



**INSTITUTO FEDERAL
SANTA CATARINA**

MINISTÉRIO DA EDUCAÇÃO

SECRETARIA DE EDUCAÇÃO PROFISSIONAL E TECNOLÓGICA

INSTITUTO FEDERAL DE EDUCAÇÃO, CIÊNCIA E TECNOLOGIA DE SANTA CATARINA

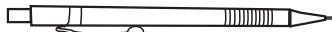
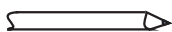
UC: Desenho Técnico

Profª Luciana da Rosa Espíndola (luciana.espindola@ifsc.edu.br)

DESENHO TÉCNICO

MATERIAL (sugerido para esta unidade curricular)

- Lápis + apontador ou lapiseira com ponta metálica (preferencial)



- Grafite - Classificação de dureza:

8H 7H 6H 5H 4H 3H 2H H F **HB B** **2B** 3B 4B 5B 6B 7B
duros médios moles

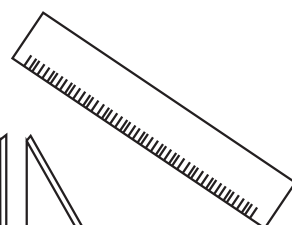
- Borracha branca macia



- Fita adesiva

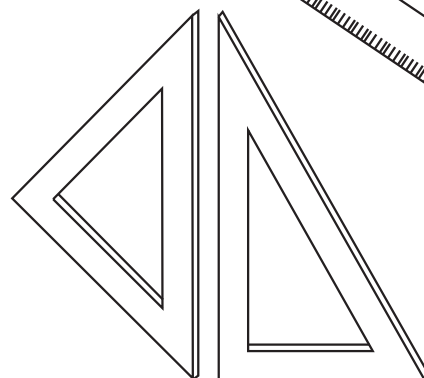


- Régua graduada



- Folha A4 com margem (gramatura sugerida 75 g - 90 g)

- Esquadros sem graduação (par: 30°- 60° ; 45°)



- Álcool e flanela (para limpeza da mesa e dos materiais)

NORMAS TÉCNICAS (ABNT)

NBR 8402 - Execução de caracter para escrita em desenho técnico

NBR 8403 - Aplicação de linhas em desenho - Tipos de linha - Largura das linhas

NBR 10067 - Princípios gerais de representação em desenho técnico

NBR 10068 - Folha de desenho - Leitura e dimensões

NBR 10582 - Apresentação da folha para desenho técnico

NBR 10126 - Cotagem em desenho técnico

NBR 10647 - Desenho Técnico

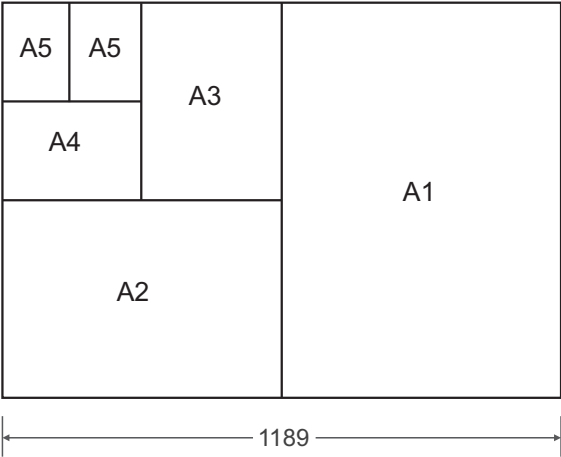
NBR 13142 - Desenho Técnico - Dobramento de cópia

BIBLIOGRAFIA BÁSICA

- SPECK, H. J.; PEIXOTO, V. V. **Manual básico de desenho técnico**. 5. ed. rev. Florianópolis, SC: Ed. da UFSC, 2009. 203p.

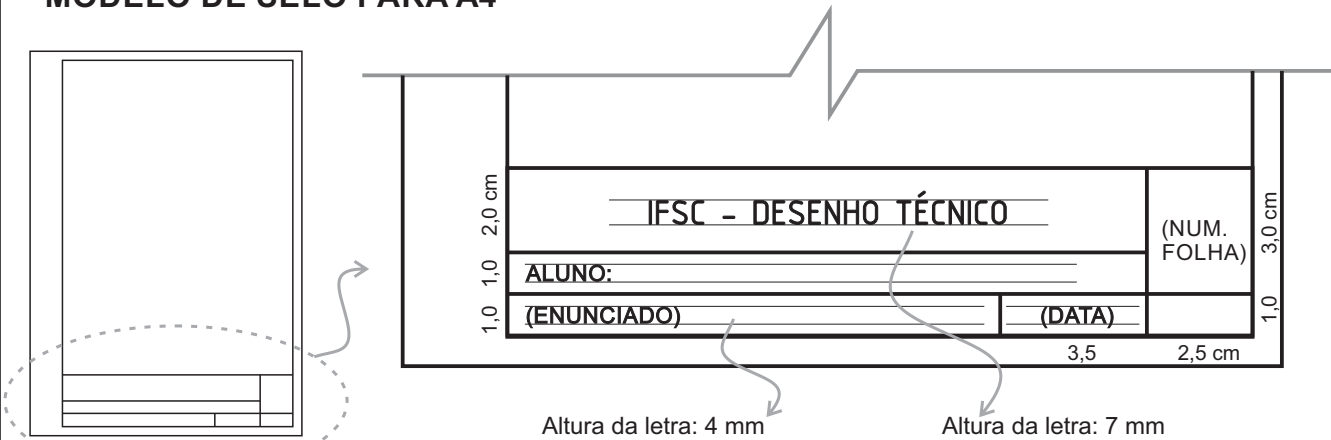
- PRINCIPE JR, A. R. **Noções de Geometria Descritiva**. Volume I. Nobel, 1983.

FOLHAS E MARGENS



FORMATO	DIMENSÕES (mm)	MARGEM ESQUERDA (mm)	DEMAIS MARGENS (mm)
A0	841 X 1189	25	10
A1	549 X 841	25	10
A2	420 X 594	25	7
A3	297 X 420	25	7
A4	210 X 297	25	7

MODELO DE SELO PARA A4



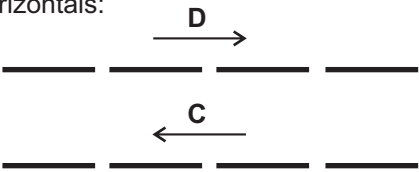
Obs: Em toda a folha, escrever apenas com caligrafia técnica. Utilize linhas de auxílio, com traçado mais fraco, as quais não devem ser apagadas.

TRAÇADO À MÃO LIVRE

Linhas retas:

Fixar cotovelo e pulso, girando este último até uma posição limite conforto/desconforto. Repetir a operação para uma nova posição cotovelo/pulso, formando uma reta composta por pequenos segmentos (SPECK, PEIXOTO, 2010).

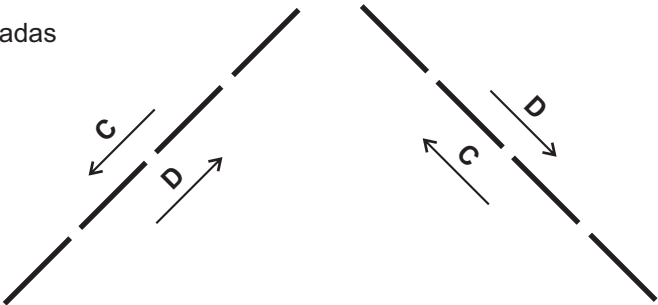
a) Horizontais:



b) Verticais:

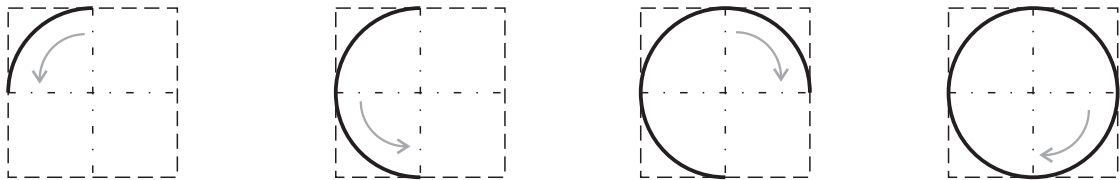


c) Inclínadas

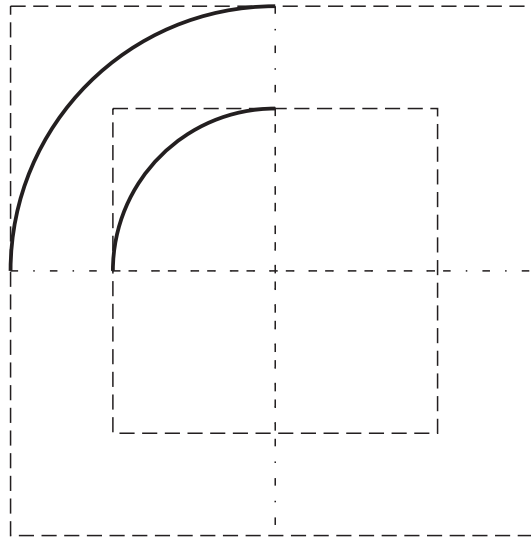


C = canhotos
D = destros

Traçados de curvas: circunferências - Traçar um quadrado de lado igual ao diâmetro da circunferência desejada e inscrevê-la no mesmo (SPECK, PEIXOTO, 2010).



Atividade: Completar as circunferências concêntricas:



CALIGRAFIA TÉCNICA (ABNT)

Para a escrita de letra técnica a NBR 8402 (1994) sugere algumas instruções para a escrita em desenhos técnicos. Duas das principais exigências na escrita em desenho técnico são: a legibilidade e a uniformidade.

Para isso, a norma sugere que deve ser aplicada a mesma largura de linha para letras maiúsculas e minúsculas. E, os caracteres devem ser escritos de forma que as linhas se cruzem ou se toquem, aproximadamente, em ângulo reto. A escrita pode ser vertical ou inclinada, em um ângulo de 15° para a direita em relação à vertical.

A altura das letras é baseada na altura das letras maiúsculas. Ou seja, a letra minúscula deve ser proporcional à letra maiúscula, conforme as dimensões da tabela abaixo.

Dimensões	Valores em mm		
Altura Letras maiúsculas	3,5	5,0	10
Altura Letras minúsculas	2,5	3,5	7
Distância entre as linhas de base	5,0	7,0	14

ABCDEFGHIJKLMNOP

QRSTUVWXYZ

aabcdefghijklmnopq

rstuvwxyz

[(!?:;,"- = + x : √ ° % &)] φ

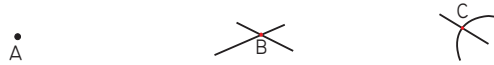
01234567789 IVX

Forma de escrita vertical

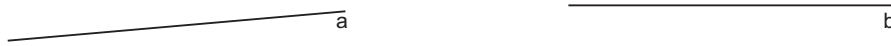
BREVE REVISÃO DOS PRINCÍPIOS DE DESENHO GEOMÉTRICO

Pode-se definir o Desenho Geométrico como a expressão gráfica da forma, considerando suas dimensões. Os elementos: ponto, reta e plano darão formato às figuras ou formas geométricas.

Ponto: graficamente, expressa-se o ponto pelo sinal obtido quando se toca a ponta do lápis no papel. Usualmente, o ponto é representado por uma letra maiúscula. Sua representação também se dá pelo cruzamento de duas linhas, que podem ser retas ou curvas.



Reta: traçado sem variar direção (horizontal, vertical ou inclinada). A reta é representada por uma letra minúscula e é infinita nas duas direções.



Plano: é representado, geralmente, por uma letra do alfabeto grego.



POSIÇÕES RELATIVAS ENTRE DUAS RETAS

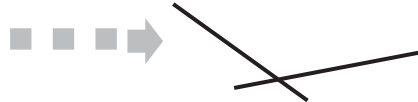
a) Perpendiculares – São retas que se cruzam formando um ângulo reto, ou seja, igual a 90° (noventa graus).



b) Paralelas – São retas que conservam entre si sempre a mesma distância, isto é, não possuem ponto em comum.



c) Oblíquas – São retas que se cruzam formando um ângulo qualquer, diferente de 90° .



Da idéia de reta, originam-se outros elementos fundamentais para o Desenho Geométrico:

SEGMENTO DE RETA – É a porção de uma reta, limitada por dois de seus pontos. O segmento de reta é, portanto, limitado e podemos atribuir-lhe um comprimento. O segmento é representado pelos dois pontos que o limitam e que são chamados de extremidades. Ex: segmento \overline{AB} :



Ângulos - Classificação:

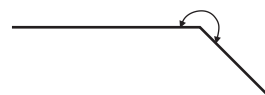
- a) reto: abertura igual a 90° ;
- b) agudo: abertura menor que 90° ;
- c) obtuso: abertura maior que 90° ;
- d) raso: abertura igual a 180° ;
- e) pleno: abertura igual a 360° ;
- f) nulo: abertura igual a 0° ;
- g) congruentes: dois ou mais ângulos são congruentes quando têm aberturas iguais.

