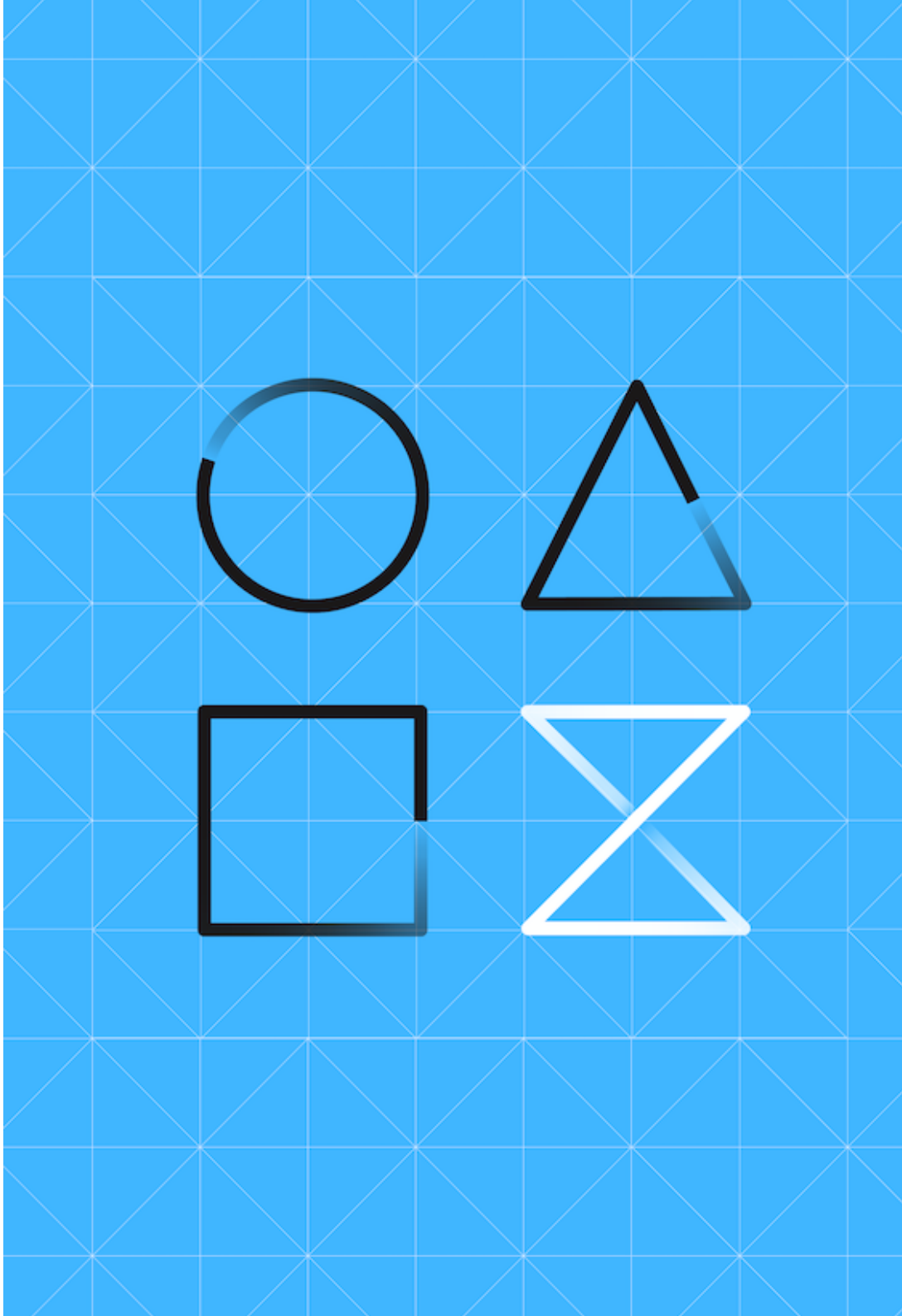
JCL1

Orchestrating the Enterprise



JCL1 - MAKING THINGS HAPPEN

The Challenge

You've seen some JCL already, but we haven't really gone in depth. In these challenges, we'll learn a little more about what JCL is used for, why it is important in a Z environment, and how you can take those skills even further. JCL is an essential part of making things happen in z/OS and getting comfortable with the concepts and syntax will let you power through many challenges you might face as you explore.

