MATHEMATICS

NUMBERS

I. How do you say the following numbers? Choose the correct option.

1. The year 2005:
   a) twenty hundred and five
   b) two thousand and five
   c) twenty-five
   d) twenty hundred five

2. £ 1 = CZK 29.78
   a) twenty-nine point seven eight Czech crowns to the pound
   b) twenty-nine seventy-eight Czech crowns for a pound
   c) one pound equalling Czech crowns twenty nine point seven eight
   d) one pound making twenty-nine point seven eight Czech crowns

3. The period from about 1994 to about 1996:
   a) the midnineties
   b) the medium nineties
   c) the middling nineties
   d) the midway nineties

4. Seven correct answers in a test of ten items. The result is:
   a) seven over ten right
   b) seven out of ten right
   c) seven on ten right
   d) seven right over ten

5. The dimensions of a rectangle 3 metres in length and 2 metres in width:
   a) three for two
   b) three by two
   c) three times two
   d) three to two

6. The result of an opinion survey:
   a) One of ten people thin that…
   b) One in ten people think that…
   c) One to ten people think that…
   d) One over ten people think that…

7. Approximately six:
   a) nearly six
   b) six-ish
   c) sixy
   d) sixer

8. At football, Germany 0, Brazil 0:
   a) Germany oh, Brazil oh
   b) Germany zero, Brazil zero
   c) Germany nil, Brazil nil
   d) Germany and Brazil love

9. 3 cm^3:
   a) three centimetre cubes
   b) three cubic centimetres
   c) three cubed centimetres
   d) three centimetric cubes

10. 3:2 as a ratio:
    a) three over two
    b) three under two
    c) three to two
    d) three at two

A $10m loan:
a) a ten-million-dollars loan
b) a ten-million-dollar loan
c) a ten millions of dollars loan
d) a loan of ten million dollar

Remember:

A 24/7 ("twenty-four seven") business is one that operates 24 hours a day seven days a week.

10m is 10 million

10bn is 10 billion (a billion = thousand million)

1 ½ hours is one and a half hours or an hour and a half (or ninety minutes)

The period from January to June is six months (not half a year).

ADDITION AND SUBTRACTION

NUMBERS

Read the text and put the paragraphs into the right order.

A

In every number each digit has a certain *place value*, and the position of a digit in a number gives the digit its value. From right to left these values are units, tens, hundreds, thousands, ten thousands, and so on. For example, in the four-digit number 9,547, the digit 7 has a value of 7 units, the 4 is in the tens place and has a value of 4 tens (40 units), the 5 is in the hundreds place with a value of 5 hundreds (500 units), and the 9 in the thousands place has a value of 9 thousands (9,000 units)

B

Technicians and engineers are more concerned with concrete numbers. A *concrete number* is one that is connected with a particular quantity or object and therefore consists of two parts. The first part is a number which tells us *how much*; the second part specifies the unit of measurement or object and tells us *what*. For example, 60 cycles, 25 ohms, 10 microfarads, and 30 henrys are concrete number. In Chap. 11 you will study some interesting methods of dealing with concrete numbers as applied to units and dimensions relating to electricity and electronics.

C

An *abstract number* is one that has no reference to any quantity or object. For example, the number 16, when used by itself, is an abstract number. In general, you will be concerned with abstract numbers only when dealing with basic mathematical principles and procedures.

D

Our system of *numbers* is composed of the 10 digits 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0. All numbers consist of combinations of these digits. Arithmetic consists of the relations of numbers and the methods of computing with numbers.

E

In general, concrete numbers should be added only when they are related to the *same kind* of *units* or *things*. For example, it would not make sense to add 47 ohms and 2 horsepower. However, this rule cannot be followed blindly because it *would* be sensible to add 40 resistors and 35 capacitors to obtain 75 parts, or objects. Here, we would be adding parts or *things*.

ADDITION

The word "plus" indicates addition and is denoted by +. The equality sign = means "is equal to". Thus, in the language of mathematics 6 + 8 = 14. In English this says that 6 plus 8 is equal to 14. The quantity, or number, obtained by adding two or more numbers is known as the *sum* of those numbers. Therefore, as indicated above, the sum of 6 and 8 is 14.

Read the passages below and think of the best headings.

