6. Štirikotniki

6.1. Vrste štirikotnikov

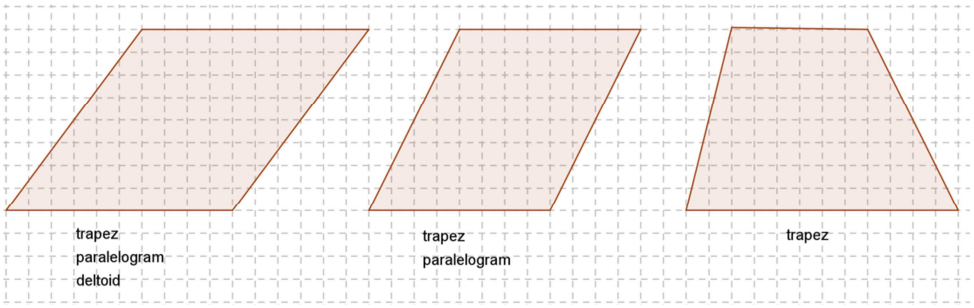
1 Kvadrat je tudi pravokotni.
Kvadrat je tudi romb.
Paralelogram je tudi trapez.
…

2 Tlakovci, parket, okno, papir, papirnat zmaj,zidak,...

3 Deltoidi: c, d, e
Kvadrati: d
Pravokotniki: a, d
Rombi: d, e

4 Pravkokotnik, kvadrat, romb, paralelogram, deltoid, trapez.

5



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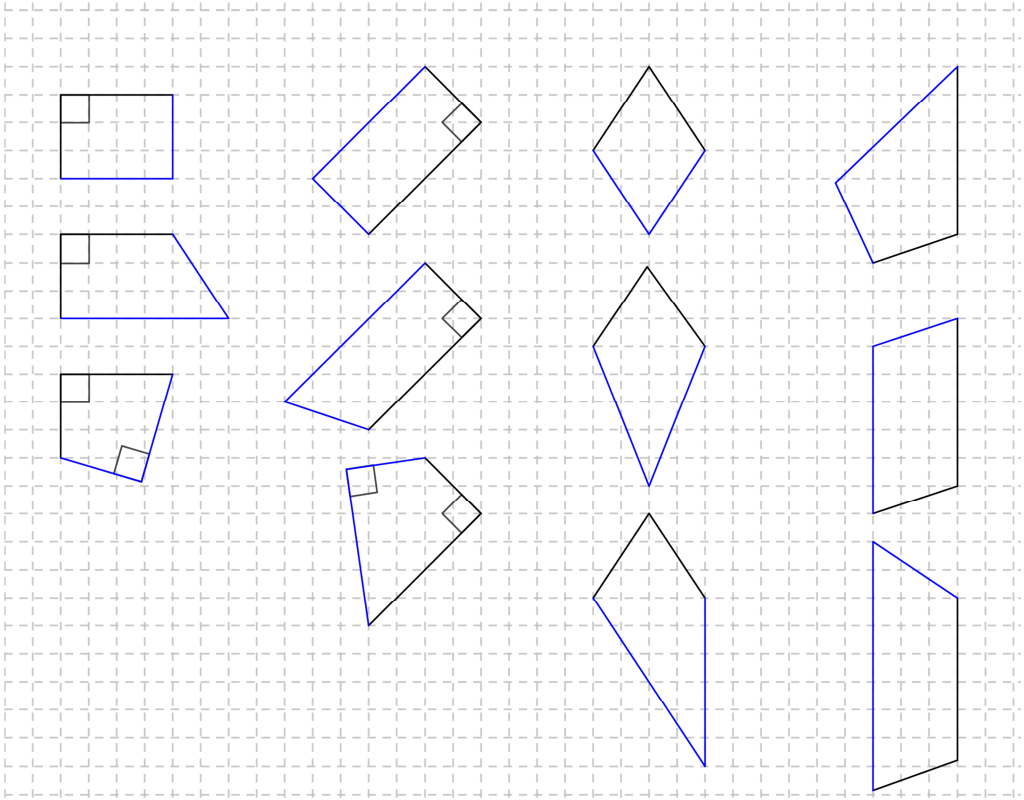


7

a) Kvadrat.
b) Kvadrat, pravokotnik, romb, paralelogram, deltoid.
c) Nobena vrsta posebnih štirikotnikov (kvadrat, pravokotnik, paralelogram, romb, trapez, deltoid) nima enako dolgih natanko treh stranic.

8

a) 80°
b) 135°
c) 65°
č) 130°

9 Posebnež med temi je štirikotnik č), ki ima vse notranje kote enako velike.

	a)	b)	c)	č)	d)	e)	f)	g)
α	90°	145°	83°	90°	68°	127°	100°	125°
β	90°	45°	107°	90°	67°	47°	65°	56°
γ	110°	45°	90°	90°	87°	111°	83°	83°
δ	70°	125°	80°	90°	138°	75°	112°	96°

10

a) $\delta = 112°$
b) $360°$

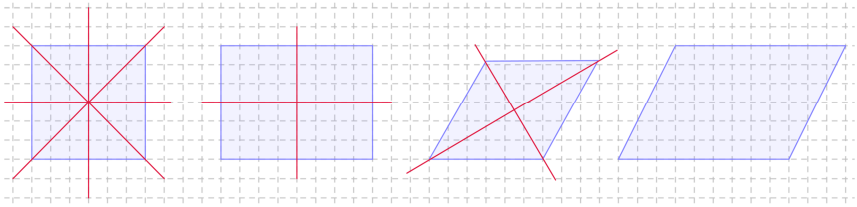
6.2. Paralelogrami

1 Paralelogrami so prvi, tretji, četrti in peti štirikotnik(gledano od leve proti desni od zgoraj navzdol).

2

a) 130°
b) 70°, 110°, 110°
c) 70°, 70°, 110°
č) 110°, 110°

3



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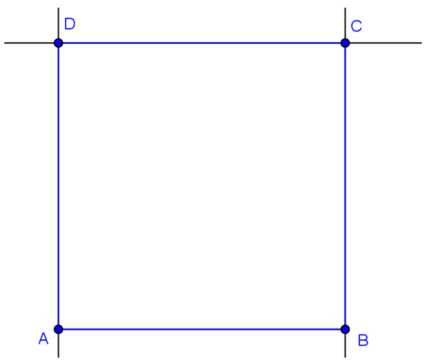

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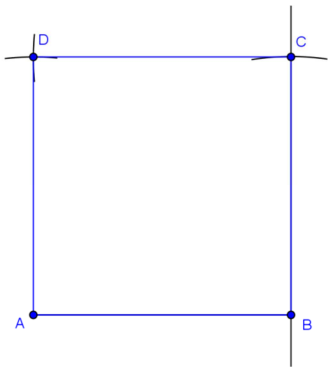
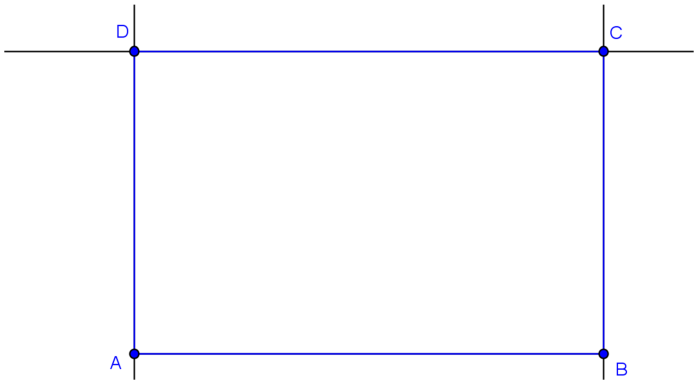
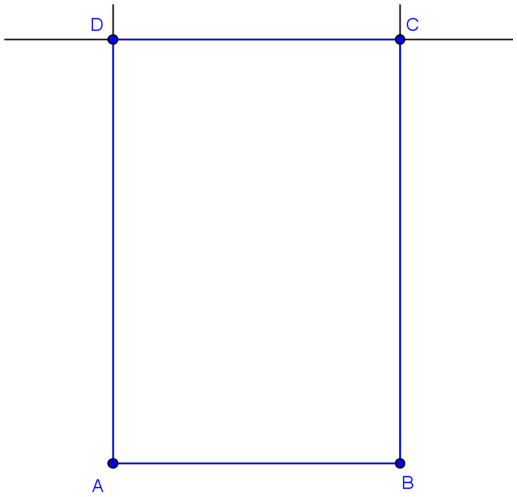


6

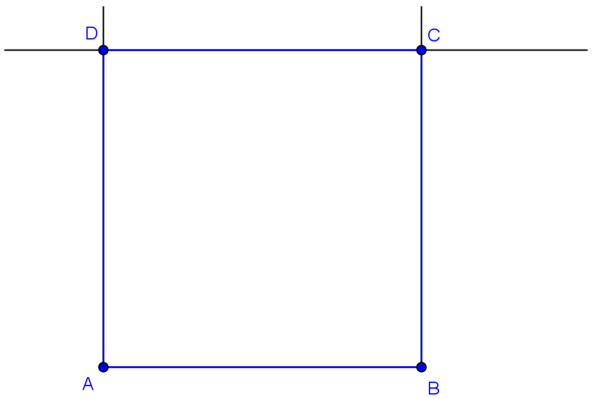
a)



b)

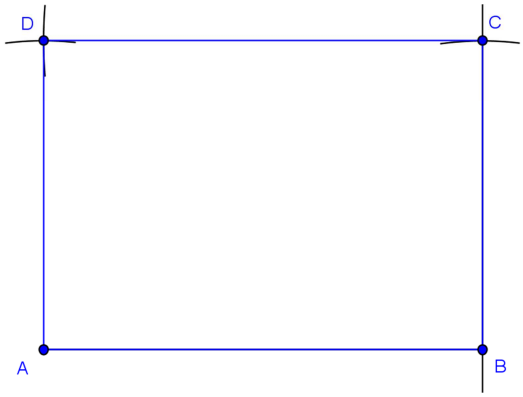


c)