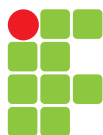
Quanto a posição que ocupam:

a) ângulo convexo: abertura maior que 0° e menor que 180°



b) ângulo côncavo: abertura maior que 180° e menor que 360°





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UC: Desenho Técnico

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ALUNO (A) :

MATRÍCULA :

LETRA TÉCNICA

A	a	0
B	b	1
C	c	2
D	d	3
E	e	4
F	f	5
G	g	6
H	h	7
I	i	8
J	j	9
K	k	0
L	l	1
M	m	2
N	n	3
O	o	4
P	p	5
Q	q	6
R	r	7
S	s	8
T	t	9
U	u	0
V	v	1
X	x	2
Z	z	3
W	w	4
Y	y	5



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ALUNO (A) : _____ MATRÍCULA : _____

TRAÇADOS À MÃO LIVRE

1) Linhas horizontais

2) Linhas verticais



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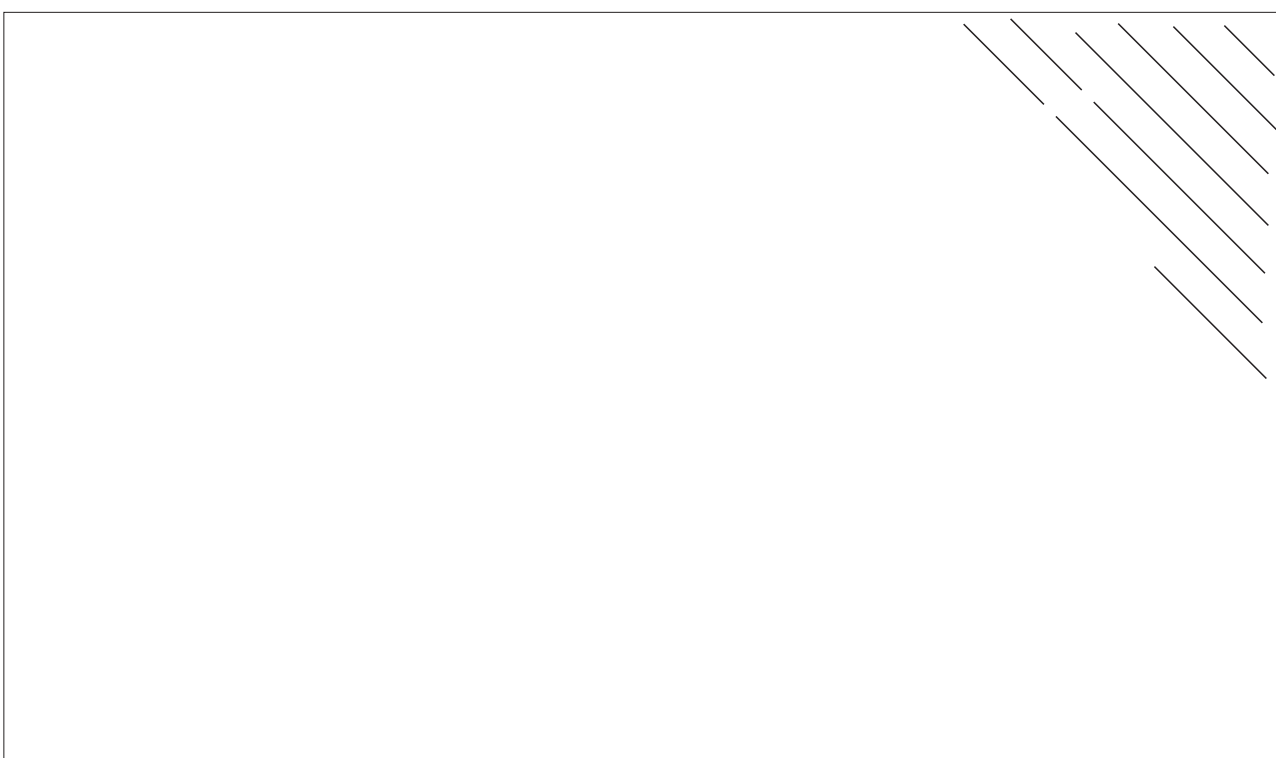
ALUNO (A) : _____ MATRÍCULA : _____

TRAÇADOS À MÃO LIVRE

3) Linhas inclinadas



4) Linhas inclinadas





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ALUNO (A) :

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TRAÇADOS COM ESQUADROS

1) Linhas horizontais espaçadas a 0,50 cm:

2) Linhas verticais espaçadas a 0,50 cm:



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ALUNO (A) : _____ MATRÍCULA : _____

TRAÇADOS COM ESQUADROS

3) Linhas inclinadas à 30° e 150° respectivamente

--	--

4) Linhas inclinadas à 45° e 135° respectivamente

--	--

5) Linhas inclinadas à 60° e 120°

--	--



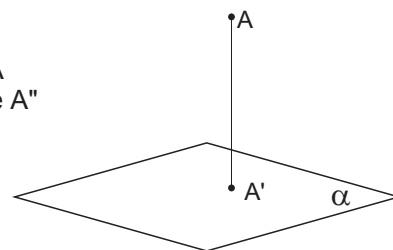
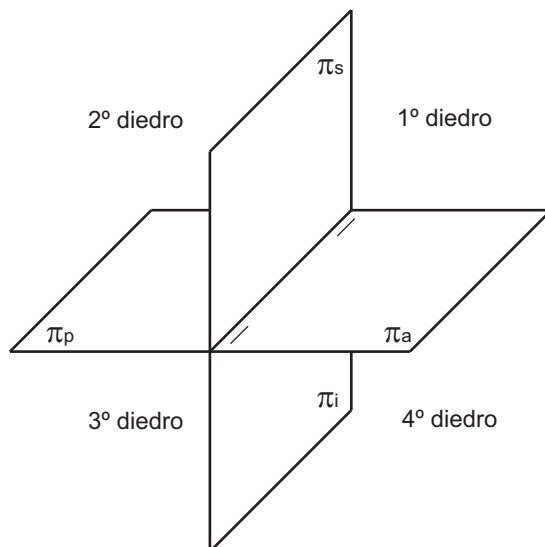
GEOMETRIA DESCRITIVA - PONTOS

PROJEÇÃO ORTOGONAL = perpendicular ao plano

Ponto no espaço = representado por uma letra maiúscula, por exemplo: A

Ponto projetado no plano = representado pela mesma letra, exemplo: A' e A''

Os planos de projeção, perpendiculares entre si, formam quatro regiões que são os diedros e quatro semi-planos.



Segundo a NBR, no Brasil, trabalha-se, principalmente, nos 1º e 3º diedros.

Semi-planos:

π_a - horizontal anterior;

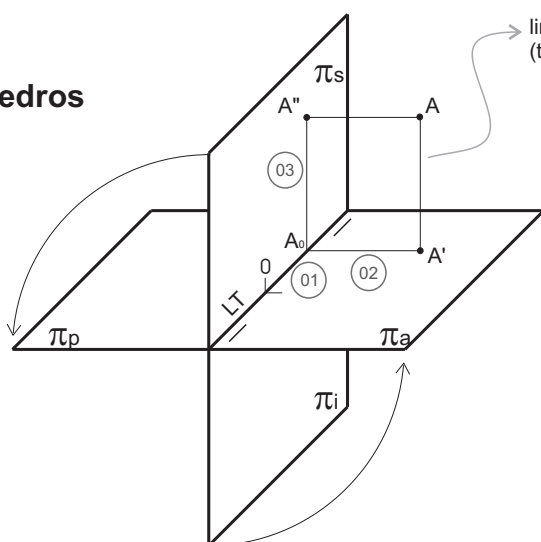
π_p - horizontal posterior;

π_s - vertical superior;

π_i - vertical inferior;

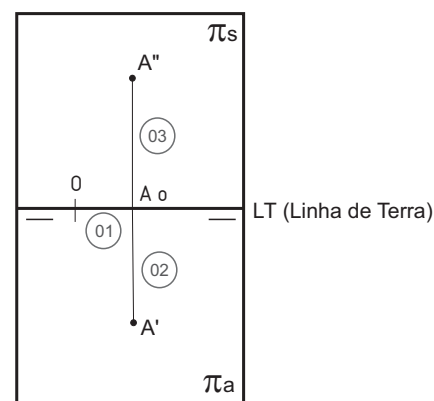
Para representar as figuras do espaço no plano, rebate-se o plano vertical sobre o plano horizontal.

Diedros



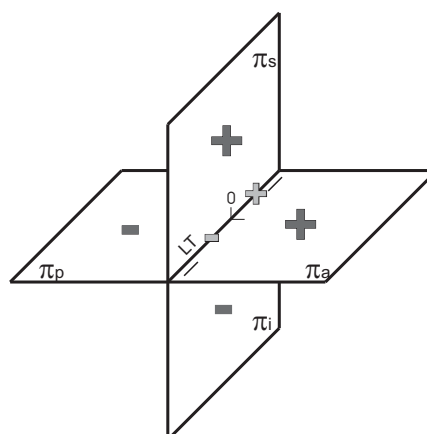
linha de projeção ou linha de chamada
(traçado contínuo fraco)

Épura



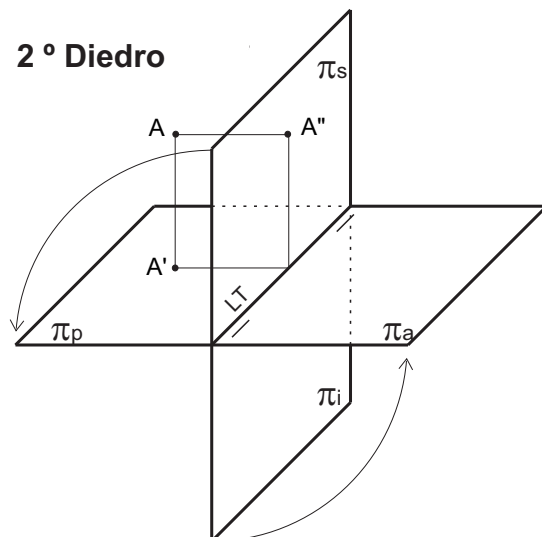
Coordenadas:
[abscissa; afastamento; cota]
[A_o ; A' ; A'']

- 01 **Abscissa** - o ponto de origem O é marcado na Linha de Terra. A partir desse, é marcado o ponto A_o .
- 02 **Afastamento** - a partir de A_o é marcado ponto A' no plano horizontal.
- 03 **Cota** - a partir de A_o é marcado ponto A'' no plano vertical.

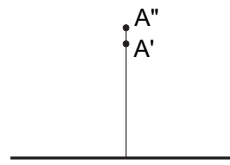


Representação dos demais diedros em épura:

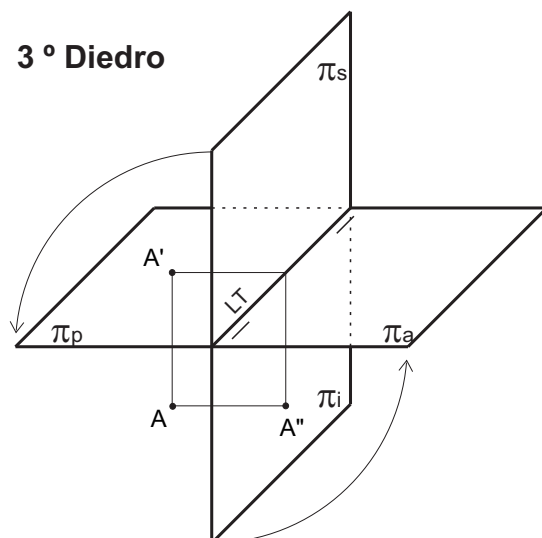
2 ° Diedro



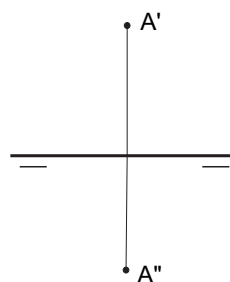
Épura



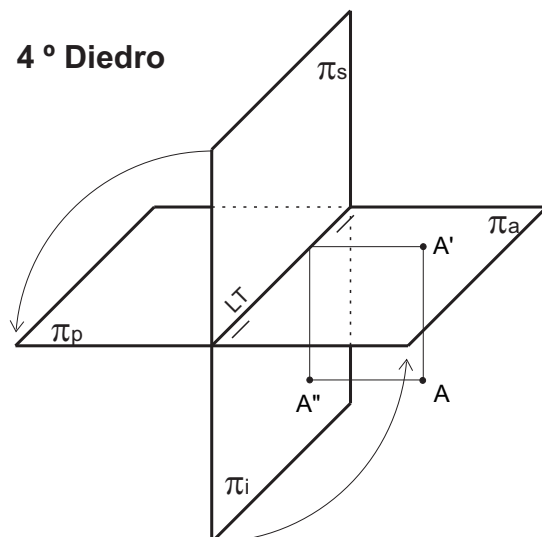
3 ° Diedro



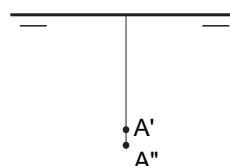
Épura



4 ° Diedro



Épura





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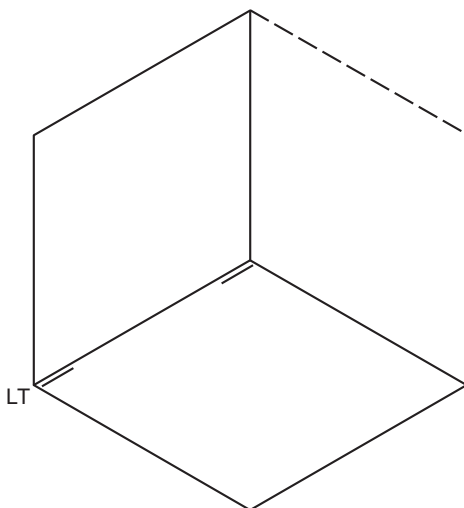
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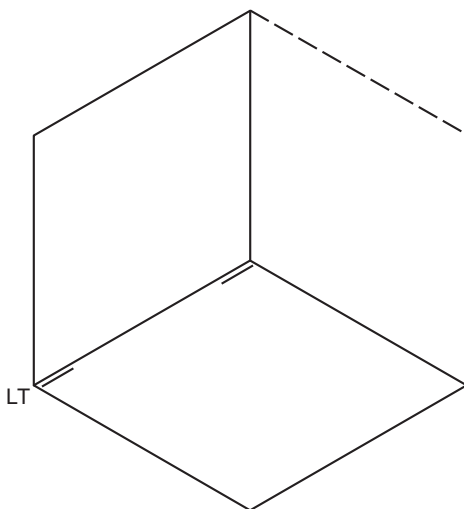
PONTO EM DIEDRO E ÉPURA

01 (A) [-1 ; 1 ; 2]



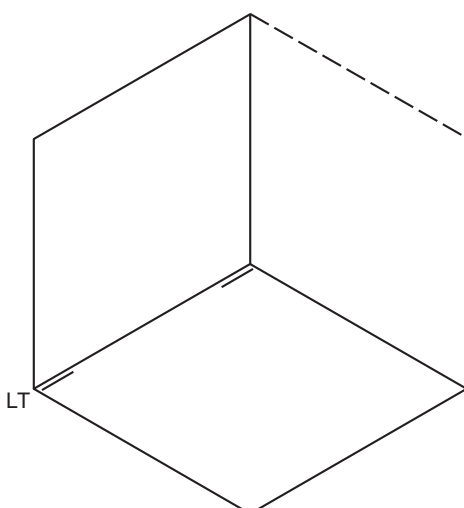
LT _____

02 (A) [0 ; 0 ; 1,5]



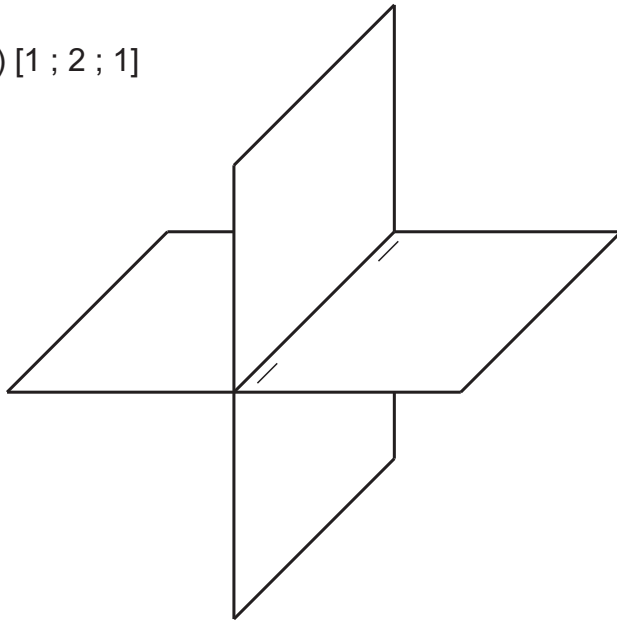
LT _____

03 (A) [1 ; 1,5 ; 1,5]



