CKS$^{Q\&As}$

Certified Kubernetes Security Specialist (CKS) Exam

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QUESTION 1

Given an existing Pod named nginx-pod running in the namespace test-system, fetch the service-account-name used and put the content in /candidate/KSC00124.txt

Create a new Role named dev-test-role in the namespace test-system, which can perform update operations, on resources of type namespaces.

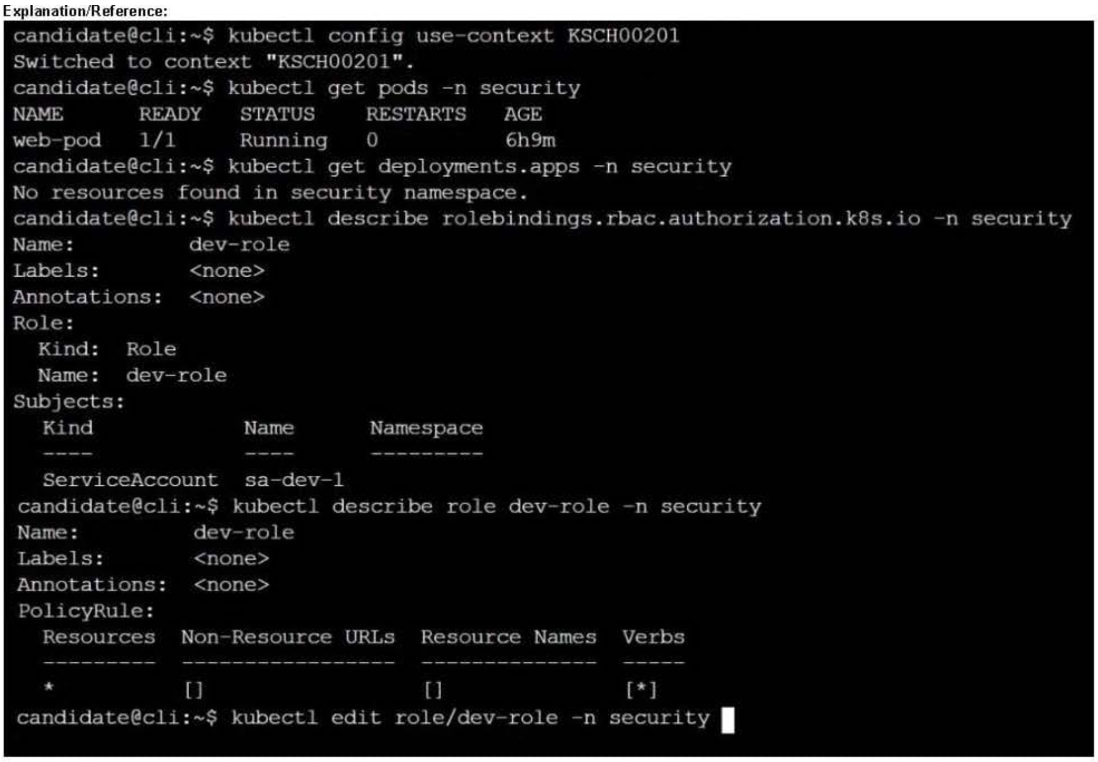
Create a new RoleBinding named dev-test-role-binding, which binds the newly created Role to the Pod\\'s ServiceAccount (found in the Nginx pod running in namespace test- system).

