Sometimes it is helpful to add lines or segments to a diagram to more easily complete a proof. The following is a list of appropriate justifications for adding different figures to a diagram.

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| **Diagram** | **Statement** | **Reason** |
|  | Add Point *A* | Two lines intersect in exactly one point |
|  |  |  |
|  | Draw auxiliary | Between any two points there is exactly one line |
|  |  |  |
|  | Add Midpoint *D* | Ruler Postulate |
|  |  |  |
|  | Draw angle bisector | Protractor Postulate |
|  |  |  |
|  | Draw perpendicular segment | Perpendicular Postulate: through a point outside a line there is exactly one line perpendicular to the given line |
|  |  |  |
|  | Draw parallel line | Parallel Postulate: through a point outside a line there is exactly one line parallel to the given line |

Be cautious when combining any of the above statements. For example, you can guarantee that an auxiliary line is perpendicular to a given segment, but you cannot always guarantee that it will be the perpendicular bisector of the segment.

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| --- | --- |
| **Correct:**    Construct midpoint *D* using the Ruler Postulate  Construct perpendicular  using the Perpendicular Postulate | **Incorrect:**  Construct perpendicular bisector using the Ruler Postulate and the Perpendicular Postulate.  🡪🡨 can be a segment bisector OR a perpendicular segment, but there is no guarantee that it is BOTH. In other words, point *D* may very well be a midpoint, but that does not insure that  must be perpendicular to  and visa versa. |

Draw the indicated auxiliary, then write the reason justifying its construction.

|  |  |
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| 1. Draw aux.   Reason:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1. Add point *R* so that  is an angle bisector.   Reason:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |
| 1. Add aux. perpendicular to.   Reason:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | 1. Draw aux. parallel to.   Reason:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |