JCL

Chapter b2
Introducing procedures

Job Control Language

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Job Control Language

Chapter b1. Using special DD statements

Chapter b2. Introducing procedures

Chapter b3. Modifying EXEC parameters

Chapter b4. Modifying DD parameters

Chapter b5. Determining the effective JCL

Chapter b6. Symbolic parameters

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Job Control Language

Chapter c1. Nested procedures

Chapter c2. Cataloging procedures

Chapter c3. Using utility programs

Chapter c4. Sample utility application

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Chapter b2

Introducing procedures

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Unit introduction.

JCL programmers often use procedures (pre-coded JCL) to avoid repetitive coding of information and as a time saving technique.

This unit describes cataloged and in-stream procedures and their advantages. The unit further explains how to identify a procedure definition in the job stream. The unit ends by discussing how to execute a procedure.

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Introducing procedures.

Course objectives.

Be able to:

- **Define the terms procedure, cataloged procedure and in-stream procedure.**

- **Specify where a procedure can be located.**

- **Specify when to use an in-stream procedure and when to use a cataloged procedure.**

- **Identify the JCL statements that define an in-stream Procedure.**

- **Code the JCL to obtain a procedure listing.**

- **Code a statement to invoke a procedure.**

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What is a procedure?

Procedure.

What is a procedure?

A procedure is a pre-coded set of JCL statements with a unique name.

JCL statements that are used by several users or used repeatedly are placed in a procedure. Use of procedures not only saves time but also avoids errors.

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What is a procedure?

Using procedures.

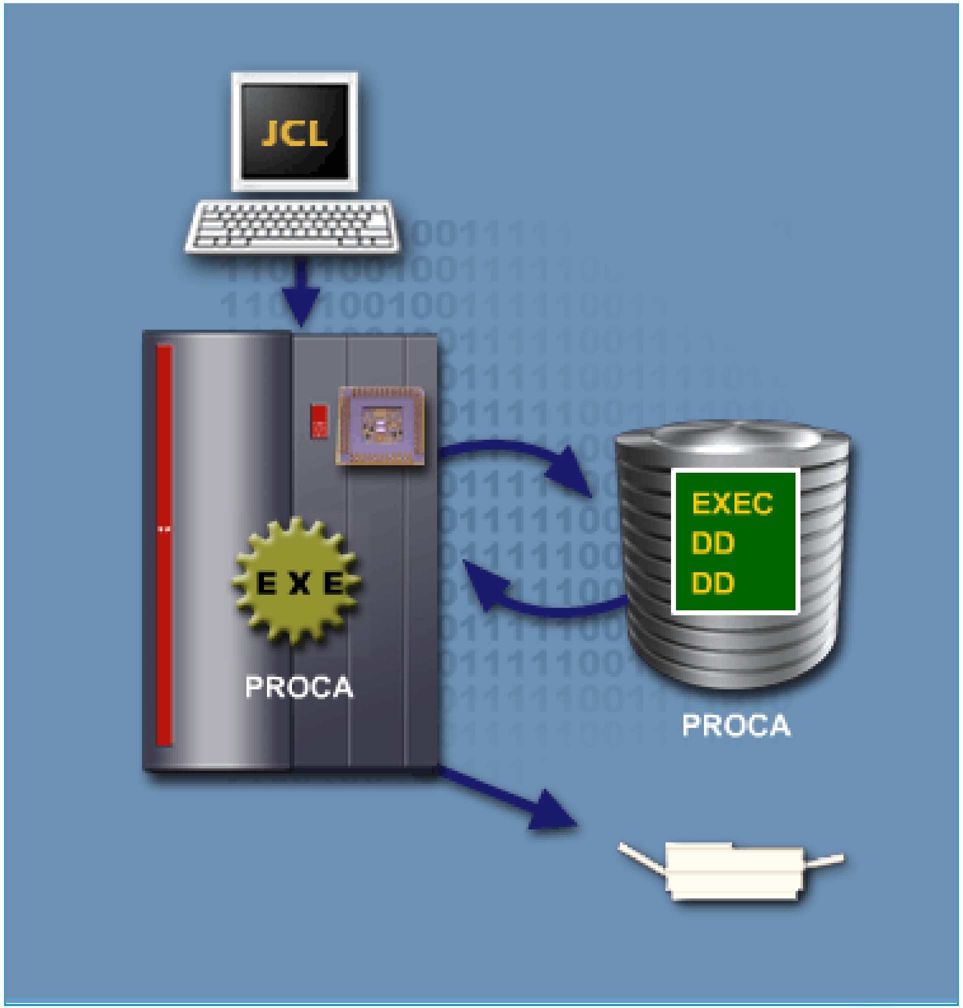
How does a procedure work?

A procedure is brought into a job stream at the appropriate place to perform its function with an EXEC statement that refers to it by its name.

In the example shown, a procedure called PROCA is invoked.

```
//JSTEP   EXEC     PROCA
```

This line executes the procedure PROCA.



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Using procedures.

Most installations have pre-coded procedures that enable you to perform compiles, link edits and tests quickly and easily.

To use pre-coded procedures, the code must contain the following statements:

- A single EXEC statement that invokes the procedure.
- A DD statement to identify the source program in case of compiles.
- DD statements for the test data.

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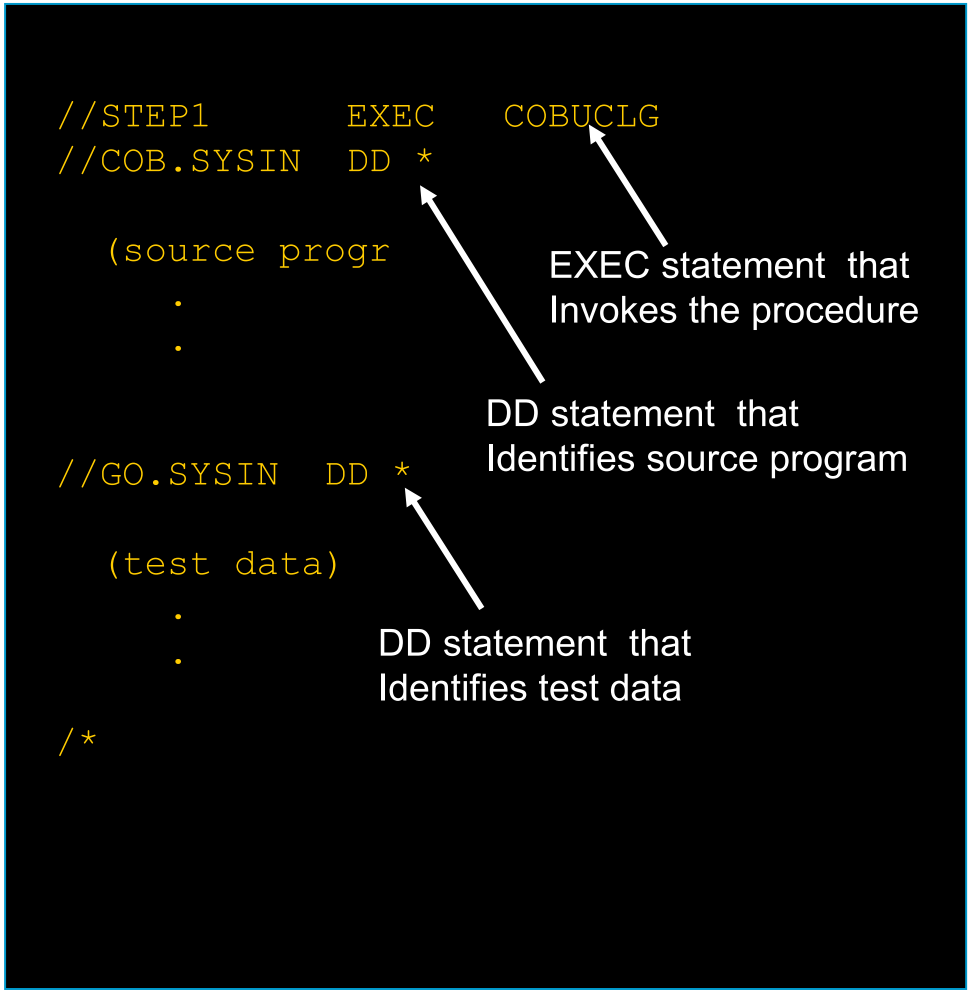
Procedure – an example.

The example shown on the right shows a job stream to invoke a procedure named COBUCLG that may be available to help compile,

link edit, and test COBOL program.



```
//STEP1        EXEC    COBUCLG
//COB.SYSIN    DD *

     (source progr
         .
         .


//GO.SYSIN   DD *

     (test data)
         .
         .

/*
```

EXEC statement that
Invokes the procedure

DD statement that
Identifies source program

DD statement that
Identifies test data

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Advantages of a procedure.

Advantages of using a procedure are:

- Procedures can greatly simplify JCL.
- Procedures help in maintaining complex or lengthy JCL.
- Procedures help you to standardize data set and program usage.

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Are we on track?

Which of the following are advantages of using procedures?

A. They simplify the JCL you have to code for a job.

B. They permit standardization of data set and program usage.

C. They enable you to copy parameter values from previous DD statements.

D. They permit easier maintenance of JCL.

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What is a procedure?

Glossary.

Procedure
Prepared sets of job control statements cataloged in a procedure library.

Compile
To translate source language statements into machine instructions.

Link Edit
To combine subroutines into executable program called a load module.

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Cataloged and In-Stream procedures.

Cataloged procedures.

A procedure is referred to as either a cataloged procedure or an in-stream procedure depending upon where it is defined.

What are cataloged procedures?

Cataloged procedures are stored as members of a partitioned data set that is used as a procedure library.

When a cataloged procedure is used, its JCL is taken from the default procedure library, or a user-specified procedure library.

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Invoking a cataloged procedure.

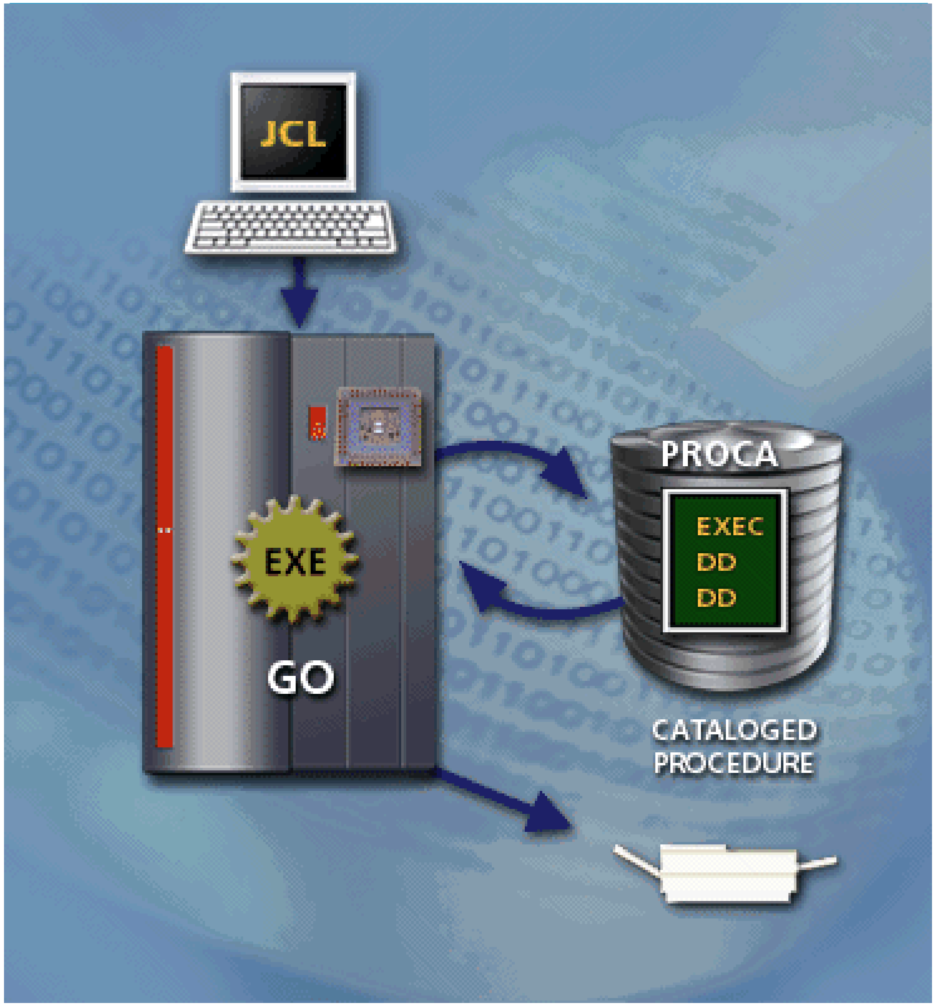
The JCL for a cataloged procedure is invoked with a single EXEC statement. Consider a procedure by name PROCA. This can be invoked in two ways:

Precede the name of the procedure with PROC=

```
//GO        EXEC PROC=PROCA
```

Or by directly specifying the procedure name.

```
//GO        EXEC PROCA
```



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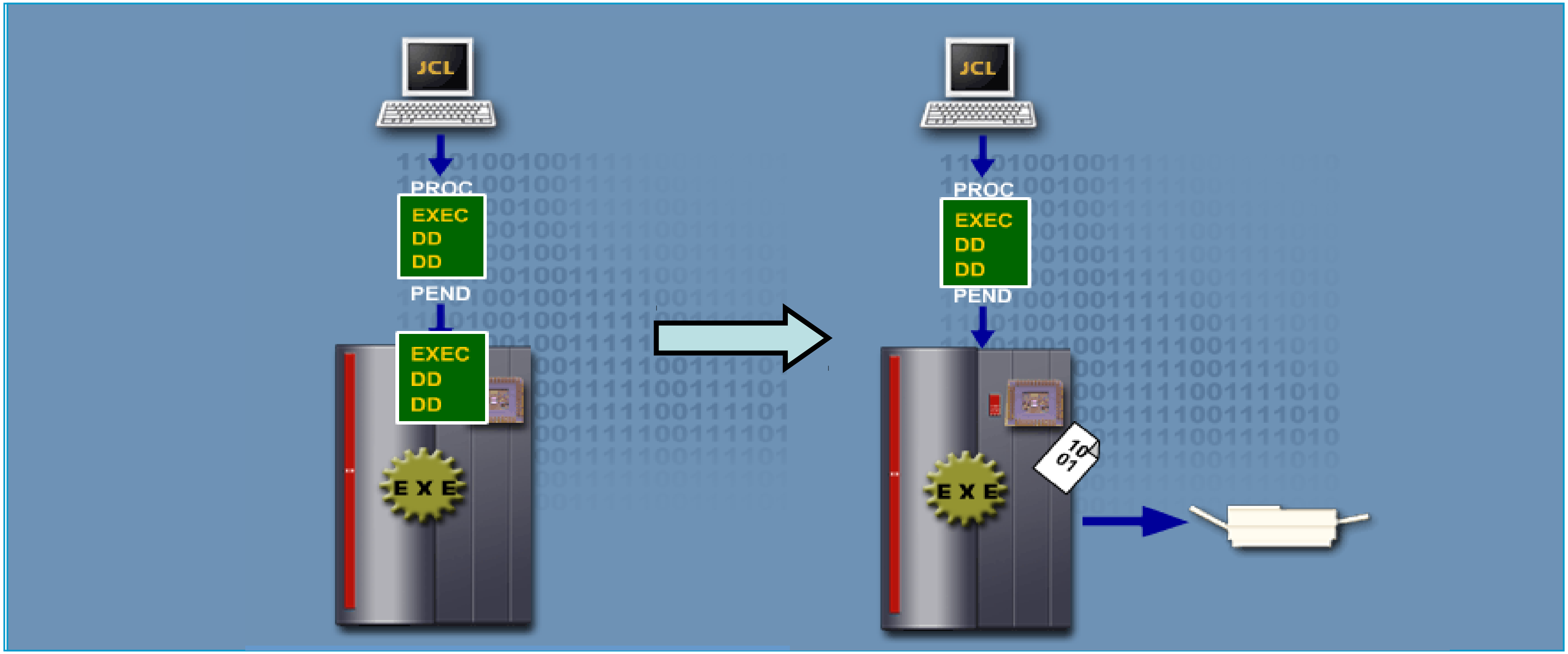
Cataloged and In-Stream procedures.

In-Stream procedures.



In-stream procedures are identical to cataloged procedures, except that they are placed along with the job in the input stream. When the procedure is invoked, the JCL in the procedure definition is inserted at the invocation point in the job stream itself.

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Invoking an In-Stream procedure.

The following points must be considered while using an in-stream procedure:

- The JCL for an in-stream procedure is defined within the job stream itself.

- In-stream procedures begin with a PROC statement and are terminated by a PEND statement.

- The in-stream procedure is placed following the JOB statement but before the first EXEC statement.

- The JCL of an in-stream procedure is merged into the executable portion of the job when an EXEC statement invokes the procedure.

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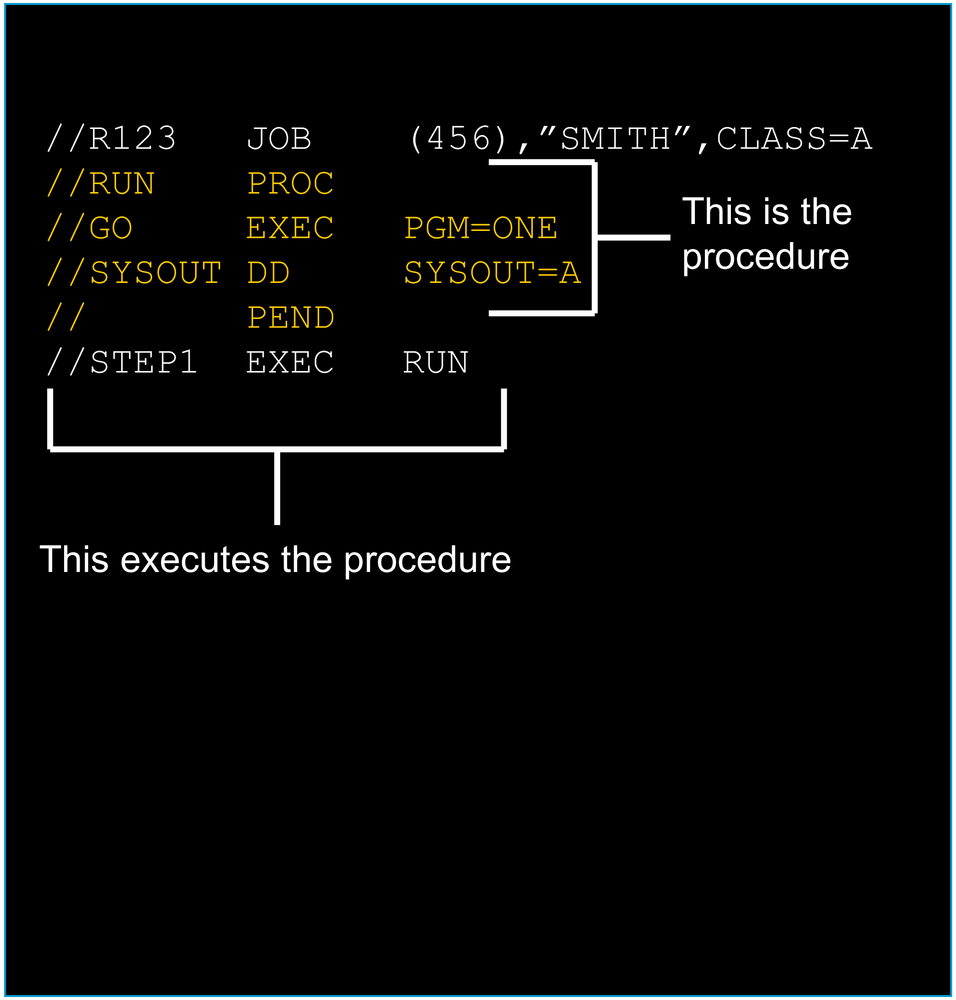
Cataloged and In-Stream procedures.

In-Stream procedure – an example.

The example shown on the right is an in-stream procedure named RUN.

Note that PROC begins the procedure and PEND ends it. The procedure is invoked by the first EXEC statement.



```
//R123   JOB    (456),”SMITH”,CLASS=A
//RUN    PROC
//GO     EXEC   PGM=ONE
//SYSOUT DD     SYSOUT=A
//       PEND
//STEP1  EXEC   RUN
```

This is the procedure

This executes the procedure

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Choosing the right procedure.

When to use an in-stream procedure?

If a procedure is just created and has to be tested for errors, an in-stream procedure can be used.

When to catalog a procedure?

If a thoroughly tested procedure needs to be used by many people, it is cataloged for subsequent retrieval.

A cataloged procedure is easy to retrieve and maintain.

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Are we on track?

Match the following items with their definitions.

1. Procedure

2. Cataloged procedure

3. In-stream procedure

A. A procedure that is defined in the job stream.

B. Pre-coded JCL, with a unique name, which consists of one or more steps.

C. A procedure that is stored in a procedure library.

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Cataloged and In-Stream procedures.

Are we on track?

The following are situations in which you might use a procedure. Match the situations with the type of procedures that would be appropriate.

1. Testing a new procedure
2. Many people will use the procedure

A. An in-stream procedure.

B. A cataloged procedure.

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Cataloged and In-Stream procedures.

Are we on track?

A(n) ________________ procedure is stored as a member of a partitioned data set.

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Cataloged and In-Stream procedures.

Glossary.

JCLLIB

A statement that enables you to specify your own library for locating cataloged procedures.

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In-Stream procedure.

How to identify an in-stream procedure?

An in-stream procedure can be identified by the statements PROC and PEND.

The function of the PROC statement is to isolate the in-stream procedure definition from the rest of the JCL statements for a job.

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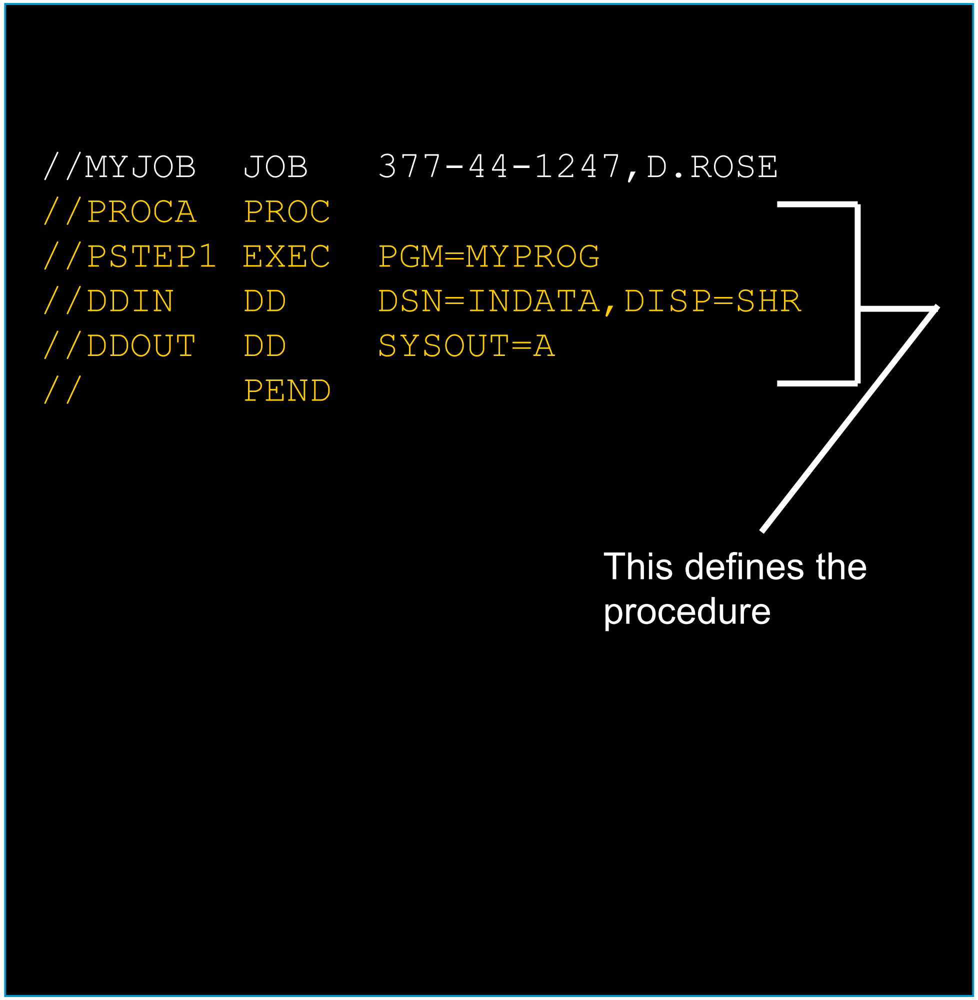
Identifying In-Stream procedures.

