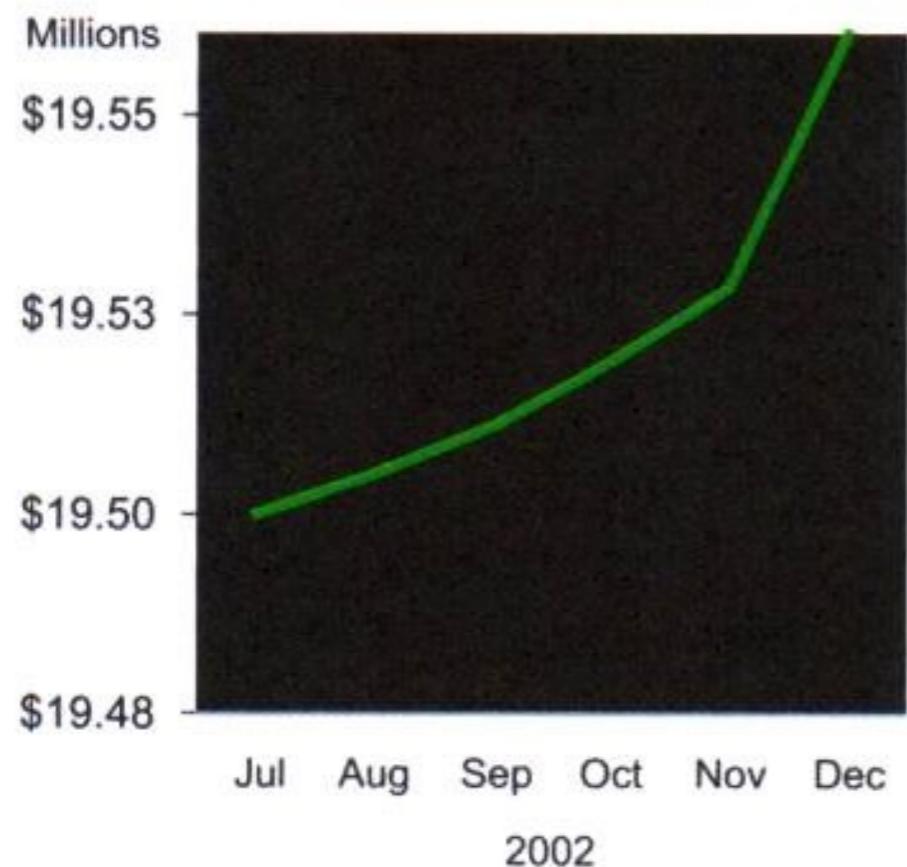


5

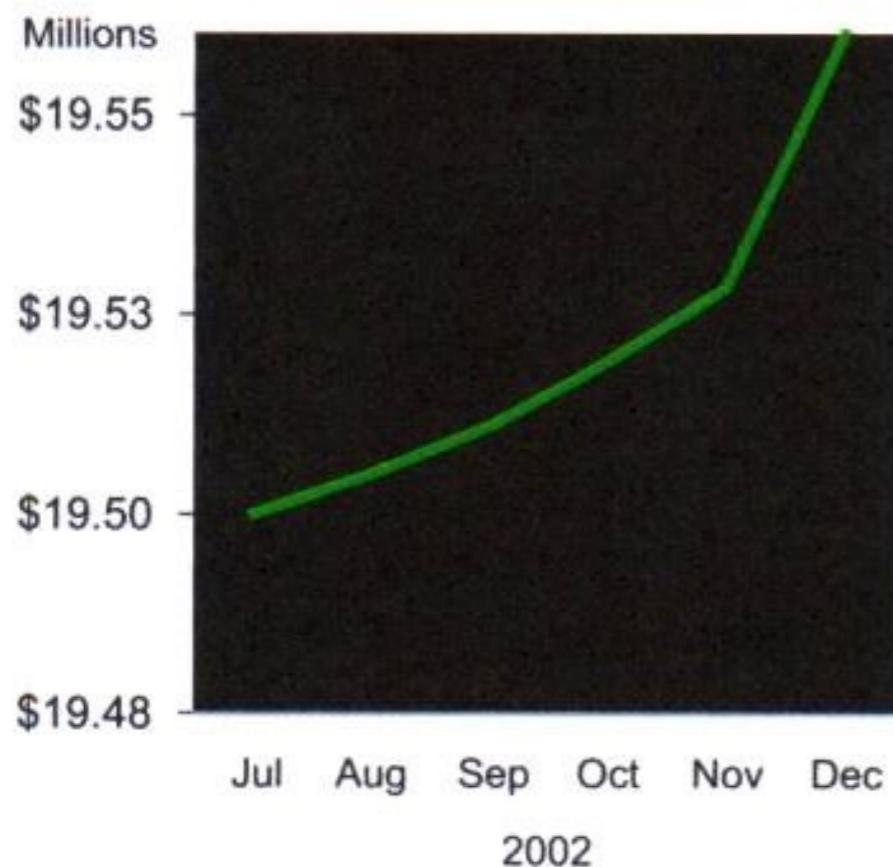
GRÁFICOS

Profa. Raquel C. de Melo Minardi

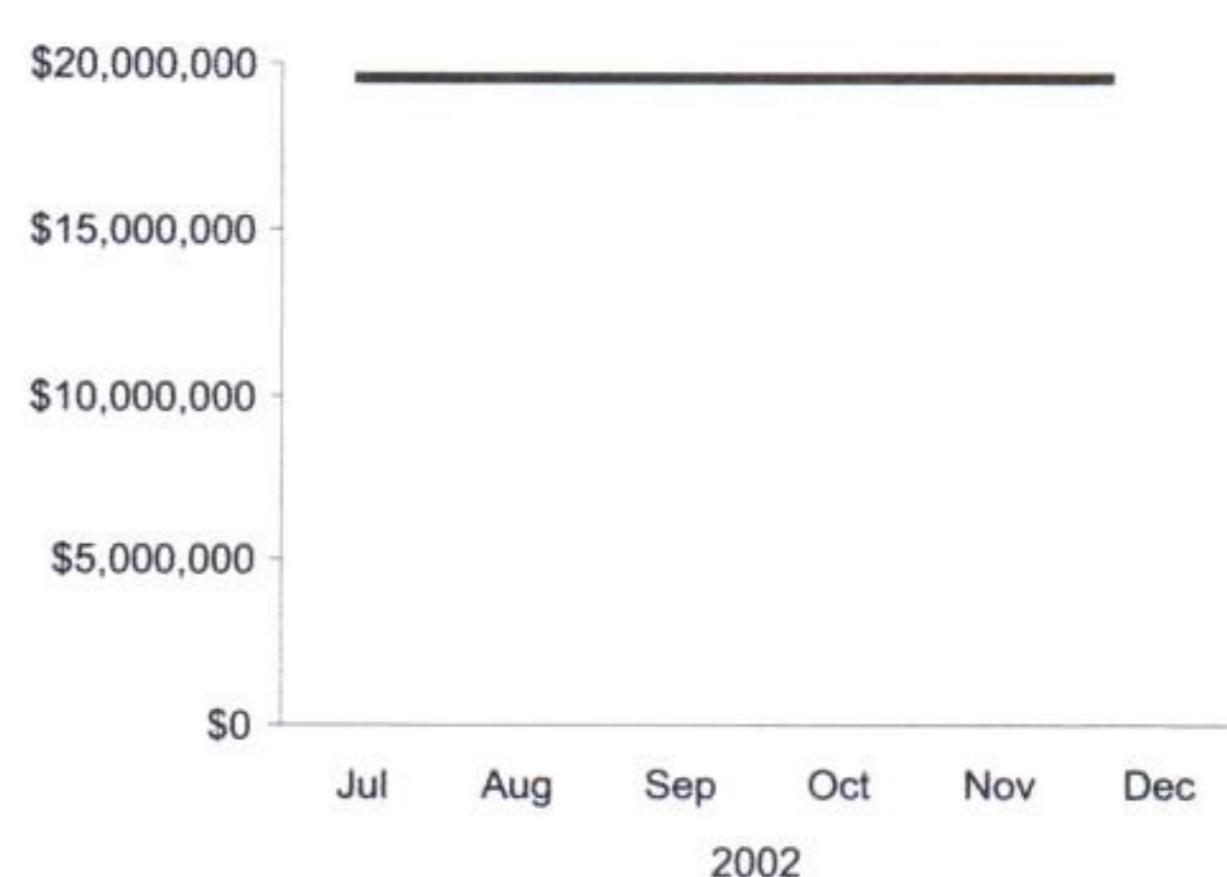
Sales are Skyrocketing!



Sales are Skyrocketing!



Sales are Flat!

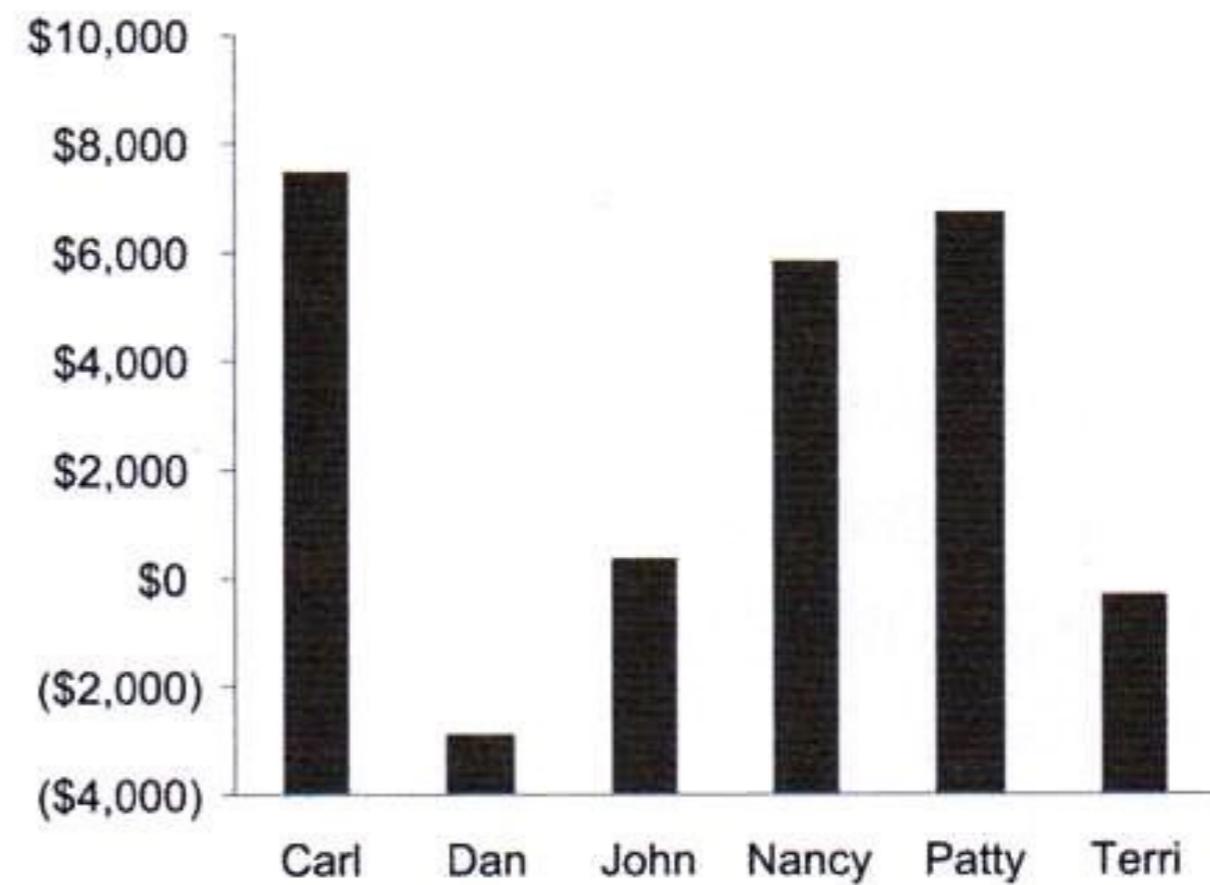
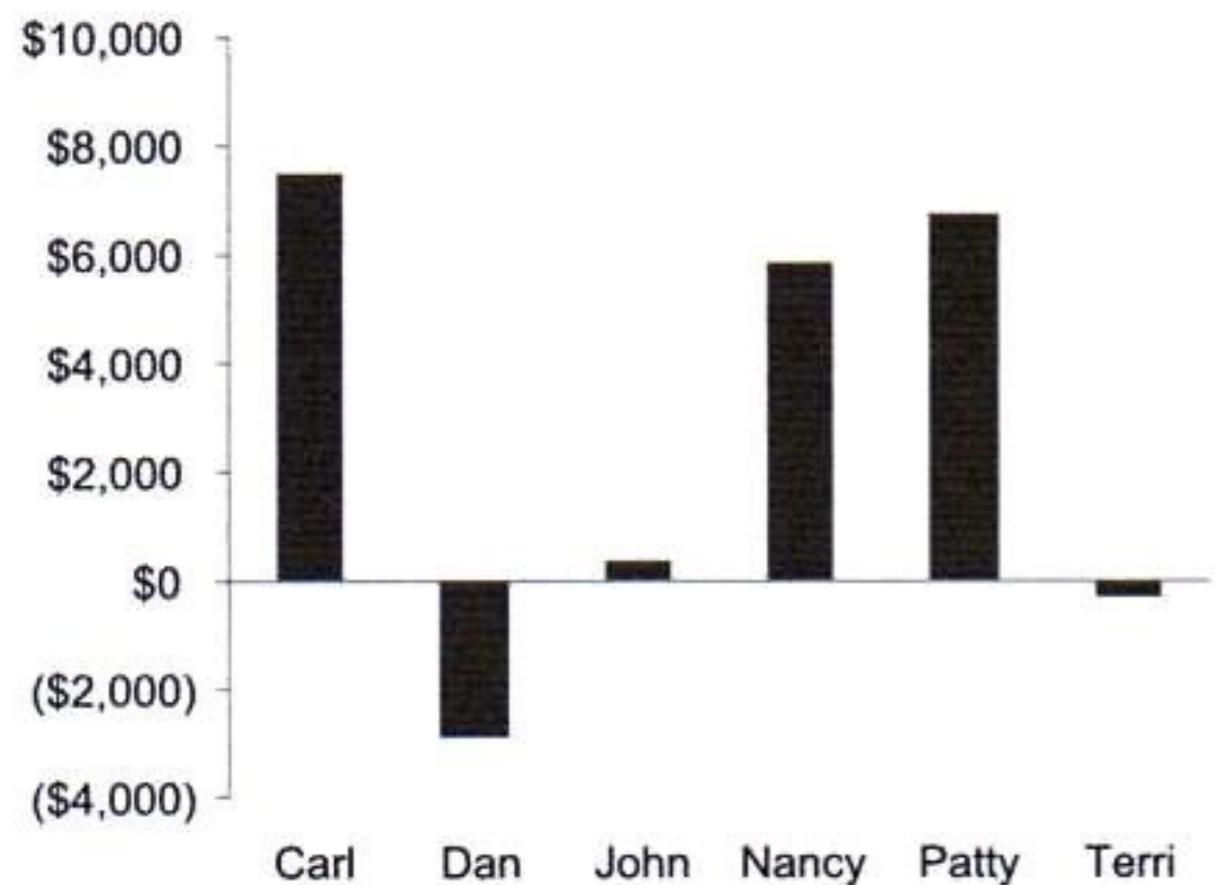


Um aumento de 1% parece um aumento de 200%

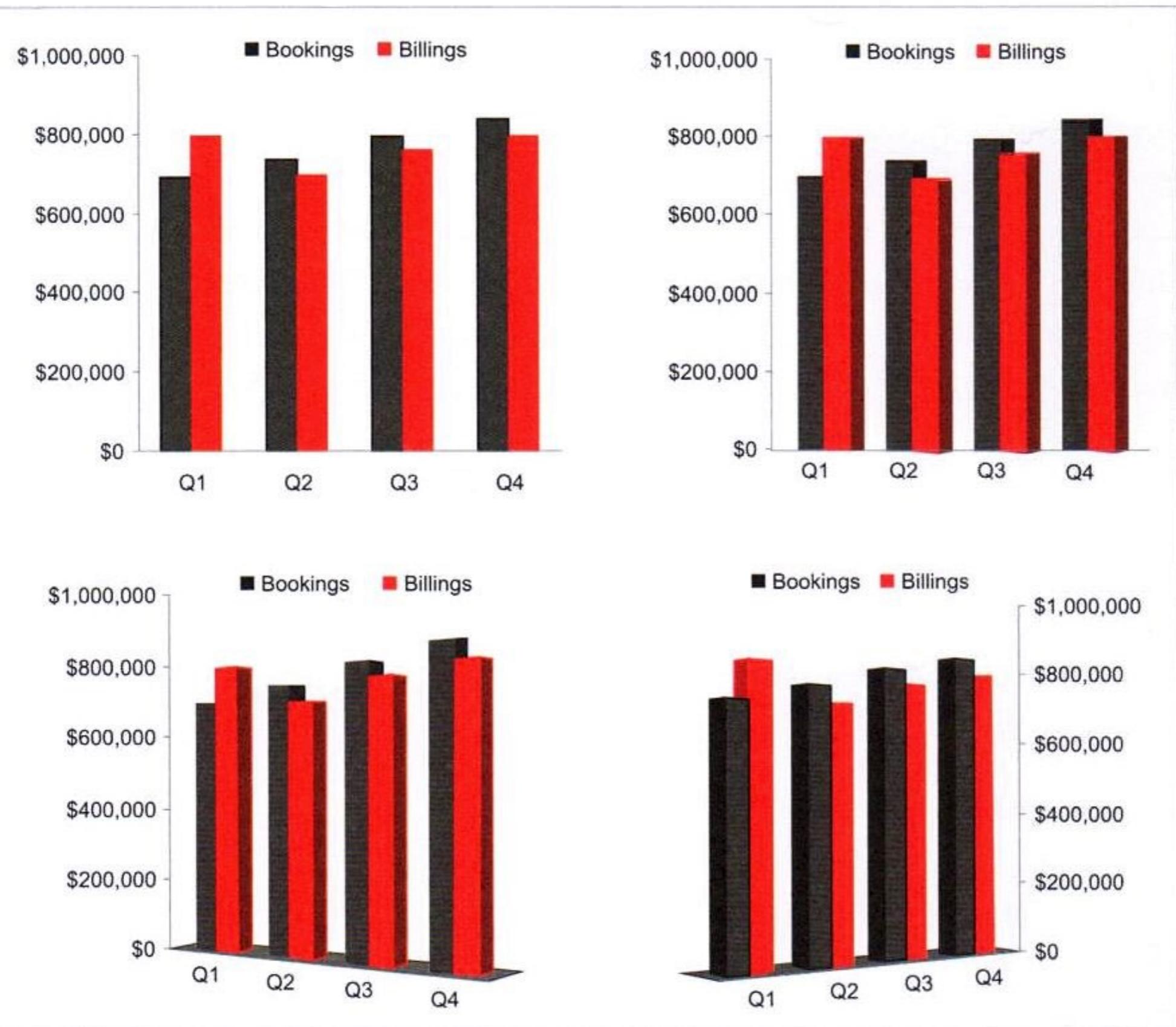
Quais aspectos do gráfico foram usados para causar este efeito?

- A escala no eixo y não inicia do 0 fazendo com que pequenas elevações pareçam significativas
- A área do gráfico tem altura maior ou igual a largura, fazendo com que pequenas elevações pareçam maiores
- A linha é verde, cor que reforça a positividade da mensagem
- A legenda com o termo “Millions”

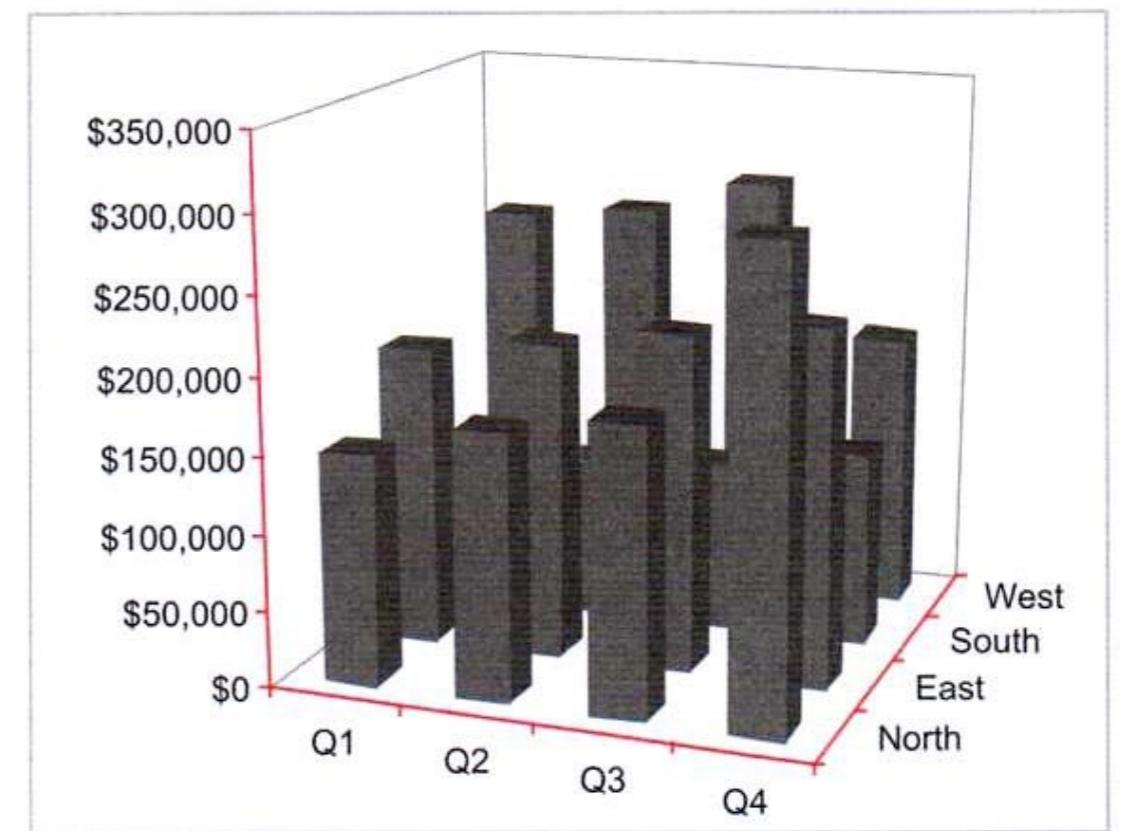
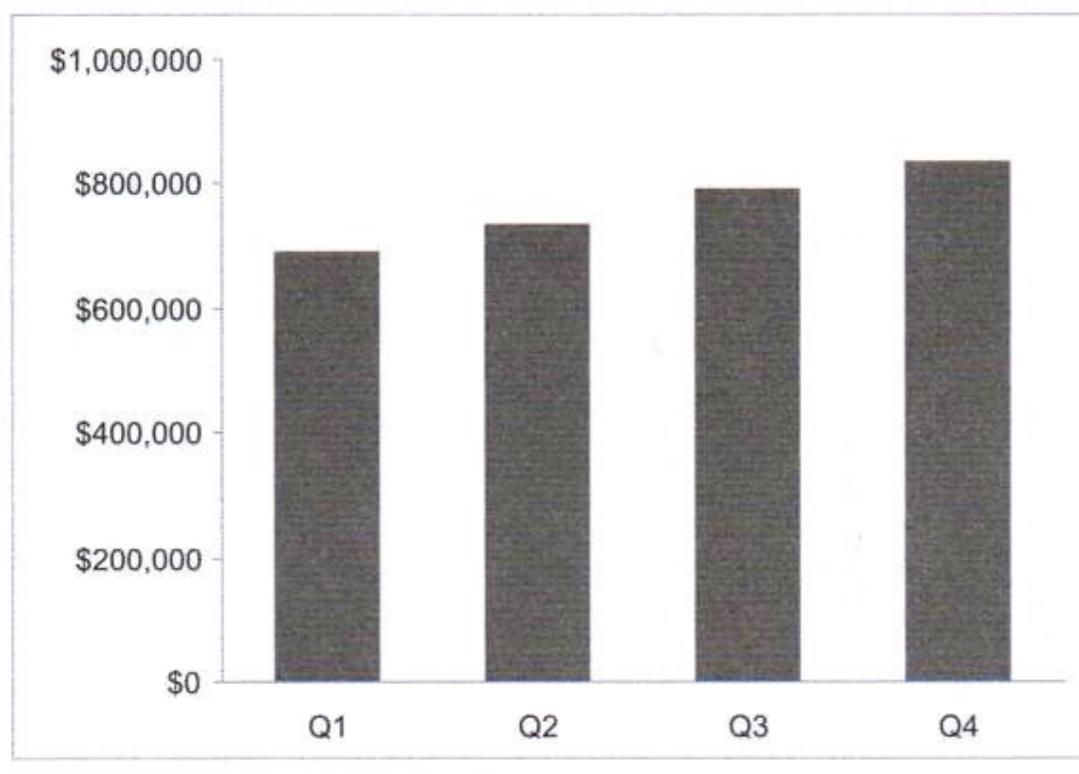
- Faça com que a diferença de tamanho entre as marcações nos eixos correspondam às diferenças nos valores que elas representam
- Inclua o valor zero nas escalas quantitativas ou alerte o usuário quando não o fizer
- Atenção especial para os gráficos de barras: tamanho das barras codificam a informação quantitativa e deve ser mantido



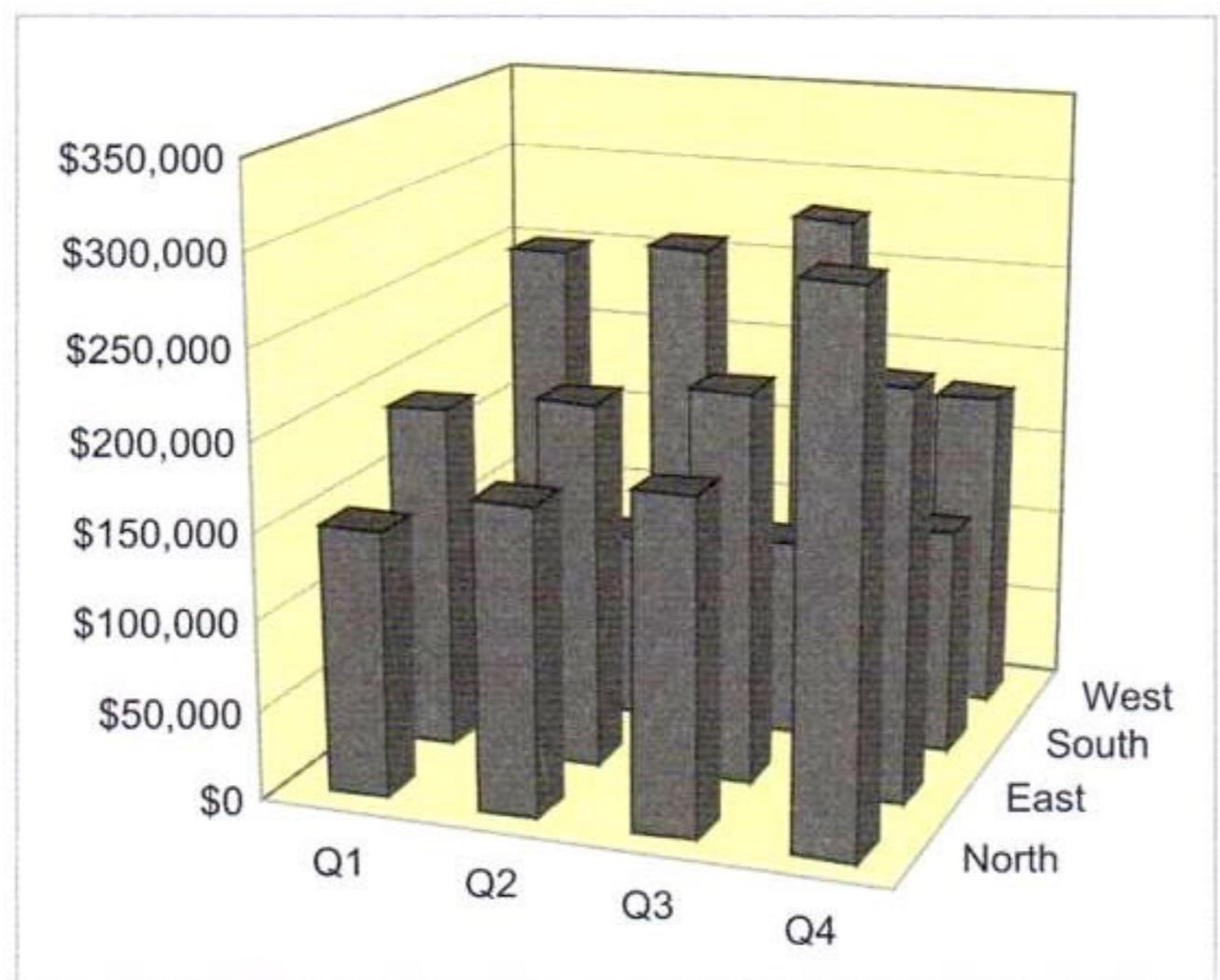
Representação confusa

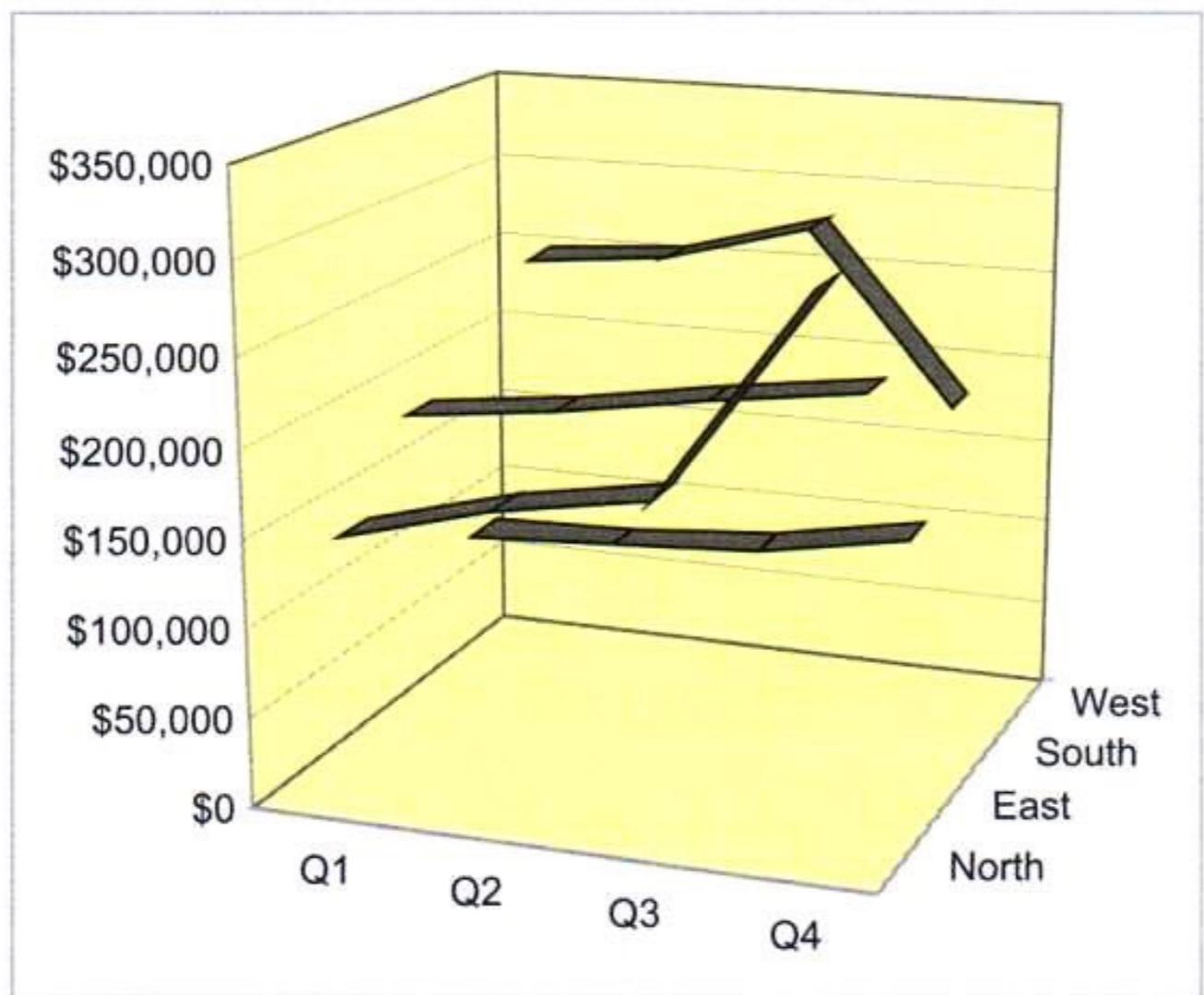


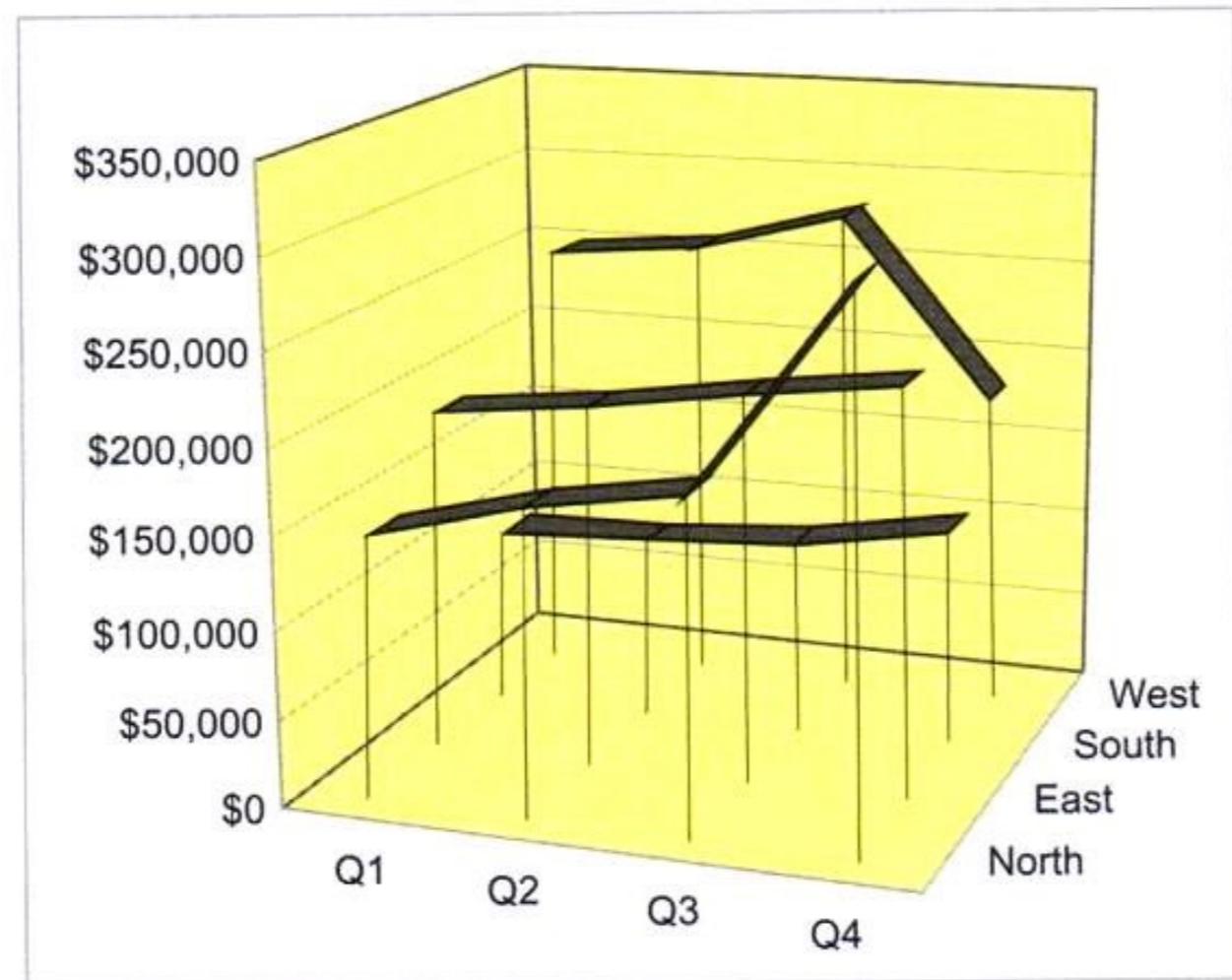
- A adição de uma terceira dimensão adiciona não adiciona informação qualquer: princípio *data-ink ratio* de Tufte
- Adiciona-se conteúdo visual que os usuários precisam processar resultando em perda de tempo e esforço



