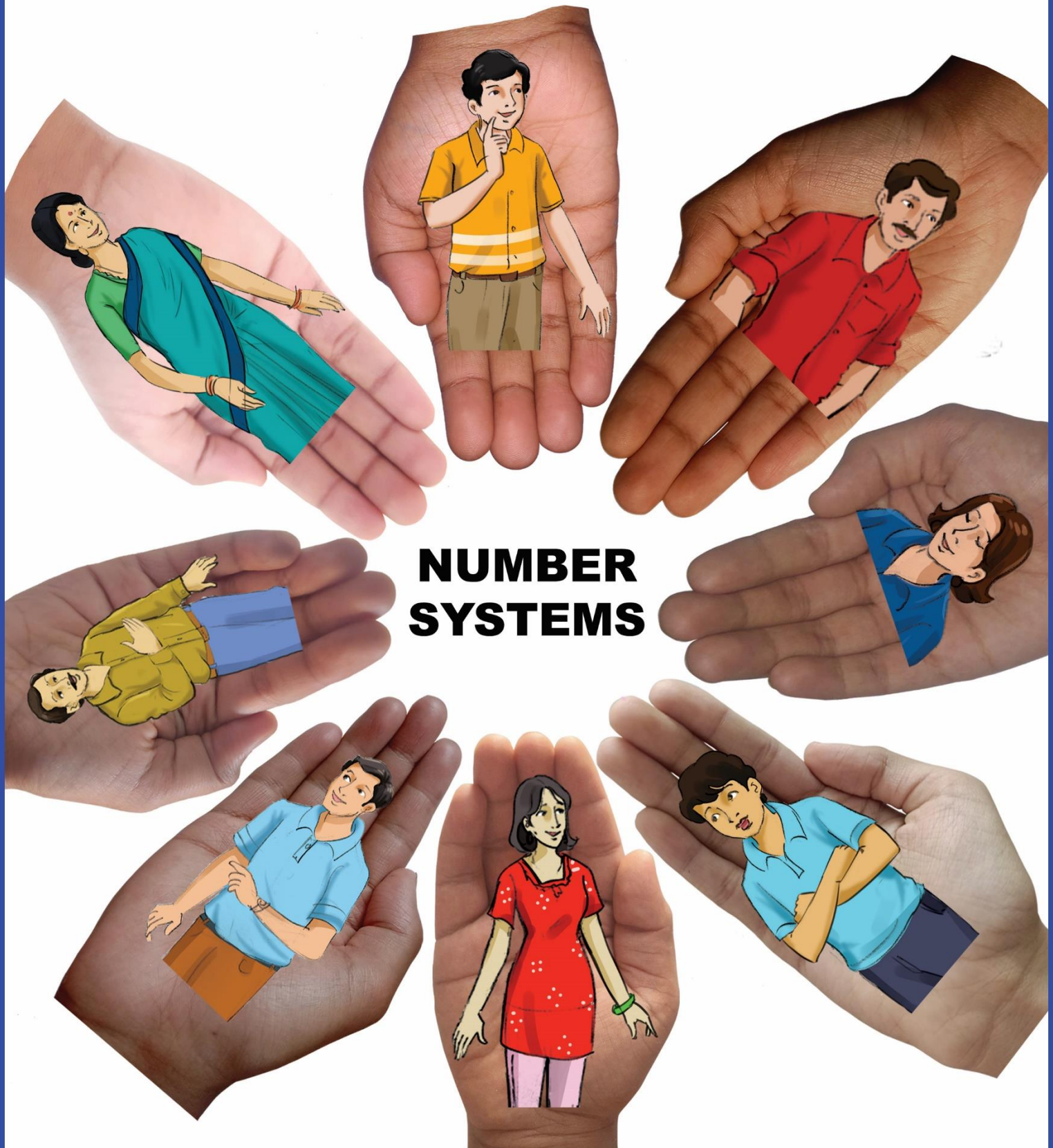


CLASS IX

MATHEMATICS



NUMBER SYSTEMS



Nurturing Future

Naman Vidya

Masipirhi, Hazaribagh - 825301 (Jharkhand)

Affiliated with CBSE

From the students' hearts

Dear Friends/ Readers,

We, the students of Naman Vidya, are elated to know that in accordance with NEP 2020, CBSE is introducing several changes in the teaching pedagogy for the betterment of all students. Art integration with curriculum, competency-based education, value-based education, and stress on physical fitness, is a farsighted endeavour to make our personalities wholesome and integrated -- through development of values, individuality and intellect.

We express our gratitude towards Ms. Anita Karwal, Secretary, Department of School Education, Ministry of Human Resource Development, Mr. Manoj Ahuja (Chairman, Central Board of Secondary Education), N.C.E.R.T. & Mr. Sandeep Sethi (Education Director, M.S.M.S.II), whose invaluable inputs and constant motivation have encouraged us to curate the curricular concepts in the form of interesting graphics. We find it easy to understand concepts through these art integrated graphic novels, as these are application-based and are related to our real-life scenarios.

We are thankful to our school team for having faith in us and giving us an opportunity to showcase our creativity, imagination and most importantly to make us feel that we too can contribute in the development of the education system of our country.

We have enjoyed this process and look forward to more.

Enjoy reading!

Your friend

Vaibhav Vashistha
Class IX
Naman Vidya
Hazaribagh

PREFACE

This graphic novel has been prepared to enhance the understanding of Number Systems among students. It stresses on teaching the concepts with fun and examples. The entire storyline has shown practical applications of the use of numbers. This is a determined attempt to encourage improvement of numerical problem-solving skills and, more importantly, it focuses on the use of rational numbers and irrational numbers in daily life.

Besides the coverage of all the topics in this chapter, the novel shows how a child interacts with his family and friends to clear his doubts and tries to develop the interactive skills of the readers and generate their curiosity in the characters of the novel. This novel has succeeded in educating students in a new and interesting way.

NUMBER SYSTEMS



0962CH01

To access the comic book and additional interactive digital content, download the DIKSHA app from Google Play Store on your Android smartphone or tablet and scan the QR code using DIKSHA app.

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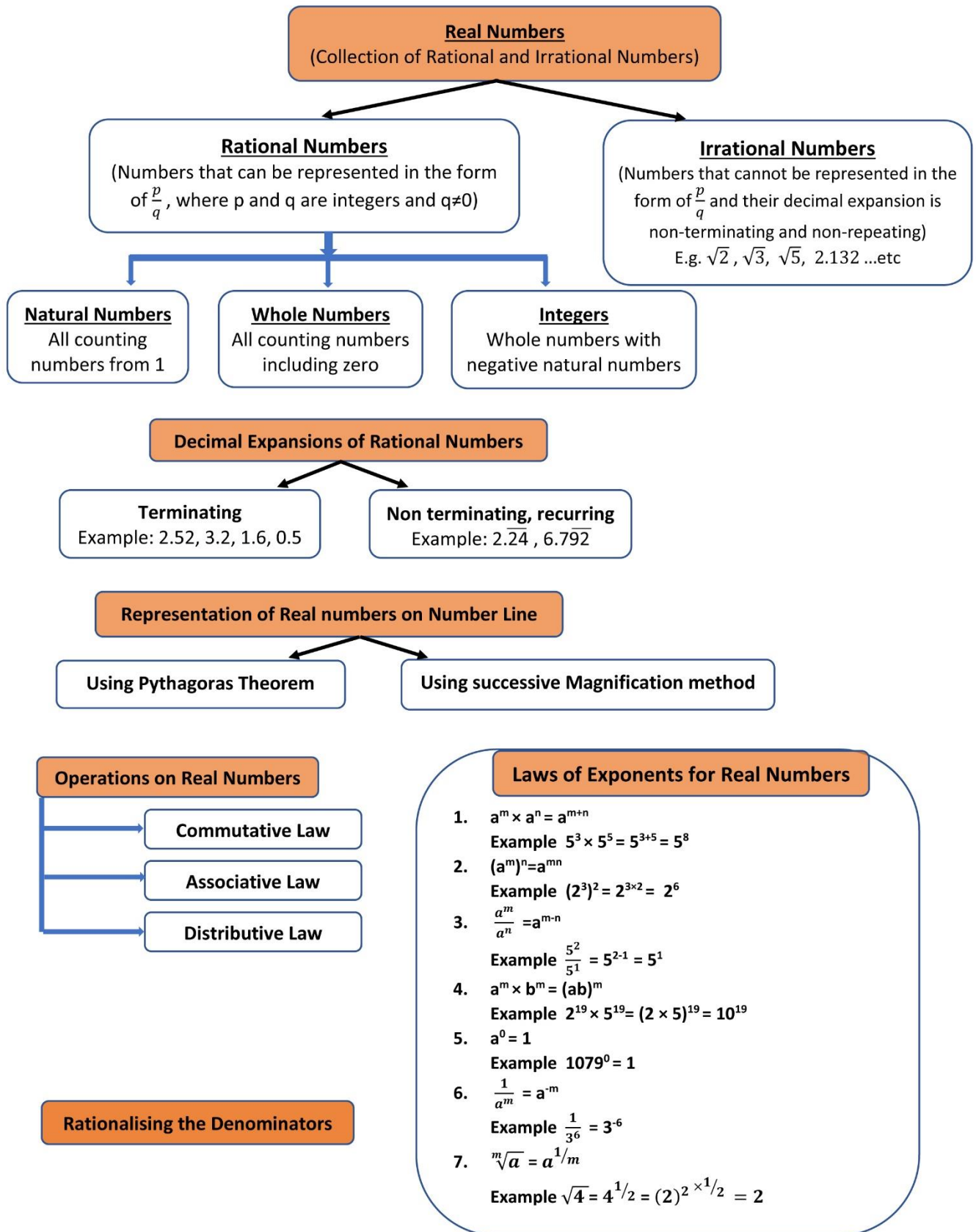
LEARNING OBJECTIVES

- 1) Recall natural numbers, whole numbers, integers and rational numbers and classify a given number as either of them.
- 2) Represent a given number in the form p/q in order to show whether the given number is rational or not.
- 3) Calculate and find rational numbers between any two rational numbers in order to prove that there are infinite rational numbers between any two given rational numbers.
- 4) Modify a given non-terminating decimal number in the form of p/q and comment whether this number is irrational.
- 5) Use Pythagoras' theorem and create a Pythagorean triplet and construct the length equivalent to root of a given number.
- 6) Deduce the value of a given fraction in its decimal form and infer if the decimal number is terminating or non-terminating.
- 7) Use successive magnification and represent a given decimal number on a number line.
- 8) Use the commutative, associative and distributive laws for addition and multiplication of irrational numbers and determine whether the sum, difference, quotients and products of irrational numbers are irrational or not.
- 9) Rationalize the denominator of a given expression with a square root term in the denominator and convert it to an equivalent expression whose denominator is a rational number.
- 10) Extend the laws of exponents and simplify a given expression.

LEARNING OUTCOME

It applies logical reasoning in classifying real numbers and proving their properties in order to use them in different situations.

STORY BOARD



CHARACTERS



Krishna: A boy who is studying in Class 9.



Shanti Devi: Krishna's mother who is a housewife.



Mr. Gupta: Owner of a nearby grocery shop.



Mr. Murari: A friend of Mr. Gupta



Khushi: Krishna's sister



Arjun: Krishna's father

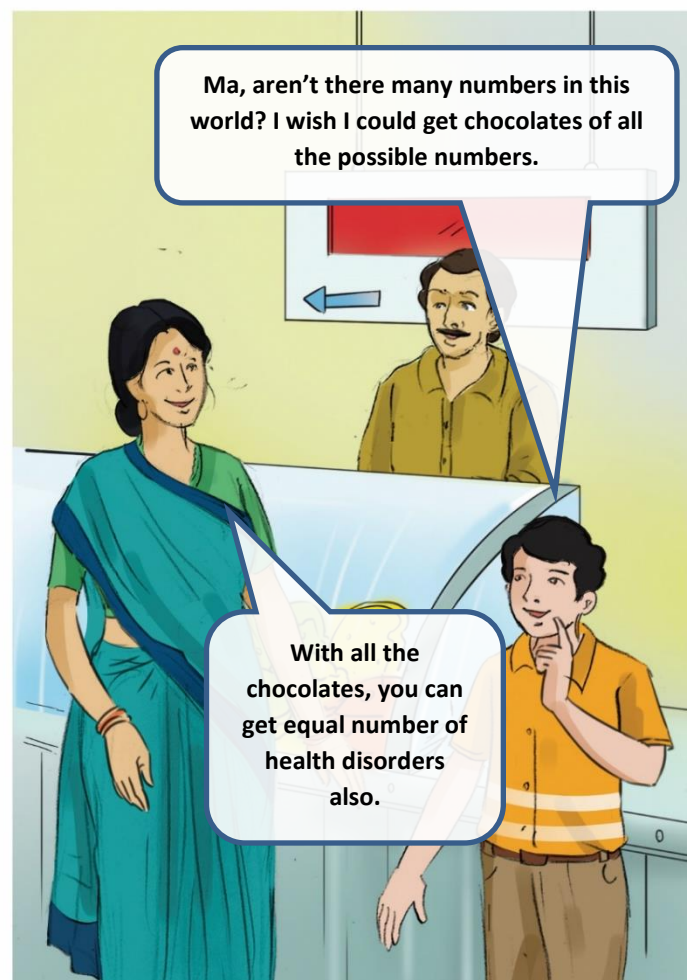


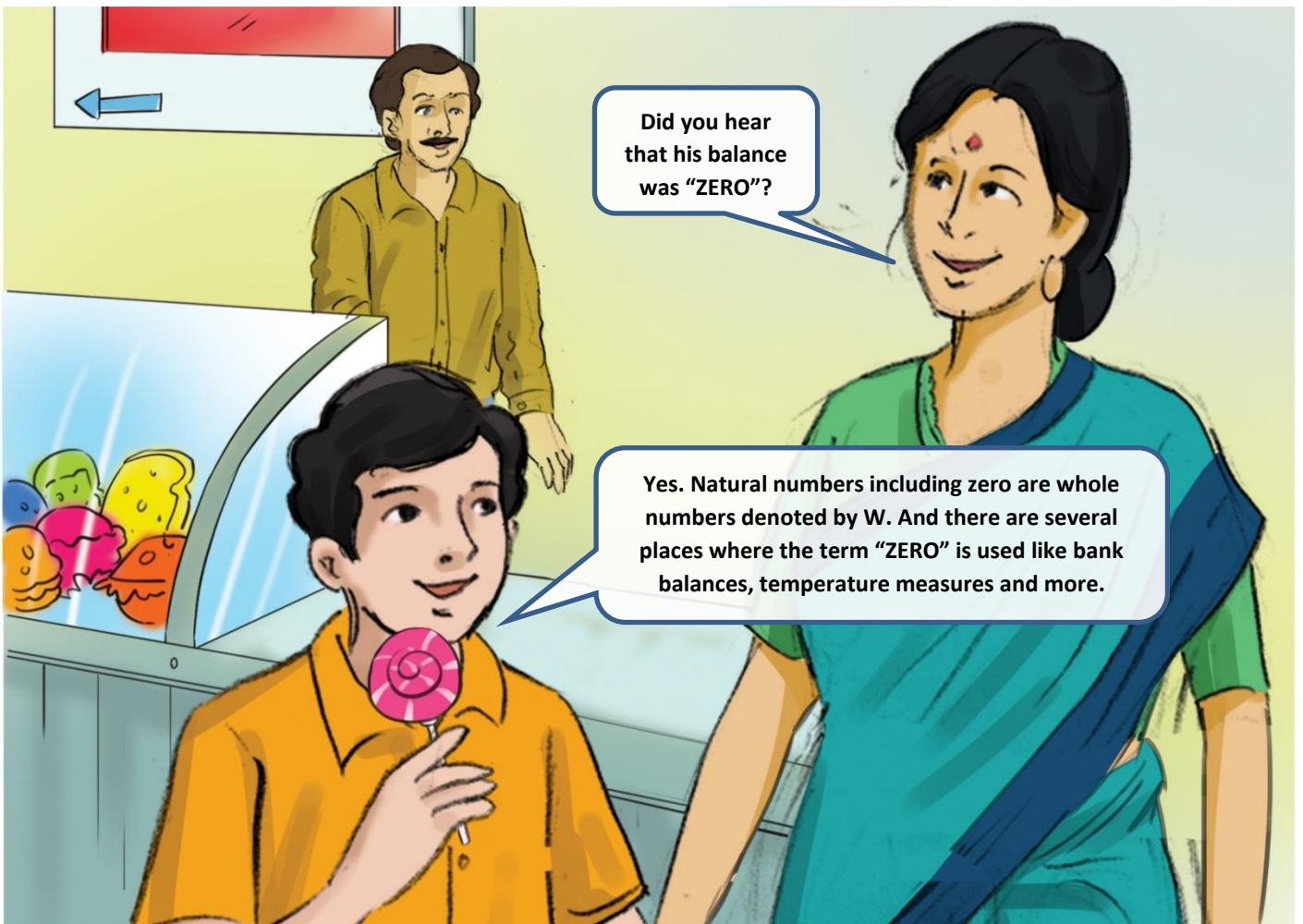
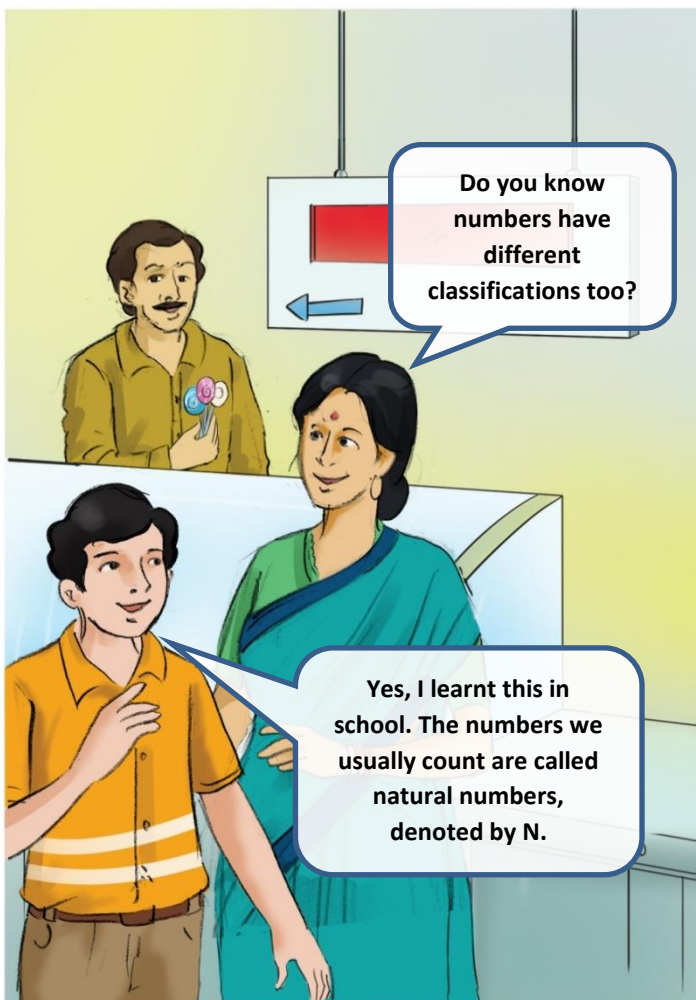
Akash: Krishna's neighbour



Lady at the billing counter

Krishna and his mother have just reached the nearby grocery store.





