

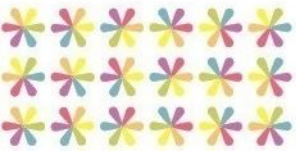
MNEMOTEHNIKA V MATEMATIKI: KDAJ DA, KDAJ NE

AMBROŽ DEMŠAR

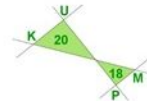
Zavod Sv. Stanislava, Osnovna šola Alojzija Šuštarja



**ZAVOD SV.
STANISLAVA**



4. mednarodna konferenca o učenju in poučevanju matematike KUPM 2018

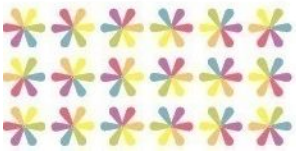
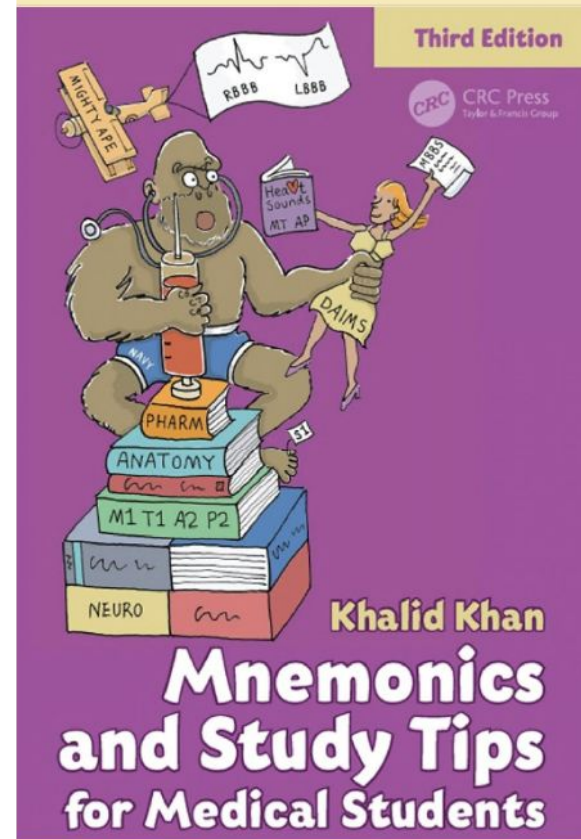


REPUBLIKA SLOVENIJA
MINISTRSTVO ZA IZOBRAŽEVANJE,
ZNANOST IN ŠPORT



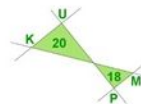
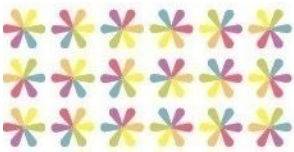
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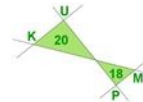
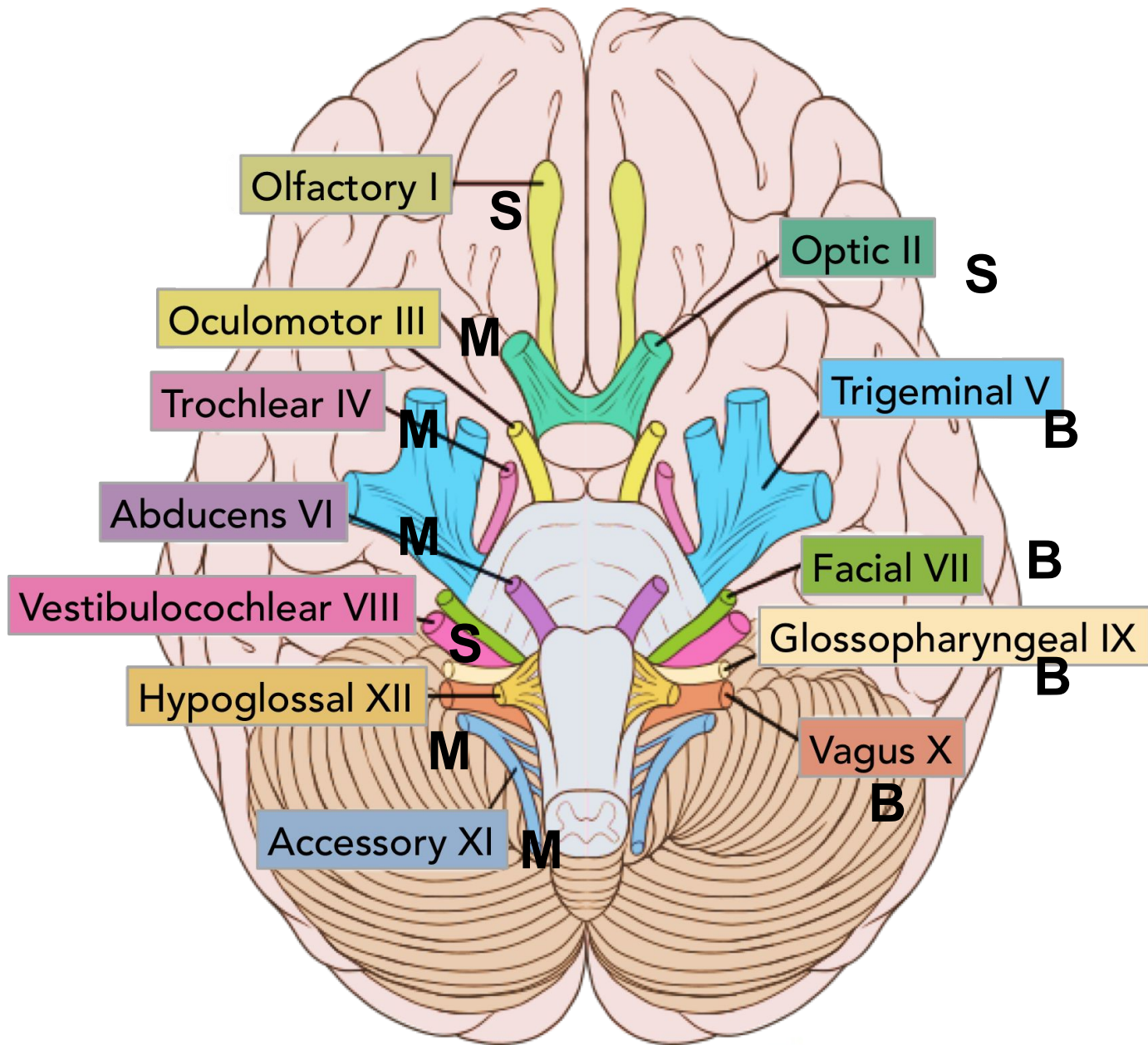


O

S ome	S ensory	I. mozganski zivec
S ay	S ensory	II.
M arry	M otor	III.
M oney	M otor	IV.
B ut	B oth	V.
M y	M otor	VI.
B ride	B oth	VII.
S ays	S ensory	VIII.
B ig	B oth	IX.
B alls	B oth	X.
M atter	M otor	XI.
M ore	M otor	XII.



O



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nepotrebnih stikov (kina, gledališča, potovanja itd.).

3. Kronično kataralno vnetje nosne sluznice (rhinitis chronica catarrhalis) je dolgotrajno nespecifično vnetje nosne sluznice. Poleg kroničnih sprememb na sluznici so matne z oteženim nosnim dihanjem in slabšim vohom.

SPLOŠNI DEJ:

- Endokrinske žleze
- Vitamini ↓
- Temp. zraka, Onemazhen Suh/Vlažen zrak
- Podnebne razmere (MA)
- Hepatorenalni
- ♥, ožilja
- kajenje, kron. alkoholizem

NOVO: 6 MIO I.E.

LOKALNI DEJ:

• Akutna porazlj. vnetja

• Izloček dolgotr. draži iz oblica

• P&P neprav. NV (deviacija, benigni t, vnetjic)

ZNAKI

- težje diha obli nos
- izcedek
- v žrelu peča + prazno - tujek zjutraj
- glavobol
- Voh

RINOSKOPSKO: nabrekli, rdeči-želi, lepljiva / v. gnojna, zmanjšana sluz

ROFERON-A (interferon alfa-2a)

ke, ki pogojujejo razvoj kroničnega vnetja. in zdraviti samo vnetje. Zdraviti je treba temeljno bolezen, povečati odpornost organizma, zboljšati delovne razmere, zdraviti patološke procese v žrelu in obnosnih votlinah. Sicer pa je treba vkapavati v nos kapljice, ki so že opisane pri zdravljenju akutnega rinitisa.

