

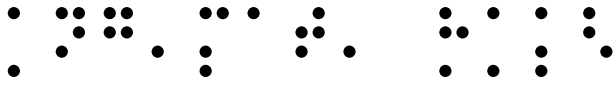
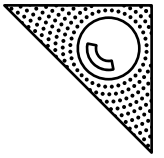
**Tastbare Versionen ausgewählter  
Grafiken aus dem Schulbuch**

# Angewandte Mathematik HAK 2

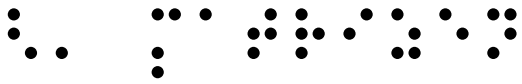
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**Grafiken: Tomáš Batha**



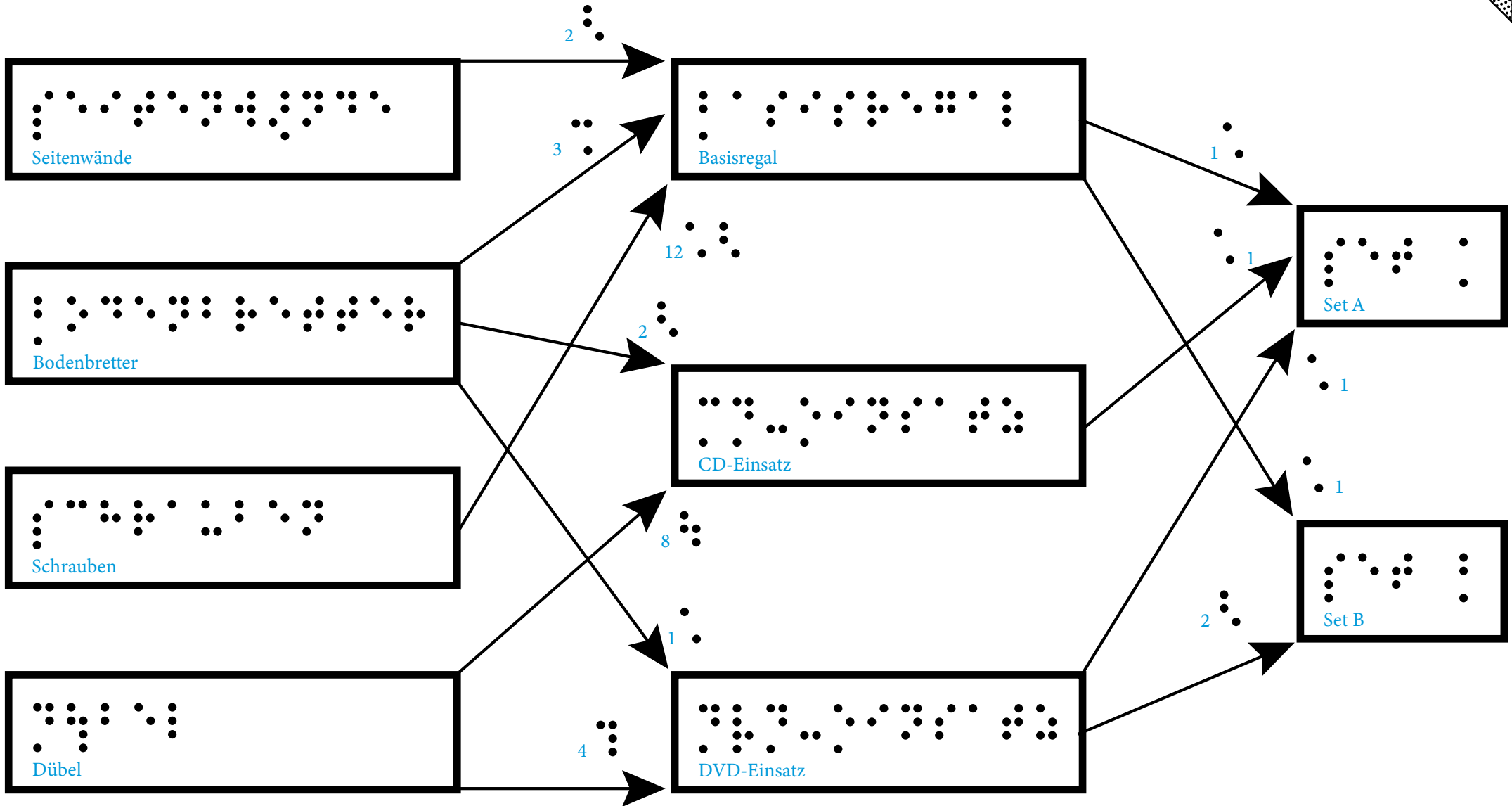
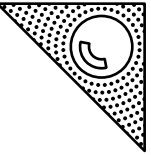
Ang.Mat. HAK2



2. Matrizen

# Angewandte Mathematik HAK Band 2

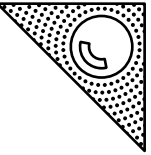
## 2. Matrizen



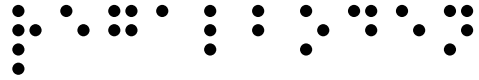
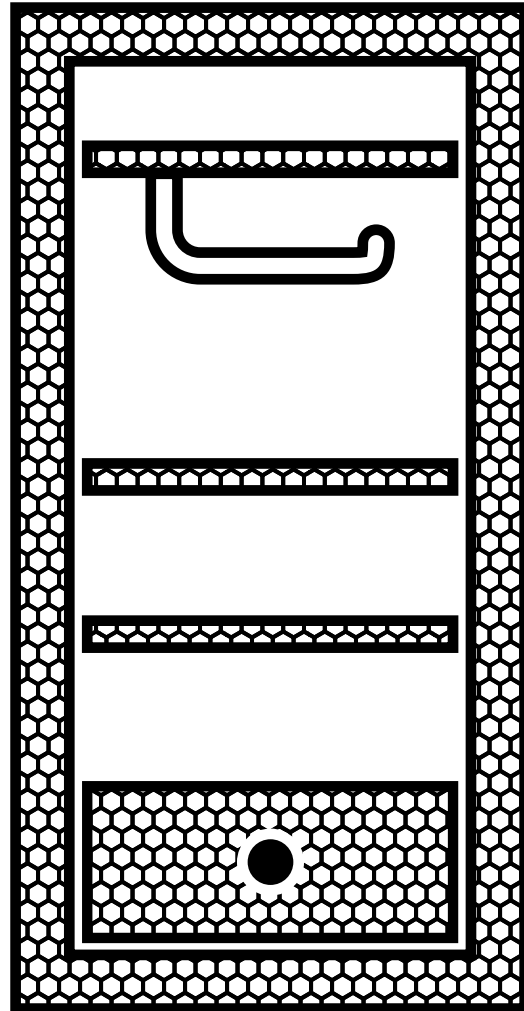
Bestandteile

Zwischenprodukte

Endprodukte



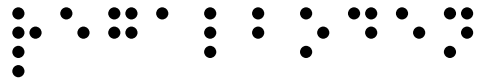
Schrank A



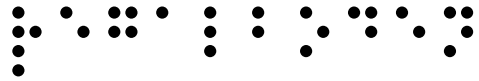
Regalboden



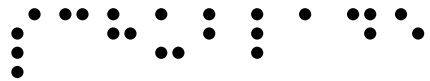
Hosenaufh.



Regalboden

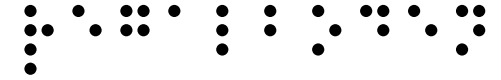
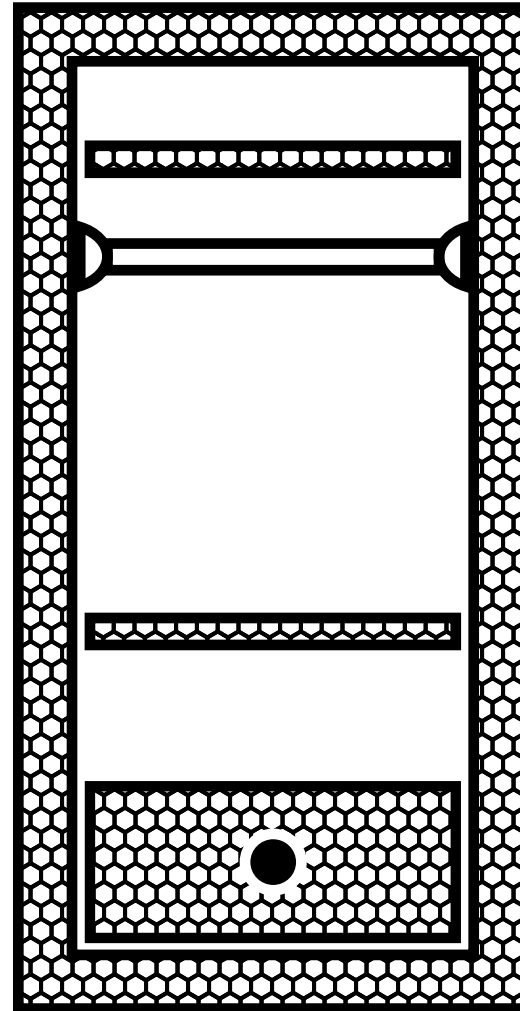


Regalboden

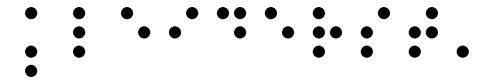


Schublade

Schrank B



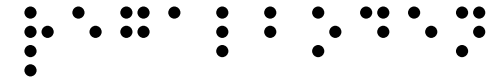
Regalboden



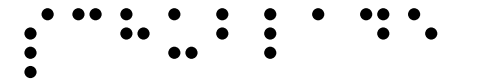
Kleiderst.



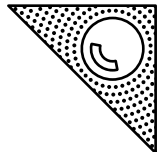
Regalboden



Regalboden



Schublade



Regalboden

Schublade

Hosenaufhängung

Kleiderstange

Schrank A

Schrank B

Graz

Salzburg

Klagenfurt

35

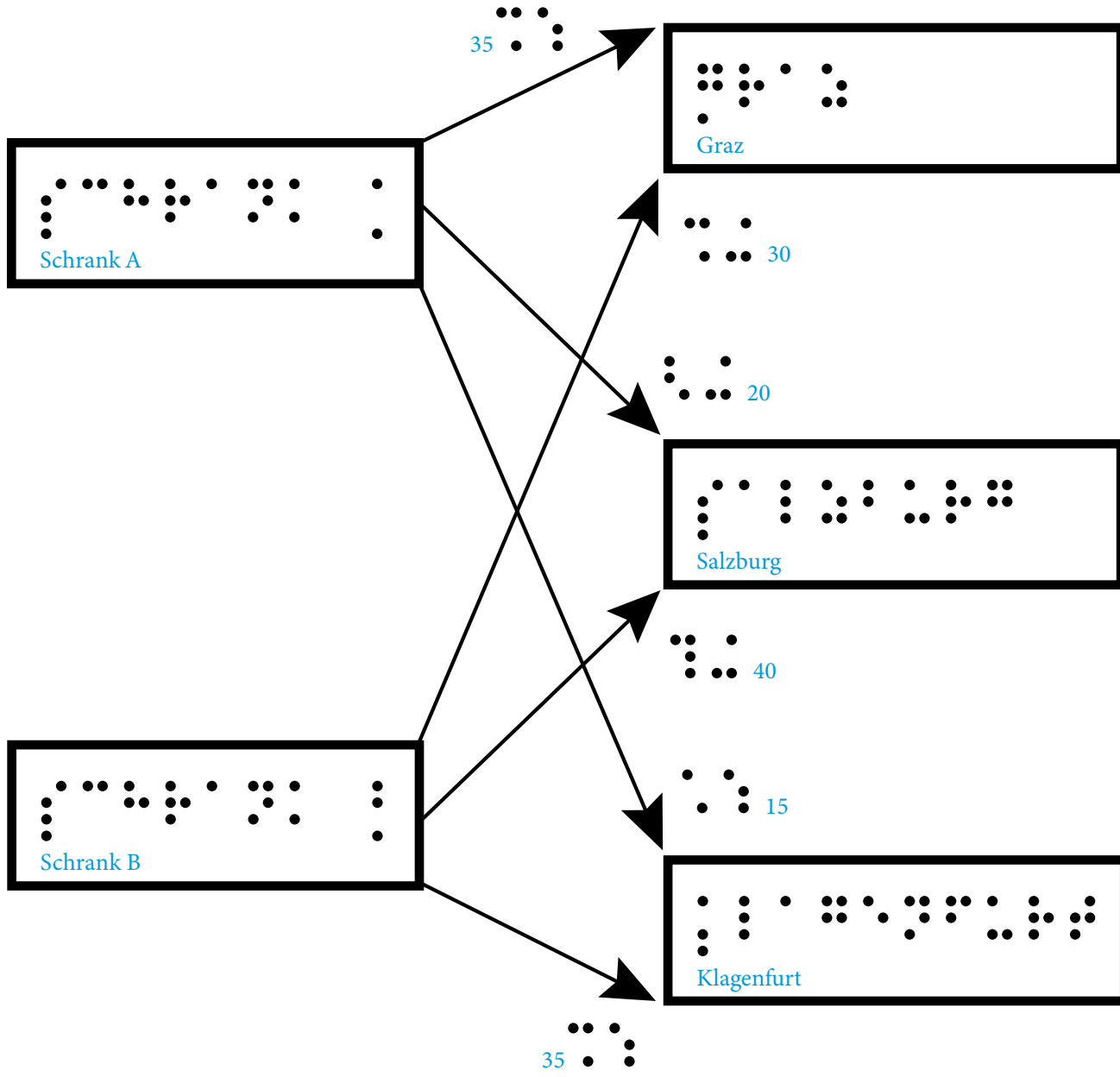
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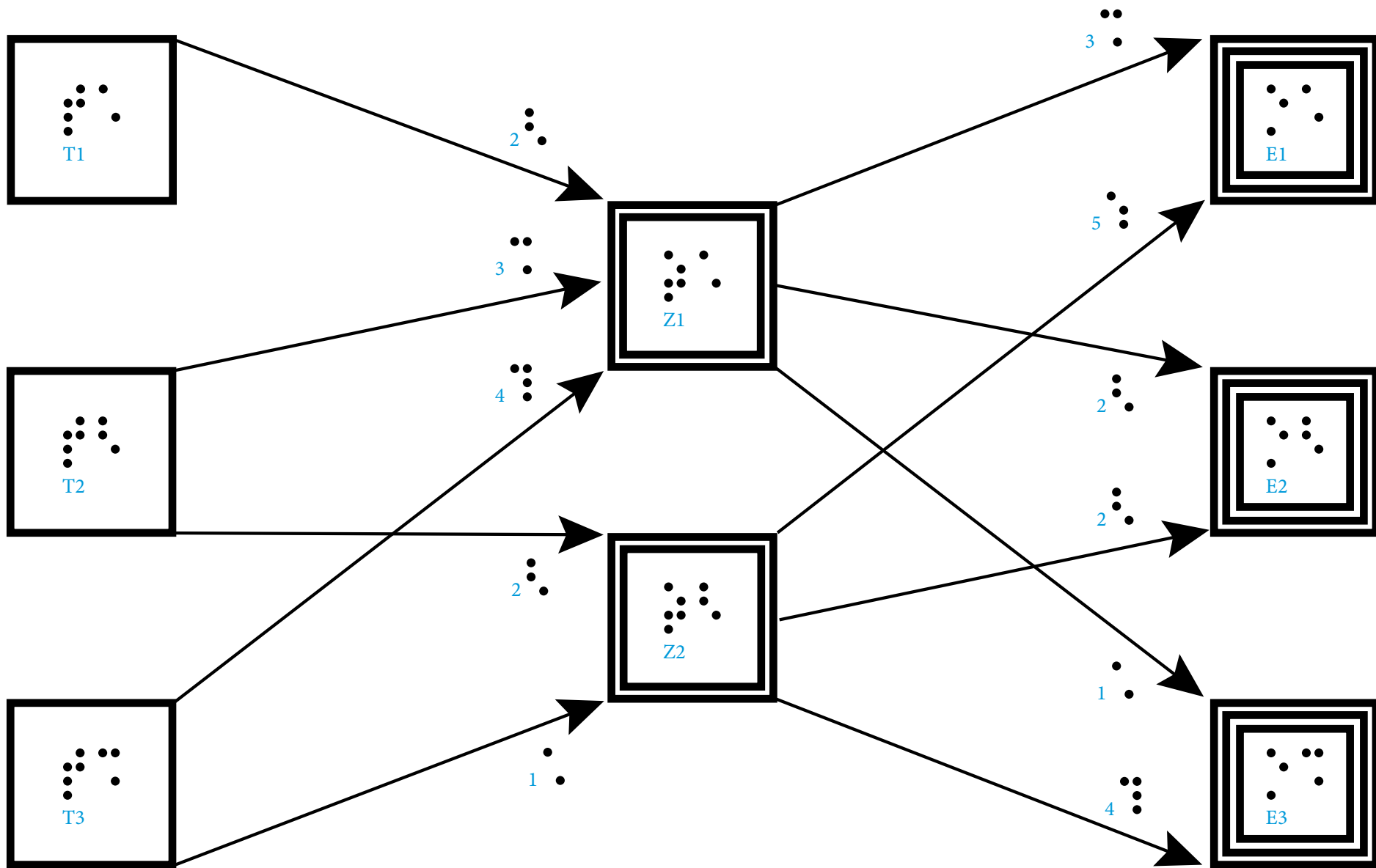
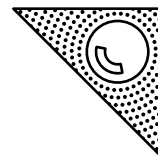
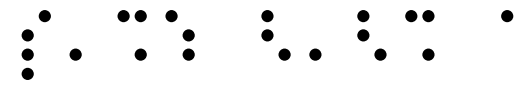
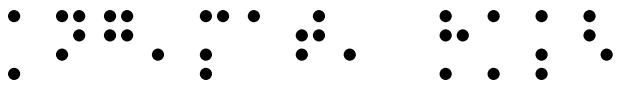
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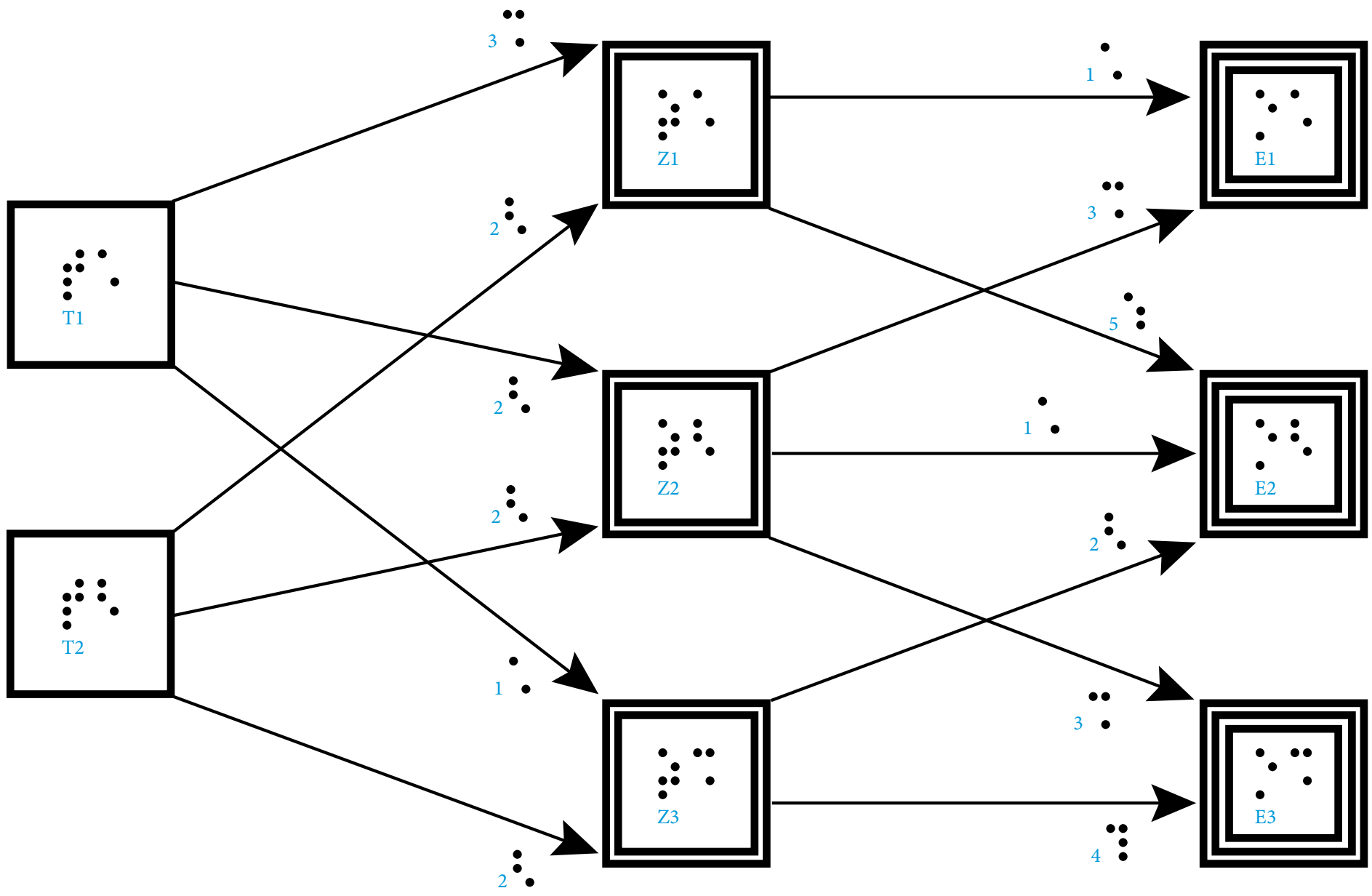
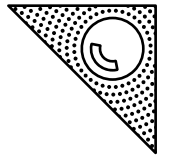
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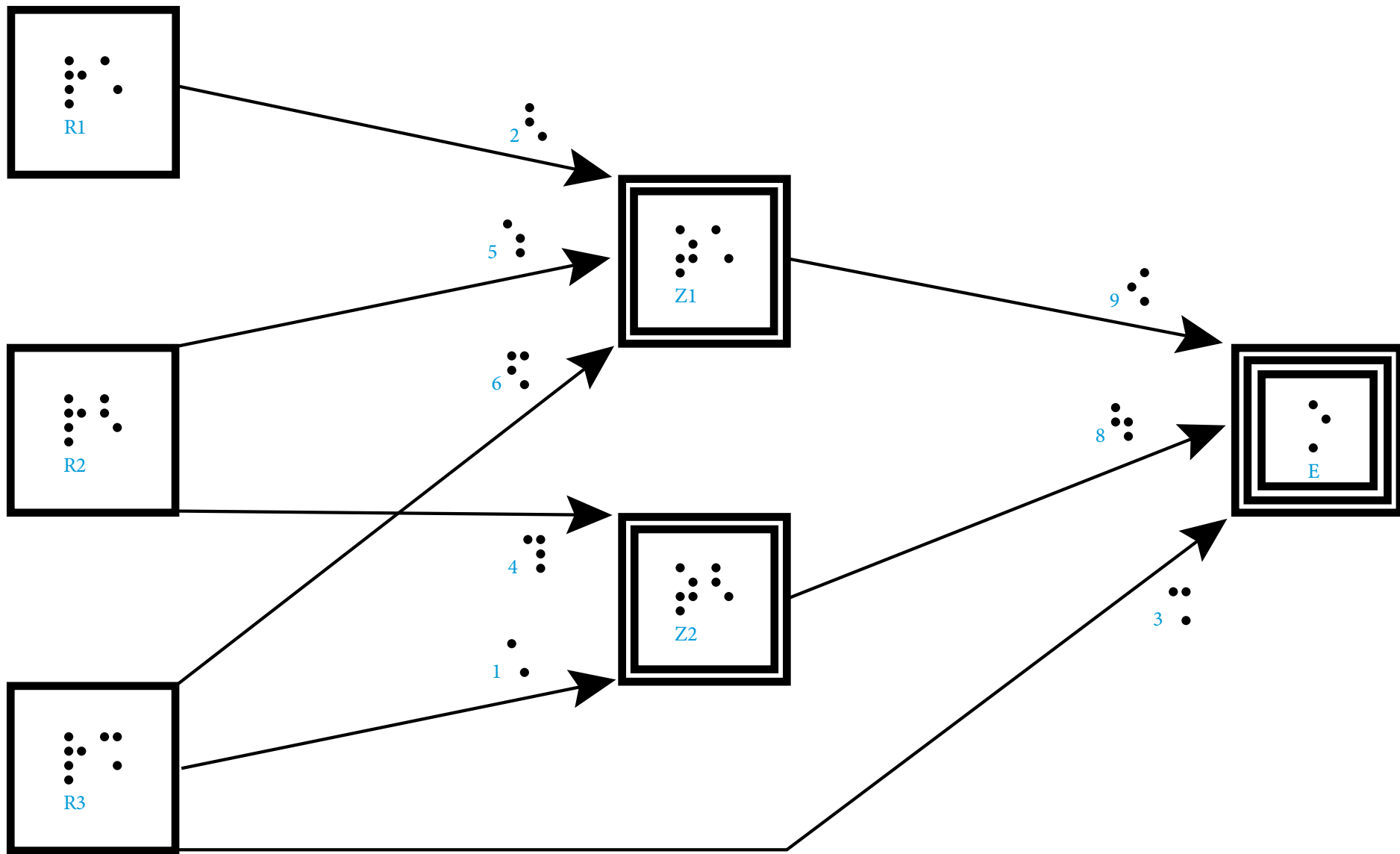
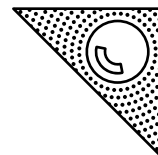
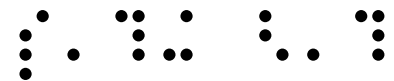
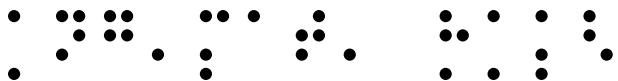
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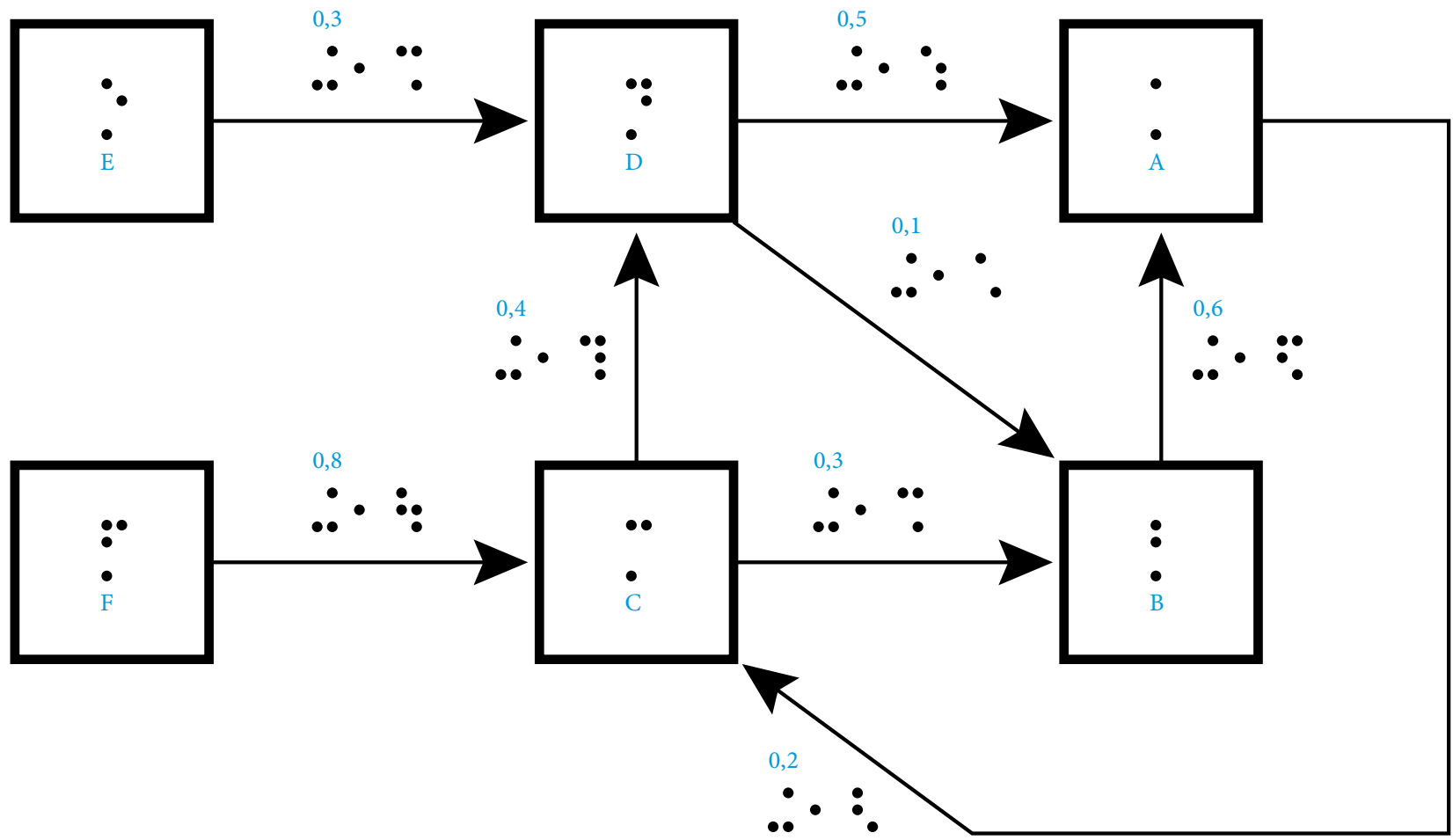
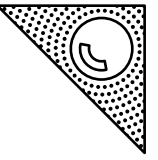


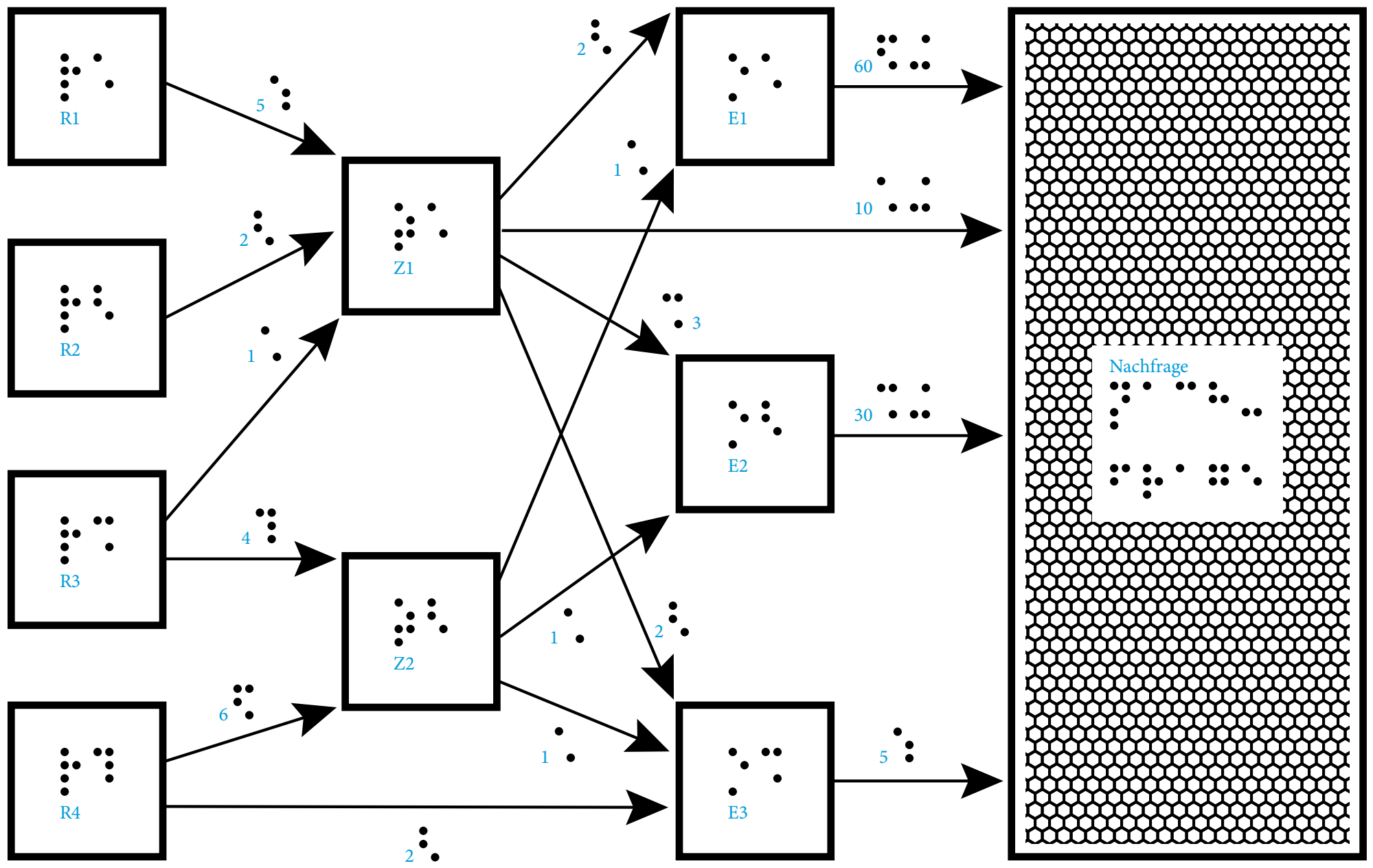
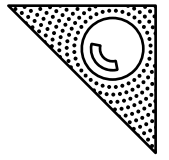




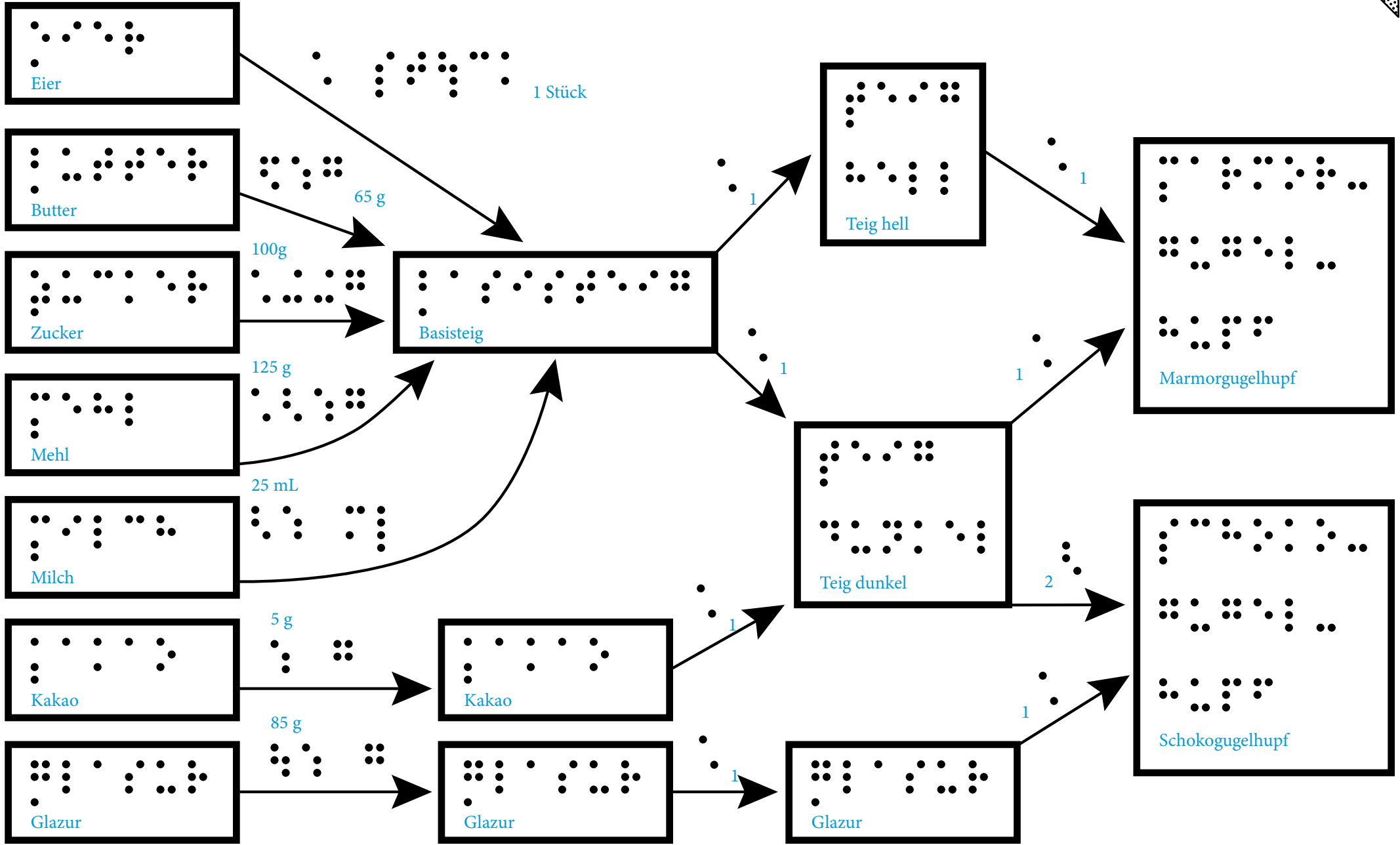
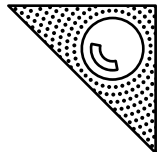


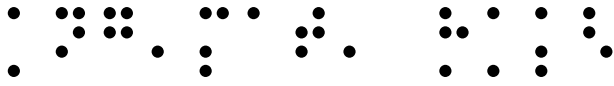
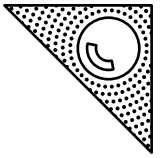




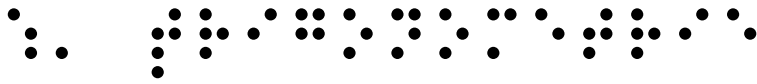


Ang.Mat. HAK2





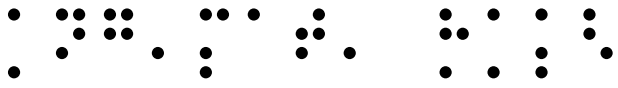
Ang.Mat. HAK2



5. Trigonometrie

# Angewandte Mathematik HAK Band 2

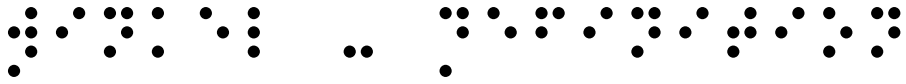
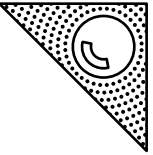
## 5. Trigonometrie



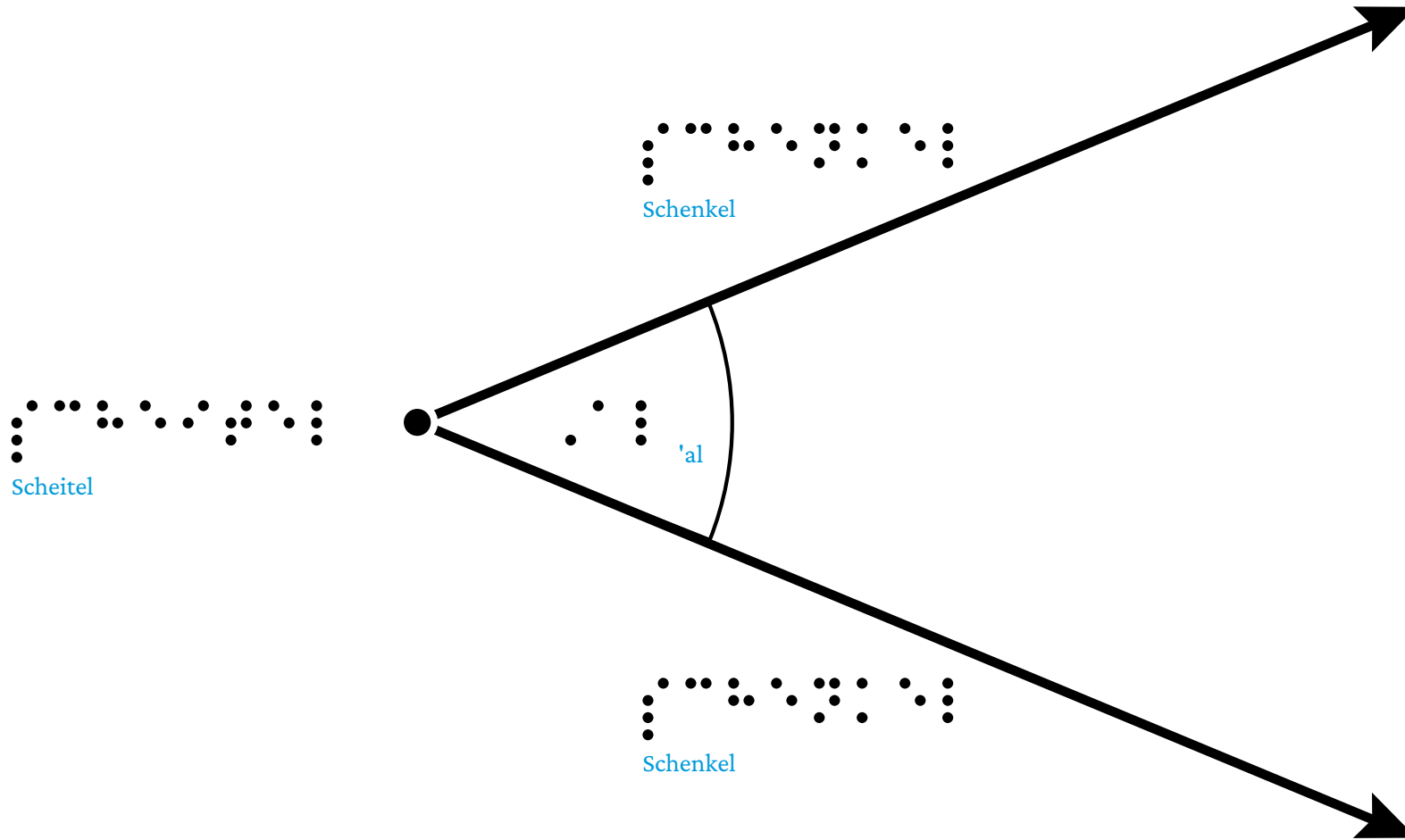
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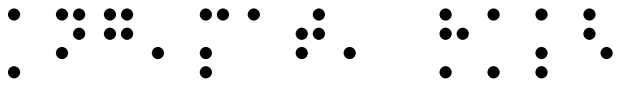


S.106



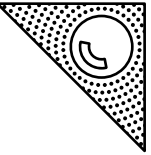
Winkel - Definition



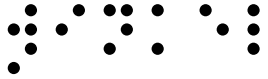


Ang.Mat. HAK2

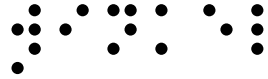
S.106



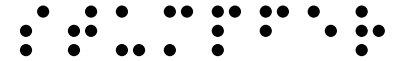
Einteilung der Winkel nach ihrer Größe 1/2



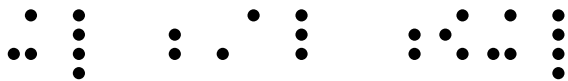
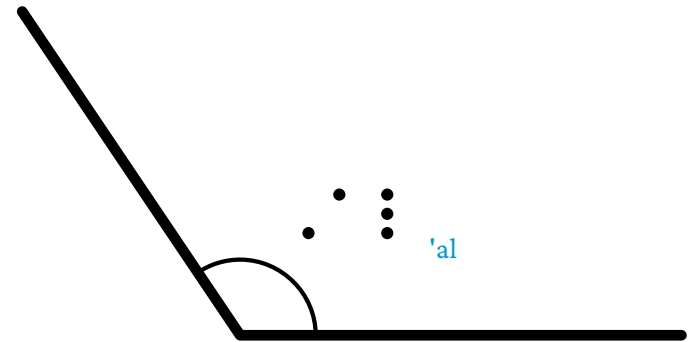
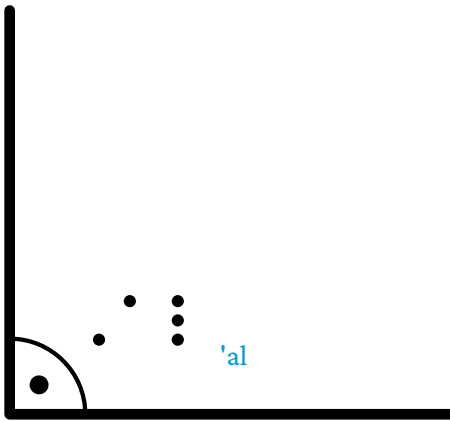
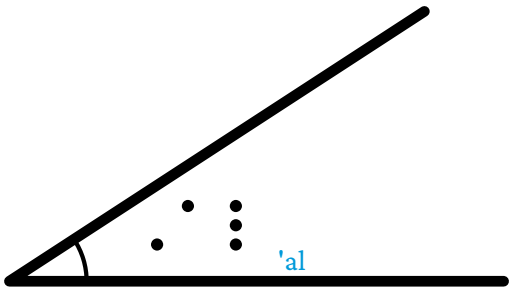
spitzer Winkel



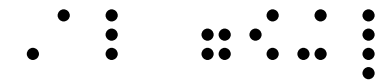
rechter Winkel



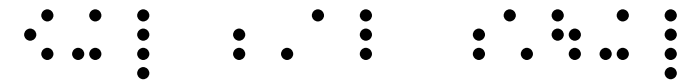
stumpfer Winkel



$0^\circ < 'al < 90^\circ$



$'al = 90^\circ$

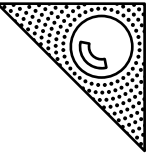


$90^\circ < 'al < 180^\circ$

Braille representation of the title 'Einteilung der Winkel nach ihrer Größe 2/2'.

Ang.Mat. HAK2

S.106



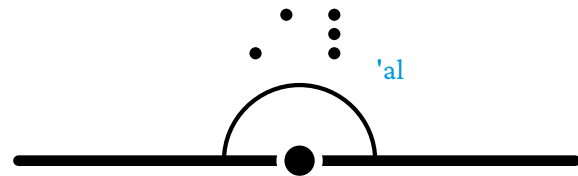
Braille representation of the title 'Einteilung der Winkel nach ihrer Größe 2/2'.