Before You Begin

You should have completed the FILES1 challenge, all about Data Sets and Members. If you have those concepts understood, you're all set to continue with the steps in this challenge.

Investment

Steps	Duration
15	90 minutes

JCL1|230519-0915

1 LOAD IT UP

ZXP.PUBLIC.JCL(JCLSETUP).jcl

```
1   //JCLSETUP JOB
2   //     EXEC PGM=IEFBR14
3   //LOAD   DD DSN=&SYSUID..LOAD,DISP=(,CATLG),DATACLAS=SLOAD
4   //JCL    DD DSN=&SYSUID..JCL,DISP=(,CATLG),DATACLAS=SPDS
5   //SOURCE DD DSN=&SYSUID..SOURCE,DISP=(,CATLG),DATACLAS=SPDS
6   //OUTPUT DD DSN=&SYSUID..OUTPUT,DISP=(,CATLG),DATACLAS=SPDS
7
```

JCL1|230519-0915

Look in **ZXP.PUBLIC.JCL** for a member named **JCLSETUP**. This is a fairly simple job that will allocate a few new data sets you need for this, and other challenges.

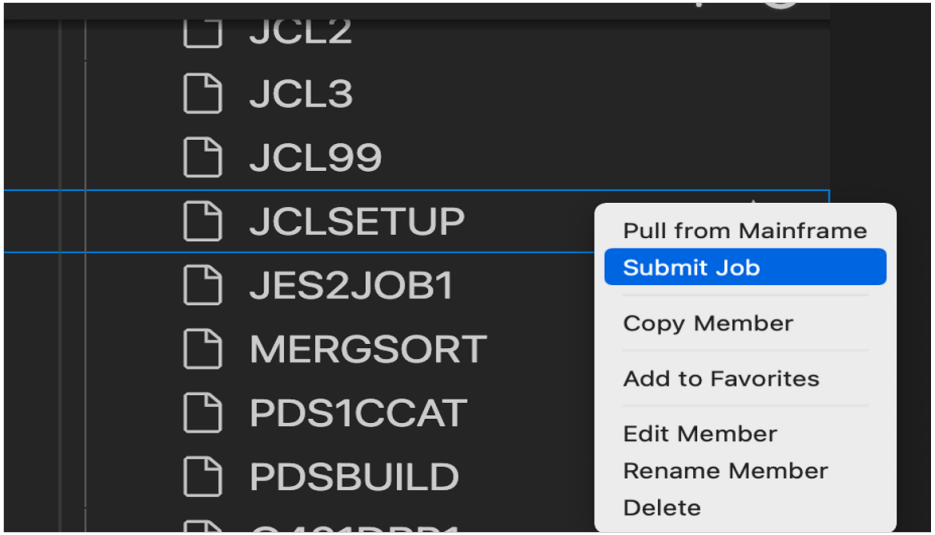
(Line #4 creates your own JCL data set.)

You can see in Line #3, it mentions &SYSUID..LOAD. The Ampersand (&) with SYSUID after it is what is known as a “Symbolic”, and when the system sees that, *it* will replace &SYSUID with your userid.

You don’t need to make any chances to this job for it to work.

This means everyone can use the same job, and it will automatically replace &SYSUID with their userid. How convenient!

