

GAMES WITH AN ABACUS



Let us begin with Ghanshyam's story.

This is a very old story. A story so old that it is about a time when people did not know how to count. A man lived on the banks of the Narmada river. We don't know his name but let us call him Ghanshyam. Ghanshyam possessed a few cows. Every night he drove his cows into a cave so that they would be safe from wild animals. He would let them out to graze in the morning and herd them back to the cave when he returned every evening. But Ghanshyam was always worried. He was never sure whether all his cows had returned or not since he didn't know how to count. So he kept thinking about how to keep track of his cows. One day Ghanshyam did find a way. In the morning when the cows were ready to leave for the forest he stood at the entrance of the cave with his fists closed and his hands stretched out in front. As the cows went out of the cave one by one, he opened one finger of his right fist for each cow. When all fingers of the right hand had been opened he started opening the fingers of his left hand. When all the cows had gone the position of the fingers on his two hands were as shown in Figure 1.

How many cows did Ghanshyam have at that time? (1)

In the evening when the cows returned, he again stood at the entrance of the cave with his fists closed and opened one finger for each cow entering the cave. When all the cows had entered the cave, only the thumb of his left hand remained closed. So he knew that all his cows had returned.

This went on for many months but then a new problem arose. The number of cows in his herd increased. Ghanshyam discovered that even after opening the fingers of both hands there were still some cows remaining to be counted.

What could he do now?



Figure 1

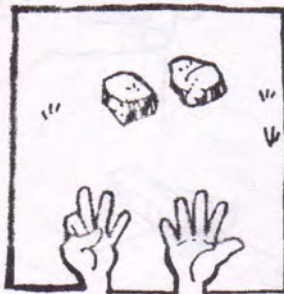
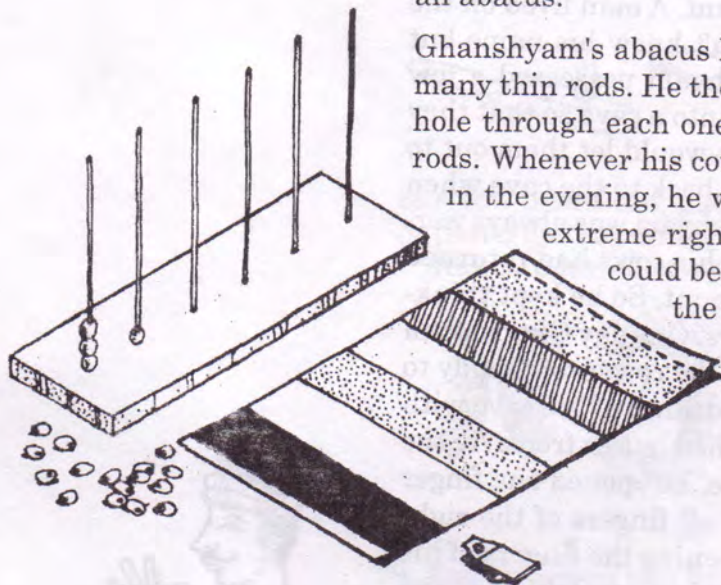


Figure 2

Ghanshyam was a clever person. He found an answer to this new problem too. When all the fingers of his hands were opened he picked up a pebble, kept it to one side and then closed both his fists again. As the cows went out he again opened his fingers one by one for every cow that passed, just as he had done earlier. When all the cows had left, Ghanshyam found he had one pebble and the position of his fingers was as shown in Figure 2.

How many cows did Ghanshyam have now? (2)

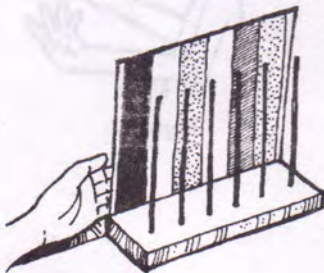
The number of cows Ghanshyam had kept increasing. He used his pebble technique to count them and check whether all his cows had returned. In a few years Ghanshyam had so many cows that he had to keep a lot of pebbles with him. To escape this laborious and tedious task he made himself an abacus.



