

SEM 0564 - DESENHO TÉCNICO MECÂNICO I

Notas de Aulas v.2020

Aula 02 – Projeção: tipos, vistas e diedros

Prof. Assoc. Carlos Alberto Fortulan

Departamento de Engenharia Mecânica
Escola de Engenharia de São Carlos
Universidade de São Paulo



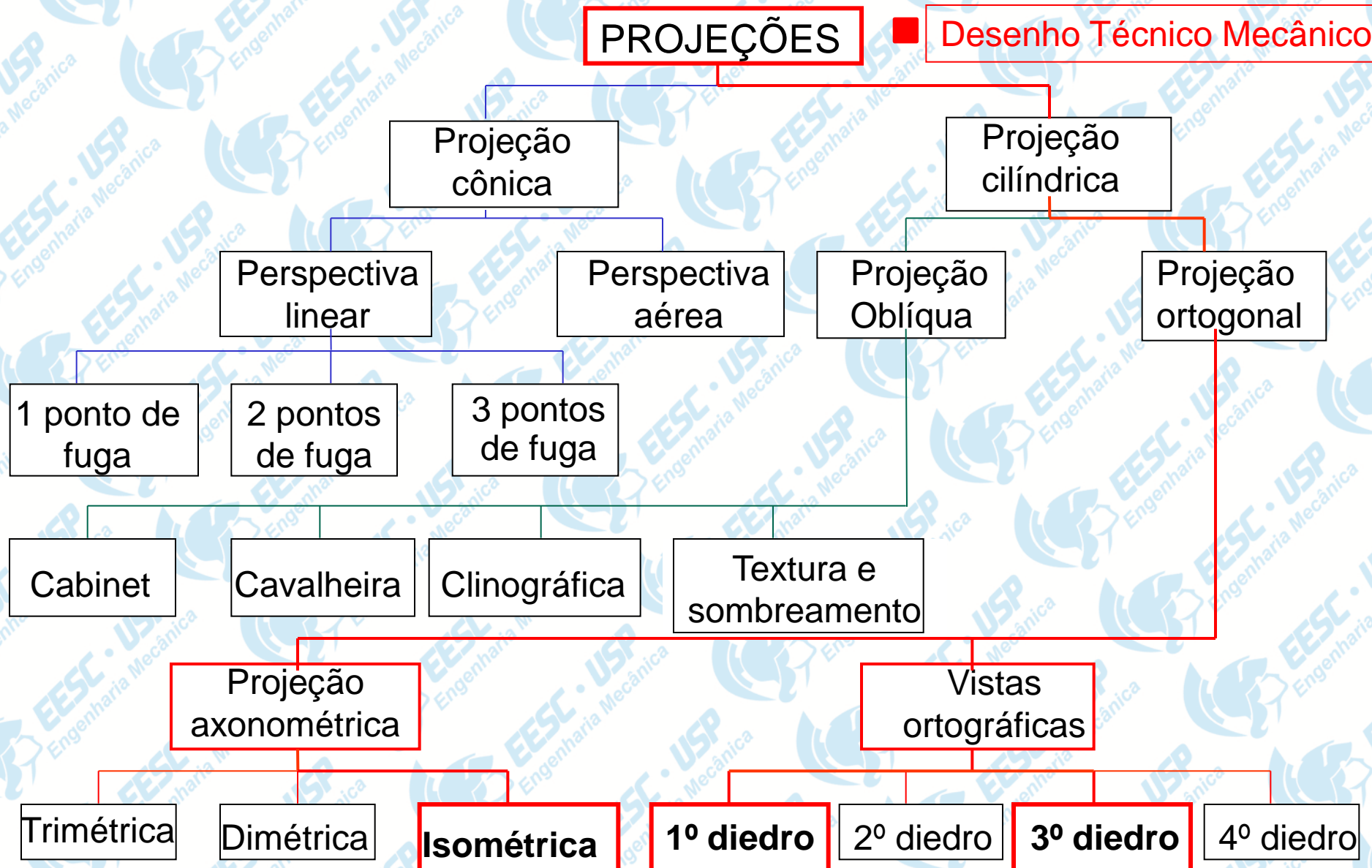
PROJEÇÕES

Utiliza-se de projeções para comunicar a forma de um desenho 3D (três dimensões) em uma folha de papel (2D – duas dimensões). São envolvidos 4 elementos nesta relação:

- O ponto de vista;
- O objeto;
- O plano de projeção;
- As retas projetantes ou linha de visada.

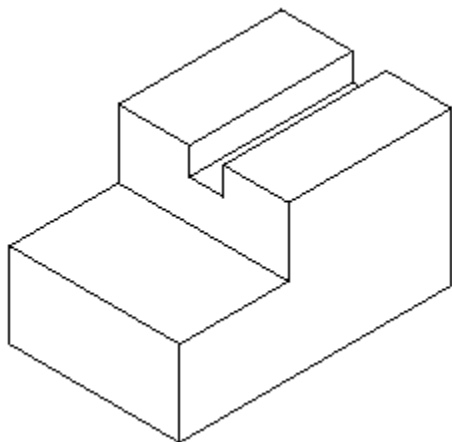
A projeção de um objeto em um plano é chamada de **Vista**.



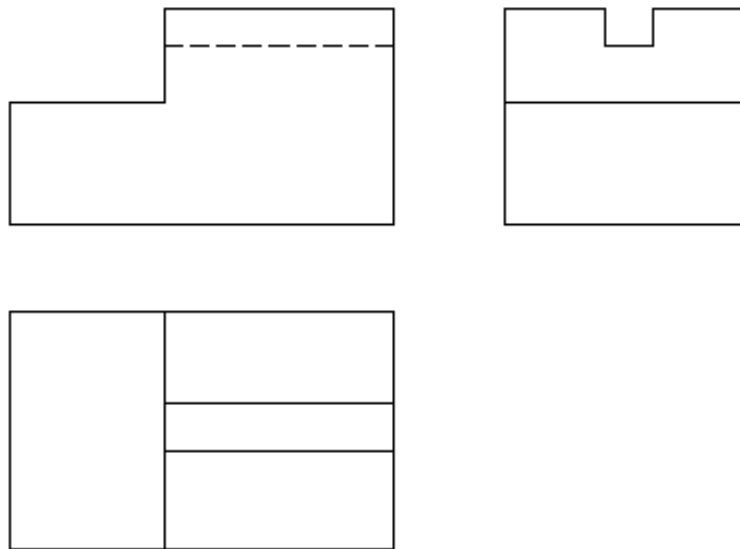


Tipos de Desenho

Perspectiva



Vistas ortográficas

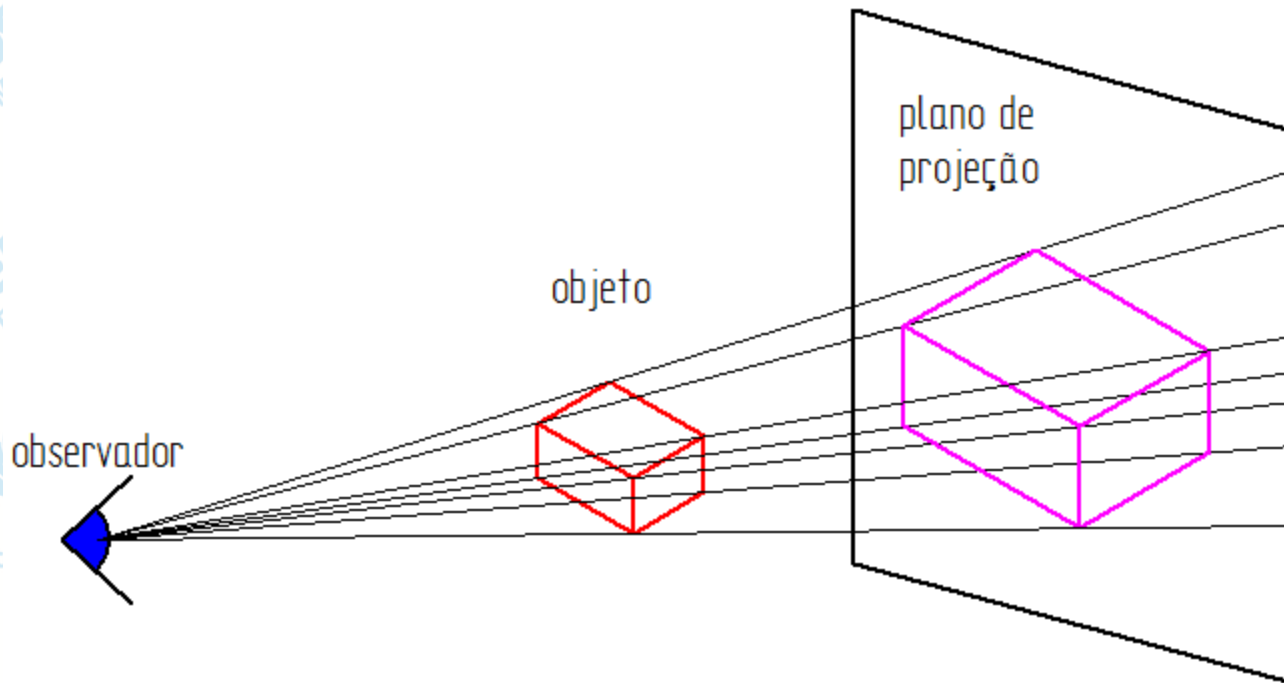


Figuras resultantes de projeção cilíndrica ou cônica sobre um único plano, com a finalidade de permitir a percepção da forma global de um objeto.

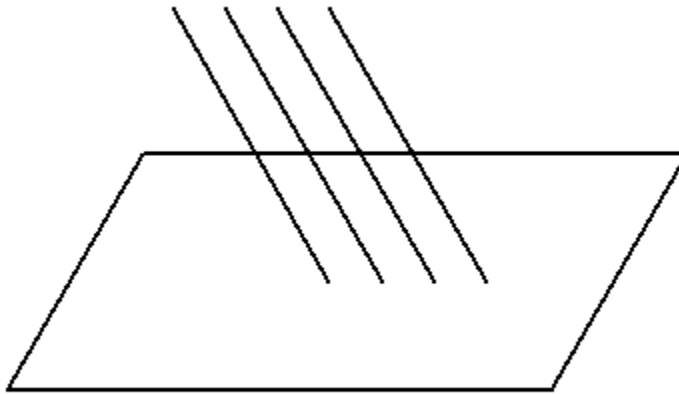
Figuras resultantes de projeções ortogonais de modo a representar com exatidão a forma do objeto com seus detalhes.



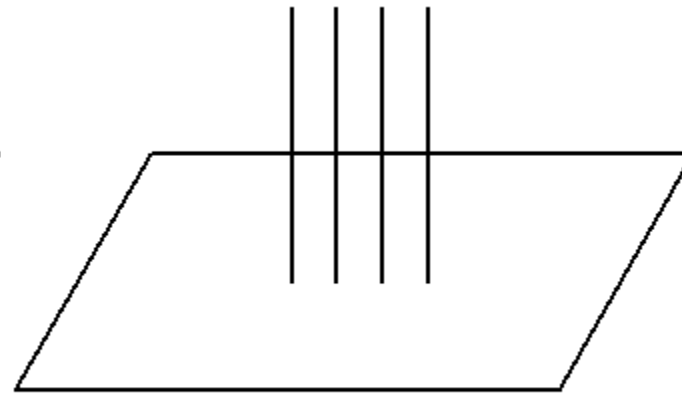
PROJEÇÕES – Perspectiva cônica



PROJEÇÕES – Perspectivas cilíndricas



Projeção oblíqua



Projeção ortogonal



Projeções axonométricas

Perspectiva isométrica

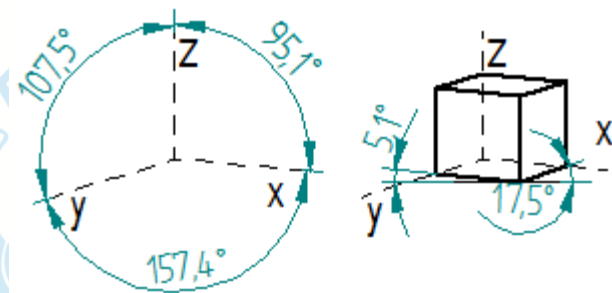
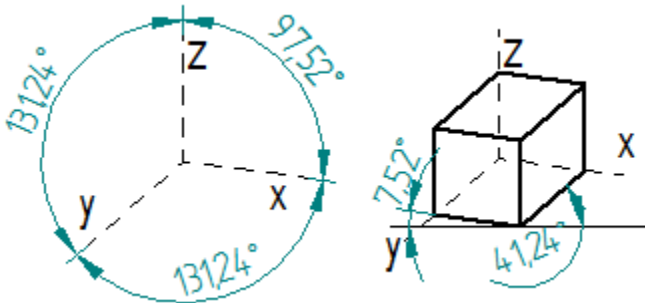
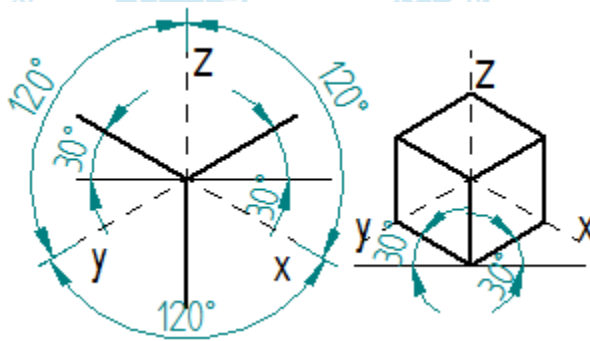
- Eixos axonométricos – 120 graus
- Coeficientes de redução iguais nos três eixos

Perspectiva dimétrica

- Eixos axonométricos – dois ângulos iguais e um diferente
- Coeficientes de redução iguais em dois eixos e um diferente

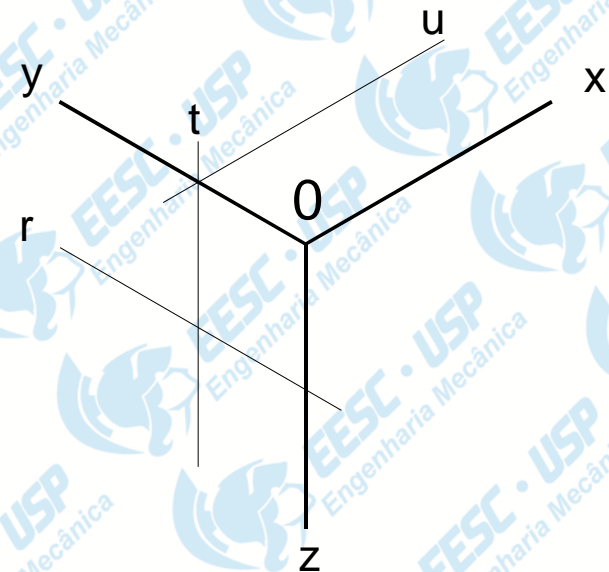
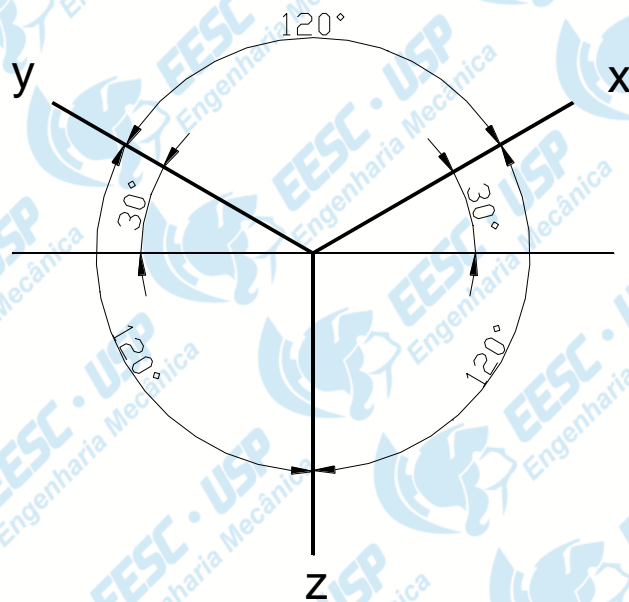
Perspectiva trimétrica

- Eixos axonométricos – três ângulos diferentes
- Coeficientes de redução diferentes em todos os eixos



Perspectiva isométrica (projeção isométrica)

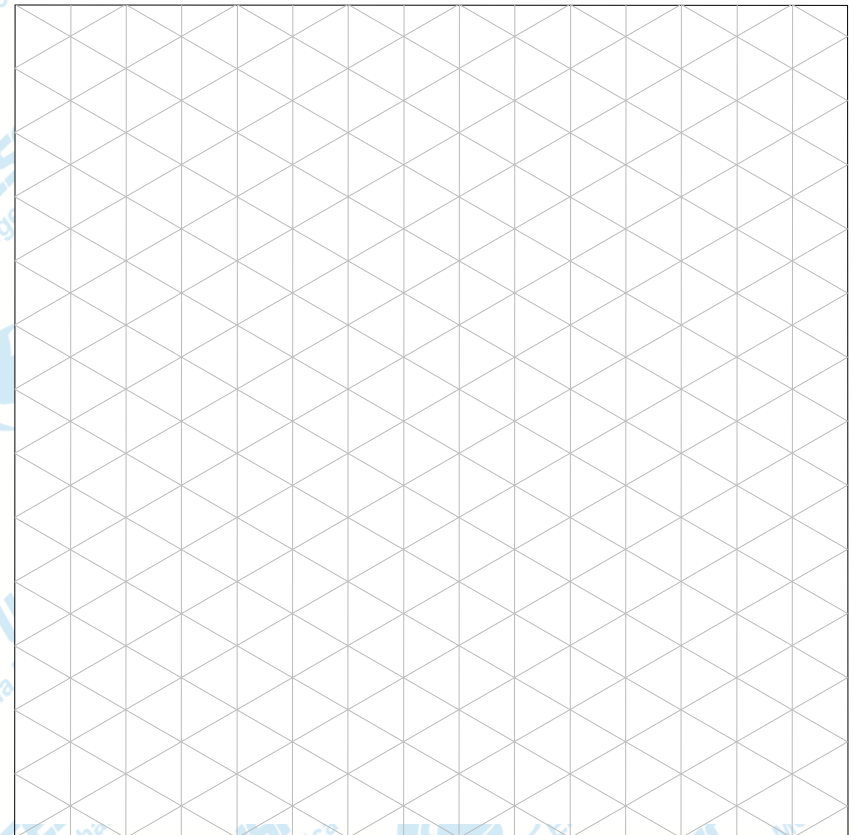
Em perspectiva isométrica os três eixos (x,y,z) formam entre si ângulos de 120° . Os eixos oblíquos formam com a horizontal ângulos de 30° . Toda linha paralela aos eixos isométricos são chamadas de linhas isométricas.