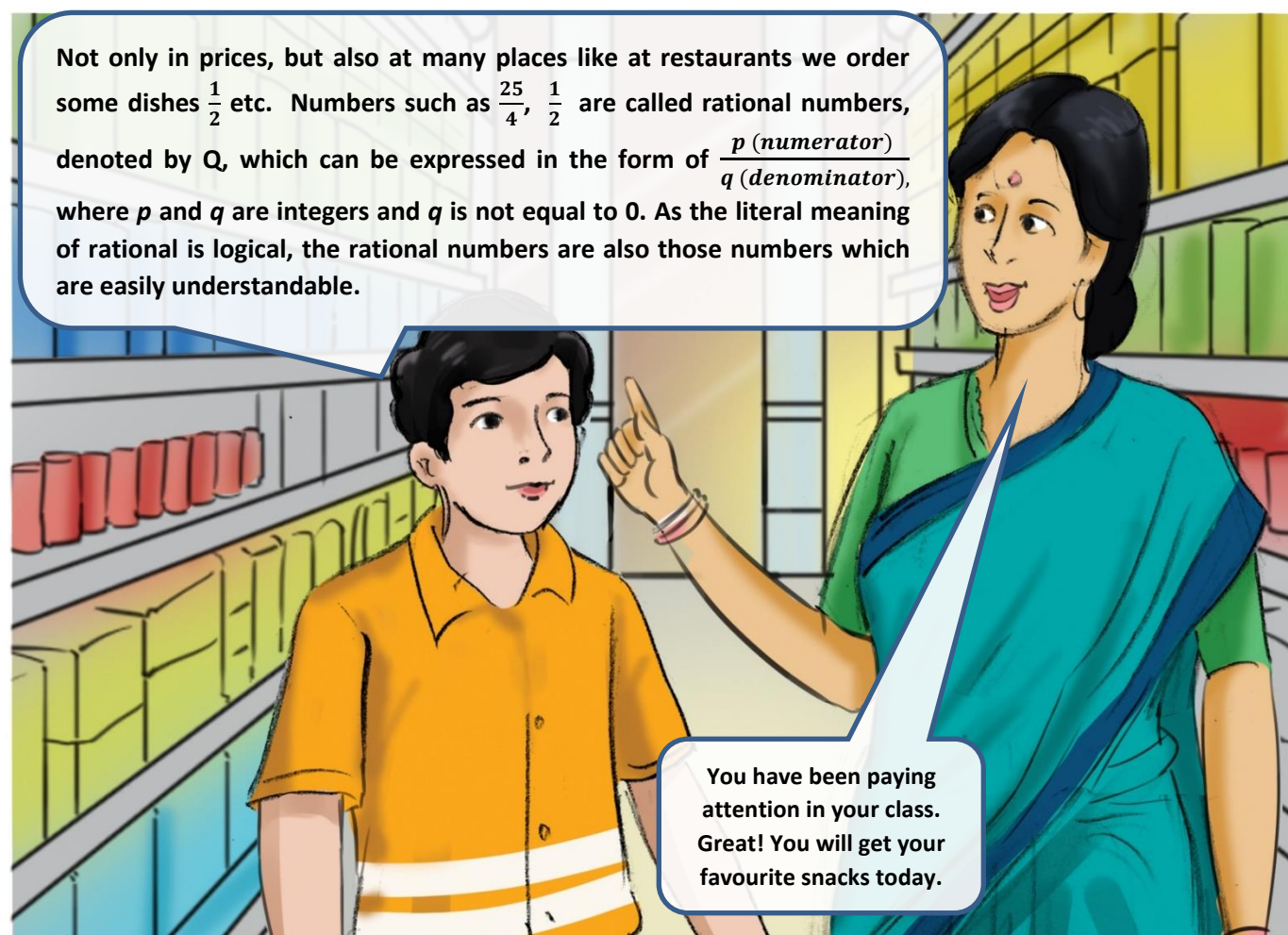


Hey Gupta, how are you?

Hey, Murari! It's been long since we met.

I was out of town. But forget about that; it looks like your business is booming.

No, I faced a big loss recently. I had to run the shop at a loss of ₹ 20,000, hence I was 20,000 down that is -20,000.



ANSWER THESE

Krishna is stuck with some questions and wants help from you. Will you help him?
Give correct answers to the given questions.

Q.1 State whether these statements are true or false:

- a) Every rational number has to be an integer.
- b) $\frac{56}{8}$ is an integer.
- c) There can be infinite rational numbers between two integers.
- d) Most whole numbers are natural numbers.

Q.2 Classify the following numbers as Rational, Integer, Natural or Whole.
(There can be more than one answer)

- a) 55 –
- b) -29 –
- c) $\frac{-25}{5}$ –
- d) $\frac{22}{7}$ –
- e) $\left(\frac{21}{7}\right) - \left(\frac{24}{8}\right) -$

Q.3 Choose the correct options:

- i) Rational Numbers are expressed in the form of p/q where p and q are _____ and $q \neq 0$.
 - a) Integers
 - b) Natural numbers
 - c) Whole numbers
 - d) Irrational number
- ii) Natural numbers with 0 are called _____.
 - a) Whole numbers
 - b) Natural numbers
 - c) Integers
 - d) Rational numbers

Krishna is at his neighbour's house to meet his friend Akash

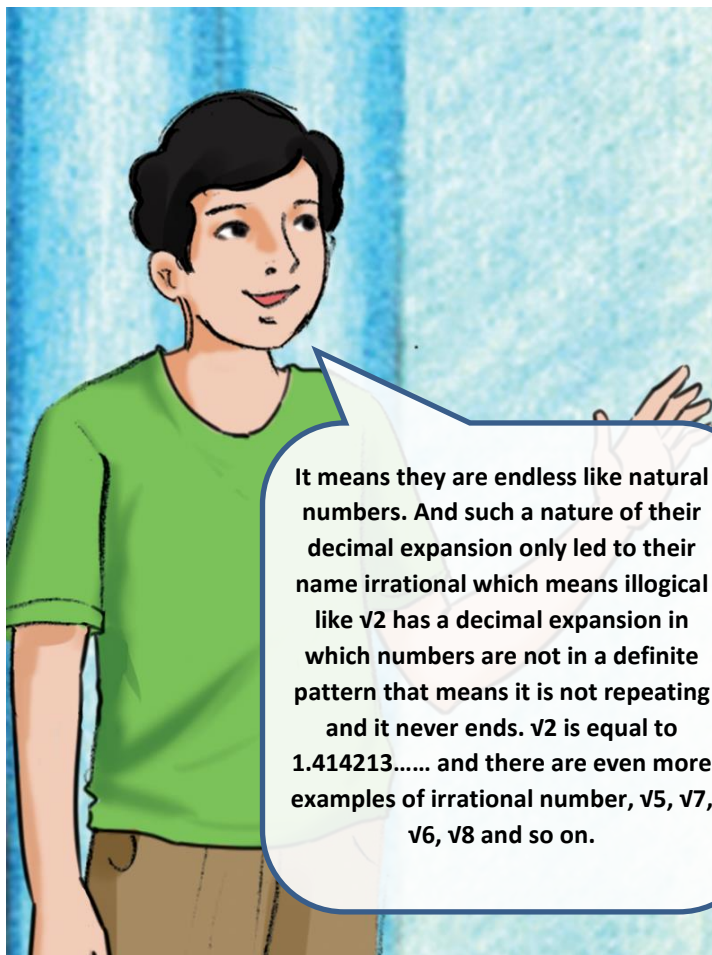
Hi Akash!

Hey Krishna, I was just studying about squares and square roots. Did you know there are only ten perfect squares from 1 to 100?

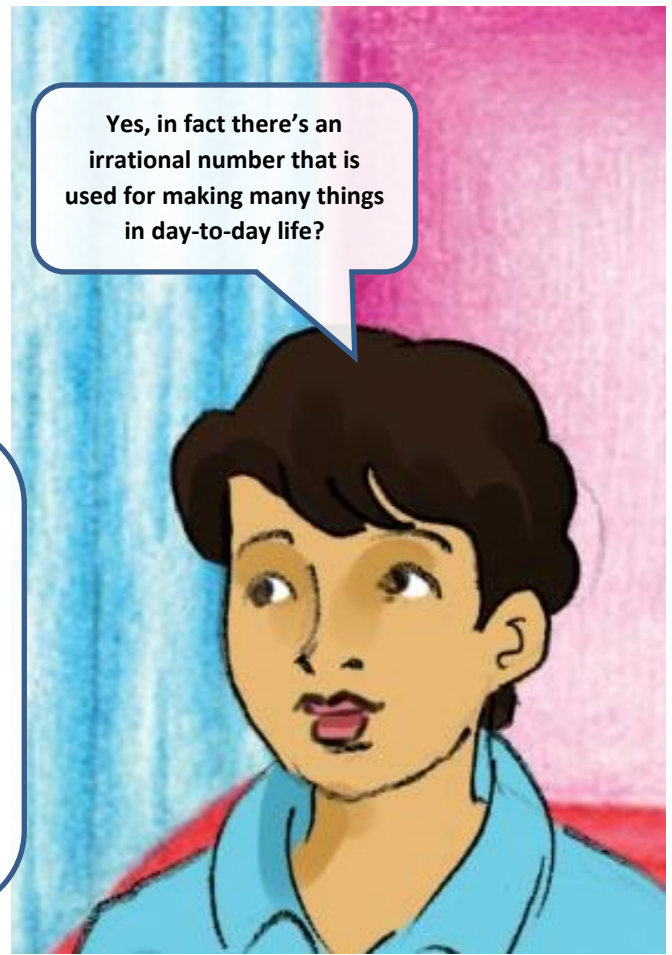
Wow! That is interesting. What about the square root of other numbers?

I checked up and learned that these numbers are called irrational numbers.

These can't be expressed as $\frac{p}{q}$ and their decimal expansion is non-terminating and non-repeating, that is, the numbers are not coming in a definite pattern in their decimal expansion and are endless.



It means they are endless like natural numbers. And such a nature of their decimal expansion only led to their name irrational which means illogical like $\sqrt{2}$ has a decimal expansion in which numbers are not in a definite pattern that means it is not repeating and it never ends. $\sqrt{2}$ is equal to 1.414213..... and there are even more examples of irrational number, $\sqrt{5}$, $\sqrt{7}$, $\sqrt{6}$, $\sqrt{8}$ and so on.



Yes, in fact there's an irrational number that is used for making many things in day-to-day life?



What's that?