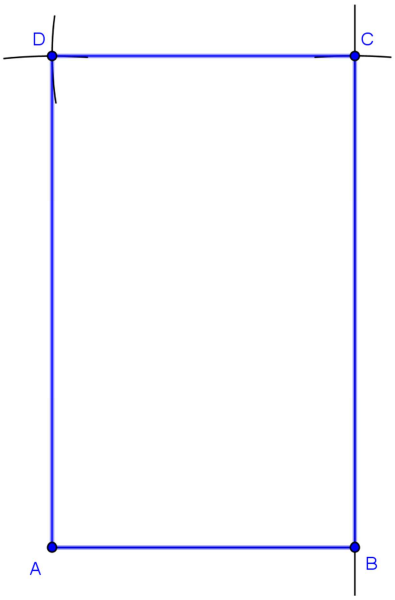


7

a)



b)



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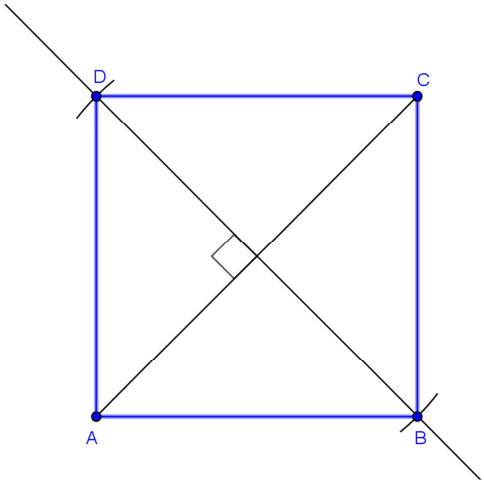

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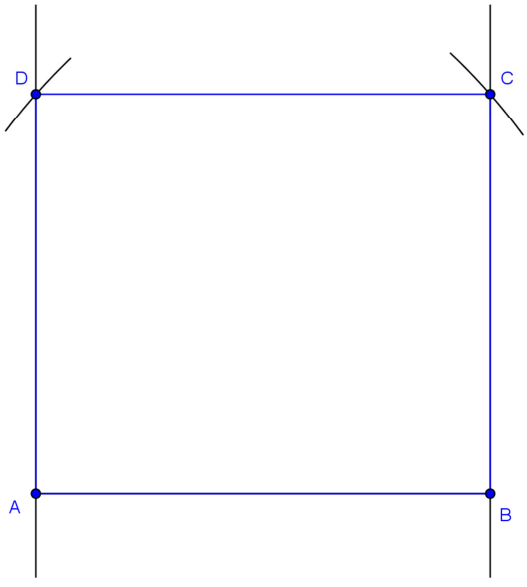
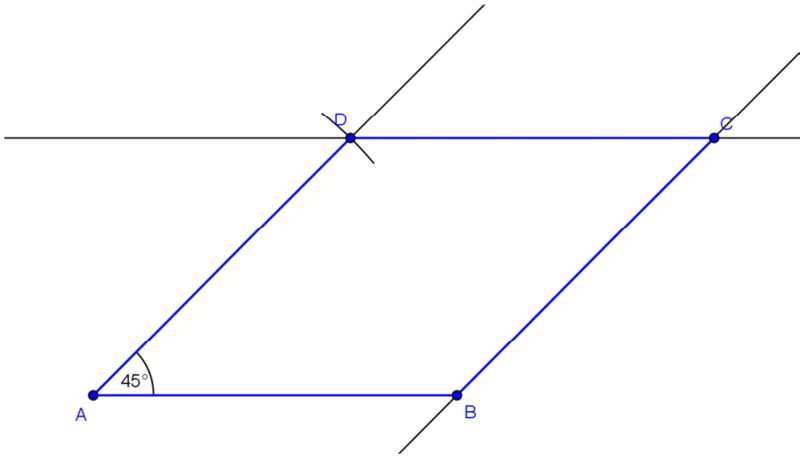
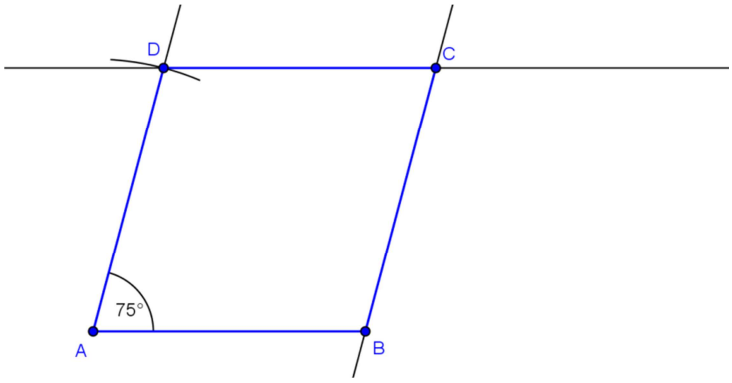


10

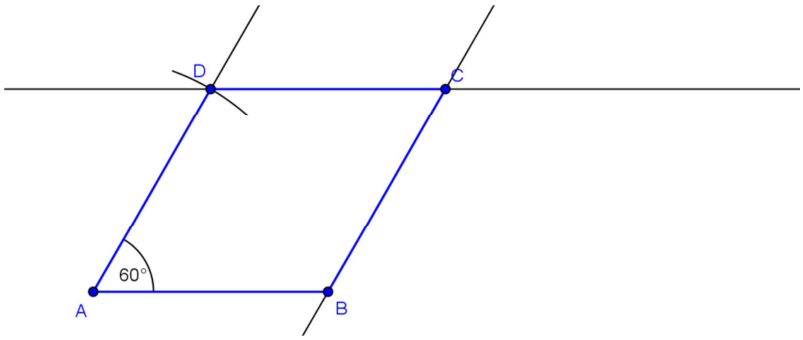
a)



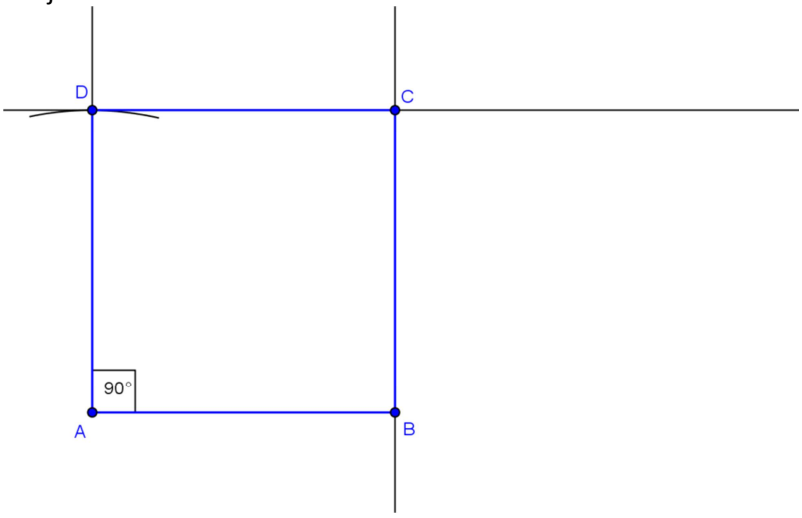
b)



c)

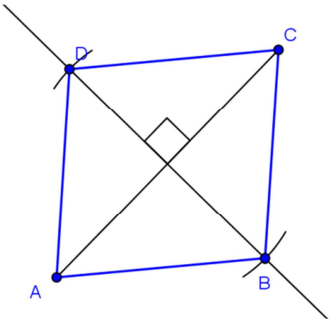


č) Ta romb je kvadrat.

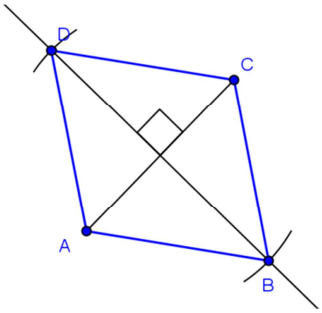


11

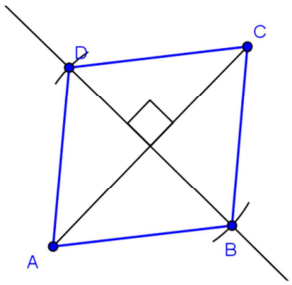
a)



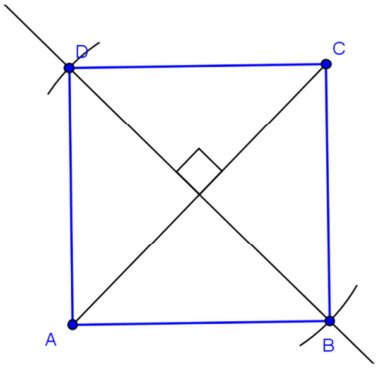
b)



c)

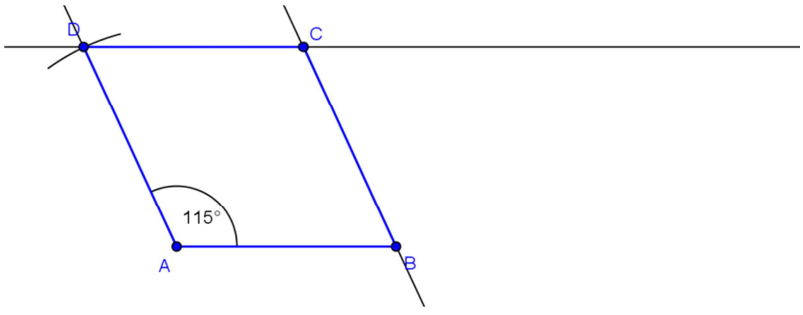


č) Ta romb je kvadrat.