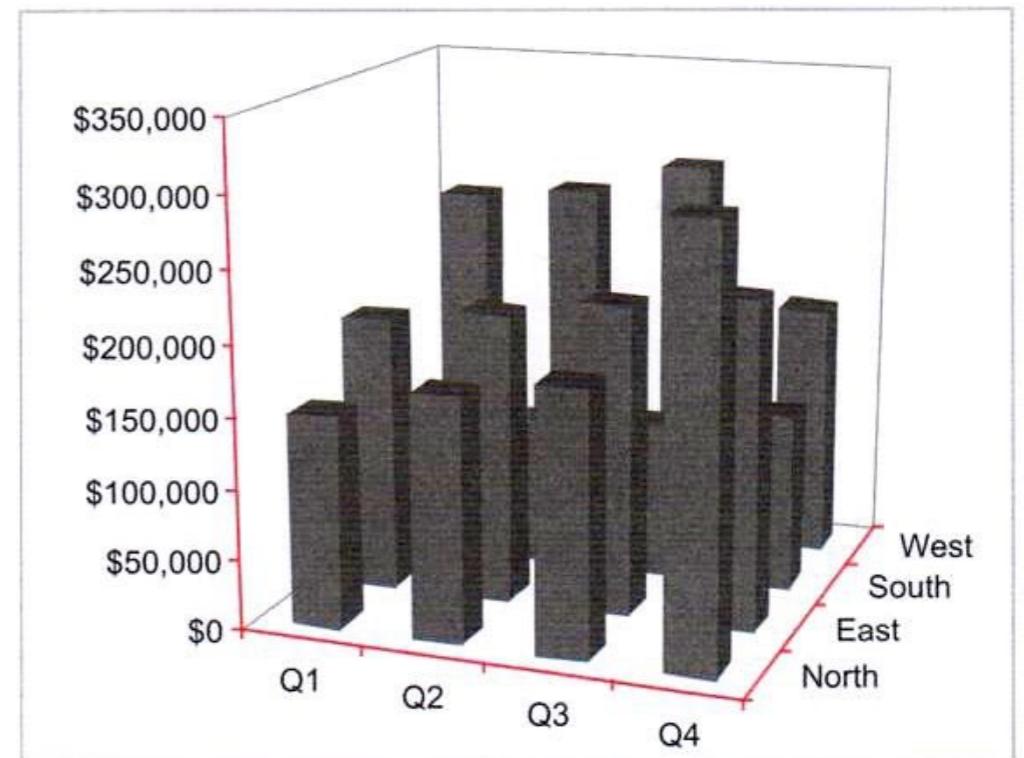
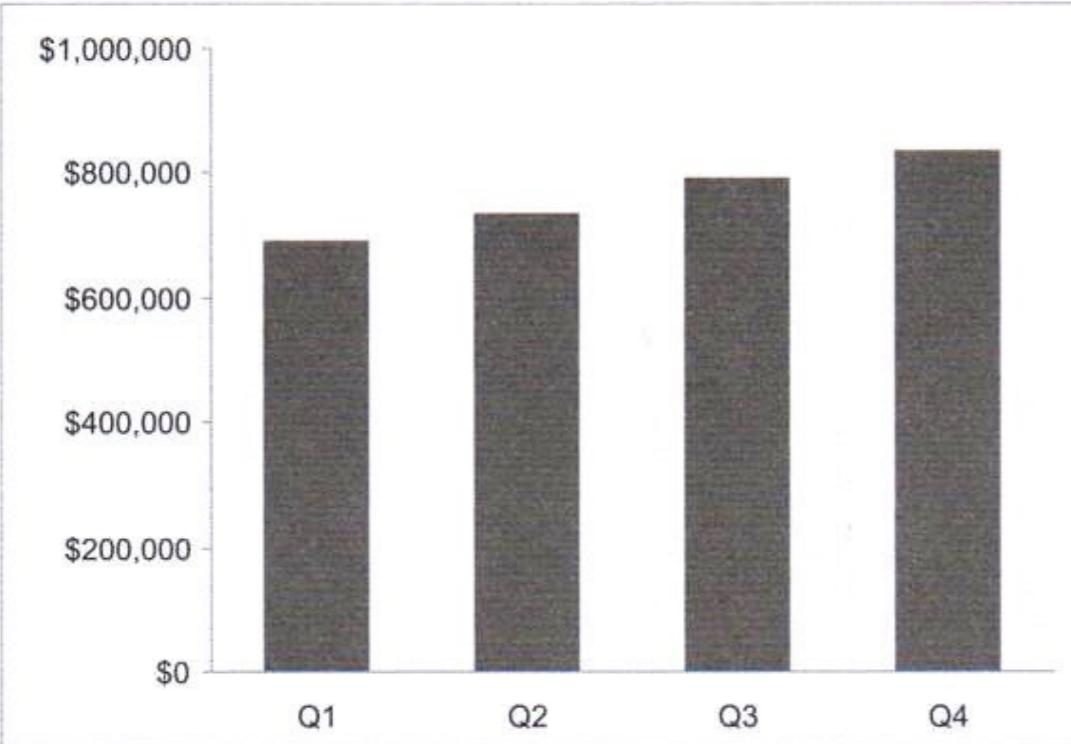
Em teoria, um gráfico tridimensional pode exibir dados com três variáveis



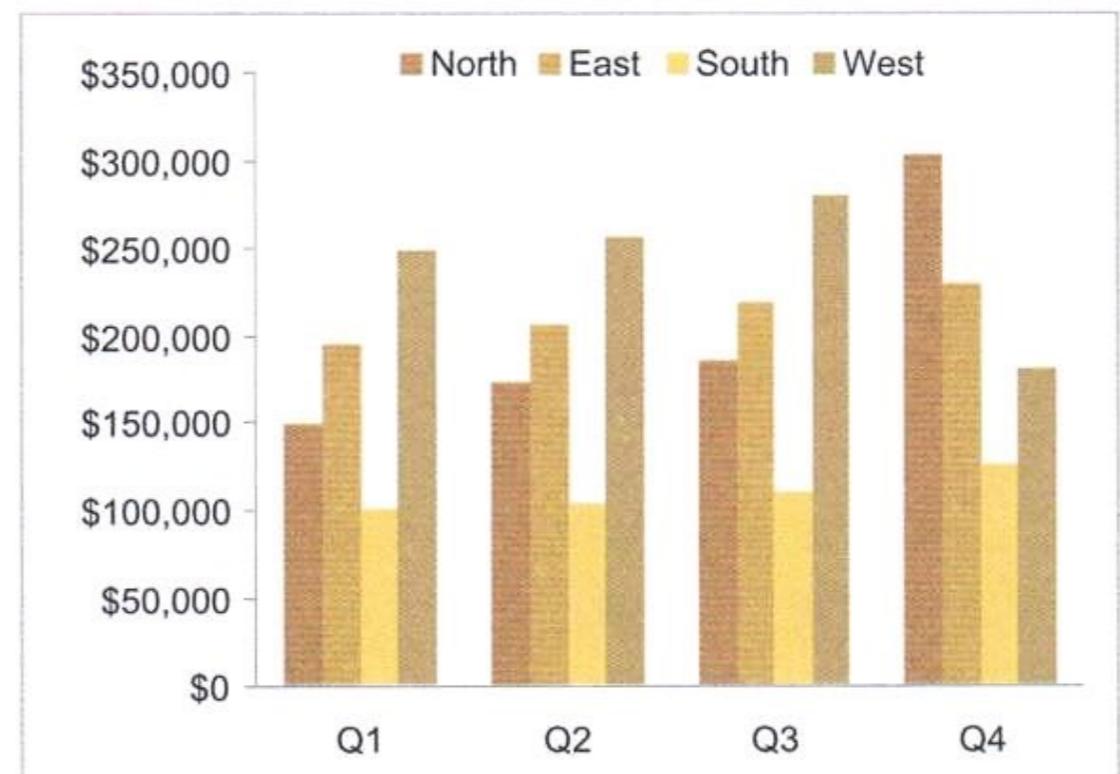




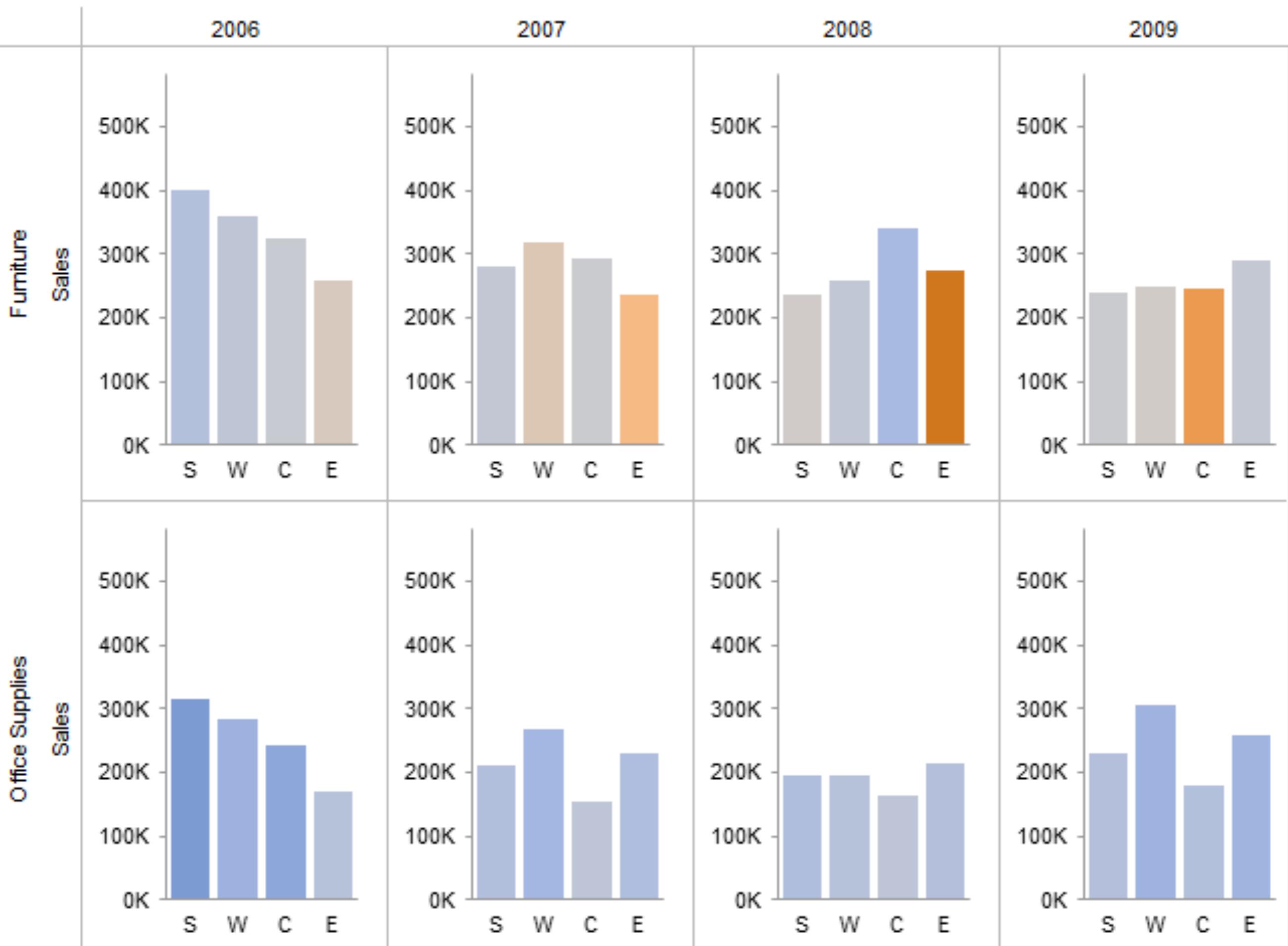
Uso de *drop lines*



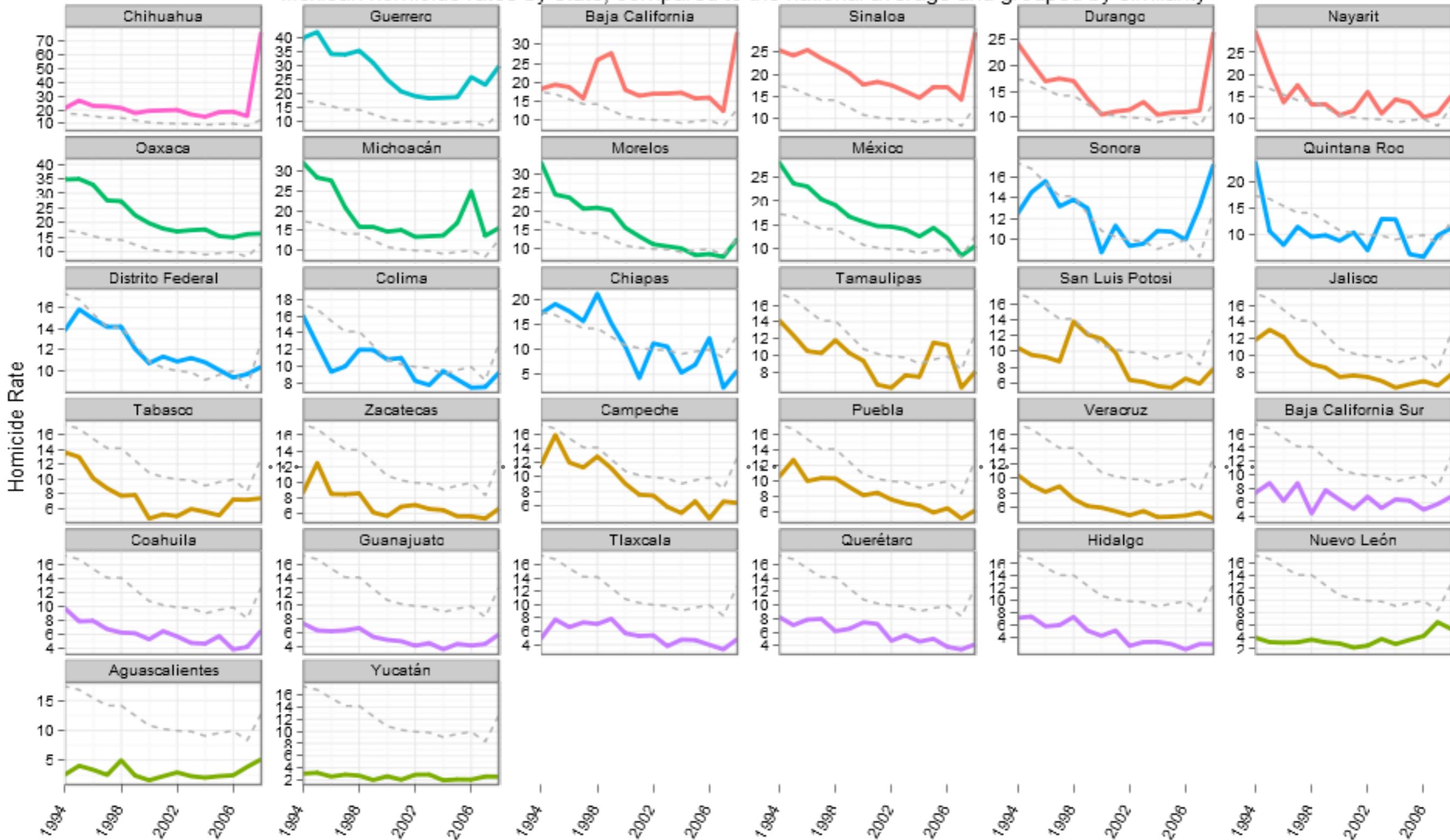
A melhor opção acaba não usando a terceira dimensão

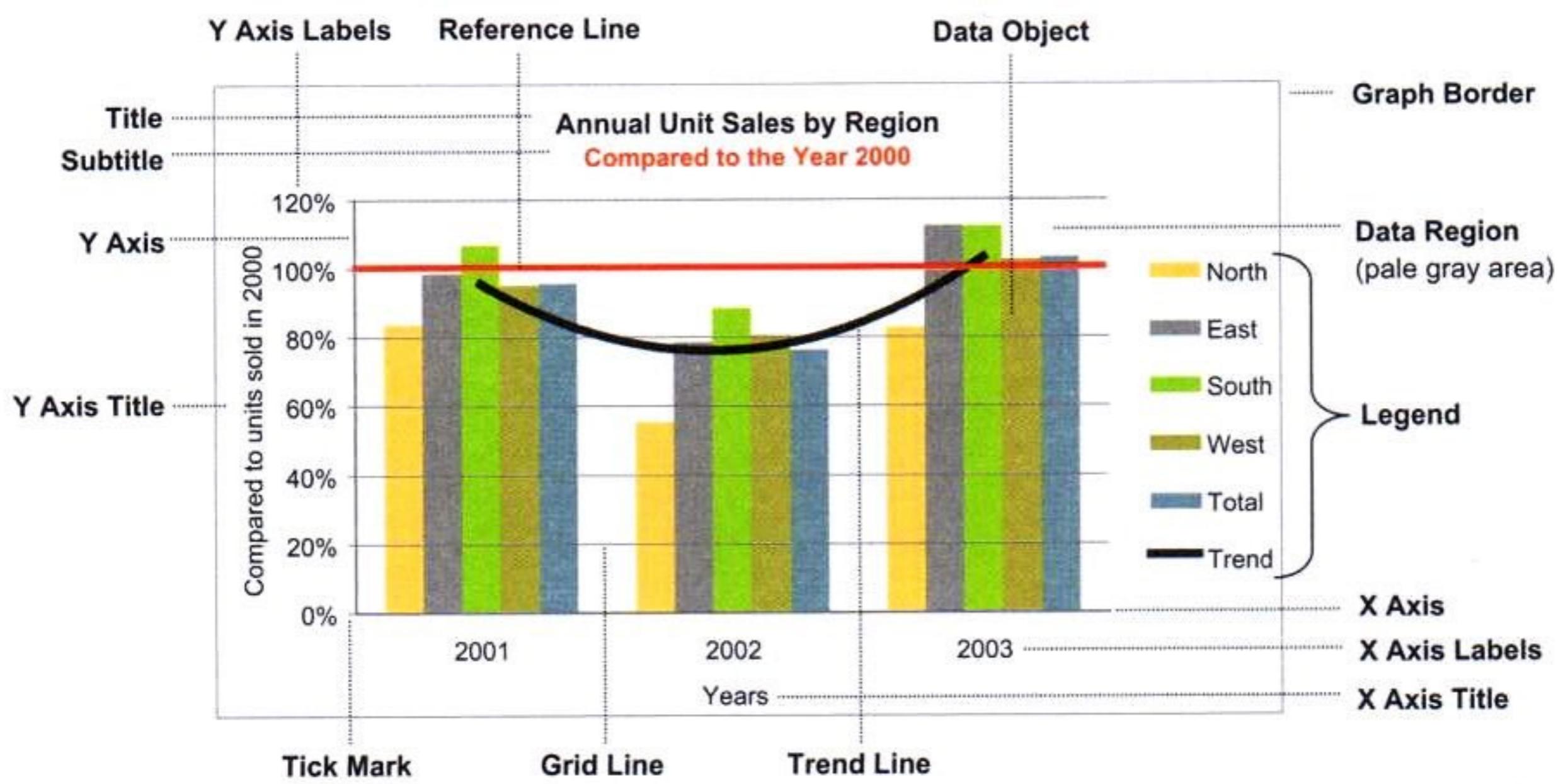


E se houverem mais dimensões?
Como resolver este problema?



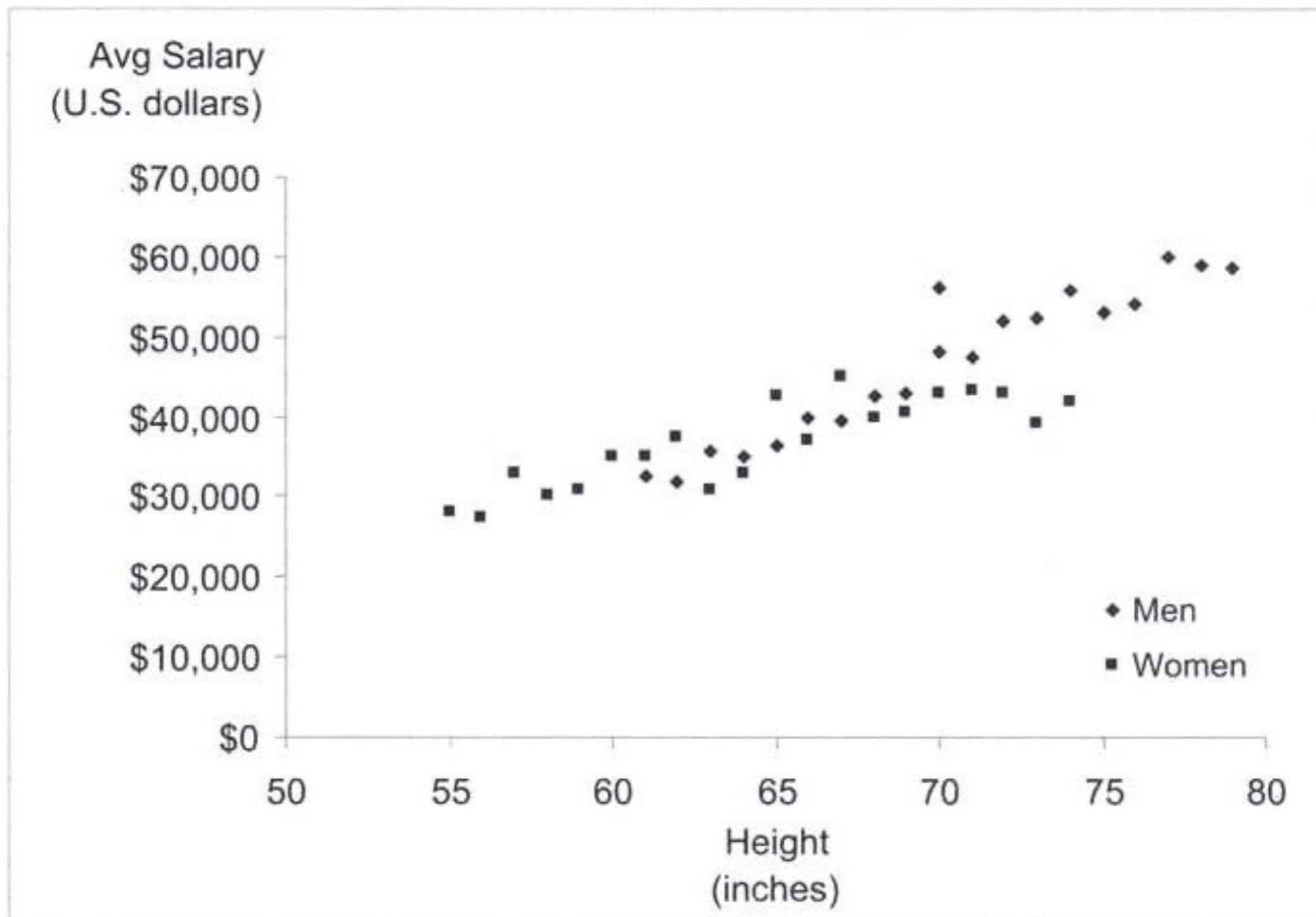
Mexican homicide rates by state, compared to the national average and grouped by similarity

