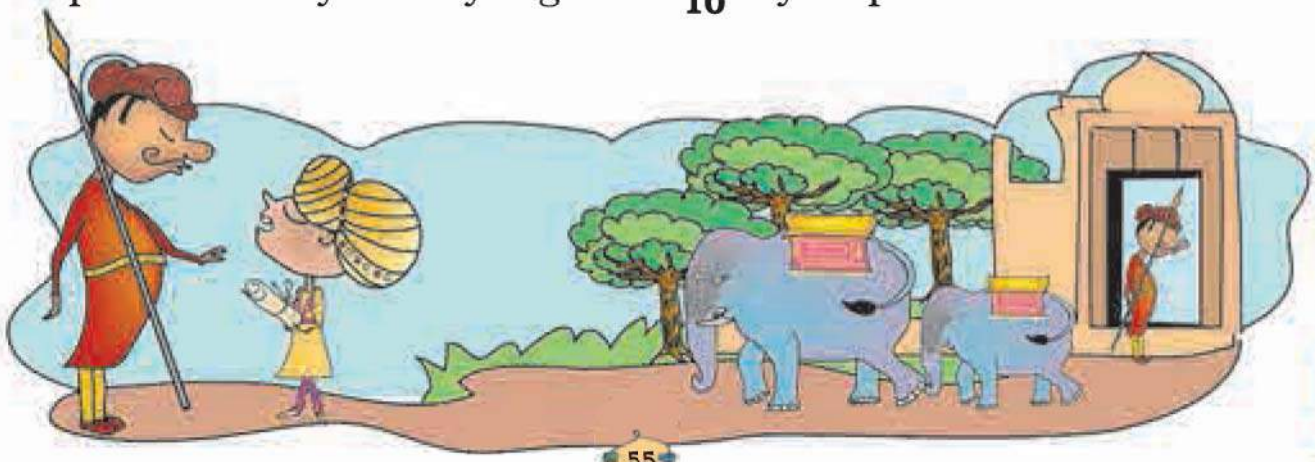
Birbal was then a young boy living in a village. He was very clever and could write poetry.

He thought he would try his luck in the King's court. So he took some of his poems and set off for the city.

When he reached the outer gate of the palace, he was stopped by the gatekeeper. "Hey! Stop there! Where are you going?", shouted the gatekeeper.

"I am a poet. I want to see King Akbar and show my poems to him", replied the poet.

"Oh, you are a poet! The king is kind, he will surely give you a prize. I will let you in if you give me $\frac{1}{10}$ of your prize".



Young Birbal agreed since he had no other way.

When he went in, the gatekeeper calculated "If he gets 100 gold coins I will get _____ gold coins".

The poet came to a second gatekeeper.

This gatekeeper also said, "I will let you in if you give me **two-fifth** of your prize". The poet agreed.

The gatekeeper happily calculated, "The poet will get at least 100 gold coins so I will get _____ gold coins!"

The poet reached the last gate. The gatekeeper said, "I will allow you to see the king only if you give me **half** of the prize that you get". The poet had no other way. He agreed and went inside.

The gatekeeper thought, "Today is a great day. If he gets 100 gold coins I will get _____ gold coins. But if he gets 1000 coins — wow! I will get _____".

The king was very happy with the poems and said, "Your work is very good. You can ask anything as your prize".

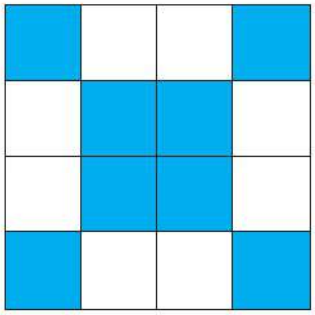
"My Lord, I want 100 slaps". "What! 100 slaps? _____". The king was shocked —

* What happened after that? Complete the story. What part of the prize did the poet get?

Patterns in Parts

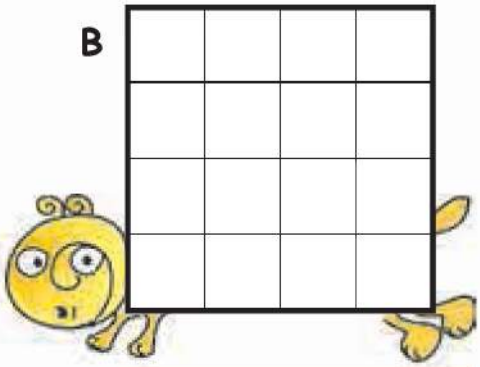
1) Make different patterns by colouring some squares in the grids B, C, D. What part of the grid did you colour? What part of the grid remained white? Write.

A

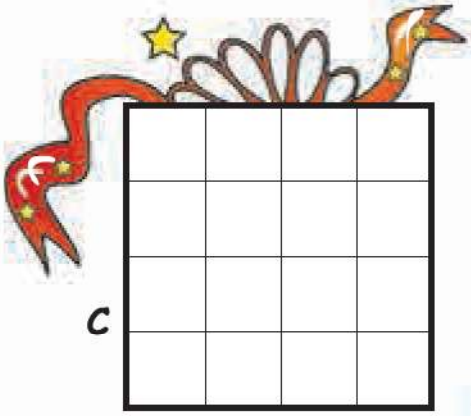


$\frac{8}{16}$ blue, $\frac{8}{16}$ white

B



C



D

2) Look at grid A again. Is the grid coloured —

a) $\frac{1}{2}$ blue, $\frac{1}{2}$ white?

b) $\frac{2}{4}$ blue , $\frac{2}{4}$ white?

c) $\frac{3}{8}$ blue, $\frac{5}{8}$ white?

d) $\frac{4}{8}$ blue, $\frac{4}{8}$ white?

Mark (×) on the wrong answer.

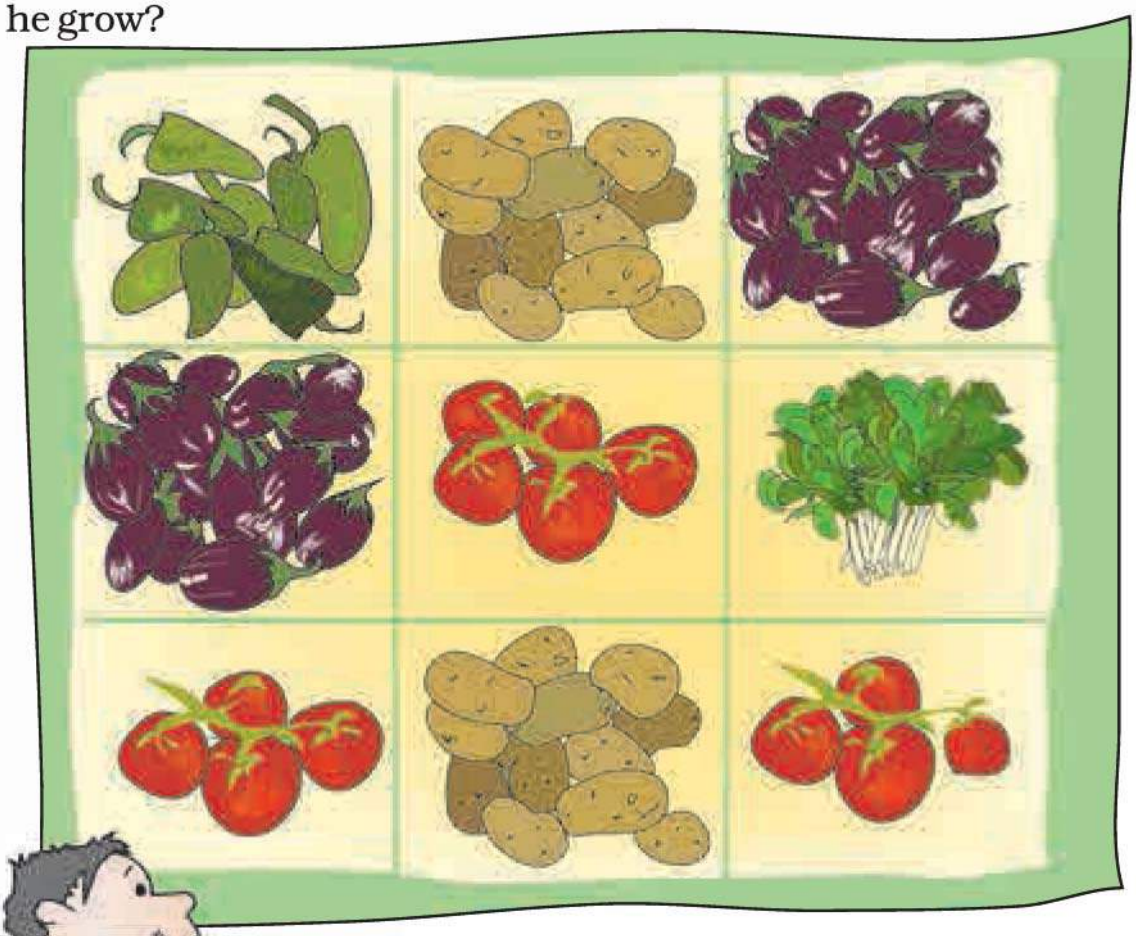
3) Draw grids of 16 squares and make patterns with

a) $\frac{2}{8}$ red, $\frac{1}{2}$ yellow, $\frac{1}{4}$ green

b) $\frac{3}{16}$ blue, $\frac{5}{16}$ red, $\frac{1}{2}$ yellow

Ramu's Vegetable Field

Ramu's vegetable field has 9 equal parts. What vegetables does he grow?



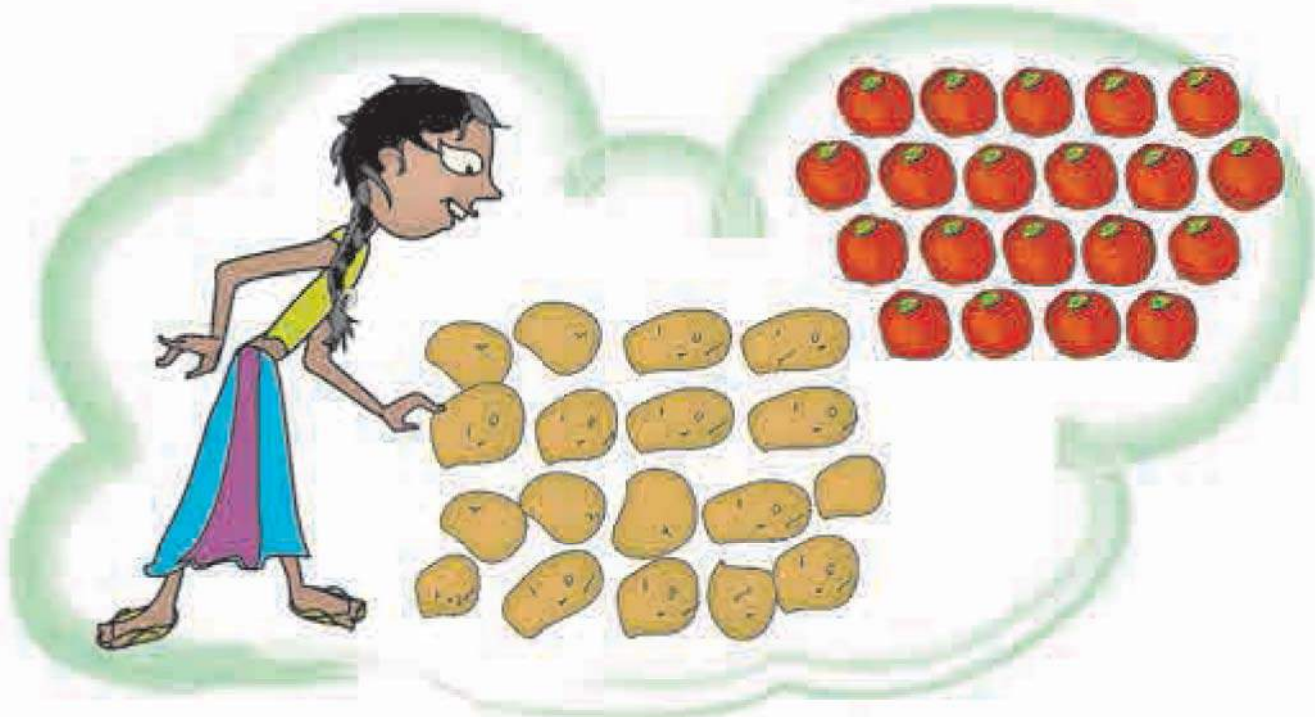
1) Which vegetable grows in the biggest part of his field? What part?

2) On what part of the field does he grow potatoes?

3) What part of the field is used to grow spinach? What part is used for brinjals?

4) Now you write some questions by looking at this picture.

❋ Ramu wanted to give these vegetables to his friends. He gave Aboobacker one-fifth of these tomatoes and $\frac{1}{3}$ of the potatoes. Srija got $\frac{2}{5}$ of the tomatoes and $\frac{3}{6}$ of the potatoes. Nancy got the rest of these vegetables. Circle Aboobacker's share in blue. Circle Srija's share in yellow.



❋ How many potatoes and tomatoes did Nancy get?