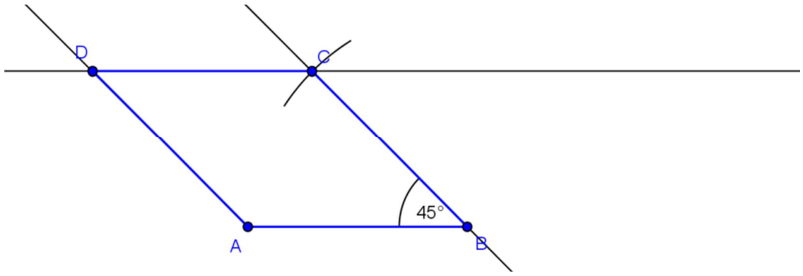


12

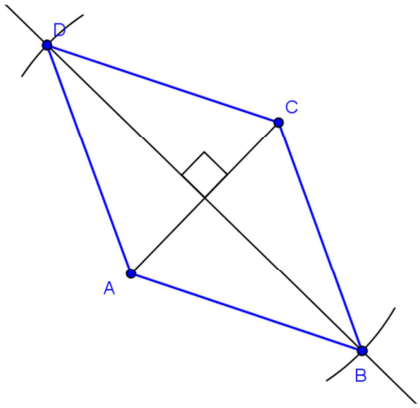
a)



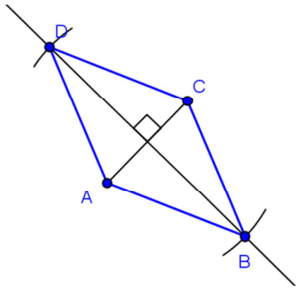
b)



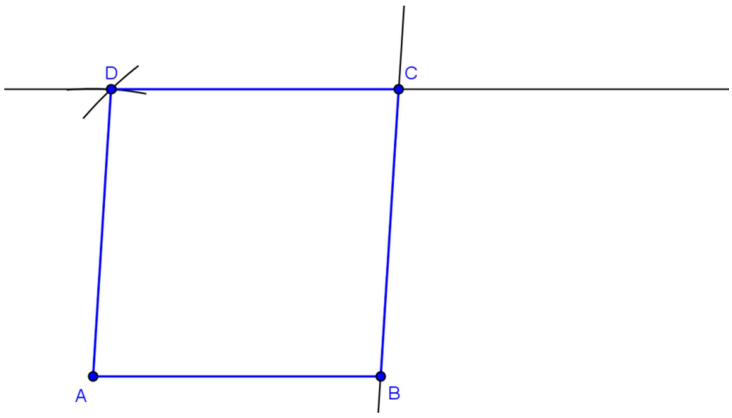
c)



č)

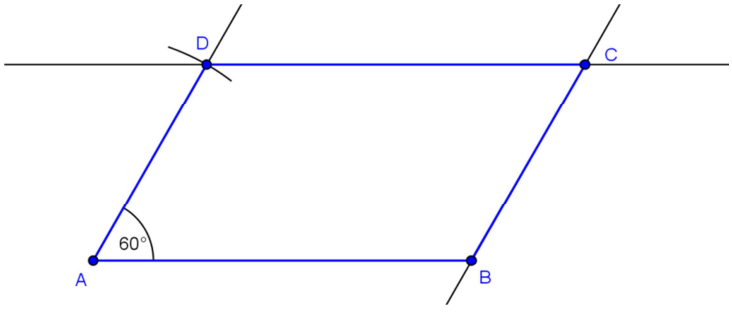


d)

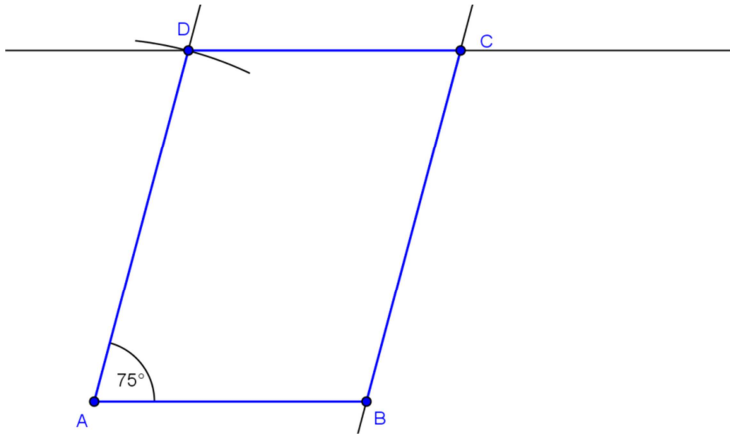


13

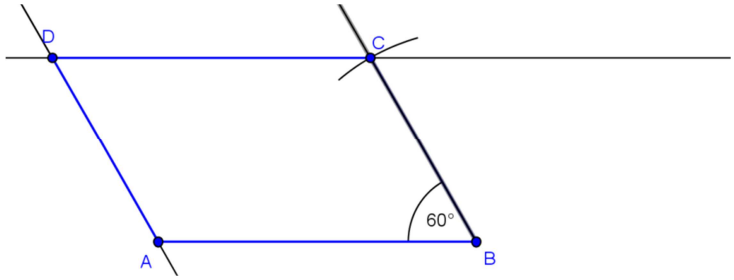
a)



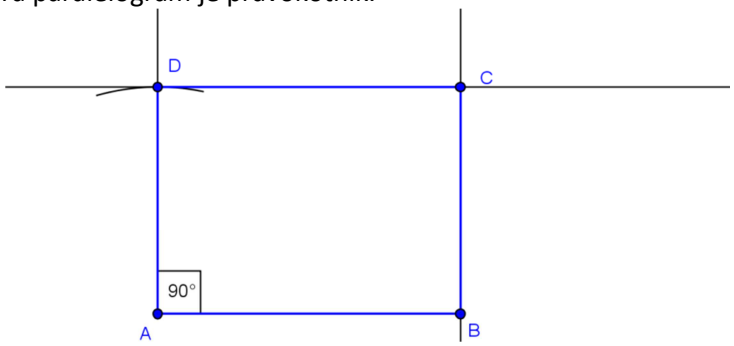
b)



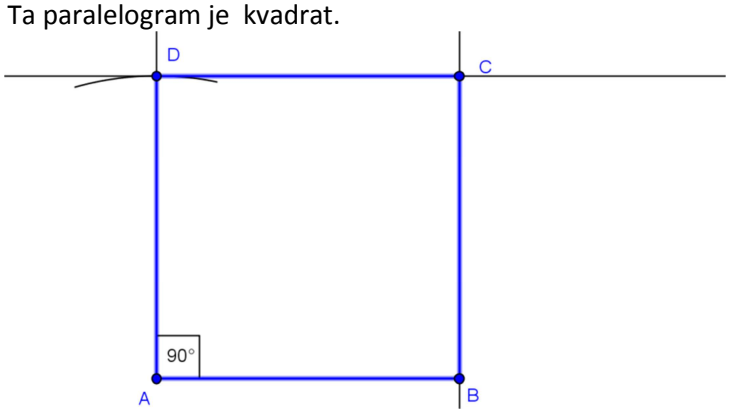
c)



č) Ta paralelogram je pravokotnik.

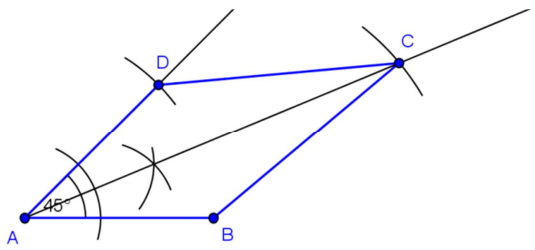


d) Ta paralelogram je kvadrat.

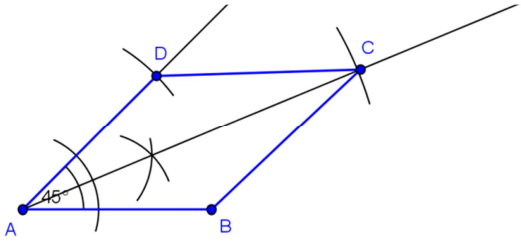


14 Opomba: Deltoid s simetralo AC.

a)



b)



15

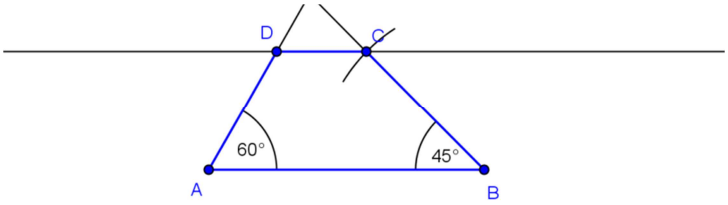
kvadrat	**pravokotnik**	**romb**	**paralelogram**
Vsi koti so pravi.	Vsi koti so pravi.	Nasprotna kota sta enako velika.	Nasprotna kota sta enako velika.
Vse stranice so enako dolge.	Nasprotni stranici sta enako dolgi.	Vse stranice so enako dolge.	Nasprotni stranici sta enako dolgi.
Diagonali se razpolavljata, sta enako dolgi in med seboj pravokotni .	Diagonali se razpolavljata in sta enako dolgi.	Diagonali se razpolavljata in sta med seboj pravokotni.	Diagonali se razpolavljata.
Je osno in središčno someren.	Je osno in središčno someren.	Je osno in središčno someren.	Je središčno someren.

16 Nekateri deltoidi so tudi rombi ali kvadrati, nekateri rombi so tudi kvadrati. Vsak kvadrat je hkrati romb in deltoid, vsak romb je deltoid.