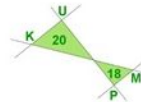
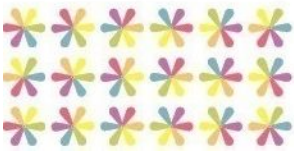
Če kroničnega kataralnega vnetja nosne sluznice nismo zdravili ali ga nismo mogli ozdraviti, lahko preide v hipertrofično ali atrofično obliko.

4. Hipertrofično kronično vnetje nosne sluznice (rhinitis chronica hypertrophica) je oblika kroničnega vnetja nosne sluznice s posebno izraženimi hipertrofičnimi spremembami zaradi razraščanja submukoznega veziva.

Dejavni KE temeljno bole Podpornost AB+ANEM Kapljice

nasledek akutnega. Dejavnike, ki in področne. Nepravilno delovanje ficiencia hepatorenalnega sistema. imatske), neprimerna temperatura, na delovnem mestu, bolezni srca in olizem so splošni dejavniki, ugodni so pomembni področni dejavniki: ženje nosne sluznice z izločkom iz ti v nosni votlini (deviacija nosnega m vnetju prevladujejo metaplazija er eksudat v subepitelijskem sloju, s bolezenska znamenja. Splošnih ni ali nora kar naprej usekovati. V žrelu ga ono zjutraj, ko vstane. Včasih ga boli namenjem ustreza tudi rinoskopska obložena z lepljivo, včasih gnojno ali stransko. Odstraniti moramo dejavni-

RKK

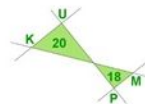
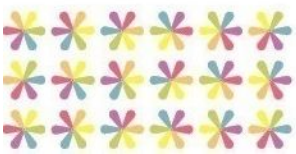


0 UVOD

-1 MNEMOTEHNIKE

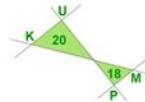
+2 METRIČNI SISTEM

ENOT



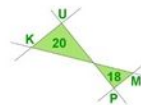
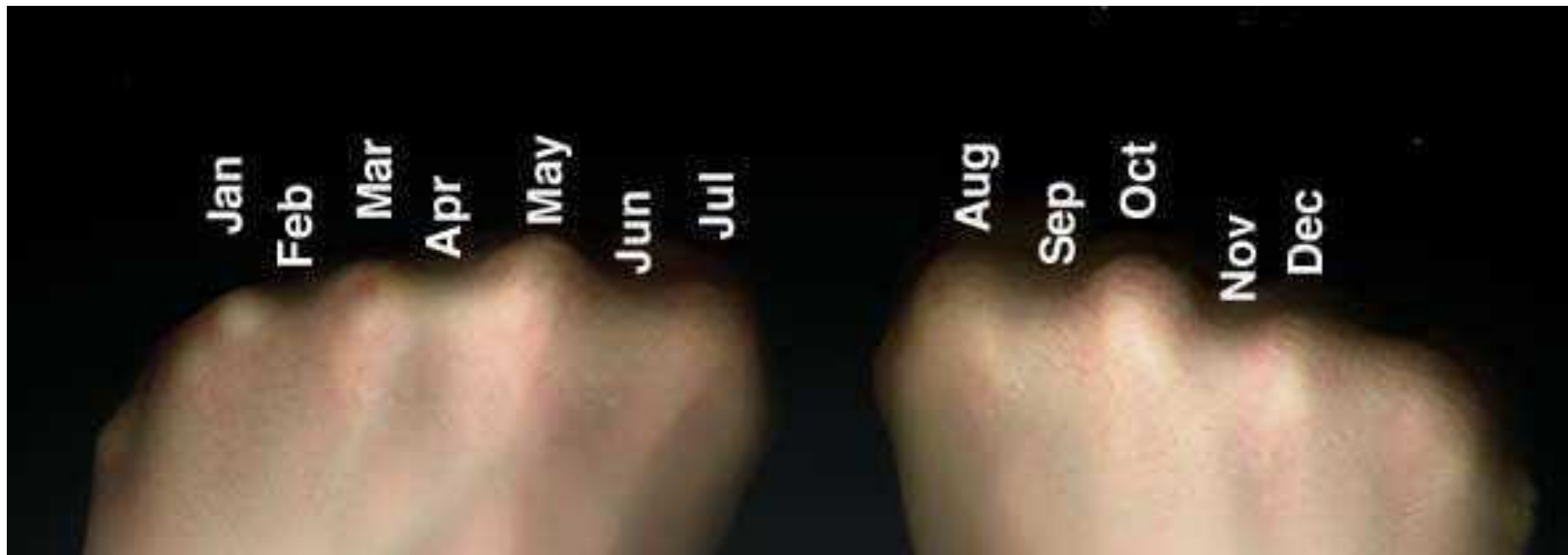
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Mnemotehnika [gr. mneme- spomin] je vsaka tehnika, ki nam pomaga, da lažje pomnimo, naj bo to kratica, zgodbica, rima, vozec na robcu ipd. Osnova vseh spominskih tehnik je oblikovanje močnih asociacij.



O

Pri tem gre lahko za izjemnost, pretiravanje, čutnost, preprostost, medsebojno povezanost, vpletenost in ustvarjalnost, kar lahko uporabimo tudi pri pouku matematike.



+0

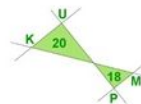


sin kota = nasprotna
hipotenuza

streha = na
hiši

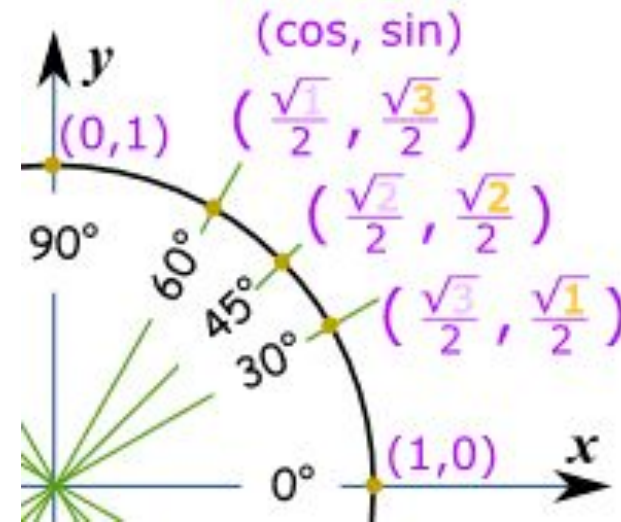
cos kota = priležna
hipotenuza

klet = pod
hišo

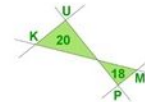
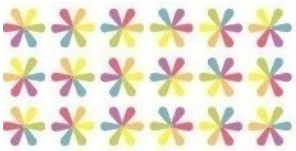


+0

	30°	45°	60°
sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$



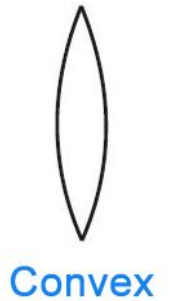
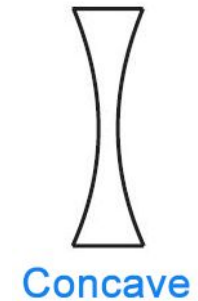
$$\frac{\sqrt{0}}{2} \quad \frac{\sqrt{1}}{2} \quad \frac{\sqrt{2}}{2} \quad \frac{\sqrt{3}}{2} \quad \frac{\sqrt{4}}{2}$$



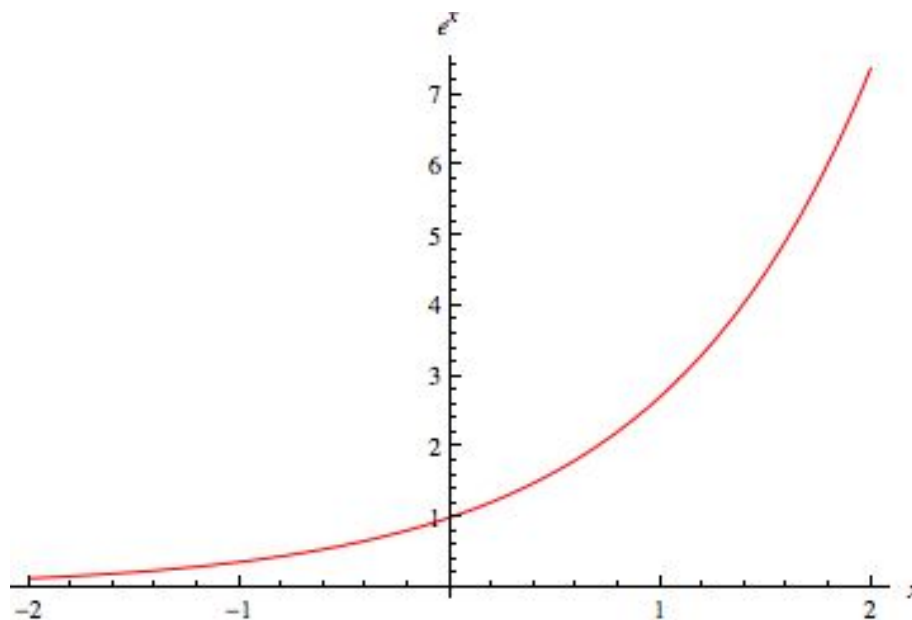
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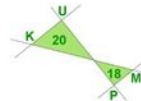
V **konkavno** funkcijo se ne da naliti **kave**.



