Constraint 3	100.	50.	<=	8,000.	0.4
Solution->	1.	0.	<=	60.	10.
	60.	40.		3,800.	

Ranging

Solved Problem 7-2 Solution

Variable	Value	Reduced Cost	Original Val	Lower Bound	Upper Bound
X1	60.	0.	50.	40.	Infinity
X2	40.	0.	20.	0.	25.
Constraint	Dual Value	Slack/Surplus	Original Val	Lower Bound	Upper Bound
Constraint 1	0.	120.	400.	280.	Infinity
Constraint 2	0.4	0.	8,000.	6,000.	9,500.
Constraint 3	10	0	60	40	80

7-35 Graphically solve the following problem:

$$\text{Maximize profit} = 8X_1 + 5X_2$$

$$\text{subject to} \quad X_1 + X_2 \leq 10$$

$$X_1 \leq 6$$

$$X_1, X_2 \geq 0$$

(a) What is the optimal solution?
(b) Change the right-hand side of constraint 1 to 11 (instead of 10) and resolve the problem. How much did the profit increase as a result of this?
(c) Change the right-hand side of constraint 1 to 6 (instead of 10) and resolve the problem. How much did the profit decrease as a result of this? Looking at the graph, what would happen if the right-hand-side value were to go below 6?
(d) Change the right-hand-side value of constraint 1 to 5 (instead of 10) and resolve the problem. How much did the profit decrease from the original profit as a result of this?
(e) Using the computer output on this page, what is the dual price of constraint 1? What is the lower bound on this?
(f) What conclusions can you draw from this regarding the bounds of the right-hand-side values and the dual price?

7-36 Serendipity[6]

The three princes of Serendip
Went on a little trip.
They could not carry too much weight;
More than 300 pounds made them hesitate.
They planned to the ounce. When they returned to Ceylon
They discovered that their supplies were just about gone
When, what to their joy, Prince William found
A pile of coconuts on the ground.
"Each will bring 60 rupees," said Prince Richard with a grin
As he almost tripped over a lion skin.
"Look out!" cried Prince Robert with glee
As he spied some more lion skins under a tree.
"These are worth even more—300 rupees each
If we can just carry them all down to the beach."
Each skin weighed fifteen pounds and each coconut, five,
But they carried them all and made it alive.
The boat back to the island was very small
15 cubic feet baggage capacity—that was all.
Each lion skin took up one cubic foot
While eight coconuts the same space took.
With everything stowed they headed to sea
And on the way calculated what their new wealth might be.
"Eureka!" cried Prince Robert, "Our worth is so great
That there's no other way we could return in this state.
Any other skins or nut that we might have brought
Would now have us poorer. And now I know what—
I'll write my friend Horace in England, for surely
Only he can appreciate our serendipity."

Formulate and solve **Serendipity** by graphical LP in order to calculate "what their new wealth might be."

7-37 Bhavika Investments, a group of financial advisors and retirement planners, has been requested to provide advice on how to invest $200,000 for one of its clients. The client has stipulated that the money must be put into either a stock fund or a money market fund, and

[6] The word *serendipity* was coined by the English writer Horace Walpole after a fairy tale titled *The Three Princes of Serendip*. Source of problem is unknown.

Constraint 3
Solution->
Variable
S
M
Constraint
Constraint 1
Constraint 2
Constraint 3

the annual return should be at least $14,000. O conditions related to risk have also been specified, the following linear program was developed to l with this investment decision:

Minimize risk $= 12S + 5M$

subject to

$S + M = 200{,}000$	total investment is $200,000
$0.10S + 0.05M \geq 14{,}000$	return must be at le $14,000
$M \geq 40{,}000$	at least $40,000 mu be in money marke fund

$S, M \geq 0$

where

S = dollars invested in stock fund

M = dollars invested in money market fund

Output for Problem 7-38

Maximize
Constraint 1
Constraint 2
Constraint 3
Solution->
Variable
S
M
Constraint
Constraint 1
Constraint 2
Constraint 3