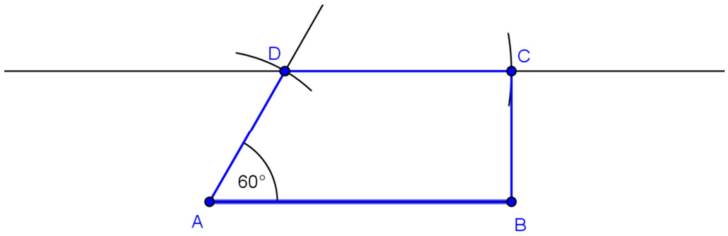
6.3. Trapezi

1

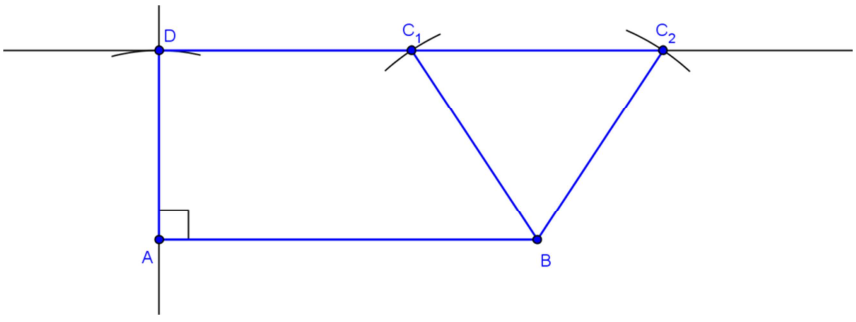
a)



b)

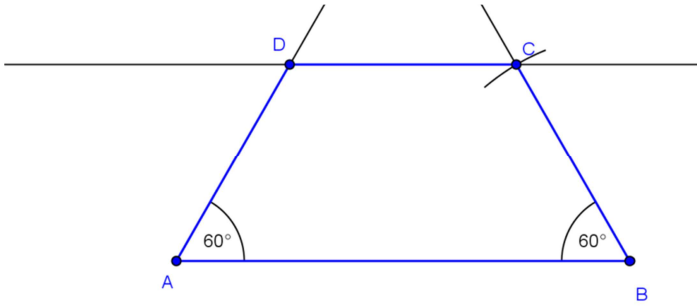


c)

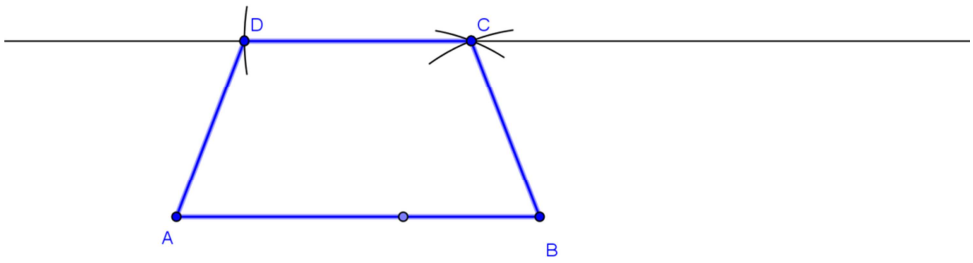


2

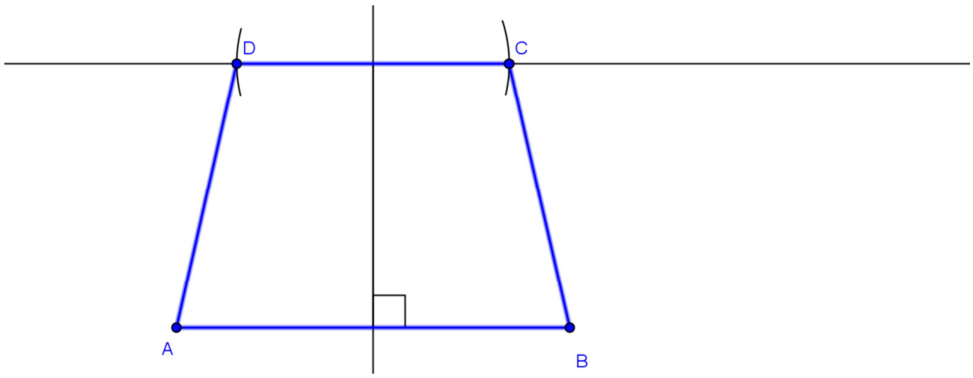
a)



b)

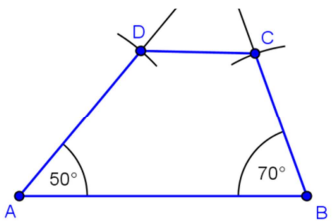


c)

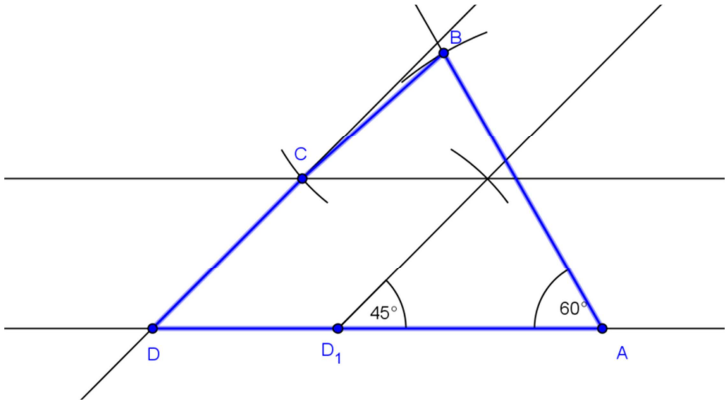


4

a)



b)



6.4. Obseg in ploščina štirikotnikov

1 $o = 15{,}2$ cm; $o = 13$ cm; $o = 9{,}4$ cm; $o = 9$ cm; $o = 9{,}6$ cm; $o = 10{,}4$ cm

2 ①$o = 9{,}6$ cm; ②$o = 9{,}4$ cm; ③$o = 7{,}2$ cm; ④$o = 8{,}6$ cm; ⑤$o = 9{,}6$ cm

3

a) $o = 14{,}4$ cm
b) $o = 8{,}6$ cm
c) $o = 13{,}2$ cm
č) $o = 17{,}8$ cm
d) $o = 21{,}9$ cm

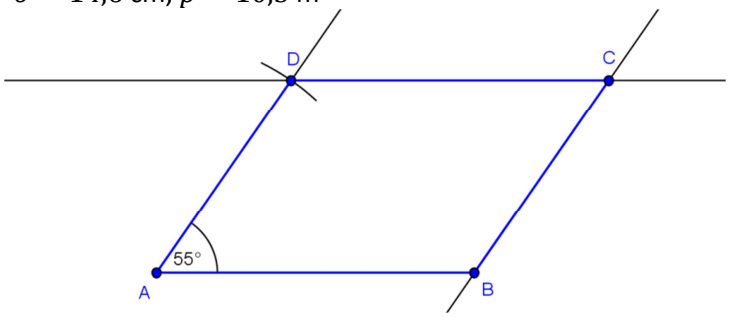
4

a) $b = 2{,}4$ cm
b) $a = 5{,}55$ cm
c) $d = 7$ cm
č) $b = 5$ cm
d) $b = 1{,}5$ cm

5

a) $o = 23{,}4$ cm, $p = 22{,}5$ cm^2
b) $o = 20{,}4$ km, $p = 25$ km^2
c) $o = 24{,}8$ dm, $p = 19{,}2$ dm^2
č) Največjo ploščino ima pravokotnik, saj je v tem primeru višina pri danih stranicah največja.

6 $o = 14{,}6$ cm, $p = 10{,}5$ m^2

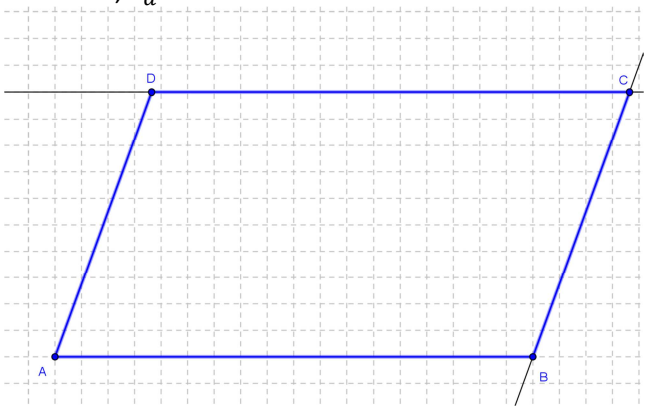


7

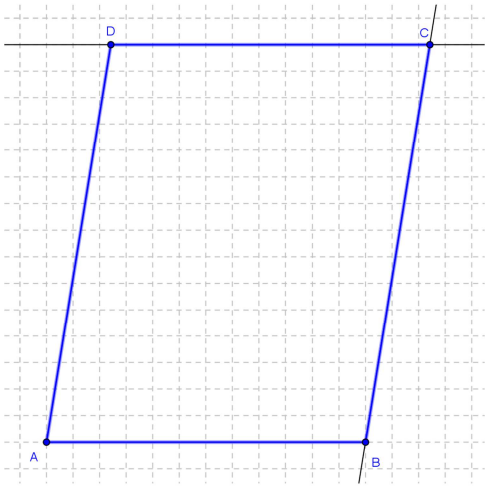
	a [m]	b [m]	v_a [m]	o [m]	p [m^2]
a)	2,6	1,6	1,4	8,4	3,64
b)	5,3	2,2	3,5	15	18,55
c)	5	4,1	2,4	18,2	12
č)	3,7	2,6	1,7	12,6	6,29