Pi. It is used to make items like bowls of correct sizes, tyres and many more. Pi is actually the ratio of circumference to the diameter of a circle. But when the diameter is an integer, the circumference is not and vice-versa. And, thus it can never be expressed in the form of $\frac{p}{q}$ where p and q are integers, and hence Pi is an irrational number whose value is approximately equal to $\frac{22}{7}$.





INTELLIGENT SOLVING

Q.4 You have to distribute the rational numbers and irrational numbers in their respective columns.

$$\sqrt{2}, \frac{22}{7}, \pi, \frac{34}{56}, (\sqrt{3})^2, 2 + \sqrt{2}, \sqrt{32} \times \sqrt{2}, 34, \sqrt{36}, \sqrt{54}$$

Rational Numbers	Irrational Numbers

Q.5 Give examples of some irrational numbers.

Q.6 Fill in the blanks:

- $\frac{22}{7}$ is a _____ number.
- The collection of all sets of rational and irrational numbers together is known as _____.
- Real numbers are denoted by _____.
- Irrational numbers are not in the form of _____ where _____ $\neq 0$.

Q.7 State whether the statements are true or false:

- π is a rational number.
- $\sqrt{25}$ is a rational number.
- No. of rational numbers between 3 and 4 is finite.
- There are infinite integers between two integers.

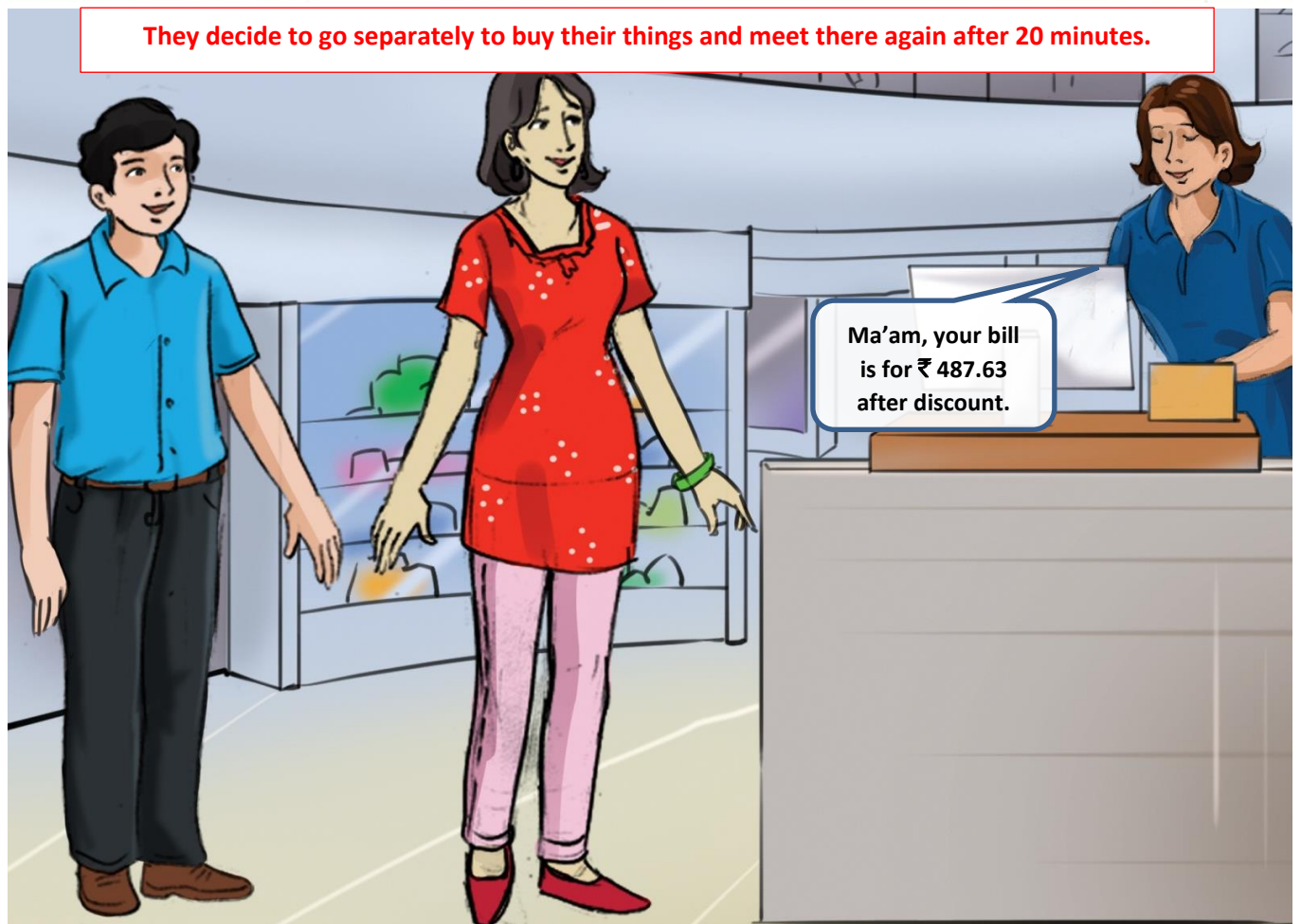
Q.8 Find one rational number between the following:

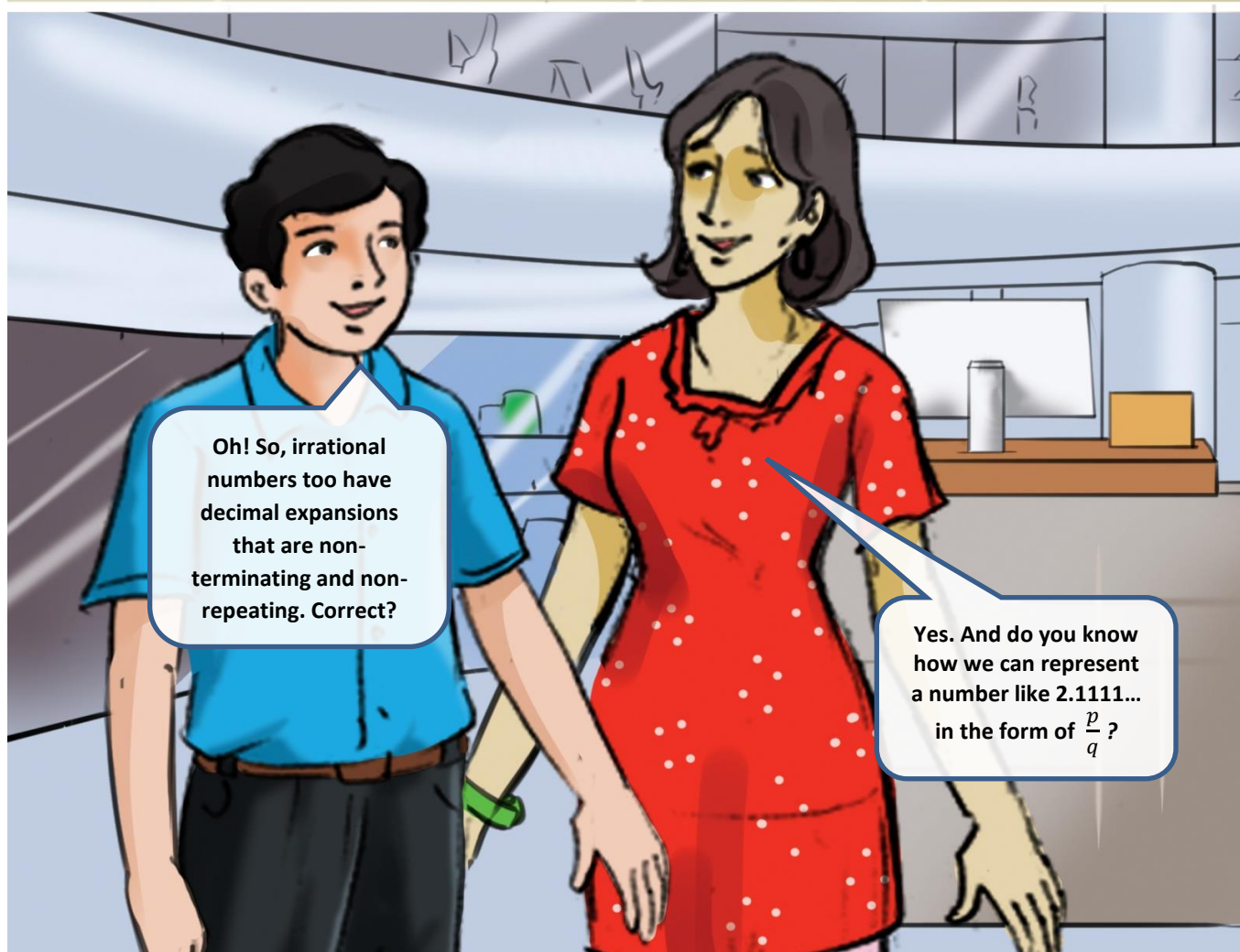
- 2 and 3
- 32 and 33
- 52 and 53
- 27 and 28

Krishna and Khushi are at the shopping mall to buy some things.



They decide to go separately to buy their things and meet there again after 20 minutes.







Not exactly, but I can try.

Let $x=2.1111\dots$

$10x=2.1111\dots\times 10= 21.1111\dots$

ATQ,

$10x-x=21.1111\dots-2.1111\dots=19$

$9x=19$

$x=\frac{19}{9}$

Am I right?

You are absolutely right. Looks like you have been working on your mathematical skills.

Thanks for the compliment.

SOLVE THESE

Q.9 Write decimal expansions of the following:

a) $\frac{22}{7}$

b) $\frac{55}{2}$

c) $\frac{44}{12}$

d) $\frac{45}{4}$

Q 10 Represent $3.\overline{532}$ in the form of $\frac{p}{q}$.