2 SUBMIT IT



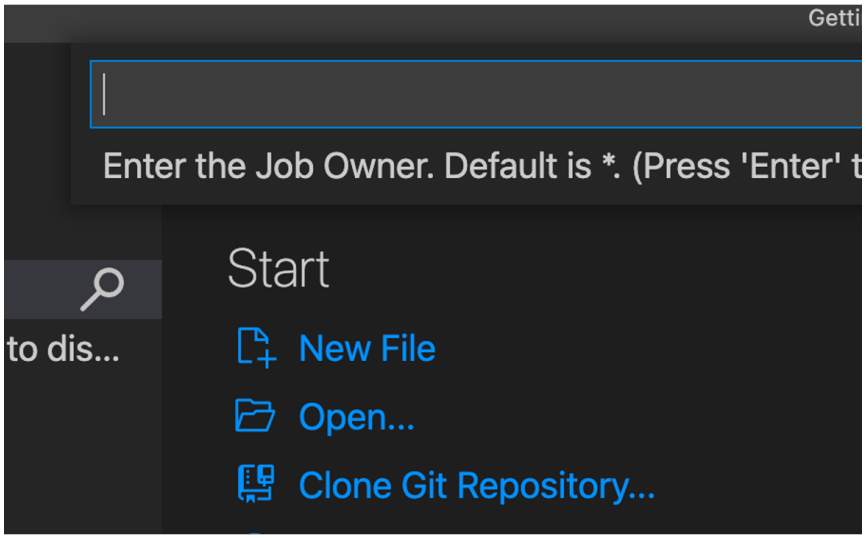
Right-click on that job and select Submit Job.

A note on the word “Job”: JCL is used to describe to the system exactly what you want it to do. The task which we hand over to the system is known as a “Job”, and the component of z/OS that accepts, processes, and manages the output of these jobs is known as the **Job Entry Subsystem (JES)**.

So, for this challenge, we’ve sent a job off to JES for it to process the task that we just looked at.

Note: this job is intended to create datasets for you ; if you run it more than once, you are likely to see errors about **DUPLICATE** dataset names.

3 FILTER AND FIND



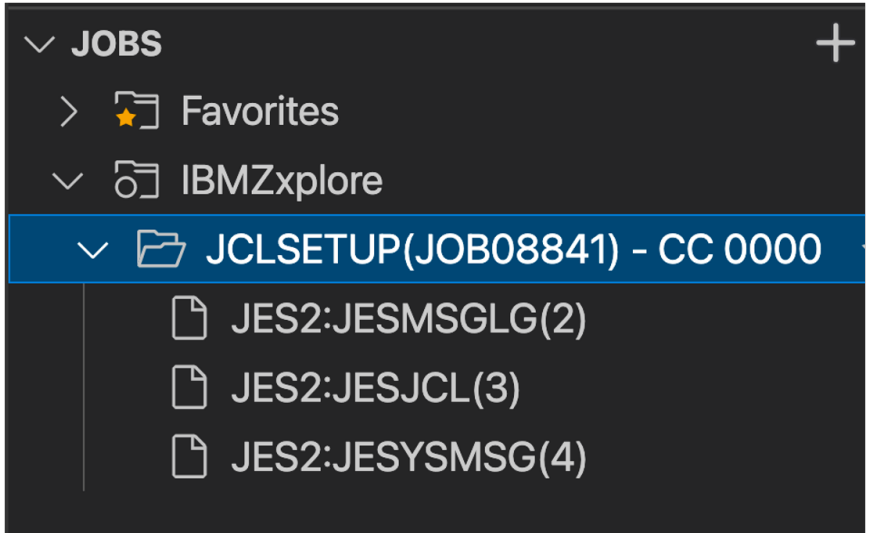
You should already have a profile under **JOBS** on the left side of VSCode.

Click on the magnifying glass ( ) to the right of it.

- Enter your userid for the Job Owner
- Enter an asterisk (*) for the Job Prefix
- Hit Enter (blank, no data) for Job Id Search.

You can redo this filter by clicking on the magnifying glass again, and selecting Owner/Prefix or Job Id. You should be able to find the job you just submitted in here. Look for “JCLSETUP”. We’ll dig into that next.

