# Ken Hamady's Unofficial Guide to Learning Crystal Reports® v9-v14  Part I:

This set of lessons is designed to teach you the basics of using Crystal Reports.  It is fortunate that the basics have not changed much since version 9 was released in 2002.  This allows me to cover all of the later versions in one book. You will see notes where versions differ.

The lessons are illustrated by examples taken from the sample database that came with earlier versions of Crystal Reports (Xtreme.MDB).  If you are using CR 2008 or any later version this MDB is no longer part of the software download.  If you don't have the Xtreme.MDB you can download if from the following link in my blog:

https://kenhamady.com/cru/archives/113  (downloading and connecting to the sample data)

https://kenhamady.com/cru/archives/3093 (connecting to the sample data from CR 2020)

The approach I recommend for self study is to read a section until you get to the next exercise number.  Then turn to the back and follow the steps for that exercise.  Then read the lesson section a second time.  Repeat the lesson if the topic is not clear.

Before you decide to send me questions, you should read my FAQ page:

https://kenhamady.com/faq.shtml

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# Ken Hamady's Unofficial Guide
# To Learning Crystal Reports®

## Basic terms you should know:

**Report –** A file (.RPT) that holds your report design settings (fields used, sorting, totals, etc.).
**Table –** A computer file made up of rows and columns of information.
**Records –** The rows of a table that hold information about one item.
**Fields** – The columns of a table, each with a defined data type (see page 2).
**Database –** A collection of related tables.
**Data Set** – A virtual table created by the report.  It includes all of the columns (fields) used in the report and the records (rows) that meet your criteria.  It can be drawn from several tables.

## Using the Standard Wizard:

I teach my students to use the Standard Report Wizard (**File ➡ New ➡ Standard Report**) to get the first draft of their reports.  I start all of my own reports this way because:

   1) The wizard walks you through the key settings for a first draft, all of which can be changed.
   2) It automatically spaces and aligns the fields you select on the details band.
   3) It automatically adds the date and page numbers (things you are going to do anyway).

The wizard also provides an overview of Crystal features.  Each of the wizard steps listed here corresponds to a later lesson.  The lessons teach you how to use the full menu-based features.

> **Data** – Select the data source and tables that you will be using for your report.
> **Link -** Draw the links between tables to indicate the proper relationships.
> **Fields** – Select fields for your report and browse their contents if needed.
> **Group –** Organize the report into "chunks" by date, department or any other field.
> **Summary –** Creates subtotals for the groups defined in the previous step.
> **Group Sorting –** Rank the groups based on the highest (or lowest) subtotals.
> **Chart –** Add bar, line or pie charts to your report, based on the subtotals.
> **Record Selection –** Add rules to specify which records should be included in the report.
> **Template –** Select one of Crystal's default template styles to format the report.

## Examining the report in preview:

To stop an actively running report click the red circle with the 'x' on the lower toolbar.
       (In v9/10 you use the small square box on the far right to stop a report.)
Note - You can't stop a report until the database responds with data.
To refresh the data click the opposing arrows icon or go to **Report ➡ Refresh Report Data**.
       (In v9/10 you use the "lightning bolt" icon to refresh a report.)

To page through the report use the "VCR" buttons (  ⏮  ◀  ▶  ⏭  ).
Use the **Group Tree** listing on the far left to jump to any group in the report.
Use the **Design / Preview** folder tabs to switch between design mode and print preview mode.

☞ **Using the Report Gallery to start a new report (See Exercise 1)**

# Working in design mode:

**Sections:**

The white design area that contains the objects is sometimes called the report "Canvas". This area is divided into 7 different sections and each appears at a different frequency:

**Page Header** - once per page, at the top.
**Page Footer** - once per page, at the bottom.
**Report Header** - once per report, above the page header of the first page.
**Report Footer** - once per report, above the page footer of the last page.
**Detail** - once for each record in the data set.
**Group Header** - once per group, just before the first record in the group.
**Group Footer** - once per group, just after the last record in the group.

> ☞ **Create another report (see Exercise 2).**

**Saving, Printing and Exporting:**

Most of the options in the 'File' menu are the same as any other application. Others include:
**File ➡ Save Data with Report** – When checked, this saves the "data set" with the RPT file.
**File ➡ Export** - Creates a spreadsheet, text file or document from your report.
**File ➡ Options** - Global settings that affect the next new report you create.
**File ➡ Report Options** - A subset of the global settings that affect only the current report.

**Using Undo (Edit ➡Undo/Redo):**

Crystal has a powerful undo feature that will allow you to reverse the last change or the last several changes. If you undo more changes than you intended you can also redo one or several changes. To reverse a single change use the bent arrow button. To reverse several changes at once, use the triangle next to the bent arrow to list recent changes. Highlight the list of steps you want to undo or redo.

> ☞ **Using Undo (See Exercise 3).**

**The Field Explorer:**

In the "View" menu you can show/hide several 'Explorer' panes. The one you will use the most is the **Field Explorer** which lists the all of the field objects in the report, organized by the field categories. You can add any listed field to the report by dragging it from the field explorer onto the canvas. If you put a field directly onto the detail band a column heading will be added for you.

**Data types for Fields:**

**Number (Currency, Long Integer, Short Integer, etc)** – Can contain only numbers.
**String (Character, Memo, VarCar, etc)** – Can contain letters, numbers and symbols.
**Date (DateTime, DateTimeString)** – Has the year, month and day. May contain the time.
**Boolean** – Can only contain Yes/No or True/False.

## Adding, moving and changing objects:

| | |
|---|---|
| Insert a data field | Drag the field from the "Field Explorer" (see page 2) to the details. |
| Insert a text object | Use the menu items **Insert ➡ Text Object,** and then click or draw a box where you want the text to appear.  This creates a small word processor box for typing your text.  Click outside the box when you are done typing. |
| Edit a text object | Double-click the text object to reopen the word processor. |
| Delete an object | Select the object and then hit the delete key. |
| Move an object | Select the object in its center and drag it.  The cursor should be a 4-way arrow.   If the object is attached to a guideline, you can move the guideline along the ruler and the object will move (see below). |
| Select multiple objects | Hold the **CTRL** key while you click several objects.  Click an object a second time to deselect it.<br><br>You can also select a group of objects by using the "lasso". Click once anywhere in the background to clear your cursor. Then click beside the first object you want to select.  Hold the mouse button down and drag the cursor box to surround or touch all of the objects. |
| Size objects | Click on any object and you will see at least 4 sizing "handles", one on each of the 4 sides.  A cursor placed over a handle becomes a 2-way arrow.  Drag a handle in, out, up or down to adjust the size. |
| Size a section | Place your cursor over the horizontal "pipe" at the bottom of any section.  Your cursor should become a sizing arrow, pointing up and down.  Drag up or down to adjust the size of that section. |
| Move a Guideline | Drag one of the tabs along the ruler to move a row or column of objects.  Keep the tab on the ruler while you drag it, then release. |
| Add a Guideline | Click once on either ruler to create a new guideline at that point. |
| Remove a Guideline | Drag the tab for a guideline off of the ruler and then release it. |
| Attach to a Guideline | Drag a field so that one of its 4 edges is very close to a guideline.  The field's edge will "snap" to the guideline, and 2 very small red indicators will appear.  Once attached to a guideline, an object will move when the guideline is moved. |
| Change the Template | Use the menu options **Report ➡Template Expert** to apply a different style template to an existing report. |

☞ **Insert, Delete and Arrange Objects (see Exercise 4).**

## Understanding Areas and Sections:

**Controlling the visibility of Sections:**

The 7 sections discussed at the top of page 2 can be turned on and off in 2 different ways:

**Hiding** - Allows drill-down, which lets you view the details of one group on demand.

**Suppressing** – Prevents a section from appearing during drilling down.

"Hide" and "Suppress" are properties of each section. You can change these properties in the section expert **(Report ➡ Section Expert)** or by right-clicking on the section name.

**Creating a Summary Report that allows for Drill Down:**

For example, you can create a summary report by either hiding or suppressing the Details section. Usually you will also hide or suppress the Group Header immediately above the Details. If you "hide" these 2 sections, they can be shown on demand by using drill-down. If you "suppress" them, they will not appear in drill-down mode. To drill-down, you preview the report and place your cursor over a subtotal. The cursor will turn into a magnifying glass. If you double-click on the subtotal, Crystal will open up a new tab to display the details for that group. The tab name will indicate the name of the group. You can close these extra tabs in v9/10 by clicking the small red 'x' on the right, next to the VCR panel. In v11 the 'x' is gray and it is on the drill-down tab, itself. The 'x' on the right in v11 is the stop button.

When you hide details you may still see column headings for the hidden fields. These can be moved down into the hidden Group Header. Then they will only appear on drill-down.

**How fields behave when placed in headers and footers:**

Database fields are usually placed in the Details section and therefore show a value for every record. When you create a summary report all of the details are hidden. However, you may still want to show some useful detail values in the group footer of the summary report. For instance you may want to show the date of the last order or the amount of the highest order along with the subtotals. If you place a database field on your Group Footer, it will display the value from the last record of that group. Fields in the Group Header will display a value from the first record. By changing how the hidden details are sorted (described in the next lesson), you can control which records are first or last and therefore which values appear on the headers and footers. Other header and footer sections behave in the same way. For instance, a field placed in the Report Footer will display the value from the last record in the entire report.

☞ **Drilling Down (See Exercise 5).**

**Other Section Properties in the Section Expert (on the "paging" tab in v12-v14):**

**New Page Before** - Inserts a page break before any section (usually group header).

**New Page After** - Inserts a page break after any section (usually group footer).

**Reset Page Number After** - Next page will be reset to page 1 (usually group footer).

☞ **Adding Page Breaks (See Exercise 6).**

## Organizing the report, Sorting and Grouping:

There are two ways to put the records of your report in order:  **Sorting** and **Grouping.**

Say you wanted to alphabetize a list of cities.  Sorting the records by city would put them in alphabetical order in one continuous list.  Grouping the records by city would put the records in the same order, but there would be a gap in the report between the records of one city and the records of the next.  These gaps are the Group Header and the Group Footer, which cause each city to have its own block of records.  You need a group, if you need subtotals in your report.  Also, most page breaks use a Group Footer and so require adding a group.

It is very common to use both sorting and grouping in the same report.  When you do, the groups always take priority over sorts.  So the groups could be called the 'primary' sorts.

**Sorting Records (Report ➡ Record Sort Expert):**

You add a sort by selecting **Report ➡ Record Sort Expert** and selecting any field in the left pane.  You click the top arrow to move this field to the right pane.  To remove a sort you highlight a field in the right pane and click the bottom arrow.  Each field in the sort list can be set to sort ascending or descending, using the indicator at the bottom of the window.

Groups are also listed at the top of the sort window as a reminder that they are the 'primary' sort fields.   They can't be deleted or changed here, but are managed in the Group Expert discussed below.

> ☞ **Changing Sorts (See Exercise 7).**

**Grouping Records (Report ➡ Group Expert):**

Adding a group will put the records in the same order as adding a sort, but a Group comes with three automatic features not provided by a Sort.  These are the Group Header, the Group Footer and the Group Name field.  Adding a group allows you to also add subtotals and page breaks for each group.

You add a group by selecting the menu options **Report ➡Group Expert** and selecting a field in the left pane.  You click the top arrow to move this field to the right pane.  To remove a sort you highlight a field in the right pane and click the bottom arrow.  Each field in the group list can be set to ascending or descending by using the 'options' button at the bottom of the expert window.  This options button also allows you to change the field used for an existing group level and several other group properties.