1) *Divide the white area in square A into two equal parts.*

Got the answer? Was that easy?

Now do the second question.

2) *Divide the white area in square B into three equal parts!*

That too is easy, isn't it?

Now see the third question.

3) *Divide the white area in square C into four equal parts!!*

Is it a bit difficult? Don't worry, take your time.

Only if you have given up, look for the answer.

Here comes the last question .

4) *Divide the white area in square D into seven equal parts!!!!*

The world record for this is 7 seconds. But you can take minutes!

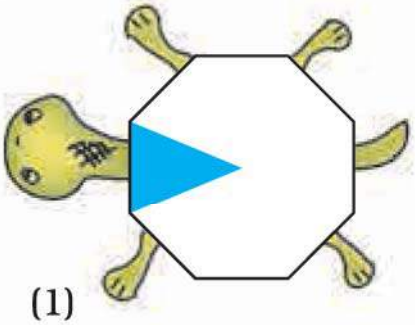
Tired of thinking? Look for the answer on page 68.

So was that difficult??

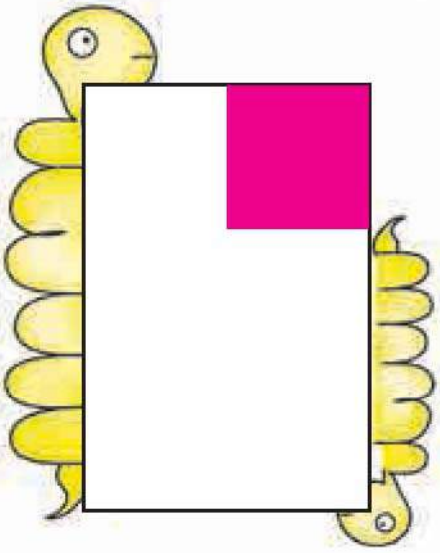
Guess and Check

A) What part of each shape is coloured?

First guess the answer, then check.



(1)



(2)

The colouring circle game and many more such activities should be done in class. The follow-up discussions for all these activities will play a major role in developing children's conceptual understanding about fractions.

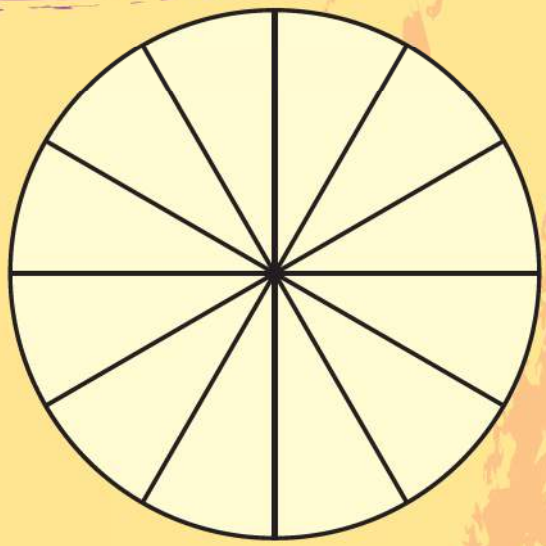
Game: Who Colours the Circle First?

This game is to be played in groups of 4. Each player has to make a circle as shown. Each one has to make 15 tokens on slips of paper. Write $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{12}$ $\frac{2}{12}$ $\frac{3}{12}$ $\frac{4}{12}$ ..... $\frac{11}{12}$ to make your tokens.

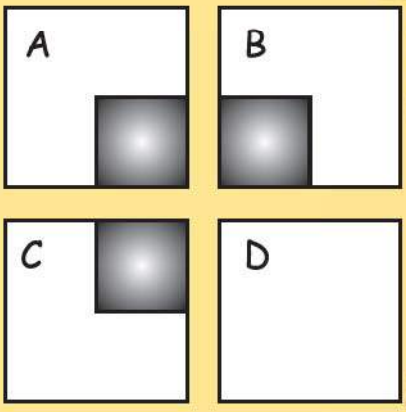
Shuffle the tokens and make a pile in the middle of the group. Now you are ready to start the game.

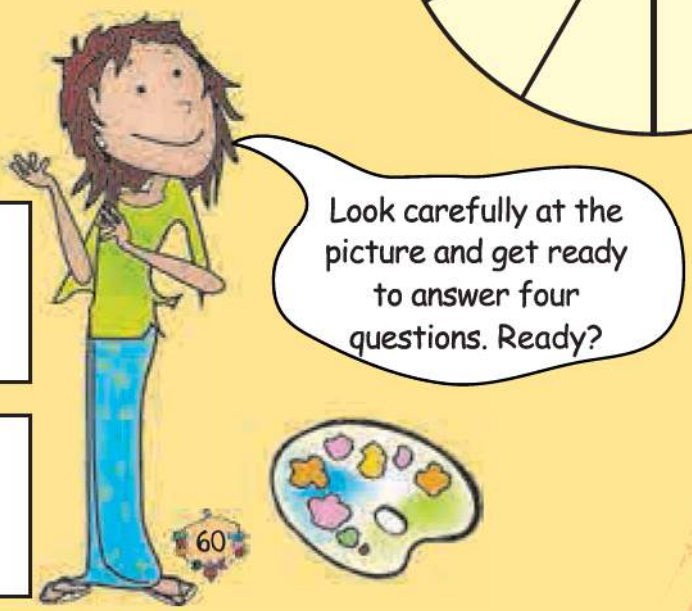
The first player takes a token from the pile, colours that part of the picture, and puts the token under the pile. The next player does the same, and so on. The winner is the one who first colours the circle completely.

- Who won the game?
- What are the winner's tokens?
- Write the tokens you got.
- What part of the circle did you colour?

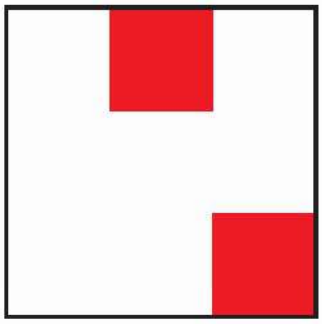


The Card Puzzle

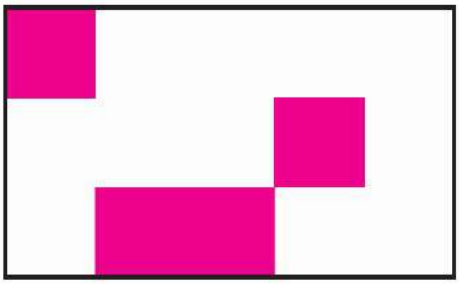




(3)



(4)



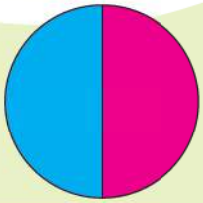
B) Do you remember this picture? Look at the small triangle. What part of the square is it? How will you find this out?

Divide the big triangles and other shapes into small triangles (like the red one). How many small triangles are there altogether?

Coloured Parts

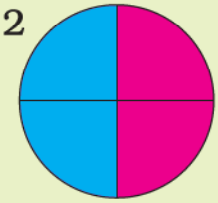
Complete these

1



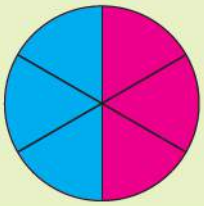
This circle is divided into two equal parts. Out of _____ equal parts one part is coloured blue.

2



Here the circle is divided into _____ equal parts. Out of _____ equal parts, _____ parts are coloured blue.

3

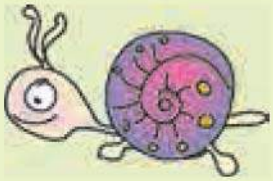


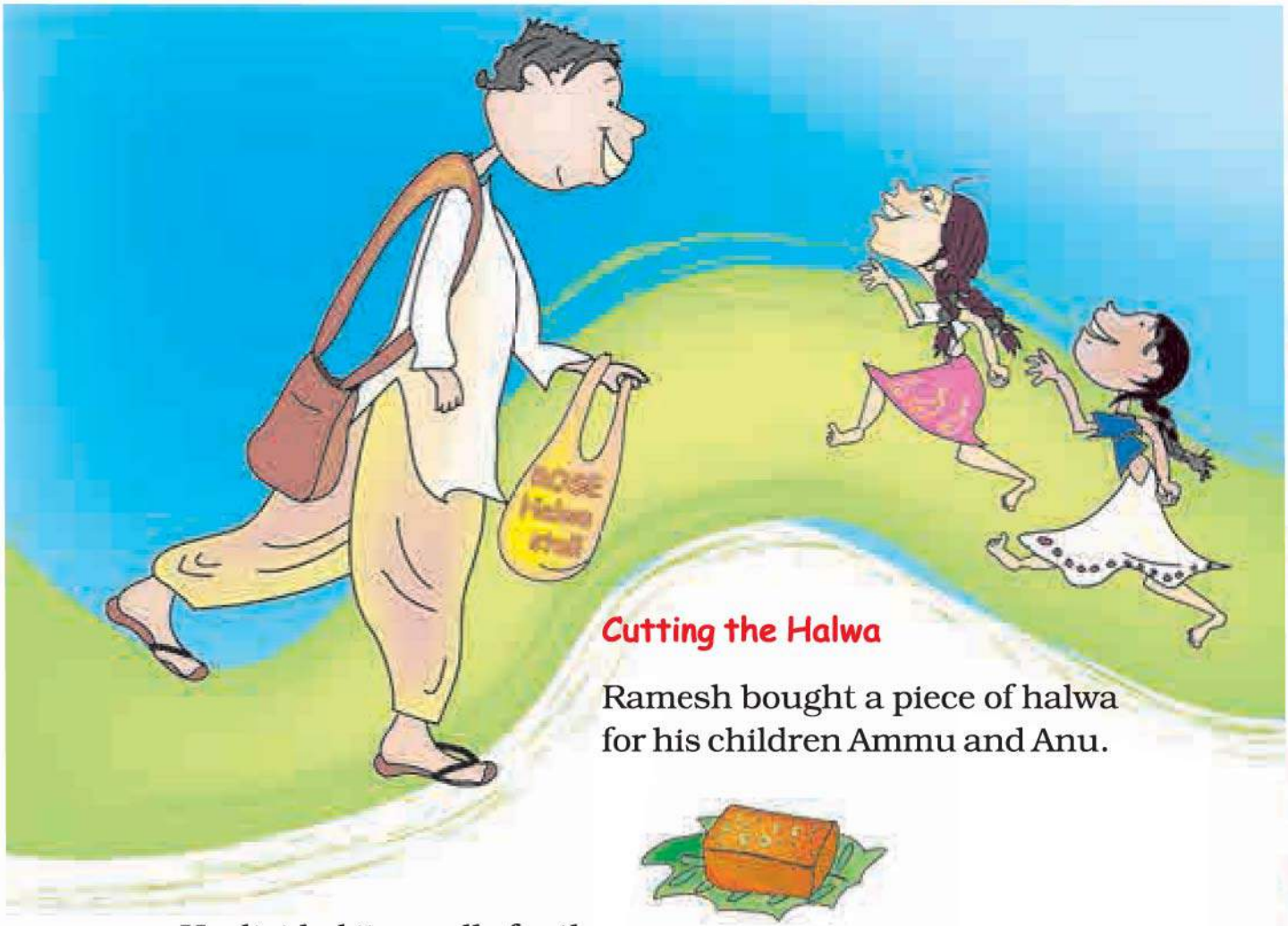
Here the circle is .....
.....
.....
.....

4

Here the circle is .....
.....
.....
.....

So we can say that $\frac{1}{2} = \frac{2}{....} = \frac{....}{6} = \frac{....}{8}$





Cutting the Halwa

Ramesh bought a piece of halwa for his children Ammu and Anu.

He divided it equally for them.

❋ Each will get _____ part of halwa.

"This piece is too big. We can't eat it", they said.

So he divided the pieces into half again. Now how many pieces will Ammu get? _____

❋ What part of the halwa is it? _____

"Make it even smaller, Dad" they asked.

So he again cut the halwa into smaller pieces.

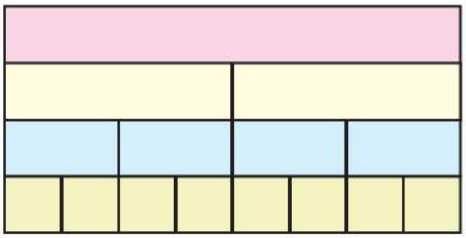
"Ok, thank you, Dad."

* Now how many pieces will each get?
* What part of the halwa is each piece now?
* If Ramesh had cut the halwa into 6 equal parts how many pieces would each have got? Look at your answers for questions 1 to 4 and write —

$$\frac{1}{2} = \text{—} = \text{—} = \text{—} = \text{—} = \text{—}$$

Parts of the Strip

Look at the picture. Write what part of the strip is each green piece. Write the part for a piece of each colour.



How many one-fourths will make a half?

How many $\frac{1}{8}$ will make $\frac{1}{4}$?

How many $\frac{1}{8}$ are in $\frac{1}{2}$?

