SolidWorks Sketch relations

SolidWorks is a 'parametric' solid modelling software. This means that designs are dimension driven i.e. the geometry can be changed by modifying the dimensions. When changing dimensions it is important that the integrity of the geometry is maintained e.g. lines which are joined must remain joined, vertical lines remain vertical etc. Also when the design is modified it is important that the design changes in a predictable manner. The way the designer intends for the geometry to change in the event of changes in dimension is referred to as 'design intent'. This is achieved by applying appropriate geometric relationships. The following geometric relationships are available in Solid works.

Applying relations
Sketch relations are added by selecting the item or items in question and choosing the appropriate relationship. Solid works presents the user with the available options (a) in the feature manager and (b) in a popup tablet adjacent to the geometry in question.

Many relationships may also be applied by simply dragging and dropping a point of one element onto the appropriate location on another element.

Constraints on a single point
On selecting a point e.g. the end of a line or the centre of a circle. The user is presented with the single option to fix. This locks the point in space.

Constraints between two points
On selection of two points the user has to option to merge (or connect) the points or to apply a horizontal or vertical relationship between them.

Shown opposite are the effects of merged and horizontal relationships.

N.B. to select multiple items select and hold down the ctrl key.
**Constraints between a point and a line**
On selecting a point and a line the user is presented with midpoint and coincident options.

The midpoint option connects the point to a definite midpoint location.

The coincident option however connects the point to anywhere on the line. This allows the point to slide along the line.

**Constraints on a single line**
On selecting a line the user is presented with the options, to make horizontal, make vertical or fix.

Application of the horizontal constraint makes the line horizontal and applies the horizontal constraint symbol. To remove the constraint select and delete the symbol.

**Constraints between line/circle**
Selection of a line and circle makes available the tangent relationship.

Application of the tangent relationship forces the line to point in the direction of, but not necessarily touch, the tangent point. Where this is the case the relationship is represented by a dotted extension of the line.

If it is required for the line to touch the circle at the tangent point, this can be achieved using the extend command. This will result in both a ‘tangent’ and ‘connect’ relationship.

**Constraints between two lines**
On selecting two lines the following relationships are made available, parallel, perpendicular, equal and collinear.

**Constraints between two circles**
On selecting two circles the following relationships are made available, concentric, tangent, equal and coradial.
**Constraints between two lines**
On selecting two lines the user is presented with the following relationships.

The parallel \( \parallel \) relationship forces two lines to be parallel to each other and to maintain this relationship in the event of any modifications.

The perpendicular \( \perp \) relationship forces two lines to be perpendicular to each other and to maintain this relationship in the event of any modifications.

The equals \( = \) relationship force two elements (e.g. lines) to be equal in length. On changing the length of one or other line the other line will change length accordingly.

The collinear \( \in \) relationship forces two lines to be in line with each other and to maintain this relationship in the event of any adjustments.

**Constraints between two circles**
On selecting two circles the user is presented with the following relationships.

The concentric \( \bigcirc \) relationship is used to joint the centres of two circles. Or make the circle centres coincident.

Similarly the equals’ \( = \) relationship can be used to force two circles to be equal in diameter.

The tangent \( \odot \) constraint can be used to cause two circles to become tangential to each other.

The coradial \( \bigodot \) relationship forces two circles to be concentric and equal in diameter i.e. in other words the two circles appear as one.

**Deleting constraints**
To remove a constraint simple select and delete the constraint symbol. Alternately select the entity in question and delete the unwanted constraint from the Existing Relations in the property manager.