8

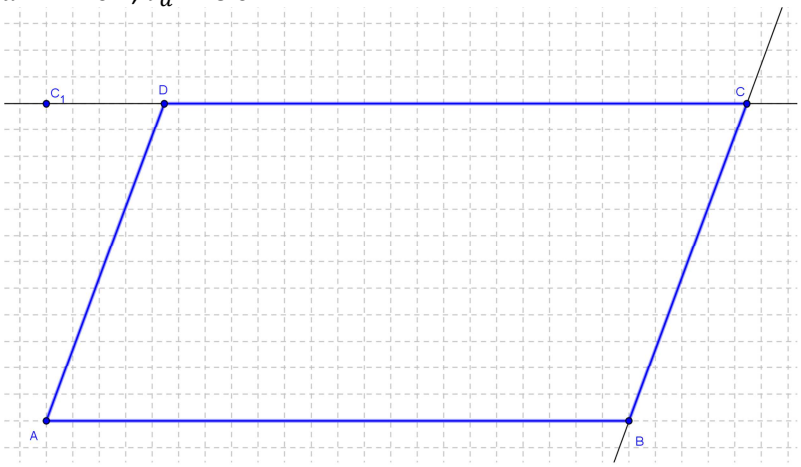
a) $a = 9$ cm, $v_a = 5$ cm



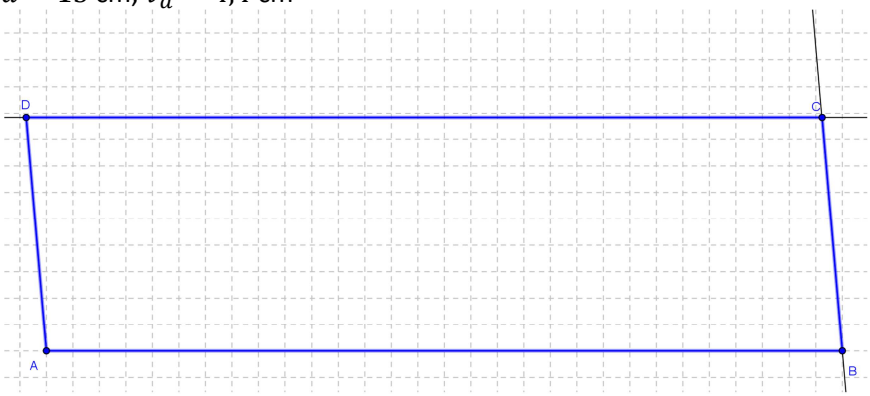
$a = 6$ cm, $v_a = 7{,}5$ cm



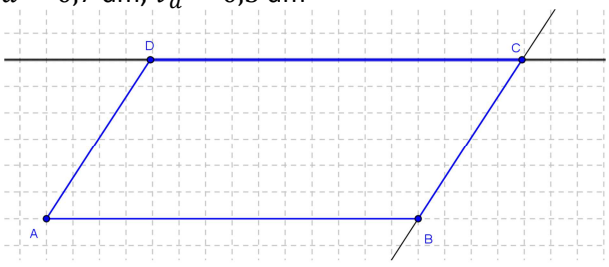
b) $a = 11$ cm, $v_a = 6$ cm



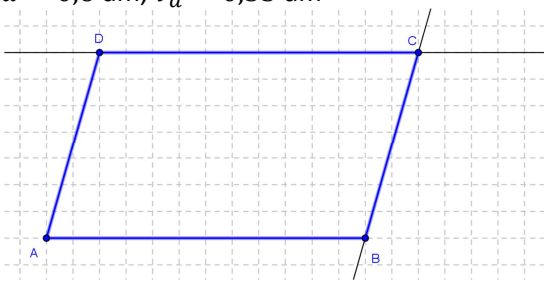
$a = 15$ cm, $v_a = 4{,}4$ cm



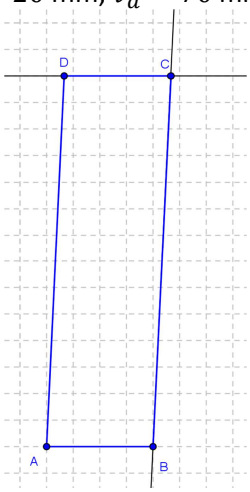
c) $a = 0{,}7$ dm, $v_a = 0{,}3$ dm



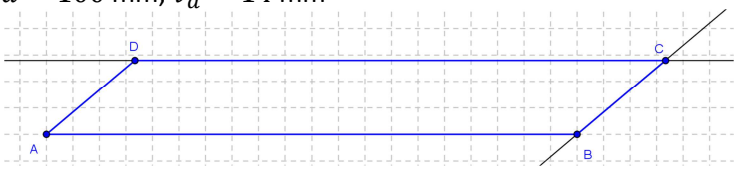
$a = 0{,}6$ dm, $v_a = 0{,}35$ dm



č) $a = 20$ mm, $v_a = 70$ mm

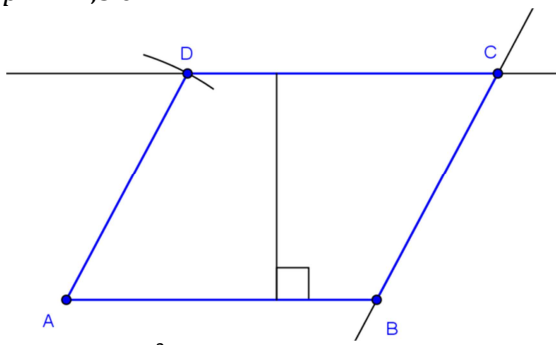


$a = 100$ mm, $v_a = 14$ mm

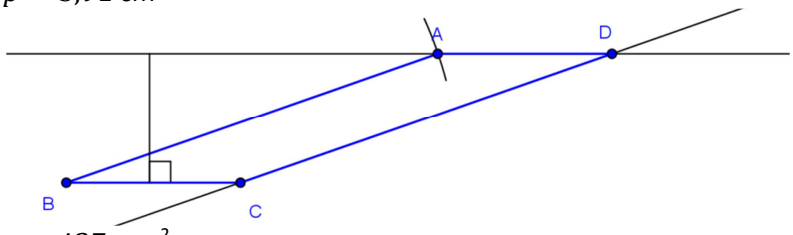


9

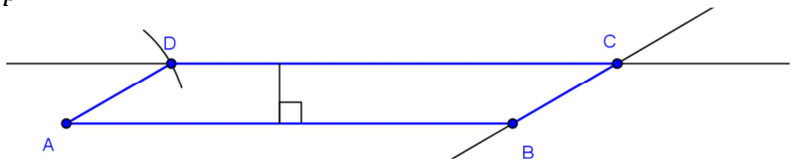
a) $p = 12{,}3$ cm^2



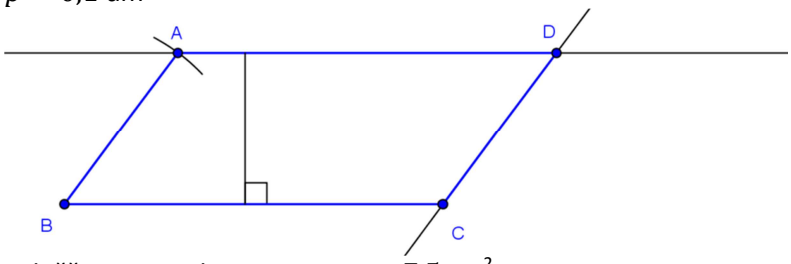
b) $p = 3{,}91$ cm^2



c) $p = 427$ mm^2



č) $p = 0{,}1\ \text{dm}^2$

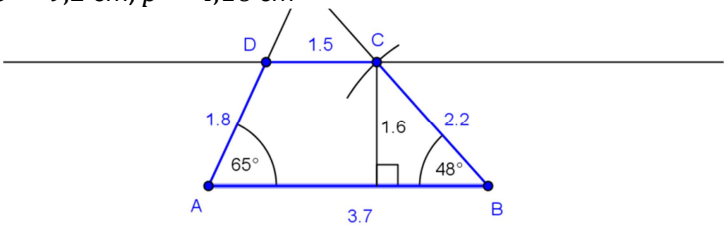


10 Vse ploščine so enake in merijo $p = 7{,}5\ \text{cm}^2$.

11

a) $p = 6\ \text{cm}^2$
b) $p = 12{,}8\ \text{cm}^2$
c) $p = 10{,}64\ \text{cm}^2$
č) $p = 2{,}625\ \text{cm}^2$
d) $p = 24{,}2\ \text{m}^2$
e) $p = 5\ \text{cm}^2$

12 $o = 9{,}2\ \text{cm}, p = 4{,}16\ \text{cm}^2$

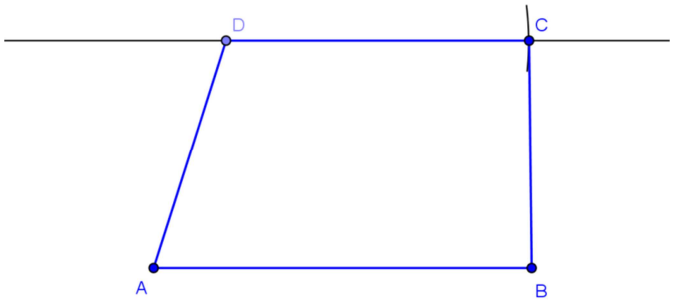


13

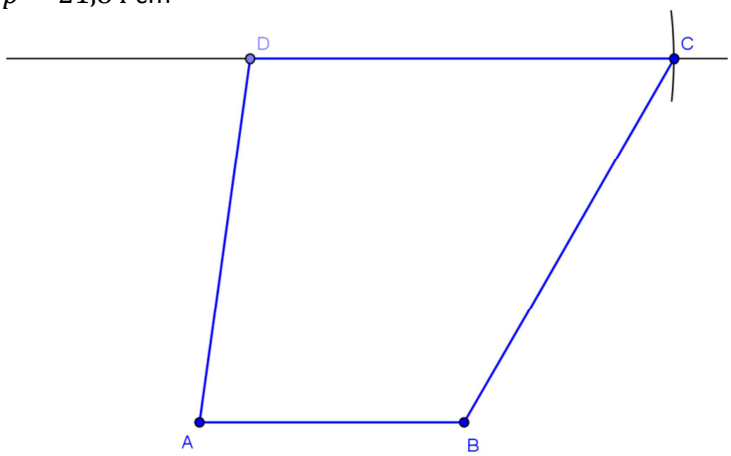
a) Trapez je preoblikoval v ploščinsko enak pravokotnik z enako višino.
b) Srednjica *s* je daljica, ki povezuje razpolovišči krakov trapeza.

14 Opomba: Pri danih podatkih je mogoče načrtati neskončno trapezov, ki se razlikujejo v dolžini krakov. Trapez na sliki prestavlja eno od možnih rešitev.