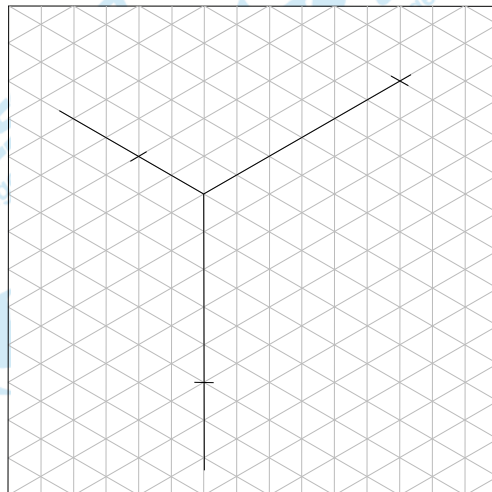
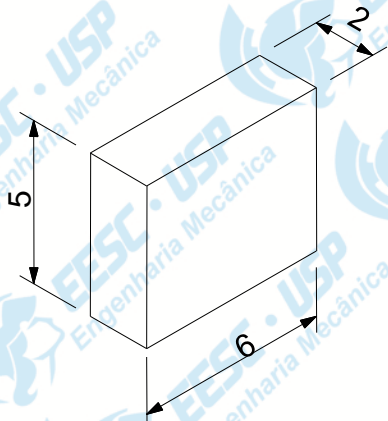
Perspectiva isométrica - traçado

A utilização da projeção isométrica provoca redução igual em todos os eixos de aproximadamente 19%. Por serem iguais utiliza-se do tamanho real do objeto e a proporção será mantida, isto é chamado de perspectiva isométrica simplificada.

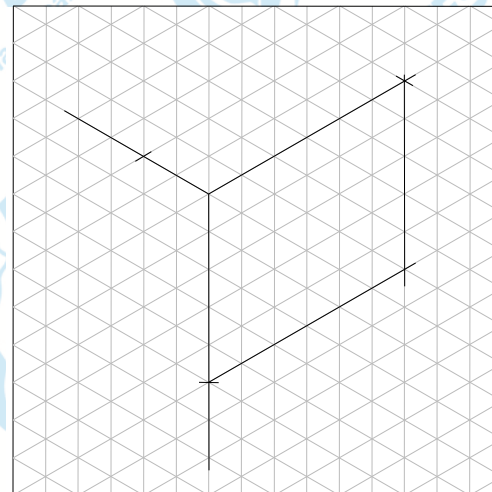
O uso do papel reticulado simplifica o aprendizado.



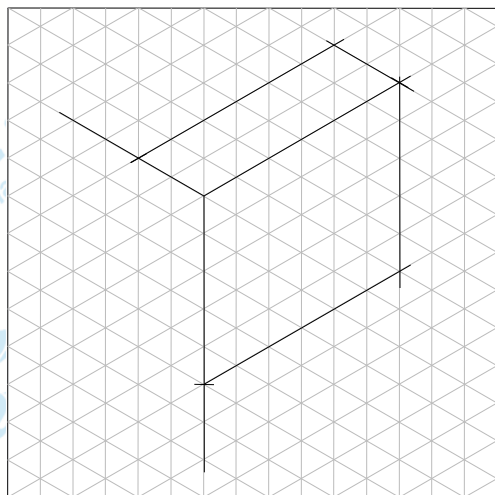
Perspectiva isométrica – exemplo prisma retangular



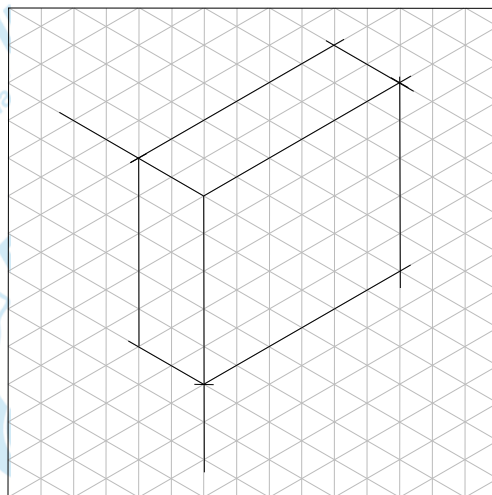
01 - marcar dimensões



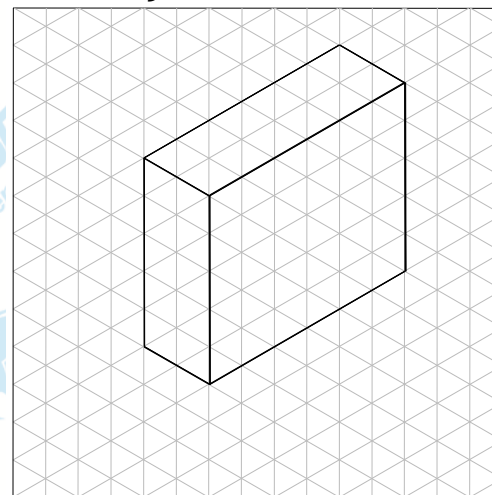
02 - traçar a face frontal



03 - traçar a face superior



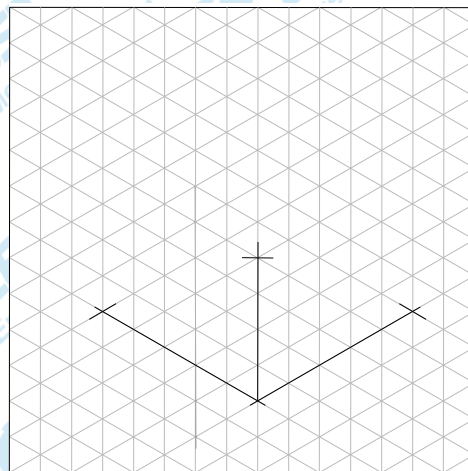
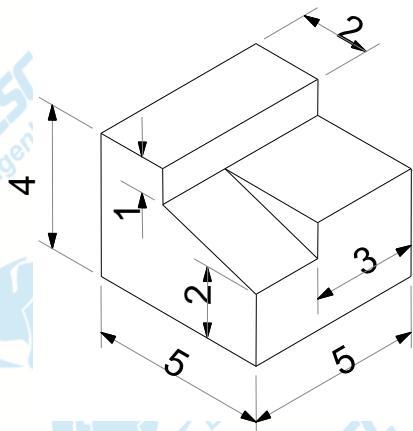
04 - traçar a lateral esquerda



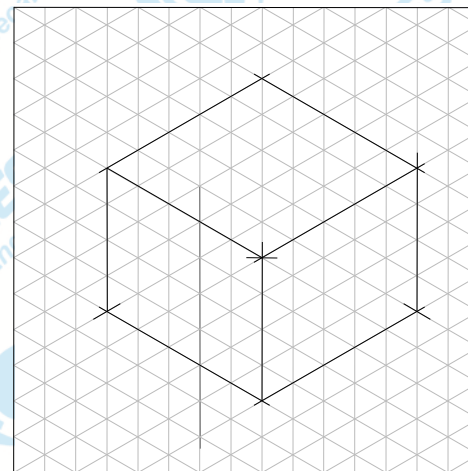
05 - apagar linhas de construção e reforçar contornos



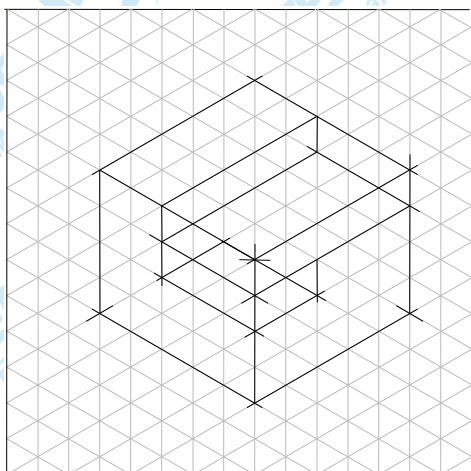
Perspectiva isométrica – elementos paralelos e oblíquos



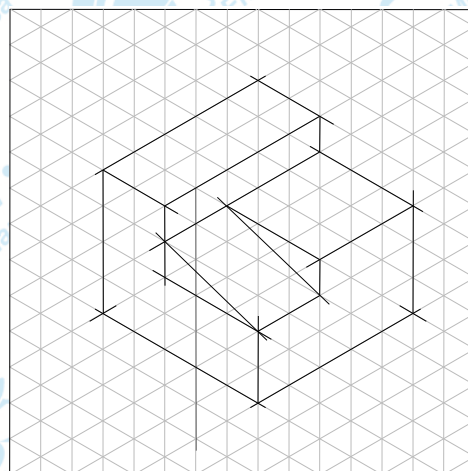
01 - marcar dimensões



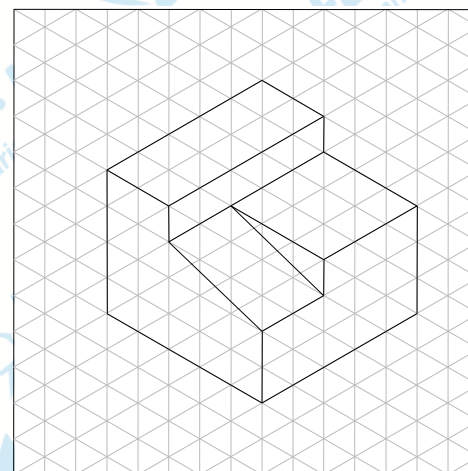
02 - traçar as três faces



03 - traçar os detalhes paralelos e apagar linhas excedentes.



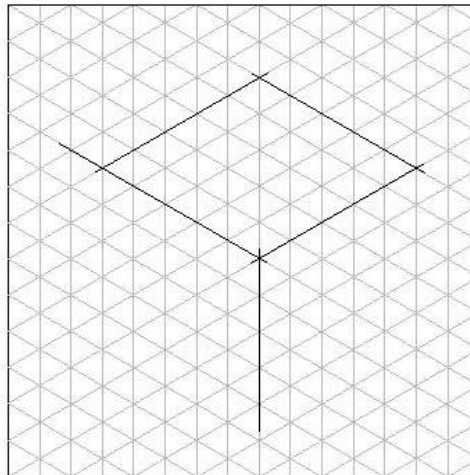
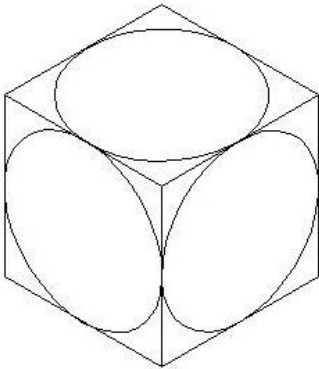
04 - traçar os segmentos oblíquos e apagar linhas excedentes



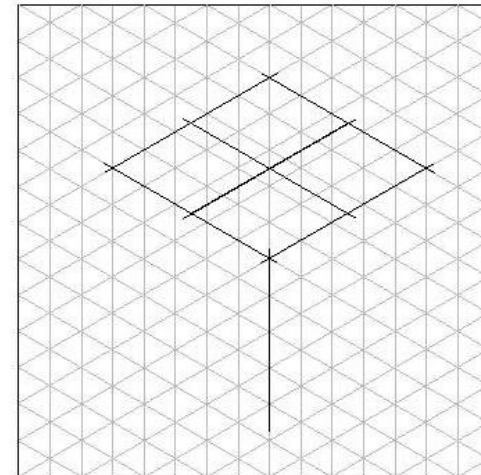
05 - apagar linhas de construção e reforçar contornos



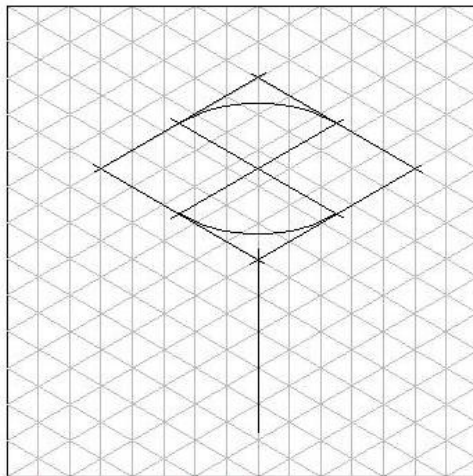
Perspectiva isométrica – círculo



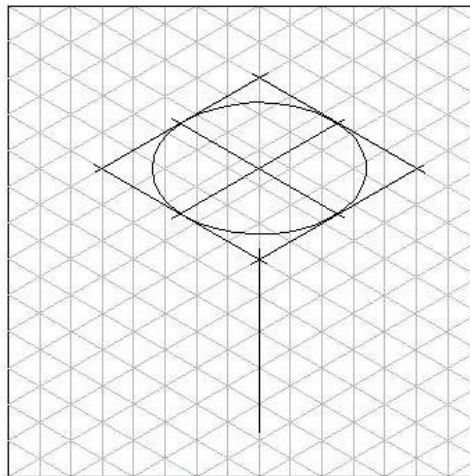
01 - marcar dimensões



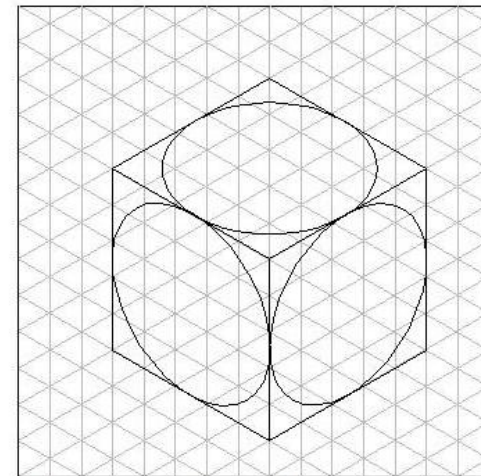
02 - traçar face e dividir em quatro partes iguais



