

Part A: [Marks 60]

1. [Marks: 5] Create a resource group in your Azure portal and deploy three resources. Azure Data Factory, Azure SQL DB and Blob storage account.

Resource groups

University of Toronto |utoronto.onmicrosoft.com|

+ Create

Manage view

Refresh

Export to CSV

Open query

Assign tags

You are viewing a new version of Browse experience. Click here to access the old experience.

Filter for any field...

Subscription equals all

Location equals all

Add filter

Name	Subscription	Location
MIE1628	Azure for Students	East US

mie1628johnzhou_1752727880861 | Overview

Deployment

Search

Delete

Cancel

Redeploy

Download

Refresh

Overview

Inputs

Outputs

Template

Your deployment is complete

Deployment name : mie1628johnzhou_1752727880861

Subscription : Azure for Students

Resource group : MIE1628

Start time : 7/17/2025, 12:51:34 AM

Correlation ID : 1fa0ac54-9486-4899-99e9-9a803b69278c

Deployment details

Next steps

Go to resource

Give feedback

Tell us about your experience with deployment

Microsoft.SQLDatabase.newDatabaseNewServer_b512eb278f9a4b44a9d7b | Overview

Deployment

Search

Delete

Cancel

Redeploy

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Overview

Inputs

Outputs

Template

Deployment is in progress

Deployment name : Microsoft.SQLDatabase.newDatabaseNewServer_b512eb278f9a4b44a9d7b

Subscription : Azure for Students

Resource group : MIE1628

Start time : 7/17/2025, 12:46:27 AM

Correlation ID : b5400c4e-9834-4699-9c73-57061301c449

Deployment details

Resource	Type	Status	Operation details
mie1628db	Microsoft.Sql/servers	Accepted	Operation details

Give feedback

Tell us about your experience with deployment

Microsoft.DataFactory-20250717005318 | Overview

Deployment

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Inputs

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Template

Your deployment is complete

Deployment name : Microsoft.DataFactory-20250717005318

Subscription : Azure for Students

Resource group : MIE1628

Start time : 7/17/2025, 12:54:34 AM

Correlation ID : e6d07932-0bbe-4915-947e-e5e9f2814330

Deployment details

Next steps

Go to resource

Give feedback

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MIE1628

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Essentials

Subscription (mq09) : Azure for Students

Subscriptions ID : 47a50360-e559-4826-b1ba-8ce8b8d212a2

Tags (add) : Add tags

Deployments : 4 Succeeded

Location : East US

Resources

Recommendations

Filter for any field...

Type equals all

Location equals all

Add filter

Showing 1 to 4 of 4 records


Show hidden types

Name	Type	Location
mie1628db	SQL server	Canada Central
mie1628johnzhou	Storage account	Canada Central
mie1628johnzhouDF	Data factory (V2)	Canada Central
mie1628sqldb (mie1628db/mie1628sqldb)	SQL database	Canada Central

No groups

2. [Marks: 15] Now create a pipeline in Azure Data Factory and copy gender_jobs_data.csv file from the Blob storage account to Azure SQL DB. (First copy this file from your local machine to Blob Storage). See this <https://docs.microsoft.com/en-us/azure/data-factory/tutorial-copydata-portal> for reference.

Copy from local machine to Blob storage:



