METODE GRAFIK

Dorian Auto manufactures luxury cars and trucks. The Company believes that its most likely customers are high-income women and men. To reach these groups, Dorian Auto has ambarked on an ambitious TV advertising campaign and has decided to purchase 1-minute commercial spots on two types of programs: comedy shows and football games. Each comedy commercial is seen by 7 million high-income women and 2 million high-income men. Each football commercial is seen by 2 million high-income womwn and 12 milion high-income men. A 1-minute comedy ad cost $50,000, and a 1-minute football ad cost $100,000. Dorian would like the commercials to be seen by at least 28 million high-income women and 24 million high-income men. Use linear programming to determine how Dorian Auto can meet its advertising requirements at minimum cost.

Model

X_1 = number of 1-minute comedy ads purchased

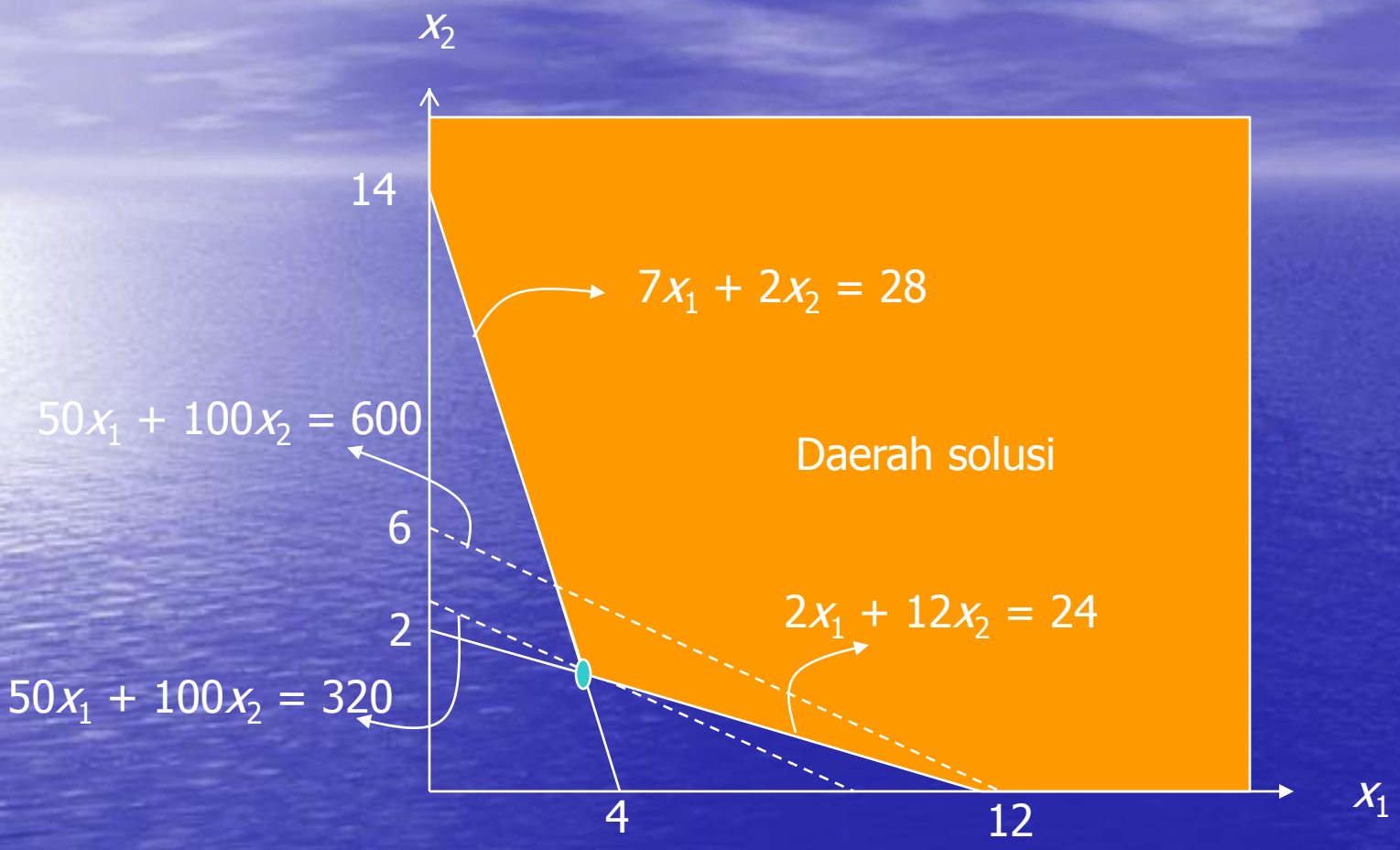
X_2 = number of 1-minute football ads purchased

Min $z = 50x_1 + 100x_2$.

