Upon completion of the procedure, the caller procedure must restore any saved non-preserved registers and adjust the stack point (**$sp**) as necessary if any arguments were passed on the stack.

Note, for floating-point arguments appearing in registers you must allocate a pair of registers (even if it's a single precision argument) that start with an even register.

8.4 Linkage

The term ***linkage*** refers to the basic process of getting to a procedure and getting back to the correct location in the calling routine. This does not include argument transmission, which is addressed in the next section.

The basic linkage operation uses the **jal** and **jr** instructions. Both instructions utilize the $ra register. This register is set to the return address as part of the procedure call.

The call to a procedure/function requires the procedure/function name, generically labeled as <procName>, as follows:

```
jal     <procName>
```

The **jal**, or jump and link, instruction, will copy the **$pc** into the **$ra** register and jump to the procedure <procName>. Recall that the **$pc** register points to the next instruction to be executed. That will be the instruction immediately after the call, which is the correct place to return to when the procedure/function has completed.

If the procedure/function does not call any other procedures/functions, nothing additional is required with regard to the **$ra** register.

A procedure that does not call another procedure is referred to as a "leaf procedure". A procedure that calls another procedure is referred to as a "non-leaf procedure".

The return from procedure is as follows:

```
jr      $ra
```

If the procedure/function calls yet another procedure/function, the **$ra** must be preserved. Since **$ra** contains the return address, it will be changed when the procedure/function calls the next procedure/function. As such, it must be saved and restored from the stack in the calling procedure. This is typically performed only once at the beginning and then at the end of the procedure (for non-leaf procedures).

Refer to the example programs for a more detailed series of examples that demonstrate the linkage.