PROC statement.

The PROC statement identifies the name by which the procedure is invoked.

For example, the PROC statement to identify the beginning of an in-stream procedure named PROCA is:

//PROCA PROC



```
//MYJOB   JOB   377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC  PGM=MYPROG
//DDIN    DD    DSN=INDATA,DISP=SHR
//DDOUT   DD    SYSOUT=A
//        PEND
```

This defines the procedure

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Identifying In-Stream procedures.

PEND statement.

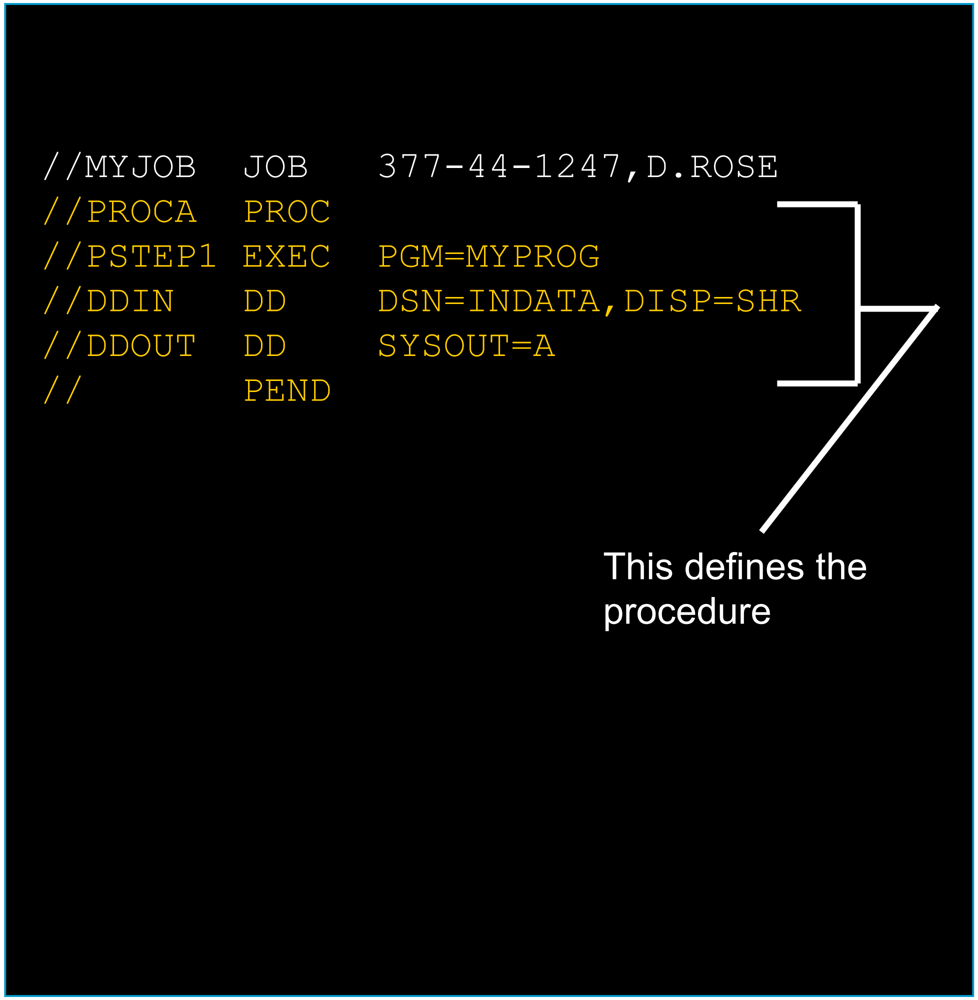
The PEND statement immediately follows an in-stream procedure definition.

It can be used with or without a name.

```
//                PEND
```

or

```
//ENDPROC         PEND
```



```
//MYJOB  JOB   377-44-1247,D.ROSE
//PROCA  PROC
//PSTEP1 EXEC  PGM=MYPROG
//DDIN   DD    DSN=INDATA,DISP=SHR
//DDOUT  DD    SYSOUT=A
//       PEND
```

This defines the procedure

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Identifying In-Stream procedures.

Are we on track?

Enter the JCL statement that begins an in-stream procedure

______________.

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Identifying In-Stream procedures.

Are we on track?

Which of the following begins an in-stream procedure and isolates it from the rest of the job stream?

A. A PROC statement.

B. A PEND statement.

C. A procedure step.

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Identifying In-Stream procedures.

In-Stream procedure definition.

An in-stream procedure definition can be included anywhere within a job stream following the JOB statement, but it must precede the EXEC statement that invokes the procedure.

Generally, the definitions for an in-stream procedure are placed at the beginning of the job stream.

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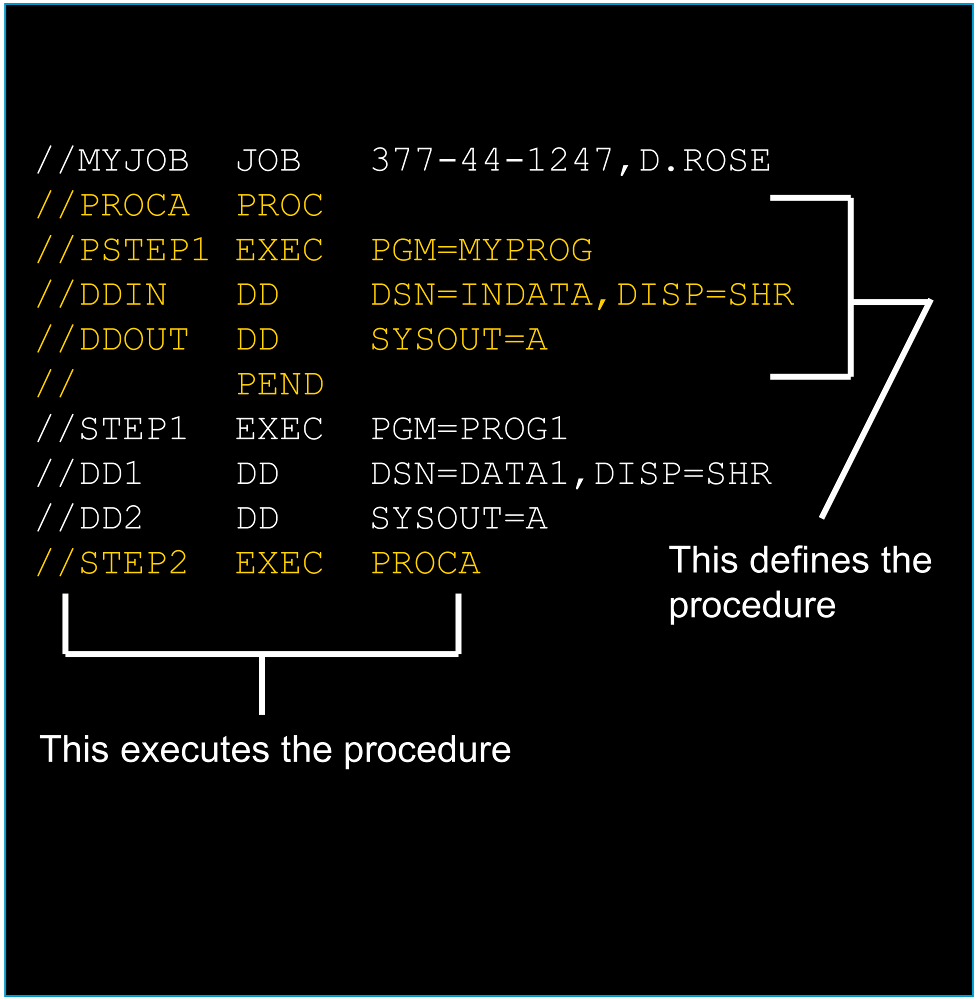
Identifying In-Stream procedures.

In-Stream procedure – an example.

The example on the right shows a job stream that contains an in-stream procedure definition named PROCA.

The JCL between the PROC and PEND statements defines the procedure. The EXEC statement that refers to the procedure name executes it.



```
//MYJOB   JOB    377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1 EXEC   PGM=MYPROG
//DDIN    DD     DSN=INDATA,DISP=SHR
//DDOUT   DD     SYSOUT=A
//        PEND
//STEP1   EXEC   PGM=PROG1
//DD1     DD     DSN=DATA1,DISP=SHR
//DD2     DD     SYSOUT=A
//STEP2   EXEC   PROCA
```

This defines the procedure

This executes the procedure

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Identifying In-Stream procedures.

Are we on track?

Refer to the procedure for MYJOB shown below

```
//MYJOB   JOB    377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC   PGM=MYPROG
//DDIN    DD     DSN=INDATA,DISP=SHR
//DDOUT   DD     SYSOUT=A
//        PEND
//STEP1   EXEC   PGM=PROG1
//DD1     DD     DSN=DATA1,DISP=SHR
//DD2     DD     SYSOUT=A
//STEP2   EXEC   PROCA
```

Which of the following EXEC statements invokes the procedure?

A. //STEP2 EXEC PROCA
B. //STEP1 EXEC PGM=PROG1
C. //PSTEP1 EXEC PGM=MYPROG

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Identifying In-Stream procedures.

Procedure definition.

A procedure definition may have several procedure steps. Each step consists of the following:

- An EXEC statement that identifies a program to be executed.

- The DD statements required to define the data sets to be used or created by the program.

```
//MYJOB   JOB   377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC  PGM=MYPROG
//DDIN    DD    DSN=INDATA,DISP=SHR
//DDOUT   DD    SYSOUT=A
//PSTEP2  EXEC  PGM=MYPROG2
//* COMMENT
//DDIN    DD    DSN=INDATA2,DISP=SHR
//        PEND
//STEP1   EXEC  PGM=PROG1
//DD1     DD    DSN=DATA1,DISP=SHR
//DD2     DD    SYSOUT=A
//STEP2   EXEC  PROCA
```

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In-Stream procedure definition – an example.

The in-stream procedure definition on the right contains the following two procedure steps:

- PSTEP1, which executes a program named PROG1.
- PSTEP2, which executes a program named PROG2.

The DD statements that follow define the data sets that will be created by the program.

```
//TRANSACT PROC
//PSTEP1 EXEC  PGM=PROG1
//DD1 DD DSN=INTRAN,DISP=SHR
//DD2 DD DSN=MASTER,DISP=SHR
//DD3 DD SYSOUT=A
//DD4 DD DSN=&&VALID,UNIT=SYSDA,
// DISP=(NEW,PASS),SPACE-(TRK,(1,1))
//PSTEP2 EXEC  PGM=PROG2
//DD5    DD  DSN=&&VALID,DISP=(OLD,DELETE)
//DD6    DD  SYSOUT=A
//       PEND
```

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Identifying In-Stream procedures.

Are we on track?

Which of the following can be part of a procedure definition?

A. PROC statement

B. EXEC statement invoking the same procedure

C. Procedure step DD statements

D. PEND statement

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Are we on track?

Following are JCL statements from a sample job stream containing an in-stream procedure. Place the statements in the correct order.

```
A. //PSTEP1   EXEC   PGM=MYPROG
B. //STEP1    EXEC   PROCA
C. //PROCA    PROC
D. //MYJOB    JOB    337-44-1247,D.ROSE
E. //         PEND
F. //DDIN     DD     DSN=INDATA,DISP=SHR
G. //DDOUT    DD     SYSOUT=A
```

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Identifying In-Stream procedures.

Are we on track?

Match the following terms with their descriptions:

1. Procedure definition.
2. Effective JCL.
3. Procedure step.

A. The JCL in a procedure definition combined with the JCL you code.

B. Pre-coded JCL with a unique name, which consists of one or more job steps.

C. A job step within a procedure.

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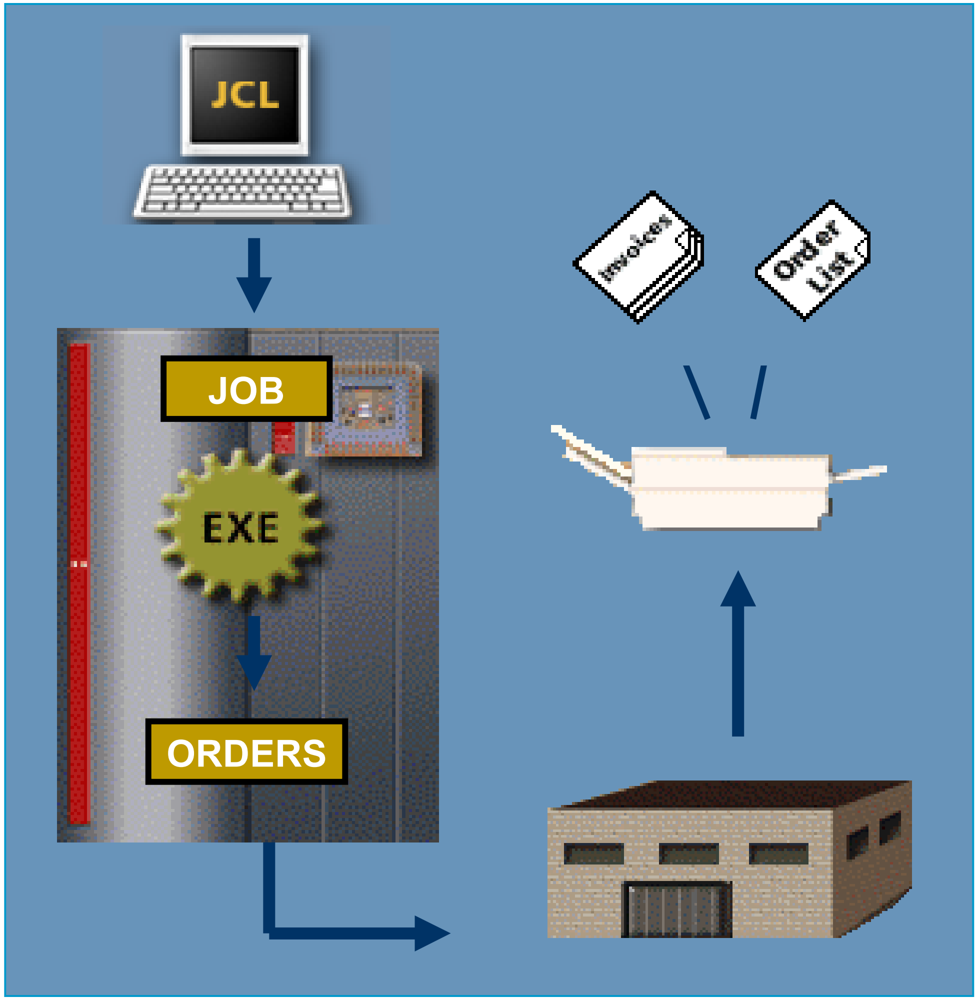
Design a basic procedure – an example.

The screen on the right illustrates the example where each week, a department produces a transaction file named INTRAN that contains new customer orders for the week.

A list of orders to be filled is sent to the warehouse and an invoice is sent to each customer.

The order list and associated invoice are printed once a week.



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Design a basic procedure – an example.

You are asked to create a procedure named TRANSACT to accomplish the following task:

- **Invoke a program named PROG1 – This checks input transactions against a master customer list to determine if each transaction applies to a valid customer. PROG1 then writes any rejected transactions to a transaction exception report. It writes all valid transactions to a temporary data set that is passed to PROG2.**

- **Invoke a program named PROG2 – This processes the valid transactions passed to it from PROG1 and creates an order list/invoice for each customer.**

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Designing procedures.

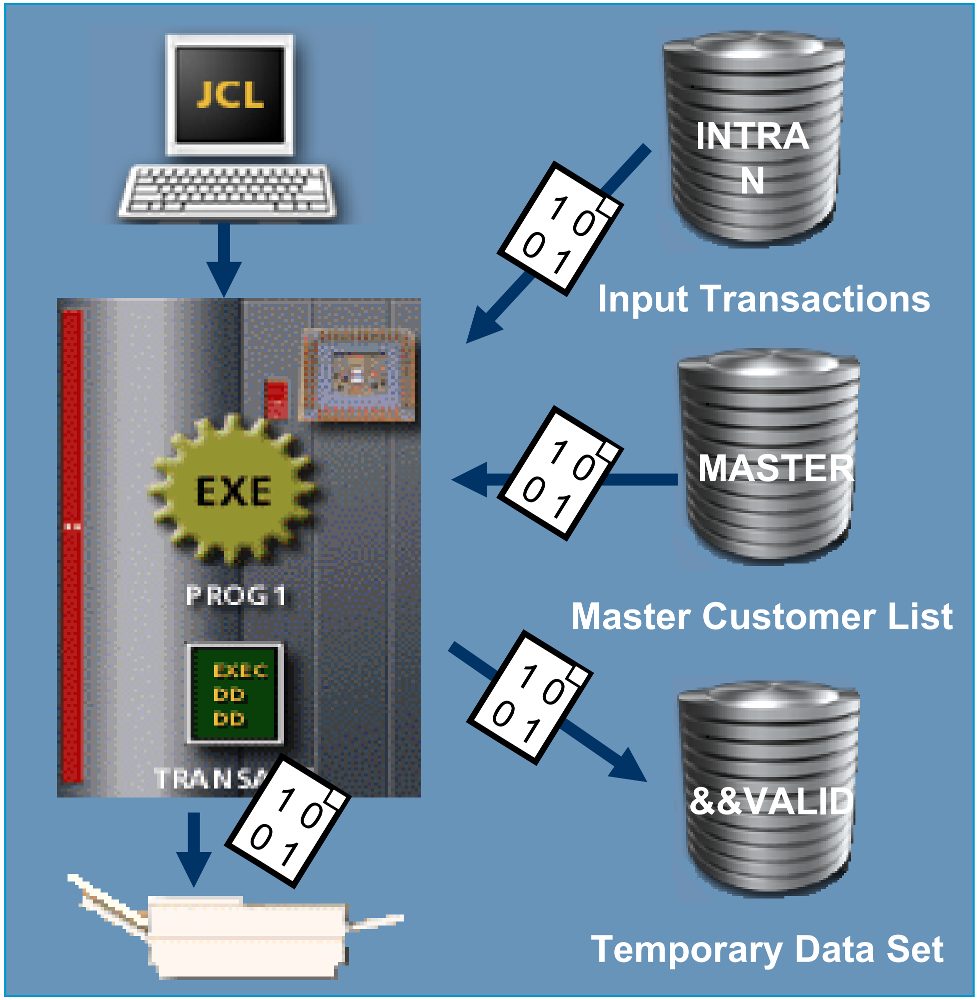
Design a basic procedure – PROG1 data sets.

PROG1 uses the following data sets:

- The input transactions are in a cataloged data set INTRAN. PROG1 uses the DDname DD1.
- The master customer list is in a cataloged data set MASTER. PROG1 uses the DDname DD2.
- The transaction exception report is to be created as SYSOUT class A output {DDname DD3}.
- Valid transactions go to a temporary data set to be passed to PROG2 {Ddname DD4}. The temporary data set should be named &&VALID and space allocated for it

on a SYSDA unit. Use single-track primary

and secondary space allocation



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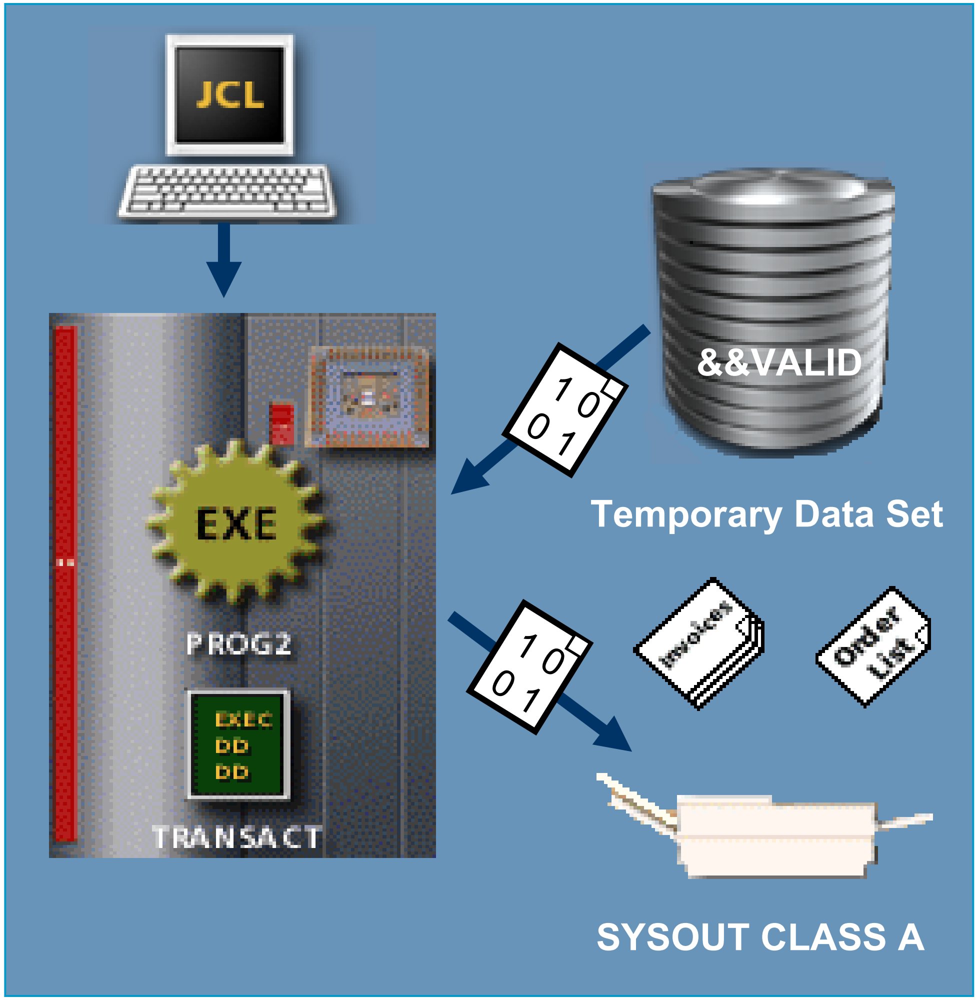
Design a basic procedure – PROG2 data sets.

PROG2 uses the following data sets:

- The valid transactions passed from PROG1 are in a temporary data set named &&VALID. PROG2 uses the DDNAME DD5.
- The order list/invoice for each customer is created as SYSOUT class A output. PROG2 uses the DDNAME DD6.



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Designing procedures.

Are we on track?

Which of the following are characteristics of an effective procedure?

A. It executes the required programs in the needed order.

B. It contains few DD specification, enabling the user to add these later.

C. It specifies the data sets required for each program.

D. It requires a minimum of runtime adaptations.

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Designing procedures.

Are we on track?

Which of the following statements could be included in a procedure definition?

```
A. //MYJOB   JOB    377,DEPT50

B. //STEP1   EXEC   PGM=A

C. //DD2     DD     DATA

D. /*

E. //DD3     DD     DSN=MYDATA,DISP=SH

F. //DD4     DD     SYSOUT=A

G. //
```

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Designing procedures.

Are we on track?

In coding the JCL for the previous TRANSACT procedure, how many DD statements would you require?

A. Two

B. Four

C. Five

D. Six

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Are we on track?

Match the name of data sets required for TRANSACT with the data set description:

1. INTRAN **A. A temporary data set that is output for PROG1 and input for PROG2.**

2. MASTER **B. A cataloged data set with the master customer list.**

3. &&VALID **C. Printed output of the customer order list and invoices.**

4. SYSOUT **D. A cataloged data set with weekly transactions.**

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Are we on track?

Complete the JCL statements to fulfill the requirements of the sample application, as follows:

```
1. //PSTEP1 EXEC PGM=PROG1
2. //DD1    DD   __________ DISP=SHR
3. //DD2    DD   __________ DISP=SHR
4. //DD3    DD   SYSOUT=A
5. //DD4    DD   ______DISP=(NEW,PASS),UNIT=SYSDA,SPACE=(TRK,(1,1))
6. //PSTEP2 EXEC __________
7. //DD5    DD   DSN=&&VALID,DISP=(OLD,DELETE)
8. //DD6    DD   SYSOUT=A
```

In line 2, identify the input data set named DD1, used by PROG1
In line 3, identify the input data set named DD2, used by PROG1
In line 5, identify the temporary data set named DD4
In line 6, identify the program executed in PSTEP2

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Cataloging.