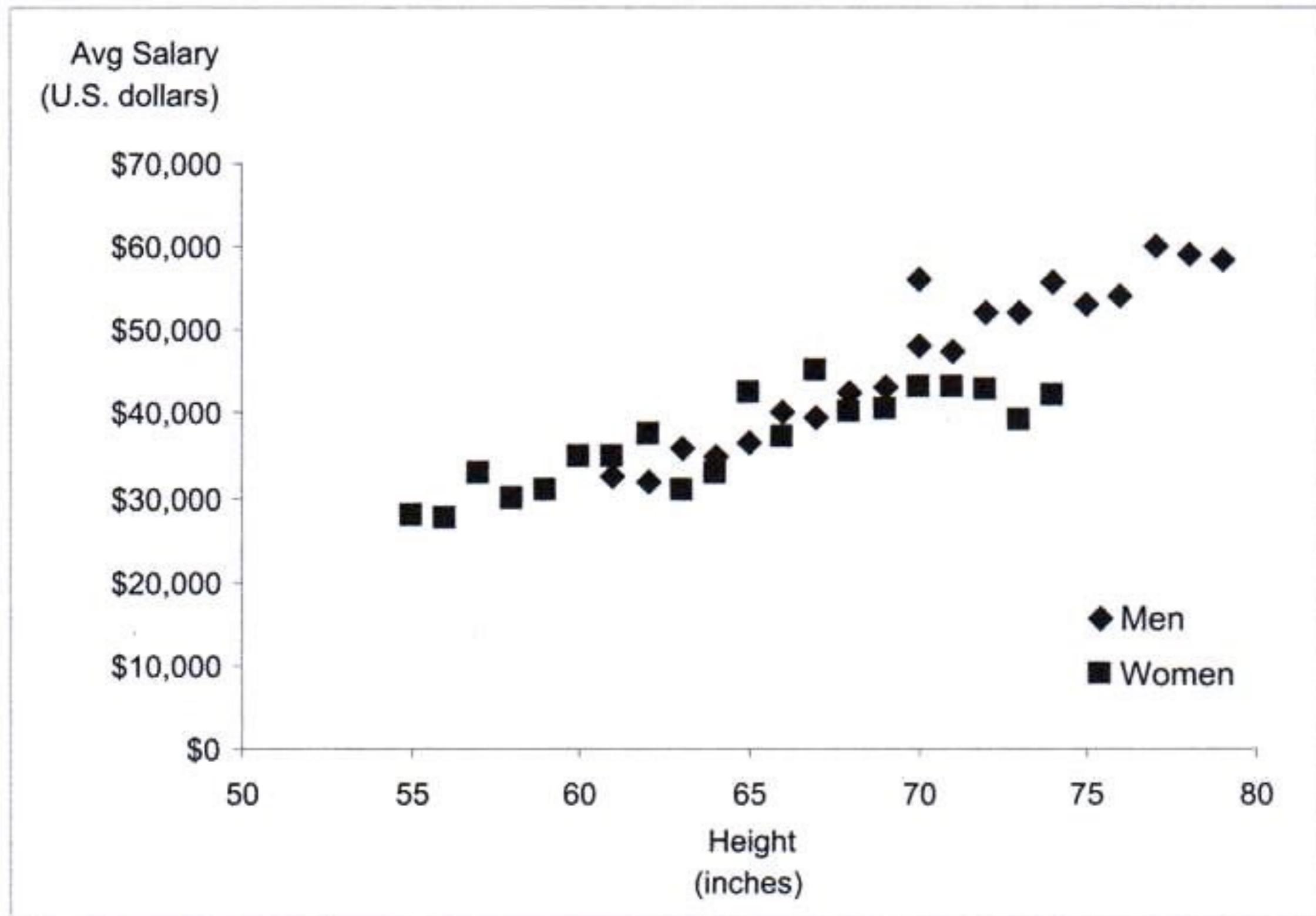




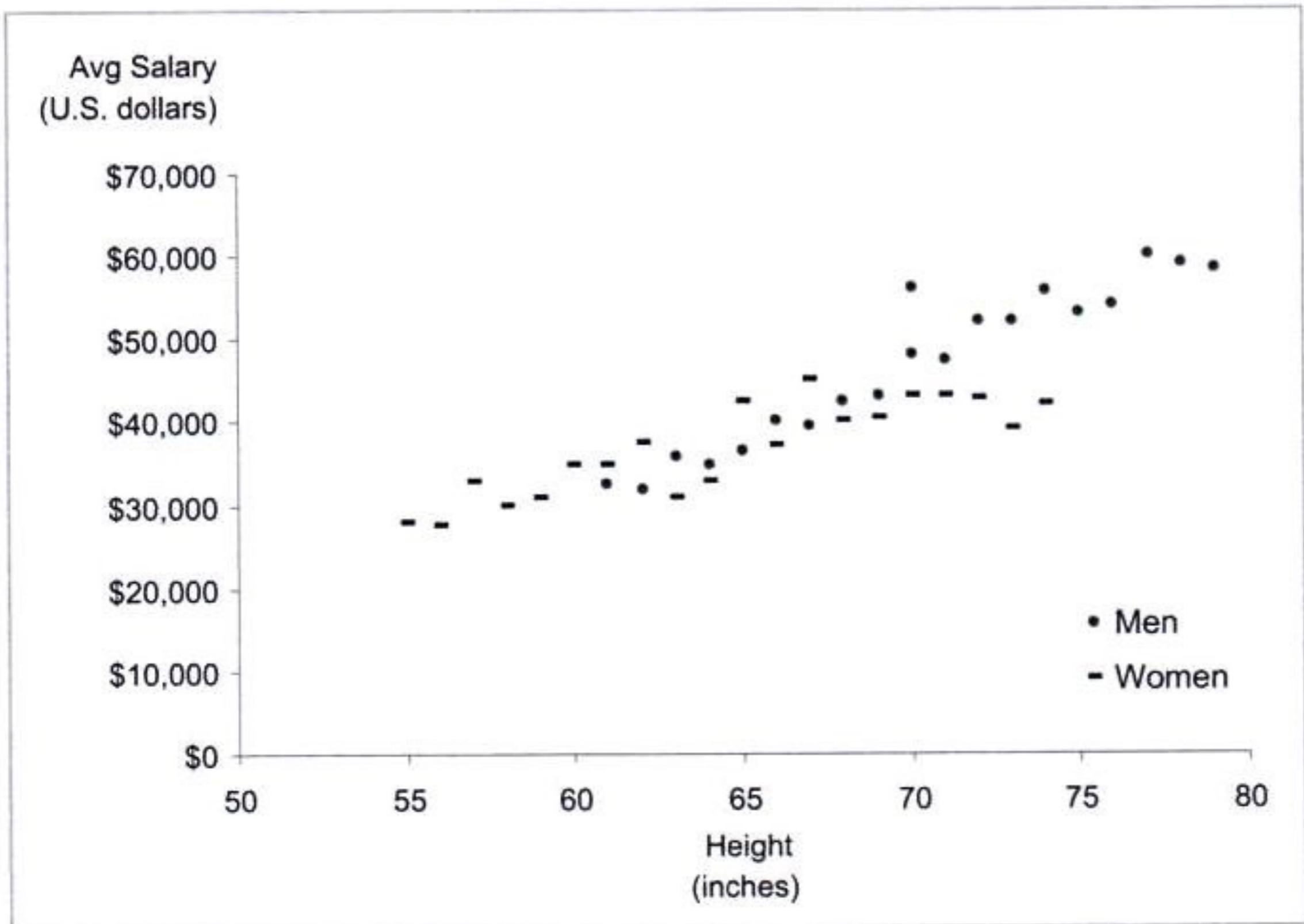
PONTOS

- Faça com que os pontos sejam distintamente visíveis

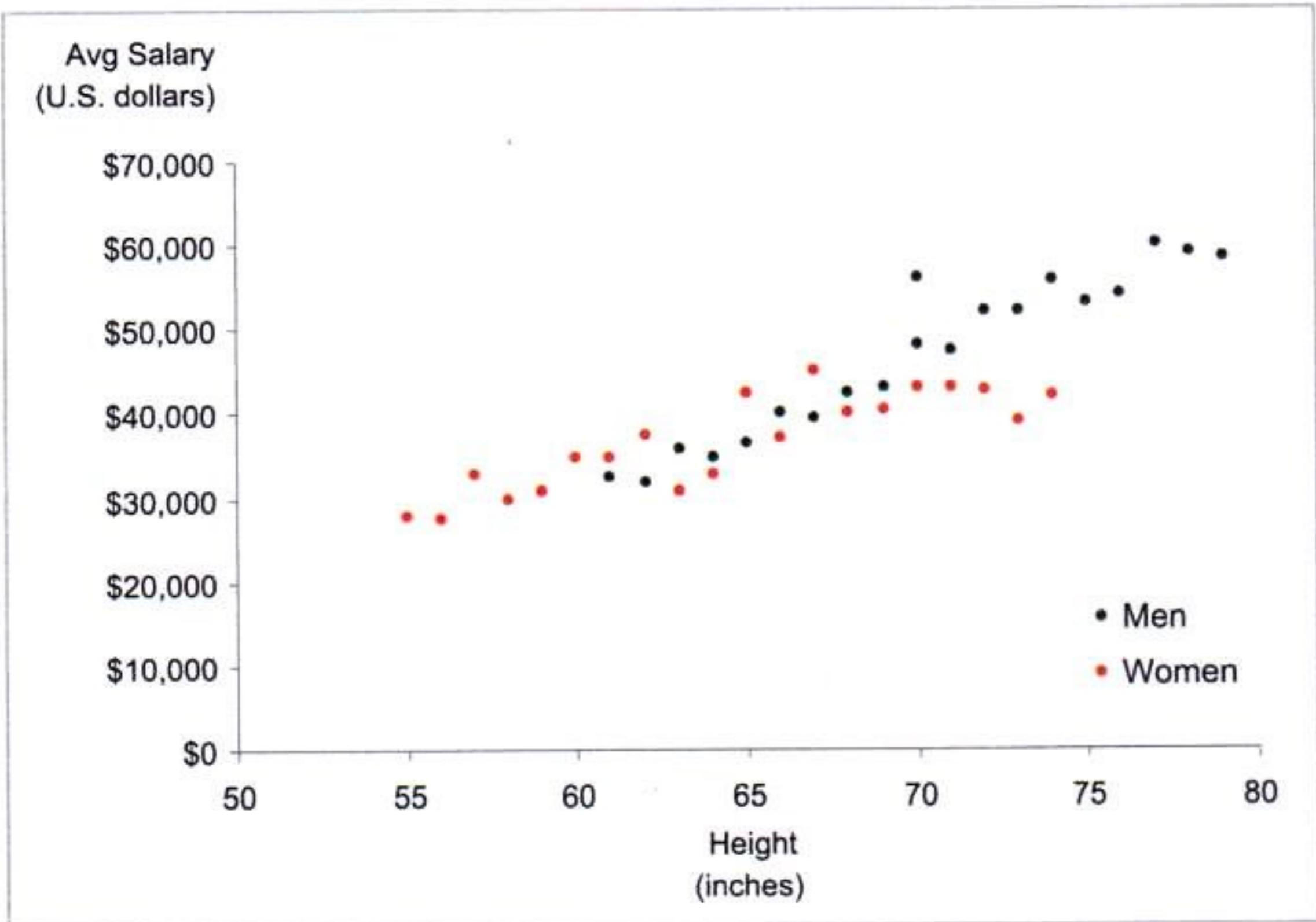




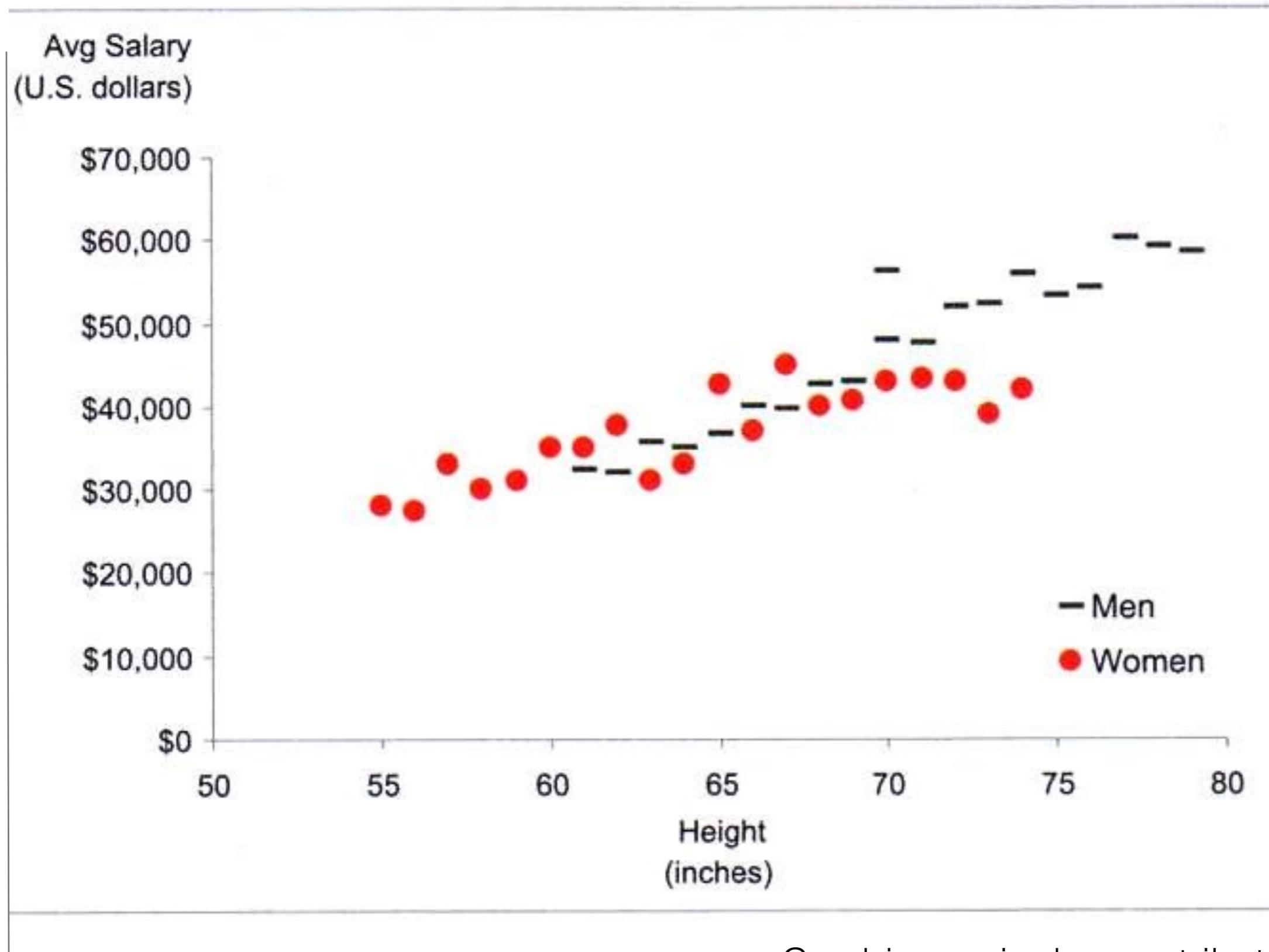
Aumente o tamanho dos pontos



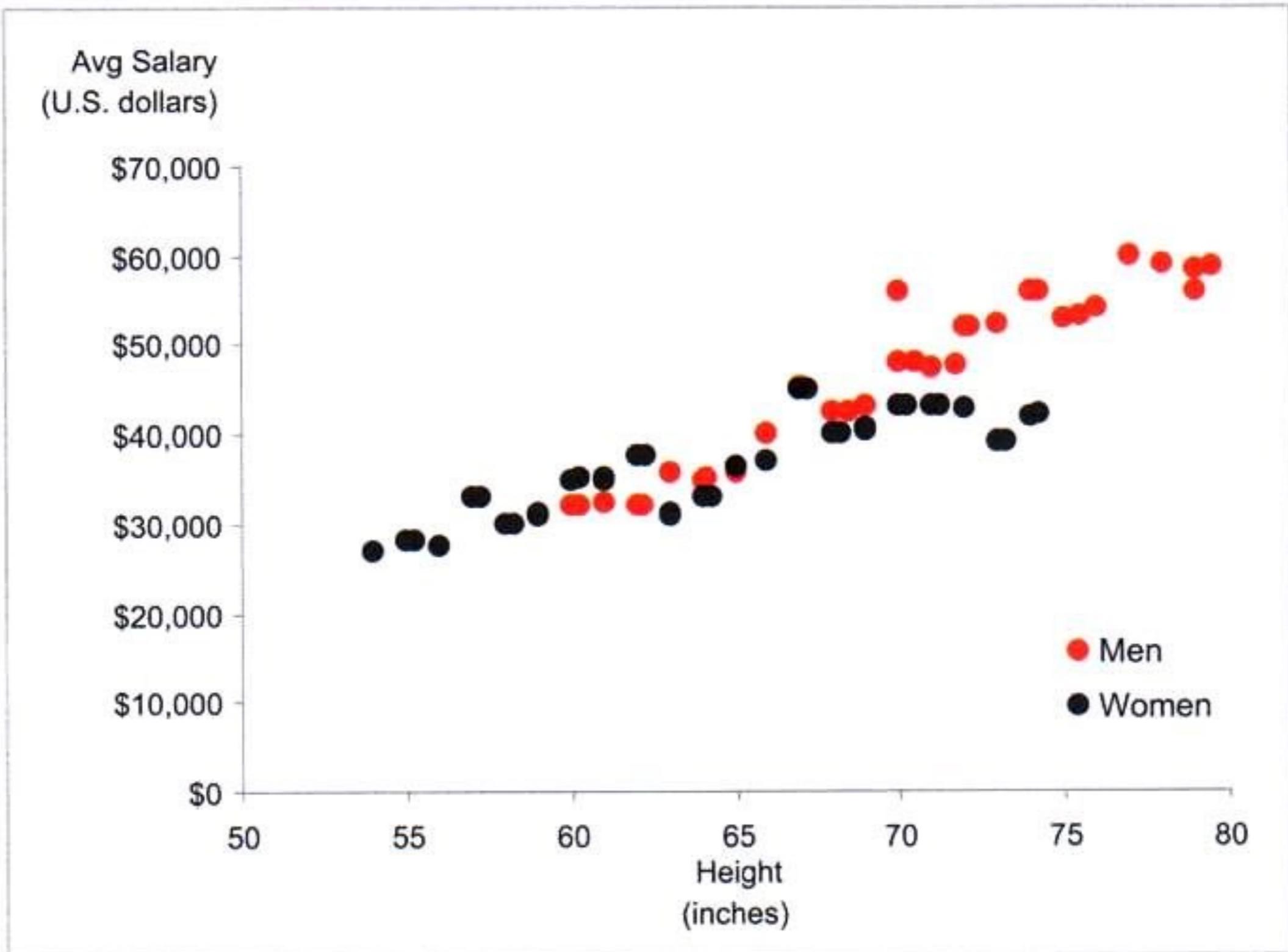
Use formas mais visualmente distintas

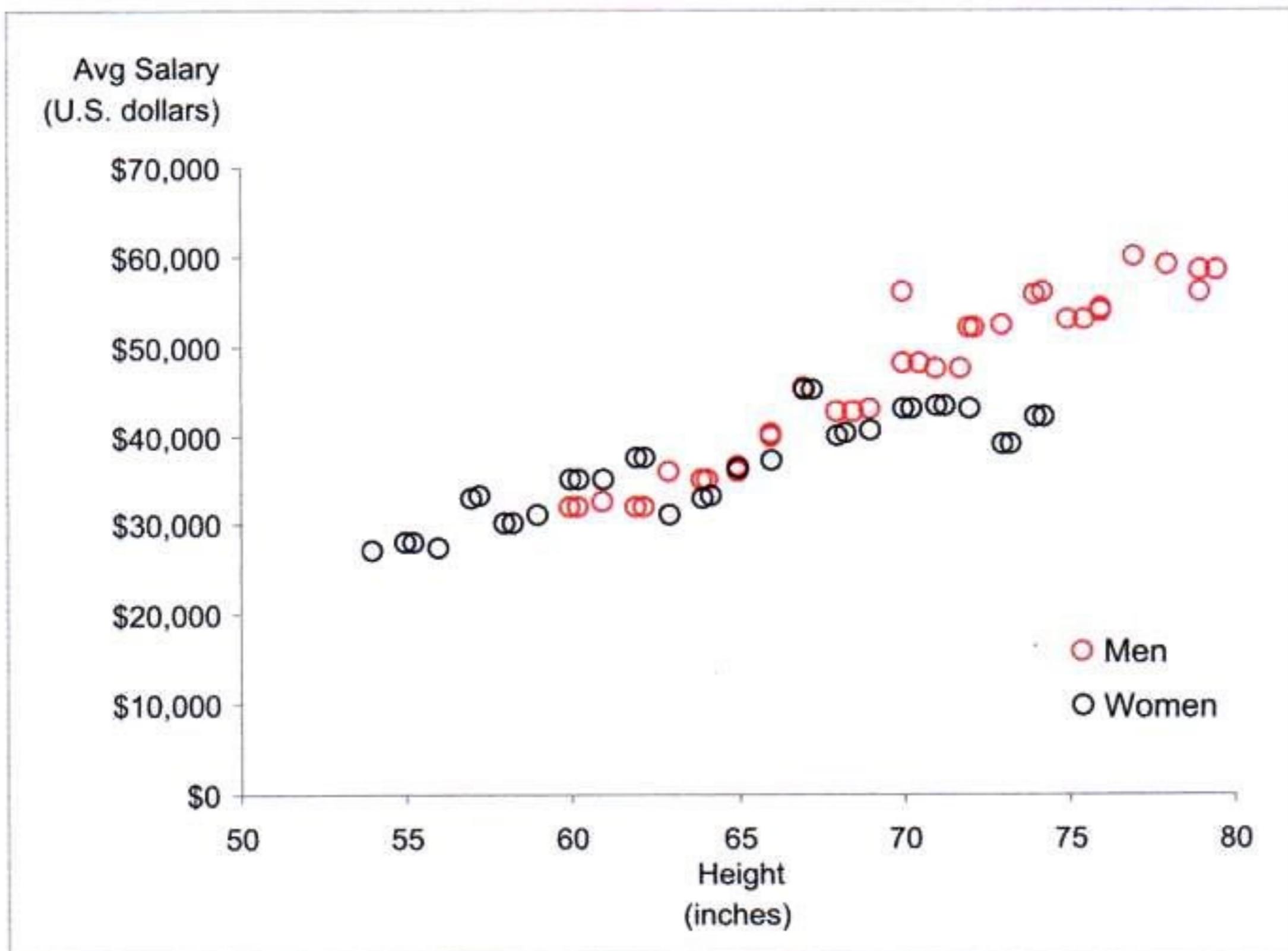


Use cores diferentes

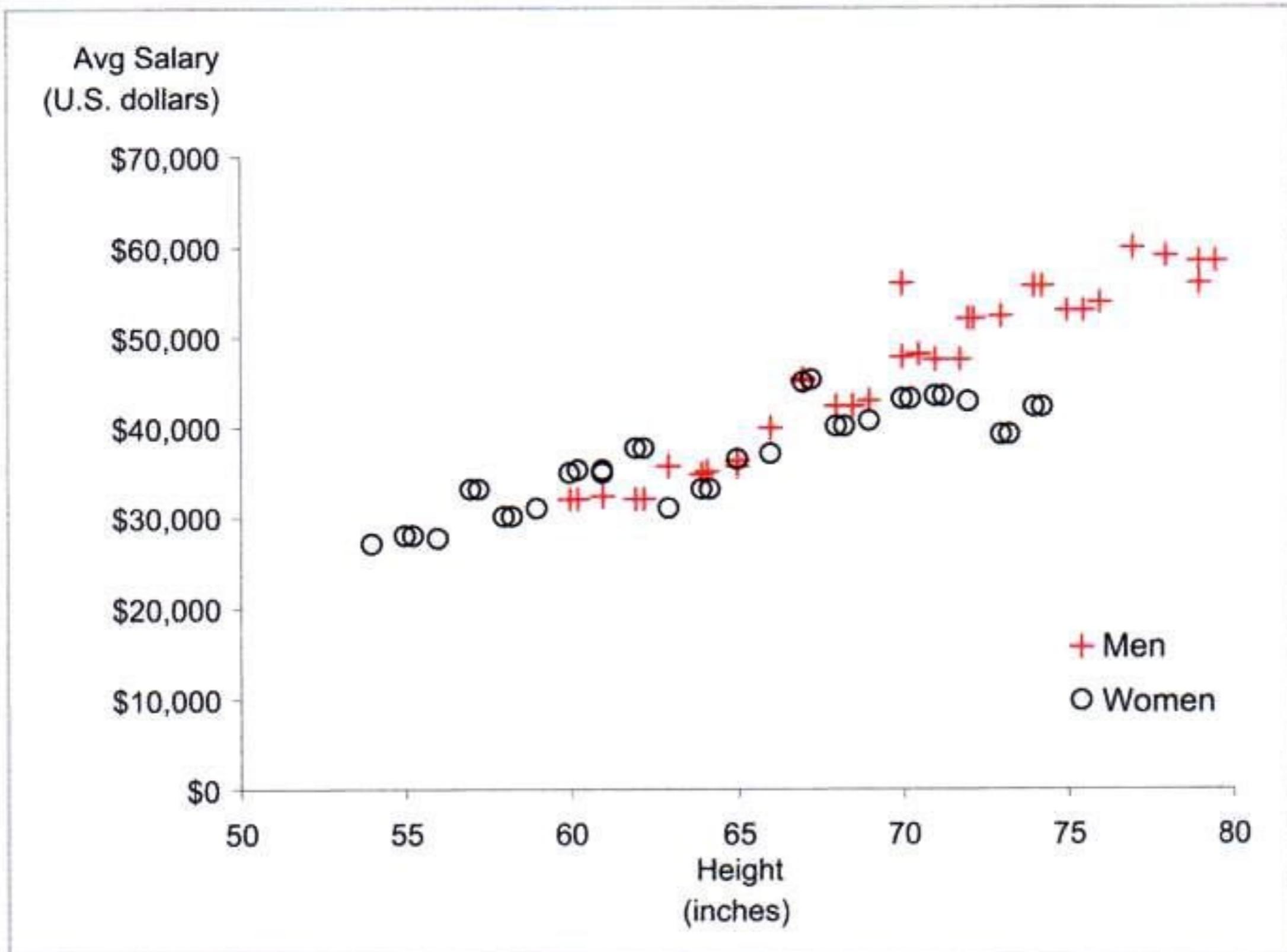


Combine mais de um atributo

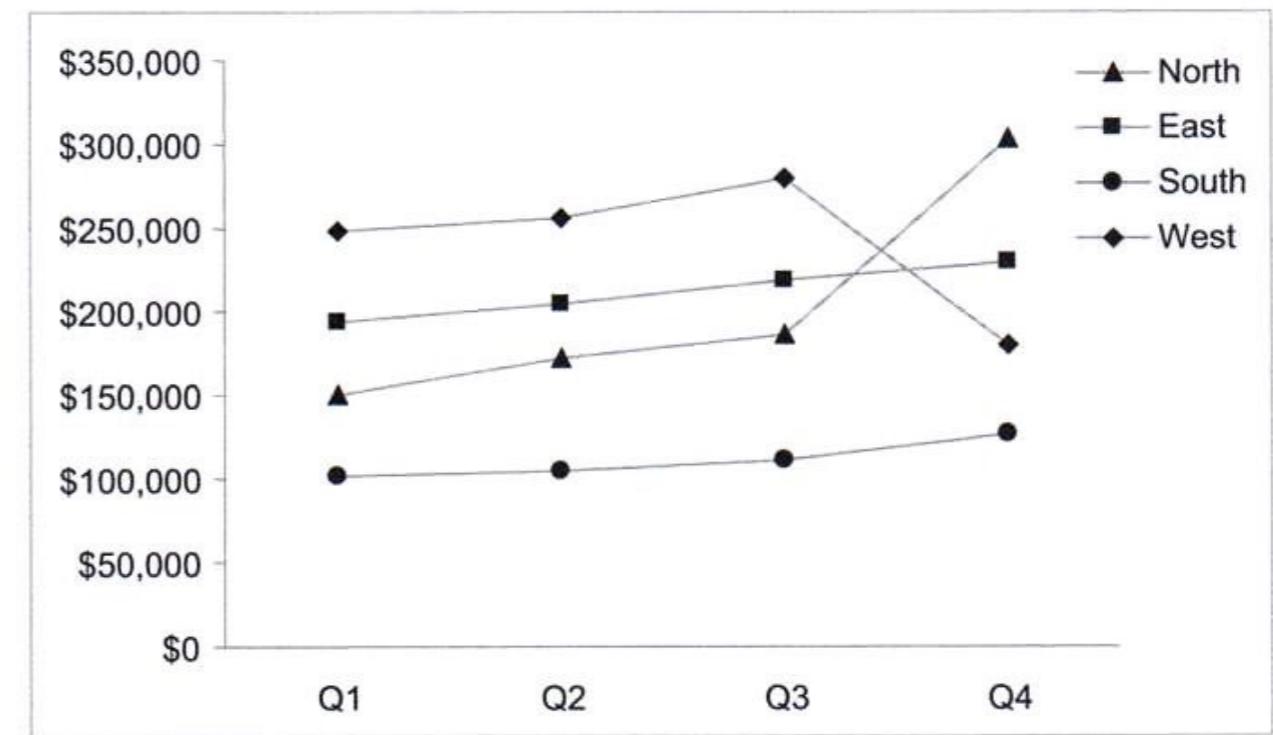
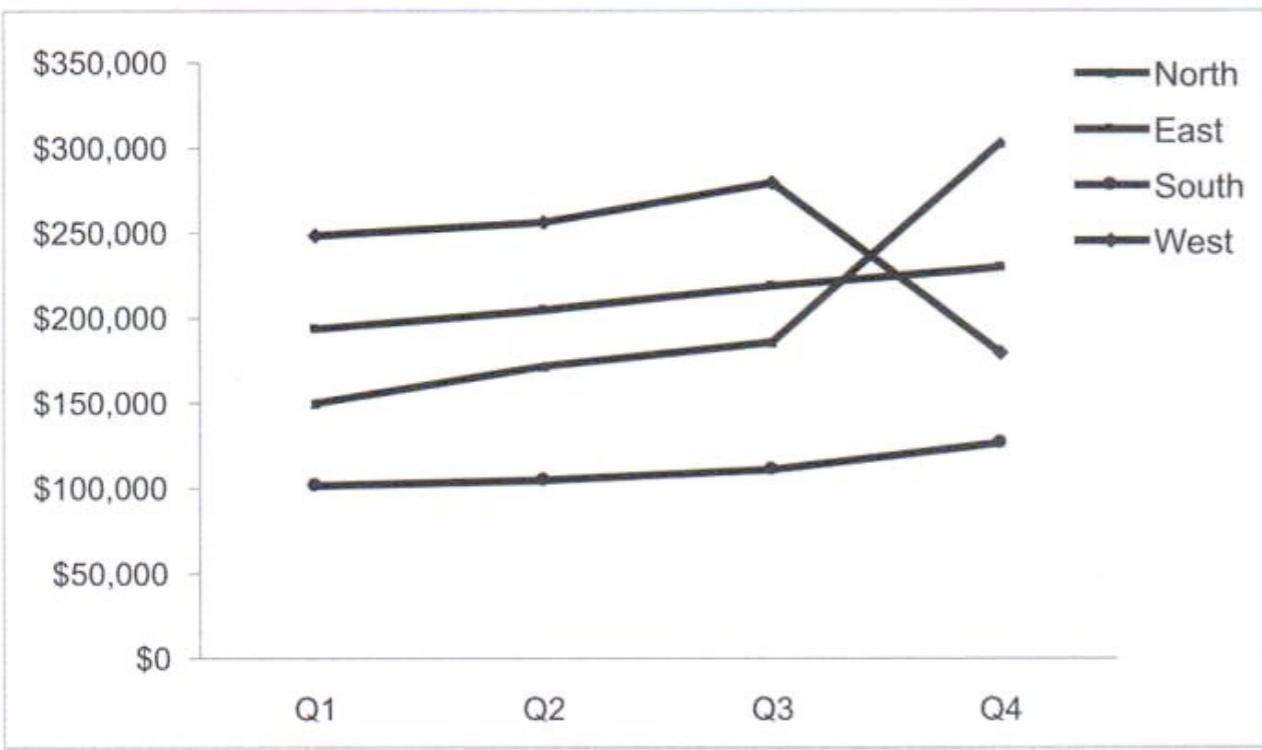




Use pontos sem preenchimento



E use objetos mais distintos



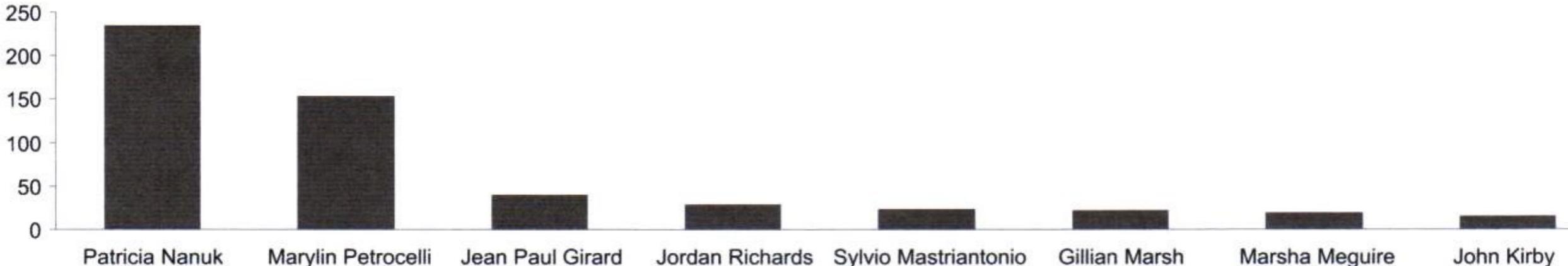
- Aumente os pontos e escolha objetos mais distintos
- Faça os pontos se destacarem com relação às linhas

BARRAS

- Vários atributos das barras merecem atenção:
 - Orientação
 - Proximidade
 - Preenchimento
 - Bordas
 - Bases

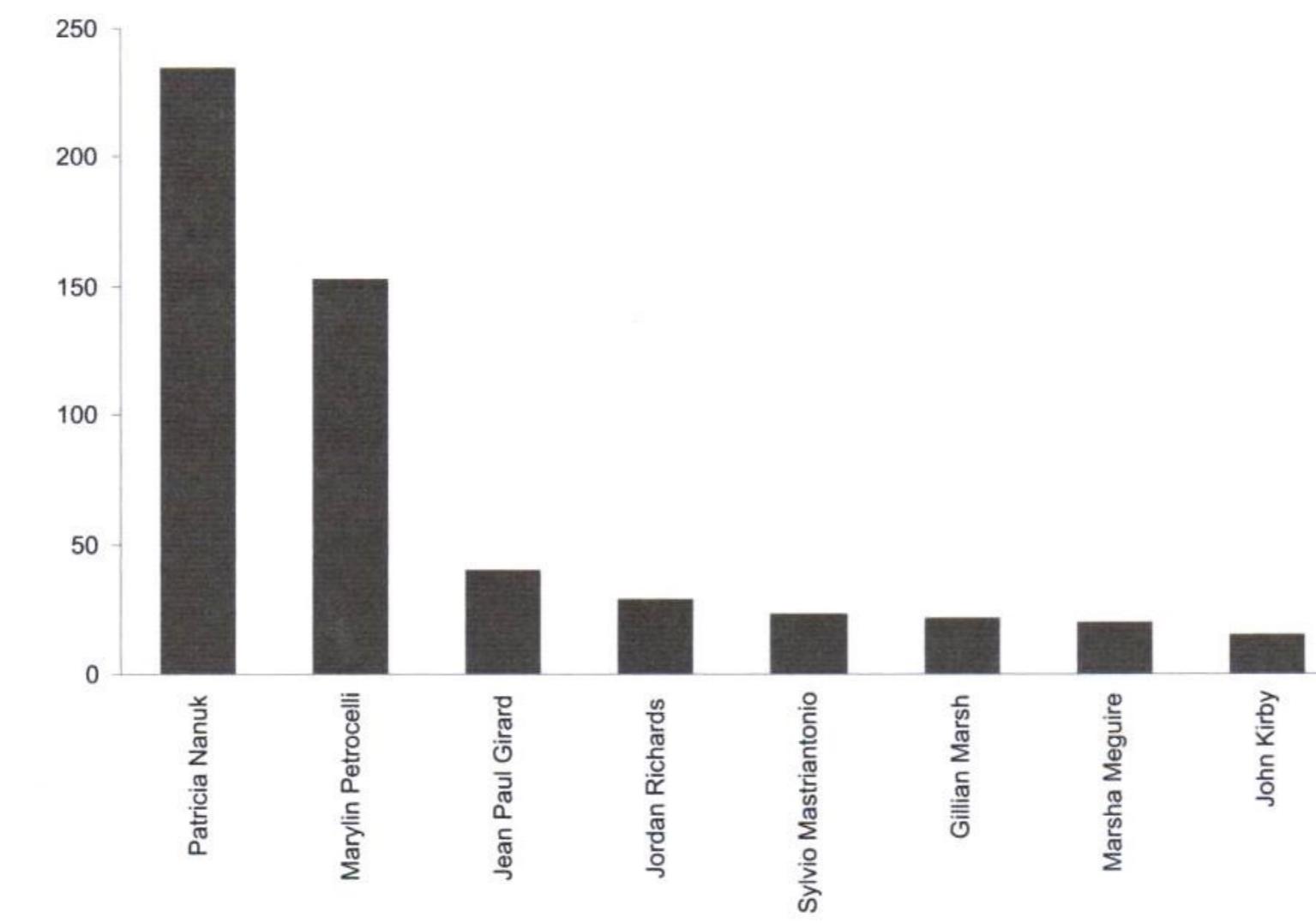
Number
of
Orders

Top Sales Representatives



Number
of
Orders

Top Sales Representatives

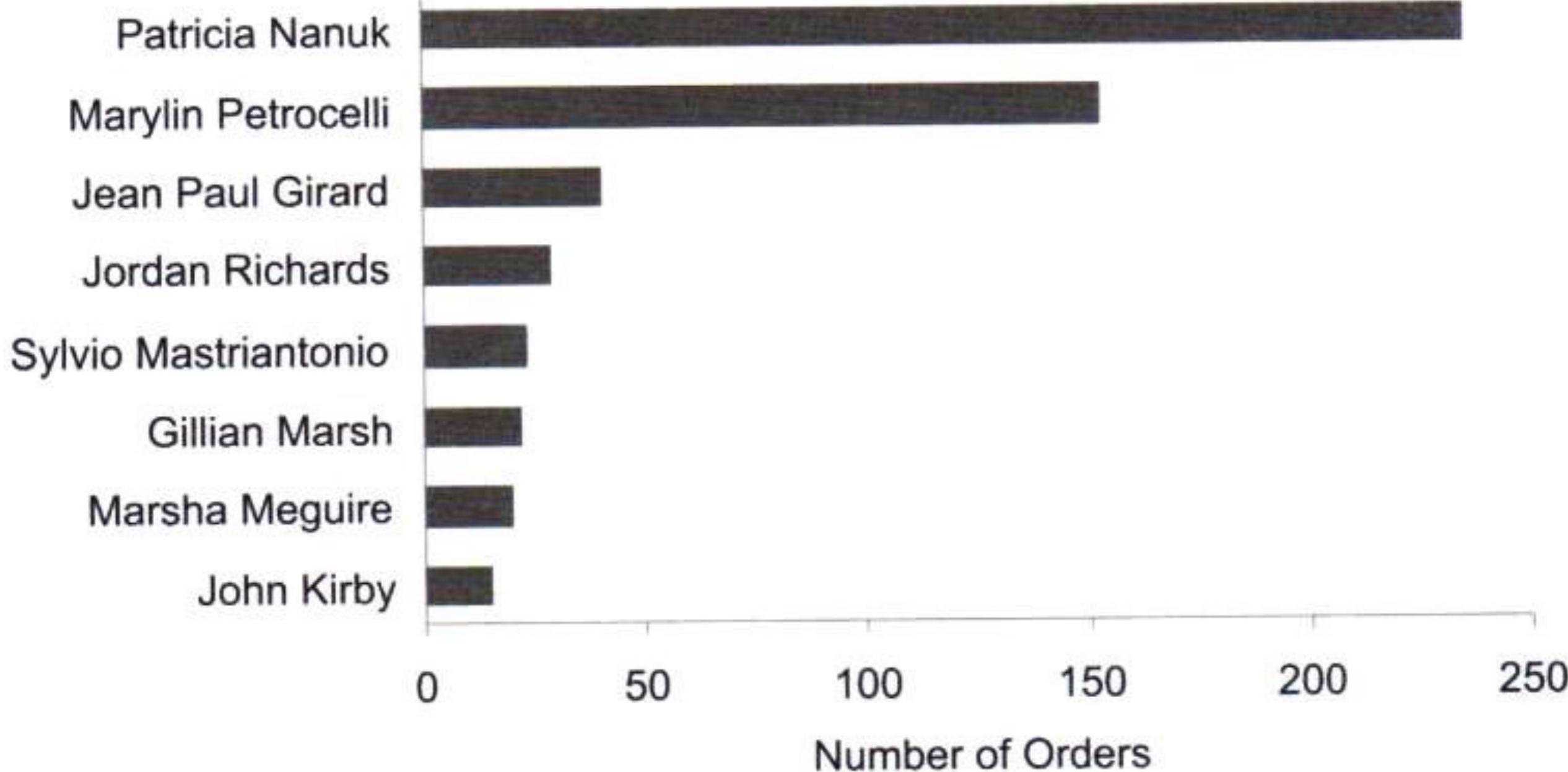


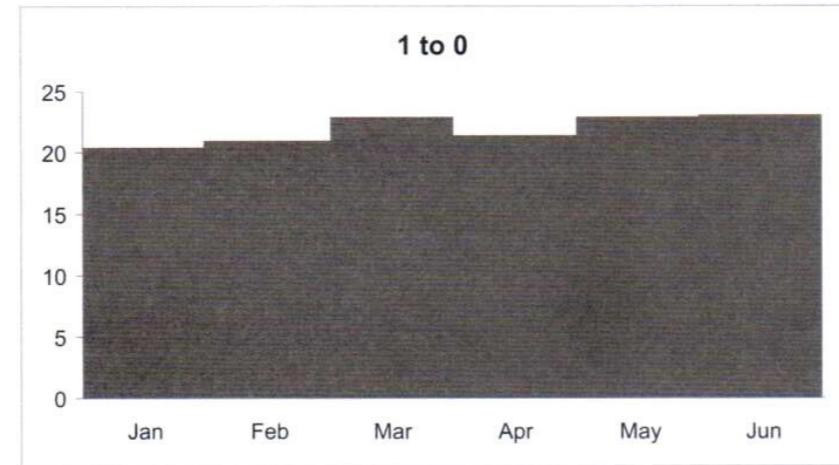
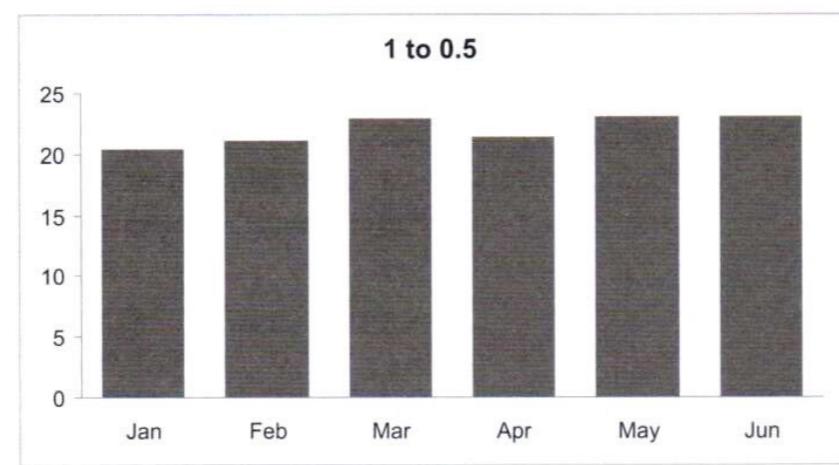
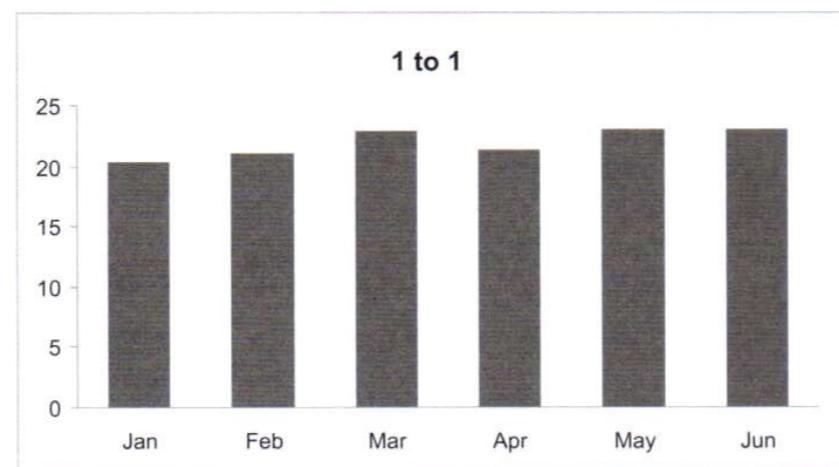
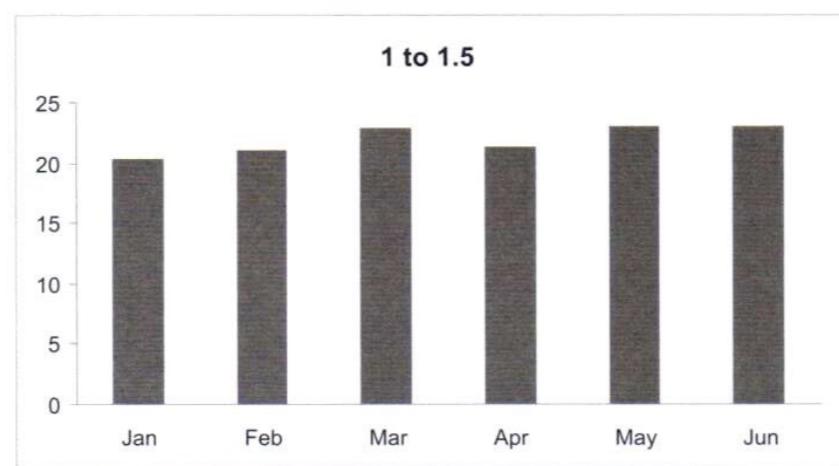
BARRAS

