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QUESTION 1: Graphical method to solve

Maximize Z = 6x1 + 11x2 s.t. 2x1 + x2 ≤ 104, x1 + 2x2 ≤ 76, x1, x2 ≥ 0

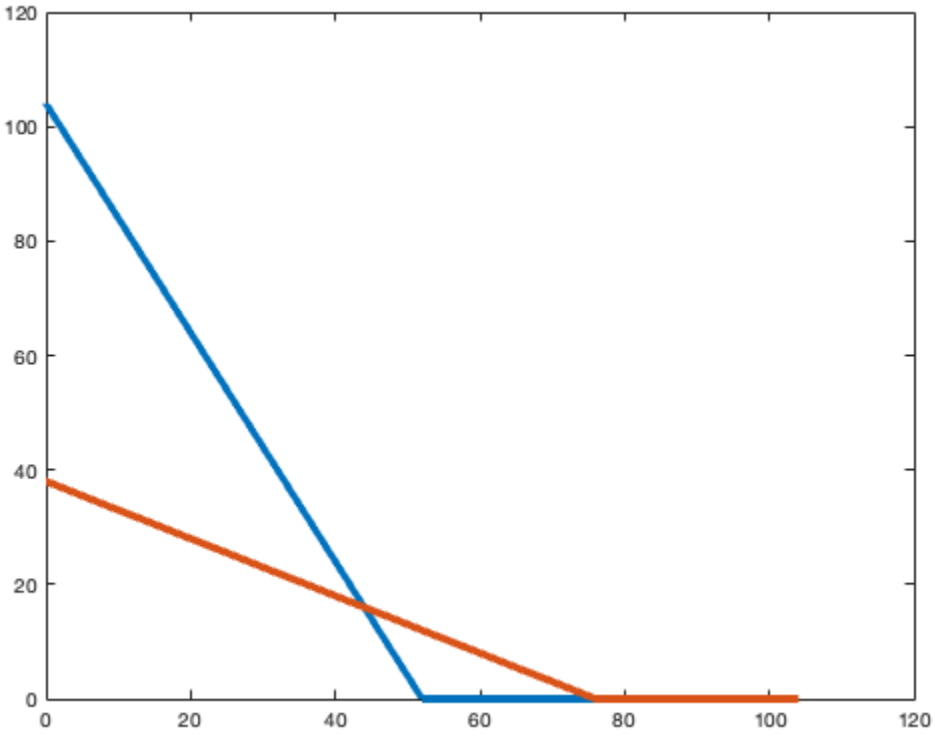
```
clc
clear all
format short
```

Input parameters

```
c=[6, 11]; %cost objective function
A=[2,1; 1,2; 0,1; 1,0];
B=[104; 76; 0; 0];
n=size(A,1);
x1=0:0.01:max(B);

for i=1:n-2 %we take n-2 since we are also taking x1=0 and x2=0 as they have
no significance in our graph
    y(i,:)=(B(i)-A(i,1)*x1)/A(i,2);
end
```

Drawing the lines

```
for i=1:n-2
    y(i,:)=max(0,y(i,:));
    plot(x1,y(i,:),'linewidth',4)
    hold on
end
hold on
```



Finding the point of intersection

```
pt=[0;0];
for i=1:size(A,1)
    A1=A(i,:);
    B1=B(i,:);
    for j=i+1:size(A,1)
        A2=A(j,:);
        B2=B(j,:);
        A3=[A1;A2];
        B3=[B1;B2];
        X3=inv(A3)*B3
        % X3=A3\B3;
        if(X3>=0)%since the number of chairs can never be negative
            pt= [pt X3];
        end
    end
end
X=pt';
X=unique(X,'rows')%solution
```

```
X3 =

    44
    16
```

```
X3 =

    52
     0


X3 =

     0
   104


X3 =

    76
     0


X3 =

     0
    38


X3 =

     0
     0


X =

     0     0
     0    38
     0   104
    44    16
    52     0
    76     0
```

Keep only Feasible Points

```
x1=X(:,1);
x2=X(:,2);

for i=1:n-2
    ind=find(A(i,:)*X'>B(i))
    X(ind,:)=[]
end
```

```
ind =

     6


X =

     0     0
     0    38
     0   104
    44    16
    52     0


ind =

     3


X =

     0     0
     0    38
    44    16
    52     0
```

Evaluate The Objective Function Value

```
obj_val=c*X';
[value, ind]=max(obj_val);
value;
X(ind,:)
Optimal=[X(ind,:) value];
```

