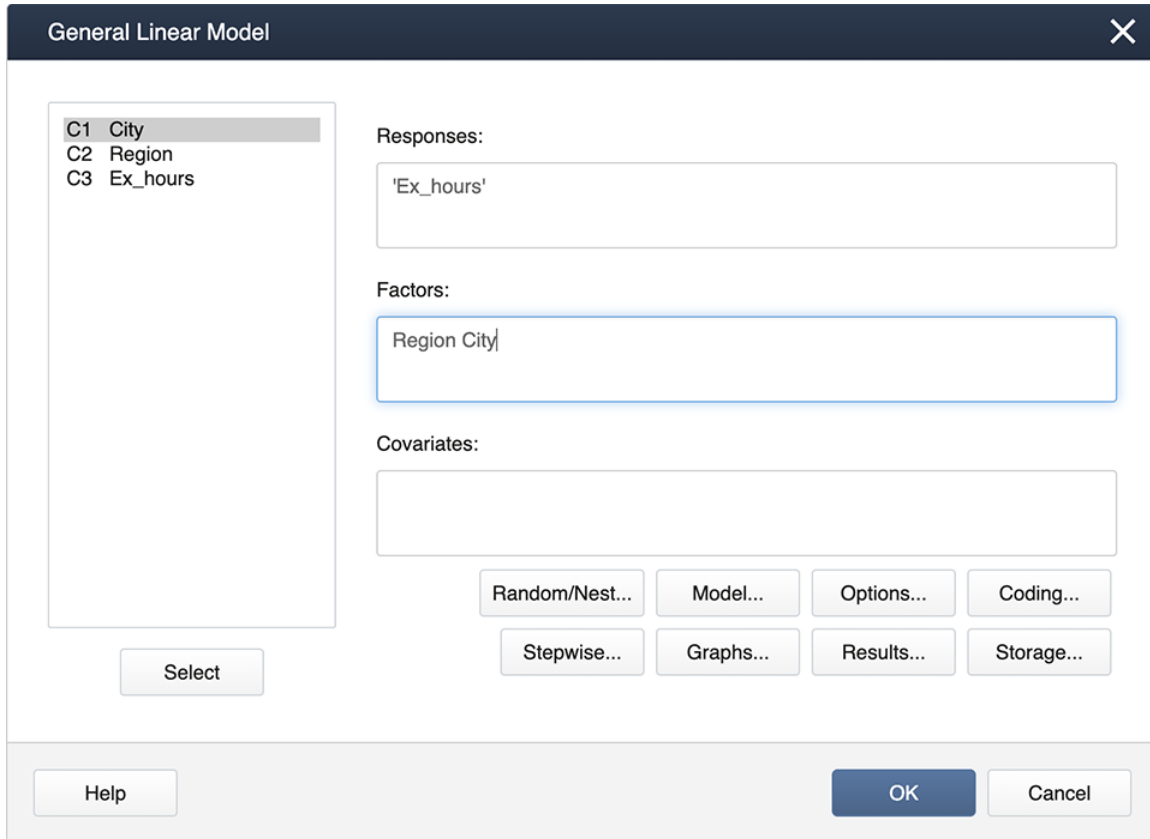


## 5.2.2: Nested Model in Minitab

In Minitab, for the following ([Nested Example Data](#)):

