HW 8.4 (b) Key
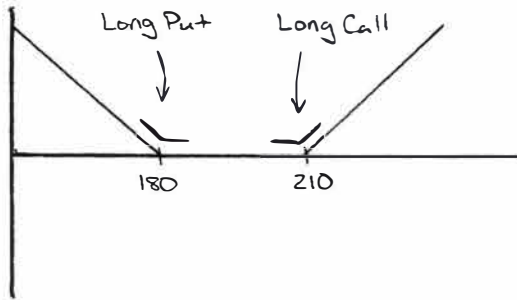
1. The following premiums are for one-year European options for an underlying asset with a current spot price of $190:

Strike Price	Call	Put
170	40.16	8.67
180	34.20	12.03
190	28.90	16.05
200	24.25	20.73
210	20.21	26.01

The continuously compounded risk-free annual rate of interest is 7%.
Find the cost of a 180-210 strangle.   [16 #08]

A) 32.24   B) 8.18   C) 34.58   D) −32.24   E) −8.18

Long Put   Long Call

180   210

$$Cost = 12.03 + 20.21$$
$$= \boxed{32.24}$$

2. The following premiums are for one-year European options for an underlying asset with a current spot price of $140:

Strike Price	Call	Put
120	31.42	5.57
130	25.20	8.86
140	19.92	13.09
150	15.54	18.22
160	11.99	24.19

The continuously compounded risk-free annual rate of interest is 5%.
Find the cost of a butterfly spread constructed from a staddle using at-the-money options and a strangle using options that are out-of-the-money by $10.   [16 #09]

A) −8.61   B) 0.90   C) −9.05   D) 8.61   E) −0.90

Long Put   Short Call + Short Put   Long Call

130   140   150
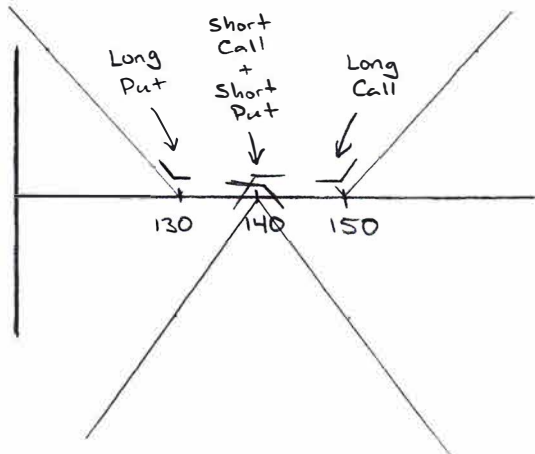
$$Cost = 8.86 - 19.92 - 13.09 + 15.54$$
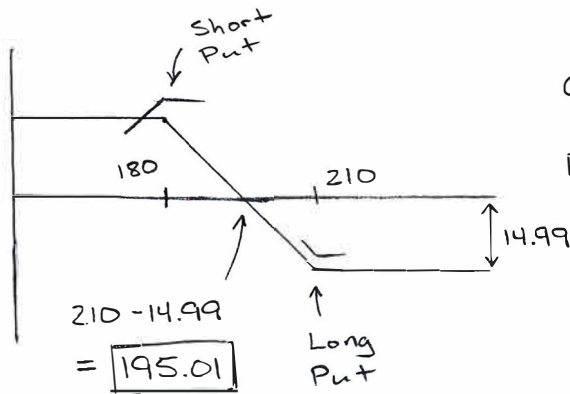$$= \boxed{-8.61}$$

3. The following premiums are for one-year European options for an underlying asset with a current spot price of $190:

Strike Price	Call	Put
170	40.16	8.67
180	34.20	12.03
190	28.90	16.05
200	24.25	20.73
210	20.21	26.01

The continuously compounded risk-free annual rate of interest is 7%.
At a spot price at expiration of X, the profit from a 180-210 bear spread is 0. Find X.   [16-62]

A) 195.00   B) 193.99   C) 196.02   D) 195.00   E) 196.01

Short
Put

180   210

14.99

210 - 14.99
= 195.01

Long
Put

$Cost = 26.01 - 12.03 = 13.98$

$FV(Prem) = 13.98 e^{0.07} = 14.99$

4. The following premiums are for one-year European options for an underlying asset with a current spot price of $150:

Strike Price	Call	Put
130	33.14	6.18
140	26.99	9.50
150	21.71	13.68
160	17.26	18.70
170	13.58	24.48

