## A Find the answers to these questions in the following text.
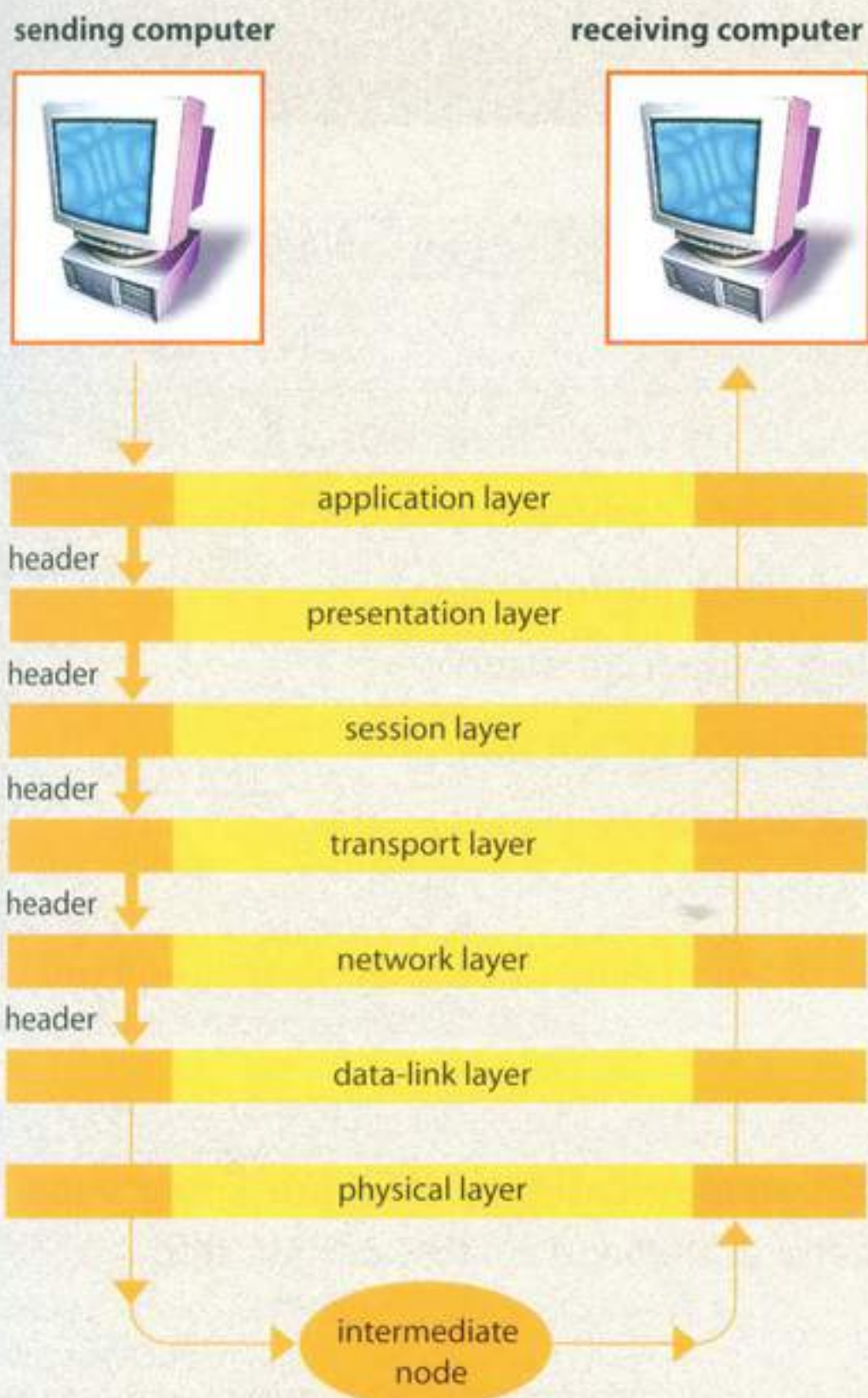
1   Into what units is data subdivided by the following layers?
    a   transport layer
    b   network layer
2   What is the purpose of a transmission checksum test?
3   How long does the data-link layer keep a copy of each packet?
4   What processes can be carried out at intermediate nodes?
5   Which network communications layer is described by each of the following statements?
    a   Makes sure that the message is transmitted in a language that the receiving computer can understand
    b   Protects the data being sent
    c   Encodes and sends the packets
    d   Supervises the transmission
    e   The part of a communications process that a user sees
    f   Starts communications and looks after communications among network nodes
    g   Chooses a route for the message
    h   Makes backup copies of the data if required
    i   Confirms the checksum, then addresses and duplicates the packets