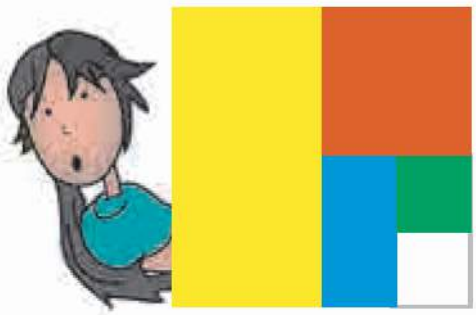
Now ask your friends some questions on the same picture.

Patterns

Look at this square.

What part is coloured blue?

What part is green?



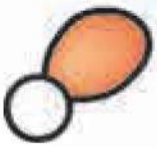
Puzzle: Is it Equal?

Ammini says half of half and one-third of three-quarters are equal. Do you agree? How will you show this?

The use of concrete things (such as matchsticks, bottle caps etc.) will help children make sense of equivalent fractions such as $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$. Children must make their own fraction strips using papers of different sizes. Encourage them to compare the strips by colouring them into different fractions.

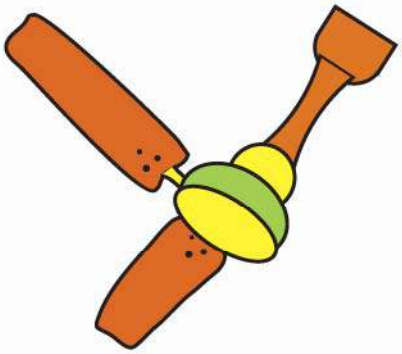
From a Part to the Whole

1) This show $\frac{1}{5}$ petals of a flower. Complete the flower by drawing the other petals.



2) The picture shows one-third of the blades of a fan. Complete the picture by drawing the other blades.

3) Half of the blades of another fan are shown here. Complete the picture by drawing the other half. How many blades have you drawn?



Rupees and Paise

How many will make one rupee ?

Is 50 paise half of one rupee ?

How many will make ten rupees ?

One rupee is _____ part of ten rupees.

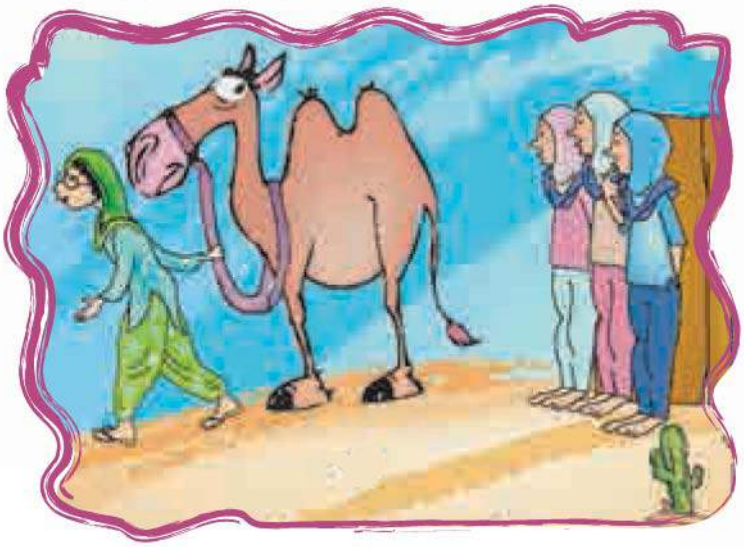
How many will make ten rupees ?

Two rupees is _____ part of ten rupees.

How many will make ten rupees ?

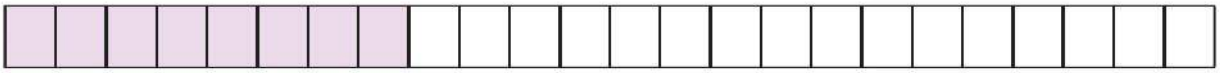
Five rupees is _____ part of ten rupees.

"The one remaining is mine", said the aunt and took her camel away!



❋ How did this happen? Discuss.

Arun's Time Table



Sleeping: One third of a day

Use different colours to show

Playing: One eighth of a day

Studying: $\frac{1}{4}$ of a day

How many hours does Arun take for

Sleeping? ☐ hours

Studying? ☐ hours

Playing? ☐ hours

What part of the day does he use for other activities?

An Old Woman's Will

Once there lived an old woman. She lived with her three daughters. She was quite rich and had 19 camels. One day she fell ill. The daughters called the doctor. The doctor tried his best but could not save the woman. After her death, the daughters read what she had written in her will.

My eldest daughter will get $\frac{1}{2}$ of my camels
My second daughter will get $\frac{1}{4}$ of my camels
My third daughter will get $\frac{1}{5}$ of my camels

The daughters were really puzzled. "How can I get $\frac{1}{2}$ of the 19 camels?" asked the eldest daughter.

"Half of 19 is nine and a half. But we can't cut the camel!" The second daughter said.

"That is right. But what will we do now?" asked the third daughter".

Just then they saw their aunt coming. The daughters told her their problem.

"Show me the will. I have an idea. You take my camel. So you have 20 camels. Now can you divide them as your mother wanted?" the aunt said.

"You want half of the camels, don't you? Take 10 camels" she said to the eldest daughter.

"Take your share", the aunt told the second daughter. She took one-fourth of the camels and got _____ camels.

"You can take one-fifth of the camels", the aunt told the third daughter. She got _____ camels. The daughters were very happy and counted their camels 10+ _____ + _____ =19.

School Magazine

A school has decided to bring out a magazine every quarter of the year. How many magazines will they have in a year? If they want to print it at the end of each quarter of a year, which are the months for printing? Mark the number for those months.

1	2	3	4	5	6	7	8	9	10	11	12

Sleeping Beauty!

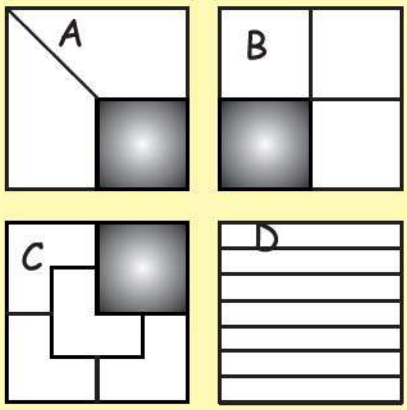
Have you heard of Kumbhakarna, the brother of Ravana? He is famous for sleeping for half a year.

Most people sleep about 8 hours a day. Then what part of a day is it? _____

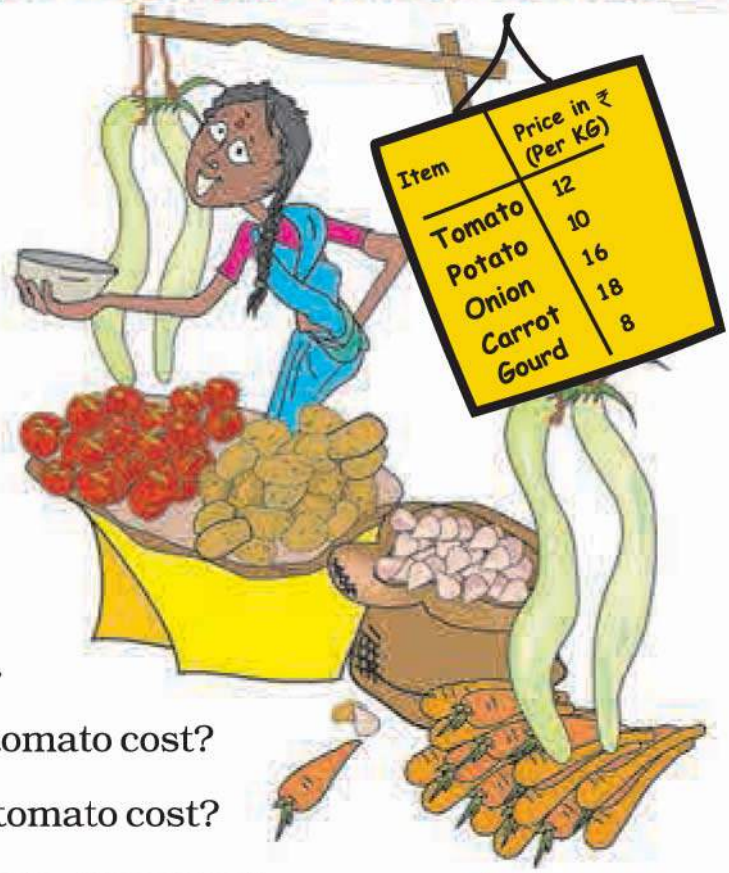
So what part of a year do they sleep? A person 60 years old must have slept _____ years!!!

Answer: Card Puzzle (page 61)

Did you get stuck on square D? Actually that was the easiest!!



Children should be encouraged to think of what part of a day they spend in different activities. They should be sensitive about those children who have to spend a large part of the day working or helping at home. They should also be encouraged to think about parts of a year.



Keerti's Shopping List

Look at the yellow price list.

a) How much does 2 kg of tomato cost?

b) How much does $\frac{1}{2}$ kg of tomato cost?

c) Kiran wants $2\frac{1}{2}$ kg of tomato. How much will it cost?

d) How much does $3\frac{1}{2}$ kg potato cost?

e) What is the price of $1\frac{1}{4}$ kg of carrot?

f) He bought a gourd of weight $4\frac{3}{4}$ kg and it costs _____

g) Look at the shopping list in Keerti's hand. How much will she have to pay to buy all of these?

h) Make a bill of your own for vegetables you want to buy. Find the total money you will have to pay.

Item	*Price in ₹ (per kg)*	*Amount*
	Total	

Children should be encouraged to bring samples of real price lists and bills to discuss in the classroom.

Practice time

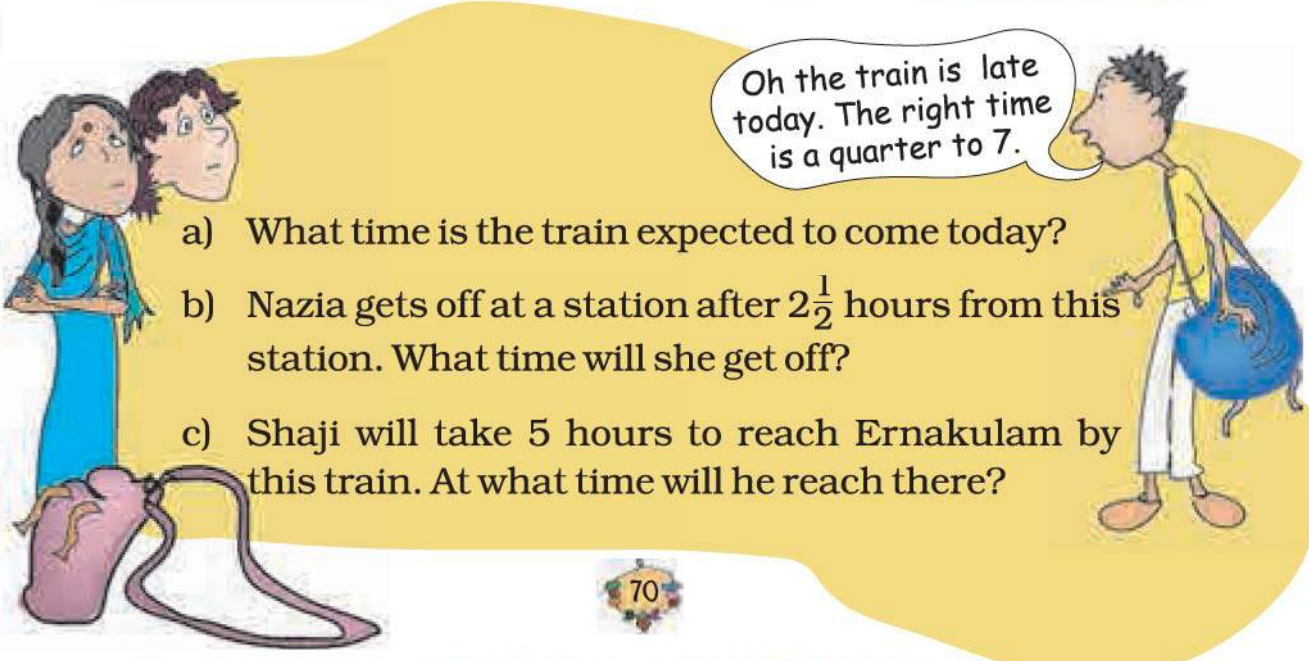
1) Raheem's journey

Raheem has to travel $1\frac{1}{4}$ km to reach school. What distance does he travel to go to school and come back home ?

2) What coins?

Latha bought a pencil and a pen for seven and a half rupees. She gave ₹ 10/–. The shopkeeper gave back the money in coins of half and one rupee. What are the coins she got ?

3) At the railway station



a) What time is the train expected to come today?

b) Nazia gets off at a station after $2\frac{1}{2}$ hours from this station. What time will she get off?

c) Shaji will take 5 hours to reach Ernakulam by this train. At what time will he reach there?

