(5)

Lucky Puck

Vancouver has 400, Edmonton 350
Winnipeg needs 250 Saskatoon 350

Shipping Costs

Source \ Destination	Winnipeg	Saskatoon
Vancouver	5	8
Edmonton	6	2

5.1 Let X_1 = helmets from Vancouver to Winnipeg
X_2 = " " Vancouver to Saskatoon
X_3 = " " Edmonton to Winnipeg
X_4 = " " Edmonton to Saskatoon

5.2 Minimize $5X_1 + 8X_2 + 6X_3 + 2X_4$ (1)

subject to

$X_1 + X_2 \leq 400$ (2)

$X_3 + X_4 \leq 350$ (3)

$X_1 + X_3 = 250$ (4)

$X_2 + X_4 = 350$ (5)

$X_1, X_2, X_3, X_4 \geq 0$

negate (1) and the objective statement becomes

Maximize

$-5X_1 - 8X_2 - 6X_3 - 2X_4$

Convert to slack form

$Z = -5X_1 - 8X_2 - 6X_3 - 2X_4$
$X_5 = 400 - X_1 - X_2$
$X_6 = 350 - X_3 - X_4$
$X_7 = 250 - X_1 - X_3$
$X_8 = 350 - X_2 - X_4$

5.3 Solve

$X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 \geq 0$

5.3) Solve

Looking at X_6 & X_8

$X_6 = 350 - X_3 - X_4 \Rightarrow$ Helmets left in Edmonton
$X_8 = 350 - X_2 - X_4 \Rightarrow$ Helmets NOT shipped to Saskatoon

we get

$350 = X_8 + X_2 + X_4$
$X_6 = X_8 + X_2 + X_4 - X_3 - X_4$
$X_6 = X_8 + X_2 - X_3$

Clearly $X_8, X_7 = 0$ since all helmets must get to their Destination. Likewise the number left in Edmonton equals the number shipped from Edmonton to Winnipeg.

However, the simplest solution is to look at the costs and realize that shipping

350 from Edmonton to Saskatoon
and 250 from Vancouver to Winnipeg
With 0 from Edmonton to Winnipeg and
0 from Vancouver to Saskatoon
Gives an optimal solution which is on a vertex which we no call from Algebra 2 is a MINIMUM/MAXIMUM.