What is cataloging?

Once an in-stream procedure is tested, it can be cataloged for general use. Cataloging means storing it in a procedure library (PDS) using a utility program.

Once an in-stream procedure has been cataloged, the EXEC statement that invokes this procedure refers to it by its member name in the procedure library.

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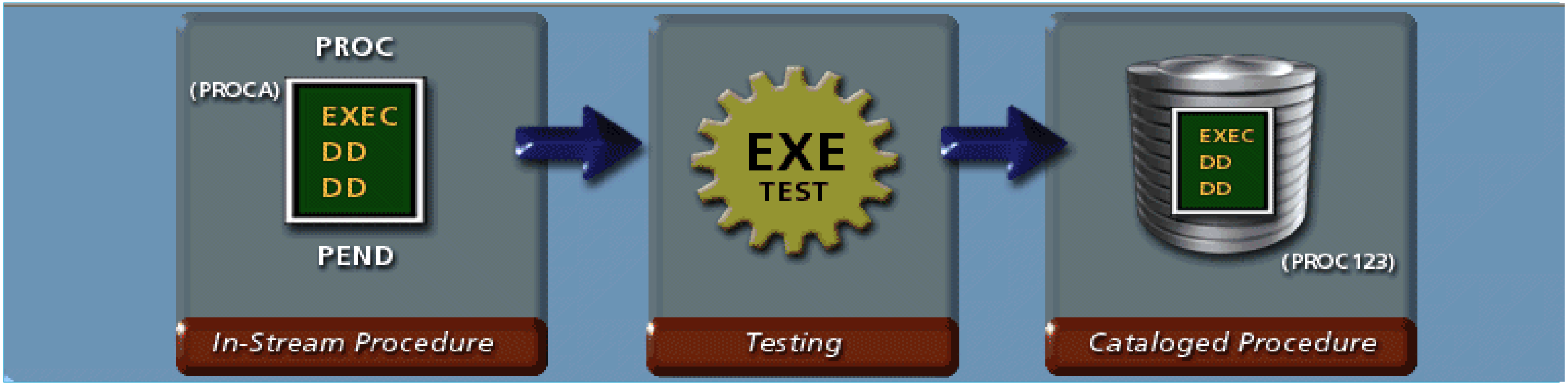
Cataloging – an example.



In the example, notice that the procedure name PROCA changes to the member name PROC123 once the procedure is cataloged.

Users must then invoke the procedure using the name PROC123.

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Obtaining a procedure listing.

Overview.

Before a procedure is used, the user should obtain a JCL listing and examine its contents to ensure that it meets the processing requirements.

The user must determine that the procedure being used executes the right programs in the proper sequence, using appropriate data sets.

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Obtaining a procedure listing.

Procedure listing.

How to obtain a procedure listing?

A procedure listing can be obtained using one of the following methods:

- Use the IEBGENER utility.

- Use the IEBPTPCH utility.

- Execute a job and include the TYPRUN=SCAN parameter on the JOB statement. Then, within the job stream, include an EXEC statement that refers to the procedure to be listed.

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Obtaining a procedure listing.

Procedure listing – an example.

The following example shows how to use TYPRUN=SCAN to obtain a listing of a cataloged procedure named PROCB.

```
//MYJOB    JOB    377-42-1247,D.ROSE,
//                TYPRUN=SCAN,MSGLEVEL=(1,1)
//JSTEP    EXEC   PROCB
```

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Obtaining a procedure listing.

Are we on track?

You can get a procedure listing by coding _____________ on the JOB statement of a job that invokes the procedure.

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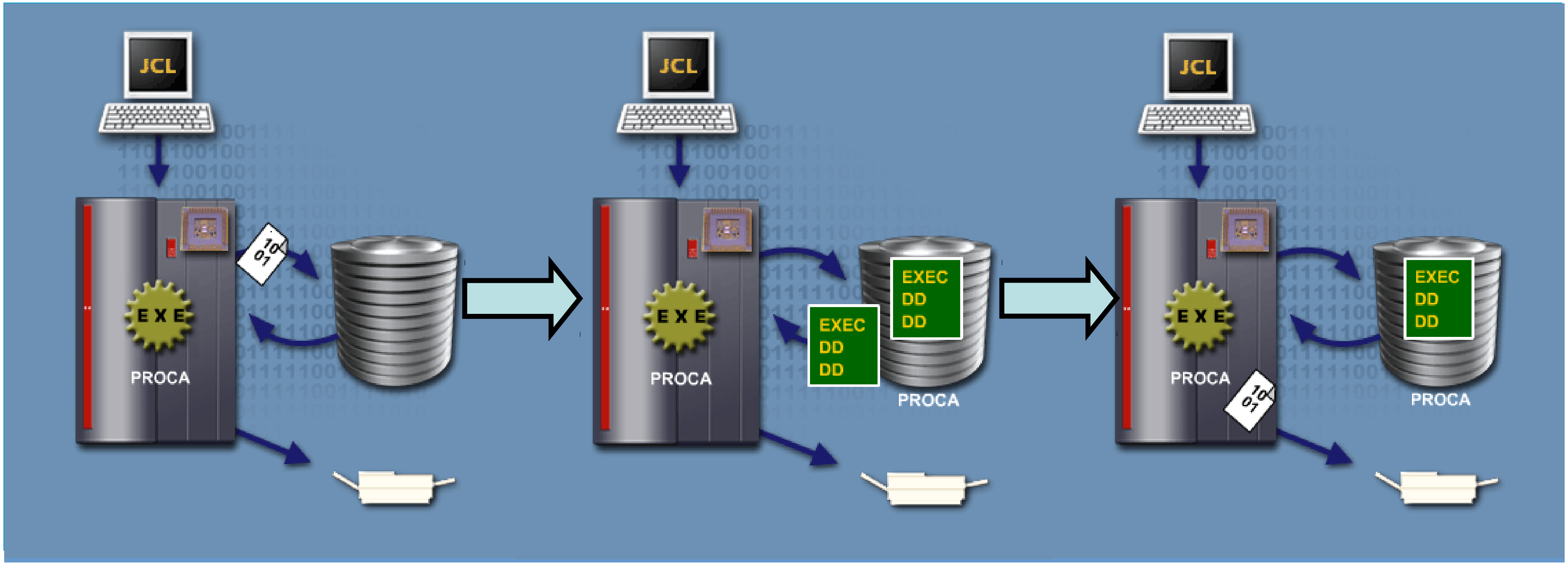
Invoking a procedure.



A procedure is invoked with an EXEC statement that identifies the procedure by name.

The example shown invokes a procedure named PROCA.

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Invoking a procedure.

Procedure name.

To invoke the procedure PROCA the following statement can be used:

```
//JSTEP1      EXEC   PROC=PROCA
```

In another way of invoking a procedure, the programmer can omit PROC= in the EXEC statement. In this format only procedure name is given. In the example considered, the procedure PROCA can also be invoked in the following way:

```
//JSTEP1      EXEC   PROCA
```

How to obtain the procedure name to specify in the EXEC statement ?

For an in-stream procedure, the procedure name would be the name identified in the PROC statement.
For a cataloged procedure, the procedure name would be the name under which the procedure was cataloged.

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Invoking a procedure.

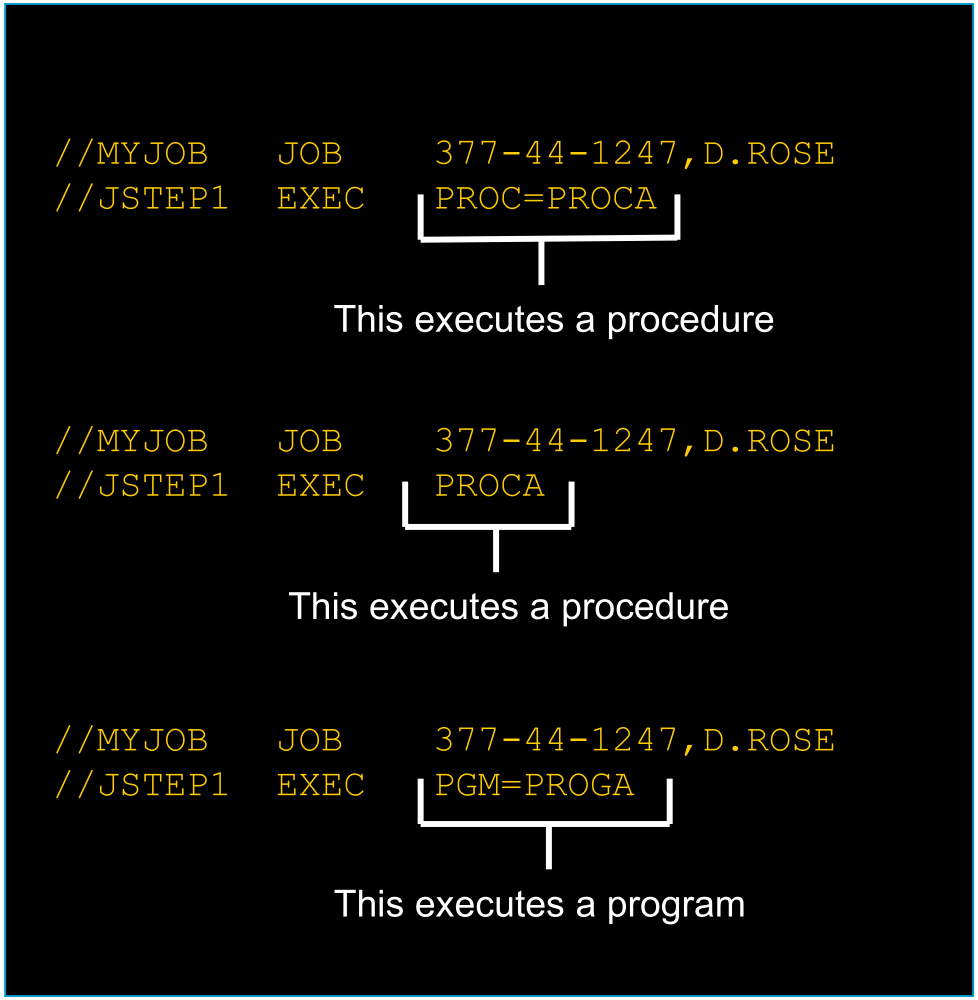
Invoking a program.

What is the difference between invoking a procedure and a program?

To invoke a procedure the keyword parameter PROC= can be used or it can be omitted. However, to invoke a program, the keyword parameter PGM= must be used.

Consider the examples shown on the right:

The first two examples invoke a procedure. The third one invokes a program.



```
//MYJOB    JOB     377-44-1247,D.ROSE
//JSTEP1   EXEC    PROC=PROCA
```

This executes a procedure

```
//MYJOB    JOB     377-44-1247,D.ROSE
//JSTEP1   EXEC    PROCA
```

This executes a procedure

```
//MYJOB    JOB     377-44-1247,D.ROSE
//JSTEP1   EXEC    PGM=PROGA
```

This executes a program

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Invoking a procedure.

Are we on track?

Code a statement to invoke a procedure named XYZ:

//STEPNAME ________.

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Unit summary.

Now that you have completed this unit, you should be able to:

- **Define the terms procedure, cataloged procedure and in-stream procedure.**
- **Specify where a procedure can be located.**
- **Specify when to use an in-stream procedure and when to use a cataloged procedure.**
- **Identify the JCL statements that define an in-stream procedure.**
- **Code the JCL to obtain a procedure listing.**
- **Code a statement to invoke a procedure.**

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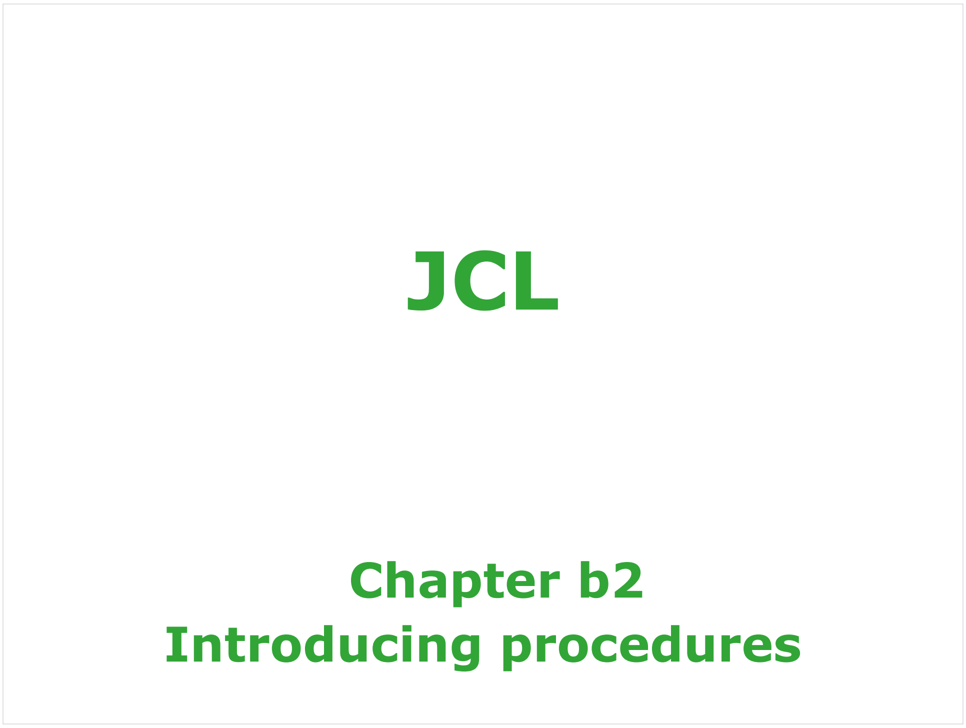

JCL

Chapter b2
Introducing procedures

Job Control Language

Chapter a1. Introduction to JCL

Chapter a2. Coding JOB statements

Chapter a3. Coding EXEC statements

Chapter a4. Coding DD statements

Chapter a5. Analyzing job output

Chapter a6. Conditional processing

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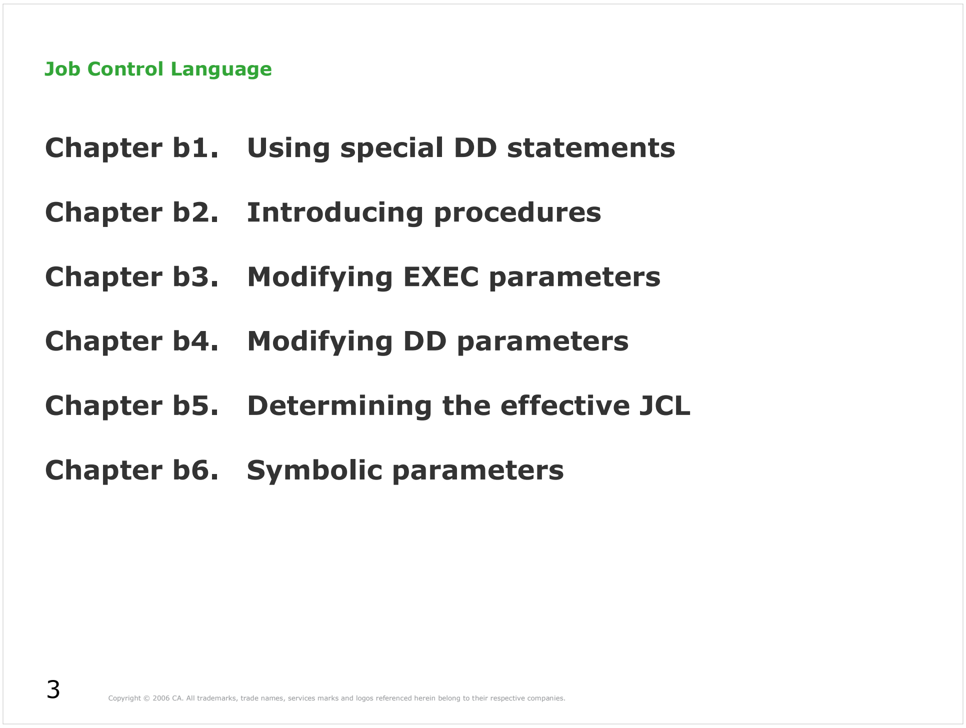

Job Control Language

Chapter b1. Using special DD statements

Chapter b2. Introducing procedures

Chapter b3. Modifying EXEC parameters

Chapter b4. Modifying DD parameters

Chapter b5. Determining the effective JCL

Chapter b6. Symbolic parameters

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Job Control Language

Chapter c1. Nested procedures

Chapter c2. Cataloging procedures

Chapter c3. Using utility programs

Chapter c4. Sample utility application

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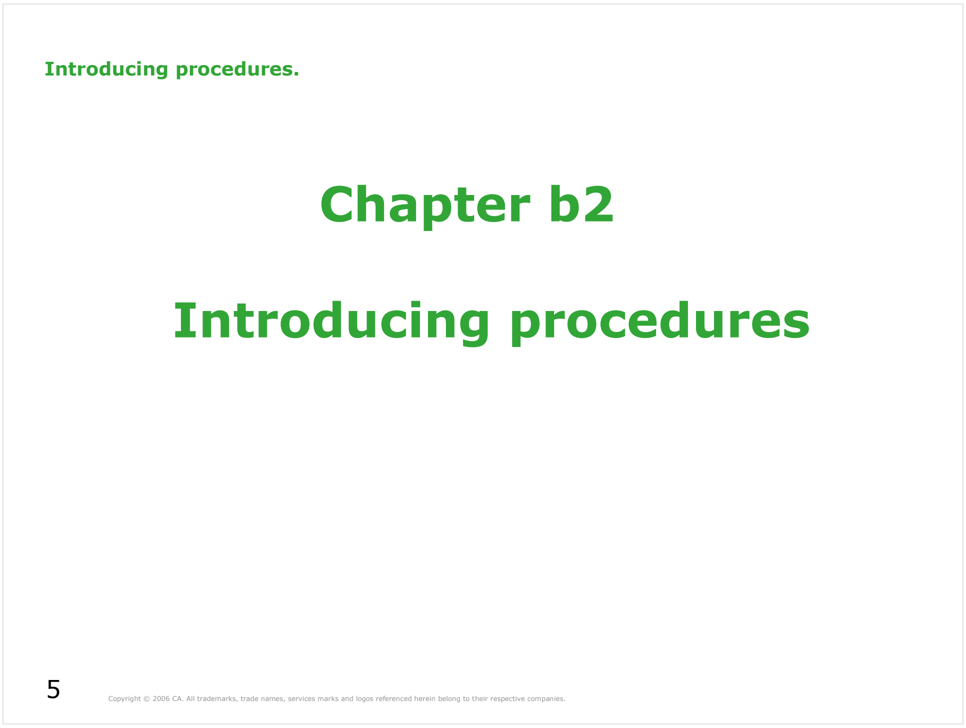

Chapter b2

Introducing procedures

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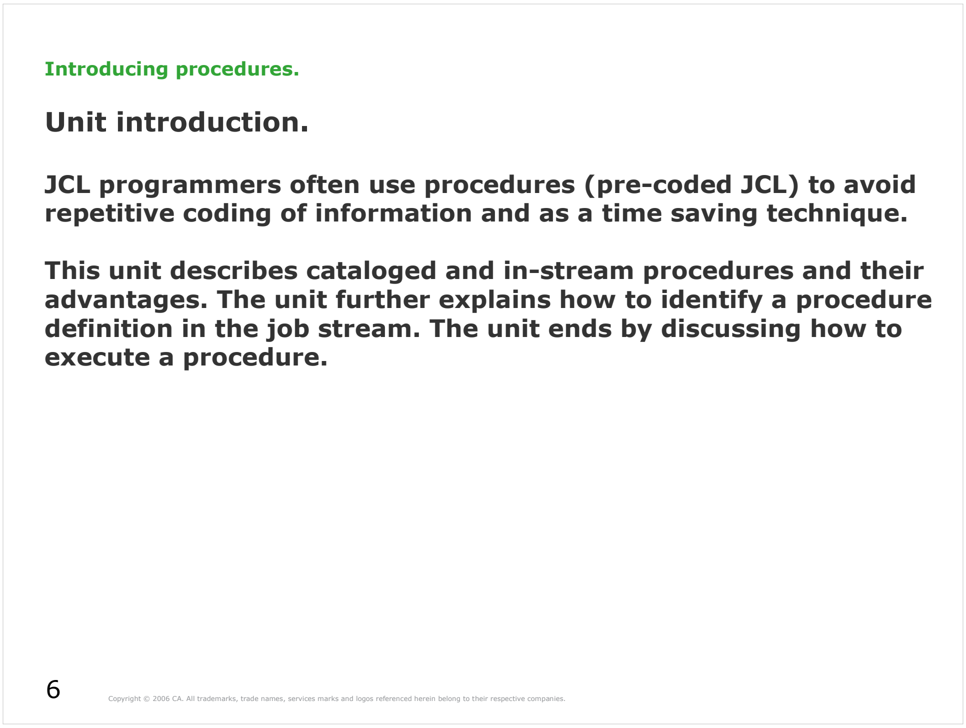

Introducing procedures.

Unit introduction.

JCL programmers often use procedures (pre-coded JCL) to avoid repetitive coding of information and as a time saving technique.

This unit describes cataloged and in-stream procedures and their advantages. The unit further explains how to identify a procedure definition in the job stream. The unit ends by discussing how to execute a procedure.

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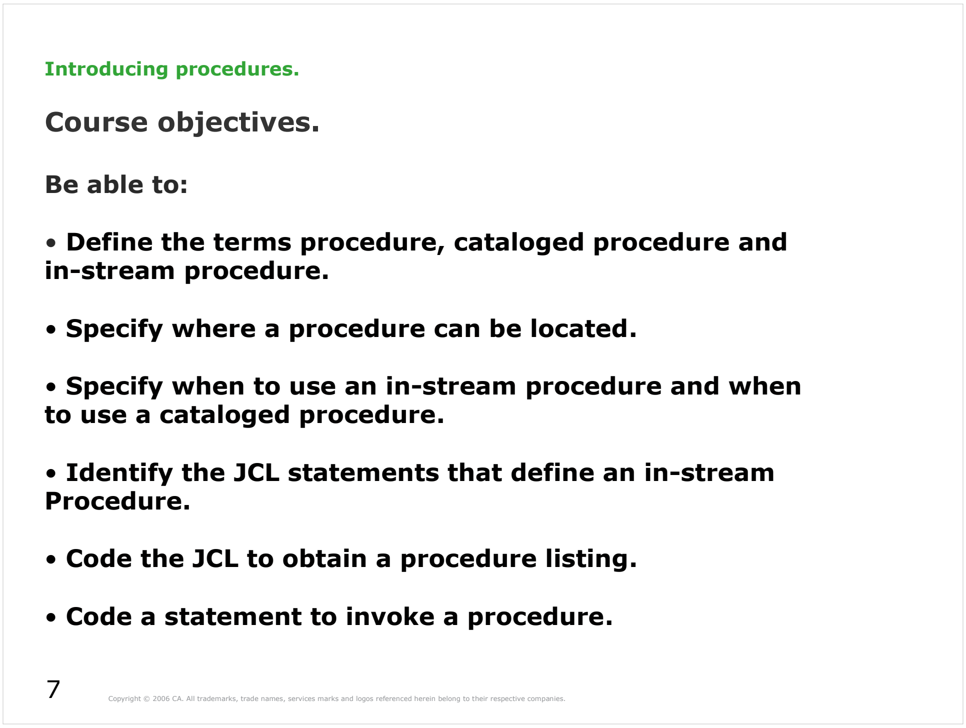
In-Stream Procedures

An in-stream procedure is a named set of JCL statements in a job that can be re-executed *within that job*, simply by invoking the name of the procedure. This enables you to execute the set of control statements more than one time in the same job without having to repeat the statements.

Cataloged Procedures

A cataloged procedure, like an in-stream procedure, is a named set of JCL statements. However, these control statements are placed, or **cataloged**, in a PDS or PDSE known as a **procedure library**. This enables a cataloged procedure to be invoked *by any job*. Cataloged procedures can be placed in the system procedure library SYS1.PROCLIB or in any user-specified procedure library (for example JCLLIB).



Introducing procedures.

Course objectives.