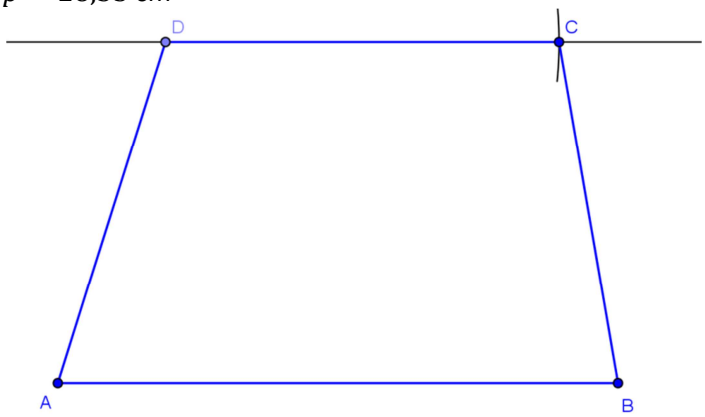
a) $p = 13{,}5\ \text{cm}^2$



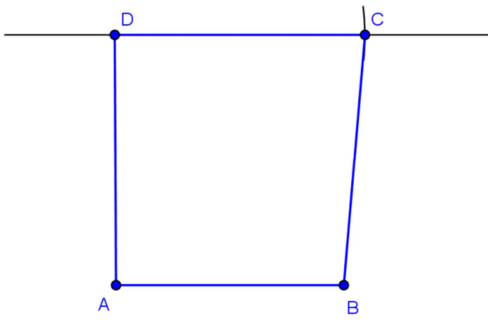
b) $p = 21{,}84\ \text{cm}^2$



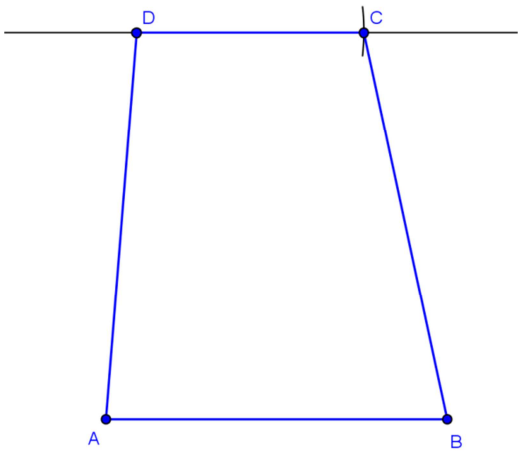
c) $p = 28{,}35\ \text{cm}^2$



č) $p = 10{,}395\ \text{cm}^2$



d) $p = 19{,}125\ \text{cm}^2$



15

a) $a = 22\ \text{cm}, c = 12\ \text{cm}, v = 2\ \text{cm}$
$a = 11\ \text{cm}, c = 2{,}6\ \text{cm}, v = 5\ \text{cm}$

b) $a = 17\ \text{cm}, c = 15\ \text{cm}, v = 6\ \text{cm}$
$a = 14\ \text{cm}, c = 10\ \text{cm}, v = 8\ \text{cm}$

c) $a = 18\ \text{mm}, c = 12\ \text{mm}, v = 30\ \text{mm}$
$a = 34\ \text{mm}, c = 16\ \text{mm}, v = 18\ \text{mm}$

č) $a = 0{,}75\ \text{km}, c = 0{,}5\ \text{km}, v = 0{,}4\ \text{km}$
$a = 1{,}7\ \text{km}, c = 0{,}8\ \text{km}, v = 0{,}2\ \text{km}$

d) $a = 150\ \text{m}, c = 70\ \text{m}, v = 300\ \text{m}$
$a = 320\ \text{m}, c = 120\ \text{m}, v = 150\ \text{m}$

e) $a = 61061\ \text{mm}, c = 56780\ \text{mm}, v = 4\ \text{mm}$
$a = 19000\ \text{mm}, c = 45682\ \text{mm}, v = 2\ \text{mm}$

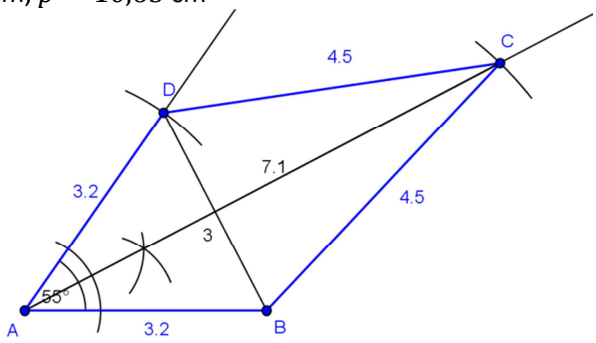
16 Trapez s temi podatki ni enolično določen, zato ni mogoče določiti ploščine in obsega.

17 $p = 65\ \text{m}^2$

18 $P = 77\ \text{m}^2$

19 $p = 9{,}02\ \text{cm}^2$; $p = 40\ \text{cm}^2$; $p = 42\ \text{cm}^2$

20 $o = 15{,}4\ \text{cm}$, $p = 10{,}65\ \text{cm}^2$



21

a) $p = 8{,}82\ \text{cm}^2$

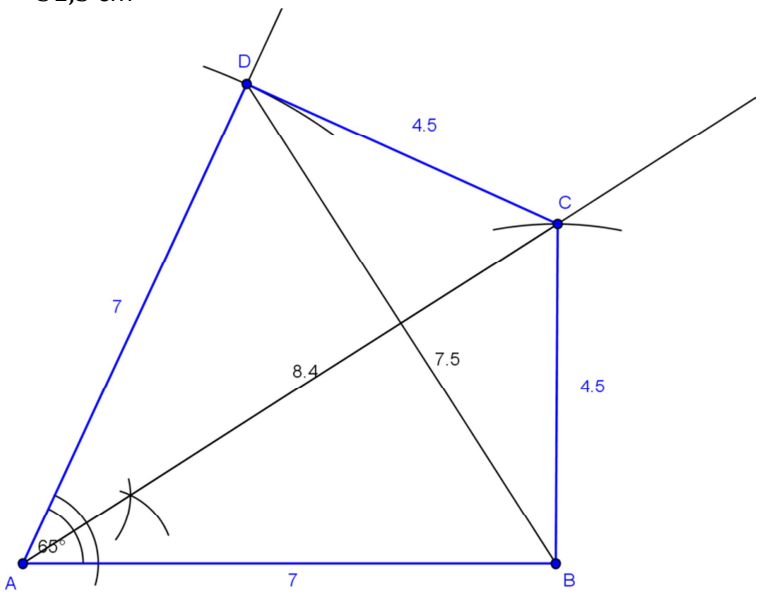
b) $p = 2{,}4\ \text{m}^2$

c) $p = 150\ \text{cm}^2$

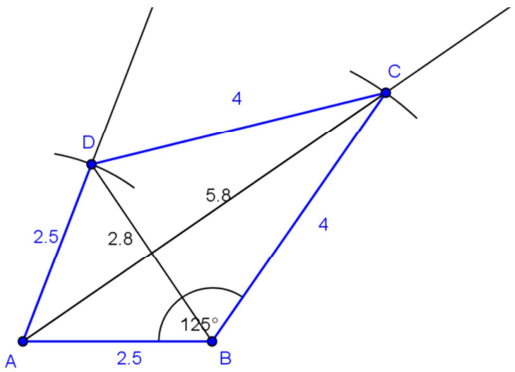
č) $p = 1200\ \text{cm}^2$

22

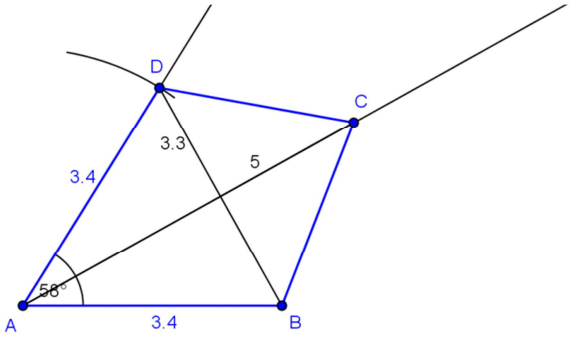
a) $p = 31{,}5\ \text{cm}^2$



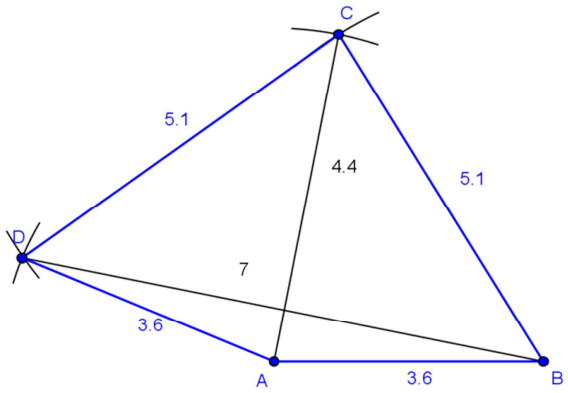
b) $p = 8{,}12\ \text{cm}^2$



c) $p = 8{,}25\ \text{cm}^2$



č) $p = 15{,}4\ \text{cm}^2$



23

a) $f = 6$ cm
b) $e = 11{,}5$ mm
c) $f = 5$ dm
č) $f = 50$ dm

24 Ploščini sta enaki $\left(p = \frac{e \cdot f}{2}\right)$, obsega sta enaka le v primeru, ko se diagonali deltoida razpolavljata (tak deltoid je romb).

25

a) Obsega ni mogoče enolično določiti, saj so dolžine stranic deltoida odvisne od točke v kateri diagonala *e* seka diagonalo *f*.
b) Potrebuje 1250 cm^2 papirja.

26 Drži. Vsi rombi, ki se ujemajo v stranici in višini na to stranico, imajo enako ploščino.

27

a) $p = 41\ \text{e}^2$
b) $p = 60\ \text{e}^2$

28

a) $p = 4{,}62\ \text{m}^2$
Potrebujemo približno 0,6 l barve, torej 1 pločevinko.
b) Glede na sliko lahko ocenimo, da moramo pobarvati približno 8 m^2 zidu. Zato potrebujemo približno 1,2 l barve, torej 2 pločevinki.

29 Dobimo mrežo škatle.

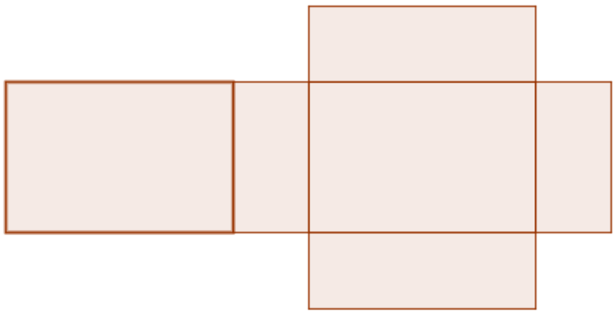
30 Pokončna štiristrana prizma je obdana z 2 skladnima štirikotnikoma in 4 pravokotniki, poševna štiristrana prizma je obdana z 2 skladnima štirikotnikoma in 4 paralelogrami.

