

MATH 371 - Quiz 3

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For the take home quiz #3 we were assigned supplementary problem 6.11 pg.131 which is given below.

Maximize: $z = 2x_1 + 10x_2 + x_3$
subject to: $5x_1 + 2x_2 + x_3 \leq 15$
 $2x_1 + x_2 + 7x_3 \leq 20$
 $x_1 + 3x_2 + 2x_3 \leq 25$
with: all variables non-negative and integral.

We will be using [PuLP](#) a python library for solving linear programming problems. we then created the local variables that we would be using for x_1, x_2 , and x_3 .

```
# Setup the problem to be a pure integer program
x = LpVariable("x", 0, None, cat='Integer')
y = LpVariable("y", 0, None, cat='Integer')
z = LpVariable("z", 0, None, cat='Integer')
```

Next we can initialize the constraint functions, and object functions.

```
# constraint functions
prob += 5*x + 2*y + 1*z <= 15
prob += 2*x + 1*y + 7*z <= 20
prob += 1*x + 3*y + 2*z <= 25
# objective function
prob += 2*x + 10*y + 1*z
```

Now we call the `prob.solve()`, and it will automatically branch and bound and give us the optimal solution if it works.

```
# solve the IPP
prob.solve()
```

Solution

From using the branching and bounding method to solve the IPP we end up with the result of

$$\begin{cases} x_1 = 0; \\ x_2 = 7; \\ x_3 = 1; \\ z = 71 \end{cases}$$

as the optimal solution. Below shows the basic tree for the branch and bound method.