Be able to:

- **Define the terms procedure, cataloged procedure and in-stream procedure.**

- **Specify where a procedure can be located.**

- **Specify when to use an in-stream procedure and when to use a cataloged procedure.**

- **Identify the JCL statements that define an in-stream Procedure.**

- **Code the JCL to obtain a procedure listing.**

- **Code a statement to invoke a procedure.**

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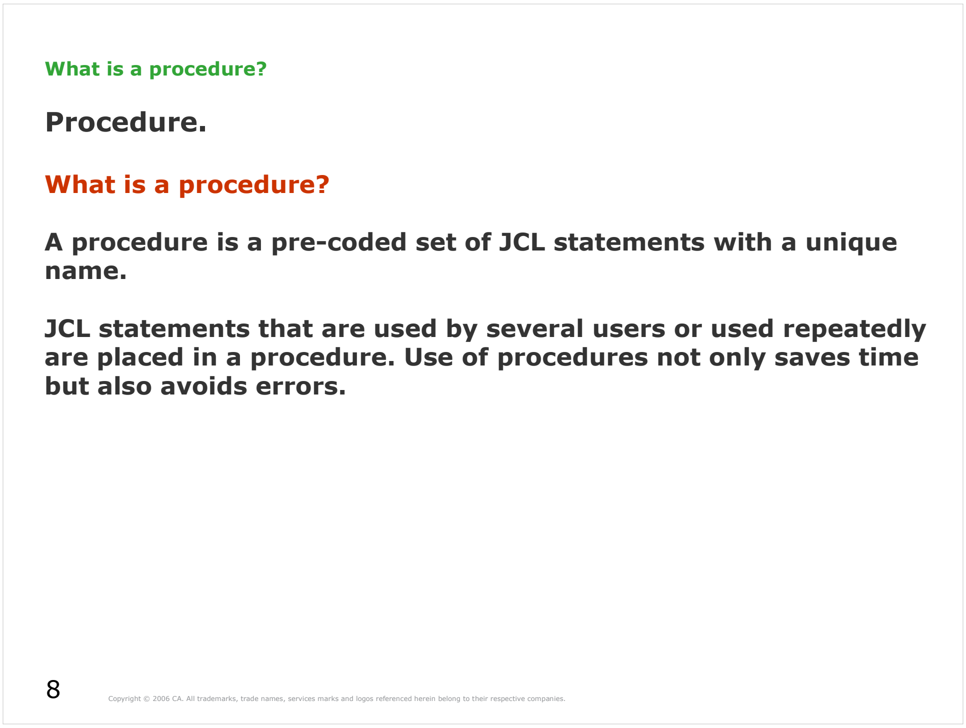

What is a procedure?

Procedure.

What is a procedure?

A procedure is a pre-coded set of JCL statements with a unique name.

JCL statements that are used by several users or used repeatedly are placed in a procedure. Use of procedures not only saves time but also avoids errors.

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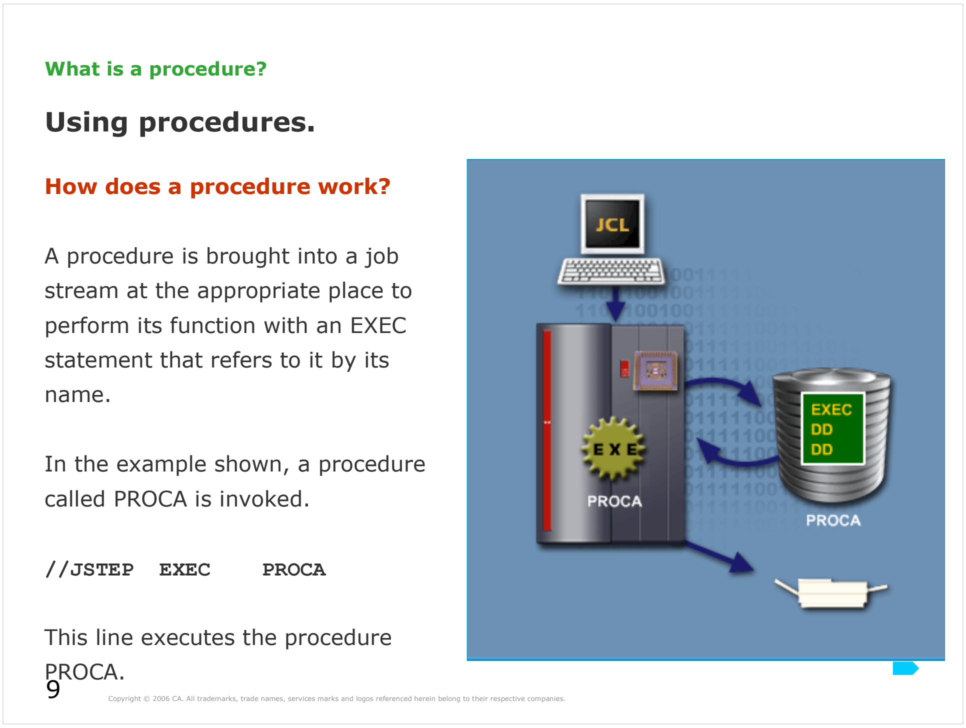
See SYS1.PROCLIB(HLASMCLG) cataloged procedure:

This procedure runs the assembler, link-edits the newly assembled program and runs the program after the link-edit is accomplished.

See MCOE.EDU.JCL.JCL(LASMCLG) JCL statements how to invoke the HLASMCLG cataloged procedure.



What is a procedure?

Using procedures.

How does a procedure work?

A procedure is brought into a job stream at the appropriate place to perform its function with an EXEC statement that refers to it by its name.

In the example shown, a procedure called PROCA is invoked.

```
//JSTEP   EXEC     PROCA
```

This line executes the procedure PROCA.

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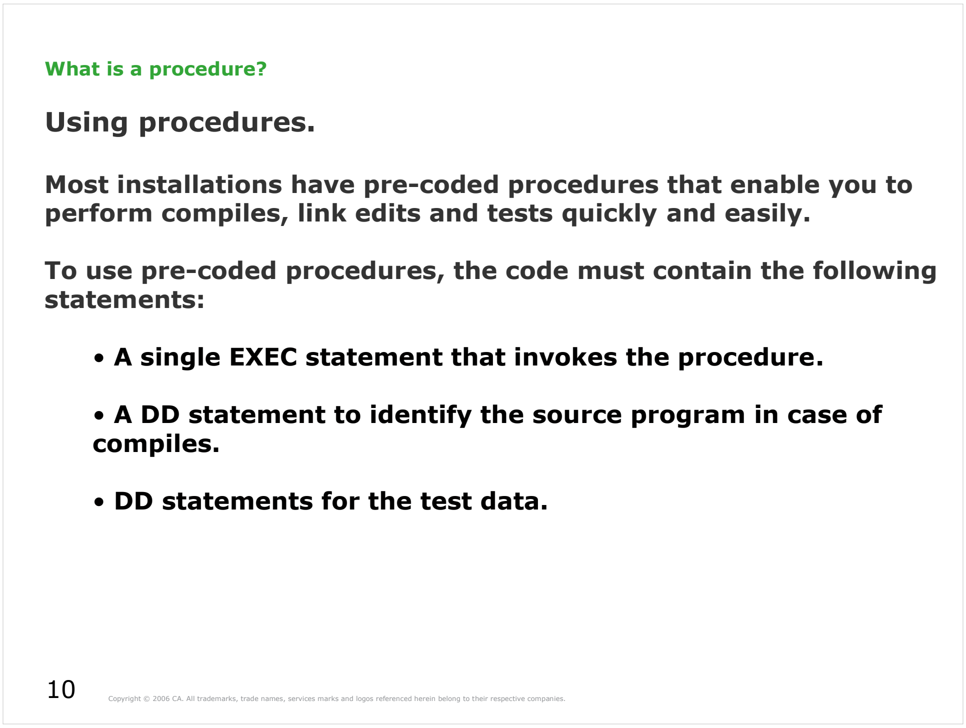
A procedure may consist of one or more procedure steps.

When the system encounters the above EXEC statement in a job stream, it locates the definition of PROCA and brings the pre-coded JCL statements into the current JCL and then executes it.



What is a procedure?

Using procedures.

Most installations have pre-coded procedures that enable you to perform compiles, link edits and tests quickly and easily.

To use pre-coded procedures, the code must contain the following statements:

- **A single EXEC statement that invokes the procedure.**
- **A DD statement to identify the source program in case of compiles.**
- **DD statements for the test data.**

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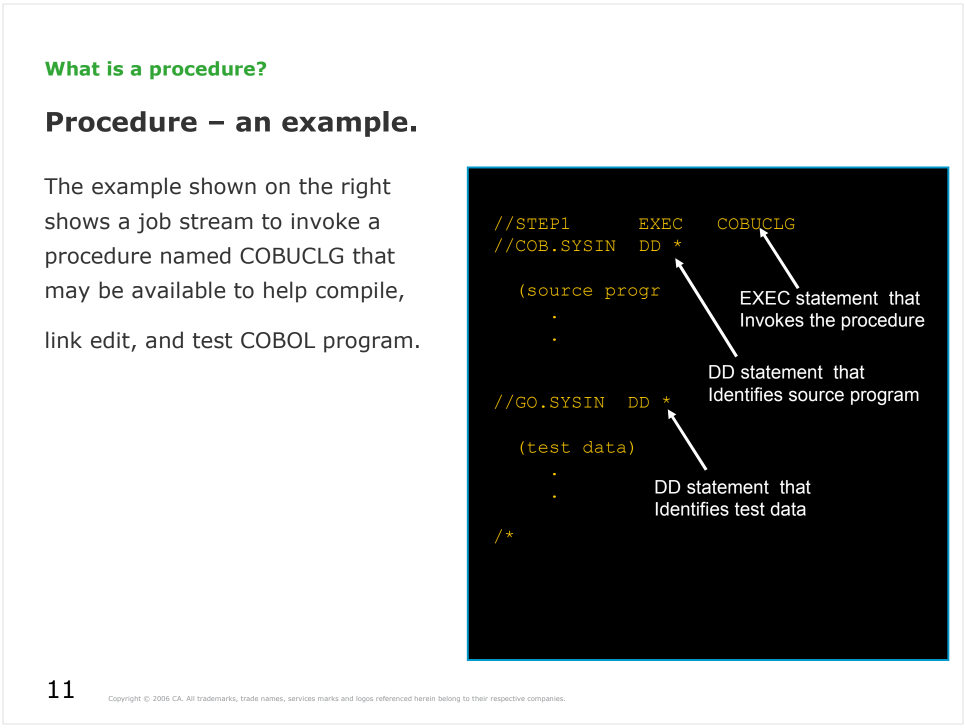

What is a procedure?

Procedure – an example.

The example shown on the right shows a job stream to invoke a procedure named COBUCLG that may be available to help compile,

link edit, and test COBOL program.

```
//STEP1       EXEC    COBUCLG
//COB.SYSIN   DD *

  (source progr
       .
       .


//GO.SYSIN   DD *

  (test data)
       .
       .
/*
```

EXEC statement that Invokes the procedure

DD statement that Identifies source program

DD statement that Identifies test data

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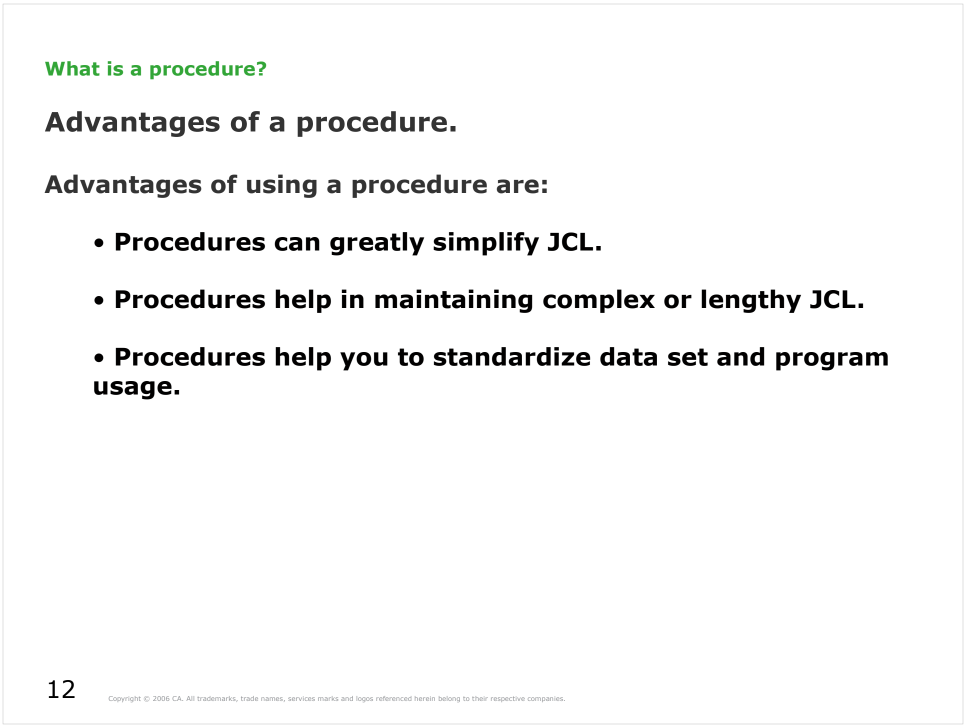
See IGY.SIGYPROC(IGYWCLG) cataloged procedure:

This procedure runs the Cobol compiler, link-edits the object module and runs the program after the link-edit is accomplished.

Caller must supply //COBOL.SYSIN DD ...

Caller must also supplay //COBOL.SYSLIB DD ... for COPY statements.

See MCOE.EDU.JCL.JCL(LCOBCLG) JCL statements how to invoke the IGYWCLG cataloged procedure.



What is a procedure?

Advantages of a procedure.

Advantages of using a procedure are:

- **Procedures can greatly simplify JCL.**
- **Procedures help in maintaining complex or lengthy JCL.**
- **Procedures help you to standardize data set and program usage.**

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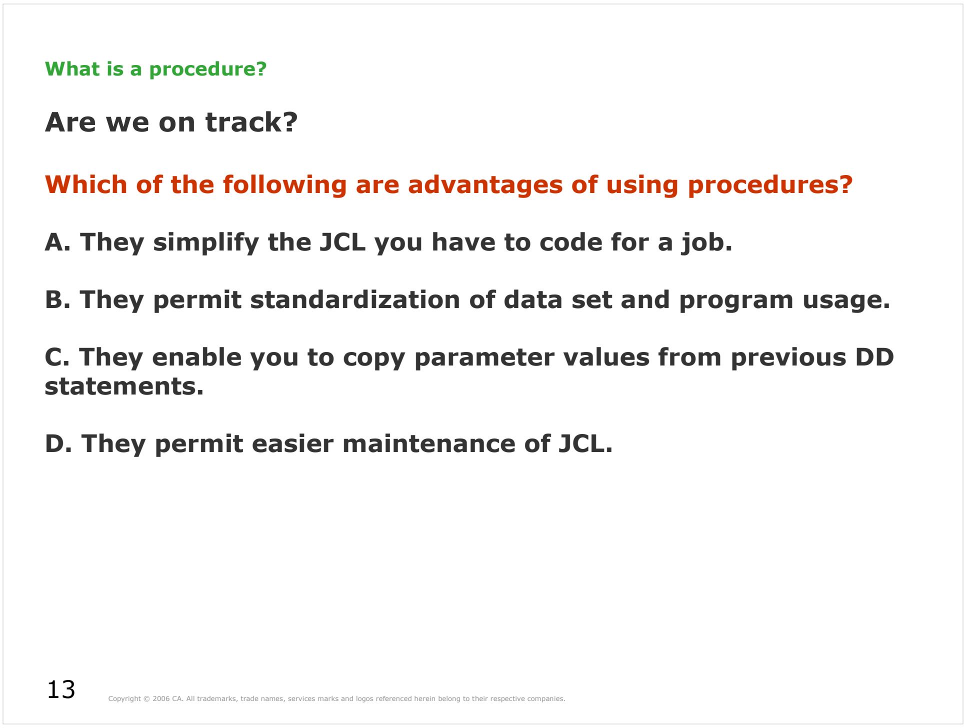
If a great deal of information needs to be supplied to an application, procedure reduces the JCL that need to be coded. Moreover, you do not have to record the entire JCL stream each time you want to perform the same task.

If the JCL for an application is modified or enhanced, you need to make only the appropriate modifications to the procedure. The enhancements will then be accessible to all users.

If several application users require the same input data sets to perform their tasks, a procedure can ensure that everyone uses the appropriate data set identifications and program control functions.



What is a procedure?

Are we on track?

Which of the following are advantages of using procedures?

A. They simplify the JCL you have to code for a job.

B. They permit standardization of data set and program usage.

C. They enable you to copy parameter values from previous DD statements.

D. They permit easier maintenance of JCL.

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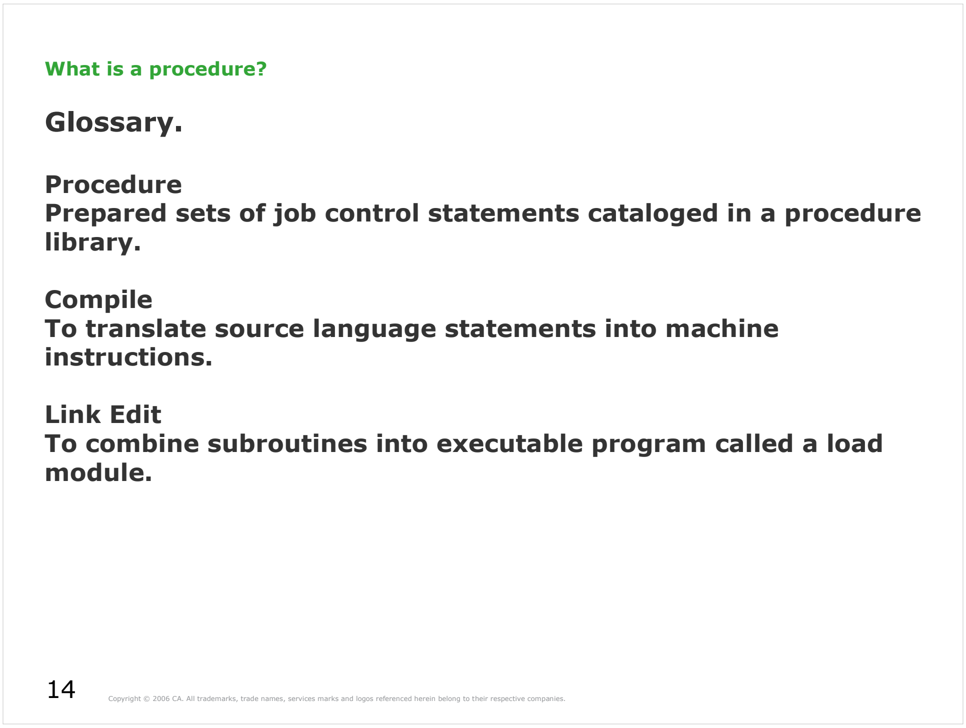
The correct answer is A., B., and D.



What is a procedure?

Glossary.

Procedure
Prepared sets of job control statements cataloged in a procedure library.

Compile
To translate source language statements into machine instructions.

Link Edit
To combine subroutines into executable program called a load module.

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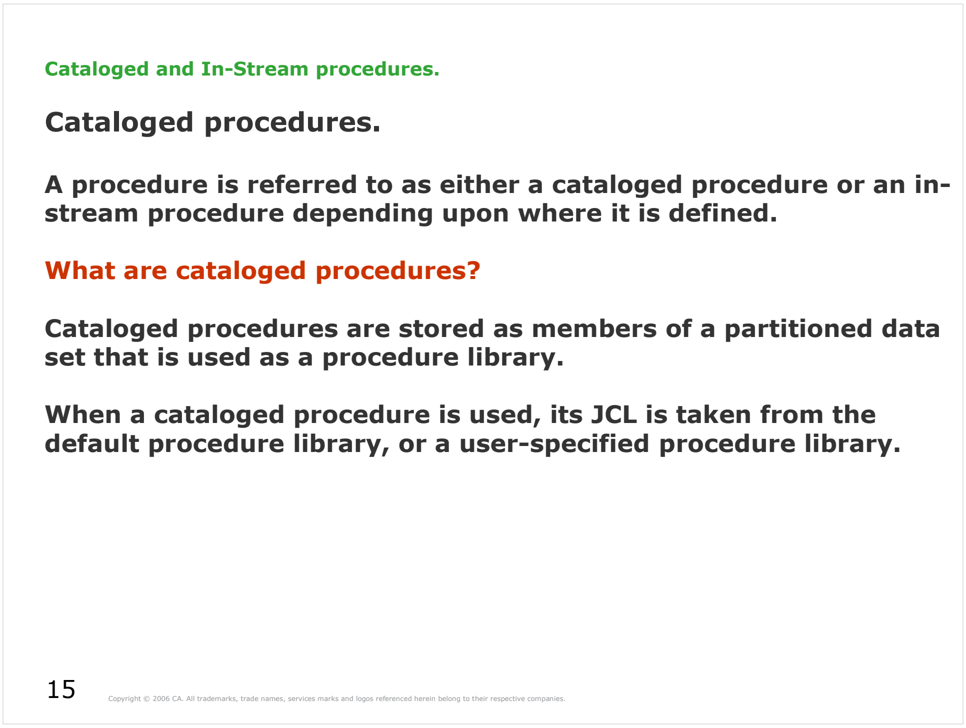

Cataloged and In-Stream procedures.

Cataloged procedures.

A procedure is referred to as either a cataloged procedure or an in-stream procedure depending upon where it is defined.

What are cataloged procedures?

Cataloged procedures are stored as members of a partitioned data set that is used as a procedure library.

When a cataloged procedure is used, its JCL is taken from the default procedure library, or a user-specified procedure library.

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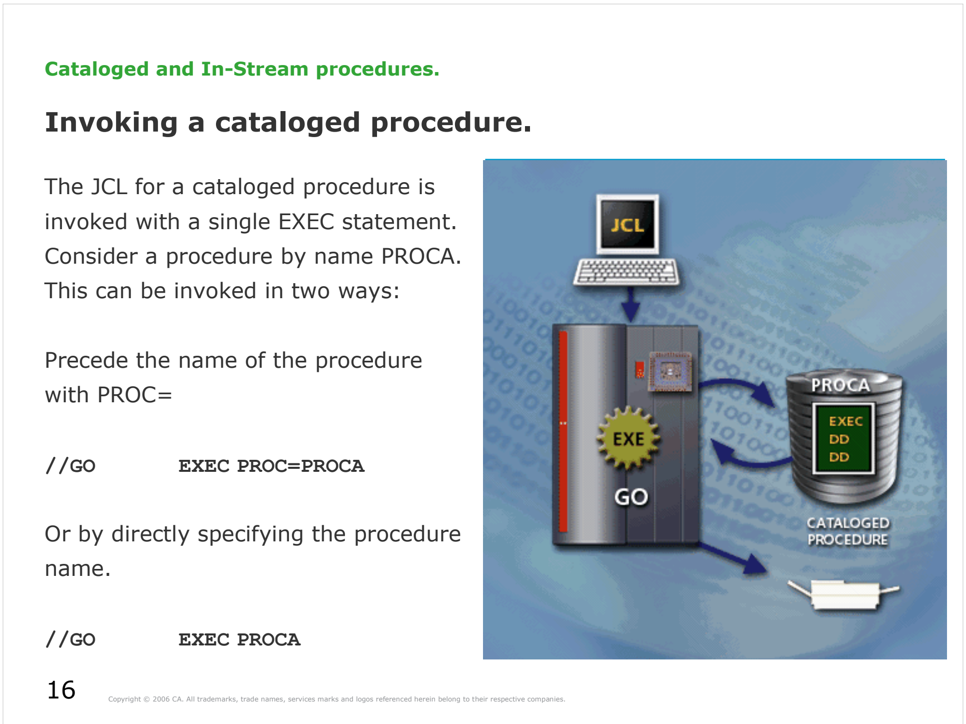
IBM supplies a procedure library named SYS1.PROCLIB.



Cataloged and In-Stream procedures.

Invoking a cataloged procedure.

The JCL for a cataloged procedure is invoked with a single EXEC statement. Consider a procedure by name PROCA. This can be invoked in two ways:

Precede the name of the procedure with PROC=

```
//GO        EXEC PROC=PROCA
```

Or by directly specifying the procedure name.

```
//GO        EXEC PROCA
```

JCL
EXE
GO
PROCA
EXEC
DD
DD
CATALOGED PROCEDURE

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It is not necessary to code a DD statement to identify the library in which the procedure resides since the system keeps track of the system PDSs used as procedure library. You can specify other procedure libraries with the JCLLIB statement. You can code only one JCLLIB statement per job.

JCLLIB Statement

Purpose

Use the JCLLIB statement to:

•Identify the names of the private procedure libraries that the system uses for the job. The system searches the libraries for:

– Procedures named on any EXEC statements.