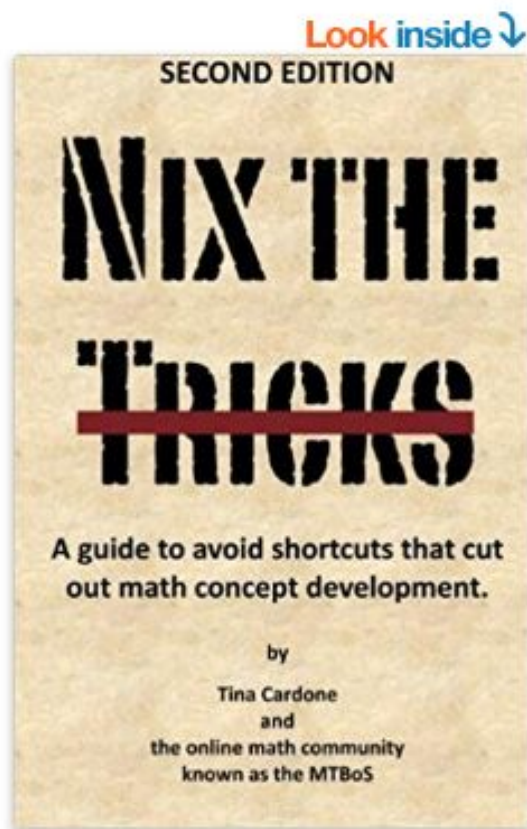
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Eksponentna je konveksna.



1



[See all 3 images](#)

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Paperback – January 14, 2015

by Tina Cardone (Author)

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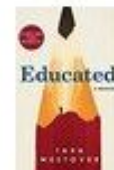
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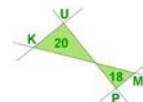
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Do you cringe when a student declares "cross multiply!" as fractions? It doesn't matter whether you teach elementary or high school math, having a student yell out a trick without stopping to think of alternatives to the shortcuts so prevalent in mathematics education are so bad for understanding math.



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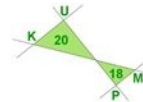
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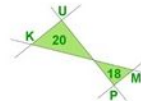
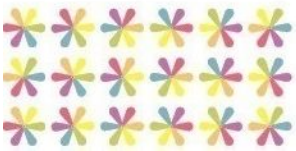
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Zato moramo biti pri uporabi mnemotehnik v matematiki previdni: ob neprimerni rabi lahko daje učencu navidezen občutek znanja ali pripelje celo do napak pri razumevanju matematičnih konceptov. Pred uporabo mnemotehnik je vedno pomembno zagotoviti dobro razumevanje snovi, ki se kasneje lahko “zavije v plašč” mnemotehnik (McPherson 2011) **Primum non nocere.**

Everything should be as simple as it can be, but not simpler.



1

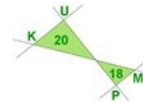
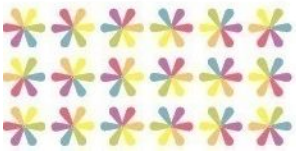


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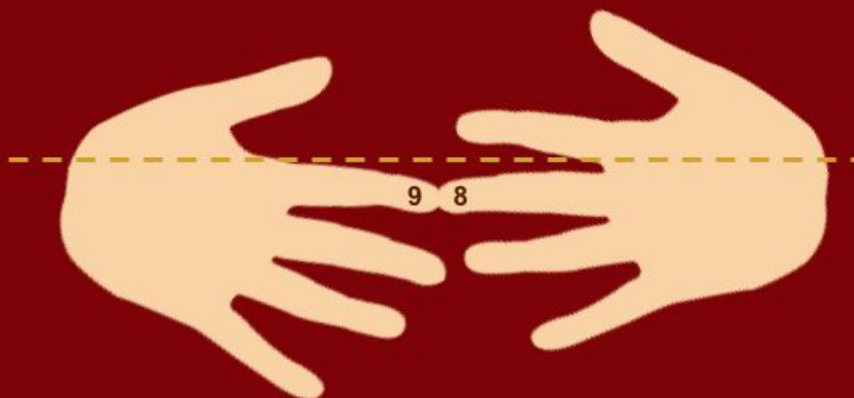
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Prikaz množenja s prsti



Izračunati želiš zmnožek števil 9 in 8 (9×8).

- Dotakni se s prstoma, označenima z 9 in 8.
- Nad njima si zamisli črto.

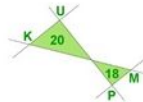


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(), ^ , · , : , + , -

PEMDAS

$$6 : 2 \cdot 5 = 6 : 10$$

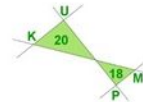
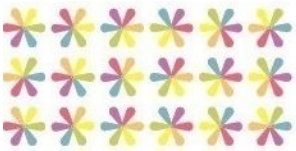


+ 1

• : , + -

Izpustiti, nikar usmrtiti.

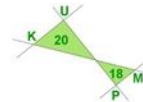
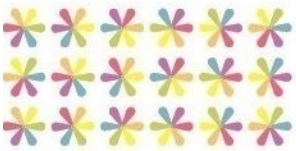
Izpustiti nikar, usmrtiti.



-1

Dodaj 0 pri množenju z 10

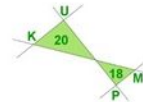
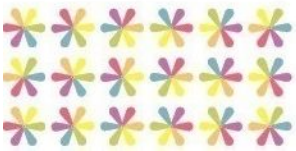
$$0,5 \cdot 10 = 0,50$$



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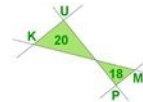
$$|+5| = +5$$

~~$$|4 - i| = 4 + i$$~~



-1

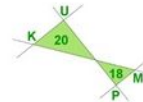
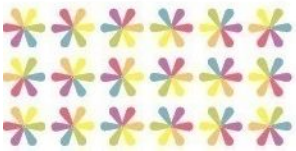
$$- \begin{array}{r} 53^\circ 18' \\ \underline{12^\circ 45'} \end{array}$$



= 1

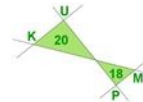
$$- \begin{array}{r} 53^\circ 18' \\ \underline{12^\circ 45'} \end{array}$$

$$- \begin{array}{r} 52^\circ 78' \\ \underline{12^\circ 45'} \end{array}$$



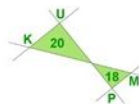
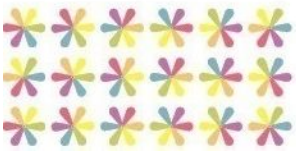
= 1

$$\begin{aligned}3\frac{1}{5} &= 1 + 1 + 1 + \frac{1}{5} \\ &= \frac{5}{5} + \frac{5}{5} + \frac{5}{5} + \frac{1}{5} \\ &= \frac{16}{5}\end{aligned}$$



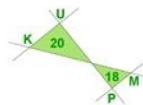
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$$\begin{array}{r} 10) + 12 \\ \hline 2 \quad 4 \\ + \quad + \\ 3 \quad 5 \\ \hline 15 \end{array} = \frac{22}{15}$$



