

1. Create a Kubernetes cluster using minikube.

Answer: Cluster using MiniKube:

```
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Switch to PowerShell | Restart | Manage files | New session | Editor | Web preview | Settings | Help  
System load: 0.28      Processes:      140  
Usage of /: 19.7% of 28.02GB  Users logged in: 0  
Memory usage: 0%      IPv4 address for eth0: 10.0.0.4  
Swap usage: 0%  
  
Expanded Security Maintenance for Applications is not enabled.  
  
0 updates can be applied immediately.  
  
Enable ESM Apps to receive additional future security updates.  
See https://ubuntu.com/esm or run: sudo pro status  
  
Last login: Thu Jul 3 05:55:12 2025 from 74.225.207.63  
mini@minikube-server:~$ docker --version  
Docker version 28.3.1, build 38b7060  
mini@minikube-server:~$ minikube version  
minikube version: v1.36.0  
commit: f8f52f5de11fc6ad8244afac475e1d0f96841df1-dirty  
mini@minikube-server:~$ minikube start  
👉 minikube v1.36.0 on Ubuntu 24.04  
🔧 Using the docker driver based on an existing profile  
🔧 Starting "minikube" primary control-plane node in "minikube" cluster  
🔧 Pulling base image v0.0.47 ...  
🔧 Restarting existing docker container for "minikube" ...  
🔧 Preparing Kubernetes v1.33.1 on Docker 28.1.1 ...  
🔧 Verifying Kubernetes components...  
   • Using image gcr.io/k8s-minikube/storage-provisioner:v5  
   • Enabled addons: default-storageclass, storage-provisioner  
🌟 Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
```

Activate Windows
Go to PC settings to activate Windows.

```
mini@minikube-server:~$ minikube status  
minikube  
type: Control Plane  
host: Running  
kubelet: Running  
apiserver: Running  
kubeconfig: Configured
```

2. Create a Kubernetes cluster using kubeadm.

Answer: Cluster using Kubeadm:

```
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Switch to PowerShell | Restart | Manage files | New session | Editor | Web preview | Settings | Help

mini@minikube-server:~$ sudo swapoff -a
mini@minikube-server:~$ sudo sed -i 's/#/#/' /etc/fstab
mini@minikube-server:~$ sudo apt update
Hit:1 http://azure.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://azure.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://azure.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://azure.archive.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:5 https://download.docker.com/linux/ubuntu noble InRelease
Get:6 http://azure.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1221 kB]
Get:7 http://azure.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [251 kB]
Get:8 http://azure.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [162 kB]
Get:9 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1103 kB]
Get:10 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [281 kB]
Get:11 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [376 kB]
Get:12 http://azure.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [1391 kB]
Get:13 http://azure.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [290 kB]
Get:14 http://azure.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:15 http://azure.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:16 http://azure.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7092 B]
Get:17 http://azure.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [16.4 kB]
Get:18 http://azure.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [212 B]
Get:19 http://azure.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:20 http://azure.archive.ubuntu.com/ubuntu noble-security/main amd64 Packages [970 kB]
Get:21 http://azure.archive.ubuntu.com/ubuntu noble-security/main Translation-en [173 kB]
Get:22 http://azure.archive.ubuntu.com/ubuntu noble-security/main amd64 Components [21.6 kB]
Get:23 http://azure.archive.ubuntu.com/ubuntu noble-security/universe amd64 Packages [869 kB]
Get:24 http://azure.archive.ubuntu.com/ubuntu noble-security/universe Translation-en [191 kB]
Get:25 http://azure.archive.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.3 kB]
Get:26 http://azure.archive.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [1347 kB]
Get:27 http://azure.archive.ubuntu.com/ubuntu noble-security/restricted Translation-en [290 kB]
Get:28 http://azure.archive.ubuntu.com/ubuntu noble-security/restricted amd64 Components [288 B]
Get:29 http://azure.archive.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [288 B]
```