03 - traçado das linhas curvas



04 - concluir traçado das linhas curvas

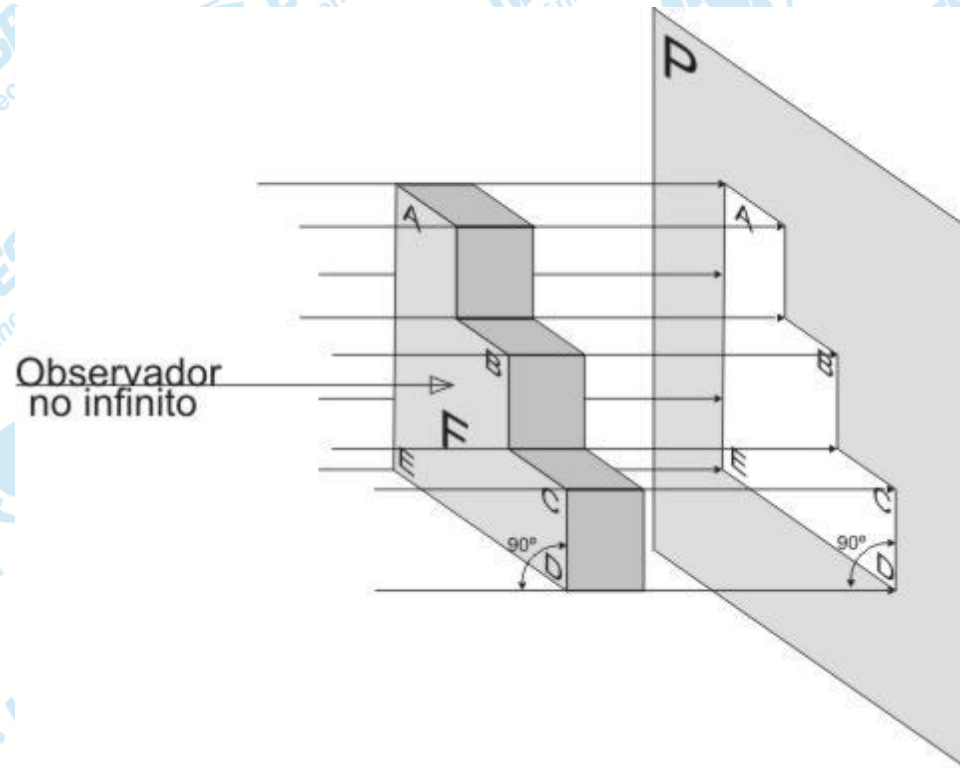


05 - apagar linhas de construção e reforçar contornos



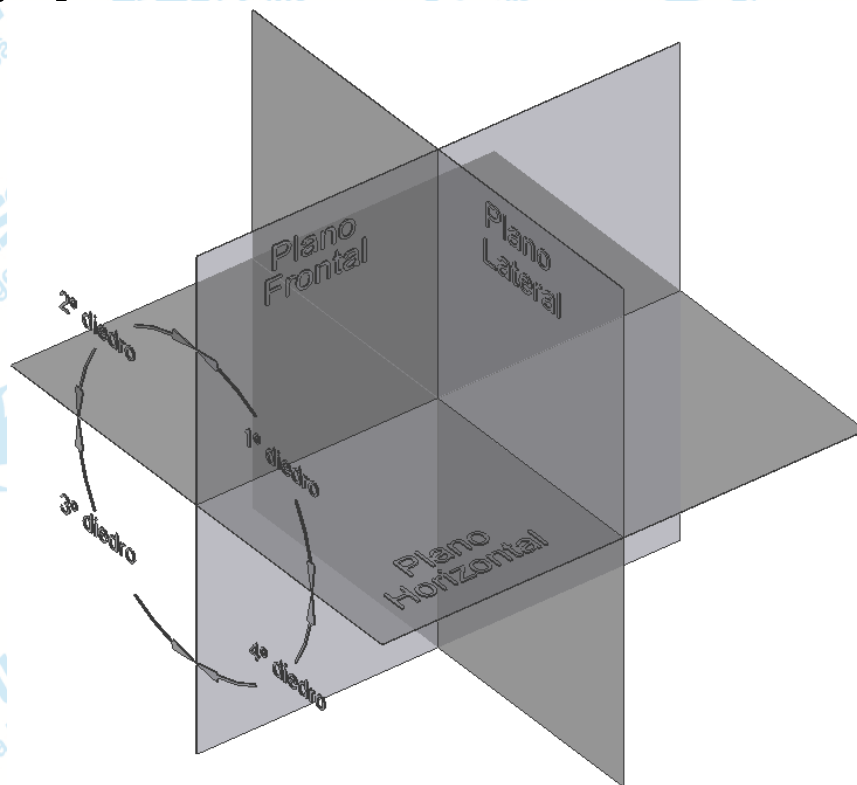
Projeções ortográficas

Linhas projetantes paralelas entre si e perpendiculares ao plano de projeção reproduzem no plano uma imagem com o mesmo contorno e mesma grandeza do objeto. Na Projeção Ortográfica, a figura plana considerada é reproduzida em verdadeira grandeza.



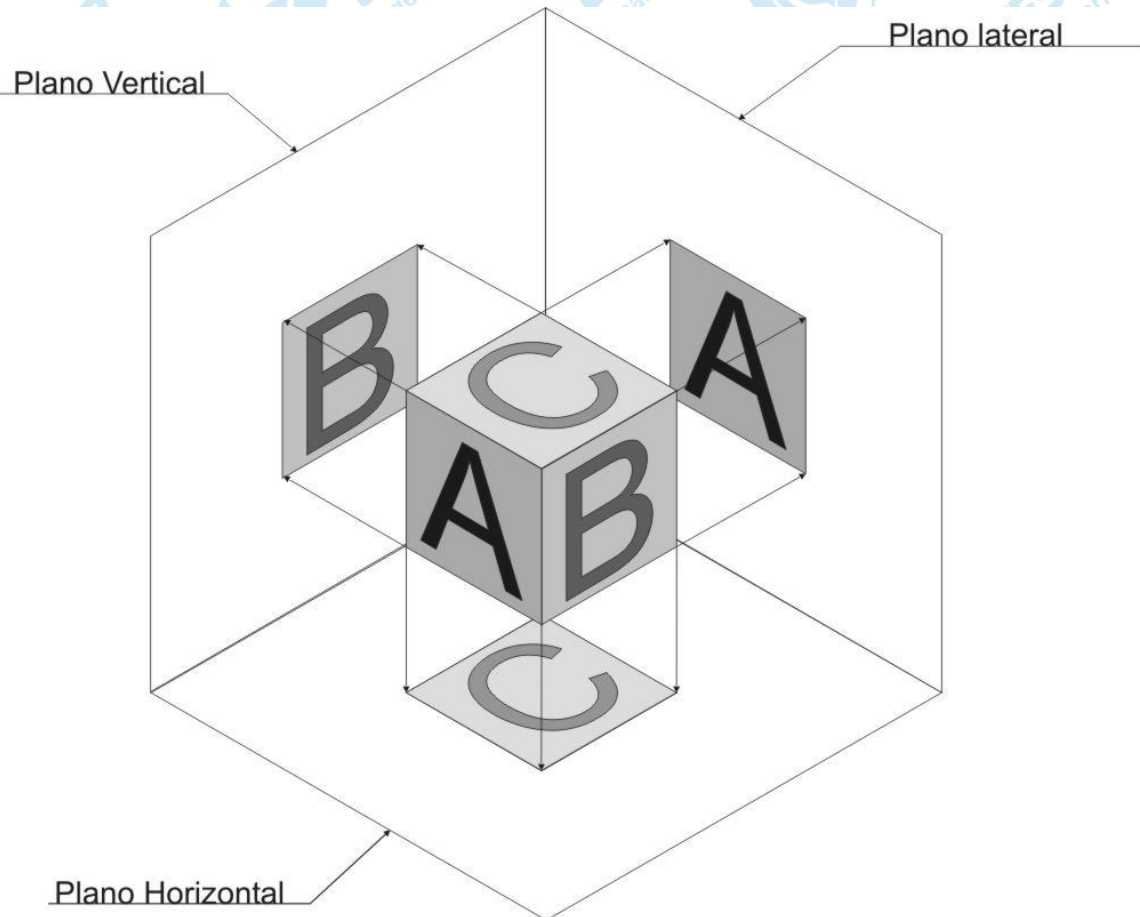
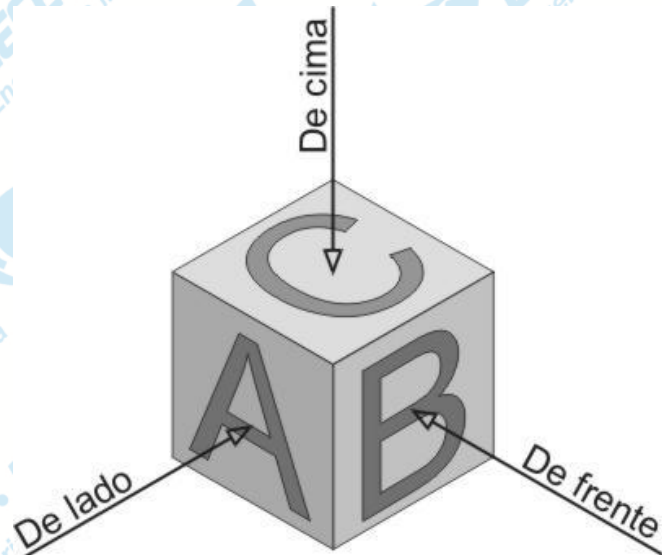
Projeção ortográfica - Diedros

Em Desenho Técnico apenas os 1º e 3º diedros tem aplicação difundida. No Brasil, assim como na Europa, Ásia e em outros países usa-se da projeção no **1º diedro**, nos EUA e no Canadá se aplica a projeção no **3º diedro**.

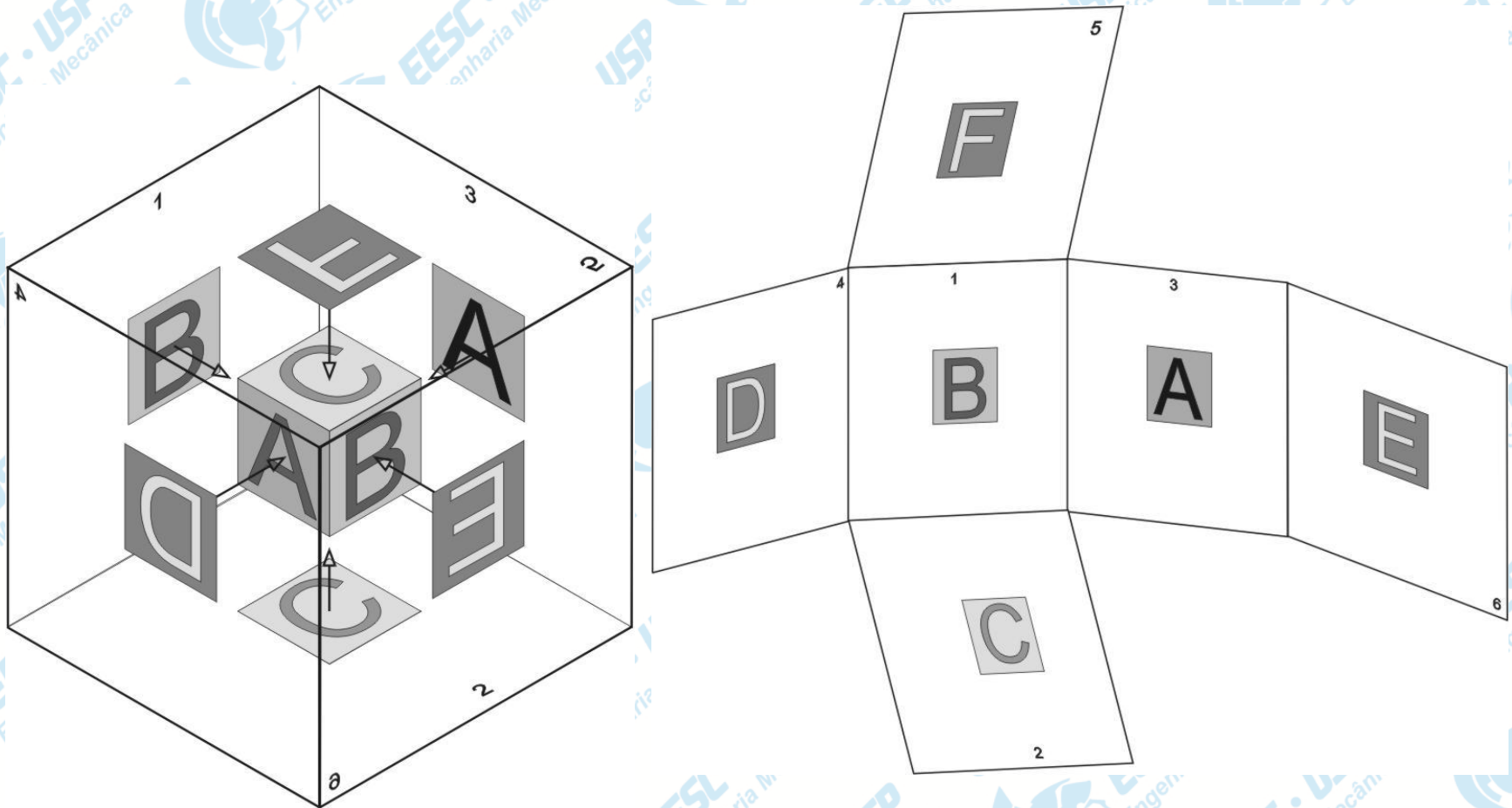


Projeção ortogonal no 1º Diedro - procedimento

Objeto: cubo



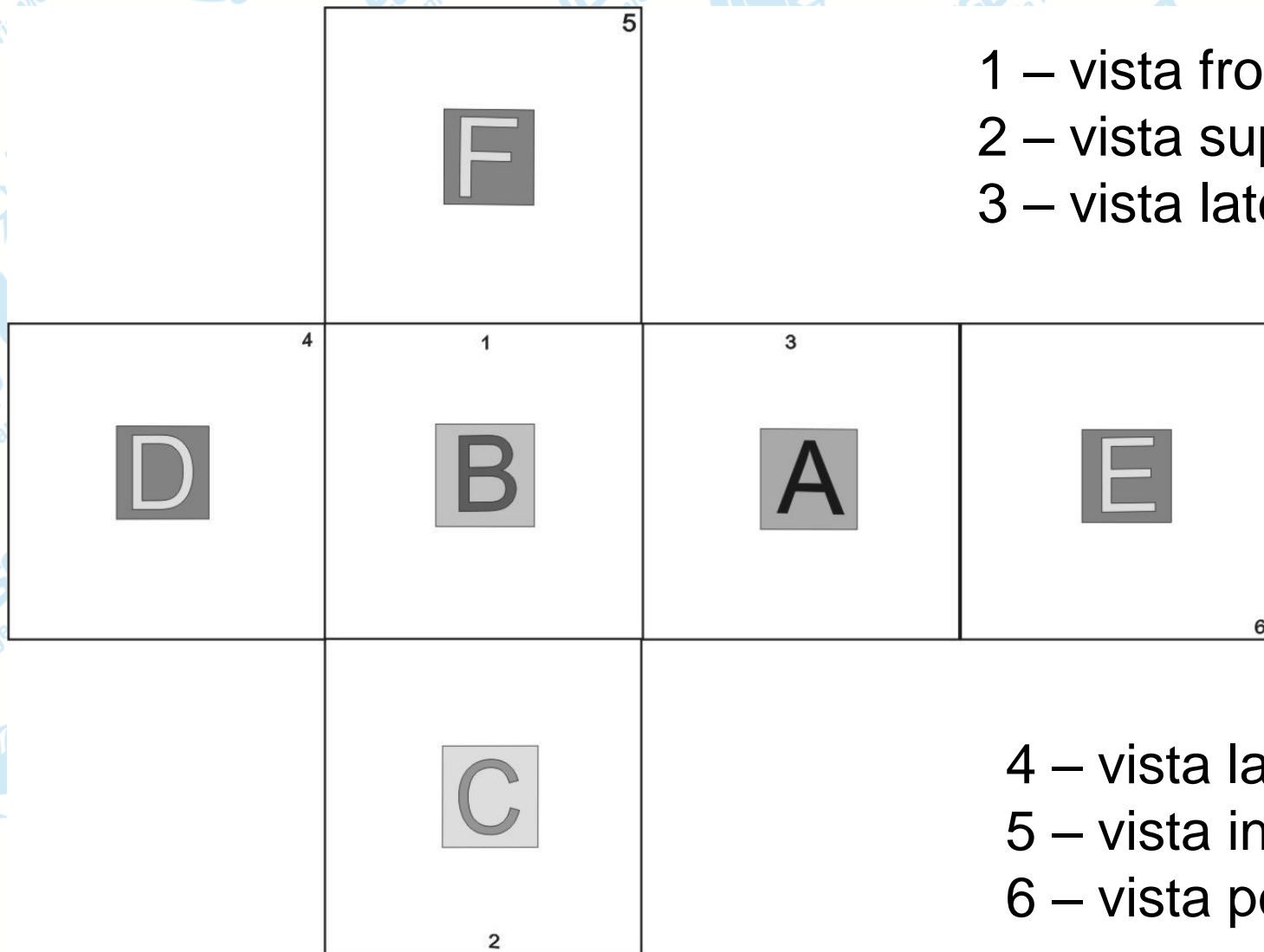
Projeção ortogonal no 1º Diedro - procedimento