A. See explanation below.

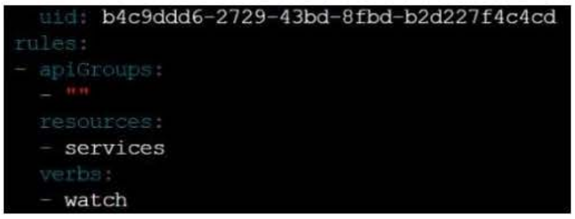
B. PlaceHolder

Correct Answer: A

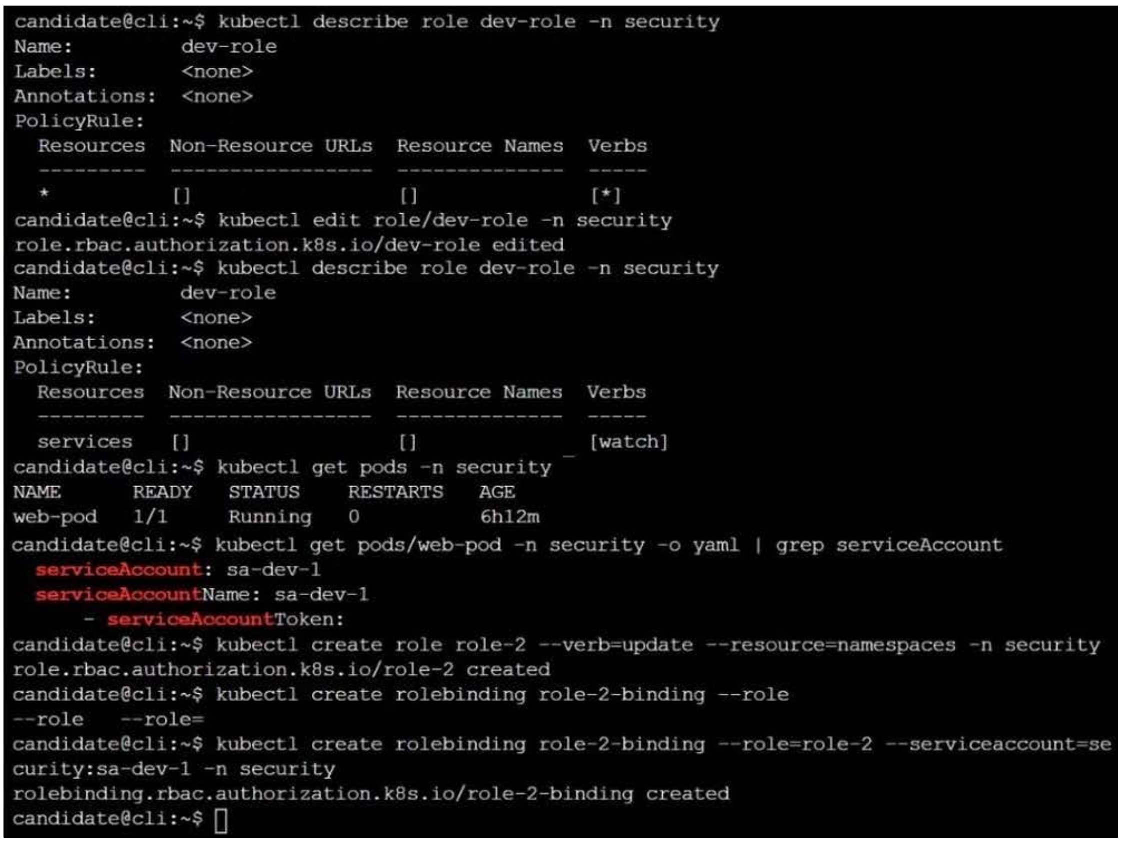
Explanation/Reference:



```
candidate@cli:~$ kubectl config use-context KSCH00201
Switched to context "KSCH00201".
candidate@cli:~$ kubectl get pods -n security
NAME      READY   STATUS    RESTARTS   AGE
web-pod   1/1     Running   0          6h9m
candidate@cli:~$ kubectl get deployments.apps -n security
No resources found in security namespace.
candidate@cli:~$ kubectl describe rolebindings.rbac.authorization.k8s.io -n security
Name:         dev-role
Labels:       <none>
Annotations:  <none>
Role:
  Kind:  Role
  Name:  dev-role
Subjects:
  Kind            Name      Namespace
  ----            ----      ---------
  ServiceAccount  sa-dev-1
candidate@cli:~$ kubectl describe role dev-role -n security
Name:         dev-role
Labels:       <none>
Annotations:  <none>
PolicyRule:
  Resources  Non-Resource URLs  Resource Names  Verbs
  ---------  -----------------  --------------  -----
  *          []                 []              [*]
candidate@cli:~$ kubectl edit role/dev-role -n security
```