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Switch to PowerShell | Restart | Manage files | New session | Editor | Web preview | Settings | Help

mini@minikube-server:~$ sudo apt install -y apt-transport-https ca-certificates curl gpg software-properties-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package software-properties-common
mini@minikube-server:~$ sudo apt install -y apt-transport-https ca-certificates curl gpg software-properties-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203).
curl is already the newest version (8.5.0-2ubuntu10.6).
gpg is already the newest version (2.4.4-2ubuntu17.2).
gpg set to manually installed.
software-properties-common is already the newest version (0.99.49.2).
software-properties-common set to manually installed.
The following NEW packages will be installed:
  apt-transport-https
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 3970 B of archives.
After this operation, 36.9 kB of additional disk space will be used.
Get:1 http://azure.archive.ubuntu.com/ubuntu noble-updates/universe amd64 apt-transport-https all 2.8.3 [3970 B]
Fetched 3970 B in 0s (65.6 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 68180 files and directories currently installed.)
Preparing to unpack .../apt-transport-https_2.8.3_all.deb ...
Unpacking apt-transport-https (2.8.3) ...
Setting up apt-transport-https (2.8.3) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
```

```
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mini@minikube-server:~$ curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.33/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg  
mini@minikube-server:~$ echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.33/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list  
mini@minikube-server:~$ sudo apt-get update  
Hit:1 http://azure.archive.ubuntu.com/ubuntu noble InRelease  
Hit:2 http://azure.archive.ubuntu.com/ubuntu noble-updates InRelease  
Hit:3 http://azure.archive.ubuntu.com/ubuntu noble-backports InRelease  
Hit:4 http://azure.archive.ubuntu.com/ubuntu noble-security InRelease  
Hit:5 https://download.docker.com/linux/ubuntu noble InRelease  
Get:6 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb InRelease [1186 B]  
Get:7 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb Packages [5202 B]  
Fetched 6388 B in 1s (8088 B/s)  
Reading package lists... Done  
mini@minikube-server:~$ sudo apt-get install -y kubelet kubeadm kubectl  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
  conntrack cri-tools kubernetescni  
The following NEW packages will be installed:  
  conntrack cri-tools kubeadm kubectl kubelet kubernetescni  
0 upgraded, 6 newly installed, 0 to remove and 1 not upgraded.  
Need to get 95.4 MB of archives.  
After this operation, 351 MB of additional disk space will be used.  
Get:1 http://azure.archive.ubuntu.com/ubuntu noble/main amd64 conntrack amd64 1:1.4.8-1ubuntu1 [37.9 kB]  
Get:2 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb cri-tools 1.33.0-1.1 [17.3 MB]  
Get:3 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb kubeadm 1.33.2-1.1 [12.7 MB]  
Get:4 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb kubectl 1.33.2-1.1 [11.7 MB]  
Get:5 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb kubernetescni 1.6.0-1.1 [37.8 MB]  
Get:6 https://prod-cdn.packages.k8s.io/repositories/iscv/kubernetes:/core:/stable:/v1.33/deb kubelet 1.33.2-1.1 [15.9 MB]  
Fetched 95.4 MB in 2s (62.0 MB/s)  
Selecting previously unselected package conntrack.  
Activate Windows  
Go to PC settings to activate Windows.
```

```
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Switch to PowerShell Restart Manage files New session Editor Web preview Settings Help  
Scanning linux images...  
Running kernel seems to be up-to-date.  
No services need to be restarted.  
No containers need to be restarted.  
No user sessions are running outdated binaries.  
No VM guests are running outdated hypervisor (qemu) binaries on this host.  
mini@minikube-server:~$ sudo apt-mark hold kubelet kubeadm kubectl  
kubelet set on hold.  
kubeadm set on hold.  
kubectl set on hold.  
mini@minikube-server:~$ sudo systemctl enable --now kubelet
```

3. Deploy an AKS cluster using the portal. Access the dashboard and create roles for multiple users.

Answer: AKS Cluster using Portal:

The screenshot shows the Microsoft Azure portal interface. At the top, there's a navigation bar with the Microsoft Azure logo, a search bar, and user information. Below the navigation bar, the main heading is 'microsoft.aks-1751778773041 | Overview'. The left sidebar contains a search bar and a list of tabs: Overview (selected), Inputs, Outputs, and Template. The main content area displays 'Deployment is in progress'. It includes deployment details such as 'Deployment name: microsoft.aks-1751778773041', 'Subscription: Azure for Students', 'Resource group: Kube', 'Start time: 7/6/2025, 10:43:44 AM', and 'Correlation ID: 66bdf346-6f89-479f-81bb-be7a521c1f60'. A table shows the deployment details for the 'aks-demo-cluster' resource, which is of type 'Microsoft.ContainerService/mana...' and has a status of 'Created'. The table has columns for Resource, Type, Status, and Operation details. On the right side, there are several informational panels: 'Microsoft Defender for Cloud' with a link to 'Go to Microsoft Defender for Cloud >', 'Free Microsoft tutorials' with a link to 'Start learning today >', and 'Work with an expert' with a link to 'Find an Azure expert >'. At the bottom right, there's a 'Activate Windows' notification.