Einteilung der Winkel nach ihrer Größe 2/2

Braille representation of the title 'gestreckter Winkel'.

Braille representation of the title 'gestreckter Winkel'.

gestreckter Winkel



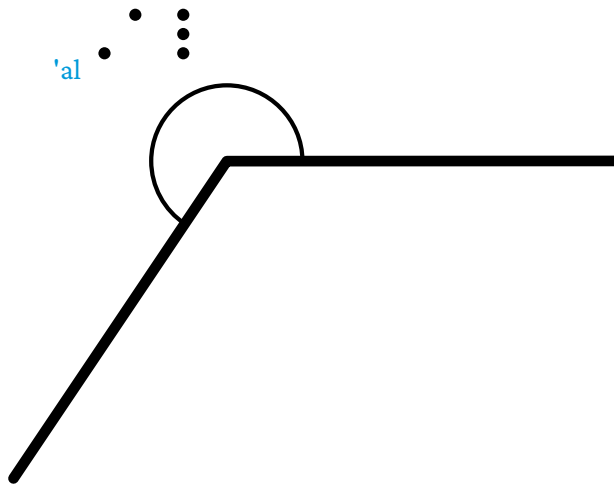
Braille representation of the equation  $'al = 180^\circ$ .

'al = 180°

Braille representation of the title 'erhabener Winkel'.

Braille representation of the title 'erhabener Winkel'.

erhabener Winkel



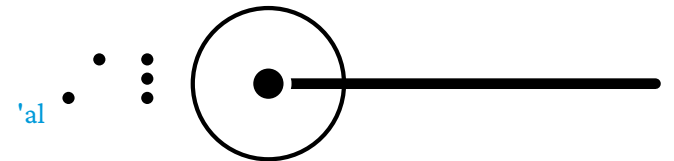
Braille representation of the inequality  $180^\circ < 'al < 360^\circ$ .

180° < 'al < 360°

Braille representation of the title 'gestreckter Winkel'.

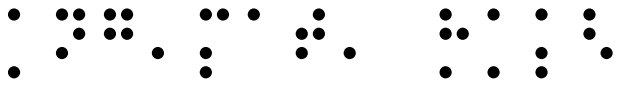
Braille representation of the title 'gestreckter Winkel'.

gestreckter Winkel



Braille representation of the equation  $'al = 360^\circ$ .

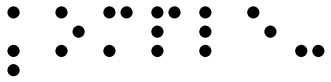
'al = 360°



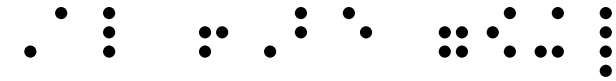
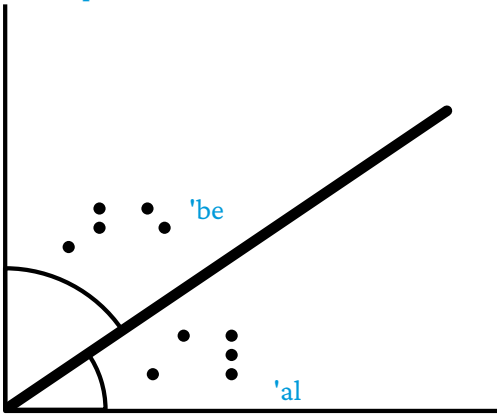
Ang.Mat. HAK2



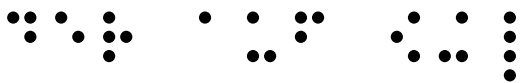
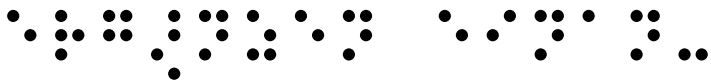
Winkelpaare in besonderer Lage



Komplementärwinkel



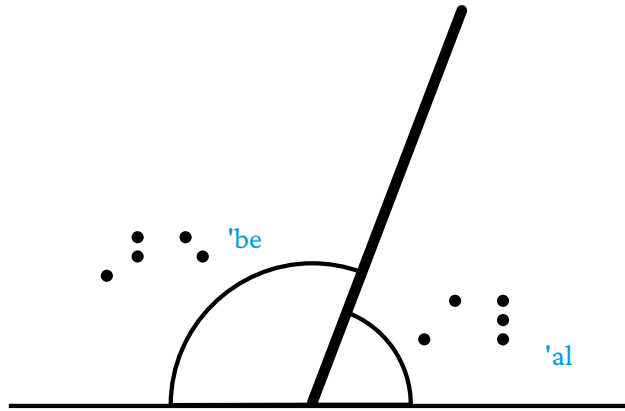
'al + 'be = 90°



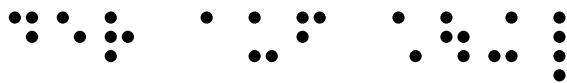
ergänzen einander auf 90°



Komplementärwinkel



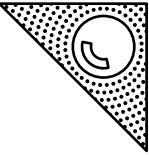
'al + 'be = 180°



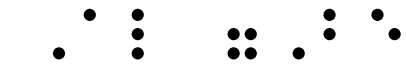
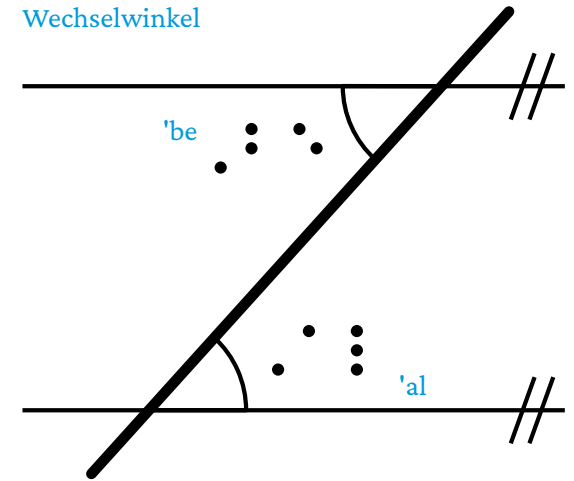
ergänzen einander auf 180°



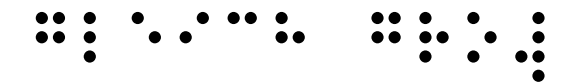
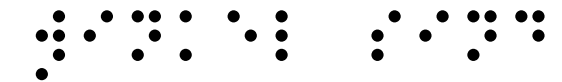
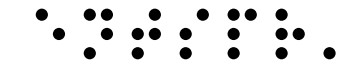
S.106



Wechselwinkel

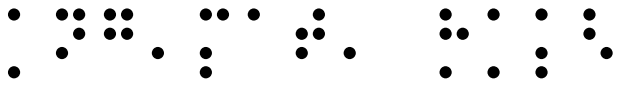


'al = 'be

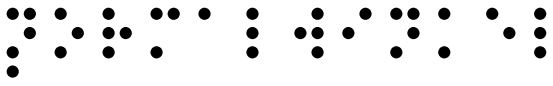


entspr. Winkel sind gleich groß





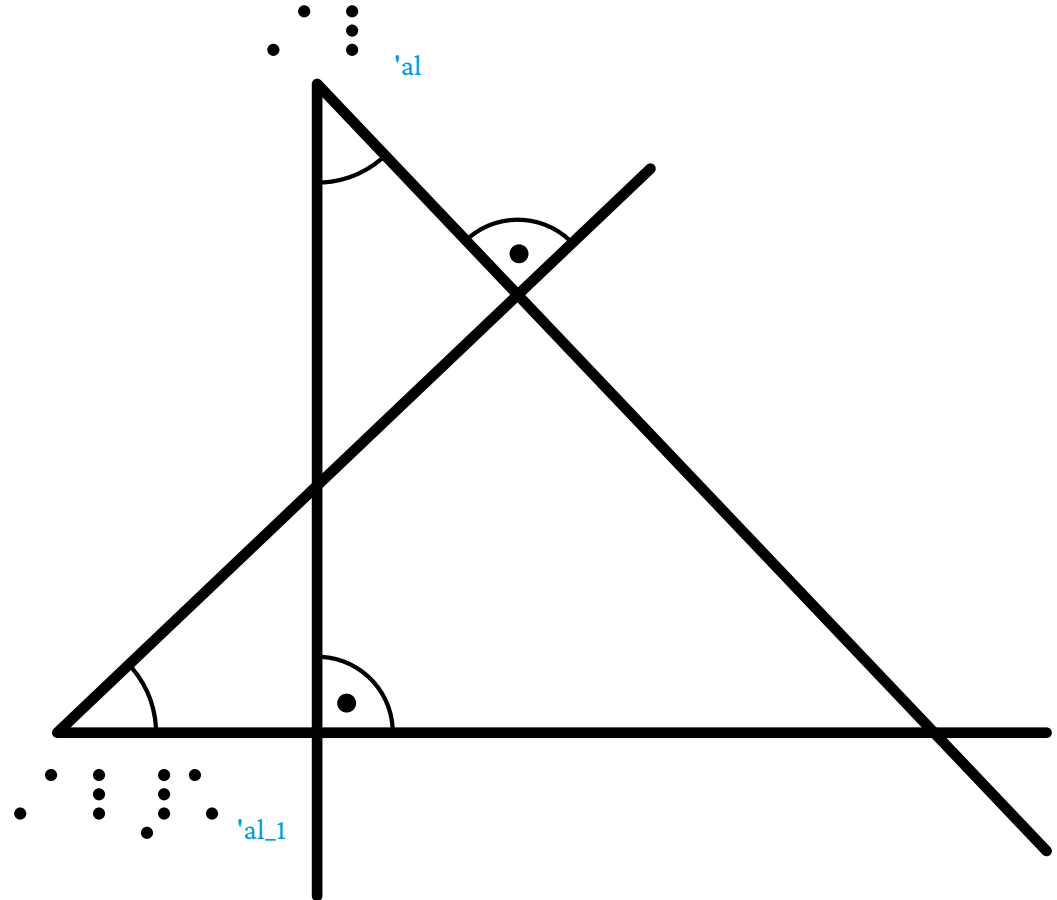
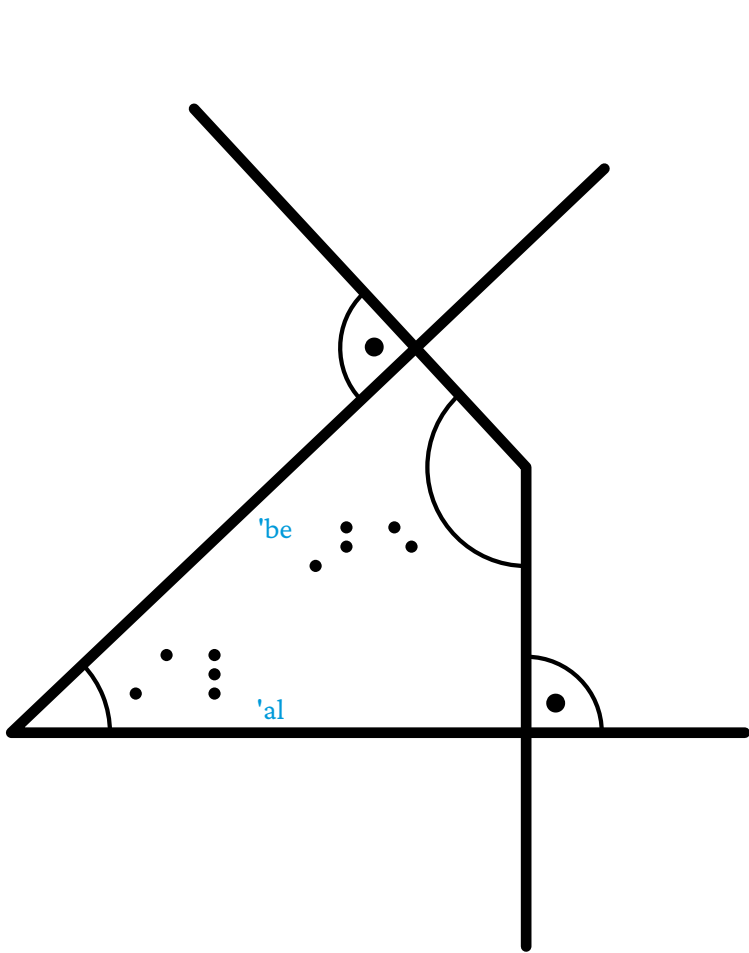
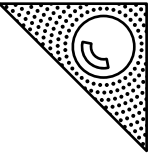
Ang.Mat. HAK2

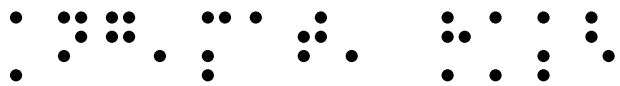


Normalwinkel

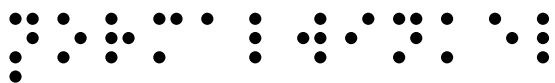


S.106

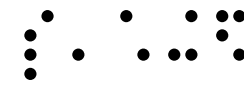
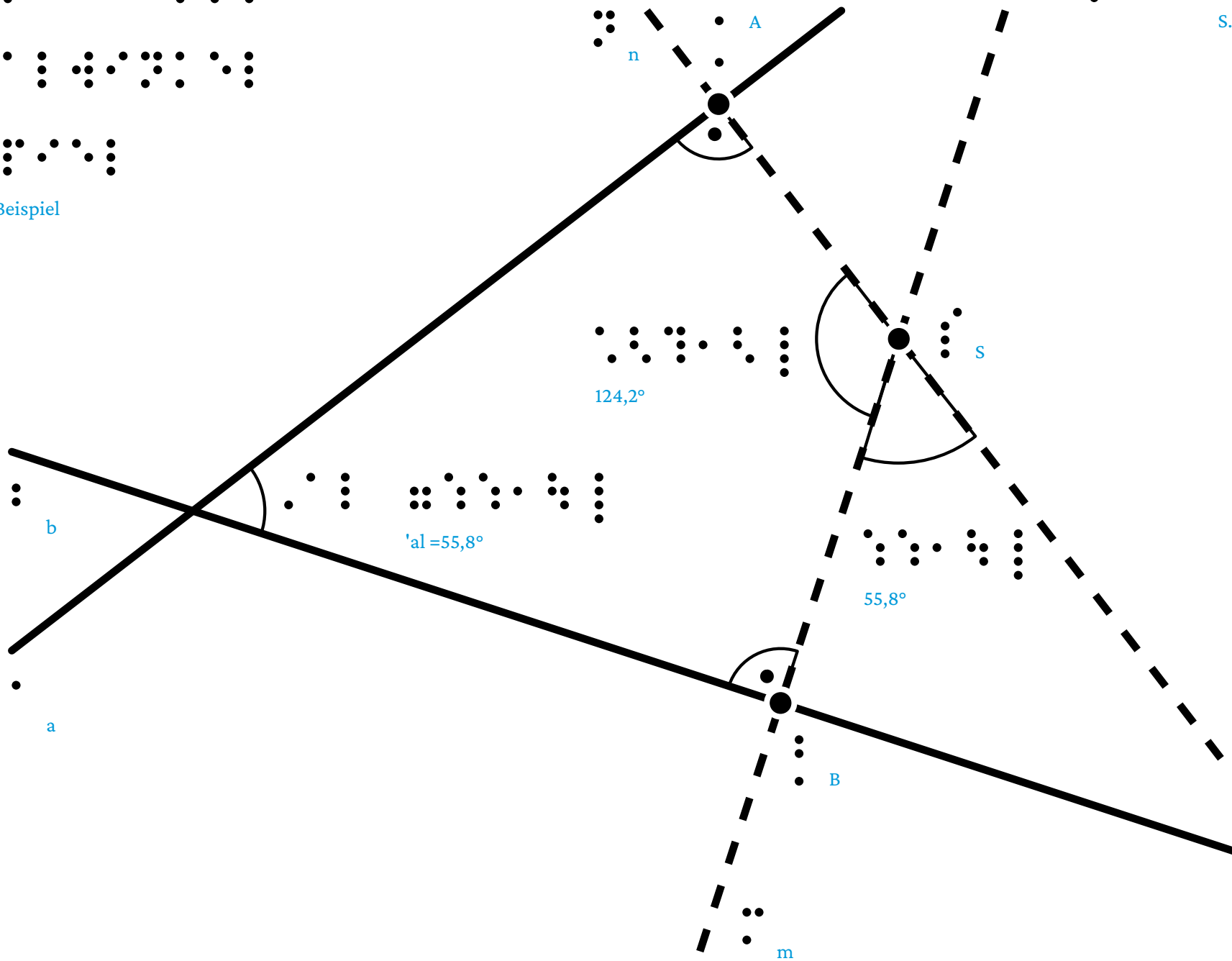




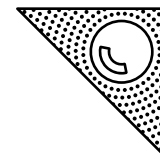
Ang.Mat. HAK2

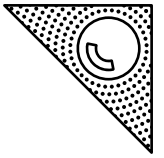
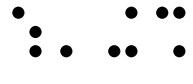
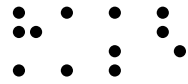
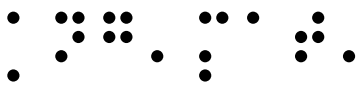


Normalwinkel-Beispiel

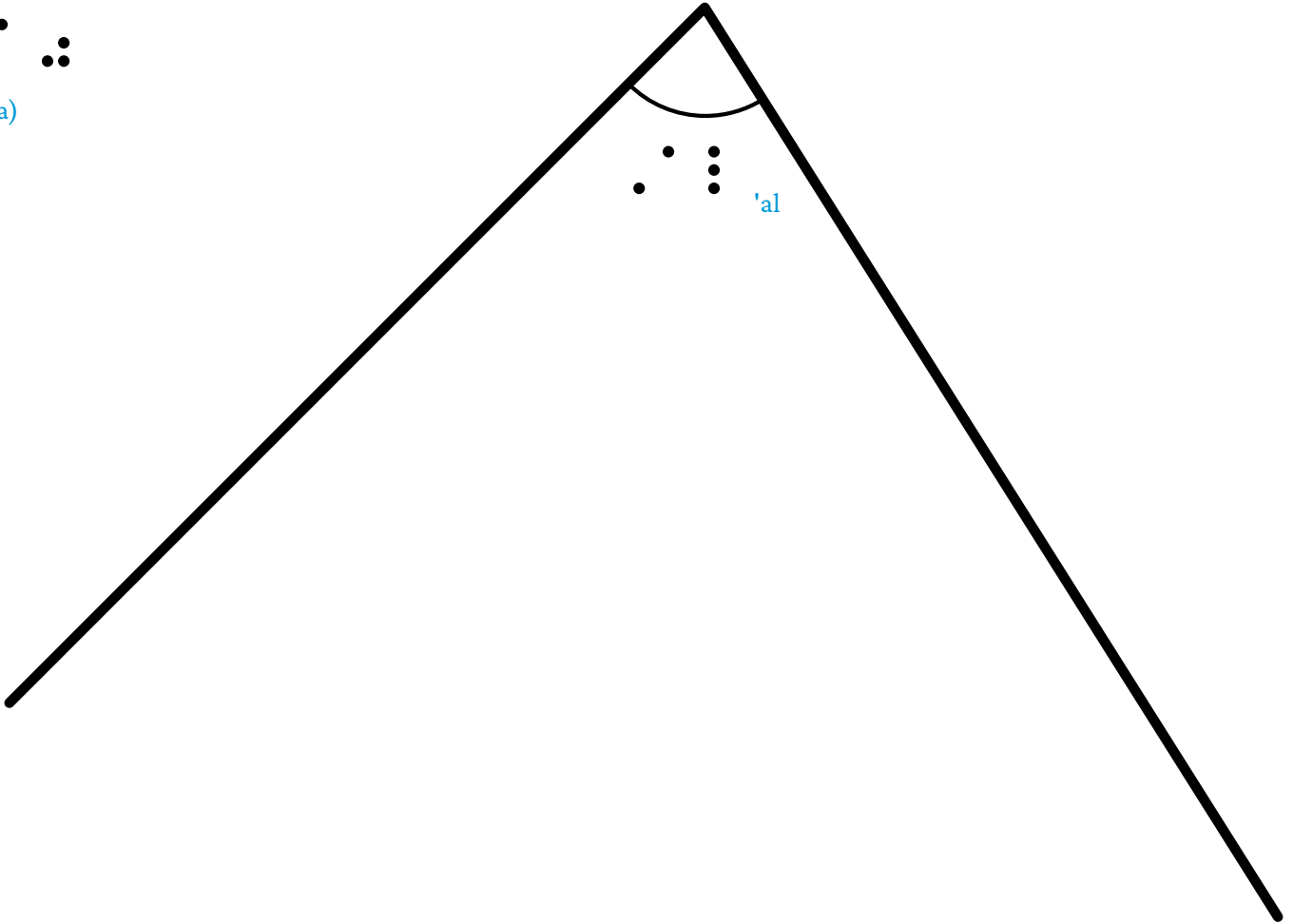


S.106

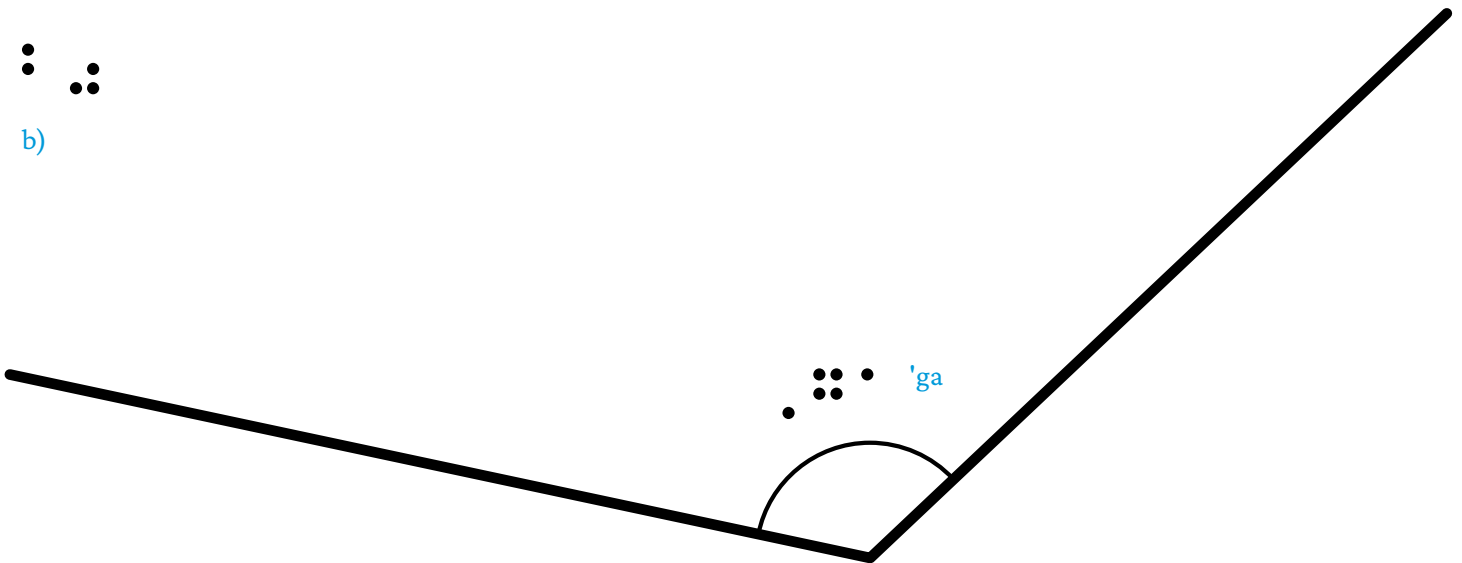


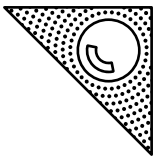
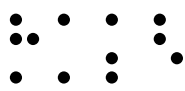
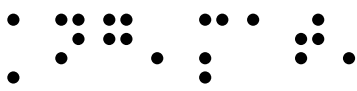


a)

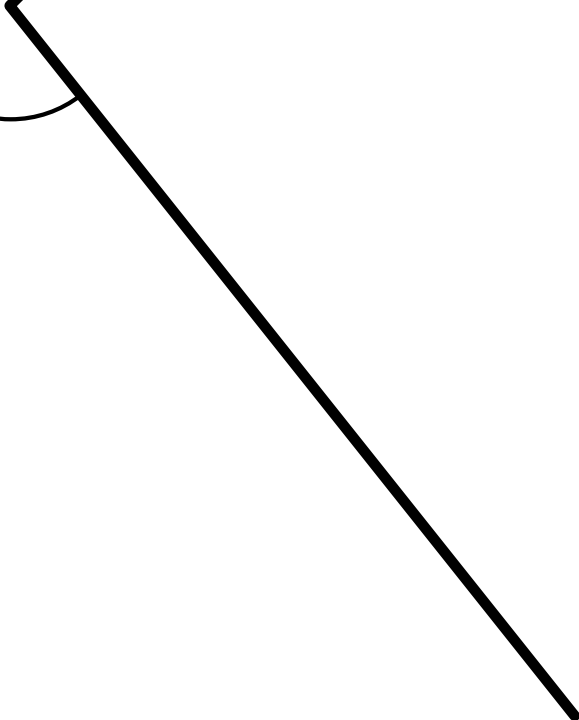
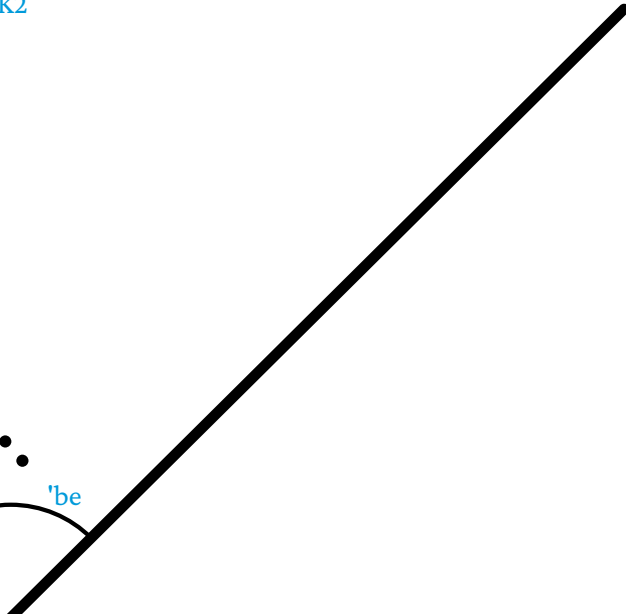
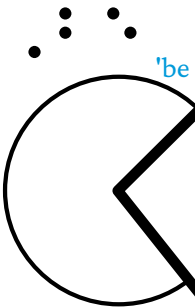


b)

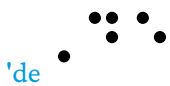
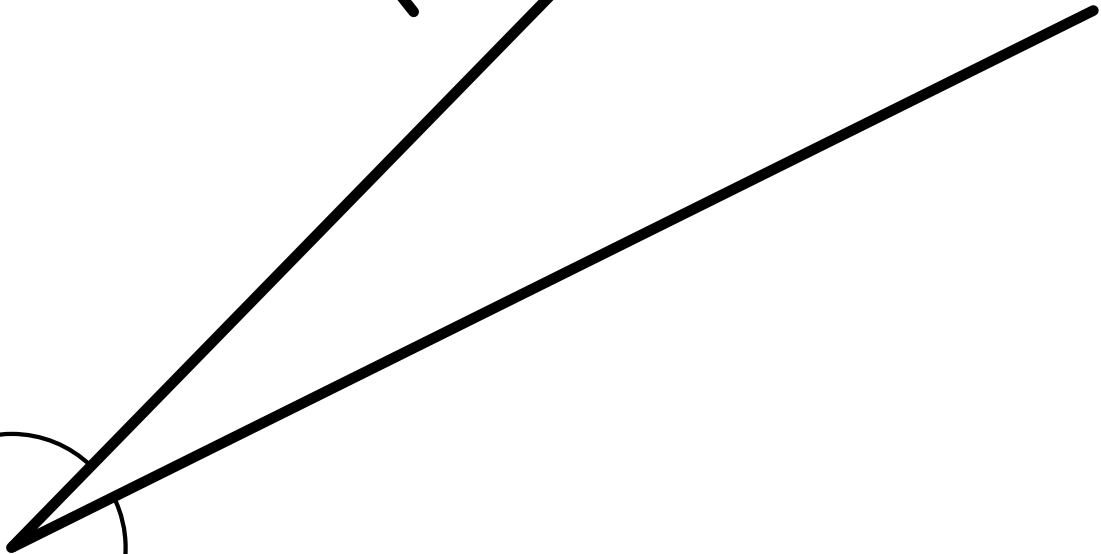
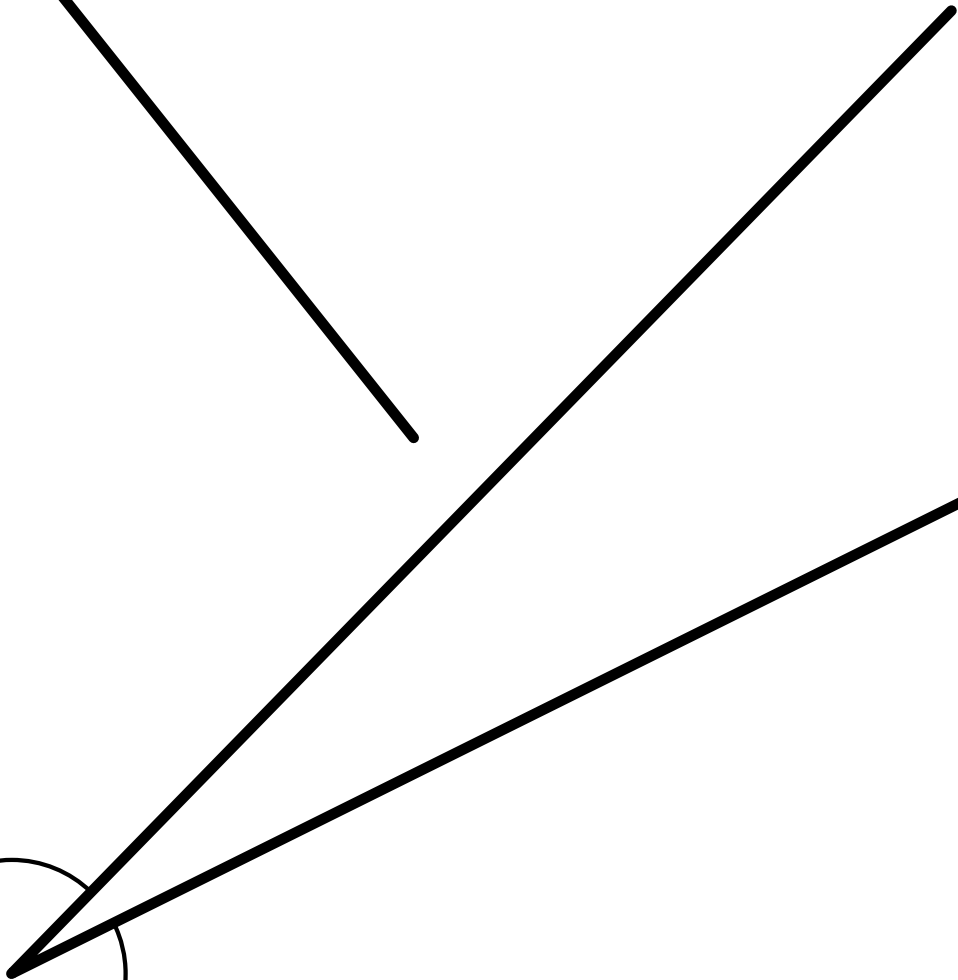
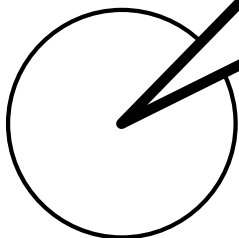


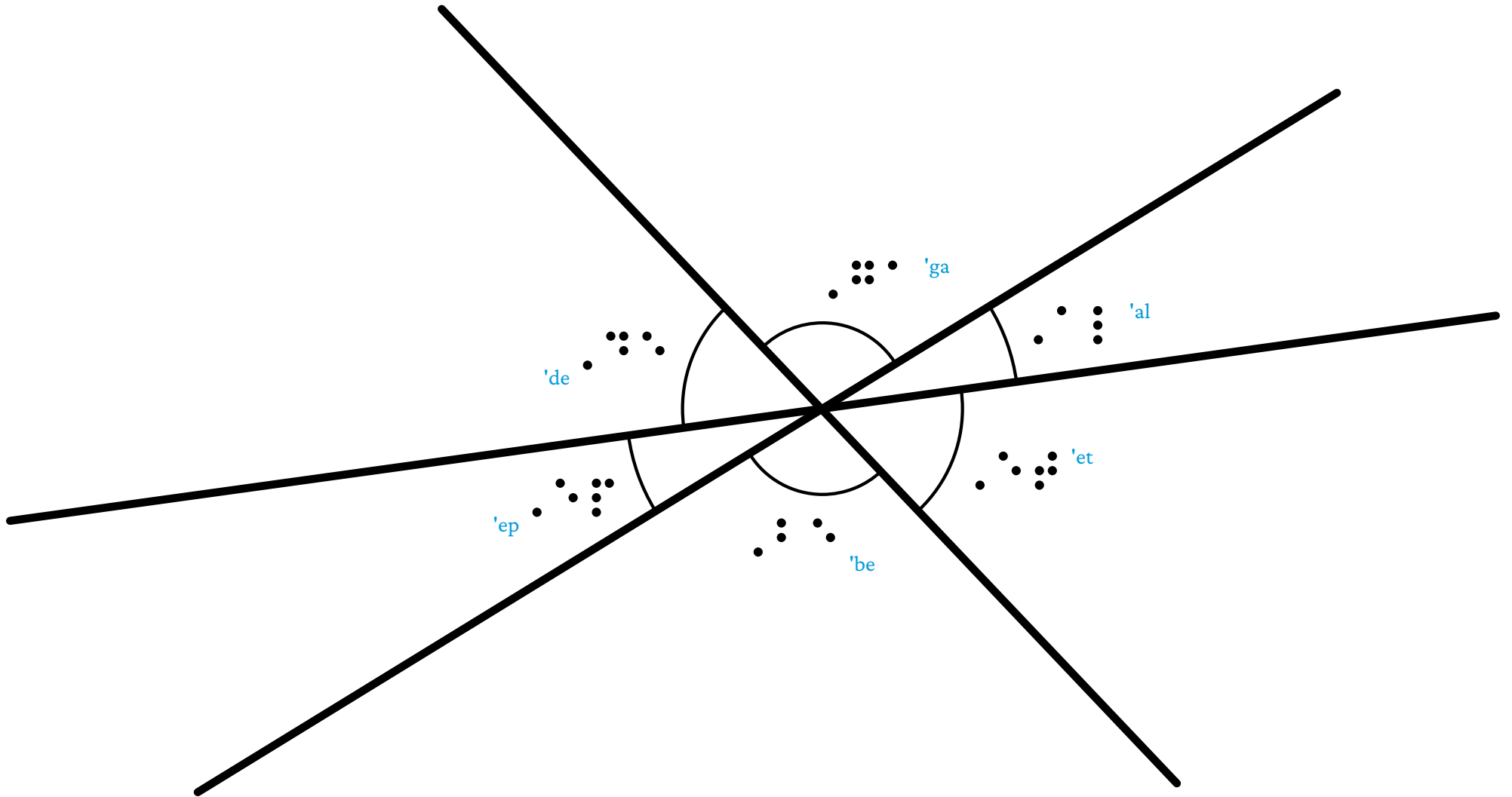
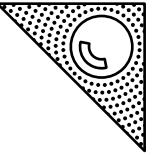
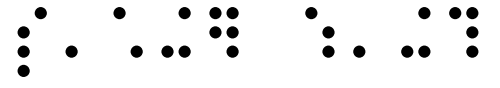
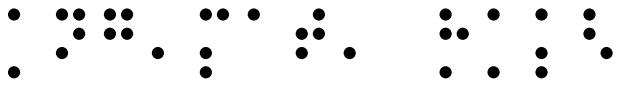


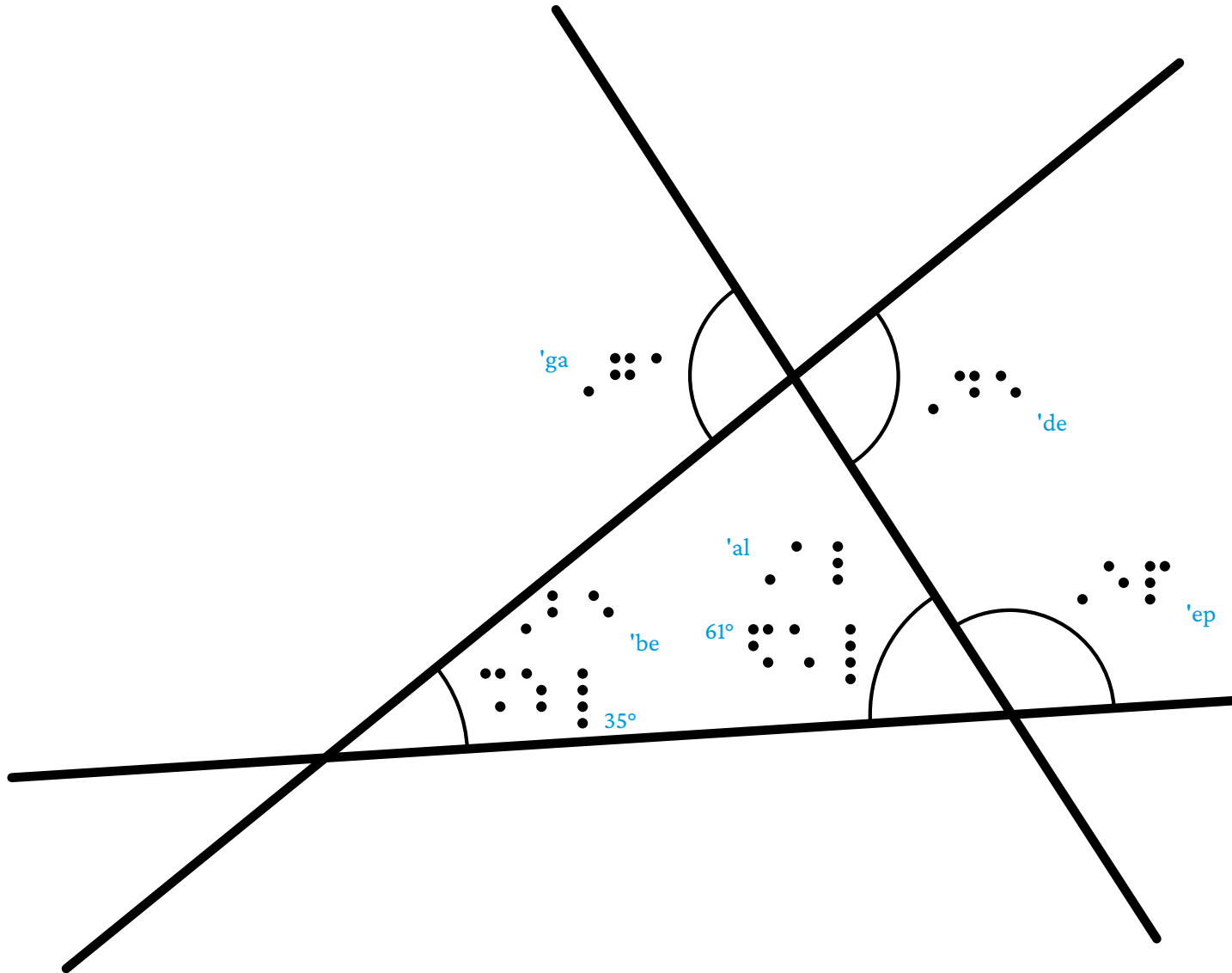
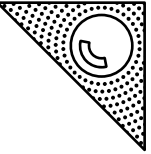
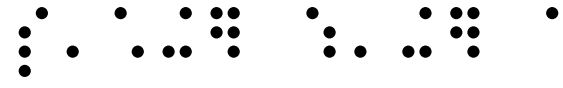
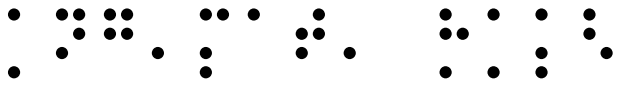
c)

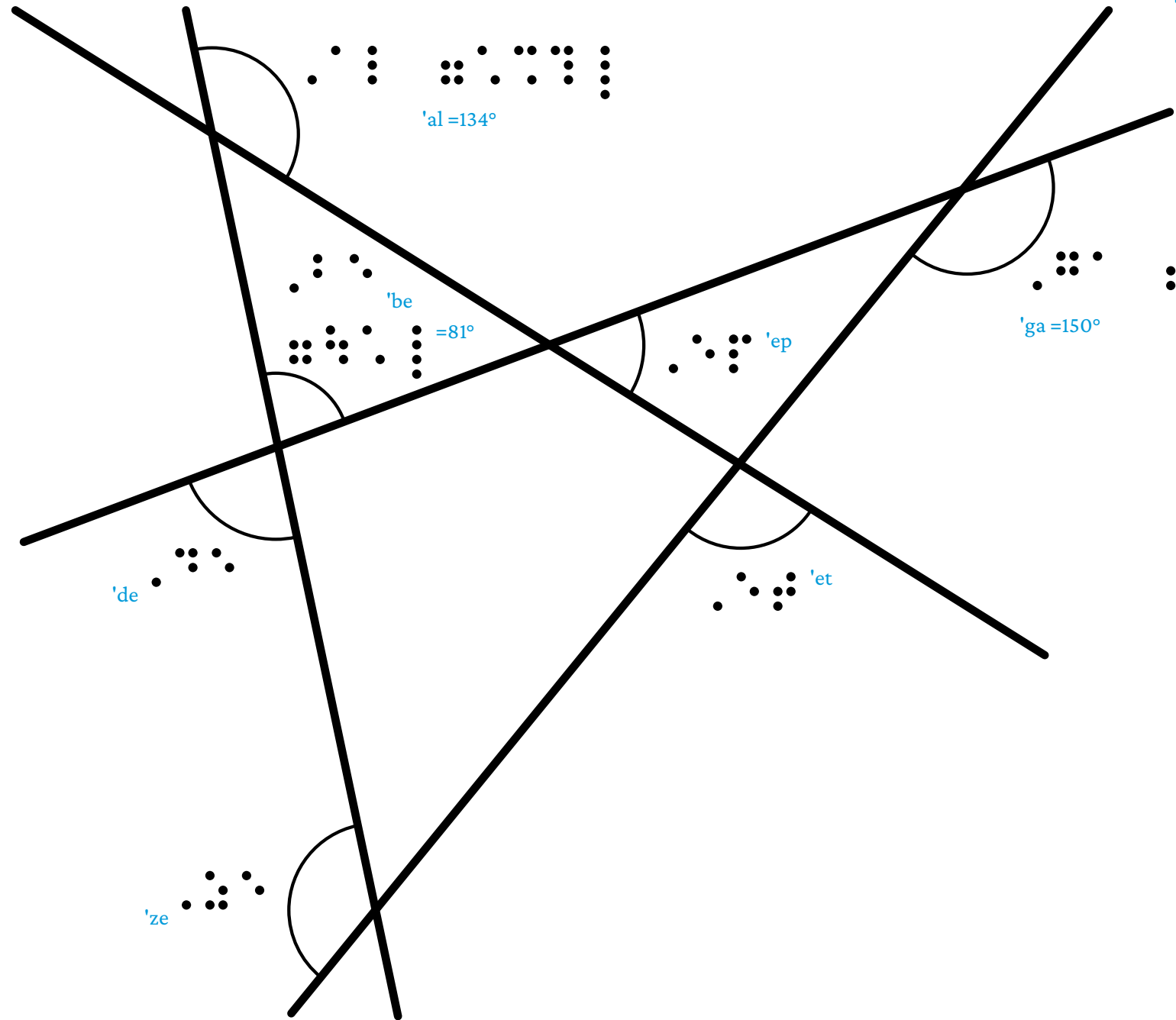
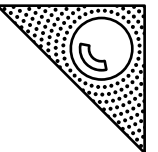


d)









