# Project Planning & Control

## *Lesson 7*
## *Minimum Moment Concept*

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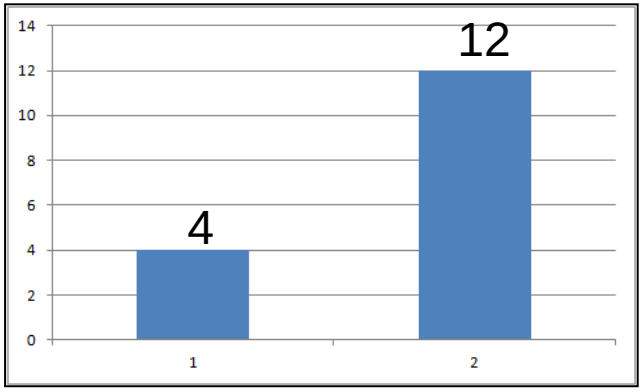
# Minimum Moment Concept

- Based on attempting to achieve a rectangular profile. (ideal ?)

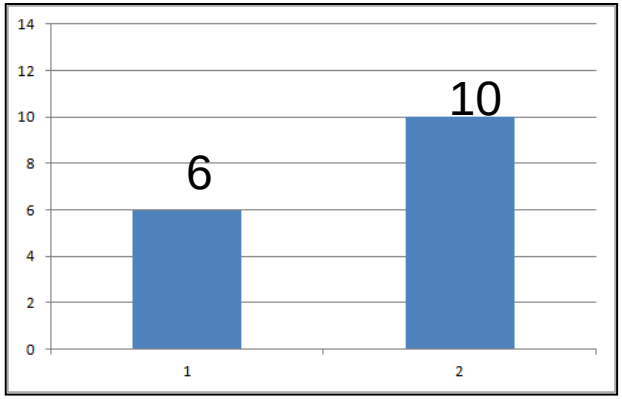
- Moment of the resource histogram about the X axis is minimum for a rectangular profile.

