

# UNDERSTANDING NUMBER

## MATHS FOR UNDERSTANDING

AGEM

# WHAT IS THE ROLE OF MATHEMATICS IN MODERN LIFE?



Start:00:00 End:00:36

## REVIEWING THE VIDEO

QUESTION 1 : THE SPEAKER SAYS THAT,"MATHEMATICS YIELDS CERTAIN KNOWLEDGE ABOUT THE UNDERLYING REALITIES OF THE MATERIAL WORLD". WHICH ONE OF THE FOLLOWING CHOICES IS AN EXAMPLE OF WHAT THE SPEAKER SAYS

- ① My mother loves me.
- ② An apple falls from a tree to the ground because of gravity
- ③ We should respect the feelings of others.
- ④ Corruption is bad for our country.

# HOW RECENT IS THE USE OF MATHEMATICS?



Start:00:39 End:01:41

## REVIEWING THE VIDEO

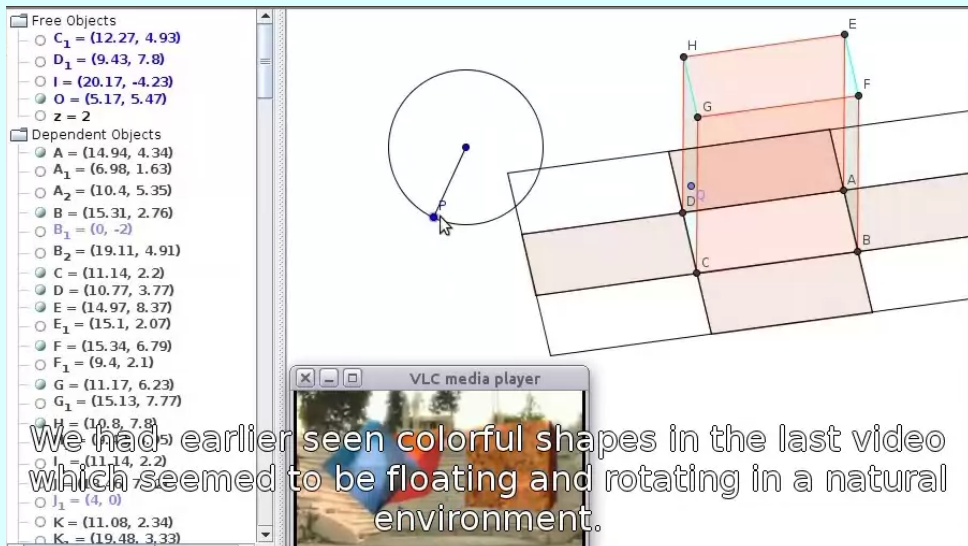


Source: [http://www.dailymotion.com/video/x1uc4rg\\_bbc-the-story-of-maths-1-of-4-the-language-of-the-universe\\_tv](http://www.dailymotion.com/video/x1uc4rg_bbc-the-story-of-maths-1-of-4-the-language-of-the-universe_tv)

**QUESTION 2 : IN THE PICTURE ABOVE, THE BLUE DIAMOND SHAPE THAT YOU SEE IS:**

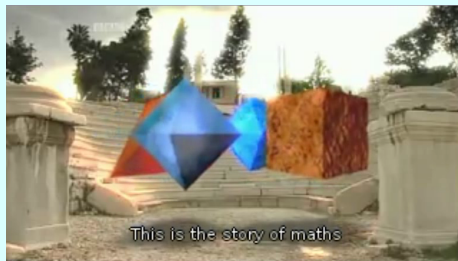
- ① A balloon floating above the ground.
- ② A solid object suspended by a wire.
- ③ An image created using mathematics and added to the video
- ④ An image created by a magician

# CAN WE USE MATHEMATICS TO CREATE FILMS?



We had earlier seen colorful shapes in the last video which seemed to be floating and rotating in a natural environment.

# REVIEWING THE VIDEO



QUESTION 3 : TO WHAT EXTENT DID THE LAST VIDEO HELP YOU UNDERSTAND HOW THE COLORFUL OBJECTS IN THE PICTURE WERE CREATED MATHEMATICALLY

- 1 Not at all
- 2 A little bit
- 3 Somewhat
- 4 Quite a bit
- 5 Completely

# DRAWING CONCLUSIONS

## **The need for measurement and calculation**

The videos that we have seen remind us that modern life demands measurement and calculation relating to different types of quantities, with greater ability from all of us today than at any other time in the past.



# WHAT IS MATHEMATICS?

ARITHMETIC RELATES TO THE STUDY OF QUANTITIES.

ALGEBRA RELATES TO THE STUDY OF STRUCTURE.

GEOMETRY TO THE STUDY OF SPACE.

ANALYSIS TO THE STUDY OF CHANGE.

# OUR GOALS FOR THE FULL COURSE

## THE EXPECTATIONS FOR THIS COURSE

We expect to develop the following four primary capacities in each of you during this course:

**OBSERVE:** To observe and measure competently.

**CALCULATE:** To calculate correctly and reliably.

**INFER:** To be able to apply previous knowledge to new situations.

**REPORT:** To be able to describe the results of your calculations in written and spoken English.

## OUR GOAL FOR THIS LESSON

### GOAL OF THIS LESSON

The goal of this lesson is:

- 1 Why do we not just observe quantities and manipulate quantities in our memory instead of using mathematics?