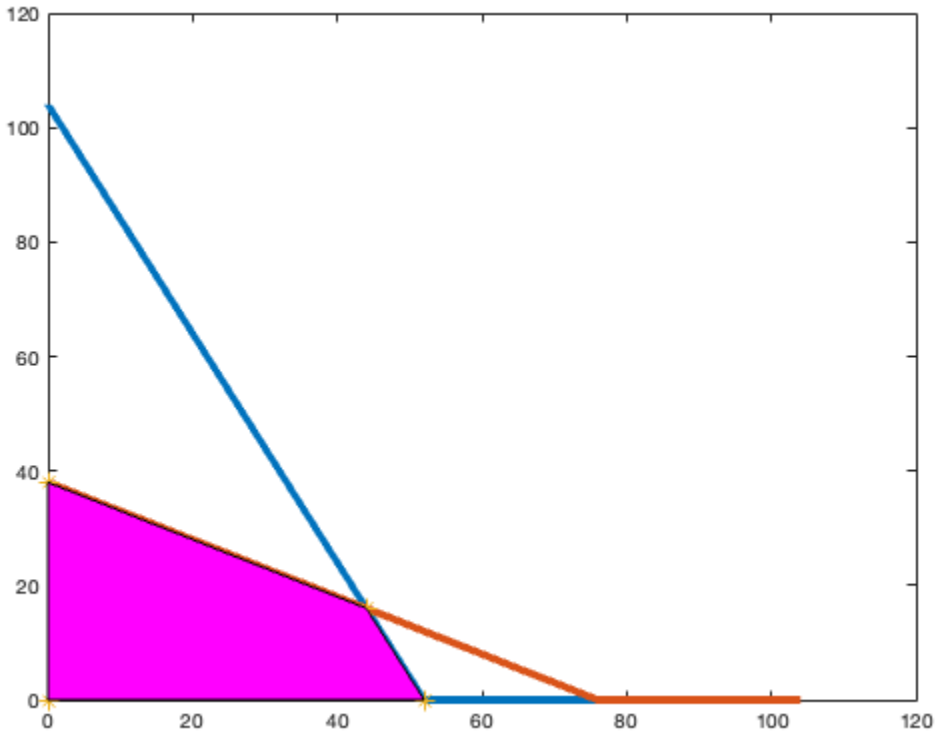
```
ans =

    44    16
```

Shaded feasible region

```
x=X(:,1);
y=X(:,2);
scatter(X(:,1),X(:,2),'*')
hold on
k=convhull(x,y)%the shaded region where a and y is satisfied
fill(x(k),y(k),'m')
```

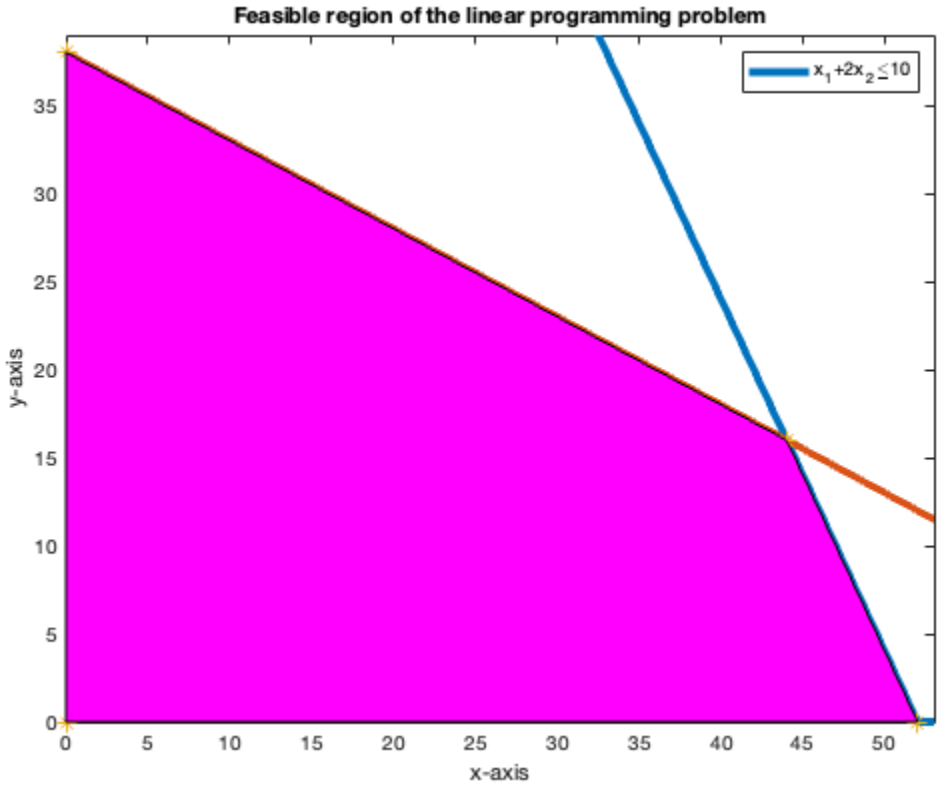
```
k =
```

```
1
4
3
2
1
```



setting the axes

```
xlim([0 max(x)+1])
ylim([0 max(y)+1])

xlabel('x-axis')
ylabel('y-axis')
title('Feasible region of the linear programming problem')
legend('x_1+2x_2\leq10')
```



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