Ghanshyam's abacus had a wooden base on which he fixed many thin rods. He then collected a lot of beads and made a hole through each one of them so they could slip onto the rods. Whenever his cows left the cave to graze, or returned in the evening, he would put one bead on the rod at the extreme right for each cow. When no more beads could be put on that rod, he would remove all the beads from the rod and, in their place, put a single bead onto the rod next to it.

Look at the abacus in your kit. This abacus is like the one Ghanshyam made.

Let us do some experiments with the abacus. First of all, cut out the abacus strip from your kit copy and fix it on your abacus.



EXERCISE 1

With the help of the beads, show how you would count the first nine cows on the abacus.

How will you show the tenth cow on the abacus? (3)
Show a count of 11; 14; 17 and 19 cows on your abacus.

(4)

EXERCISE 2

Display the following number of cows on your abacus: 21; 29; 50; 87 and 99 (5)

How would you show the 100th cow? (6)

How would you show 1,000 on the abacus? (7)

- How would you display 10,000 on the abacus? (8)
- Show the following numbers on your abacus: 7; 56; 115; 827; 589; 9,901 (9)
- Is there some relationship between the numbers as they are written and the number of beads on different rods in the abacus? (10)
- What is the largest number that can be shown on your abacus? (11)
- What would you have to do to show 10,00,000 on this abacus? (12)

PLACE VALUE

EXERCISE 3

Remove all the beads. Take one bead and place it on the rod at the extreme right. What number does the abacus show now? (13)

The place value of the bead in this case is one.

Remove this bead and place it on the adjacent rod, that is, the second rod from the right. Now what is the number shown on the abacus? (14)

How many times the previous number is this number? (15)

The place value of the bead here is ten.

Remove the bead and place it on the third rod from the right. What is the number shown now? (16)

How many times the previous number is this number? (17)

What is the place value of the bead in this position? (18)

Whenever you shift the bead to the next rod to the left, how many times the previous number is the new number? (19)

Show 382 on the abacus and say what the place value of 3 is? (20)

Show 3,082 on your abacus and say what the place value of 3 is. (21)

Show 582,755 on your abacus. What are the place values of 5 in this number? (22)

Multiply the following numbers on your abacus and write the answers in your exercise book:

$$2 \times 10$$

$$4 \times 100$$

$$70 \times 1,000 \quad (23)$$

Multiply the following numbers on your abacus and show

your results to your teacher:

$$11 \times 10$$

$$21 \times 100$$

$$325 \times 10$$

EXERCISE 4

Remove all the beads from the abacus. Take a bead and place it on the rod at the extreme left and read the number.

What is the place value of the bead in this position? (24)

Now remove the bead and place it on the rod next to it to the right. Read the number again. What part of the previous number is this number? (25)

What is the place value of the bead in this position? (26)

Remove the bead and shift it one more place towards the right. What part of the previous number is this new number? (27)

Each time you shift the bead one place to the right, what fraction of the previous number is the new number? (28)

Divide the following numbers on your abacus and write your answers in your exercise book:

$$7,800 \div 100$$

$$530 \div 10$$

$$400 \div 100 \quad (29)$$

Repeat Exercise 3 and 4 with two beads. That is, put two beads on a rod and then shift both beads to the left or right each time. Repeat this exercise with 5 and 8 beads.

DECIMAL NUMBERS ON THE ABACUS

EXERCISE 5

Show the following numbers on your abacus:

a) One lakh 1,00,000

b) One-tenth of this 10,000

c) One-tenth of this 1,000

d) One-tenth of this 100

e) One-tenth of this 10

f) One-tenth of this 1

If you now have to show one-tenth of one, what would you have to do? (30)

Cut out the decimal strip from your kit copy. Fold it and fix it to the abacus in such a way that the decimal point lies between the first and second rods from the right (Figure 3).