> ☞ **Working with Groups (See Exercise 8).**

**The Group Name field:**

The "Group Name" field is a label that prints for each group, showing that groups' current value. It is usually added automatically to the Group Header or Footer. You can also add the Group Name manually by dragging it onto the report from the Field Explorer. When you use the options button to change an existing group from one field to another, the group name automatically updates to display values of the new field. The group names are also what you see listed in the group tree on the left of the preview screen.

**Ranking Groups based on their subtotals (Report ➡ Group Sort Expert):**

The Group Sort Expert allows you to put your groups into a ranked order, based on the values of each group's subtotal. The groups can be ranked in either ascending or descending order. You can also specify the number of groups that should display. This can be set based on a specific number of groups (like the Top10 Customers based on sales) or based on a percentage of the grand total (Customers that account for 80% of sales).

The following are your options:
**For this Group Sort:**
   **No Sort** – Shuts off the Group Sort and reverts to the order setting in the Group Expert.
   **All** – Rank and display all of the groups based on one or more subtotals.
   **Top N** – Rank groups in descending order, showing only the highest "N" groups
   **Bottom N** - Rank groups in ascending order, showing only the lowest "N" groups
   **Top Percentage** – Display groups in descending order until reaching "N" percentage.
   **Bottom Percentage** - Display groups in ascending order until reaching "N" percentage.

**Based on:** Select the subtotal(s) that are used to rank the groups.
**Where N/Percentage is:** Set the number of groups, or the cumulative percentage, to display.
**Include Others:** Display the leftover groups in one combined group called "Others".
**Include Ties:** Extend beyond "N" as long as the "Nth" group is tied with subsequent group(s).

**Note** – The grand total of your report reflects all of the records being used to determine the TopN, not just those that display. So be aware that when you don't display 'others', they are still included in the grand total. One solution is to use a running total, mentioned later in the lesson on Group Selection.

     ☞ **Using the TopN feature (See Exercise 9).**

**Basic Group Charts or Graphs (Insert ➡ Chart):**

Crystal Reports allows you to take a series of subtotals and create a chart.  The chart can be a line, a series of bars or a pie.  These charts can be placed in the Report Header or Footer or in any of the Group Headers or Footers.  A chart placed in the Report Header or Footer will print once and will reflect all of the subtotals in the report.  A chart in a Group Header or Footer will print once per group, and will reflect all of the subtotals within that group.

**Adding a Chart object to the Report:**

**Versions 11 - 14:**  In these most recent versions of Crystal Reports you must place the chart frame onto the report as soon as you select the chart icon or click **Insert ➡ Chart** (before you have specified your options).  So before you start it is a good idea to identify the section that will hold the chart and expand the section so that it is three inches deep (the size of the default chart frame).  Otherwise you must place the top edge of the chart frame within the target section so that Crystal can expand the section for you.

Once you have the chart frame on the report you can right-click in an empty area of the frame and select the Chart Expert.  You put in your selected options as described below.

**Versions 9 and 10:**  In these versions when you select the chart icon or click **Insert ➡ Chart** you are taken directly into the Chart Expert, before the frame is placed on the report.  You put in your selected options as described below.  The chart is placed onto the report for you automatically when you leave the expert.  You can choose to have the chart placed in either the Group Header or in the Report Header.  Once you leave the Chart Expert you can move the chart to any of the four appropriate sections.  To get back to the Chart Expert you right-click in an empty area of the frame and select the Chart Expert.

**Chart Expert Tabs:**

> **Type** – Select Bar, Pie, Line, etc.
> **Data** – **Layout** – Tie the chart to group values, cross-tab values or nothing (advanced).
> > **On Change Of** - specify which group level the slices or bars will represent.
> > **Show** - selects the subtotal to use when measuring the bars/slices.
> **Axes** – Override the default ranges and scales of the chart.
> **Options** – Turn specific features on and off such as the legend, labels and values.
> **Color Highlight** – Associate specific colors with specific Groups.
> **Text** – Override and format the automatically-generated headings and titles.

For more advanced changes you can right-click on the chart and select **Chart Options.**

    ☞ **Inserting a Pie Chart (See Exercise 10).**

## Summary Fields:

A Summary field takes a column in the report and applies a summary function, like Sum, to that column.  Functions can be applied to an entire column (a grand total) or can be applied to each group within the column (a subtotal).

There are 4 steps to create a summary field:

1)  Select the menu items **Insert ➡ Summary** to open the summary window.
      (Or use the Sigma on the "Insert" tool bar)

2)  Select the field (column) that you want to summarize at the top.

3)  Specify the summary function you want to use.  The most common are:
      **Sum** – only works with numbers, adds up the numeric values and gives a total.
      **Count** – counts every value in the column, even if it is a duplicate.
      **Distinct Count** – same as count, but doesn't include duplicate values.
      **Average** – the sum divided by the count (ignores null values but count's zeros).
      **Maximum** - find the highest value in the column or group.
      **Minimum** – find the lowest value in the column or group.

4)  Specify the location of the new total by selecting either a Grand Total or one of the existing groups in the report. Grand totals will appear on the Report Footer.  If you select a group the subtotal will appear on the Group Footer.  If you want to add a subtotal for a group that doesn't exist, you can use the "Insert Group" button to add a new group on the fly.  This group will be added after any existing groups in the hierarchy.

**Changing the Summary Field:**

If you need to change an existing summary field you can click on the summary field and use the menu options **Edit ➡ Summary**.  Or, you can right-click on the summary field, and select **Edit Summary**.  Both reopen the summary properties window where you can change either the summary function or the field to be summarized.

If you want to change the location of the summary field, you can simply drag it from one section to another.  Summary fields are relative to where they are placed.  A summary field placed in a Report Header/Footer will calculate that summary for the entire report.  A summary field placed in a Group Header/Footer will calculate that summary for each group.

☞ **Inserting Grand Totals, Subtotals and Summaries (See Exercise 11)**

**Note** – In versions 9/10 of Crystal (using the default settings), a numeric or currency value that is two wide for the column will be "clipped".  This means the extra digits will be truncated with no warning.  In some cases you may not notice that the number has been clipped.  You can turn off "field clipping" for all new reports by using the following menu options:
      **File ➡ Options ➡ Fields (Tab) ➡ Number/Currency (Buttons) ➡Customize (Button)**

## Using Cross-Tab Objects (Insert ➡ Cross-Tab):

A Cross-Tab is a summary table that can analyze your data using two fields. An example would be "sales by state by month" with a row for each state and a column for each month. The cross-tab would fill in each cell of the table with a subtotal of sales for that state and that month. Each row and column would have a total, with a grand total in one corner. You can use any two fields for the analysis, as long as they are in one of the tables used by the report. These fields don't have to be used anywhere else in the report.

## Where to put a Cross-tab:

First select a section to contain the cross-tab, based on how often the cross-tab should appear. Expand the section to roughly one inch to accommodate the cross-tab. Your choices are:

**Report Header/Footer** - print once per report, and summarizes all of the records in the report.
**Group Header/Footer** - print for each group, and summarizes all of the records in each group.

## Adding the Cross-tab Object:

Then use the menu options **Insert ➡ Cross-Tab** to start the process. In v11-v14 you first place the Cross-Tab into a report section. Then you right-click in the upper left corner (the empty notch) to open the Cross-Tab Expert.

In v9/v10 selecting **Insert ➡ Cross-Tab** takes you directly into the Cross-tab Expert. Once you have selected your options (see below) you place the cross-tab object into the appropriate section.

## Using the Cross-Tab Expert:

Take the field that you want to summarize (sum, count, average, etc.) and drag it into the "Summarize Fields" box. If the field is numeric, the cross-tab will sum by default. Any other field will be counted by default. You can change the summary function by highlighting the total and using the "Change Summary" button.

Take the fields that you want as row and column headings and drag them into the other two boxes. Crystal will create one row in the cross-tab for each value of the row field. Crystal will create one column in the cross-tab for each value of the column field. Click "OK" to close the Cross-Tab Expert.

If you want to reopen the cross-tab expert and make changes you right-click in the upper left (handle) corner of the Cross-Tab. Clicking in any other cell will select only that cell. You also use the handle corner to move a cross-tab.

## Other Points:

You can change the size of any cross-tab column by clicking any cell in that column and using the sizing handles on either side. Changing the size of one group column changes ALL groups.

Report sections will expand during preview as the cross-tab expands. But as the cross-tab grows it will overlap any objects placed below it in same section. If this happens you can split the section below the cross-tab, using the method described on page 24.

☞ **Inserting a Basic Cross-Tab (See Exercise 12)**

## Finding the data you want:

**Using the Select Expert (Report ➡ Select Expert [ ➡ Record in v12-v14 ] ):**
The Select Expert is how you specify which records to include in your report.  You use it to add criteria "tabs" or rules.  Records that meet all of these rules are included in the report.

**Adding a rule -** When you open the Select Expert it will display any existing rules, or (if no rules exist) a list of available fields.  You would select a field from this list to add the first rule.  If there are existing rules you click "NEW" to get the field list, and then select a field for the new rule.  Once you select a field you click "OK".  This creates a tab for that field's rule.

**Comparison types:**
**is equal to** – an exact match of a single value
**is one of** – an exact match of any one of a list of values
**is less/greater than** - works with any data type, based on the sort order of that data type
**is between** – includes the 2 target values and any value that would sort between them
**startswith** – includes any value whose starting characters exactly match the target value
**is like** – allows the use of wild card characters, particularly the asterisk
**is in the period** – only available for dates, see page 17
      (Each comparison has both an "is" and an "is not" option)

**Entering target value:**
Single values - If you click the little triangle at the right end of this box, Crystal will generate a sample of values from your database.  Or, you can simply type a value into the box.  If you type your own value note that some database connections are case sensitive, but most are not.

**Multiple values** – Some comparisons ("is one of", "startswith" and "like") allow you to enter a list of multiple values for the comparison.  If you use the drop down samples to select a value it will be added to the list automatically.  If you type a value you must click "Add" to include it in the list.  Click "Remove" to remove an unwanted value from the list.

**Changing and Deleting Rules:**
You change a rule by reopening the select expert and clicking on the tab for that rule.   You can change either the comparison type or the value, or both.  To change the field you have to delete the tab and create a new tab.

You delete a rule by clicking on the tab for that rule and clicking the "Delete" button on the right.  Do not confuse the New/Delete buttons on the right with the Add/Remove buttons used to manage a list of comparison values.

Anytime you change the rules and preview the report, Crystal will ask you if you want to "refresh" or "use saved data".   When you use saved data, Crystal will look through the data set currently in memory and select records that meet the new criteria.   If you refresh the data, Crystal will take your new criteria back to the database and look through the raw data.

      ☞ **Record Selection (See Exercise 13)**

# Reports with multiple tables, creating links:

**Overview:**

Imagine one table with 5 fields (columns) and a second table with 4 fields. If you linked these tables together, Crystal would create one wider table from them. We call this your data set. Each record (or row) in the data set would have 9 fields - 5 from Table A and 4 from Table B. So, how does Crystal know which records from table A to combine with which records from table B? The key is in the link that you draw between the tables. The link line goes from one field to another, and these two fields become the 'linking' fields. Whenever the value of table A's link field matches a value in table B's link field, then those two source records are combined into the wider record of your data set.

**Linking in the Database Expert (Database ➡ Database Expert ➡ Link Tab):**

Any time you have two tables in a report, Crystal will automatically attempt to link them for you. Unfortunately, this "Auto-Link" feature is not usually accurate. If the link is not correct, you can clear all of the links using the 'Clear Links' button and draw your own link lines. Or you can delete a single link line by click on that line and clicking the 'Delete Link' button.