Projeção completa



Projeção completa com o nome das vistas

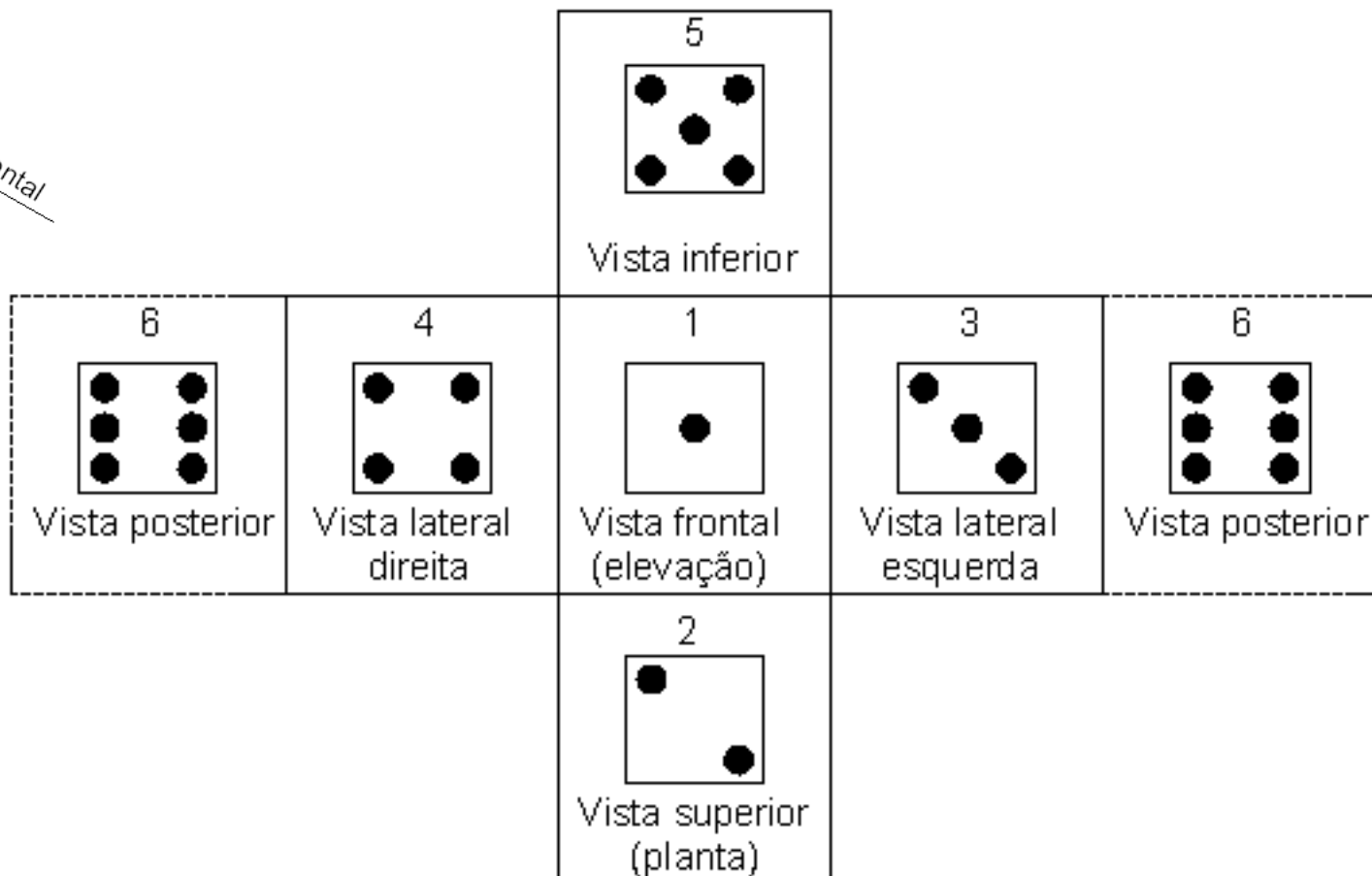
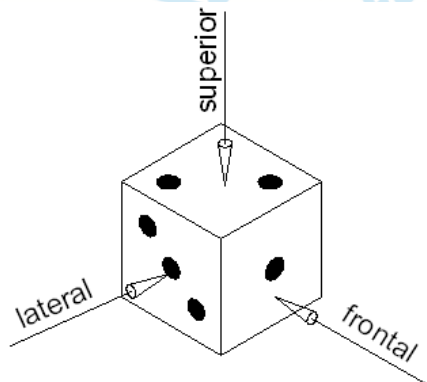


1 – vista frontal (elevação)
2 – vista superior (planta)
3 – vista lateral esquerda

4 – vista lateral direita
5 – vista inferior
6 – vista posterior

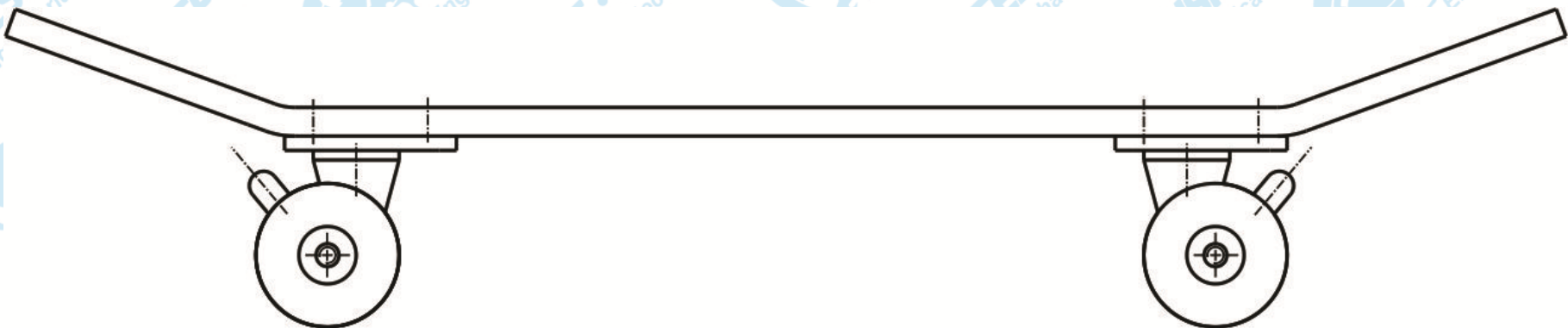
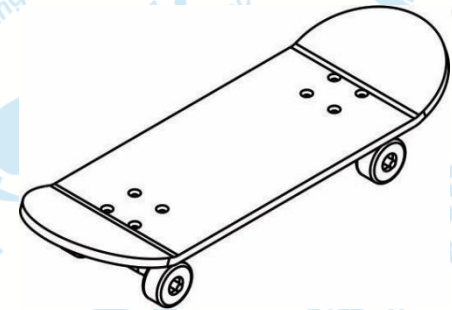


Projeção completa de um dado (nome e posição das vistas)



Projeção ortográfica - Vista frontal (antiga elevação)

A vista frontal é escolhida pelo desenhista/projetista como a principal vista que projetada no plano frontal representa uma peça. Sua projeção será neutra quanto ao diedro utilizado. Geralmente é a vista mais comum aos olhos dos observadores.



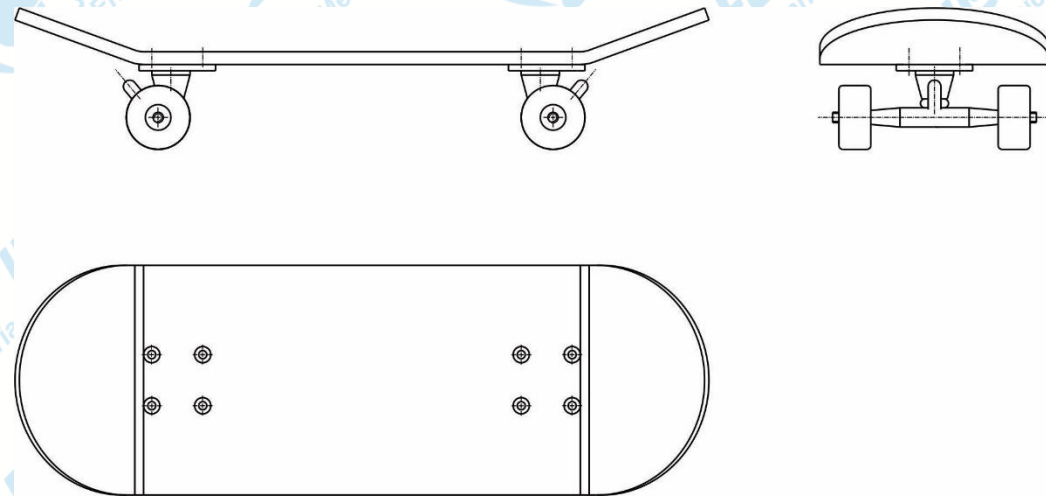
Projeção ortográfica - demais vistas

Em desenho técnico a **redundância** de informação é considerada um **grave erro** e inclui o número de vistas projetadas, somente se aplica as vistas indispensáveis para a interpretação tridimensional do desenho. Simbologias e linhas de simetria podem ser aplicadas em uma vista para “dispensar” uma outra vista. Ex: símbolo de diâmetro (\varnothing) e linhas de centro pode denotar uma peça cilíndrica.

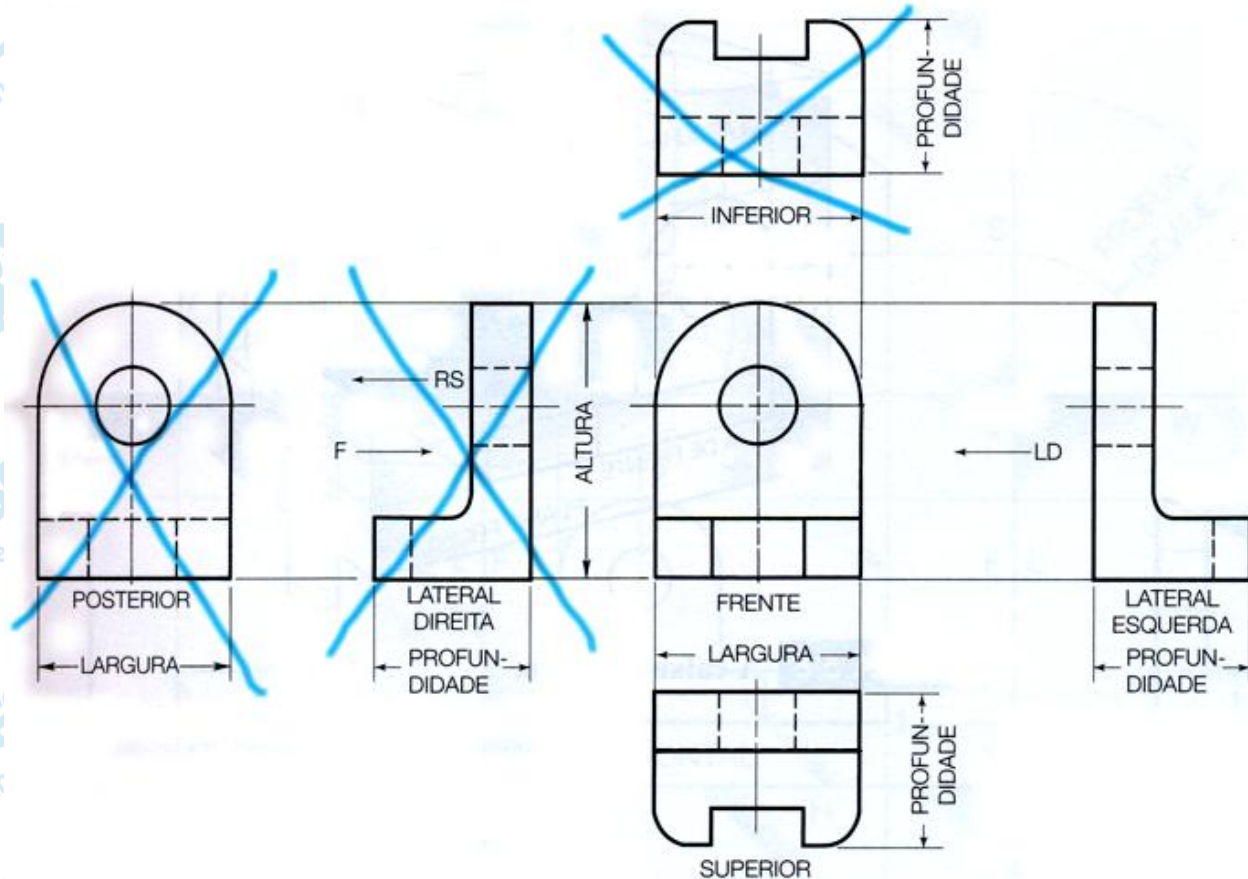
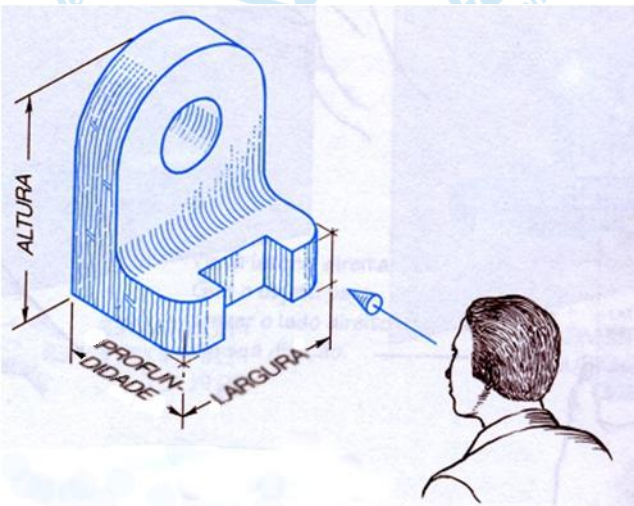
No 1º Diedro, preferencialmente, as demais vistas projetadas são:

Lateral Esquerda e Superior

(ou Planta) que são situadas à direita e em baixo da vista frontal, respectivamente.



Projeção ortogonal no 1º Diedro - Exemplo

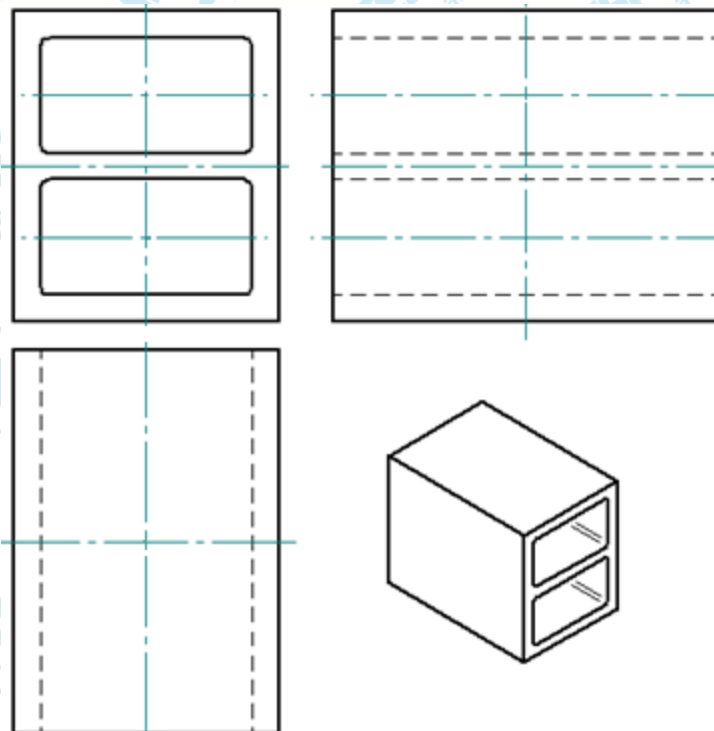


Vistas desnecessárias



Projeções ortogonais – Linhas de centro e simetria

Nas projeções ortogonais, quando peças simétricas, rasgos, rebaxos e furos são representados, deve-se fazer a marcação das linhas de simetria do objeto e de centro para os demais.

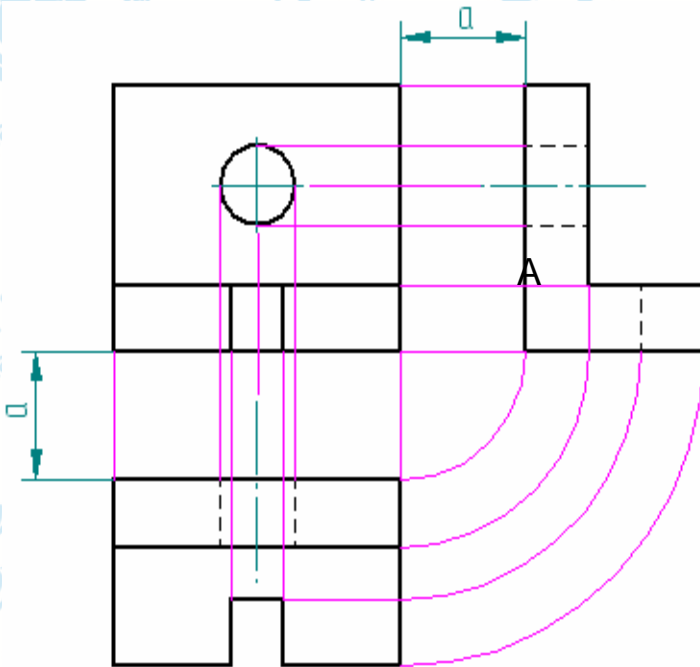


Projeções ortográficas – Correspondência entre as vistas

As linhas comuns entre as vistas devem estar perfeitamente alinhadas e é possível projetar as linhas de uma vista para as demais, assim como a posição de seus detalhes.