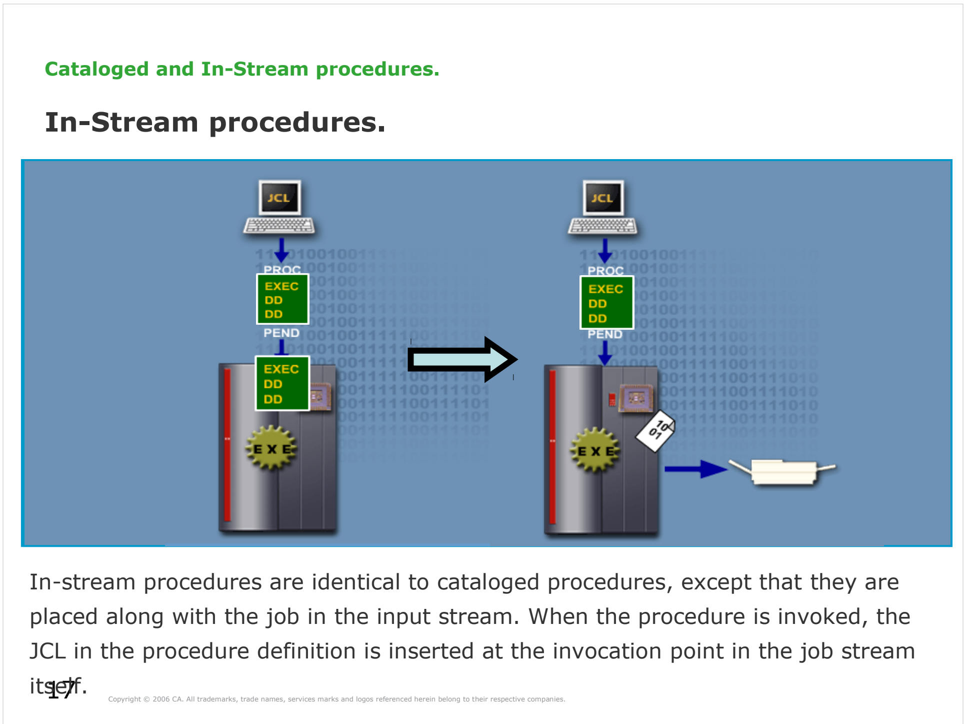
– Groups of JCL statements (called INCLUDE groups) named on any INCLUDE statements.

•Identify the names of the system procedure libraries and installation-defined procedure libraries that the system uses for the job.

•Identify the order in which the libraries are to be searched. The system searches the libraries in the order in which you specify them on the JCLLIB statement, prior to searching any unspecified default system procedure libraries.

Syntax

//[name] JCLLIB ORDER=(library[,library]...) [comments]



Cataloged and In-Stream procedures.

In-Stream procedures.

JCL
PROC
EXEC
DD
DD
PEND
EXEC
DD
DD
EXE
JCL
PROC
EXEC
DD
DD
PEND
EXE
10
01

In-stream procedures are identical to cataloged procedures, except that they are placed along with the job in the input stream. When the procedure is invoked, the JCL in the procedure definition is inserted at the invocation point in the job stream itself.

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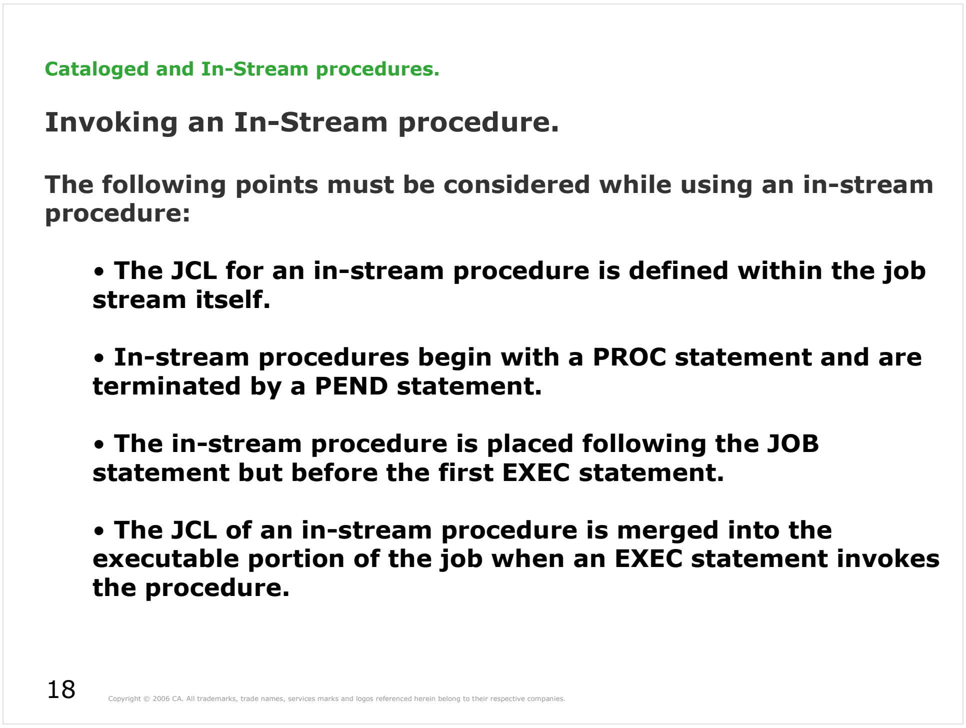
The difference is – PEND statement.



Cataloged and In-Stream procedures.

Invoking an In-Stream procedure.

The following points must be considered while using an in-stream procedure:

- **The JCL for an in-stream procedure is defined within the job stream itself.**
- **In-stream procedures begin with a PROC statement and are terminated by a PEND statement.**
- **The in-stream procedure is placed following the JOB statement but before the first EXEC statement.**
- **The JCL of an in-stream procedure is merged into the executable portion of the job when an EXEC statement invokes the procedure.**

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Sample of In-Stream procedure

Its name is PTEST, and it ends with a PEND statement:

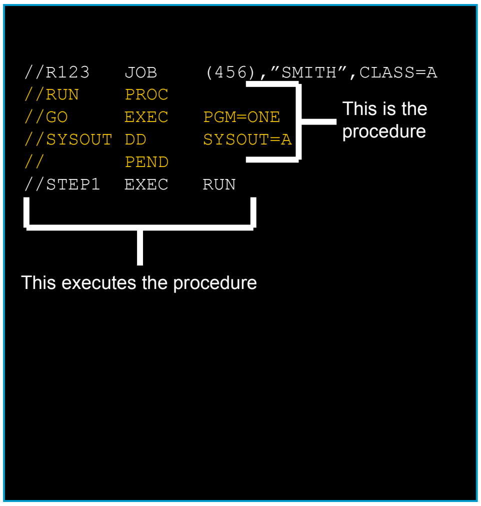
```
//JOB1 JOB CT1492,'JIM MOSER'        Starts job.
//PTEST PROC                         Starts in-stream procedure.
//PSTA EXEC PGM=CALC                 Identifies first step in procedure.
//DDA DD DSNAME=D.E.F,DISP=OLD
//DDB DD DSNAME=DATA1,DISP=(MOD,PASS)
//DDOUT DD SYSOUT=*                  Request 3 data sets for first procedure step.
//PSTB EXEC PGM=PRNT                 Identifies second step in procedure.
//DDC DD DSNAME=*.PSTA.DDB,DISP=OLD
//DDREP DD SYSOUT=A                  Request 2 data sets for second procedure step.
// PEND                              Ends in-stream procedure.
//STEP1 EXEC PROC=PTEST              First step in JOB1, executes procedure.
//PSTA.IN DD *
(data)                               Adds in-stream data to procedure step PSTA.
/*
```

Cataloged and In-Stream procedures.

In-Stream procedure – an example.

The example shown on the right is an in-stream procedure named RUN.

Note that PROC begins the procedure and PEND ends it. The procedure is invoked by the first EXEC statement.



```
//R123    JOB    (456),”SMITH”,CLASS=A
//RUN     PROC
//GO      EXEC   PGM=ONE
//SYSOUT  DD     SYSOUT=A
//        PEND
//STEP1   EXEC   RUN
```

This is the procedure

This executes the procedure

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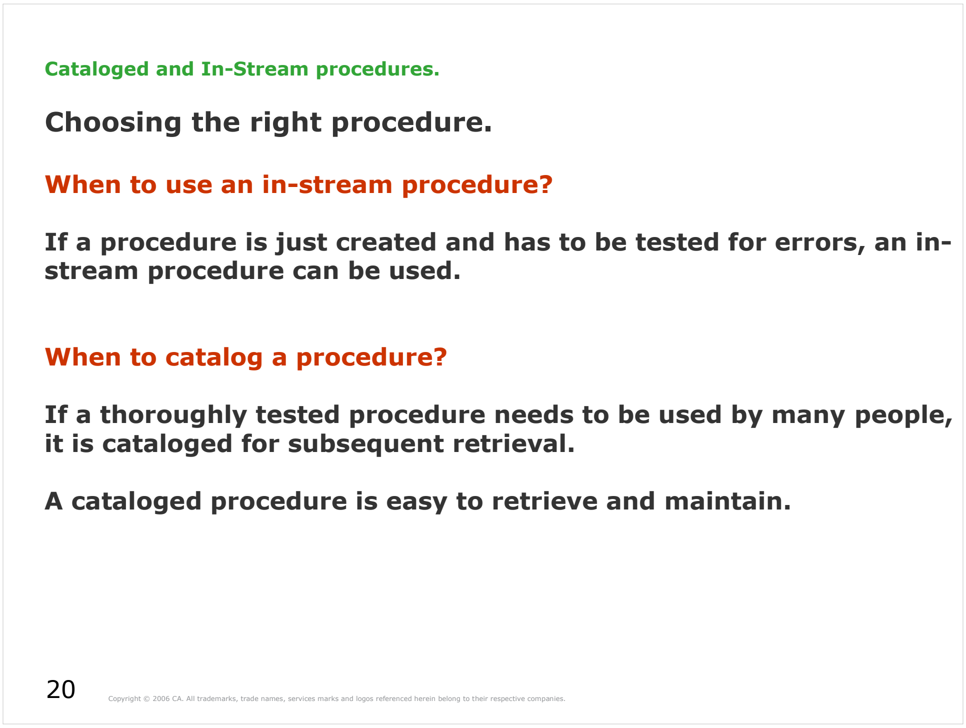

Cataloged and In-Stream procedures.

Choosing the right procedure.

When to use an in-stream procedure?

If a procedure is just created and has to be tested for errors, an in-stream procedure can be used.

When to catalog a procedure?

If a thoroughly tested procedure needs to be used by many people, it is cataloged for subsequent retrieval.

A cataloged procedure is easy to retrieve and maintain.

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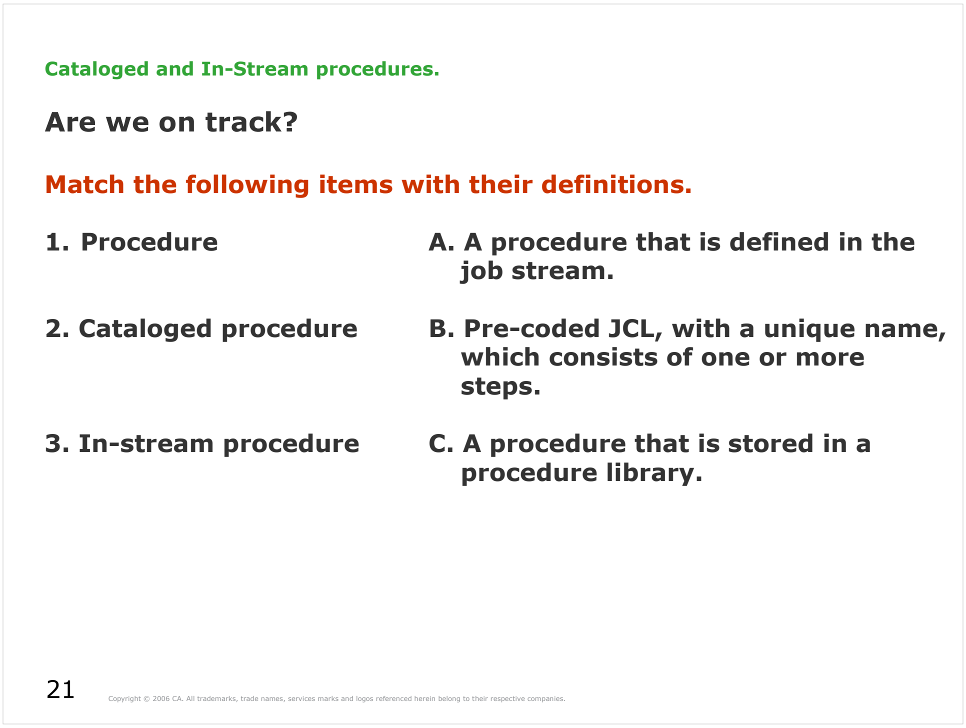

Cataloged and In-Stream procedures.

Are we on track?

Match the following items with their definitions.

1. Procedure

2. Cataloged procedure

3. In-stream procedure

A. A procedure that is defined in the job stream.

B. Pre-coded JCL, with a unique name, which consists of one or more steps.

C. A procedure that is stored in a procedure library.

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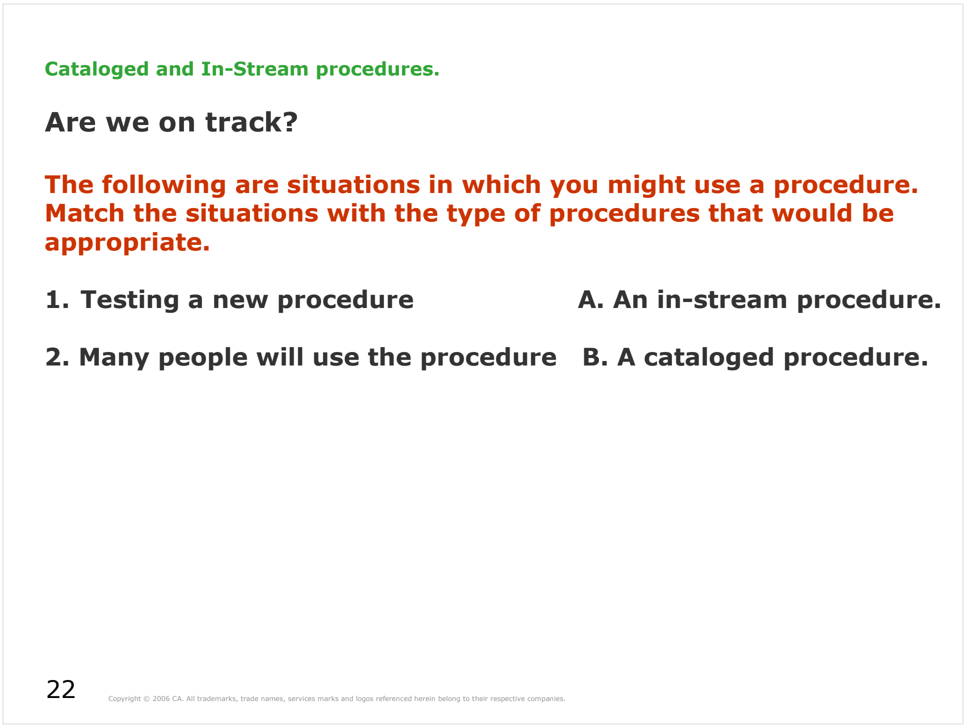
The correct answer is 1-B, 2-C, and 3-A.



Cataloged and In-Stream procedures.

Are we on track?

The following are situations in which you might use a procedure. Match the situations with the type of procedures that would be appropriate.

1. Testing a new procedure **A. An in-stream procedure.**

2. Many people will use the procedure **B. A cataloged procedure.**

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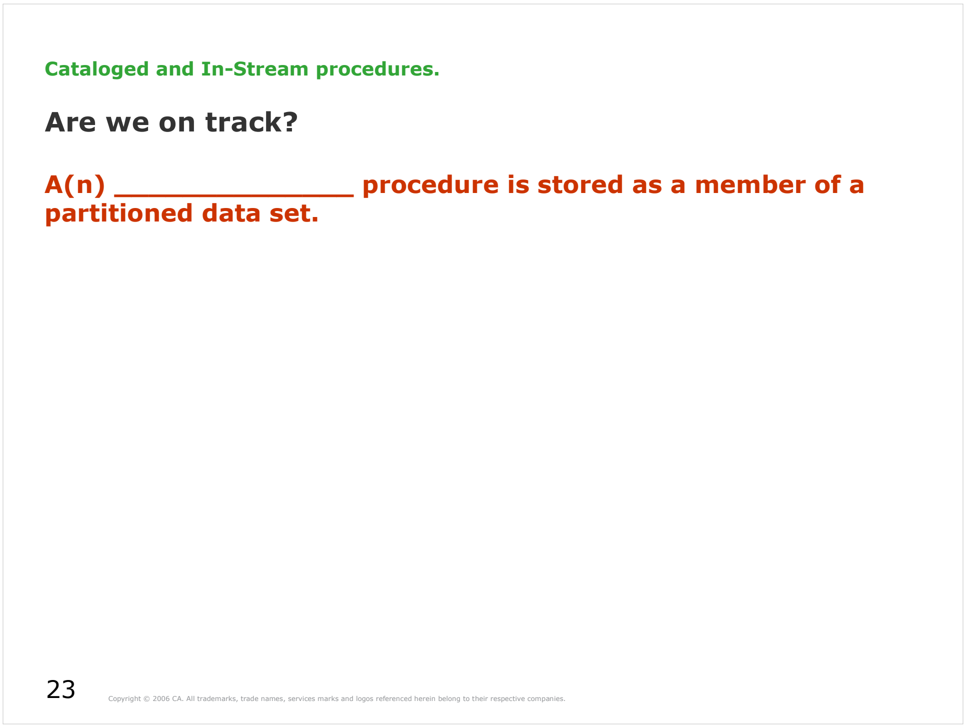
The correct answer is 1-A and 2-B.



Cataloged and In-Stream procedures.

Are we on track?

A(n) ________________ procedure is stored as a member of a partitioned data set.

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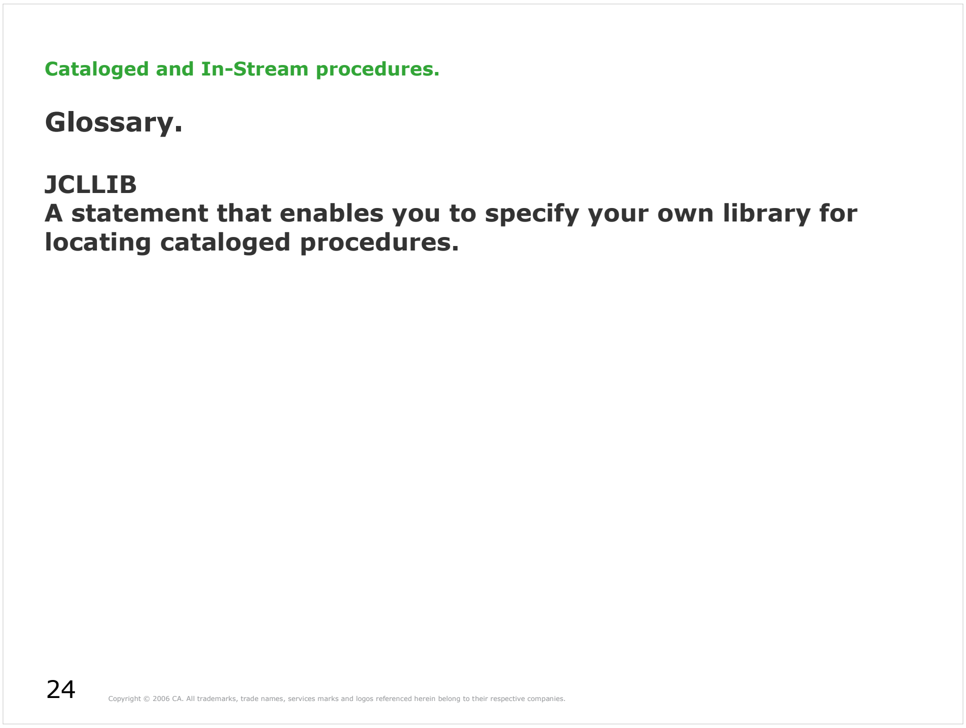
The correct answer is cataloged.



Cataloged and In-Stream procedures.

Glossary.

JCLLIB
A statement that enables you to specify your own library for locating cataloged procedures.

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Identifying In-Stream procedures.

In-Stream procedure.

How to identify an in-stream procedure?

An in-stream procedure can be identified by the statements PROC and PEND.

The function of the PROC statement is to isolate the in-stream procedure definition from the rest of the JCL statements for a job.

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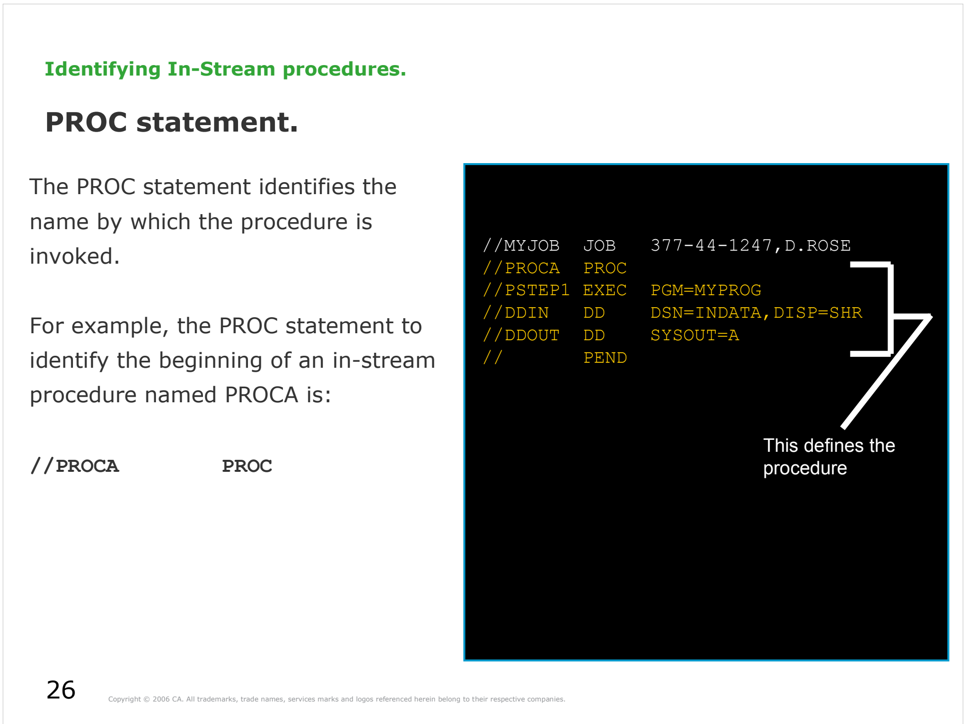

Identifying In-Stream procedures.

PROC statement.

The PROC statement identifies the name by which the procedure is invoked.

For example, the PROC statement to identify the beginning of an in-stream procedure named PROCA is:

```
//PROCA          PROC
```

```
//MYJOB   JOB   377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC  PGM=MYPROG
//DDIN    DD    DSN=INDATA,DISP=SHR
//DDOUT   DD    SYSOUT=A
//        PEND
```

This defines the procedure

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If the JCL for a job contains more than one in-stream procedure, each will begin with a PROC statement that assigns a unique name to the procedure.

PROC Statement

Purpose

The PROC statement marks the beginning of a procedure. The PROC statement can assign default values to symbolic parameters, if coded, in the procedure.