Remove all the beads from the abacus. Now take a bead and place it on the rod to the extreme right. In this position the bead depicts one-tenth of one. The place value of this bead is 0.1. That is, this bead displays 0.1 in this position.



Figure 3

How would you now show 0.2; 0.6; 0.7 and 0.9 on your abacus? (31)

If you add another one-tenth (i.e. 0.1) to the last number, how would you show it on the abacus? (How did you depict 10 after 9 in Exercise 1?) (32)

EXERCISE 6

Display the following numbers on your abacus: 0.5; 0.9; 1.3; 8.9; 15.7 and 109.6 (33)

Your teacher will now show you some numbers on the abacus. Write down these numbers in your exercise book. (34)

What would you do if you have to depict one-tenth of 0.1, that is one-hundredth of one? (How did you depict one-tenth of one?) (35)

Shift the decimal point to between the second and third rods from the right.

Show the following numbers on your abacus: 0.01; 0.03; 0.05; 0.09

If another one-hundredth is now added, how would you show it? (36)

How would you show one-thousandth of one, that is one-tenth of 0.01? (37)

Your teacher will give you many decimal numbers. Show these decimal numbers on the abacus. (S)he will also show you many numbers on the abacus.

Write down these numbers and draw the respective pictures of the abacus in your exercise book. (38)

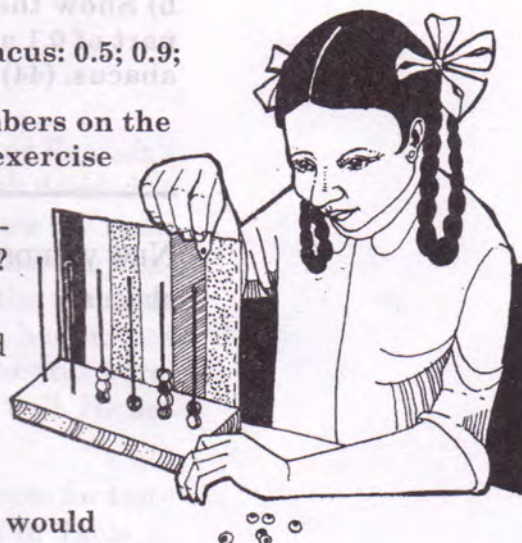
EXERCISE 7

Shift the decimal point to lie between the third and fourth rods from the right. Remove all the beads from the abacus. Now put a bead on the rod to the extreme left.

What number is this? (39)

Now remove the bead and place it on the next rod to the right. Write down this number. What part of the previous number is it? (40)

Repeat this process by shifting the bead one place to the right each time.





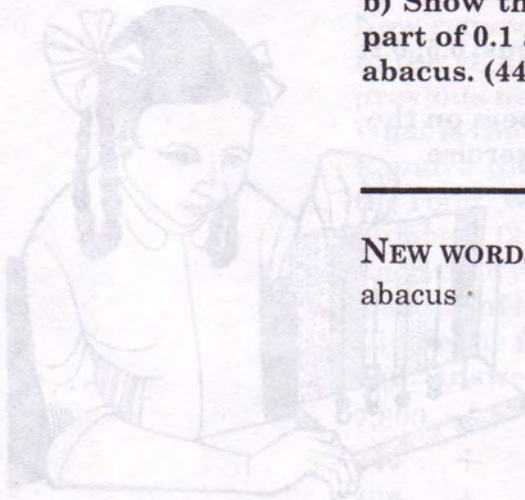
What part of the number is obtained each time when the bead is moved one place to the right? (41)

Does the same thing happen, in the same manner, even when the bead crosses to the right of the decimal point? (42)

Now let us do a few exercises with decimals:

a) Multiply the following numbers on your abacus and write the answers in your exercise book: 0.01×10 ; 0.18×100 ; $0.56 \times 1,000$ (43)

b) Show the one-hundredth part of 315, the one-tenth part of 0.1 and the one-thousandth part of 0.01 on your abacus. (44)



NEW WORDS

abacus · place value