ORIENTAÇÃO

- Barras horizontais são a melhor escolha quando:
 - O gráfico mostra relacionamento de ranking
 - Os rótulos das categorias não cabem na versão vertical

Top Sales Representatives

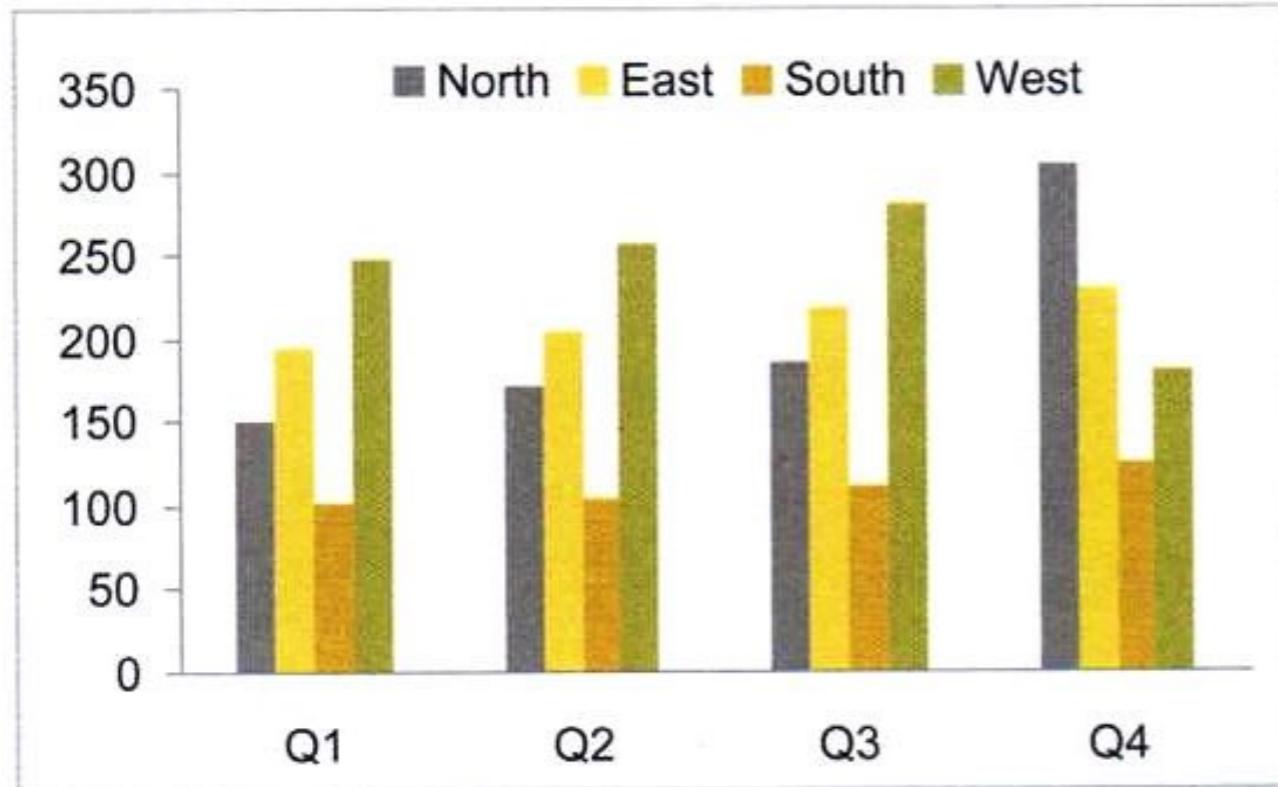




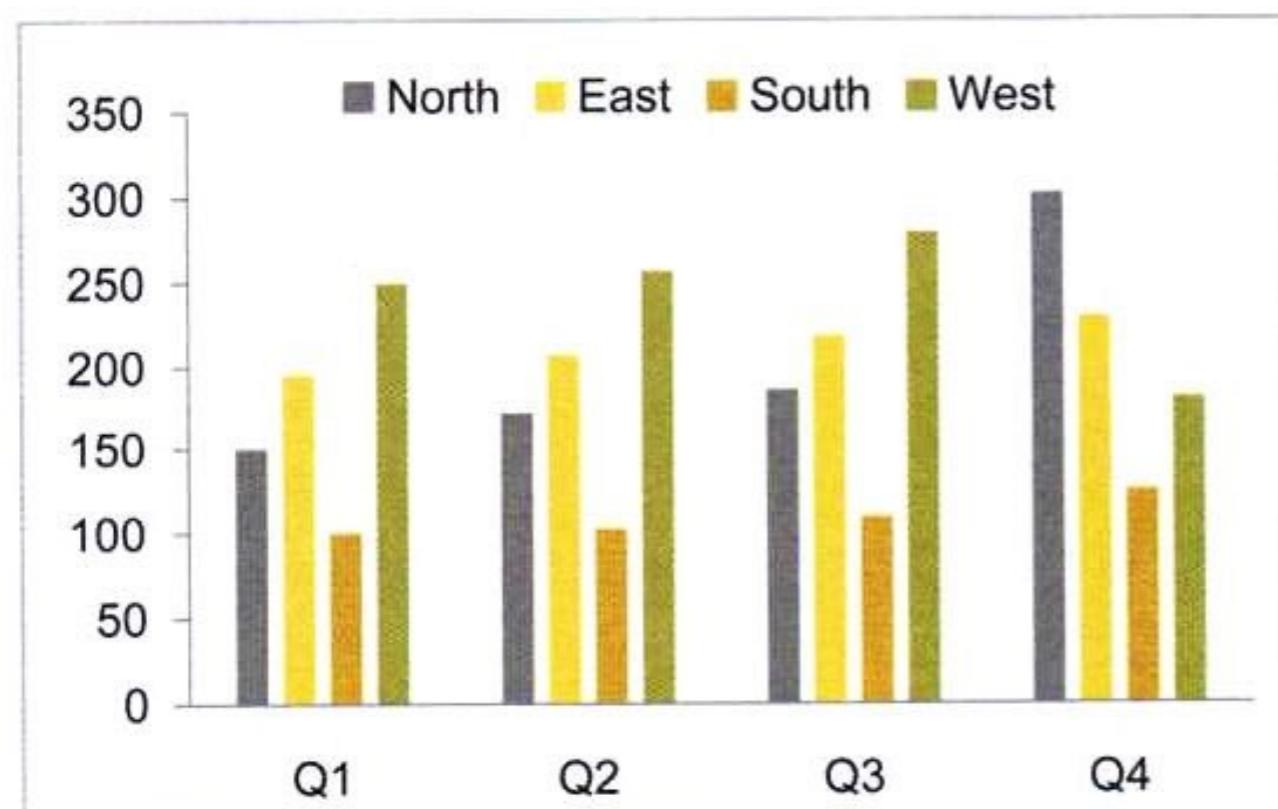
BARRAS

PROXIMIDADE

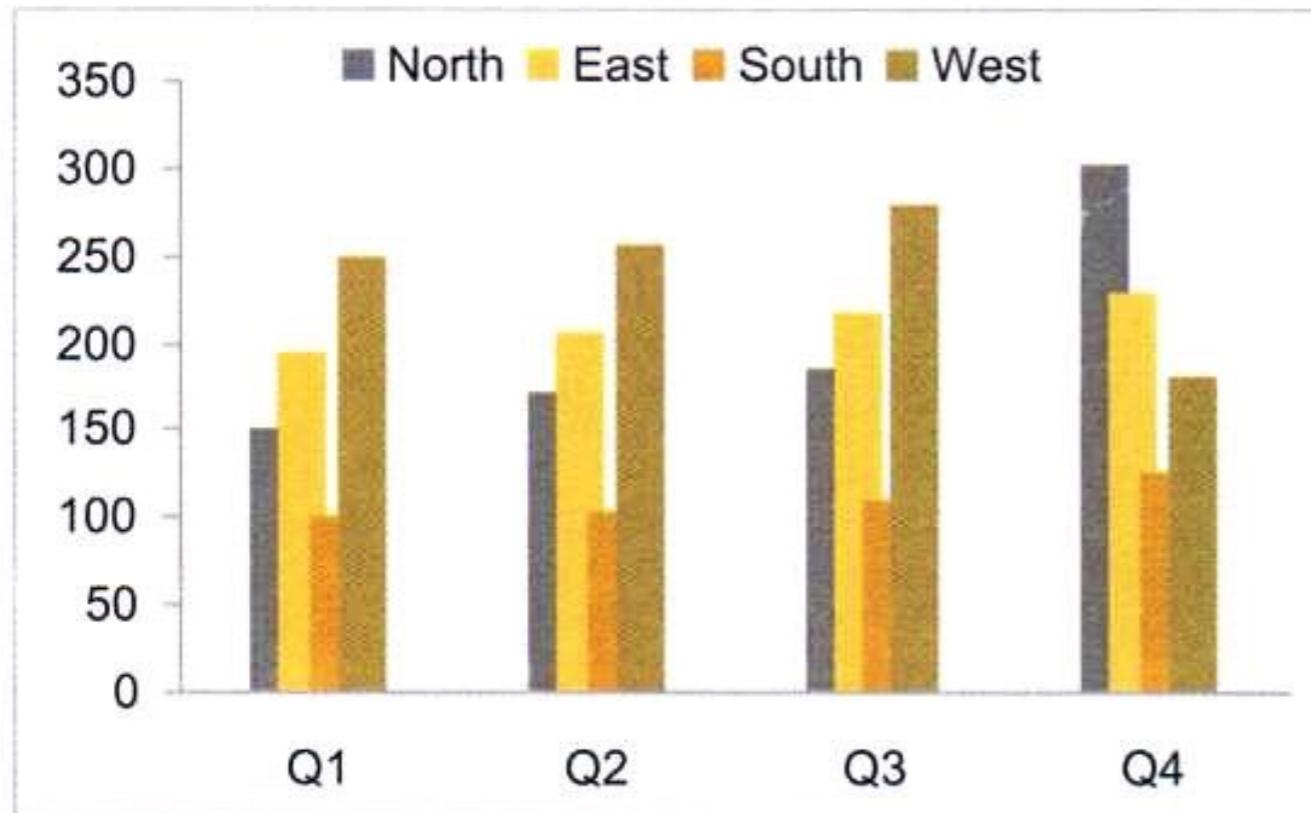
- Manter a razão entre a largura das barras e o espaçamento entre 1:1,5 e 1:0,5



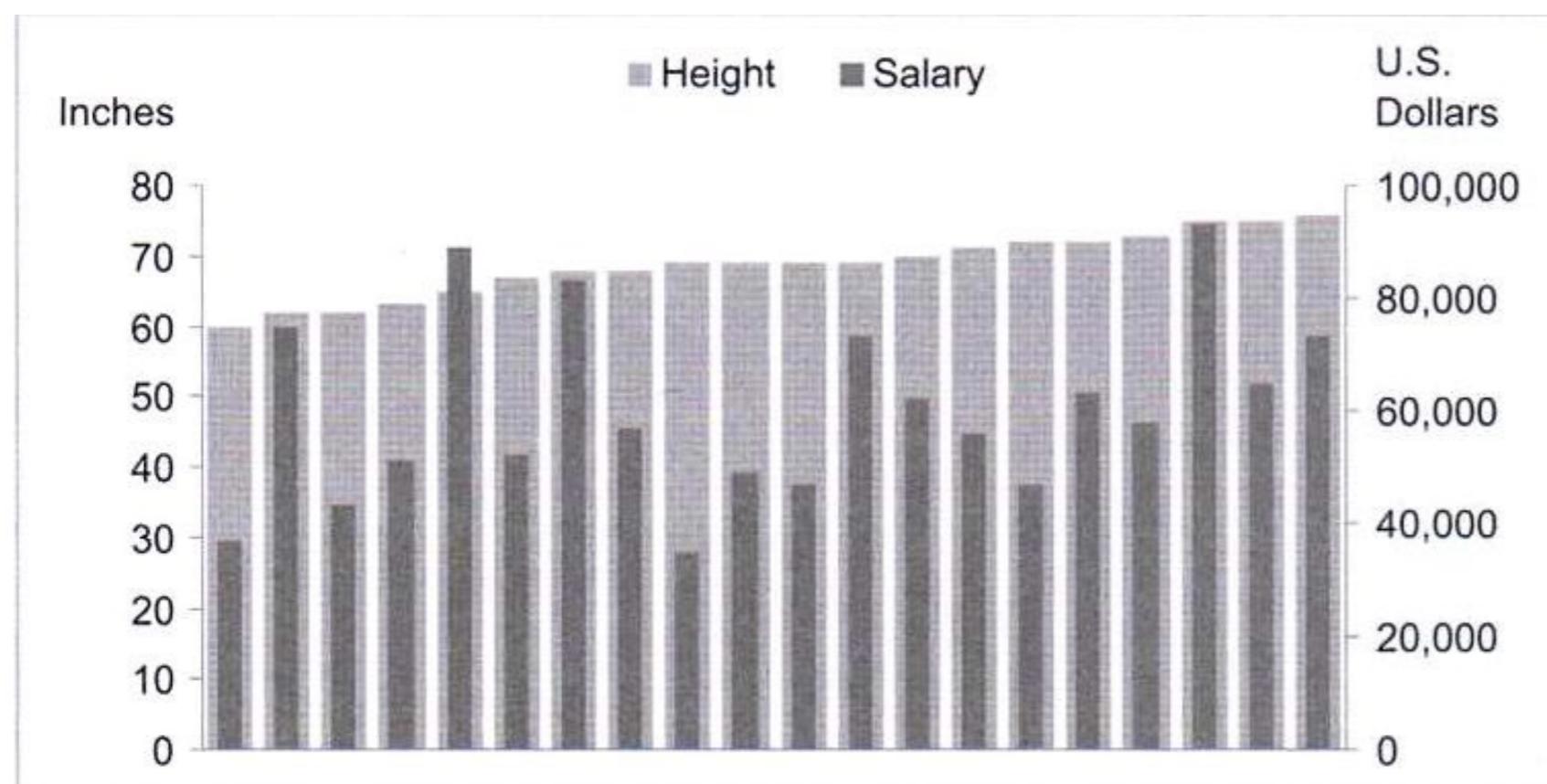
Uma exceção ocorre quando as barras representam subdivisões categóricas (barras agrupadas)



Neste caso, o espaço não é necessário



Nunca sobreponha barras...



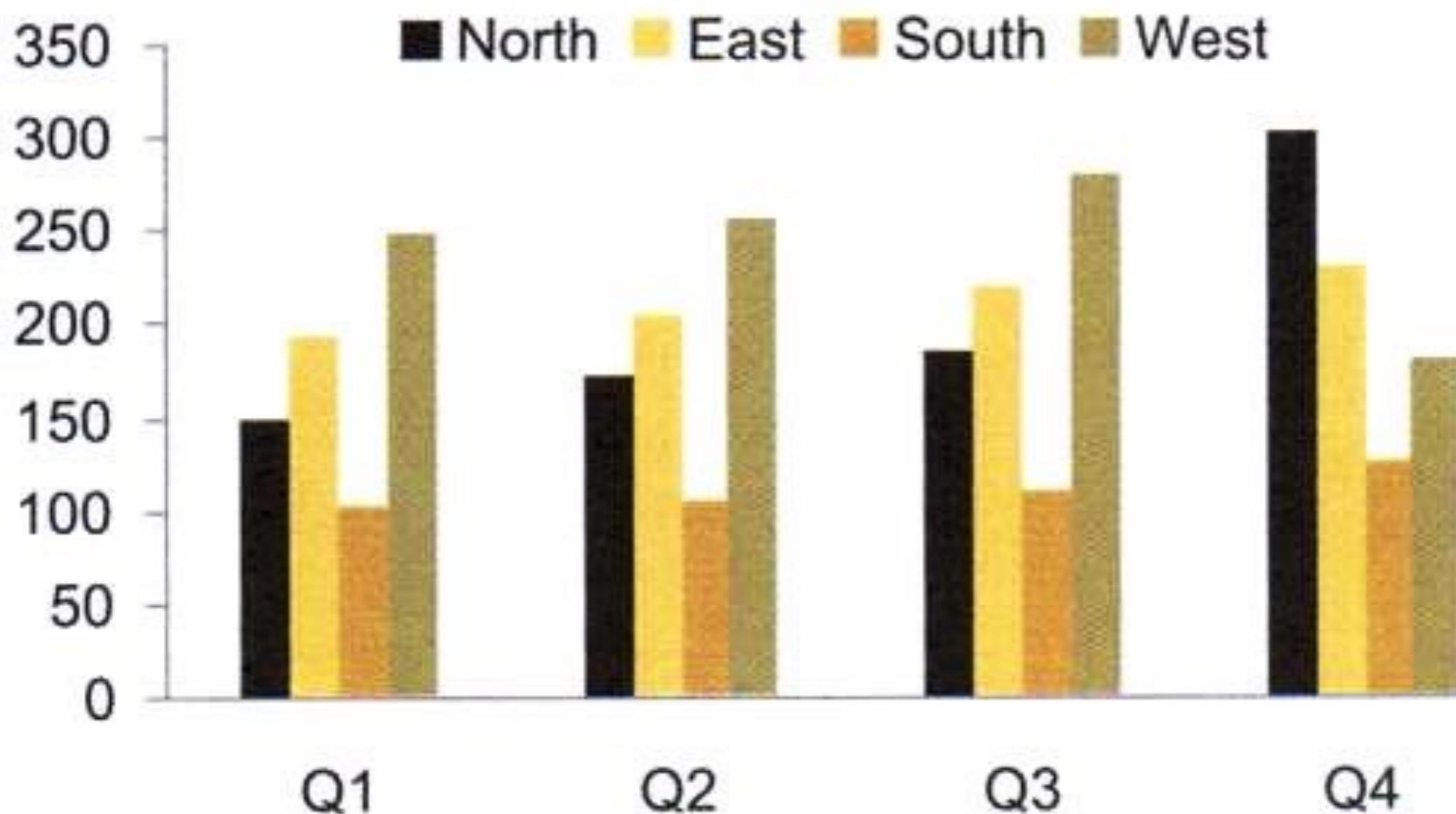
...exceto quando
quiser analisar
correlações

BARRAS

PREENCHIMENTO

- Preenchimento
- Evite usar padrões pois eles comumente provocam efeitos visuais indesejados
- Use cores de preenchimento claramente distintas
- Use cores balanceadas em termos de intensidade para dados que tenham a mesma importância
- Use cores mais intensas apenas quando desejar realçar valores particulares

North Region Exhibits Greatest Growth!

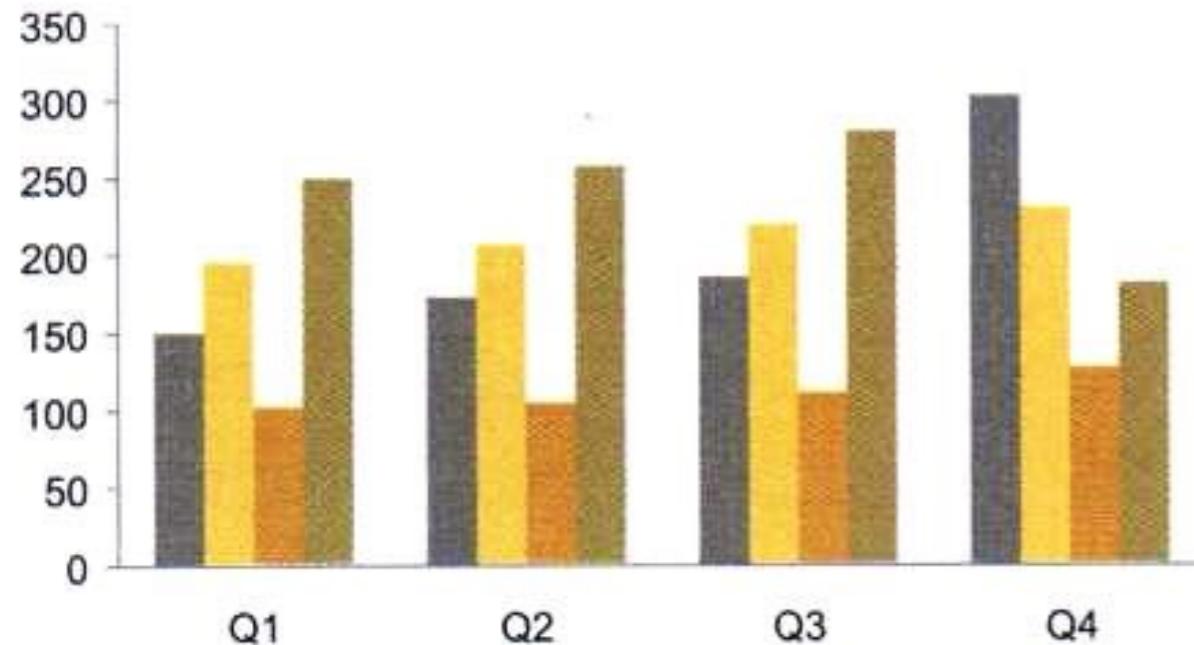


BARRAS

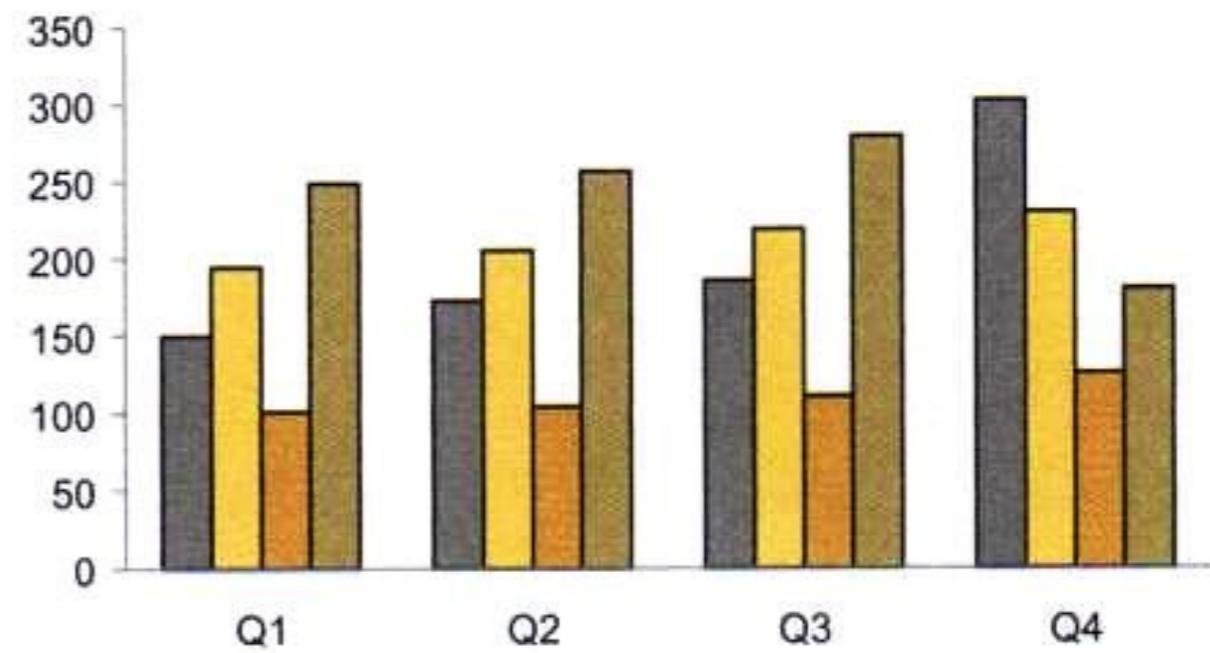
BORDAS

- Componente visual que não adiciona informação
- Útil apenas quando a cor da barra pode ser confundida com a cor do fundo
- Útil para destacar valores

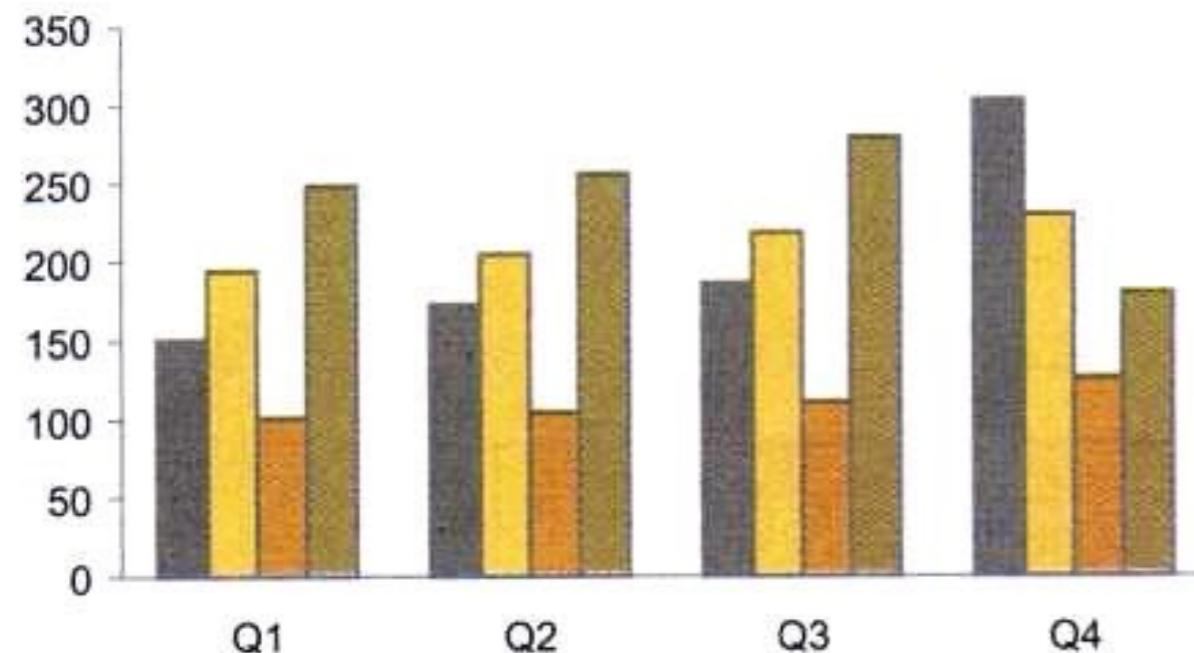
No bar borders



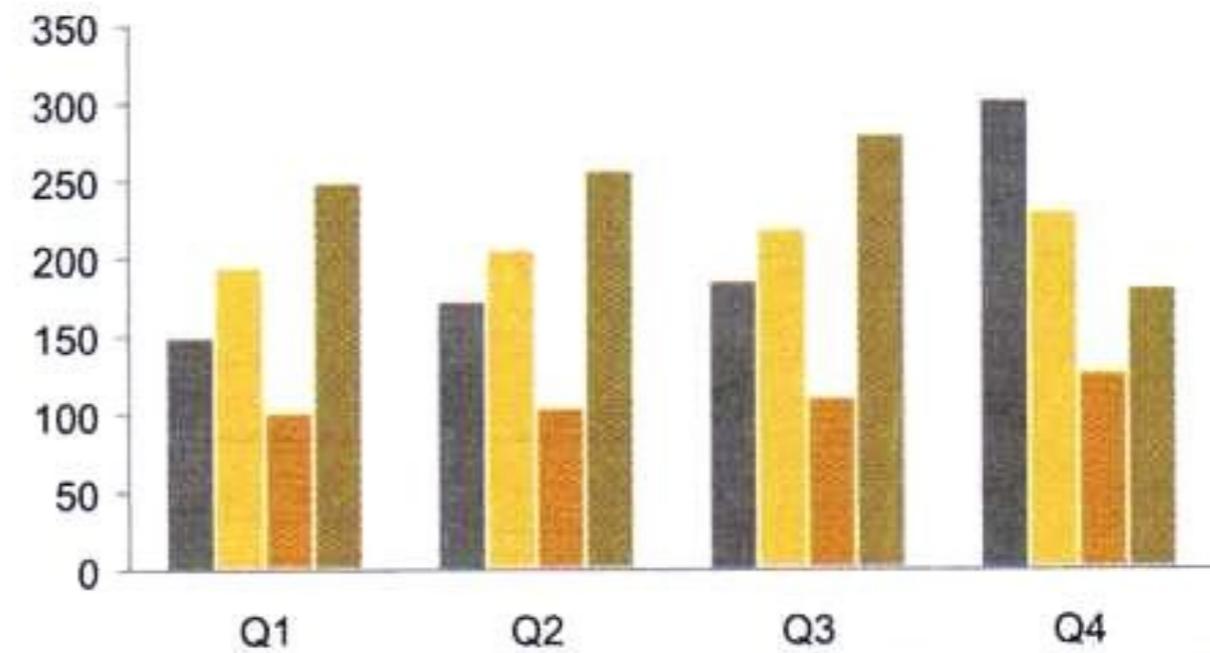
Black bar borders



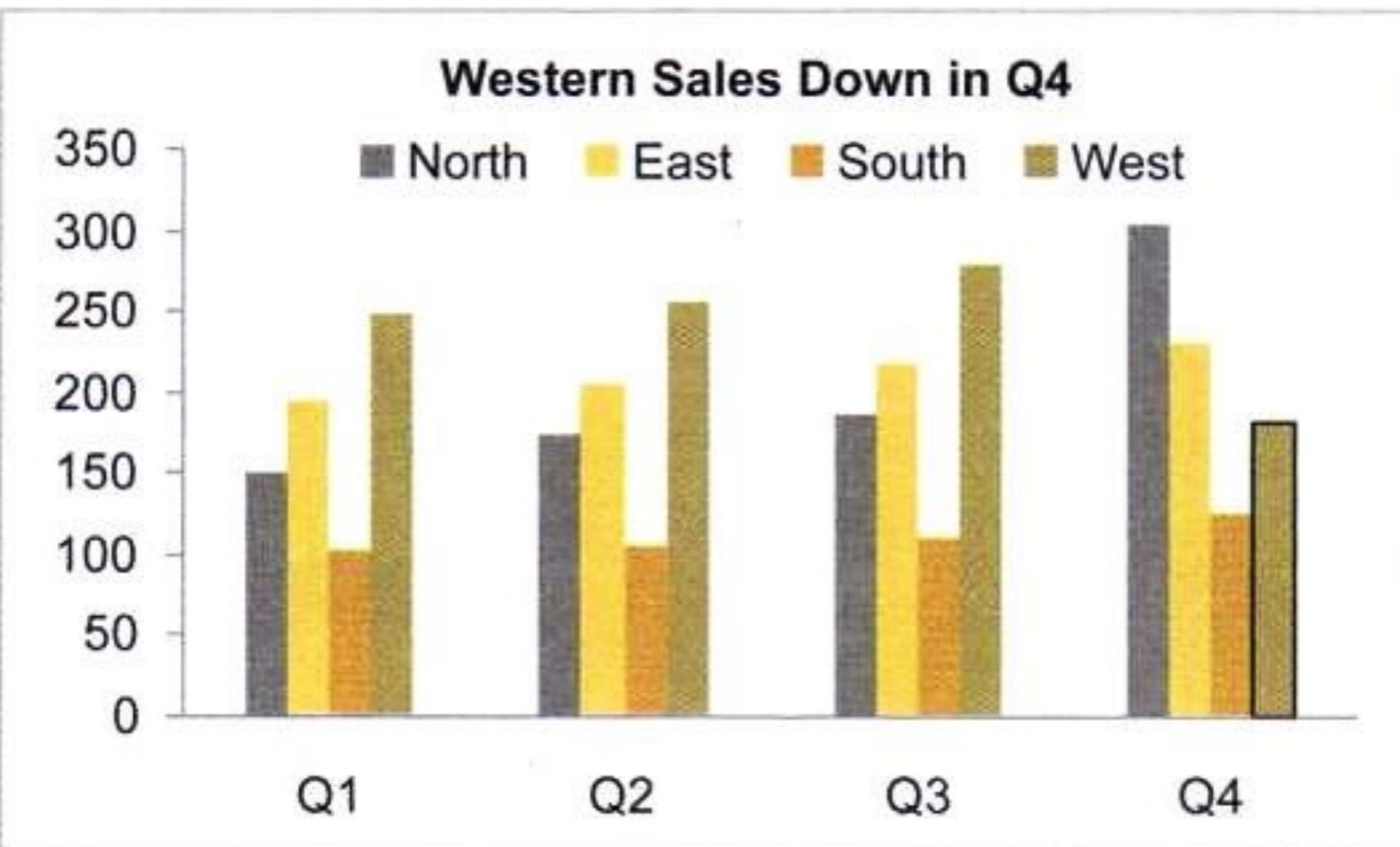
Gray bar borders



White bar borders



Western Sales Down in Q4



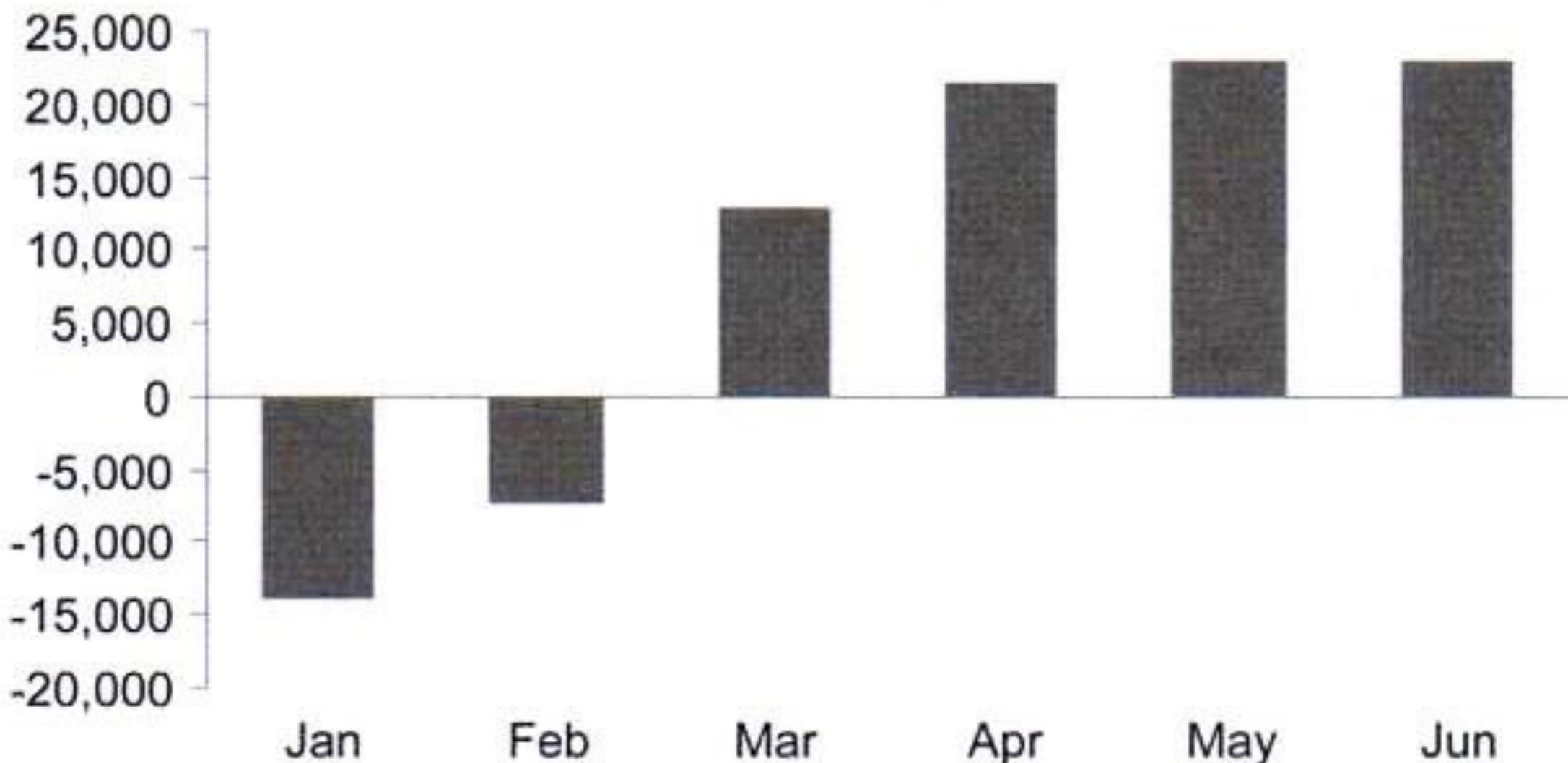
BARRAS

BASES

- Onde devem começar as barras e por que?