…… *(main heading)*

…… *(subheading 1)*

A *common fraction*, as distinguished from a decimal fraction (Chap. 5), is an indicated division of two whole numbers and expresses one or more of equal parts into which a thing is divided. For example, the common fraction 5/6 has two meanings, either that 5 is to be divided by 6 or ghat something has been divided into 5 or 6 equal parts.

The number *above* the line of a fraction, the dividend, is called the *numerator* of the fraction. The number *below* the line, the divisor, is called the *denominator* of the fraction. Note that the numerator states *how many* of the *equal parts* that are contained in the denominator. Thus,

$$\textbf{A fraction} = \frac{\textbf{numerator}}{\textbf{denominator}} = \frac{\textbf{how many parts}}{\textbf{number of equal parts}}$$

A fraction in which the numerator is less than the denominator is called a *proper fraction*. 1/3, 5/8, and 12/13 are proper fractions.

An *improper fraction* is one containing a numerator equal to or greater than the denominator. 4/4, 9/9, 3/2, and 9/4 are improper fractions.

…… *(subheading 2)*

When working with fractions, it is necessary to make frequent use of the following important principles.

1) The numerator and the denominator of a fraction can be multiplied by the same number, except zero, without changing the value of the fraction.
2) The numerator and the denominator of a fraction can be divided by the same number, except zero, without changing the value of the fraction.

Example 1 $\frac{4}{5} = \frac{4 \times 3}{5 \times 3} = \frac{12}{15} = \frac{4}{5}$

Example 2 $\frac{12}{15} = \frac{12 : 3}{15 : 3} = \frac{4}{5} = \frac{12}{15}$

It will be noted that no new principles are involved in performing these operations, because multiplying or dividing both numerator and denominator by the same number, except zero, is the same as multiplying or dividing the fraction by 1.

HOW TO READ THE MAIN MATHEMATICAL SYMBOLS AND SIGNS

In English, like in Czech, there is not one generally accepted "correct" way of reading mathematical symbols and expressions. The most common uses are given below. However, mathematicians usually prefer the shortest version if the context is clear.

symbol	English	Czech
+	plus	plus
-	minus	mínus
±	plus / minus	plus/mínus
=	equals / is equal to	rovná se / je roven
≠	does not equal / is not equal to	nerovná se / není roven
≈	is approximately equal to	přibližně se rovná
≡	is equivalent / is identically equal	je ekvivalentní
>	greater / bigger /larger than	větší než
<	less /smaller than	menší než
≯	not greater than	není větší než
≥	greater than or equal to	větší nebo roven než
( )	(round) brackets / parentheses *(pl.)*	kulaté závorky
[ ]	(square) brackets	hranaté závorky
{ }	braces / curly brackets	složené závorky
(…	open bracket / brackets opened	začátek závorky
…)	close bracket / brackets closed	konec závorky
(a + b)	open bracket a plus b close bracket / a plus b all in brackets	začátek závorky a plus b konec závorky / a plus b to vše v závorce
a · x	a times x / a multiplied by x	a krát x / a násobeno x
ax	ax	ax
a : x	a divided by x	a děleno x
a/x	a over x	a lomeno x
a : b *(ratio)*	a to b	a ku b
a : b = x : y	a is to be as x is to y	a se má ku b jako x se má ku y
∞	infinity	nekonečno
ã	a tilde	a s vlnovkou
a*	a star	a s hvězdičkou
$\bar{a}$	a bar	a s pruhem
$\bar{\bar{a}}$	a double bar	a se dvěma pruhy
a´	a dash	a s čárkou
a_n	a sub n / a n / a subscript n	a s indexem n / a n
a_1	a sub 1	a jedna
|a|	absolute value of a	absolutní hodnota z a
n!	n factorial	n faktoriál
→	tends to	blíží se
⇒	implies	implikuje
A	capital A	velké a