4 YOU GOT A ZERO. PERFECT!

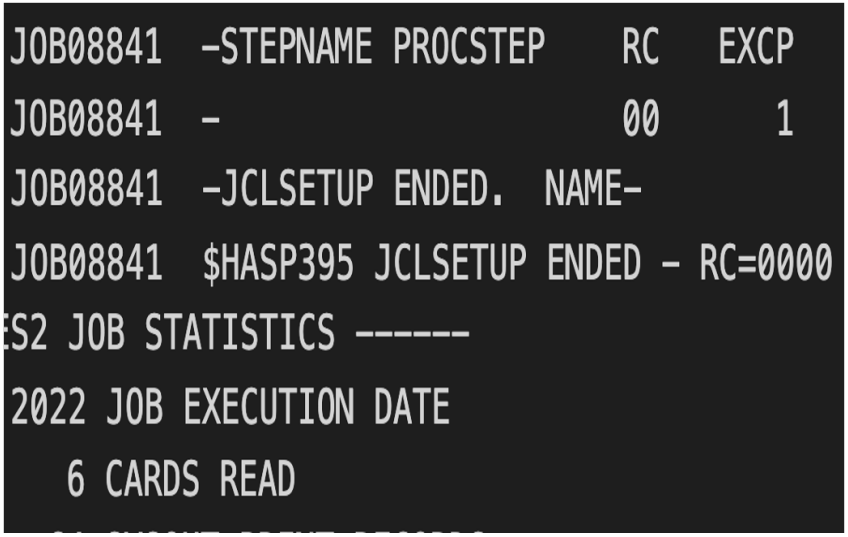


Open up the triangle “twistie” next to the JCLSETUP job you just submitted. There will probably be other jobs in there as well, but we’re specifically looking for **JCLSETUP**. If you submitted it more than once, find the one with CC 0000 to the right.

You’ll also see this number in the **JESMSGLG** member once you open the twistie. A condition code (CC) of zero means everything ran as expected, with no errors, so that’s good!

If you got any other number, then there’s usually something worth investigating and probably fixing.

5 JUMP RIGHT TO IT



You may have noticed that after submitting JCL, a little message pops up in the bottom right corner of VS Code. Rather than digging through your JOBS output, you can usually just click on that message, and it will take you right to the output.

A job will start out in **ACTIVE** while it's being run. You can refresh the status of a job by closing and then re-opening the twistie to the left of the job name.

6 KICKING OFF SOME COBOL

```
1   //JCL2    JOB 1
2   //*************************************************/
3   //COBRUN  EXEC IGYWCL
4   //COBOL.SYSIN  DD DSN=ZXP.PUBLIC.SOURCE(CBL0001),DISP=SHR
5   //LKED.SYSLMOD DD DSN=&SYSUID..LOAD(CBL0001),DISP=SHR
6   //*************************************************/
7   // IF RC = 0 THEN
8   //*************************************************/
9   //RUN     EXEC PGM=CBL0001
10  //STEPLIB   DD DSN=&SYSUID..LOAD,DISP=SHR
11  //FNAMES    DD DSN=ZXP.PUBLIC.INPUT(FNAMES),DISP=SHR
12  //LNAMES    DD DSN=ZXP.PUBLIC.INPUT(LNAMES),DISP=SHR
13  //COMBINE   DD DSN=&SYSUID..OUTPUT(NAMES),DISP=SHR
14  //SYSOUT    DD SYSOUT=*,OUTLIM=15000
15  //CEEDUMP   DD DUMMY
16  //SYSUDUMP  DD DUMMY
```


Copy the **JCL2** member from **ZXP.PUBLIC.JCL** to your own **JCL** data set, and then open your copy.

You may need to close and re-open your **DATA SETS** triangle to refresh the view, so your JCL2 shows up.

This JCL is used to compile and run some COBOL code. After compiling, it will put the resulting program in your **LOAD** data set.

Note: the programs in the LOAD dataset are binary - you won't be able to view anything in here with VSCode.

In JCL, statements that define where data is coming from, or going to, are known as **Data Definition** statements, or simply, "DD statements".

Look for the line that begins with **//COBRUN** - this is the start of a job "step" that with run the COBOL compiler. On the next line, you can see the input data set (the source) on Line 18 (**//COBOL.SYSIN**), and where it will put the output on the following line (**//LKED.SYSLMOD**).

The lines following the start of the **//RUN** step have the same format:

```
//"ddname"  DD DSN="dataset",DISP="access"
```

- “ddname” is also known as the file name - the name used by programs to access data in datasets
- “dataset” is the actual location of the data - this can change, but the program doesn’t need to be aware
- “access” states how the program can use the dataset

Reading further, if the job gets a Return Code of 0 (because everything went without any problems) from the compile step, it will then run the **CBL0001** program.