-1

$$\frac{2}{3} \div \frac{4}{5} = \frac{10}{12}$$



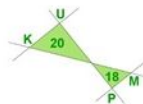
= 1

$$\frac{2}{3} \div \frac{2}{3} = 1$$

$$\frac{2}{3} \div \frac{1}{3} = 2$$

$$\frac{4}{5} \div \frac{3}{5} = \frac{4}{3}$$

$$\frac{4}{5} \div \frac{1}{2} = ?$$



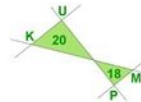
= 1

$$\frac{2}{3} \div \frac{2}{3} = 1$$

$$\frac{2}{3} \div \frac{1}{3} = 2$$

$$\frac{4}{5} \div \frac{3}{5} = \frac{4}{3}$$


$$\frac{4}{5} \div \frac{1}{2} = \frac{8}{10} \div \frac{5}{10} = \frac{8}{5}$$



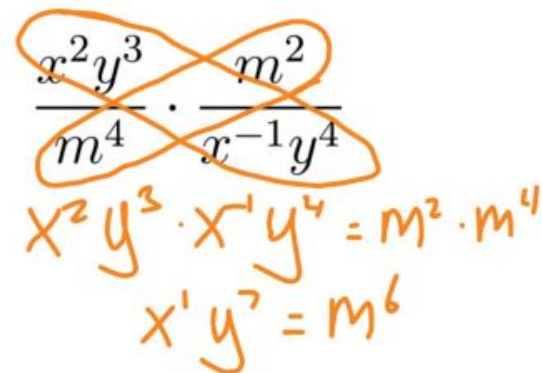
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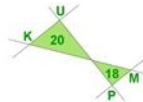
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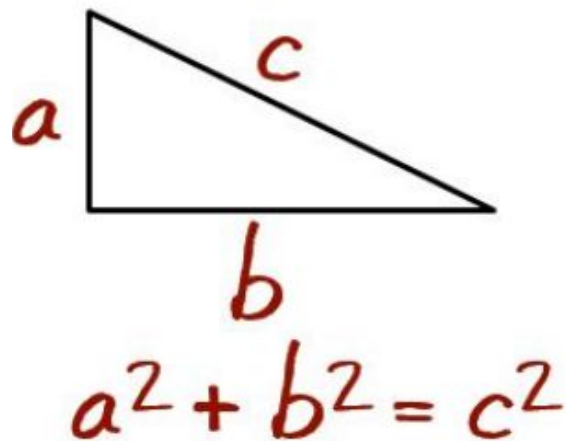

$$\frac{2}{3} = \frac{x}{5}$$
$$2 \cdot 5 = x \cdot 3$$

$$\frac{1}{2} \cdot \frac{3}{4} = \frac{1 \cdot 4}{2 \cdot 3} = \frac{4}{6}$$

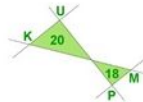
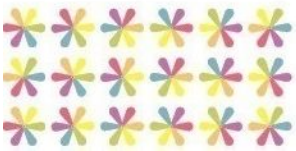

$$\frac{x^2 y^3}{m^4} = \frac{m^2}{x^{-1} y^4}$$
$$x^2 y^3 \cdot x^{-1} y^4 = m^2 \cdot m^4$$
$$x^{-1} y^7 = m^6$$



-1



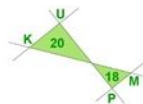
$$D = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2}$$



-1



Happy face.



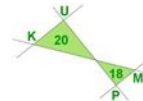
= 1

$$\begin{aligned}23 \cdot 45 &= (20 + 3)(40 + 5) \\ &= 20(40 + 5) + 3(40 + 5) \\ &= 20 \cdot 40 + 20 \cdot 5 + 3 \cdot 40 + 3 \cdot 5 \\ &= 800 + 100 + 120 + 15\end{aligned}$$

	40	5
20	800	100
3	120	15

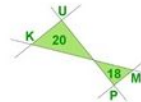
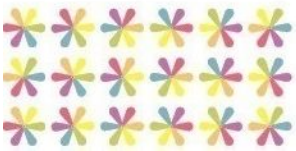
$$\begin{aligned}(2x + 3)(x - 4) &= (2x + 3)(x) + (2x + 3)(-4) \\ &= 2x^2 + 3x - 8x - 12 \\ &= 2x^2 - 5x - 12\end{aligned}$$

	2x	3
x	$2x^2$	$3x$
-4	$-8x$	-12



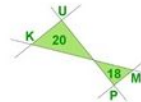
+ 1

je večkratnik
24 \longleftrightarrow 6
je delitelj



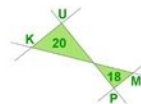
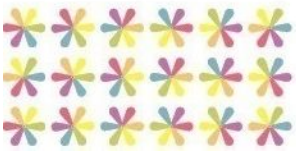
+1

L1HA in SODA

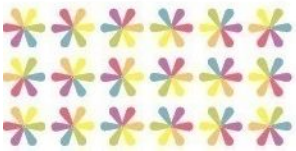


+ 1

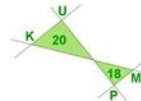
22,90 • < | 23



+ 1



4. mednarodna konferenca o učenju in poučevanju matematike KUPM 2018



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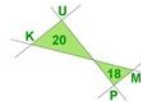


+ 1

, pod

,

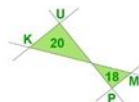
napišite na moj nagrobnik.



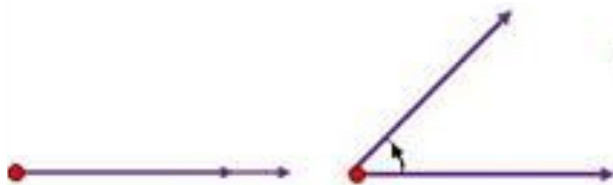
1

$$\frac{4x + 2}{2} = \frac{4x + \cancel{2}}{\cancel{2}} = 4x$$

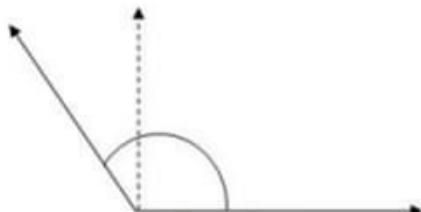
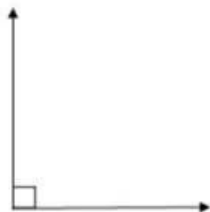
Kdor krajša čez plus, bo dobil šus.



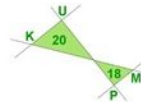
1



Nič oster,

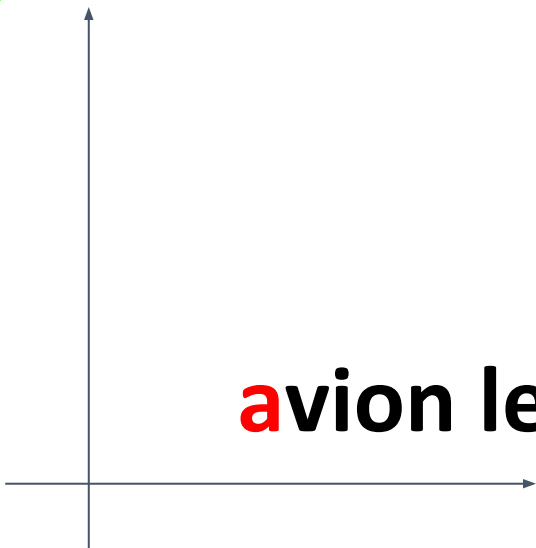


prej top, iztegnjen v grob.



1

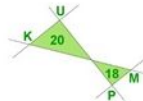
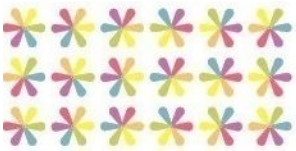
v oblake



avion leti



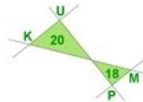
Najprej greš **do** dvigala, potem pa **gor - dol**.



1

**Lepo vzgojeni otroci dajo
v cerkvi kapo dol.**

$$\begin{aligned}\sqrt{1800x^5} &= \sqrt{100} \cdot \sqrt{18x^5} = \\ &= \sqrt{100} \cdot \sqrt{9} \cdot \sqrt{2} \cdot \sqrt{x^4} \cdot \sqrt{x^1} = \\ &= 10 \cdot 3 \cdot \sqrt{2} \cdot x^2 \cdot \sqrt{x} = \\ &= 30 \sqrt{2} x^2 \sqrt{x}\end{aligned}$$



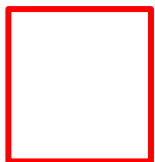
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.