To draw your own link lines, drag one linking field onto the corresponding field in the other table. When the target field is highlighted release the mouse button. The link line will appear.

**Linking and "Table Inflation":**

Two tables being linked will almost always have a "One-to-Many" relationship. This means that the linking field in one table will find several matching values in the other table (i.e. several Orders for a single Customer). When these tables are linked, the record taken from the "one" table will link to ALL of the matching records in the "many" table. This record ends up repeating for each matching record it find, so that a Customer name will print next to each of his orders. Even numeric fields will repeat if they come from the 'one' end of the relationship. I call this "Table Inflation" because any sum that you do based on these fields will be inflated by the repeated values. The "many" table does not repeat its records so totals from that table are not inflated. Only sums on fields from the 'one' end of the relationship are inflated.

**Join Types:**

Crystal will join tables using an "Inner Join" by default. This means that only records that find a match in the other table are included. If you want to include records that don't have a match in one of the tables, like Customer without Orders, you can use one of the "Outer Join" options. Highlight a single link arrow in the visual linking window and click the "Link Options" button on the right. You will see the options "Equal", "Left Outer" and "Right Outer". A "Left Outer Join" keeps records from the "Left" table, even when they don't have a match in the table on the "Right". A "Right Outer Join" keeps records from the "Right" table, even if they don't have a match on the Left. A "Full Outer Join" (only available in certain databases) means that unmatched records on both sides will be kept.

**Note** – with an outer join, the link arrow points from the "Left" table to the "Right" table.

> ☞ **Creating, deleting and changing links (See Exercise 14)**

**Adding and Removing Tables (Database ➡ Database Expert):**

You can add and remove tables from the report at any time using the Database Expert. When you open this window you will see the all of the available tables on the left, and the tables being used on the right. You add a table by highlighting it in the left pane and clicking the top arrow button. It will move to the right. You remove a table by highlighting it on the right and clicking the third arrow button, moving it out of the right pane. You can remove all of the tables at once using the bottom button.

If you want to give a table a more workable name (just for this report) you can change its "alias". The alias is the name used by the report when referring to a table. By default the alias is the original name of the table in the database. However, you can click on any table in the right pane and give it an alias. If a single click on the name doesn't put the name into "edit" mode, you can also use the F2 function key to put the name into "edit" mode. Click outside the "edit" box once you have changed the alias.

☞ **Adding and Removing Tables Manually (See Exercise 15)**

**Recognizing Changes in the Tables (Database ➡ Verify Database):**

When you first add a table to a report, Crystal takes a snapshot of the fields in that table. If you later add or change fields in the table, an existing report may not recognize those changes. You can force a report to update its snapshot of the tables by using the menu commands: **Database ➡ Verify Database.** Crystal will check each of the tables used by the report and compare the current structure to its snapshot structure. If it finds changes it will update the report. If a field used by the report has been removed from the table, renamed or changed Crystal will ask you to map that field to the appropriate new field.

**Changing a Report's Source Table (Database ➡ Set DataSource Location):**

If you create your report using a test database, and then you want to change the report to use a production database, you will need to use the menu items: **Database ➡ Set DataSource Location**. This will open a window with an upper and lower pane.

You can "re-point" the entire database or an individual table. Select the database or table to change in the upper window, and then highlight the replacement in the lower pane. Click the "Update" button when you are done. In the upper pane you can confirm the change by checking the properties of a table or of the entire database.

If you change the data source for the entire database, Crystal will replace each table with a table of the same name in the new database. If Crystal doesn't find all of the tables in the new database, you will get a message asking you to locate the tables individually. This would happen if the table is missing from the new database or if the table name is not identical. If the fields are different in the new table, Crystal will ask you to map the fields used by the report. This feature is the same as the mapping window used when "Verifying" the database.

☞ **Verifying or Setting the Location of a table (See Exercise 16)**

## Using Formula Fields to create new data:

When you add a formula in Crystal, you are adding a new column to a report's data set. This new column will usually derive its value from existing fields (columns) in the data set, like "Unit Price * Quantity". The new column can then be used like any other column.

To start a new formula open the "Field Explorer" using the menu commands **View ➡ Field Explorer**. Right-click "Formula Fields" in the tree and select "New". Enter a name for the formula and click "OK" ("Use Editor" in v9/v10). You will open the Formula Editor within the "Formula Workshop". The large empty window is where your formula is built. Above it are three small panes containing the building blocks. These allow you to insert the following object into your formula:

**Fields** – The box on the left allows you to select any database, formula or summary field to be part of your formula. You double-click a field and it appears in the formula. Field names will have curly braces on either end. The source table name will be the first part of the field.

**Operators** – The box on the right contains the math symbols and other operators that are used to link arguments together. The basic arithmetic operators are:
- **+ (plus)** Addition, used with numbers, dates and to connect strings.
- **- (dash)** Subtraction, can be used with numbers and dates.
- **\* (asterisk)** Multiplication, can be used only with numbers.
- **/ (forward slash)** Division, can be used only with numbers.

**Functions** – The middle pane has special words that make changes to formula values. Most functions are used with parentheses, which hold the data values for the function. The function list shows these parentheses with some hints to help you determine the correct values to enter for each function. Only a few functions, like CurrentDate, do not need any data values.

**Literal values** – You may need to enter a specific number, string or date into a formula. For instance to calculate a 6% sales tax I would need to enter the number **.06** into the formula. This would be a literal value. The syntax used depends on the data type of the literal value:

Numbers are entered without any special characters.
String values must be in quotes (single or double - as long as they match) like **"Mr."**
Date values are entered as either: **Date (2008, 12, 31)** or **#12/31/2008#**

**Managing formula fields in the Formula Workshop:**

Once you have written a formula you save it by clicking the "Save" button on the toolbar. To modify another formula while in the formula workshop you highlight that formula in the field tree along the left side of the Workshop window, and that formula will appear in the window. You can also right-click any field in the list and either delete that field or rename it. When you are done you can click the "Close" button to close the Formula Workshop.

Once you have left the Formula Workshop you can see all of your existing formulas in the Field Explorer. You can modify any formula by right-clicking on that formula and selecting "Edit". If a formula is visible on the report you can right-click on the object and select "Edit".

## Character Operators:

### Concatenate:

This means to create a column by combining two or more text values into one.  You place a "&"
or a "+" sign between the text values to combine them.  The following formula would print
names that looked like "Hamady, Ken":

```
{Customer.Last Name} & ", " & {Customer.First Name}
```

### Subscript:

This means to create a column that extracts specific character positions from the middle of a text
field.  You enter a field and then specify the starting and ending position numbers with the word
"to" between them.  The numbers go inside square brackets.   Assume that the character field
{Cus.Address} has the 9-character string **"Suite 103"** in the first record of the table.  You could
write the following two formulas:

| | | |
|---|---|---|
| `{Cus.Address}` | `[7 to 9]` | would print the characters **"103"** |
| `{Cus.Address}` | `[4]` | would print the letter **"t"** |

### Math Functions:

The **Round ()** function behaves just like the spreadsheet function.  By default it will round to
zero decimals but you can round to any number of decimal places by putting the number after the
field, separated by a comma.  Rounding to 2 decimal places would look like this:

```
Round ( {Order.Amount}, 2 )
```

**Note** - When you use the tool bar to reduce the decimal places on a number, that number will
appear to round up or down appropriately.  But this rounding is just visual.  It does not change
the field's underlying value.  Any formula or total that uses this field will still use the unseen
decimal places.  You can use the Round() function in a formula to create a true rounded
equivalent of this field.

☞ **Adding Basic Formulas (See Exercise 17)**

## Character Functions:

These functions allow you to modify character strings.

**Right()** - Copies a specific number of characters from the right end of a text string. (There are also **Left()** and **Mid()** but these are often done with subscripts.)

`Right( {Cus.CityState}, 2)` would extract "PA" from "Langhorne, PA"

**Val()** – Changes a character field containing a numeric value into a true numeric value.

`Val ({table.code})` would convert "1234" into 1,234.00 as a numeric.

**ToText()** - Changes numeric fields into numeric text. This is necessary to concatenate a number with a text field. The three most common arguments used with ToText() are:

**ToText ( {FieldName} , Number of Decimals , Thousands Separator String)**

The default on most PCs is usually set to 2 decimals with a comma, so for example:

`ToText({FieldName})`          would look like       123,456.00
`ToText({FieldName}, 0 , "")` would look like       123456

☞ **String Functions (See Exercise 18)**

## Date Math and Date Functions:

Crystal can add and subtract dates. For instance you can use "{date} + 30" and get a date that is 30 days after each value in the {date} column. Use "{date} - 30" and you get a date 30 days before. If you subtract one date value from another date value you will get the number of days between the two dates. There are also several date functions:

**Year()** – Gives a 4 digit number based on the year of a date field.
**Month()** - Gives a 2 digit number based on the month of a date field.
**Day()** - Gives a 2 digit number based on the day of a date field.
**DayOfWeek()** – Gives a 1 digit number based on the day of the week (1 = Sunday).
**Date()** – Converts a DateTime value into a Date (ignoring the time).

**CurrentDate** – Returns today's date, which can be used as part of the formula.
**MonthName()** – Converts a number into the name of a month (4 into April)
**WeekDayName()** – Converts a number into a Day of the Week (4 into Wednesday)
**DateAdd()** – Adds weeks, months, or years to a date field.
   `DateAdd("m", 3, {startdate})`              - adds 3 months to the date.
**DateDiff()** – Calculates the difference between two dates in weeks, months, or years.
   `DateDiff("w", {startdate}, {enddate})`      - weeks between two dates.
   `DateDiff("yyyy", {startdate}, {enddate})` - years between two dates.

☞ **Date Math and Date Functions (See Exercise 19)**

## Boolean (True/False) Expressions:

**True / False (Boolean) values:**

Many formula expressions result in a True or False value. These are called "Boolean" expressions in Crystal. Any time you use comparison symbols in a formula, like "greater than", "less than", or "equal to", you will get a Boolean expression. There are two primary uses of Booleans in Crystal: in an If-Then-Else statement and in the Selection Formula.

**If-Then-Else Statements:**

These allow you to use a Boolean expression to choose between two values to print on a report. For example, you could create a formula field called {@Salutation}, which will print either "Ms." or "Mr." based on the person's gender. The formula would contain a Boolean statement to decide which string to print. In this example, the field will print "Mr." when the Boolean is True and "Ms." when the Boolean is False.

```
If   {Student.Gender} = "M"
Then  "Mr. "
Else  "Ms. "
```

You need all three parts of the formula, and each must start with the appropriate word. The capital letters, spacing and separate lines make it easier to read, but are mostly ignored by Crystal.

The first phrase starts with **"If"** and must contain a Boolean expression.
The second phrase starts with **"Then"** and contains the value to print if the Boolean is True. The third phrase starts with **"Else"** and is the value to print if the Boolean is False.

The second and third statements must use values that are the same data type (i.e. if one is number, the other must also be a number).

☞ **Formulas that use If-Then-Else logic (See Exercise 20)**

## Using "IN" to check for one string within another:

Another operator that generates a Boolean value is the word "in". To determine if one text string contains another you can use the operator "in" between the two strings. The result of the following formula would be either "True" or "False" depending on whether or not the Customer name had the word "Bike" in it.

```
"Bike" in {Customer.Customer Name}
```

☞ **Finding one string in another (See Exercise 21).**

## Using "IN" with Date Range Functions (MonthToDate, YearToDate, etc.):

If you use the select expert with a date field, you can use the comparison "is in the period" to select records that fall into one of about 25 predefined date ranges. This will find all records in the selected range. Crystal calculates the date range assuming that today is the computer system date. If you want to use a different date (an "as of" date), use the menu commands **Report ➤ Set Print Date** to override this date with the date you want to use. Keep in mind that this also affects the print date field, which usually prints in the page header.