**Stat > ANOVA > General Linear Model > Fit General Linear Model**

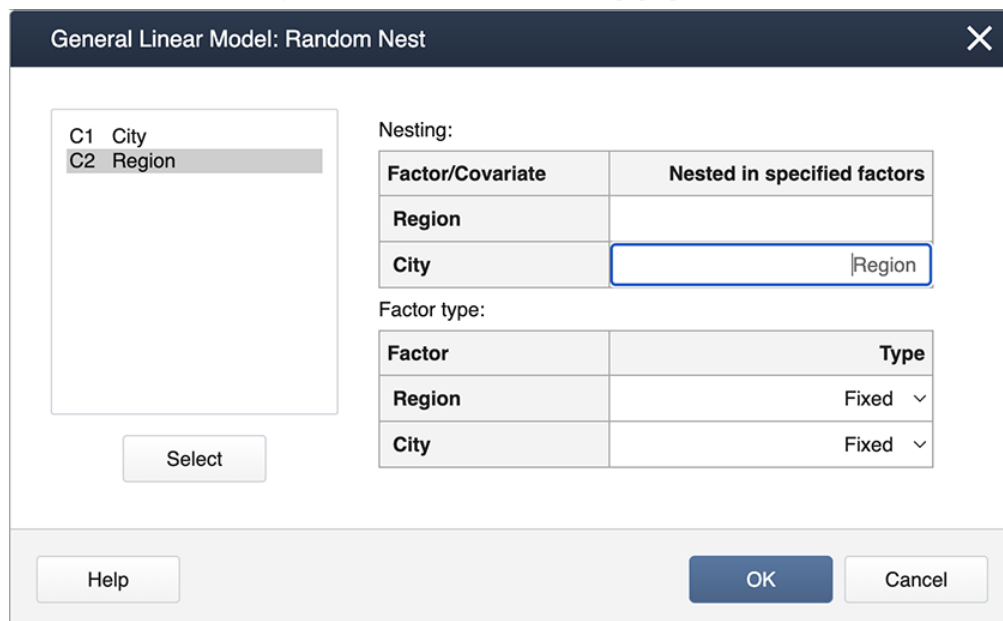
Enter the factors 'Region' and 'City' in the Factors box, then click on **Random/Nest...** Here is where we specify the nested effect of City in Region.



The 'General Linear Model' dialog box shows the following configuration:

- Responses:** 'Ex\_hours'
- Factors:** Region City
- Covariates:** (empty)
- Buttons:** Random/Nest..., Model..., Options..., Coding..., Stepwise..., Graphs..., Results..., Storage...
- Select button:** (bottom left)
- Help, OK, Cancel buttons:** (bottom)

Figure 5.2.2.1: General Linear Model pop-up window.



The 'General Linear Model: Random Nest' dialog box shows the following configuration:

- Nesting:**

Factor/Covariate	Nested in specified factors
Region	
City	Region
- Factor type:**

Factor	Type
Region	Fixed
City	Fixed
- Select button:** (bottom left)
- Help, OK, Cancel buttons:** (bottom)

Figure 5.2.2.2: Random Nest pop-up window.

The output is shown below.

## Factor Information

General Linear Model: response versus School, Instructor

Factor	Type	Levels	Values
Region	Fixed	2	1,2
City(Region)	Fixed	6	Atlanta(1), Chicago(1), SanFran(1), Atlanta(2), Chicago(2), SanFran(2)

## Analysis of Variance

Source	DF	Adj SS	Adj MS	F	P
Region	1	108.00	108.000	15.43	0.008
City(Region)	4	616.00	154.000	22.00	0.001
Error	6	42.00	7.000		
Total	11	766.00			

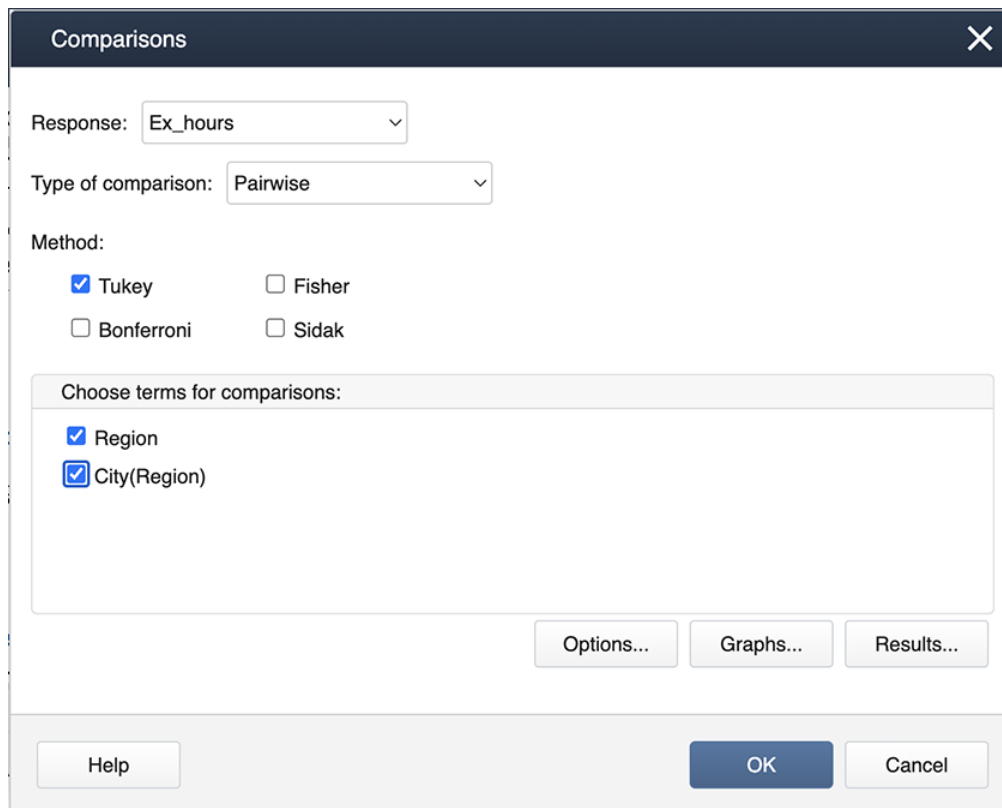
## Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
2.64575	94.52%	89.95%	78.07%

