In [2]:
```
from gamspy import (Container, Variable, Equation, Model, Set, Parameter, Su
import numpy as np
```

In [23]:
```
c = Container()

# Sets
ads = Set(c, 'ads', records=['TV', 'Magazine', 'Radio'])

# Parameters
cost = Parameter(c, 'cost', domain=ads, records=np.array([20000, 10000, 2000
audience = Parameter(c, 'audience', domain=ads, records=np.array([1800000, 1
wizard_weeks = Parameter(c, 'wizard_weeks', domain=ads, records=np.array([1,

# Variables
x = Variable(c, 'x', domain=ads, type='Positive')

# Objective: Maximize total audience
objective = Sum(ads, audience[ads] * x[ads])

# Constraints
budget_constraint = Equation(c, 'budget_constraint', domain=[])
budget_constraint[:] = Sum(ads, cost[ads] * x[ads]) <= 1000000

tv_time_constraint = Equation(c, 'tv_time_constraint', domain=[])
tv_time_constraint[:] = x['TV'] >= 10

wizard_weeks_constraint = Equation(c, 'wizard_weeks_constraint', domain=[])
wizard_weeks_constraint[:] = Sum(ads, wizard_weeks[ads] * x[ads]) <= 100

# New constraints
magazine_min_constraint = Equation(c, 'magazine_min_constraint', domain=[])
magazine_min_constraint[:] = x['Magazine'] >= 2  # At least 2 magazine pages

radio_max_constraint = Equation(c, 'radio_max_constraint', domain=[])
radio_max_constraint[:] = x['Radio'] <= 120  # At most 120 minutes of radio

# Model
model_4 = Model(c,
              name='model_4',
              equations=c.getEquations(),
              problem=Problem.LP,
              sense=Sense.MAX,
              objective=objective)
```

In [18]:
```
model_1.solve(options=Options(equation_listing_limit=100))
print("Objective Function Value: ",round(model_1.objective_value,4),"\n")
print("advertising methods: \n", x.records)
print("status: ", model_1.status)
print("solver status: ", model_1.solve_status)
```

```
Objective Function Value:  98000000.0

advertising methods:
         ads  level  marginal  lower  upper  scale
0         TV   10.0       0.0    0.0    inf    1.0
1  Magazine   80.0       0.0    0.0    inf    1.0
status:  ModelStatus.OptimalGlobal
solver status:  SolveStatus.NormalCompletion
```

In [20]:
```
model_2.solve(options=Options(equation_listing_limit=100))
print("Objective Function Value: ",round(model_2.objective_value,4),"\n")
print("advertising methods: \n", x.records)
print("status: ", model_2.status)
print("solver status: ", model_2.solve_status)
```

```
Objective Function Value:  92000000.0

advertising methods:
         ads  level  marginal  lower  upper  scale
0         TV   40.0       0.0    0.0    inf    1.0
1  Magazine   20.0       0.0    0.0    inf    1.0
status:  ModelStatus.OptimalGlobal
solver status:  SolveStatus.NormalCompletion
```

In [22]:
```
model_3.solve(options=Options(equation_listing_limit=100))
print("Objective Function Value: ",round(model_3.objective_value,4),"\n")
print("advertising methods: \n", x.records)
print("status: ", model_3.status)
print("solver status: ", model_3.solve_status)
```

```
Objective Function Value:  118000000.0

advertising methods:
         ads  level  marginal  lower  upper  scale
0         TV   10.0       0.0    0.0    inf    1.0
1  Magazine    0.0 -250000.0    0.0    inf    1.0
2     Radio  400.0       0.0    0.0    inf    1.0
status:  ModelStatus.OptimalGlobal
solver status:  SolveStatus.NormalCompletion
```

In [25]:
```
model_4.solve(options=Options(equation_listing_limit=100))
print("Objective Function Value: ",round(model_4.objective_value,4),"\n")
print("advertising methods: \n", x.records)
print("status: ", model_4.status)
print("solver status: ", model_4.solve_status)
```

```
Objective Function Value:  100194285.7143

advertising methods:
         ads       level  marginal  lower  upper  scale
0         TV   29.028571       0.0    0.0    inf    1.0
1  Magazine   17.942857       0.0    0.0    inf    1.0
2     Radio  120.000000       0.0    0.0    inf    1.0
status:  ModelStatus.OptimalGlobal
solver status:  SolveStatus.NormalCompletion
```

In [ ]:
```

```