You can also use these date range functions in formulas to create Boolean values, like:

```
{Orders.OrderDate} in MonthToDate
```

This expression will be True if the date is in the period "MonthToDate" and False if it is not. Because this is a valid Boolean expression, it can be used in an If-Then-Else formula, to check for dates within a defined period. You can use the equal sign instead of "in" if you prefer.

☞ **Date Range Functions (See Exercise 22)**

## Writing your own Selection Formula:

Whenever you use the "Select Expert", Crystal takes your rules and writes a Boolean expression based on the Select Expert rules. This expression is then used as a test for each record in the database. The records that test "True" qualify to get into the report's data set. Those that test "False" are ignored.

If you are in the select expert, you can hit the "show formula" and "hide formula" buttons to control if this formula is visible. This is the expression that Crystal is using for selecting the records. This formula may have many parts, but it is always a Boolean test that is applied to each record. Sometimes you need to use a formula that the Select Expert can't write. For instance, the expert can only connect multiple rules with "AND". If you need to connect two rules with an "OR", you must edit the formula and change the "AND" to an "OR".

You also need to edit this formula if a selection rule needs to compare one field to another. For instance, locating all customers that have a {Balance} that is greater than their {Credit Limit}. For a formula like this one you will probably find it easier to write the selection formula using the Formula Workshop rather than the Select Expert. You can get there several ways, but the easiest is to use the menu options **Report ➤ Selection Formula ➤ Record**. The Record Selection Formula is the most common one to work with. We will discuss the Group Selection Formula on page 22.

The Record Selection Formula follows all of the same rules as a formula field, with the additional restriction that it must always be a Boolean expression. In some cases, when you make changes to the selection formula, the Select Expert may no longer be able to interpret them. When this occurs, the Select Expert will show a message about a "composite expression". The formula is still valid, but any additional changes must also be made through the formula editor.

☞ **Using OR in a selection formula (See Exercise 23)**

## Using "IN" to check for "Between" or "One Of":

You could use the Select Expert to add rules that say things like this:

> A) Zip Code -- is between -- 00001 and 50000
> B) State -- Is One Of -- `PA, NJ, OH, DE`

In both cases Crystal will write a Boolean expression in the selection formula. And, in both formulas you will see the word IN. These patterns can be copied when you write If-Then-Else statements. In the examples on this page, you can also use the equal sign instead of "IN".

### Finding Values that are "Between":

If you wrote rule "A" in the Select Expert, you would use the "is between" comparison. If you opened the selection formula you would see that the "is between" comparison generates an expression using "in" and "to". It would look something like:

```
{Customer.Zip} in "00001" to "50000"
```

Because this pattern is a valid Boolean expression, it can also be used in an If-Then-Else statement in a formula field:

```
If {Customer.Zip} in "00001" to "50000"
Then "East"
Else "West"
```

> ☞ **Checking a value against a range of values (See Exercise 24).**

### Finding Values that are "One Of":

If you wrote rule "B" in the Select Expert, you would use the "Is One Of" comparison. If you opened the selection formula you would see that the "Is One Of" comparison generates an expression using "in" and a list inside square brackets. It would look something like:

```
{Customer.Region} in  ["PA" , "NJ" , "OH" , "DE"]
```

Because this is a valid Boolean, it can also be used in an If-Then-Else statement:

```
If {Customer.Region} in  ["PA" , "NJ" , "OH" , "DE"]
Then "Local"
Else "National"
```

> ☞ **Checking a value against a list of values (See Exercise 25).**

## Browsing and Pasting Data into a Formula (Edit ➧ Browse Field Data):

Just about any time you select a field in a field list, you have the option of "Browsing" that field. This means checking the data type and length of a field, and displaying a list of sample values from the database. If you browse within the Formula Editor you can select a value from this sample list and paste it into the formula as a literal value. While in the Formula Editor, highlight any database field in the "Fields" pane. You will see a small aqua magnifying glass on the tool bar. Click that button to browse. This list you see is taken from the first 500 records. To paste a value, click the "Paste Data" button at the bottom of the browse window.

☞ **Browsing Field Values (See Exercise 25).**

## IsNull() Function (in the "Print State" function category):

In most modern databases an empty value is called a "Null" value. Most formulas in Crystal Reports can't process a Null value. The rule in Crystal is that if any field in a formula has a Null value, then the formula will return a null value on that record. Let's say you write a "Full Name" formula made up of last name, first name and middle initial. The "Full Name" will be blank on any record where one of these 3 fields is null, even if it is only the middle initial.

In simpler reports, you can use global or report options to eliminate null values from your data set (see next page). However, I recommend that you use the **IsNull()** function to deal with Null values. This function allows you to check a field and see if it is Null before the formula uses the value. The **IsNull()** function requires only one value in the parentheses; the name of the field you are checking. It would look something like this:

```
IsNull ( {Client.Initial} )
```

This expression will give you a Boolean value that is "True" when the field is null and "False" when it contains a value. Because it is a Boolean expression you can use it with If-Then-Else logic to substitute another value for the Null value. The following formula checks for a Null middle initial, and if it finds one, uses an empty string value instead. This allows the formula to print the first and last names even when the middle initial is Null. It will print the middle initial when there is one.

```
{Client.Last Name} & ", " &
{Client.First Name} &  "  " &
     if IsNull ({Client.Initial})
     then ""
     else  {Client.Initial}
```

☞ **Using IsNull() in a formula field (See Exercise 26).**

## Setting Global Reporting Options:   (File ➜ Options ➜ Reporting Tab)

There are several global options on this tab that allow you to change the way Crystal behaves. For instance, you can set Crystal to 'AutoSave' every few minutes.  This tab also has a setting that converts all of the Null values in a data set into their "default" values.  The default value is a zero for numeric fields and an "empty string" for character fields.

You can make this change in 2 places, depending on how you want it applied:
> **File ➜ Options (Reporting Tab)** - affects all new reports that are created, from now on.
> **File ➜ Report Options -** affects only the one report that is currently open.

One note for v11-v14 users.  You have the option of setting this property within the Formula Editor for one formula.  This allows that formula to automatically replace Null values with their default values, without affecting any other fields or formulas.  This is probably the best way to use this feature.

**Note –** Using this feature in "Report Options" replaces the null values only *after* the records are selected.  Database fields in selection formula are not affected by this feature.

## Using the Selection Formula to find Empty (Null) Values:

You will also use **IsNull()** when you are looking for records that have a Null value in a specific field.  For example, you may want to select records where a field was missed during data entry. If you wanted to select only the records where the field {Customer.Region} was Null, you would have to use the function **IsNull()** in the selection formula.   These comparisons would NOT work to find records with null values:

```
{Customer.Region} = ""
{Customer.Region} < "a"
```

These comparisons *would* include records that have an empty string or space characters, but they would skip all of the records that have a true Null value in that field.

Since the **IsNull()** function generates a Boolean value, it can be your entire selection formula when you want to find records with a Null value. Or you can add it as an additional rule.  When using **IsNull()** for selection, it is usually easier to edit the Record Selection formula in the Formula Editor (**Report ➜ Formula Workshop).**  Add the following rule after any rules that are already in your record selection formula:

```
... and IsNull  ( {Customer.Region} )
```

If this is your only rule, of course, you do not need the word "and".   If the field is Null, this formula will be "True" and the record will be selected.  If the field contains any value, then the formula will be "False" and the record will be skipped.


☞ **Finding empty (Null) values (See Exercise 27)**

# Using Summary Functions in Formulas:

**Sum(), Count(), Distinct Count(), Average() Minimum() Maximum()**
Usually you create summary fields by using the menu options **Insert ➡Summary**. These automatic summary fields can only appear in certain sections of the report. They are also relative to the section that contains them. For instance, a grand total that is moved up to the Group Footer will immediately become a subtotal for that group.

However, if you write a grand total in a formula, using one of the summary functions, the formula will NOT be relative to where it was placed. You could place the formula in any section of the report, and it would always print the Grand Total of that report.

There are more than 20 different summary functions in the function list. Any one of these can be used to create either a grand total subtotal in a formula. The syntax for both is shown below. It is even easier if the total you are going to use in your formula is already on the report. In that case, the total field will be in the list of fields inside the formula editor. Totals are the fields that have a sigma ( Σ ) in front of them. You can double-click any total in the list, and the expression for that total will appear in your formula.

**Recognizing or Creating Grand Totals (Report Area Totals):**
A grand total is any total that summarizes a field for the entire report. When you write a grand total inside a formula there should only be that one field in the parentheses. This is true when you write the expression yourself, and it is also true when you select a "Report Area" total from the field list. The formula below will summarize the entire Amount column. It will be the same number no matter where it is placed on the report.

```
Sum ( {Orders.Amount} )
```

**Recognizing or Creating Subtotals (Group Totals):**
A subtotal summarizes each group separately. When you write a subtotal inside a formula there should be two fields in the parentheses. The first is the field you are totaling. The second is the field you are totaling 'by'. This second field will always be an existing group field in your report. The formula below will summarize the Order Amounts for each Customer Name. This formula will have a separate value for each group.

```
Sum ({Orders.Amount}, {Customer.Customer Name})
```

In rare cases you will see (or enter) a third value inside the parentheses. This is only needed when your group field is a date, and the group is set to break weekly, monthly, etc. The word in the formula has to match the 'break' setting for that date group. The eligible words are weekly, biweekly, semimonthly, monthly, quarterly, semiannually or annually. The formula would look like this:

```
Sum ({Orders.Amount}, {Orders.Order Date}, "monthly")
```

☞ **Creating Summary Fields (See Exercise 28)**

## Understanding Group Selection, Using a Subtotal as Criteria:

Whenever you use a subtotal as selection criteria, you are doing "Group Selection". Let's say that you only wanted to select customers that have placed more than $500 in orders in the past year. To accomplish this Crystal would first have to select all of the orders for that year, then group then by customer and finally calculate the subtotal of those orders for each customer. Only then could it determine which Customers went over $500.

You can use subtotals in the select expert (the "Group" select expert in v12-v14) by choosing a subtotal from the field list, just like you would use a database field. The subtotals all have the sigma ( Σ.) in front. Crystal will also write a selection formula for you, using your selected subtotal. However, Crystal keeps this selection formula separate from the record selection formula. The "record selection formula" will only include rules that use database fields. The "group selection formula" is for any rule that uses subtotals.

These two rules are separate because they are used at two different times. Crystal actually makes two passes through the data to create a report, first as it reads the data and again as it prints the data. The record selection formula is used while Crystal "reads" the data into memory. This formula determines which records get into the data set.

After this first pass, Crystal does grouping and sorting, and then calculates the subtotals and grand totals. The group selection formula has to wait until after these steps, because it needs the subtotals. The group selection formula then checks the subtotals to determine which groups meet the criteria. Some records will get into the data set because they meet the record selection criteria (first pass), but then won't print on the report because their group doesn't meet the group selection criteria (second pass).

Crystal calculates the grand totals with the subtotals. The grand totals are therefore calculated *before* the group selection rules are applied. That is why the "automatic" grand totals include all of the records that meet the record selection criteria, even those that didn't meet the group selection criteria. So, if you use group selection in your report, your grand totals will be higher than the sum of the subtotals that show on the report. This also occurs any time you use the TopN feature without the "Others".

You can solve this problem by using a running grand total instead of the "automatic" grand total. Running totals can be very sophisticated, but even a simple running total will solve the problem outlined above. The steps are listed as part of the exercise for this lesson.