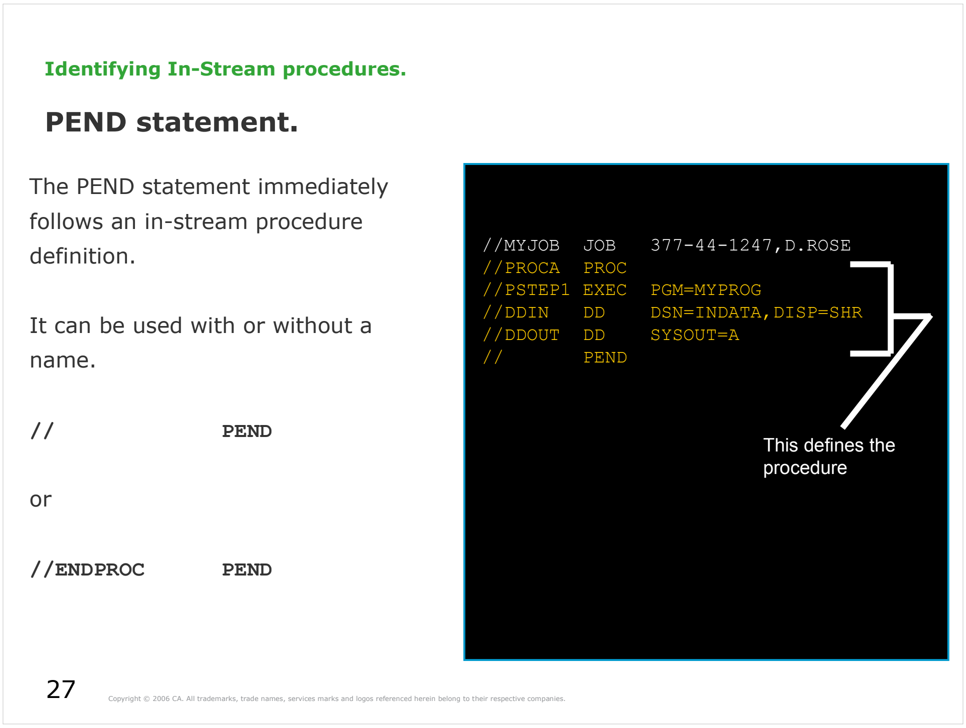
Syntax

For a cataloged procedure:

//[name] PROC [parameter [comments]] //[name] PROC

For an in-stream procedure:

//name PROC [parameter [comments]] //name PROC



Identifying In-Stream procedures.

PEND statement.

The PEND statement immediately follows an in-stream procedure definition.

It can be used with or without a name.

```
//             PEND
```

or

```
//ENDPROC      PEND
```

```
//MYJOB   JOB   377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC  PGM=MYPROG
//DDIN    DD    DSN=INDATA,DISP=SHR
//DDOUT   DD    SYSOUT=A
//        PEND
```

This defines the procedure

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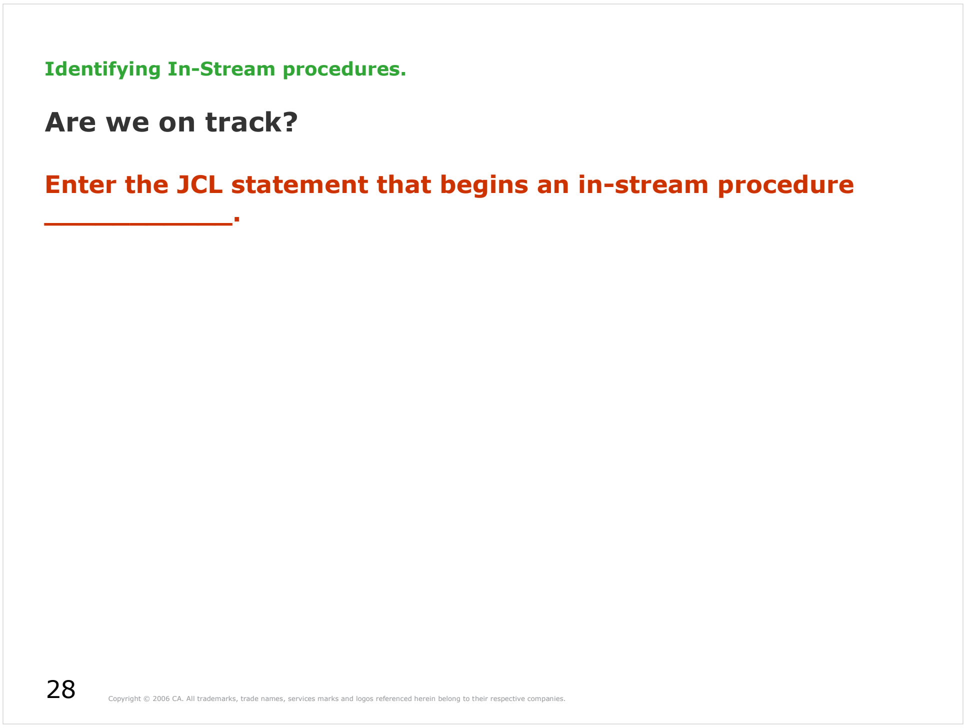
PEND Statement

Purpose

Use the PEND statement to mark the end of an in-stream procedure. You may end a cataloged procedure with a PEND statement, but it is not required.

Syntax

//[name] PEND [comments]



Identifying In-Stream procedures.

Are we on track?

Enter the JCL statement that begins an in-stream procedure ____________.

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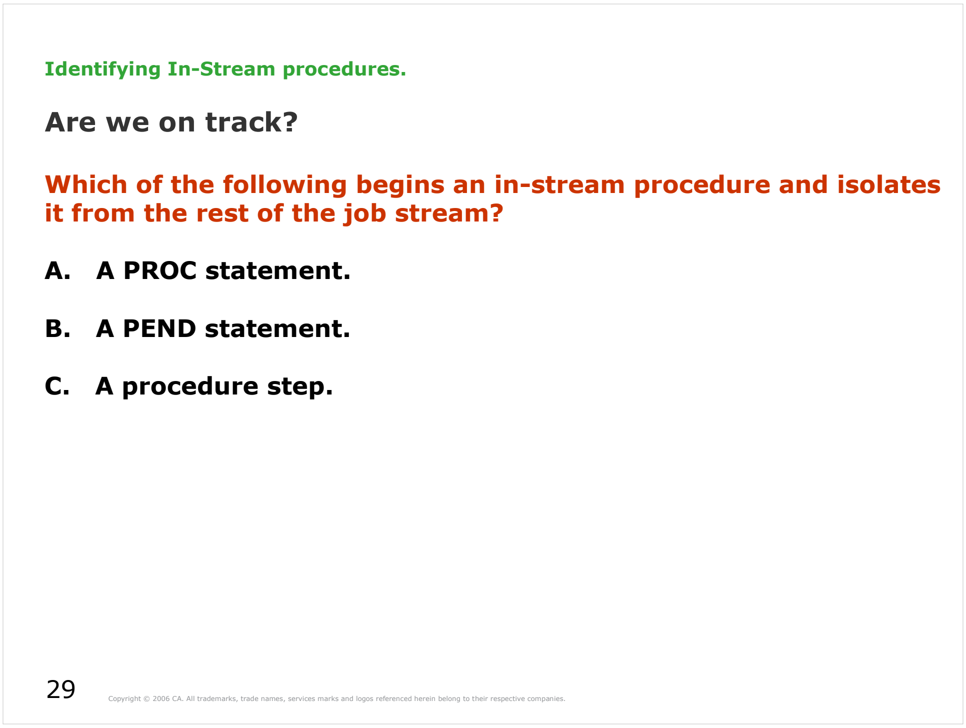
The correct answer is PROC.



Identifying In-Stream procedures.

Are we on track?

Which of the following begins an in-stream procedure and isolates it from the rest of the job stream?

A. A PROC statement.

B. A PEND statement.

C. A procedure step.

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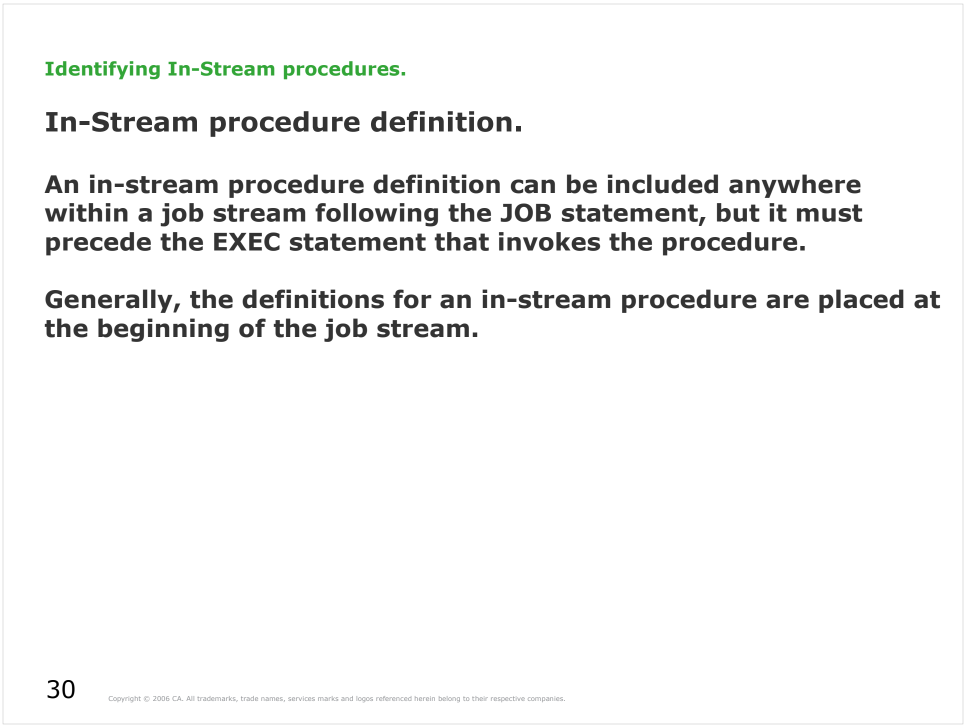
The correct answer is A.



Identifying In-Stream procedures.

In-Stream procedure definition.

An in-stream procedure definition can be included anywhere within a job stream following the JOB statement, but it must precede the EXEC statement that invokes the procedure.

Generally, the definitions for an in-stream procedure are placed at the beginning of the job stream.

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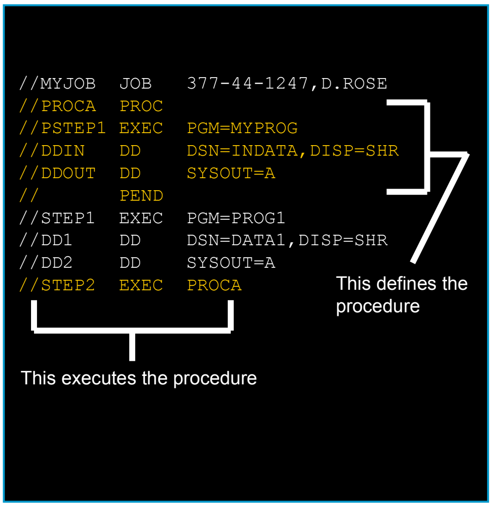
Identifying In-Stream procedures.

In-Stream procedure – an example.

The example on the right shows a job stream that contains an in-stream procedure definition named PROCA.

The JCL between the PROC and PEND statements defines the procedure. The EXEC statement that refers to the procedure name executes it.



```
//MYJOB   JOB    377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC   PGM=MYPROG
//DDIN    DD     DSN=INDATA,DISP=SHR
//DDOUT   DD     SYSOUT=A
//        PEND
//STEP1   EXEC   PGM=PROG1
//DD1     DD     DSN=DATA1,DISP=SHR
//DD2     DD     SYSOUT=A
//STEP2   EXEC   PROCA
```

This defines the procedure

This executes the procedure

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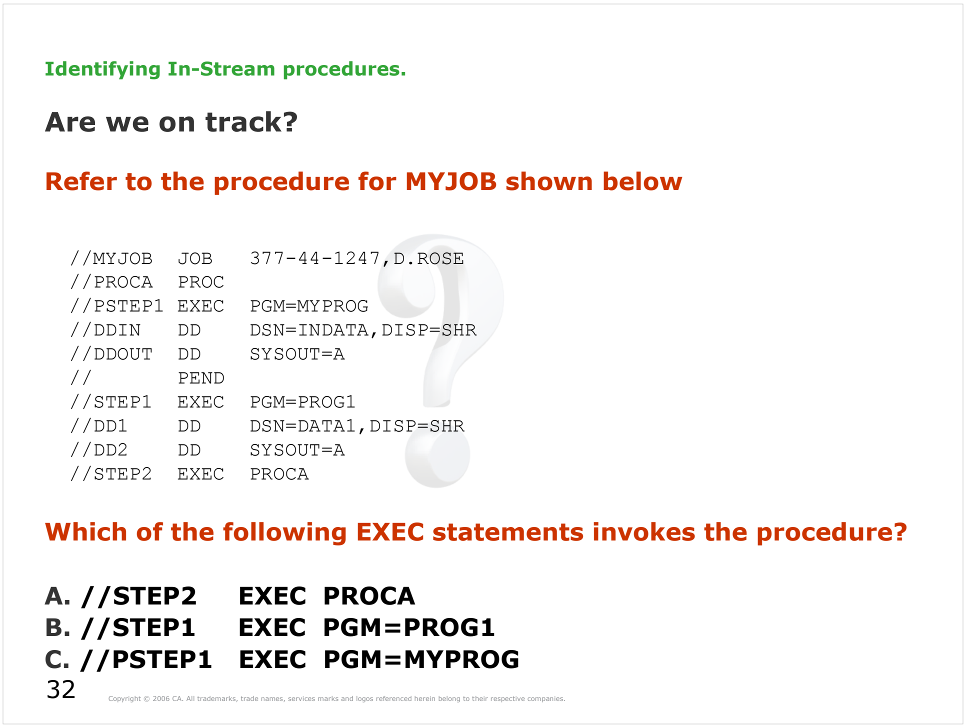

Identifying In-Stream procedures.

Are we on track?

Refer to the procedure for MYJOB shown below

```
//MYJOB  JOB   377-44-1247,D.ROSE
//PROCA  PROC
//PSTEP1 EXEC  PGM=MYPROG
//DDIN   DD    DSN=INDATA,DISP=SHR
//DDOUT  DD    SYSOUT=A
//       PEND
//STEP1  EXEC  PGM=PROG1
//DD1    DD    DSN=DATA1,DISP=SHR
//DD2    DD    SYSOUT=A
//STEP2  EXEC  PROCA
```

Which of the following EXEC statements invokes the procedure?

A. //STEP2   EXEC PROCA
B. //STEP1   EXEC PGM=PROG1
C. //PSTEP1   EXEC PGM=MYPROG

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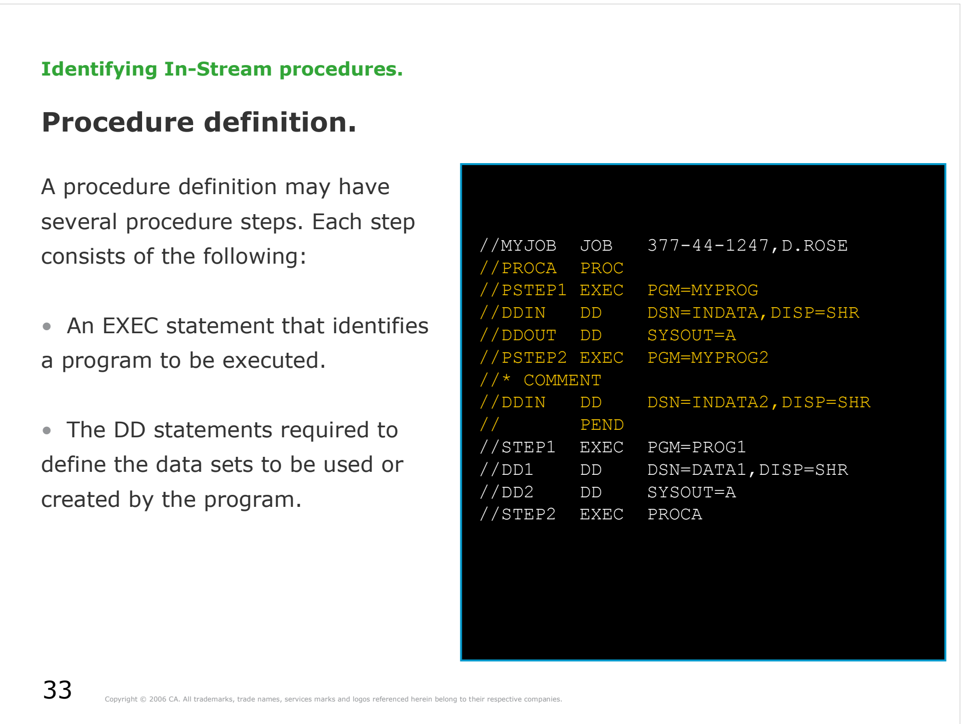
The correct answer is A.



Identifying In-Stream procedures.

Procedure definition.

A procedure definition may have several procedure steps. Each step consists of the following:

- An EXEC statement that identifies a program to be executed.
- The DD statements required to define the data sets to be used or created by the program.

```
//MYJOB   JOB   377-44-1247,D.ROSE
//PROCA   PROC
//PSTEP1  EXEC  PGM=MYPROG
//DDIN    DD    DSN=INDATA,DISP=SHR
//DDOUT   DD    SYSOUT=A
//PSTEP2  EXEC  PGM=MYPROG2
//* COMMENT
//DDIN    DD    DSN=INDATA2,DISP=SHR
//        PEND
//STEP1   EXEC  PGM=PROG1
//DD1     DD    DSN=DATA1,DISP=SHR
//DD2     DD    SYSOUT=A
//STEP2   EXEC  PROCA
```

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In the example shown, the name of the procedure (PROCA) is the name on the EXEC statement.

The COMMENT statement (/ /*) can also be included at any appropriate place to aid in documenting the procedure.

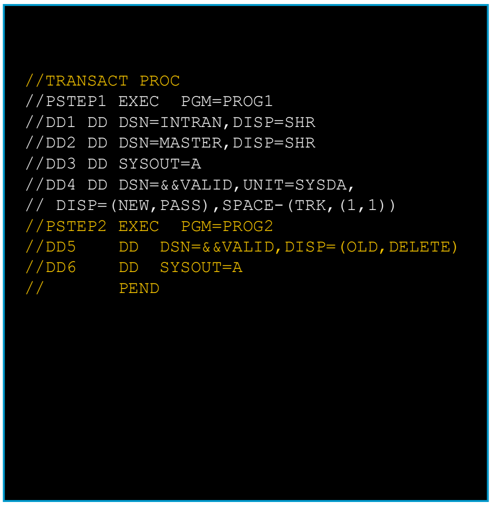
Identifying In-Stream procedures.

In-Stream procedure definition – an example.

The in-stream procedure definition on the right contains the following two procedure steps:

- PSTEP1, which executes a program named PROG1.
- PSTEP2, which executes a program named PROG2.

The DD statements that follow define the data sets that will be created by the program.



```
//TRANSACT PROC
//PSTEP1 EXEC   PGM=PROG1
//DD1  DD DSN=INTRAN,DISP=SHR
//DD2  DD DSN=MASTER,DISP=SHR
//DD3  DD SYSOUT=A
//DD4  DD DSN=&&VALID,UNIT=SYSDA,
//  DISP=(NEW,PASS),SPACE-(TRK,(1,1))
//PSTEP2 EXEC   PGM=PROG2
//DD5      DD   DSN=&&VALID,DISP=(OLD,DELETE)
//DD6      DD   SYSOUT=A
//         PEND
```

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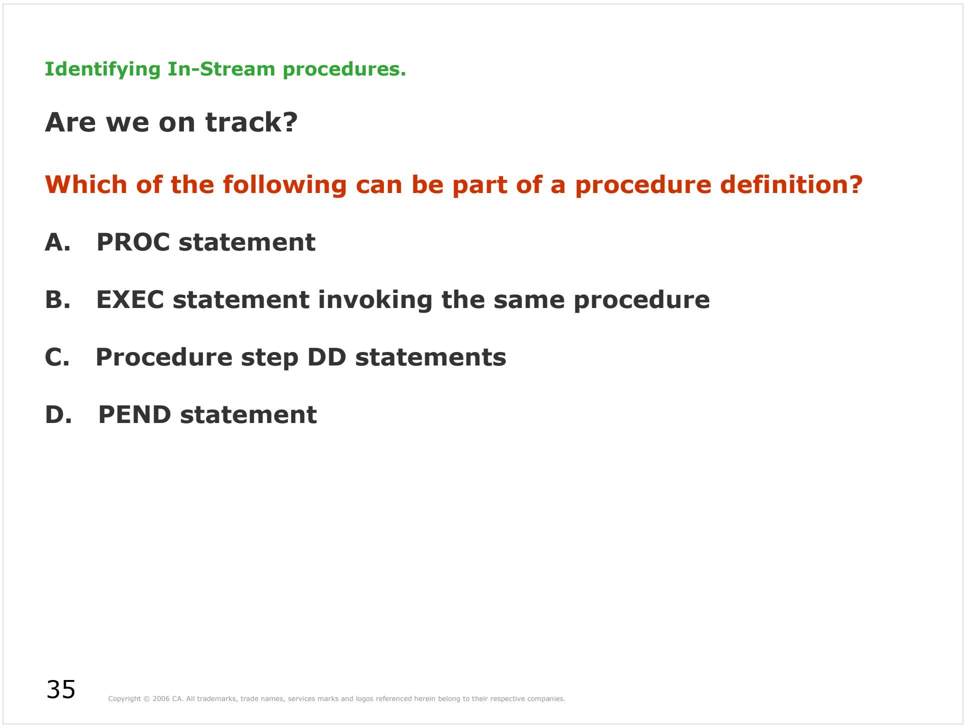

Identifying In-Stream procedures.

Are we on track?

Which of the following can be part of a procedure definition?

A. PROC statement

B. EXEC statement invoking the same procedure

C. Procedure step DD statements

D. PEND statement

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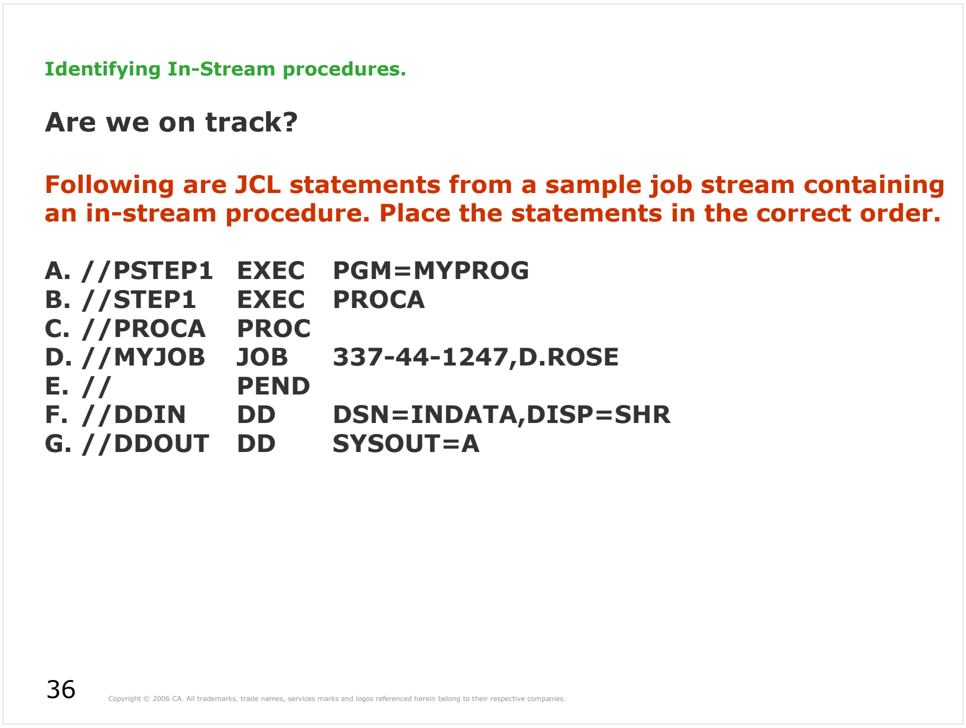
The correct answer is A., C., and D.



Identifying In-Stream procedures.

Are we on track?