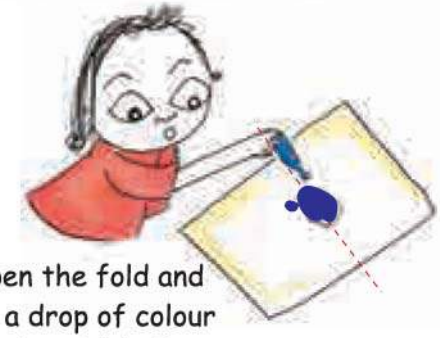
5 Does it Look the Same?

Let's Make Patterns From a Drop of Colour

Make your pattern

Take a sheet of paper

Fold it into half



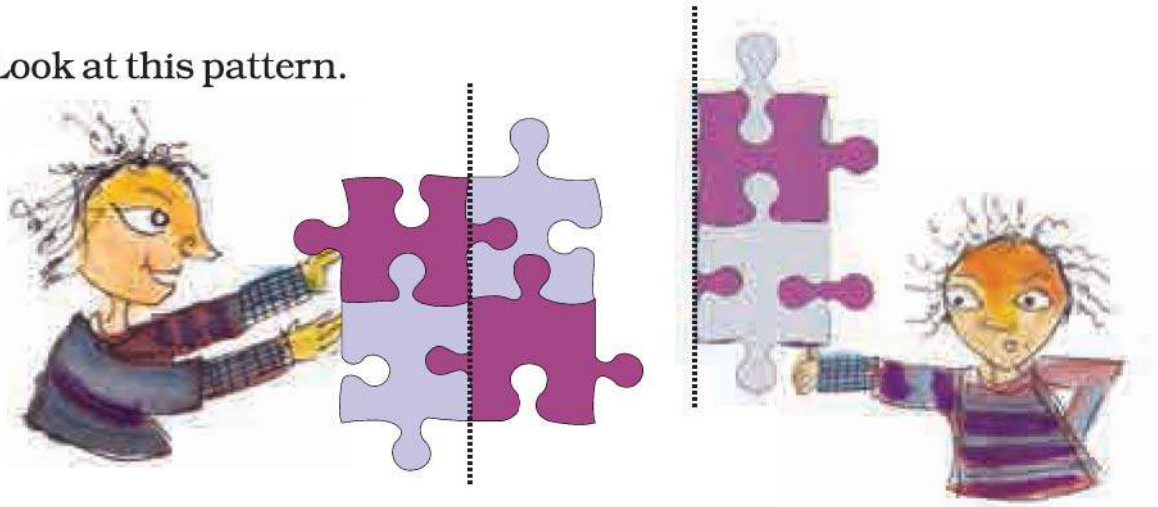
Open the fold and put a drop of colour on the middle line

Fold it twice and press it to spread the colour

Open it and see a beautiful pattern

Can you cut this pattern in such a way that you get two similar mirror halves? In how many ways can you do it?

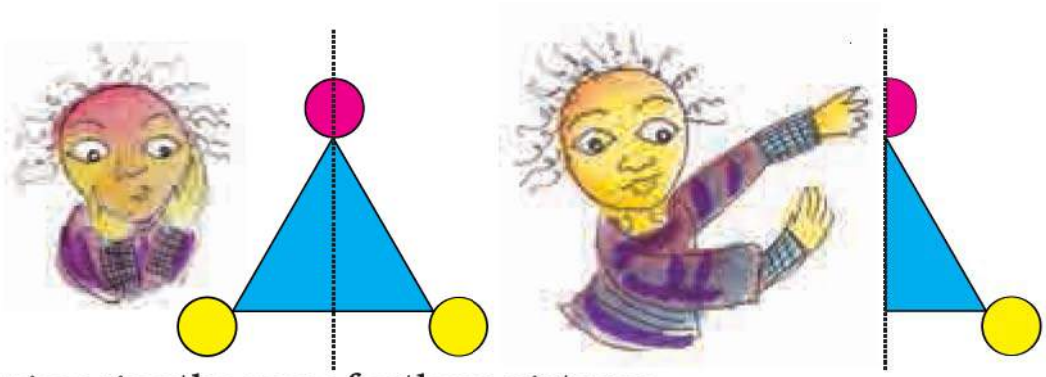
Look at this pattern.



The dotted line divides the shape into two halves. But if you fold it along the dotted line, the left half does not cover the right half completely. So the two halves are not mirror halves.

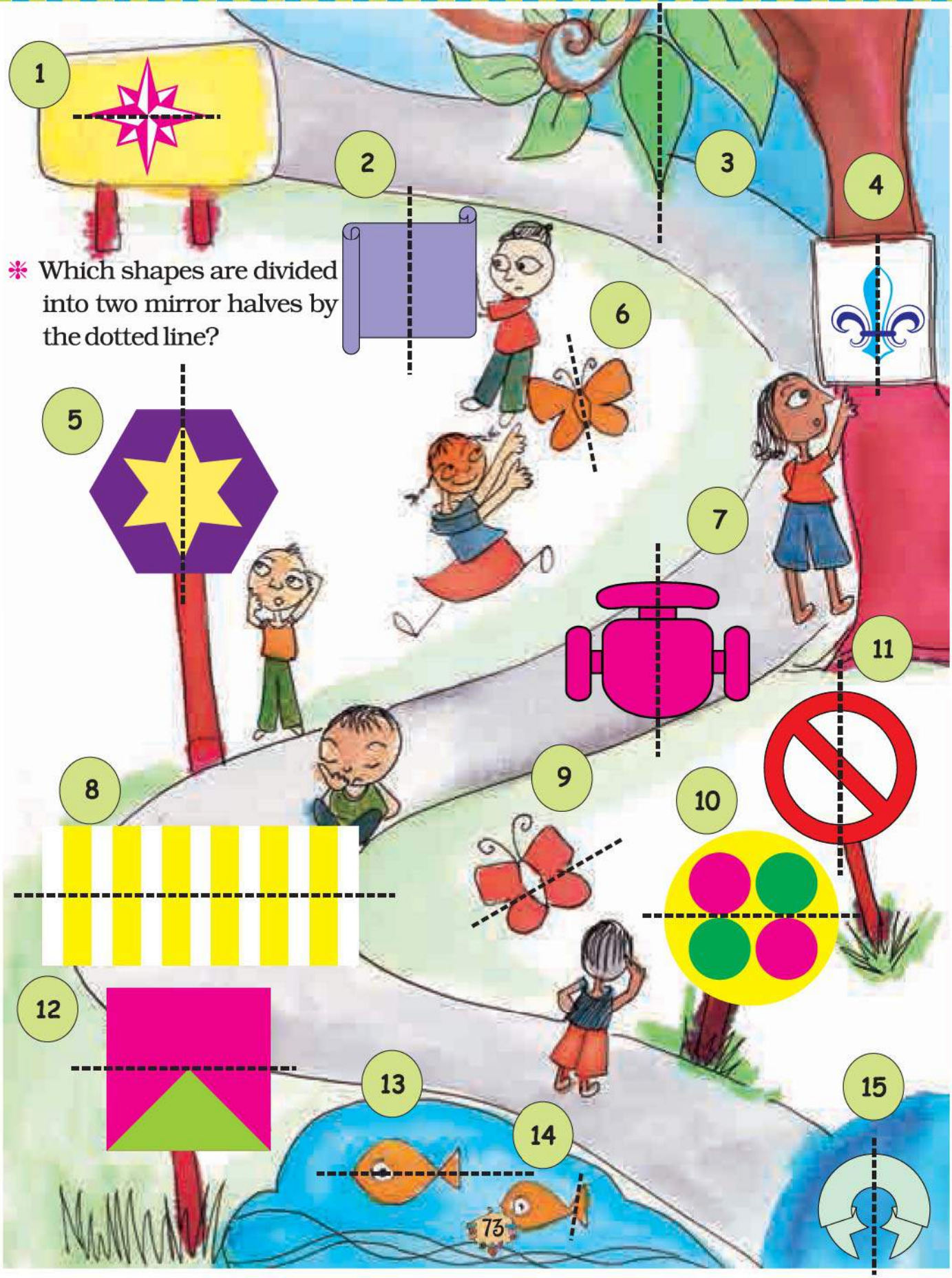
Now look at another shape.

If you fold it along the dotted line, one half will cover the other similar half completely. So the two here are mirror halves.



Now imagine the same for these pictures.

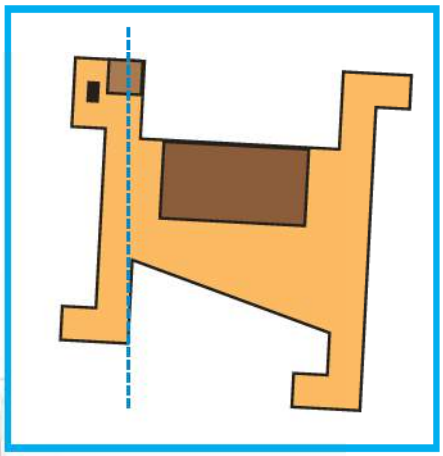
On the next page, children need to understand that even though the shape is symmetric, the colour scheme of the figure can make it asymmetric (e.g. in shapes 10 and 12). Encourage children to look for asymmetry based on the shape as well as the colour scheme.

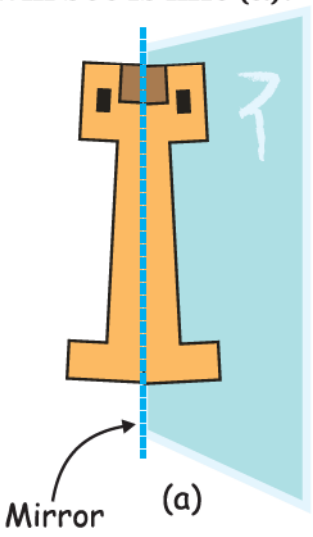


❋ Which shapes are divided into two mirror halves by the dotted line?

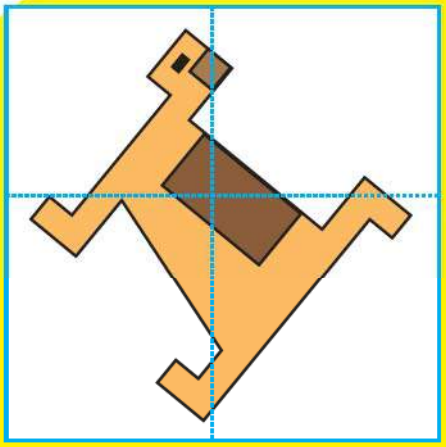
Mirror Games

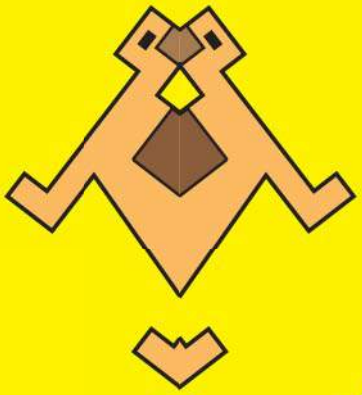
1. Here is a picture of a dog. You can place a mirror on the dotted line. Then the part of the dog to the right of the line will be hidden behind the mirror. What you will see is like (a).





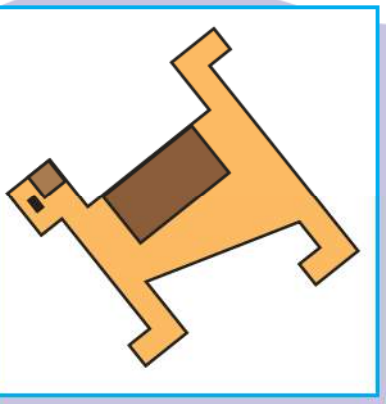
Look at the figure in the white box. On which of the dotted lines will you keep the mirror so that you get shape (b)? Also tell which part of the picture will be hidden when we keep the mirror on the dotted line.

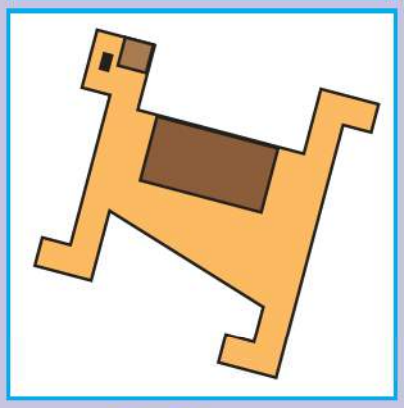


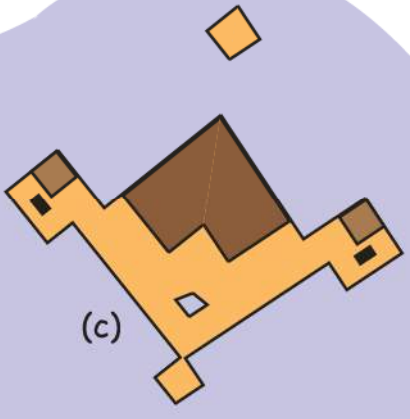


(b)

Now make a line on the white box to show where you will keep the mirror to get the picture next to it.