☞ **Group Selection (See Exercise 29)**

## Visual Effects and Presentation:

**Formatting Fields by Type: (Format ➤ Field)**

Select any field and select menu options **Format ➤ Field** to view the formatting options for that field. Or, you can right-click the field and select the same option. You will notice that the tabs vary with the data type of the field.

**Common Tab:**

The most used settings here are the "Can Grow" which allows a character field to wrap to additional lines when needed. Suppress, and suppress if duplicated are also here.

**Borders Tab:**

A border is a box around a single field or text object that can include lines, colors or both. The lines can be put on all 4 sides of a field, and can have a variety of looks (line types, color, fit, shadow). You select the line type for each of the four sides of the border if you want a line around it. If you want the line to be a different color you select the color from the color box next to the word "Border" at the bottom. If you want the box to have a fill color you check off "Background" and you will get a second color box to select the background color.

**Font Tab:**

The most used settings on the Font tab are already on the toolbar.

**Number/Date Tab:**

Select from the most common formats, or click 'Customize' to design your own format.

**Hyperlink Tab:**

You can make any field into a hyperlink that will open a page, a file or generate an Email.

**Formatting multiple fields:**

You can select multiple fields by clicking on them while holding the Shift key (or using the 'lasso' described on page 3). Once you have selected a group of objects, you can use the menu options **Format ➤ Format Objects.** You can then change properties for all of the fields at once.

☞ **Formatting fields (See Exercise 30).**

**Section Colors:**

You can also change the background color of an entire section. This occurs under the menu option **Report ➤ Section Expert.** Highlight the section you want to change and then click on the color tab in the upper right corner of that window. If you put a checkmark in the "Background" box and you will get a color selector. The color selected will be applied to that section each time it appears in the report.

☞ **Formatting Sections (See Exercise 31).**

**Lines and Boxes: (Insert ➡ Line/Box)**

Using the menu options **Insert ➡ Line (or Box)** will turn your cursor into a pencil.  You can use this to draw a line or box in any section of your report.   Keep the following points in mind:

♦ Lines are either vertical or horizontal (not diagonal).

♦ Both Lines and Boxes can be assigned a color.  Boxes can also have a fill color.  These options are under the format menu (**Format ➡ Line/Box**)

♦ Vertical objects that go beyond a single section should start and end in corresponding sections (group header to group footer) and will stretch from one to the other.

☞ **Adding Lines and Boxes (See Exercise 32).**

**Adding Pictures:**

You can add picture or image files to Crystal Reports. Crystal accepts images in JPG, TIFF and BMP formats (but not GIF).  Use **Insert ➡ Picture** and browse to the image file.   The image can be resized once it is on the report canvas.

**Special fields:**

Special fields are calculated automatically by Crystal Reports.  The full list is visible at the bottom of the Field Explorer.  Below are my favorites:

| | |
|---|---|
| Page N of M | Prints: "Page 1 of 10", "Page 2 of 10", etc. |
| File path and Name | Prints the path and file name of RPT file being run |
| Record Selection Formula | Prints the criteria that the records have to meet |
| Group Selection Formula | Prints the criteria that groups (subtotals) have to meet |

☞ **Insert Special Fields (see Exercise 33).**

**Splitting Sections (Report ➡ Section Expert):**

Any of the 7 sections can be split into subsections if needed.  For instance, you could separate the detail section into subsections so that each part can be individually set to "suppress blank section".  That way a second address line would only print if it had a value.  Subsections can also prevent objects that "Can Grow" from overlapping one another.  If you want to put several cross-tab objects in the report header (one below the other) you will probably give each its own subsection.  That will prevent them from "growing" over top of each other.   The following buttons in the Section Expert allow you to create and manage subsections:

**Insert** - Splits the highlighted section into two sub-sections.
**Delete** - Eliminates the highlighted sub-section.
⬆ ⬇ - Moves the highlighted sub-sections up or down within a section.
**Merge** - Combines the highlighted sub-section with the one below it.

☞ **Splitting Sections (see Exercise 34).**

## __Working with larger text objects:__

**Overview:**

As you have seen, we can type text objects anywhere on the report.   Some text objects, like footnotes, comments or a message can be a paragraph or more.   You can even embed fields into the middle of these text objects.   If a text object with an embedded field is on the detail band, it will print for every record and every field value will be represented.    If this text object is in a Group Header or Footer, Crystal will include the field value from the first or last record in that group, as described on page 4.

**Inserting a larger Text Object:**

To insert a text object use the menu commands **Insert ➡ Text Object** and then click in the section where the text should be.  Then you simply type the text or paste it in from any other text editor or word processor program.   You can type more text than will fit into the box.  The box will not expand automatically, but it can be resized later.  Each time you hit "Enter" the text will have a return, although your text will seem to disappear.  When you have typed in the desired text, you click outside of the box to exit the text object.  You can then make the text object deeper or wider to see all of the text.

**Editing and formatting a Text Object:**

To edit the text object you double click it.  You will be back in "Word Processor" mode.  When you are done editing, you can click anywhere outside the box to save your changes.

You can format the entire text object, or individual words within it.  You can also cut and paste, change the font and style using the style buttons on the toolbar.   One thing you can't do in Crystal is "spell check", so you may want to copy the text from another word processor.

**Adding fields to a Text Object:**

To add fields to a text object you can drag them from the Fields Explorer and drop them into the proper place in the text.  However, the exact insertion point can be difficult to see when you first insert the field.   If you place it in the wrong spot, you can:
1) Edit the text object with a double click.
2) Select the field object in the text with a single click.
3) Drag it within the text object to the appropriate spot.

Of course you can also use the undo to remove it and try again.

☞ **Adding Fields to a large Text Object (See Exercise 35).**

# A brief review of other members of the Report Gallery:

**Overview:**

All members of the report gallery share the same basic steps in report creation. Each has a slightly different set of tabs, to make it easier to create specialized reports. Some of these topics are covered more thoroughly in advanced training.

**Cross Tabs:**

Allows you to generate a cross tab, and optionally include a corresponding graph. The details do not show up when you use this expert. That is why I prefer not to use this expert. I prefer to add cross-tabs to reports.

**Mailing Labels:**

Allows you to select from 30 standard label types, or create a custom label size. In this expert Crystal puts one field per line, so if you want to include multiple fields per line (like City, State, and Zip) you should write a formula that combines these fields while you are on the fields tab of the expert. Then use this formula a line on your label.

**OLAP:**

This can only be used if you have an OLAP server and a predefined cube.

## Class Exercises:

### Exercise 1 - Using the Standard Wizard to start a new report

First, download the Xtreme sample data using the link on page 1 of this guide. Remember where you save it.
If you are using CR 2020 use the second link on page 1 for instructions on how to connect to the data.
For users of all prior versions through CR 2016, start with the following menu options:

**File ➡ New ➡**
Click "Standard" (in v9/10 Click "OK") .
Expand the folder marked "Create New Connection"
Expand the folder marked "Access/Excel(DAO)
Browse to the folder, select the Xtreme.mdb.
Click "Open" then "Finish" to get back to the DATA window.
Expand the Tables node within to see the list of tables.
Highlight the table "Customer" and click the top arrow to move it to the right.
Highlight the table "Orders" and click the top arrow to move it to the right.
Click "Next" and the "Links" window will appear.
Confirm that the tables are connected with a line from Customer ID to Customer ID.
If not, drag Customer ID from one table and drop it on the same field in the other table.
Click "Next" to open the fields window.
Expand the Orders node at the bottom so that you can see the fields from both tables
Select the following Fields by highlighting them and clicking the top arrow:
     "Customer ID" and "Customer Name" from the Customer Table.
     "Order ID", "Order Amount", "Order Date" from the Orders Table.
Click "Next" to move to the Grouping window..
Highlight "Customer Name" and click the top arrow
The field will move from the left to the right.
Click "Next" to move to the "Summaries" window.
Crystal will move all of the numeric fields to the right for you.
Highlight the field "Sum of Customer ID" on the right
Change the selector at the bottom right from "Sum" to "DistinctCount"
Highlight the field "Sum of Order ID" on the right.
Change the selector at the bottom right from "Sum" to "Count"
Keep the third field as "Sum of Order Amount".

Click "Next" 3 times to skip "Group Sorting" and "Chart"
You should be on "Record Selection".
Highlight {Order ID} on the left and click the top arrow to move it to the right.
In the first selector change "any value" to "is between".
In the two empty boxes type the values 1800 and 2800.

Click "Finish" at the bottom of the window to generate the report..
When the preview window comes up, save the report as Lesson 1.
Page through the report, using the VCR buttons at the top of the screen.

**Exercise 2 - A second report**

      Repeat the steps in Exercise 1 and recreate the original report.
      When done save the report under the name Sort.
      Save it a second time under the name Layout.

**Exercise 3 – Using Undo**

      Switch to Design mode and locate the column headings in the Page Header.
      Click on each column heading one-by-one and hit your delete key to delete each one.
      Click the "Undo" arrow several times to bring these objects back.
      Click the "Redo" arrow to delete theses objects again.
      Use the triangle next to the "Undo" arrow to undo all of the deletes at once.

**Exercise 4 - Inserting, Deleting and Arranging Objects**

      **Adding a field to the report:**
      Find the Customer Name field on the Details band and delete it.
      Go into the View menu and open the Field Explorer.
      Expand the node for "Database Fields" and expand the node for the "Orders" table.
      Locate the field "Ship Via" and drag it onto the detail band, into the empty space.
      Preview to see the new column that you have created.
      Switch back to design mode.

      **Adding a title to the page header:**
      Select **Insert ➨ Text Object**
      In v9/10 - click in the Page Header with the text object and type  - *This is a Title*
      In v11-v14 - draw an empty box in the Page Header and type - *This is a Title*
      Click anywhere outside the box to exit the text object.
      Click on the text object to select it and make it Bold with a 16 point font.
      Use the sizing handles to make the frame wider and taller if needed.

      To edit the text, double click on the title and change it to - *This is Another Title*
      Click outside the text object to close it.

      Locate the first guideline on the top ruler (around the 1" mark)
      Drag this guideline to the left, close to the edge of the design area.
      Note that the objects attached to this guideline move with it.
      Drag this guideline off the ruler to delete it  (click 'undo' to put it back).

      Slide the "Print Date" to the left until its left edge "sticks" to this guideline.
      Move the Guideline back to the 1" mark to confirm that the field is attached.

      Put your cursor over the gray pipe running along the bottom of the detail section.
      When the cursor becomes a 2-headed arrow, click and drag down one half inch.
      Preview and notice the difference in the depth of each detail line (double spaced).
      Switch back to design mode and use undo to put it back to its original size.

**Exercise 5 - Drilling down**

Close the Layout report and reopen the Sort report you created earlier.
Select the menu options **Report ➡ Section Expert**
Notice that the Report Header is highlighted.
Highlight "Details" in the list at the left and check "Hide (Drill Down OK)".
Highlight "Group Header 1" also and check "Hide (Drill Down OK)".
Click OK and preview. (Note the summary nature of the report).
Put your cursor over a subtotal and note the "drill down" indicator.
Double click on any subtotal to see the detail behind it.
Note that you are in a new preview window with a new tab at the top.
Switch back to Preview and drill down on another subtotal.
In v11-v14 close each drill down tab by clicking on the gray "x" on the drill-down tab.
In v9/10 Close each drill down tab by clicking on the red "x" next to the VCR panel.