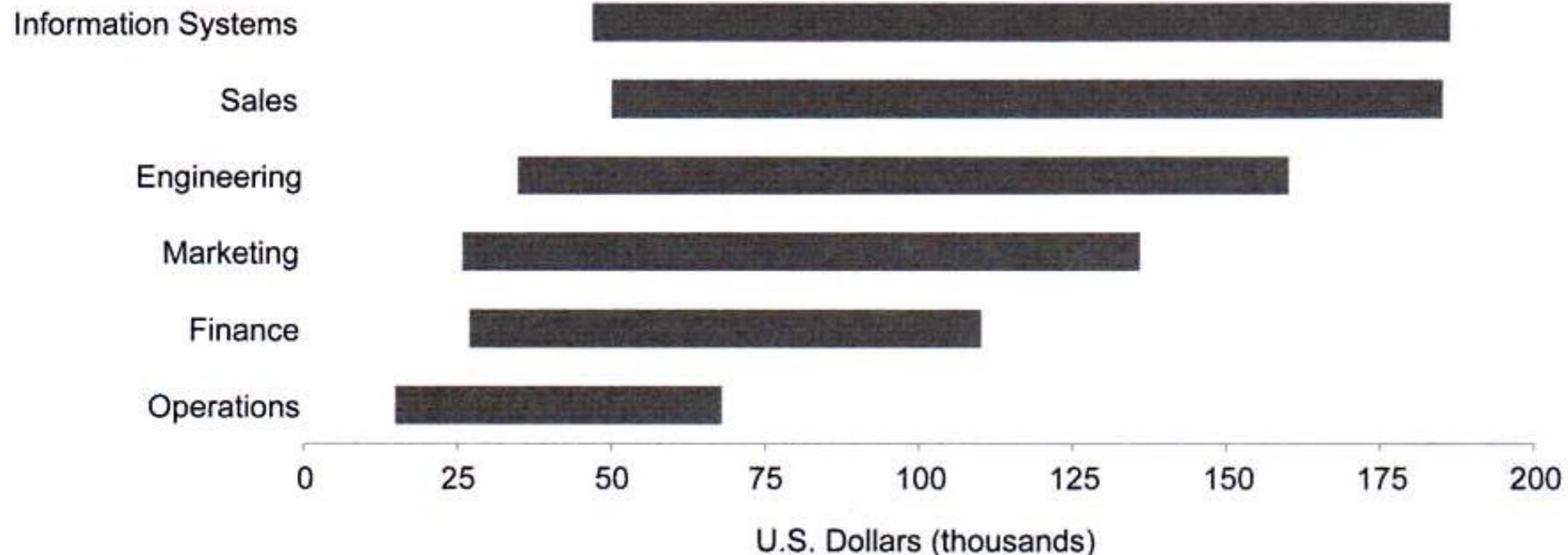
U.S. Dollars

2003 Profit & Loss



Sempre de 0 uma vez que seu comprimento indica quantidade

Salary Ranges by Department

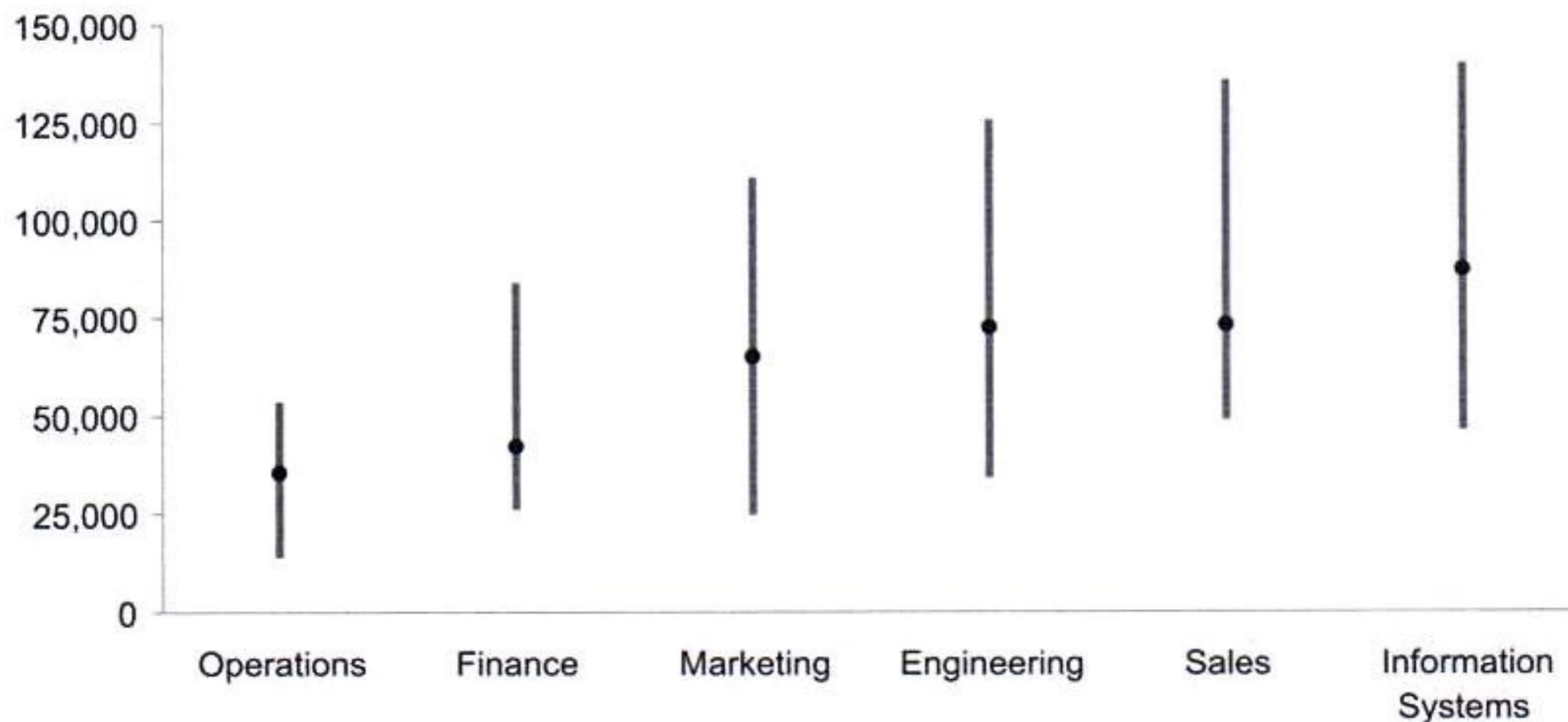


Exceto quando indicam uma **faixa de valores**

Neste caso, seu **comprimento indica a amplitude do intervalo**

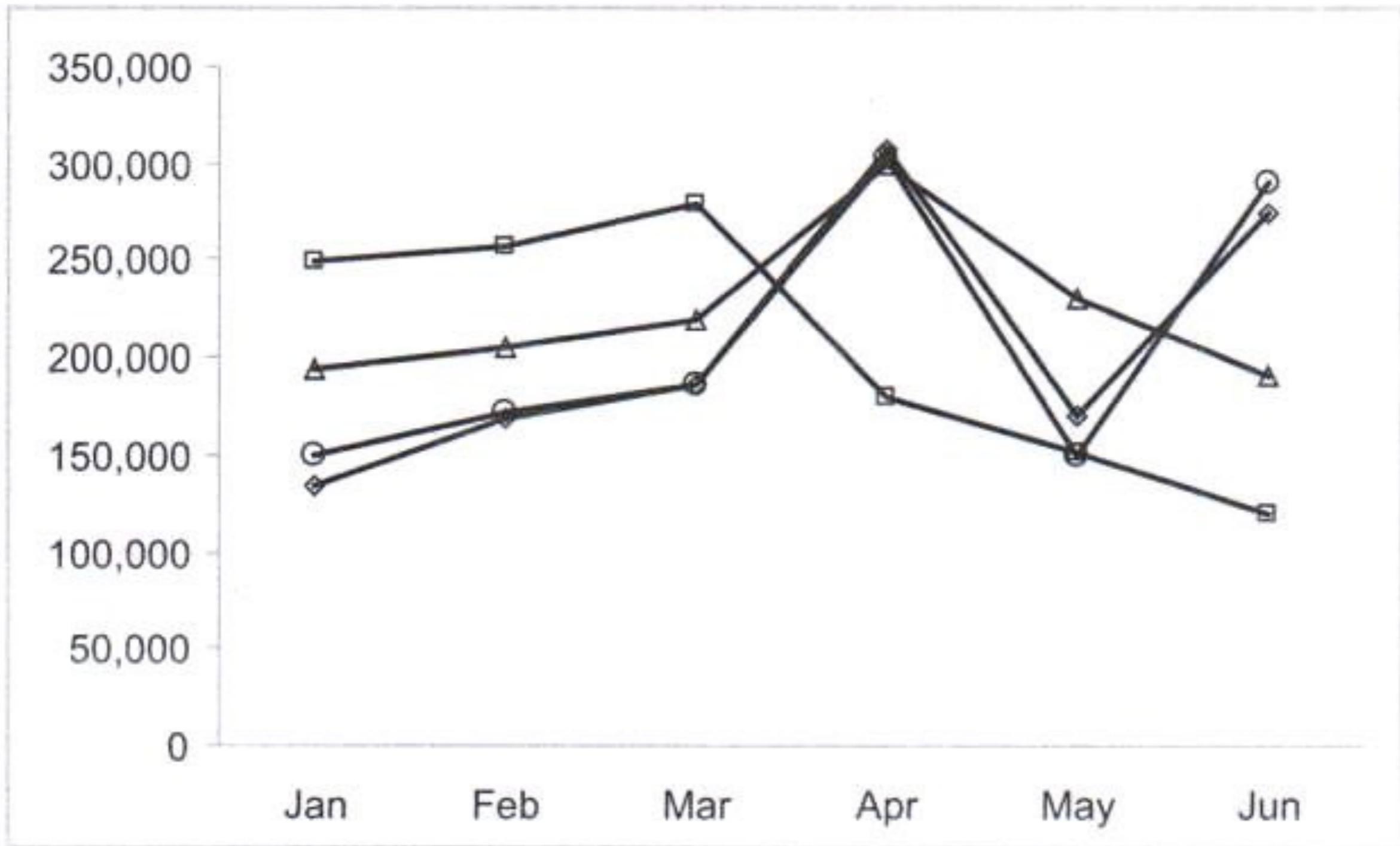
U.S. Dollars

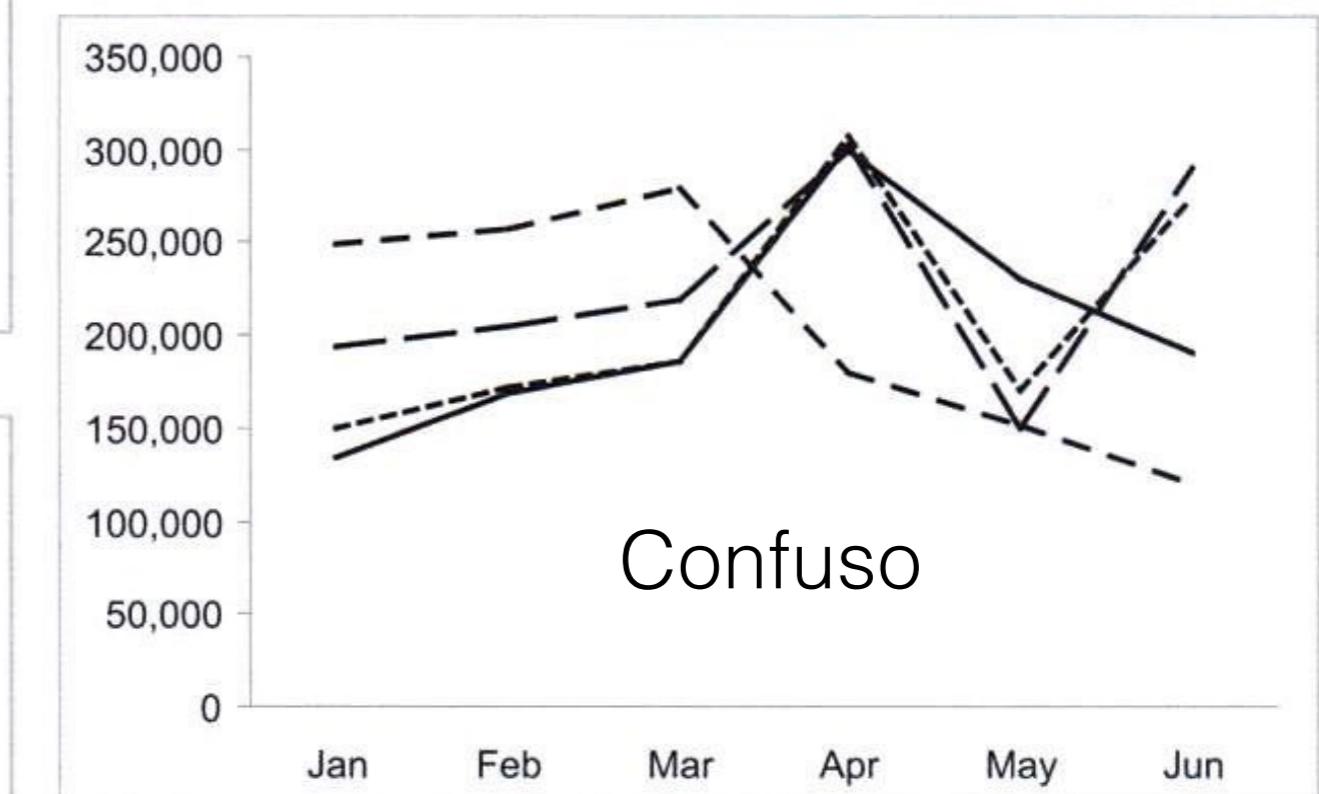
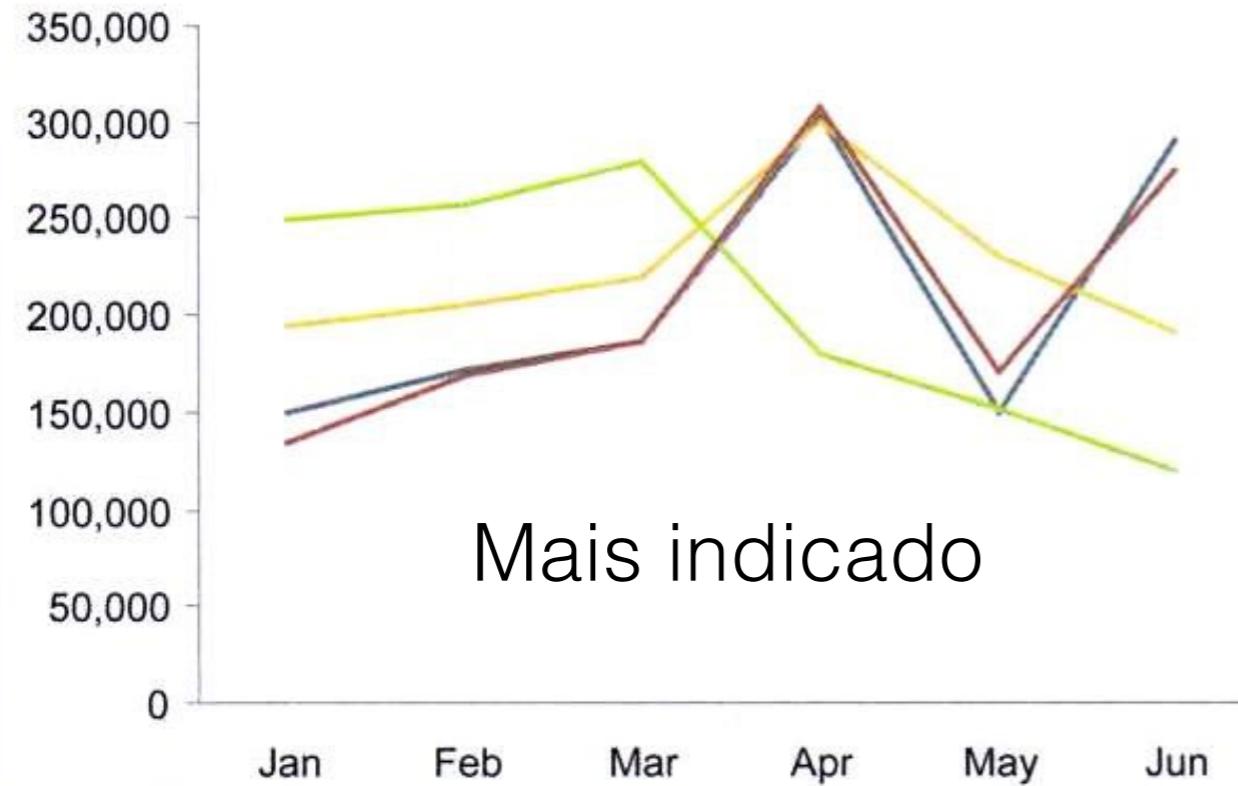
Minimum, Maximum, and Median Salaries by Department



LINHAS

- Há basicamente quatro categorias:
 - Linha padrão
 - Linha max-min
 - Linha de tendência
 - Linha de referência

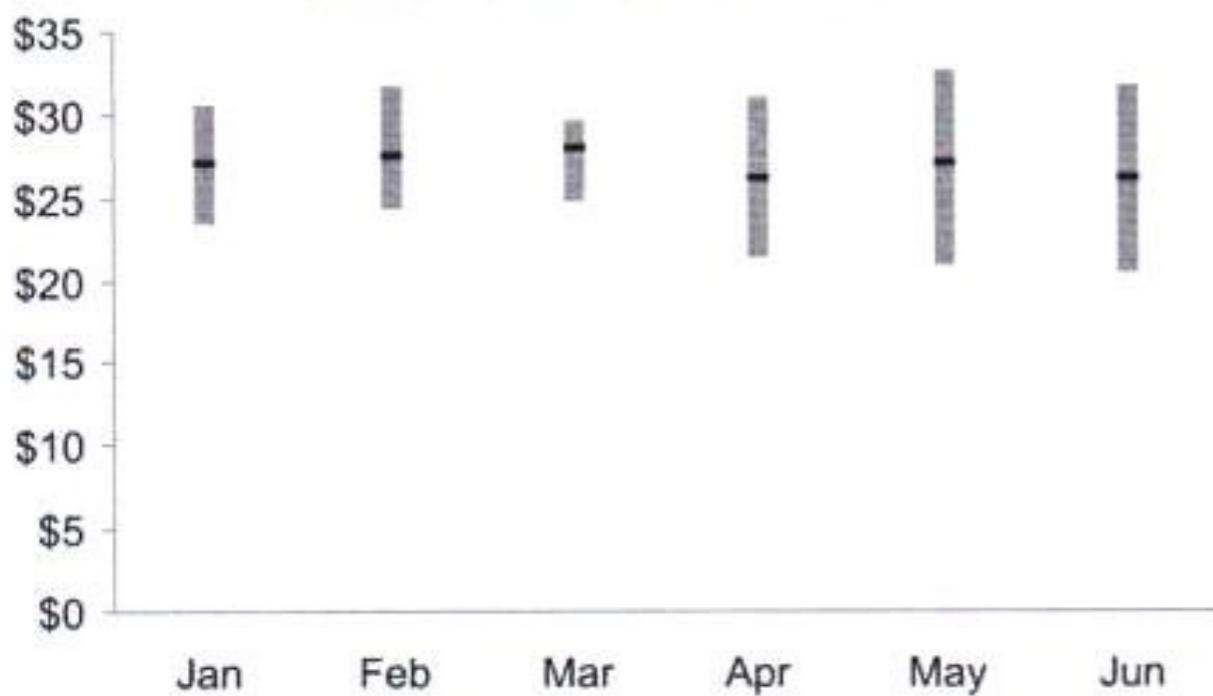




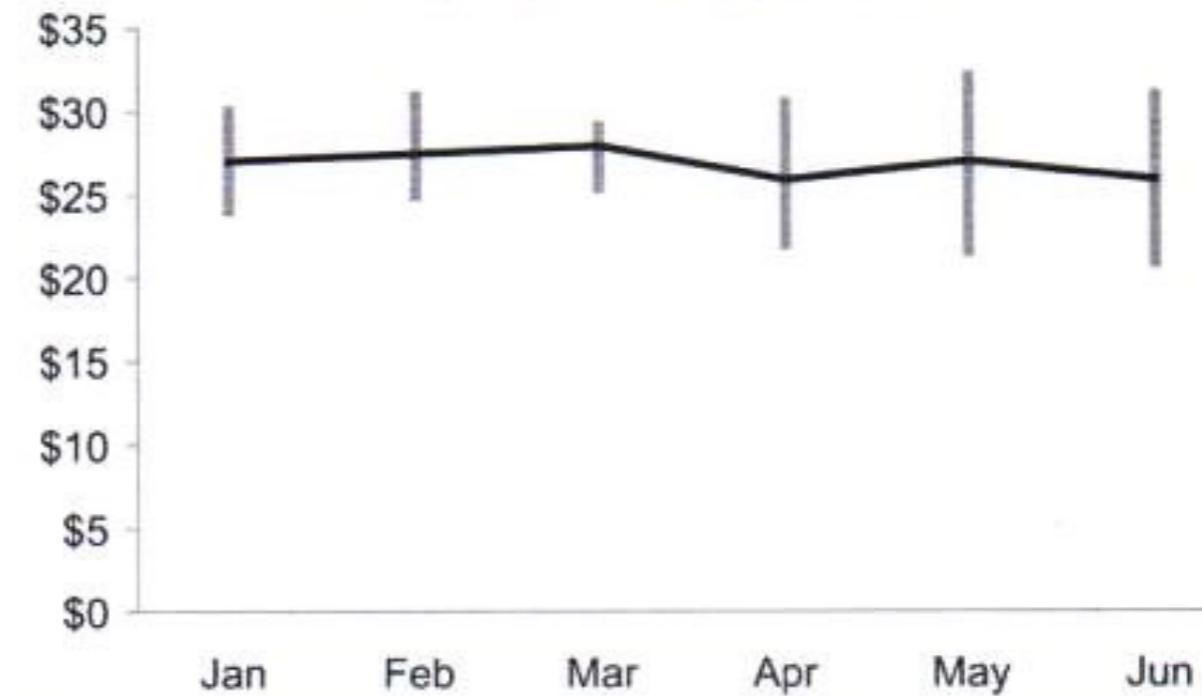


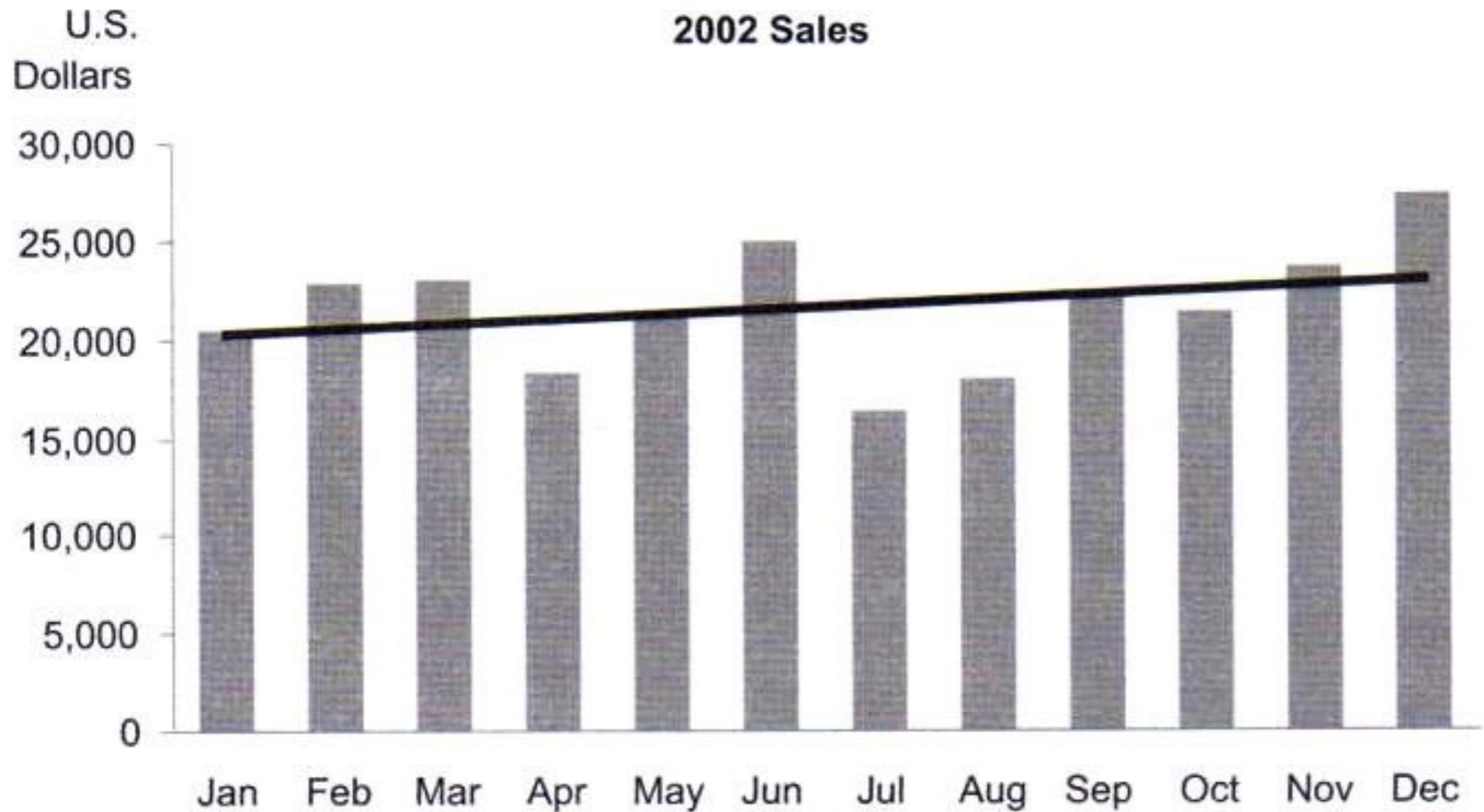


Selling Price
(Range in gray; Average in black)



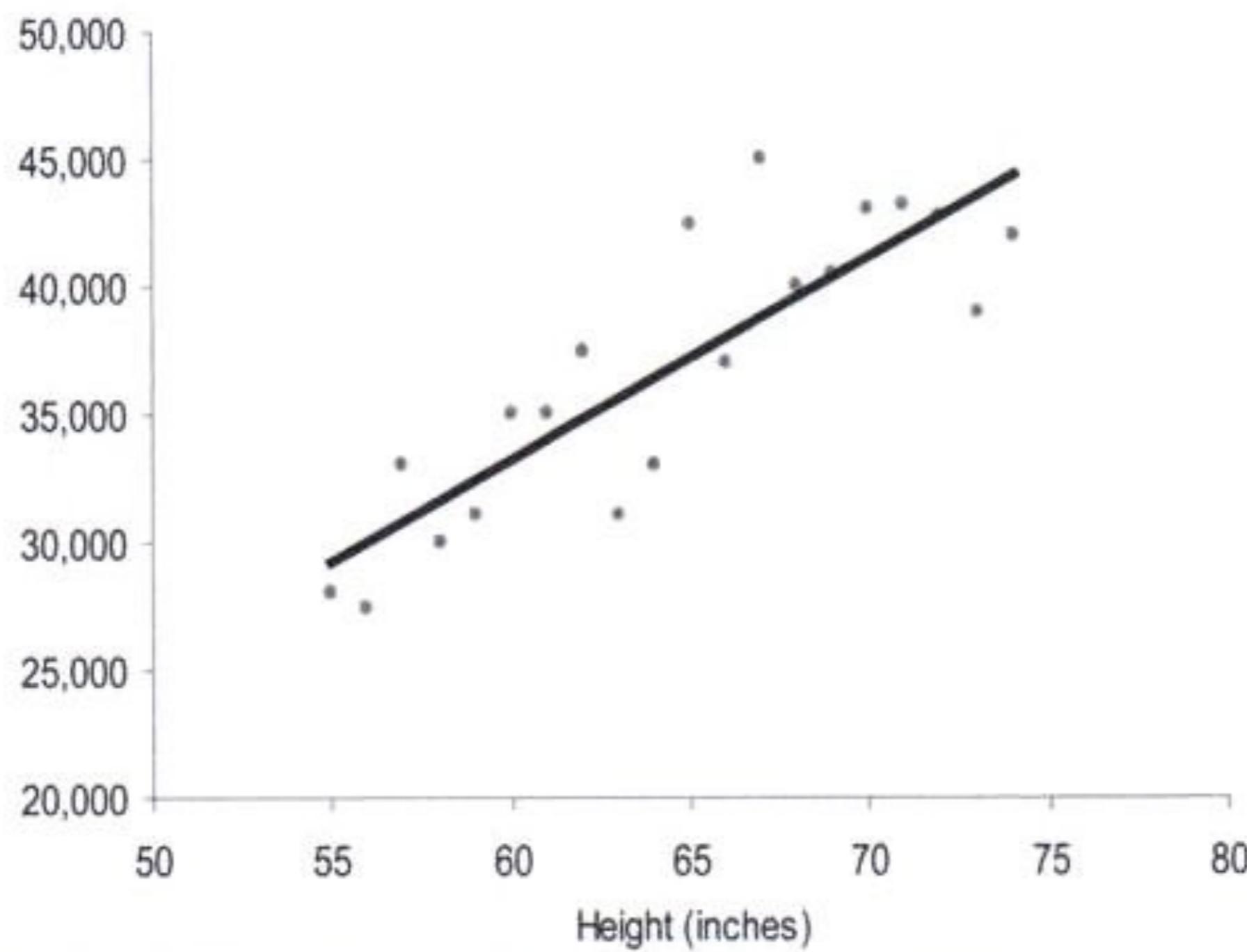
Selling Price
(Range in gray; Average in black)

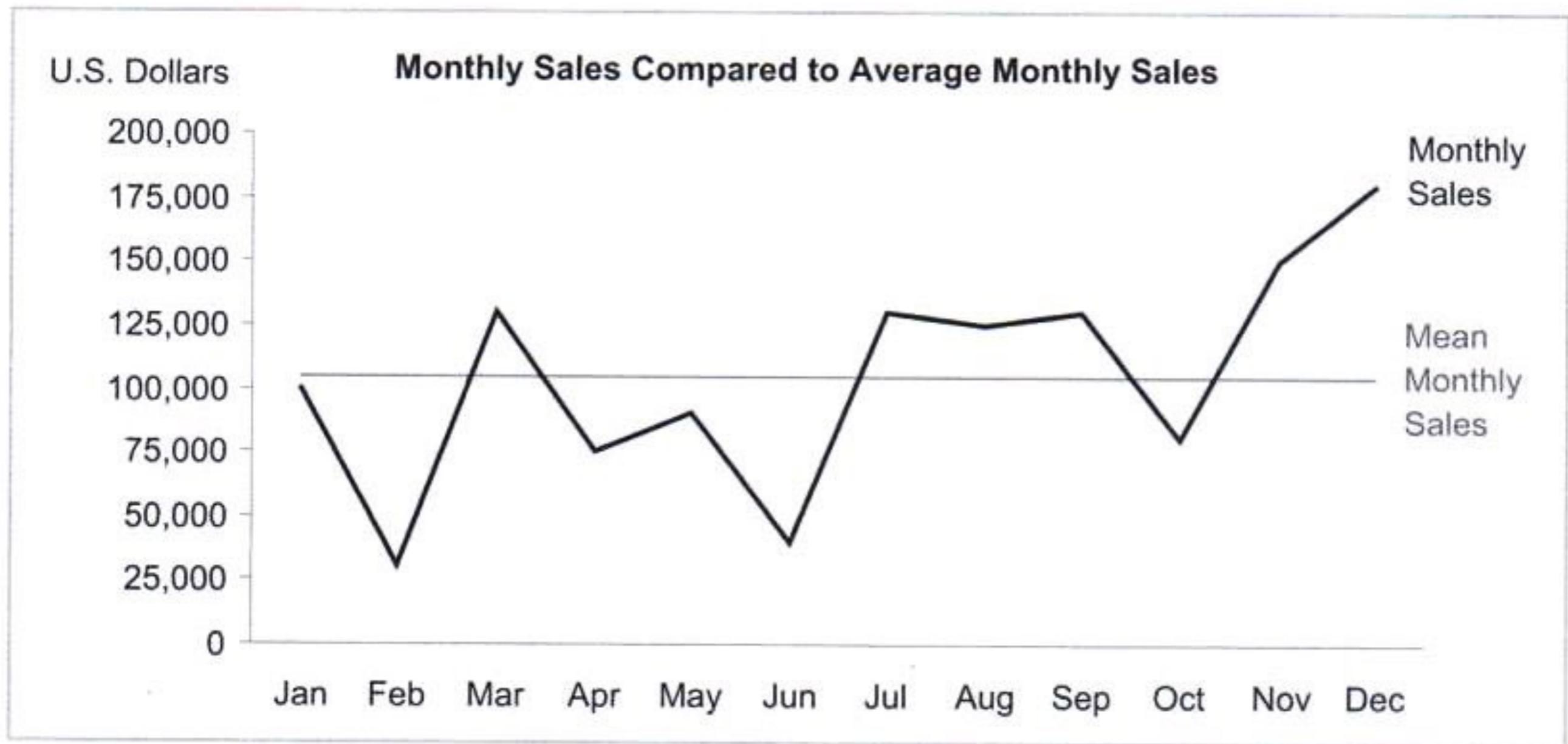




Avg Salary
(U.S. dollars)