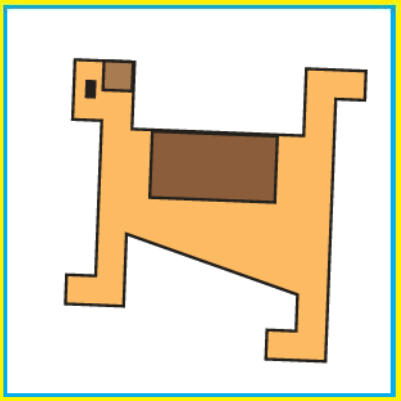


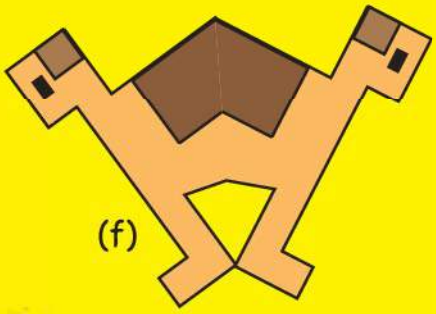


(c)

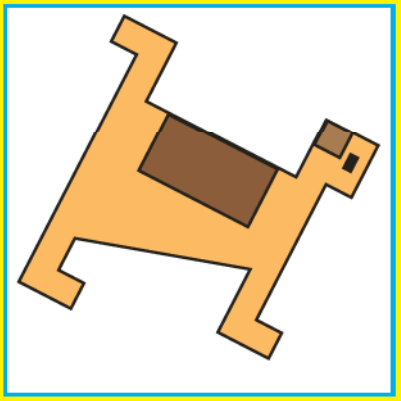
(d)

(e)

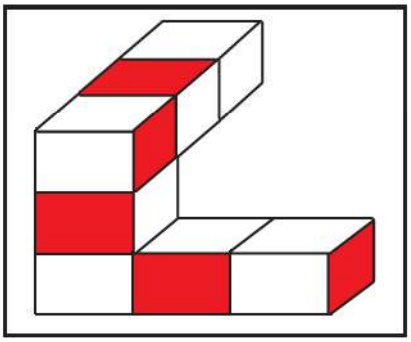




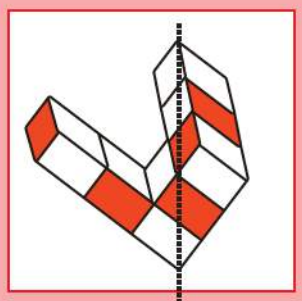
(f)

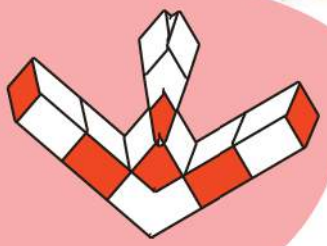


2. Venky has made a red and white shape. Make a line on the white box where you will keep a mirror to get that shape. Look at how the line is drawn in the first box to get the picture next to it.

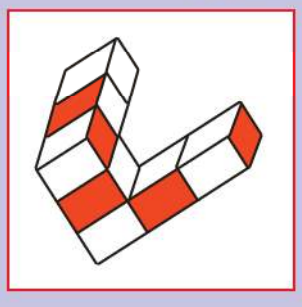


(a)

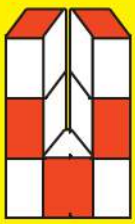


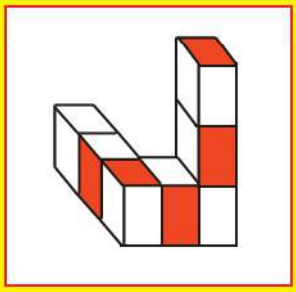


(b)

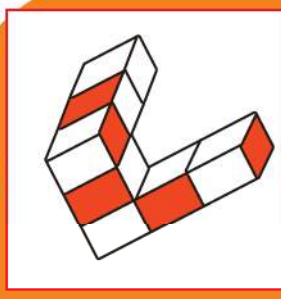


(c)

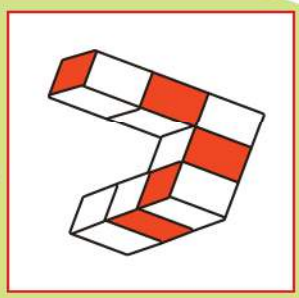




(d)



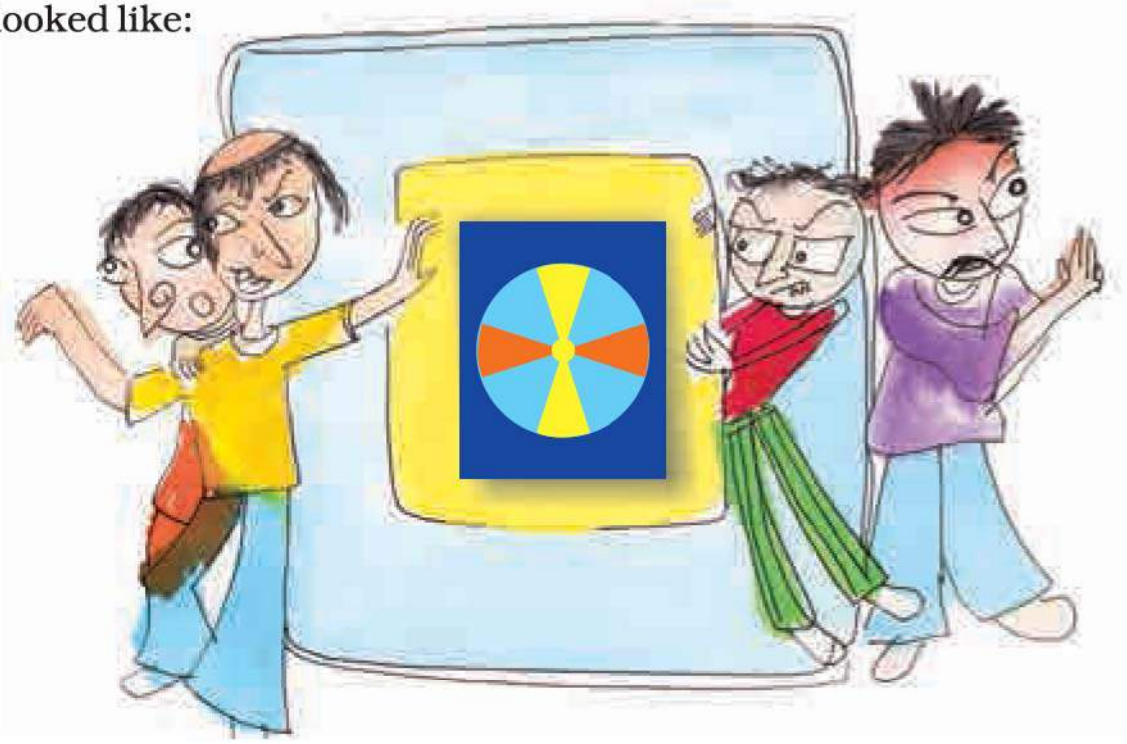
(e)



Encourage children to look at the final picture in each pair and guess where the line of symmetry should be made on the original shape in the white box.

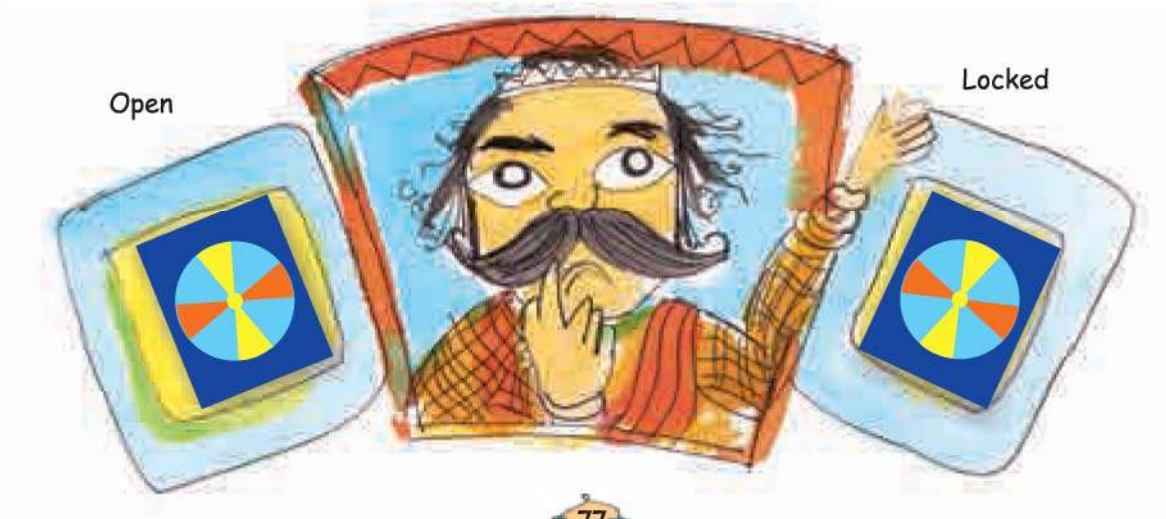
Half a Turn

Once there was a king. He was upset because thieves kept stealing costly jewels from his locker. Here is what the locker looked like:



The locker could be opened by giving its handle half a turn. Another half turn and the locker would be locked again.

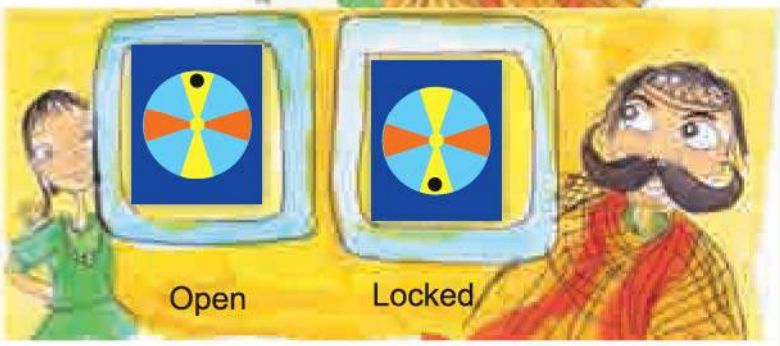
The king would often leave the locker open thinking it was locked. Can you guess the reason?



One day his clever daughter gave him an idea which he liked very much. Now he never got confused.

Can you guess what the idea was?

The king's daughter asked the king to put a dot on one of the yellow blades.

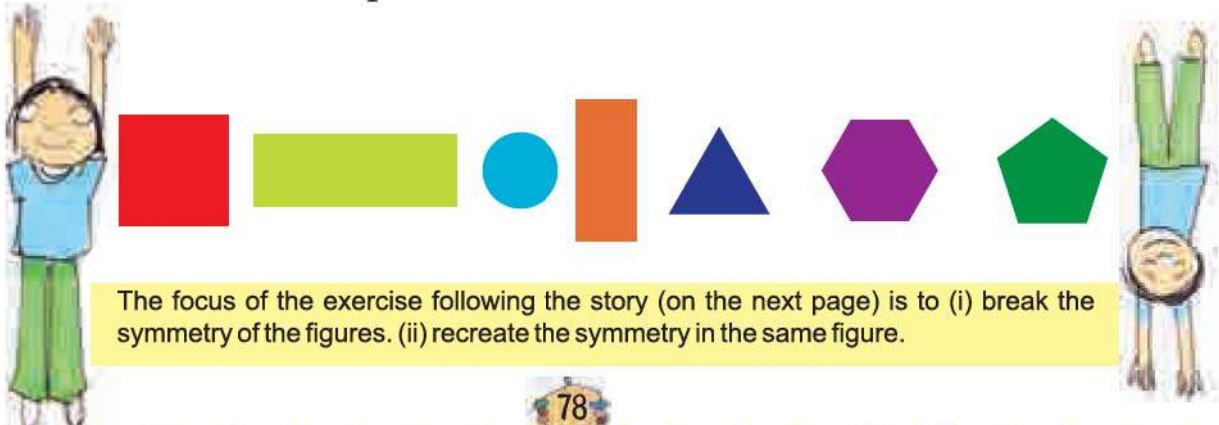


The king had many such lockers with different handles. Check if, on giving them half a turn, he can get confused with these too.

What will you do to solve the problem for each of these?

Same after $\frac{1}{2}$ turn?

Guess which of the shapes below would look the same after half a turn.



The focus of the exercise following the story (on the next page) is to (i) break the symmetry of the figures. (ii) recreate the symmetry in the same figure.

Do you find it difficult to tell? If yes, then there is a way to check your guess. Here's how you can do it.

Take any of the shapes. Trace its outline on a sheet of paper. Now keep the shape on its outline and give it a half turn. See if the shape fits its outline.

Practice time

1) Find out which letters in the English alphabet look the same after half a turn.

2) Which of these English words reads the same on half a turn?

ZOOM, MOW, SWIMS, SIS, NOON

3) Give half a turn to the numbers from 0 to 9. Find which of them still looks the same.

4) Think of all 2, 3 and 4 digit numbers which look the same on half a turn.

Example

2 digit numbers 11, _____, _____

3 digit numbers 101, 111, _____, _____, _____, _____, _____, _____

4 digit numbers 1001, 1111, _____, _____, _____, _____, _____

5) Which among the following pictures will look the same on half a turn?