$$M=\Sigma(Y*Y/2)$$



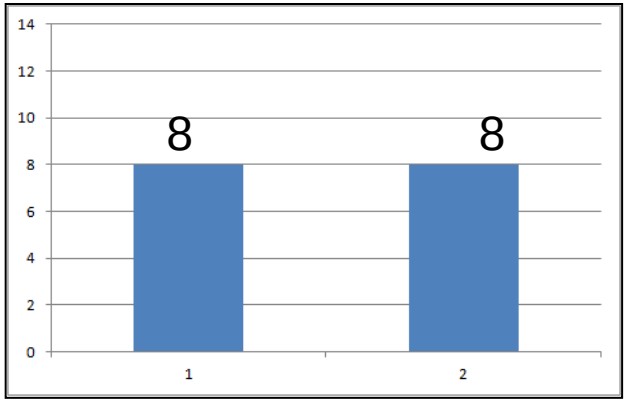

M=4*4/2 + 12*12/2

**= 80**




M=6x6/2 + 10*10/2

**= 68**



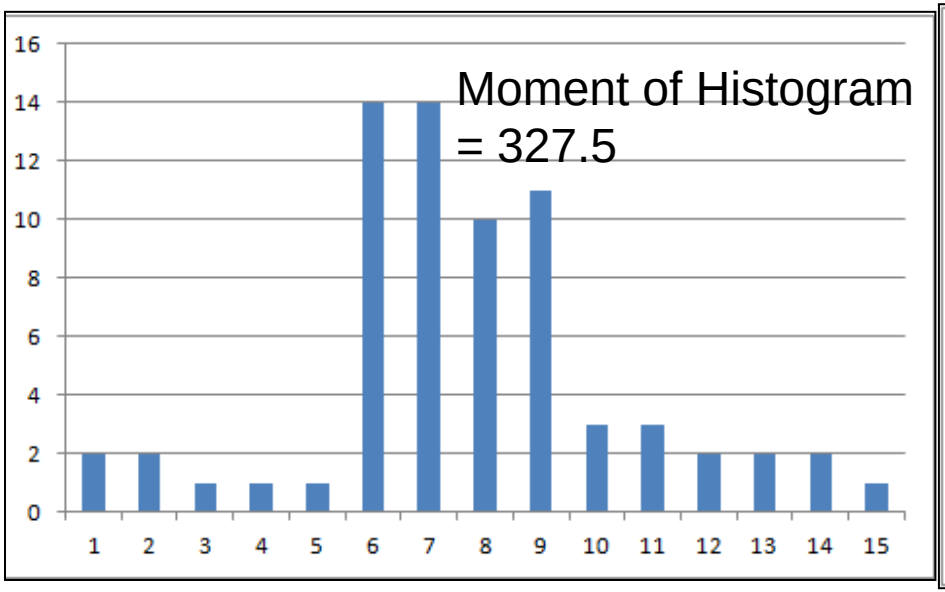

M=8*8/2 + 8*8/2

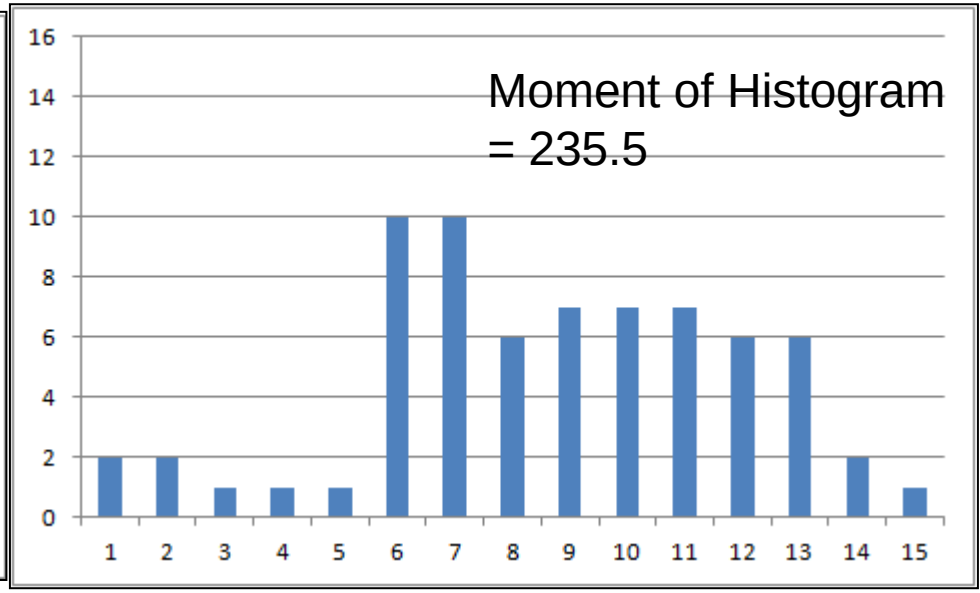
**=64** **MIN VALUE**

# Applying Minimum Moment Concept

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 2 | 2 | | | | | | | | | | | | |
| B | | | 1 | 1 | 1 | | | | | | | | | |
| C | | | | | | 6 | 6 | 6 | 6 | | | | | |
| D | | | | | | 4 | 4 | 4 | 4 | | | | | |
| E | | | | | | 4 | 4 | | | | | | | |
| F | | | | | | | | | | 2 | 2 | | | |
| G | | | | | | | | | | | | 2 | 2 | 2 |
| H | | | | | | | | | 1 | 1 | 1 | | | |
| I | | | | | | | | | | | | | | 1 |
| | 2 | 2 | 1 | 1 | 1 | 14 | 14 | 10 | 11 | 3 | 3 | 2 | 2 | 2 | 1 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 2 | 2 | | | | | | | | | | | | |
| B | | | 1 | 1 | 1 | | | | | | | | | |
| C | | | | | | 6 | 6 | 6 | 6 | | | | | |
| D | | | | | | | | | 4 | 4 | 4 | 4 | | |
| E | | | | | | 4 | 4 | | | | | | | |
| F | | | | | | | | | 2 | 2 | | | | |
| G | | | | | | | | | | | 2 | 2 | 2 | |
| H | | | | | | | | 1 | 1 | 1 | | | | |
| I | | | | | | | | | | | | | | 1 |
| | 2 | 2 | 1 | 1 | 1 | 10 | 10 | 7 | 7 | 7 | 6 | 6 | 6 | 2 | 1 |