mie1628container

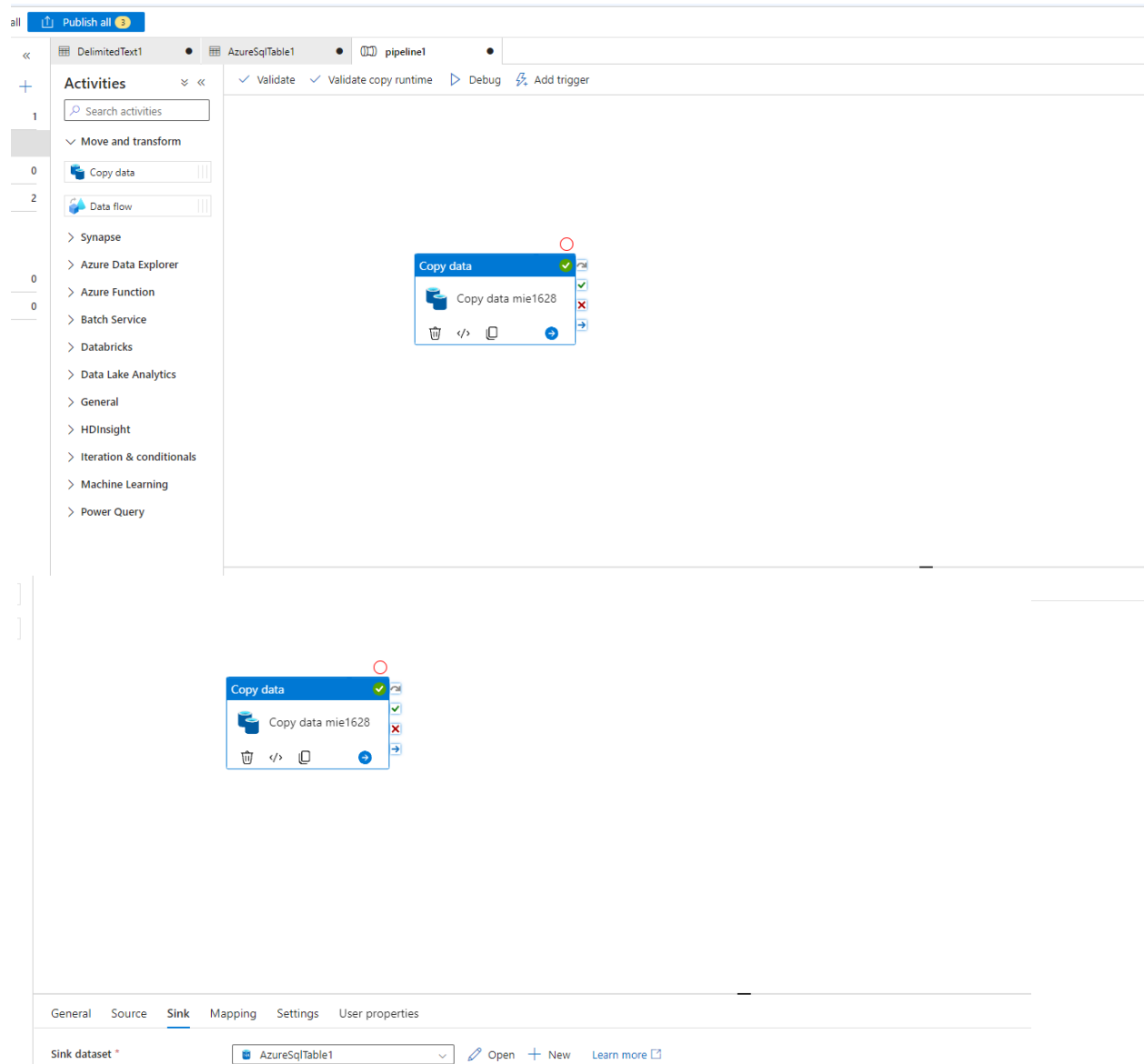
Authentication method: Access key (Switch to Microsoft Entra user account)

Search blobs by prefix (case-sensitive)

Showing all 1 items

Name	Last modified	Access tier	Blob type	Size	Lease state
gender_jobs_distribution2.csv	7/17/2023, 1:11:50 AM	Hot (inferred)	Block blob	379.72 KiB	Available

setup sink and source



all Publish all

DelimitedText1 AzureSqlTable1 pipeline1

Activities

- 1 Search activities
- 0 Move and transform
 - 0 Copy data
 - 2 Data flow
- 0 Synapse
- 0 Azure Data Explorer
- 0 Azure Function
- 0 Batch Service
- 0 Databricks
- 0 Data Lake Analytics
- 0 General
- 0 HDInsight
- 0 Iteration & conditionals
- 0 Machine Learning
- 0 Power Query

