

CS 544 (Spring 2026): Exam 1 (Version A)

Full Name: _____

Student ID Number: _____

Give the best answer to each of the following, using what we learned in class. For the multiple choice, fill your answers on the separate bubbles sheet. For fill-in-the-blank, write directly here.

1. If you need to sandbox processes, some of which run on Linux and others on Windows, which is better?
(A) containers (B) virtual machines
2. You have 4 billion floating point operations to do on a device capable of 8 GFLOPS. How many seconds will it take to do the operations?
(A) 0.002 (B) 0.5 (C) 1 (D) 2.0 (E) 2000.0
3. You have a URL `http://someaddr:someport/someresource`. Which part is processed by the HTTP layer of the network stack, specifically?
(A) someaddr (B) someport (C) someresource
4. You want to connect from a browser on your laptop to Jupyter running in a container on your VM. What should `????` be in step 3, of the following steps?
Step 1: Write a command in the Dockerfile to launch Jupyter on port 2446
Step 2: Use `-L localhost:4369:localhost:3035` to establish the SSH tunnel
Step 3: Use `-p ????:2446` in the `docker run ...` command
Step 4: Enter `http://localhost:4369/` in the browser
(A) 5000 (B) 4369 (C) 2446 (D) 3035 (E) 8888
5. With gRPC, what generated class does a server override?
(A) a servicer class (B) a stub class
6. An older gRPC client does NOT send a field the gRPC server was expecting. What happens?
(A) the server crashes
(B) the server ignores the request
(C) the server returns an error to the client
(D) the server uses a default value for missing field
7. In a Dockerfile, how could you specify that "apt update" should execute during build?
(A) `EXEC apt update` (B) `DO apt update`
(C) `CMD apt update` (D) `RUN apt update`

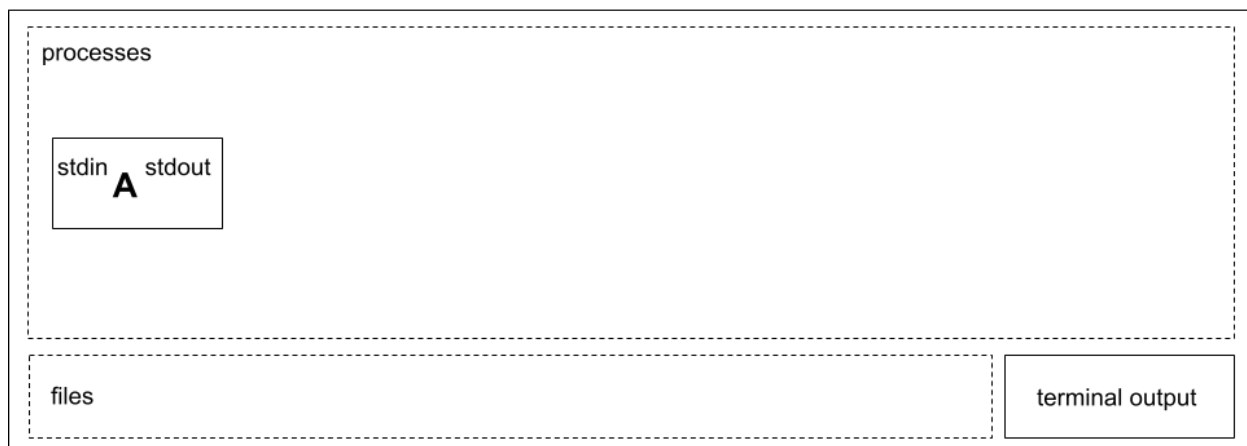
8. Which one is an example of a latency measurement?
(A) 6 MB (B) 2 seconds (C) 3 MB/s
9. To delete a Docker image X, run `docker` _____ X
10. The two main constructs defined in a .proto file are messages and _____
11. The _____ command lists the files and directories in a location
12. An IPv4 address contains _____ bits
13. A N_____ is often used to forward from public to private IP addresses
14. To run a command with root privileges, prefix it with _____
15. Name either of the transport protocols we covered in class that provides port numbers:

16. The _____ program counts lines, words, and characters in its stdin

Question 17. Consider the shell commands, run in order, and illustrate it in the area below:

A | B
C > E
D >> E

We have already drawn process A for you. Draw the rest as processes or files in the appropriate area. We will ignore stderr for this exercise. Label stdin/stdout for processes, and use arrows to connect as appropriate. Assume each process just prints its name using a Python print (for example, A uses `print("A")`). Represent files as boxes in the appropriate area. Write file names to the left of any file boxes. Inside any file boxes, write whatever letters it will contain at the end.