Método 1 (Compasso):

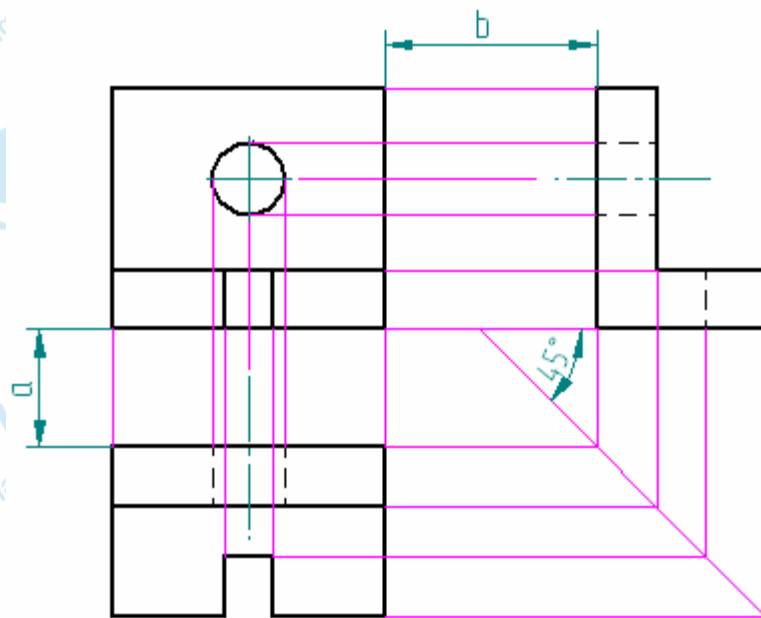
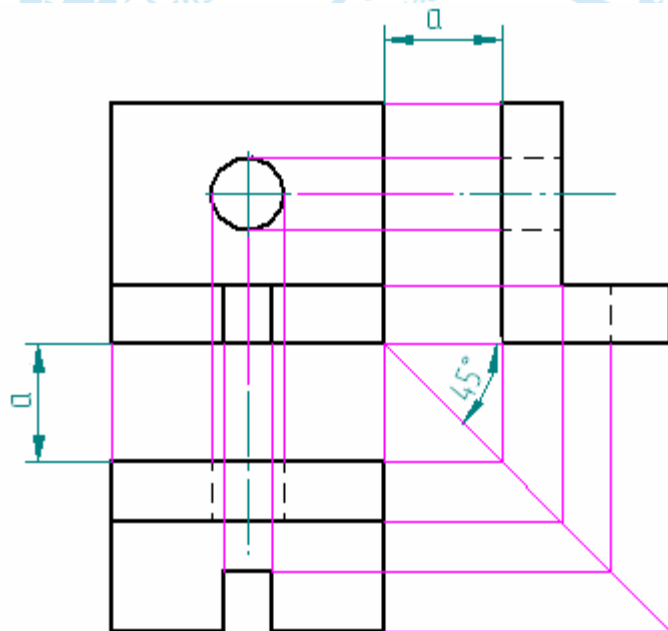
1. Fazer prolongamentos (linhas projetantes auxiliares) de bordas, limites de furos e linhas de centro da vista frontal já em mãos;
2. Traçar uma segunda vista;
3. Colocar a ponta seca do compasso no vértice A;
4. Traçar quartos de circunferência, com o grafite sobre prolongamentos da segunda vista traçada.



Projeções ortográficas – Correspondência entre as vistas

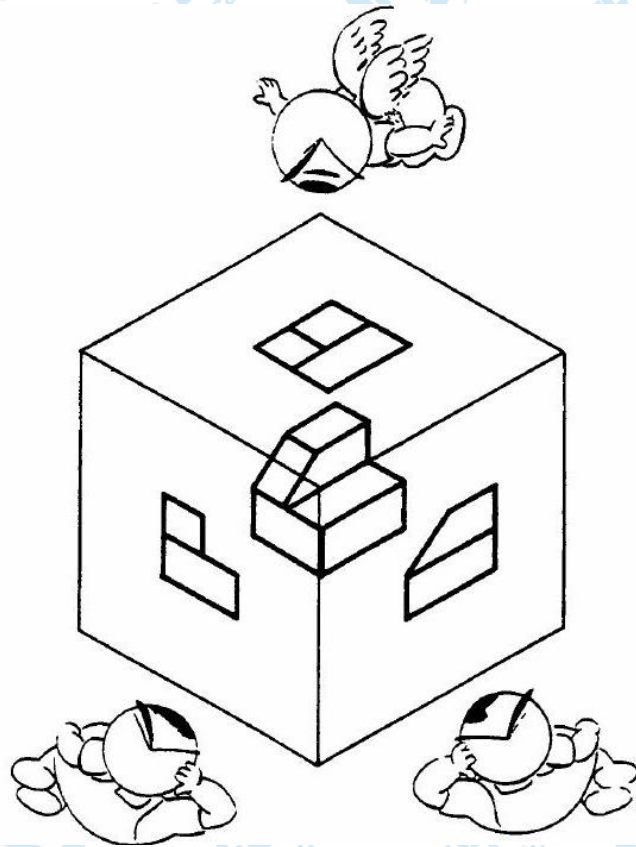
Método 2
(Régua) :

1. Traçar uma reta a 45° com a horizontal
2. Estender as linhas de uma vista até tocar a linha inclinada
3. Projetá-las na outra vista até a altura correta.

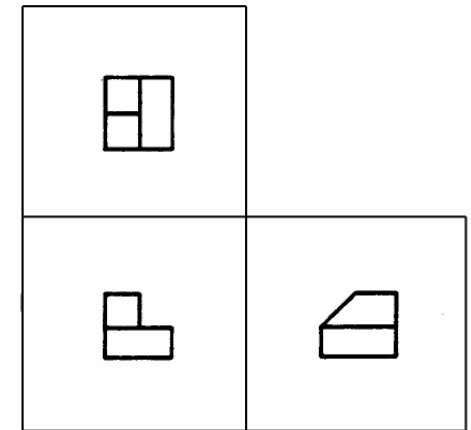
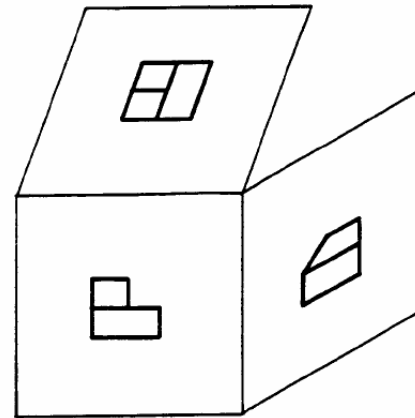


Projeção ortogonal no 3º Diedro

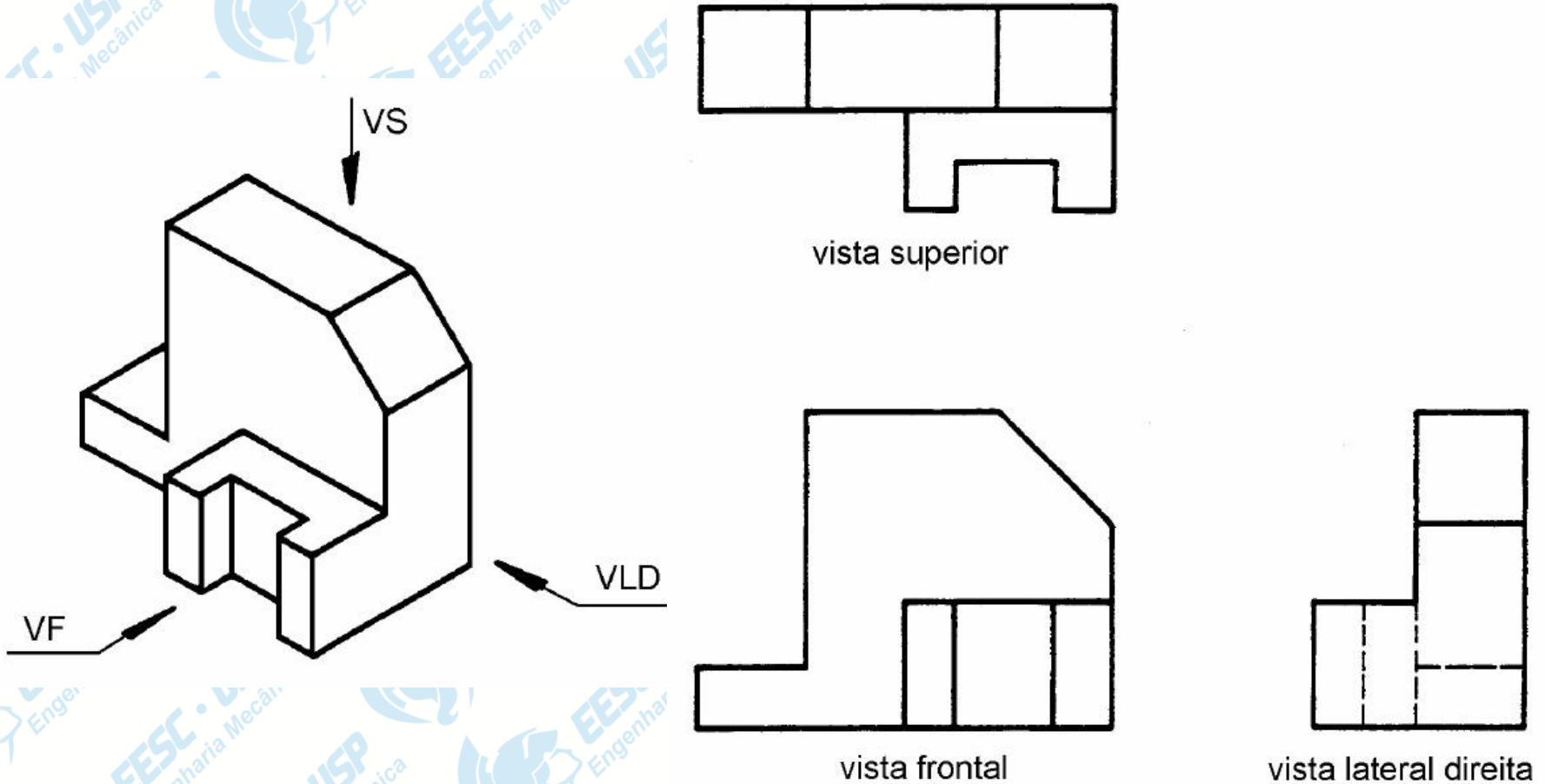
No terceiro diedro a preferência é pela vista frontal, seguidas das Lateral Direita e Superior, que se situam na direita e em cima, respectivamente.



Projeção no terceiro diedro



Projeção ortogonal no 3º Diedro - Exemplo

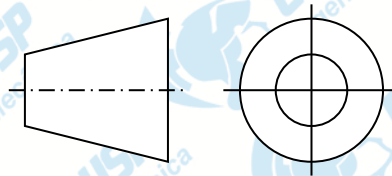


Fonte: Apostila Desenho Mecânico, v9. Projeção ortogonal. Convênio SENAI/São Paulo

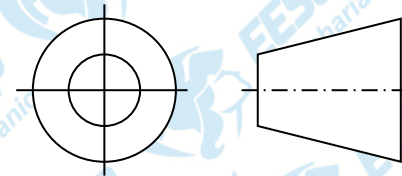


Símbolos de Projeção ortogonal no 1º Diedro e 3º Diedro

Na legenda deve estar incluída a representação do diedro usado no desenho:

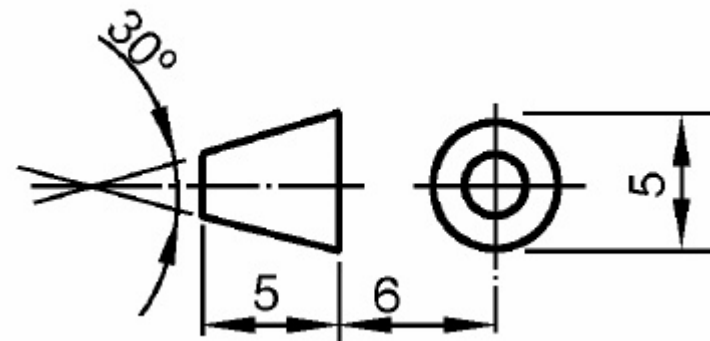


1º Diedro



3º Diedro

Dimensões do Símbolo :



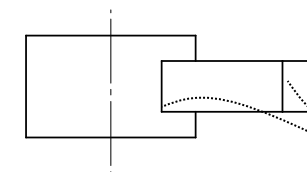
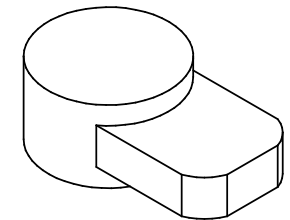
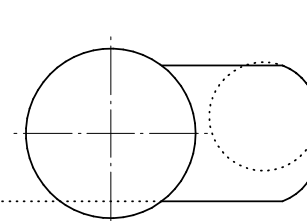
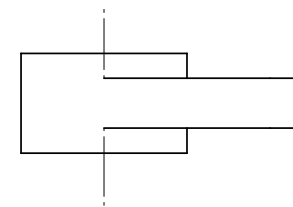
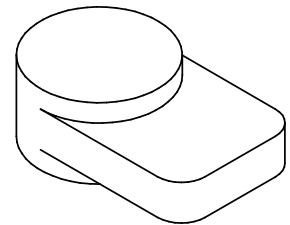
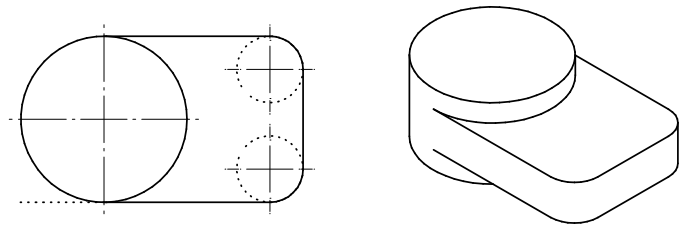
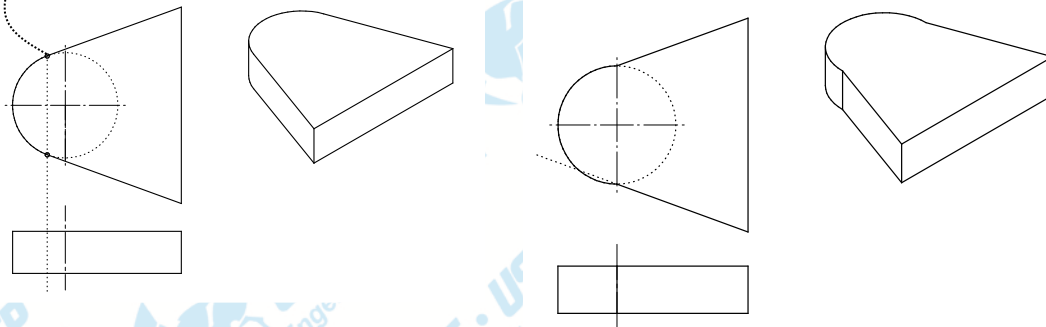
Fonte: Apostila Desenho Mecânico. Desenho com instrumentos. Convênio SENAI/São Paulo



Glossário e dicas

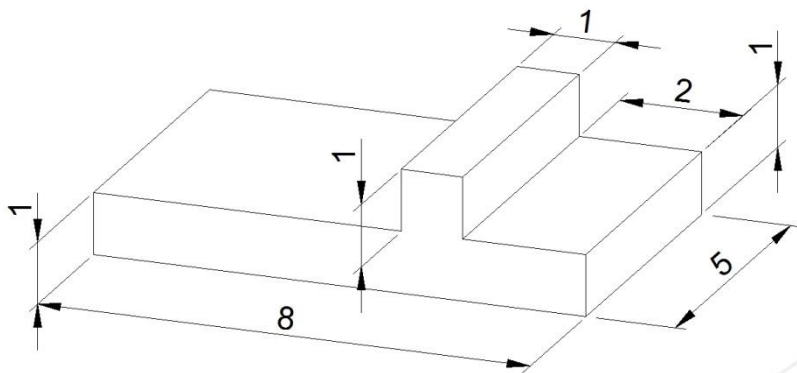
Uma reta é **tangente** a um círculo, quando prolongada, toca apenas em único um ponto (a reta é concordante com o círculo), caso contrário, onde haja duas interseções a reta será uma secante e tridimensionalmente resulta uma linha secante. Na tangência não haverá aresta.