'al = 134°

'be = 81°

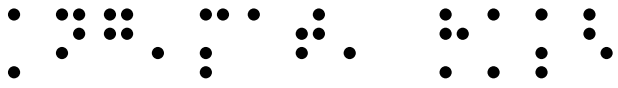
'ga = 150°

'de

'ze

'ep

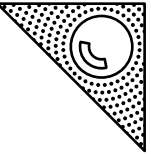
'et



Ang.Mat. HAK2



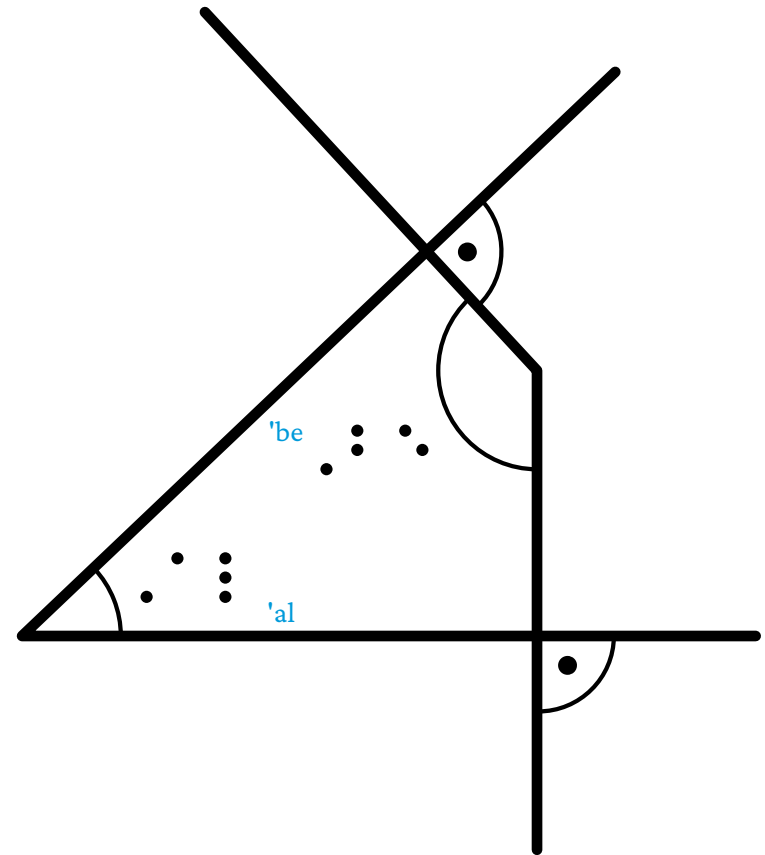
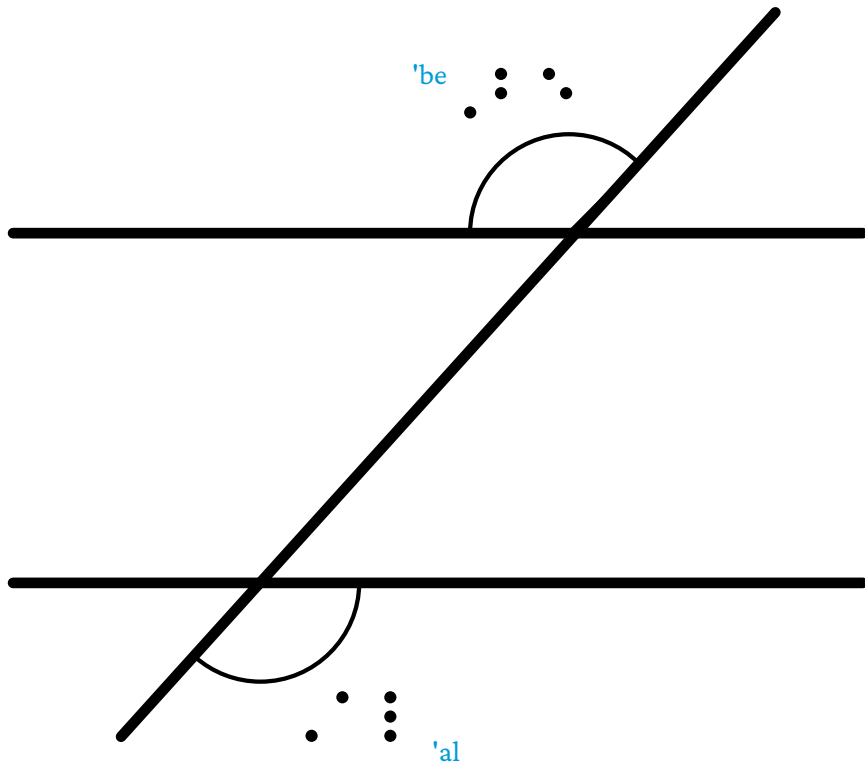
S.107 5.08



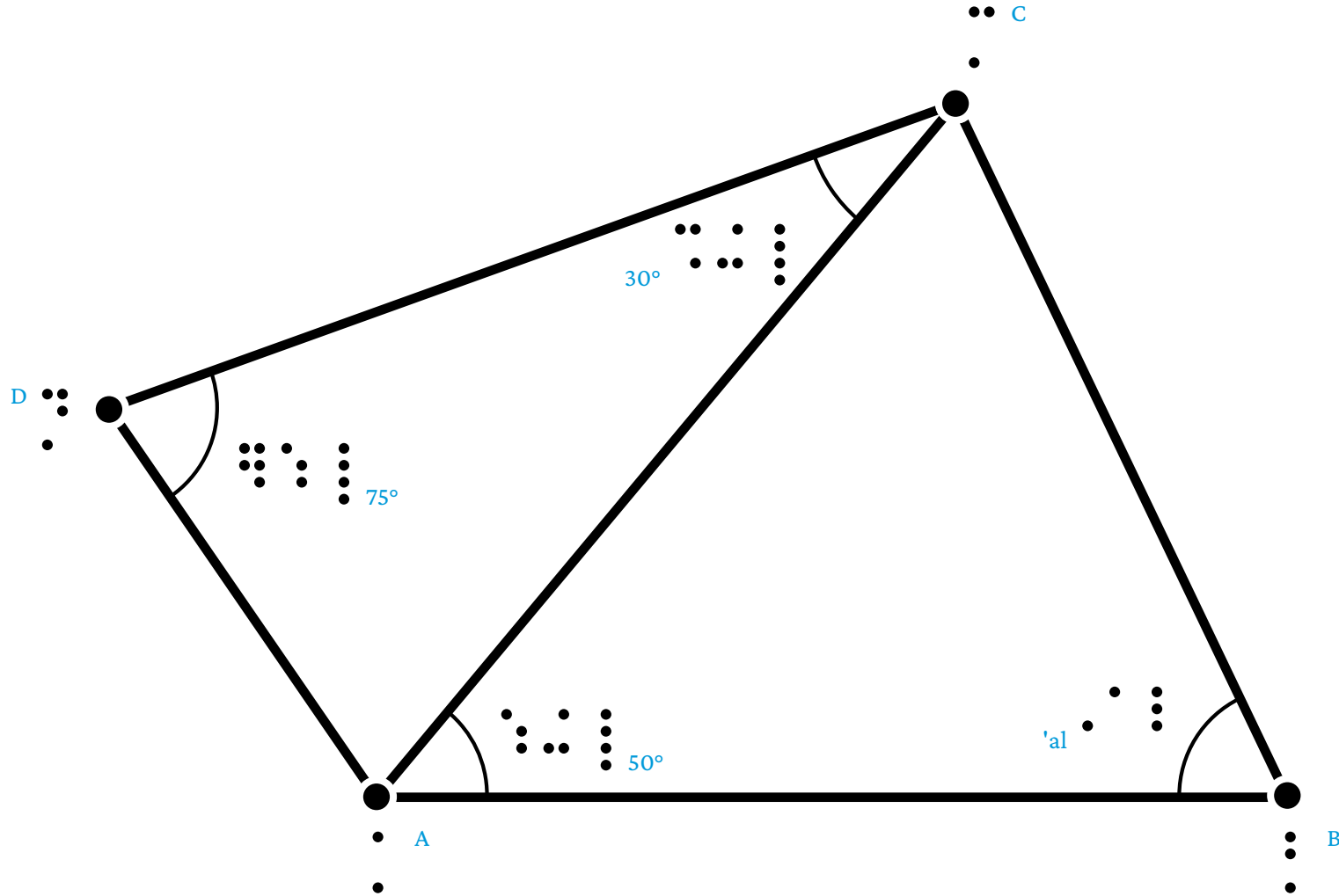
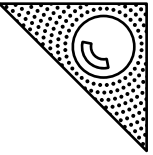
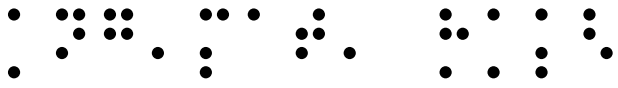
a)



b)



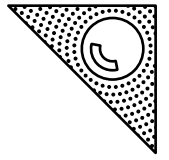




Braille text:  $\triangle$

Ang.Mat. HAK2

Braille text: S.108



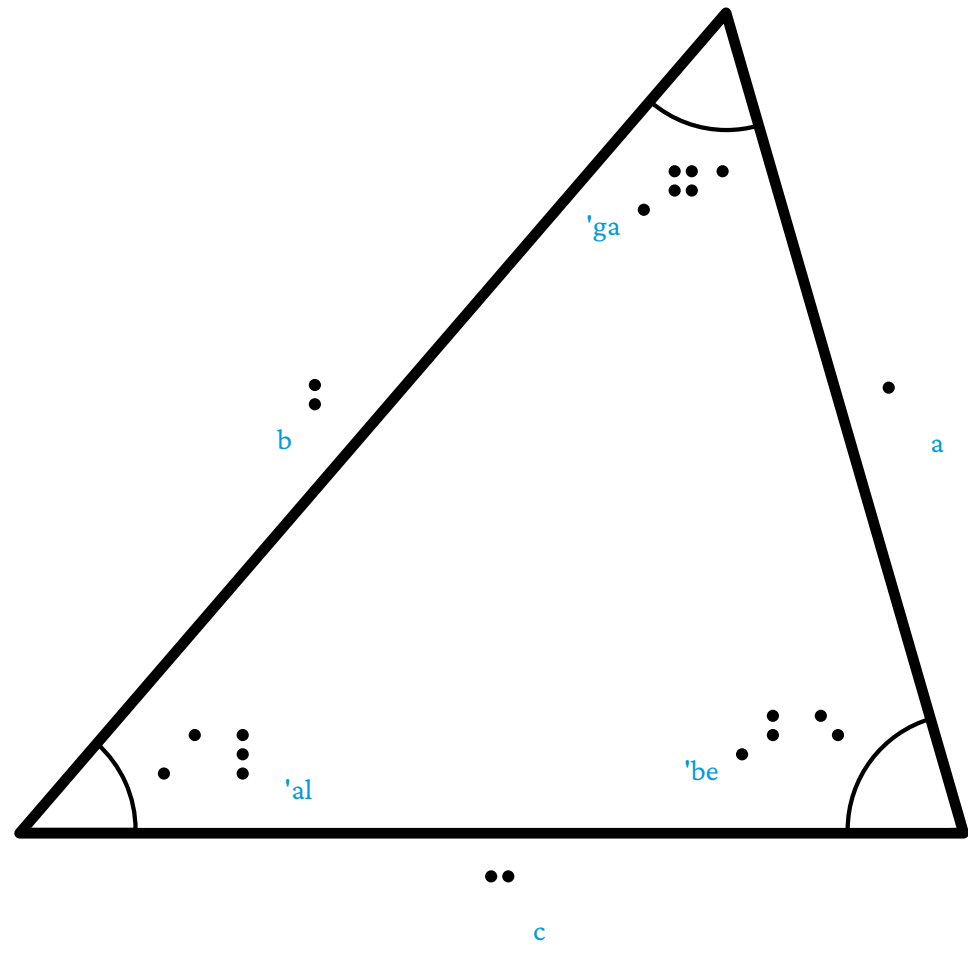
Braille text: Einteilung der Dreiecke nach den Seiten

Einteilung der Dreiecke nach den Seiten

Braille text: 1) allgemeines Dreieck

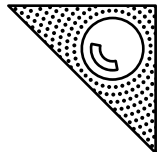
Braille text: 1) allgemeines Dreieck

1) allgemeines Dreieck



Braille text: Ang.Mat. HAK2

Braille text: S.108



Ang.Mat. HAK2

S.108

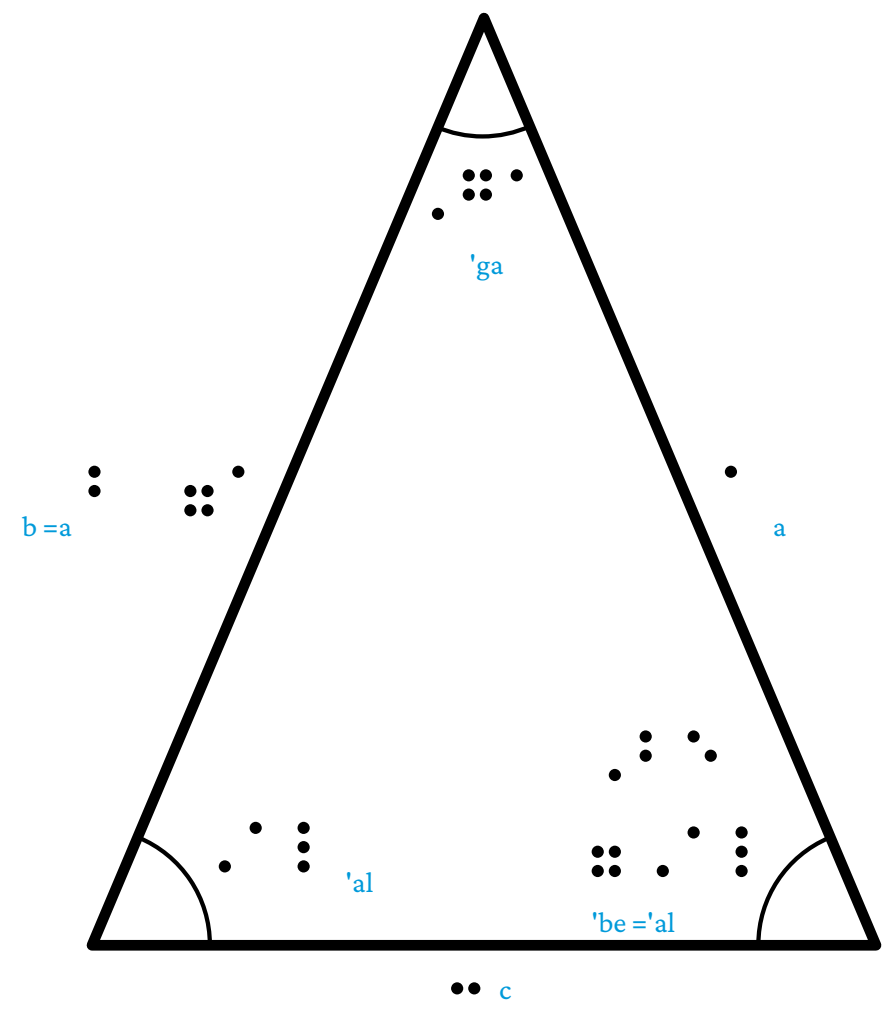
Braille text: Einteilung der Dreiecke nach den Seiten

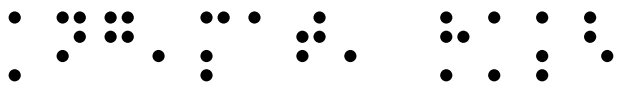
Einteilung der Dreiecke nach den Seiten

Braille text: 2) gleichschenkliges Dreieck

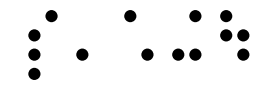
Braille text: 2) gleichschenkliges Dreieck

2) gleichschenkliges Dreieck

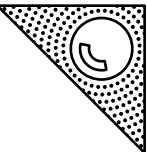




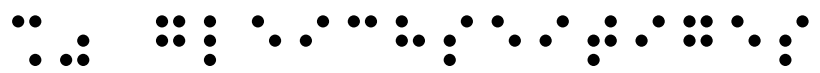
Ang.Mat. HAK2



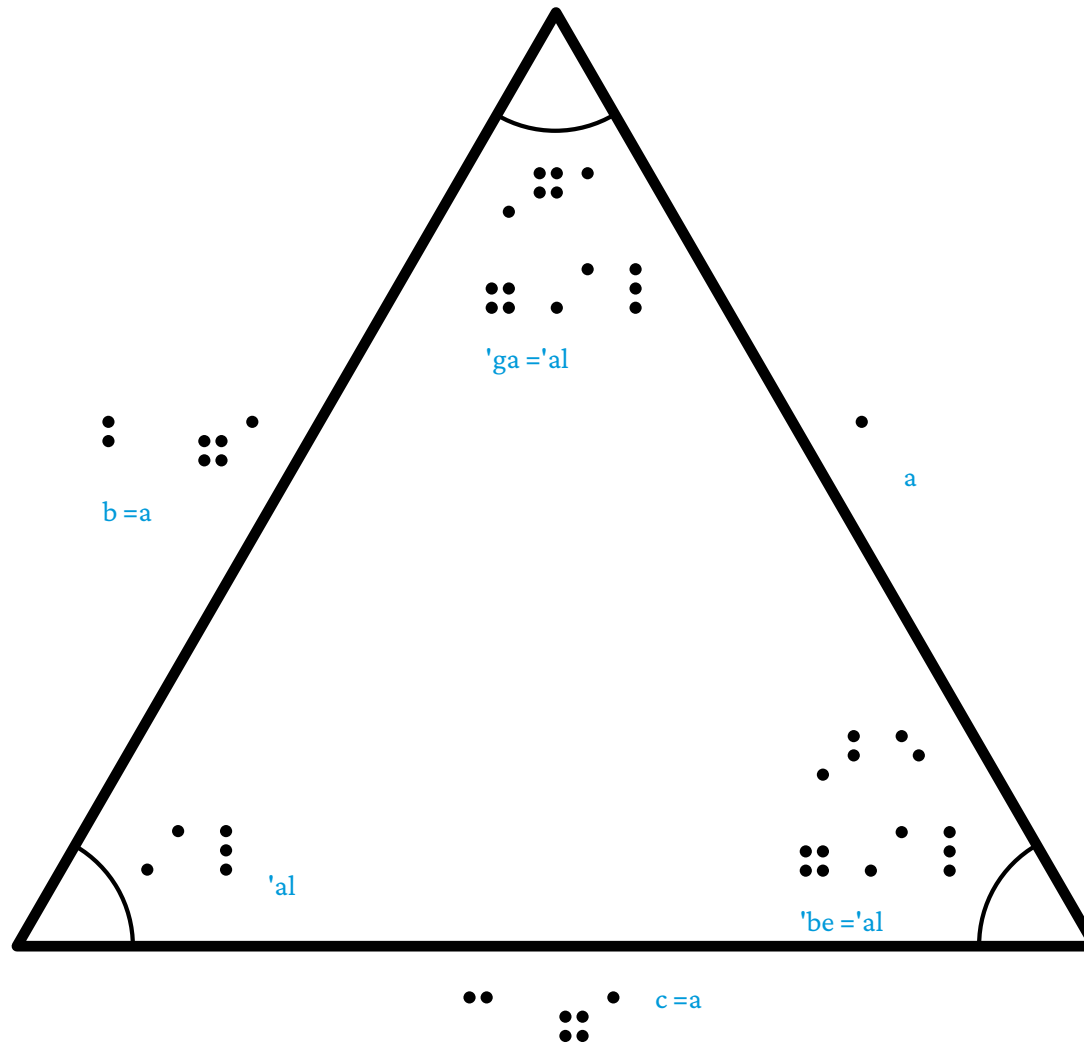
S.108

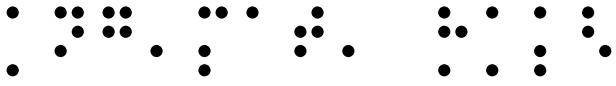


Einteilung der Dreiecke nach den Seiten



3) gleichseitiges Dreieck

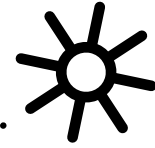
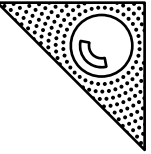




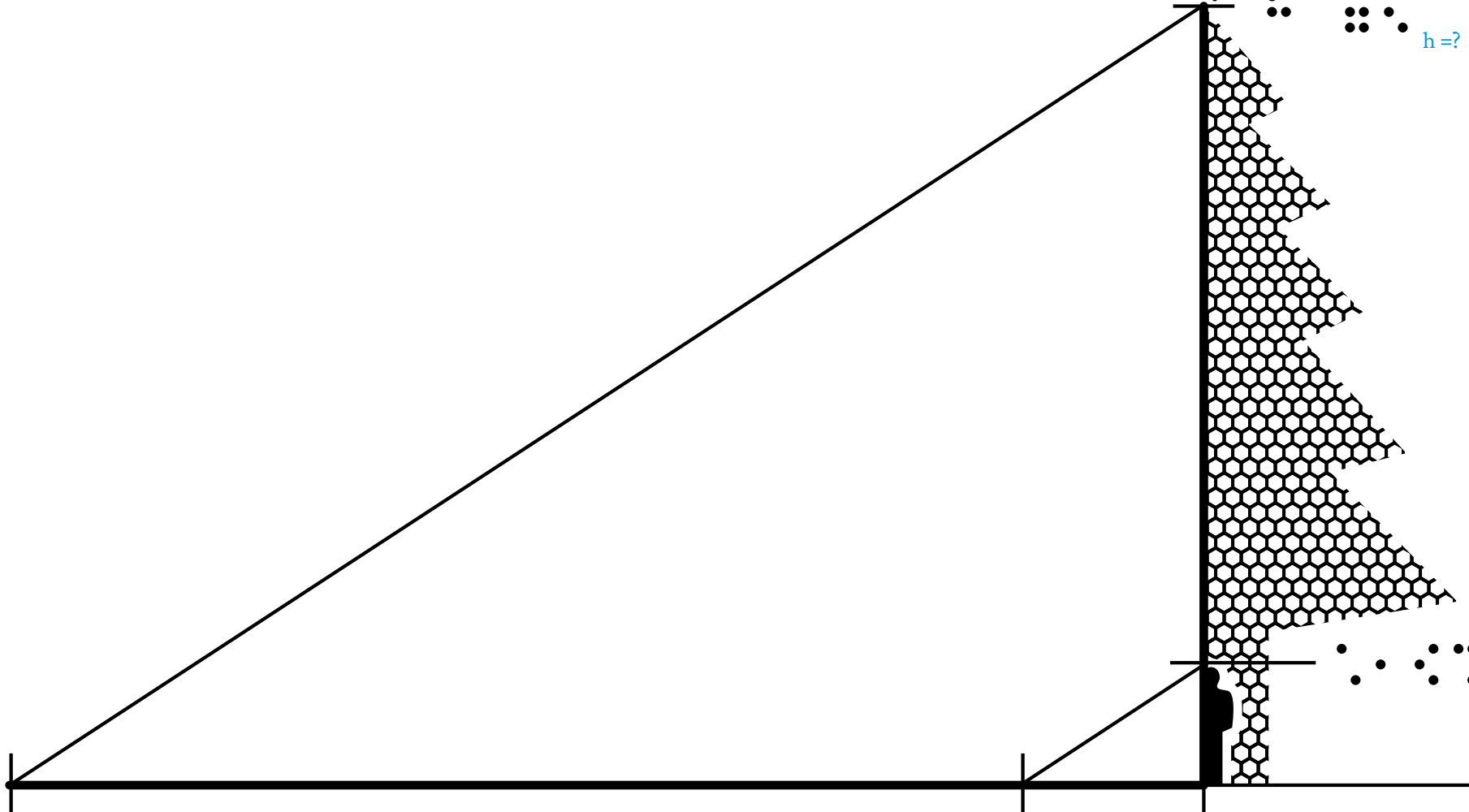
Ang.Mat. HAK2



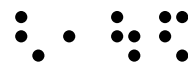
S.108 5.13



$h = ?$



37,40



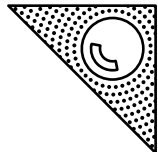
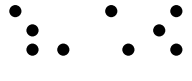
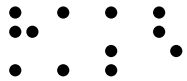
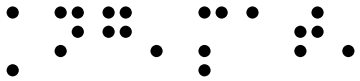
2,86



0

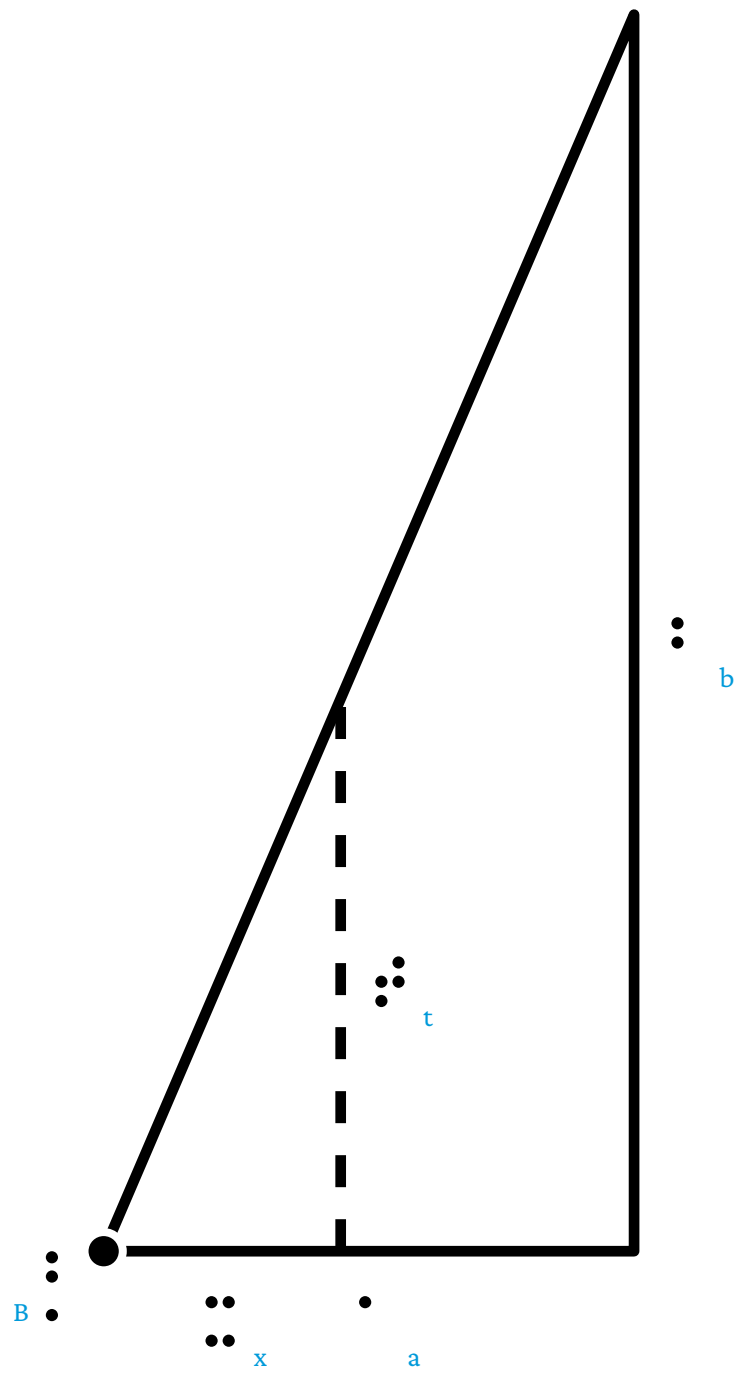


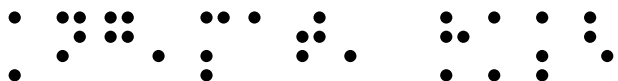
1,93



Ang.Mat. HAK2

S.108 5.19





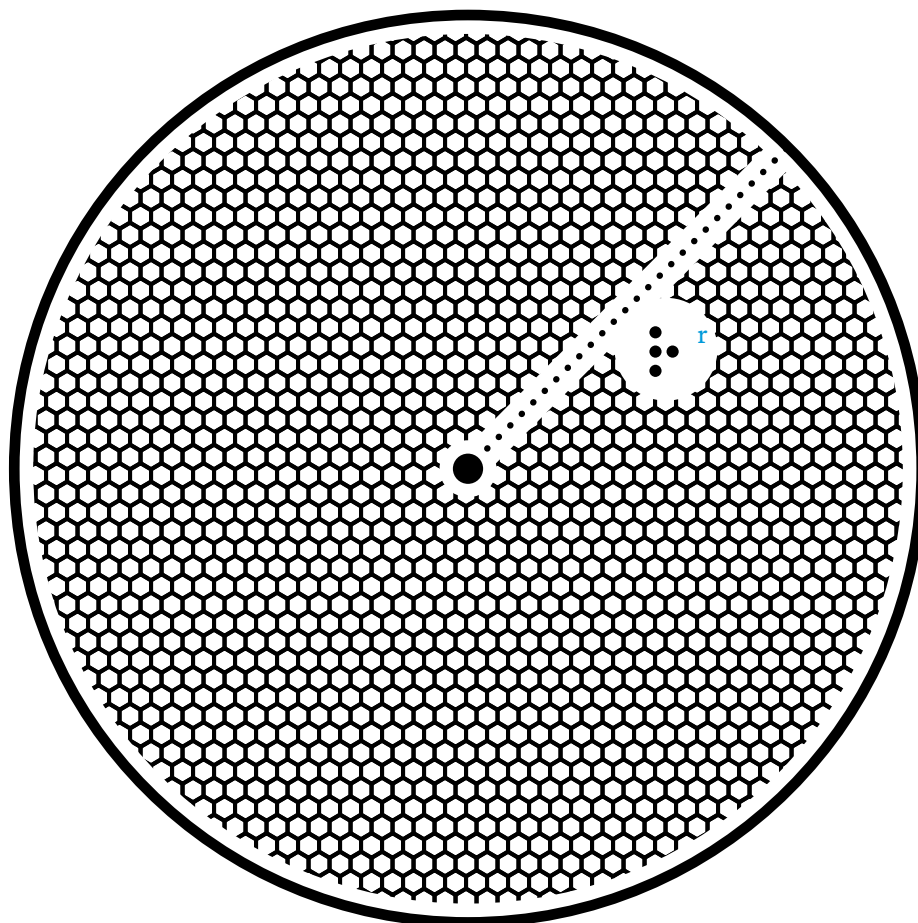
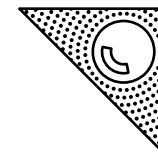
Ang.Mat. HAK2

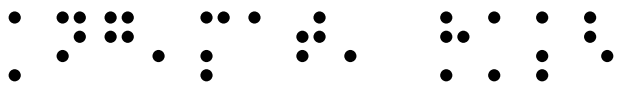


Kreis



S.110

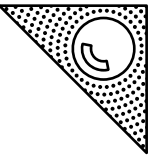




Ang.Mat. HAK2

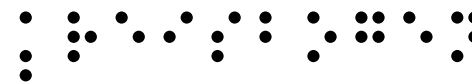


S.110

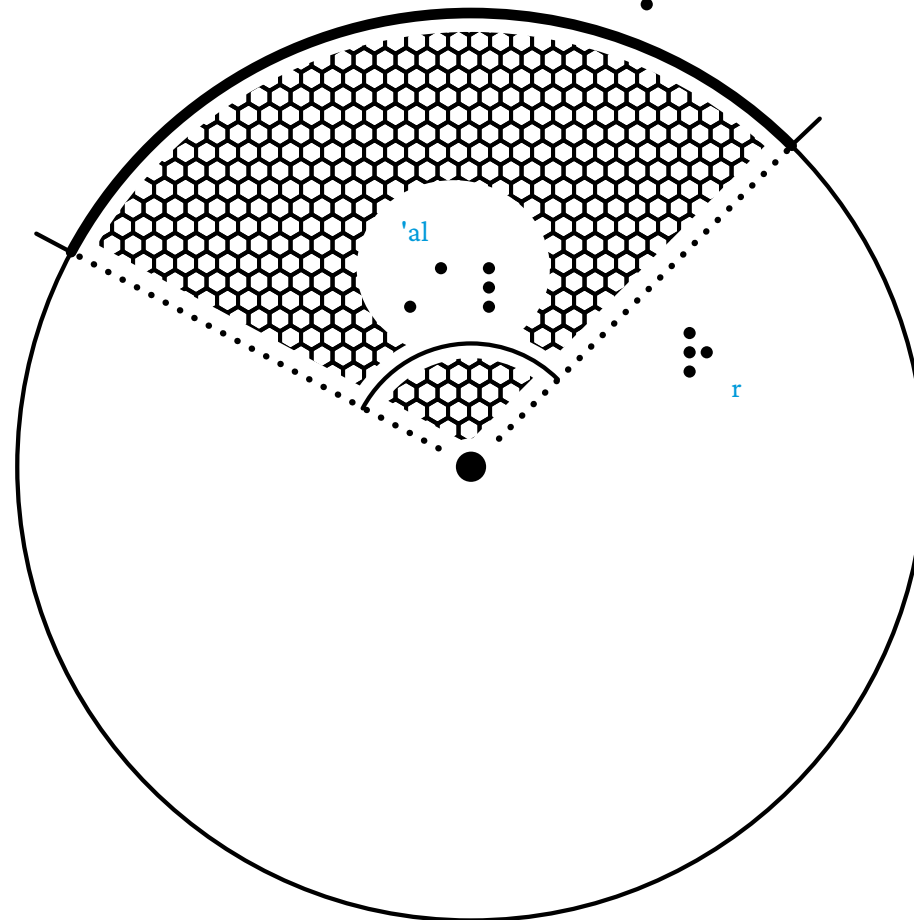


Kreisbogen (Kreisausschnitt)

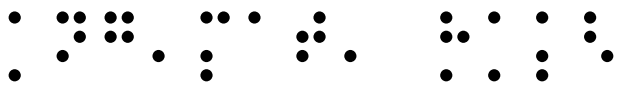
b



Kreisbogen



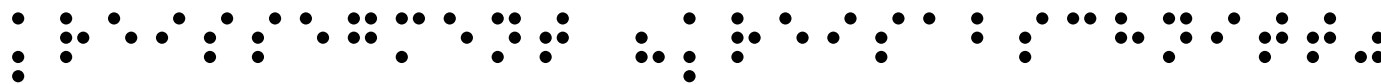
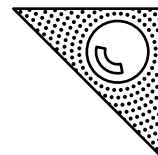




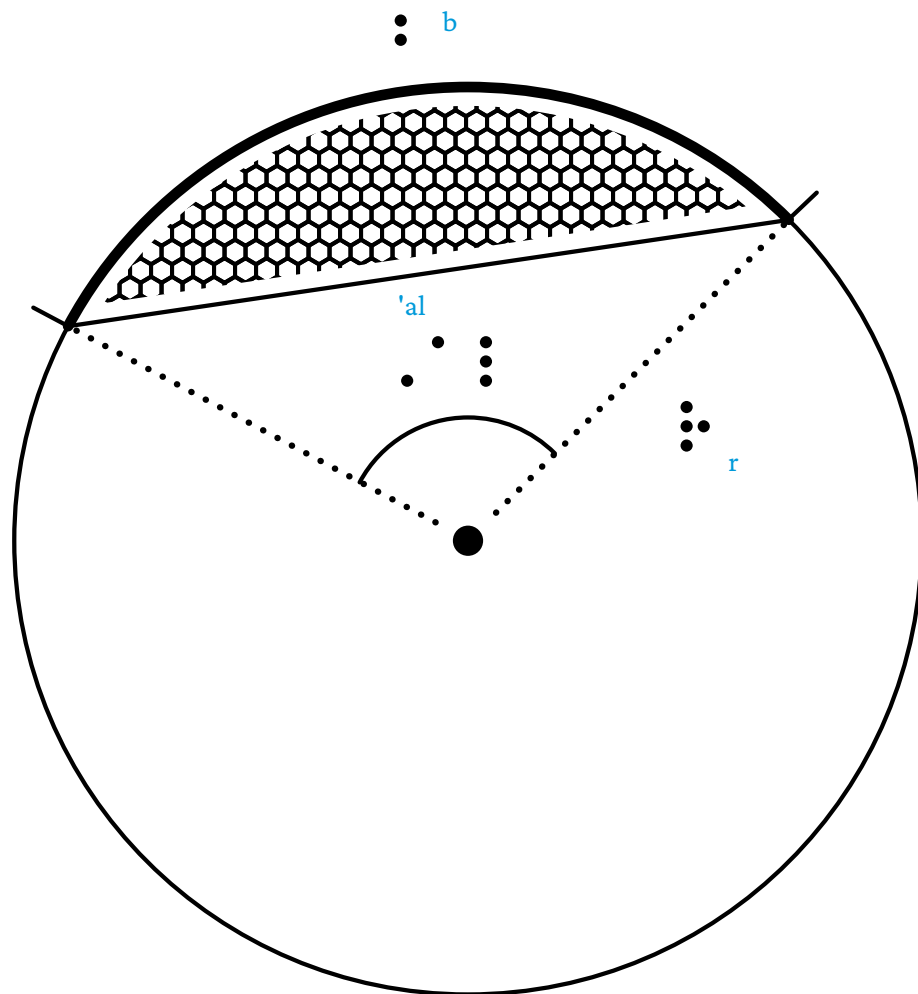
Ang.Mat. HAK2



S.110



Kreissegment (Kreisabschnitt)

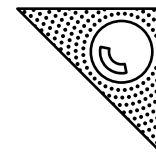


Braille text:  $\alpha + \beta + \gamma = 180^\circ$

Ang.Mat. HAK2

Braille text:  $\alpha + \beta + \gamma = 180^\circ$

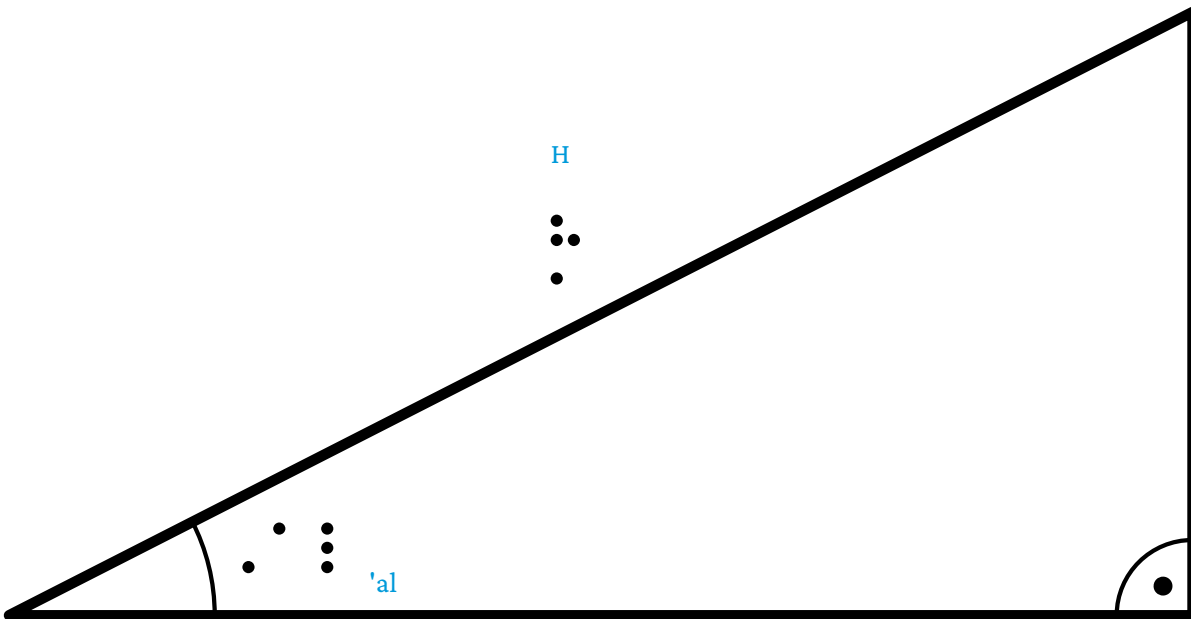
S.112



Braille text:  $\alpha + \beta + \gamma = 180^\circ$

Braille text:  $\alpha + \beta + \gamma = 180^\circ$

Bezeichnungen im rechtwinkligen Dreieck



H

Braille for H

'al

Braille for 'al

Braille text:  $\alpha + \beta + \gamma = 180^\circ$

GK von 'al

Braille text:  $\alpha + \beta + \gamma = 180^\circ$

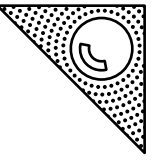
AK von 'al

Braille text:  $\frac{a}{b} = \frac{c}{d}$

Ang.Mat. HAK2

Braille text:  $\frac{a}{b} = \frac{c}{d}$

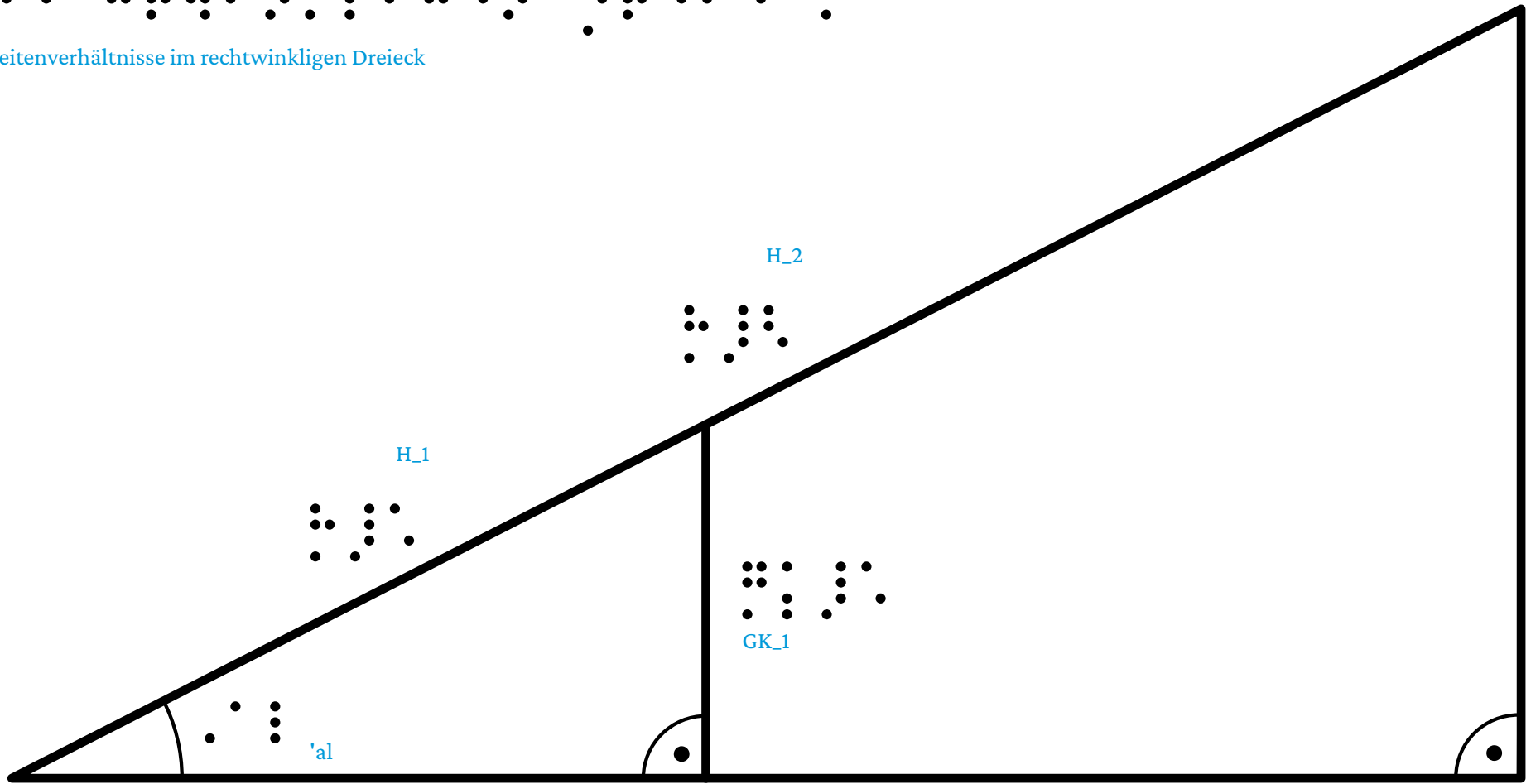
S.112



Braille text:  $\frac{a}{b} = \frac{c}{d}$

Braille text:  $\frac{a}{b} = \frac{c}{d}$

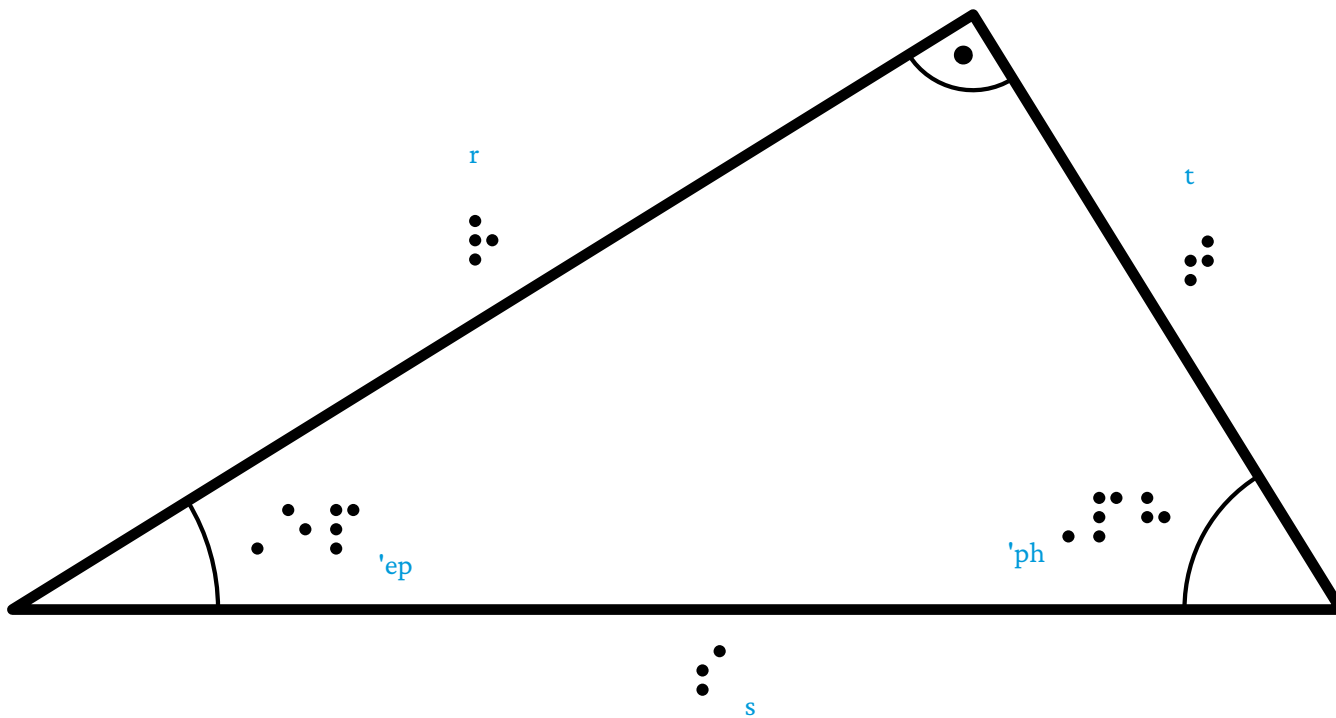
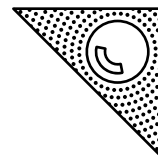
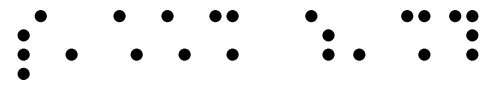
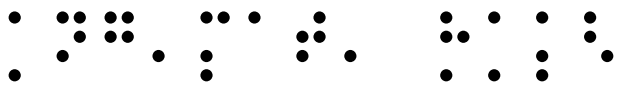
Seitenverhältnisse im rechtwinkligen Dreieck