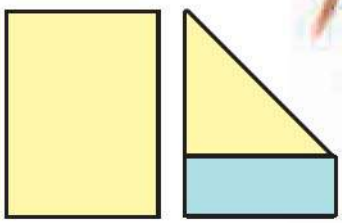
Activity Time

Have you ever seen a windmill? What is it used for?

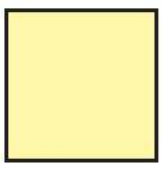
Let us make a toy windmill.

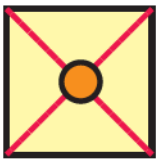
1. Take a sheet of paper.

2. Fold it as shown in the picture.

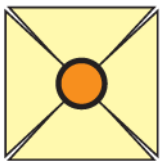


3. Cut out the blue part of the paper. Your sheet of paper will now look like a square.

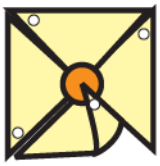




4. Fold it along the red lines and then open the fold. Draw a circle on the sheet as shown in the picture.

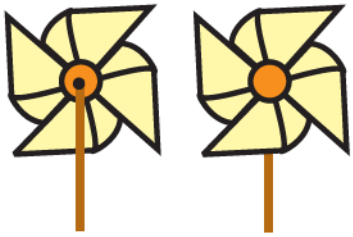


5. Cut along the red lines till you reach the circle. The paper will look like this.

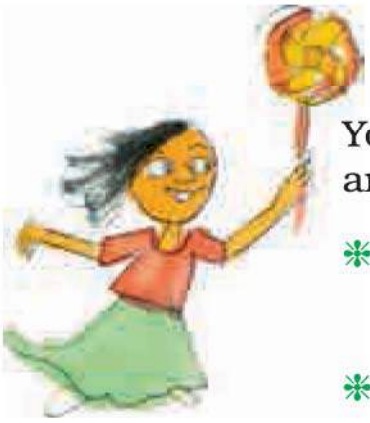


6. Take a pin and make holes on the four corners as shown in the picture.

7. Now fold the corners such that all the holes lie one on top of the other.



8. Pass the pin through the holes and fix it in the stick.

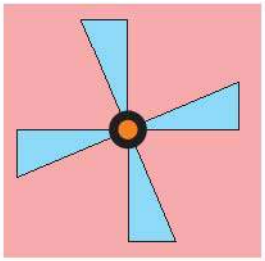


Your windmill is ready. Run with it and see how fast it moves.

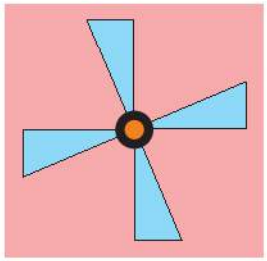
- Does your windmill look the same on $\frac{1}{4}$ of a turn?
- Does it look the same on half a turn? Discuss.

One-fourth Turn

Does the fan look the same on $\frac{1}{4}$ turn?

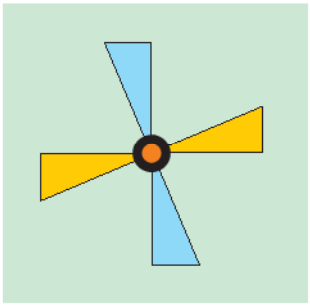


Before turning it



After $\frac{1}{4}$ turn

Will this fan also look the same after $\frac{1}{4}$ turn? Draw in the yellow box.



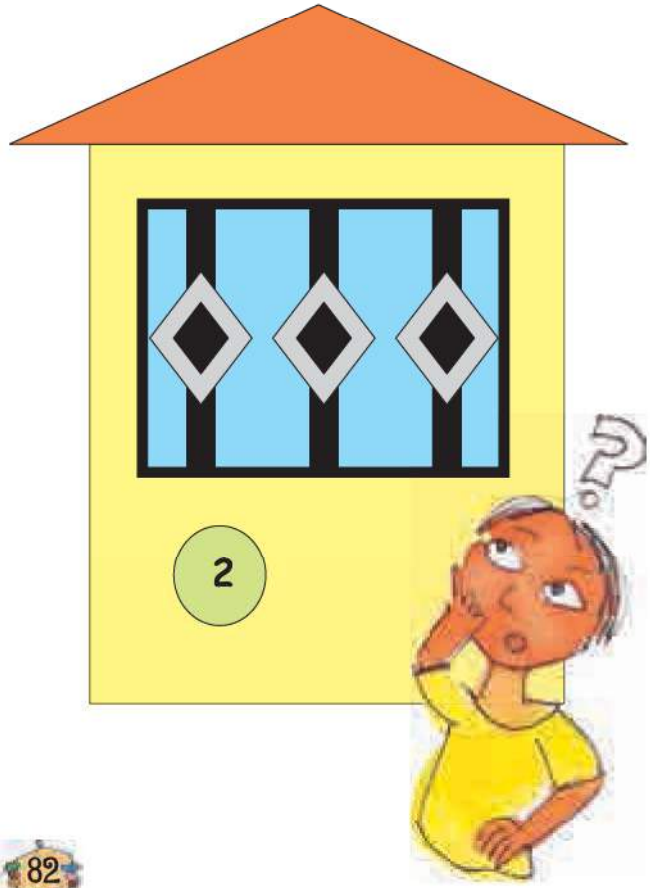
Before turning it

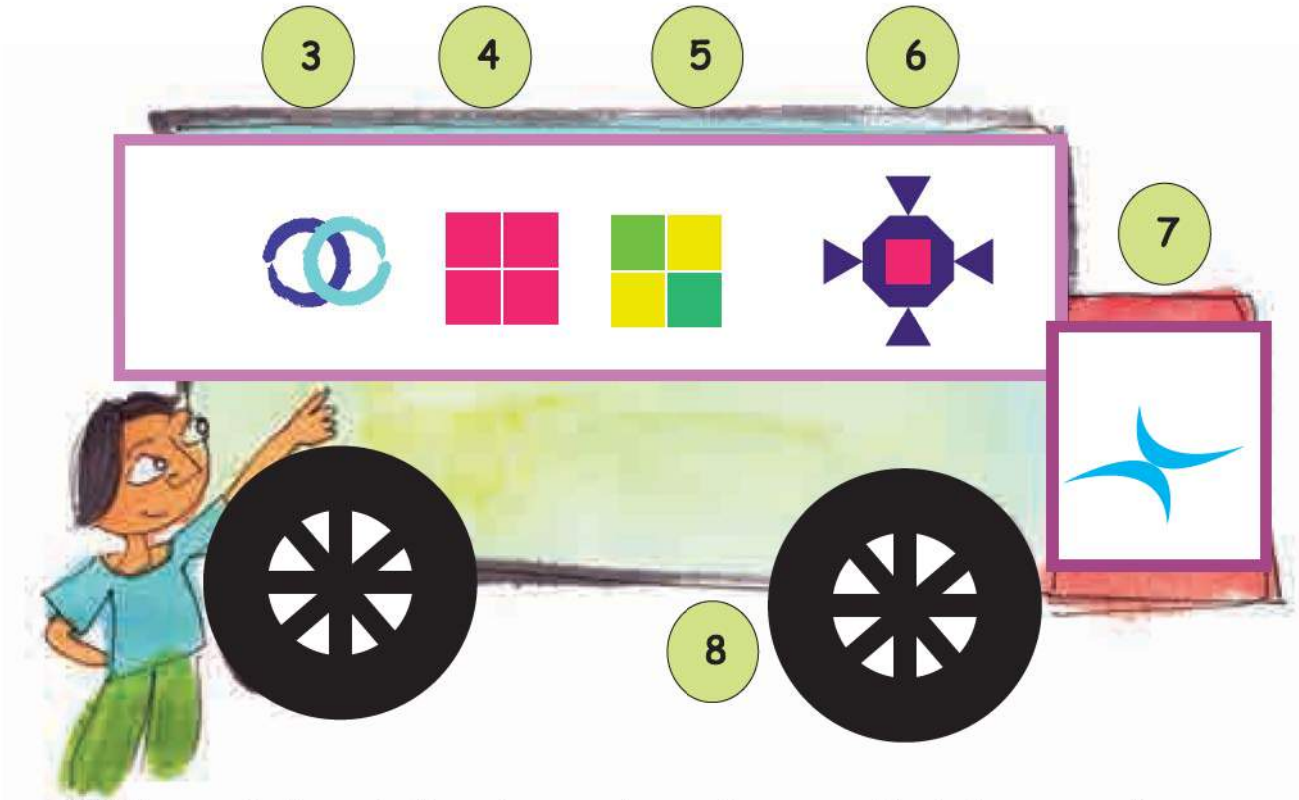
After $\frac{1}{4}$ turn

Practice time

A) ❋ Among the following shapes, find out which ones would look the same after $\frac{1}{4}$ turn. Put a (✓).

❋ Put a (✗) on the shapes that will not look the same after half a turn.

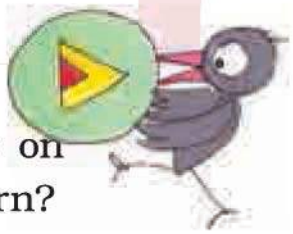




B) Try and change the shapes in such a way that the new shape remains the same on giving it half a turn.

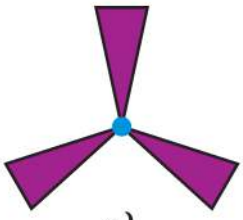
C) Draw what the following shapes would look like on $\frac{1}{4}$ turn and half a turn.

	On $\frac{1}{4}$ turn	*On half turn*
a)		
b)		
c)		
d)		

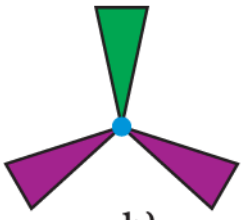


Which of the above shapes do not look the same on $\frac{1}{4}$ turn? Which shapes do not look the same on $\frac{1}{2}$ a turn?

❊ Which fan will look the same on a $\frac{1}{3}$ turn?

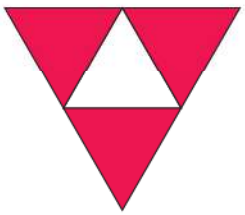


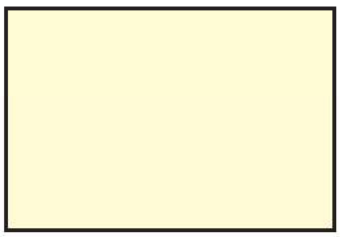
a)



b)

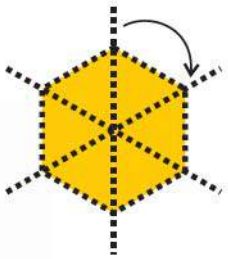
❊ Draw this shape after $\frac{1}{3}$ turn.



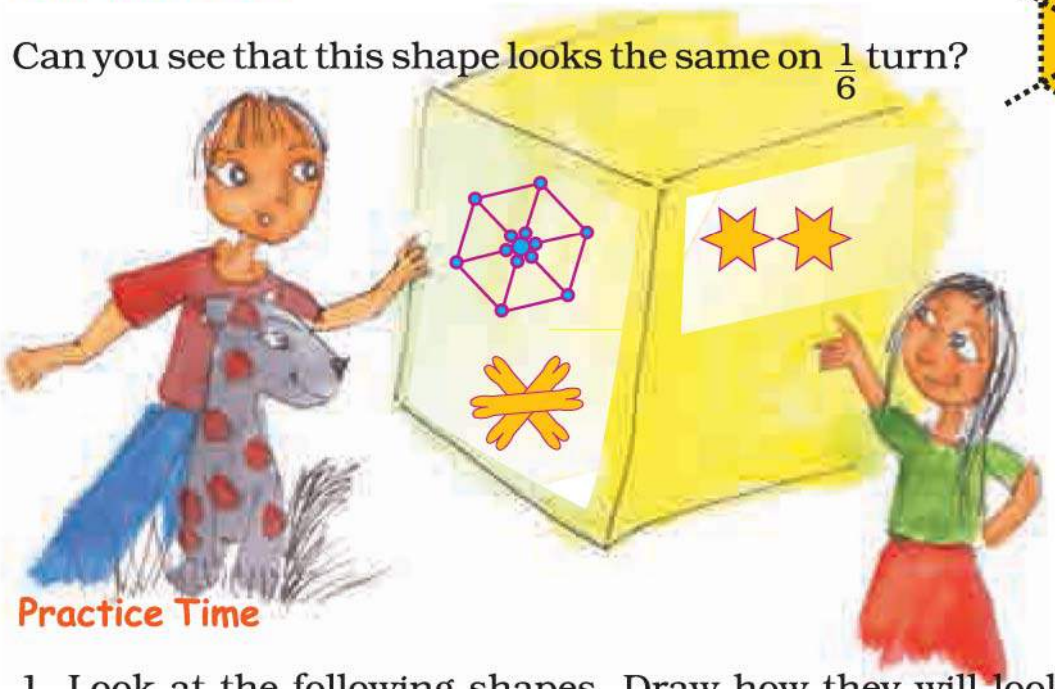


Shape after $\frac{1}{3}$ turn

One-sixth Turn



Can you see that this shape looks the same on $\frac{1}{6}$ turn?