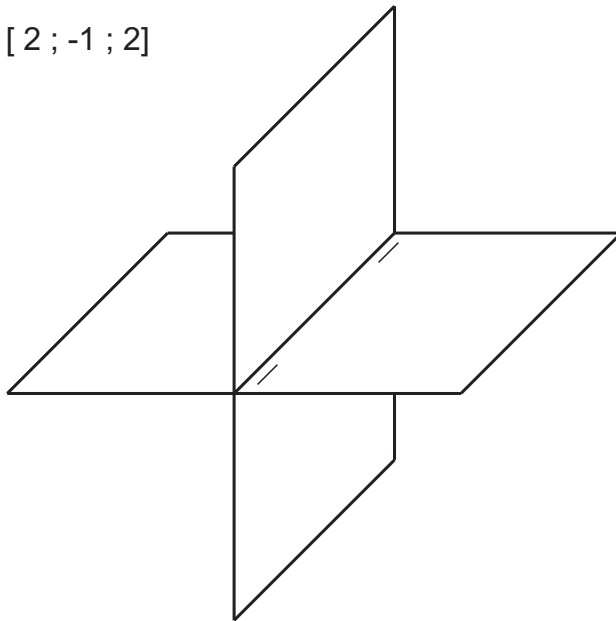
LT _____

④ (A) [1 ; 2 ; 1]



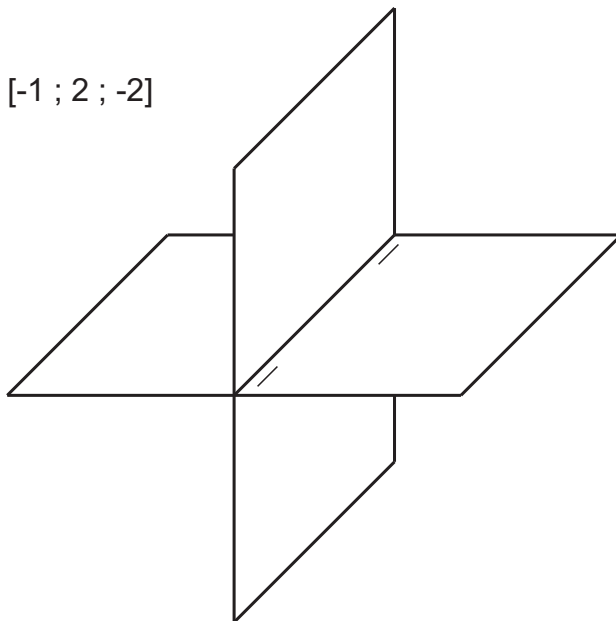
LT

⑤ (B) [2 ; -1 ; 2]



LT

⑥ (C) [-1 ; 2 ; -2]



LT



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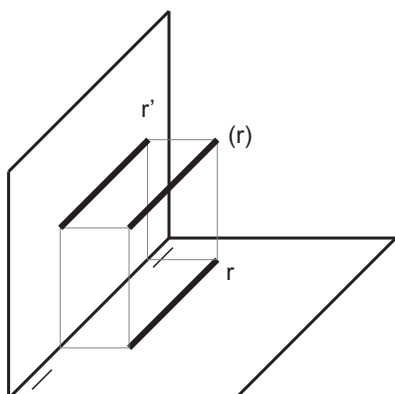
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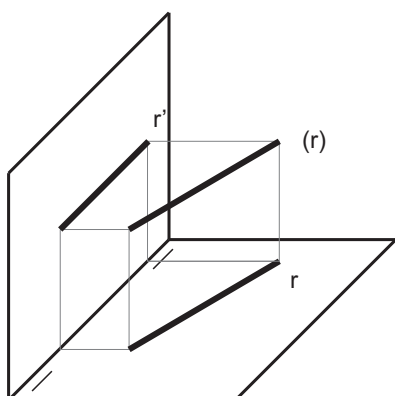
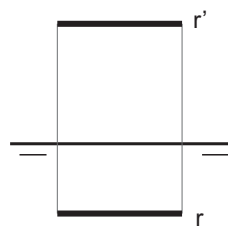
PROJEÇÃO ORTOGONAL DE RETAS

1º Diedro

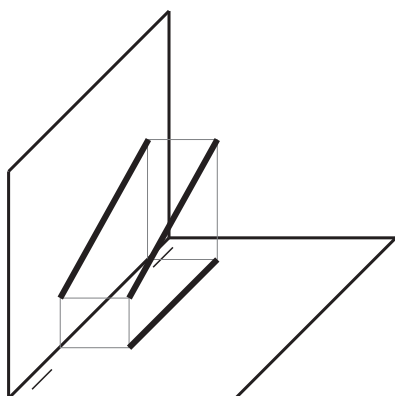
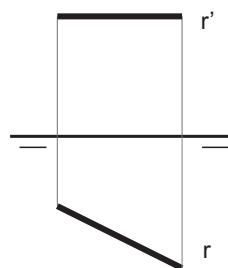


Reta fronto-horizontal: paralela à LT, paralela aos planos horizontal e vertical

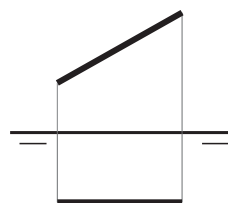
Épura

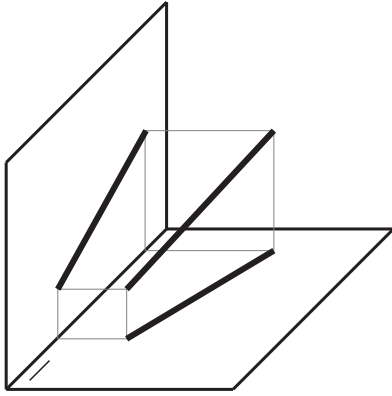


Reta horizontal: paralela ao plano horizontal e oblíqua ao vertical

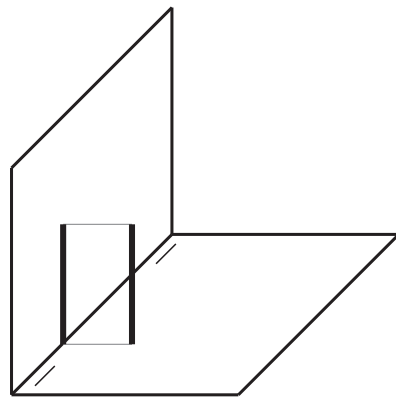
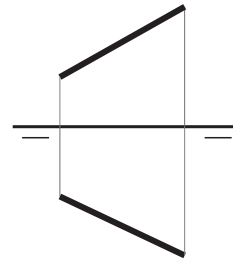


Reta frontal: paralela ao plano vertical e oblíqua ao horizontal

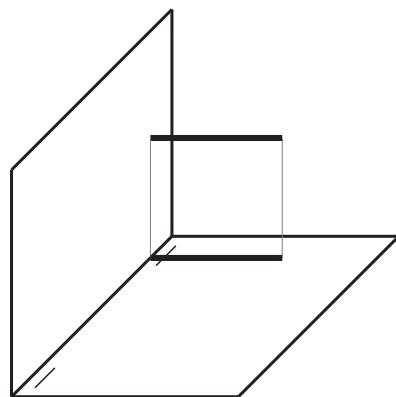
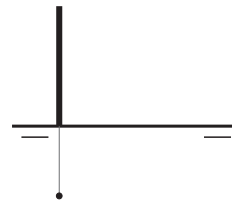




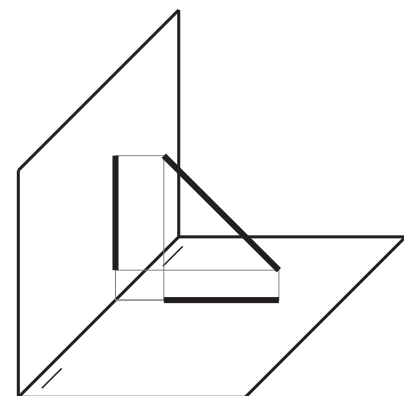
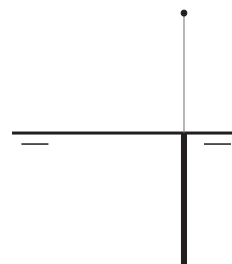
Reta qualquer: oblíqua aos planos vertical e horizontal



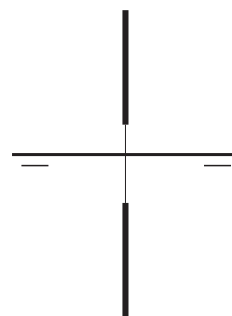
Reta vertical: perpendicular ao plano horizontal



Reta de topo: perpendicular ao plano vertical



Reta de perfil: oblíqua aos dois planos e perpendicular à linha de terra





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UC: Desenho Técnico

Profª Luciana da Rosa Espíndola (luciana.espindola@ifsc.edu.br)

ALUNO (A) :

MATRÍCULA :

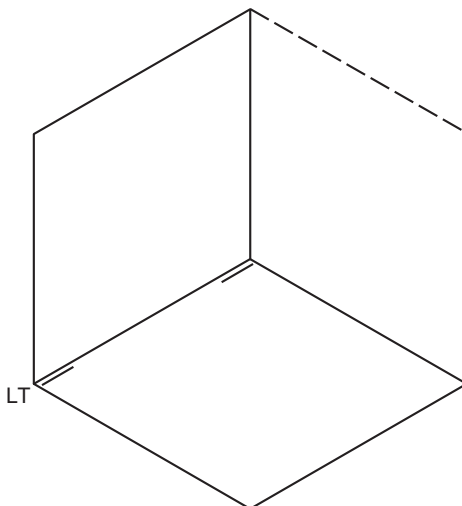
RETA EM DIEDRO E ÉPURA

01

(A) [-1 ; 1 ; 2]

(B) [1 ; 1 ; 2]

Reta fronto-horizontal
(paralela à LT, paralela aos
planos horizontal e vertical)



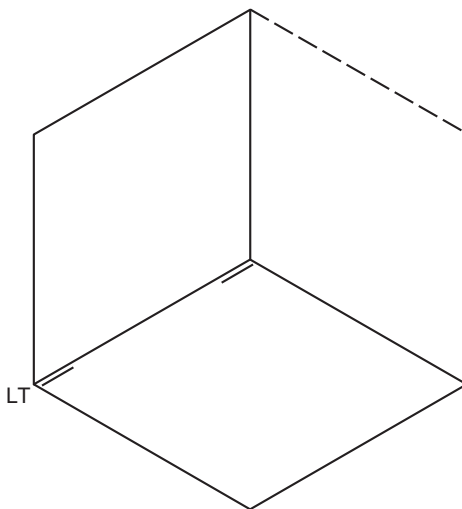
LT =

02

(A) [0 ; 0 ; 2]

(B) [0 ; 2 ; 2]

Reta de topo
(perpendicular ao plano
vertical)



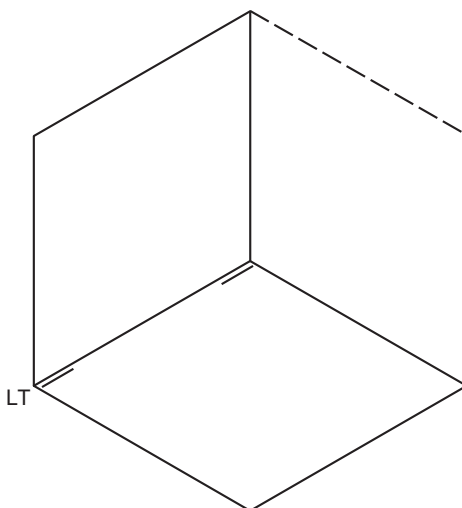
LT =

03

(A) [-1 ; 0 ; 2]

(B) [1 ; 2 ; 2]

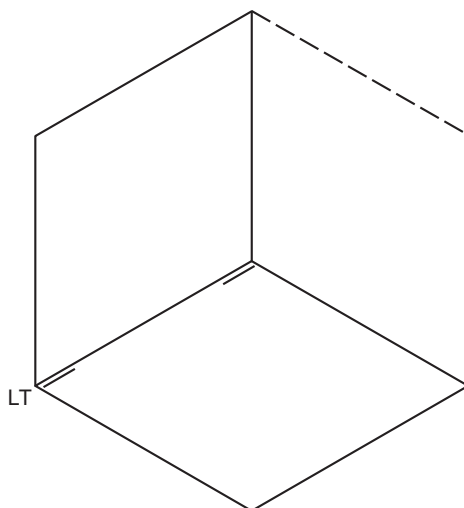
Reta horizontal
(paralela ao plano
horizontal e oblíqua ao
plano vertical)



LT =

- 04 (A) $[-1; 2; 0]$
(B) $[1; 2; 2]$

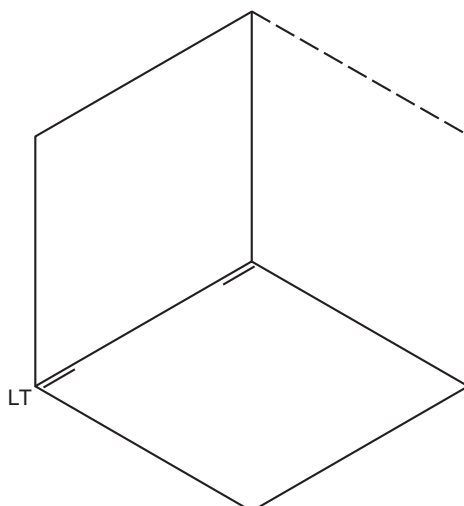
Reta frontal
(paralela ao plano vertical e
oblíqua ao plano horizontal)



LT =

- 05 (A) $[1; 0; 2]$
(B) $[1; 3; 0]$

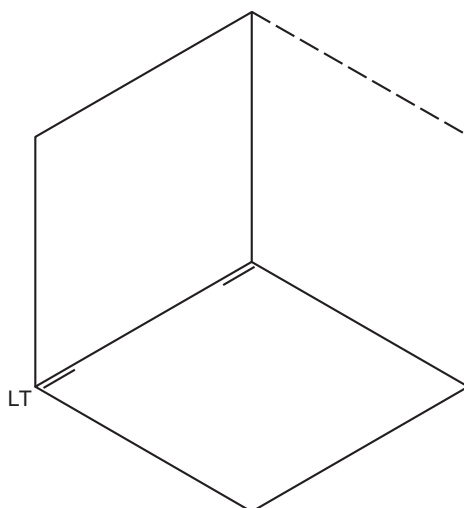
Reta de perfil
(oblíqua aos dois planos e
perpendicular à linha de terra)



LT =

- 06 (A) $[1; 2; 0]$
(B) $[1; 2; 3]$

Reta vertical
(perpendicular ao plano
horizontal)



LT =



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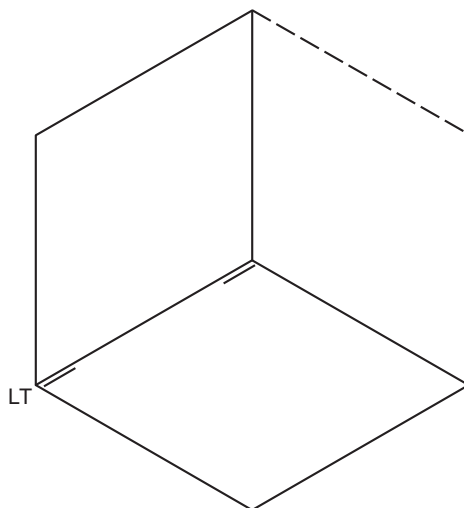
Profª Luciana da Rosa Espíndola (luciana.espindola@ifsc.edu.br)