```
dhruv [ ~ ]$ az aks get-credentials --resource-group Kube --name aks-demo-cluster
Merged "aks-demo-cluster" as current context in /home/dhruv/.kube/config
dhruv [ ~ ]$ kubectl apply -f https://raw.githubusercontent.com/kubernetes/dashboard/v2.7.0/aio/deploy/recommended.yaml
namespace/kubernetes-dashboard created

serviceaccount/kubernetes-dashboard created
service/kubernetes-dashboard created
secret/kubernetes-dashboard-certs created
secret/kubernetes-dashboard-csrf created
secret/kubernetes-dashboard-key-holder created
configmap/kubernetes-dashboard-settings created
role.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrole.rbac.authorization.k8s.io/kubernetes-dashboard created
rolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
clusterrolebinding.rbac.authorization.k8s.io/kubernetes-dashboard created
deployment.apps/kubernetes-dashboard created
service/dashboard-metrics-scraper created
deployment.apps/dashboard-metrics-scraper created
dhruv [ ~ ]$
```

4. Deploy a microservice application on AKS cluster and access it using public internet.

Answer: Deploy image of Application On AKS cluster:

```
dhruv [ ~ ]$ kubectl config current-context
aks-demo-cluster
dhruv [ ~ ]$ kubectl get nodes
NAME                                STATUS   ROLES    AGE   VERSION
aks-agentpool-25777836-vmss000000  Ready   <none>   21m   v1.32.5
aks-agentpool-25777836-vmss000001  Ready   <none>   21m   v1.32.5
dhruv [ ~ ]$ kubectl create deployment aks-demo-cluster --image=hpranav/kodekloudappcs:v1 --replicas=1
deployment.apps/aks-demo-cluster created
dhruv [ ~ ]$ kubectl get deployment
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
aks-demo-cluster 1/1      1            1           19s
dhruv [ ~ ]$ kubectl get podds
error: the server doesn't have a resource type "podds"
dhruv [ ~ ]$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
aks-demo-cluster-78f6d4db9f-cwzdb  1/1     Running   0           35s
dhruv [ ~ ]$
```

Creating Public IP Address:

```
dhruv [ ~ ]$ kubectl expose deployment aks-demo-cluster --type=LoadBalancer --port=80 --target-port=80
service/aks-demo-cluster exposed
dhruv [ ~ ]$ kubectl get service
NAME            TYPE          CLUSTER-IP   EXTERNAL-IP   PORT(S)          AGE
aks-demo-cluster  LoadBalancer  10.0.48.127  52.190.37.24  80:32164/TCP     31s
kubernetes      ClusterIP      10.0.0.1     <none>        443/TCP          30m
dhruv [ ~ ]$
```

Output Of APPLICATION on Public IP Address:

← → ↻ ⚠ Not secure | 52.190.37.24

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Welcome

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Message: Hello World from AppSettings.json

System name: aks-demo-cluster-78f6d4db9f-cwzdb

IP address: ::ffff:10.244.0.146

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Activate Windows
Go to PC settings to activate Windows.

5. Expose services in the cluster with node port, cluster IP, load balancer.

Answer: Expose Service and Creating Public Ip Address:

```
dhruv [ ~ ]$ kubectl expose deployment aks-demo-cluster --type=LoadBalancer --port=80 --target-port=80
service/aks-demo-cluster exposed
dhruv [ ~ ]$ kubectl get service
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
aks-demo-cluster	LoadBalancer	10.0.48.127	52.190.37.24	80:32164/TCP	31s
kubernetes	ClusterIP	10.0.0.1	<none>	443/TCP	30m

```
dhruv [ ~ ]$
```