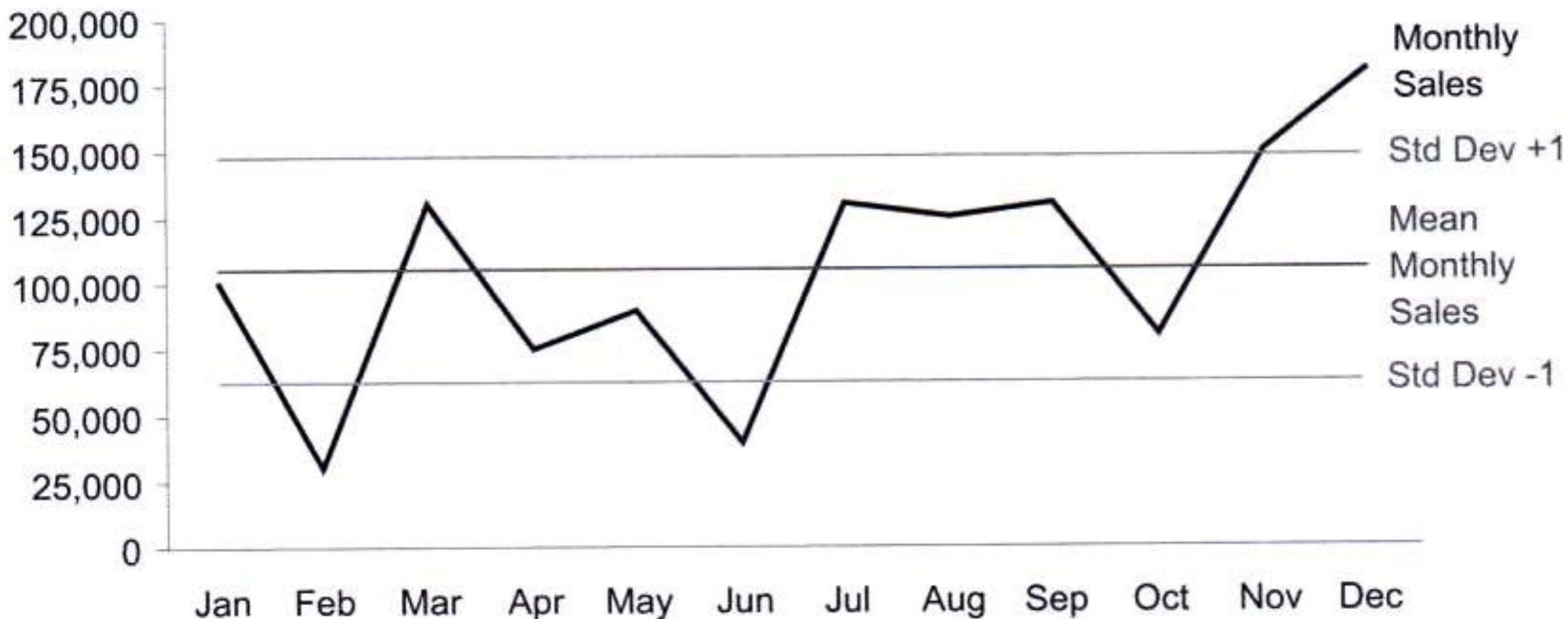
Correlation of Height and Salary





U.S. Dollars

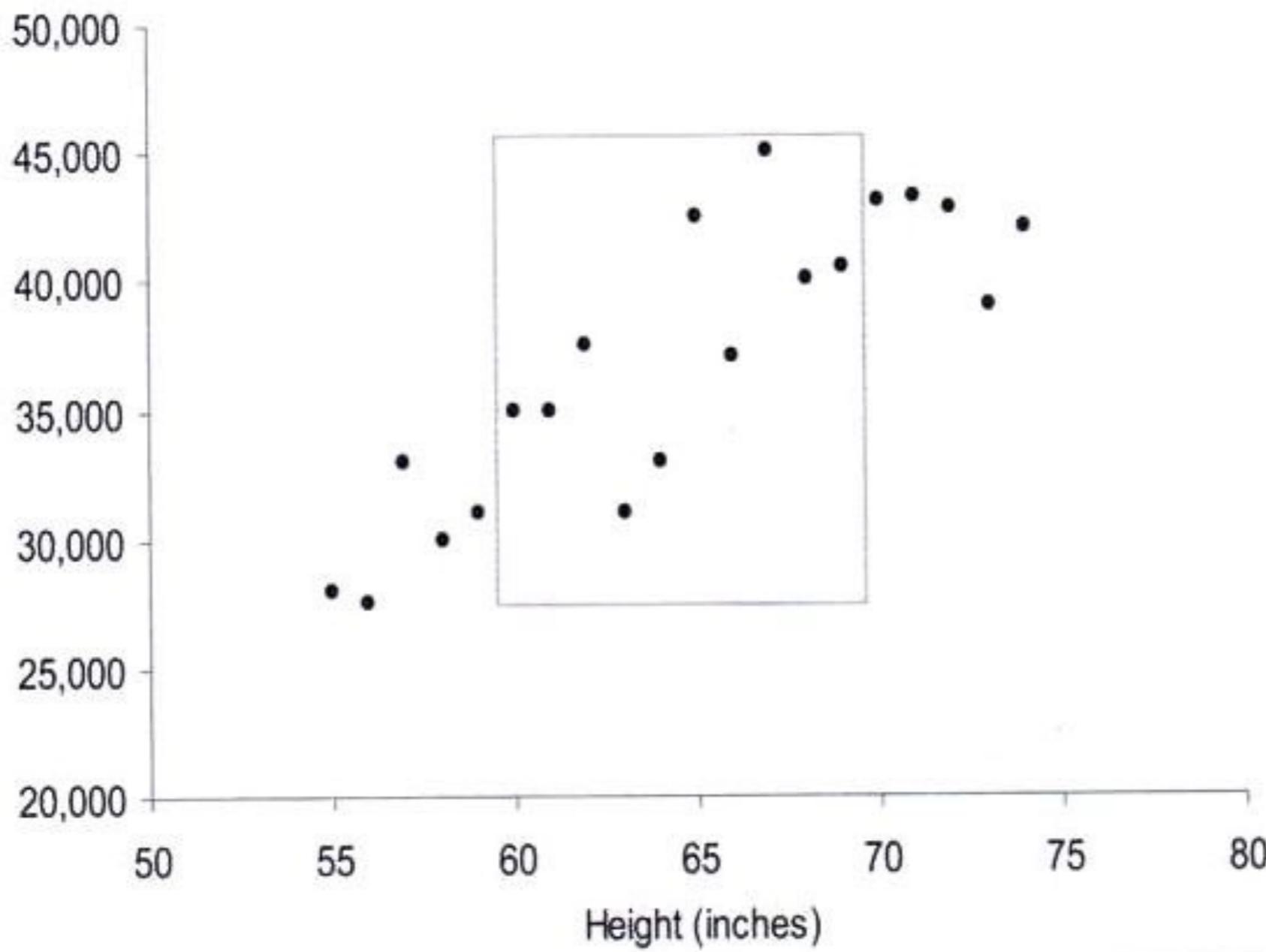
2003 Monthly Sales Compared to the Norm



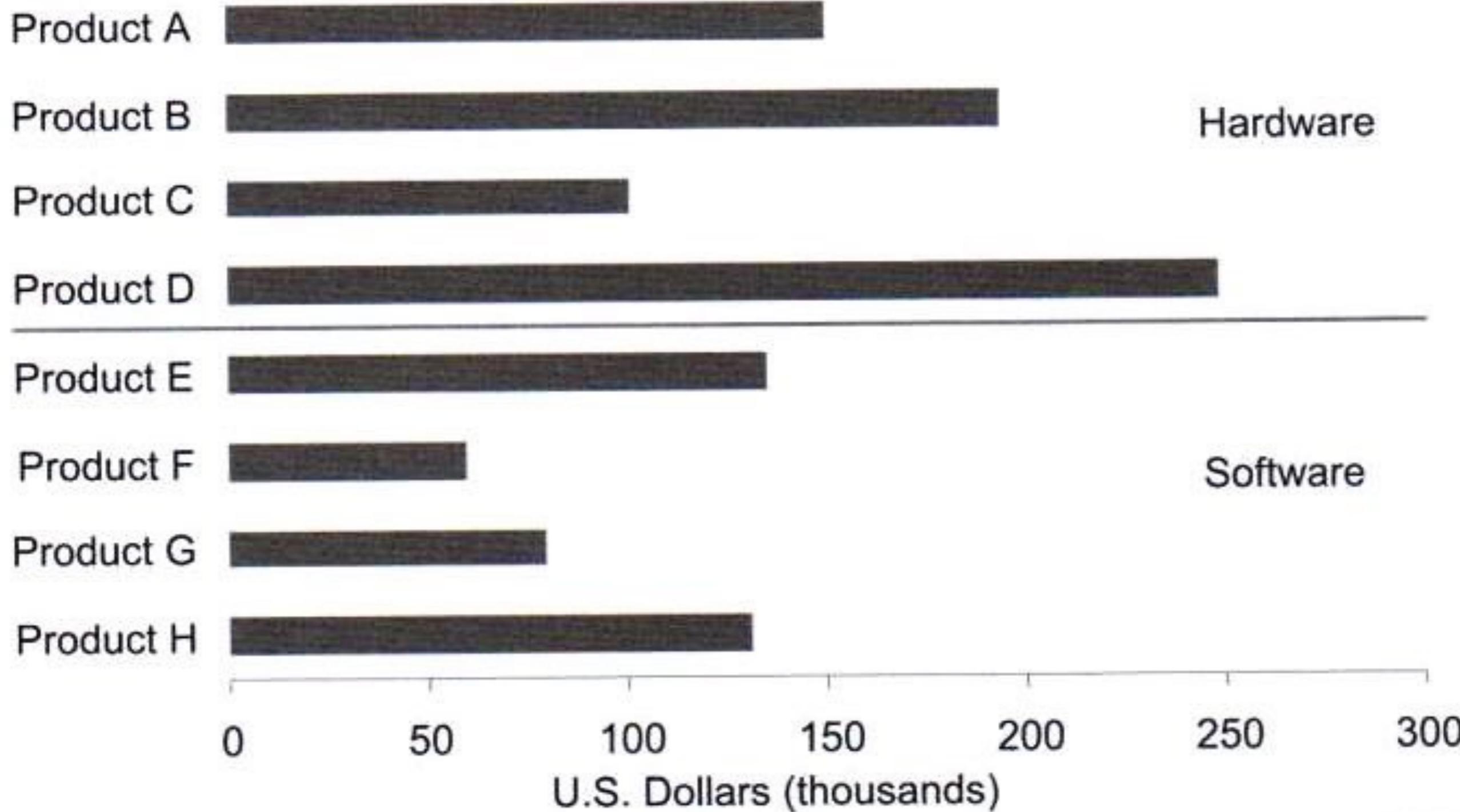
Avg Salary
(US dollars)

Correlation of Male Heights and Salaries

(Gray rectangle displays 1 standard deviation from the mean)

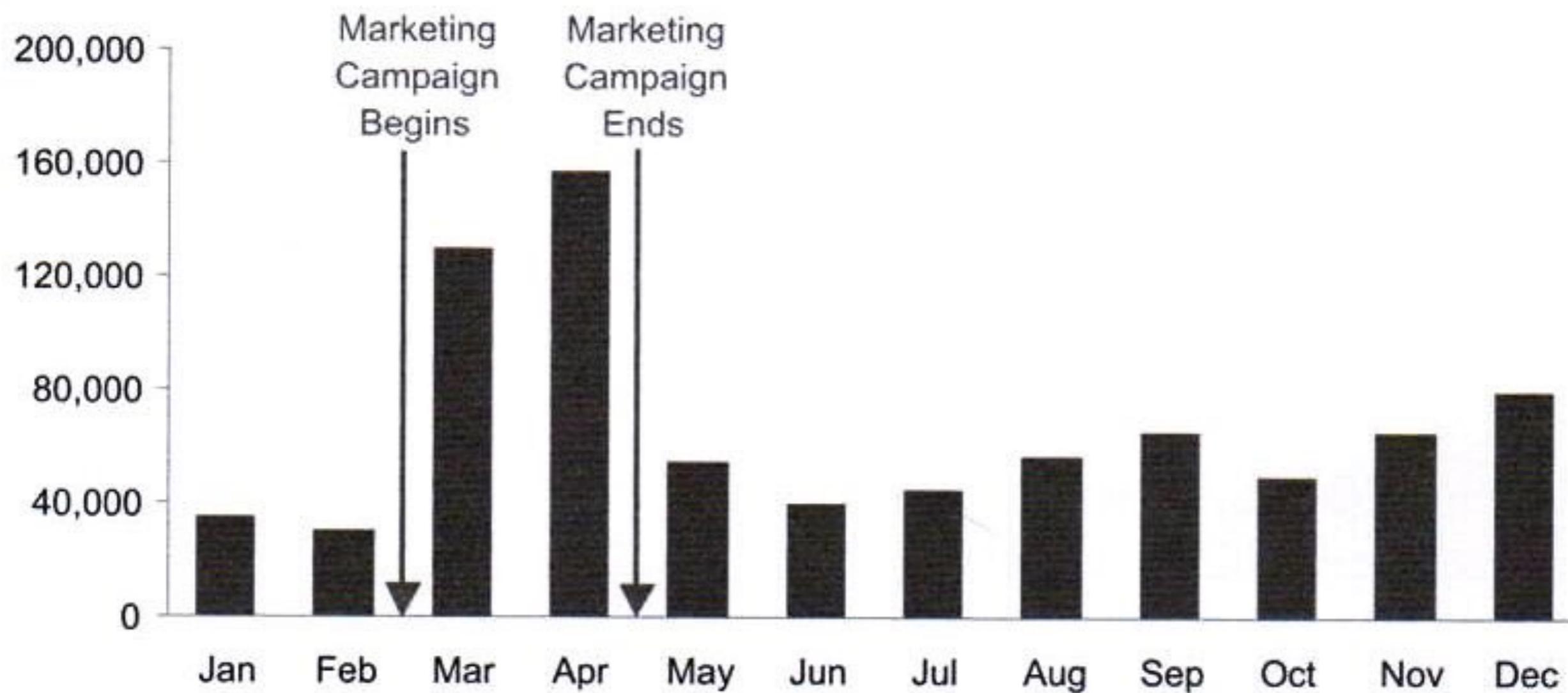


2005 Sales



U.S. Dollars

Widget Sales



Útil para marcar ocorrência de eventos

U.S. Dollars

2003 Fruit Sales

North

East

South

West

500,000

400,000

300,000

200,000

100,000

0

Mangoes

Peaches

Apples

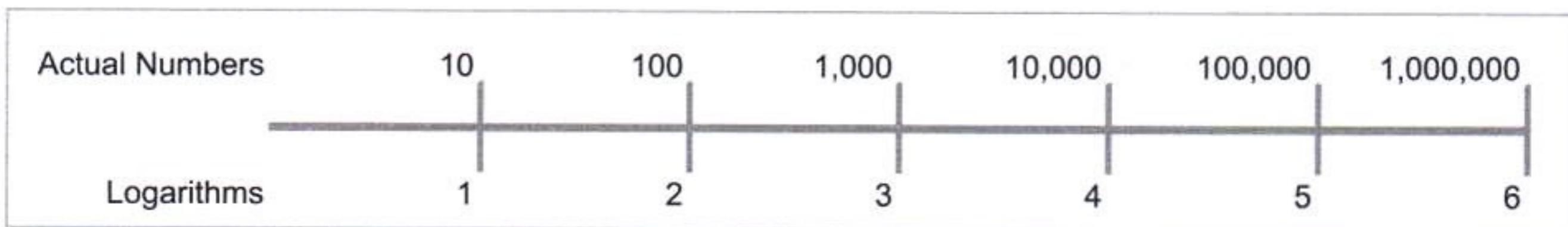
Pears

Guavas

Qual o problema com esta representação?

ESCALAS

- Escala comum
- Escala logarítmica: logaritmo é a potência a qual o número, chamado base, precisa ser elevado para ser igual ao número
 - Ex.: $\log_{10}(1.000.000) = 6$



**Log 10 Scale
(U.S. \$)**

2003 Fruit Sales

North East South West

1,000,000

100,000

10,000

1,000

100

10

1

Mangoes

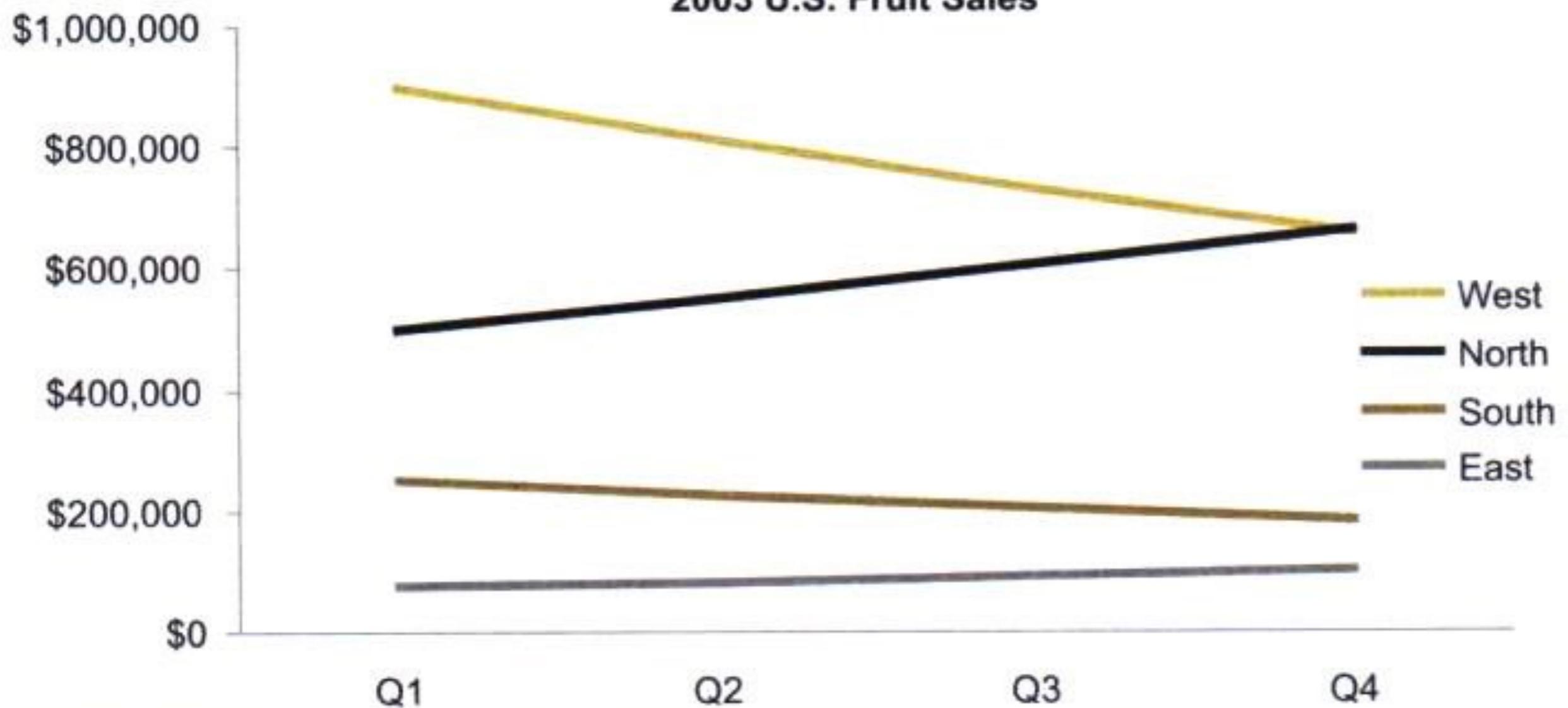
Peaches

Apples

Pears

Guavas

2003 U.S. Fruit Sales



**Log Scale
(base 10)**

2003 U.S. Fruit Sales

\$1,000,000

\$100,000

\$10,000

Q1

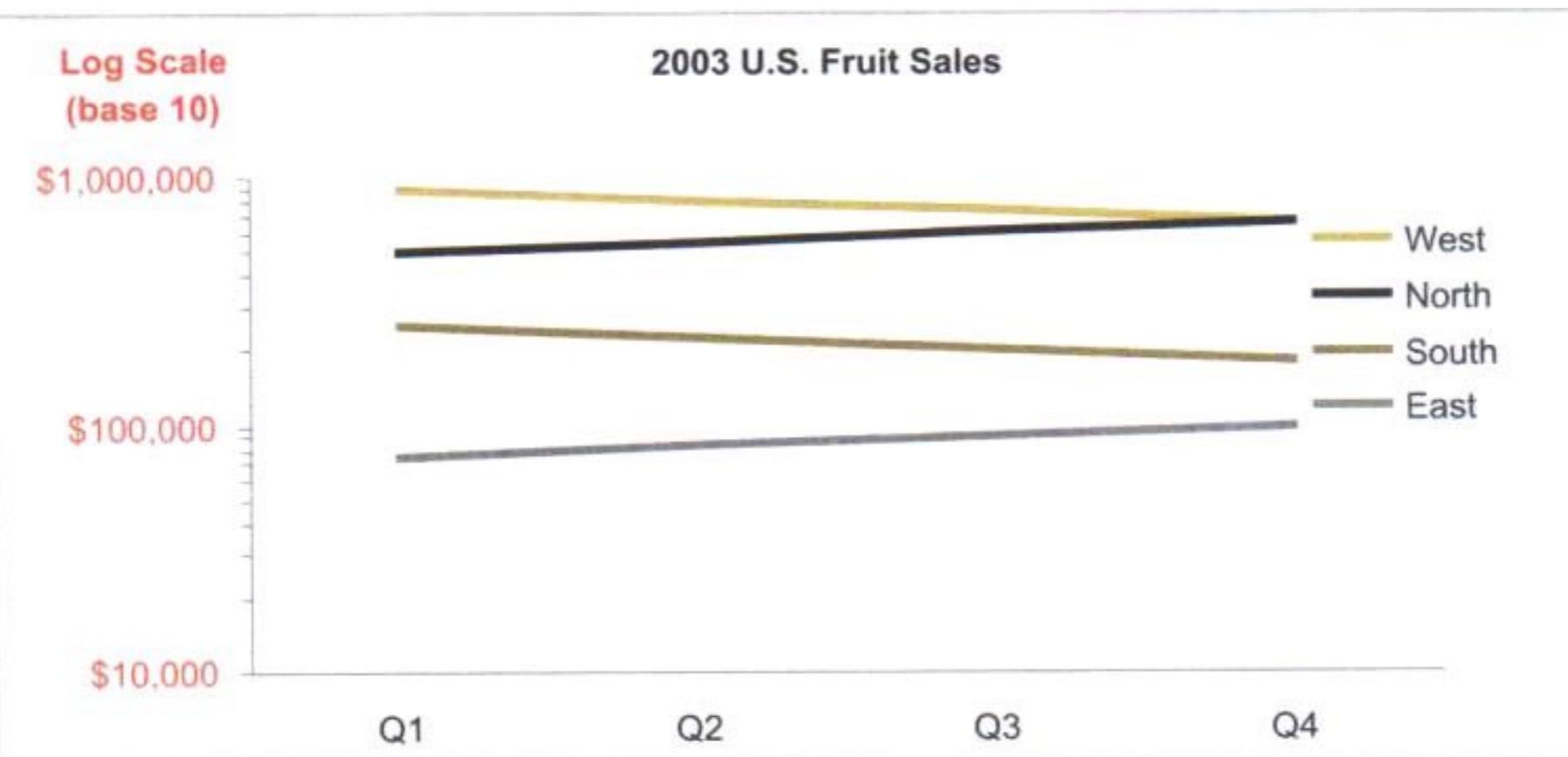
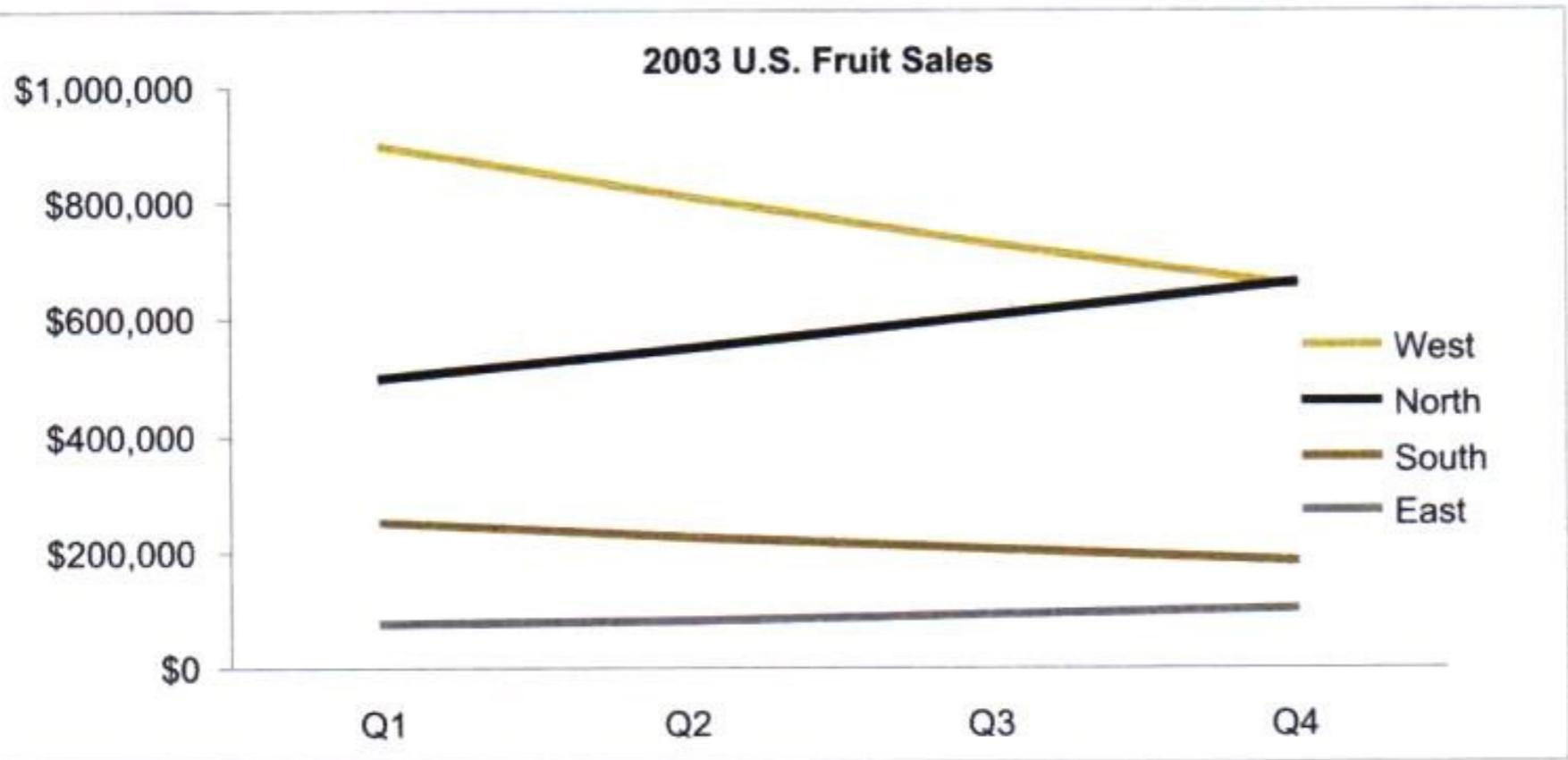
Q2

Q3

Q4

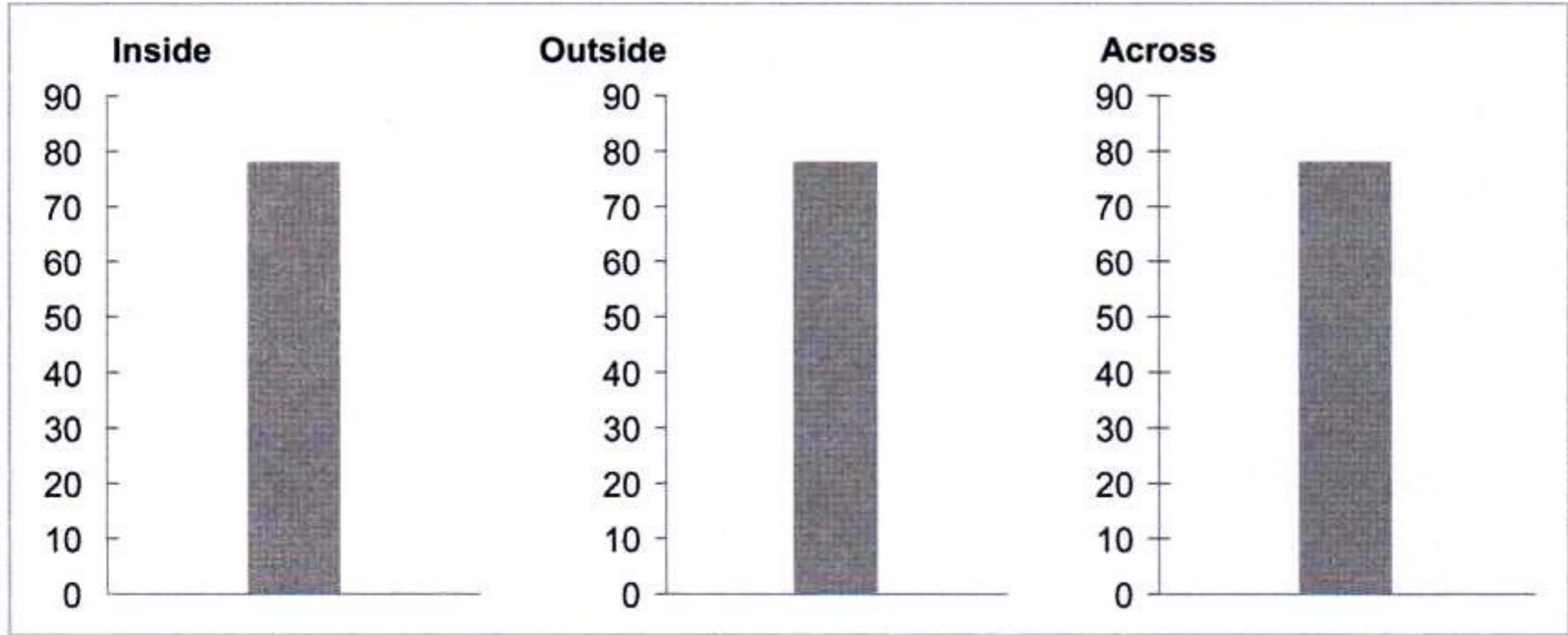
West
North
South
East

Linhos paralelas indicam mesma taxa de (de)crescimento



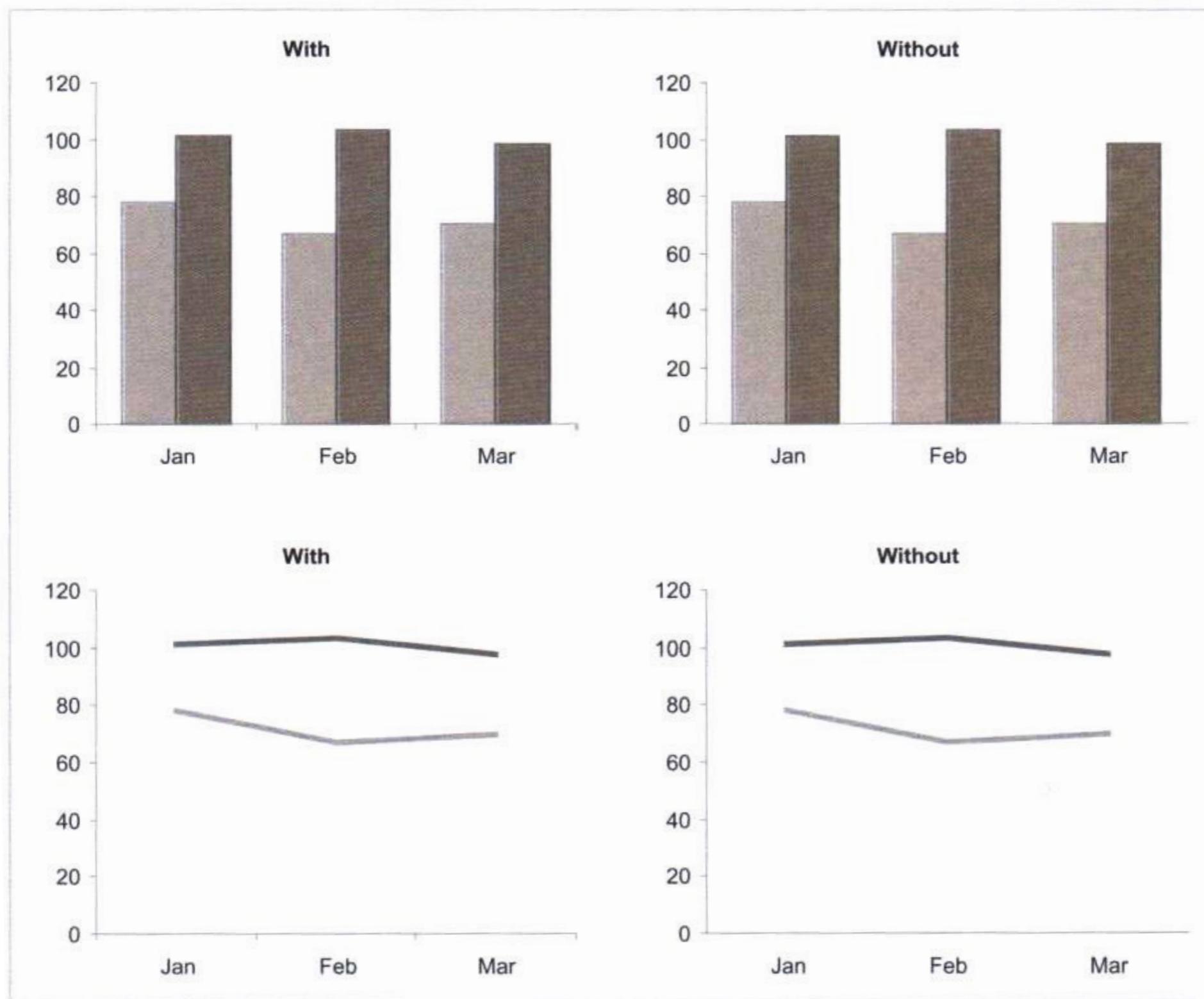
MARCAÇÕES DOS EIXOS

- Quão visíveis precisam ser?
- Onde elas deveriam aparecer?
- Quando elas podem ser eliminadas?
- Quantas usar?
- Quais valores deveriam ser exibidos?