Greek alphabet

Česky/Czech	Anglicky/English	Výslovnost/Pronunciation
α (alfa)	alpha	'ælfə
β (beta)	beta	'bi:tə
γ, Γ (gama)	gamma	'gæmə
δ, Δ (delta)	delta	'deltə
ε, ϵ (epsilon)	epsilon	'epsɪlɒn, ep'sailɒn
ζ ((d)zéta)	zeta	'zi:tə
η (éta)	eta	'i:tə
$\theta, \vartheta, \Theta$ (theta)	theta	'θi:tə
ι (iota)	iota	aɪ'əʊtə
$\kappa, \varkappa$ (kappa)	kappa	'kæpə
λ, Λ (lambda)	lambda	'læmdə
μ (mí)	mu	'mju:
ν (ný)	nu	'nju:
ξ, Ξ (ksí)	xi	saɪ, zaɪ, ksaɪ, gzaɪ
o (omikron)	omicron	əʊ'maɪkrɒn
π, Π (pí)	pi	paɪ
ρ, ϱ (ró)	rho	rəʊ
σ, Σ (sigma)	sigma	'sɪgmə
τ (tau)	tau	tɔ:, taʊ
υ (ypsilon)	upsilon	ʌp'saɪlən, 'ʊpsɪlɒn
φ, ϕ, Φ (fí)	phi	faɪ
χ (chí)	chi	kaɪ
ψ, Ψ (psí)	psi	psaɪ, saɪ
ω, Ω (omega)	omega	'əʊmɪgə

MATHEMATICAL OPERATIONS

English	Czech	examples	
addition	sčítání	5 + 7 = 12	five plus seven equals/is/makes/are/is equal to twelve
to add	sčítat	a + b = c	a plus b equals c
subtraction	odečítání	9 – 3 = 6	nine minus three equals six
to subtract	odečítat	a – b = c	a minus be equals c
multiplication	násobení	1x	once
to multiply	násobit	2x	twice
		3x	three times (etc.)
		5 x 3 = 15	five time three is fifteen
		ab = c	a (times) b equals c
division	dělení	6 : 2 = 3	six divided by two is three
to divide	dělit	a : b = c	a divided by b equals c
raising to the power	mocnění	5^2	five squared
to raise to the power of	umocnit na	a^3	a cubed
power	mocnina	a^{-3}	a to the minus three
exponent	exponent/ mocnina	$(a + b)^2$	a plus be all squared
		$x^2 + y^2$	x squared plus y squared
superscript	horní index	$(a + b)^3$	a plus b all cubed
subscript	index		
		Pattern for reading higher powers: to + definite article + ordinal number:	
		a^4	a to the fourth
		a^n	a to the nth
		a^{n+1}	a to the n plus one
		$(a^m)^n$	a to the mth all to the nth
		$1 + x^5$	one plus x to the fifth
		$(a + b)^{-1}$	a plus b all to the minus one
		a^{-1}	a to the minus one
		a^{-n}	a to the minus n
		$a^{1/3}$	a to the one third
		$a^{-1/3}$	a to the minus one third
		$a^{1/x}$	a to the one over x
		$a^{2/3}$	a to the two thirds

English	Czech	examples
extraction of the root/ finding the root	odmocňování	$\sqrt{a}$ the square root of a $\sqrt[3]{a}$ the cube root of a / a to the one third
to find the root	odmocnit	
index, indices *(pl.)*	odmocnitel	Pattern for reading next roots:
root	kořen	definite article + ordinal number + root of
		$\sqrt[4]{a}$ the fourth root of a $\sqrt[n]{a}$ the nth root of a / a to the one over n $\sqrt[x]{a}$ the xth root of a / a to the one over x $\sqrt[-3]{a}$ The minus cube root of a / a to the minus one third

fractions	zlomky	1/2 a half / one half
vulgar fractions	obecné zlomky	1/3 one third
numerator	čitatel	1/4 one quarter / one fourth
denominator	jmenovatel	
fraction line	zlomková čára	Pattern for reading other fraction:
		numerator: basic number; denominator: ordinal number in plural (unless there is 1 at the end)
		3/2 three halves 2/5 two fifths 4/10 four tenths a/b a over b 5/21 five over twenty-one

decimal fractions	desetinný zlomek	.1 / 0.1 point one / nought point one
decimal / decimal number	desetinné číslo	.01 point nought one
decimal point	desetinná tečka	.001 point double nought one
nought (BE), oh, zero (AE)	0 (nula)	.321 point three two one
		2.1 two point one 12.5 twelve point five