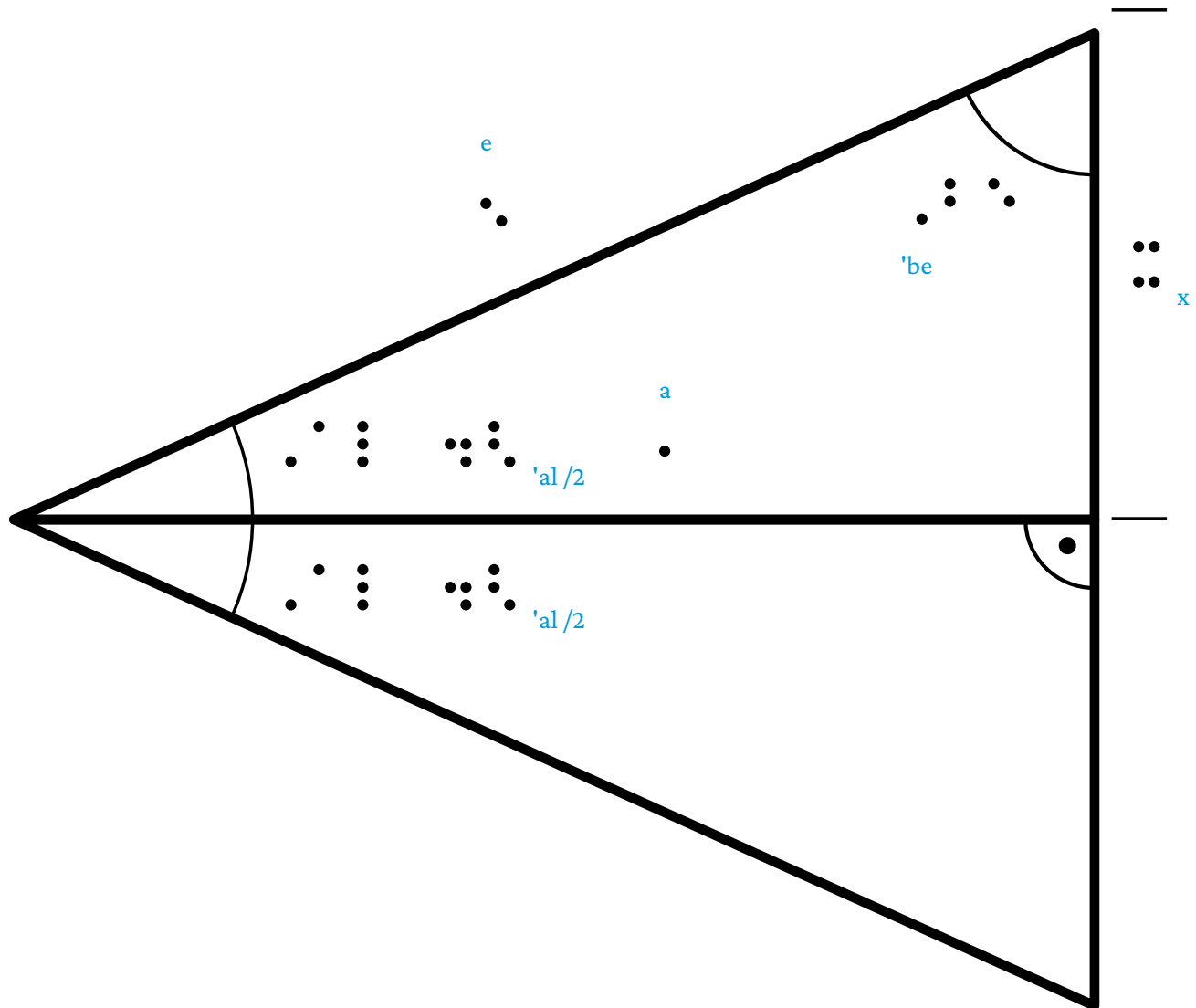
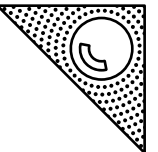
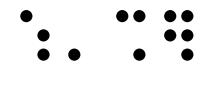
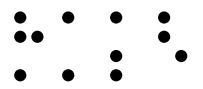
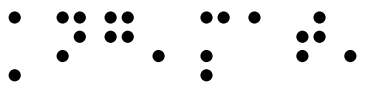


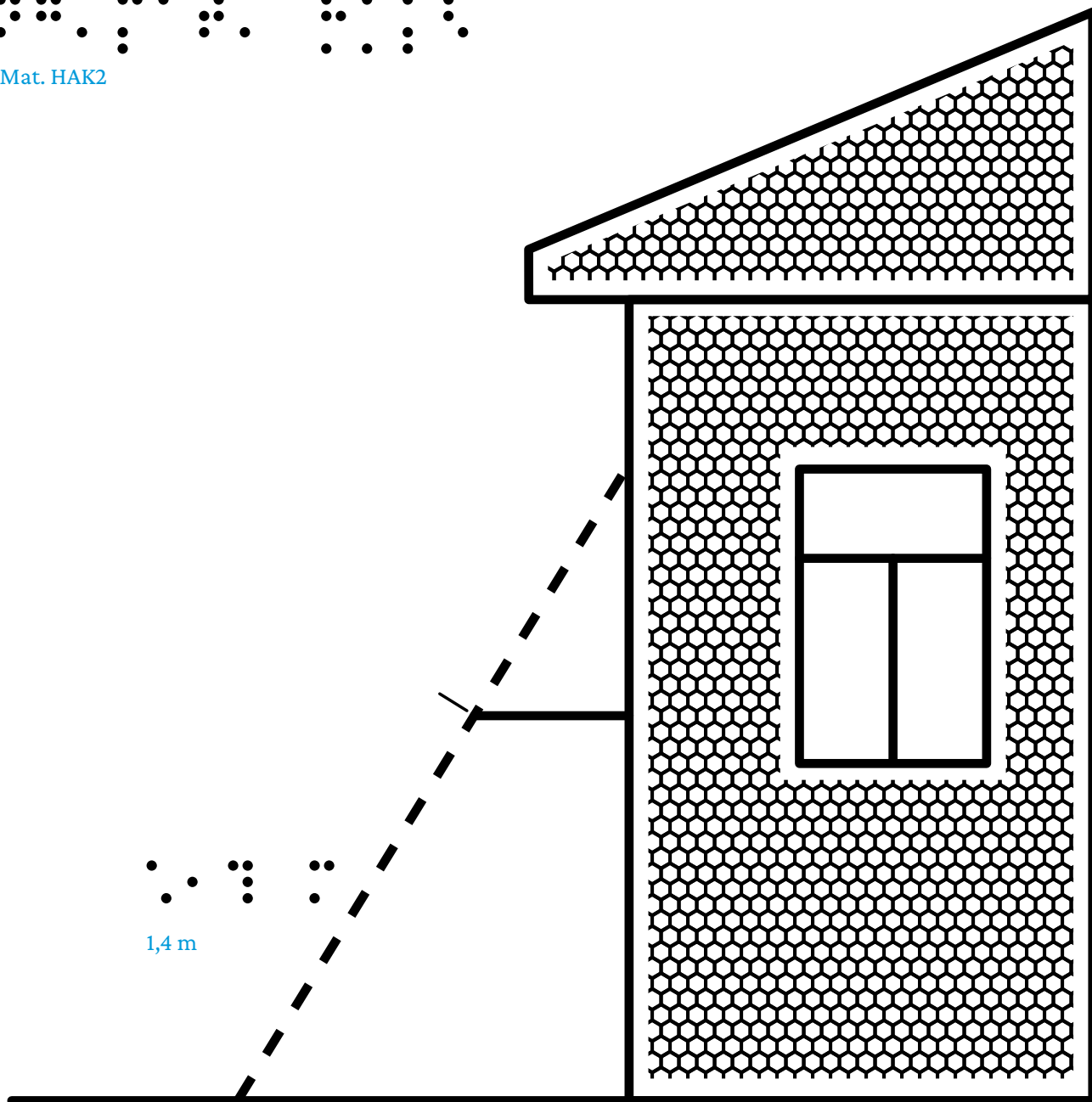
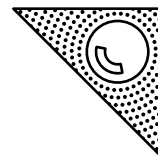
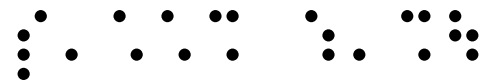
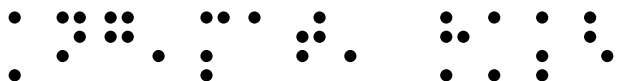
Braille text:  $\frac{a}{b} = \frac{c}{d}$

Braille text:  $\frac{a}{b} = \frac{c}{d}$

Braille text:  $\frac{a}{b} = \frac{c}{d}$







1,4 m

0,8 m

Braille text: Ang.Mat. HAK2

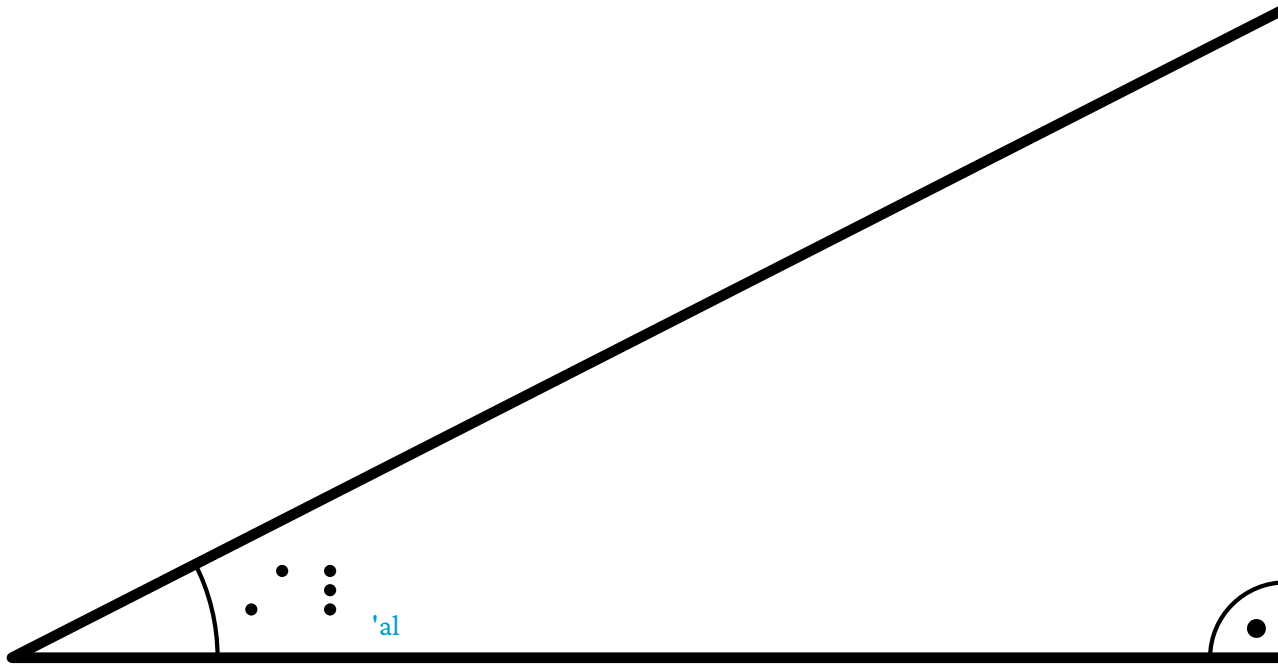
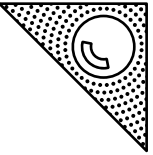
Ang.Mat. HAK2

Braille text: Lösung

Lösung

Braille text: S.114 5.43

S.114 5.43



Braille text: 6 cm

6 cm

Braille text: Höhenunterschied = GK von 'al

Braille text: Höhenunterschied = GK von 'al

Höhenunterschied = GK von 'al

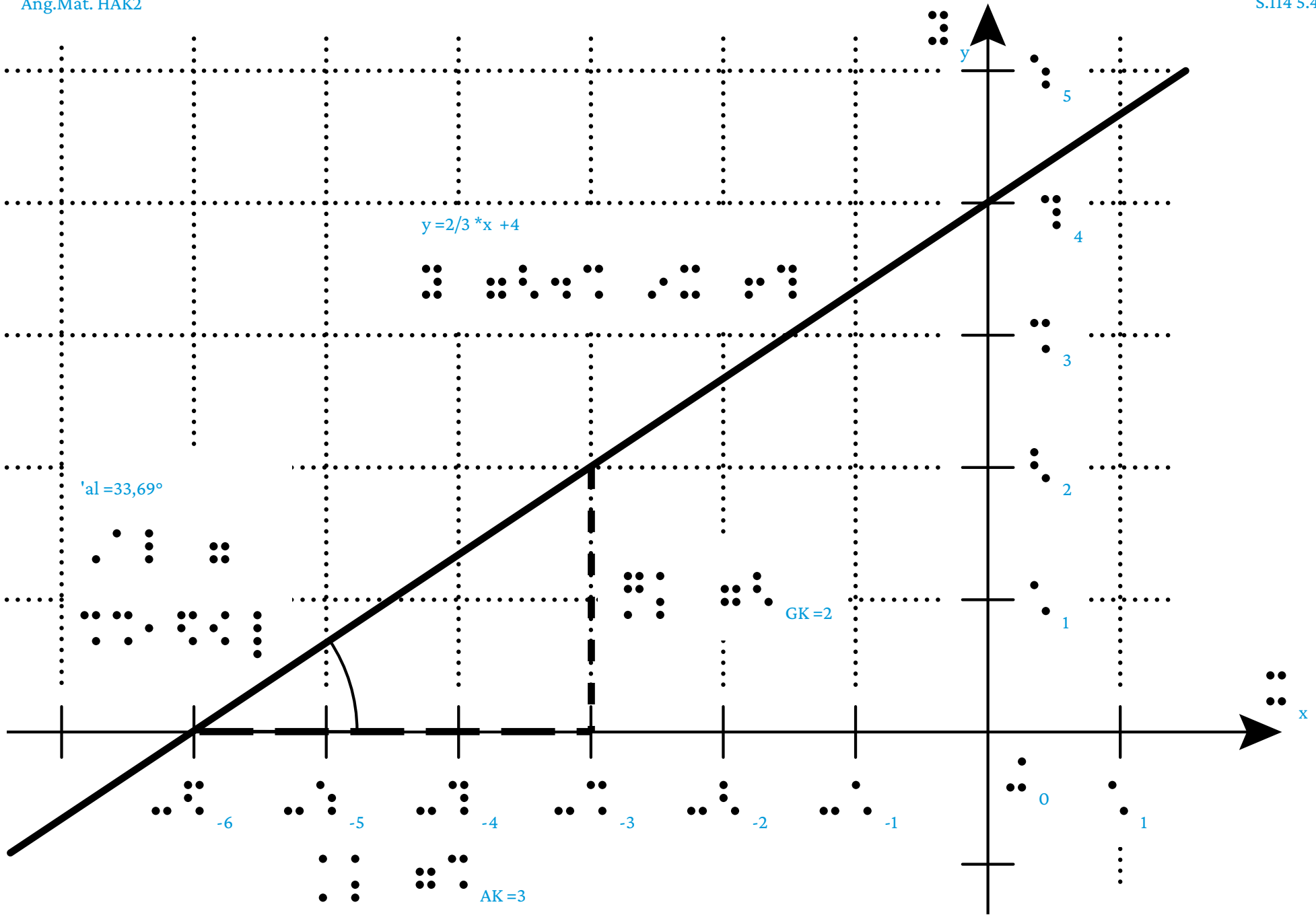
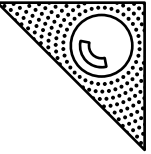
Braille text: 100 cm

100 cm

Braille text: Horizontale Entfernung = AK von 'al

Braille text: Horizontale Entfernung = AK von 'al

Horizontale Entfernung = AK von 'al



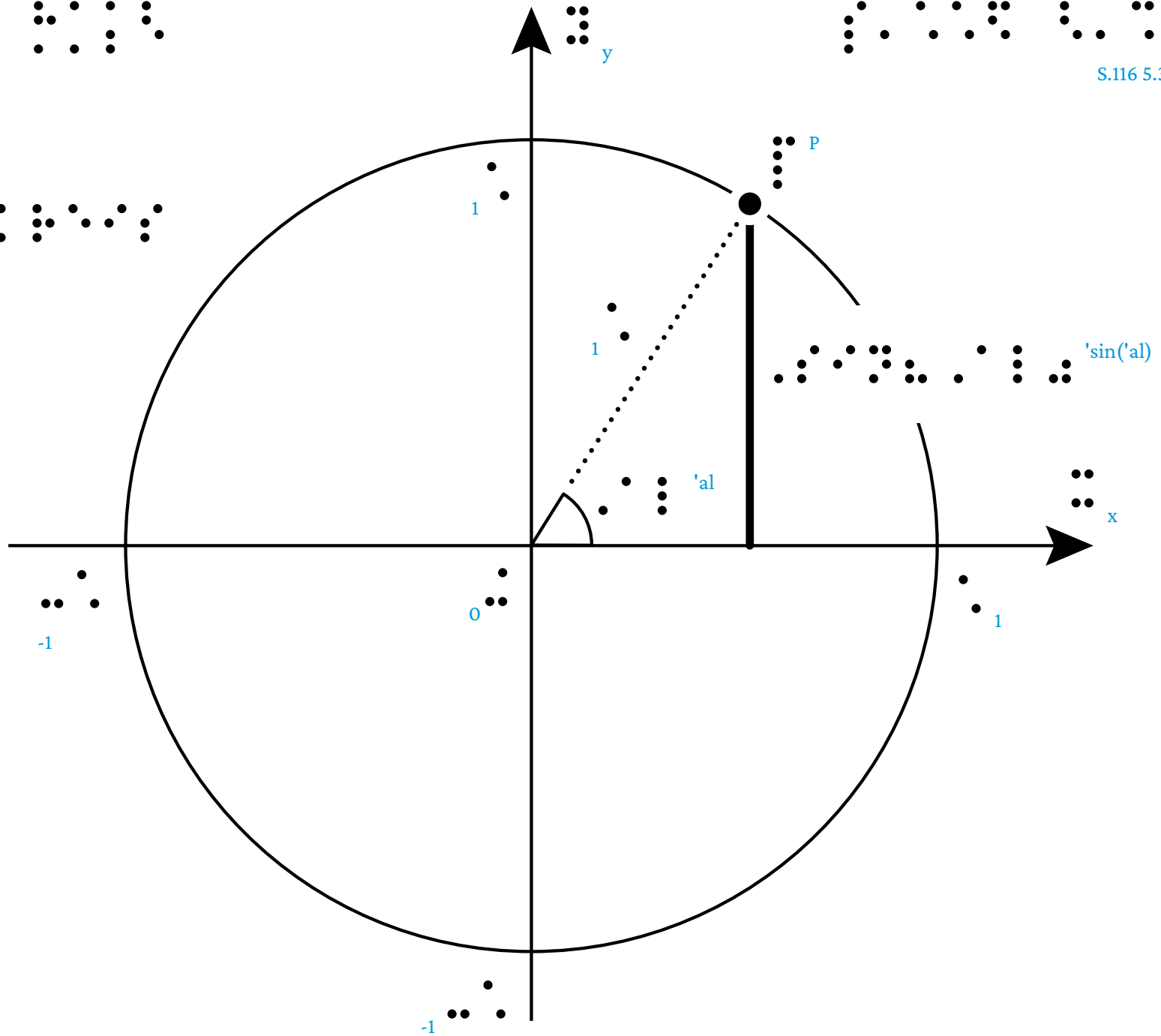
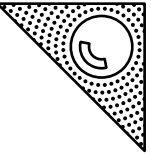


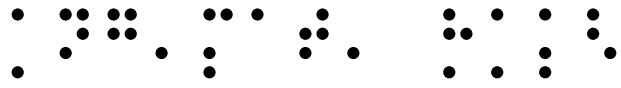
Ang.Mat. HAK2

Sinus im Einheitskreis

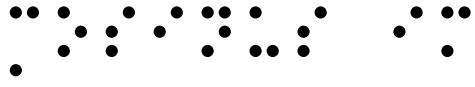
Sinus im Einheitskreis

S.116 5.3

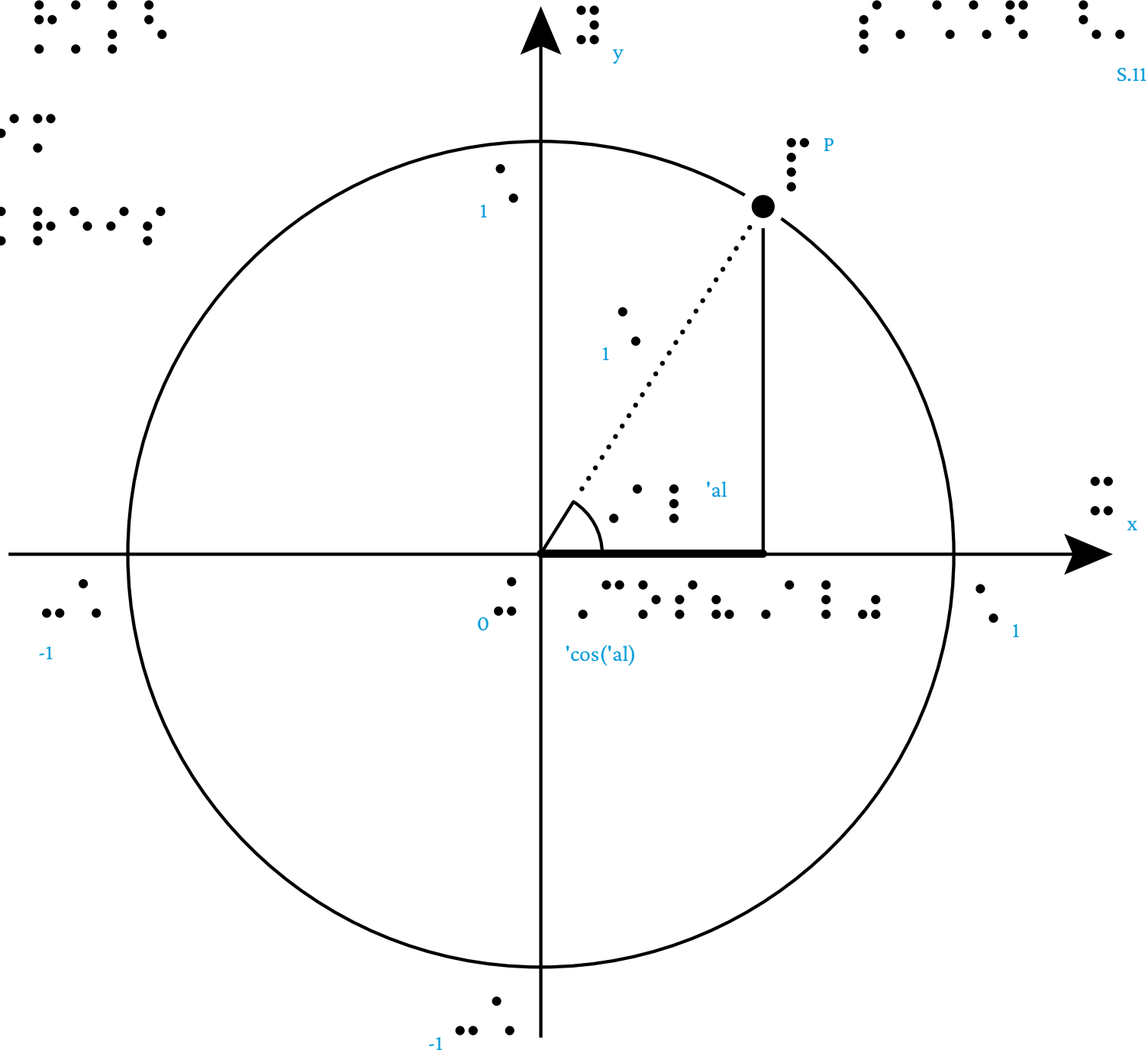




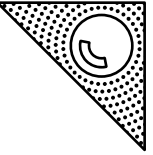
Ang.Mat. HAK2



Cosinus im Einheitskreis



S.116 5.3

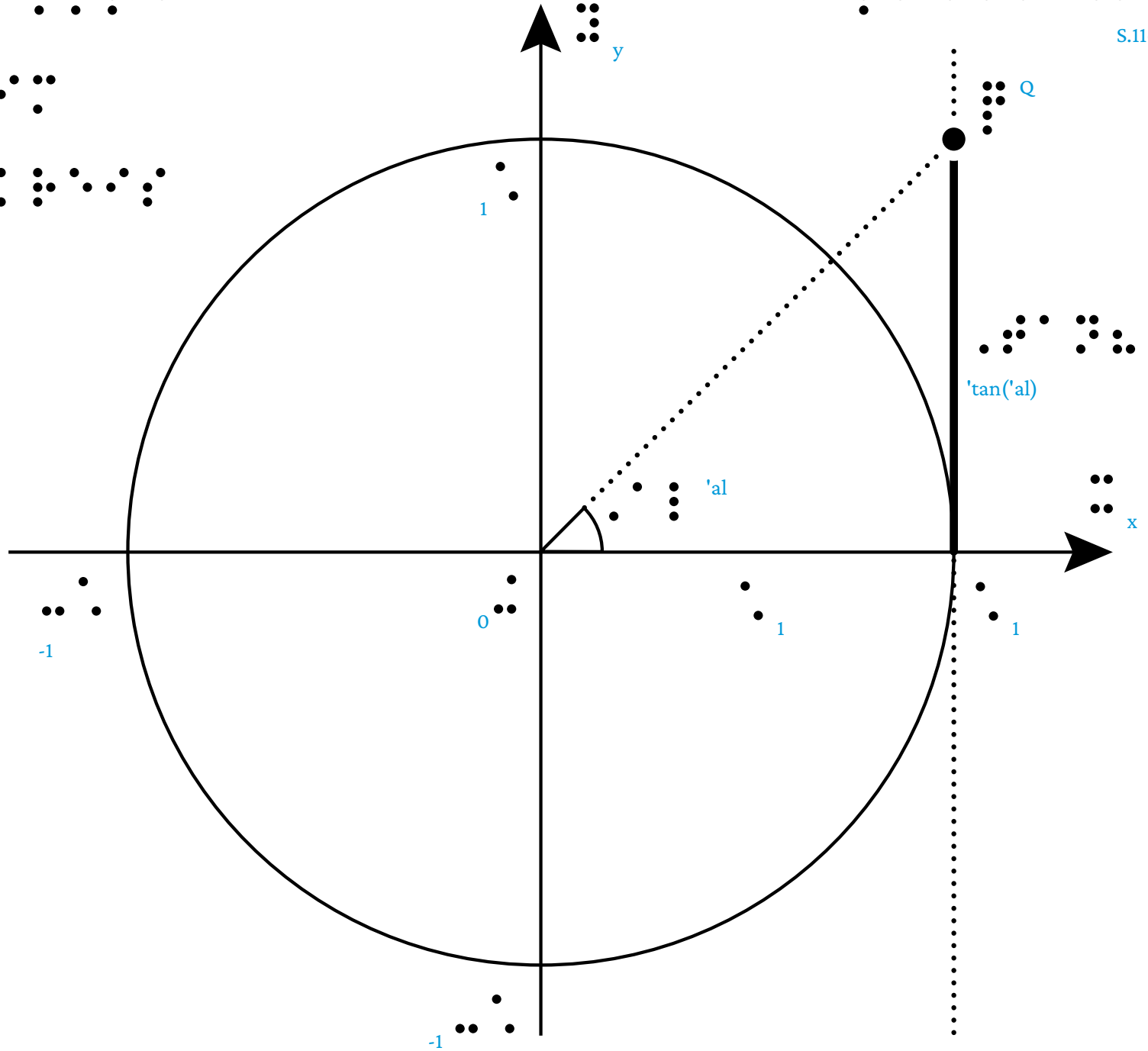
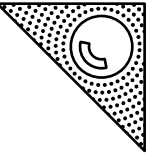


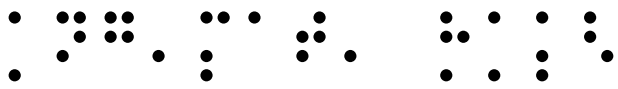
Ang.Mat. HAK2

Tangens im Einheitskreis

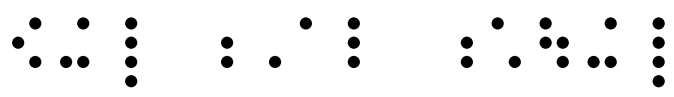
Tangens im Einheitskreis

S.116 5.3

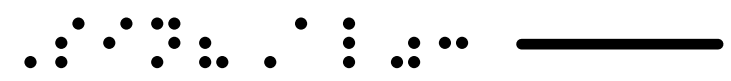




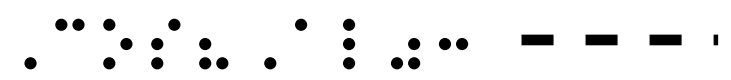
Ang.Mat. HAK2



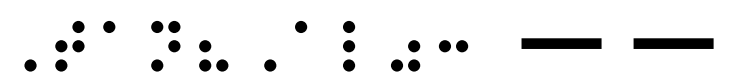
90° < 'al < 180°



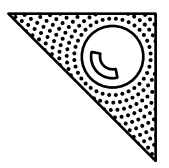
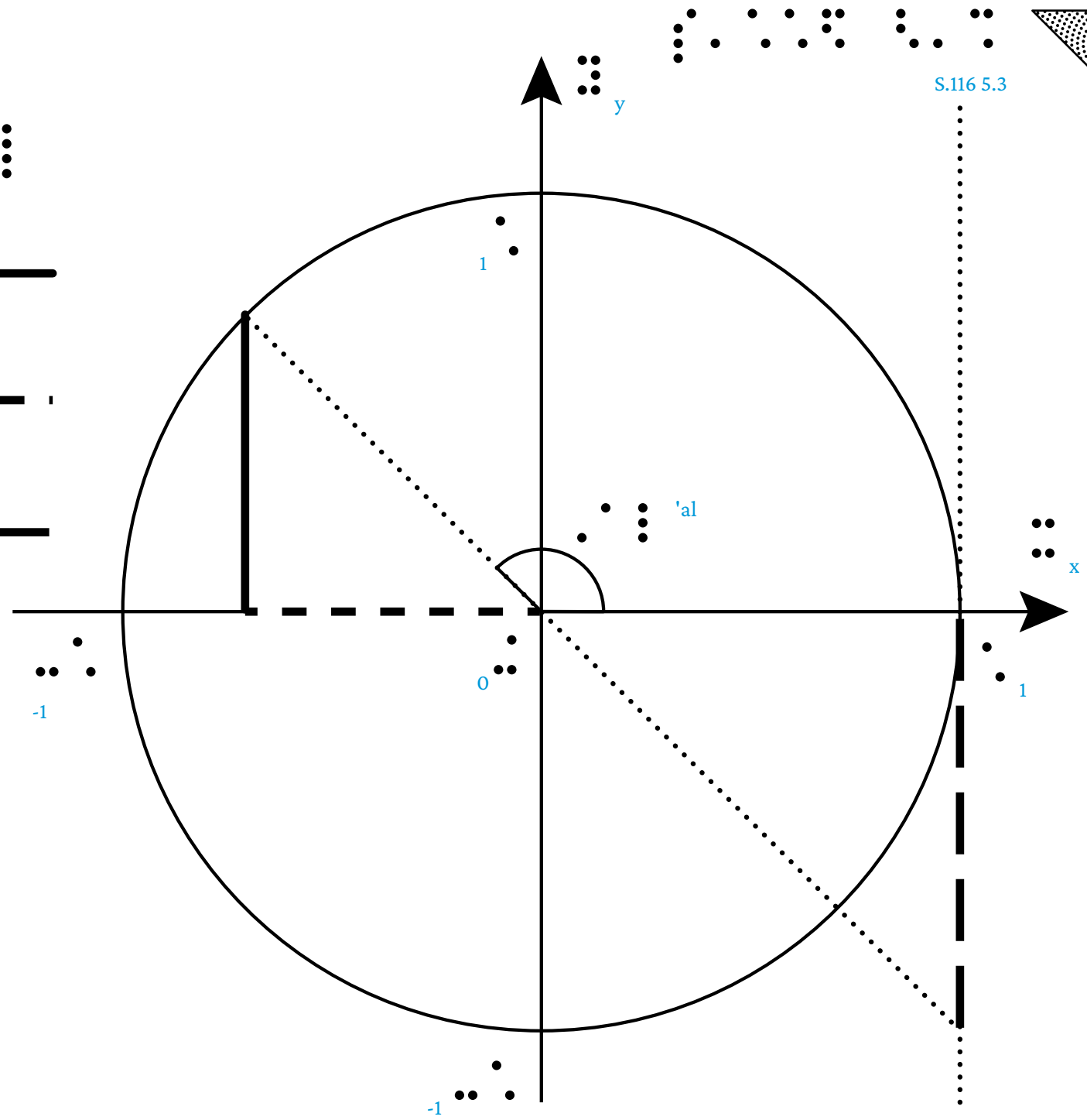
'sin('al):

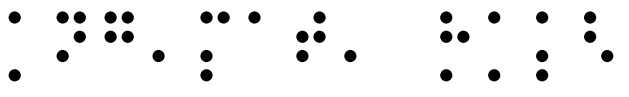


'cos('al):

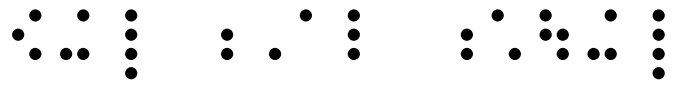


'tan('al):

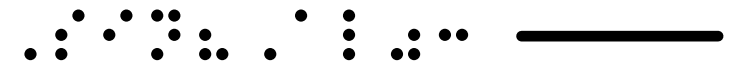




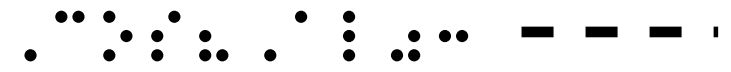
Ang. Mat. HAK2



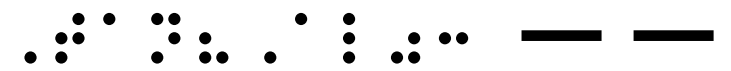
180° < 'al < 270°



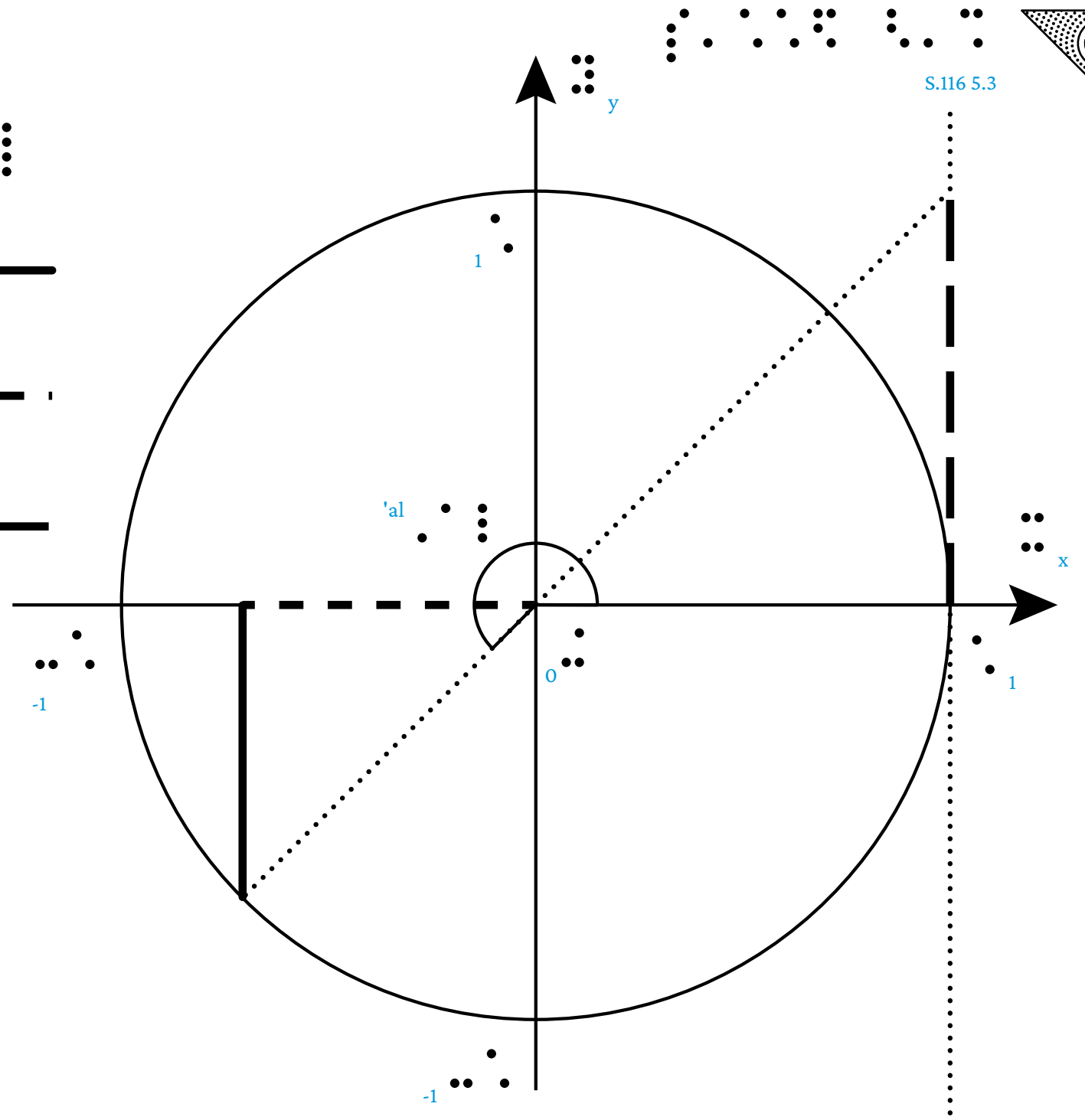
'sin('al):



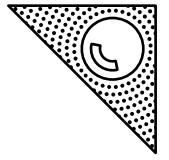
'cos('al):



'tan('al):



S.116 5.3



Ang.Mat. HAK2

270° < 'al < 360°

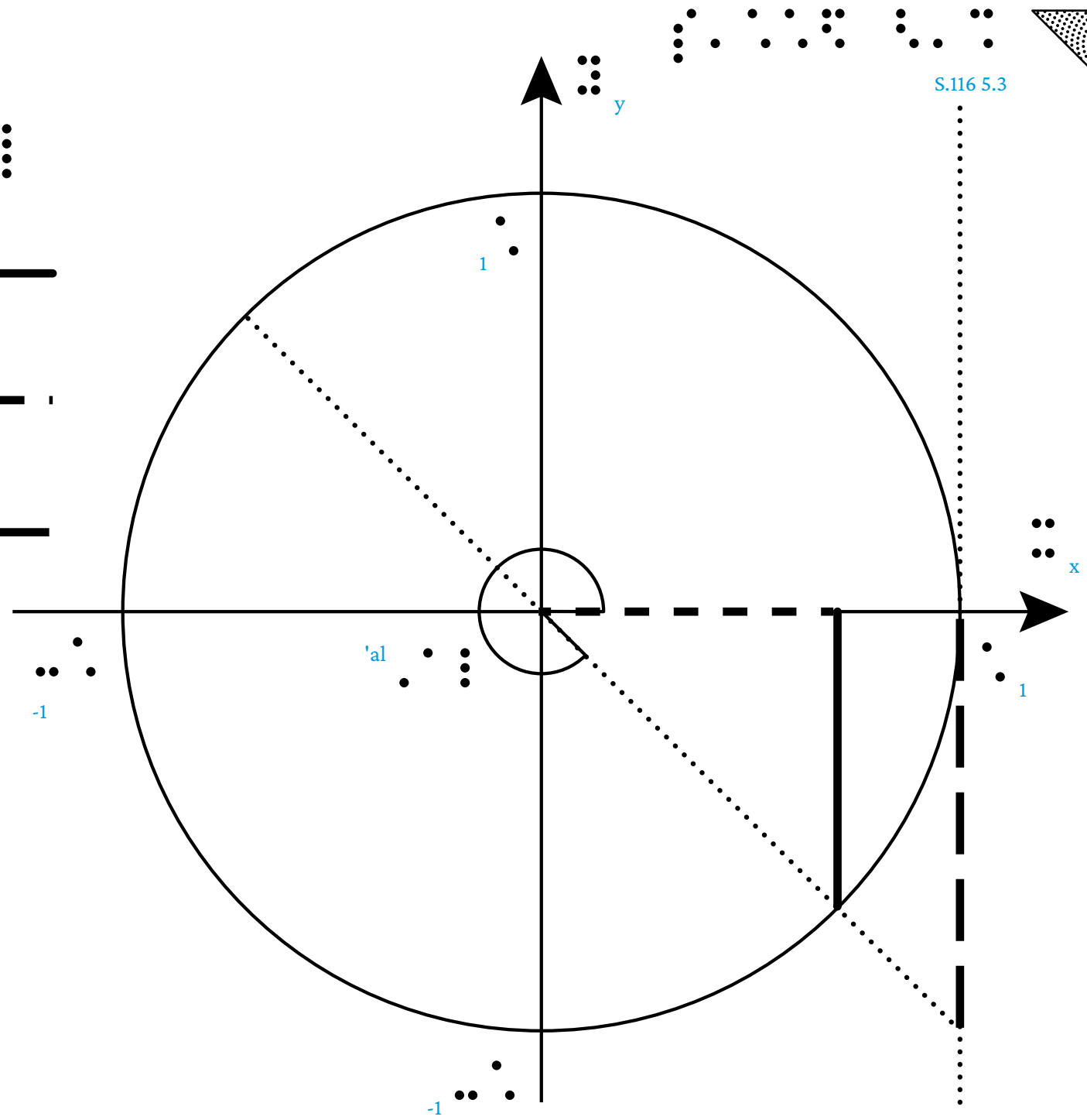
'sin('al):

'cos('al):

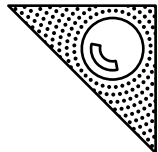
'tan('al):

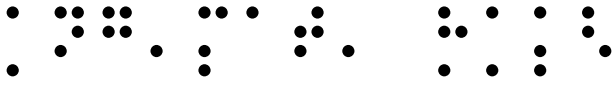
-1

1



S.116 5.3

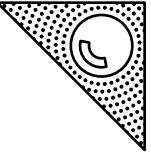




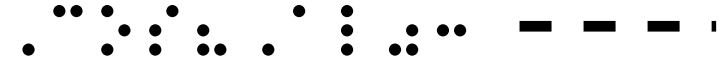
Ang.Mat. HAK2



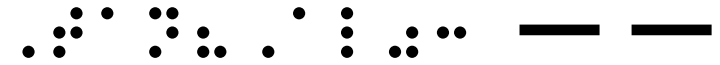
S.117 5.57



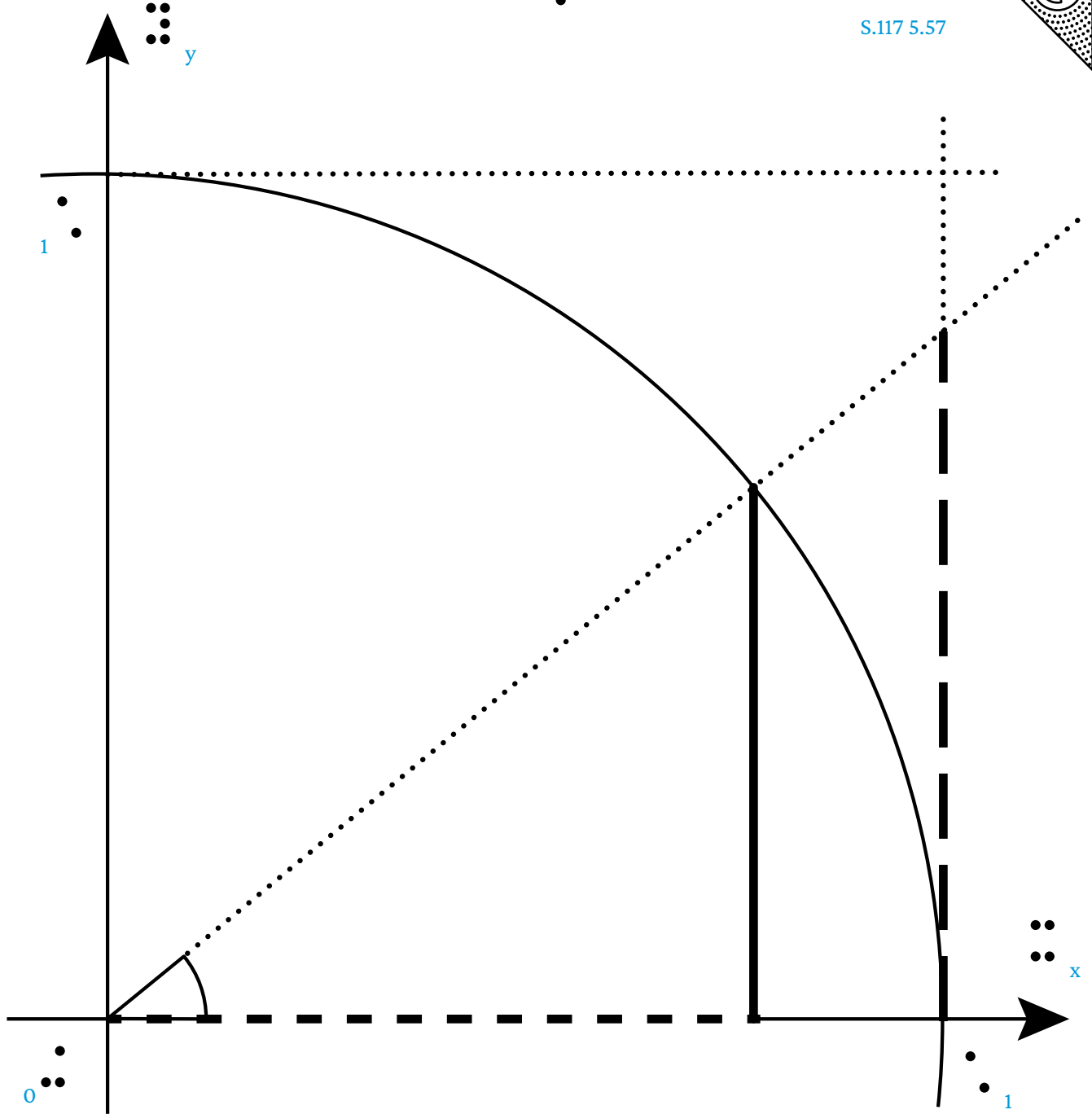
'sin('al):