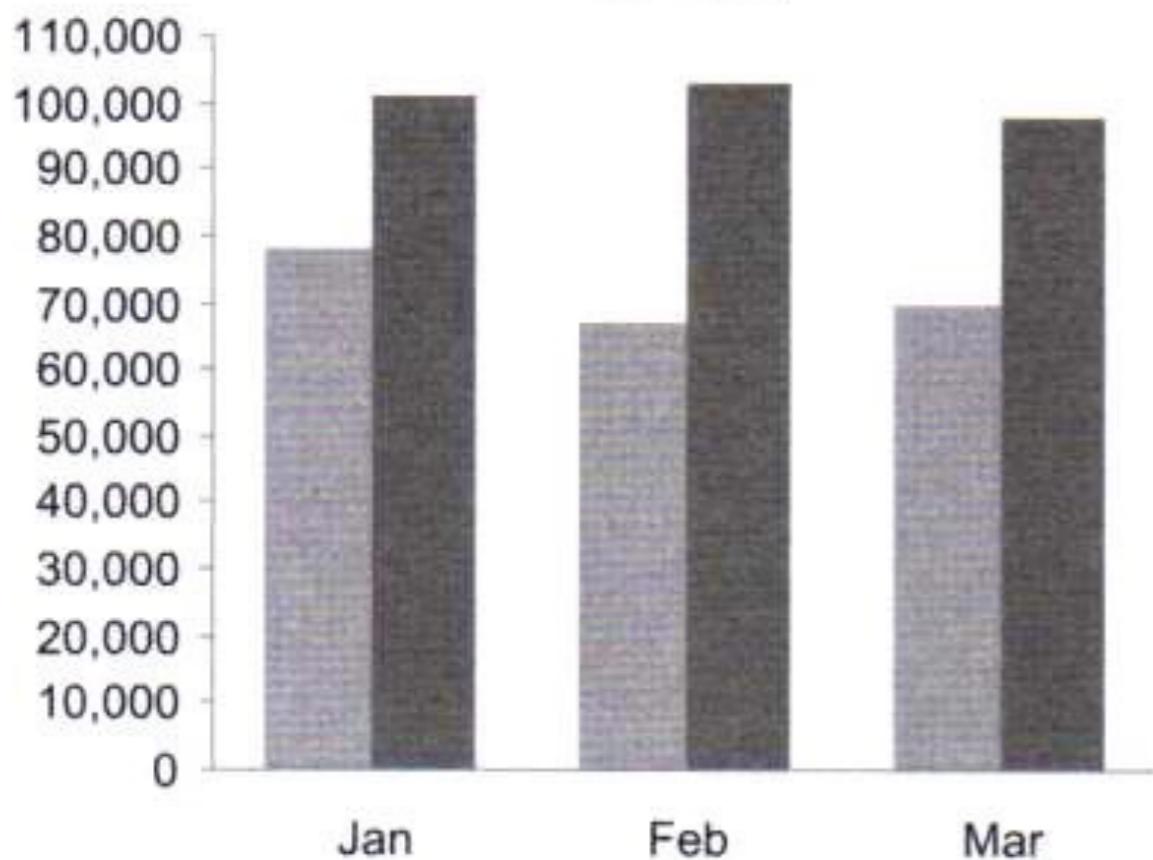
As **marcações** das legendas devem ser discretas quando comparadas aos objetos que representam os dados

Devem ser posicionadas preferencialmente na área externa à área dos dados

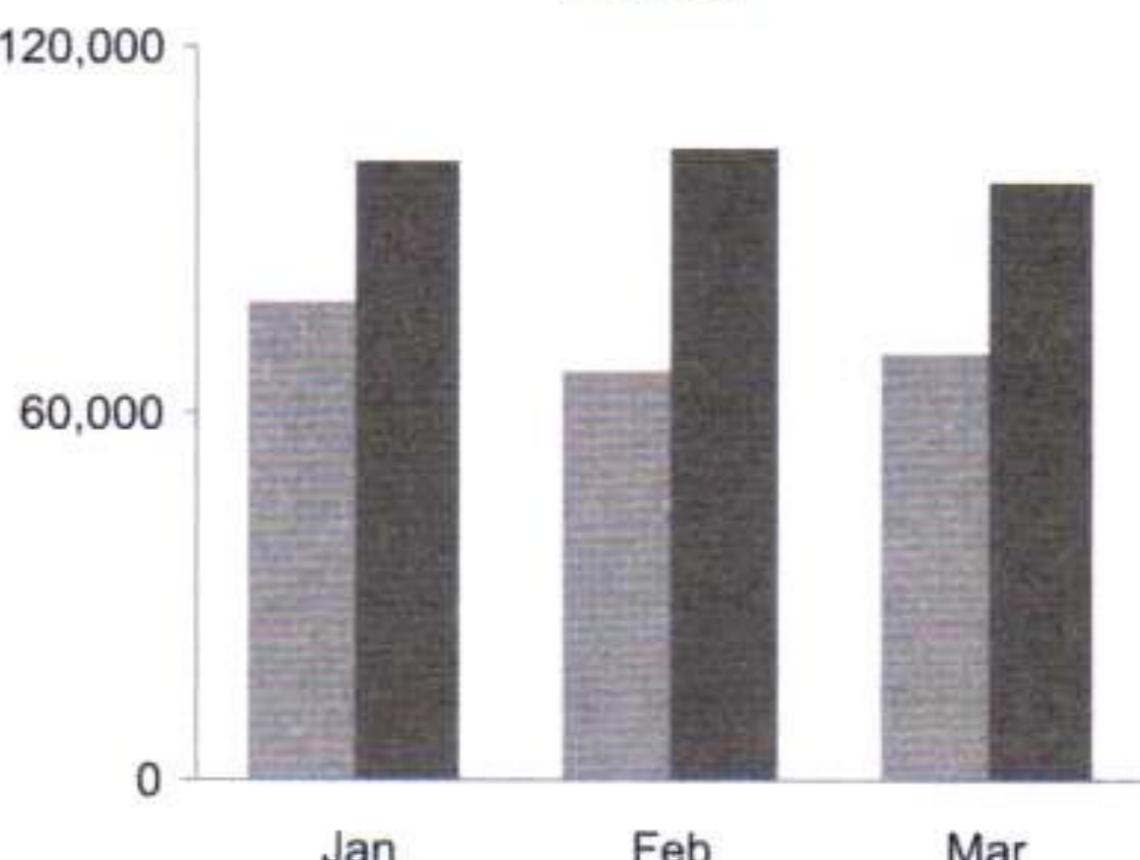


Podem ser **eliminadas** quando representarem **dados categóricos**

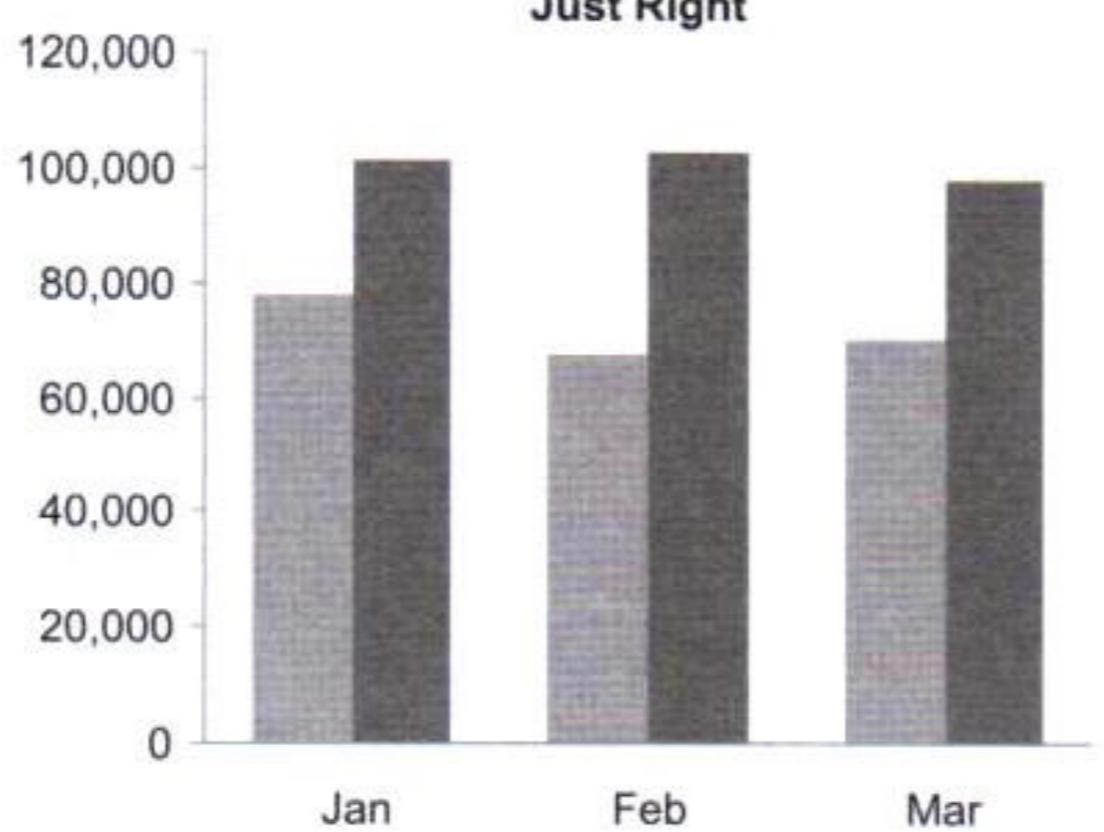
Too Many

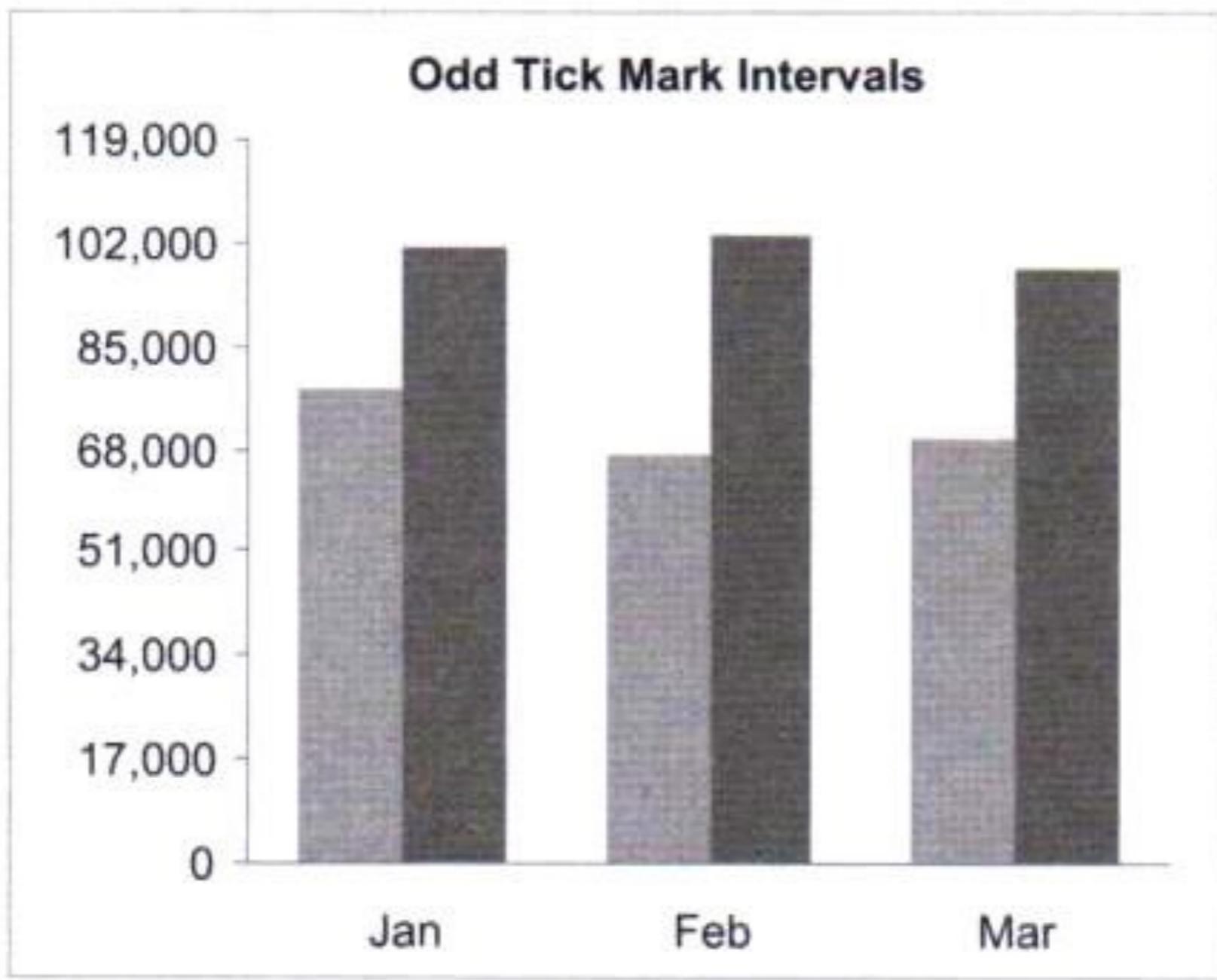


Too Few



Just Right

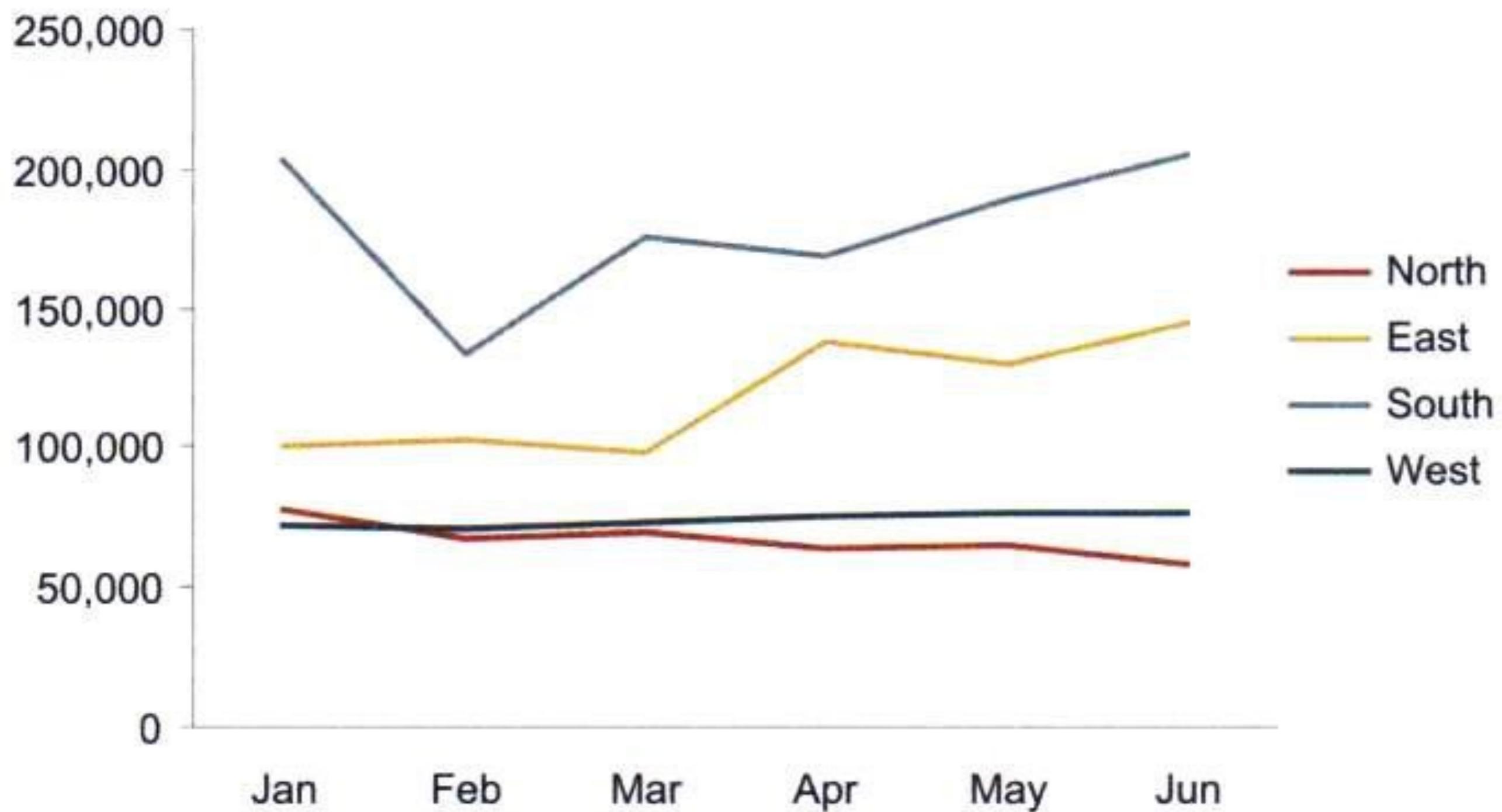


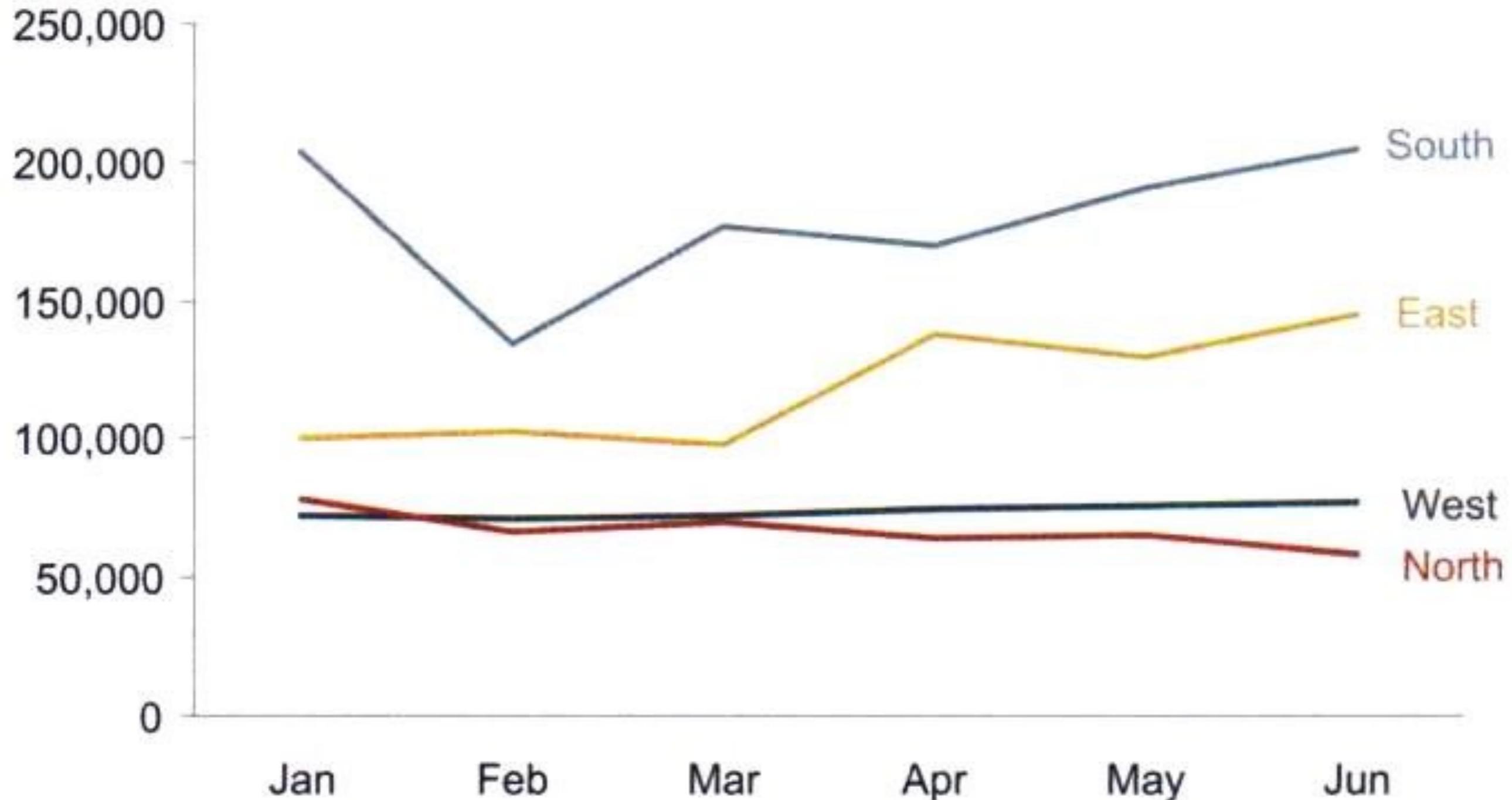


Use valores redondos e pares

LEGENDAS

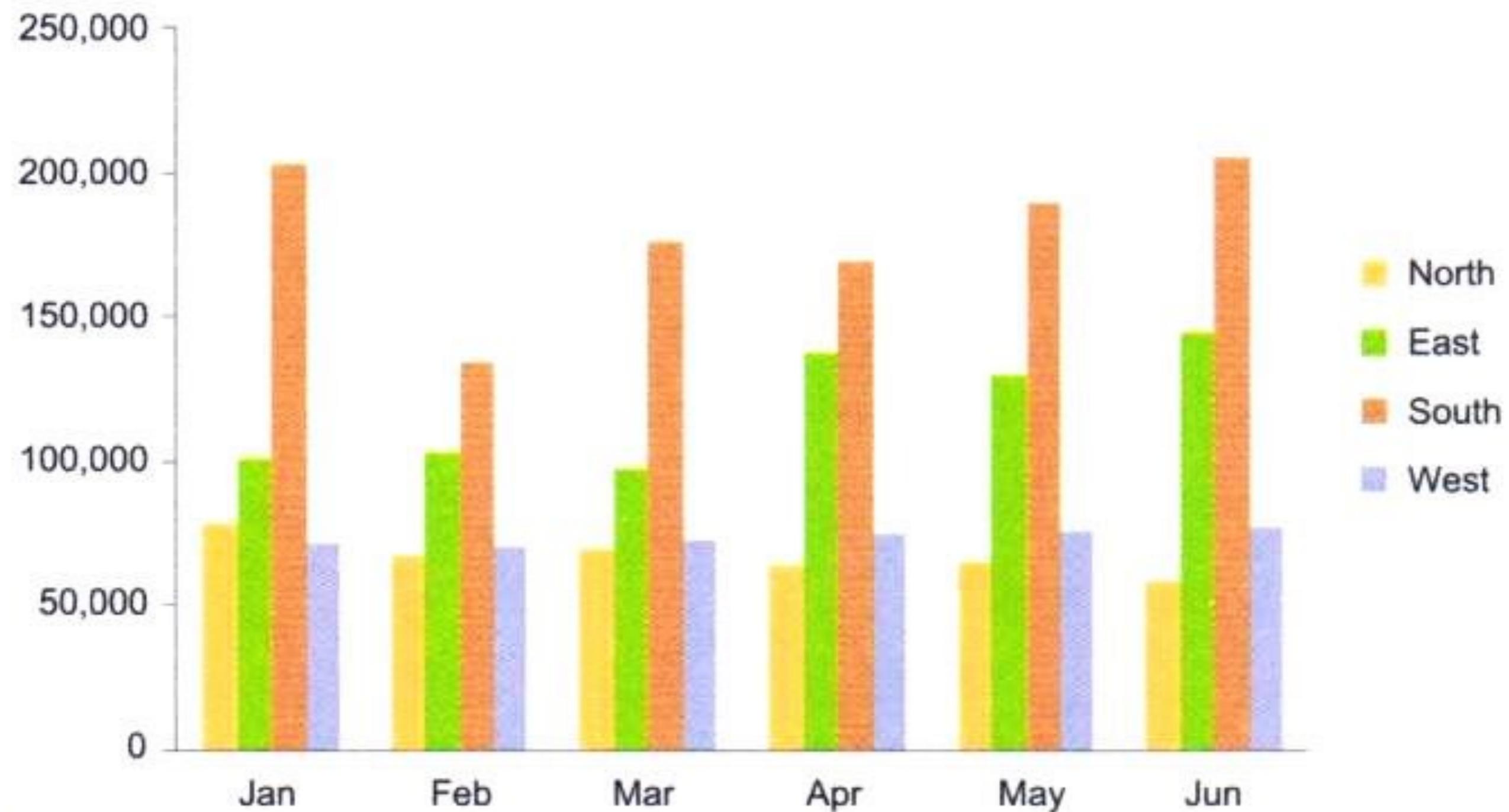
- Quando podem ser eliminadas?
- Onde elas devem ser posicionadas?
- Quão visíveis devem ser?
- Devem ter bordas?
- Onde posicionar os rótulos das legendas?

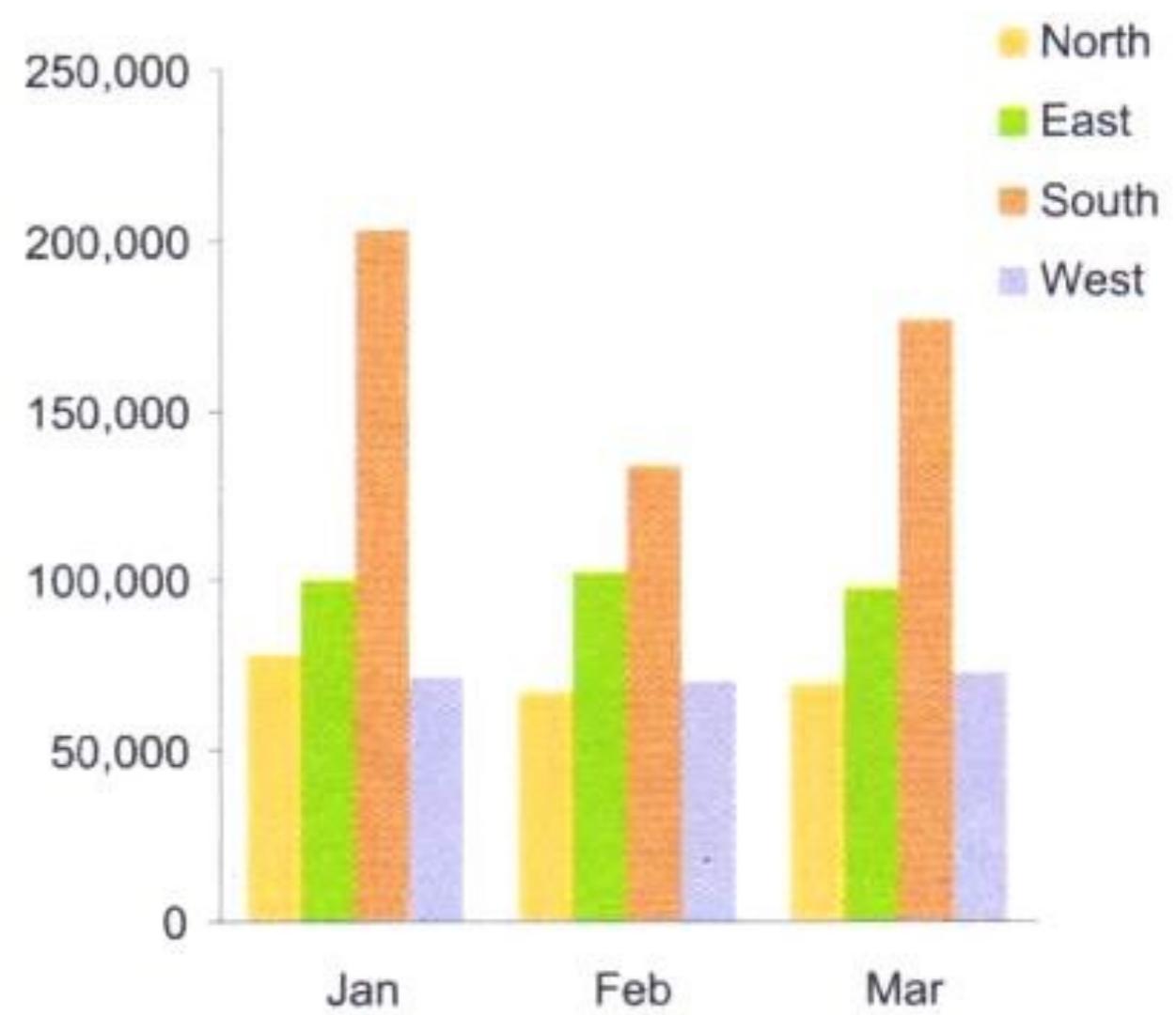
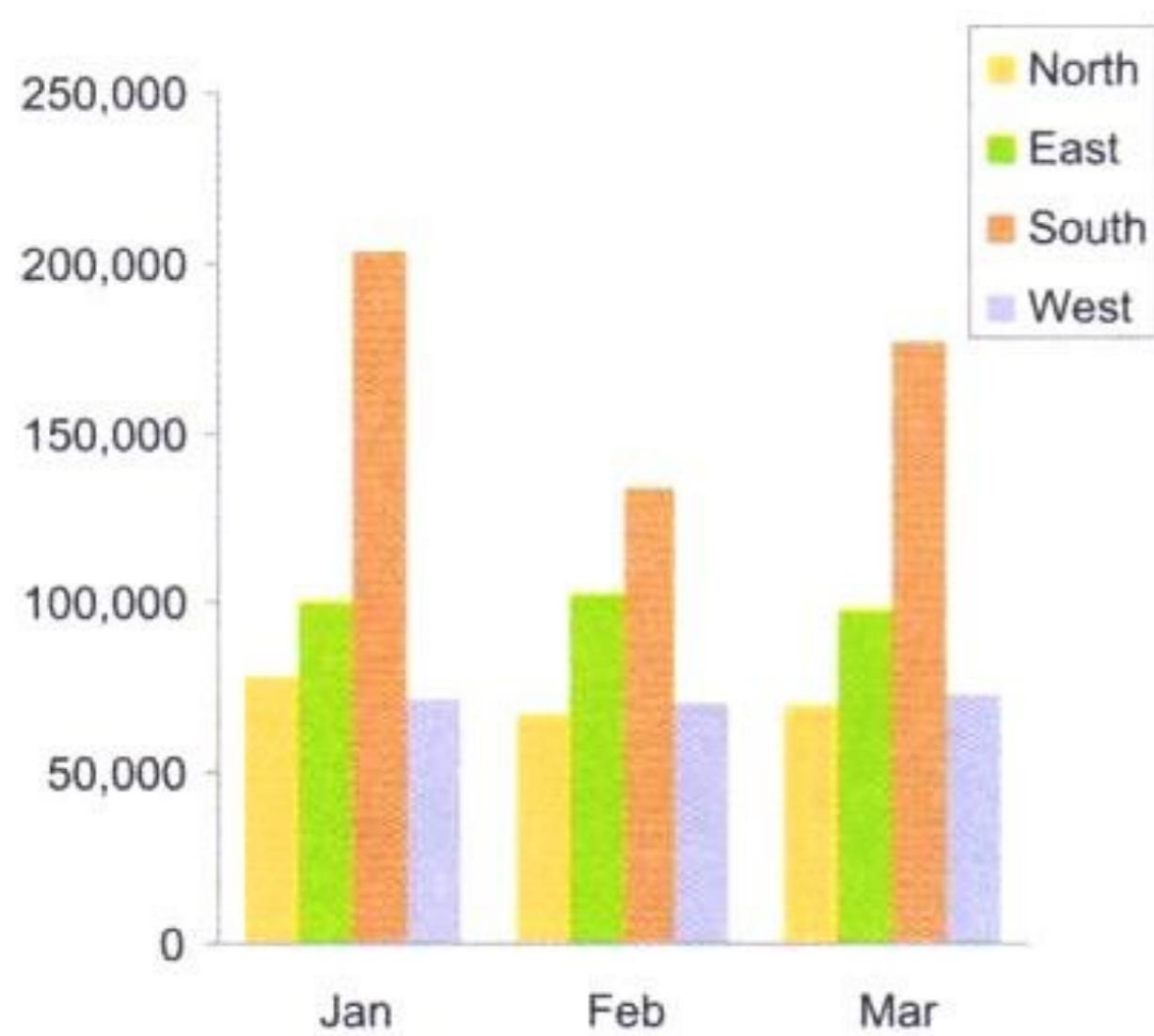




Legendas podem ser substituídas pela rotulação de linhas

- Legendas devem ser posicionadas preferencialmente fora da área de dados
- Quanto mais próximas estiverem dos dados melhor
- Elas não devem chamar mais atenção que os dados
- Legendas não devem ter bordas, uma vez que bordas chamam atenção para os objetos contornados