# Network Communications

1   The application layer is the only part of a communications process that a user sees, and even then, the user doesn't see most of the work that the application does to prepare a message
5   for sending over a network. The layer converts a message's data from human-readable form into bits and attaches a header identifying the sending and receiving computers.

2   The presentation layer ensures that the
10  message is transmitted in a language that the receiving computer can interpret (often ASCII). This layer translates the language, if necessary, and then compresses and perhaps encrypts the data. It adds another header specifying the
15  language as well as the compression and encryption schemes.

3   The session layer opens communications and has the job of keeping straight the communications among all nodes on the network.
20  It sets boundaries (called bracketing) for the beginning and end of the message, and establishes whether the messages will be sent half-duplex, with each computer taking turns sending and receiving, or full-duplex, with both
25  computers sending and receiving at the same time. The details of these decisions are placed into a session header.

4   The transport layer protects the data being sent. It subdivides the data into segments,
30  creates checksum tests – mathematical sums based on the contents of data – that can be used later to determine if the data was scrambled. It can also make backup copies of the data. The transport header identifies each segment's
35  checksum and its position in the message.

5   The network layer selects a route for the message. It forms data into packets, counts them, and adds a header containing the sequence of packets and the address of the receiving
40  computer.

6   The data-link layer supervises the transmission. It confirms the checksum, then addresses and duplicates the packets. This layer keeps a copy of each packet until it receives
45  confirmation from the next point along the route that the packet has arrived undamaged.

sending computer          receiving computer

application layer

header

presentation layer

header

session layer

header

transport layer

header

network layer

header

data-link layer

physical layer

intermediate node

7 The physical layer encodes the packets into the medium that will carry them – such as an analogue signal, if the message is going across a
50 telephone line – and sends the packets along that medium.

8 An intermediate node calculates and verifies the checksum for each packet. It may also reroute the message to avoid congestion on the network.

55 9 At the receiving node, the layered process that sent the message on its way is reversed. The physical layer reconverts the message into bits. The data-link layer recalculates the checksum, confirms arrival, and logs in the
60 packets. The network layer recounts incoming packets for security and billing purposes. The transport layer recalculates the checksum and reassembles the message segments. The session layer holds the parts of the message until the
65 message is complete and sends it to the next layer. The presentation layer expands and decrypts the message. The application layer converts the bits into readable characters, and directs the data to the correct application.

['How Computers Work' by Ron White and Timothy Edward Downs (Ziff-Davis Press) – Extract in PC Magazine, February 1993]

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**B** Re-read the text to find the answers to these questions.

**1 Match the terms in Table A with the statements in Table B.**

| Table A |
| --- |
| a Bracketing |
| b Half-duplex |
| c Full-duplex |
| d Checksum |

| Table B |
| --- |
| i Transmission mode in which each computer takes turns sending and receiving |
| ii Mathematical calculations based on the contents of data |
| iii Set boundaries for the beginning and end of a message |
| iv Transmission mode in which both computers send and receive at the same time |

**2 Mark the following statements as True or False:**

a Most of the work that an application does to prepare a message for sending over a network is not seen by the user.
b ASCII is always used to transmit data.
c The encryption layer compresses the message.
d The network layer keeps track of how many packets are in each message.
e The network layer keeps a copy of each packet until it arrives at the next node undamaged.
f Analogue signals are used on ordinary telephone lines.
g When a message arrives at its destination, it passes through the same seven network communications layers as when it was sent, but in reverse order.