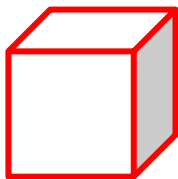
0 dimenzij



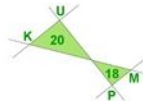
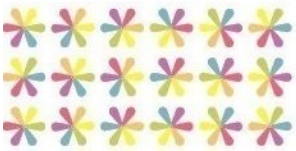
1 dimenzija **cm¹**



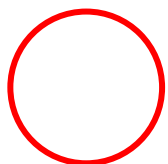
2 dimenziji **cm²**



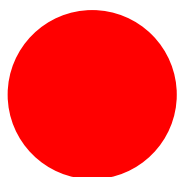
3 dimenzije **cm³**



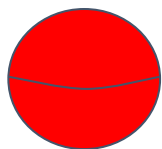
1



obseg $2\pi r$ cm

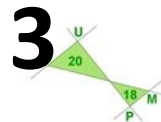
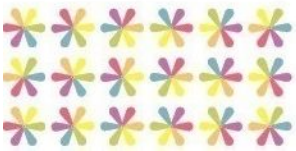


ploščina πr^2 cm²

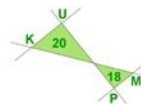
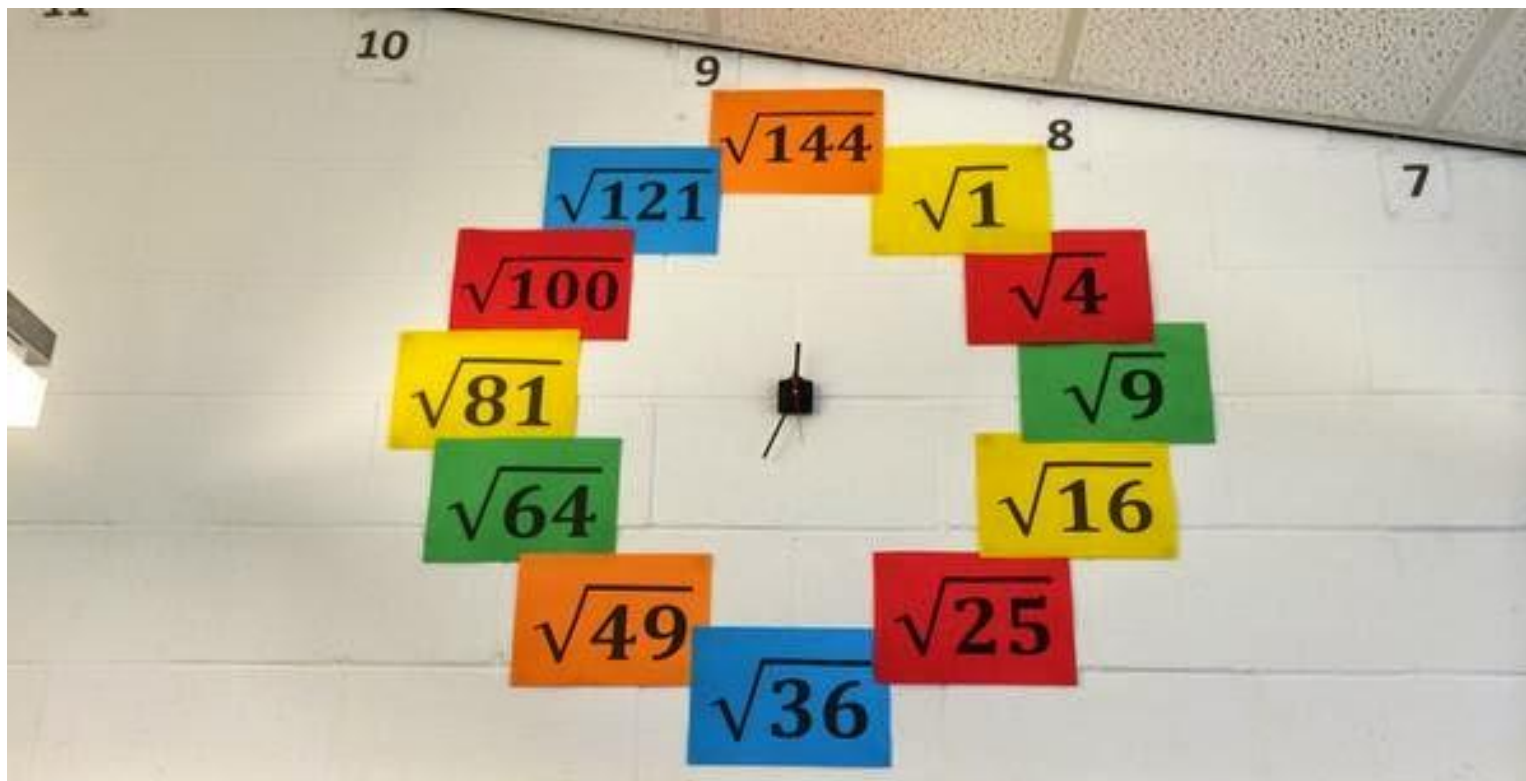


površina $4\pi r^2$ cm²

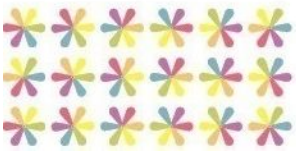
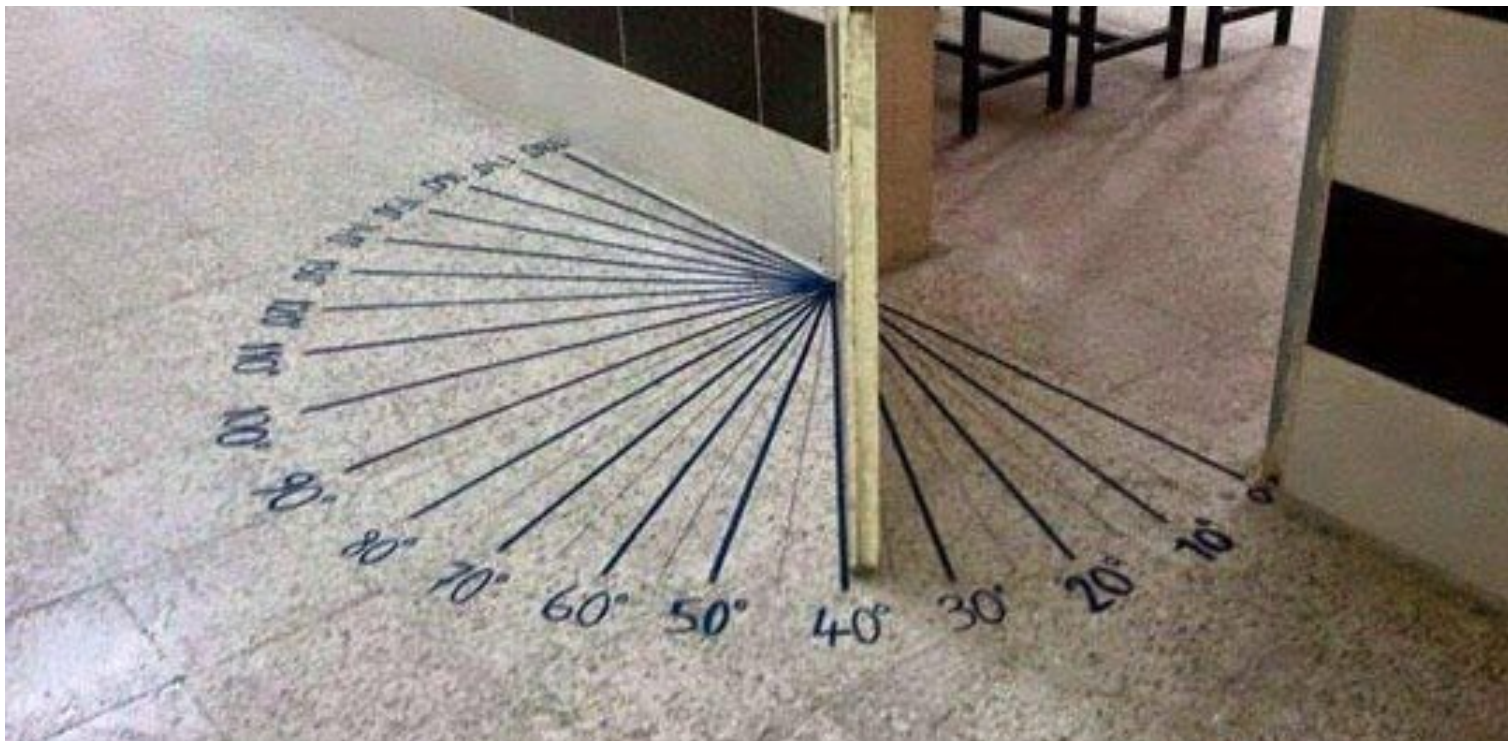
volumen $4\pi r^3$ cm³