s.t. $7x_1 + 2x_2 \geq 28$ (HIW)

$2x_1 + 12x_2 \geq 24$ (HIM)

$x_1 , x_2 \geq 0$



Jadi, min $z = 320$ pada titik (3.6, 1.4)

METODE SIMPLEKS

A. Mengubah ke bentuk baku simpleks

Maks $z = 4x_1 + 3x_2$

$x_1 + x_2 \leq 40$

$2x_1 + x_2 \leq 60$

$Z = 4x_1 + 3x_2 + 0.S_1 + 0.S_2$

$x_1 + x_2 + S_1 = 40$

$2x_1 + x_2 + S_2 = 60$

Min $z = 2x_1 + 5x_2$

$x_1 + x_2 + \geq 25$

$2x_1 + x_2 + \geq 50$

Min $z = 2x_1 + 5x_2 + 0.e_1 + 0.e_2$

$x_1 + x_2 - e_1 = 25$

$2x_1 + x_2 - e_2 = 50$

S = variabel *slack*

e = variabel *excess*

B. Definisi-definisi

Diberikan sistem persamaan linier Ax = b dengan m persamaan dan n Variabel ($n \geq m$), maka sebanyak $n - m$ variabel yang bernilai 0 disebut *variabel nonbasis* (NBV) dan sisanya sebanyak m disebut *Variabel basis* (BV).

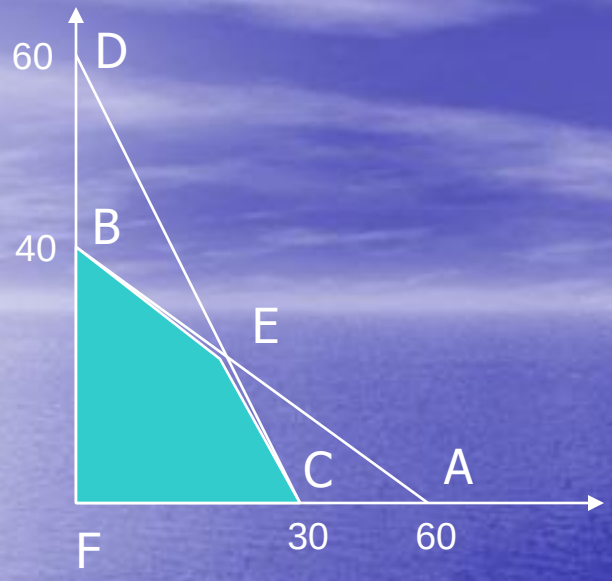
Varibel basis adalah matriks kolom yang satu elemennya bernilai 1 dan yg Lainnya bernilai 0.

Setiap solusi basis yang memuat semua variabel tak negatif adalah *Solusi layak basis* (bfs)

Contoh $Z = 4x_1 + 3x_2 + 0.S_1 + 0.S_2$

$$x_1 + x_2 + S_1 = 40$$
$$2x_1 + x_2 + S_2 = 60$$

Terdapat 4 – 2 = 2 NBV dan 2 BV.



BV	NBV	bfs	Kores. dgn ttk sudut
x_1, x_2	s_1, s_2	$s_1, s_2 = 0, x_1 = x_2 = 20$	E
x_1, s_1	x_2, s_2	$x_2, s_2 = 0, x_1 = 30, s_1 = 10$	C
x_1, s_2	x_2, s_1	$x_1 = 40, s_2 = -20$	A (bukan bfs)
x_2, s_1	x_1, s_2	$s_1 = -20, x_2 = 60$	D (bukan bfs)
x_2, s_2	x_1, s_1	$x_2 = 40\ s_2 = 20$	B
s_1, s_2	x_1, x_2	$s_1 = 40, s_2 = 60$	F

ALGORITMA SIMPLEKS

Tabel awal

$z - 60x_1 - 30x_2 - 20x_3 = 0$	$z = 0$
$8x_1 + 6x_2 + x_3 + S_1 = 48$	$S_1 = 48$
$4x_1 + 2x_2 + 1.5x_3 + S_2 = 20$	$S_2 = 20$
$2x_1 + 1.5x_2 + 0.5x_3 + S_3 = 8$	$S_3 = 8$
$x_2 + S_4 = 5$	$S_4 = 5$

Tabel awal

z	x_1	x_2	x_3	s_1	s_2	s_3	s_4	BV
1	-60	-30	-20	0	0	0	0	$z = 0$
0	8	6	1	1	0	0	0	$s_1 = 48$
0	4	2	1.5	0	1	0	0	$S_2 = 20$
0	2	1.5	0.5	0	0	1	0	$S_3 = 8$
0	0	1	0	0	0	0	1	$S_4 = 5$