The continuously compounded risk-free annual rate of interest is 5.5%.
Find the range of spot prices at expiration for which a written straddle using at-the-money options has a profit greater than zero.   [16-63]

A) Between 112.61 and 187.39   D) Less than 112.61 or greater than 187.39
B) Between 141.97 and 158.03   E) Less than 141.97 or greater than 158.03
C) Between 114.61 and 185.39

37.39

150

150 - 37.39   150 + 37.39
= 112.61   = 187.39
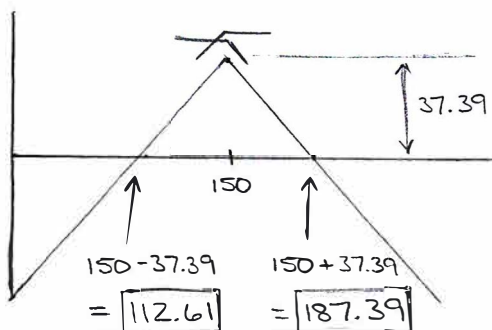
$Cost = 21.71 + 13.68 = 35.39$

$FV(Prem) = 35.39 e^{0.055} = 37.39$

5. The option premiums below are for 3-month European options on Stock A, which is currently priced at $60.

   The continuously compounded rate of interest is 4%.

   Stock A pays no dividends.

Strike Price	Call	Put
57	5.55	1.98
60	3.88	3.28
67	1.42	7.75

   Using 3-month call options with strike prices 57, 60, and 67, Beth constructs an asymmetric butterfly spread using the smallest integer values of options available.

   Let X_i represent the price of Stock A in 3 months that would result in a 0 profit for this strategy.

   Calculate the mean (average) of all such X_i values. [16_A3]

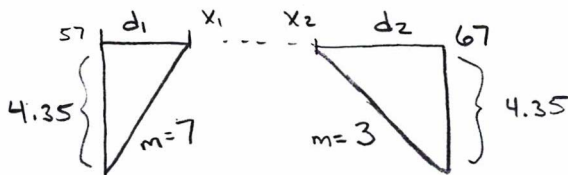   A) 61.59   B) 62.82   C) 64.05   D) 65.28   E) 66.51
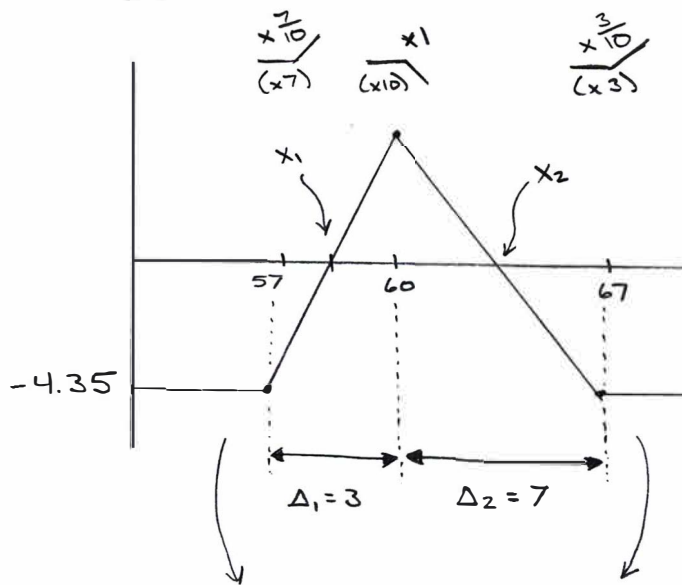
Construct Using:

7 K=57 Long Calls
10 K=60 Short Calls
3 K=67 Long Calls

$$\text{Cost} = 7(5.55) - 10(3.88) + 3(1.42)$$
$$= 4.31$$
$$FV(\text{cost}) = 4.31\, e^{0.01} = 4.35$$

$$\frac{4.35}{d_1} = 7 \qquad \frac{4.35}{d_2} = 3$$

$$d_1 = 0.62 \qquad d_2 = 1.45$$

$$X_1 = 57.62 \qquad X_2 = 65.55$$

$$\tfrac{1}{2}(X_1 + X_2) = \boxed{61.59}$$