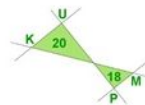
1



1



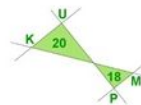
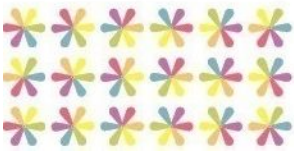
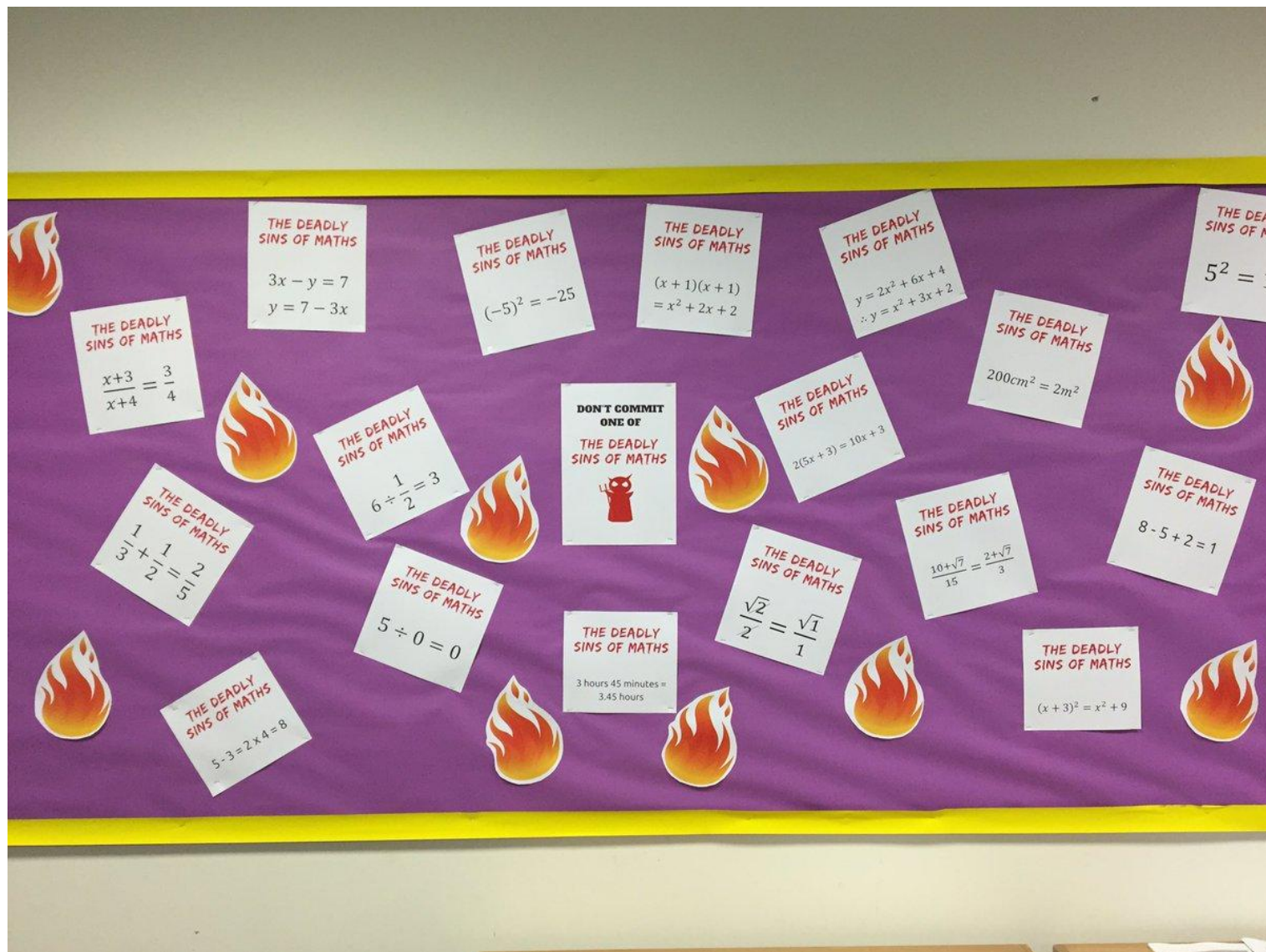
4. mednarodna konferenca o učenju in poučevanju matematike KUPM 2018



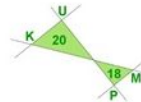
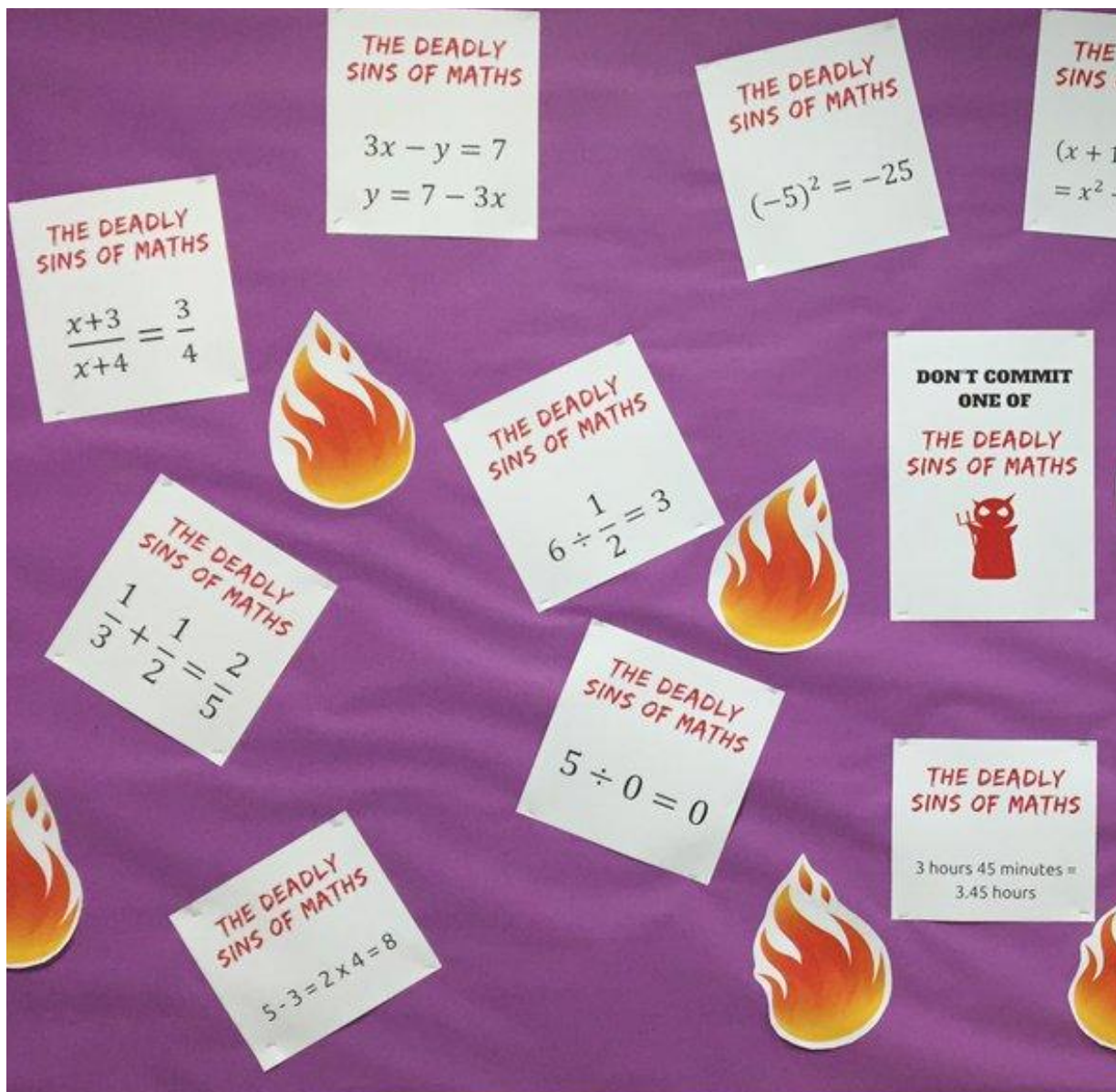
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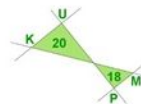
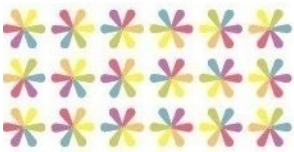
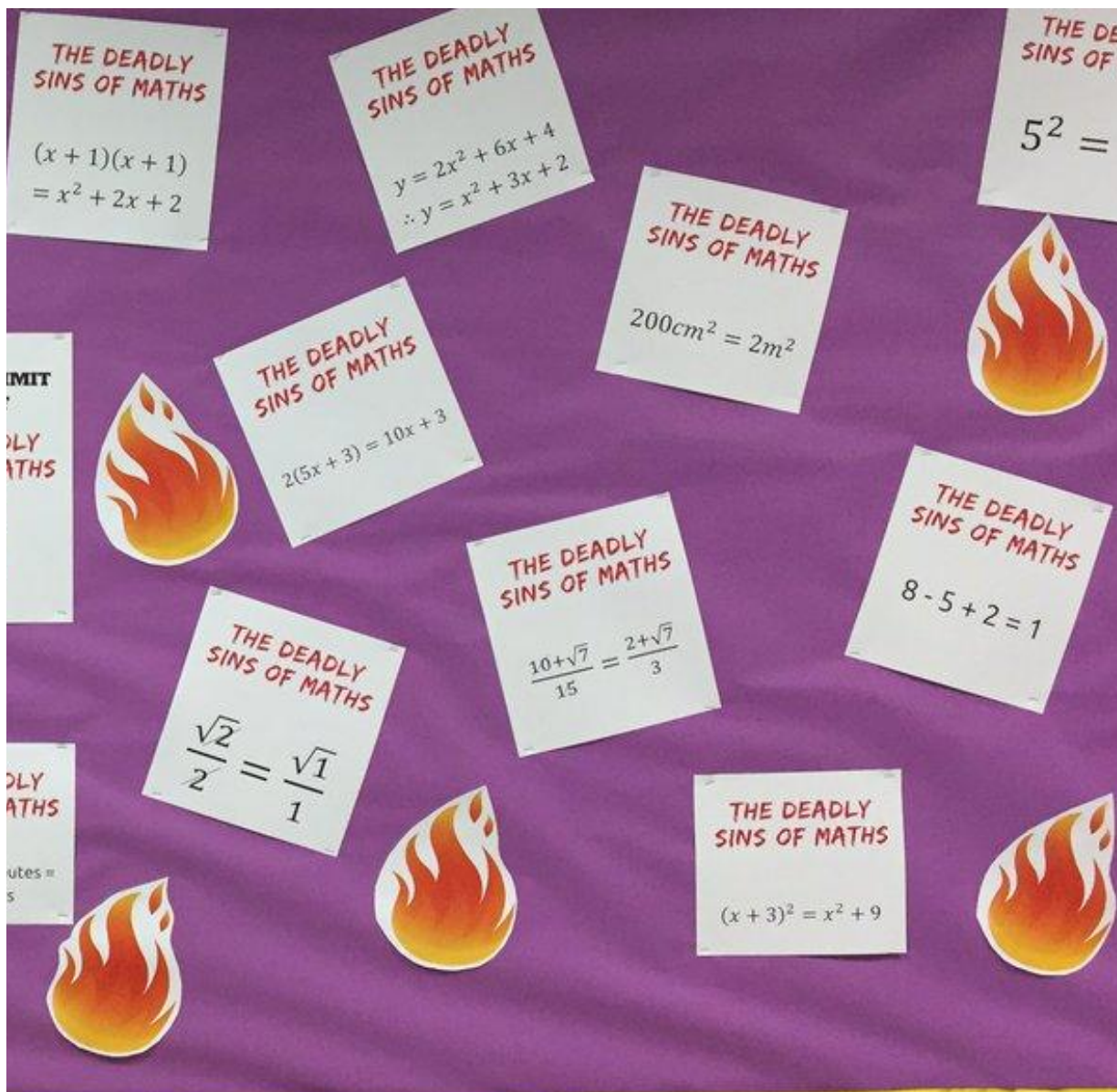
1