ALUNO (A) :

MATRÍCULA :

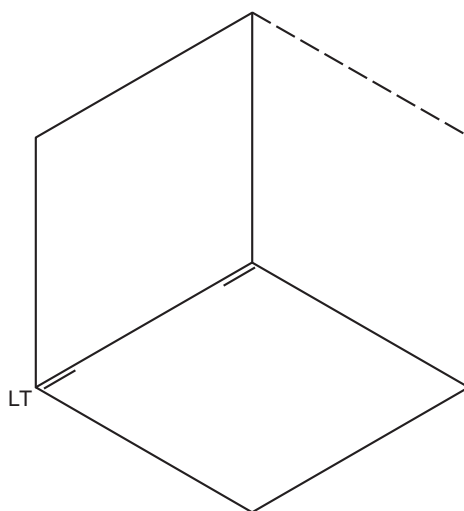
PLANO EM DIEDRO E ÉPURA

- 01 (A) $[-1; 2; 3]$
(B) $[-1; 2; 1]$
(C) $[1; 2; 3]$



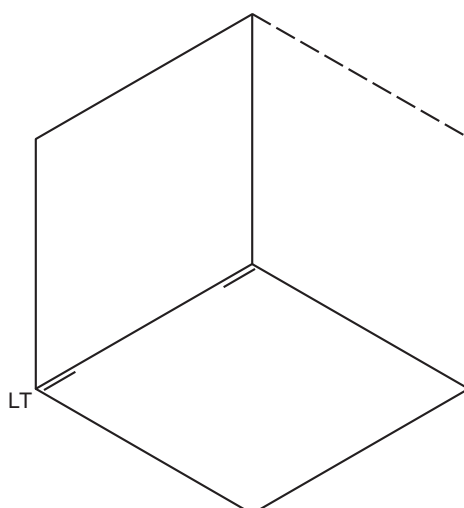
LT _____

- 02 (A) $[0; 1; 1]$
(B) $[0; 3; 3]$
(C) $[0; 3; 1]$



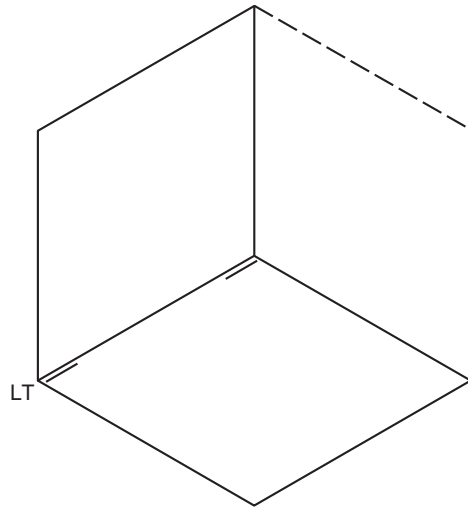
LT _____

- 03 (A) $[-1; 1; 1]$
(B) $[0; 3; 3]$
(C) $[1; 1; 1]$



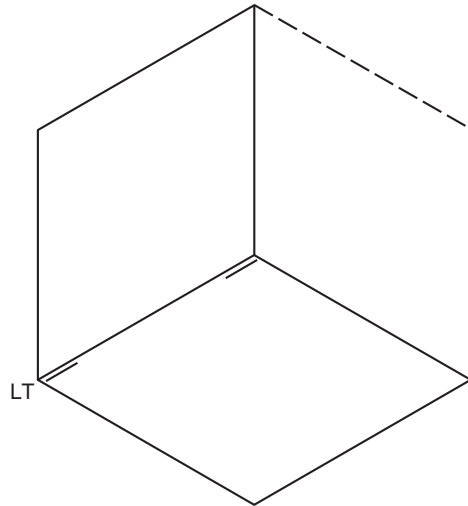
LT _____

- 04 (A) [-1 ; 3 ; 3]
 (B) [-1 ; 1 ; 1]
 (C) [1 ; 1 ; 1]
 (D) [1 ; 3 ; 3]



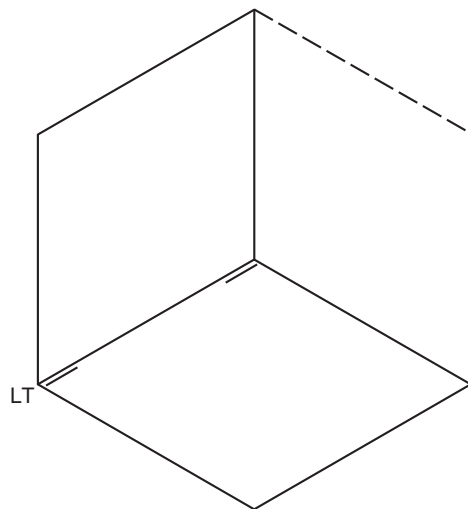
LT _____

- 05 (A) [-1 ; 1 ; 2]
 (B) [-1 ; 3 ; 2]
 (C) [1 ; 3 ; 2]
 (D) [1 ; 1 ; 2]



LT _____

- 06 (A) [0 ; 1 ; 1]
 (B) [0 ; 3 ; 1]
 (C) [0 ; 3 ; 3]
 (D) [0 ; 1 ; 3]



LT _____



VISTAS ORTOGONAIS

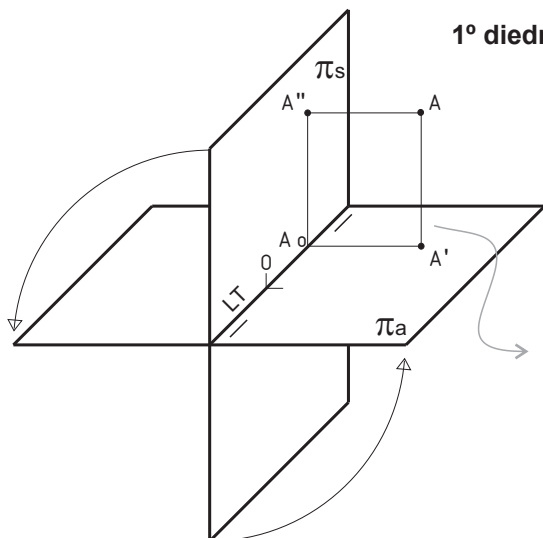
PROJEÇÃO ORTOGONAL = perpendicular aos planos horizontal e vertical.

Segundo a NBR, no Brasil, trabalha-se, principalmente, nos 1º e 3º diedros.

Trabalharemos com o 1º Diedro no exemplo e nas atividades seguintes.

Diedros

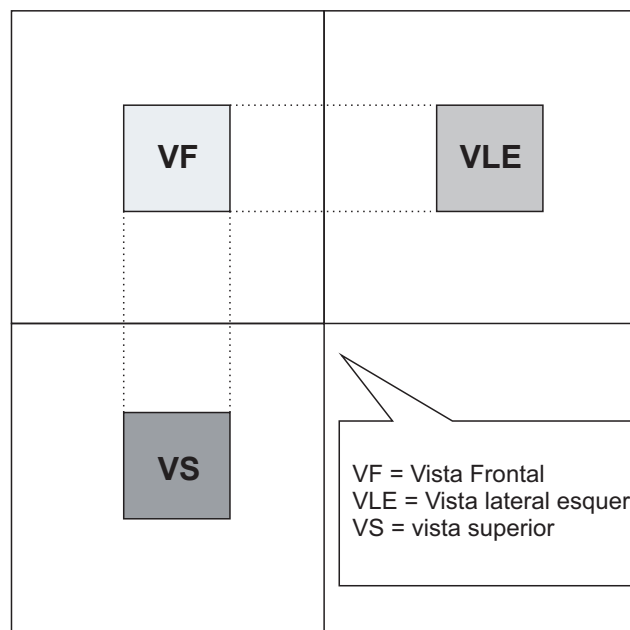
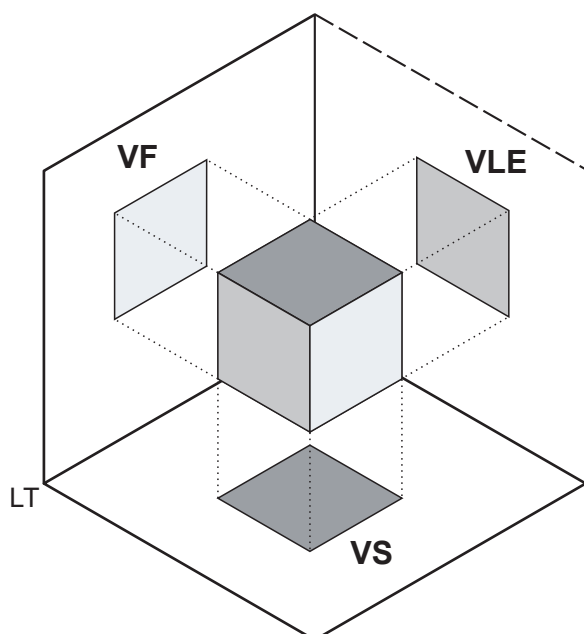
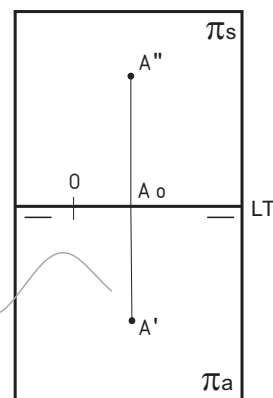
1º diedro



linha de projeção ou linha de chamada (traçado contínuo fraco ou tracejado)

Semi-planos:
 πa - horizontal anterior;
 πs - vertical superior;

Épura



VF = Vista Frontal
VLE = Vista lateral esquerda
VS = vista superior



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ALUNO (A) :

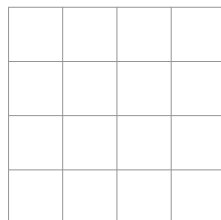
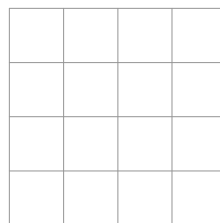
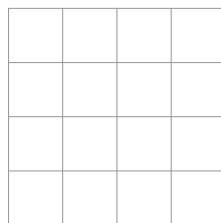
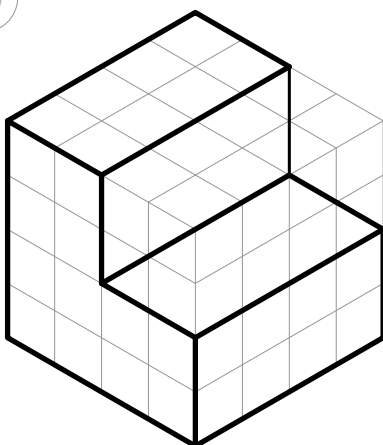
MATRÍCULA :

VISTAS ORTOGONAIS

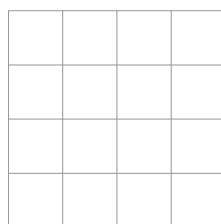
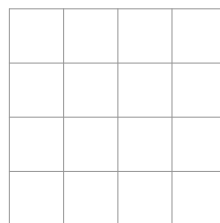
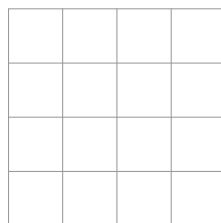
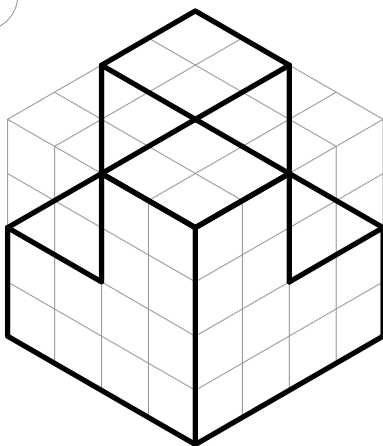
As resoluções desses exercícios podem ser observadas nos vídeos:

<https://www.youtube.com/playlist?list=PL91kdQJa92sSr0dWEPaEyc9lclZVovc3L>

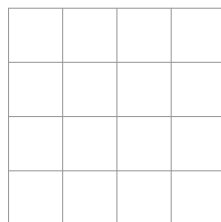
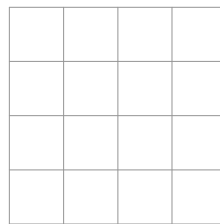
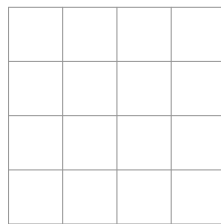
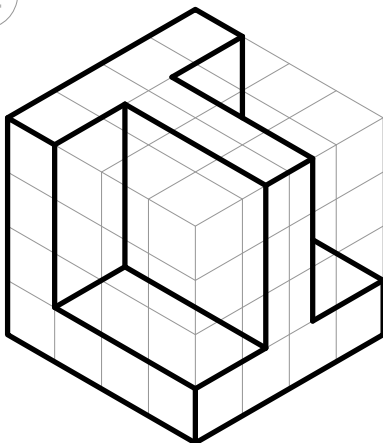
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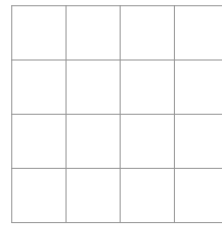
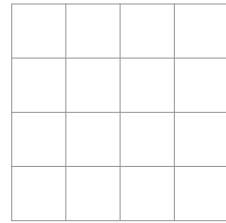
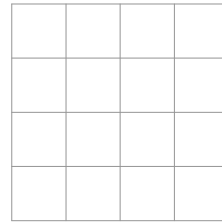
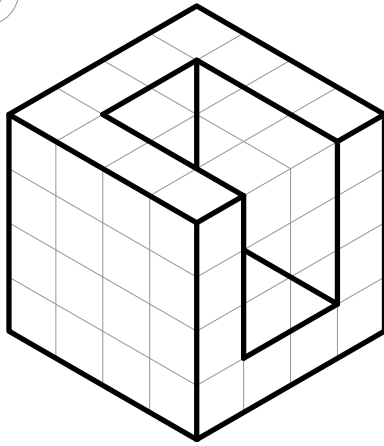
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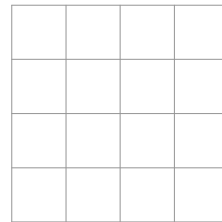
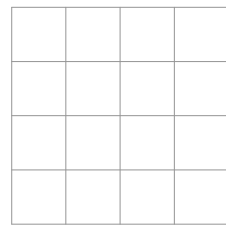
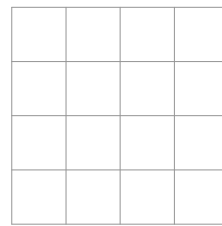
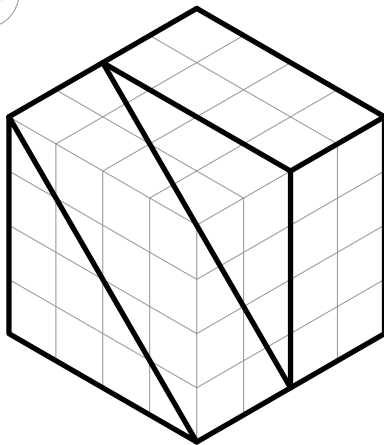
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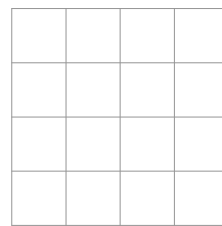
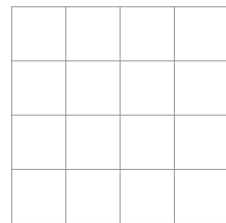
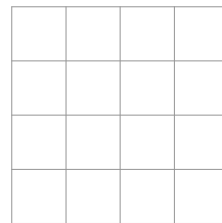
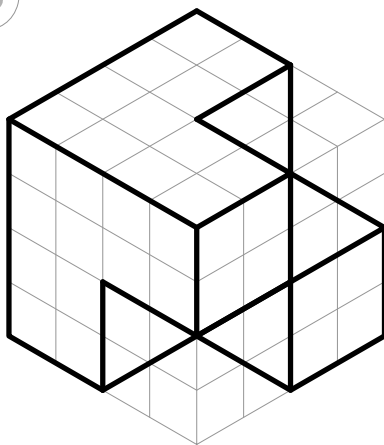
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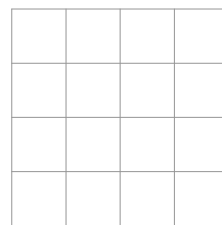
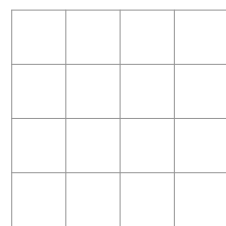
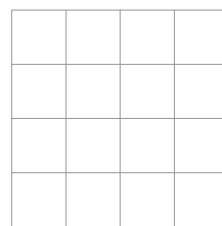
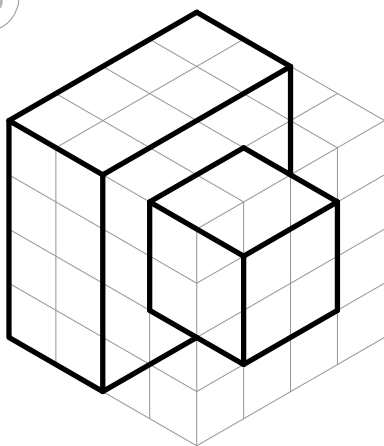
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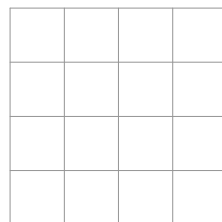
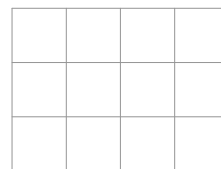
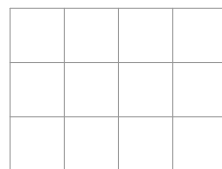
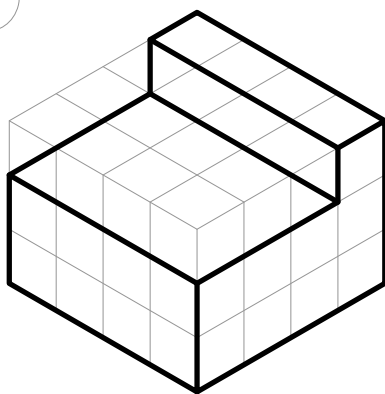
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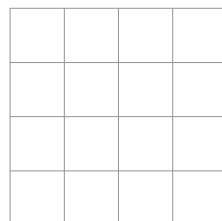
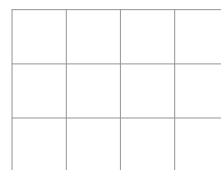
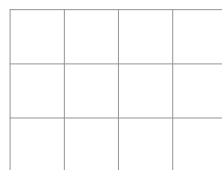
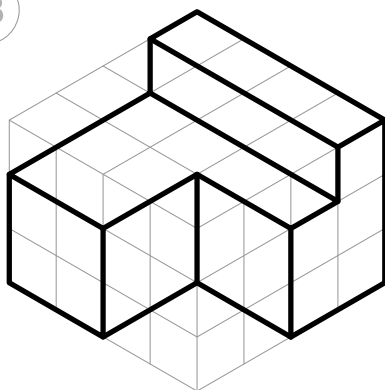
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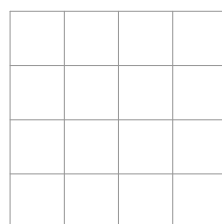
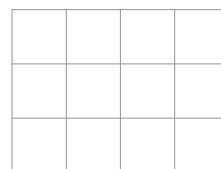
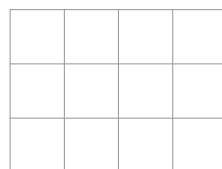
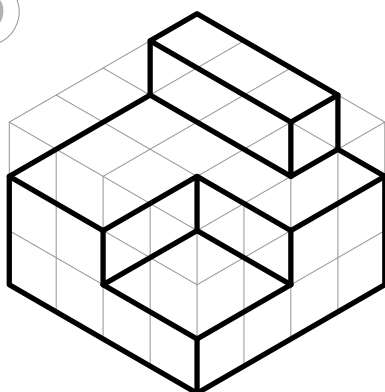
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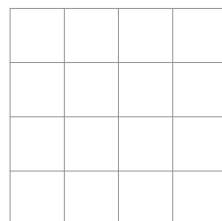
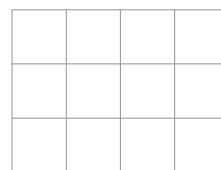
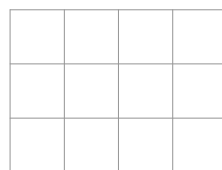
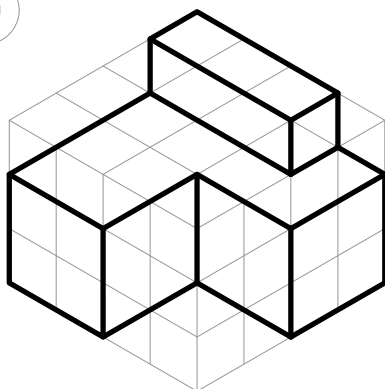
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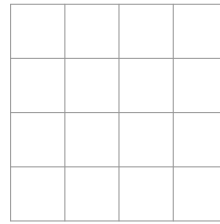
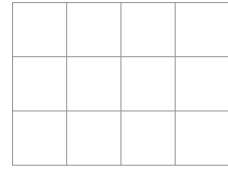
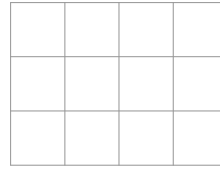
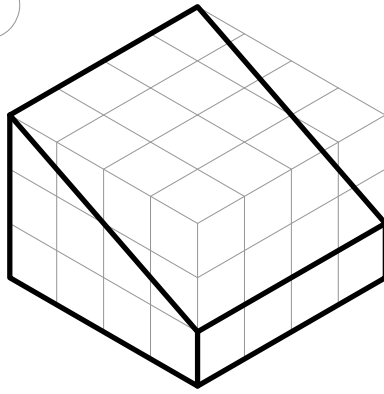
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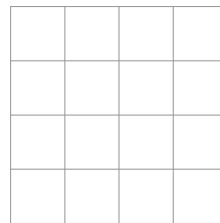
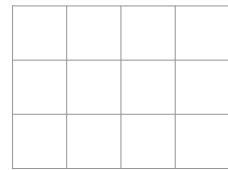
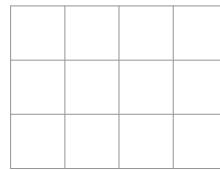
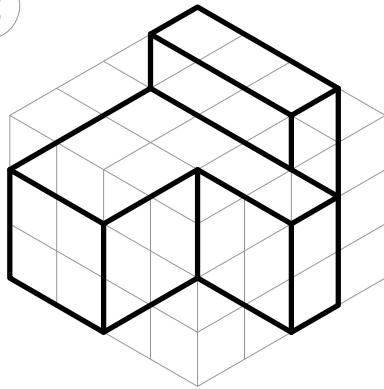
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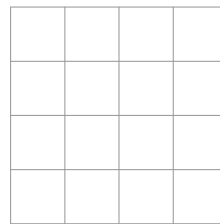
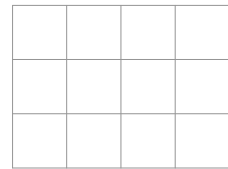
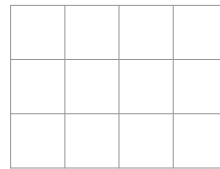
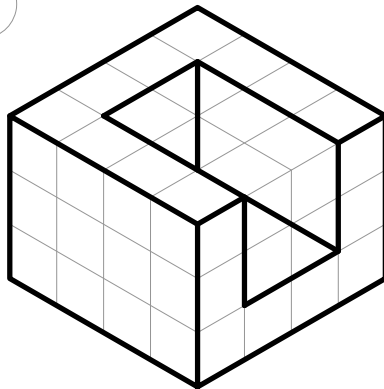
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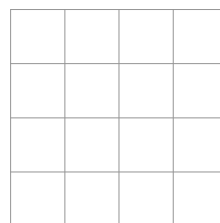
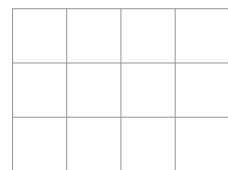
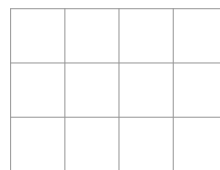
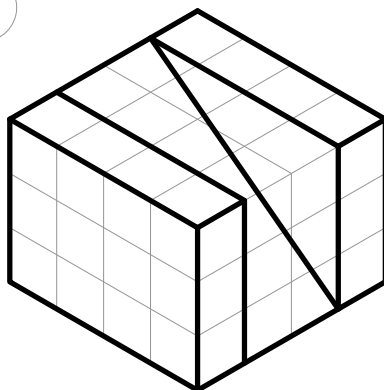
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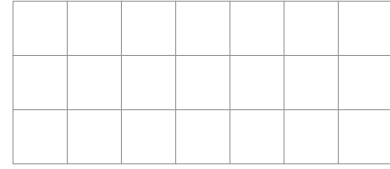
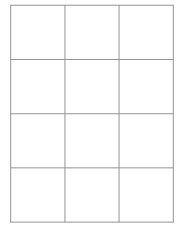
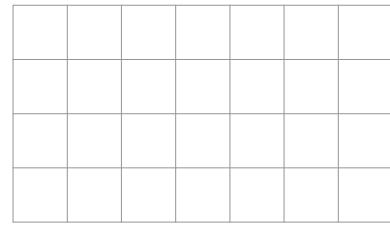
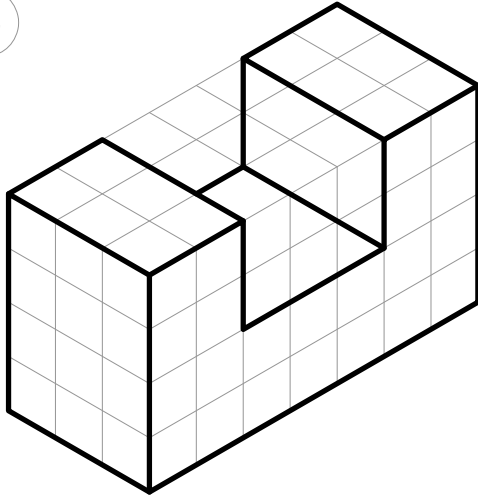
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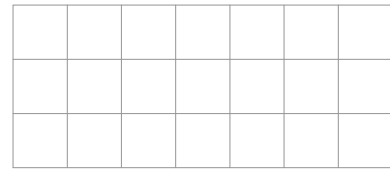
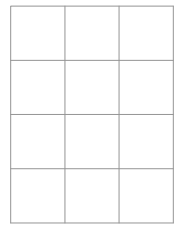
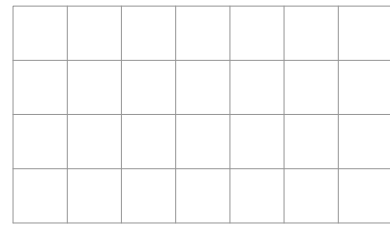
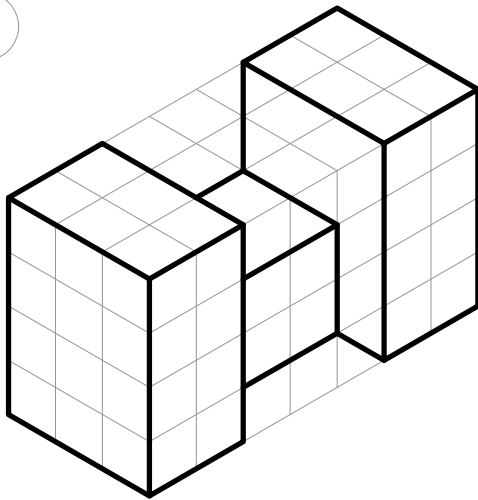
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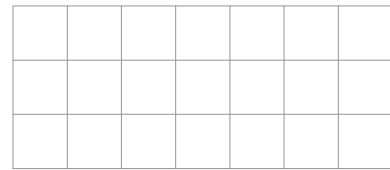
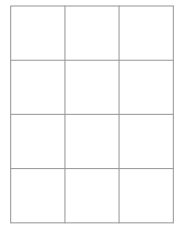
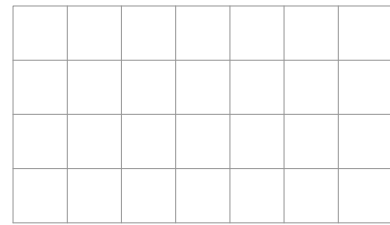