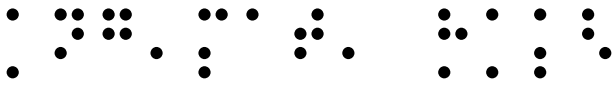


'cos('al):

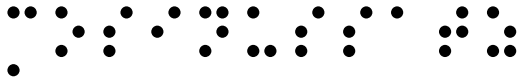


'tan('al):

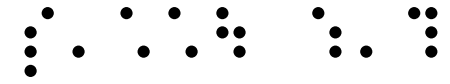




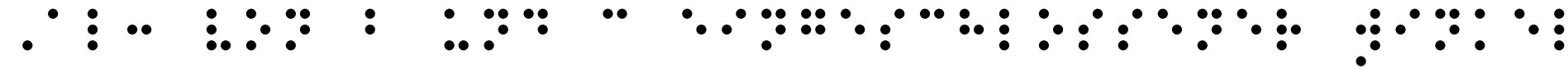
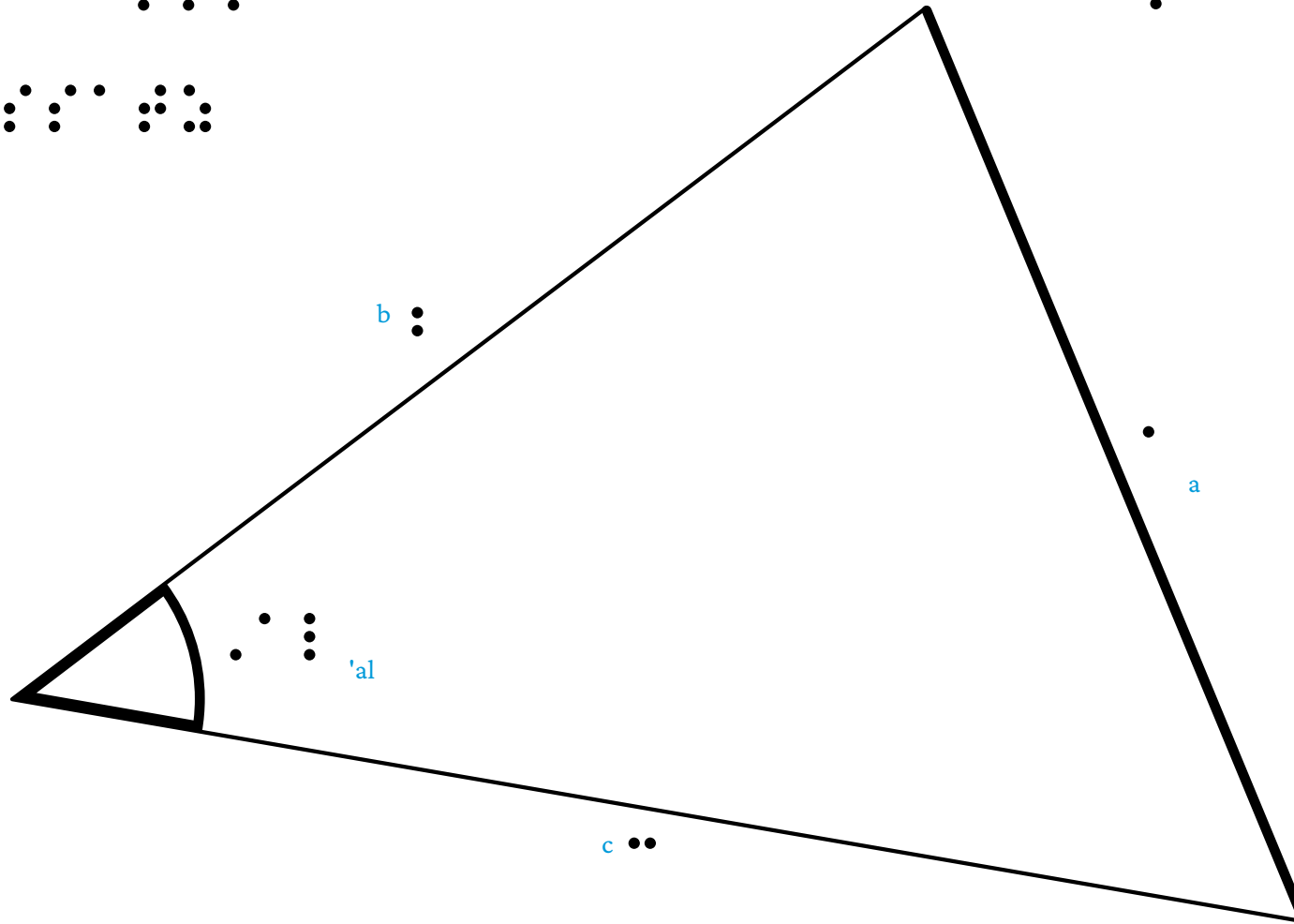
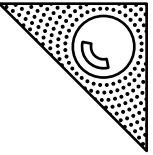
Ang.Mat. HAK2



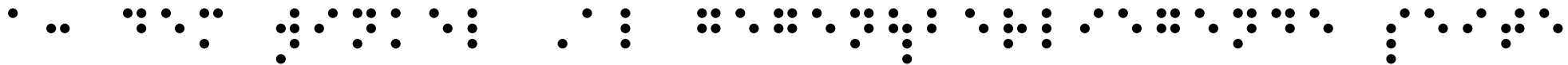
Cosinussatz



S.118 5.4

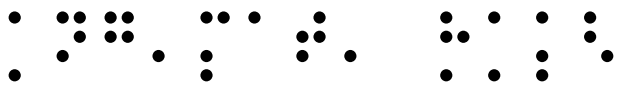


'al: von b und c eingeschlossener Winkel

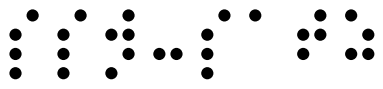


a: dem Winkel 'al gegenüberliegende Seite





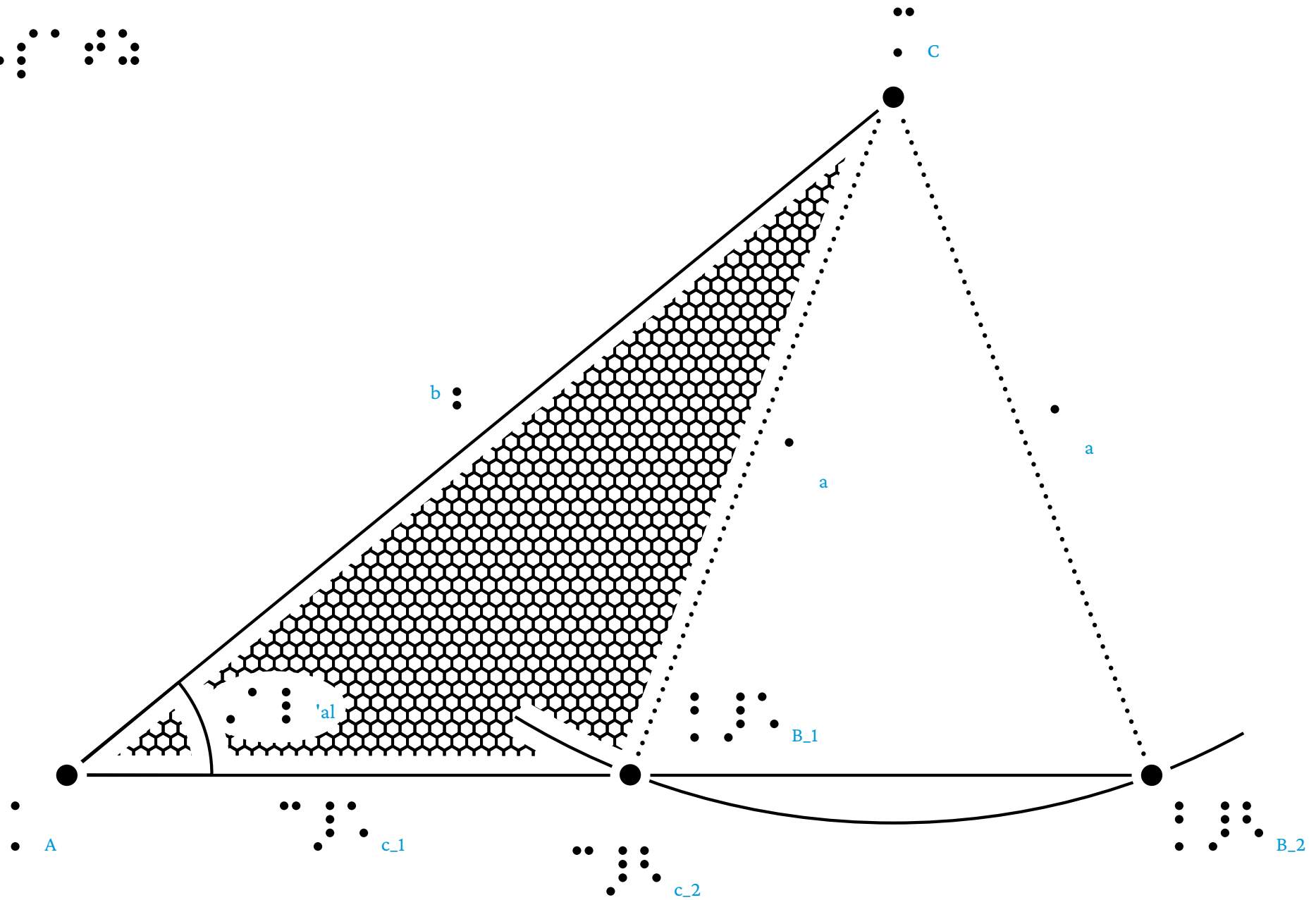
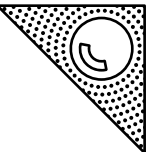
Ang.Mat. HAK2

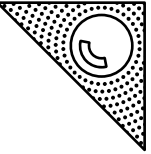
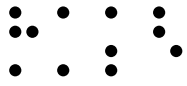
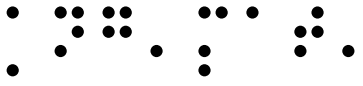


SSW-Satz



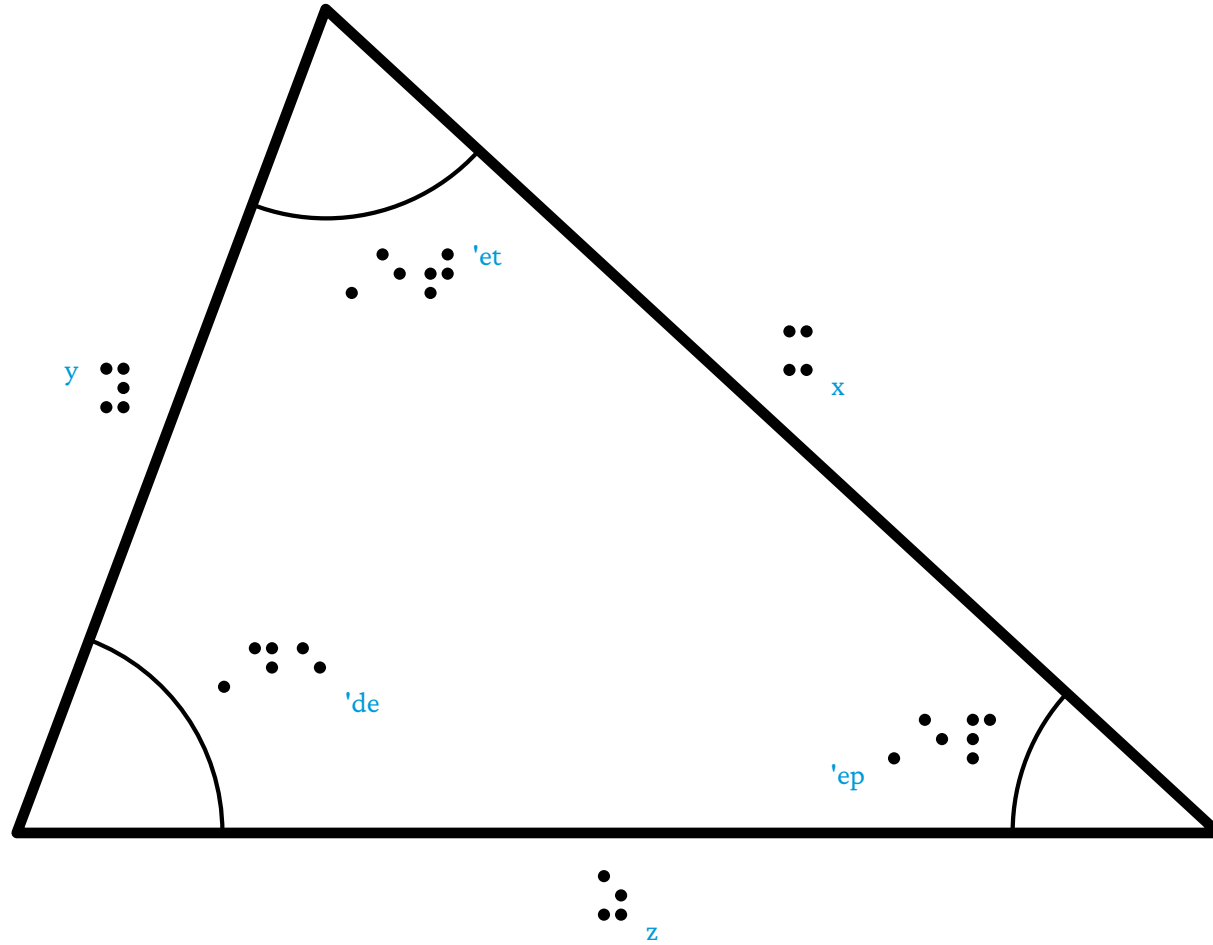
S.118

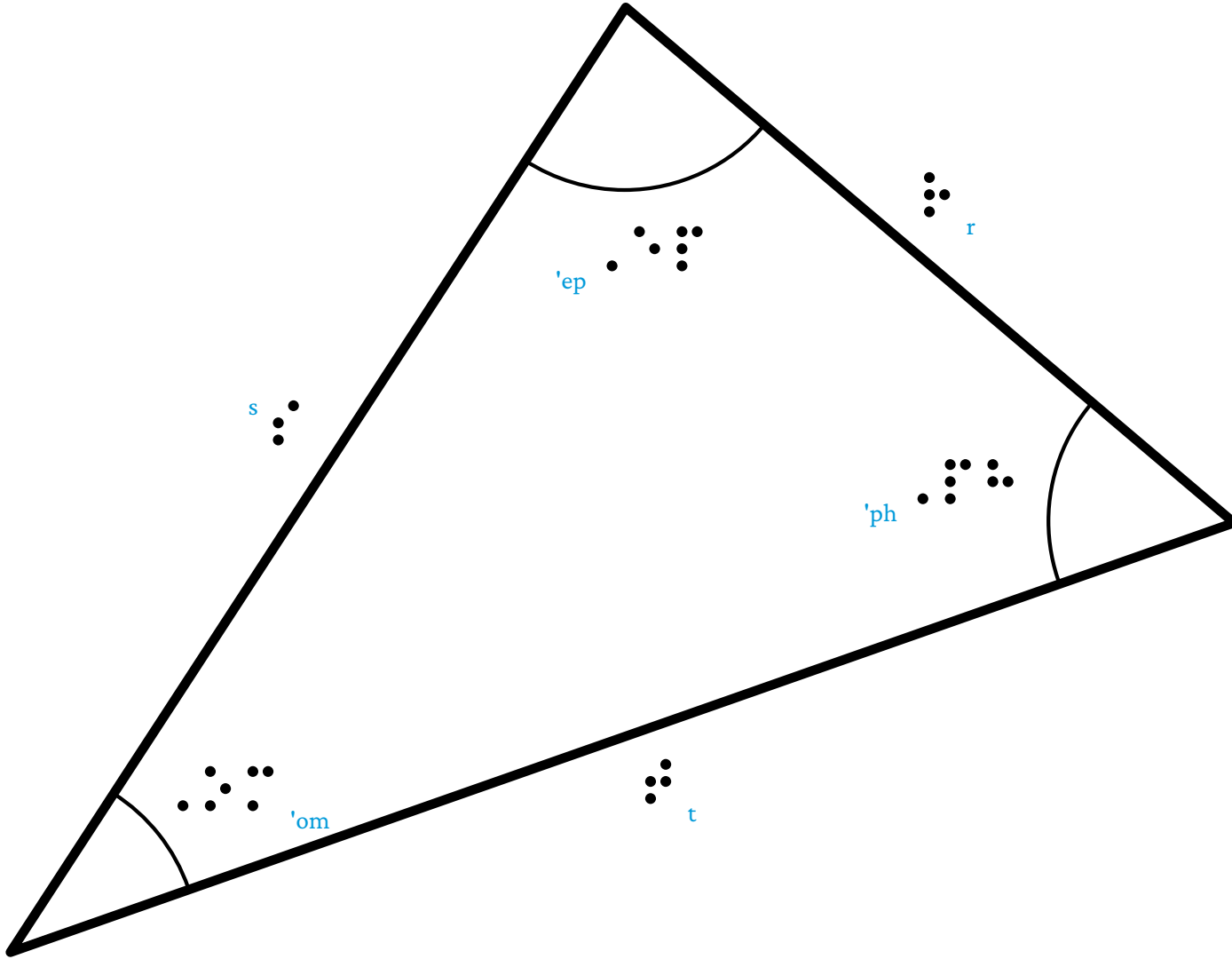
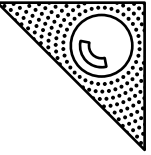
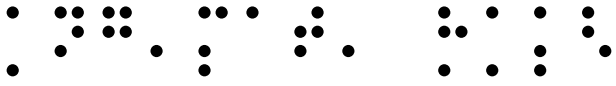


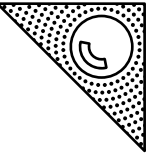
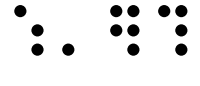
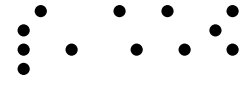
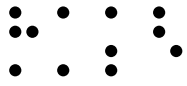
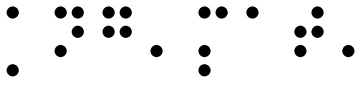


Ang.Mat. HAK2

S.119 5.69

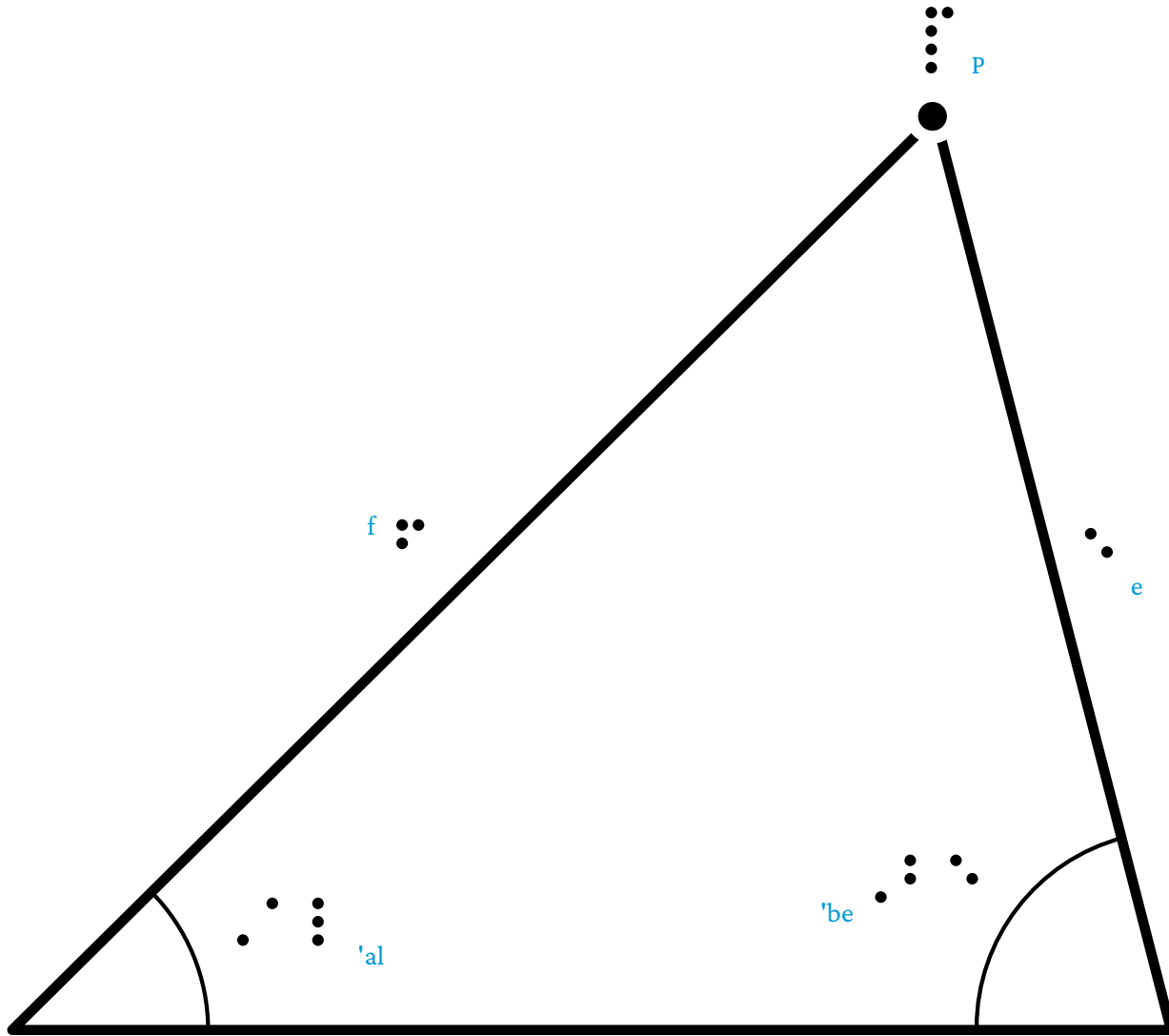


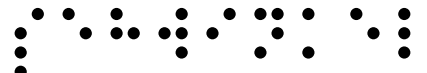
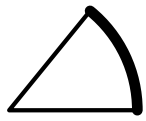
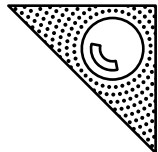
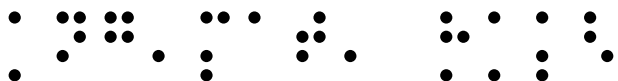




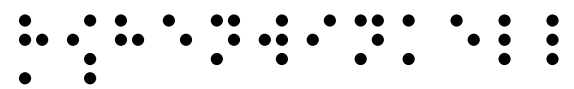
Ang.Mat. HAK2

S.119 5.74

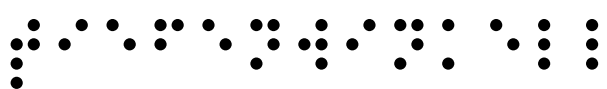
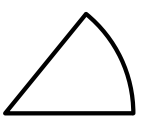




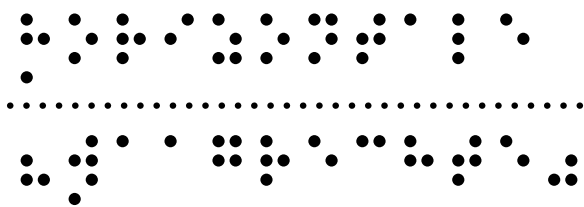
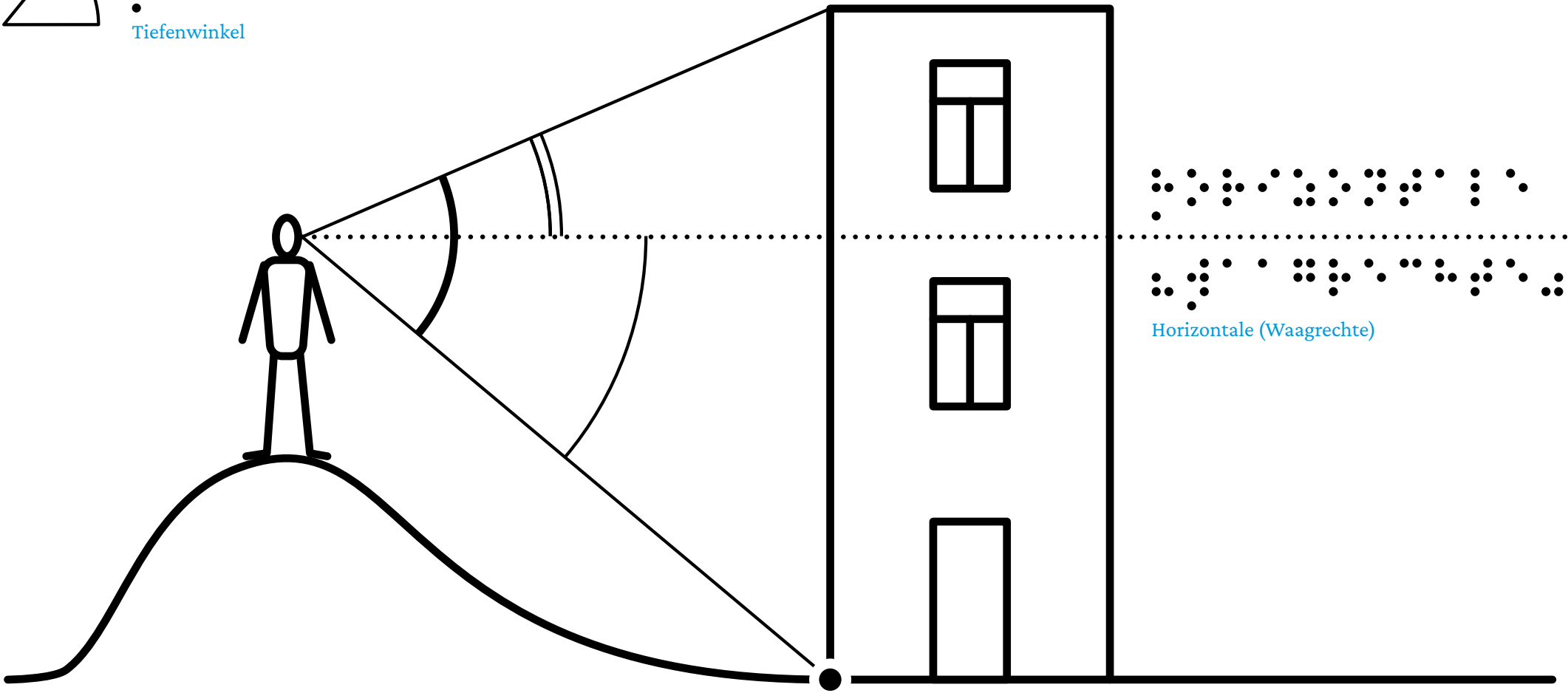
Sehwinkel



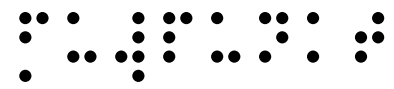
Höhenwinkel



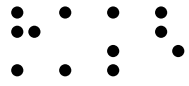
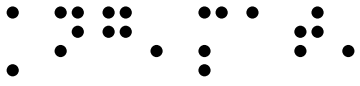
Tiefenwinkel



Horizontale (Waagrechte)

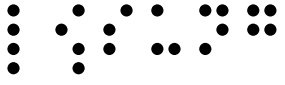
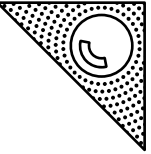


Fußpunkt

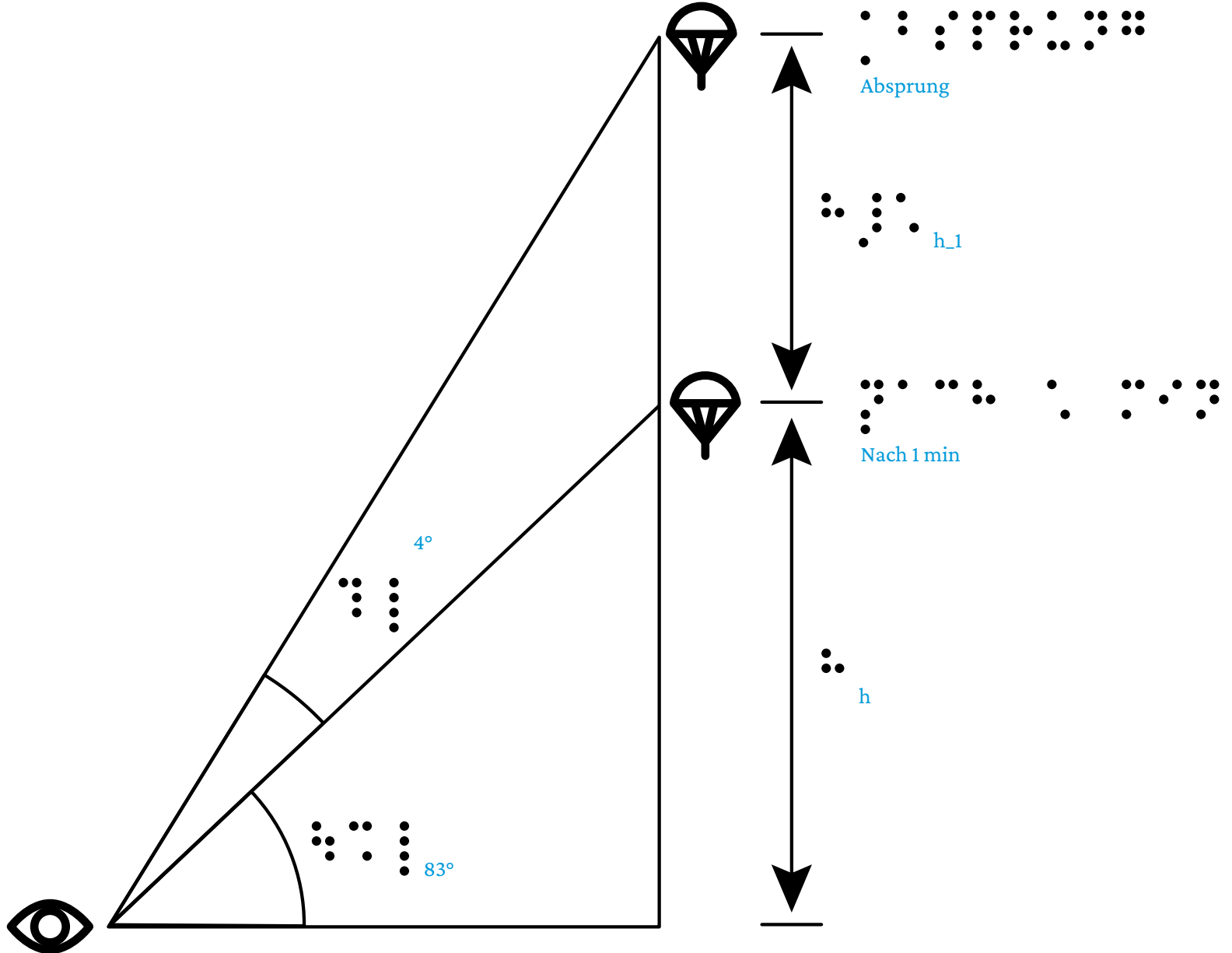


Ang.Mat. HAK2

S.120 5.78



Lösung

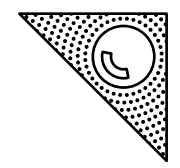


Braille text: Ang.Mat. HAK2

Ang.Mat. HAK2

Braille text: S.120 5.79

S.120 5.79

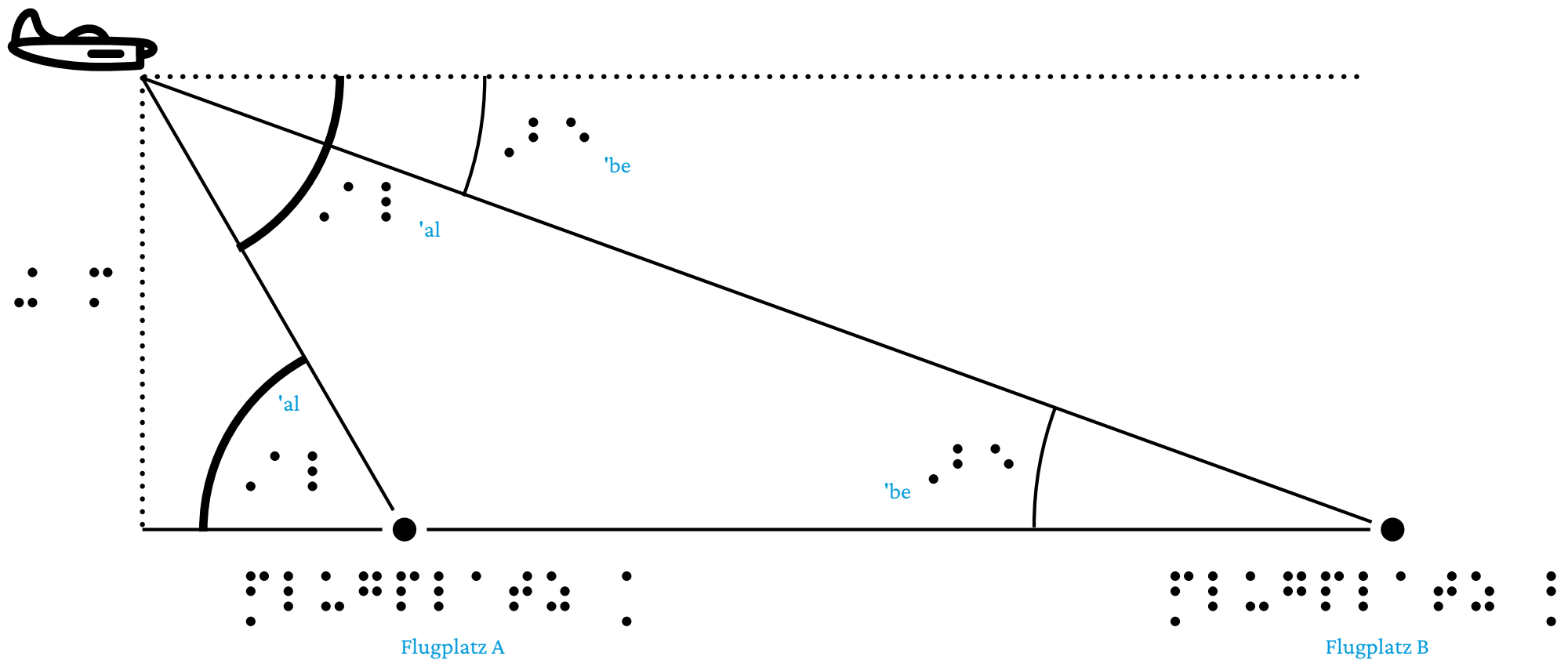


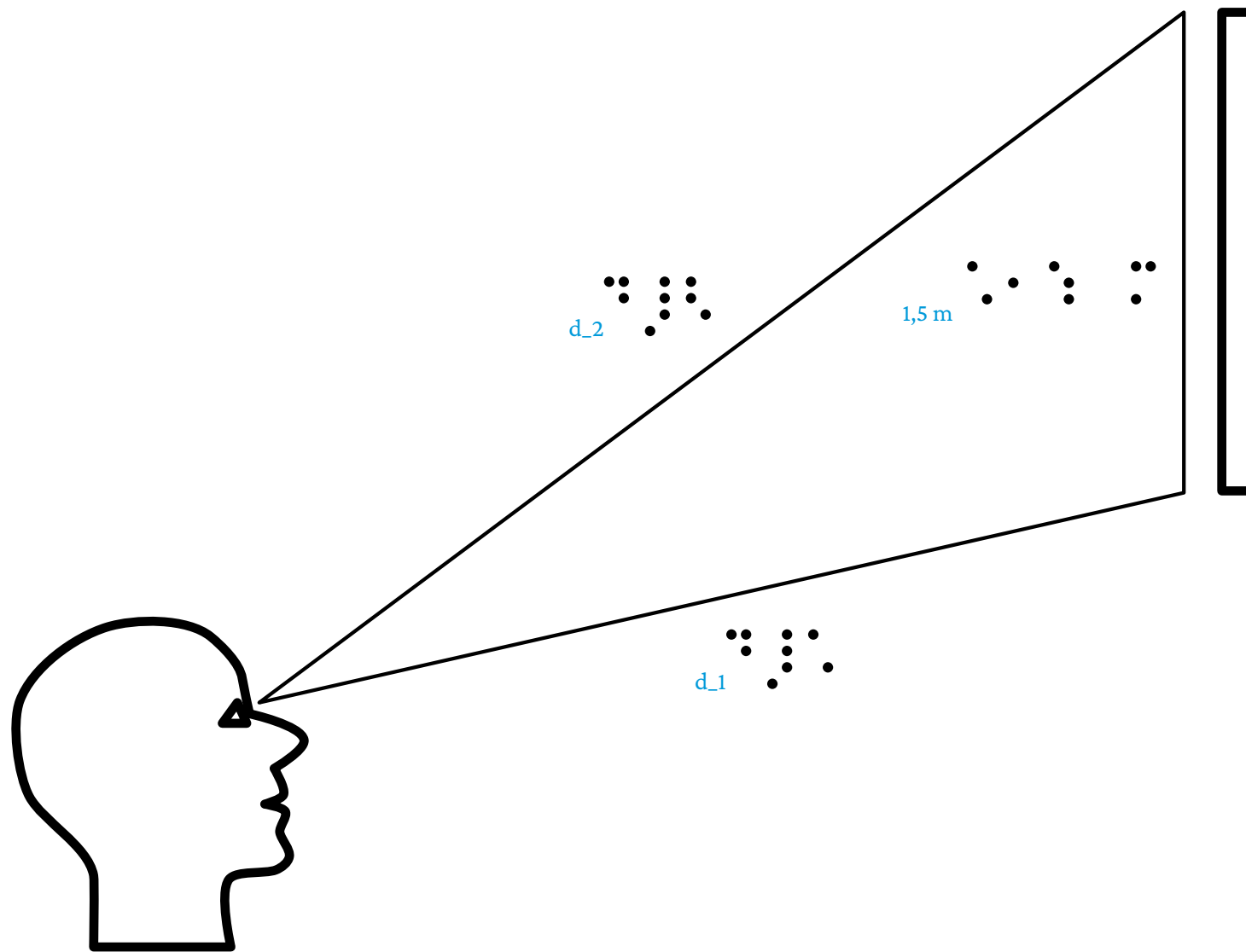
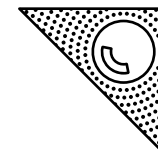
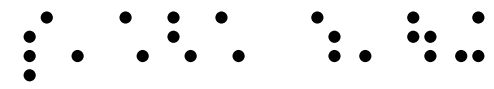
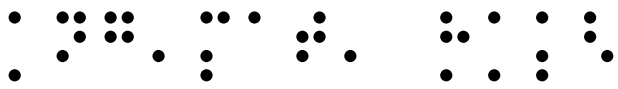
Braille text: Lösung

Lösung

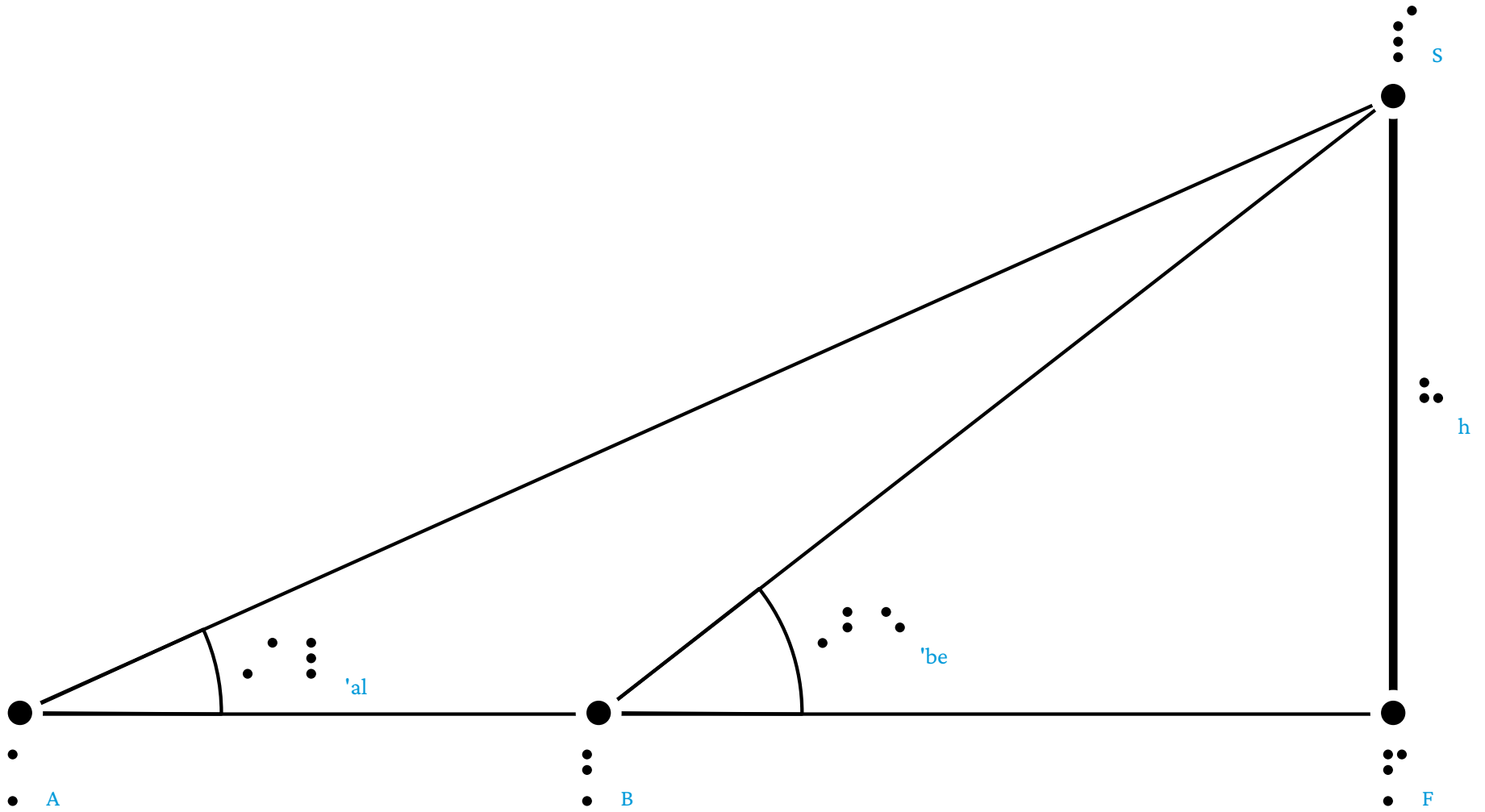
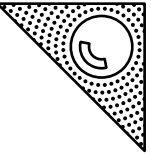
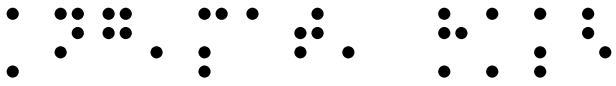
Braille text: 2500 m

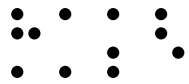
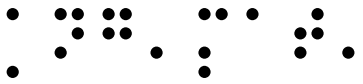
2500 m



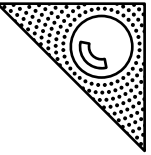




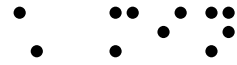




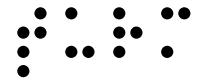
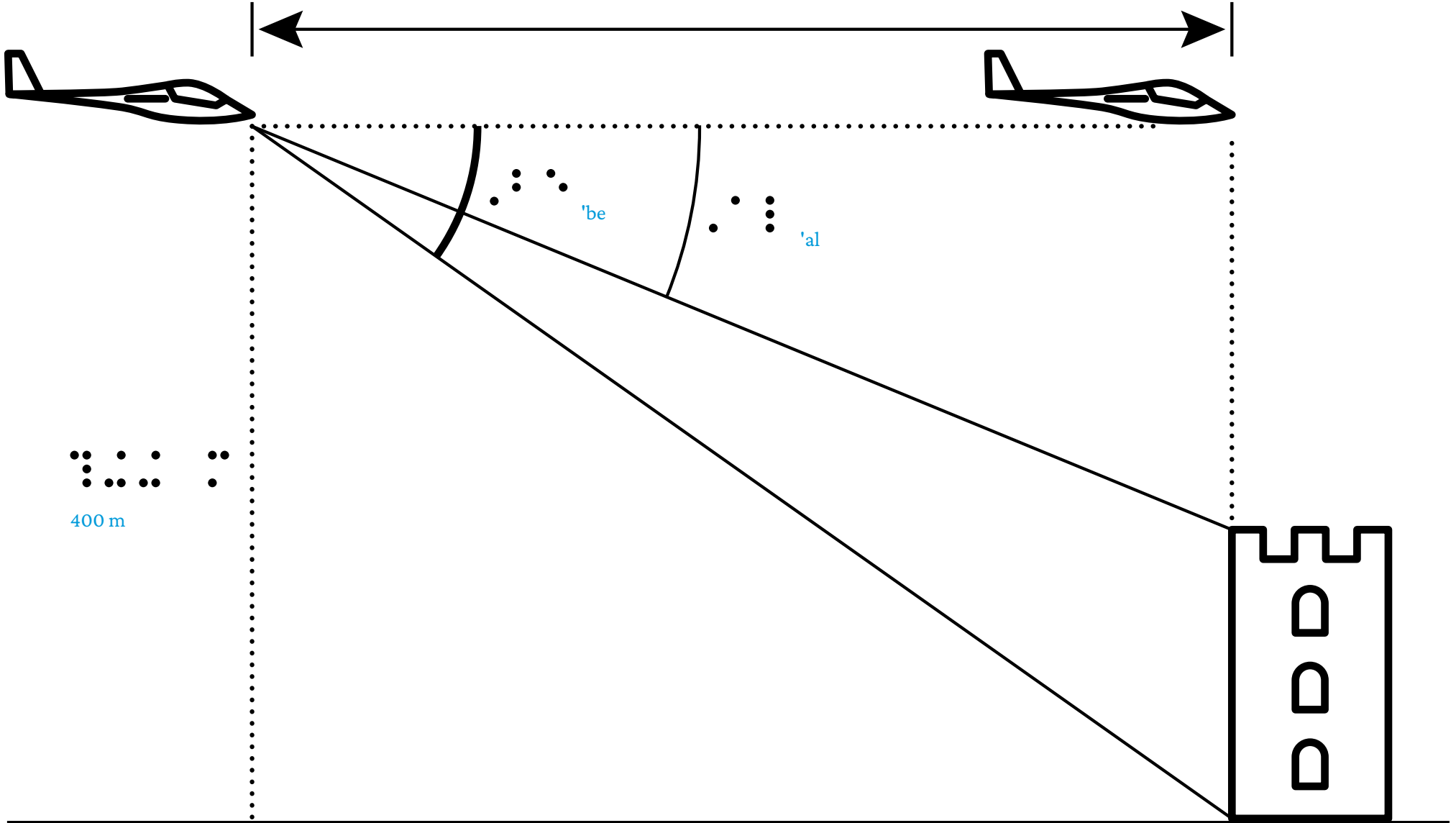
1 min