Copy data

Copy data mie1628

General Source Sink Mapping Settings User properties

Sink dataset * AzureSqlTable1 Open + New Learn more

Copy data

Copy data mie1628

Parameters

Variables

Settings

Output

Pipeline run ID

b666e322-b4c3-4040-81c1-ddbfadd306a0

Pipeline status

Succeeded

View debug run consumption

All status

Monitor in Azure Metrics

Export to CSV

Showing 1 - 1 of 1 items

Activity name	Activity status	Activity type	Run start	Duration	Integration runtime	User properties	Activity run ID	Log
Copy data mie1628	Succeeded	Copy data	7/17/2025, 2:27:51 AM	15s	AutoResolveIntegrationRuntime (Canada Central)		2cb08b09-c871-46db-97cc-da134bf62de8	

Detail of debug running:

Showing 1 - 8 items								Last refresh
<input type="checkbox"/>	Pipeline name	Run start	Run end	Duration	Status	Triggered by	Run ID	Parameters
<input type="checkbox"/>	pipeline1	7/17/2025, 2:27:49 AM	7/17/2025, 2:28:07 AM	18s	Succeeded	Manual trigger	b666e322-b4c3-4040-81c1-ddbfadd306a0	Parameters
<input type="checkbox"/>	pipeline1	7/17/2025, 2:28:16 AM	7/17/2025, 2:28:39 AM	23s	Succeeded	Manual trigger	eadccf8-fa15-43f2-85a7-adb449591a7c	
<input type="checkbox"/>	pipeline1	7/17/2025, 2:32:42 AM	7/17/2025, 2:33:05 AM	24s	Succeeded	Manual trigger	69b84010-f1c8-4561-96e1-15e3b441e70	

Data Factory

mie1628johnzhouDF

Search factory and documentation

Details

Refresh

Learn more on copy performance details from here.

Activity run id: 2cb08b09-c871-46db-97cc-da134bf62de8

Azure Blob Storage

Region: Canada Central

Succeeded

Azure SQL Database

Region: Canada Central

Data read: 387.004 KB

Files read: 1

Rows read: 2,088

Peak connections: 1

Data written: 619.128 KB

Rows written: 2,088

Peak connections: 2

Copy duration: 00:00:12

Throughput: 129.001 KB/s

Azure Blob Storage → Azure SQL Database

Start time: 7/17/2025, 2:27:52 AM

Used DIUs: 4

Used parallel copies: 1

Duration: 00:00:12

Details	Working duration	Total duration
Queue		00:00:07
Transfer	<div><div>Listing source: 00:00:00</div><div>Reading from source: 00:00:00</div><div>Writing to sink: 00:00:00</div></div>	00:00:03

Data consistency verification: Not verified

Showing 1 - 1 of 1 items

Activity name	Activity status	Activity type	Run start	Duration	Integration runtime
Copy data mie1628	Succeeded	Copy data	7/17/2025, 2:27:51 AM	15s	AutoResolveIntegrationRuntime (Canada Central)

3. [Marks: 10] Explain the different types of triggers available in ADF. Now create a schedule trigger and run your pipeline every 3 minutes. Show 5 successful runs.

- **Tumbling windows trigger:** trigger the pipeline running in fixed-size, non-overlapping time windows. It is used for time-based incremental data loads, and it can ensure that processing only happen once.
- **Schedule trigger:** trigger the pipeline running based on a pre-specified schedule and configure different specs like start-end time, frequency etc. It is used for running task in a regular basis.
- **Event-based trigger:** trigger the pipeline in response to certain event happened within Azure resources
- **Manual via UI trigger:** manually trigger the pipeline from ADF user interface (UI) for on-demand basis.

Scheduled 5 successful run every 3 min:

New trigger

Name *

Description

Type *

Schedule

Start date *

7/15/2025, 2:57:00 AM

Time zone *

Eastern Time (US & Canada) (UTC-4)

This time zone observes daylight savings. Trigger will auto-adjust for one hour difference.