**Exercise 6 – Adding Page Breaks**

Select the menu options **Report ➡ Section Expert**
Highlight the Detail section and uncheck "Hide (Drill Down OK)".
Highlight the Group Header and uncheck "Hide (Drill Down OK)".
Highlight the Group Footer (if using v12-v14 click on the "Paging" tab)
Check off "New Page After".
Click "OK" and Note that each group has it's own page.
Jump to the last page of the report.
Note that the Grand Totals (Report Footer) are on their own page.

Use **Report ➡ Section Expert** (if using v12-v14 click on the "Paging" tab)
Highlight the Group Footer and uncheck "New Page After".
Click "OK" and note that the report has no page breaks.

**Exercise 7 - Changing the Sort**

Note that each customer's records are in random order.
Use menu options **Report ➡ Record Sort Expert**
Highlight the "Order Date" field and click the top arrow.
Once the field moves from left to right, click "OK".
Note that the dates are now in chronological order within the group.

Use menu options **Report ➡ Record Sort Expert**
Highlight the "Order Date" field on the right and click the second arrow.
This removes the sort.
Highlight the "Order Amount" field on the left and click the top arrow.
Once the field moves from left to right, click "OK".
Note that the Amounts are now in order within the group.

**Exercise 8 – Working with Groups**

Select **Report ➜Group Expert,**
Highlight the field "Order Date" on the left and click the top Arrow.
Now highlight the field "Order Date" on the Right and click "Options"
Select "For each Year" instead of "For each Week"
Click "OK" twice and notice the new headings for each year.
Also note that the records are still sorted by "Order Amount".

Again, select **Report ➜ Group Expert,**
Highlight the field "Order Date" on the Right and click "Options"
Change the field from "Order Date" to "Ship Via".
Click OK twice and note that the report is now organized by shipping method.
And the Group Name now prints "Ship Via" values..
Also note that the records are still sorted by amount within the group.

Select **Report ➜Group Expert,**
Highlight the field "Ship Via" on the Right and click the third arrow to remove the group.
Click OK and note that you are back to one group, sorted on Amount.

**Exercise 9 - Using the Group Sort Feature:**

Use the Menu Options **Report ➜ Group Sort Expert**
Change the selection "No Sort" to "TopN"
Set the "Based On" as "Sum of Order Amount"
Leave the "N" value at 5
Add a check mark to "Include Others".
Click OK to view the report.
Note that the Group tree only shows five Customers and Others.
Switch to Design mode.
Right click on the word "Details" in the margin and select "Hide"
Right click on the words "Group Header" in the margin and select "Hide"
Notice that the "Others" group is 90% of the report.

Use the Menu Options **Report ➜ Group Sort Expert**
Remove the check mark for "Include Others".
Click "OK" and note that the "Others" group is now missing
Also note that the Grand Total is still the same.
See the note regarding this issue in the lesson material.

Use the Menu Options **Report ➜ Group Sort Expert**
Change the selection from "TopN" to "Bottom N"
Leave the other settings unchanged.
Click OK to view the report.
Note that the report now shows the lowest five groups.

Use the Menu Options **Report ➜ Group Sort Expert**
Change the selection from "Bottom N" to "All"
Leave the "Based On" as "Sum of Order Amount"

Note that the order is set to "Ascending"
Click OK to view the report.
Note that all Groups are shown from lowest to highest sales.

Use the Menu Options **Report ➡ Group Sort Expert**
Change the selection back to "No Sort".
Click OK to view the report.
Note that all Groups are back in their original order.

## Exercise 10 - Inserting Charts

Use the Menu Options **Report ➡ Group Sort Expert**
Change the selection "No Sort" to "TopN"
Set the "Based On" as "Sum of Order Amount"
Leave the "N" value at 5
Do not add a check mark to the "Include Others" property.
Click OK to view the report.

Select the menu options **Insert ➡ Chart**:
Users in v9/10 are taken directly into the Chart Expert.
Users in v11-v14 must first click in the Report Header to give the chart a location.
Then you right-click in the backround of the chart to open the Chart Expert.

Once in the Chart Expert. You make the following selections:
    **Type Tab:** Keep the default bar chart type
    **Data Tab:** On Change of = Customer Name
Show = Sum of Orders.Order Amount
Click "OK" to preview the chart.

Double click on a bar and note that it allows you to drill-down to the details.
Close the Drill-Down using 'x' on the tab (v11-v14) or the red "x" to the right (v9/10).

Right-click in the background of the chart and select the Chart Expert.
Select the category for "Pie" charts, and select the "tilted" pie in the first row.
Go to Options and check the legend back on.
Move the check for "Data Points" from Values to Labels.
Click "OK" to see the chart converted to a Pie chart.

Delete the chart by selecting the chart object and hitting "Delete" on the keyboard.
Click "Undo" to put the chart back.
Save the report under the name Charts

## Exercise 11 - Inserting Grand Totals, Subtotals and Summaries

Create a new report using just the Customer Table.
Add the Fields: Customer ID, Customer Name, Region, Last Year's Sales, Address1.
Click "Next" until you are on the Record Selection step.
Add a rule that says "Country" - "is one of"
Select Canada and hit Enter or Add
Select China and hit Enter or Add

Select England and hit Enter or Add
Click "Finish" to preview the report, which should be 1 page of 33 Records.

Insert a Grand Total Sum to calculate the Sum of Last years Sales:
Use the menu options **Insert ➡ Summary**
Choose the field "Last Years Sales"
Choose the function "Sum"
Choose the location "Grand Total"
Click "OK" and notice the new total at the bottom.

Insert a Grand Total Average of Last years Sales
Use the menu options **Insert ➡ Summary**
Choose the field "Last Years Sales"
Choose the function "Average"
Choose the location "Grand Total"
Click "OK" and the new total will land on top of the first.
Drag the Average to the right and put it under the Addresses

Insert a Grand Total Count on Customer ID
Use the menu options **Insert ➡ Summary**
Choose the field "Customer ID"
Choose the function "Count"
Choose the location "Grand Total"
Click "OK" to see the count at the bottom.

Insert another Grand Total Count on Region
Use the menu options **Insert ➡ Summary**
Choose the field "Region"
Choose the function "Count"
Choose the location "Grand Total"
Click "OK" to see the same number as the first column.
Note that it even counts the duplicates

To Count of how many different states are included:
Right-click on the Total under the Region column.
Select "Edit Summary"
Change the function from "Count" to "Distinct Count".
It now counts the number of different states in the list.

Use **Insert ➡ Group**  or the Group Expert to add a group by Region.

Insert a Subtotal Sum of Last years Sales:
Use the menu options **Insert ➡ Summary**
Choose the field "Last Years Sales"
Choose the function "Sum"
Choose the location "Group 1 Region"
Click "OK" and note the subtotals for each Region.

Insert a Subtotal Count of Customer ID:
>Use the menu options **Insert ➜ Summary**
>Choose the field "Customer ID"
>Choose the function "Count"
>Choose the location "Group 1 Region"
>Click "OK" and note the count for each Region.

Save the report under the name Summary Fields

## Exercise 12 - Inserting a Basic Cross-Tab

Create a new report using the Standard Expert
Use the tables Customer and Orders.
Select the following fields:
Customer ID, Customer Name, Country, Order Amount, Order Date and Ship Via.
Group on Customer Name.
On the Totaling step it will Sum the Order Amount.
Change the function for Customer ID from Sum to Count.
Click next 3 times  to get to the "Record Selection" step
Add the rule:    "Order ID"  -  "is between"  -  1800  and  2800.
Click Finish.
Switch to Design mode and un-suppress the Report Header (if it is suppressed).
Size the Report Header so that it is about the same as the Page Header

Select the menu options **Insert ➜ Cross-Tab**
In v9/10 you will be taken directly into the Cross-tab Expert.

In v11-v14 you must first click in the Report Header to specify the cross-tab location.
Then you right-click in the upper left corner of the cross-tab to open the Cross-tab Expert.

Highlight "Order ID" and click the arrow next to the "Summarize Field" box.
Click the "Change Summary" button and change the operation from Sum to Count.
Highlight "Country" and click the arrow next to the "Rows" box.
Highlight  "Ship Via" and click the arrow next to the "Columns" box.
In v11-v14 click on the tab called "Customize Style"  on the top.
Remove the following two checksmarks at the bottom of the window:
>Row Totals on Left
>Column Totals on Top
Click OK (and if in v9/10 click in the white area of the report header).
Preview the report and look at the top of the first page of the report.
You may need to narrrow the columns a bit if the cross-tab is wider than the page.

Right-click in the upper left corner of the Cross-Tab and select the Cross-Tab Expert.
Highlight "Ship Via" in the field list and click the arrow next to Summarized Fields".
Highlight "Order Date" and click the arrow next to the "Rows" box.
Highlight "Order Date" in the "Rows" box and click the "Group Options" below it.
Change the "For each Day" to be "For each Year", and click OK.
Click on the "Customize Style" tab and highlight the row "Customer Country".
Change the Background color to Aqua.

Preview the report.

Switch back to design mode.
Right-click in the upper left corner of the Cross-Tab and select the Cross-Tab Expert.
Highlight both fields in the "Rows" box, and click the lower arrow to remove them.
Preview and note that it only does the columns, with a total row.

Switch to Design mode and make the Group Footer one inch deeper.
Select the Cross-Tab and click the "Copy" button on the tool bar and then click "Paste".
Put your cursor in the Group Footer, just below the Group Name and click.
Preview and you should see cross-tabs for each group, showing group level totals.

Save the report under the name "Select Expert" for the next lesson.
Switch back to Design mode.
Select each of the Cross-Tabs and delete them by hitting the delete key.
To shrink the sections, drag the section pipes back up.

## Exercise 13 - Record selection

Continue with the same report and switch to design mode.
Click in the blank report header to make sure no fields are selected.
Open the select expert by using the menu options **Report ➡ Select Expert**
**(in v12-v14 you should also select Record)**
To add a new rule click either the "New" tab or the "New" button.
Select the field "Ship Via" and click OK.
Change "is any value" to "is equal to".
In the third box select FedEx.
Click OK and "refresh" the report when asked.
Preview the report and see just FedEx.

Reopen the Select Expert and change "is equal to" to "is one of".
In the third box select FedEx and UPS.
Click OK and Preview the report, refreshing it when asked.

Reopen the Select Expert and delete both rules by using the "Remove" button.
Click "New" and select the field Customer Name.
Change "is any value" to "starts with"
In the third box type:   **Bi** and hit "Enter" (or the "Add" button.)
Again, in the third box type:   **Cyc** and hit "Enter" (or the "Add" button.)
Click OK and preview the report  (All names starting with either Bi or Cyc)

Reopen the Select Expert and change "starts with" to "is like"
Highlight "Bi" in the values list and hit "Delete".
Highlight "Cyc." in the values list and hit "Delete".
In the third box type:    **\*Bik\***   and hit "Enter" (or the "Add" button.)
In the third box type:    **\*Cyc\***   and hit "Enter" (or the "Add" button.)
Click OK and Preview the report  (All names containing either Bik or Cyc)

To add another rule for order amounts greater than or equal to $3,000:
Re-Open the select expert.
click the "New" tab or "New" button.
Select the field "Order Amount".
Change "is any value" to "is greater than or equal to".
Type the number 3000 in the third box.
Click OK and use saved data.

Save this report by clicking the disk on the tool bar.