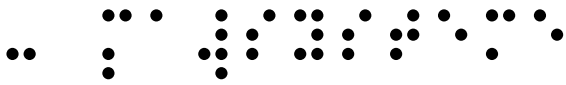
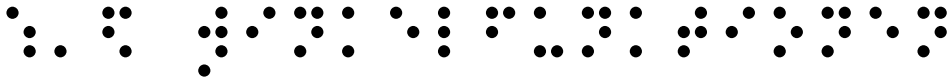
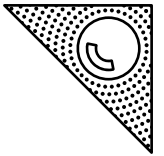
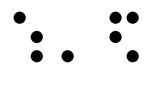
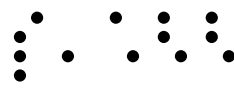
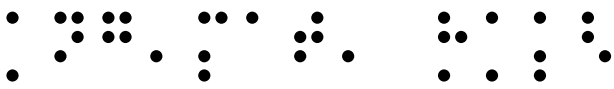
Ang.Mat. HAK2



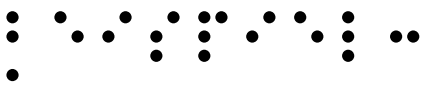
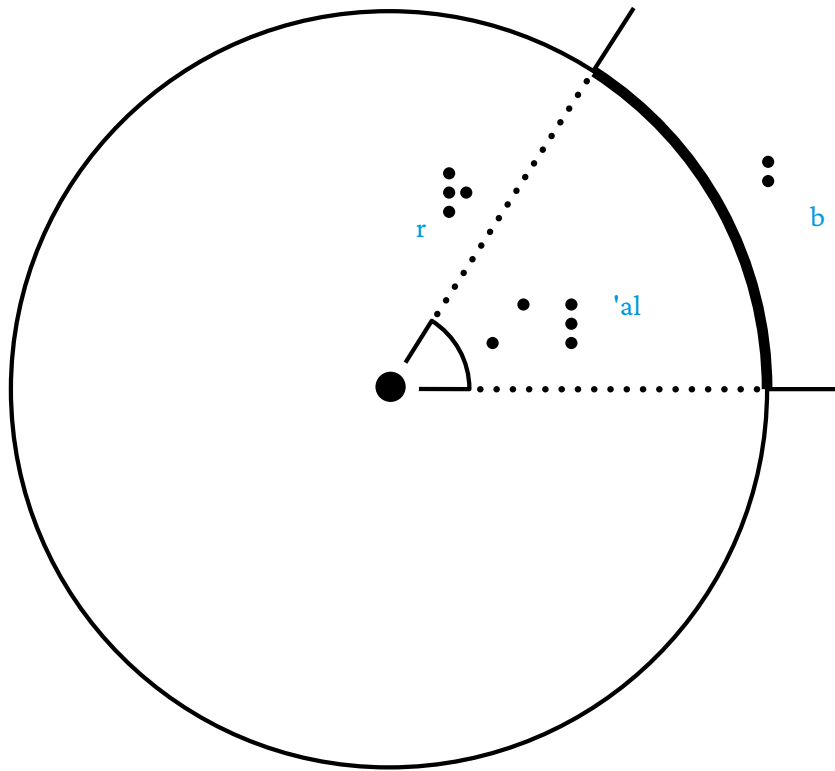
S.121 5.87



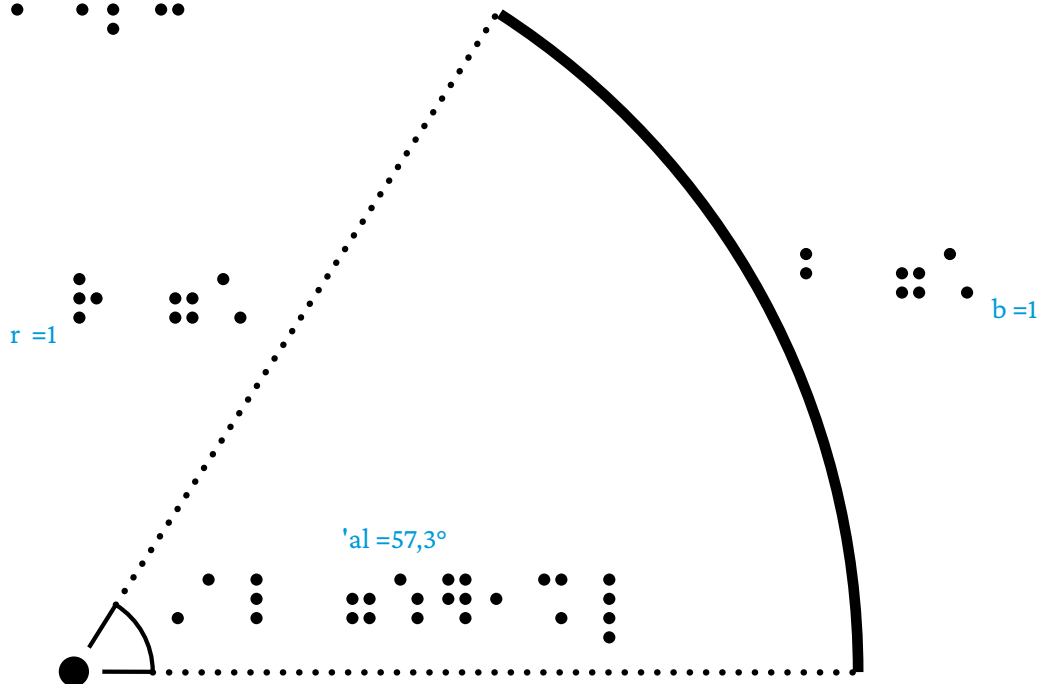
Turn



5.6 Winkelfunktionen - Maßsysteme



Beispiel:

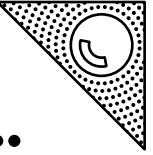


$2\pi$   $180^\circ$   $\frac{1}{2}\pi$   $90^\circ$

Ang.Mat. HAK2

$360^\circ$   $\pi$   $180^\circ$   $\frac{1}{2}\pi$   $90^\circ$   $\frac{1}{4}\pi$   $45^\circ$   $\frac{1}{8}\pi$   $22.5^\circ$

S.122 5.6



Besondere Winkel im Grad- und Bogenmaß 1/3

$2\pi$   $180^\circ$   $\pi$   $90^\circ$   $\frac{1}{2}\pi$   $45^\circ$   $\frac{1}{4}\pi$   $22.5^\circ$   $\frac{1}{8}\pi$   $11.25^\circ$   $\frac{3}{8}\pi$   $33.75^\circ$

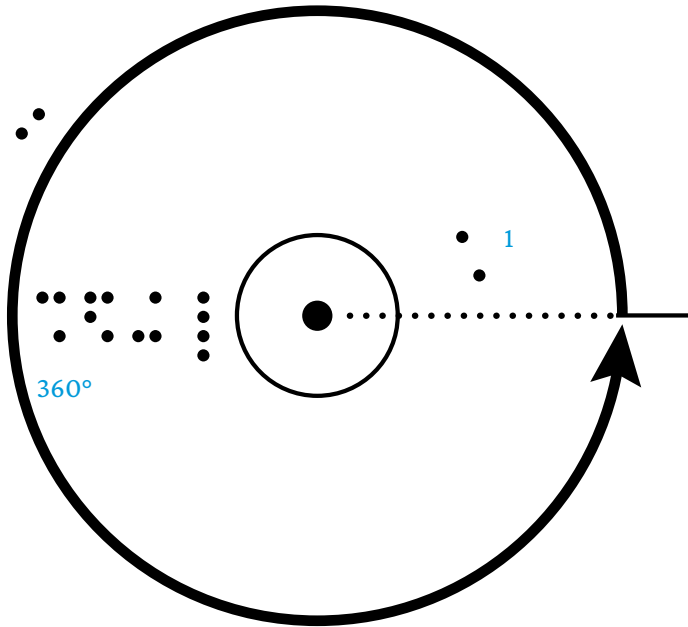
Ganze Drehung, Gradmaß:  $360^\circ$ , Bogenmaß:  $2\pi$

$\pi$   $180^\circ$   $\frac{1}{2}\pi$   $90^\circ$   $\frac{1}{4}\pi$   $45^\circ$   $\frac{1}{8}\pi$   $22.5^\circ$   $\frac{3}{8}\pi$   $33.75^\circ$

Halbe Drehung, Gradmaß:  $180^\circ$ , Bogenmaß:  $\pi$

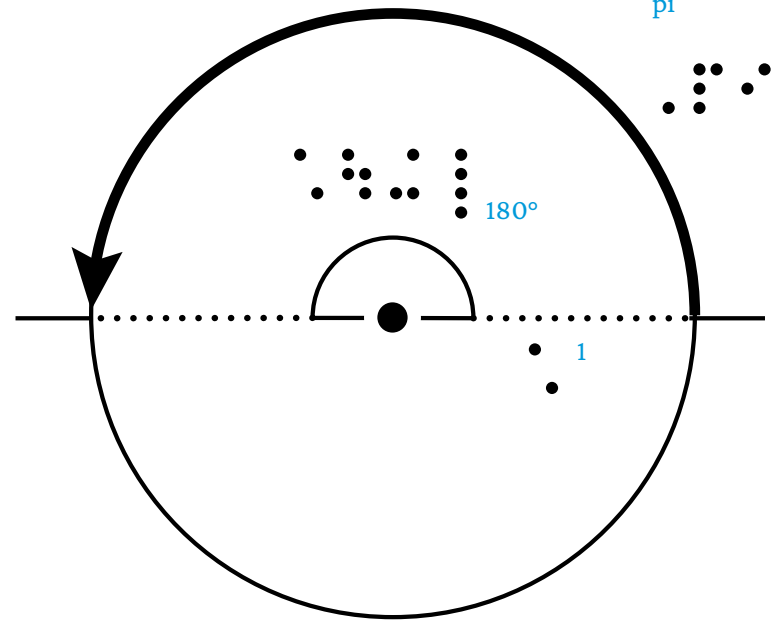
$2\pi$

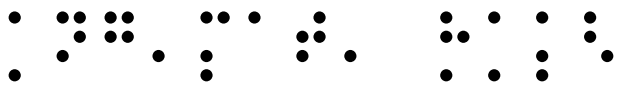
$360^\circ$



$\pi$

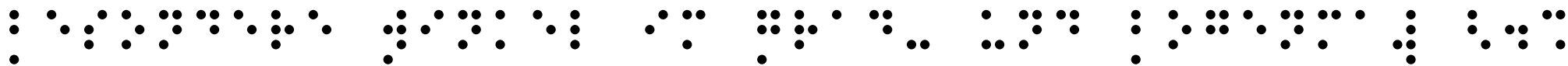
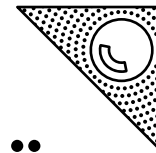
$180^\circ$



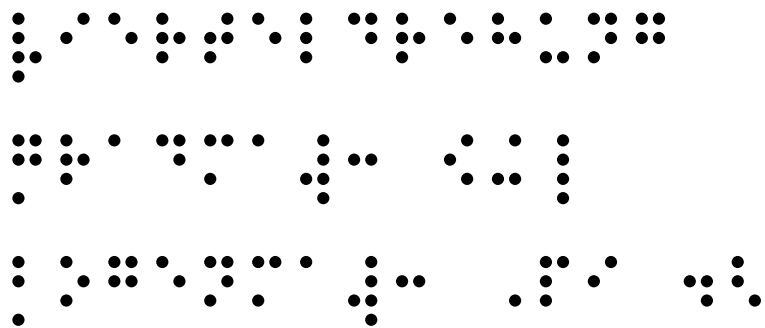


Ang.Mat. HAK2

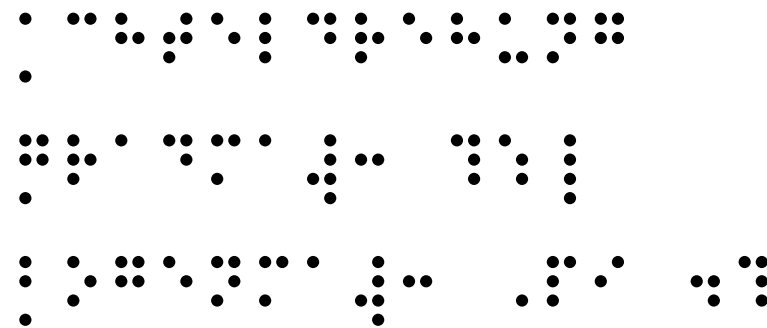
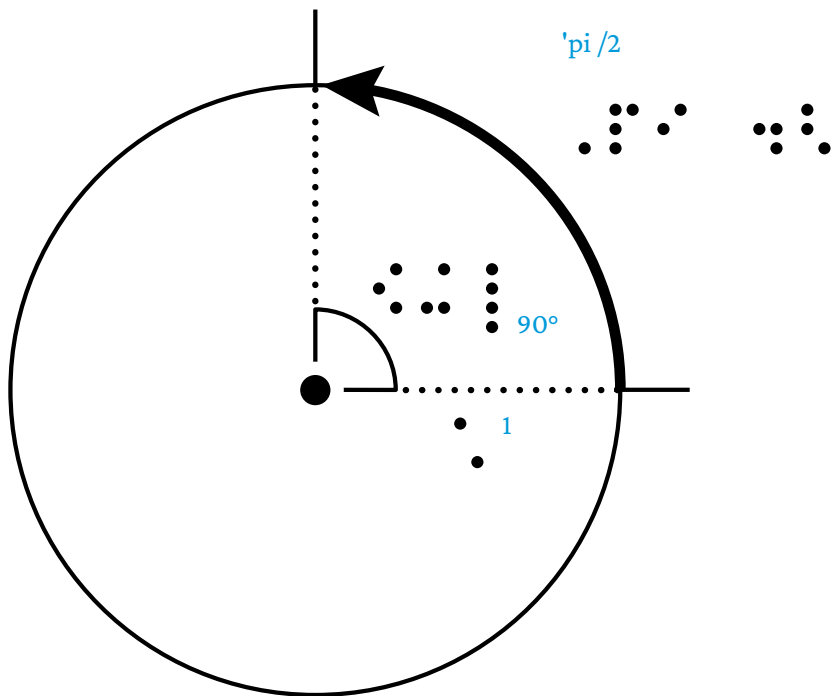
S.122 5.6



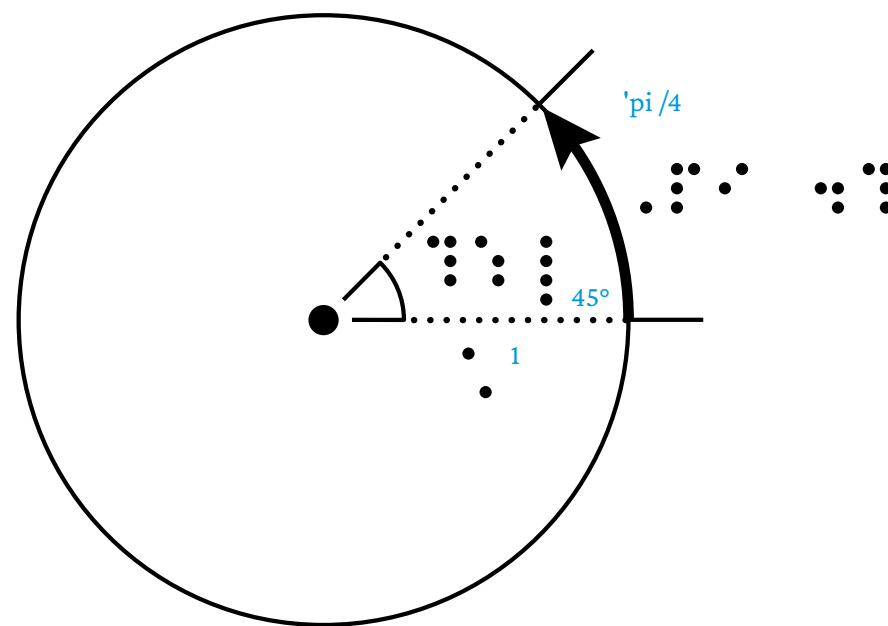
Besondere Winkel im Grad- und Bogenmaß 2/3

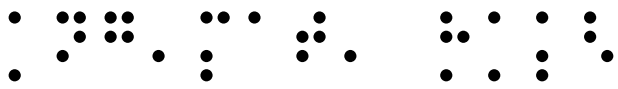


Vierteldrehung, Gradmaß: 90°, Bogenmaß:  $\pi/2$

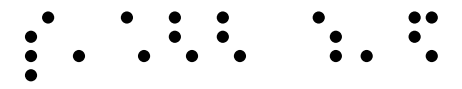


Achteldrehung, Gradmaß: 45°, Bogenmaß:  $\pi/4$

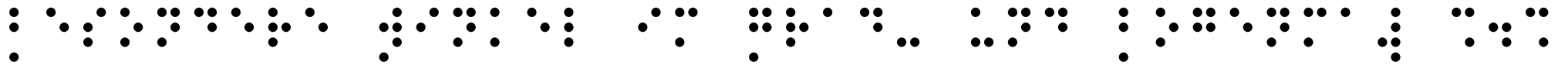
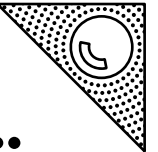




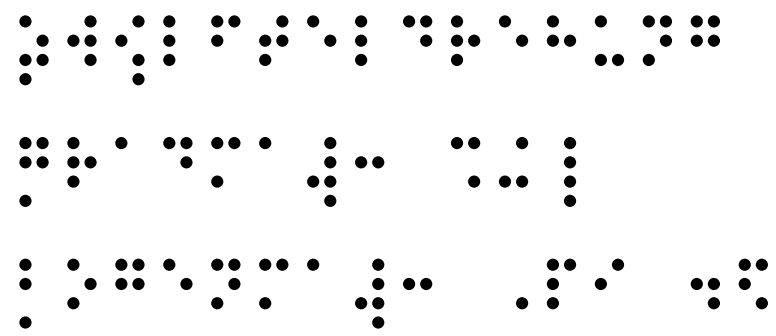
Ang. Mat. HAK2



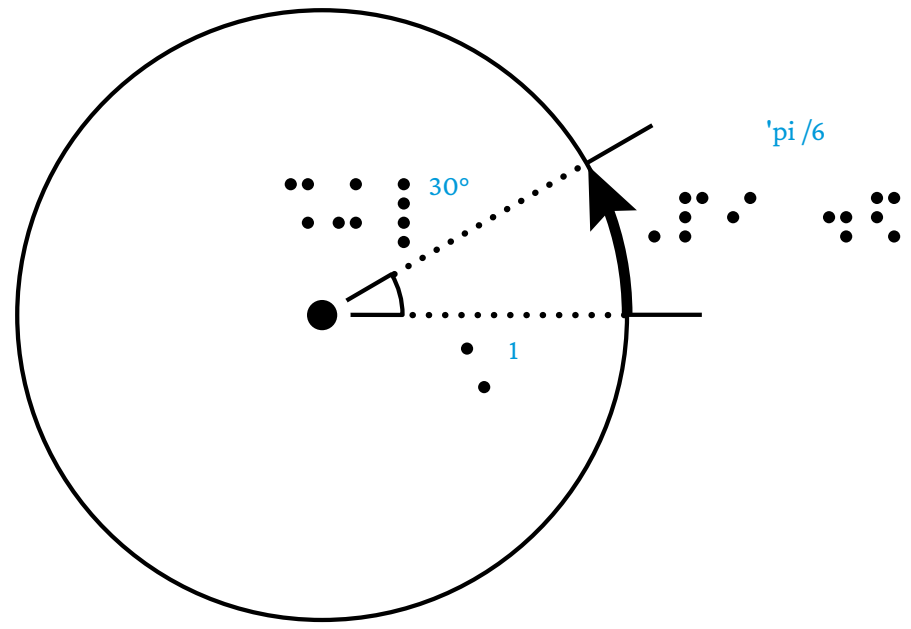
S.122 5.6

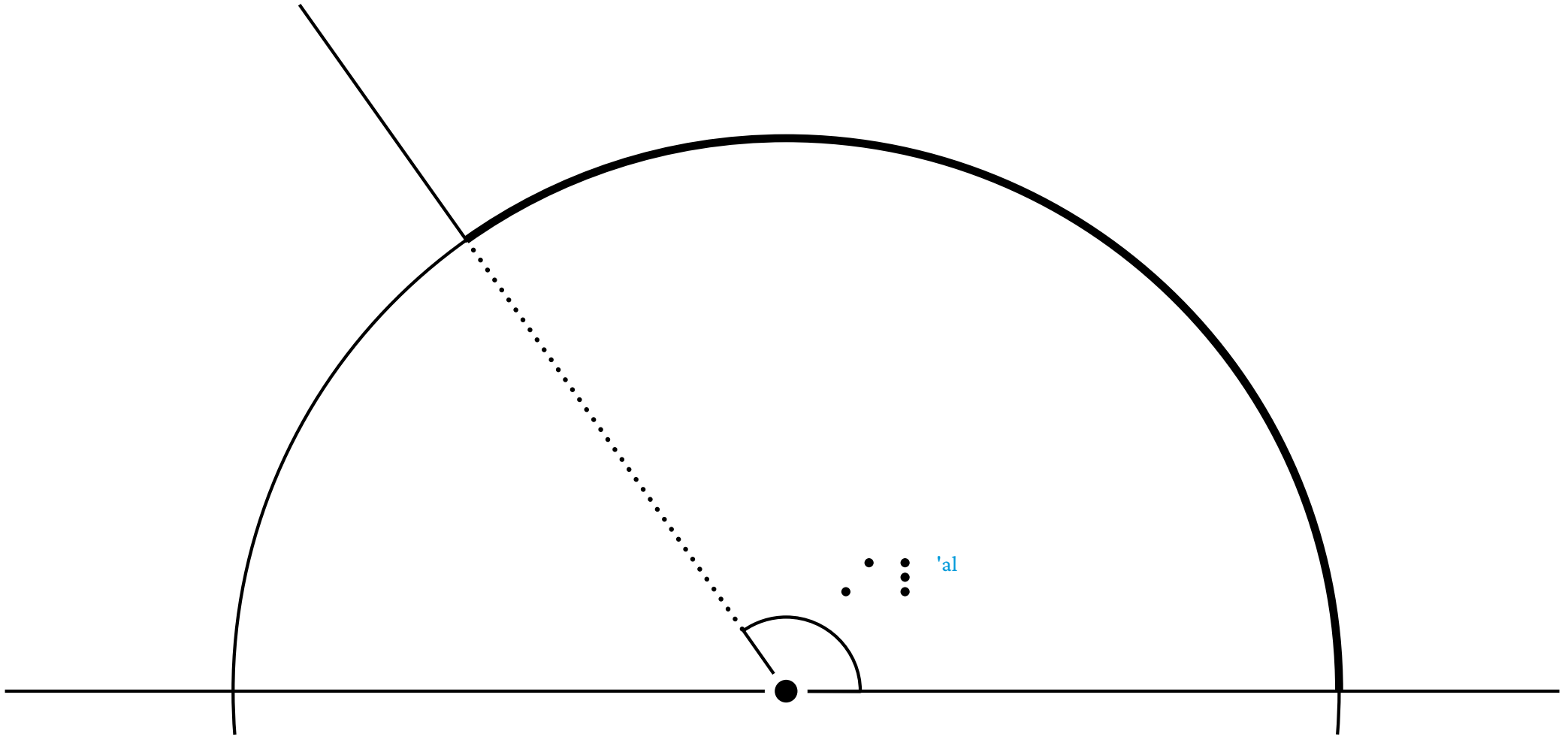
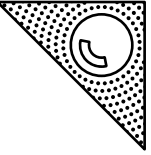
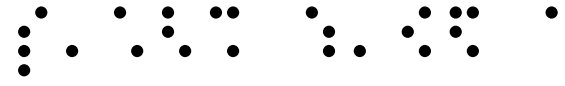
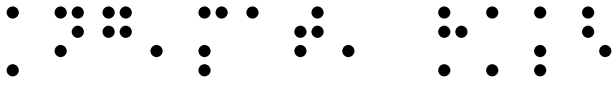


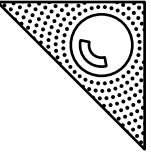
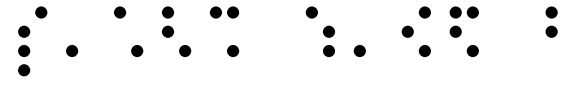
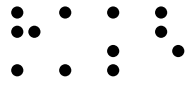
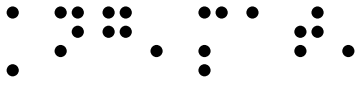
Besondere Winkel im Grad- und Bogenmaß 3/3



Zwölfteldrehung, Gradmaß: 30°, Bogenmaß: 'pi /6

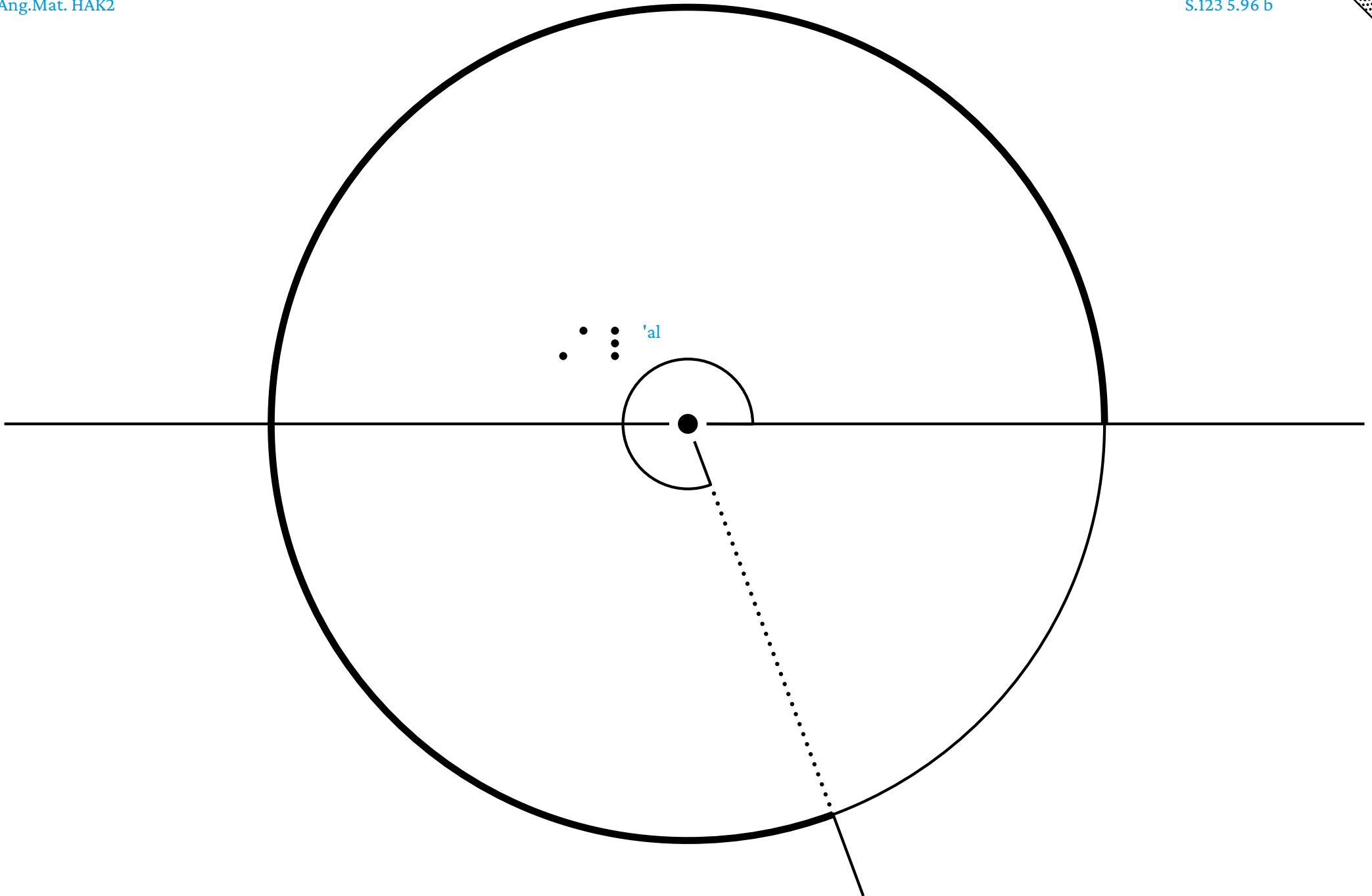






Ang.Mat. HAK2

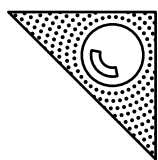
S.123 5.96 b



al



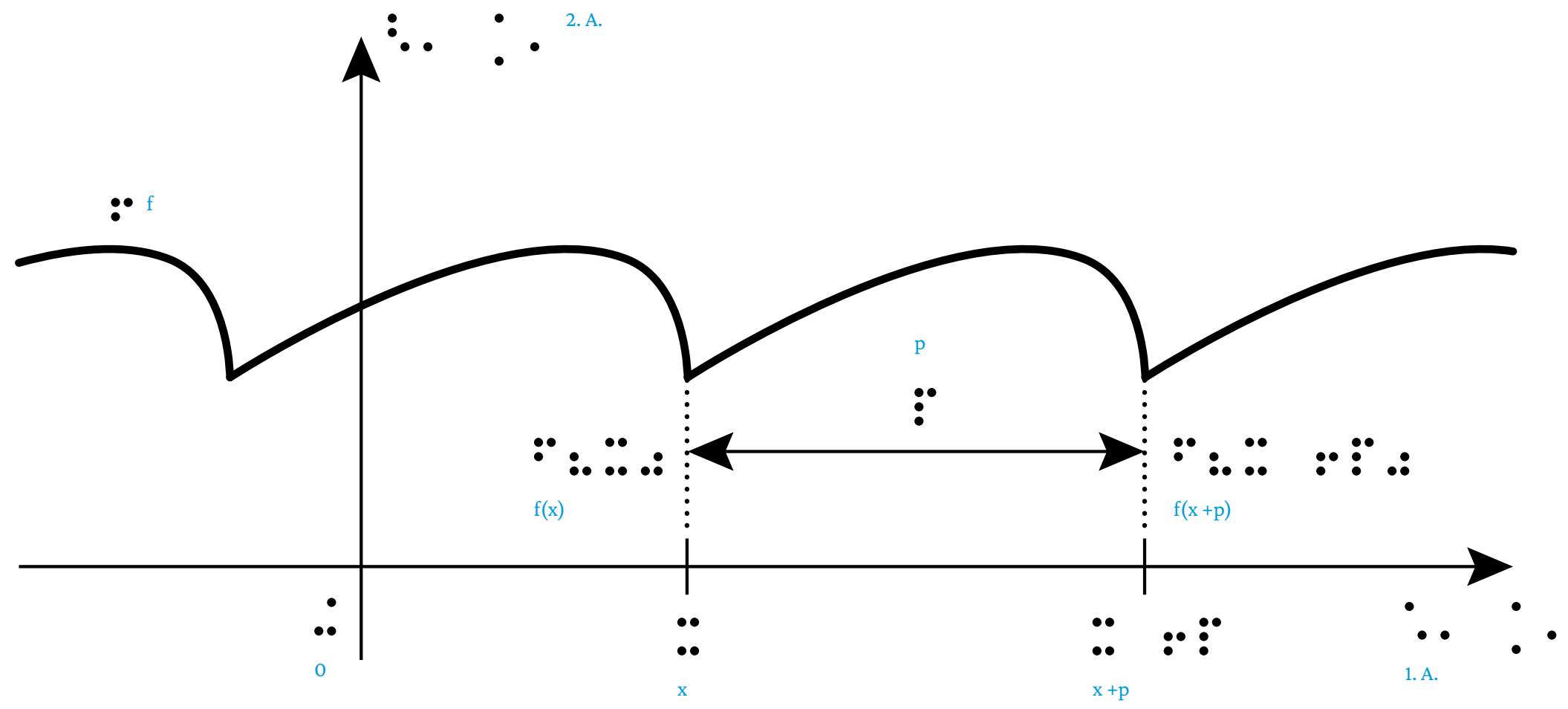
Ang.Mat. HAK2

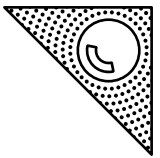
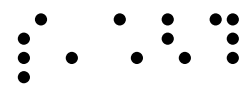
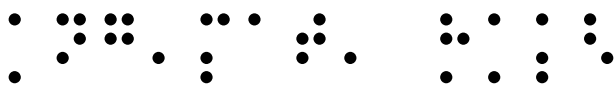


Graphen der Winkelfunktionen und Periodizität

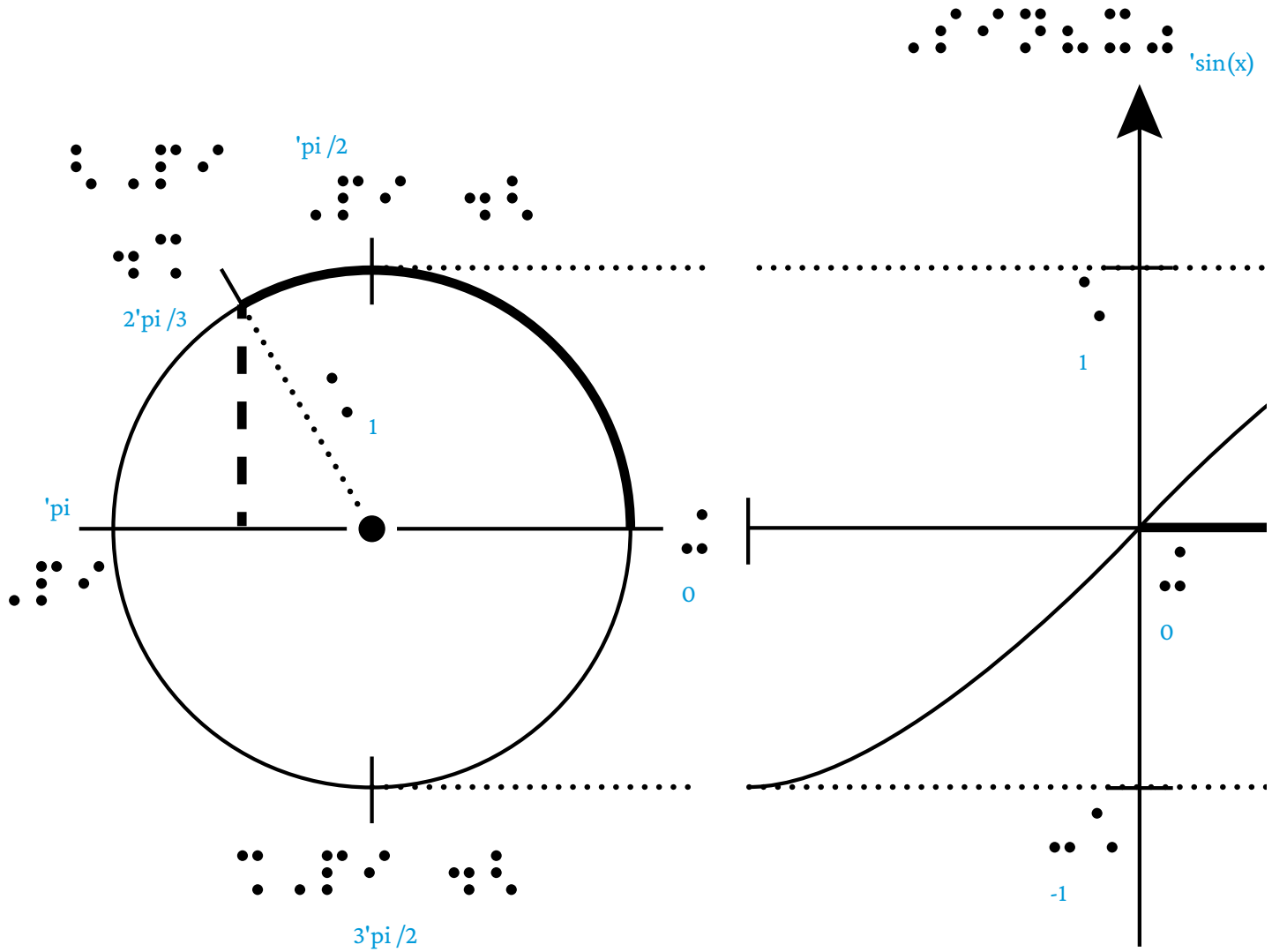
Graphen der Winkelfunktionen und Periodizität

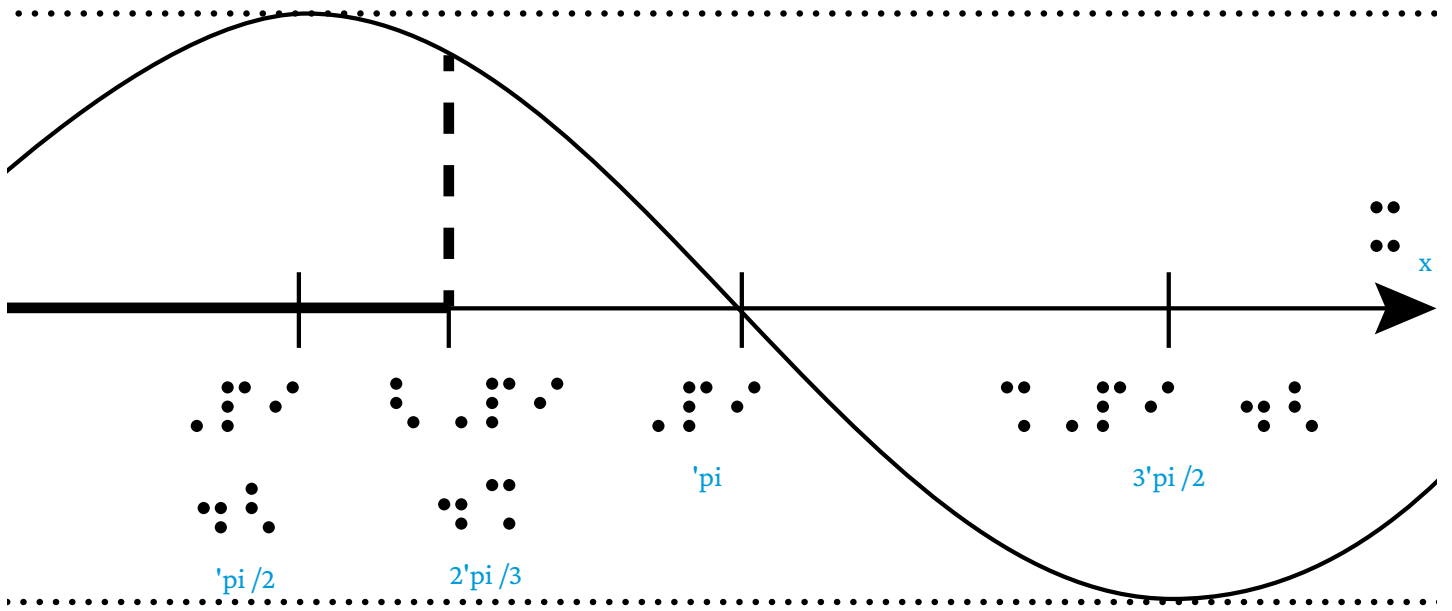
Graphen der Winkelfunktionen und Periodizität

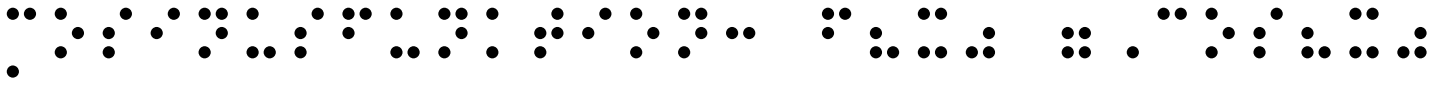
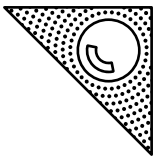
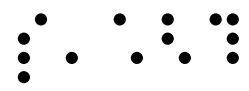
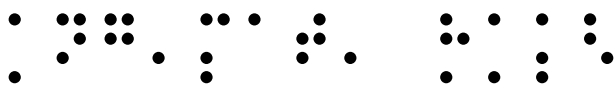