Q 11 Choose the correct option:

a) The decimal expansion of $\sqrt{7}$ is

i) of finite decimals

ii) 2.646

iii) repeating

iv) non terminating and non-repeating

b) The number 2.760098000760000098... is

i) A natural number

ii) Irrational number

iii) Whole Number

iv) Rational number

c) Irrational number between 2.3435553434... and 3.647593409403... is

i) 2.4563837828...

ii) 3.76343884394...

iii) 4.64367236345...

iv) 5.45672365878237...

d) If the decimal representation of a number is non-terminating and non-recurring, then the number is _____

i) A natural number

ii) Irrational number

iii) Whole Number

iv) Rational number

Q 12 Write two rational numbers between $\frac{1}{7}$ and $\frac{2}{7}$ in decimal.

Krishna and Khushi are playing chess in their living room.

I am sure that I am going to win. I'll start by moving my knight.

Hey Krishna, did you notice the knight's unique movement?

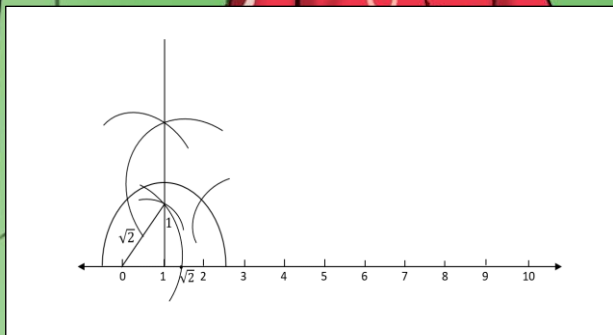
Unique?

Yes. If we join the points to where it goes, it forms a right-angled triangle.

This reminds me of Pythagoras' theorem and Pythagorean triplets.

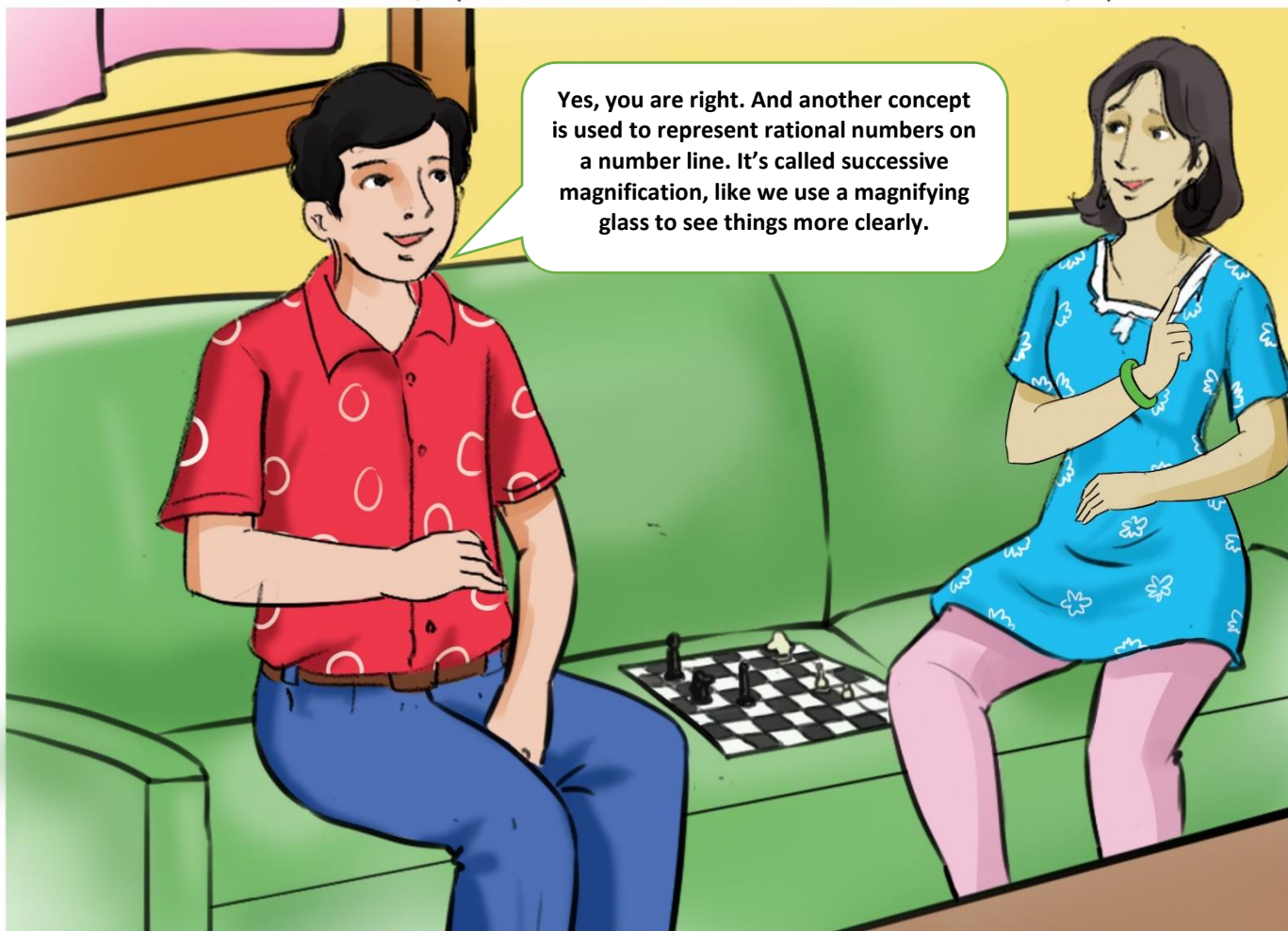
Do you know that this theorem plays a very important role in representing irrational numbers on number line?

Wow!! Yes, I know it is related to the representation of irrational numbers on the number line. We use Pythagorean triplets to find the length equivalent to the root of a given number.



Good! We can take the example of $\sqrt{2}$. To mark $\sqrt{2}$ on the number line, we have to follow some steps-

- At 1 unit on the number line draw a perpendicular of 1 unit.
- Now, connect the perpendicular to the 0-unit point on the number line.
- It becomes a right-angled triangle with 1 unit as base and perpendicular. So, by using the Pythagoras' theorem, we know that the hypotenuse is $\sqrt{2}$.
- Take the compass, measure the hypotenuse and draw an arc by keeping the needle at 0.
- The point that is cut by the arc on the number line is $\sqrt{2}$'s location on the number line.



This method finds rational numbers' accurate position on the number line.

We take out ten rational numbers between any two rational numbers until we mark the position of the given number. Like to mark 0.25, we take nine rational numbers between 0 and 1 like 0.1, 0.2, 0.3, 0.4, 0.5 till 0.9 and then we take nine rational numbers between 0.2 and 0.3 like 0.21, 0.22, 0.23, 0.24, 0.25 till 0.29. When see the number, we have to mark it.

Krishna and his family are waiting at the theatre for the movie to start.

I am excited to watch "URI The Surgical Strike" which is based on the military operation at the border.

There's half an hour left for the movie to start.

Then, let's play a game.

Okay, but what?

You find something related to maths in the movie; something on which the movie is based.

I got it. It's *Operation*, but the word '*operation*' and mathematical '*operation*' are different. It's more like an operation in a hospital.

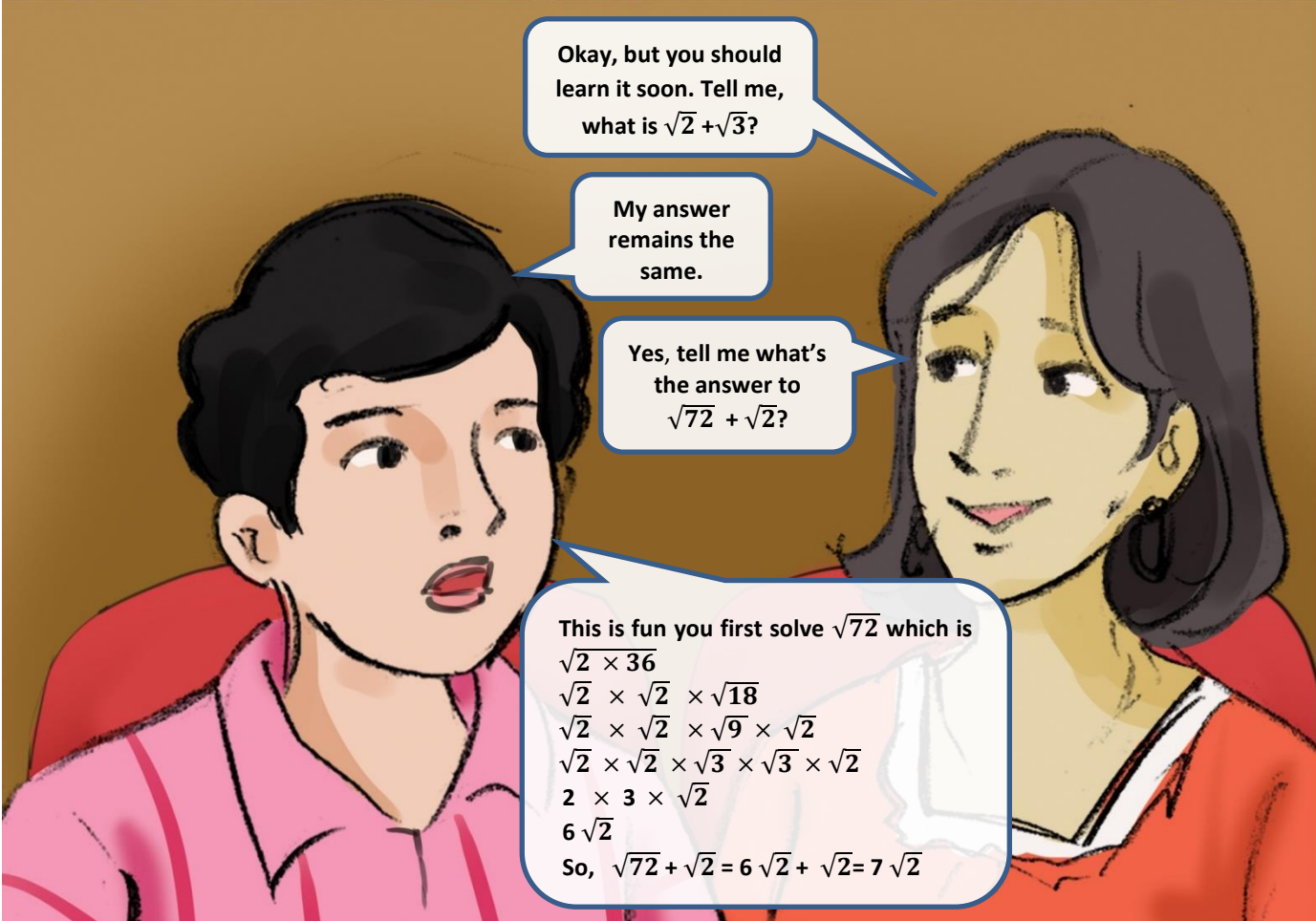


How so?