# ESTIMATING QUANTITY

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

TAKE A CAREFUL LOOK AT THESE TWO PICTURES



**Picture A**



**Picture B**

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 4

Which picture had more peanuts?

- 1 The picture on the left called **Picture A**
- 2 The picture on the right called **Picture B**

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 5

How many peanuts were there in the picture on the left called **Picture A**

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 6

How many peanuts were there in the picture on the right called **Picture B**

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?



## ANOTHER EXERCISE

Observe this picture carefully for one minute



# ESTIMATING QUANTITY- AN EXERCISER

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 7

How many coins did not have a perfectly round edge?

- ① One
- ② Two
- ③ Three
- ④ Four
- ⑤ Five or more

# ESTIMATING QUANTITY- AN EXERCISER

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

QUESTION 8 HOW MANY COINS HAD A VALUE WRITTEN ON THEM I.E. THE TAILS WERE UP?

- 1 One
- 2 Two
- 3 Three
- 4 Four
- 5 Five or more

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 9

How many coins had the number 20 visible?

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 10

How many coins had the number 10 visible?

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 11

How many coins showed a human head?

# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## WHAT DID WE OBSERVE?

- 1 When the number of peanuts were 3 almost everyone could remember the right number.
- 2 When the categories were small e.g. the round coins versus the rest most could remember.
- 3 As time wore on and the questions got more detailed less people could remember.

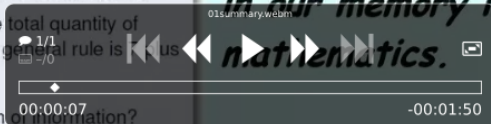
# ESTIMATING QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## WHY DOES THIS HAPPEN?

- 1 For a few seconds focus on listening, smelling, seeing everything around you. Then ask yourself if you would like to be able to remember all that you heard, saw and smelled, for the longer time.
- 2 Our Working Memory is designed to get rid of the information we perceive - normally within 20 to 30 seconds - unless there is reason to remember it.
- 3 Working Memory also limits the total quantity of information we remember. The general rule is  $7 \pm 2$  or minus 2 **unique** items.
- 4 However, what is a **unique** item of information?

*The goal we are working on is to explore why we cannot merely observe and manipulate quantities in our memory instead of using mathematics.*



# REMEMBERING A SPOKEN QUANTITY- AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 12 AN EXPERIMENT ?

- 1 I shall speak out a 4 digit number to you once only.
- 2 Please do not write down anything
- 3 When I have finished I shall ask you to type in the number I spoke.
- 4 Typing the number before I activate your keyboard will not allow your estimate to be captured. We expect to develop the following four primary capacities in each of you during this course:



# REMEMBERING A SPOKEN QUANTITY - AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 13 AN EXPERIMENT ?

- 1 I shall speak out an 8 digit number to you once only.
- 2 Please do not write down anything
- 3 When I have finished I shall ask you to type in the number I spoke.
- 4 Typing the number before I activate your keyboard will not allow your estimate to be captured.

# REMEMBERING A SPOKEN QUANTITY - AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 14 AN EXPERIMENT ?

- 1 I shall speak out a 9 digit number to you once only.
- 2 Please do not write down anything
- 3 When I have finished I shall ask you to type in the number I spoke.
- 4 Typing the number before I activate your keyboard will not allow your estimate to be captured.

# REMEMBERING A SPOKEN QUANTITY - AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## QUESTION 15 AN EXPERIMENT ?

- 1 I shall speak out a 12 digit number to you once only.
- 2 Please do not write down anything
- 3 When I have finished I shall ask you to type in the number I spoke.
- 4 Typing the number before I activate your keyboard will not allow your estimate to be captured.

# REMEMBERING A SPOKEN QUANTITY - AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## REFLECTING ON THOSE EXERCISES?

- ➊ More people got it right when the number of digits was small.
- ➋ There was a large variation in the digits recalled when the number of digits was large.
- ➌ In this last number the items of information that had to be remembered were only two:
  - ➊ The initial number
  - ➋ The pattern i.e. increase in each number
- ➍ Hence, the answer to the question we raised about what is a unique item of information, is:
  - ➊ it can be a single symbol
  - ➋ It can be a group of identical symbols.

# REMEMBERING A SPOKEN QUANTITY - AN EXERCISE

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

## COMING TO A CONCLUSION

- 1 We can expect to be able to remember only about 4 - give or take a few for individual differences - unique patterns in an image
- 2 Even that memory is liable to disappear within 30 seconds unless we reinforce that memory in some way.
- 3 Therefore we cannot depend on being able to just see and manipulate quantities in our memory instead of using mathematics.
- 4 If we cannot depend on memory we have to use some way of representing information on a more permanent basis.
- 5 We could draw a picture but our artistic skills may not be that great. Hence, we use simple drawings such as symbols. We will examine the type of symbols mankind has used through the ages.

# DID WE ACHIEVE OUR GOAL?

GOAL 1: WHY DO WE NOT JUST SEE AND MANIPULATE QUANTITIES IN OUR MEMORY INSTEAD OF USING MATHEMATICS?

OUR FIRST GOAL IS STATED ABOVE. PLEASE TYPE IN A NUMBER FROM 1 TO 5 WHICH TELLS US THE EXTENT TO WHICH THIS GOAL WAS ATTAINED IN YOUR CASE.

- ① This means you do not believe that this goal was attained in your case
- ②
- ③
- ④
- ⑤ This means the goal was fully attained in your case.