Practice Time

1. Look at the following shapes. Draw how they will look on $\frac{1}{3}$ and $\frac{1}{6}$ turn.

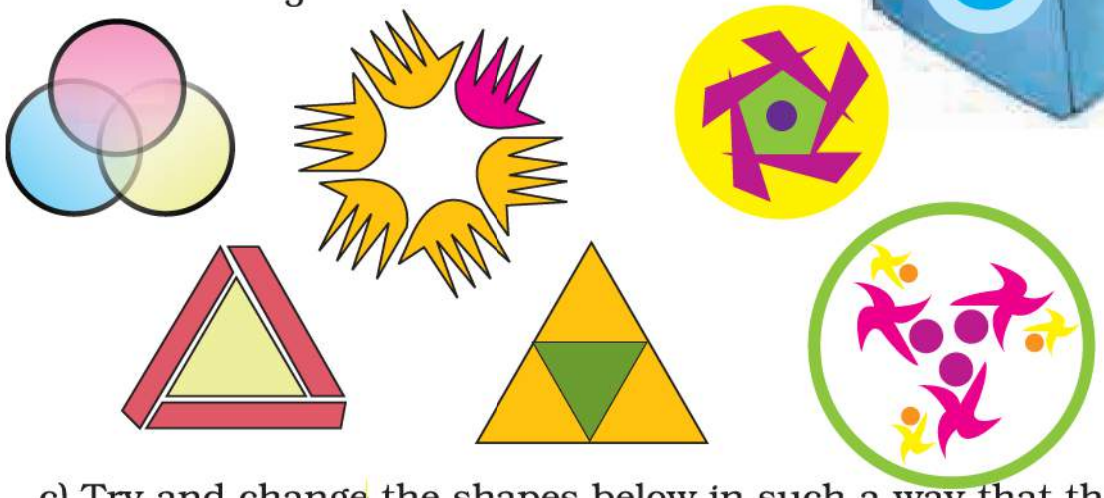
	$\frac{1}{3}$ *turn*	$\frac{1}{6}$ *turn*

Encourage children to look at the figure and see what kind of a symmetry there is. If they need they can draw six lines to see how to rotate a figure through $\frac{1}{6}$ turn. They should also be able to see that a figure which looks the same on $\frac{1}{6}$ turn will also look the same on $\frac{1}{3}$ turn (which is the same as two $\frac{1}{6}$ turns).

2. Look at the following shapes —

a) Find out which of these figures look the same on $\frac{1}{3}$ turn. Mark them with (✓).

b) Which are the ones that will not look the same after $\frac{1}{3}$ turn? Mark them with (×).



c) Try and change the shapes below in such a way that they look the same on $\frac{1}{3}$ turn.

3. Draw some shapes which will look the same after $\frac{1}{3}$ turn.

4. Draw some shapes which will look the same after $\frac{1}{6}$ turn.

6 Be My Multiple, I'll be Your Factor

The Mouse and the Cat

The hungry cat is trying to catch Kunjan the mouse. Kunjan is now on the 14th step and it can jump 2 steps at a time. The cat is on the third step. She can jump 3 steps at a time. If the mouse reaches 28 it can hide in the hole. Find out whether the mouse can get away safely!

a) The steps on which the mouse jumps —

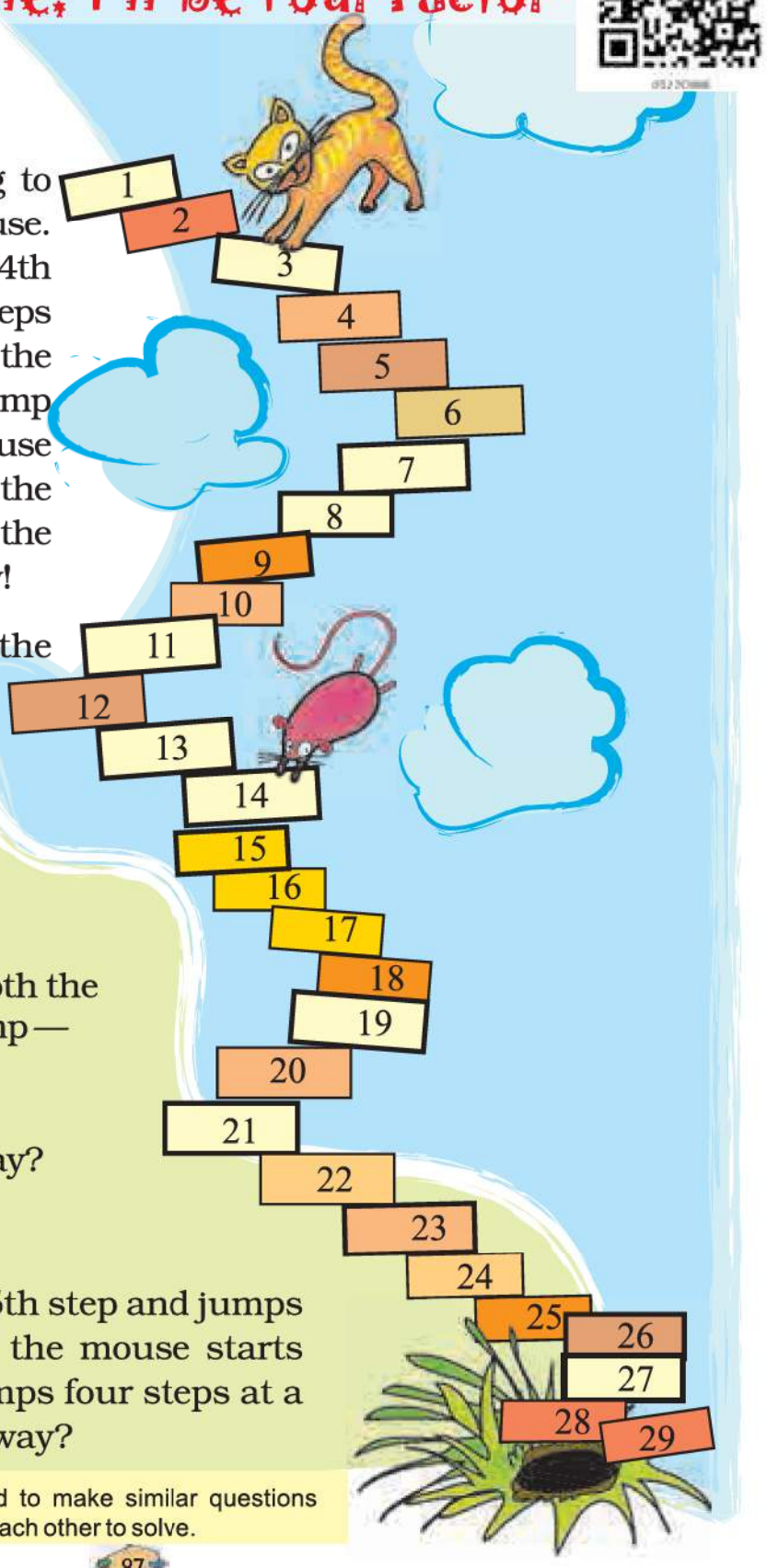
_____

b) The steps on which the cat jumps —

_____

c) The steps on which both the cat and the mouse jump —

d) Can the mouse get away?



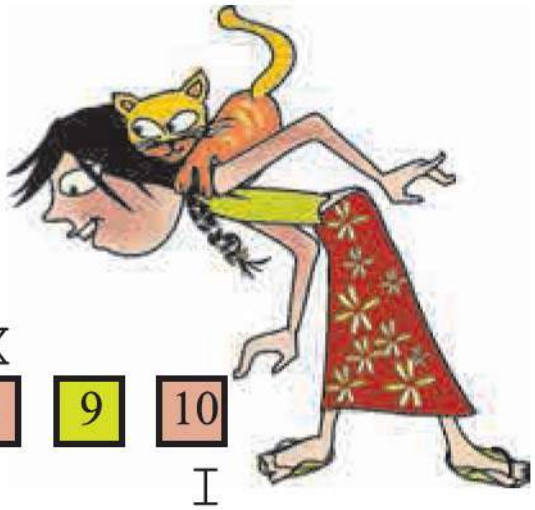
Find out

If the cat starts from the 5th step and jumps five steps at a time and the mouse starts from the 8th step and jumps four steps at a time, can the mouse get away?

Children should be encouraged to make similar questions with different multiples and ask each other to solve.

Who is Monto waiting for?

Monto cat is waiting for somebody. Do you know for whom he is waiting? There is a trick to find out.



			D				X		
1	2	3	4	5	6	7	8	9	10
	M					P			I
11	12	13	14	15	16	17	18	19	20
			O						
21	22	23	24	25	26	27	28	29	30
R			N		U				
31	32	33	34	35	36	37	38	39	40
			B	W			S		
41	42	43	44	45	46	47	48	49	50
	J				H				E
51	52	53	54	55	56	57	58	59	60

Mark with a red dot all the numbers which can be divided by 2.

Mark a yellow dot on the numbers which can be divided by 3 and a blue dot on the numbers which can be divided by 4.

Which are the boxes which have dots of all three colours?

What are the letters on top of those boxes?

Write those letters below in order.

Meow Game

To play this game, everyone stands in a circle. One player calls out 'one'. The next player says 'two' and so on. A player who has to call out 3 or a number which can be divided by 3 has to say 'Meow' instead of the number. One who forgets to say 'Meow' is out of the game. The last player left is the winner.

Which numbers did you replace with 'Meow'?

3, 6, 9.....

We say these numbers are the **multiples** of 3.

Play the game by changing the number to 4.

Now, which numbers did you replace with 'Meow'?

These numbers are the multiples of 4.

❋ Write any ten multiples of 5.

Make children play this game several times with multiples of different numbers.

Dice Game

Throw two dice together. What are the numbers that turn up on the faces of the dice? Make a two-digit number using them. If it is a multiple of any of the numbers written next to the circles, you can write it in that circle. Then it is your friend's turn. The one who can write more numbers in 10 rounds is the winner.

I have 3 and 2 on my dice. If I make 23, it is not the multiple of any of the numbers. So I will make 32, which is a multiple of 4, and write it in the red circle.

6

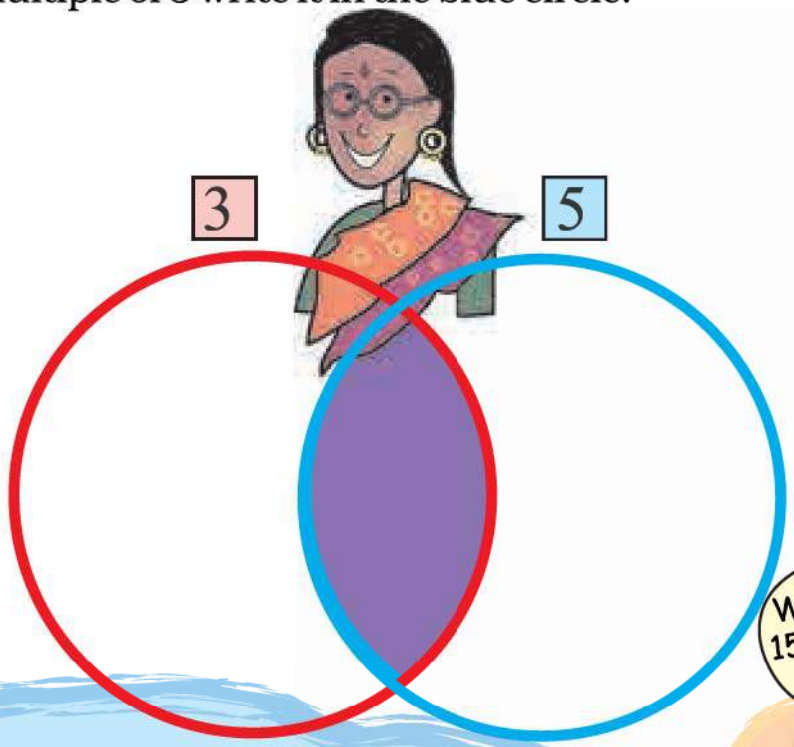
4

5

7

Common Multiples

Think of a number. If it is a multiple of 3 write it in the red circle. If it is a multiple of 5 write it in the blue circle.



Some numbers are multiples of both 3 and 5.

So we can say that they are **common** to both 3 and 5.

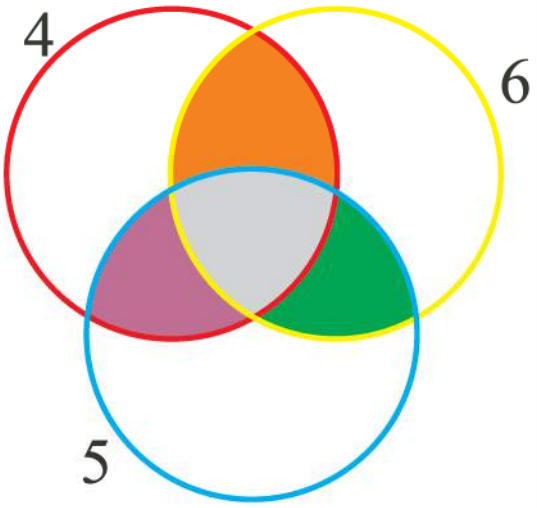
Think! If you write the multiples common to 3 and 5 in the purple part, then will they still be in both the red and the blue circles?