Like doctors operate on the human body with their tools; we use mathematical operations to operate on numbers. I have done a lot of operations with rational numbers.

Only rational numbers, not irrational?

I just learned it in school. I haven't solved many questions. But in my class, there was introduction of operations between rational and irrational numbers. They told us that sum and difference of a rational and an irrational number are always an irrational number like $\sqrt{2} + 3 = \sqrt{2} + 3$, $\sqrt{5} - 10 = \sqrt{5} - 10$ etc. We also learnt that the product or quotient of a non-zero rational and irrational number is irrational like $\sqrt{2}/3 = \sqrt{2}/3$, $3 \times \sqrt{2} = 3\sqrt{2}$ etc.

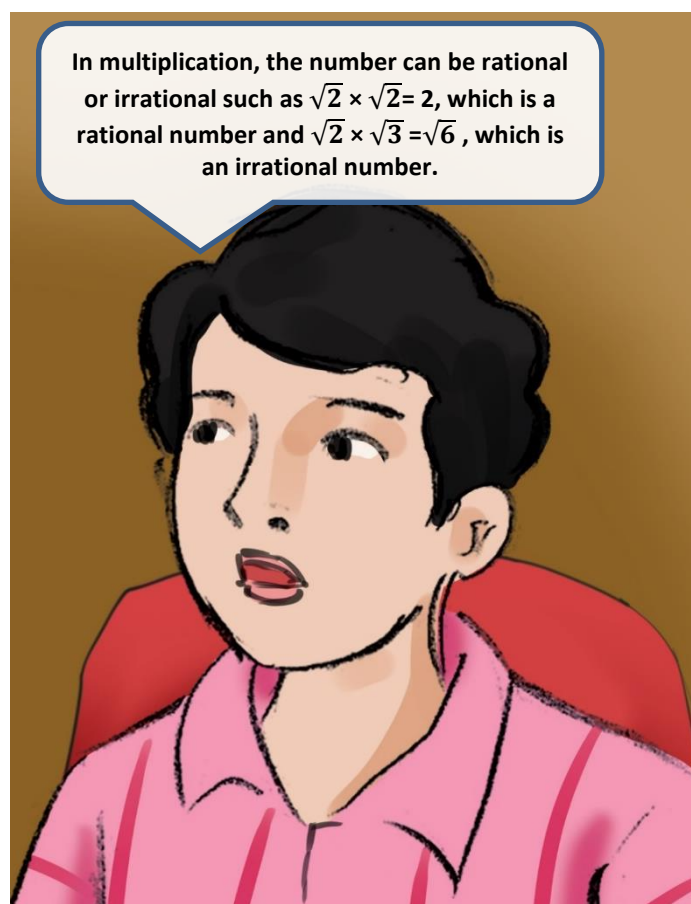
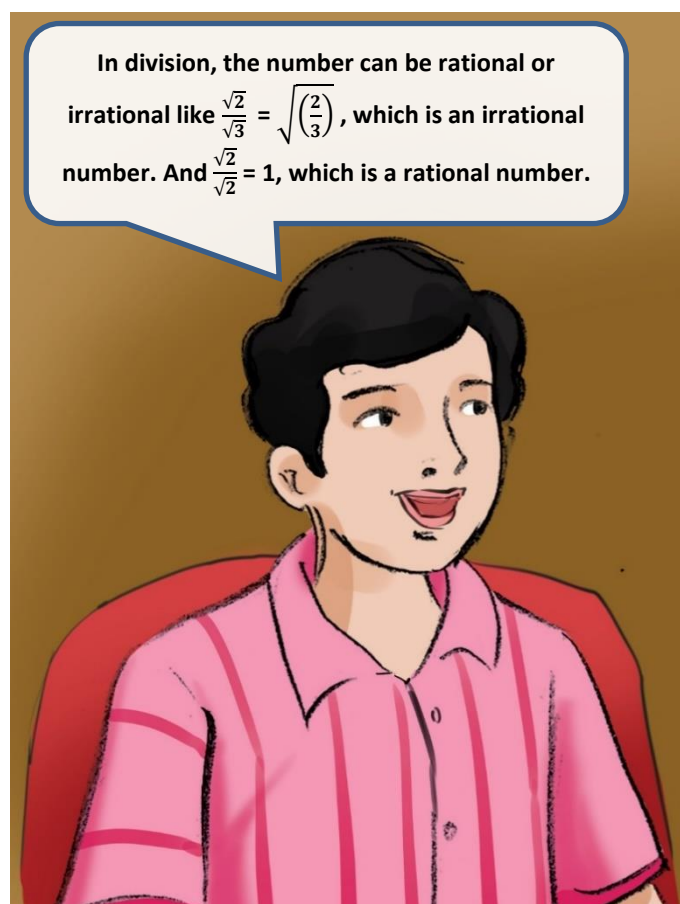


Okay, but you should learn it soon. Tell me, what is $\sqrt{2} + \sqrt{3}$?

My answer remains the same.

Yes, tell me what's the answer to $\sqrt{72} + \sqrt{2}$?

This is fun you first solve $\sqrt{72}$ which is
 $\sqrt{2} \times 36$
 $\sqrt{2} \times \sqrt{2} \times \sqrt{18}$
 $\sqrt{2} \times \sqrt{2} \times \sqrt{9} \times \sqrt{2}$
 $\sqrt{2} \times \sqrt{2} \times \sqrt{3} \times \sqrt{3} \times \sqrt{2}$
 $2 \times 3 \times \sqrt{2}$
 $6\sqrt{2}$
So, $\sqrt{72} + \sqrt{2} = 6\sqrt{2} + \sqrt{2} = 7\sqrt{2}$





Right. But there is more to learn. There are many laws in mathematics like associative law, commutative law and distributive law of multiplication over addition. Check for the laws that are satisfied by irrational numbers.



Yes, I'll try that. The irrational numbers are commutative under multiplication and addition. In division, $\frac{\sqrt{2}}{\sqrt{3}} \neq \frac{\sqrt{3}}{\sqrt{2}}$ and in subtraction, $\sqrt{2} - \sqrt{3} \neq \sqrt{3} - \sqrt{2}$. They are associative under addition and multiplication, as in multiplication $(\sqrt{2} \times \sqrt{3}) \times \sqrt{5} = \sqrt{2} \times (\sqrt{3} \times \sqrt{5})$ and the same in addition. The irrational numbers also fulfil the distributive property. Example -> $5\sqrt{2} + 10\sqrt{3} = 5(\sqrt{2} + 2\sqrt{3})$



TRY THESE

Q 13. Solve the given questions:

- a) $\sqrt{2} + \sqrt{18}$
- b) $\sqrt{5} - 25$
- c) $\sqrt{2} \times \sqrt{32} + 8$
- d) $\sqrt{2} + \frac{\sqrt{6}}{\sqrt{3}}$

Q 14. State whether True or False:

- a) Product of two rational numbers is a real number.
- b) Sum of a rational and an irrational number can be rational or irrational.
- c) Irrational numbers are not commutative under addition and multiplication.
- d) In subtraction of a rational and irrational number, the result is always an irrational number.
- e) $\sqrt{2} - \sqrt{4}$ is a rational number.

Q 15. Match the Following:

Column A	Column B
a) $\sqrt{2} + \sqrt{3} + \sqrt{7}$	1) Associative property
b) $22/7$	2) Irrational number
c) $\sqrt{2} + \sqrt{3} = \sqrt{3} + \sqrt{2}$	3) Rational number
d) $(\sqrt{3} + \sqrt{2}) + \sqrt{5} = \sqrt{3} + (\sqrt{2} + \sqrt{5})$	4) Commutative property

Krishna and his family are sitting and watching television.

I love watching this quiz show.
The people win money with their
wisdom. They can win up to
₹ 1,00,00,000.

It increases our
knowledge too.