31 Zidak, tlakovec, škatla, kocka, stolpnica, …

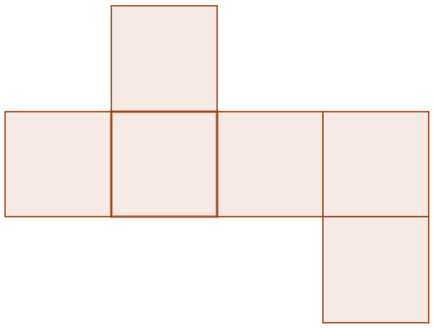
32 Druga mreža.

33 Da.

34



35 Narisati je mogoče 11 različnih mrež kocke. Na sliki je ena predstavljena ena rešitev.



36 $P = 128\ \text{cm}^2$

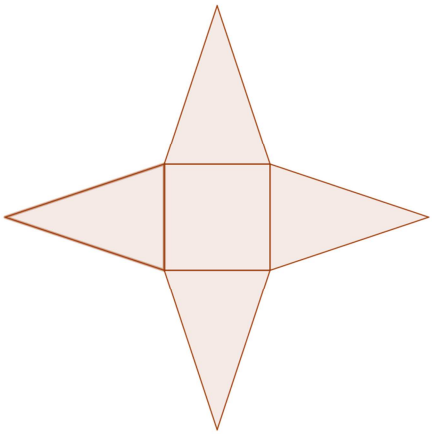
37 Pokončna štiristrana piramida je obdana z 1 štirikotnikom in 4 enakokrakimi trikotniki. Poševna piramida je obdana z 1 štirikotnikom in 4 trikotniki.

38 b)

39

a) Da.
b) Da.

40



41 Največja možna površina je $128\ \text{cm}^2$ (če je osnovna ploskev kvadrat).

Utrdi svoje znanje

1

a) Romb ima vse stranice enako dolge, diagonali se razpolavljata pod pravim kotom.
b) Kraka nista vzporedna in enako dolga.
c) Kraka nista vzporedna.
č) Osnovnici sta vzporedni.

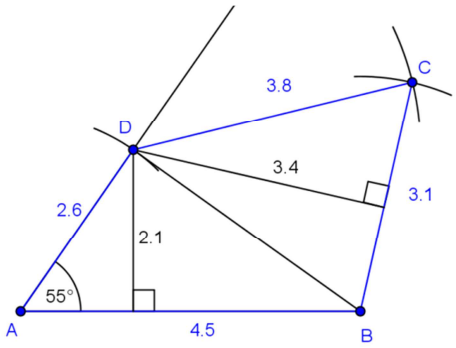
2 Vsak kvadrat je hkrati tudi pravokotnik in romb. Vsak romb, kvadrat ali pravokotnik je hkrati tudi paralelogram. Le nekateri paralelogrami so tudi rombi ali kvadrati ali pravokotniki.

3

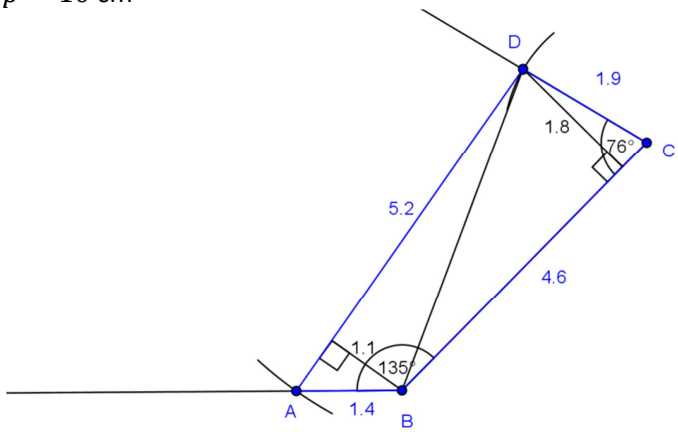
a) $a = 10$ cm, $b = 6$ cm, $v_a = 2{,}5$ cm
b) $a = 2{,}5$ cm, $b = 1{,}5$ cm, $v_a = 2{,}5$ cm
c) $a = 5$ cm, $b = 3$ cm, $v_a = 5$ cm
č) $a = 2{,}5$ cm, $b = 3$ cm, $v_a = 2{,}5$ cm
d) $a = 4{,}5$ cm, $b = 2{,}7$ cm, $v_a = 2{,}5$ cm
e) $a = 7{,}5$ cm, $b = 3$ cm, $v_a = 2{,}5$ cm

4

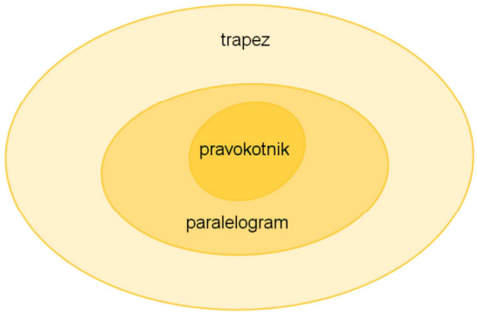
a) $p \doteq 10$ cm^2



b) $p \doteq 10$ cm^2



5



6

a) Površina vrtička je največja, če ima obliko enakostraničnega trikotnika s stranico dolžine 37 m.
Zasejeta lahko približno 593 m^2 vrtička.
b) Potrebujeta približno 1800 semen vsake vrste. Semena paradižnika stanejo približno 178 €. Cene sončničnih semen ni mogoče izračunati, saj ne vemo, koliko semen je v posamezni vrečici.

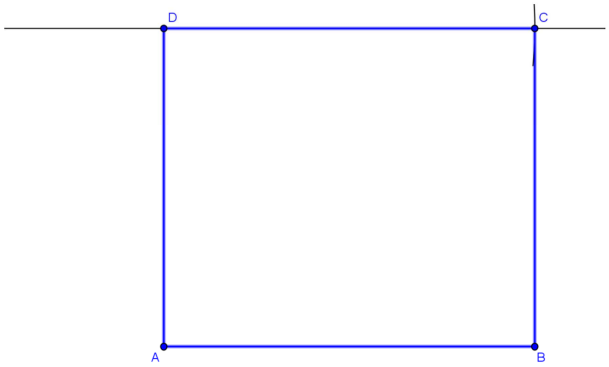
7

a) $2100\ \text{mm}^2$, $2450\ \text{mm}^2$, $1575\ \text{cm}^2$,$1750\ \text{cm}^2$, $1225\ \text{cm}^2$, $2625\ \text{cm}^2$.

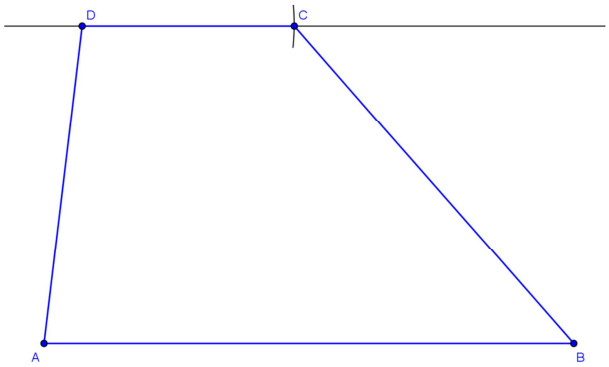
b) Deska je bila pred razrezom dolga približno 369 mm in široka 35 mm. Zaradi žaganja je bilo izgubljenih približno 315 mm^2 deske.

8

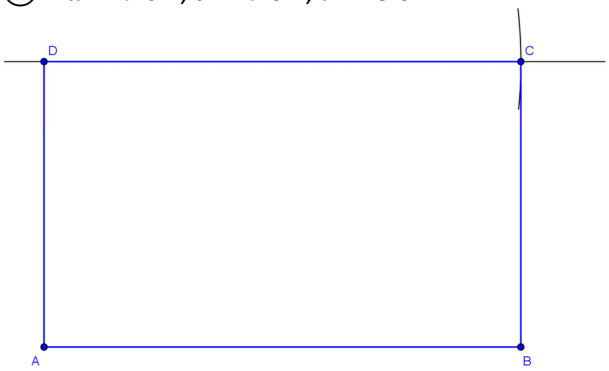
① $a = 7$ cm, $c = 7$ cm, $v = 6$ cm



$a = 10$ cm, $c = 4$ cm, $v = 6$ cm

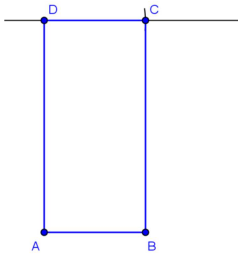


② $a = 9$ cm, $c = 9$ cm, $v = 6$ cm

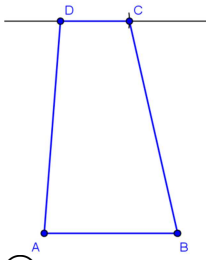


$a = 10$ cm, $c = 8$ cm, $v = 6$ cm

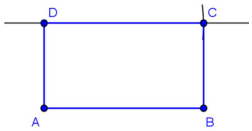
③ $a = 19$ mm, $c = 19$ mm, $v = 40$ mm



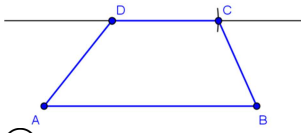
$a = 25$ mm, $c = 13$ mm, $v = 40$ mm



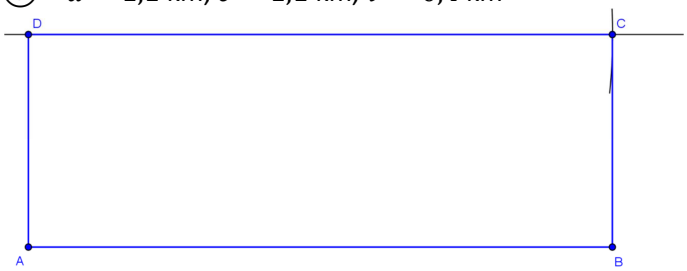
④ $a = 3$ dm, $c = 3$ dm, $v = 1{,}6$ dm