## Exercise 14 - Linking tables with a One-To-Many relationship

Click **File** ➡**New**, and select "Blank Report"
(Just this one time, to show you why I use the Wizards.)
If you are in v9 or v10 click OK to launch the Wizard.
Find and add the Employee table and click "OK"
Open the Field Explorer from the view menu.
Open the list of fields in the Employee table
Hold your Shift or Ctrl key while you click on the following fields:
Employee ID, Last Name, Position, Salary and SSN.
Drag them as a group and put them on the detail band.
Preview the report.
Add a Grand Total that Sums the Salary Column.
Add a Grand Total that does a Distinct Count of the Employee ID Column.
Note the number of Employees, and the total salary.
Use the menu options **Database ➡ Database Expert**
Select the table  "Orders" and move it to the right
Click "OK" and Crystal may link them for you.
(If they aren't linked, link Employee ID to Employee ID.)
Click "OK" again and let Crystal Refresh the report.
Preview and note the totals haven't changed, yet.
This is because the new table has not been used.
Switch to design mode.

## Seeing "Table Inflation:

Delete the field "SSN" from the last column.
Open the "Field Explorer"
Click the plus sign next to "Database" and then click the plus next to "Orders".
Select the field "Order Amount" and drag it onto the detail band.
Preview the report and go to the last page to view the totals.
Note that the Salary column has duplicate information and an inflated total.
This is the result of table Inflation.
(This type of problem is solved in the Advanced material.)

## Change the equal join to an outer join:

Also, note that the number of employees listed on the report has dropped.
Because we used an Inner Join, any employee with no orders won't show.
Use the menu options **Database ➡Database Expert** and click on the "Links" tab.
Highlight the line for this join and click "Link Options".

Select "Left Outer Join" and click OK 3 times to refresh the data.

Note that there are now 15 employees.

Save the report under the name Table Inflation.

## Exercise 15 - Removing Tables Manually

Use the menu options **Database ➡Database Expert**

Highlight the Orders Table on the right side.

Click third arrow button to remove this table

Crystal will warn that you have used fields from the table.

Click OK twice and the table will deflate back to the original 15 records.

## Exercise 16 - Verifying or Setting the Location of a table

Use the menu options Database ➡ Verify Database.

The message should say "Database is up to date"

Use the menu options Database ➡ Set DataSource Location

Highlight the "Xtreme" database in the top window.

From here you could highlight another database at the bottom and click "Update"

Open the tables category and highlight Employee table in the top window.

From here you could highlight another table and click "Update"

Crystal would then request the data from the new Database or Table.

Click "Close" to cancel this window.

Close the report without saving it.

## Exercise 17- Adding Basic Formulas

Create a new report using the Customer Table.

Use the following fields:

Customer Name, Contact First Name, Contact Last Name, Last Years Sales, Phone.

Click Finish and switch to "Design" mode.

Use the menu commands **View ➡ Field Explorer** to show the Field Explorer

Highlight "Formula Fields" in the tree on the left

Click the "sparkle" (New) button on the Explorer tool bar.

Enter "Full Name" as the name of the formula.

Click "Use Editor" to open the formula editor window

The formula editor has 3 panes at the top.

Locate the first (Fields) pane

Open the "Report Fields" by clicking the plus sign.

Open the table "Customer" by clicking its plus sign

Find the "Contact Last Name" field and double click it.

Type an ampersand into the formula.

Type a single quite, a comma,  a space, and another single quote

Type a second ampersand

Double click the field "Contact First Name" in the field list.

Your formula should look like this:

{Customer.Contact Last Name}  &  ", " & {Customer.Contact First Name}

(The quotes are around a comma and a single space character.)

Click "Save" on the second tool bar, just above the "Fields" pane..
Click "Close" on the first tool bar to the far left.

On the report, delete the two fields "First Name" and "Last Name"
Make sure the "Field Explorer is still active on the left side.
Open the Formulas category by clicking the plus sign next to Formulas
Drag the "Full Name" formula into the empty spot on the detail band
Preview to see a column of full names.  Save this report as "Strings".

**Substring**

Continue with the report above.
Click on the Formulas category in the Field Explorer
Click the "Sparkle" (New) button for a new formula
Enter the name "Initial" and click "Use Editor"
Double click the field "Customer Name" to add it to the formula
Put  the number 1 in square brackets after the name:

> {Customer.Customer Name} [ 1 ]

Save the formula and Close the Editor
Use the menu options **Report ➡Group Expert**
Move the field "Initial" to the right to add a new group.
Click OK and notice that the report is organized like a directory.

Note that the records aren't sorted in a particular order within each group.
Use the menu options **Report ➡Record Sort Expert**
Move the field "Customer Name" from left to right
Click "OK" and note that the records are now sorted within each group.

**Multiplication and Rounding:**

Switch to Design mode and delete the phone number field.
Add a new formula called Projected Sales:

> {Customer.Last Year's Sales} * 1.06

Place this formula in empty place where Phone was and Preview
Use the menu options **Insert ➡ Summary** to add a subtotal of the Projected Sales.
Use the Group Tree on the left to go the "N" group
Note that the subtotal is off by 2 cents.

Use the tool bar to add one more decimal place to the formula column.
Note the hidden portions of the penny that exist in each number.

Right-click on the detail field "Projected Sales" and select "Edit Formula"
Place your cursor at the beginning of the formula

Open up the list of functions (using the plus sign) in the center pane.
Open the "Math" section of the function list.
Open the Round function group in the list
Double-click the first Round function example to add the function.
Move the second parenthesis to the end of the formula so you have:

**Round ( {Customer.Last Year's Sales} * 1.06 )**

If I were to leave this it would round to a whole dollar, and we want it to the penny,
Add a comma and the number 2 to the end, just inside the parenthesis, so that it is:
**Round ( {Customer.Last Year's Sales} * 1.06 , 2 )**

Save the formula and close the formula workshop.
Note that the third decimal is always zero, and that the total is adjusted
Reduce the decimals for this column back down to 2, and the total is still correct.

Switch back to design and click on the field "Projected Sales", on the detail band.
Use the "delete" button on your keyboard to remove this field (the heading goes as well).
Also delete the subtotal for this field.
Note that the formula is still listed in the field explorer with a check mark.
This indicates that a field is still being used.
Refresh the report, and note that the check mark is gone.
Highlight the Projected Sales formula in the field Explorer.
Delete it using either the "X" or the Delete key on your keyboard.
The field is completely removed from the report.
If you try to delete another formula, you will be warned that the formula is in use.

**Exercise 18 - String functions – Val() and ToText()**

      **Using Val:**

Create a new one-table report on the Customer table.

Include the fields Customer Name, Address 1, Address 2.

On the "Select" step add:  **Address 2  -- starts with -- "Suite".**

Preview the report.

Sort the report on Address 2 (**Report ➡ Record Sort Expert**).

Note that the suite numbers are not in true numeric order.

Create a new formula field "Suite number".

Find the function **Val()** in the String Function list and double click it.

Double Click Address 2.

Type the following right after the field:     **[7 to 12]**

It should be after the field but inside the end parentheses of the Val() function.

It should look like this:

      Val  ( {Customer.Address2} [ 7 to 12 ]  )

Save and close this formula

Drag this field onto the end of the detail band.

Note that it is the numeric equivalent of the Suite Number.

Change the sort to use Suite Number (**Report ➡ Record Sort Expert**).

Note that the records are now in true numeric order.

You can also delete {@Suite Number} from the detail band. It will still sort.

      **Using ToText:**

Create a new report using the Product Table.

Include the Fields Product ID and Product Name.

Preview the report

Add a formula called Key and type the following:

      **{Product.Product Name}  +  ' - '  +  {Product.Product ID}**

When you save the formula you will get an Error message.

  (Product ID is a numeric field, and you can't concatenate numbers.)

Delete the field Product ID from end of the formula.

Find the string function **ToText()** and double click the first example.

Then double click the field Product ID so that the formula looks like:

      **{Product.Product Name} + ' - ' + ToText ( {Product.Product ID} )**

This time the formula should save without an error message.

Place this field on the left end of the detail band.

Preview the report and note the format of the Product ID.

It has two decimals and a thousands separator.

Edit the formula and add two arguments to the **ToText**() function so that it says:

      **{Product.Product Name} + ' - ' + ToText ( {Product.Product ID} , 0 , "")**

(The last argument is two quotes next to each other with no space between them.)

Accept and preview to see that the format has changed.

**Exercise 19 - Date math and date functions**

Create a new report using the tables Customer and Orders.
Add the fields Customer Name, Country, Order Amount, Order Date, Ship Date.
Add a Select where Region - is - equal to - "PA".
Preview the Report and use **File ➧ Printer Setup** to change the layout to Landscape.
Sort the records by Order Date.
Save the report under the name Dates.

Create the formula field  "Due Date" using the formula below:
    {Orders.Ship Date} + 15
Place it on the detail band, and preview the report.
It will add a column of dates that are 15 days after the ship date.

Create the formula field  "Turnaround" using the formula below:
    {Orders.Ship Date} - {Orders.Order Date}
Place it on the detail band, and preview the report.
It will calculate the number of days between ship date and order date as a numeric.

Create a formula called Federal Fiscal Year using the formula below:
    Year ( {Orders.Order Date} + 92 )
The number 92 is for a Federal Fiscal Year starting October 1.
You would use 184 for the typical non-profit fiscal year starting on July 1.
Place it on the detail band, and preview the report.
It will add a column of numbers representing the federal fiscal year.
Note that the  + 92  is within the parentheses but outside of the curly braces.
Save this reports as Dates, but keep it open.

**Exercise 20 - Formulas that use If-Then-Else Logic**

Continue with the report from the previous exercise, and delete the 3 formula columns.
Create the following formula to flag orders that exceed $6,000:
    **If**    {Orders.Order Amount}  >  6000
    **then**  "***"
    **else**  ""

You can simply type the words for IF THEN and ELSE into the formula.
(Note that after the else is two double quotes, with no space between them.
Place this field on the detail band and preview.
Note that any amount over $6,000 is flagged with 3 stars.

**Exercise 21 - Checking for one string inside another**

Modify the first line of the flag formula to read:
    **If**    "Bike" in {Customer.Customer Name}
    **then**  "***"
    **else**  ""

This flags any record with "Bike"  (as in Bike, Bikes or Biker) in the Customer Name.

**Exercise 22 Date range functions**

Open the Select Expert and delete the existing rules.
Hit "New" to put in the rule:

**Order Date – is – in the period – YearToDate**

This will select records where the order date is between January of this year and today.
Notice that no records are found.
Use **Report ➡Set Print Date** to change the print date 4/30/2002.
 (Use 4/30/2005 in v11- v14.)
You will now see records that are "Year to Date" based on that date.

Reopen the Select expert and click "Show Formula".
This is the pattern for using any date range function to create a Boolean.
Close the select Expert.
Re-open the formula for "Flag" and modify it to say:

**if {Orders.Order Date} in Aged0To30Days
then {Orders.Order Amount}
else   0**

Close the Formula Editor and add a grand total of this formula.

**Exercise 23 - Using OR in a selection formula**

Using the previous report, select all orders that are *either* ordered or shipped last month:
Reopen the Select Expert and delete the tab (using the DEL button on the right).
Click "New" and add the rule: Order Date - is in the period - LastFullMonth.
Click "New" again and add the rule: Ship Date - is in the period - LastFullMonth.
Click "Show Formula" at the bottom of the select window, and notice the "AND".
Change the "AND" at the end of the first line to an "OR".
Click "Hide Formula" and note that the expert has shut off.
Click OK, and Refresh the data.
Preview the report and note that this formula finds the appropriate records.
Reopen the Select Expert and click the "Show Formula" button.
Change the "OR" back to "AND", and hide the formula again.
Note that the expert has become available again.
Click OK, and refresh to see that with "AND" you get fewer records.