CS 544 (Spring 2026): Exam 1 (Version B)

Full Name: _____

Student ID Number: _____

Give the best answer to each of the following, using what we learned in class. For the multiple choice, fill your answers on the separate bubbles sheet. For fill-in-the-blank, write directly here.

1. If you need to sandbox processes, some of which run on Linux and others on Windows, which is better?
(A) containers (B) virtual machines
2. You have 4 million floating point operations to do on a device capable of 2 GFLOPS. How many seconds will it take to do the operations?
(A) 0.002 (B) 0.5 (C) 1 (D) 500.0 (E) 500000.0
3. You have a URL `http://someaddr:someport/someresource`. Which part is processed by the HTTP layer of the network stack, specifically?
(A) someaddr (B) someport (C) someresource
4. You want to connect from a browser on your laptop to Jupyter running in a container on your VM. What should `????` be in step 3, of the following steps?
Step 1: Write a command in the Dockerfile to launch Jupyter on port 2505
Step 2: Use `-L localhost:4290:localhost:3254` to establish the SSH tunnel
Step 3: Use `-p ????:2505` in the `docker run ...` command
Step 4: Enter `http://localhost:4290/` in the browser

(A) 4290 (B) 3254 (C) 2505 (D) 5000 (E) 8888
5. With gRPC, what generated class does a server override?
(A) a servicer class (B) a stub class
6. An older gRPC client does NOT send a field the gRPC server was expecting. What happens?
(A) the server crashes
(B) the server ignores the request
(C) the server returns an error to the client
(D) the server uses a default value for missing field
7. In a Dockerfile, how could you specify that "apt update" should execute during build?
(A) `EXEC apt update` (B) `DO apt update`
(C) `CMD apt update` (D) `RUN apt update`

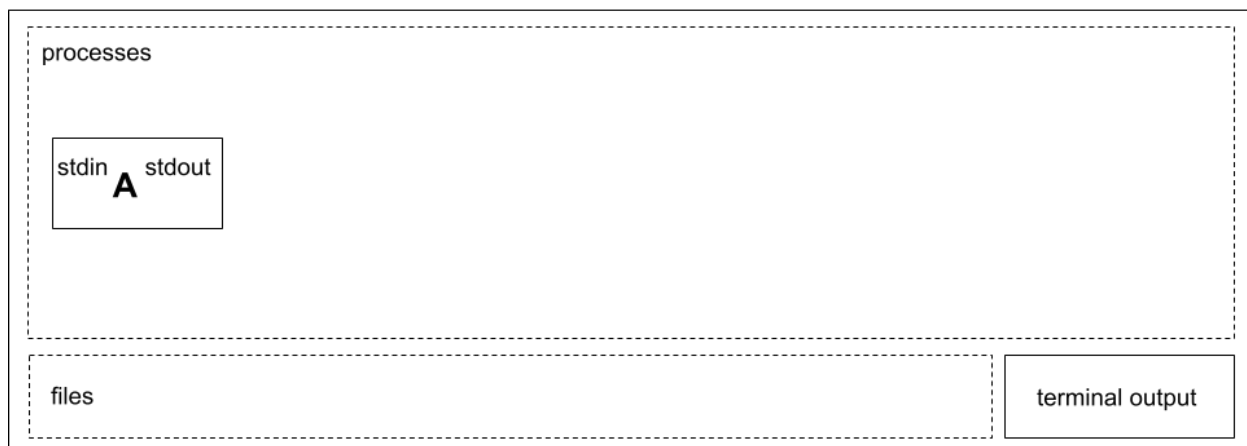
8. Which one is an example of a latency measurement?
(A) 6 MB (B) 2 seconds (C) 3 MB/s
9. An IPv4 address contains _____ bits
10. To delete a Docker image X, run `docker` _____ X
11. Name either of the transport protocols we covered in class that provides port numbers:

12. The _____ command lists the files and directories in a location
13. The _____ program counts lines, words, and characters in its stdin
14. The two main constructs defined in a .proto file are messages and _____
15. A N_____ is often used to forward from public to private IP addresses
16. To run a command with root privileges, prefix it with _____

Question 17. Consider the shell commands, run in order, and illustrate it in the area below:

A | B
C > E
D >> E

We have already drawn process A for you. Draw the rest as processes or files in the appropriate area. We will ignore stderr for this exercise. Label stdin/stdout for processes, and use arrows to connect as appropriate. Assume each process just prints its name using a Python print (for example, A uses `print("A")`). Represent files as boxes in the appropriate area. Write file names to the left of any file boxes. Inside any file boxes, write whatever letters it will contain at the end.



CS 544 (Spring 2026): Exam 1 (Version C)

Full Name: _____

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Give the best answer to each of the following, using what we learned in class. For the multiple choice, fill your answers on the separate bubbles sheet. For fill-in-the-blank, write directly here.

1. If you need to sandbox processes and your main concern is minimizing memory usage, which is better?
(A) containers (B) virtual machines
2. You have 8 million floating point operations to do on a device capable of 4 GFLOPS. How many seconds will it take to do the operations?
(A) 0.002 (B) 0.5 (C) 1 (D) 500.0 (E) 500000.0
3. You have a URL `http://someaddr:someport/someresource`. Which part is processed by the HTTP layer of the network stack, specifically?
(A) someaddr (B) someport (C) someresource
4. You want to connect from a browser on your laptop to Jupyter running in a container on your VM. What should `????` be in step 3, of the following steps?
Step 1: Write a command in the Dockerfile to launch Jupyter on port 2003
Step 2: Use `-L localhost:4747:localhost:3572` to establish the SSH tunnel
Step 3: Use `-p ????:2003` in the `docker run ...` command
Step 4: Enter `http://localhost:4747/` in the browser

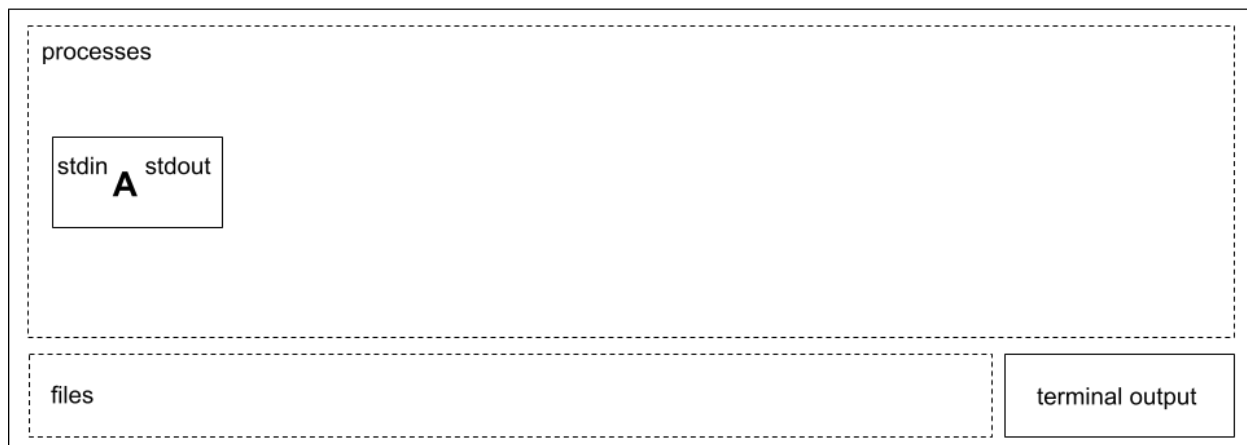
(A) 8888 (B) 2003 (C) 3572 (D) 5000 (E) 4747
5. With gRPC, what generated code does a client use to make calls?
(A) servicer code (B) stub code
6. A newer gRPC client sends a field the gRPC server was NOT expecting. What happens?
(A) the server crashes
(B) the server ignores the field
(C) the server returns an error to the client
(D) the server uses a default value for missing field
7. In a Dockerfile, how do you specify the program that should launch (by default) when a container starts?
(A) `EXEC` (B) `RUN` (C) `CMD` (D) `DO`
8. Which one is an example of a throughput measurement?
(A) 6 MB (B) 2 seconds (C) 3 MB/s

