History of Mathematics : History of Math Symbols

http://www.youtube.com/watch?v=8jXzLkpYCZE

1. Which number systems do you know?
   .....
2. How are they different from each other?
   .....

Listening. Decide whether the statements are T or F, correct the false ones.

1. People use mathematical symbols to communicate.
2. Greek and Roman number systems are close to each other.
3. Almost all Romans spoke Greek.
4. 596 is not a sensible number.
5. The Greeks were unable to develop a unified system of counting.
6. In the Roman system, number 9 can be expressed only in one way.
7. Large Roman numbers are quite complex.
8. Operators indicate operations on numbers.
9. Operations are not sufficient for doing mathematics.
10. Calculus symbols were developed by Newton and other clever people in Britain and America.
11. dy is not an operation, it is an object.
12. We use symbols even if we do not understand them.

UNIT 4

FOCUS A

SOME MATHEMATICAL NOTATION

The use of mathematical symbols arises from some simple physiological and psychological principles. Suppose you hold this text at normal reading distance and, keeping your eyes fixed on one word near the centre of the page, try to determine how much of the page is really sharp and clear. Probably you will find it is about the area that could be covered by a 25 ¢ piece. Hence, if you wish to read the sentence,

The arithmetic mean of a population is obtained by adding together all the values in the population and dividing the resulting sum by the number of such observations.

your eyes would have to start at the left of the first line, continually shift aim and focus as they scanned that line, return to the left of the second line, and so to the end of the sentence. Physical effort is really involved, though we are rarely directly conscious of it, and this effort is one of the factors which contribute to the literal fatigue resulting from careful study.

To reduce this fatigue and increase the amount of effective thinking that can be done in a given time, the mathematician uses more compact symbols. He starts replacing the entire phrase "the arithmetic mean of a population" by the symbol "μ" which is a lower case Greek „m", named mu. By a certain consistency of selection of such symbols in statistics, we will usually associate a Greek letter with a characteristic of a population. Here the Greek mu is related to the initial letter of *mean*. Next, we replace the idea "is obtained by" by the essentially equivalent idea "is equal to" and then replace it by the long-familiar symbol, =. Now we let X represent any value in our distribution but, in order to keep the individual values clearly in mind, we place the serial number of the observation as a subscript. We replace the phrase, "the number of such observations", by "N". Now we can replace "adding together all the values in our population" by the symbols:

$$X_1 + X_2 + \ldots + X_i + \ldots + X_N$$

where the row of dots (...) replace the missing values and the subscript $_i$ stands for any subscript in our set. Now we can replace the phrase, "and dividing the resulting sum by", by writing the sum over a horizontal line and the quantity we are going to divide by, N, under it, or we can put the sum in parentheses, to indicate that something is going to be done with it, then write a slanting line (formally known as a solidus!), followed by the N. Thus our long sentence becomes

$$\mu = \frac{X_1 + X_2 + \ldots + X_i + \ldots + X_N}{N}$$
$$= \left(X_1 + X_2 + \ldots + X_i + \ldots + X_N\right) / N$$

This is a considerably more compact expression, you must agree. But even this does not satisfy us. This Greek letter idea has merit. Suppose we replace the phrase, "adding together", by the equivalent word, "summing", and then substitute for it the upper case Greek

"S", Σ, or sigma. Then we follow the Σ by X_i and under the Σ we write "$i = 1$" and over it, N. Now we can write

$$\mu = \frac{\sum_{i=1}^{N} X_i}{N}$$

or

$$\mu = \sum_{i=1}^{N} X_i \Big/ N$$

Now we have a pretty compact expression. But we can go even farther in cases where we are sure no ambiguity can arise by eliminating the designations above and below the sigma, understanding that this means that we add all N of the values. Thus we have

$$\mu = \frac{\sum X}{N} \quad \text{or} \quad \mu = \sum X / N$$

Now we have a very compact expression. Yet, with the aid of our "code book" which we started when we described the meaning of each symbol, we can translate the compact expression directly back to the full directions in English.

