

# *Ch 15 Gross Premium*

**Gross Prem. consists of:**

**1-Net prem (pure single prem) to cover the cost of the risk i.e. the benefits.**

**2-Loading which consists of:**

**1/2-Commission (a % of the prems & will be paid during the prems payment's period or as specified if less).**

**2/2-Administrative expenses (fixed amount & will be incurred during the policy's period, not the prems period).**

# *Ch 15 Gross Premium*

**3/2-Cost of settlement (fixed amount & will be paid at time of death or when the policy is matured).**

**4/2-Premium tax (a % of the prems & will be paid during the prems payment's period or as specified if less).**

**5/2-Profit we will assume that it is included in the expenses).**

**6/2-Contingency loading we will assume that it is included in the expenses.**

## *Ch 15 Gross Premium*

***PV of the gross prems = PV of the net prems  
+ PV of Loading.***

# *Ch 15 Gross Premium*

***Ex 1: A life Ins Co estimates that the following expenses will be needed for a \$100,000 whole life ins policy issued at age 35:***

***a-Agent commission, 55% of the first prem, 10% of the second prem, 5% of the third through the tenth prem, followed by a “service fee” of 2% on all prems collected thereafter.***

***b-Prem taxes 3% of each gross prem.***

***c-Administrative expenses \$150 in the first yr & \$80 in each subsequent yr.***

# *Ch 15 Gross Premium*

*d-Cost of settlement at time of death claim  
\$250.*

*Compute the gross annual prem (rate of  
interest 6%).*

# ✧ *Ch 15 Gross Premium*

$$\begin{aligned}
 G \ddot{a}_{35} &= 100,250(1.06)^{0.5} A_{35} \\
 &+ 0.55G + 0.10G \overline{1/\ddot{a}}_{35:1} \\
 &+ 0.05G \overline{2\ddot{a}}_{35:8} + 0.02G \overline{10\ddot{a}}_{35} \\
 &+ 0.03G \ddot{a}_{35} + 150 + 80 \times \overline{1/\ddot{a}}_{35}
 \end{aligned}$$

# ✧ Ch 15 Gross Premium

$$\begin{aligned}
 G \frac{N_{35}}{D_{35}} = & 100,250 \times 1.029563014 \times \frac{M_{35}}{D_{35}} \\
 & + 0.55 G + 0.10 G \frac{D_{36}}{D_{35}} \\
 & + 0.05 G \frac{N_{37} - N_{45}}{D_{35}} + 0.02 G \frac{N_{45}}{D_{35}} \\
 & + 0.03 G \frac{N_{35}}{D_{35}} + 150 + 80 \times \frac{N_{36}}{D_{35}}
 \end{aligned}$$

# *Ch 15 Gross Premium*

$$\begin{aligned}
 G \frac{691534}{378037} &= 103213.692 \times \frac{8024.77}{37803.7} \\
 &+ 0.55 G + 0.10 G \times \frac{653730.2\_617630.7}{37803.7} \\
 &+ 0.05 G \times \frac{617630.7\_382226.9}{37803.7} \\
 &+ 0.02 G \times \frac{382226.9}{37803.7} + 0.03 G \times \frac{691534}{37803.7} \\
 &+ 150 + 80 \times \frac{653730.2}{37803.7}
 \end{aligned}$$



## *Ch 15 Gross Premium*

$$\begin{aligned} 18.293 G &= 21909.658 + 0.55 G + 0.095492 G \\ &+ 0.31135 G + 0.20221666 G \\ &+ 0.548783 G + 150 \\ &+ 1383.421 (21909.658 + 150 + 1383.421) \\ &= 18.293 G - (0.55 G + 0.095492 G + 0.31135 G \\ &+ 0.20221666 G + 0.548783 G) \\ 23443.079 &= 16.585158 G \end{aligned}$$

$$G = \frac{23443.079}{16.585158} = 1413.497$$

## *Ch 15 Gross Premium*

***Ex 2: A life ins Co estimates that the following expenses will be needed for a \$100,000 thirty year term ins policy issued at age 35:***

***a-Agent commission, 55% of the first premium, 10% of the second prem, 5% of the third through the tenth prem, followed by a “service fee” of 2% on all prems collected thereafter.***

***b-Prem. taxes 3% of each gross prem.***

***c-Administrative expenses \$150 in the first yr & \$80 in each subsequent yr.***

# ✧ Ch 15 Gross Premium

***d-Cost of settlement at time of death claim \$250. Compute the gross annual prem.***

**Solution:**

$$\begin{aligned}
 G \frac{N_{35} - N_{65}}{D_{35}} &= 100,250 \times 1.029563014 \frac{M_{35} - M_{65}}{D_{35}} \\
 &+ 0.55G + 0.10G \times \frac{N_{36} - N_{37}}{D_{35}} + 0.05G \times \frac{N_{37} - N_{45}}{D_{35}} \\
 &+ 0.02G \frac{N_{45} - N_{65}}{D_{35}} + 0.03G \frac{N_{35} - N_{65}}{D_{35}} + 150 + 80 \times \frac{N_{36} - N_{65}}{D_{35}}
 \end{aligned}$$