CALCULUS

English	Czech	examples	
function	funkce	$f(x)\,;F(x)\,,etc.$	fx / function x / function of x
		$y=f(x)$	y is equal to the function (of) x / y is equal to f of x

differentiation	derivování		
to differentiate	derivovat		
to derive	odvozovat		
derivative	derivace		
differential	diferenciál	dy	differential y
variation	variace	∂y	a variation in y
increment	přírůstek	Δy	an increment of y
examples			
$\frac{dy}{dx};\frac{df(x)}{dx};y';f'(x);D_xy$		the (first) derivative of y with respect to x, where $y=f(x)$ první derivace y podle x, kde $y=f(x)$	
$f'(x_0)$		the (first) derivative of f at x_0 první derivace $f(x)$ podle x v bodě x_0	
$\frac{d^ny}{dx^n};y^{(n)};f^{(n)}(x);D_x^ny$		the nth derivative of $y=f(x)$ with respect to x / d to the nth y by dx to the nth (e. g. $\frac{d^2y}{dx^2}$: d squared y by dx squared) n-tá derivace y podle x	
$\frac{\partial u}{\partial x};u_x;\partial_x u;f_x(x,y);D_x(u);f_x'(x,y)$		partial du by partial dx / the partial derivative of $u=f(x,y)$ with respect to x parciální derivace u dle x	
$\frac{\partial f}{\partial x}(x_0,y_0)$		the first partial derivative of $f(x,y)$ with respect to x at (x_0,y_0) první parciální derivace $f(x,y)$ podle x v bodě (x_0,y_0)	
$\frac{\partial^2 u}{\partial x\,\partial y};u_{xy};\partial_{xy}^2u;f_{xy}(x,y);D_y(D_xu)$		the second partial derivative of $u=f(x,y)$, taken first with respect to x and then with respect to y / partial d squared u by partial $dy\,dx$ druhá parciální derivace $u=f(x,y)$ podle x a y	

English	Czech	examples	
integration	integrování	$\int_a^b$	the integral of... from a to b
to integrate	integrovat		
integral	integrál	$\iint$	double integral
		$\int f(x)\,dx$	the integral of $f(x)$ with respect to x
		$\int_a^b f(x)\,dx$	The (definite) integral of $f(x)$ from a to b

limits	limity	$\lim$	limit
		$\longrightarrow$	tends to, approaches to (jde/blíží se k)
		$\lim_{x\to a} f(x) = b$	The limit of $f(x)$ where x tends to a is equal to b
		$\lim_{x\to a}[f(x)+g(x)] = s+t$ The limit of $f(x)$ plus $g(x)$ as x tends to a is equal to s plus t	

English	Czech
trigonometry	trigonometrie
sin x [ˈsaɪn ˈeks]	sin x
cos x [ˈkos ˈeks] / cosine x	cos x
tan x [ˈtæn ˈeks] / tangent x [ˈtændʒənt]	tg x
cot x ; ctn x [ˈkot ˈeks] / cotangent x [kəʊˈtændʒənt ˈeks]	ctg x
sec x / secant x [ˈsi:kənt ˈeks]	sec x
csc x ; cosec x, cosecant x [ˌkəʊˈsi:kənt ˈeks]	cosec x

GENERAL MATHEMATICAL VOCABULARY

above	výše uvedený, výše
according to	podle
accordingly	podobně, podle toho
algebraic	algebraický
to apply	použít, aplikovat
as	jako, stejně jako
to be true	platit (mat.)
to be valid	platit (mat.)
calculus	počet
change	změna
change of state	změna stavu
consideration	úvaha, zřetel
constant	konstanta
definition	definice
to denote	označit
dependent	závislý
differential calculus	diferenciální počet
equation	rovnice
to evaluate	vypočítat
expression	výraz
to follow	plynout /z), následovat (za), sledovat
for	neboť
to generalize	zevšeobecnit
hence	odtud plyne, z čehož plyne
to hold, held, held	ponechávat, držet, platit (o zákonu)
to imply	zahrnovat, implikovat, plynout (z)
in the form	ve tvaru
independent (of)	nezávislý
independent variable	nezávislá proměnná
lemma	lemma/poučka/pomocná věta
let	nechť, budiž
merely	pouze
partial	parciální
partial derivative	parciální derivace
proof	důkaz
property	vlastnost
quantity	množství, veličina
relation (between)	vztah (mezi)
relationship	vztah
representation	vyjádření
respect	ohled
similarly	podobně, obdobně
state	stav
theorem	poučka, teorém

thus	tak, z toho, tedy
true	pravdivý, věrný, pravý
under consideration	uvažovaný
valid (for)	platný (pro)
value	hodnota
variable *(noun)*	proměnná
where	kde
whereas	kdežto
with respect to	dle (mat.)
thence	odtamtud plyne, tudíž
whence	odkud plyne, tudíž