All making sense so far? We’re using JCL to compile, and then run some code.

WHY ARE JES AND JCL IMPORTANT? WHY CAN'T I JUST RUN PROGRAMS?

When you submit JCL, it goes to the Job Entry Subsystem (shortened to JES).

JES looks through the JCL you submitted and gathers all of the resources needed to accomplish the task. On a heavily-loaded system, it may be necessary to prioritize some jobs lower than others so that important work gets done faster.

Think of JCL as the order that a waiter writes up, and JES as the kitchen staff that looks at the order and decides how they're going to handle it.

The L in JCL stands for Language, but it really isn't a programming language as much as it is a way for us to effectively describe tasks to the system.

Everything else that shows up in the job output (the "joblog") is information about how the job ran. As you can see, there's a TON of information in here.

7 RUN, CODE, RUN

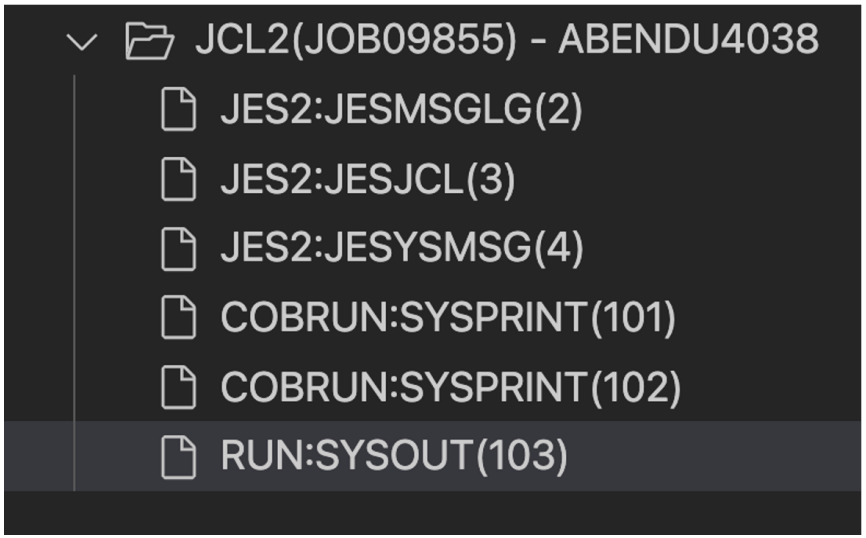
After successfully compiling the COBOL code, JES will run the program (the **//RUN EXEC PGM=CBL0001** command) and tell it where the find the input data sets, as well as where the output will be stored in your OUTPUT dataset –

```
//COMBINE   DD DSN=&SYSUID..OUTPUT(NAMES),DISP=SHR
```

The name of the DD statement is what comes directly after the double slashes, so “FNAMES” and “LNAMES”, for example.

Any lines starting with **//*** are comments and are ignored by JES. Commented lines are helpful for providing informational information, or holding lines of code we might use later, but don’t need right now.

8 THEY CAN'T ALL BE ZEROES



Submit **JCL2** from your JCL data set and then look at the output, using what you learned from the earlier steps in this challenge.

You *will* get an **ABEND** (short for Abnormal End), so something isn't quite right yet.

But don't worry - with your new skills, you will get to the bottom of this!

In the next step, you will look at the COBOL code and see how the actual code matches up with the JCL code being used to compile and execute it.

And again, don't worry! You do not need to become a COBOL expert to resolve this - remember this is a **JCL** challenge, not a COBOL challenge.

9 COMPARE THE CODE

```
*-----------------------
 IDENTIFICATION DIVISION.
*-----------------------
 PROGRAM-ID.    NAMES
 AUTHOR.        Otto B. Named
*--------------------
 ENVIRONMENT DIVISION.
*--------------------
 INPUT-OUTPUT SECTION.
 FILE-CONTROL.
     SELECT FIRST-NAME ASSIGN TO FNAMES.
     SELECT LAST-NAME  ASSIGN TO LNAMES.
     SELECT FIRST-LAST ASSIGN TO COMBINED.
```


The JCL statement beginning **//COBOL.SYSIN** points to the COBOL source code we want to compile, so let's start there. Open up that code and start looking at the **FILE-CONTROL** area.