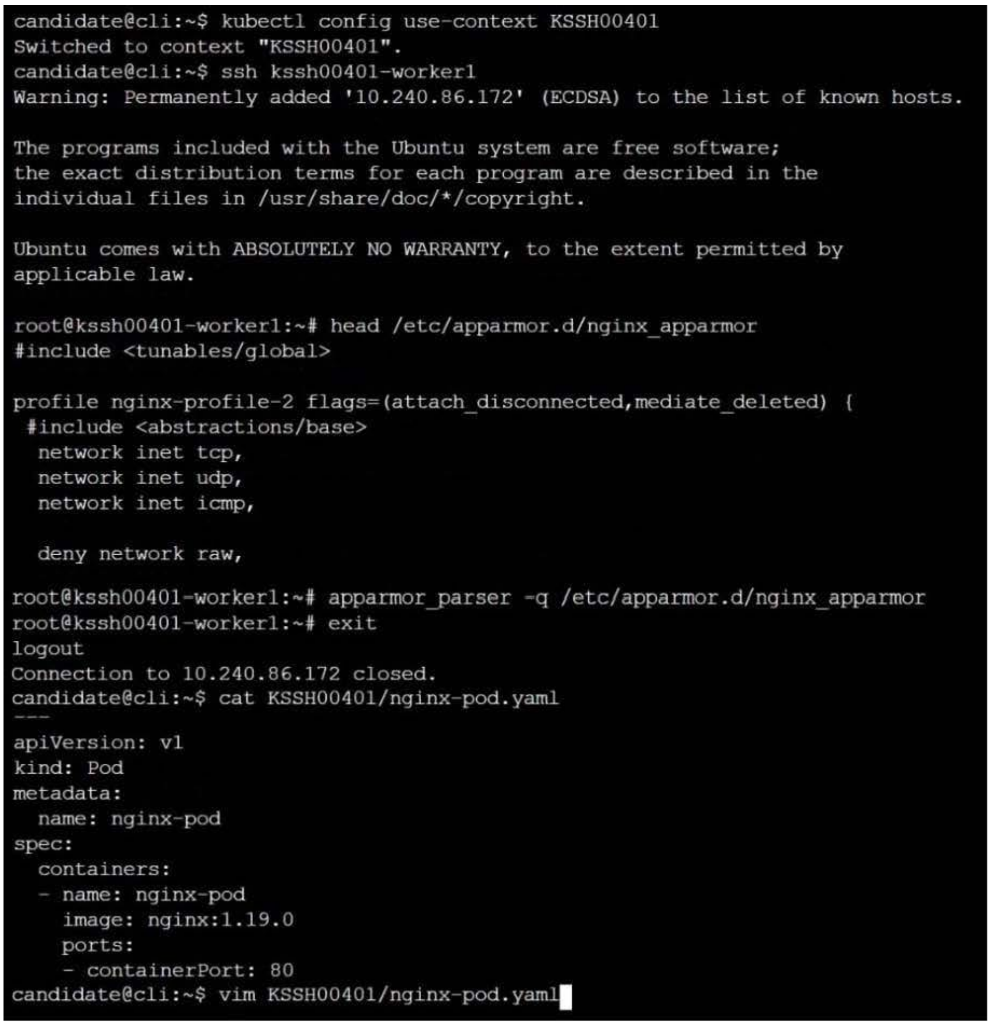


```
  uid: b4c9ddd6-2729-43bd-8fbd-b2d227f4c4cd
rules:
- apiGroups:
  - ""
  resources:
  - services
  verbs:
  - watch
```