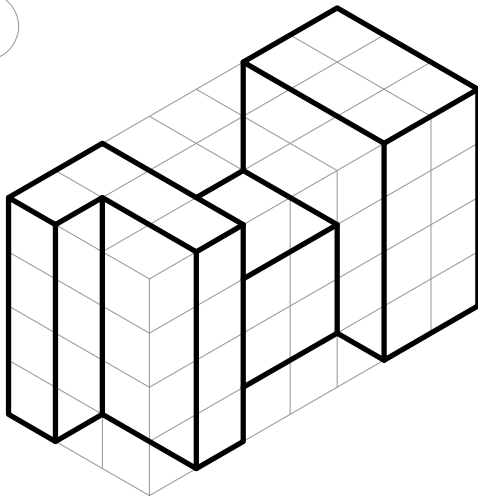
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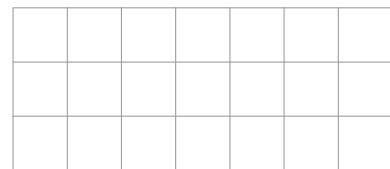
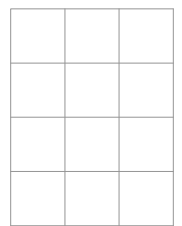
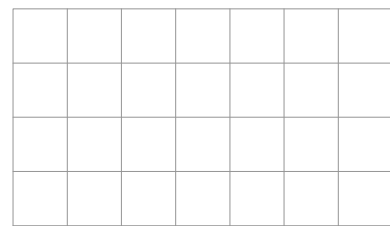
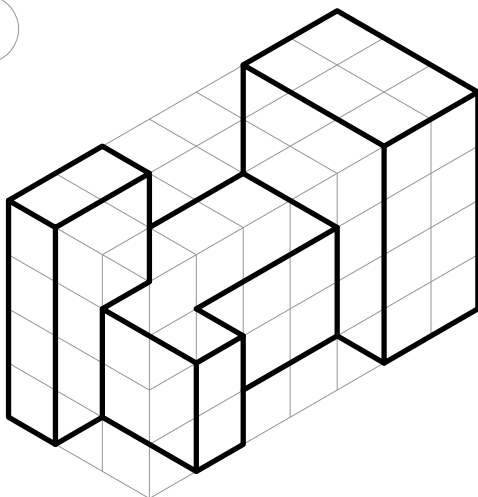
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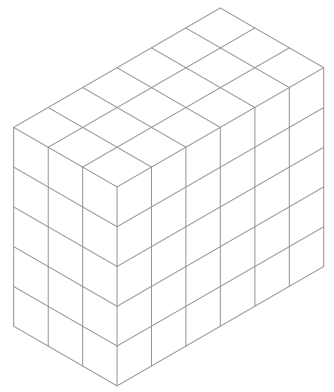
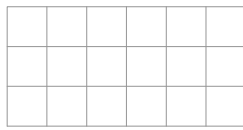
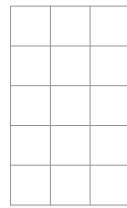
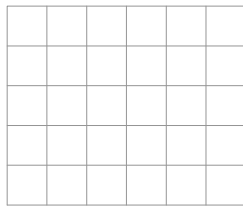
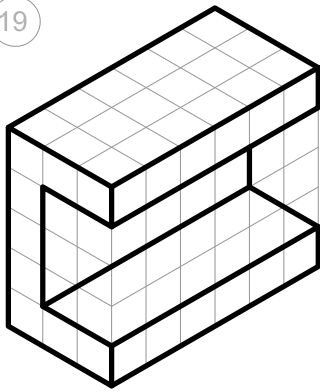
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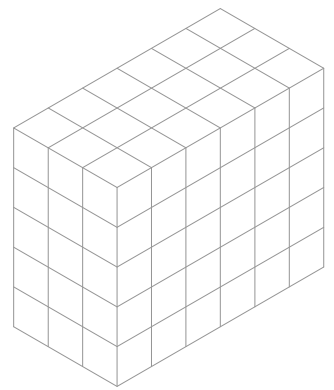
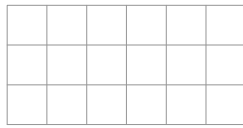
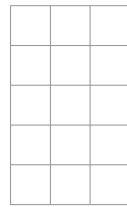
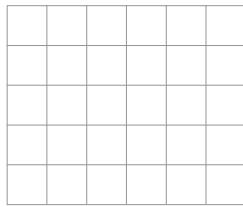
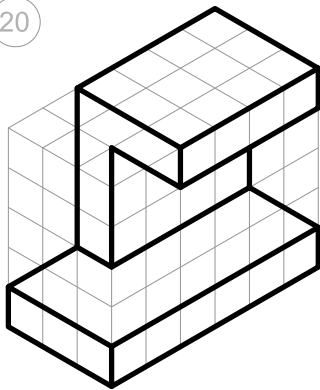
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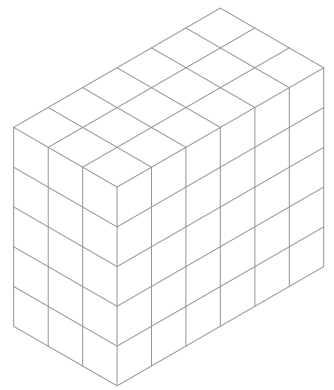
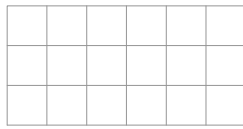
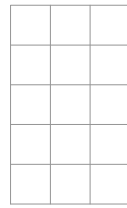
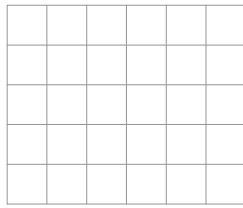
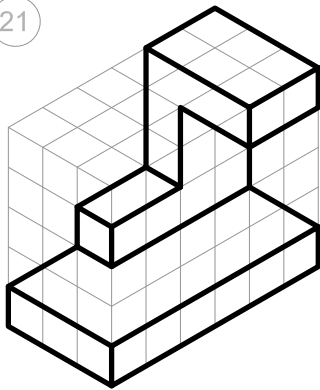
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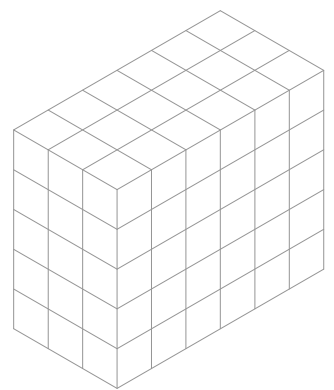
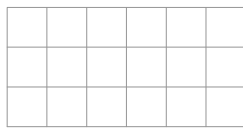
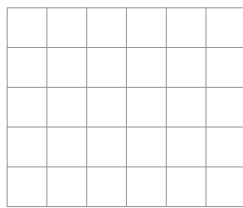
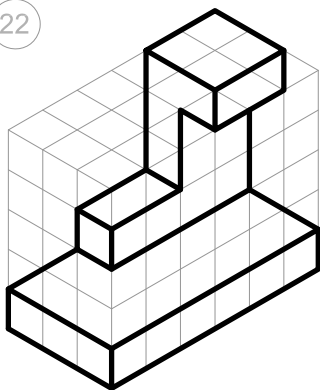
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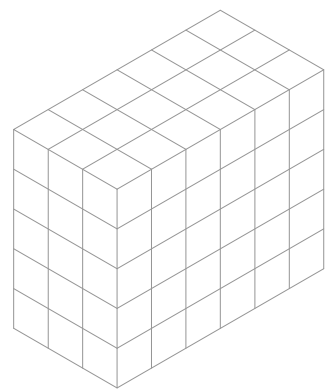
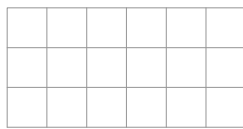
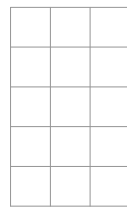
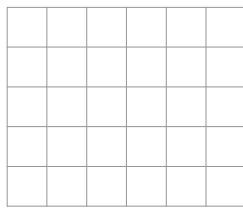
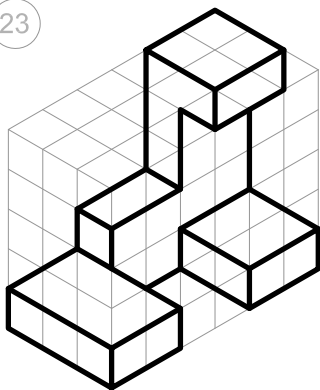
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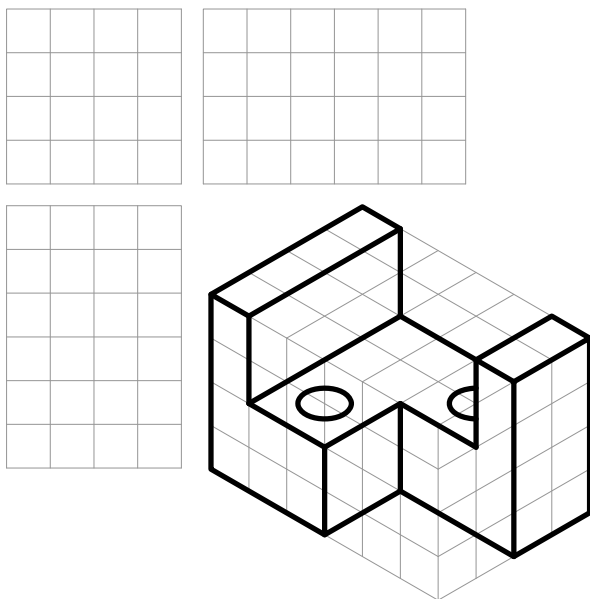
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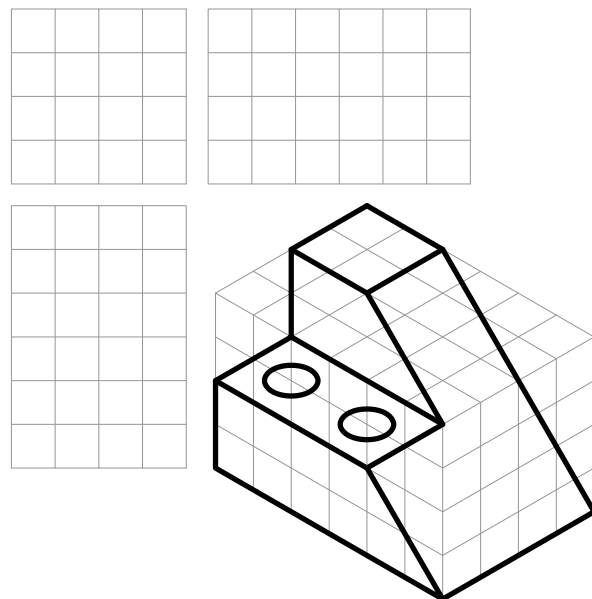
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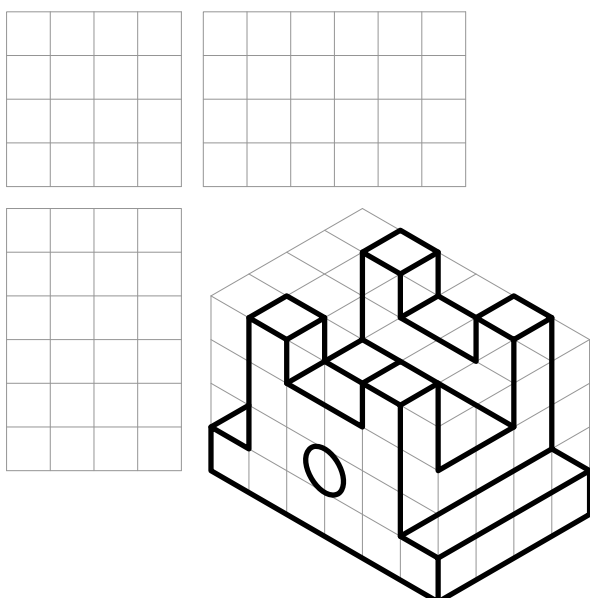
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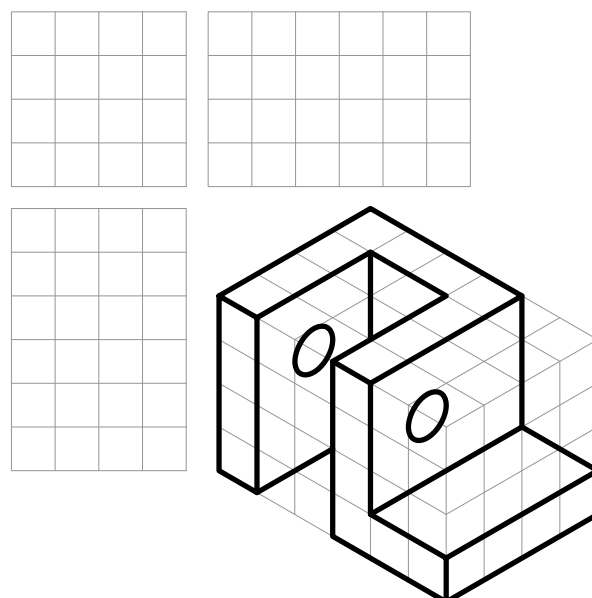
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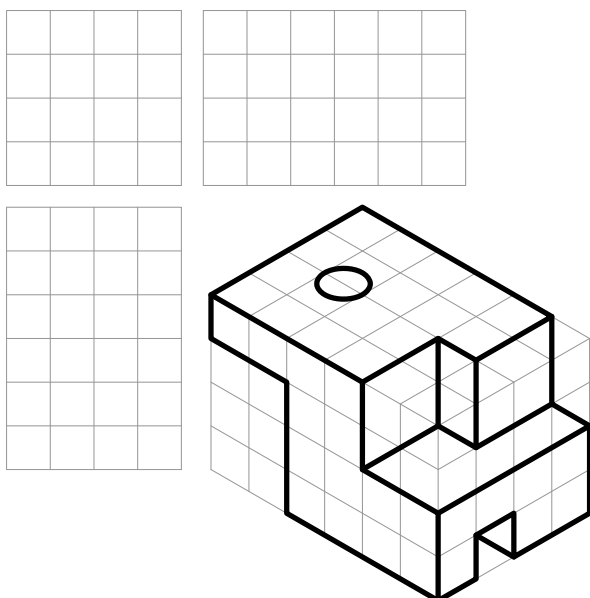
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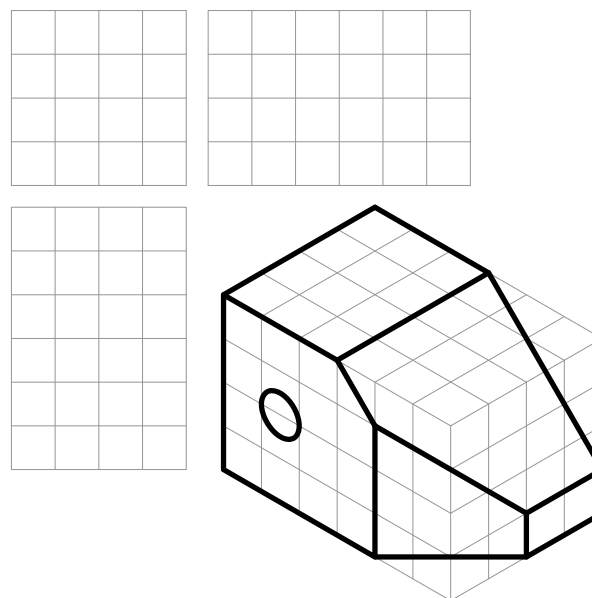
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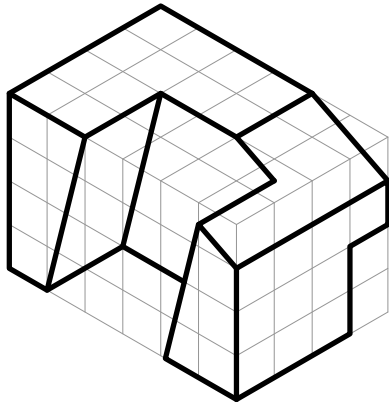
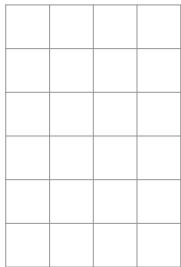
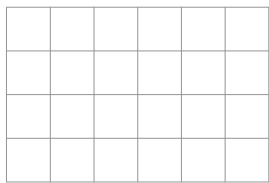
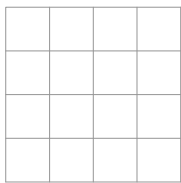
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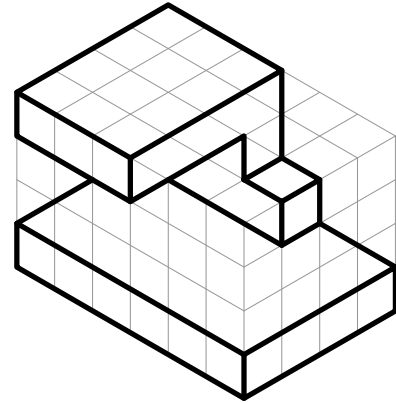
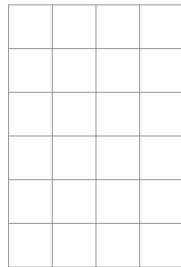
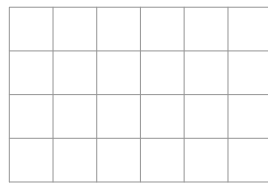
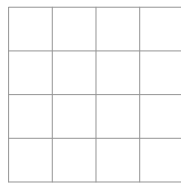
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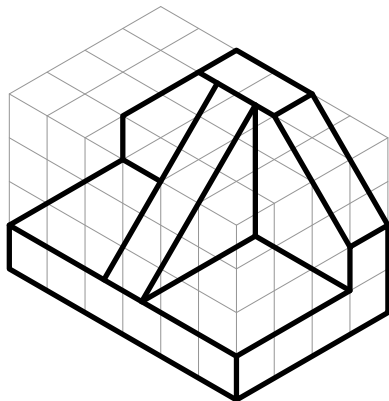
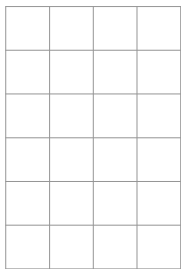
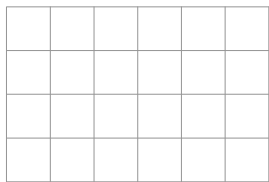
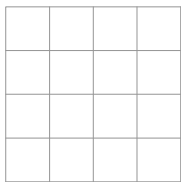
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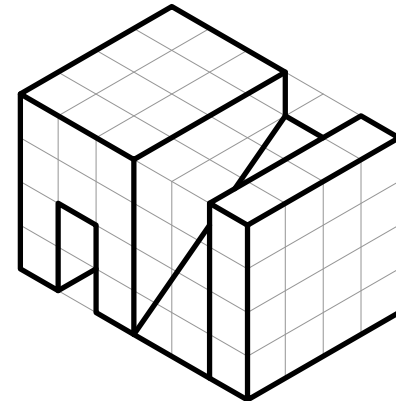
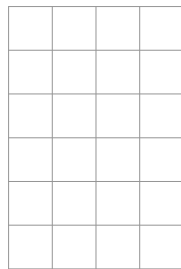
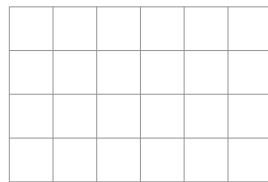
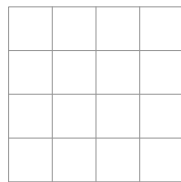
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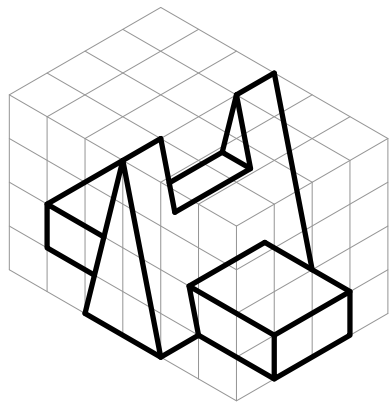
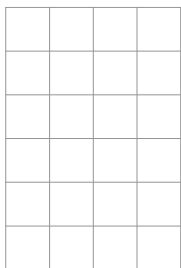
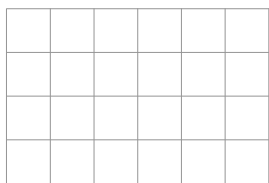
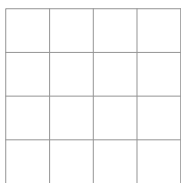
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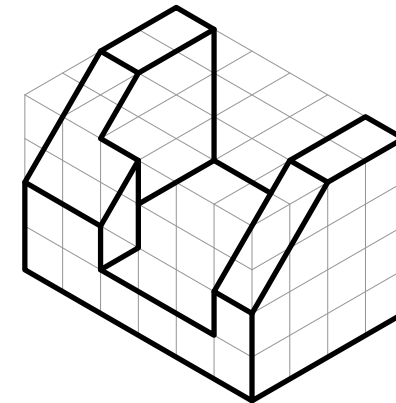
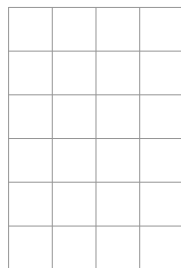
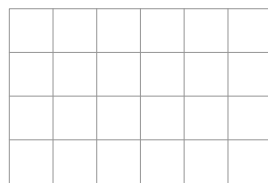
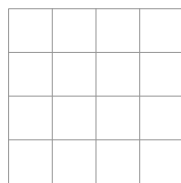
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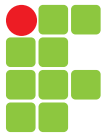