This is where we get the names for the program which we need to reference in our JCL. For example, **FIRST-NAME** is what we reference in the COBOL code, and that is assigned (or linked to) the **FNAMES** DD statement in the JCL.

Open up the JCL, COBOL code, and the joblog – look at the output, and you should be able to figure out which

*very simple **single** change*

needs to be made in order for everything to link together between the COBOL and the JCL.

It actually may help to draw everything out on a piece of paper.

When you have fixed the problem in JCL2, it should run with a CC=0, and you will *find the correct output in the correct member* of your OUTPUT data set.

This stage might take a little bit of patience.

WHAT DOES COMPILE MEAN? WHAT IS COBOL?

COBOL is a programming language used in many financial, healthcare, and government institutions. Its high degree of mathematical precision and straightforward coding methods make it a natural fit when programs need to be fast, accurate, and easy to understand.

Code that gets written by humans needs to be turned into Machine Code for it to run as a program. Compiling is a step that performs this transformation. Our JCL has two main steps, compiling the source code into machine code, and then running the program.

This particular program also requires two input files, and writes to an output file, so we will specify those files (data sets) in the JCL as well.

10 ALL ABOARD

```
//*
//PEEKSKL EXEC PGM=IEBGENER
//SYSPRINT DD DUMMY
//SYSIN    DD DUMMY
//SYSUT1   DD *
Peekskill - 41mi
//SYSUT2   DD DSN=&SYSUID..JCL3OUT,DISP=(MOD,PASS,DELETE),
//            SPACE=(TRK,(1,1)),UNIT=SYSDA,
//            DCB=(DSORG=PS,RECFM=FB,LRECL=80)
//*
//CORTLNDT EXEC PGM=IEBGENER
//SYSPRINT DD DUMMY
//SYSIN    DD DUMMY
//SYSUT1   DD *
Cortlandt - 38mi
```


Copy **JCL3** from **ZXP.PUBLIC.JCL** into your own JCL data set. Load it up and take a look at what's inside. You'll see this JCL contains a number of steps, with each one using the **IEBGENER** utility program to direct an record into a sequential data set.

There's a header, some station information for the peak train stops between Poughkeepsie, NY and Grand Central Terminal in NYC, followed by some text about operating hours.

Looks pretty straightforward … let's see what the tricky part is.

11 YOU'RE NO DUMMY

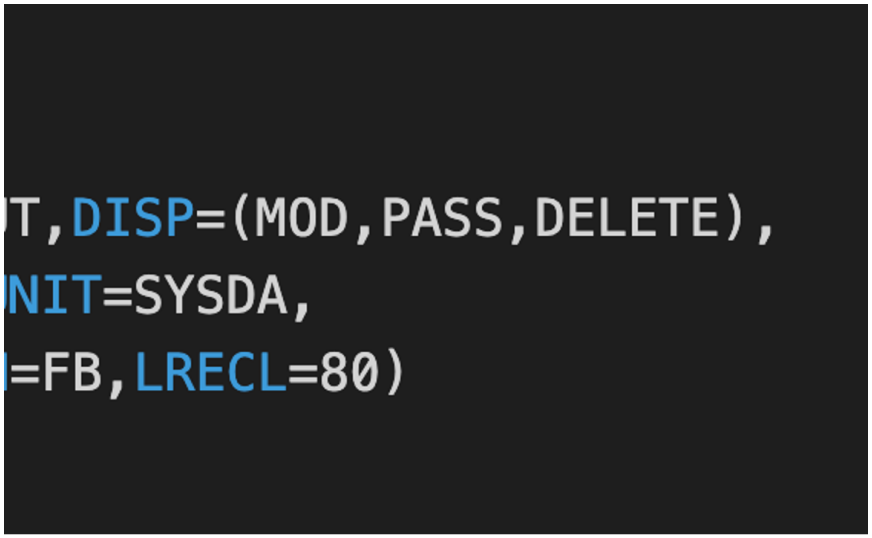
```
//JCL3     JOB
//*
//* IEBGENER is a system utility program to copy data
//*  where the default input  filename is SYSUT1
//*  and   the default output filename is SYSUT2
//*
//HEADER EXEC PGM=IEBGENER
//SYSPRINT DD DUMMY
//SYSIN    DD DUMMY
//SYSUT1   DD *
****************************************
METRO NORTH POUGHKEEPSIE -> NYC M-F SCHEDULE
PEAK HOUR OPERATION
****************************************
```


You may have also noticed lots of mentions of **DUMMY**.