Recurrence *

Every 3 Minute(s)

☐ Specify an end date

Annotations

+ New

Start trigger

☒ Start trigger on creation

Pipeline runs

Triggered

Debug

Run

Cancel options

Refresh

Edit columns

Full

Garnt

Filter by run ID or name

Local time: Last 24 hours

Pipeline name: All

Status: All

Runs: Latest runs

Triggered by: All

Add filter

Copy filters

Export to CSV

Showing 1 - 6 items

Last refreshed 0 minute

<input type="checkbox"/>	Pipeline name %s	Run start %s	Run end %s	Duration	Triggered by	Status %s	Run	Parameters	Annotations	Run ID
<input type="checkbox"/>	pipeline1	7/17/2025, 3:09:00 AM	7/17/2025, 3:09:25 AM	25s	every3min	Succeeded	Original			290e09e3-63bc-402d-980e-649182d13370
<input type="checkbox"/>	pipeline1	7/17/2025, 3:06:00 AM	7/17/2025, 3:06:24 AM	25s	every3min	Succeeded	Original			e766777b-4c7b-403e-9395-17050683a262
<input type="checkbox"/>	pipeline1	7/17/2025, 3:03:00 AM	7/17/2025, 3:03:23 AM	24s	every3min	Succeeded	Original			13c5e426-9521-40d4-bc9f-a6377a818279
<input type="checkbox"/>	pipeline1	7/17/2025, 3:00:01 AM	7/17/2025, 3:00:22 AM	22s	every3min	Succeeded	Original			3cd89449-6b1c-4024-9d81-e9d31e1b7d8a
<input type="checkbox"/>	pipeline1	7/17/2025, 2:57:02 AM	7/17/2025, 2:57:22 AM	21s	every3min	Succeeded	Original			601dd3a30-4f5b-44f9-9d5a-2a44d6775270

4. [Marks: 20] A client needs to replicate objects from ADLS Gen 2 in Canada Central to ADLS Gen2 in West Europe. Let's say they want to do this in a bi-directional way. How can you set this up? Explain in words.

- To replicate the objects in from ADLS Gen 2 in Canada Central to ADLS Gen2 in West Europe, we could use ADF to setup two pipelines: one transfer and copy from Canada to Europe and the other in reverse as a bi-directional pipeline.
- For one pipeline, we could set up ADLS Gen 2 in Canada Central and ADLS Gen2 in West Europe as source and sink and the other pipeline set up in the reversed way.
- We could set up an event-based trigger to respond to any storage event, for example, the modification happened in one of the storage, and trigger the pipeline to synchronize and replicate the modification to the other instance.

Part B: [Marks: 20]

1. [Marks:5] In the gender_jobs_data table - Filter all the OCCUPATIONS in MAJOR_CATEGORY of Computer, Engineering, and Science for the YEAR 2013

mie1628db/mie1628sqldb

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview)

SQL database

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Query 1

Run

Cancel query

Save query

Export data as

Show only Editor

```
1 SELECT *
2 FROM gender_jobs_distribution
3 WHERE MAJOR_CATEGORY = 'Computer, Engineering, and Science' AND YEAR = 2013
4
5
```

Results

Messages





Search to filter items...