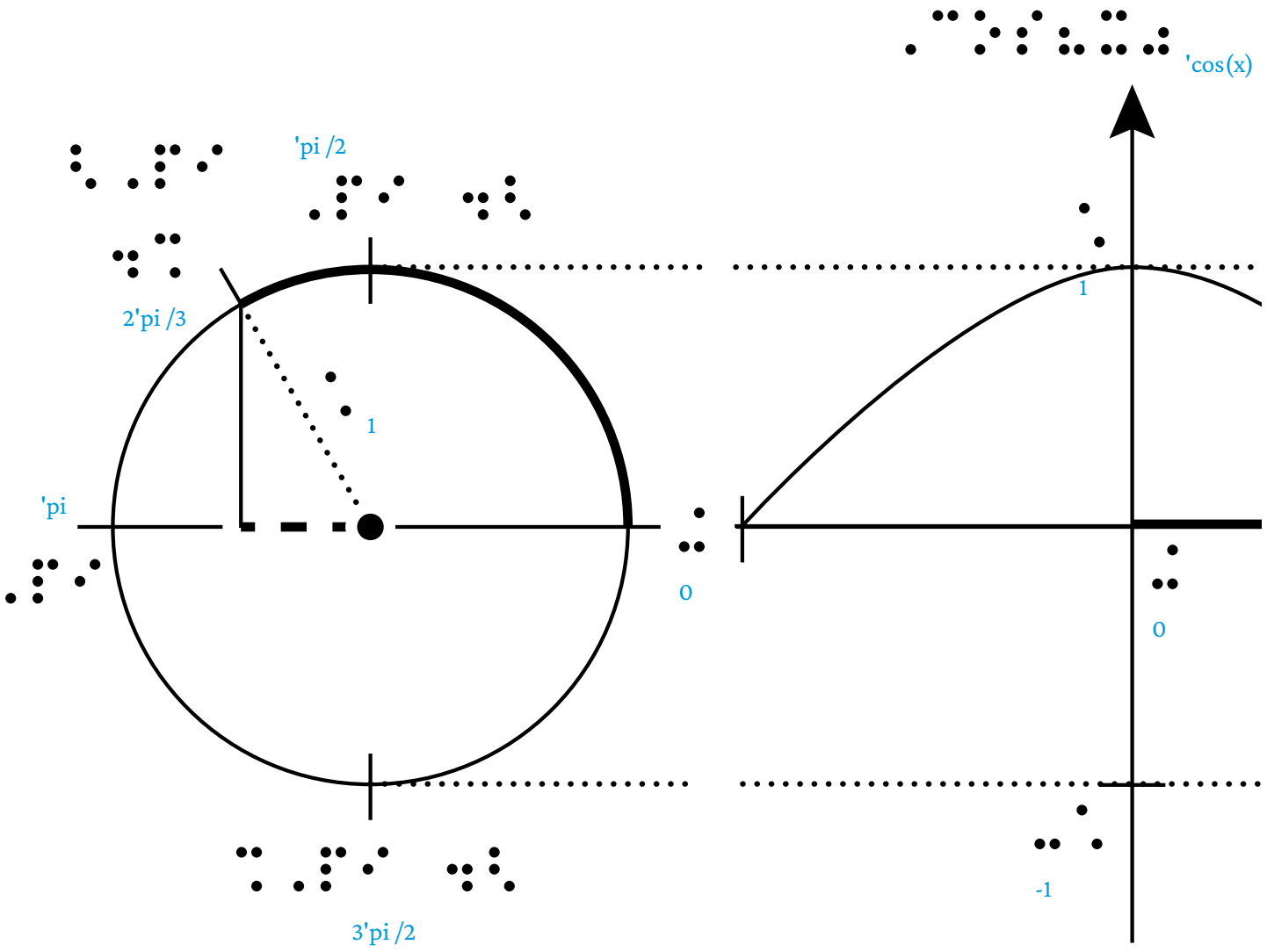
Sinusfunktion:  $f(x) = \sin(x)$

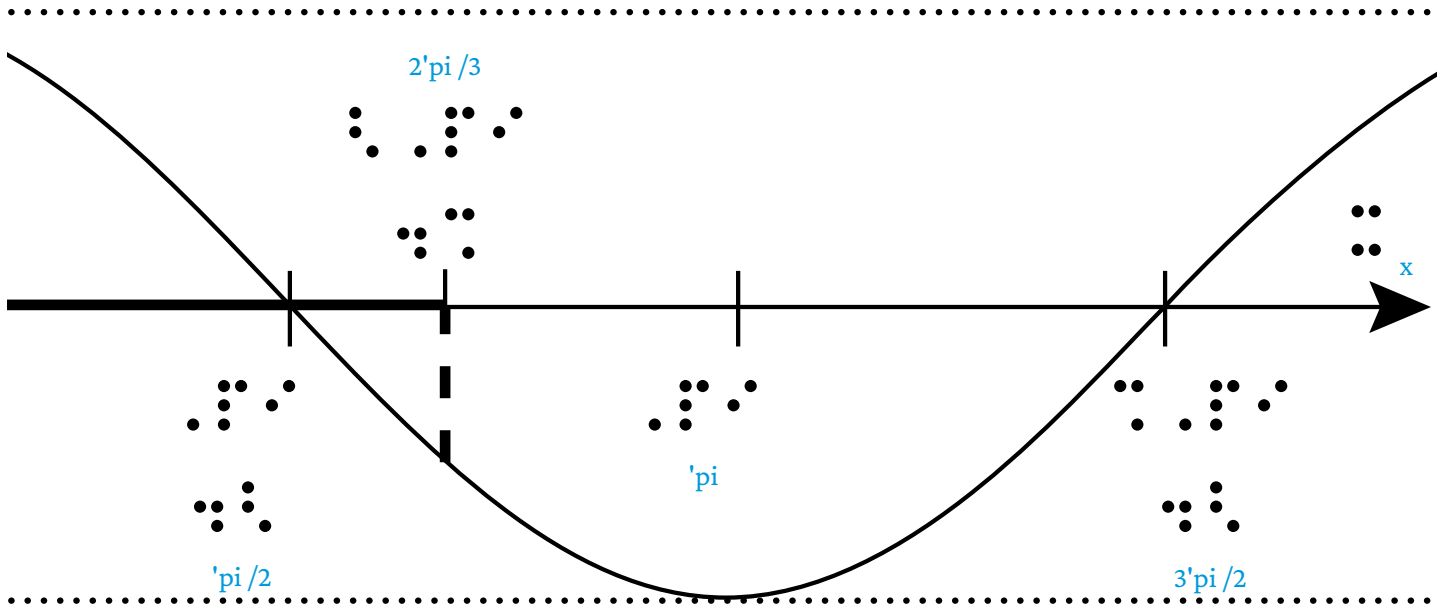


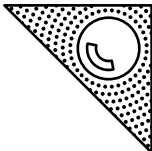




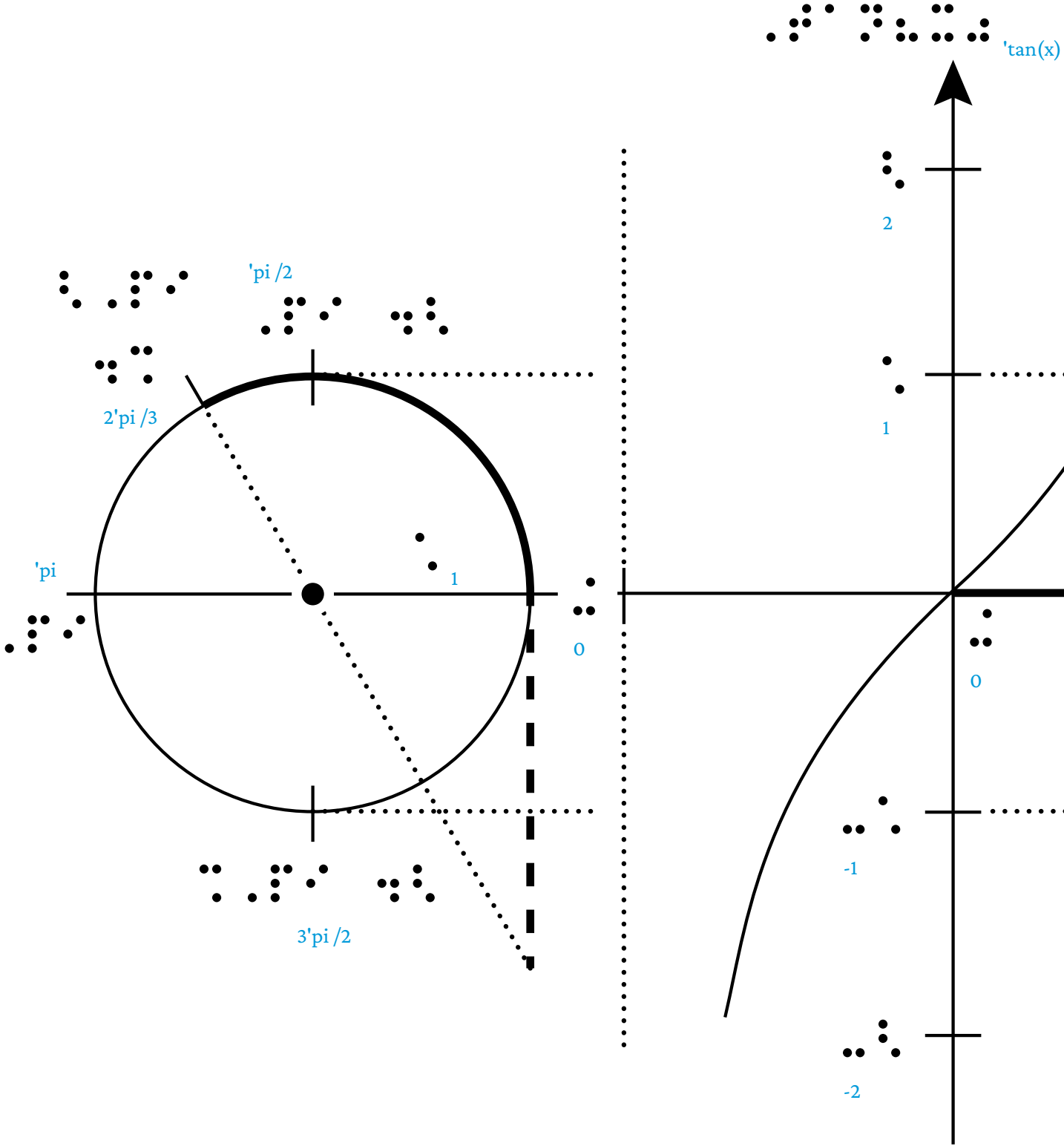
Cosinusfunktion:  $f(x) = \cos(x)$

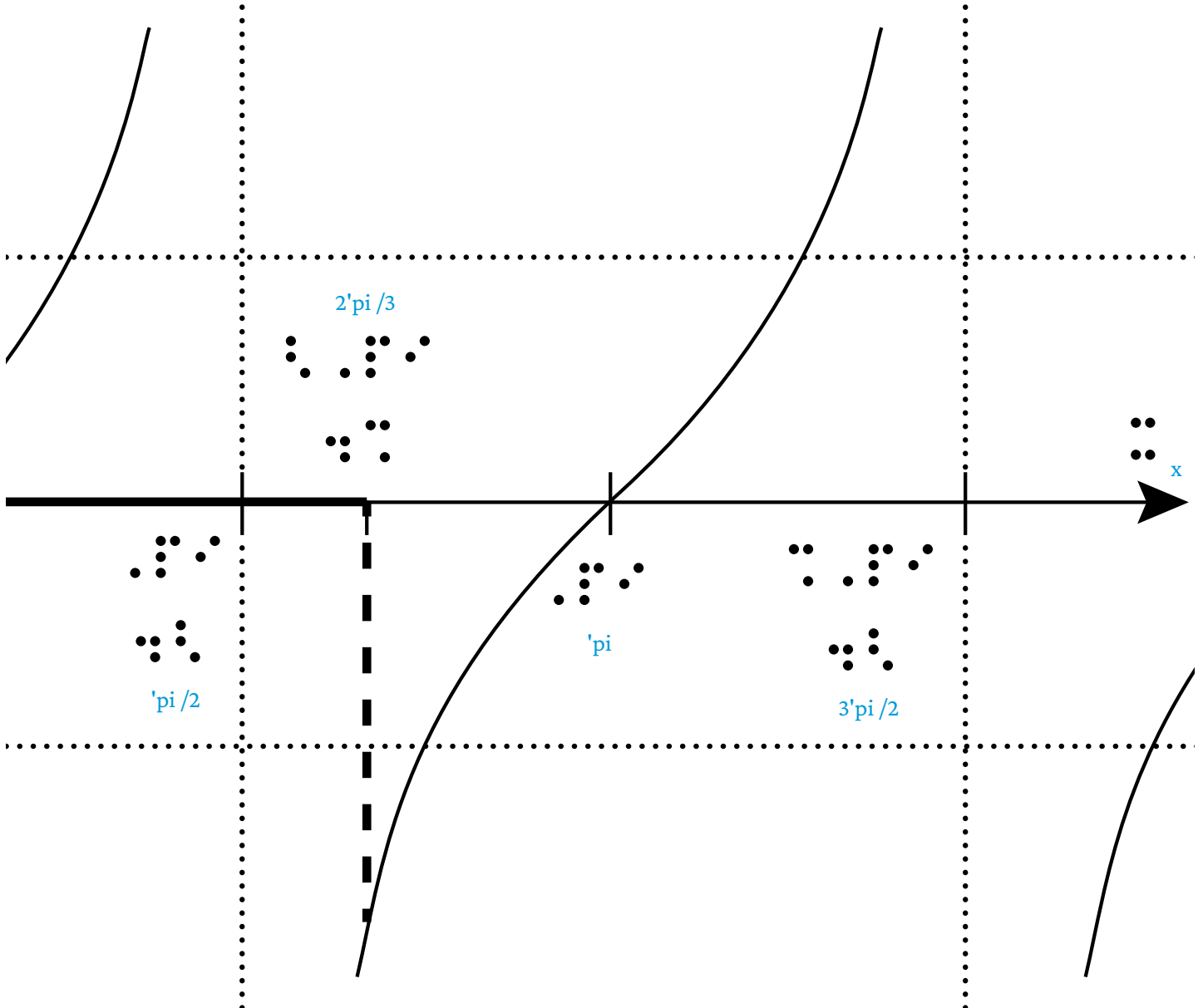






Tangensfunktion:  $f(x) = \tan(x)$





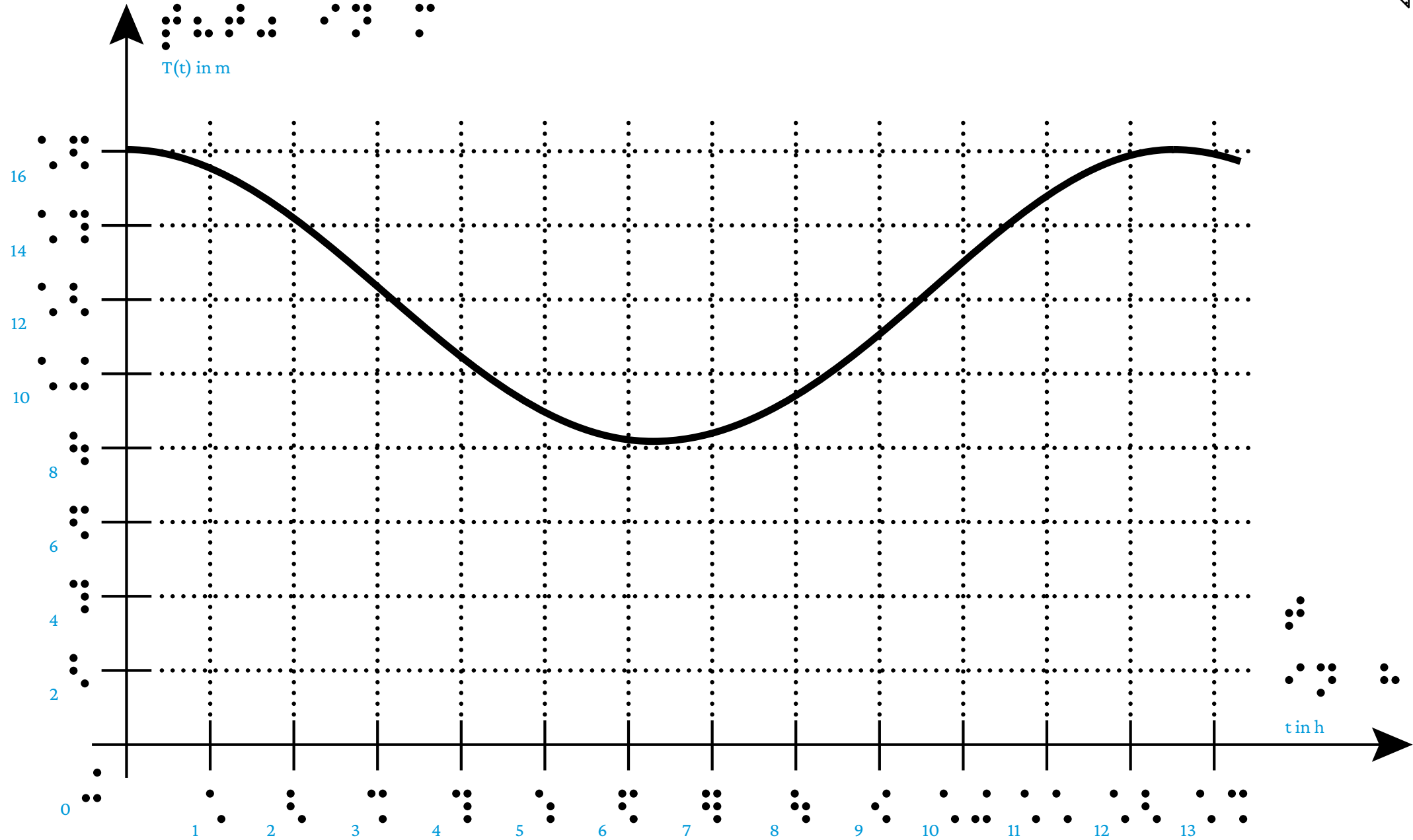
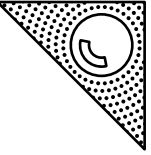
$\pi/2$

$2\pi/3$

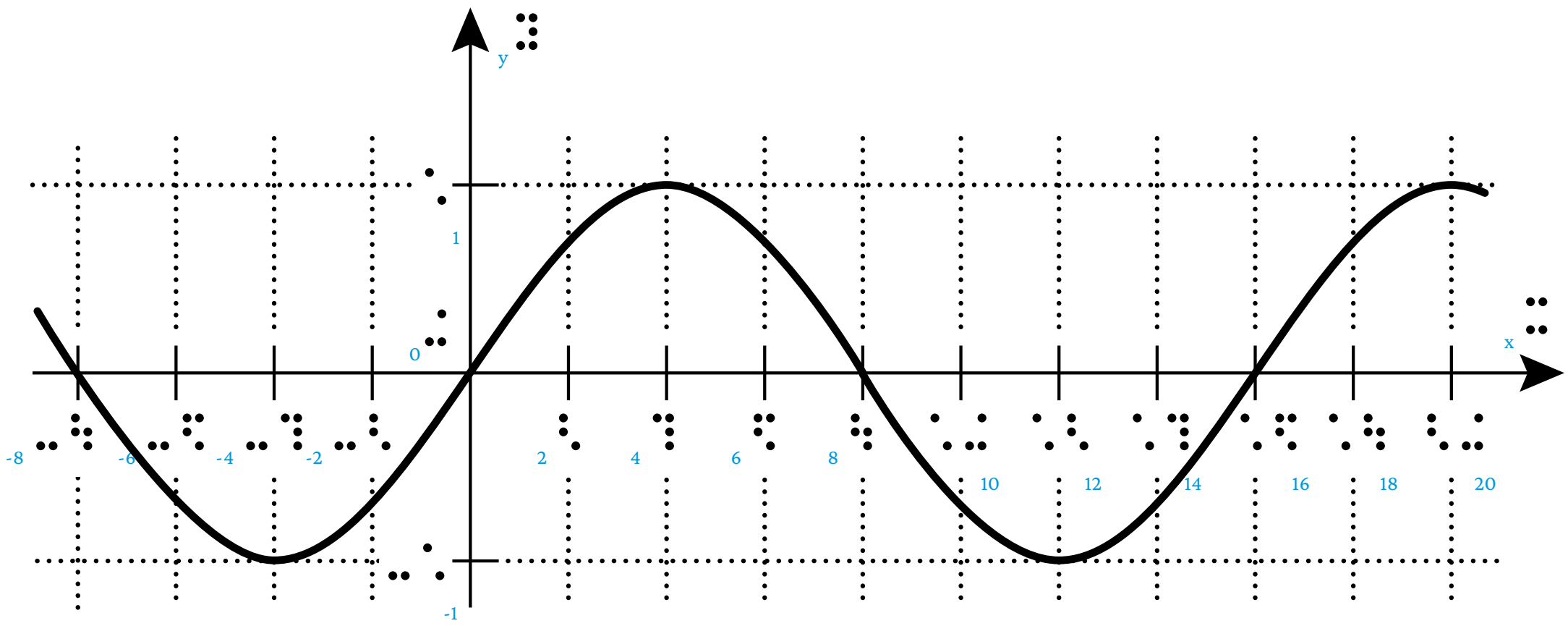
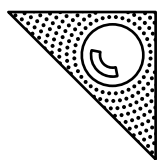
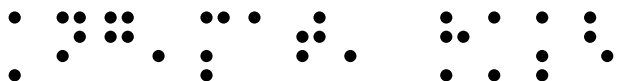
$\pi$

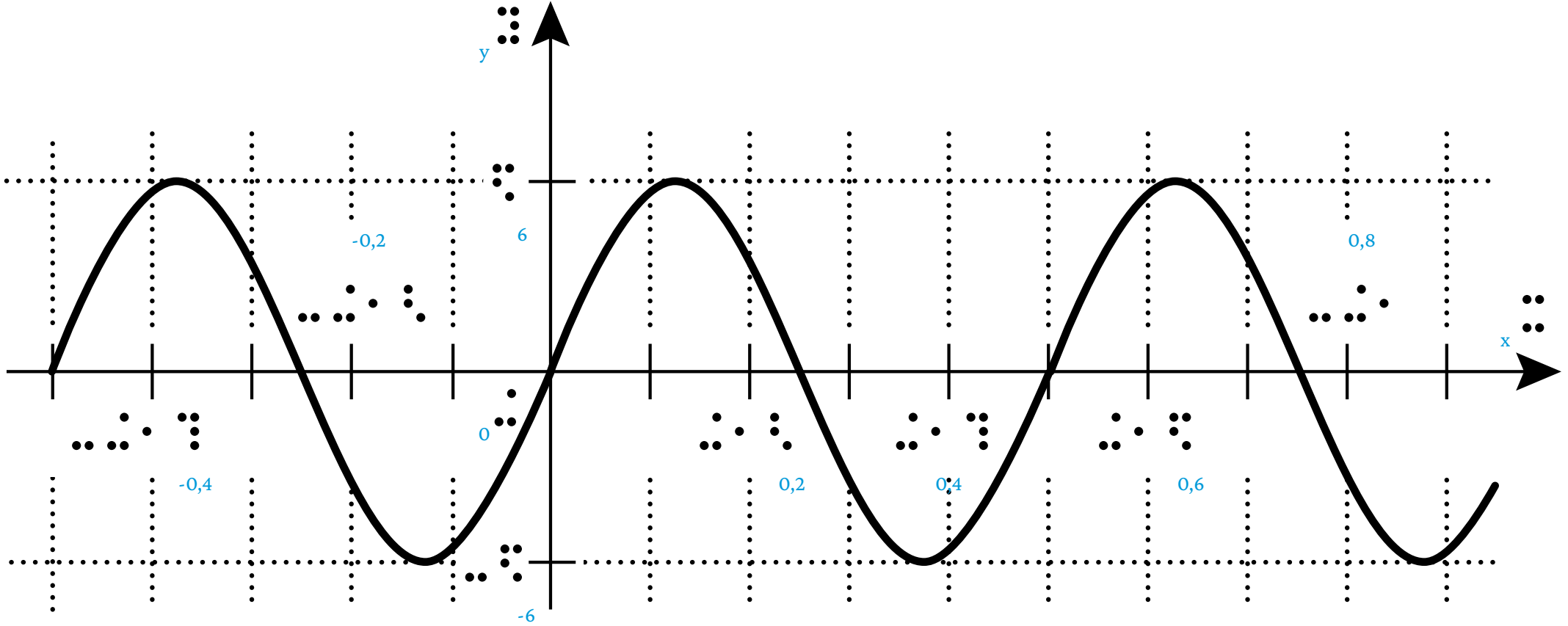
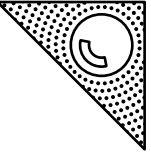
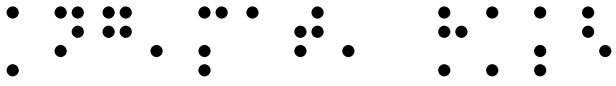
$3\pi/2$

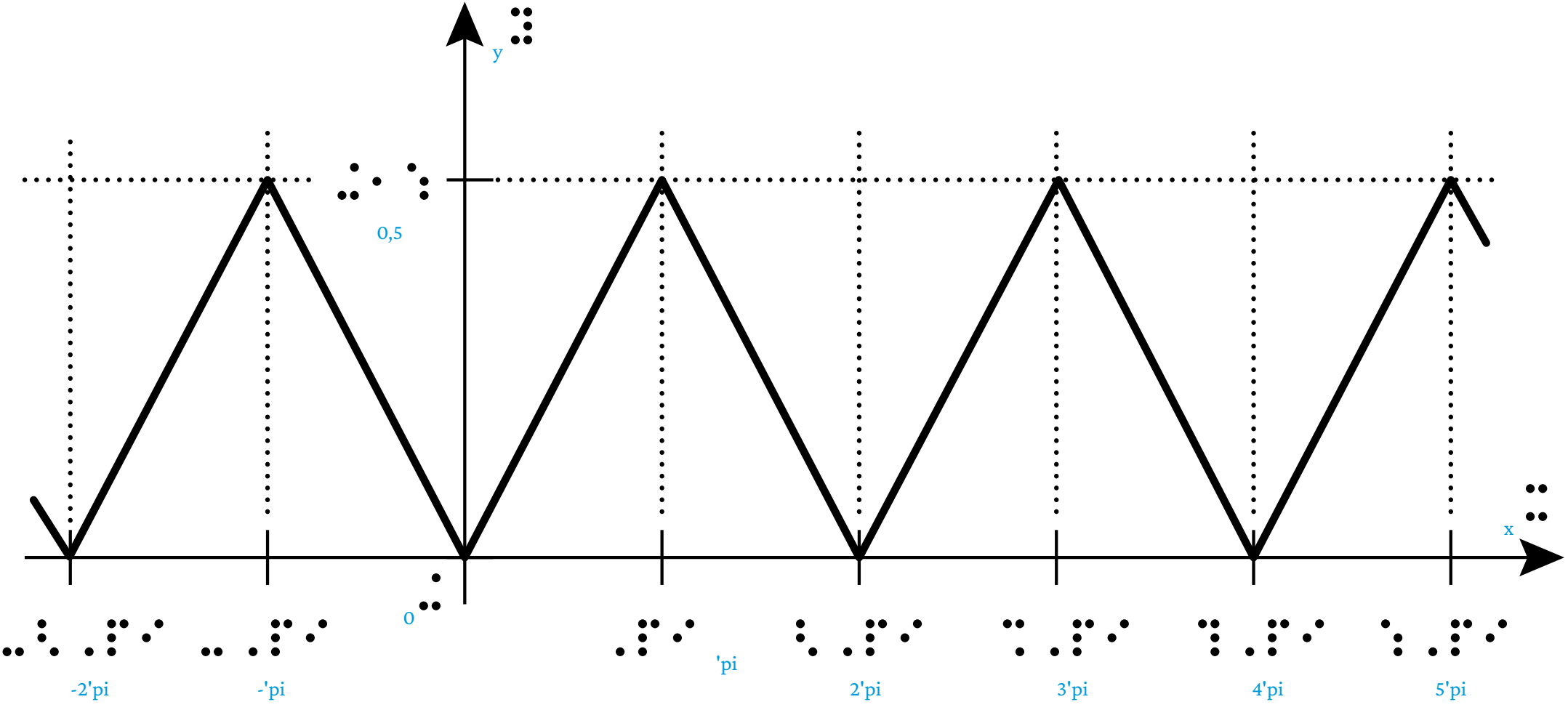
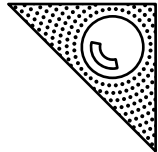
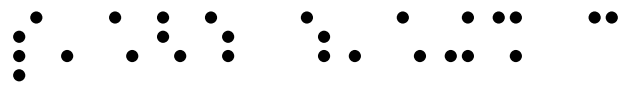
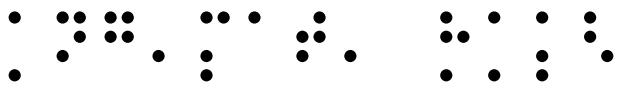
x

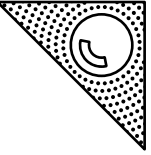




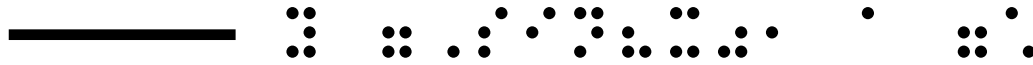
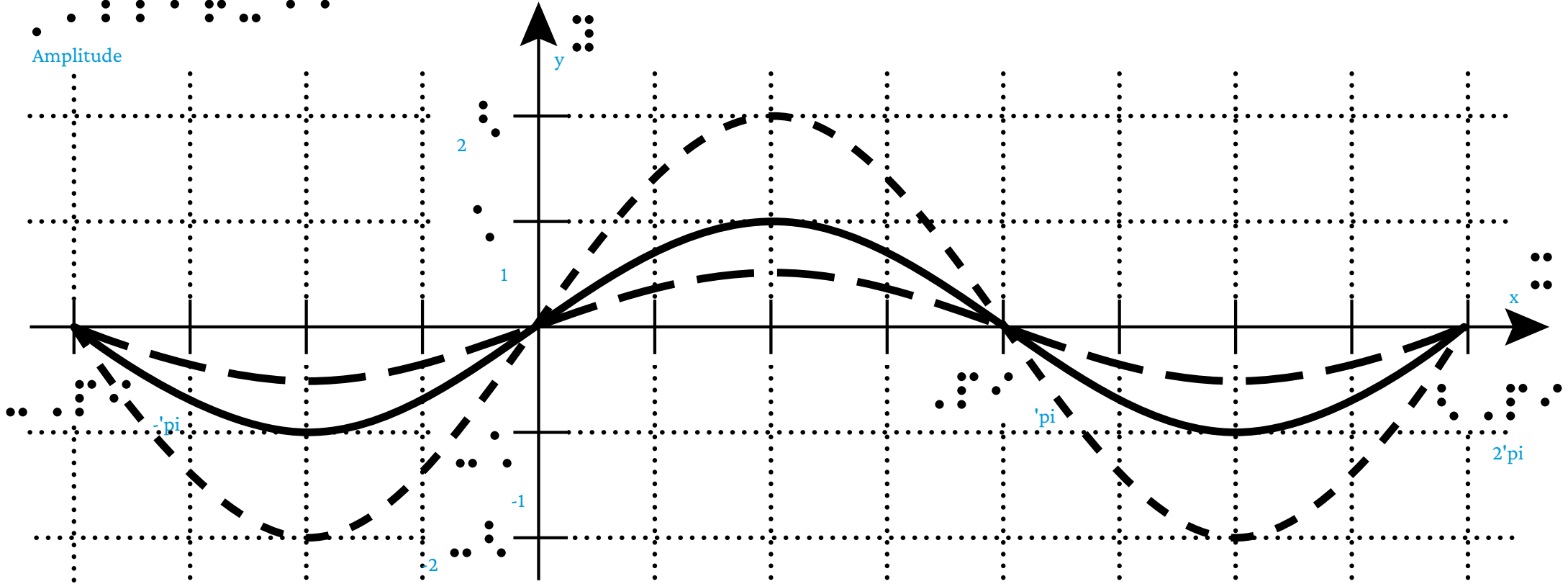








Amplitude



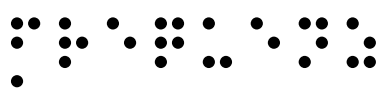
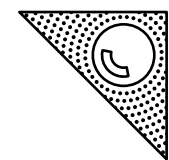
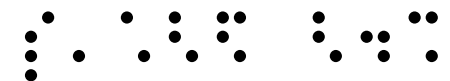
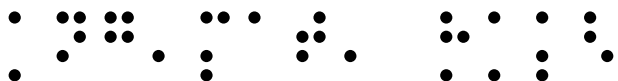
$y = \sin(x), a = 1$



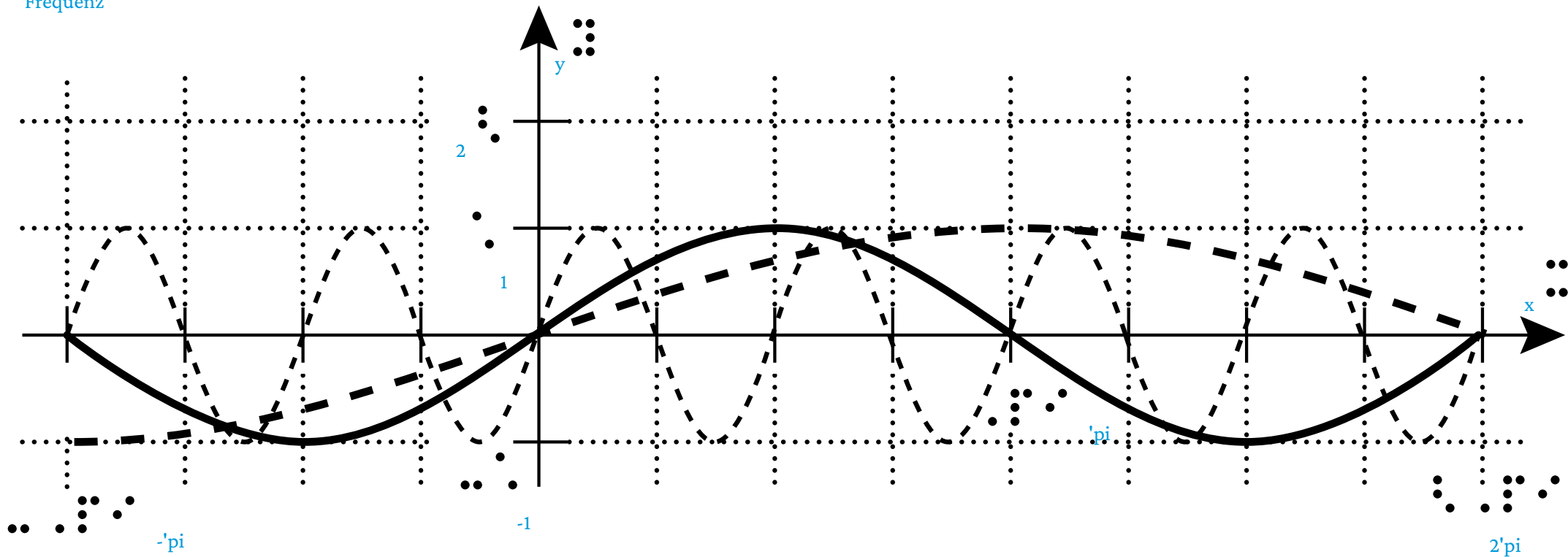
$y = 2 * \sin(x), a = 2$



$y = 0,5 * \sin(x), a = 1/2$



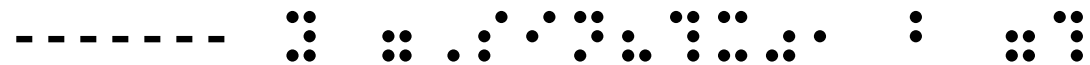
Frequenz



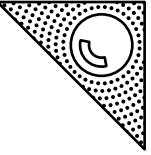
$y = \sin(x), b = 1$



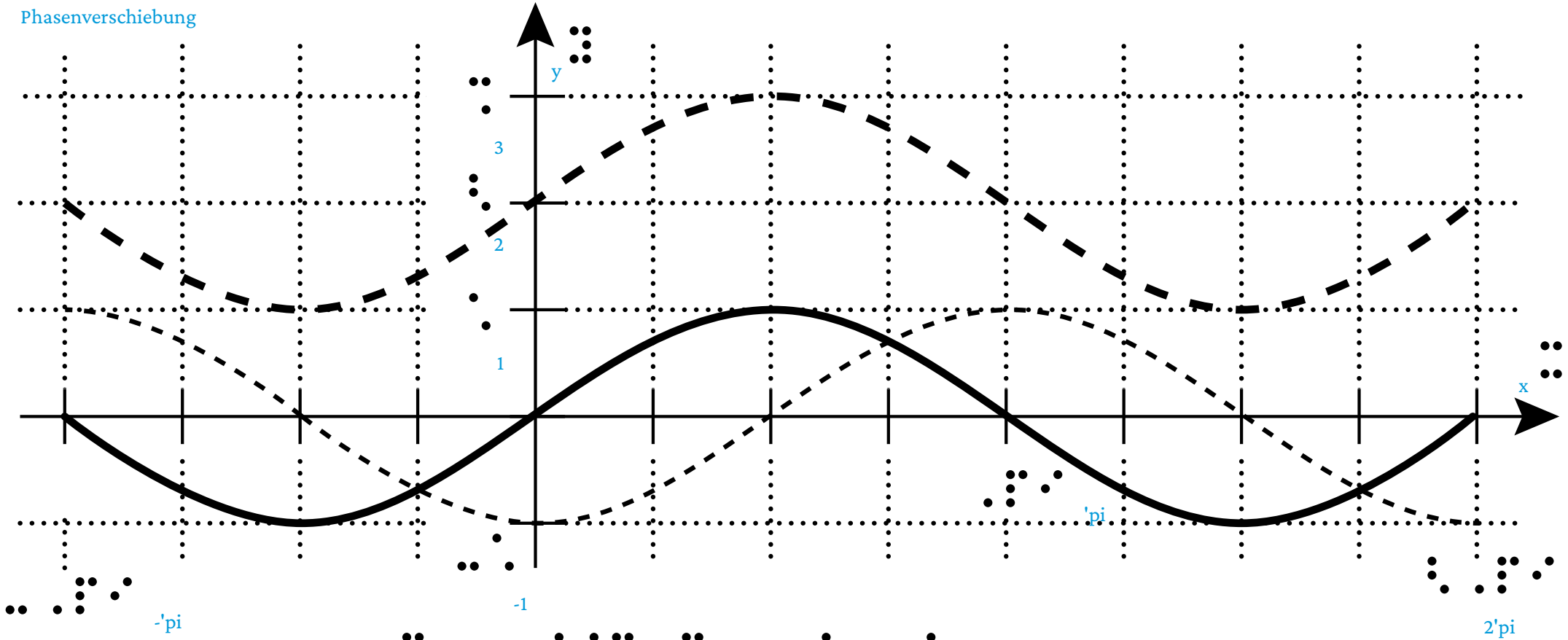
$y = \sin(0,5x), b = 1/2$



$y = \sin(4x), b = 4$



Phasenverschiebung



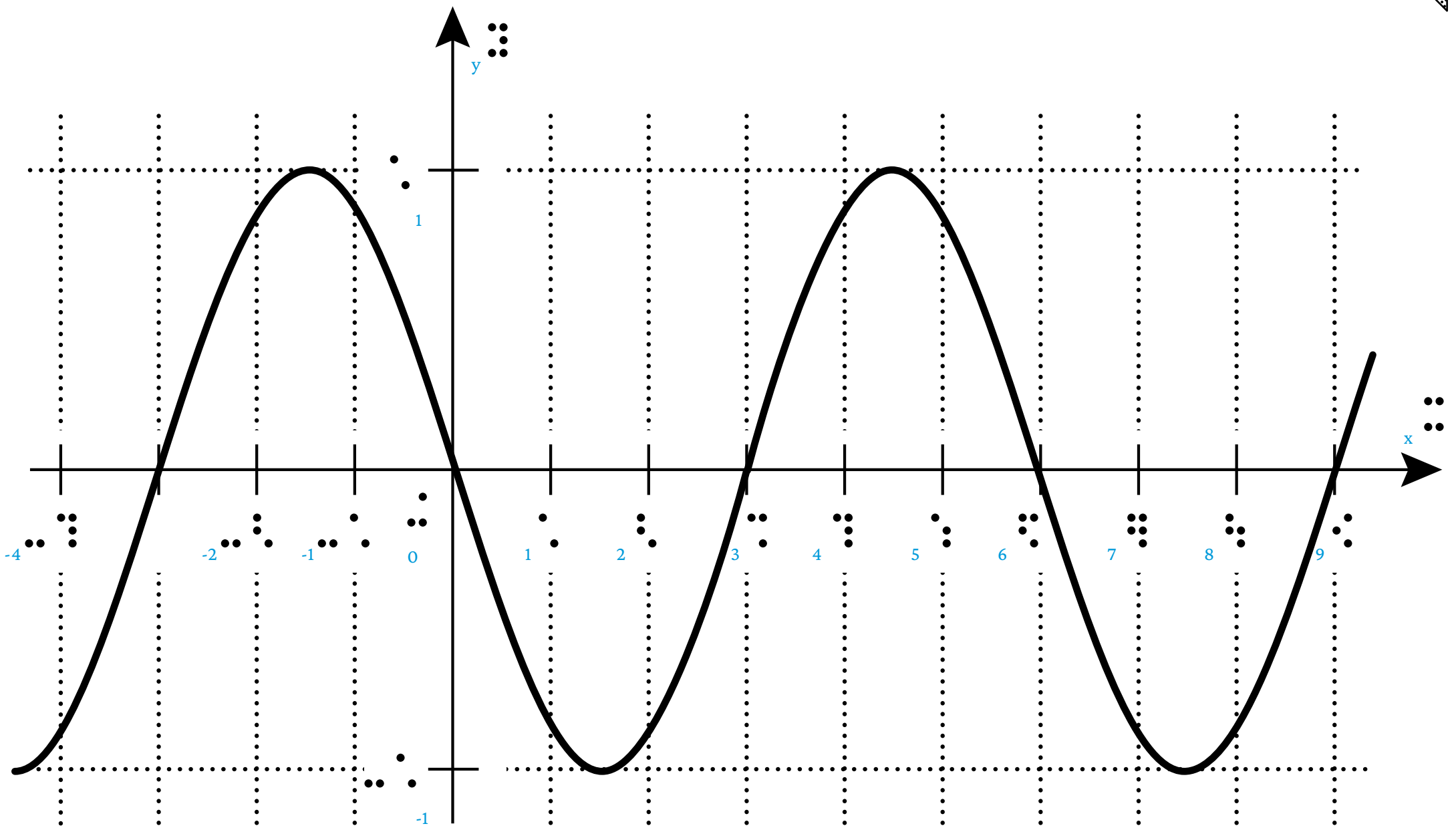
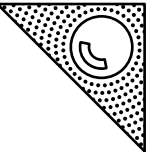
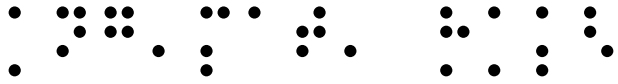
$y = \sin(x), b = 1$

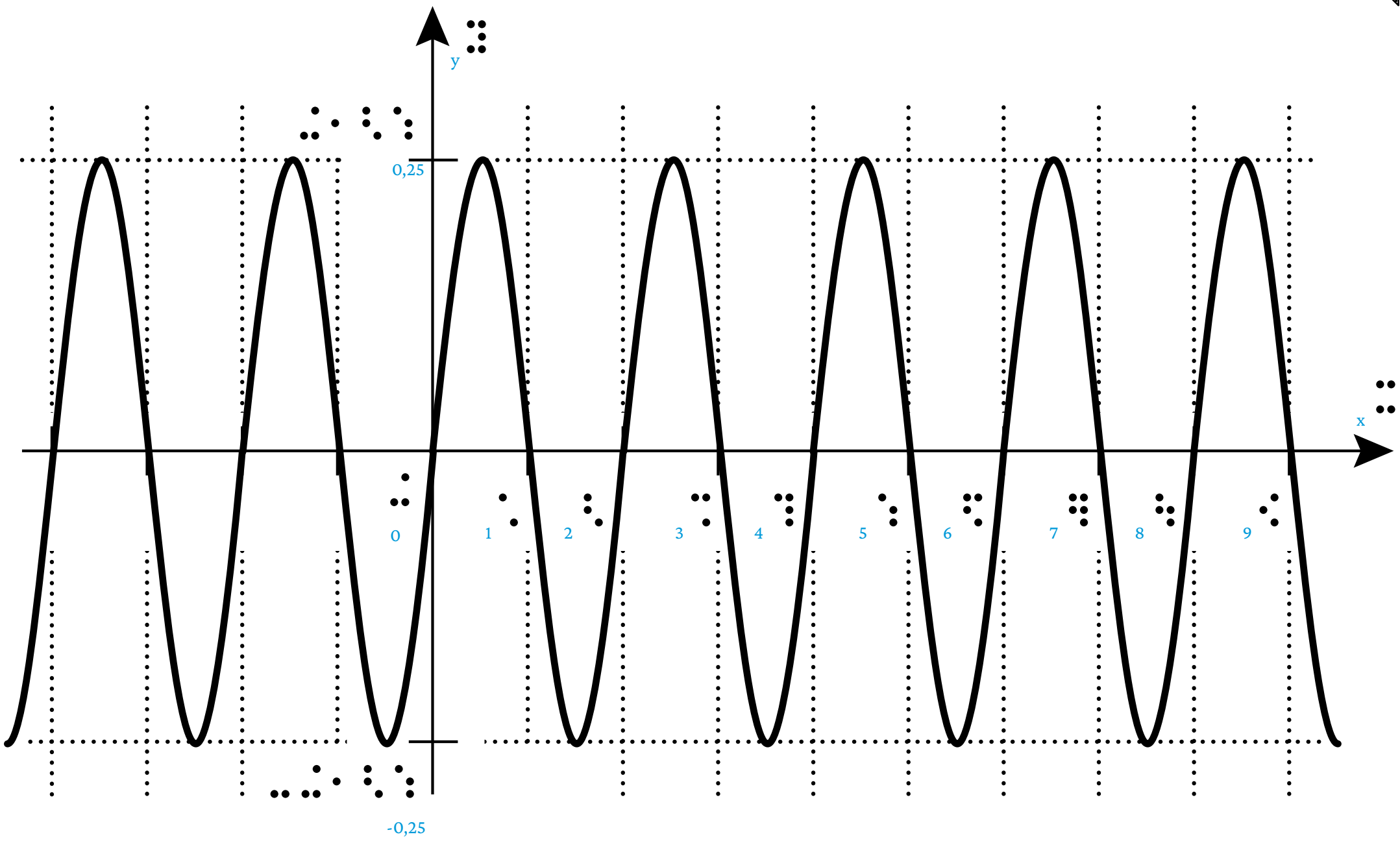
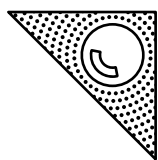
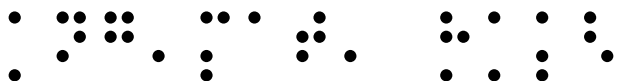


$y = \sin(x) + 2, d = 2$

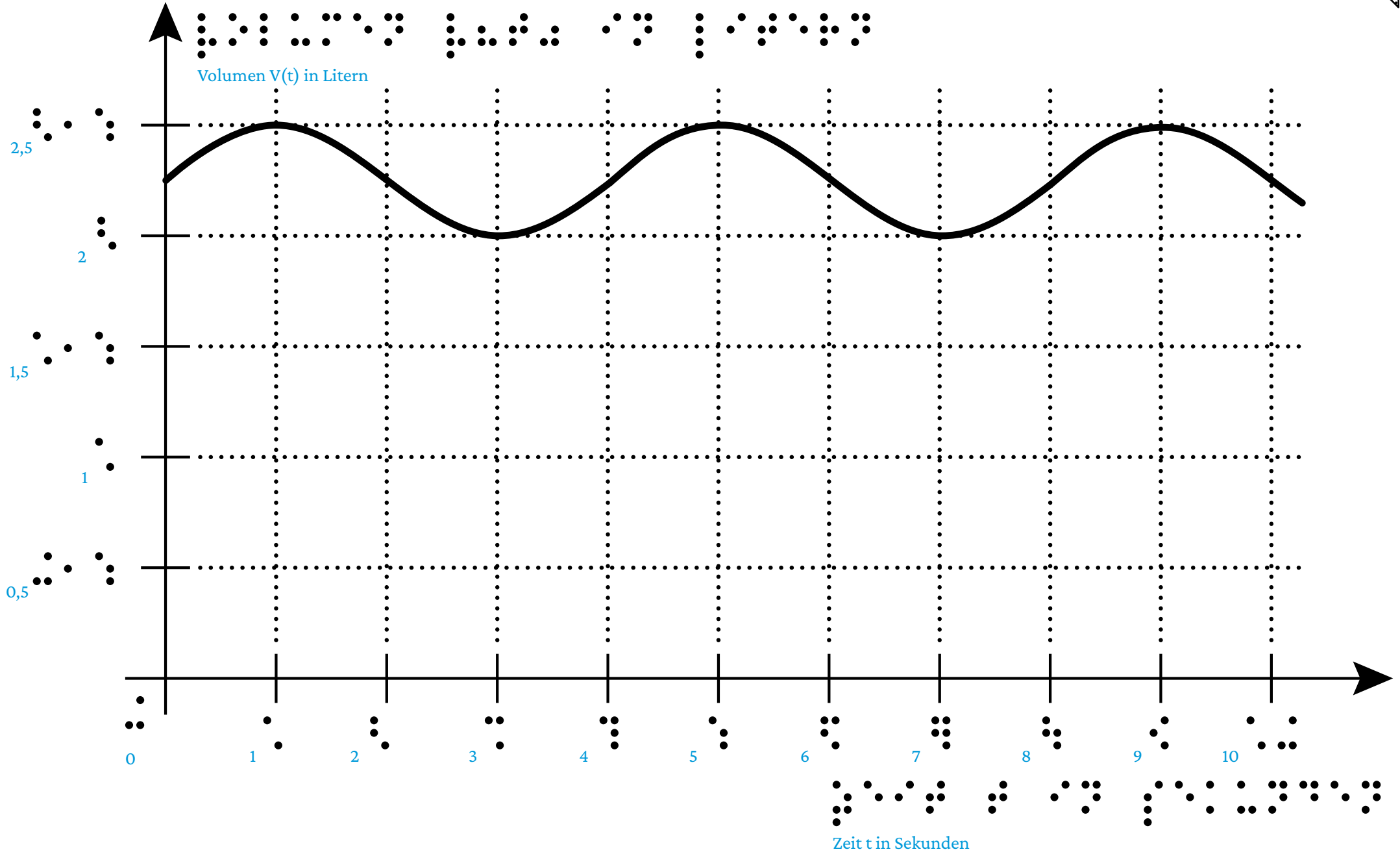
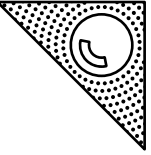