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INSTITUTO FEDERAL DE EDUCAÇÃO, CIÊNCIA E TECNOLOGIA DE SANTA CATARINA

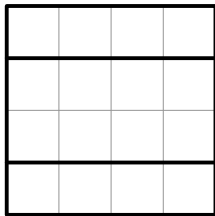
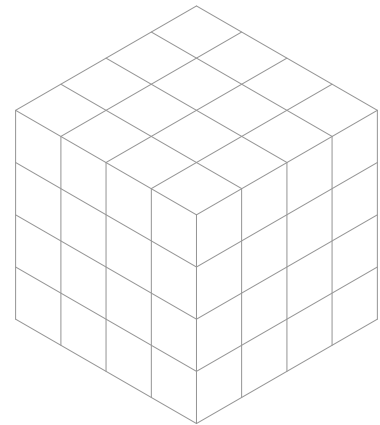
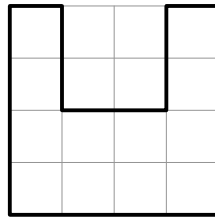
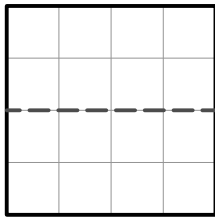
UC: Desenho Técnico

Profª Luciana da Rosa Espíndola (luciana.espindola@ifsc.edu.br)

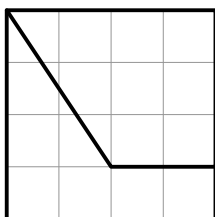
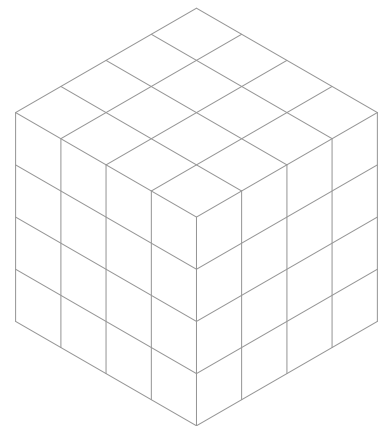
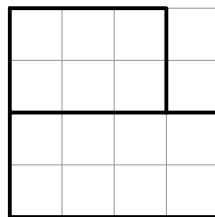
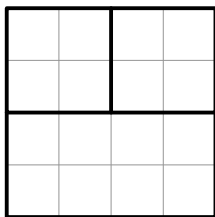
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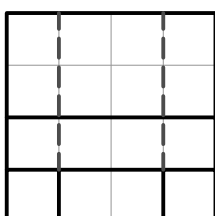
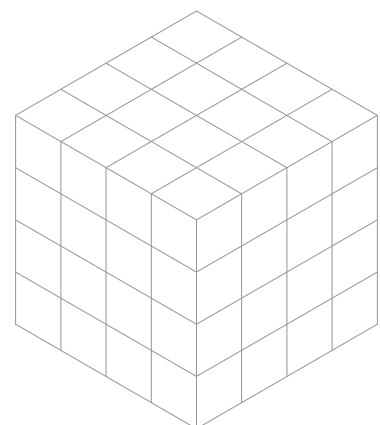
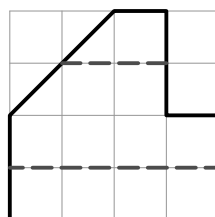
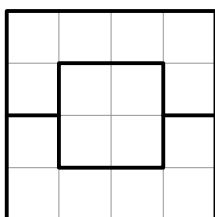
PERSPECTIVAS



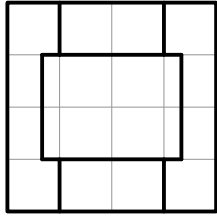
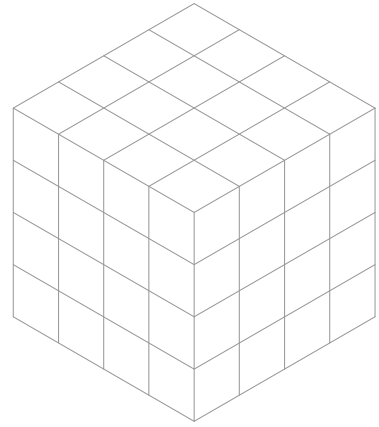
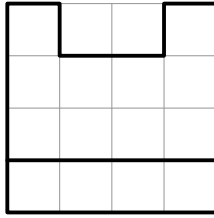
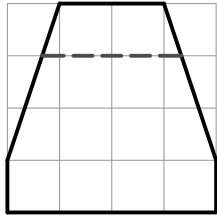
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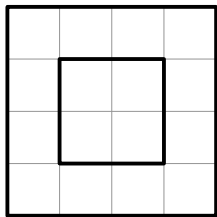
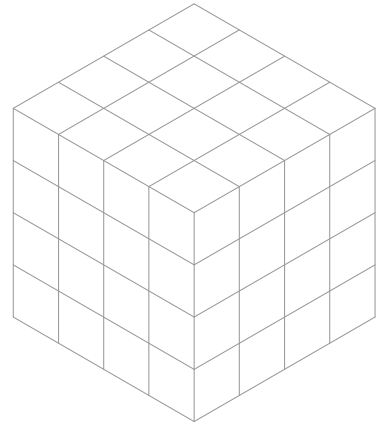
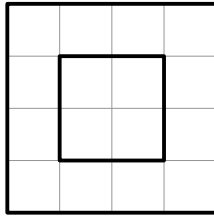
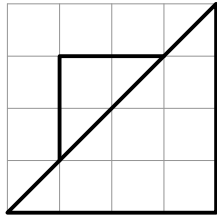
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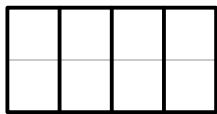
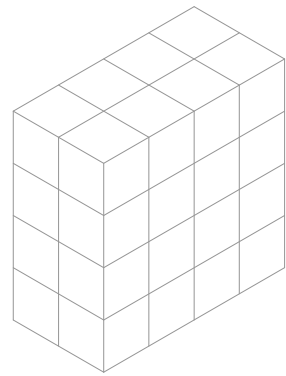
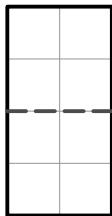
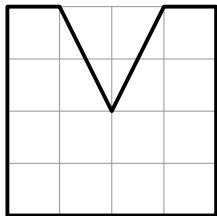
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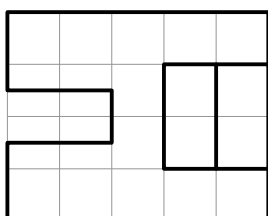
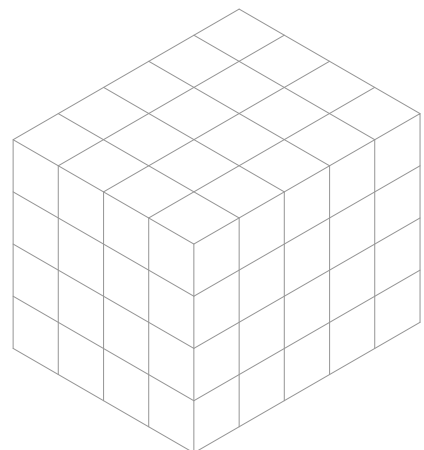
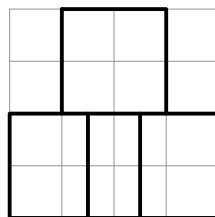
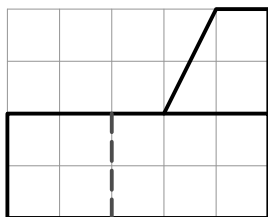
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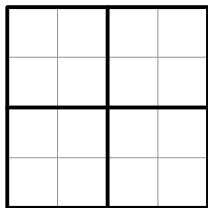
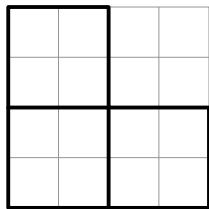
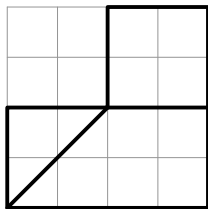
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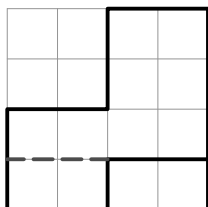
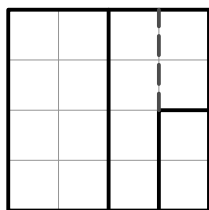
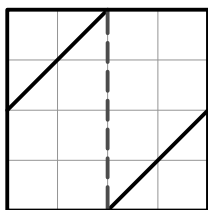
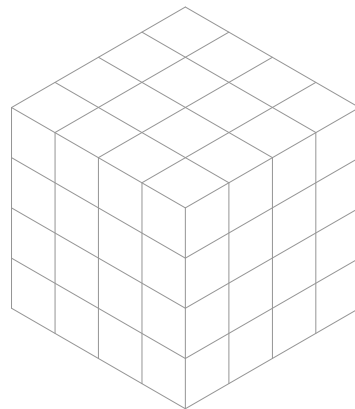
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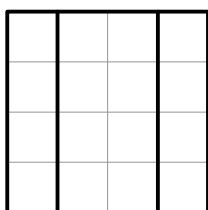
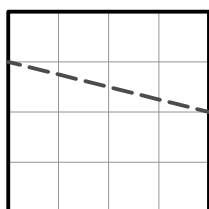
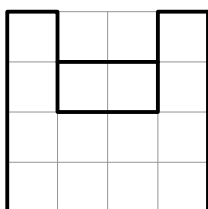
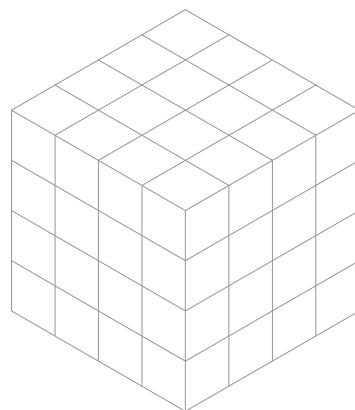
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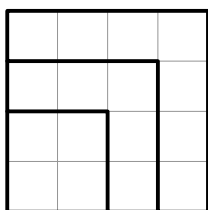
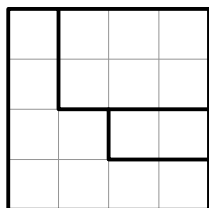
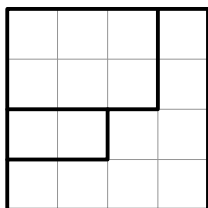
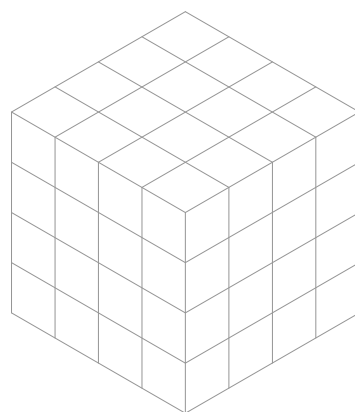
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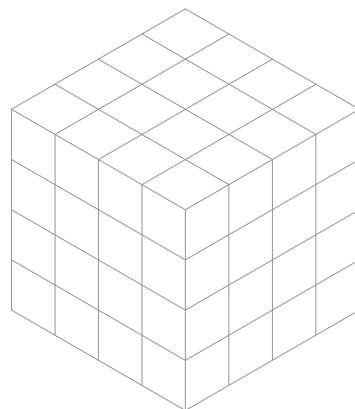
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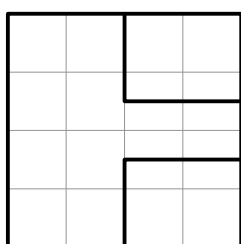
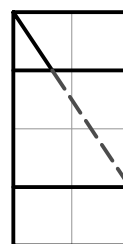
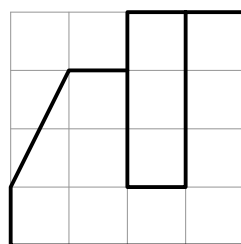
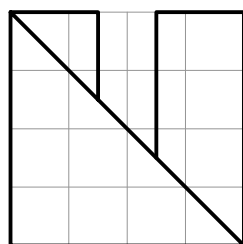
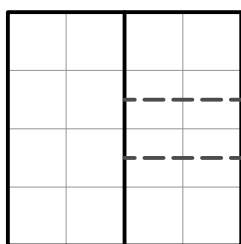
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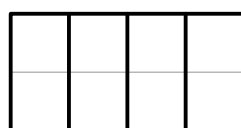
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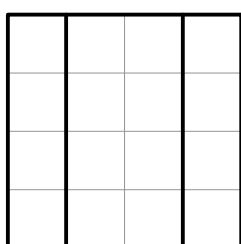
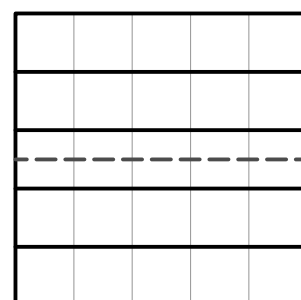
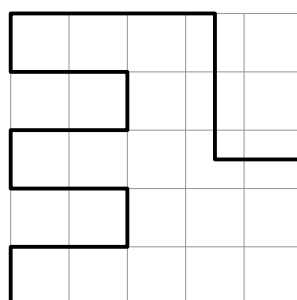
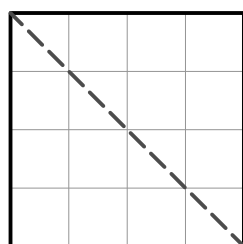
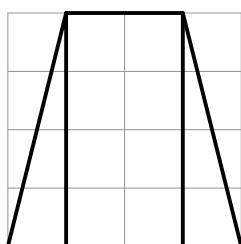
Em folha(s) A4, elaborar as perspectivas isométricas dos sólidos seguintes representados no primeiro diedro.
Cada quadrado equivale a 1 cm ou 0,5 cm.