Krishna is thinking something while watching TV

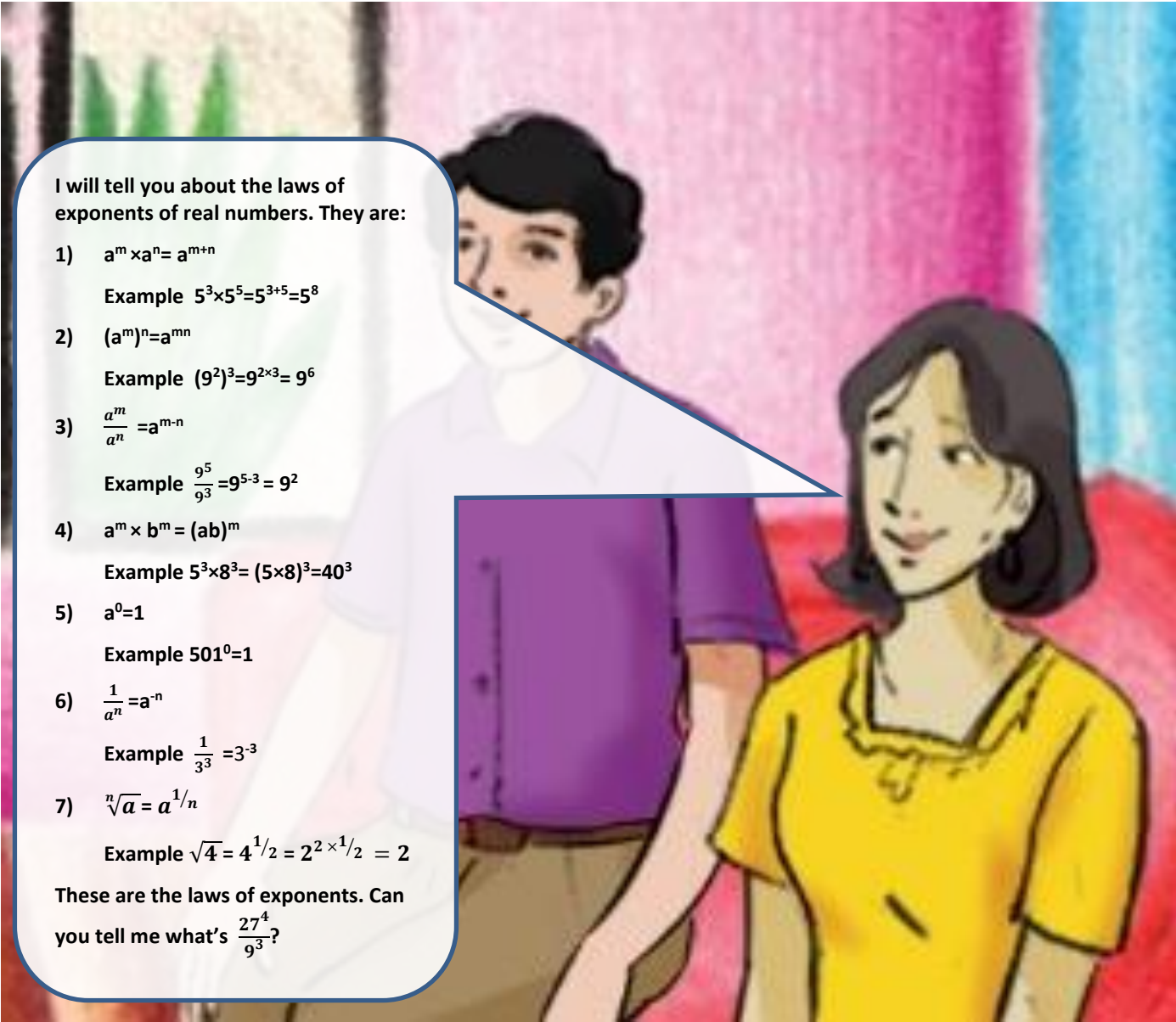


₹ 1 crore is a big amount and if we write it every time then
it will become very complex, so how can a person write
such large numbers?

Interesting question. People use
exponents to write big numbers
easily like we write $100=10^2$,
 $1000=10^3$, $10000=10^4$ etc. Similarly,
 $1,00,00,000=10^7$

It is the way we write such
long numbers.





I will tell you about the laws of exponents of real numbers. They are:

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

Example $5^3 \times 5^5 = 5^{3+5} = 5^8$

2) $(a^m)^n = a^{mn}$

Example $(9^2)^3 = 9^{2 \times 3} = 9^6$

3) $\frac{a^m}{a^n} = a^{m-n}$

Example $\frac{9^5}{9^3} = 9^{5-3} = 9^2$

4) $a^m \times b^m = (ab)^m$

Example $5^3 \times 8^3 = (5 \times 8)^3 = 40^3$

5) $a^0 = 1$

Example $501^0 = 1$

6) $\frac{1}{a^n} = a^{-n}$

Example $\frac{1}{3^3} = 3^{-3}$

7) $\sqrt[n]{a} = a^{1/n}$

Example $\sqrt{4} = 4^{1/2} = 2^2 \times 1/2 = 2$

These are the laws of exponents. Can you tell me what's $\frac{27^4}{9^3}$?



Yes. $\frac{27^4}{9^3} = \frac{(3^3)^4}{(3^2)^3}$

$$= \frac{3^{3 \times 4}}{3^{2 \times 3}}$$

$$= \frac{3^{12}}{3^6}$$

$$= 3^{12-6}$$

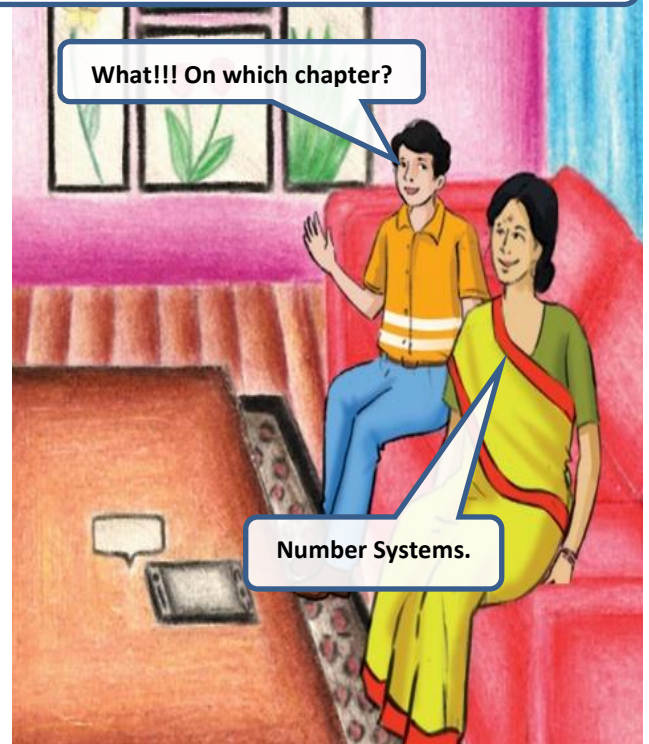
$$= 3^6$$

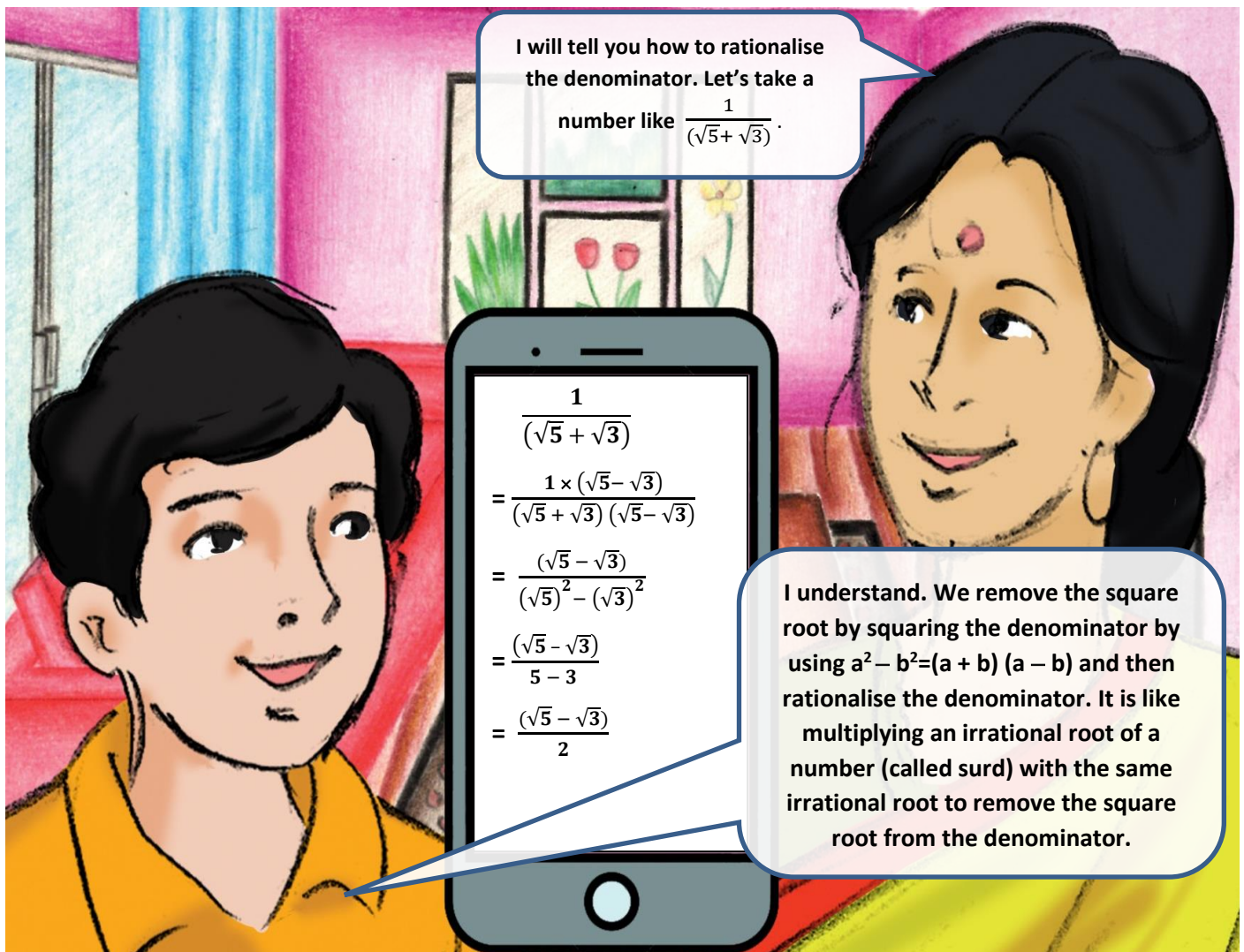
Am I right?



Correct. I believe you will excel in your class.

The phone rings and a message is received on Shanti's mobile while she and Krishna are sitting on the sofa.