9. To see currently running Docker containers, run `docker` _____
10. gRPC uses _____ for serialization/deserialization
11. A N_____ is often used to forward from public to private IP addresses
12. File access permissions in Linux are changed using the _____ command
13. The w_____ command downloads a file from a URL, saving it locally
14. The two main constructs defined in a .proto file are services and _____
15. The loopback device uses IP address _____
16. Running _____ displays the full path of your current working directory

Question 17. Consider the shell commands, run in order, and illustrate it in the area below:

A > B
C > B
D | E

We have already drawn process A for you. Draw the rest as processes or files in the appropriate area. We will ignore stderr for this exercise. Label stdin/stdout for processes, and use arrows to connect as appropriate. Assume each process just prints its name using a Python print (for example, A uses `print("A")`). Represent files as boxes in the appropriate area. Write file names to the left of any file boxes. Inside any file boxes, write whatever letters it will contain at the end.



CS 544 (Spring 2026): Exam 1 (Version D)

Full Name: _____

Student ID Number: _____

Give the best answer to each of the following, using what we learned in class. For the multiple choice, fill your answers on the separate bubbles sheet. For fill-in-the-blank, write directly here.

1. If you need to sandbox processes and your main concern is minimizing memory usage, which is better?
(A) containers (B) virtual machines
2. You have 8 million floating point operations to do on a device capable of 16 GFLOPS. How many seconds will it take to do the operations?
(A) 0.0005 (B) 1 (C) 2.0 (D) 2000.0 (E) 2000000.0
3. You have a URL `http://someaddr:someport/someresource`. Which part is processed by the HTTP layer of the network stack, specifically?
(A) someaddr (B) someport (C) someresource
4. You want to connect from a browser on your laptop to Jupyter running in a container on your VM. What should `????` be in step 3, of the following steps?
Step 1: Write a command in the Dockerfile to launch Jupyter on port 2550
Step 2: Use `-L localhost:4211:localhost:3488` to establish the SSH tunnel
Step 3: Use `-p ????:2550` in the `docker run ...` command
Step 4: Enter `http://localhost:4211/` in the browser

(A) 4211 (B) 2550 (C) 3488 (D) 5000 (E) 8888
5. With gRPC, what generated code does a client use to make calls?
(A) servicer code (B) stub code
6. A newer gRPC client sends a field the gRPC server was NOT expecting. What happens?
(A) the server crashes
(B) the server ignores the field
(C) the server returns an error to the client
(D) the server uses a default value for missing field
7. In a Dockerfile, how do you specify the program that should launch (by default) when a container starts?
(A) `EXEC` (B) `RUN` (C) `CMD` (D) `DO`
8. Which one is an example of a throughput measurement?
(A) 6 MB (B) 2 seconds (C) 3 MB/s

9. The `w` _____ command downloads a file from a URL, saving it locally
10. The two main constructs defined in a `.proto` file are services and _____
11. gRPC uses _____ for serialization/deserialization
12. The loopback device uses IP address _____
13. A `N` _____ is often used to forward from public to private IP addresses
14. To see currently running Docker containers, run `docker _____`
15. File access permissions in Linux are changed using the _____ command
16. Running _____ displays the full path of your current working directory

Question 17. Consider the shell commands, run in order, and illustrate it in the area below:

A > B
C > B
D | E

We have already drawn process A for you. Draw the rest as processes or files in the appropriate area. We will ignore stderr for this exercise. Label stdin/stdout for processes, and use arrows to connect as appropriate. Assume each process just prints its name using a Python `print` (for example, A uses `print("A")`). Represent files as boxes in the appropriate area. Write file names to the left of any file boxes. Inside any file boxes, write whatever letters it will contain at the end.