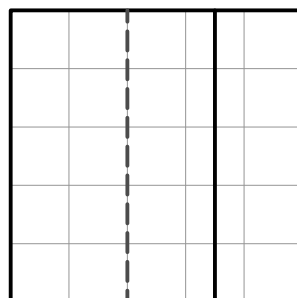
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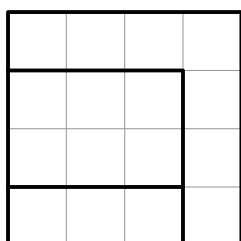
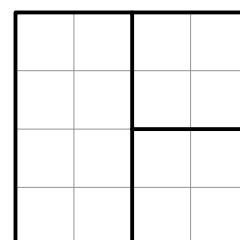
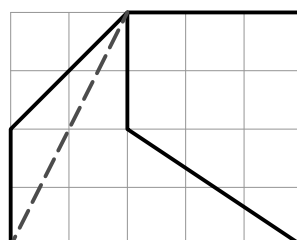
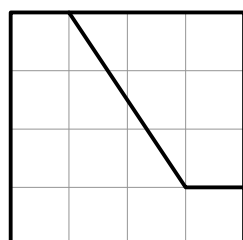
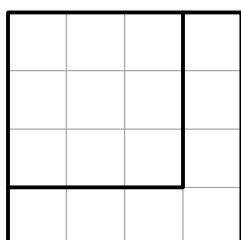
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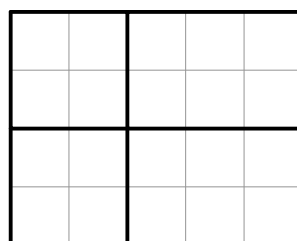
14



15



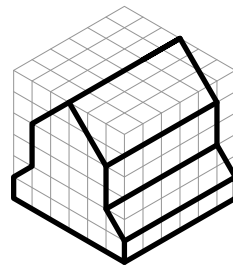
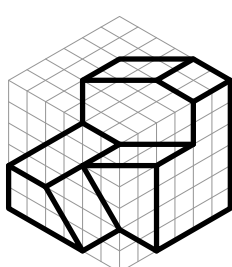
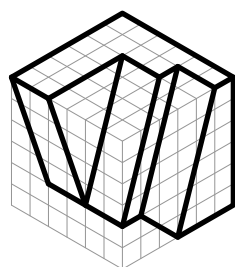
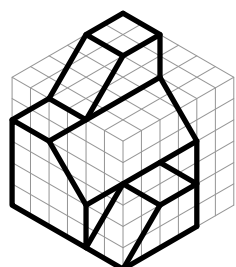
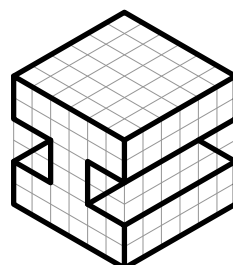
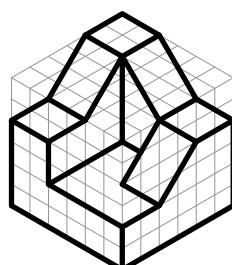
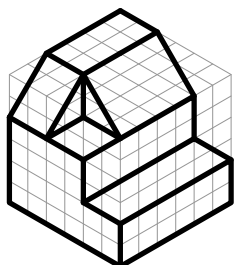
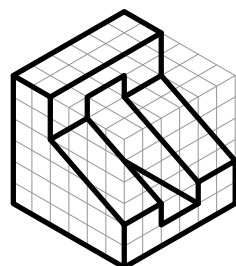
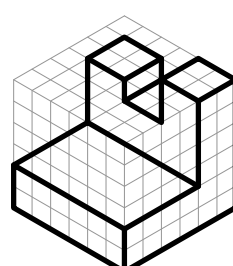
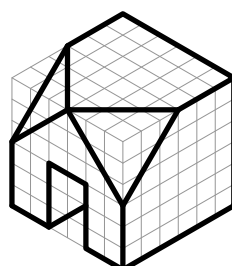
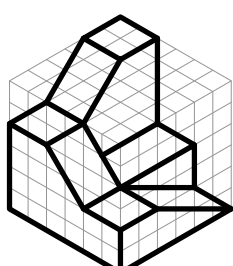
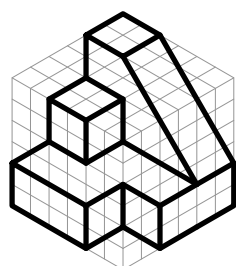
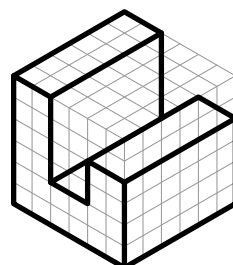
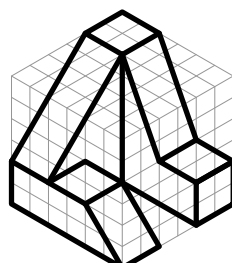
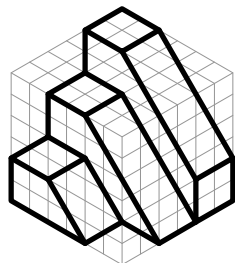
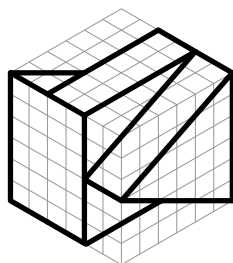
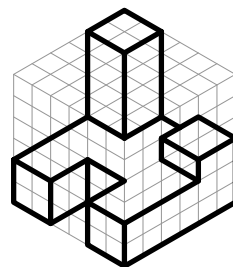
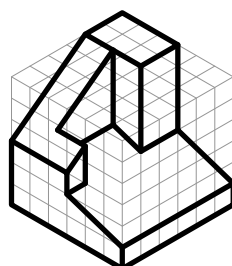
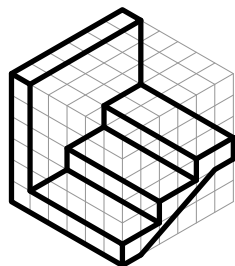
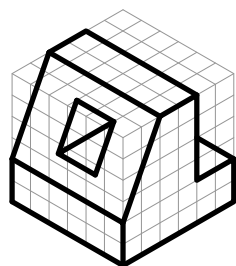
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17

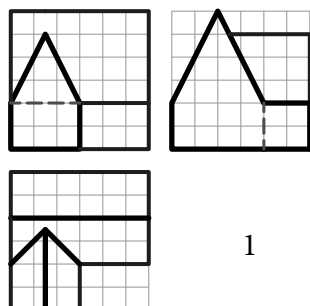


Exercícios - Vistas sólidos - 1º diedro

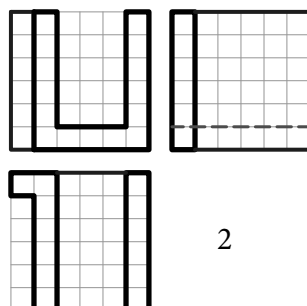




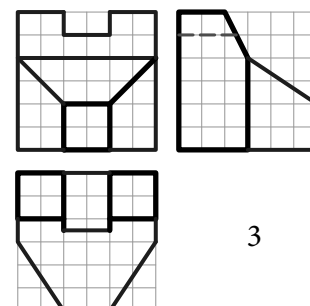
Exercícios - Perspectivas - 1º diedro



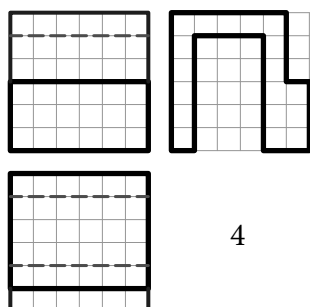
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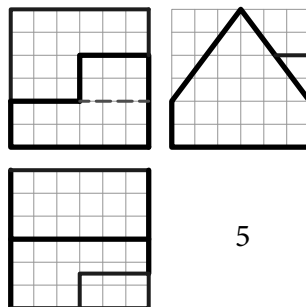
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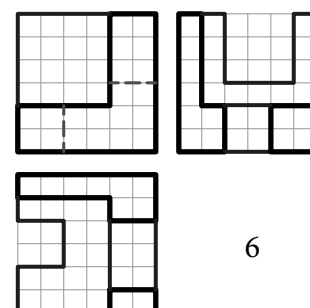
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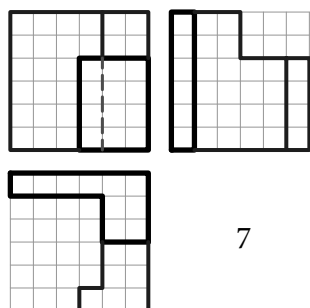
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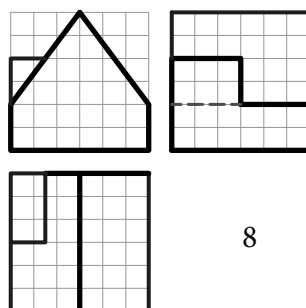
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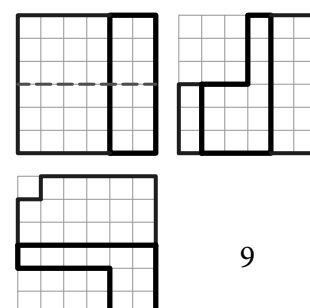
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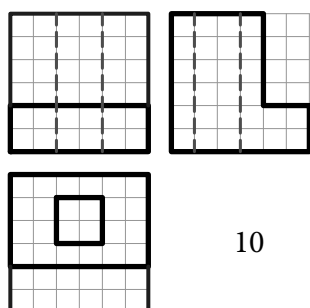
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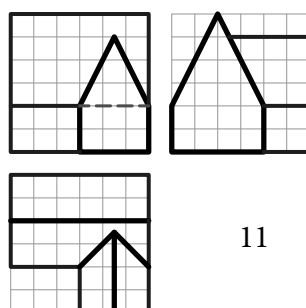
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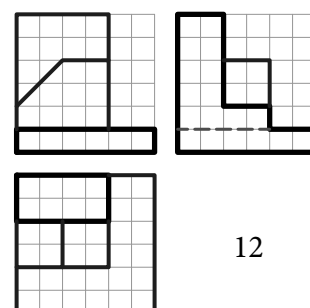
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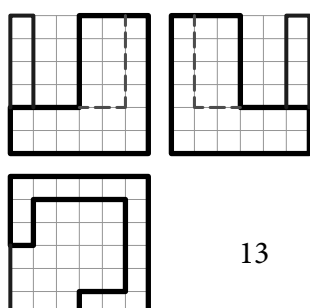
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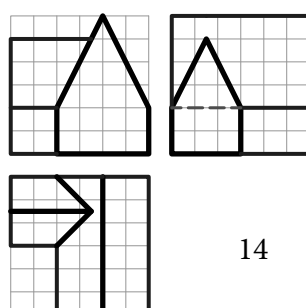
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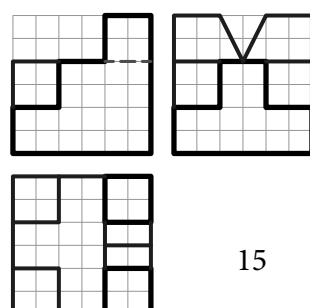
12



13



14



15