1



1



02



I. UVOD V FIZIKO



- | | |
|--|--|
| 0,5 km ² = _____ m ² | 0,5 km ² = _____ a |
| 715 mm ² = _____ cm ² | 1,17 m ² = _____ cm ² |
| 610,6 m ² = _____ km ² | 2,34 cm ² = _____ m ² |
| 7,9 km ² = _____ m ² | 1,31 cm ² = _____ m ² |
| 5,87 m ² = _____ cm ² | 0,9 cm ² = _____ m ² |
| 1187 m ² = _____ km ² | 0,152 cm ² = _____ m ² |
| 47,18 m ² = _____ ha | 47,02 m ² = _____ a |
| 13,2 dm ² = _____ mm ² | 745 m ² = _____ km ² |
| 69 dm ² = _____ m ² | 79 mm ² = _____ cm ² |
| 1001 mm ² = _____ cm ² | 0,01 m ² = _____ km ² |

VAJA 3: Pretvori enote za prostornino.

- 1 dm³ = _____ cm³ = _____ mm³
- 0,3 m³ = _____ dm³ = _____ cm³ = _____ mm³
- 1 l = _____ dm³ = _____ cm³ = _____ mm³
- 2000 mm³ = _____ cm³ = _____ dm³
- 310 ml = _____ cm³ = _____ dm³
- 6 mm³ = _____ cm³ = _____ dm³
- 2 hl = _____ dm³ = _____ m³
- 7,5 dm³ = _____ cm³ = _____ mm³
- 7,5 dm³ = _____ m³
- 0,75 dm³ = _____ l = _____ ml = _____ cm³
- 0,75 dm³ = _____ l = _____ hl

VAJA 4: Pretvori.

- | | |
|--|---|
| 3326 dm ³ = _____ m ³ | 3 m ³ 12 dm ³ = _____ dm ³ |
| 1 dm ³ = _____ l | 55 l = _____ ml |
| 234 cm ³ = _____ ml | 812 ml = _____ l |
| 78 cm ³ 237 mm ³ = _____ mm ³ | 27 m ³ = _____ ml |
| 662 ml = _____ mm ³ | 1,7 mm ³ = _____ ml |
| 87 cm ³ 4 mm ³ = _____ mm ³ | 177 cm ³ = _____ l |
| 2000000 m ³ = _____ km ³ | 157 m ³ = _____ l |

8

Fizika je naravoslovna in eksperimentalna znanost.

Fizikalne vsebine si spoznaval že od 1. do 7. razreda pri predmetih:

- spoznavanje okolja v prvi triadi,
- naravoslovje in tehnika v 4. in 5. razredu,
- in naravoslovje v 6. in 7. razredu.

Fizika je raziskovanje, logično razmišljanje, razlaga pojavov, eksperimentiranje, opazovanje ...

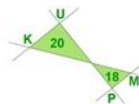
Med drugim boš spoznal/a: Keplerjeve zakone, Newtonove zakone, lomni zakon, odbojni zakon ...

Predmet fizika je v sorodu s kemijo in biologijo.



knjigarna.com

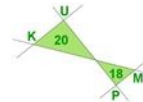
knjigarna.com



9

-2

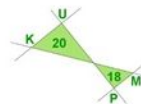
km			m	dm	cm	mm
t			kg		dag	g
	hl		l	dl	cl	ml