year	occupation	major_category	minor_category	total_workers	workers_male	workers_female	percent_female	total_earnings	total_earnings_male	total_earnings_female
2013	Computer and information res...	Computer, Engineering, and Sci...	Computer and mathematical	12991	9222	3771	29	95918	130022	88006
2013	Computer systems analysts	Computer, Engineering, and Sci...	Computer and mathematical	441533	280626	160912	36.4	75586	81174	69546
2013	Information security analysts	Computer, Engineering, and Sci...	Computer and mathematical	50851	40661	10172	20	84142	86449	80243
2013	Computer programmers	Computer, Engineering, and Sci...	Computer and mathematical	274234	260175	76139	23.3	82512	81508	75000
2013	Software developers, applicat...	Computer, Engineering, and Sci...	Computer and mathematical	824883	741308	183580	19.8	94225	96568	83308
2013	Web developers	Computer, Engineering, and Sci...	Computer and mathematical	156446	95672	40774	26.9	62056	61566	55995
2013	Computer support specialists	Computer, Engineering, and Sci...	Computer and mathematical	453726	329470	119266	26	52023	52990	49001
2013	Database administrators	Computer, Engineering, and Sci...	Computer and mathematical	101323	61969	39354	38.8	75824	84609	61378
2013	Network and computer system...	Computer, Engineering, and Sci...	Computer and mathematical	195872	160576	34996	17.9	67248	68363	61699
2013	Computer network architects	Computer, Engineering, and Sci...	Computer and mathematical	91709	84233	7476	8.2	96272	96549	54445
2013	Computer - all other	Computer, Engineering, and Sci...	Computer and mathematical	354952	277889	77063	21.7	68700	66971	65529
2013	Actuaries	Computer, Engineering, and Sci...	Computer and mathematical	22320	16642	4958	28.3	112191	116019	105739
2013	Mathematicians	Computer, Engineering, and Sci...	Computer and mathematical	1933	1603	330	17.1	76266	72799	96562
2013	Operations research analysts	Computer, Engineering, and Sci...	Computer and mathematical	121606	65206	58430	47.3	77922	86748	68925
2013	Statisticians	Computer, Engineering, and Sci...	Computer and mathematical	33119	16117	15202	48.5	81209	87488	74291
2013	Miscellaneous mathematical sci...	Computer, Engineering, and Sci...	Computer and mathematical	3686	1674	1712	46.4	70270	75221	56018
2013	Architects, except naval	Computer, Engineering, and Sci...	Architecture and engineering	145439	114341	31098	21.4	71305	75395	60218

2. [Marks:5] In the gender_jobs_data table - How many OCCUPATIONS exist in the MINOR_CATEGORY of Business and Financial Operations overall?

>>

Query 1 ×

 Run ☐ Cancel query  Save query  Export data as  Show only Editor

```
1 SELECT COUNT(DISTINCT occupation)
2 FROM gender_jobs_distribution
3 WHERE minor_category = 'Business and Financial Operations';
4
5
```

Results Messages

 Search to filter items...

28

3. [Marks:5] In the gender_jobs_data table - Get all relevant information for bus drivers across all years

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview)

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Query 1 X

Run

Cancel query

Save query

Export data as

Show only Editor

```

1 SELECT *
2 FROM gender_sns_distr(bustime
3 WHERE occupation = 'Bus drivers';
4
5

```

Results Messages

Search to filter items...

year	occupation	major category	minor category	total workers	workers.male	workers.female	percent.female	total earnings	total earnings.male	total earnings.female
2013	Bus drivers	Production, Transportation, and...	Transportation	27991	174620	101181	58.7	12725	27580	27100
2014	Bus drivers	Production, Transportation, and...	Transportation	26775	161334	106441	39.8	12414	26535	27795
2015	Bus drivers	Production, Transportation, and...	Transportation	26878	174274	114564	39.7	12098	26072	27095
2016	Bus drivers	Production, Transportation, and...	Transportation	26828	174989	101715	36.3043664	12522	26530	26700
2013	Bus drivers	Production, Transportation, and...	Transportation	27991	174620	101181	58.7	12725	27580	27100
2014	Bus drivers	Production, Transportation, and...	Transportation	26775	161334	106441	39.8	12414	26535	27795
2015	Bus drivers	Production, Transportation, and...	Transportation	26878	174274	114564	39.7	12098	26072	27095
2016	Bus drivers	Production, Transportation, and...	Transportation	26828	174989	101715	36.3043664	12522	26530	26700
2013	Bus drivers	Production, Transportation, and...	Transportation	27991	174620	101181	58.7	12725	27580	27100
2014	Bus drivers	Production, Transportation, and...	Transportation	26775	161334	106661	39.8	12414	26535	27795
2015	Bus drivers	Production, Transportation, and...	Transportation	26878	174274	114564	39.7	12098	26072	27095
2016	Bus drivers	Production, Transportation, and...	Transportation	26828	174989	101735	36.3043664	12522	26530	26870
2013	Bus drivers	Production, Transportation, and...	Transportation	27991	174620	101181	58.7	12725	27580	27100
2014	Bus drivers	Production, Transportation, and...	Transportation	26775	161334	106661	39.8	12414	26535	27795
2015	Bus drivers	Production, Transportation, and...	Transportation	26878	174274	114564	39.7	12098	26072	27095
2016	Bus drivers	Production, Transportation, and...	Transportation	26828	174989	101725	36.3043664	12522	26530	26870
2013	Bus drivers	Production, Transportation, and...	Transportation	27991	174620	101181	58.7	12725	27580	27100