Following the ANOVA run, you can generate the mean comparisons by

**Stat > ANOVA > General Linear Model > Comparisons**

Then specify "Region" and "City(Region)" for the comparisons by checking the boxes.



Comparisons

Response: Ex\_hours

Type of comparison: Pairwise

Method:

☒ Tukey ☐ Fisher

☐ Bonferroni ☐ Sidak

Choose terms for comparisons:

☒ Region

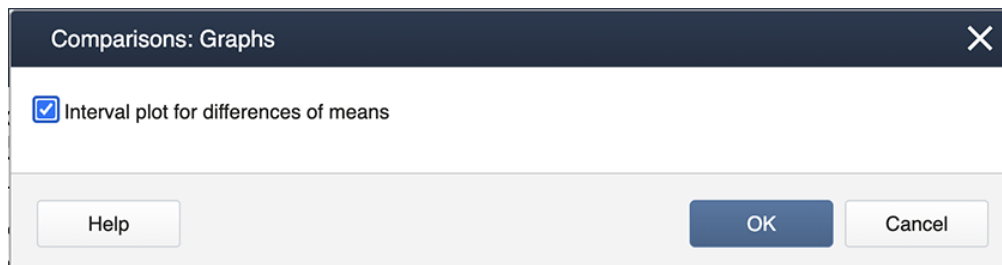
☒ City(Region)

Options... Graphs... Results...

Help OK Cancel

Figure 5.2.2.3: Comparisons pop-up window.

Then choose **Graphs** to get the following dialog box, where "Interval plot for difference of means" should be checked.



Comparisons: Graphs

☒ Interval plot for differences of means

Help OK Cancel

Figure 5.2.2.4: Comparisons: Graphs pop-up window.

The outputs are as follows.

## Comparison for Ex\_hours

### Tukey Pairwise Comparisons: Region

#### Grouping Information Using Tukey Method and 95% Confidence

Region	N	Mean	Grouping
1	6	18	A
2	6	12	B

*Means that do not share a letter are significantly different.*

 Minitab Tukey Simultaneous 95% CIs Differences of Means for Ex\_Hours graph

Figure 5.2.2.5: Tukey simultaneous 95% CIs differences of means graph for Ex\_hours, by Region.

## Tukey Pairwise Comparisons: (City)Region

### Grouping Information Using Tukey Method and 95% Confidence

City(Region)	N	Mean	Grouping			
Atlanta (1)	2	27.0	A			
Chicago(2)	2	20.0	A	B		
SanFran(1)	2	18.5	A	B	C	
Atlanta(2)	2	12.5		B	C	D
Chicago(1)	2	8.5			C	D
SanFran(2)	2	3.5				D

Means that do not share a letter are significantly different.

 Minitab Tukey Simultaneous 95% CIs Differences of Means for Ex\_hours graph

Figure 5.2.2.6: Tukey simultaneous 95% CIs differences of means graph for Ex\_hours, by City(Region).

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