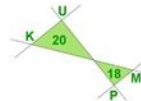
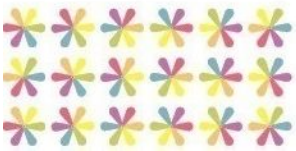
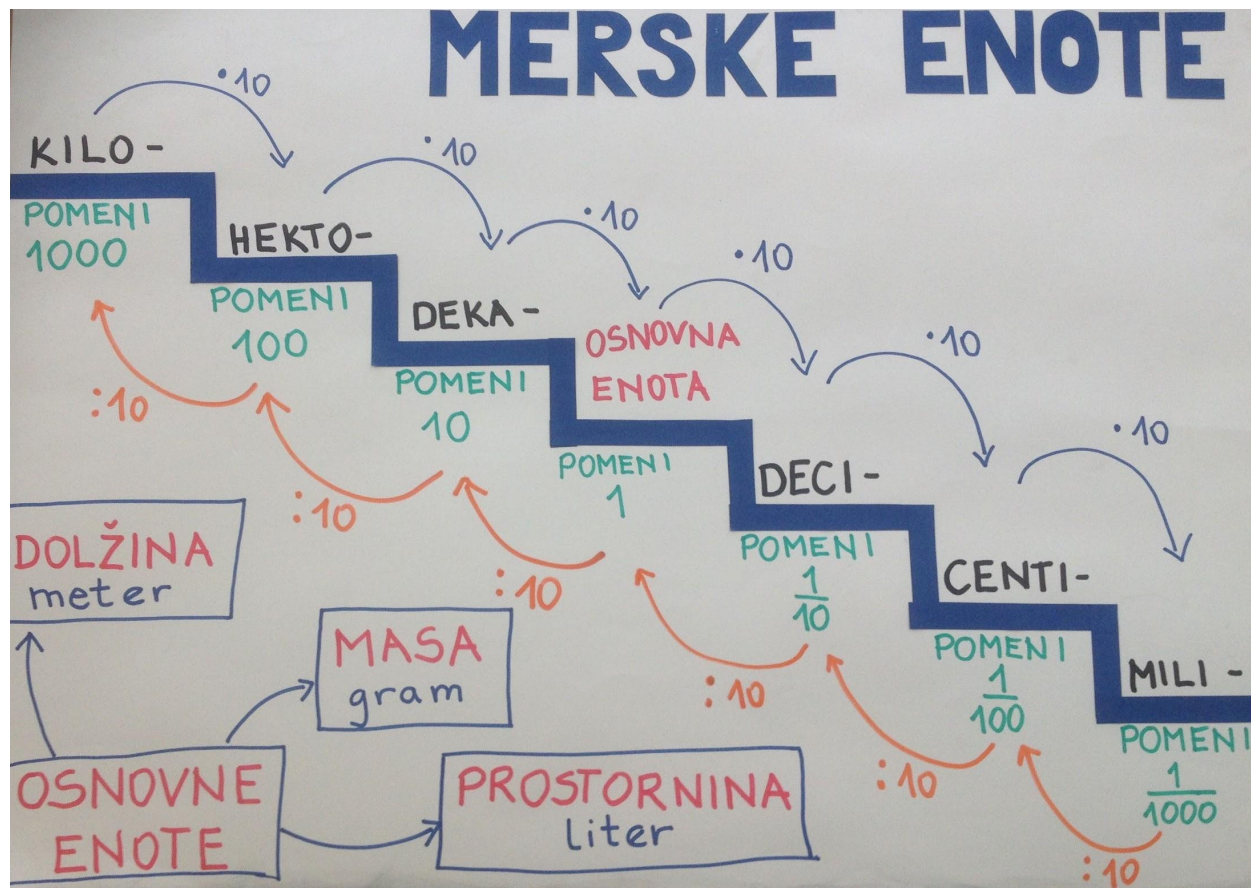
-2

PRETVARJANJE MERSKIH ENOT

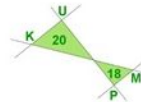
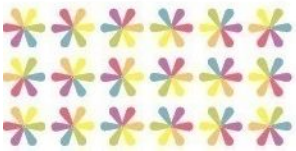
Dolžina	km			m	dm	cm	mm
Prostornina		hl		l	dl		ml
Tehtanje	t			kg		dag	g



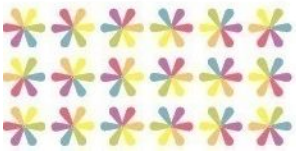
2



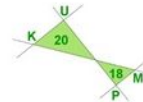
2



2



4. mednarodna konferenca o učenju in poučevanju matematike KUPM 2018



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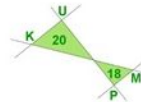
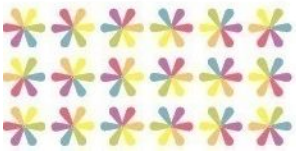


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NALOŽBA V VAŠO PRIHODNOST

2

Večina predpon so zgolj **grška** (za D, S, T, ...) in **latinska** (za d, s, t, ...) imena števil.

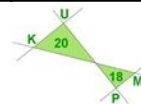
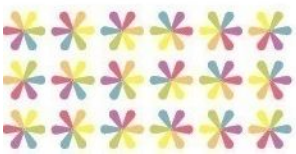
k	kilo [gr.] tisoč	1 000	1,5 km=	$1,5 \cdot 1000 \text{ m} = 1500 \text{ m}$
h	hekto [gr.] = sto	100	0,2 hl=	$0,2 \cdot 100 \text{ l} = 20 \text{ l}$
da	deka [gr.] = deset	10	5 dag=	$5 \cdot 10 \text{ g} = 50 \text{ g}$
	ena	1		
d	deci [lat.] = desetina	0,1	1 dčokolada	= desetina čokolade
c	centi [lat.] = stotina	0,01	25 cN=	$25 \cdot 0,01 \text{ N} = 0,25 \text{ N}$
m	mili [lat.] = tisočina	0,001	3000 mA=	$3000 \cdot 0,001 \text{ A} = 3 \text{ A}$



2

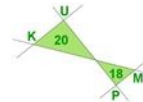
Večina predpon so zgolj **grška** (za D, S, T, ...) in **latinska** (za d, s, t, ...) imena števil.

k	kilo [gr.] tisoč	1 000	$=10^3$
h	hekto [gr.] = sto	100	$=10^2$
da	deka [gr.] = deset	10	$=10^1$
	ena	1	$=10^0$
d	deci [lat.] = desetina	0,1	$=10^{-1}$
c	centi [lat.] = stotina	0,01	$=10^{-2}$
m	mili [lat.] = tisočina	0,001	$=10^{-3}$



2

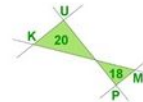
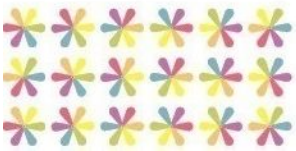
deset	ten
sto	hundred
tisoč	thousand
milijon	million
milijarda	billion
bilijon	trillion
bilijarda	quadrillion
trilijon	
trilijarda	
kvadriljon	



2

Predpone si lahko zapomniš tudi takole:

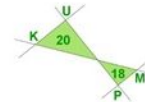
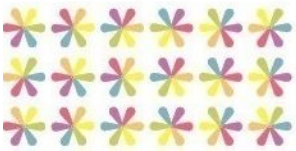
kar hitro daj 1 dober cmok mamici



2

...	km	hm	dam	- m	dm	cm	mm	...
				1	4	4,	6	9
	0,	4	7	3	0			

144,69cm= 1,4469 m
0,473 km= 4730 dm



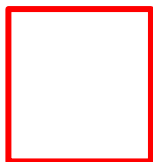
1

.

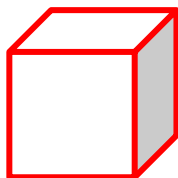
0 dimenzij



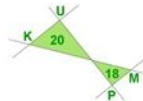
1 dimenzija **cm¹**



2 dimenziji **cm²**



3 dimenzije **cm³**

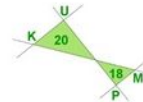
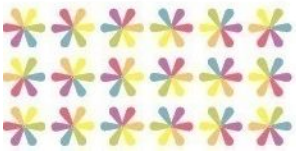


2

Pomoč pri pretvarjanju ploščinskih enot (!²) – uporabi dve mesti:

$$210 \text{ ar} = 21000 \text{ m}^2$$
$$0,5 \text{ dm}^2 = 0,0000005 \text{ ha}$$

...		km ²	hm ²	dam ²	- m ²	dm ²	cm ²	mm ²	...	
			2	1	0	0				
			0	0	0	0	0,	5		



2

Google

Prevajalnik Izklopi takojšnje prevajanje

kitajščina angleščina slovenščina **Zaznan jezik: romunščina** ↔ angleščina kitajščina (poenostavlje... slovenščina **Prevedi**

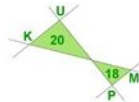
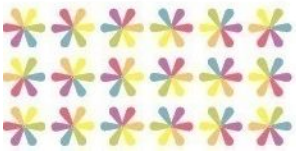
arat × oranje

Prevajalnik Izklopi takojšnje prevajanje

kitajščina angleščina slovenščina **Zaznan jezik: madžarščina...** ↔ angleščina kitajščina (poenostavlje... slovenščina **Prevedi**

aratni × žeti

...	km ²	hm ² = ha	dam ² = ar	- m ²	dm ²	cm ²	mm ²	...
		2	1 0	0 0				
		0	0 0	0 0	0 0,	5		



2

Pomoč pri pretvarjanju plostoninskih enot (!³)
– uporabi tri mesta:

$$33 \text{ litrov} = 0,033 \text{ m}^3$$

$$0,473 \text{ km}^3 = 4\,730\,000\,000 \text{ m}^3$$

$$225 \text{ ml} = \underline{\hspace{2cm}} \text{ l}$$

km ³			hm ³			dam ³			m ³			dm ³ = l			cm ³ = ml			mm ³		
											0	0	3	3						
		0,	4	7	3	0	0	0	0	0	0									