4. [Marks:5] In the `gender_jobs_data` table - Summarize the total number of `WORKERS_FEMALE` in the `MAJOR_CATEGORY` of Management, Business, and Financial by each year.

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview) ☆

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Query 1

Run Cancel query Save query Export data as Show only Editor

```
1 SELECT year, SUM(workers_female)
2 FROM gender_jobs_distribution
3 WHERE major_category = 'Management, Business, and Financial '
4 GROUP BY year;
5
```

Results Messages

Search to filter items...

year	
2013	69735123
2016	77560677
2014	72553320
2015	75436908

5. [Marks:5] In the gender_jobs_data table - What were the total earnings of male (TOTAL_EARNINGS_MALE) employees in the Service MAJOR_CATEGORY for the year 2015?

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview) ☆ ...

SQL database

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Query 1 X

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```
1 SELECT SUM(total_earnings_male)
2 FROM gender_jobs_distribution
3 WHERE major_category = 'Service' AND year = 2015;
4
```

Results Messages

Search to filter items...

22521834

6. [Marks:5] In the gender_jobs_data table - How many female workers were in management roles in the year 2015?

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview) ☆ ...

SQL database

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Query 1 X

Run Cancel query Save query Export data as Show only Editor

```
1 SELECT SUM(workers_female)
2 FROM gender_jobs_distribution
3 WHERE minor_category = 'Management' AND year = 2015;
4
```

Results Messages

Search to filter items...

46500480

7. [Marks:5] In the gender_jobs_data table - Compare the TOTAL_EARNINGS_MALE and TOTAL_EARNINGS_FEMALE earnings irrespective of occupation by each year

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Query 1 ✕

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```
1 SELECT year,SUM(total_earnings_male) AS total_earnings_male, SUM(total_earnings_female) AS total_earnings_female
2 FROM gender_jobs_distribution
3 GROUP BY year
```

Results Messages

Search to filter items...

year	total_earnings_male	total_earnings_female
2013	243437038	186489636
2016	256172742	207680418
2014	247234030	202420872
2015	249793859	204916609

8. [Marks:5] In the gender_jobs_data table - How much money (TOTAL_EARNINGS_FEMALE) did female workers make as engineers in 2016?

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview) ☆ ...

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Query 1 X

Run Cancel query Save query Export data as Show only Editor

```
1 SELECT SUM(total_earnings_female) AS total_earnings_female
2 FROM gender_jobs_distribution
3 WHERE year = 2016 AND occupation like '%engineer%';
4
```

Results Messages

Search to filter items...

total_earnings_female
16596286

9. [Marks:10] What is the total number of full-time and part-time female workers versus male workers year over year?

mie1628sqldb (mie1628db/mie1628sqldb) | Query editor (preview)

SQL database

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Query 1

Run Cancel query Save query Report data as Show only Editor

```
1 -- What is the total number of full-time and part-time female workers versus male workers year over year?
2 SELECT year, SUM(full_time_male) AS total_full_time_male_workers, SUM(part_time_male) AS total_part_time_male_workers, SUM(full_time_female) AS total_full_time_female_workers, SUM(part_time_female) AS total_part_time_female_workers
3 FROM gender_subs_distribution
4 GROUP BY year;
```

Results Messages

Search to filter items...

year	total_full_time_male_workers	total_part_time_male_workers	total_full_time_female_workers	total_part_time_female_workers
2013	40226	61543	347652	122146
2014	410123	29664	348391	121205
2015	411544	38235	351410	118368
2016	411544	38235	352819	118860