Following are JCL statements from a sample job stream containing an in-stream procedure. Place the statements in the correct order.

```
A. //PSTEP1  EXEC  PGM=MYPROG
B. //STEP1   EXEC  PROCA
C. //PROCA   PROC
D. //MYJOB   JOB   337-44-1247,D.ROSE
E. //        PEND
F. //DDIN    DD    DSN=INDATA,DISP=SHR
G. //DDOUT   DD    SYSOUT=A
```

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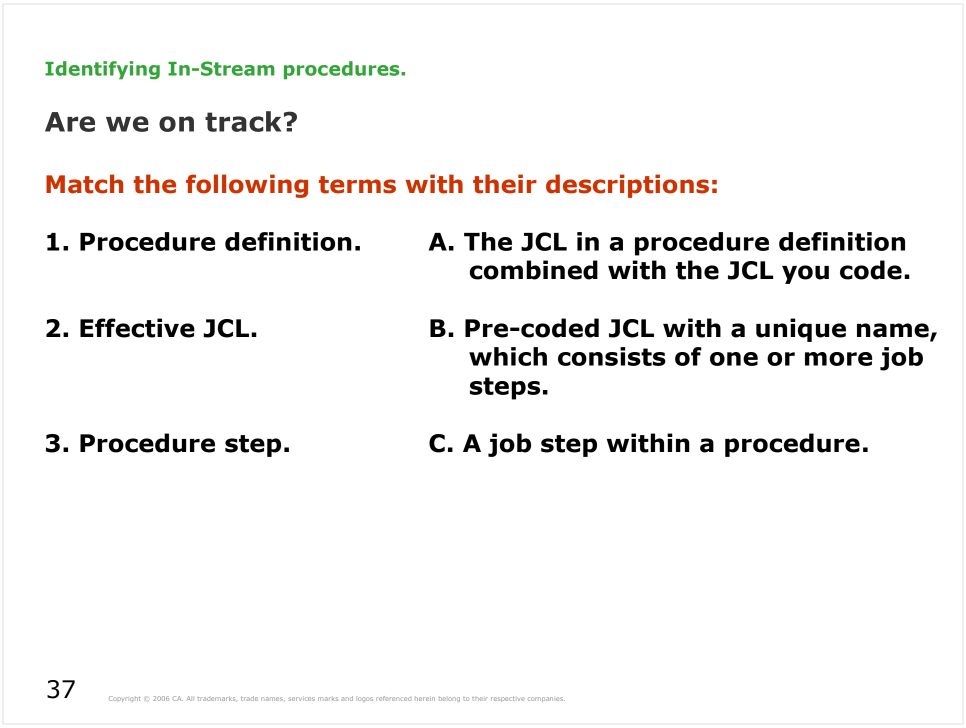
The correct order is D., C., A., F., G., E., and B.



Identifying In-Stream procedures.

Are we on track?

Match the following terms with their descriptions:

1. Procedure definition.

2. Effective JCL.

3. Procedure step.

A. The JCL in a procedure definition combined with the JCL you code.

B. Pre-coded JCL with a unique name, which consists of one or more job steps.

C. A job step within a procedure.

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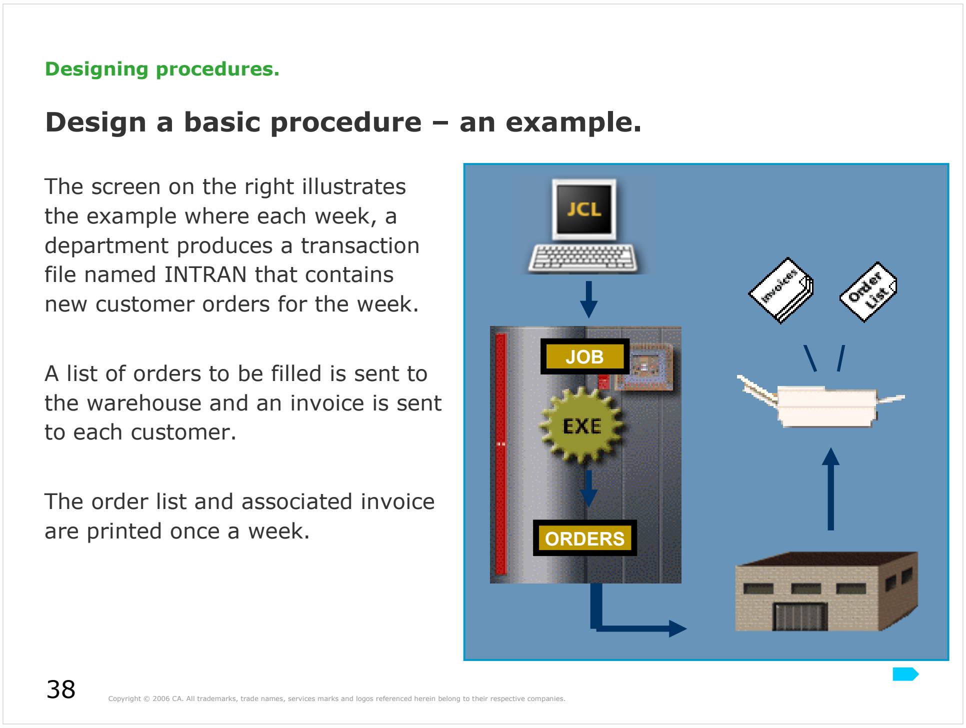
The correct answer is 1-B, 2-A, and 3-C.



Designing procedures.

Design a basic procedure – an example.

The screen on the right illustrates the example where each week, a department produces a transaction file named INTRAN that contains new customer orders for the week.

A list of orders to be filled is sent to the warehouse and an invoice is sent to each customer.

The order list and associated invoice are printed once a week.

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To look more closely at procedure design, assume you work for a company that buys goods wholesale from several manufacturers and markets them retail to a variety of customers. You work in a department that processes customers’ orders.

Design a basic procedure – an example.

You are asked to create a procedure named TRANSACT to accomplish the following task:

- **Invoke a program named PROG1 – This checks input transactions against a master customer list to determine if each transaction applies to a valid customer. PROG1 then writes any rejected transactions to a transaction exception report. It writes all valid transactions to a temporary data set that is passed to PROG2.**

- **Invoke a program named PROG2 – This processes the valid transactions passed to it from PROG1 and creates an order list/invoice for each customer.**

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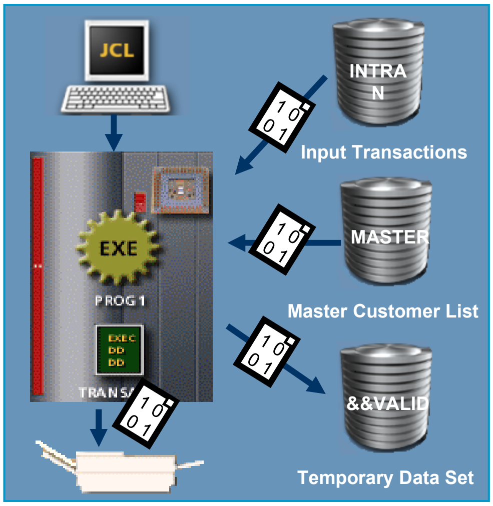
Design a basic procedure – PROG1 data sets.

PROG1 uses the following data sets:

- The input transactions are in a cataloged data set INTRAN. PROG1 uses the DDname DD1.
- The master customer list is in a cataloged data set MASTER. PROG1 uses the DDname DD2.
- The transaction exception report is to be created as SYSOUT class A output {DDname DD3}.
- Valid transactions go to a temporary data set to be passed to PROG2 {Ddname DD4}. The temporary data set should be named &&VALID and space allocated for it on a SYSDA unit. Use single-track primary and secondary space allocation



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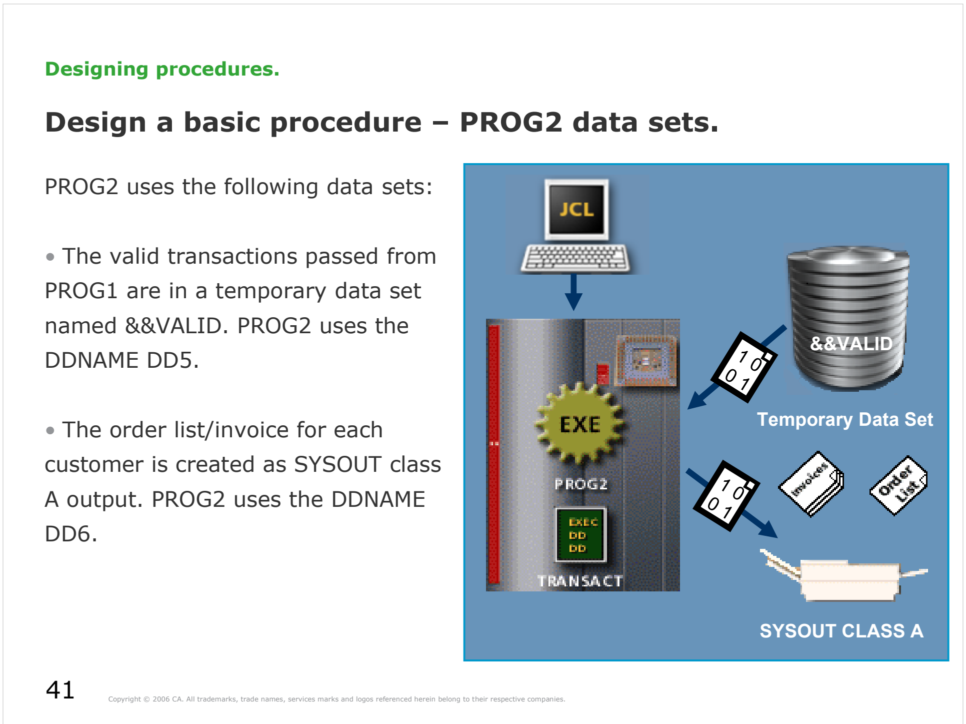

Designing procedures.

Design a basic procedure – PROG2 data sets.

PROG2 uses the following data sets:

- The valid transactions passed from PROG1 are in a temporary data set named &&VALID. PROG2 uses the DDNAME DD5.
- The order list/invoice for each customer is created as SYSOUT class A output. PROG2 uses the DDNAME DD6.

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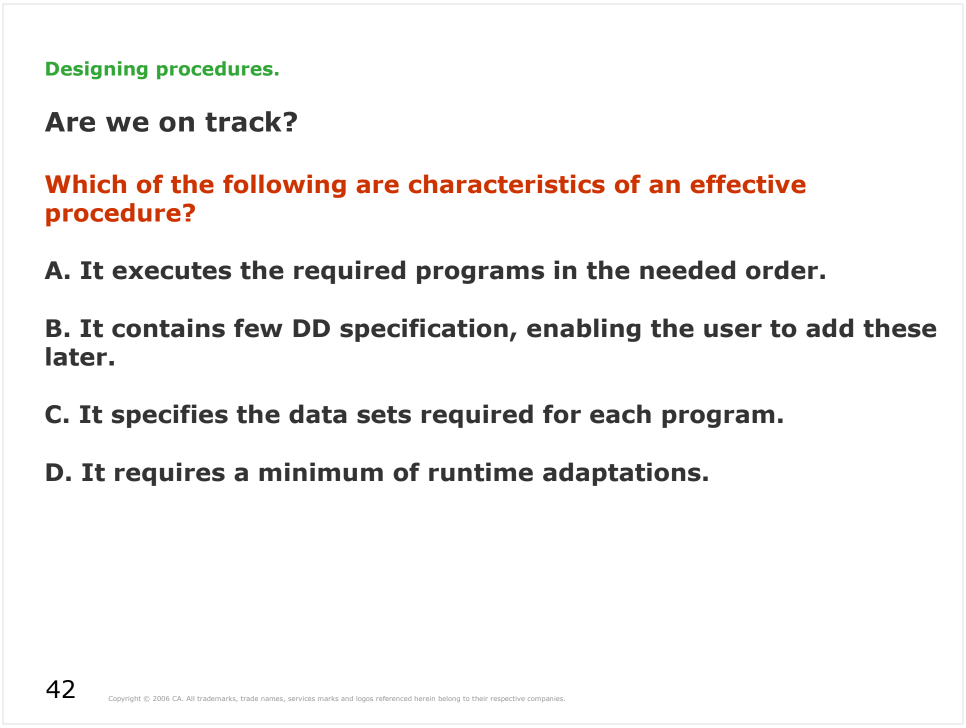
```
//PSTEP1        EXEC    PGM=PROG1
//DD1           DD      DSN=INTRAN,DISP=SHR
//DD2           DD      DSN=MASTER,DISP=SHR
//DD3           DD      SYSOUT=A
//DD4           DD      DSN=&&VALID,DISP=(NEW,PASS),
//                      UNIT=SYSDA,SPACE=(TRK,(1,1))
//PSTEP2        EXEC    PGM=PROG2
//DD5           DD
DSN=&&VALID,DISP=(OLD,DELETE)
//DD6           DD      SYSOUT=A
```



Designing procedures.

Are we on track?

Which of the following are characteristics of an effective procedure?

A. It executes the required programs in the needed order.

B. It contains few DD specification, enabling the user to add these later.

C. It specifies the data sets required for each program.

D. It requires a minimum of runtime adaptations.

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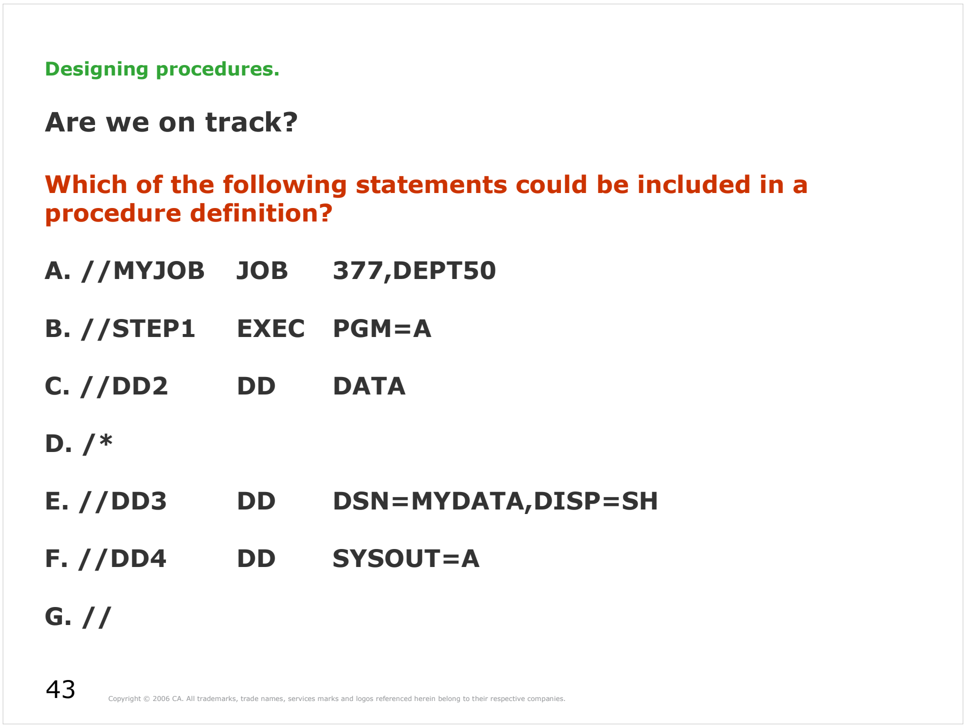
The correct answer is A., C., and D.



Designing procedures.

Are we on track?

Which of the following statements could be included in a procedure definition?

```
A. //MYJOB   JOB    377,DEPT50

B. //STEP1   EXEC   PGM=A

C. //DD2     DD     DATA

D. /*

E. //DD3     DD     DSN=MYDATA,DISP=SH

F. //DD4     DD     SYSOUT=A

G. //
```

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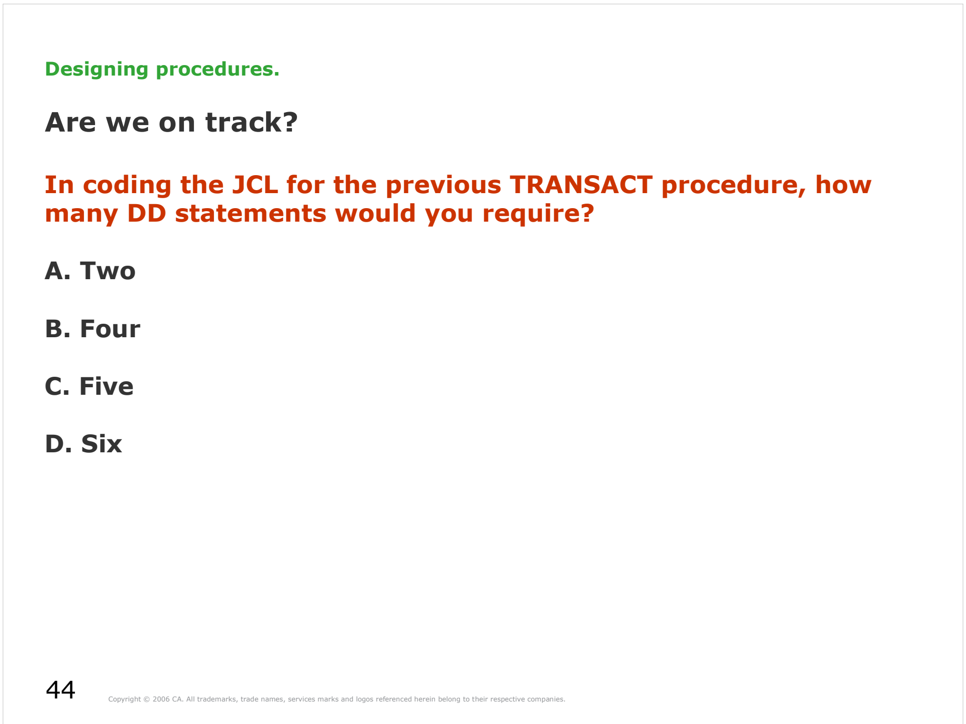
The correct answer is B., E., and F.

(Procedure definition cannot contains data.)



Designing procedures.

Are we on track?

In coding the JCL for the previous TRANSACT procedure, how many DD statements would you require?

A. Two

B. Four

C. Five

D. Six

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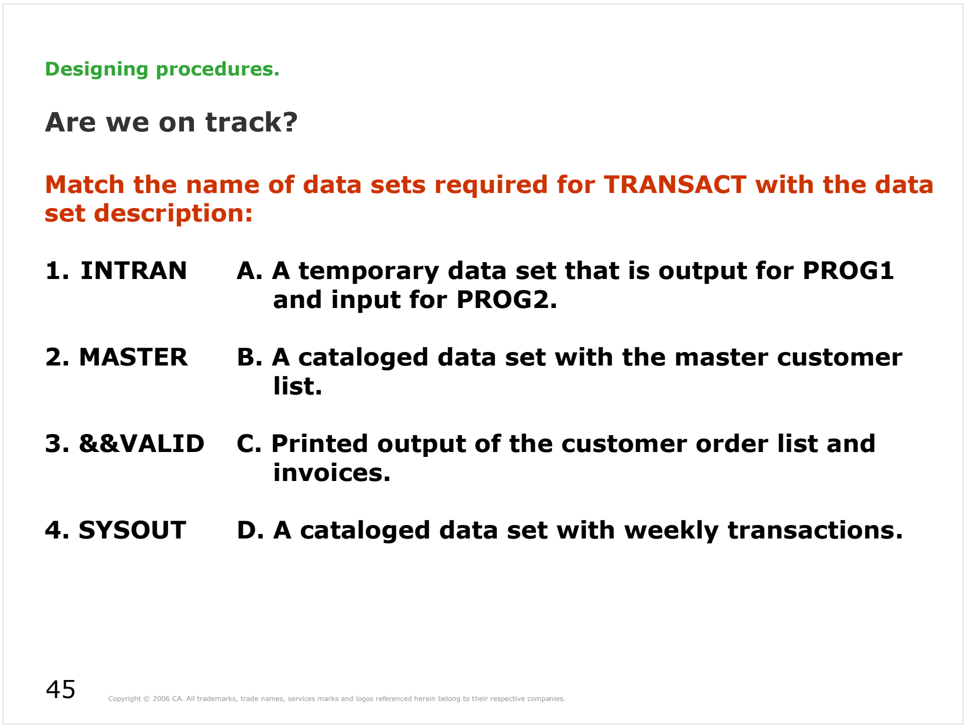
The correct answer is D.



Designing procedures.

Are we on track?

Match the name of data sets required for TRANSACT with the data set description:

1. INTRAN **A. A temporary data set that is output for PROG1 and input for PROG2.**

2. MASTER **B. A cataloged data set with the master customer list.**

3. &&VALID **C. Printed output of the customer order list and invoices.**

4. SYSOUT **D. A cataloged data set with weekly transactions.**

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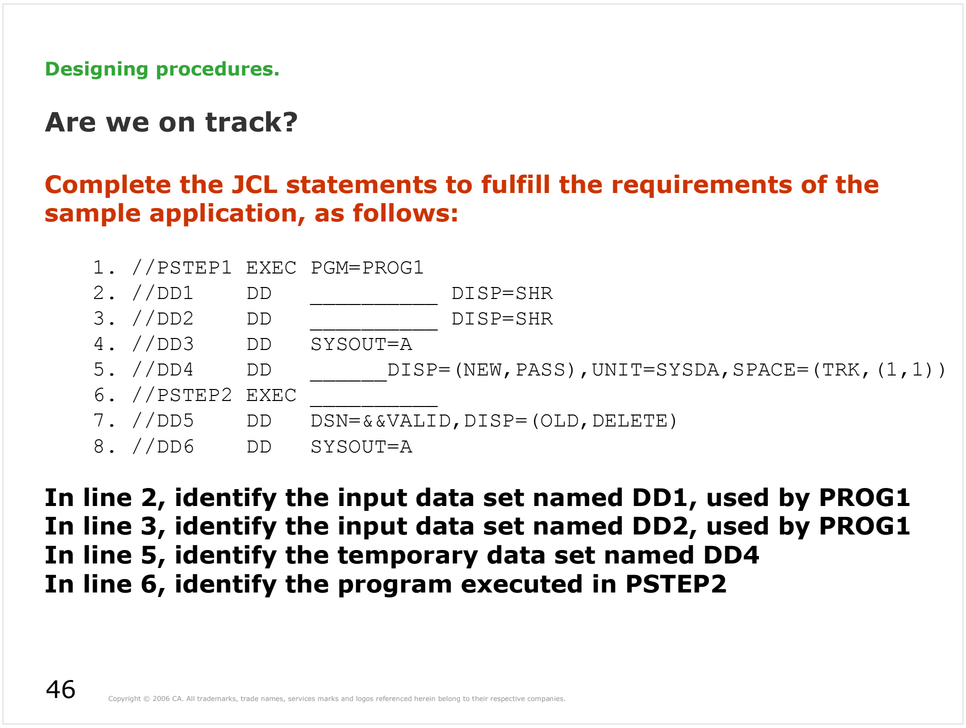
The correct answer is 1-D, 2-B, 3-A, and 4-C.



Designing procedures.

Are we on track?

Complete the JCL statements to fulfill the requirements of the sample application, as follows:

```
1. //PSTEP1 EXEC PGM=PROG1
2. //DD1    DD   __________ DISP=SHR
3. //DD2    DD   __________ DISP=SHR
4. //DD3    DD   SYSOUT=A
5. //DD4    DD   ______DISP=(NEW,PASS),UNIT=SYSDA,SPACE=(TRK,(1,1))
6. //PSTEP2 EXEC __________
7. //DD5    DD   DSN=&&VALID,DISP=(OLD,DELETE)
8. //DD6    DD   SYSOUT=A
```

In line 2, identify the input data set named DD1, used by PROG1
In line 3, identify the input data set named DD2, used by PROG1
In line 5, identify the temporary data set named DD4
In line 6, identify the program executed in PSTEP2

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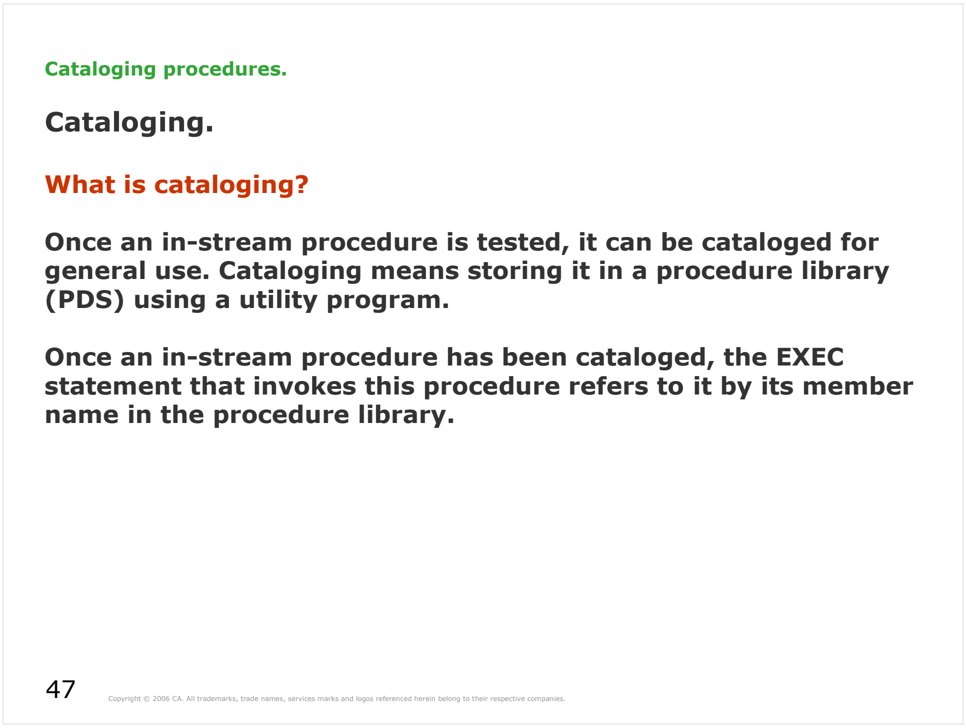
The correct answer is:

2. DSN=INTRAN,

3. DSN=MASTER,

5. DSN=&&VALID,

6. PGM=PROG2



Cataloging procedures.