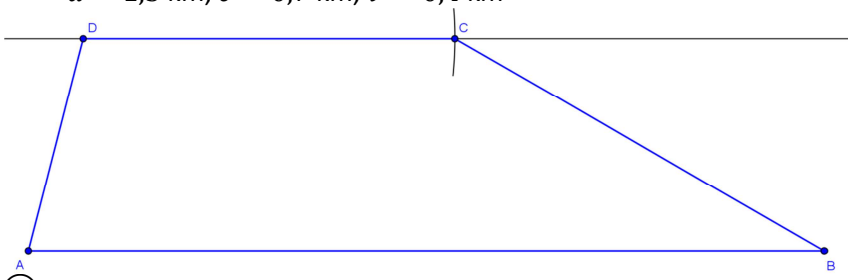
$a = 4$ dm, $c = 2$ dm, $v = 1{,}6$ dm



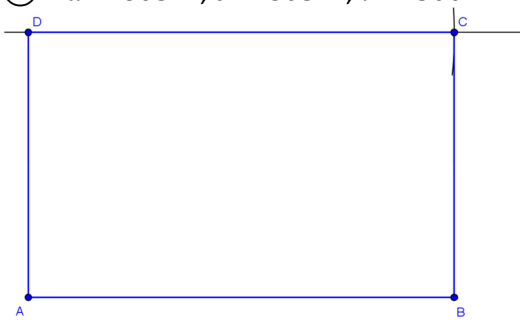
⑤ $a = 1{,}1$ km, $c = 1{,}1$ km, $v = 0{,}4$ km



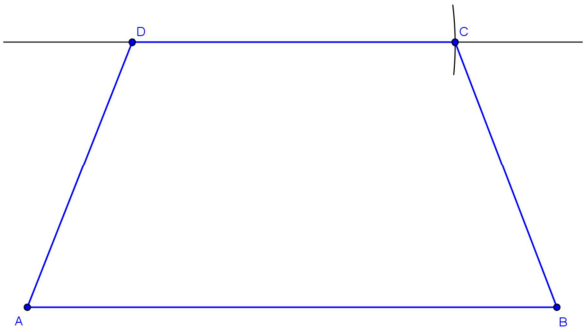
$a = 1{,}5$ km, $c = 0{,}7$ km, $v = 0{,}4$ km



⑥ $a = 805$ m, $c = 805$ m, $v = 500$ m



$a = 1000$ m, $c = 610$ m, $v = 500$ m

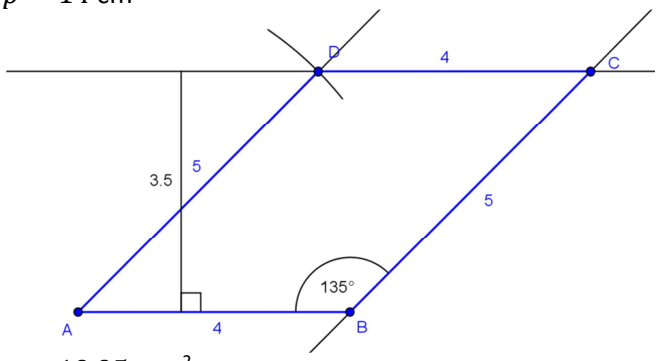


9

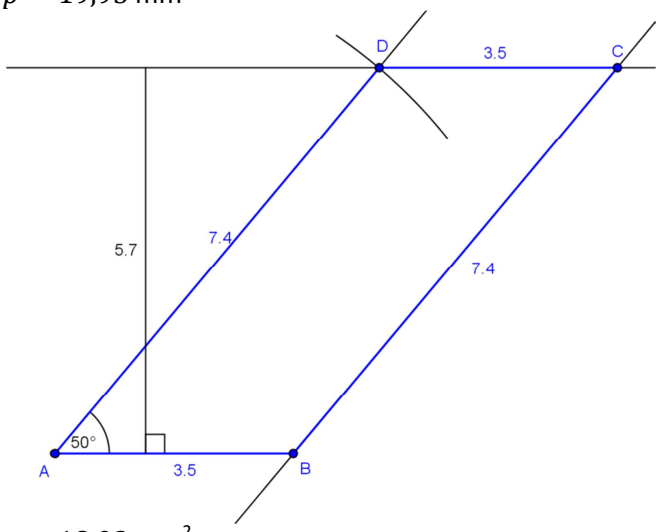
a) $p = 20{,}91\ \text{cm}^2$
b) $p = 2600\ \text{mm}^2$
c) $p = 18{,}92\ \text{mm}^2$

10

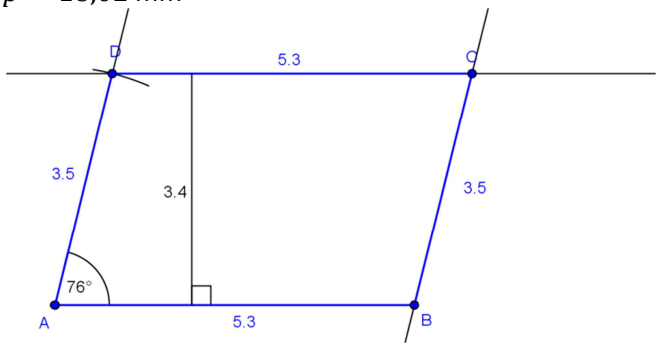
a) $p = 14\ \text{cm}^2$



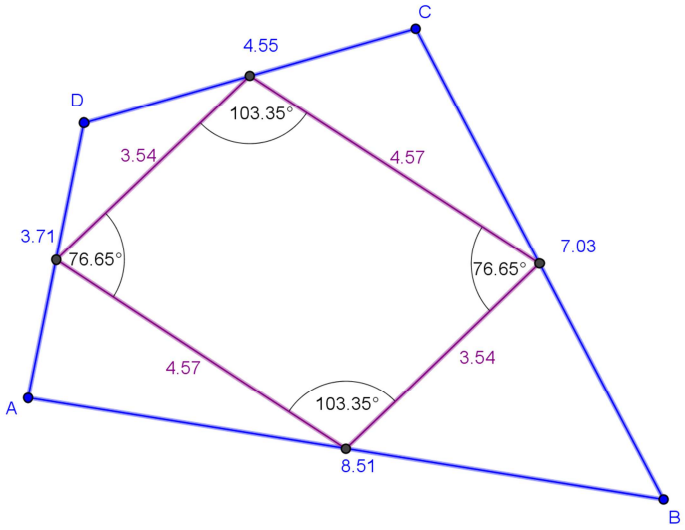
b) $p = 19{,}95\ \text{mm}^2$



c) $p = 18{,}02\ \text{mm}^2$



11 V poljubnem štirikotniku je sredinski lik paralelogram. Če se diagonali štirikotnika sekata pod pravim kotom (romb, deltoid), je sredinski lik pravokotnik. Če se diagonali štrikotnika sekata pod pravim kotom in sta enako dolgi (kvadrat), je sredinski lik kvadrat.



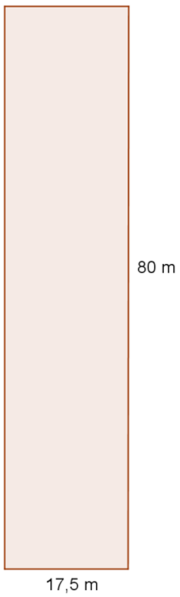
12

a) $p_A = 1200\ \text{m}^2$, $p_B = 1100\ \text{m}^2$, $p_C = 1400\ \text{m}^2$, $p_{\text{Č}} = 900\ \text{m}^2$, $p_D = 800\ \text{m}^2$, $p_E = 1400\ \text{m}^2$.

b) Družina Mastnak bi lahko kupila zemljišča B, Č ali D.

c) Dolžina ograje bo 120 m.

č) Zemljišče je široko 17,5 m.



13

a) $p = 130\ \text{cm}^2$

b) $p = 660\ \text{cm}^2$

c) $p = 775\ \text{cm}^2$

14

Diagonali razdelita vsak notranji kot v par sosednjih kotov. Diagonali tvorita pare sokotov z vrhom v presečišču diagonal. Oba para nasprotnih kotov sta skladna. Vsota notranjih kotov meri 360°.

Diagonali razdelita vsak notranji kot v par sosednjih kotov. Diagonali tvorita pare sokotov z vrhom v presečišču diagonal. Oba para nasprotnih kotov sta skladna. Vsota notranjih kotov meri 360°.

Diagonali razdelita vsak notranji kot v par sosednjih kotov. Diagonali tvorita pare sokotov z vrhom v presečišču diagonal. En par nasprotnih kotov je skladen. Vsota notranjih kotov meri 360°.

Diagonali razdelita vsak notranji kot v par sosednjih kotov. Diagonali tvorita pare sokotov z vrhom v presečišču diagonal. Noben par nasprotnih kotov ni skladen. Vsota notranjih kotov meri 360°.

Diagonali razdelita vsak notranji kot v par sosednjih kotov. Diagonali tvorita pare sokotov z vrhom v presečišču diagonal. Oba para nasprotnih kotov sta skladna. Vsota notranjih kotov meri 360°.

Diagonali razdelita vsak notranji kot v par sosednjih kotov. Diagonali tvorita pare sokotov z vrhom v presečišču diagonal. Oba para nasprotnih kotov sta skladna. Vsota notranjih kotov meri 360°.

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a) Po številu osi simetrije:

0	1	2	4
- trapez - paralelogram	- enakokraki trapez - deltoid	- pravokotnik - romb	- kvadrat

b) Po dolžini in delitvi diagonal:

$e = f$	$e \perp f$	Diagonali se razpolavljata.	Ena diagonala razpolavlja drugo.
- kvadrat - pravokotnik - enakokraki trapez	- kvadrat - romb - deltoid	- kvadrat - pravokotnik - romb - paralelogram	- deltoid

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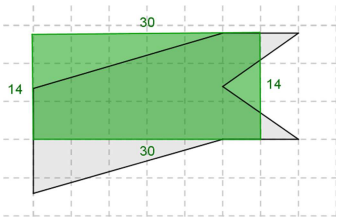
a)



b)