

Learn this formula:
 $\text{time (in seconds)} = \text{size of file (in bits)} / \text{network speed (in bits)}$

Networks

1. Construct an expression to calculate the minimum transmission rate required to transmit a 250 MiB file in exactly one hour.

There are 3600 seconds in an hour.

(4)

2. Construct an expression to show how many seconds it will take to transmit 20 MiB of data using a network transmission speed of 2 Mbps. You do not have to do the calculation.

(4)

3. Construct an expression to show how long will it take to transfer 500 KB of data using a network transmission speed of 5 Mbps?

(4)

4. If a file with a size of 1.5 GB is being transferred using a network speed of 10 Mbps, construct an expression to show many minutes will it take to complete the transfer?

(4)

5. Bandwidth refers to the maximum data transfer rate or capacity of a network. It represents how much data can be transmitted over the network in a given time period.

Bandwidth is commonly measured in bits per second (bps).

Explain two ways that the performance of a network can be affected by its environment.

(4)

ANSWERS

time (in seconds) = size of file (in bits) / network speed (in bits)

1. First, we need to convert the file size from mebibytes (MiB) to bits (b)
 $250 \text{ MiB} * 1024 = \text{KiB}$
Multiply by 1024 again to get to bytes
Multiply by 8 again to get to bits
Then we calculate the time in seconds. 60 minutes = $60 * 60$

Minimum transmission rate (network speed) = size of the file (in bits) / time taken (in seconds)

The final expression is : $250 * 1024 * 1024 * 8 / (60*60)$

2. Convert the file size to bits. $20 * 1024 * 1024 * 8$
Convert the network speed into bits per second: $2 * 1000 * 1000$ (**REMEMBER:** that 1 megabit = 1000 kilobits which is 1000 bits. Megabits and kilobits are Base 10 (denary) units.

The final expression: $20 * 1024 * 1024 * 8 / (2 * 1000 * 1000)$

3. 500 KiB in bits = $500 * 1024 * 8$
5 Mbps in bps = $5 * 1000 * 1000$
The final expression is: $500 * 1024 * 8 / (5 * 1000 * 1000)$

4. 1.5 GiB in bits = $1.5 * 1024 * 1024 * 1024 * 8$
10 Mbps = $10 * 1000 * 1000$

Final expression: $(1.5 * 1024 * 1024 * 1024 * 8) / (10 * 1000 * 1000) / 60$

NOTE: this question asked for the result in minutes which is why the final answer is divided by 60.

5. There are a wide range of factors that affect bandwidth:

Number of Devices on the Network:

The more devices connected to a network, the more they share the available bandwidth. Bandwidth is divided among connected devices, impacting data transfer rates.

Bandwidth of the Transmission Medium:

Different transmission media (e.g., copper wires, fibre-optic cables, Wi-Fi) have varying bandwidth capacities. Fibre-optic has the highest.

Type of Network Traffic:

Different types of communication (e.g., streaming videos, web browsing, file downloads) have varying bandwidth requirements.

High-definition video streaming requires more bandwidth than low-definition video.

Network Latency:

Latency refers to the period of time delay in a computer system. High latency affects response time and can impact real-time applications (e.g., online gaming, video conferencing).