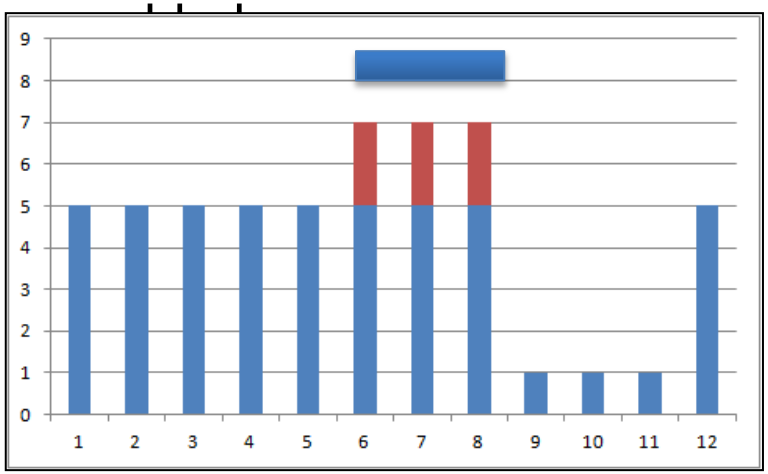


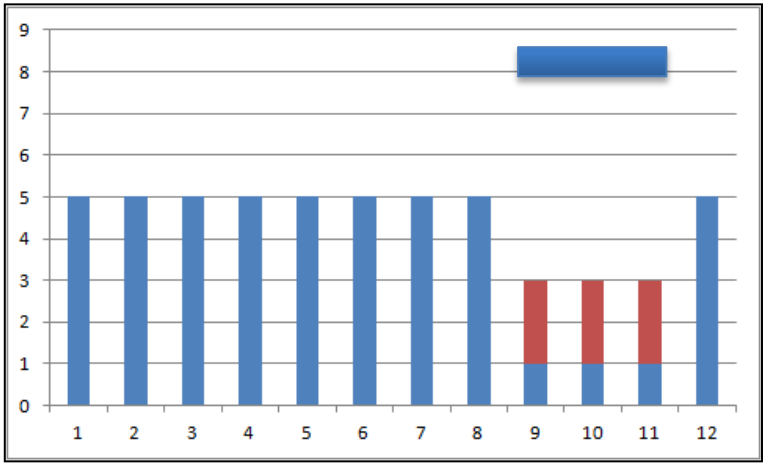



# Improvement Function

Xi Resource Level FROM which m days of resources are removed

Wi Resource Level TO which the m days of resources are




$$M1 = 1/2 * \sum_{1}^{m} Xi\text{^}2 + 1/2 * \sum_{1}^{m} Wi\text{^}2$$

$$M2 = 1/2 * \sum_{1}^{m} (Xi - r)\text{^}2 + 1/2 * \sum_{1}^{m} (Wi + r)\text{^}2$$

M1 =M2

M1 < M2

M1 > M2

# M1 > M2

$$\sum_{1}^{m} Xi\text{^}2 + \sum_{1}^{m} Wi\text{^}2 \;\gg\; \sum_{1}^{m} (Xi - r)\text{^}2 + \sum_{1}^{m} (Wi + r)\text{^}2$$

**Expanding & Collecting Terms (& dividing by -2)**

$$IF_{A,d} = r\left(\sum_{1}^{m} x_i - \sum_{1}^{m} w_i - mr\right)$$

$IF_{Ad}$ = improvement factor for shifting activity A d days out in time

r = daily resource rate for the activity

m = minimum number of days that the activity is shifted or the duration of the activity

$x_i$ = daily resource sum for the current time frame over which resources will be deducted

$w_i$ = daily resource sum for the time frame over which resources will be added

**IF >0 implies reduction in moment due to the shift**
**Magnitude of change is also important to select alternative**