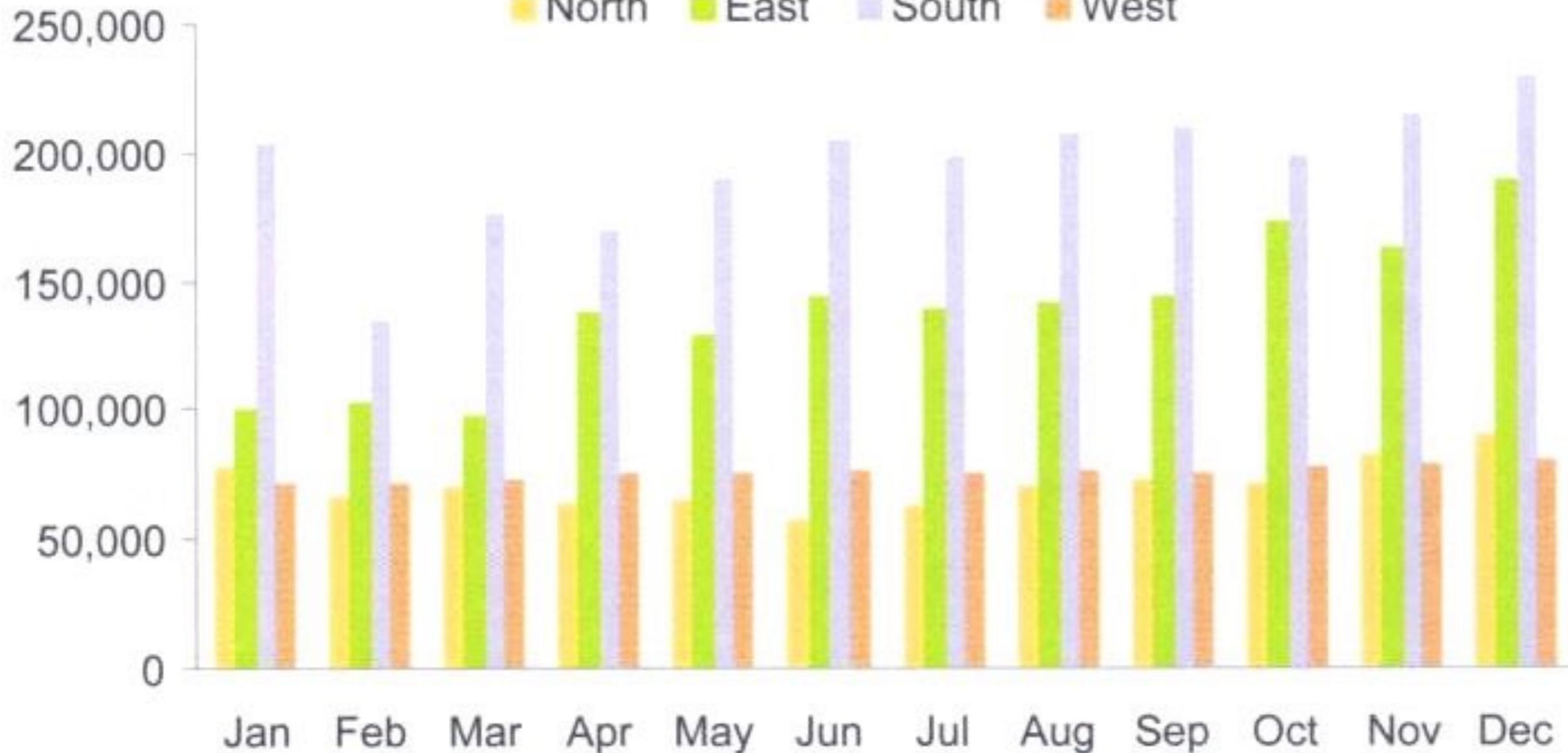




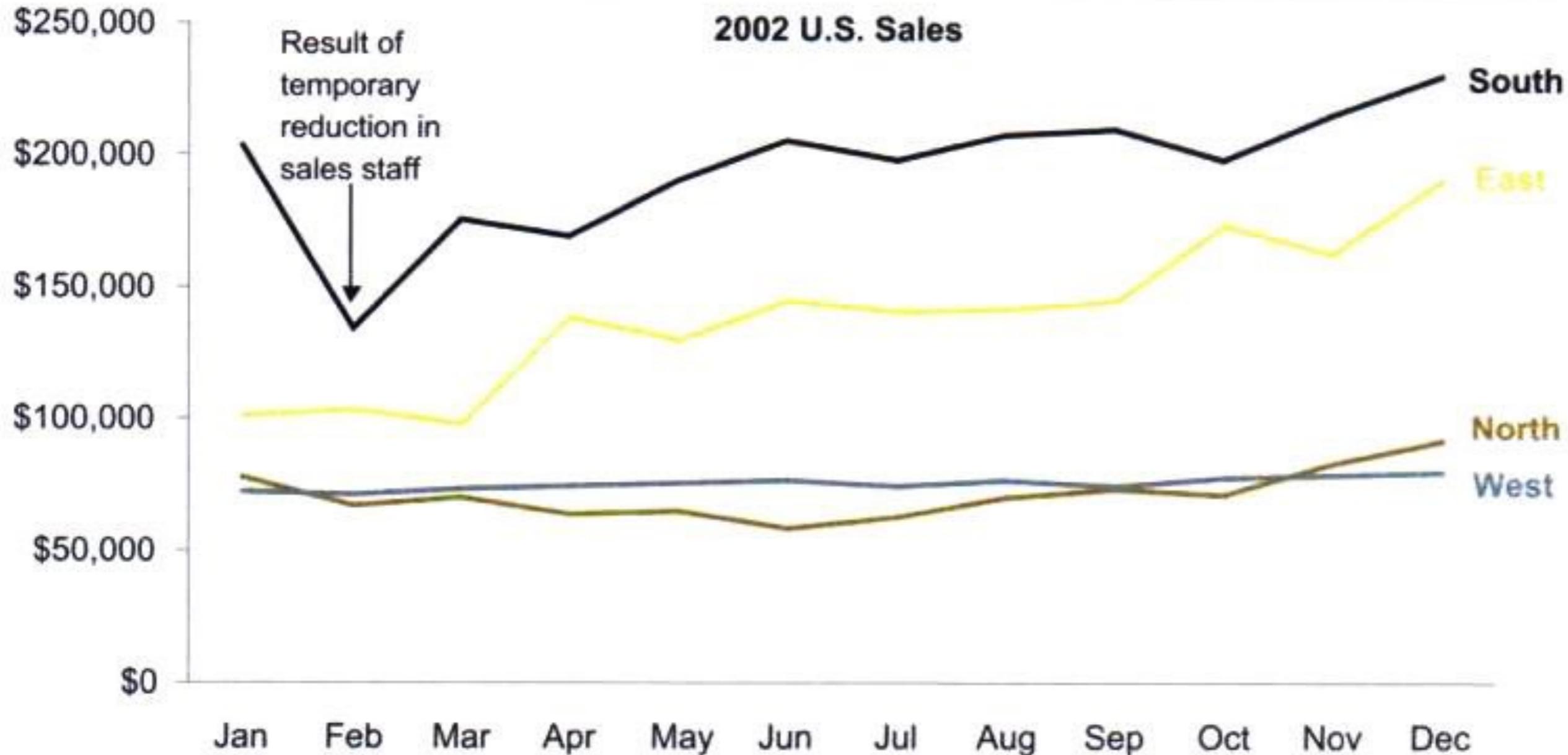
U.S. Dollars

2002 Sales

North East South West



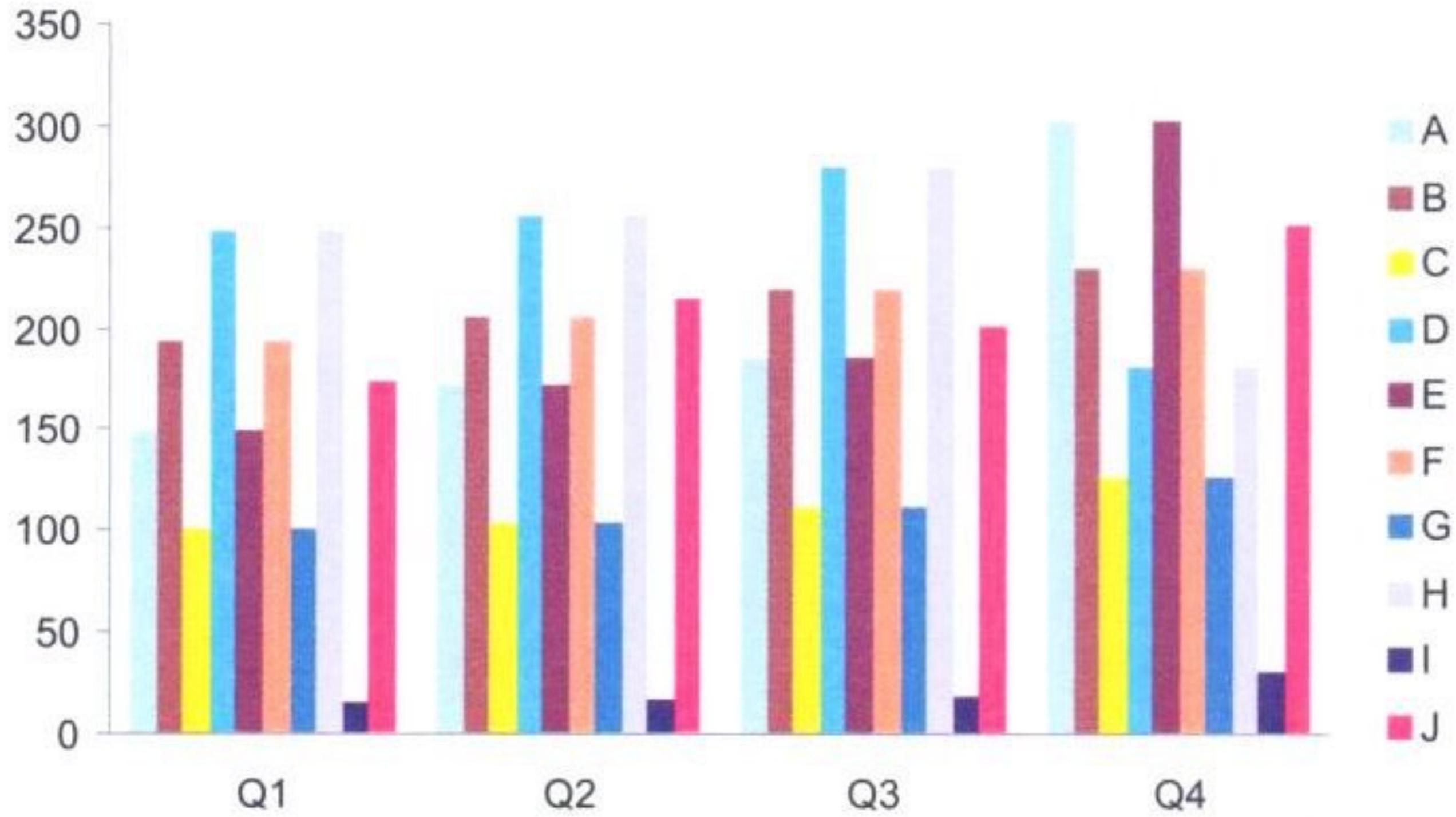
Podem ser posicionadas ao lado do gráfico verticalmente ou mesmo horizontalmente abaixo do título



Note: The relatively even distribution of sales in the west can be attributed to the sales compensation pilot program.

Pode-se colocar **texto adicional** nos gráficos com o objetivo de complementar uma informação

Normalmente, estes textos devem ser posicionados próximos aos objetos que explicam

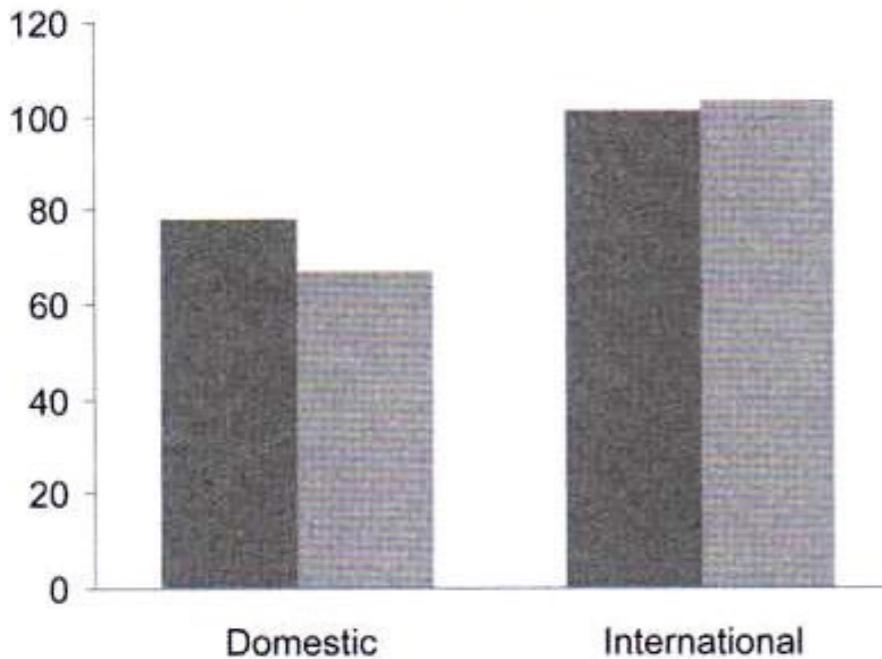


Devido às nossas limitações de memória de trabalho, o número de **subdivisões categóricas** está **entre 5 e 8**

Isto serve para barras, pontos e linhas

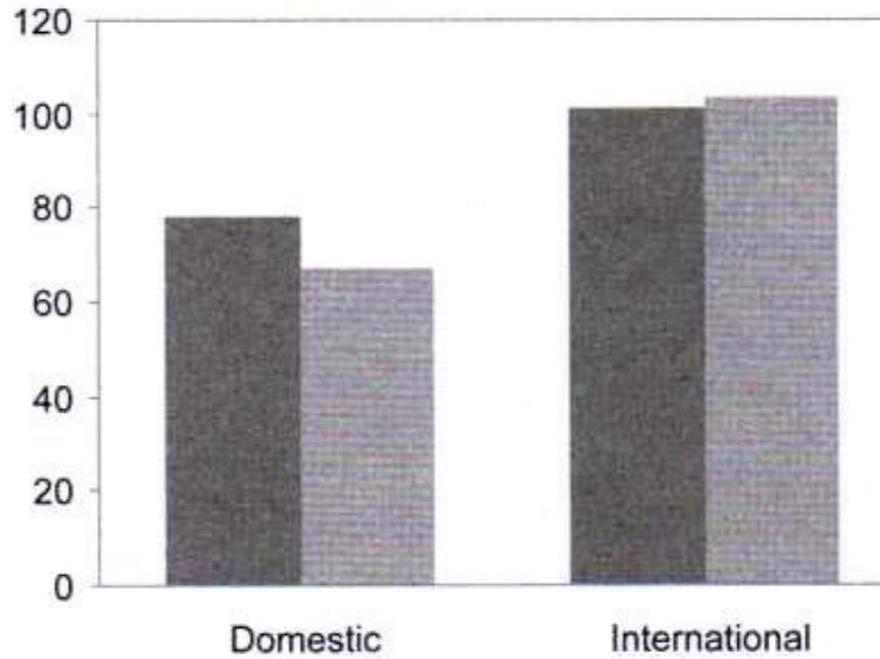
1 vertical and 1 horizontal axis

■ Direct ■ Indirect



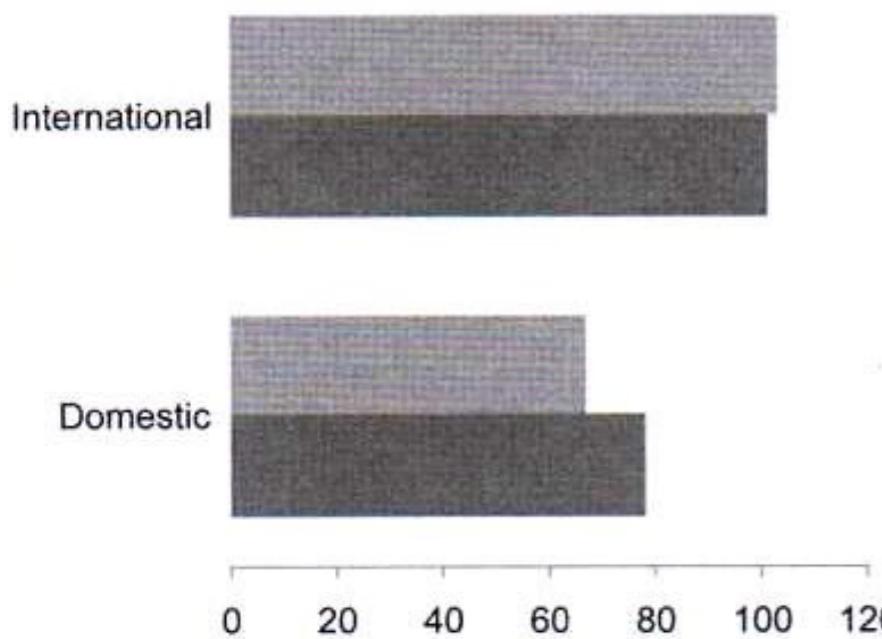
2 vertical and 2 horizontal axes

■ Direct ■ Indirect



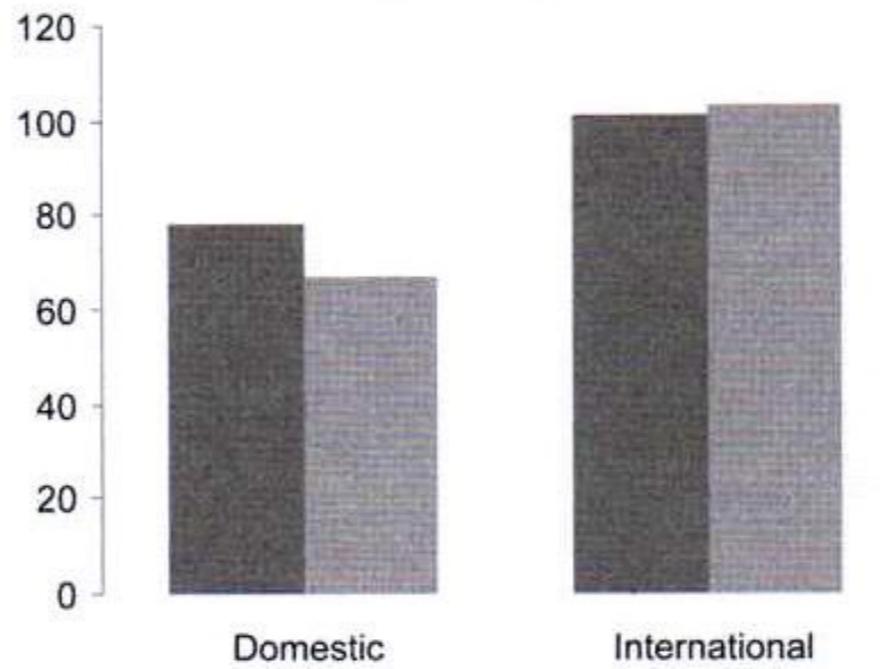
1 horizontal and no vertical axis

■ Direct ■ Indirect



1 vertical and no horizontal axis

■ Direct ■ Indirect



Borda é útil
apenas quando
é necessário
separar gráfico
de texto

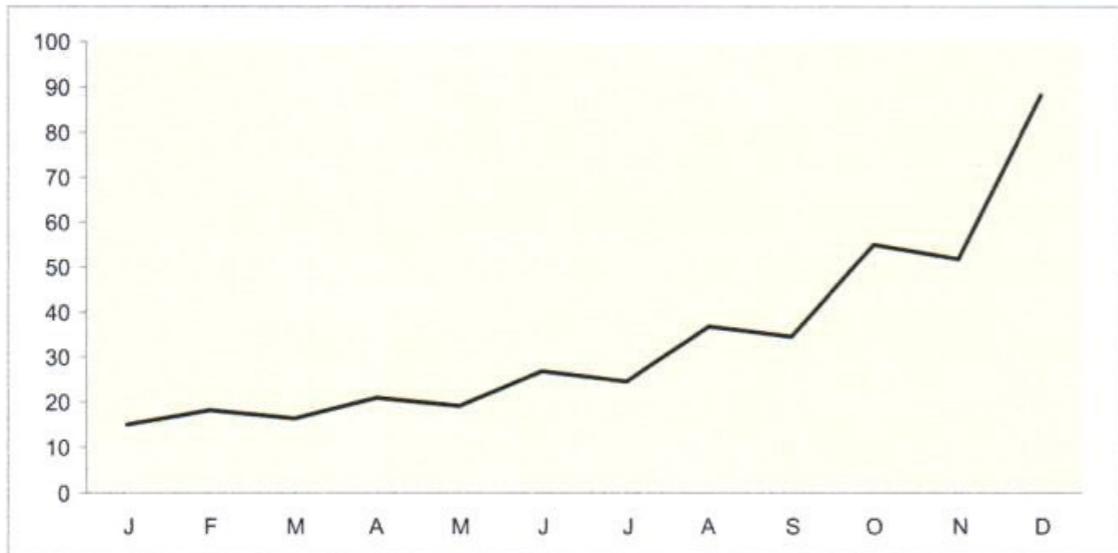


FIGURE 10.65 This graph has an aspect ratio of 1 to 2, or 0.5.

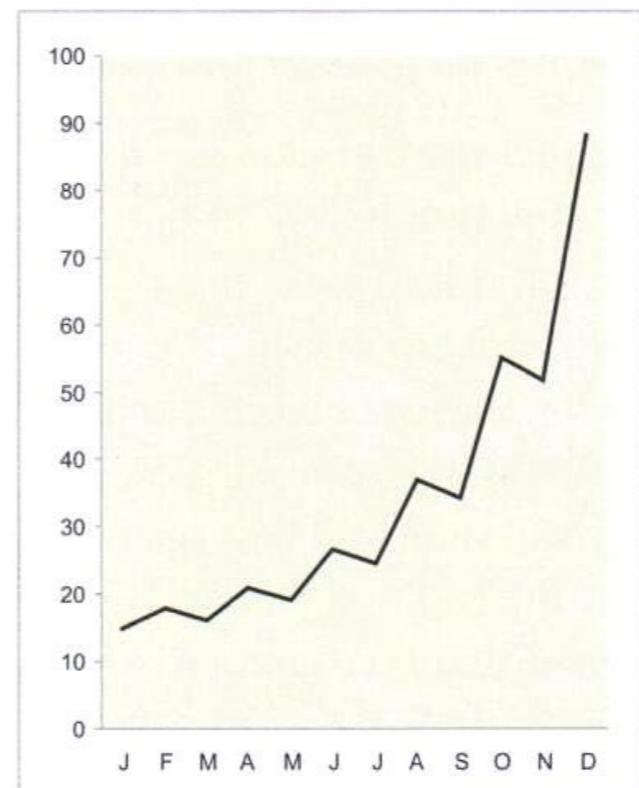


FIGURE 10.68 This graph has an aspect ratio of 1.5 to 1, or 1.5.

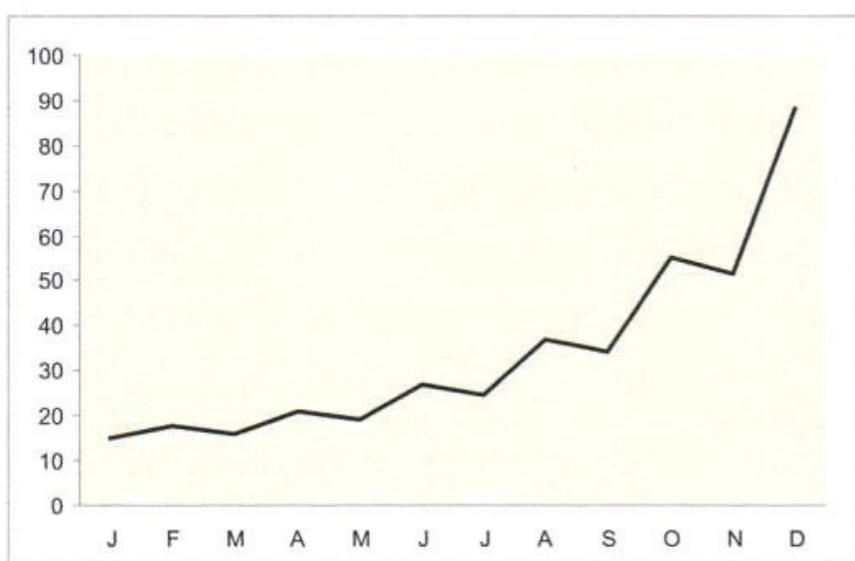


FIGURE 10.66 This graph has an aspect ratio of 1 to 1.5, or 0.67.

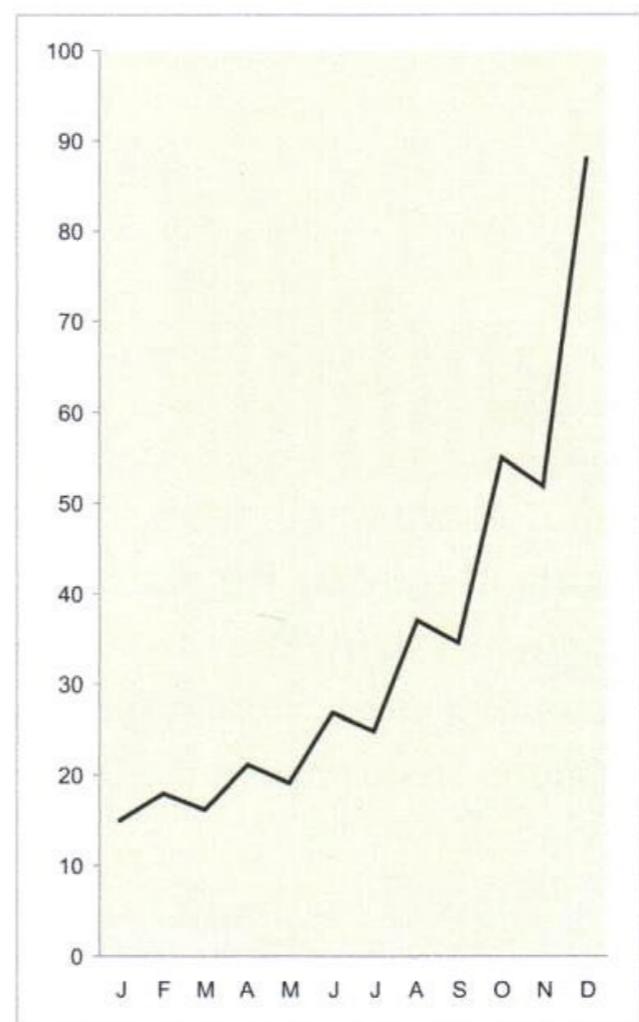


FIGURE 10.69 This graph has an aspect ratio of 2 to 1, or 2.0.

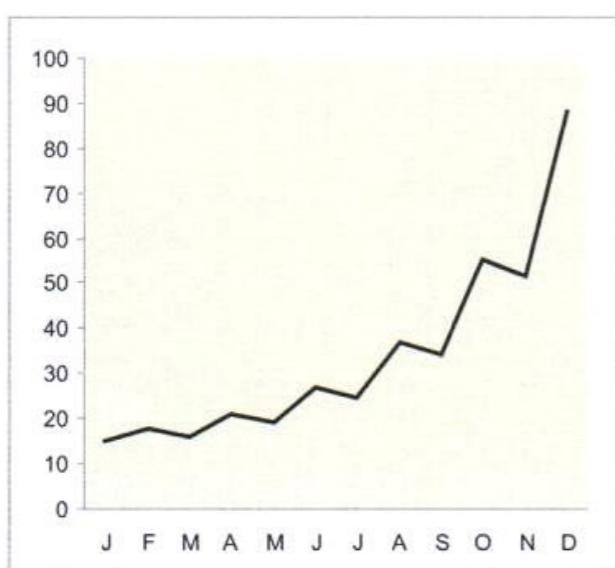
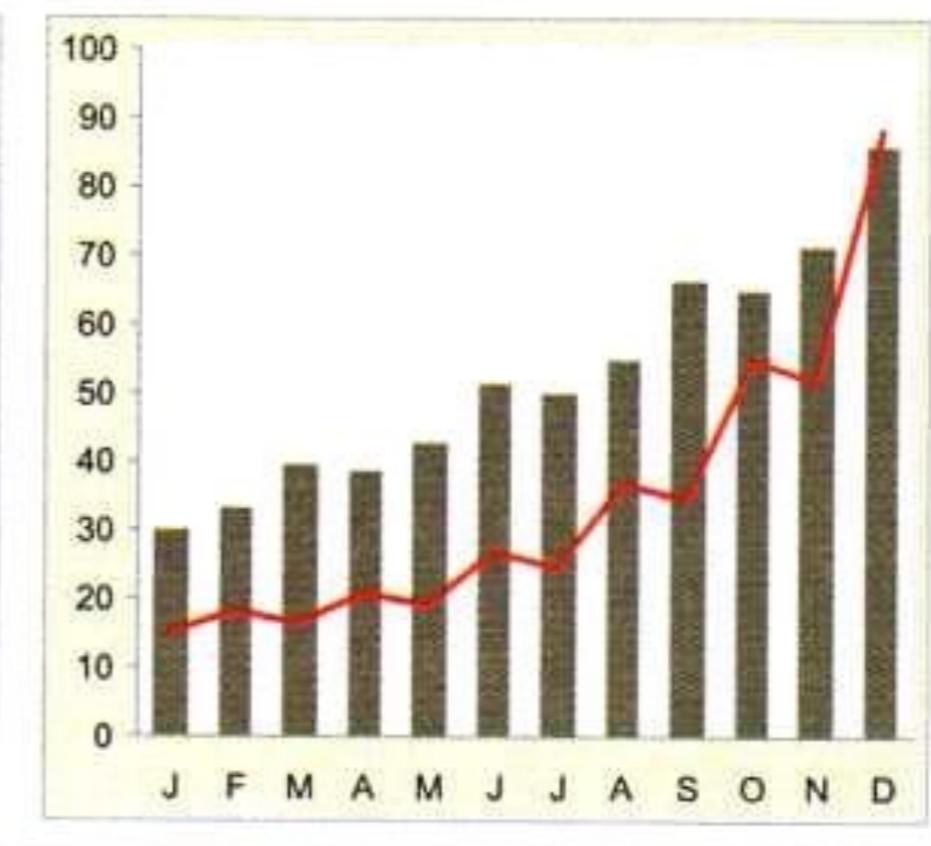
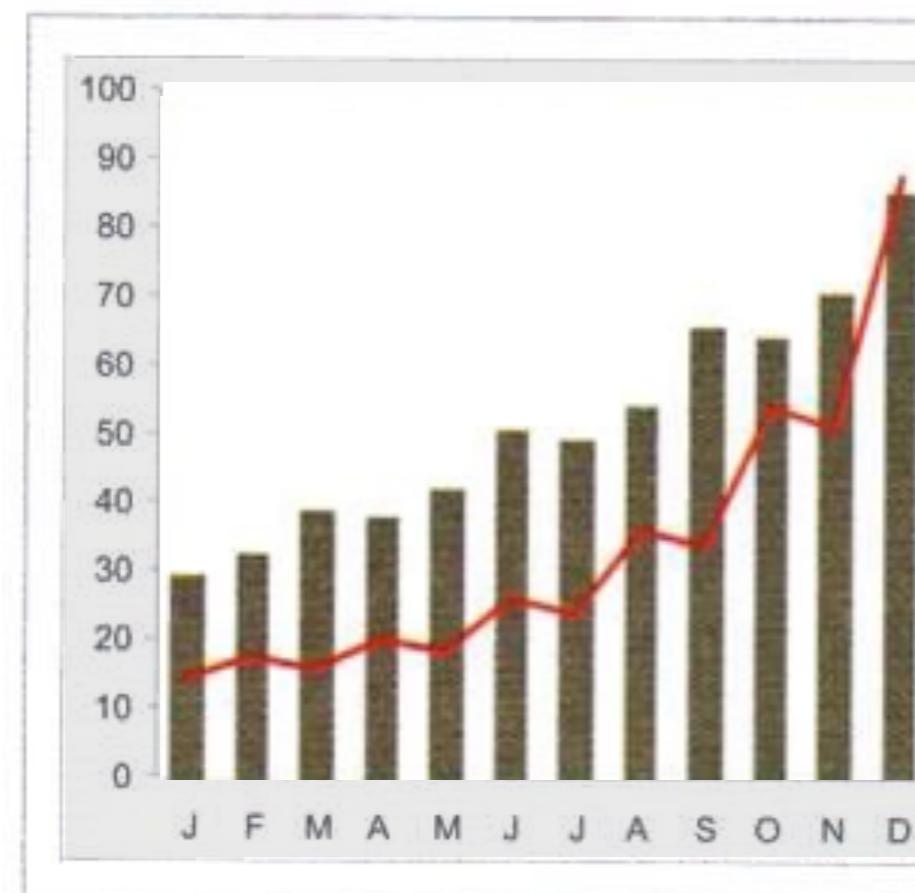
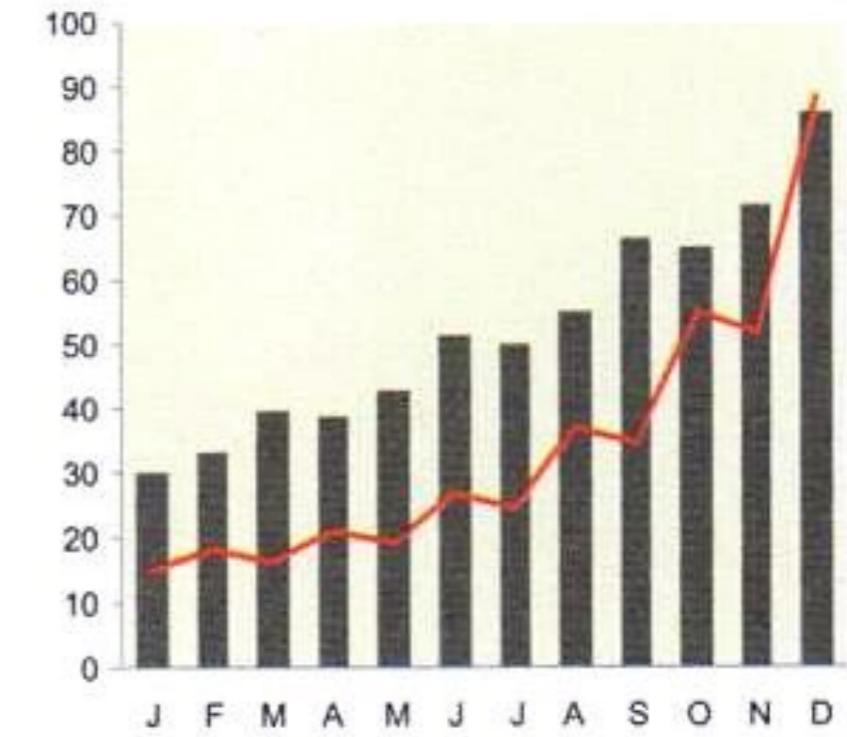
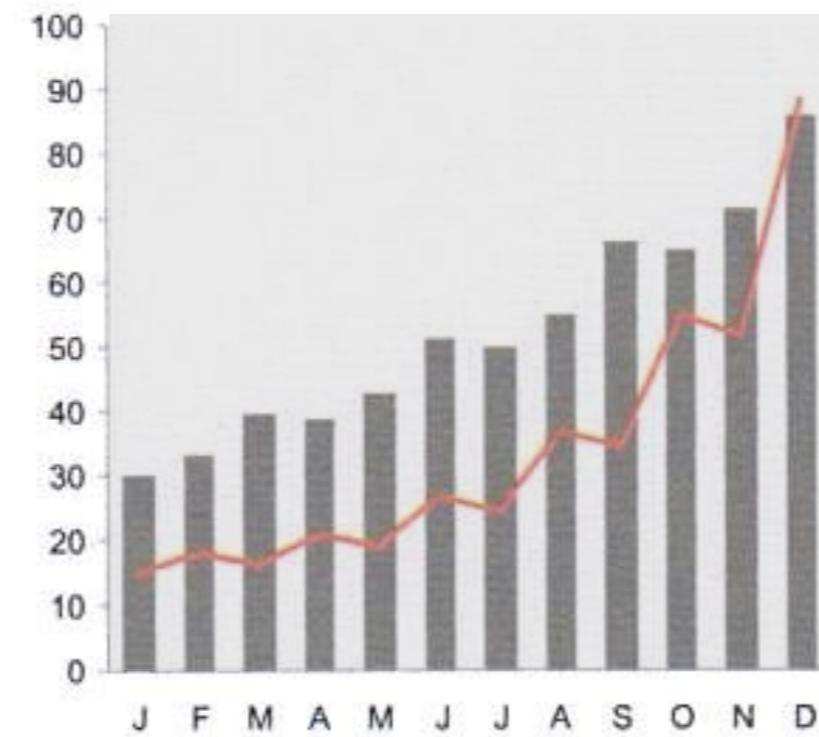
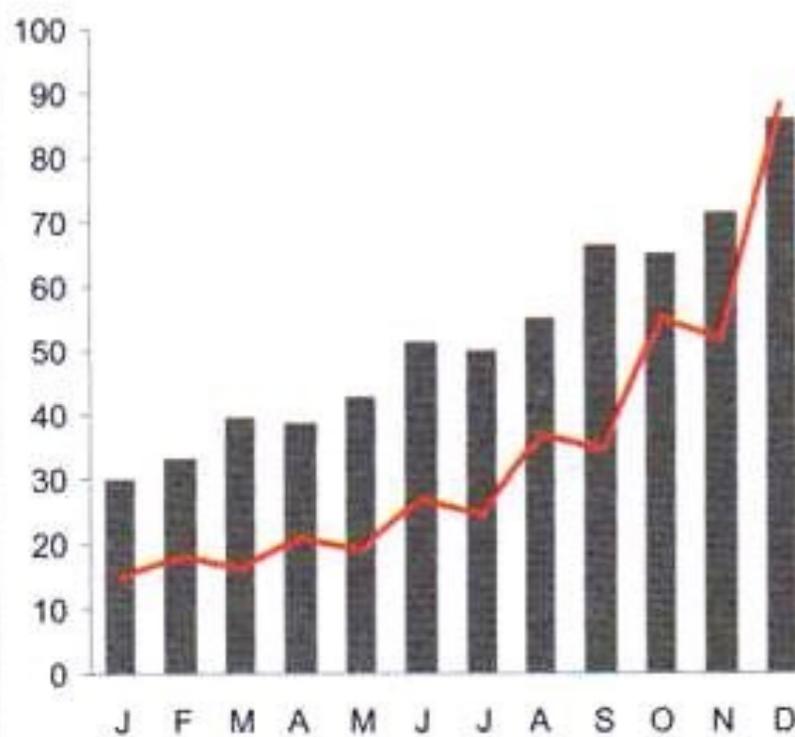


FIGURE 10.67 This graph has an aspect ratio of 1 to 1, or 1.0.

Nunca manipule a razão do aspecto para que os gráficos passem uma mensagem errada

Normalmente os gráficos devem ser mais largos que altos, exceto os *scatter plots* que pedem gráficos com área de dados quadradas



A melhor cor para o **fundo** de um gráfico é o **branco**, podendo também ser substituído por cinza ou amarelo bem suaves

Quando se quer dar destaque à área de dados, pode-se também colocar uma cor de fundo suave ao seu redor

GRIDS

- Grids têm as seguintes funções:
 - Melhorar a visibilidade dos valores correspondentes aos objetos visuais
 - Facilitar a comparação entre valores
 - Melhorar a percepção e comparação de padrões localizados
 - Grids não representam dados logo devem ser visualmente secundários