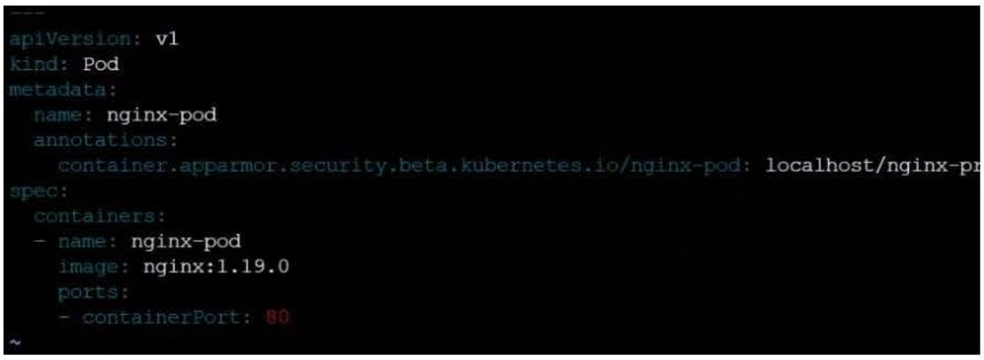


```
candidate@cli:~$ kubectl describe role dev-role -n security
Name:         dev-role
Labels:       <none>
Annotations:  <none>
PolicyRule:
  Resources  Non-Resource URLs  Resource Names  Verbs
  ---------  -----------------  --------------  -----
  *          []                 []              [*]
candidate@cli:~$ kubectl edit role/dev-role -n security
role.rbac.authorization.k8s.io/dev-role edited
candidate@cli:~$ kubectl describe role dev-role -n security
Name:         dev-role
Labels:       <none>
Annotations:  <none>
PolicyRule:
  Resources  Non-Resource URLs  Resource Names  Verbs
  ---------  -----------------  --------------  -----
  services   []                 []              [watch]
candidate@cli:~$ kubectl get pods -n security
NAME      READY   STATUS    RESTARTS   AGE
web-pod   1/1     Running   0          6h12m
candidate@cli:~$ kubectl get pods/web-pod -n security -o yaml | grep serviceAccount
  serviceAccount: sa-dev-1
  serviceAccountName: sa-dev-1
      - serviceAccountToken:
candidate@cli:~$ kubectl create role role-2 --verb=update --resource=namespaces -n security
role.rbac.authorization.k8s.io/role-2 created
candidate@cli:~$ kubectl create rolebinding role-2-binding --role
--role   --role=
candidate@cli:~$ kubectl create rolebinding role-2-binding --role=role-2 --serviceaccount=se
curity:sa-dev-1 -n security
rolebinding.rbac.authorization.k8s.io/role-2-binding created
candidate@cli:~$ 
```

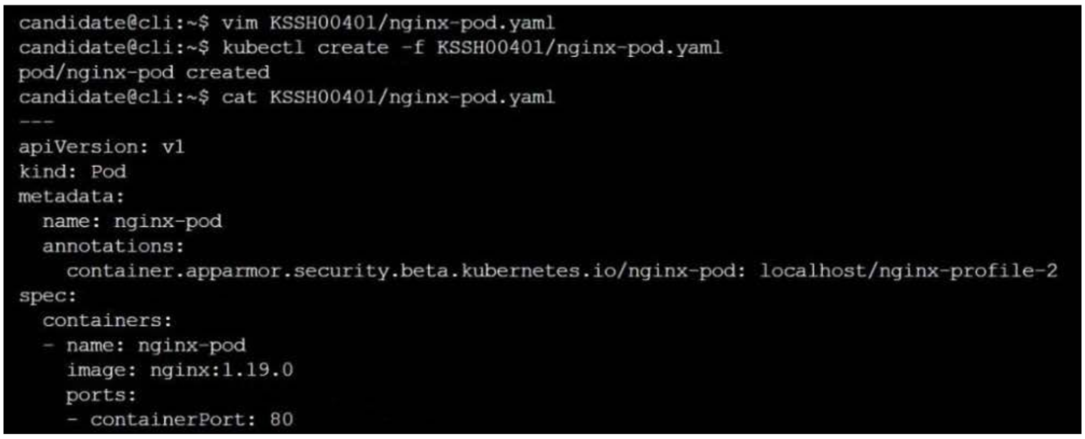
QUESTION 2



```
candidate@cli:~$ kubectl config use-context KSSH00401
Switched to context "KSSH00401".
candidate@cli:~$ ssh kssh00401-worker1
Warning: Permanently added '10.240.86.172' (ECDSA) to the list of known hosts.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

root@kssh00401-worker1:~# head /etc/apparmor.d/nginx_apparmor
#include <tunables/global>

profile nginx-profile-2 flags=(attach_disconnected,mediate_deleted) {
 #include <abstractions/base>
  network inet tcp,
  network inet udp,
  network inet icmp,

  deny network raw,

root@kssh00401-worker1:~# apparmor_parser -q /etc/apparmor.d/nginx_apparmor
root@kssh00401-worker1:~# exit
logout
Connection to 10.240.86.172 closed.
candidate@cli:~$ cat KSSH00401/nginx-pod.yaml
---
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
spec:
  containers:
  - name: nginx-pod
    image: nginx:1.19.0
    ports:
    - containerPort: 80
candidate@cli:~$ vim KSSH00401/nginx-pod.yaml
```



```
---
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  annotations:
    container.apparmor.security.beta.kubernetes.io/nginx-pod: localhost/nginx-pr
spec:
  containers:
  - name: nginx-pod
    image: nginx:1.19.0
    ports:
    - containerPort: 80
~
```



```
candidate@cli:~$ vim KSSH00401/nginx-pod.yaml
candidate@cli:~$ kubectl create -f KSSH00401/nginx-pod.yaml
pod/nginx-pod created
candidate@cli:~$ cat KSSH00401/nginx-pod.yaml
---
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  annotations:
    container.apparmor.security.beta.kubernetes.io/nginx-pod: localhost/nginx-profile-2
spec:
  containers:
  - name: nginx-pod
    image: nginx:1.19.0
    ports:
    - containerPort: 80
```

Fix all issues via configuration and restart the affected components to ensure the new setting takes effect. Fix all of the following violations that were found against the API server:

1.