Don't worry, this JCL isn't calling anyone names; it's just a way of saying "This parameter is required, but this time we aren't going to do anything with it, so it doesn't matter".

We use it here because the program we're running in each step (**IEBGENER**) requires an input statement, and requires a **SYSPRINT** DD statement, but we're not going to be making use of it, so DUMMY is a way of saying "It doesn't matter, don't waste your time setting this up"

12 A FRIENDLY DISPOSITION



In every piece of JCL we've used so far, we've encountered some sort of **DISP** (disposition) parameter.

DISP parameters are used to describe how JCL should use or create a data set, and what to do with it after the job, or job step, completes.

A standard DISP parameter has three parts. The first parameter is the status, which can be any of the following:

Parameter	Meaning
NEW	Create a new data set
SHR	Re-use an existing data set, and let other people use it if they'd like
OLD	Re-use an existing data set, but don't let others use it while we're using it

Parameter	Meaning
MOD	For sequential data sets only. Re-use an existing data set, but only append new records to the bottom of it. If no data set exists, create a new one.

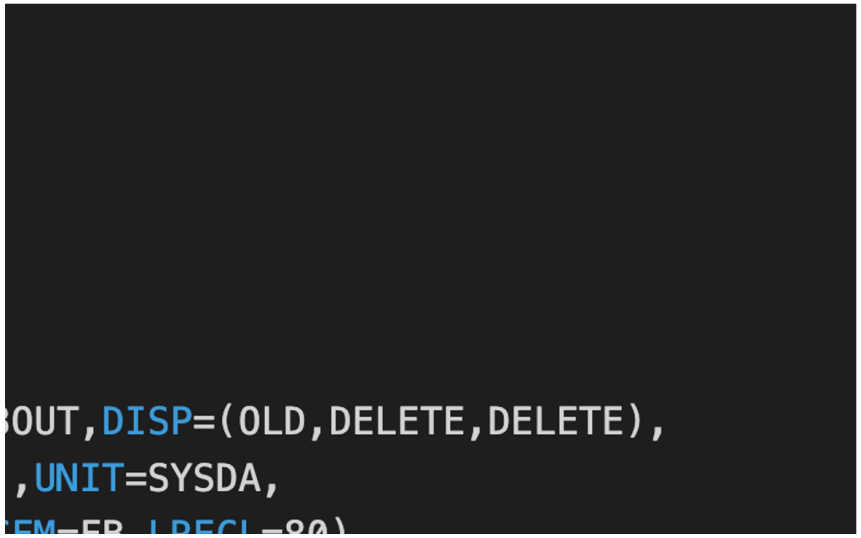
JOB OUTPUT? DD STATEMENTS? HELP ME UNDERSTAND, PLEASE

When a job runs, it produces output. This might include the data you're looking for, reasons a job didn't run successfully, or maybe just information about the system and the steps it took to make the work happen. There's a lot of information in here you probably *don't* need, but it's always better to have it than to be confused about the state of an important job.

A big part of your JCL is the DD statements, which specify which data sets (and members) to use for the input and output of the job you're submitting to the system.

The DD in DD Statement stands for Data Definition, and they start with //ddname. They will specify the name of the data set (or member), whether it already exists or needs to be created (known as the disposition), where the output should go, how much space it should take up, and a number of other variables.

13 WHAT'S YOUR STATUS?



Field 2 of the DISP parameter describes what should happen to the dataset in the case of a normal completion, and the third field is what should happen to it in the case of a failure.