* Which is the smallest among these **common multiples**? _____

Repeat the game using the numbers 2 and 7.

* Write the common multiples of 2 and 7.

Repeat the game by putting the multiples of 4, 6 and 5 in the circles.



- What common multiples of 5 and 6 did you write in the green part?
- What common multiples of 4 and 6 are written in the orange part?
- In which coloured part did you write the common multiples of 4,6 and 5?
- What is the smallest common multiple of 4, 6 and 5? _____

Puzzle

Tamarind seeds

Sunita took some tamarind (*imli*) seeds. She made groups of five with them, and found that one seed was left over. She tried making groups of six and groups of four. Each time one seed was left over. What is the smallest number of seeds that Sunita had?

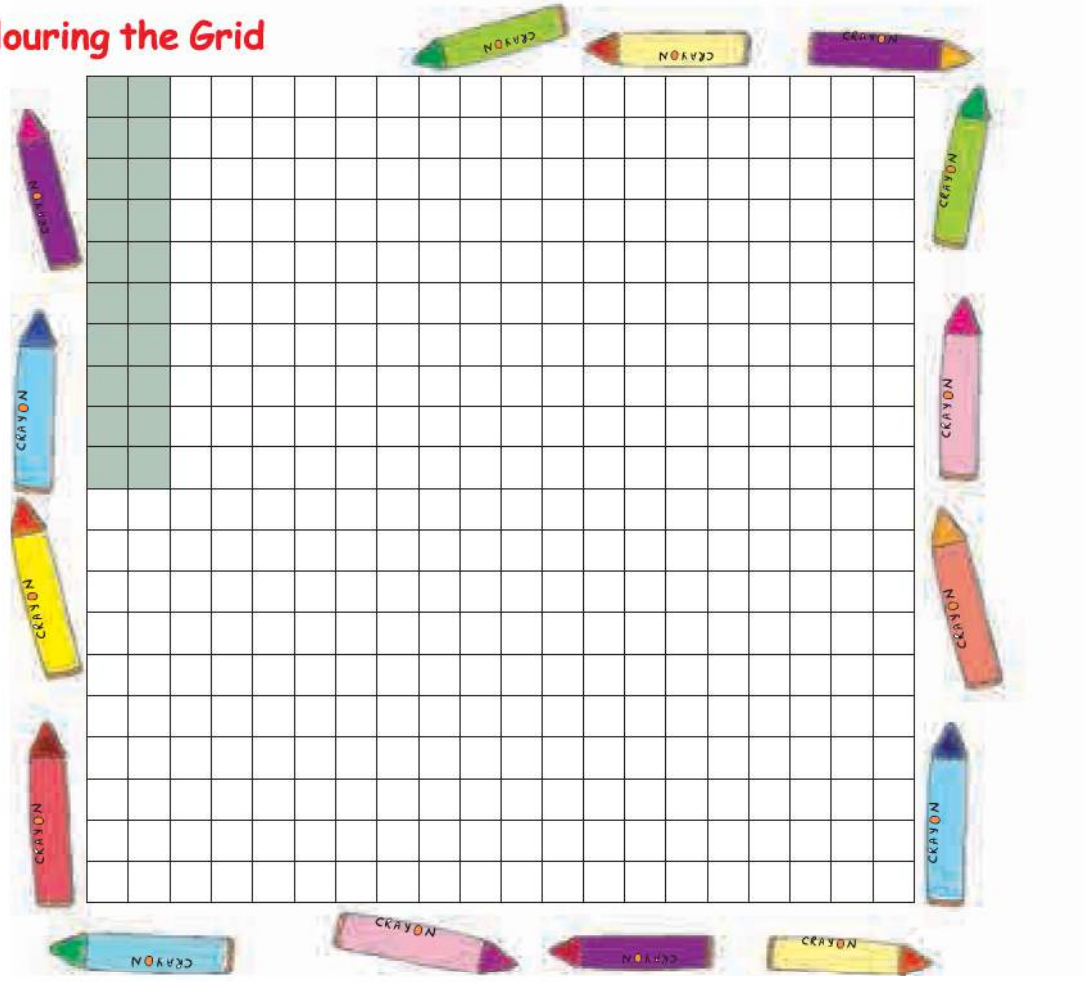
Encourage children to try out themselves such activities using seeds, pebbles etc.

More tamarind seeds

Ammini is arranging 12 tamarind seeds in the form of different rectangles. Try to make more rectangles like this using 12 tamarind seeds. How many different rectangles can you make?

If there are 15 tamarind seeds how many rectangles can you make?

Colouring the Grid



In the grid here, a rectangle made of 20 boxes is drawn.

The width of this rectangle is 2 boxes.

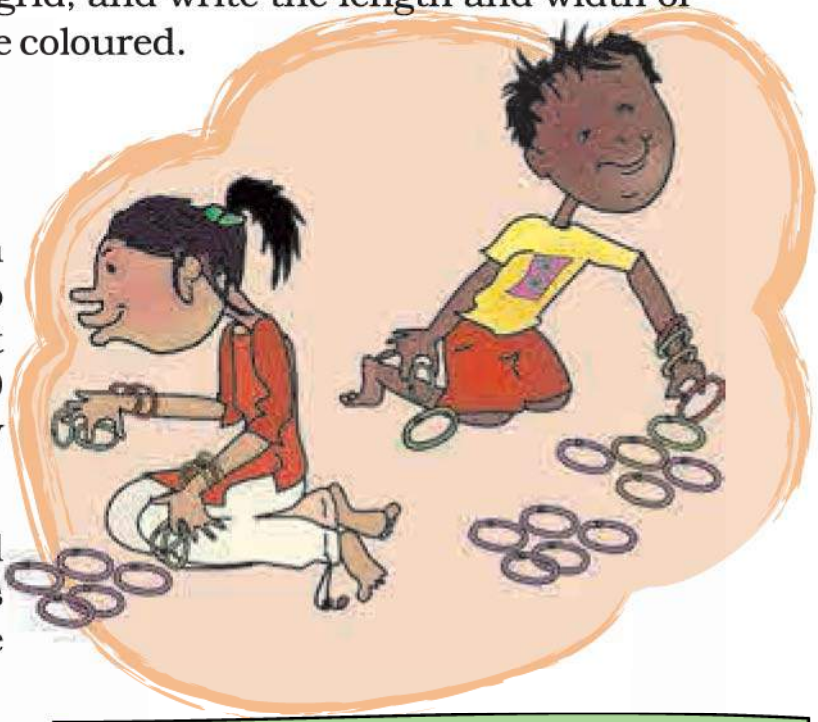
- What is its length?
- Colour a rectangle made of 20 boxes in some other way.

❋ What is the length and width of the rectangle you coloured?

❋ In how many ways can you colour a rectangle of 20 boxes? Colour them all in the grid, and write the length and width of each rectangle you have coloured.

Bangles

There are 18 bangles on the rod. Meena is trying to group them. She can put them in groups of 2, 3, 6, 9 and 18 — without any bangle being left.



❋ How many groups will she have if she makes groups of 1 bangle each? ____

Now complete the table, for different numbers of bangles. For each number see what different groups can be made.

Number of bangles	*Different groups we can make*
18	1, 2, 3, 6, 9, 18
24	1, 2, ...
5	
9	
7	
2	
10	
1	
20	
13	
21	

Fill the Chart

Complete the multiplication chart given here.

×	1	2	3	4	5	6	7	8	9	10	11	12
1												**12**
2						**12**						
3				**12**			21					
4			**12**							40		
5				20								
6		**12**										
7												
8									72			
9												
10												
11						66						
12	**12**											

Look at the green boxes in the chart. These show how we can get 12 by multiplying different numbers.

12
4×3
6×2
1×12

$12 = 4 \times 3$, so 12 is a multiple of both 4 and 3. 12 is also a multiple of 6 and 2, as well as 12 and 1. We say 1, 2, 3, 4, 6, 12 are **factors** of 12.

- What are the factors of 10? _____

  Can you do this from the chart?

- What are the factors of 36 ? _____

- Find out all the factors of 36 from the multiplication chart.

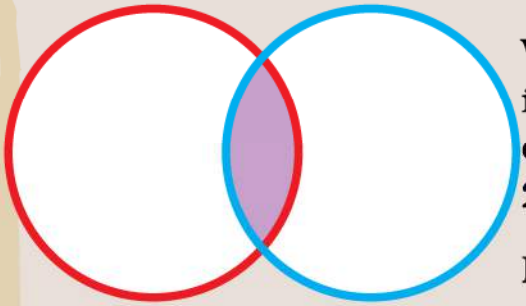
- What is the biggest number for which you can find the factors from this chart?

- What can you do for numbers bigger than that?

10
5×2
___

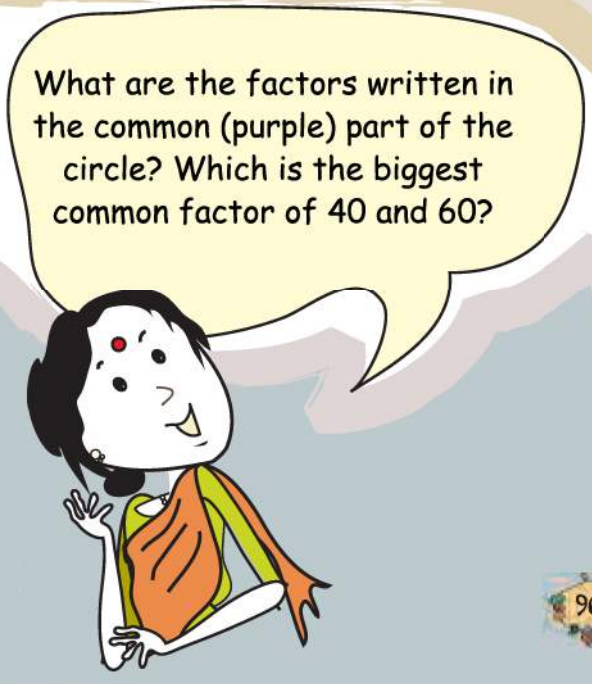
Common factors

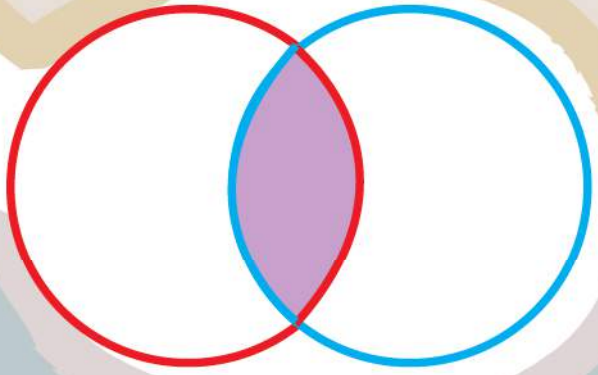
Write the factors of 25 in the red circle and the factors of 35 in the blue circle.



Which are the factors you have written in the common part (purple) of both circles? These are **common factors** of 25 and 35.

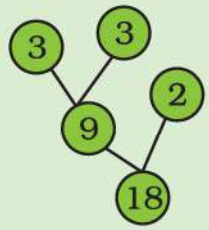
Now write the factors of 40 in the red circle and 60 in the blue circle.

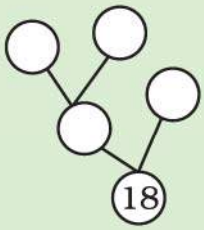




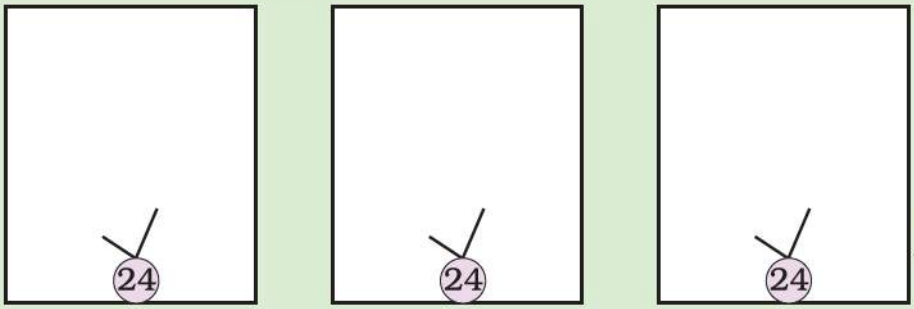
Factor Tree

Look at the factor tree. Now can you make another tree like this?





❋ In how many ways can you draw a factor tree for 24? Draw three of them below.



❋ Try drawing the factor tree using other numbers also.

Tiling Problems

1) There is a garden in Anu's house. In the middle of the garden there is a path. They decided to tile the path using tiles of length 2 feet, 3 feet and 5 feet.

The mason tiled the first row with 2 feet tiles, the second row with 3 feet tiles and the third row with 5 feet tiles. The mason has not cut any of the tiles. Then what is the shortest length of the path?