Ensure that the RotateKubeletServerCertificate argument is set to true.

2.

Ensure that the admission control plugin PodSecurityPolicy is set.

3.

Ensure that the --kubelet-certificate-authority argument is set as appropriate. Fix all of the following violations that were found against the Kubelet:

1.

Ensure the --anonymous-auth argument is set to false.

2.

Ensure that the --authorization-mode argument is set to Webhook. Fix all of the following violations that were found against the ETCD:

1.

Ensure that the --auto-tls argument is not set to true

2.

Ensure that the --peer-auto-tls argument is not set to true

Hint: Take the use of Tool Kube-Bench

A. See the below.

B. PlaceHolder

Correct Answer: A

Fix all of the following violations that were found against the API server:

a. Ensure that the RotateKubeletServerCertificate argument is set to true.

apiVersion: v1 kind: Pod metadata: creationTimestamp: null labels: component: kubelet tier: control-plane name: kubelet namespace: kube-system spec: containers:

-command:

-kube-controller-manager + - --feature-gates=RotateKubeletServerCertificate=true image: gcr.io/google_containers/kubelet-amd64:v1.6.0 livenessProbe: failureThreshold: 8 httpGet: host: 127.0.0.1 path: /healthz port: 6443 scheme: HTTPS initialDelaySeconds: 15 timeoutSeconds: 15 name: kubelet resources: requests: cpu: 250m volumeMounts:

-

mountPath: /etc/kubernetes/ name: k8s readOnly: true

-

mountPath: /etc/ssl/certs name: certs

-

mountPath: /etc/pki name: pki hostNetwork: true volumes:

-

hostPath: path: /etc/kubernetes name: k8s

-

hostPath: path: /etc/ssl/certs name: certs

-

hostPath: path: /etc/pki name: pki

b.

Ensure that the admission control plugin PodSecurityPolicy is set.

audit: "/bin/ps -ef | grep $apiserverbin | grep -v grep"

tests:

test_items:

-flag: "--enable-admission-plugins"

compare:

op: has

value: "PodSecurityPolicy"

set: true

remediation: |

Follow the documentation and create Pod Security Policy objects as per your environment.

Then, edit the API server pod specification file $apiserverconf

on the master node and set the --enable-admission-plugins parameter to a

value that includes PodSecurityPolicy :

--enable-admission-plugins=...,PodSecurityPolicy,...

Then restart the API Server.

scored: true

c. Ensure that the --kubelet-certificate-authority argument is set as appropriate. audit: "/bin/ps -ef | grep $apiserverbin | grep -v grep"

tests: test_items:

-flag: "--kubelet-certificate-authority"

set: true

remediation: |

Follow the Kubernetes documentation and setup the TLS connection between the

apiserver and kubelets. Then, edit the API server pod specification file

$apiserverconf on the master node and set the --kubelet-certificate-authority

parameter to the path to the cert file for the certificate authority.

--kubelet-certificate-authority=

scored: true

Fix all of the following violations that were found against the ETCD:

a.

Ensure that the --auto-tls argument is not set to true Edit the etcd pod specification file $etcdconf on the masternode and either remove the -- auto-tls parameter or set it to false.--auto-tls=false

b.

Ensure that the --peer-auto-tls argument is not set to true

Edit the etcd pod specification file $etcdconf on the masternode and either remove the -- peer-auto-tls parameter or set it to false.--peer-auto-tls=false

QUESTION 3

Analyze and edit the given Dockerfile

1.

FROM ubuntu:latest

2.

RUN apt-get update -y

3.

RUN apt-install nginx -y

4.

COPY entrypoint.sh /

5.

ENTRYPOINT ["/entrypoint.sh"]

6.