Ponto de concordância

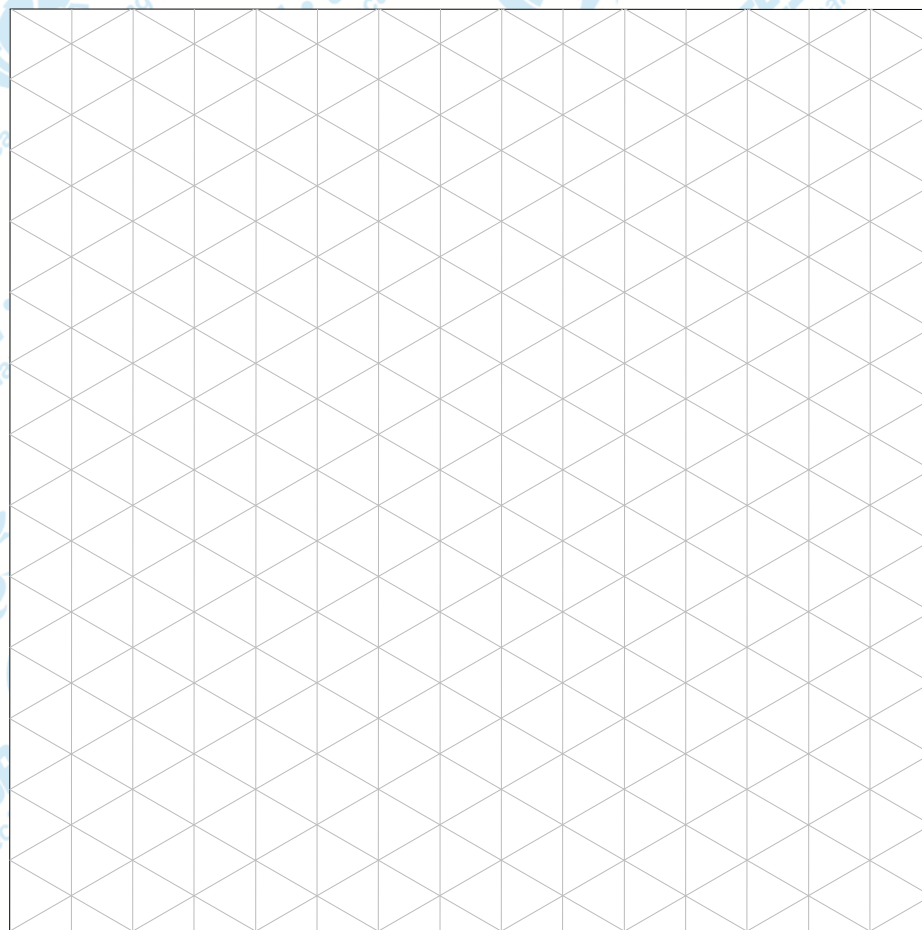


Secantes





Perspectiva dimétrica

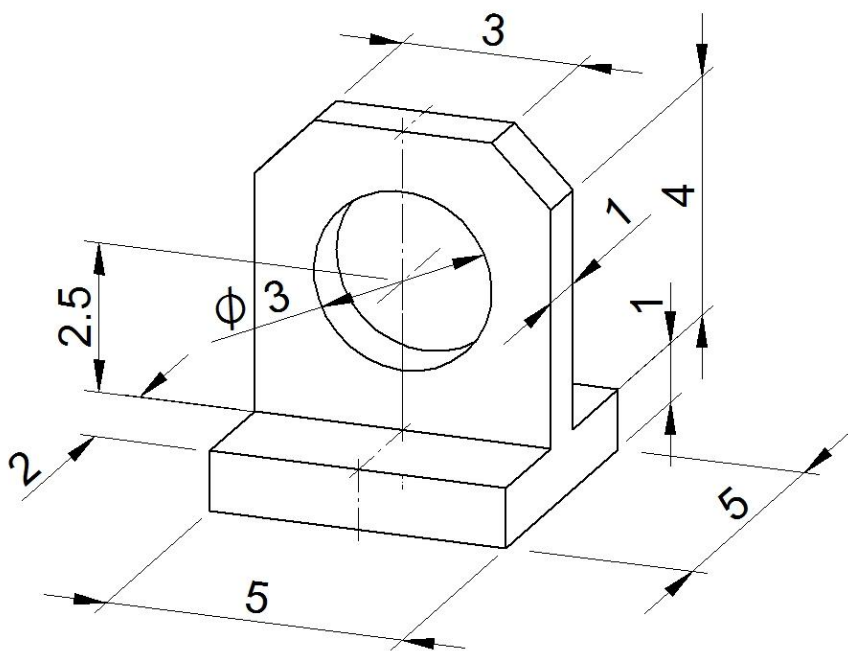


Exercício 2.1 – Desenhe a perspectiva isométrica

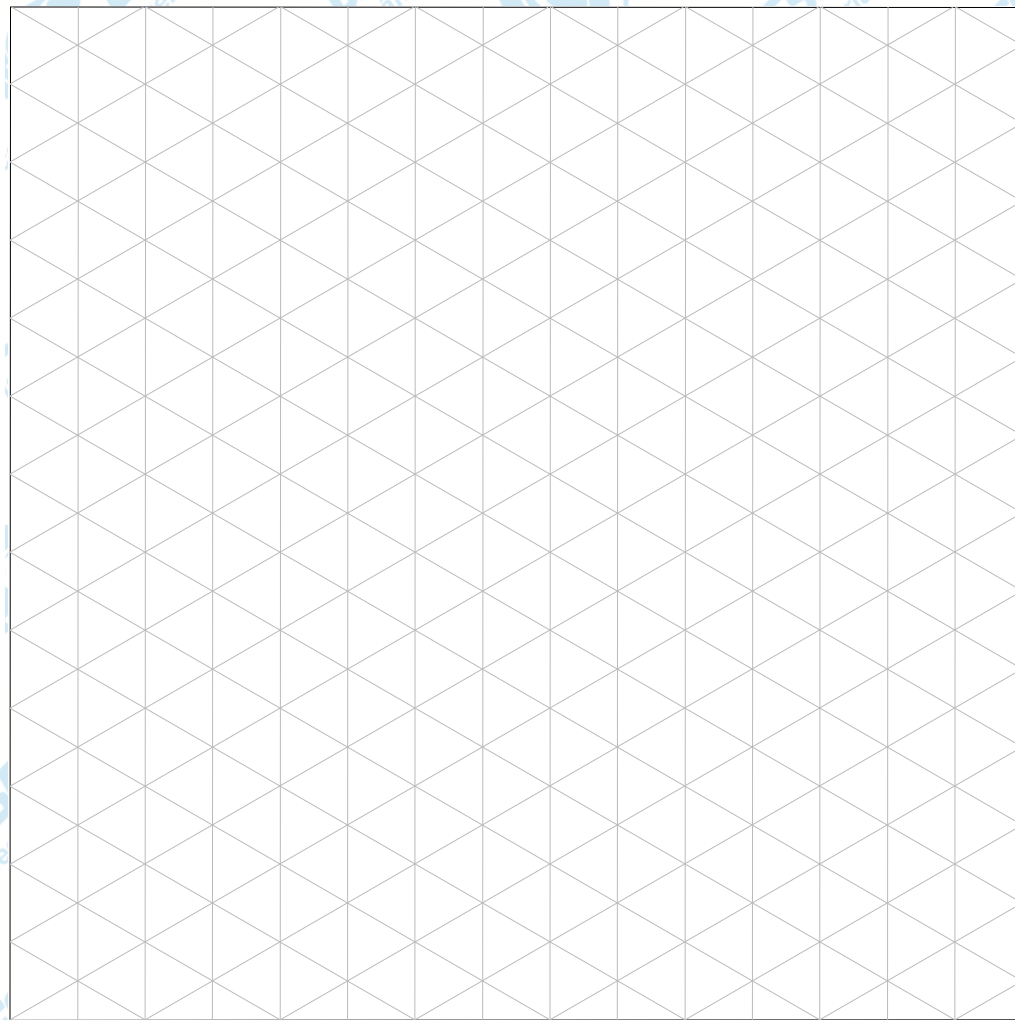
Nome: _____

Nº _____ Turma _____





Perspectiva dimétrica

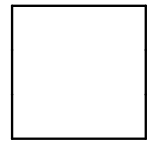
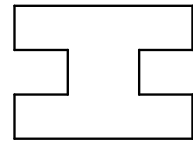
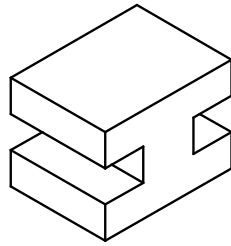
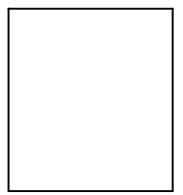
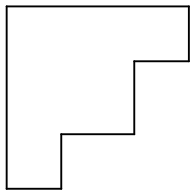
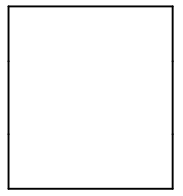
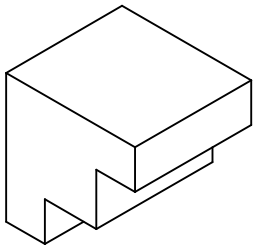
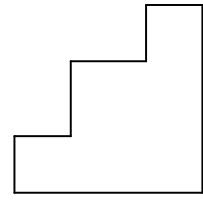
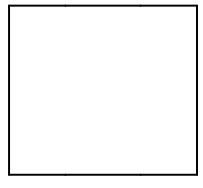
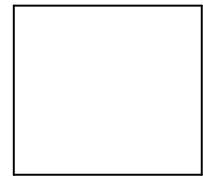
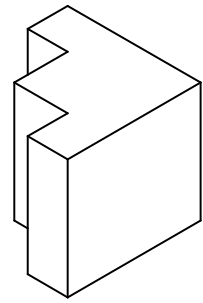
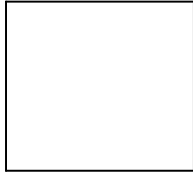
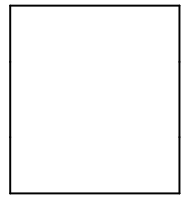
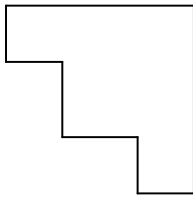
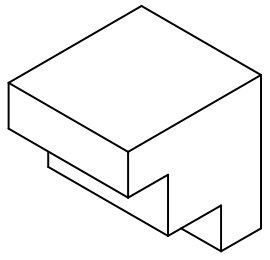


Exercício 2.2 – Desenhe a perspectiva isométrica

Nome: _____

Nº _____ Turma _____



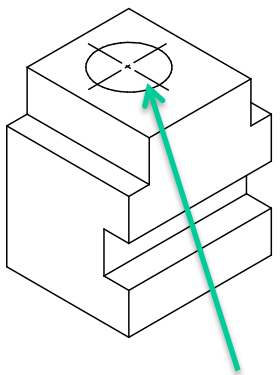


Nome: _____

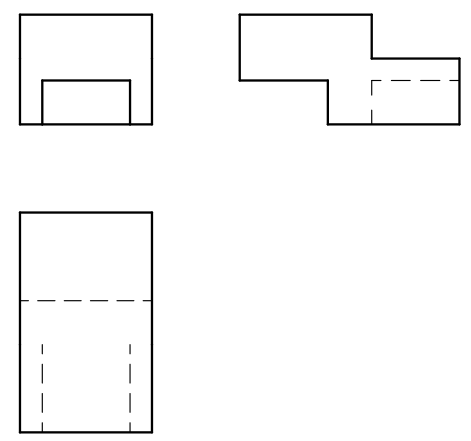
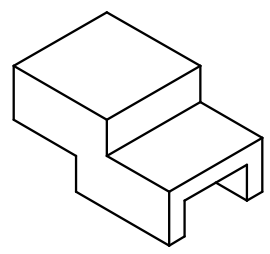
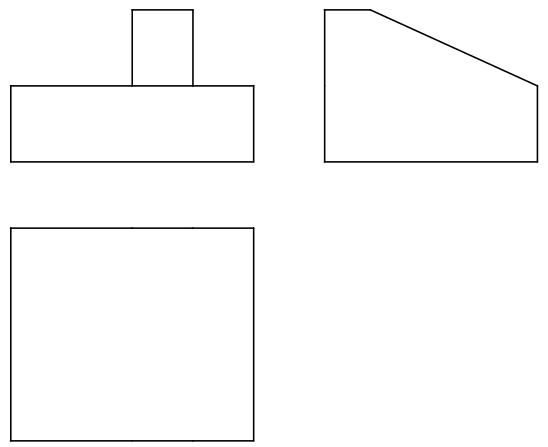
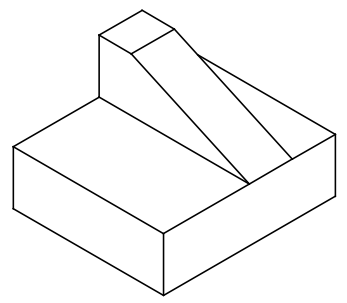
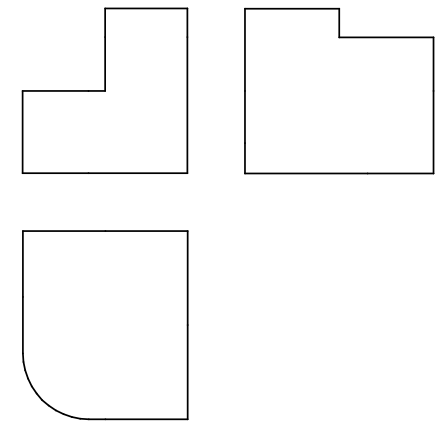
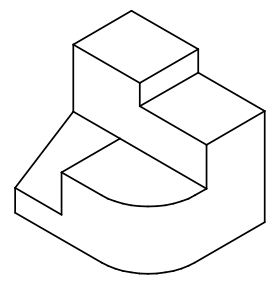
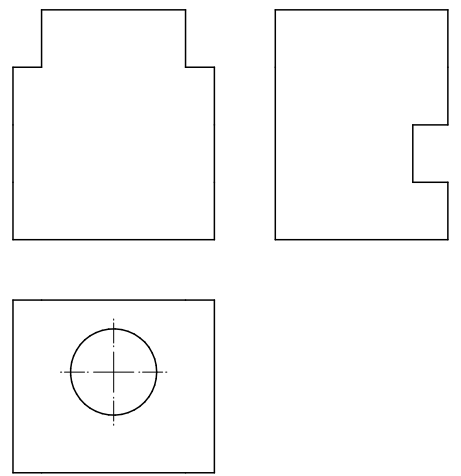
Nº _____ Turma _____

Exercício 2.3 – Complete as projeções
Diferentes vistas frontais





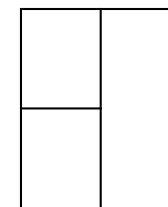
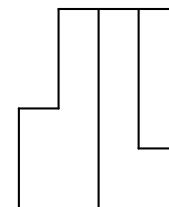
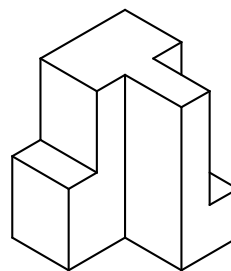
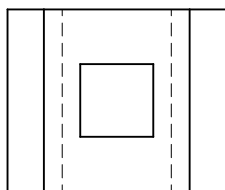
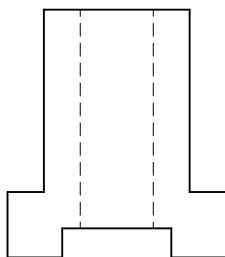
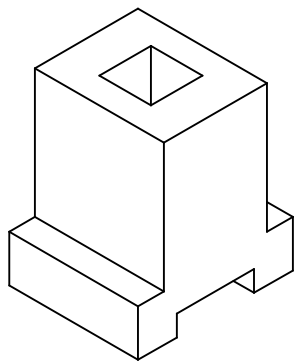
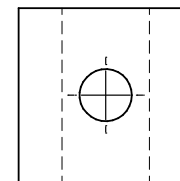
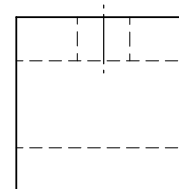
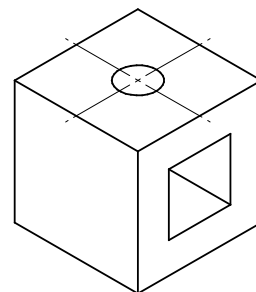
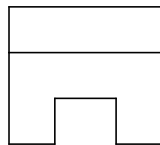
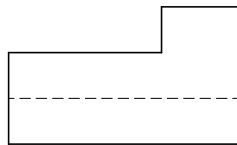
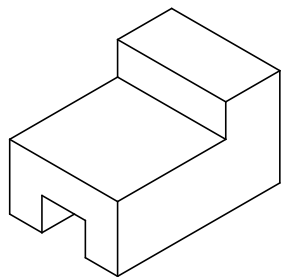
Furo Passante