There are a number of values we can use here, but for this challenge, you only need to know about the following:

Field2	Meaning
DELETE	Erase it from storage completely
CATLG	Record the data set so we can use it later
PASS	After this step completes, hold on to it so steps that come after this one can use it

14 RIGHT ON TIME

```
1  ****************************************
2  METRO NORTH POUGHKEEPSIE -> NYC M-F SCHEDULE
3  PEAK HOUR OPERATION
4  ****************************************
5  Poughkeepsie - 74mi
6  New Hamburg - 65mi
7  Beacon - 59mi
8  Cold Spring - 52mi
9  Garrison - 50mi
10 Peekskill - 41mi
11 Cortlandt - 38mi
12 Croton-Harmon - 33mi
13 Harlem - 125th Street - 4mi
14 Grand Central Terminal - 0mi
15 ************************************************************
16 Peak fares are charged during business rush hours on any
17 weekday train scheduled to arrive in NYC terminals between
18 6 a.m. and 10 a.m. or depart NYC terminals between 4 p.m.
19 and 8 p.m. On Metro-North trains, peak fares also apply to
20 travel on any weekday train that leaves Grand Central Terminal
21 between 6 a.m. and 9 a.m.
22 Off-peak fares are charged all other times on weekdays, all
23 day Saturday and Sunday, and on holidays.
```


Submit your copy of the **JCL3** job and look at the output.

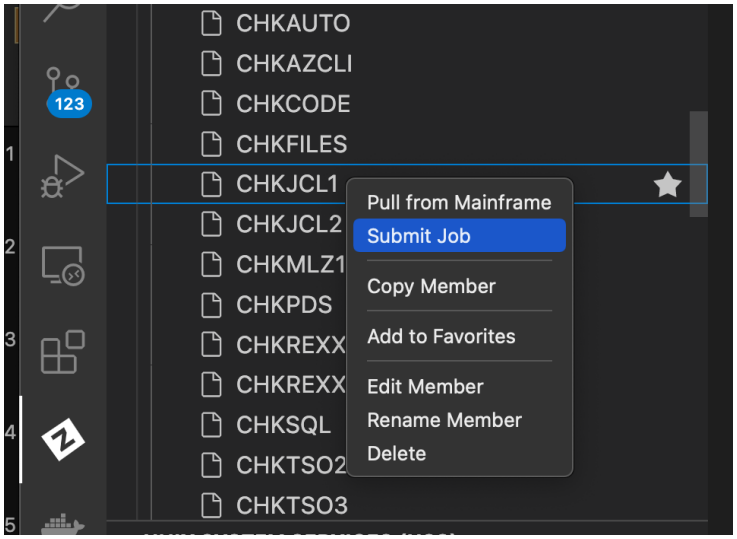
There are two edits you need to make in order for this job to run 100% correctly:

- a full listing of **10 stops**, from Poughkeepsie to Grand Central Terminal
- the information at the top and bottom of the data set.

You should also have ***no repeat stops***. If Beacon or Cortlandt is listed in there twice, something still needs fixing.

When completed, you should have the full output in your **JCL3OUT** sequential data set, totaling 23 lines (records).

15 WHO KNEW?



Now submit the job **CHKJCL1** from **ZXP.PUBLIC.JCL** to validate the correct output from JCL2 and JCL3, and hope to see completion code (CC) of 0.

If CHKJCL1 returns CC=0127, go back and double-check and adjust your work for JCL2 and JCL3, and submit those jobs again if needed.

Recheck for the correct output by submitting **CHKJCL1** again until you get CC=0000.

You will need to delete the **JCL3OUT** output data set each time before re-submitting **JCL3**.

You've accomplished a lot, and hopefully understand the requirement for following the details … Well done!

Nice job - let’s recap	Next up …
JCL can seem a little tricky, and maybe even a little unnecessary at first. We’re not used to using code to start programs, we usually just double-click on them and they run! However, once you start getting into the types of applications that keep Z systems busy 24/7, you start to build an appreciation for the precision and power that the structure gives you. Suffice to say, JCL is a necessary skill for any true Z professional.	Discover the Unix environment inside zOS – Unix System Services (USS)