Notice:

- *hence* – is often used in a formal style and means "*that is the reason or explanation for; therefore*"
- irregular comparison of the adjective *far*: *farther – farthest* (of distance only); *further – furthest* (of distance and time)
- the pronunciation and the stress of the word *fatigue* [fə'ti:g]

Exercises

1. ***In the text above find all the -ing forms and say what are their grammatical meanings and positions in sentences*** *(e.g. as a subject, after a preposition, in a construction with "of", describing a noun, a separate sentence etc.).*

2. ***Put the verbs in brackets into the correct form (-ing form or infinitive):***
   a) I am looking forward to (see) you.
   b) I arranged (meet) them here.
   c) I wish (see) the professor.
   d) It's no use (wait).
   e) I tried (persuade) him (agree) with your proposal.
   f) Stop (talk); I am trying (finish) a letter.
   g) Would you mind (lend) me $ 55. I forgot (cash) a cheque.
   h) I suggest (telephone) the hospitals before (ask) the police (look) for him.
   i) After (hear) the conditions I decided (not enter) for the competition.
   j) He postponed (make) a decision till it was too late (do) anything.
   k) At first I enjoyed (listen) to him but after a while I got tired of (hear) the same presentation again and again.
   l) It is usually easier (learn) a subject by (read) books than by (listen) to lectures.

3. ***Put the verbs in brackets into the correct form (-ing form or infinitive):***

a) I'll always remember (meet) you for the first time.
b) Don't forget (go) to the post office and (send) my letter.
c) I'll never forget (see) the President.
d) Please remember (write) a message before you go to bed.
e) You should stop (smoke). It's dangerous.
f) I will stop here (find) a hotel .
g) I regret (tell) him what happened yesterday, during the Department's meeting.
h) We regret (inform) you that your article would be published later.
i) What would you like (do) tomorrow?
j) Students enjoy (solve) these equations.
k) The boy was ashamed of (tell) a lie.

4. ***Give synonyms and antonyms to the following verbs included in the text at the beginning of the unit. Can you find any of these synonyms or antonyms in the same text?***

to arise (from), to hold, to determine, to involve, to contribute, to reduce, to replace

5. ***Read out the following:***

a) $1 \leq i \leq m$
b) $(a+b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \ldots b^n$
c) $x \leq \sqrt[3]{\frac{33}{4}} \approx 2.02$
d) $\frac{10!}{3!2!5!} = 2{,}520$

6. ***Rewrite these expressions into mathematical symbols:***

a) Four and seven is eleven _____
b) Four from eleven leaves seven _____
c) *a* minus *b* is equal to *c* _____
d) Eleven diminished by four is equal to seven _____
e) Once one is one _____
f) Twice two is four _____
g) Four times four is sixteen _____
h) *a* multiplied by *b* equals *c* _____
i) *a* plus *b* over *a* minus *b* is equal to *c* plus *d* over *c* minus *d* _____
j) one third _____
k) a half _____
l) Four and five sevenths _____
m) 0 point 0 0 two _____
n) Three squared _____

o) The second power of five _____

p) Five cubed _____

q) Five to the power three _____

r) Eight is the third power of two _____

s) *a* to the minus tenth power _____

t) The square root of four is two _____

u) The cube root of twenty-seven is three _____

v) The fifth root out of *a* to the power seven _____

w) The ratio of one to two _____

x) Twenty is to five as sixteen is to four _____

y) The ratio of *a* to *b* is *c* _____

z) The product of the sum and difference of two quantities is equal to the difference of their squares _____

aa) M is equal to R sub one multiplied by *x* minus P sub one round brackets opened, *x* minus *a* sub one round brackets closed, minus P sub two, round brackets opened, *x* minus *a* sub two, round brackets closed _____

Mathematical notation Qs.

Adapted from Rozšiřující materiály pro výuku anglického jazyka, Křepinská, Houšková, Bubeníková, Matfyzpres 2006

Read the text and decide whether the statements are true or false.

a] Mathematical symbols are used because they are convenient both from physiological and psychological perspective.

b] If you keep your eyes fixed on one word, other words become blurred.

c] Much fatigue due to study results from our ignorance of physical effort needed for reading.

d] A lower case Greek mu can replace the whole phrase.

e] The symbol = means both "is obtained by" and "is equal to".

f] The serial number as a subscript can replace X.

g] The sum over a horizontal line can be replaced by a sum preceded by a slanting line.

h] By eliminating the designations below and above sigma, confusion can arise in some cases.