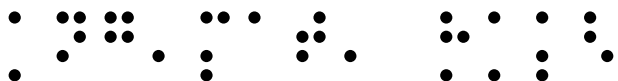
$y = \sin(x - \pi/2), c = -\pi/2$



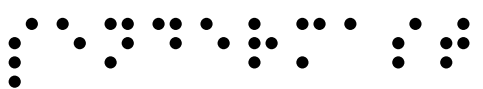




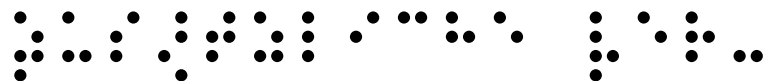




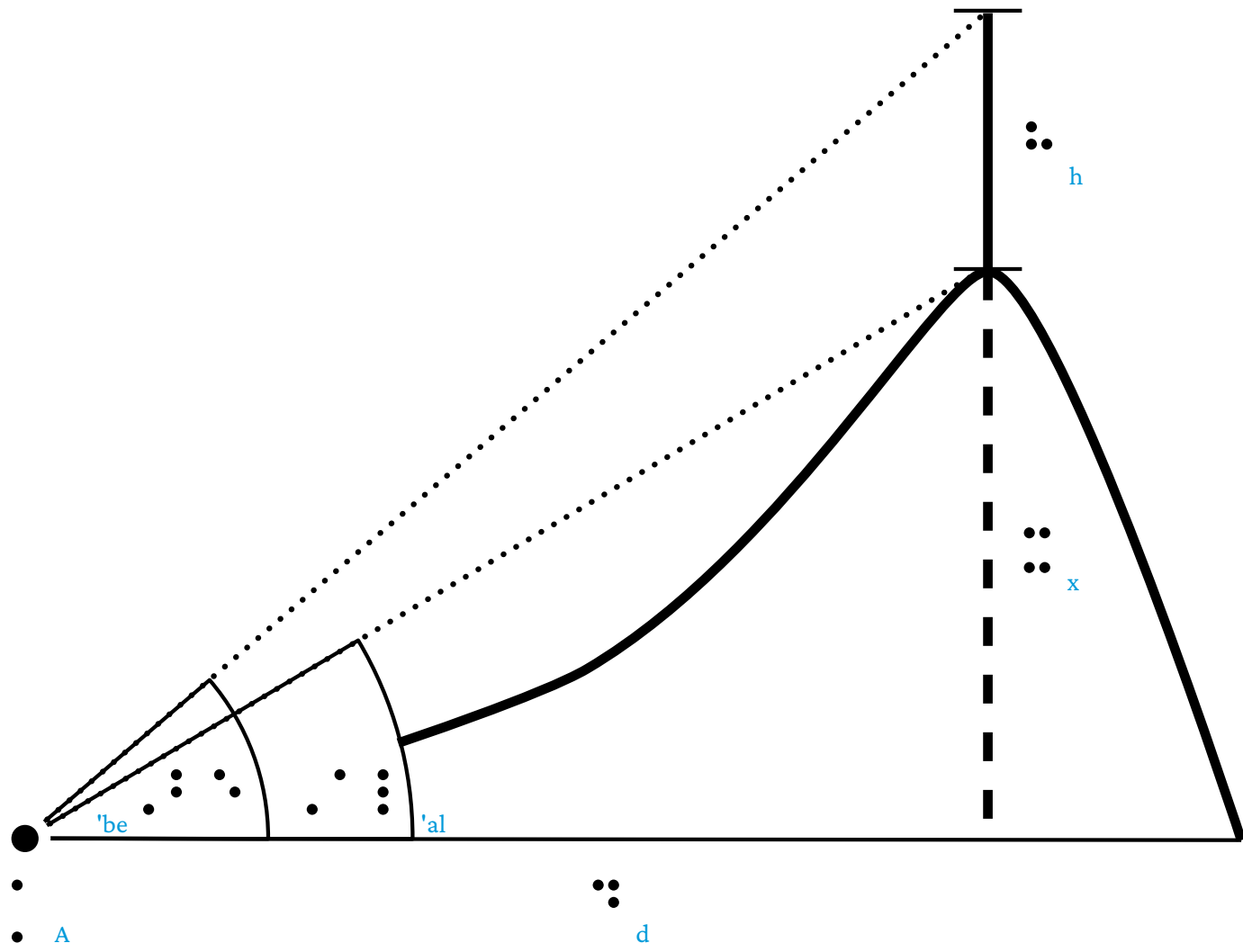
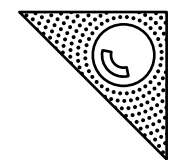
Ang.Mat. HAK2

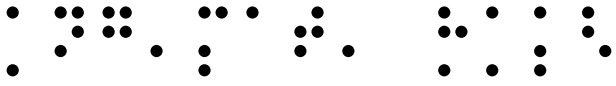


Sendermast

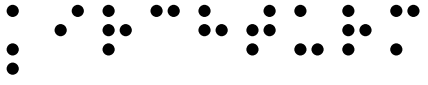


Zusätzliche Vermessungsaufgaben





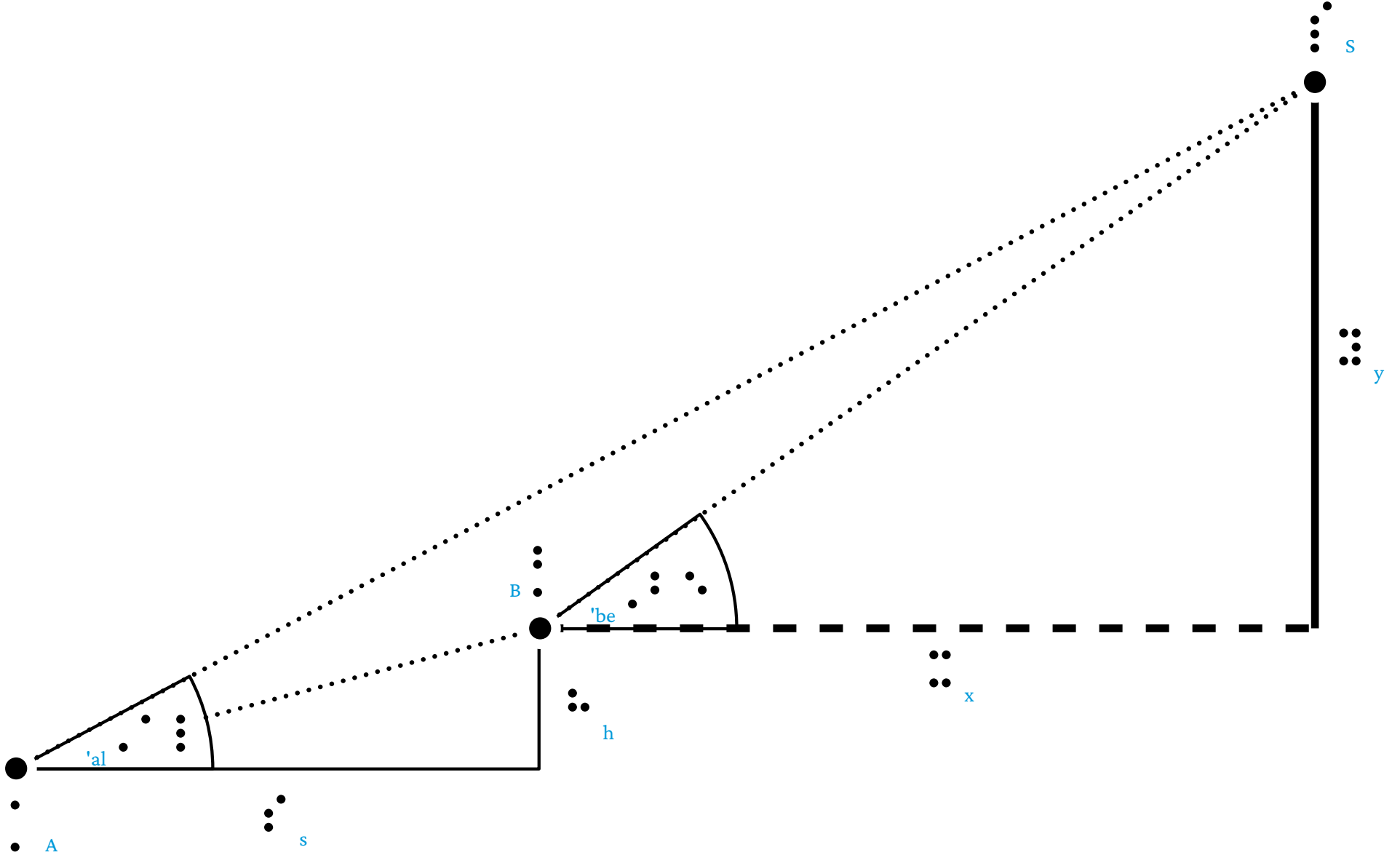
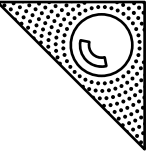
Ang.Mat. HAK2

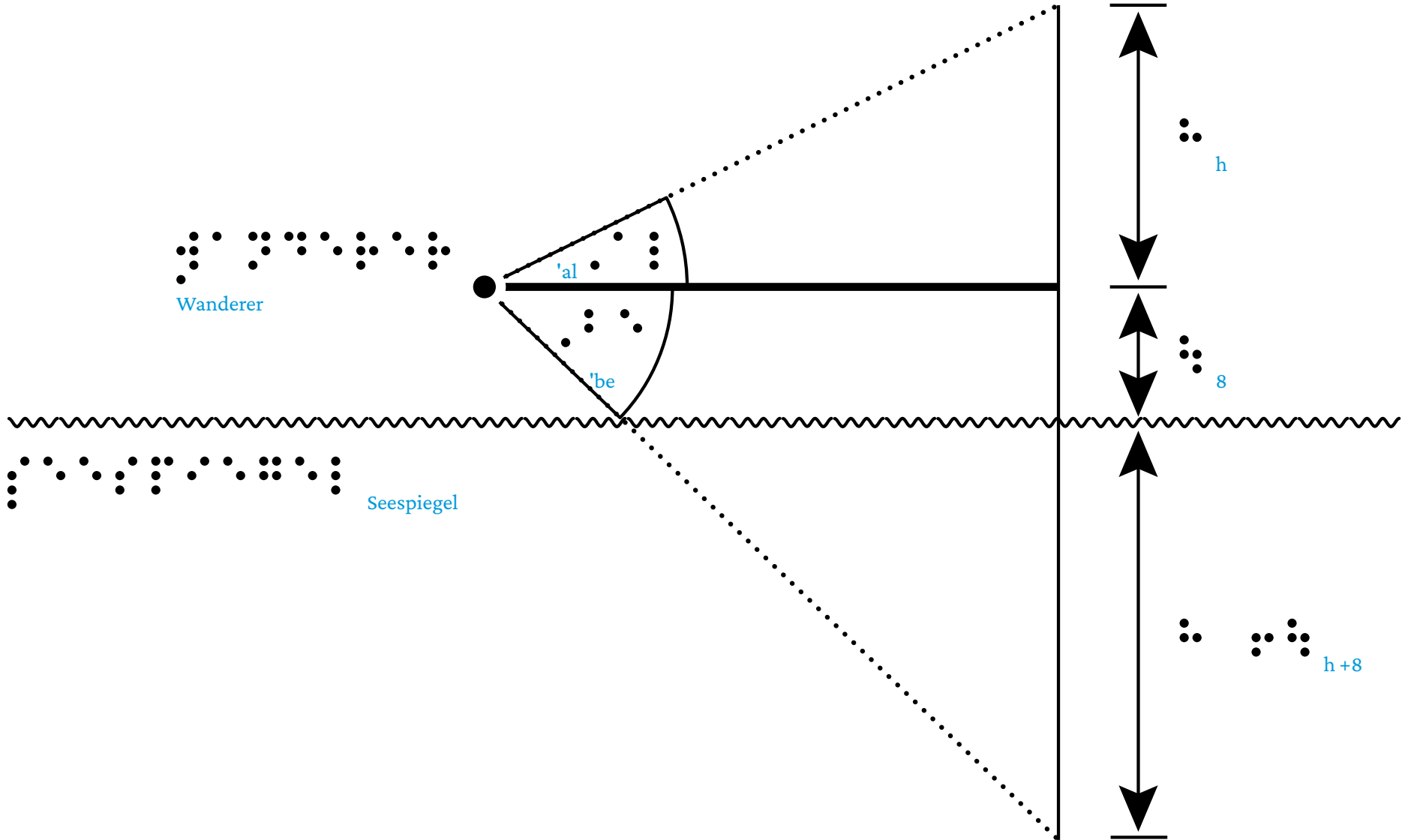
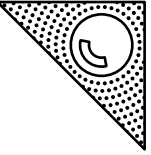
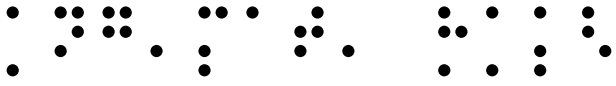


Kirchturm



Zusätzliche Vermessungsaufgaben





Wanderer

Seespiegel

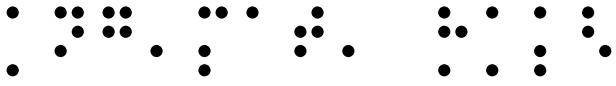
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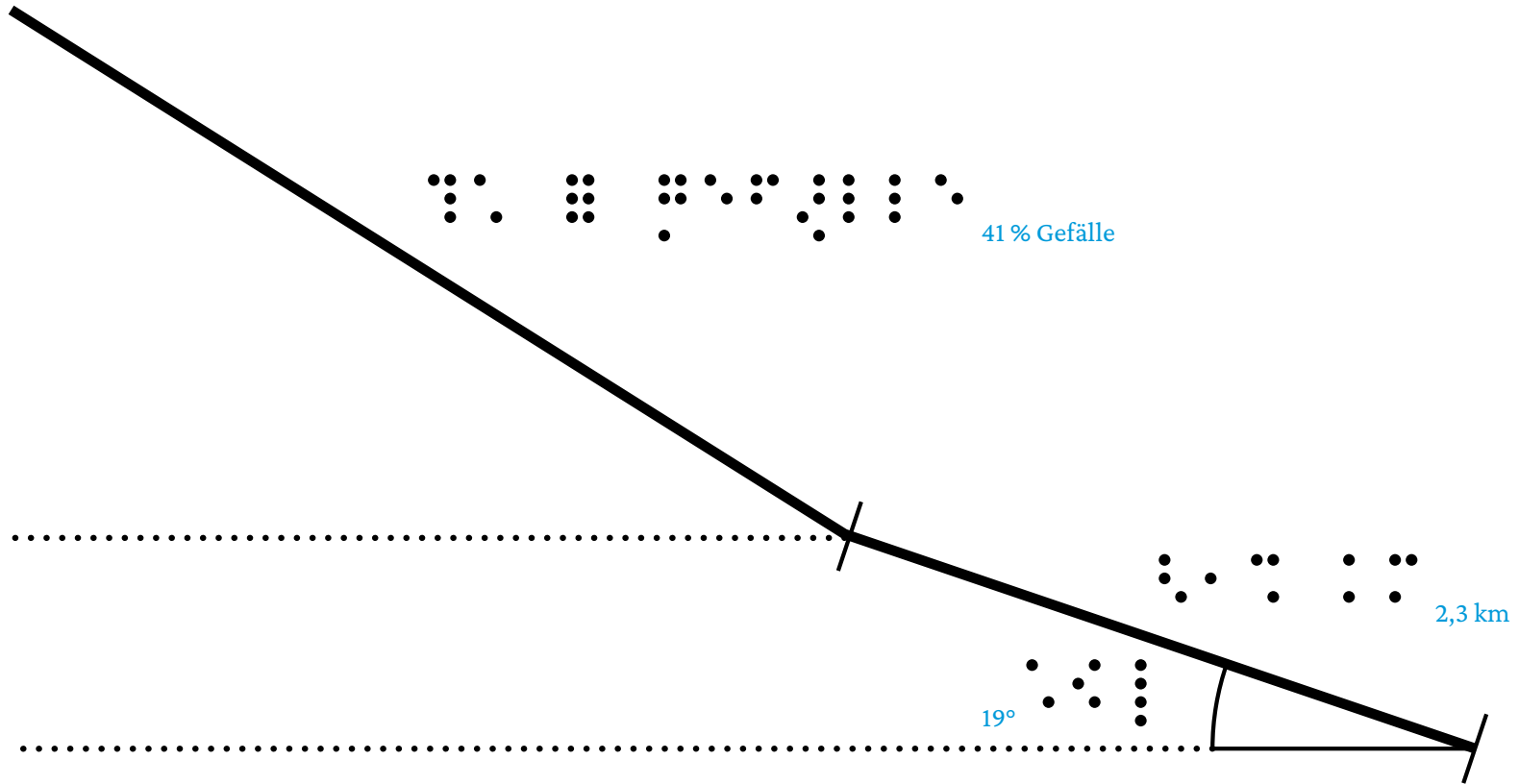
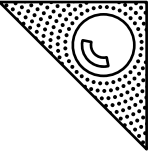
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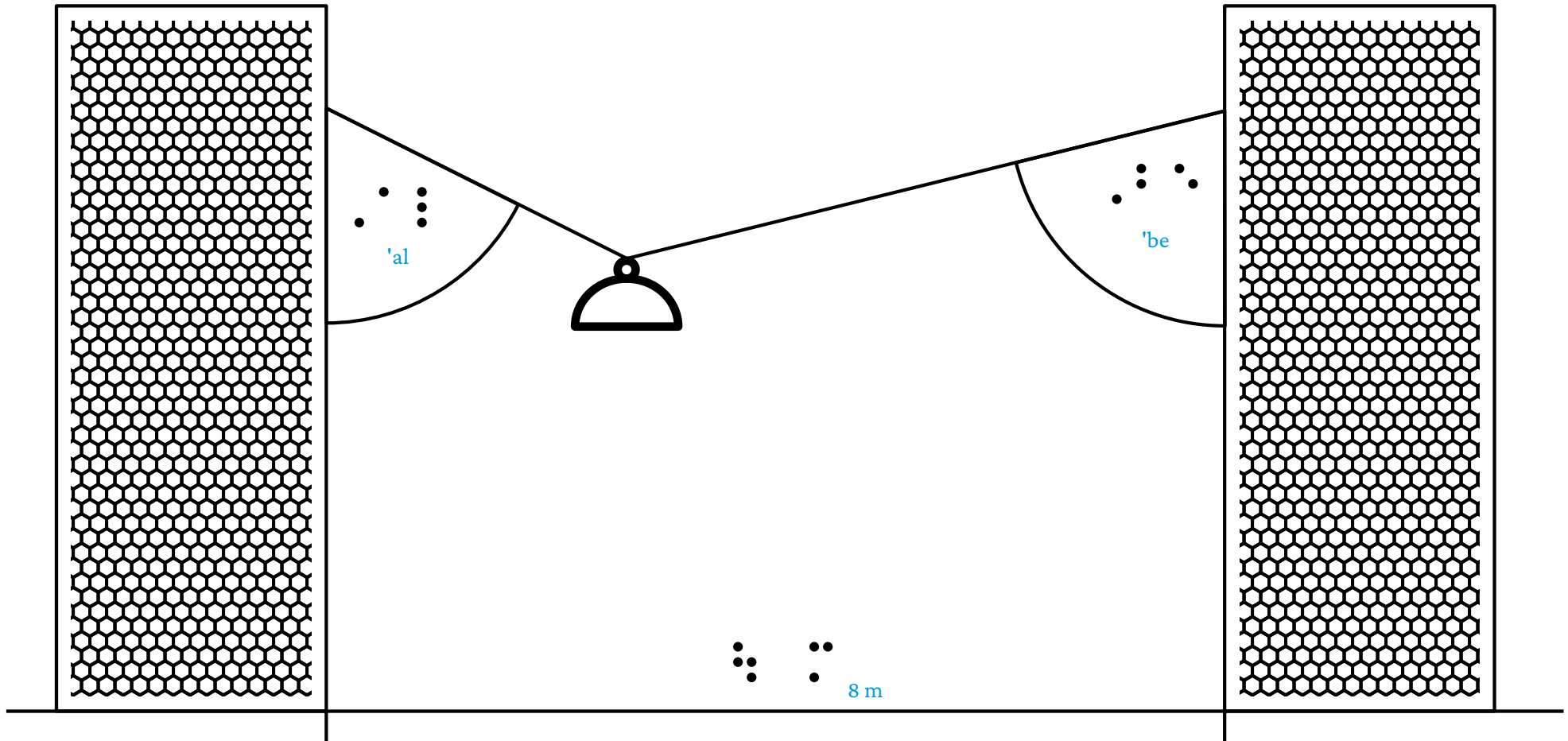
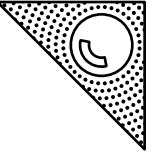
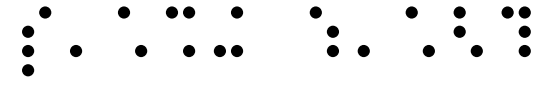
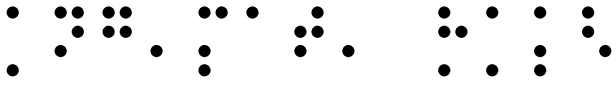


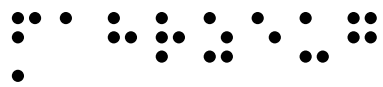
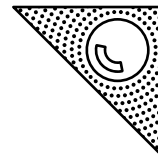
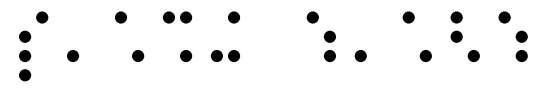
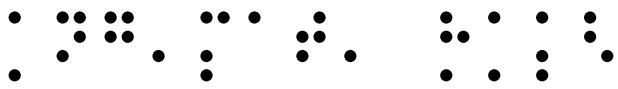
Ang.Mat. HAK2



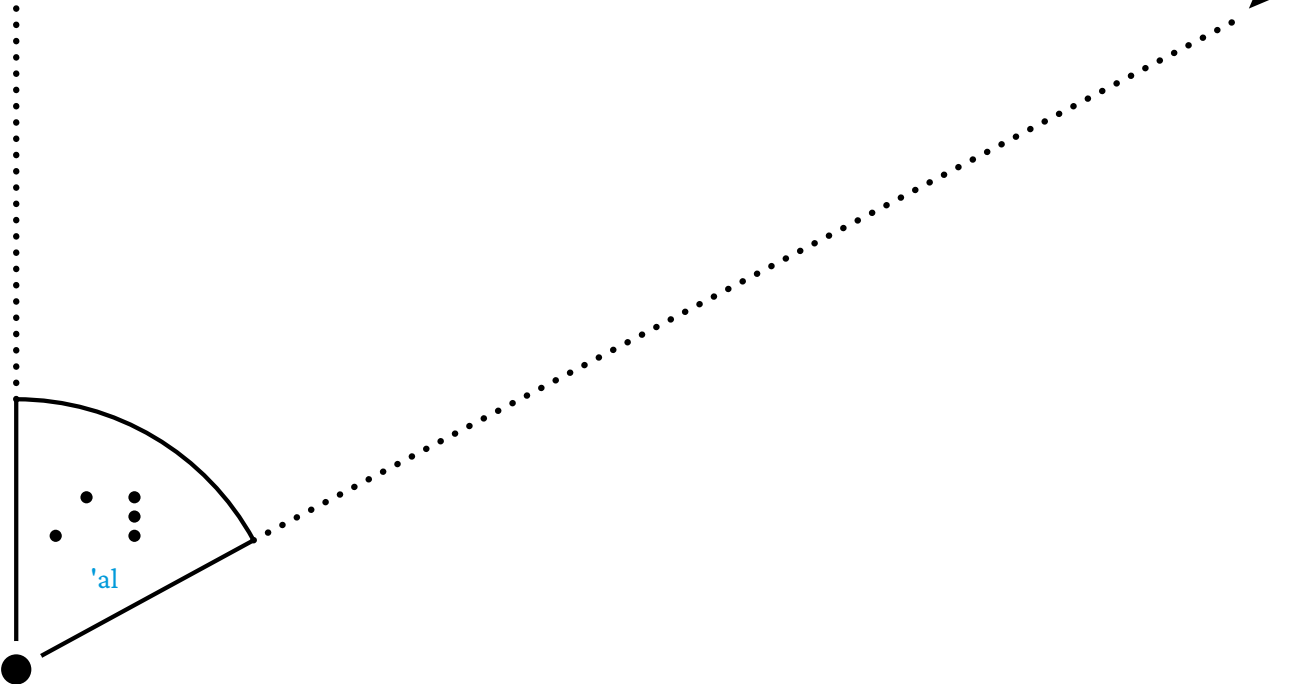
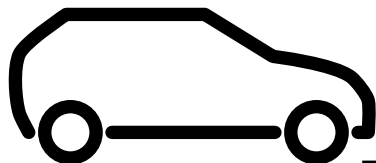
S.130 5.123



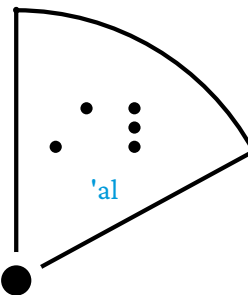




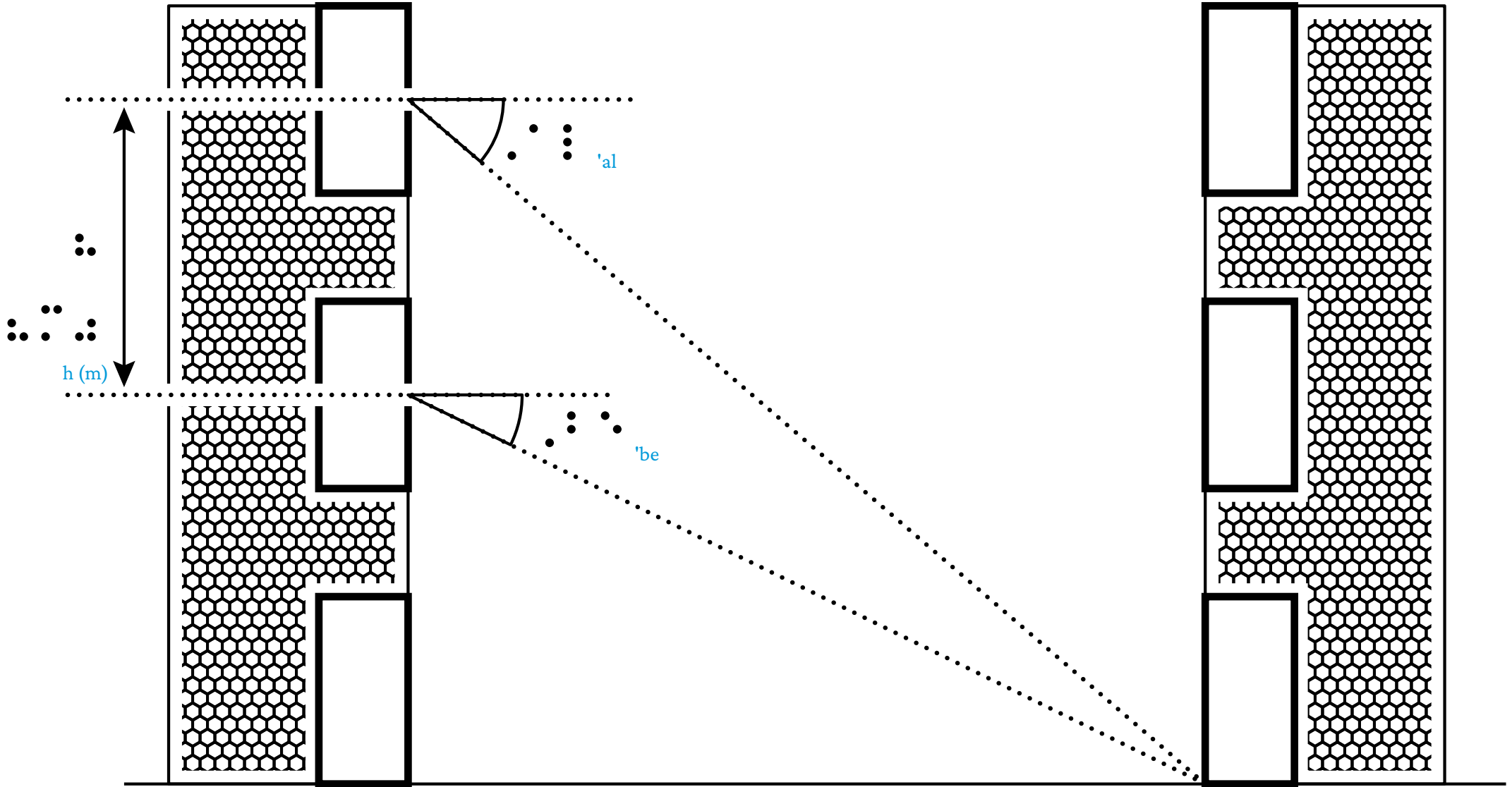
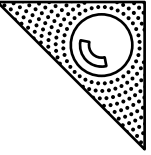
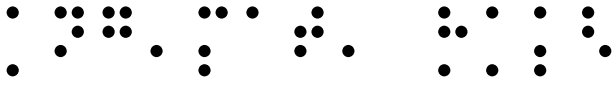
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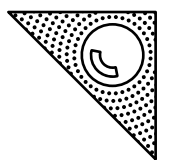
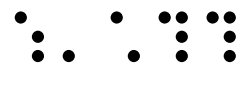
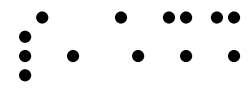
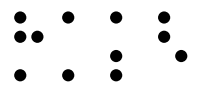
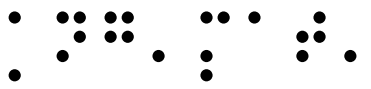
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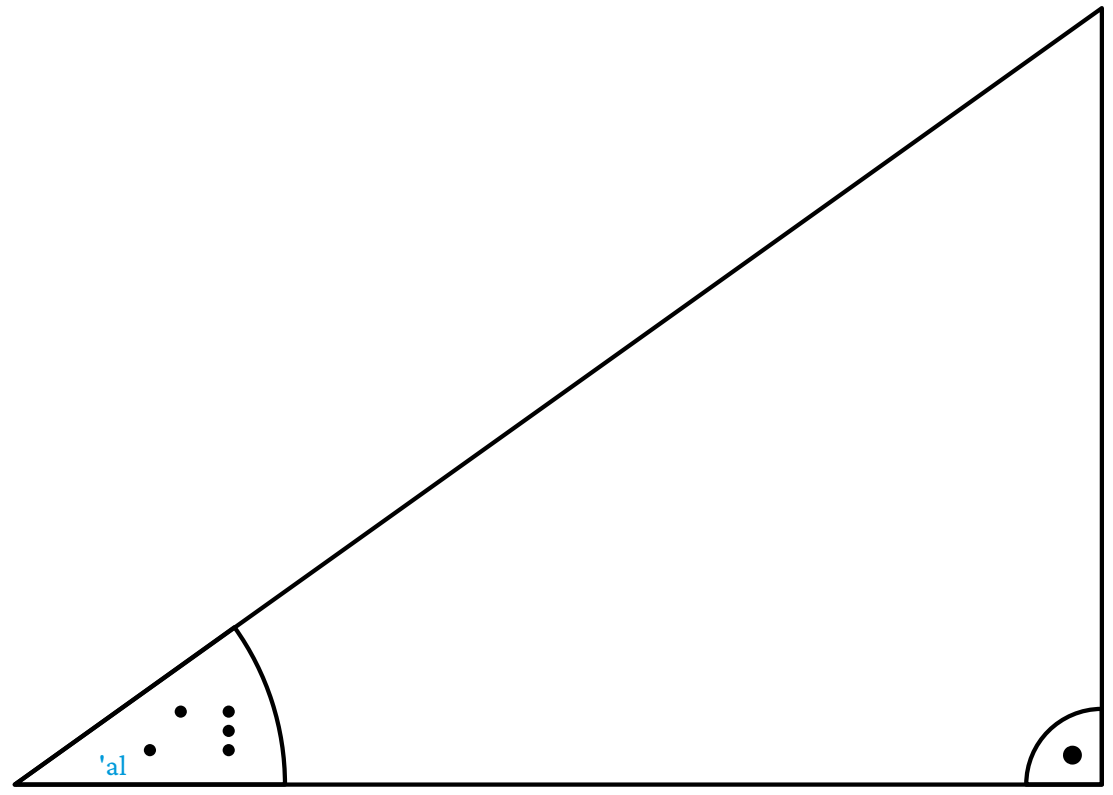






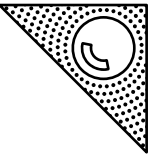
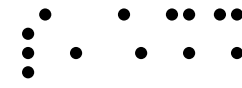
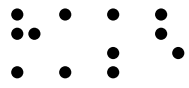
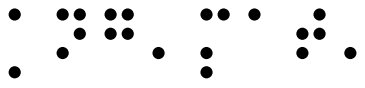
Ang.Mat. HAK2

S.133 5.144



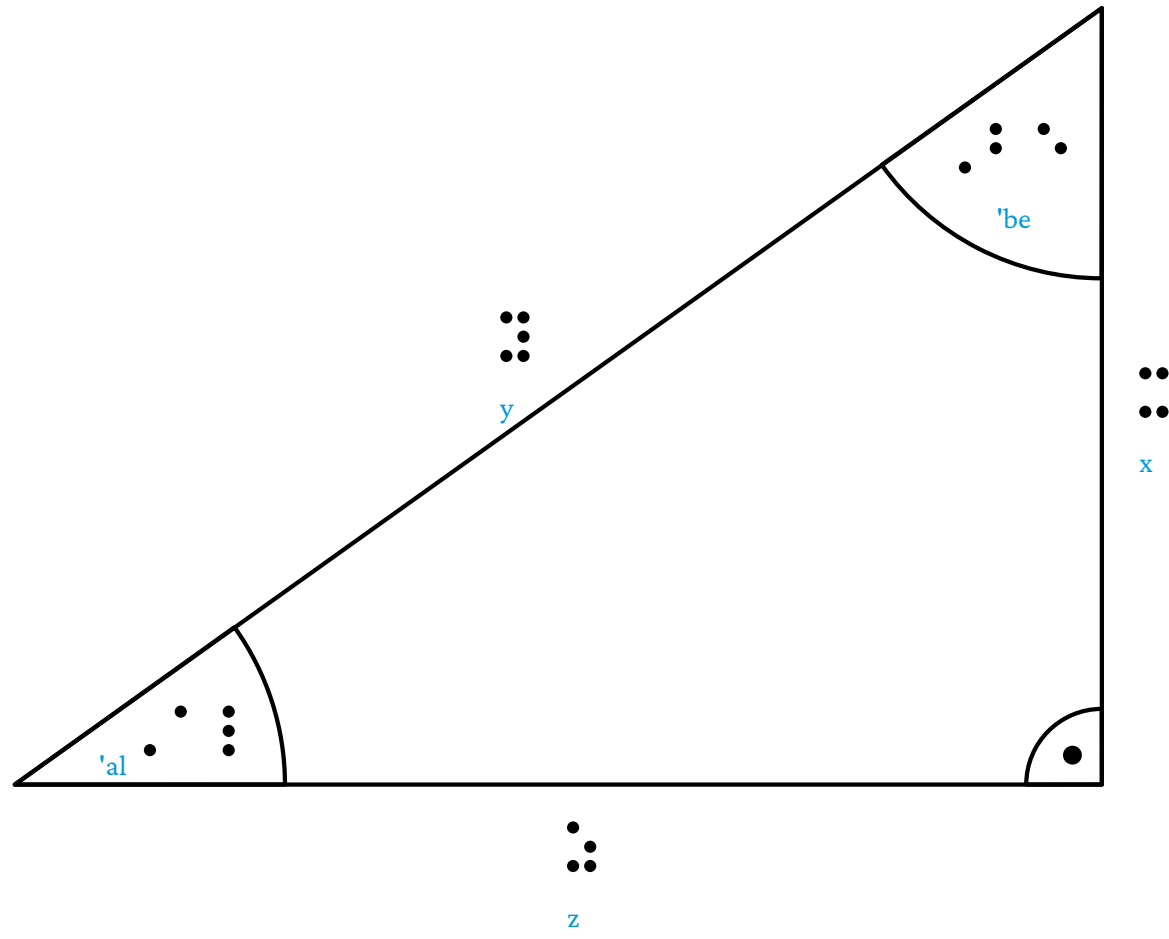
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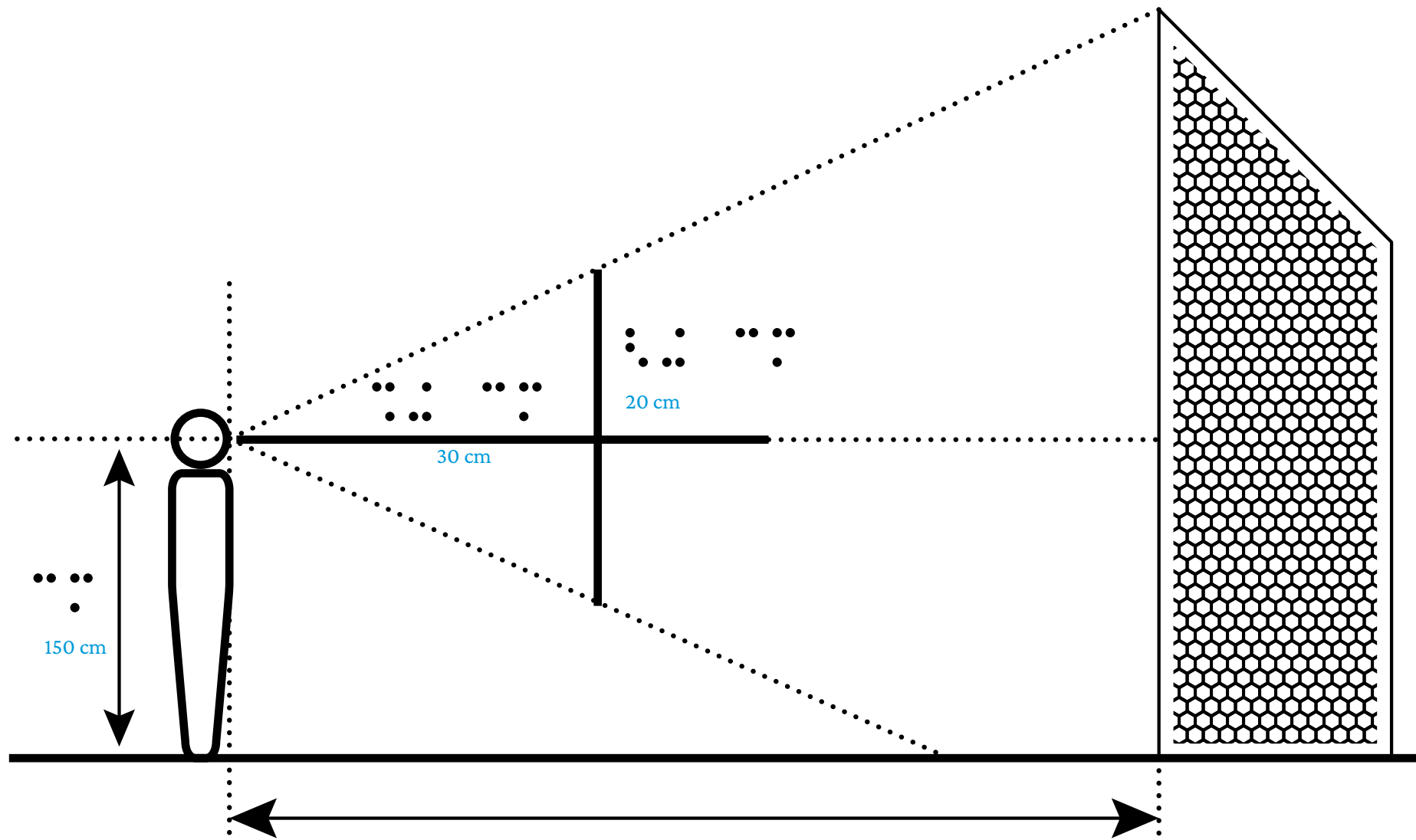
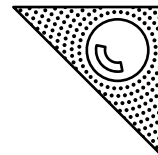
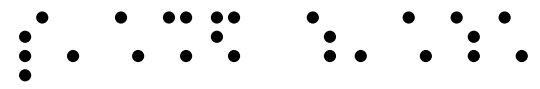
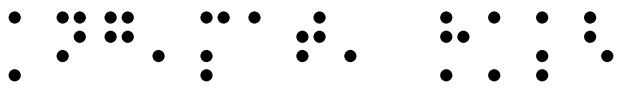
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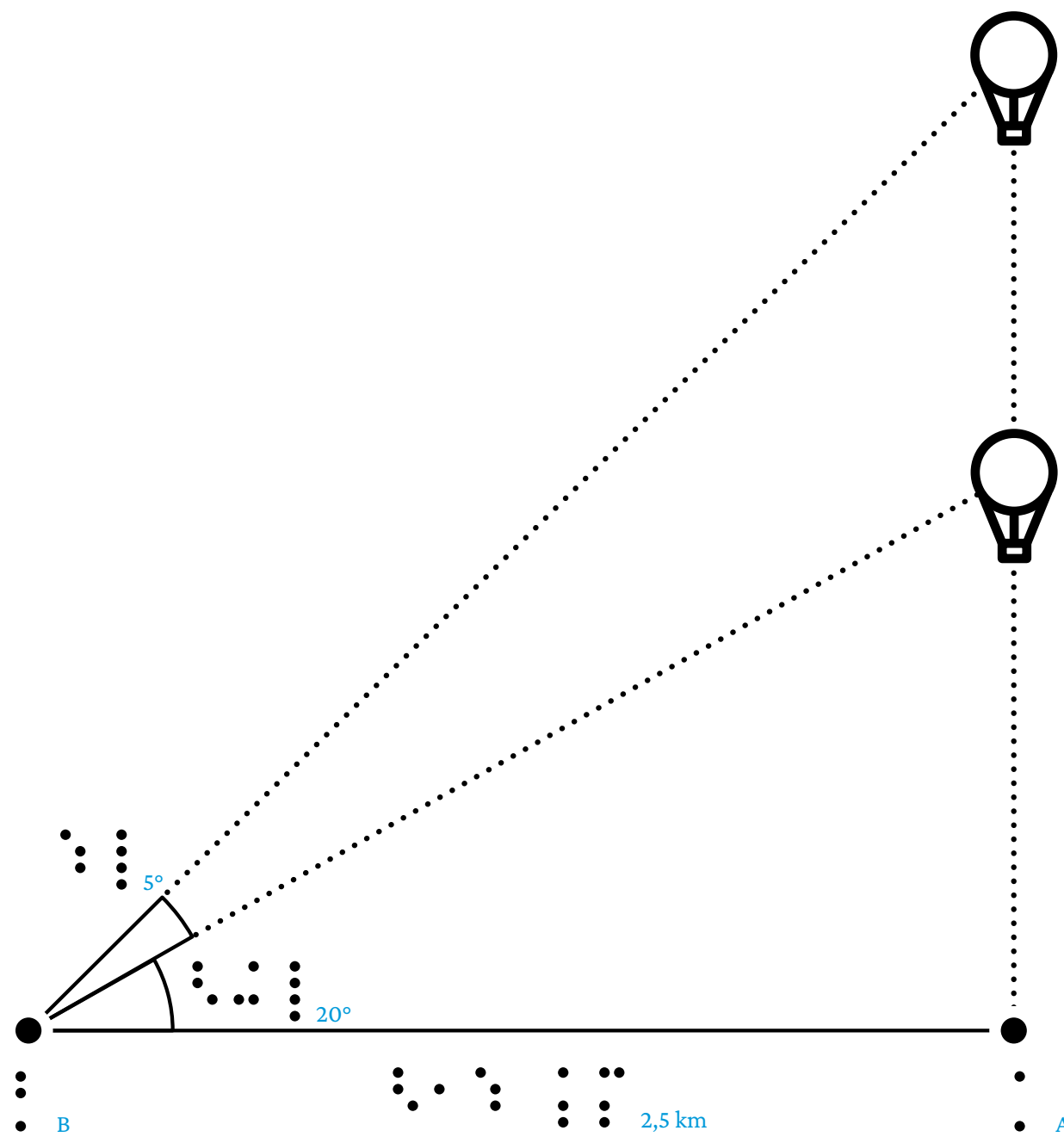
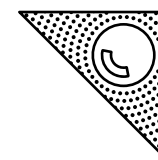
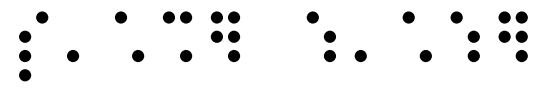
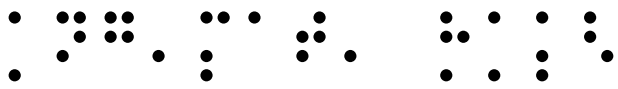


Ang.Mat. HAK2

S.133 5.146







B

2,5 km

A