Cataloging.

What is cataloging?

Once an in-stream procedure is tested, it can be cataloged for general use. Cataloging means storing it in a procedure library (PDS) using a utility program.

Once an in-stream procedure has been cataloged, the EXEC statement that invokes this procedure refers to it by its member name in the procedure library.

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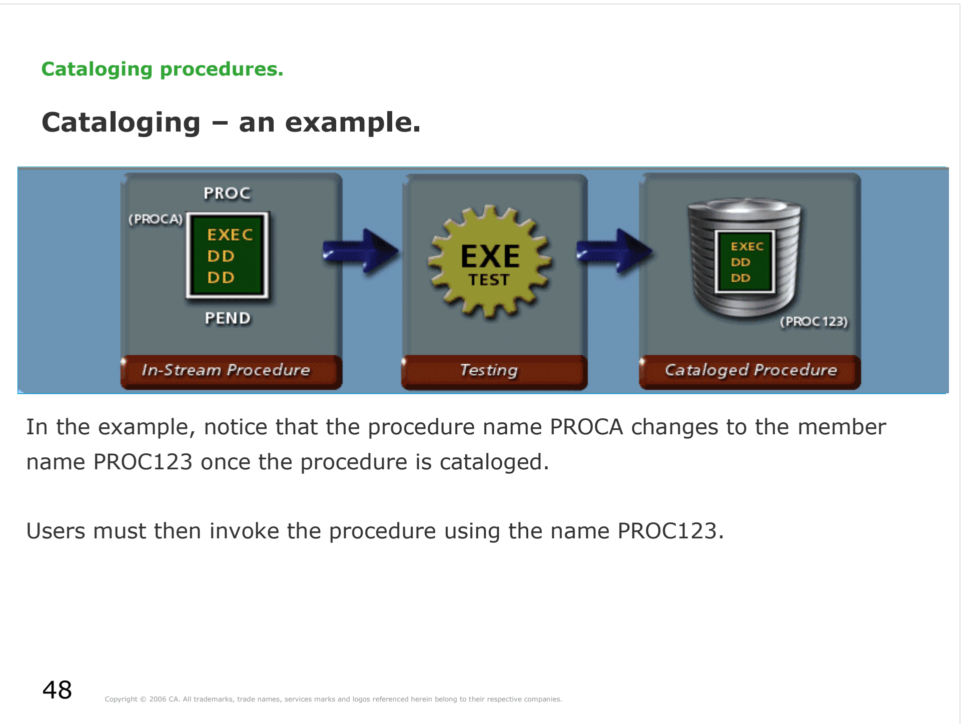

Cataloging procedures.

Cataloging – an example.

In the example, notice that the procedure name PROCA changes to the member name PROC123 once the procedure is cataloged.

Users must then invoke the procedure using the name PROC123.

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Users must then use the JCLLIB statement to identify the private library in which the procedure resides.

Obtaining a procedure listing.

Overview.

Before a procedure is used, the user should obtain a JCL listing and examine its contents to ensure that it meets the processing requirements.

The user must determine that the procedure being used executes the right programs in the proper sequence, using appropriate data sets.

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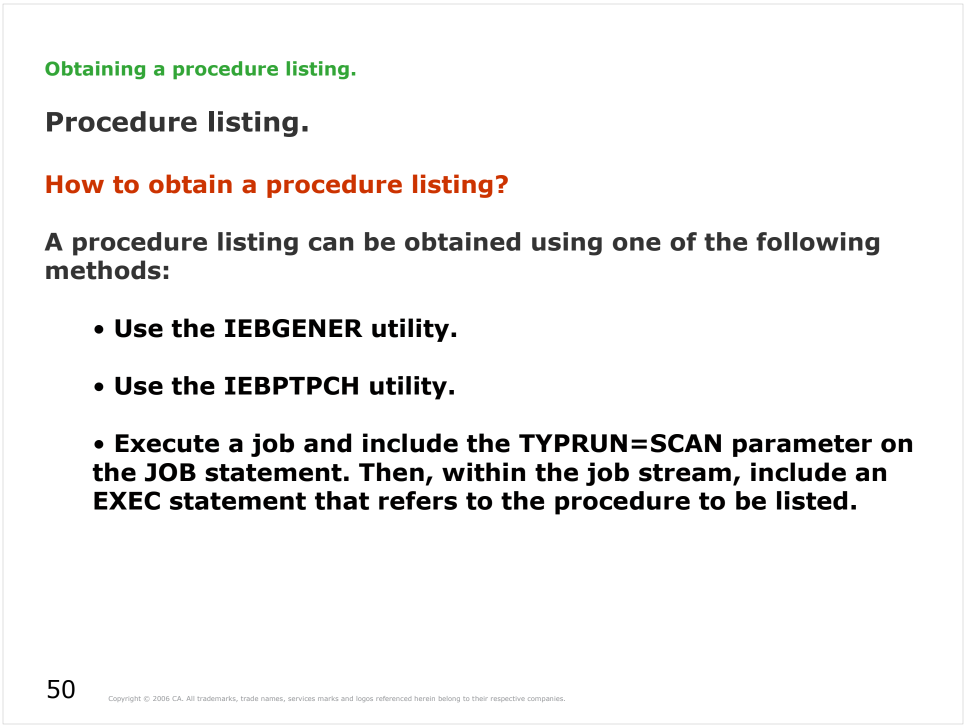

Obtaining a procedure listing.

Procedure listing.

How to obtain a procedure listing?

A procedure listing can be obtained using one of the following methods:

- **Use the IEBGENER utility.**
- **Use the IEBPTPCH utility.**
- **Execute a job and include the TYPRUN=SCAN parameter on the JOB statement. Then, within the job stream, include an EXEC statement that refers to the procedure to be listed.**

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IEBGENER is a generalized **copy utility** used to perform the following tasks:

•Produce a backup copy of a sequential data set, or a member of a PDS or PDSE.

•Produce a PDS or PDSE, or a member of either, from a sequential file.

•Produce an "edited" sequential data set, PDS, PDSE, or a member in either.

•Produce printed list of either sequential data sets or PDS/PDSE members.

•Reblock a data set or change its logical record length.

•Provide exit or editing capabilities for label processing, input data editing, key creation, or permanent I/O error

processing.

IEBPTPCH is used to **copy print or punch** all or selected **portions of a sequential, partitioned data set, or PDSE**.

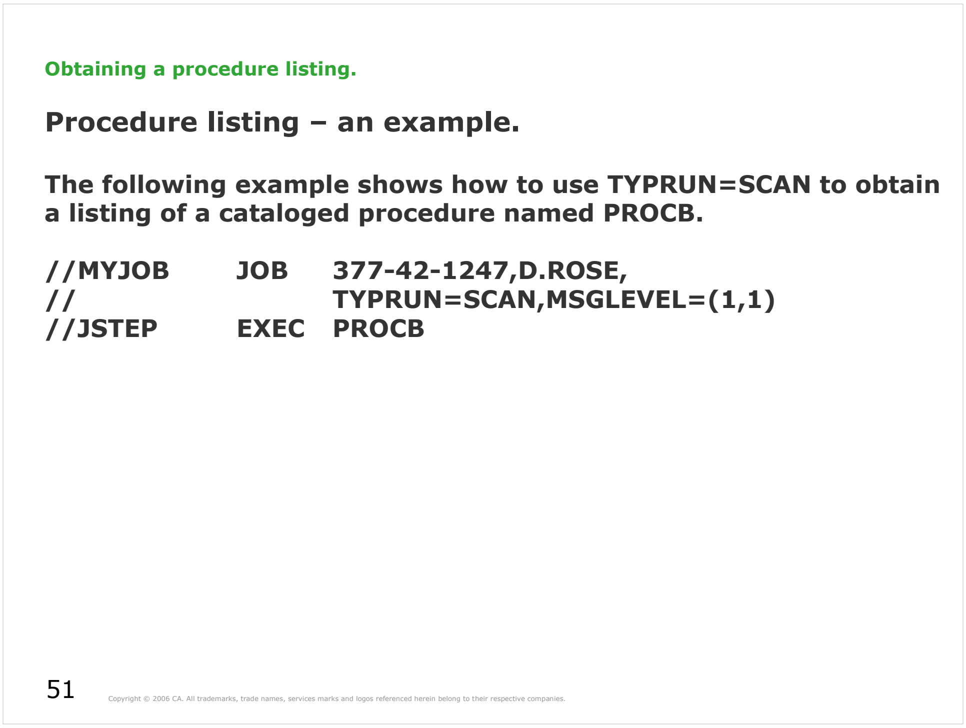
During a printing operation, IEBPTPCH can print according to default or user-supplied specifications. The default printing specifications are:

•One record per print line.

•Print lines consist of 8-character groups separated by 2 blanks.

•Unprintable characters appear as blanks.

•Blocked input causes a '*' to print at the end of each record, and '**' to print



Obtaining a procedure listing.

Procedure listing – an example.

The following example shows how to use TYPRUN=SCAN to obtain a listing of a cataloged procedure named PROCB.

```
//MYJOB      JOB    377-42-1247,D.ROSE,
//                  TYPRUN=SCAN,MSGLEVEL=(1,1)
//JSTEP      EXEC   PROCB
```

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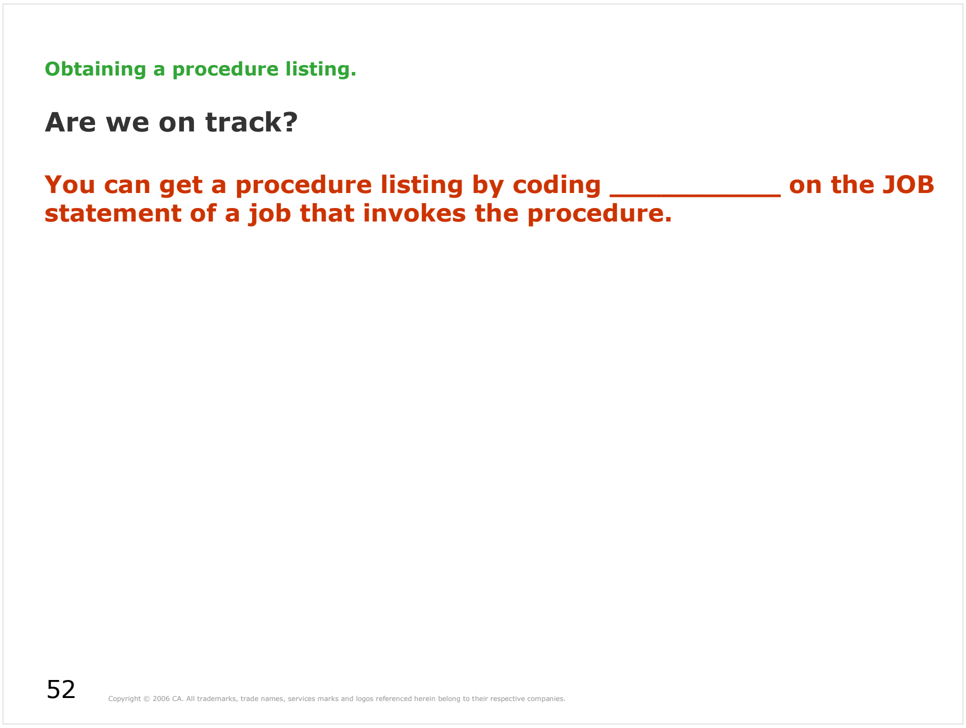
TYPRUN=SCAN only checks JCL for errors and print the listing.

See MCOE.EDU.JCL.JCL(LASMCLG).



Obtaining a procedure listing.

Are we on track?

You can get a procedure listing by coding ____________ on the JOB statement of a job that invokes the procedure.

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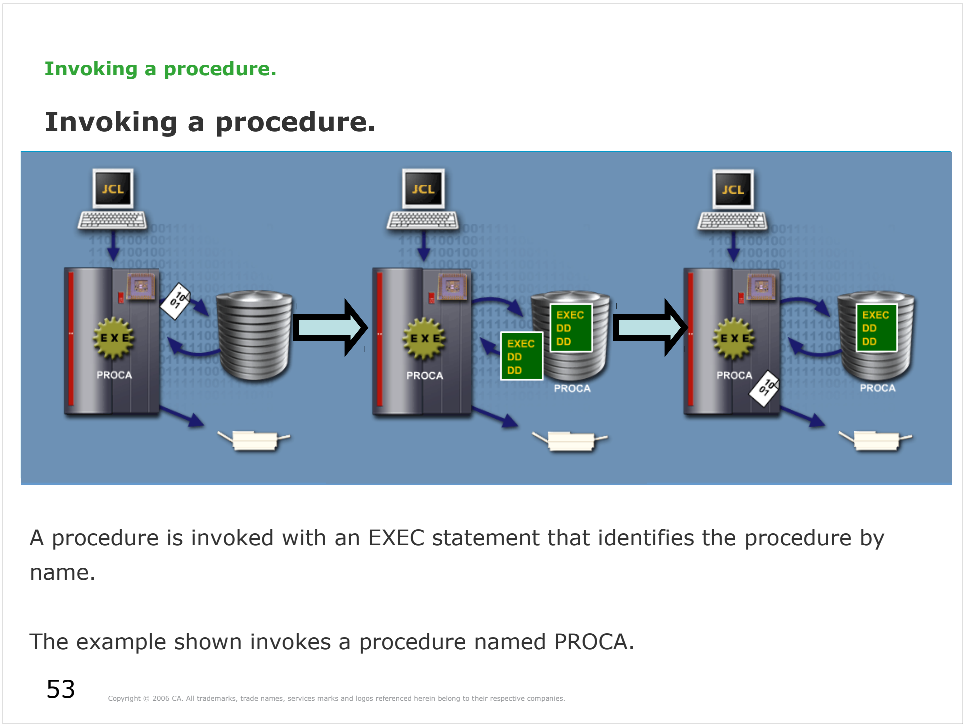
The correct answer is TYPRUN=SCAN and MSGLEVEL=(1,x).



Invoking a procedure.

Invoking a procedure.

A procedure is invoked with an EXEC statement that identifies the procedure by name.

The example shown invokes a procedure named PROCA.

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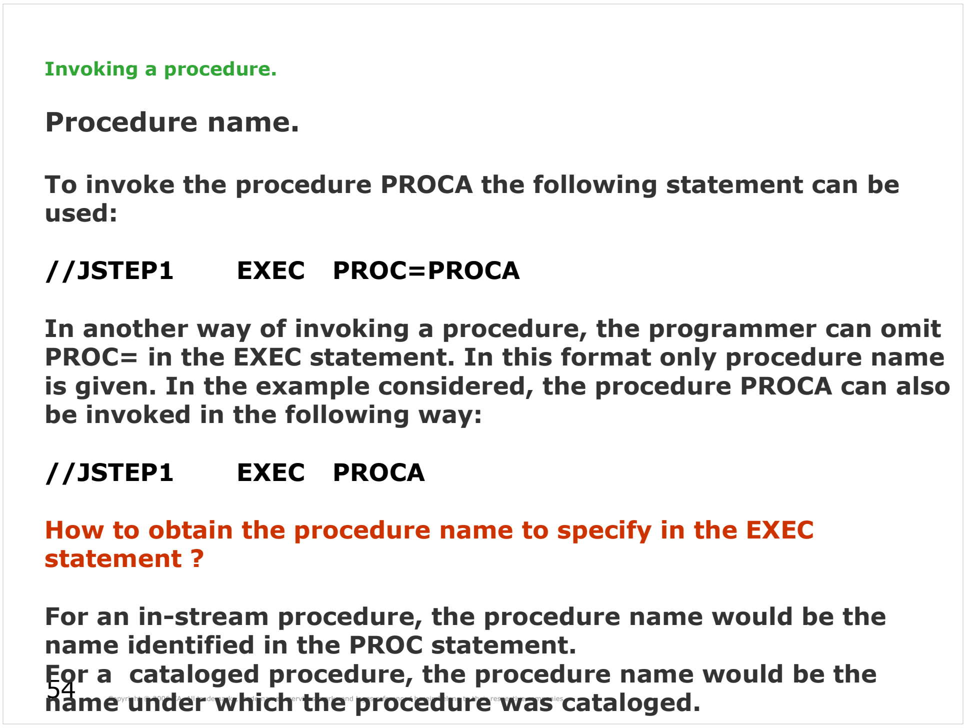
See statement in MCOE.EDU.JCL.JCL(LASMCLG):

```
//STEP1     EXEC  HLASMCLG,PARM.L='XREF’
```



Invoking a procedure.

Procedure name.

To invoke the procedure PROCA the following statement can be used:

```
//JSTEP1       EXEC   PROC=PROCA
```

In another way of invoking a procedure, the programmer can omit PROC= in the EXEC statement. In this format only procedure name is given. In the example considered, the procedure PROCA can also be invoked in the following way:

```
//JSTEP1       EXEC   PROCA
```

How to obtain the procedure name to specify in the EXEC statement ?

For an in-stream procedure, the procedure name would be the name identified in the PROC statement.
For a cataloged procedure, the procedure name would be the name under which the procedure was cataloged.

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But the problem is: how can I find a procedure in a long string of concatenated libraries?

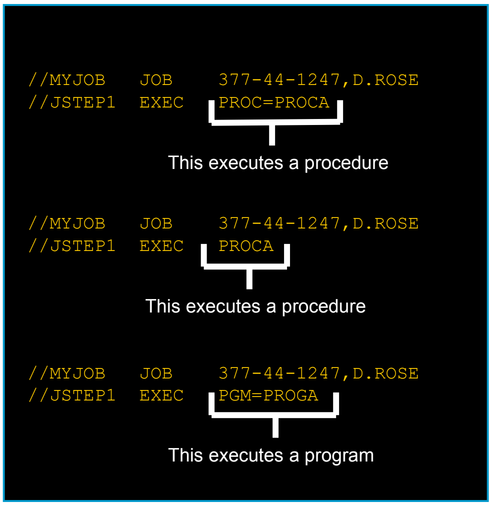
Invoking a procedure.

Invoking a program.

What is the difference between invoking a procedure and a program?

To invoke a procedure the keyword parameter PROC= can be used or it can be omitted. However, to invoke a program, the keyword parameter PGM= must be used.

Consider the examples shown on the right:
The first two examples invoke a procedure. The third one invokes a program.



```
//MYJOB    JOB     377-44-1247,D.ROSE
//JSTEP1   EXEC    PROC=PROCA
```

This executes a procedure

```
//MYJOB    JOB     377-44-1247,D.ROSE
//JSTEP1   EXEC    PROCA
```

This executes a procedure

```
//MYJOB    JOB     377-44-1247,D.ROSE
//JSTEP1   EXEC    PGM=PROGA
```

This executes a program

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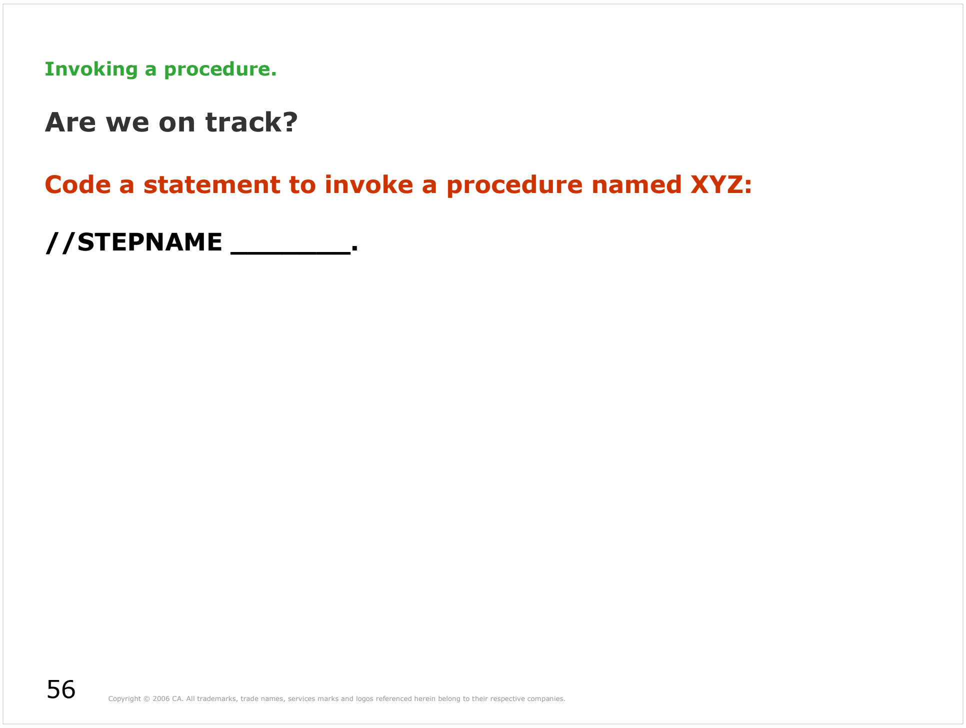

Invoking a procedure.

Are we on track?

Code a statement to invoke a procedure named XYZ:

//STEPNAME ________.

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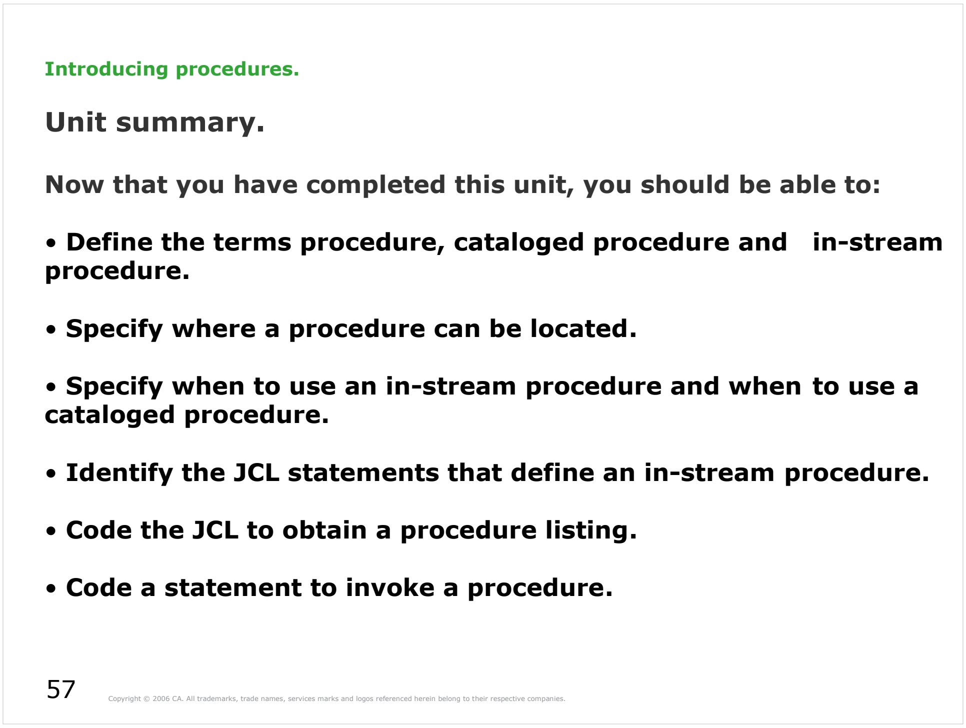
The correct answer is EXEC XYZ or EXEC PROC=XYZ.



Introducing procedures.

Unit summary.

Now that you have completed this unit, you should be able to:

- **Define the terms procedure, cataloged procedure and in-stream procedure.**
- **Specify where a procedure can be located.**
- **Specify when to use an in-stream procedure and when to use a cataloged procedure.**
- **Identify the JCL statements that define an in-stream procedure.**
- **Code the JCL to obtain a procedure listing.**
- **Code a statement to invoke a procedure.**

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