Exercício 2.4 – Complete as projeções

Nome: _____
 Nº _____ Turma _____



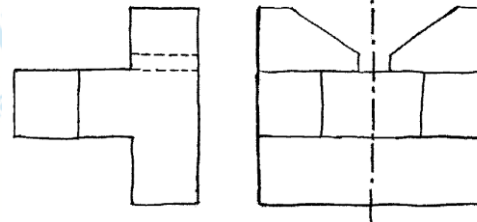
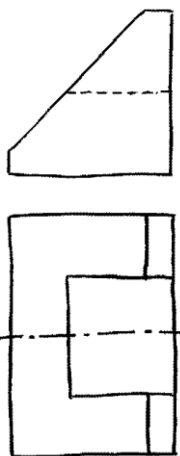
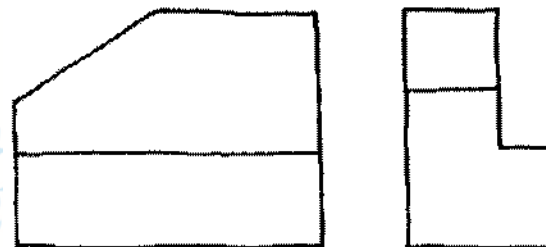
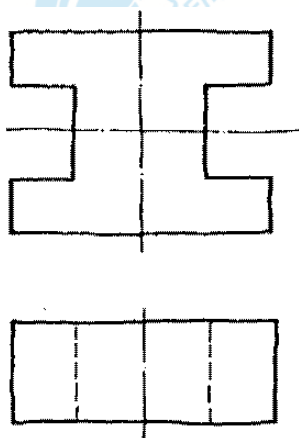


Exercício 2.5 – Desenhe a vista que falta

Nome: _____

Nº _____ Turma _____



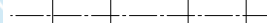
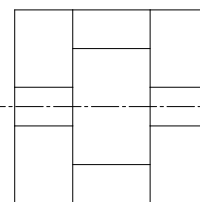
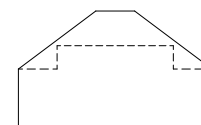
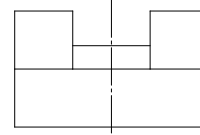
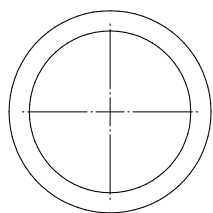
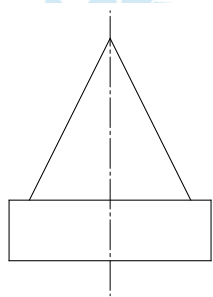
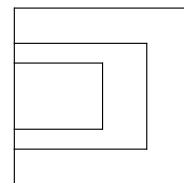
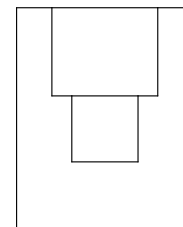
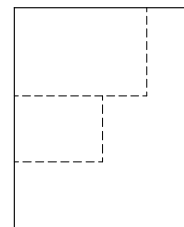
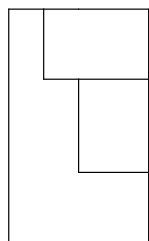
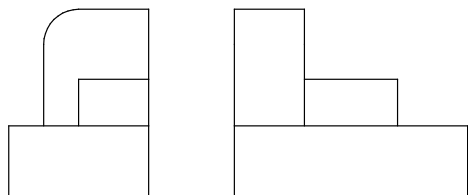


Exercício 2.6 - Complete as projeções.

Nome: _____

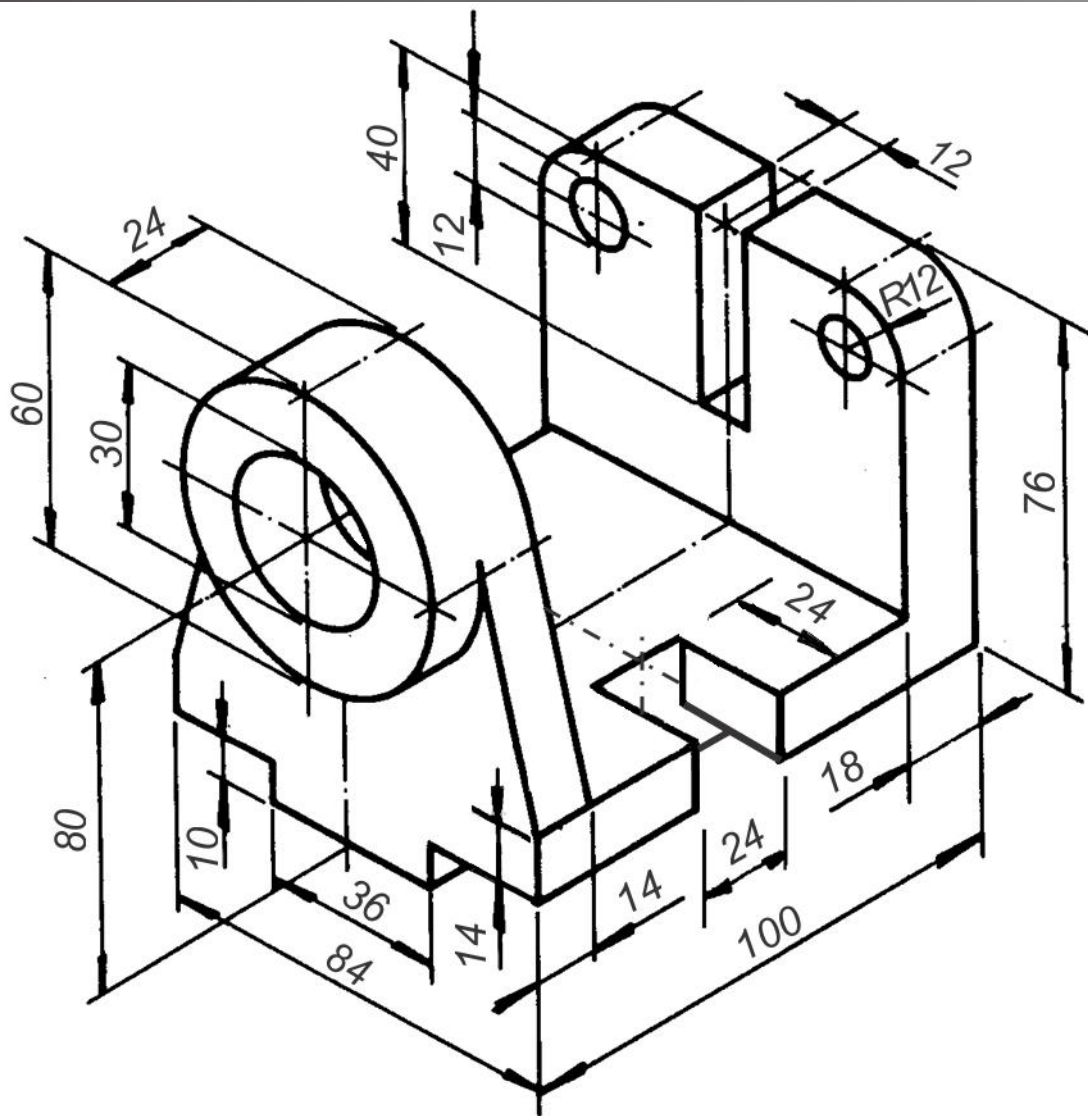
Nº _____ Turma _____





Exercício 2.7 – Pelas projeções desenhe a isométrica.



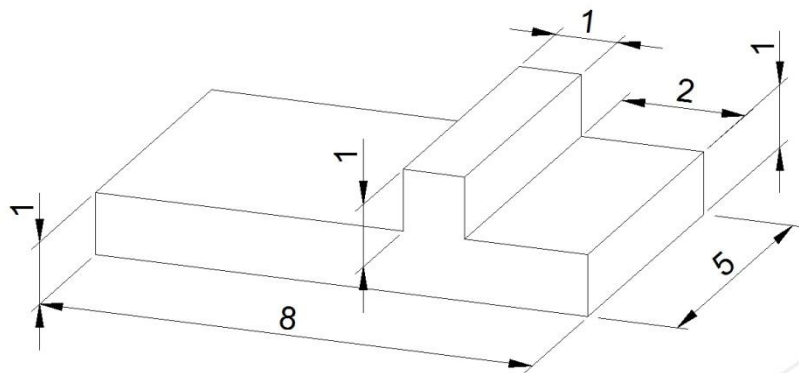


Exercício 2.7 – Desenhe as vistas a partir do croqui isométrico (sem cotas) – Para ser feito na próxima aula, trazer Folha A3 – Dobre a folha corretamente.