Use the menu options **Report ➡ Selection Formula ➡ Record**
Edit the selection formula to read:
Date ( {Orders.Order Date} )  = Date ( {Orders.Ship Date} )
The Date () function tells Crystal to ignore the times in each value.

**Note – it is easy to forget the parentheses around the curly brackets.**
Save and close the formula, then Refresh the data.
Note that all records have a Ship Date that is the same as the Order Date.

## Exercise 24 - Checking a value against a range of values

Create a new report using just the Customer Table.
Use the fields Customer Name, Region, Postal Code, Address 1.
Preview and delete the column for Address 1 (which leaves some space).
Add the following formula called "Zip Range".

{Customer.Postal Code} in "00001" to "50000"

This will create a logical value, True for zip codes in that range.
Place this on the detail band and preview.  Note how a Boolean displays.

Edit the formula to make it an If-Then-Else that returns a text value:

If {Customer. Postal Code} in "0" to "5" then "East" else "West"

## Exercise 25 - Checking a value against a list of values and using Browse

Add the following formula called "State List"

{Customer.Region} in ["PA" , "NJ" , "OH"]

This will create a logical value, True for Regions that match the list
Place this on the detail band and preview
Edit the formula to make it an If-Then-Else that returns a text value:

If {Customer.Region} in ["PA" , "NJ" , "OH"] then "Local" else "National"

## Browsing values into your formula

You can add another region to the list by using the "Browse" window.
Edit the "State List" formula.
Place your cursor after the last State and type a comma.
Highlight the field "Region" in the field pane.
Click the browse button on the tool bar (the aqua magnifying glass).
Type the letter "C" on your keyboard to get that section of the sample list.
Select "CA" and click the "Paste Data" button at the bottom of the browse window.
The value will appear in your formula (of course it is more helpful with longer entries).
Save and close the formula.

## Exercise 26 Using the IsNull() function in a formula field

Jump to the last page of the report.
Note that the formula "Zip Range" returns blank (null) when the Postal Code is Null.

Go to **File ➡ Report Options** and check off "Convert NULL field to default".
Click OK and note that the formula now prints "West" because "" is not between 0 and 5.
Go back to **File ➡ Report Options** and Uncheck "Convert NULL field to default".
Note that the formula is now printing blank (null) again.

Modify the "Zip Range" formula to check for Null values first, using:

If  IsNull ( {Customer.Postal Code} )   then "Missing"  else
If {Customer. Postal Code} in  "0"  to  "5"  then  "East"  else  "West"


The second line is the original formula.
Note that there is value for each field now, and "Missing" prints where the Postal Code is null.

### Exercise 27 – Finding records with a Null Value

Note that there are currently 269 records in the report.
Open the Select Expert and add a rule that says:
　　　Postal Code -- is greater than -- 0.
Preview and note that only 259 records are now selected, 10 are Nulls.
Reopen the Select Expert and change it to:  Postal Code / is less than or equal to / 0
Preview and note that no records appear, not even the Nulls.

Use the menu options **Report ➡ Formulas Workshop.**
Open the Selection Formulas category, and the Record Selection Formula.
Delete the entire formula.
Locate the function **IsNull(),** double click it, and double click the field Postal Code.
The field should land inside the function parentheses so that the formula now says:

IsNull ( {Customer.Postal Code} )

Save the formula, close the Formula Editor and refresh the report.
Notice that it now selects the 10 records that don't have a Postal Code.

### Exercise 28 – Using Summary fields in a formula

Create a new report using the Customer table.
Add fields Customer ID, Customer Name, Last Years Sales, and Country
Group by Country
Add summaries to Count Customer ID and Sum Last Years Sales
Select only Australia, Canada, China and Germany.
Preview the report (Click Finish) and switch to design mode.
Save the report under the name 'Summary Formulas'.

Move the grand total (sum) up to the Group Footer.
Preview and note that it has now become a subtotal.
In design, move it back down to the report footer and note that it is a grand total again.
Note, also, that it can't be placed in the Page Header, Page Footer or Detail bands.

Add a "Customer Projection" formula to show a 7% increase for each customer:
The formula should use the Last Year's Sales field and look like this:

{Customer.Last Year's Sales} * 1.07

Place this formula on the detail band.
Create a new formula called "Total Projection"
We want it to calculate a 7% increase on the grand total of the report.
Scroll down the fields listed in the formula editor's fields box.

Look for the fields that have a sigma (**Σ)** in front of them.
Look for sigma fields that say "Report Area".
Double-click the one that says "Sum of  Last Years Sales".
It should put the grand total expression into your formula.
Add the percentage increase so that the formula looks like this:

Sum ({Customer.Last Year's Sales}) * 1.07

Place this on the report footer of the report footer.

Add a "Country Projection" formula to show a 7% increase for each country:
Open the field list and look for the group of fields that have a sigma ( **Σ** ) in front of them.
Look for the pair that says "Group #1".
Double-click the one that says "Sum of  Last Years Sales".
It should put the subtotal expression into your formula.
Add the percentage increase so that the formula looks like this:

Sum ({Customer.Last Year's Sales}, {Customer.Country}) * 1.07

Place this on the Group Footer and preview.
Note that each formula projects based on a different value.

Go into Printer Setup and change the report to Landscape.
Move the Country Projection and Total Projection up to the detail's band.
Note that the Country Projection changes with each group.
Note that the Total Projection is the same all the way through the report.

## Exercise 29- Group selection

Go into the select expert and change the rule to say:
Country  -- is not equal to --USA.

Refresh the data and go to the last page of the report.
Note the number of pages you have and the grand total

Reopen the Select Expert,  and click "New".
Select the subtotal "Group #1 Country, Sum of  Last Year's Sales"
(It will have a Sigma symbol on its left.)
Change the rule to say:
is greater than -- 99000    and click OK.

Preview the report and note that it is about half as long
Only countries with a total over that amount will print.

Reopen the Select Expert and click the "Show Formula" button.
Click the radio buttons to see that the formula is now divided into 2 parts:
Record Selection using data fields.
Group Selection using a subtotal

Also note that the Grand Total didn't change.
Reopen the Select Expert and change the value to **499000.**
Note that the report is much shorter, but that the Total is still the same.

To add an accurate Grand Total, follow the following steps:
Highlight Running Total Fields in the "Field Explorer.
Click the "New" button at the top of the "Field Explorer"
Type "Running Grand" in the first Box, replacing the name "RTotal".
Highlight "Last Years Sales" in the list on the left.
Hit the top arrow button to move the field to the window on the right.
Leave the summary operation at the default value of "Sum".
Click "OK" and place this field onto the Report Footer.
Note that this total prints an accurate total of the groups that print.

Place this field on the detail band to see why it is called a running total.

## Exercise 30 – Formatting Fields

Switch to Design mode.
Right click on the Country field on the Details band and select Format Field
On the Color tab change the Font Color to any other color.
On the Common tab check off Suppress if Duplicated
Click "OK" to see the result of these changes.

Right click Last Year's Sales on the Details Band and select Format Field.
Note the common formats you can select.
Click the 'Customize' button to see more advanced formatting options.
Click "OK" twice when done.

Right click the Print Date in the page header and select Format Field.
Note the common Date formats you have as choices.
Click the 'Customize' button to see more advanced formatting options.
Click "OK" twice when done.

## Adding a Border to an object

Right-click Group 1 Name in the Group Header and select "Format Field"
Click on the Border tab.
Change "None" to "Single" on all four sides.
Leave the border color at black.
Check off the 'Drop Shadow" property.
Put a checkmark in "Background" and select Aqua.
Click "OK" to see the result.

Again, right click Group 1 Name and select Format Field.
Go to the "Border" tab and check "Tight Horizontal".
Click "OK" to see the result (width varies by length of Country).

**Formatting multiple fields**

Switch to Design.
Click on the Group Name in the Group Footer.
Hold the "Shift" key and click on the two subtotals in the Group Footer.
Let go of the shift key and right-click on either subtotal.
Select "Format Objects".
On the Border tab set the top border to 'double' and the bottom to 'single'.
Check the background color and select "Silver".
Click OK and preview the report.   Note that all 3 objects changed color.

## Exercise 31 - Formatting Sections

Open the 'Section Expert' by using menu commands **Report ➜ Section Expert**.
Highlight the Group Footer in the list on the left.
Select the Color tab in the upper right hand corner.
Put a checkmark in the "Background Color" box.
Select a lighter color from the list and click OK to see the result.

## Exercise 32 - Drawing objects

Switch to design mode.
Use the menu options **Insert ➜ Box**
Start the box in the group header, just above and to the left of the Group Name.
Drag the cursor across to the right margin, and down through 2 section pipes.
End the box in the Group Footer, just above the subtotals.
Use the menu options **Format ➜ Box**
Check off "Drop Shadow and select a 'lighter' fill color.
Click "OK" and preview to see the result.
Click on the edge of the box to select it, and hit the delete key to get rid of it.

## Exercise 33 - Special fields

Switch to design mode.
Open the last category in the Field Explorer - called "Special Fields".
Drag the field called "Page N of M" onto the page footer.
Widen your Report footer about 1 inch.
Drag the following 3 items onto the Report footer.
      File Path and Name
      Record Selection Formula
      Group Selection Formula
Preview the report to see what these items print.

## Exercise 34 – Splitting Sections

Create a new report from the Customer table.
Use the fields Customer Name, Contact First Name,
      Last Years Sales, Address1, Address2 and City.
Go to the "Select" step and select only Region equal to "CA"
Preview the report and switch to design mode.
Widen the Detail band to roughly 2 inches.
Use the menu options **Report ➜ Section Expert.**

Highlight the detail section and check "new page after".
Take off the check mark for "free form placement".
Suppress all other sections other than details and click OK.
Place Address 1, Address 2 and City on the 3 lines below Customer Name.
Place the print date two lines below City, like you would in a letter.
Preview and note that some records have an empty space below Address1.

Use the menu options **Report ➡ Section Expert.**
Highlight the detail section.
Click the "Insert" button at the top of the page twice.
You will see Details A, B and C.
Highlight Details C and take off the check mark for "free form placement".
Also add a checkmark in 'suppress blank section.
Highlight Details B and take off the check mark for "free form placement".
Also add a checkmark in 'suppress blank section.
Click "OK"

While in design mode, click on Details A in the gray margin area on the left.
You will see a hand appear as long as you hold the mouse button down.
Drag this section down so that it is below the smaller sections.
Note that it is now called details C.
Widen the new Details A so that it has room for 2 fields, one below the other.
Drag Customer Name up to the top of the new Details A
Drag Address1 to the second line of Details A.
Drag Address2 into Details B (all by itself).
Place City at the top of Details C.
The fields are in the same arrangement as before, but Address2 is by itself.
Preview and note that the empty spaces are gone for records without Address2.

## Exercise 35 - Inserting a large Text Object

Insert a text object below the print date and type in the word Dear.
Click outside the text and size the box to be 5 inches wide and 6 lines deep.
Edit the text object and put a space and a comma after the word Dear.
Hit enter twice to skip 2 lines and type "Your sales for last year were"
Hit the Space bar twice and finish with "and this includes open orders.".
Click outside of this box.

Drag the field Contact First Name over to the text object and don't let go of it.
Notice that when you are directly over the text object, the gray box disappears.
At that point you should see the cursor become a hash mark within the text.
Position this hash mark just before the Comma after the word "Dear" in the text.
Release the field carefully without moving it and it will be embedded into the text.
Preview and you will see each record with the appropriate name in the greeting.

While in preview mode, format the field {Last Years Sales} to be bold with no decimals.
While still in preview, drag the field {Last Years Sales} into the text, right after "were".
Let go when the hash mark is centered between the spaces.
Note that the number is now embedded in each paragraph.