USER ROOT

Fixing two instructions present in the file being prominent security best practice issues

Analyze and edit the deployment manifest file

1.

apiVersion: v1

2.

kind: Pod

3.

metadata:

4.

name: security-context-demo-2

5.

spec:

6.

securityContext:

7.

runAsUser: 1000

8.

containers:

9.

- name: sec-ctx-demo-2 10.image: gcr.io/google-samples/node-hello:1.0 11.securityContext: 12.runAsUser: 0 13.privileged: True 14.allowPrivilegeEscalation: false

Fixing two fields present in the file being prominent security best practice issues

Don\\'t add or remove configuration settings; only modify the existing configuration settings

Whenever you need an unprivileged user for any of the tasks, use user test-user with the user id 5487

A. See the explanation below:

B. PlaceHolder

Correct Answer: A

FROM debian:latest MAINTAINER k@bogotobogo.com

# 1 - RUN RUN apt-get update andand DEBIAN_FRONTEND=noninteractive apt-get install -yq apt-utils RUN DEBIAN_FRONTEND=noninteractive apt-get install -yq htop RUN apt-get clean

# 2 - CMD #CMD ["htop"] #CMD ["ls", "-l"]

# 3 - WORKDIR and ENV WORKDIR /root ENV DZ version1 $ docker image build -t bogodevops/demo . Sending build context to Docker daemon 3.072kB

Step 1/7 : FROM debian:latest ---> be2868bebaba

Step 2/7 : MAINTAINER k@bogotobogo.com ---> Using cache ---> e2eef476b3fd

Step 3/7 : RUN apt-get update andand DEBIAN_FRONTEND=noninteractive apt-get install -yq apt-utils ---> Using cache ---> 32fd044c1356

Step 4/7 : RUN DEBIAN_FRONTEND=noninteractive apt-get install -yq htop ---> Using cache ---> 0a5b514a209e

Step 5/7 : RUN apt-get clean ---> Using cache ---> 5d1578a47c17

Step 6/7 : WORKDIR /root ---> Using cache ---> 6b1c70e87675

Step 7/7 : ENV DZ version1 ---> Using cache ---> cd195168c5c7 Successfully built cd195168c5c7 Successfully tagged bogodevops/demo:latest

---

QUESTION 4

Create a new ServiceAccount named backend-sa in the existing namespace default, which has the capability to list the pods inside the namespace default.

Create a new Pod named backend-pod in the namespace default, mount the newly created sa backend-sa to the pod, and Verify that the pod is able to list pods.

Ensure that the Pod is running.

A. See the below:

B. PlaceHolder

Correct Answer: A

A service account provides an identity for processes that run in a Pod.

When you (a human) access the cluster (for example, using kubectl), you are authenticated by the apiserver as a particular User Account (currently this is usually admin, unless your cluster administrator has customized your cluster). Processes in containers inside pods can also contact the apiserver. When they do, they are authenticated as a particular Service Account (for example, default).

When you create a pod, if you do not specify a service account, it is automatically assigned the default service account in the same namespace. If you get the raw json or yaml for a pod you have created (for example, kubectl get pods/ -o yaml), you can see the spec.serviceAccountName field has been automatically set. You can access the API from inside a pod using automatically mounted service account credentials, as described in Accessing the Cluster. The API permissions of the service account depend on the authorization plugin and policy in use. In version 1.6+, you can opt out of automounting API credentials for a service account by setting automountServiceAccountToken: false on the service account:

apiVersion: v1 kind: ServiceAccount metadata: name: build-robot automountServiceAccountToken: false

In version 1.6+, you can also opt out of automounting API credentials for a particular pod: apiVersion: v1 kind: Pod metadata: name: my-pod spec: serviceAccountName: build-robot automountServiceAccountToken: false

The pod spec takes precedence over the service account if both specify a automountServiceAccountToken value.

QUESTION 5

Cluster: scanner

Master node: controlplane

Worker node: worker1

You can switch the cluster/configuration context using the following command:

[desk@cli] $ kubectl config use-context scanner

Given:

You may use Trivy\\'s documentation.

Task:

Use the Trivy open-source container scanner to detect images with severe vulnerabilities used by Pods in the namespace nato.

Look for images with High or Critical severity vulnerabilities and delete the Pods that use those images.

Trivy is pre-installed on the cluster\\'s master node. Use cluster\\'s master node to use Trivy.

A. See the explanation below

B. PlaceHolder

Correct Answer: A