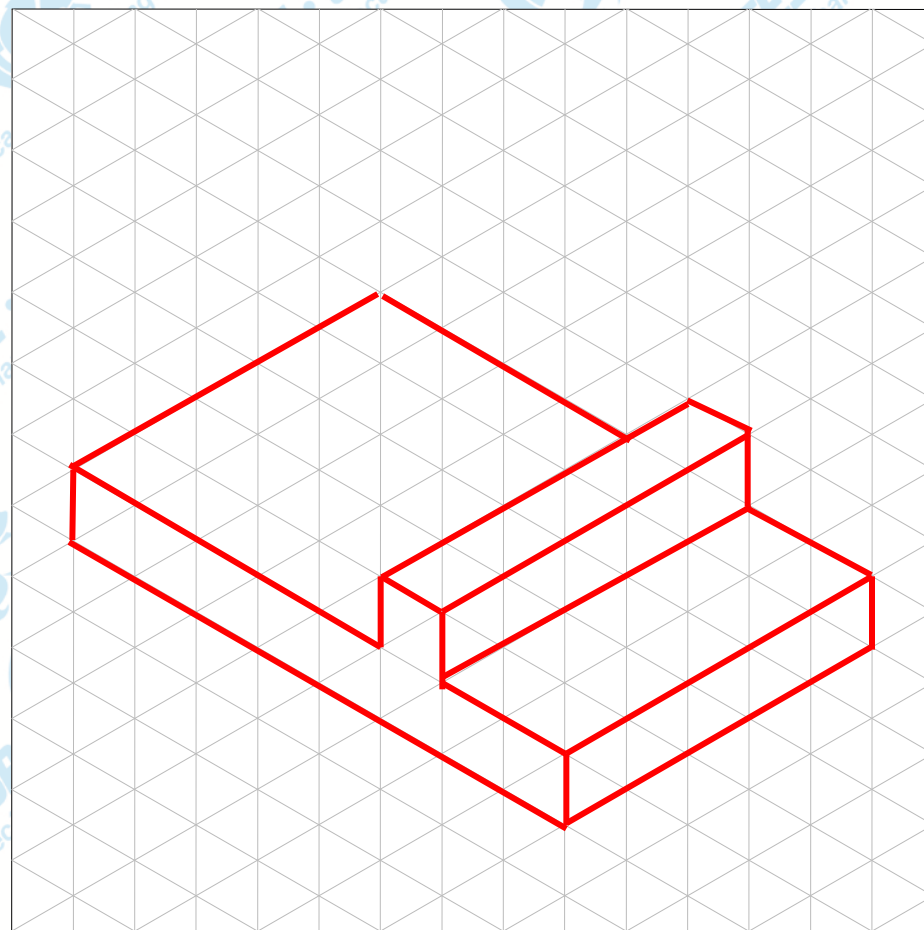


Gabarito





Perspectiva dimétrica

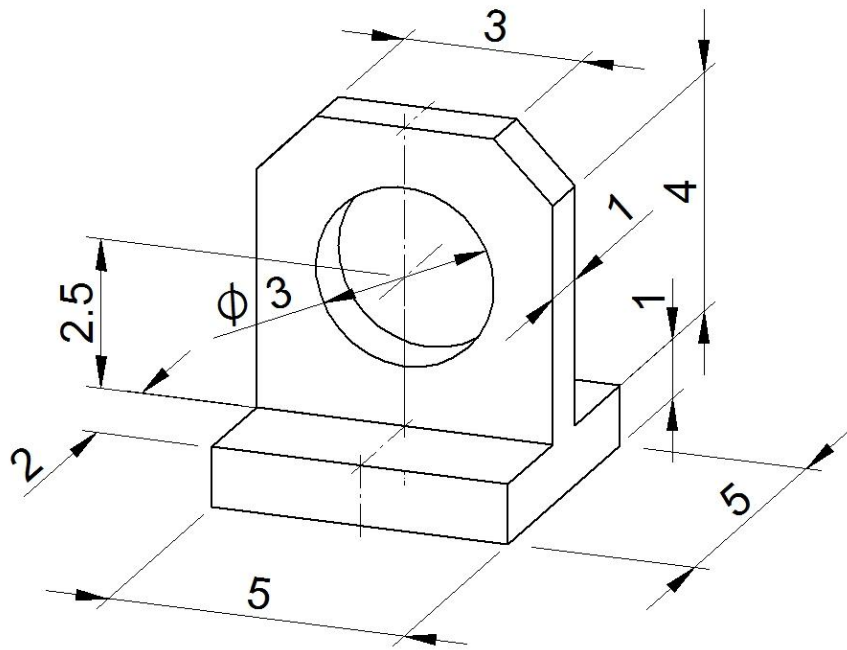


Exercício 2.1 – Desenhe a perspectiva isométrica

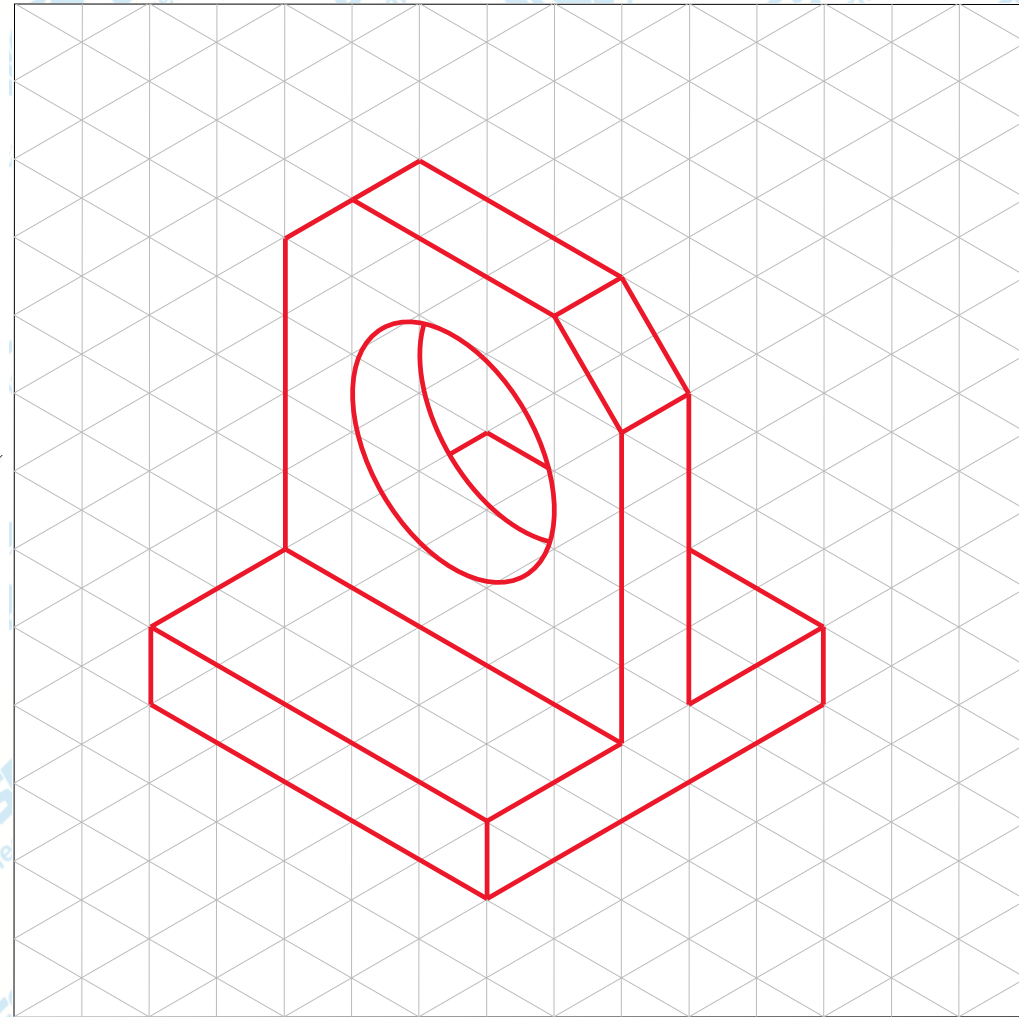
Nome: _____

Nº _____ Turma _____





Perspectiva dimétrica

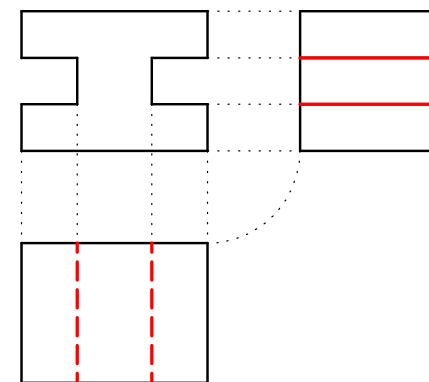
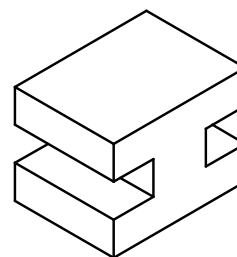
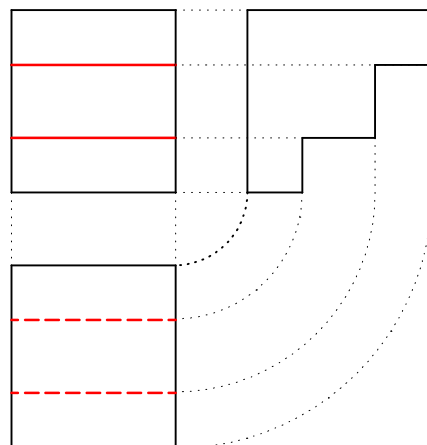
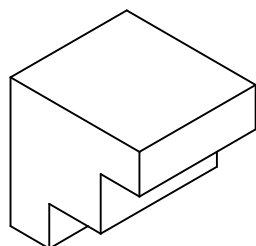
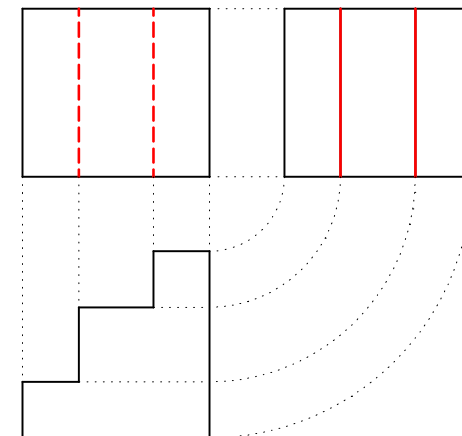
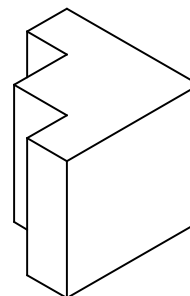
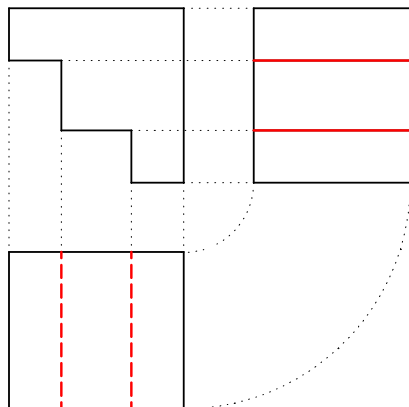
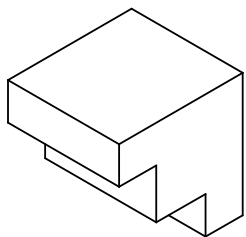


Exercício 2.2 – Desenhe a perspectiva isométrica

Nome: _____

Nº _____ Turma _____



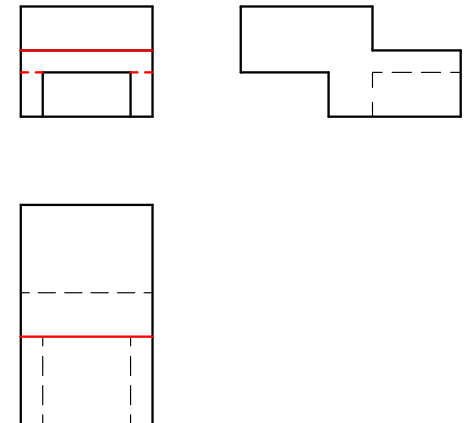
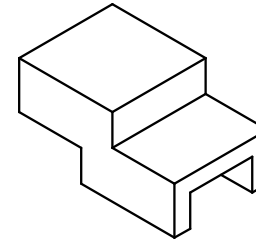
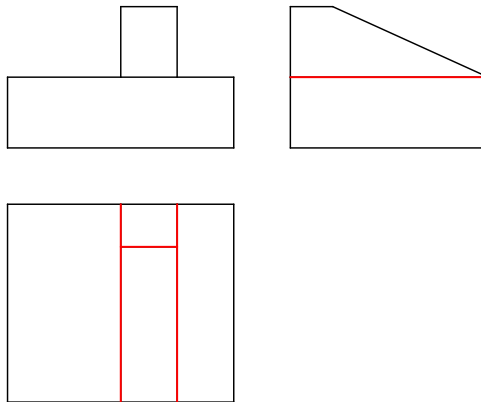
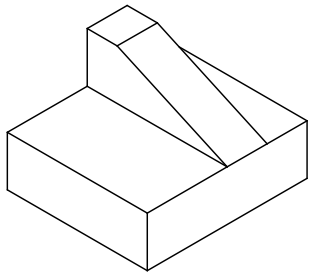
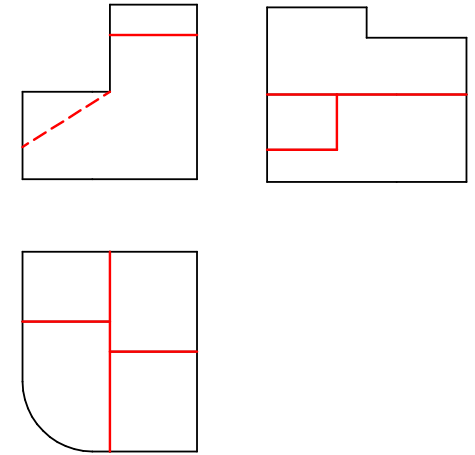
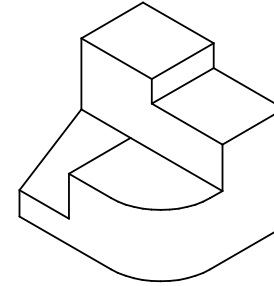
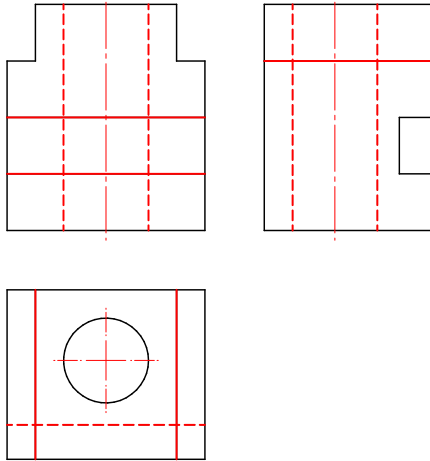
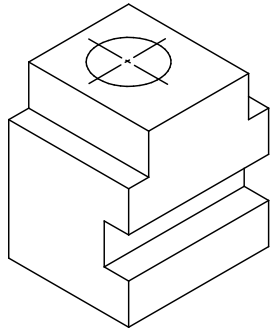


Nome: _____

Nº _____ Turma _____

Exercício 2.3 – Complete as projeções



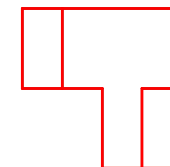
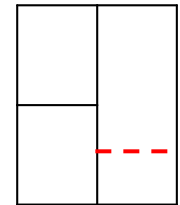
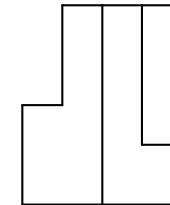
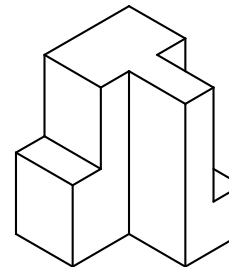
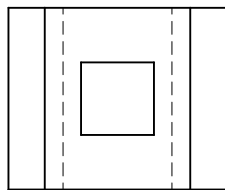
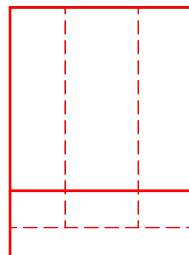
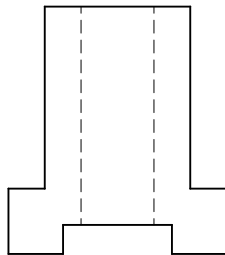
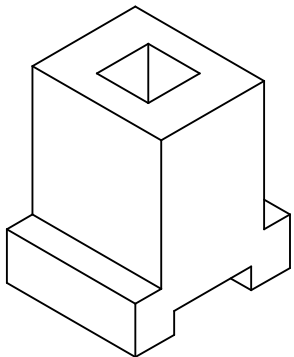
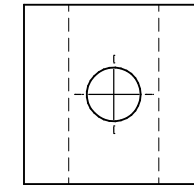
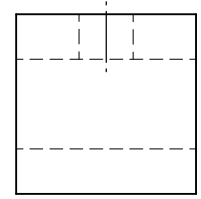
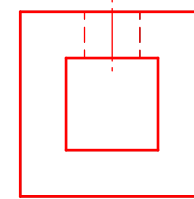
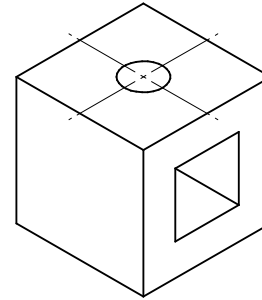
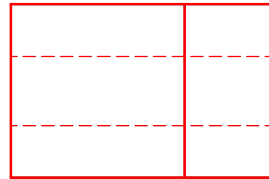
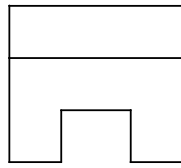
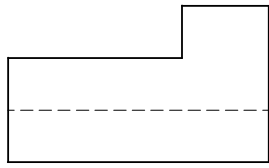
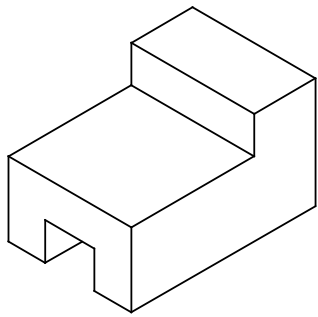


Exercício 2.4 – Complete as projeções

Nome: _____

Nº _____ Turma _____



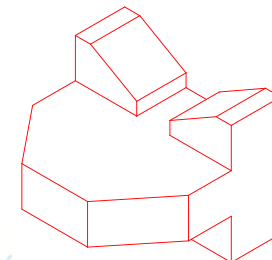
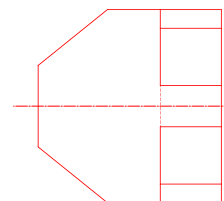
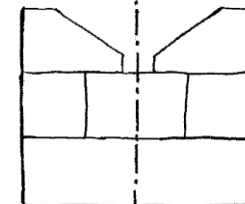
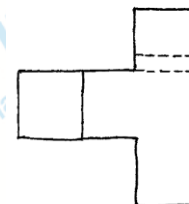
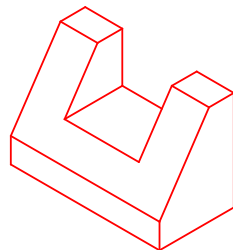
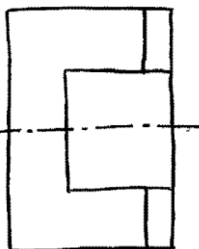
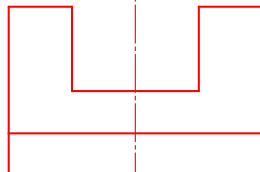
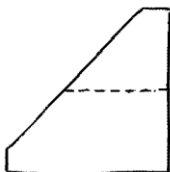
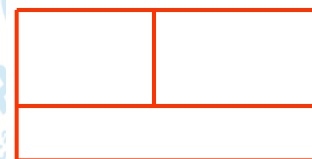
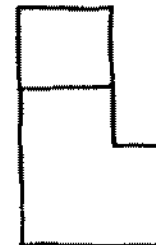
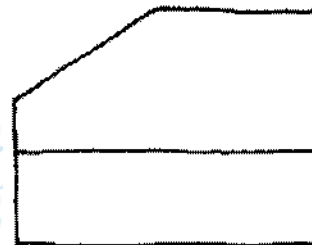
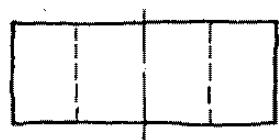
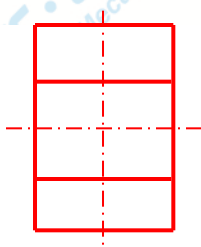
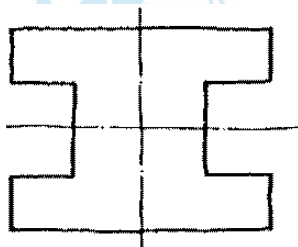


Exercício 2.5 – Desenhe a vista que falta

Nome: _____

Nº _____ Turma _____



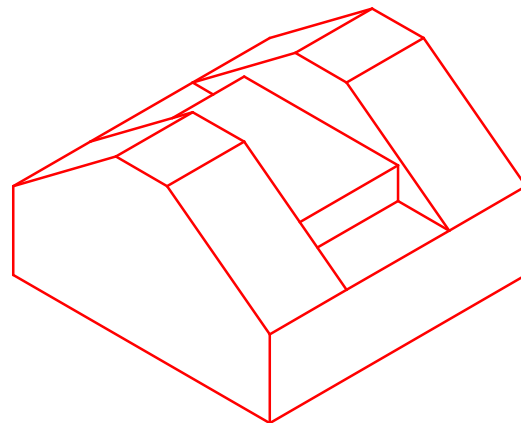
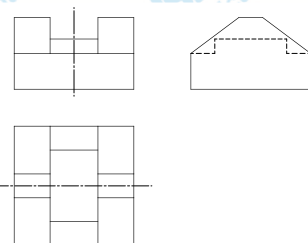
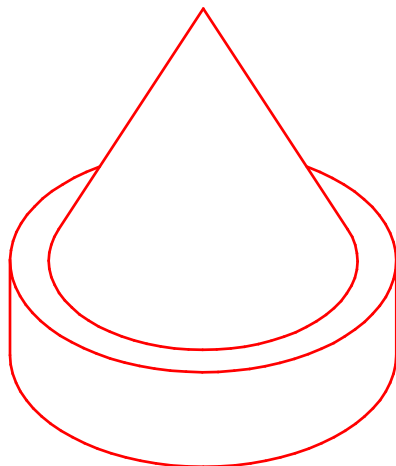
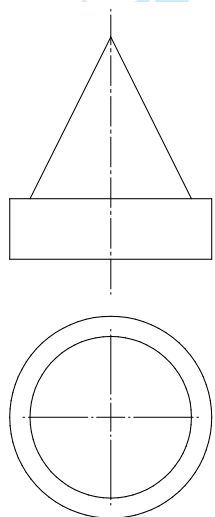
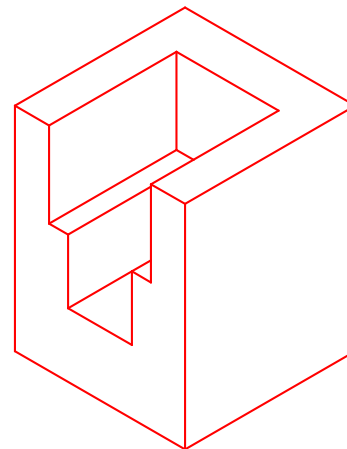
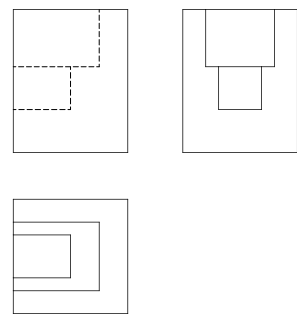
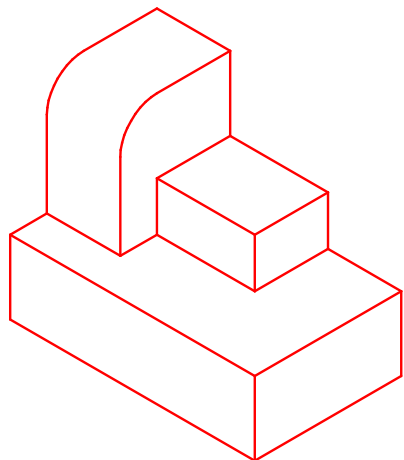
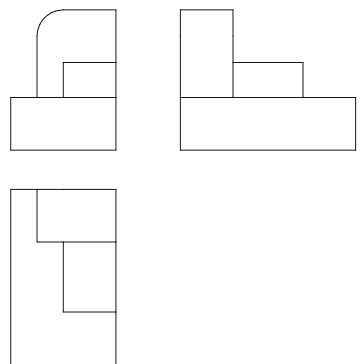


Exercício 2.6 - Complete as projeções.

Nome: _____

Nº _____ Turma _____





Exercício 2.7 – Pelas projeções desenhe a isométrica.