USING THE LAWS

Q 16. Simplify the expressions and give the answer in power:

a) $\frac{2^{35}}{2048}$ b) $\frac{27}{81}$ c) $\frac{7^9}{49}$ d) 10935^0 e) $(\sqrt{2})^4$

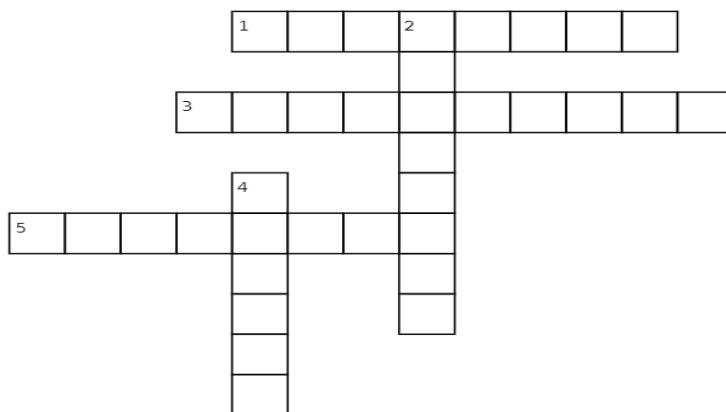
Q 17. Simplify the expression:

$$\left(\frac{4}{9}\right) \times \left(\frac{32}{243}\right)^{-10}$$

Q 18. Rationalize the denominators:

a) $\left(\frac{\sqrt{7} + \sqrt{5}}{\sqrt{13} + \sqrt{5}}\right)$ b) $\left(\frac{\sqrt{5} + \sqrt{3}}{\sqrt{3}}\right)$ c) $\frac{\sqrt{7} + \sqrt{2}}{\sqrt{7}} + \frac{7 + \sqrt{14}}{1}$

Q 19. Crossing the crossword



Down :

2. Which type of number is denoted by Z.
4. Every point on the number line represents _____ number.

Across :

1. Every recurring decimal expansion is a _____ number.
3. π is a /an _____ number.
5. Between any 2 rational numbers there are _____ rational numbers.

Q 20. Word Search:

- a) All the counting numbers are called _____ numbers.
- b) $\sqrt{72}$ is a _____ number.
- c) Which set of numbers is denoted by R?
- d) The set of negative and non-negative natural numbers with 0 is called _____.
- e) $\frac{\sqrt{2}}{\sqrt{2}}$ is a _____ number.

I	R	R	A	T	I	O	N	A	L	I
R	B	V	S	J	J	S	X	Z	V	N
A	C	C	N	A	T	U	R	A	L	T
T	D	D	W	H	O	L	E	V	C	E
I	E	E	D	W	R	Q	C	H	L	G
O	D	S	E	H	E	X	X	F	K	E
N	D	N	M	I	A	N	K	Z	J	R
A	F	Y	B	O	L	B	I	P	Y	S
L	k	H	T	T	L	A	C	E	O	U

SUMMARY

1. A number a is rational if it can be written in the form of $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
2. A number b is called irrational if it can't be written in the form of $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
3. Rational numbers have terminating or non-terminating recurring decimal expansions while the irrational numbers have a non-terminating non-recurring decimal expansion.
4. The collection of both the sets of rational and irrational numbers is called real number.
5. There is a unique real number corresponding to every point on the number line. Also, conversely, there is a unique point on the number line corresponding to each real number.
6. In subtraction, the number can be rational or irrational as $\sqrt{2} - \sqrt{2} = 0$ which is rational. $\sqrt{3} - \sqrt{2}$ is an irrational number.

In division, the number can be rational or irrational like $\frac{\sqrt{2}}{\sqrt{3}} = \sqrt{\frac{2}{3}}$, which is an irrational number. And $\frac{\sqrt{2}}{\sqrt{2}} = 1$ which is a rational number.

In multiplication, the number can be rational or irrational such as $\sqrt{2} \times \sqrt{2} = 2$, which is a rational number and $\sqrt{2} \times \sqrt{3} = \sqrt{6}$ which is an irrational number.

7. The laws of exponents of real numbers are:

- i) $a^m \times a^n = a^{m+n}$
Example $\rightarrow 5^3 \times 5^5 = 5^{3+5} = 5^8$
- ii) $(a^m)^n = a^{mn}$
Example $\rightarrow (9^2)^3 = 9^{2 \times 3} = 9^6$
- iii) $\frac{a^m}{a^n} = a^{m-n}$
Example - $\frac{9^5}{9^3} = 9^{5-3} = 9^2$
- iv) $a^m \times b^m = (ab)^m$
Example $\rightarrow 5^3 \times 8^3 = (5 \times 8)^3 = 40^3$
- v) $a^0 = 1$
Example $\rightarrow 501^0 = 1$
- vi) $\frac{1}{a^n} = a^{-n}$
Example $\rightarrow \frac{1}{3^2} = 3^{-2}$
- vii) $\sqrt[n]{a} = a^{1/n}$
Example $\rightarrow \sqrt{4} = 4^{1/2} = 2^{2 \times 1/2} = 2$

8. We remove the square root by squaring the denominator by using $a^2 - b^2 = (a+b)(a-b)$ and then rationalise the denominator.

GLOSSARY

- 1) **Natural numbers**- The numbers we usually count are called natural numbers, denoted by N.
- 2) **Whole numbers**- Natural numbers including zero are whole numbers denoted by W.
- 3) **Integers**- Whole numbers along with negative natural numbers are called integers.
- 4) **Rational numbers**- Numbers such as $\frac{25}{4}$, $\frac{1}{2}$ are called rational numbers, denoted by Q, which can be expressed in the form of $\frac{p \text{ (numerator)}}{q \text{ (denominator)}}$ where p and q are integers and q is not equal to 0.
- 5) **Irrational number**- A number b is called irrational if it can't be written in the form of $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
- 6) **Real numbers**- The collection of rational and irrational numbers are called real numbers.
- 7) **Rationalisation**- The process of reducing irrational root of a given number in denominator to a rational form after multiplying it by a suitable irrational root of a given number is known as rationalisation.
- 8) **Surd**- The irrational root of a number is called surd.

BIBLIOGRAPHY

MATHEMATICS- NCERT Textbook for Class IX

SOLUTIONS

Q.1 a) FALSE b) TRUE c) TRUE d) TRUE

Q.2 a) Rational number, Integer, Natural number, Whole number

b) Integer, Rational number c) Integer, Rational number

d) Rational number e) Whole number, Rational number, Integer

Q.3 i) a ii) a

Q 4.	Rational Numbers	Irrational Numbers
	$\frac{22}{7}, \frac{34}{56}, (\sqrt{3})^2, \sqrt{32} \times \sqrt{2}, 34, \sqrt{36}$	$\sqrt{54}, 2 + \sqrt{2}, \pi, \sqrt{2}$

Q 5. $\sqrt{3}, \sqrt{2}$

Q 6. a) Rational b) Real number c) R d) p/q, q

Q 7 a) False b) True c) False d) False

Q 8. a) $\frac{5}{2}$ b) $\frac{65}{2}$ c) $\frac{105}{2}$ d) $\frac{55}{2}$

Q9. a) $3.\overline{142857}$ b) 27.5 c) $3.\overline{6}$ d) 11.25

Q 10. Let $x = 3.\overline{532}$

$$1000x = 3.\overline{532} \times 1000 = 3532.\overline{532}$$

ATQ,

$$1000x - x = 3532.\overline{532} - 3.\overline{532}$$

$$999x = 3529$$

$$x = \frac{3529}{999}$$

Q 11 a) IV b) II c) I d) II

Q 12. a) 0.156 b) 0.178

Q 13. a) $4\sqrt{2}$ b) $\sqrt{5} (1 - 5\sqrt{5})$ c) 16 d) $2\sqrt{2}$

Q 14. a) True b) False c) False d) True e) False

Q 15. a) 2 b) 3 c) 4 d) 1

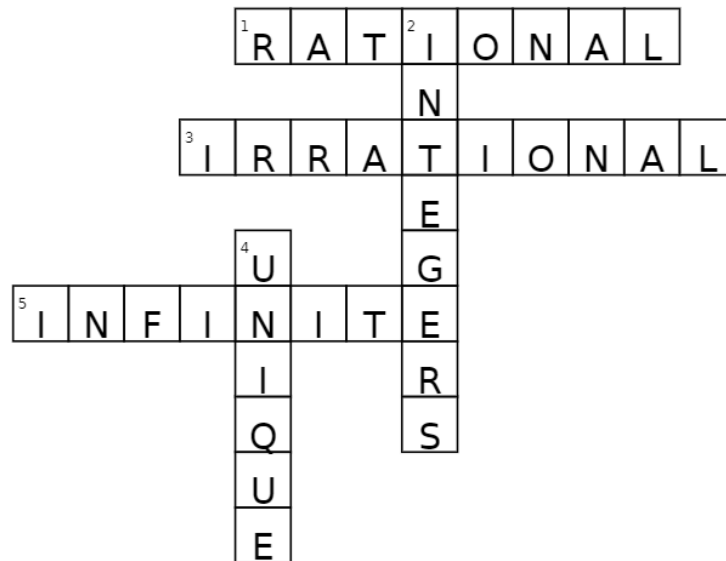
Q 16. a) 2^{24} b) 3^{-1} c) 7^7 d) 1 e) $2^2=4$

Q 17. $\left(\frac{3}{2}\right)^{48}$

Q 18. a) $\frac{(\sqrt{91}-\sqrt{35}+\sqrt{65}-5)}{8}$ b) $\frac{(\sqrt{15}+3)}{3}$ c) $\frac{(56+8\sqrt{14})}{7}$

Q 19.

CROSSWORD



Down :

2. Which type of number is denoted by Z.
4. Every point on the number line represents _____ number.

Across :

1. Every recurring decimal expansion is a _____ number.
3. π is a /an _____ number.
5. Between any 2 rational numbers there are _____ rational numbers.

Q 20.

I	R	R	A	T	I	O	N	A	L	I
R	B	V	S	J	J	S	X	Z	V	N
A	C	C	N	A	T	U	R	A	L	T
T	D	D	W	H	O	L	E	V	C	E
I	E	E	D	W	R	Q	C	H	L	G
O	D	S	E	H	E	X	X	F	K	E
N	D	N	M	I	A	N	K	Z	J	R
A	F	Y	B	O	L	B	I	P	Y	S
L	k	H	T	T	L	A	C	E	O	U

- a) Natural b) Irrational c) Real d) Integers e) Rational

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ACKNOWLEDGEMENT

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(Secretary, Department of School Education and Literacy, Ministry of Education)

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(I.A.S., Chairman, C.B.S.E.)

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