Tabel awal

z	x_1	x_2	x_3	s_1	s_2	s_3	s_4	rasio	BV
1	-60	-30	-20	0	0	0	0		$z = 0$
0	8	6	1	1	0	0	0	6	$s_1 = 48$
0	4	2	1.5	0	1	0	0	5	$S_2 = 20$
0	2	1.5	0.5	0	0	1	0	4	$S_3 = 8$
0	0	1	0	0	0	0	1	-	$S_4 = 5$

Tabel 1

z	x_1	x_2	x_3	s_1	s_2	s_3	s_4	BV	rasio
1	0	10	-5	0	0	30	0	Z = 240	
0	0	0	-1	1	0	-4	0	S_1 = 16	-
0	0	-1	0.5	0	1	-2	0	S_2 = 4	8
0	1	0.75	0.25	0	0	0.5	0	x_1 = 4	16
0	0	1	0	0	0	0	1	s_4 = 5	-

Tabel 2

Z	*x1*	*x2*	*x3*	*s1*	*s2*	*s3*	*s4*	BV	*rasio*
1	0	0	0	0	10	10	0	z = 280	
0	0	-2	0	1	-8	-8	0	s1 = 24	
0	0	-2	1	0	-4	-4	0	x3 = 8	
0	1	1.25	0	0	-0.5	1.5	0	x1 = 2	
0	0	1	0	0	0	0	1	s4 = 5	

PT unilever bermaksud membuat dua jenis sabun yakni sabun bubuk dan sabun batang.. Untuk itu dibutuhkan dua macam zat kimia yakni A dan B. Jumlah zat kimia yang tersedia adalah A = 200 kg dan B = 360 kg. Untuk membuat 1 kg sabun Bubuk diperlukan 2 kg A dan 6 kg B. Untuk membuat 1 kg Sabun batang diperlukan 5 kg A dan 3 kg B. Bila keuntungan Yang akan diperoleh setiap membuat 1 kg sabun bubuk = $3 Sedangkan setiap 1 kg sabun batang = $2. Berapa kg jumlah sabun Bubuk dan sabun batang yang sebaiknya dibuat?

X1 = jumlah sabun bubuk yang diproduksi

X2 = jumlah sabun batang yang diproduksi

Contoh 1

Maks Z = 3x1 + 2x2

2x1 + 5x2 <= 200

6x1 + 3x2 <= 360

X1, x2 >= 0

Tabel Awal

Z	X1	X2	S1	S2	BV	R
1	-3	-2	0	0	Z= 0	
0	2	5	1	0	S1=200	100
0	(6)	3	0	1	S2=360	60

X1 masuk basis

S2 keluar basis

Tabel 1

Z	X1	X2	S1	S2	BV	R
1	0	-0.5	0	0.5	Z= 180	
0	0	(4)	1	-1/3	S1=80	20
0	1	0.5	0	1/6	X1=60	120

X2 masuk basis

S1 keluar basis

Tabel 1

Z	X1	X2	S1	S2	BV
1	0	0	1/8	23/24	Z= 190
0	0	1	1/4	-1/12	X2=20
0	1	0	-1/8	5/24	X1=50

Zmaks = 190

X1 = 50 dan X2 = 20

Jadi, untuk memperoleh keuntungan Maksimum sebesar $190, maka ia Harus memproduksi sabun bubuk se-Banyak 50 dan sabun batang sebanyak 20

Contoh 2

Maks $Z = X1 + 2X2 + X3$

Kendala :

$X1 - 2X2 + X3 \leq 10$

$X1 + X2 + X3 \leq 20$

$2X1 + X2 - X3 \leq 15$

$X1, X2, X3 \geq 0$

Tabel awal

Z	X1	X2	X3	S1	S2	S3	BV	R
1	-1	-2	-1	0	0	0	Z = 0	
0	1	-2	1	1	0	0	S1=10	-
0	1	1	1	0	1	0	S2=20	20
0	2	(1)	-1	0	0	1	S3=15	15

X2 Masuk basis

S3 Keluar basis

Tabel 1

Z	X1	X2	X3	S1	S2	S3	BV	R
1	3	0	-3	0	0	2	Z = 30	
0	5	0	-1	1	0	2	S1=40	-
0	-1	0	(2)	0	1	-1	S2=5	2.0
0	2	1	-1	0	0	1	X2=15	-

X3 Masuk basis

S2 Keluar basis

Tabel 2

Z	X1	X2	X3	S1	S2	S3	BV
1	1.5	0	0	0	1.5	0.5	Z = 37.5
0	3.5	0	0	1	0.5	1.5	S1=42.5
0	-0.5	0	1	0	0.5	-0.5	X3=2.5
0	1.5	1	0	0	0.5	0.5	X2=17.5

Zmaks = 37.5

X1 = 0, X2 = 17.5 , X3 = 2.5