

NSW Independent Trial Exam
Information Processes and Technology HSC Trial Examination 2010

SUGGESTED ANSWERS AND MARKING CRITERIA

Section I - Multiple choice

| | | | | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| B | C | A | A | D | A | C | D | B | B |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| B | B | C | C | D | B | C | D | A | C |

Section II - Core

Question 21 (a)

| Marking Criteria | Marks |
|--|--------------|
| Identifies advantages AND disadvantages of the method of input | 2 |
| Identifies advantages OR disadvantages of the method of input | 1 |

Allowing the teachers to only indicate missing students is an advantage for teachers, as it will minimise the time required to enter the information, thus minimising the disruption to class.

The disadvantage is that teachers may not be as accurate in their marking of the roll if they only indicate the students they notice are missing.

Also, as students are assumed to be present unless marked absent then if a teacher (or perhaps a replacement teacher who is not familiar with the system) neglects to mark the roll then the system will not be able to correctly identify students who have been absent for the whole day. Furthermore the system requires all classrooms to have access to the system, and what happens in say PE or Ag classes that are held outside? These teachers will need to manually take the role and then transfer the absences into the system at a later time.

Question 21 (b)

| Marking Criteria | Marks |
|--|--------------|
| Identifies pilot conversion method and discusses relevant issues associated with how the two systems would work together | 3 |
| Identifies pilot conversion method and identifies conversion issues | 2 |
| Identifies pilot conversion method or identifies conversion issues | 1 |

This strategy of conversion is pilot, since a small section of the users would start using the new system while the rest would continue with the old.

The important aspect of this pilot conversion process is how will the two systems (the previous system and this new system) work together. Given that the existing morning roll call is the primary method for determining full day absences, this morning roll call must continue until the entire system is implemented. In effect the pilot will be limited to recording maths class absences and will be of little use in terms of identifying full day absences. Therefore the full capabilities of the new system cannot be utilised and tested during the pilot. In addition the maths staff will need to continue with morning roll call for the existing system to continue.

The maths staff has probably been selected, as they are more likely to be computer literate and precise in their roll marking. This may not be a wise choice as they are not a representative sample of the school staff. It should be recognised that teachers in other departments may not be able to use the new system as easily as the Mathematics teachers, and therefore the pilot implementation may not accurately reflect all of the issues that may become apparent once the system is introduced across the whole school.

Question 22 (c)

| Marking Criteria | Marks |
|--|-------|
| Purpose for each attribute is correctly indicated, including who they may change over time | 3 |
| Purpose for each attribute is correctly indicated | 2 |
| Purpose for one attribute is correctly indicated | 1 |

Unit price needs to be recorded in two tables so that the OrderDetails table can record the price that was actually charged to the Customer, and this will not change after the Customer has received their goods. In contrast, the UnitPrice in the Pots table records the price that is currently charged for each size pot. This price will change over time, and is copied to the OrderDetails table each time a new OrderDetails record is created as customer orders are entered into the system.

Question 22 (d)

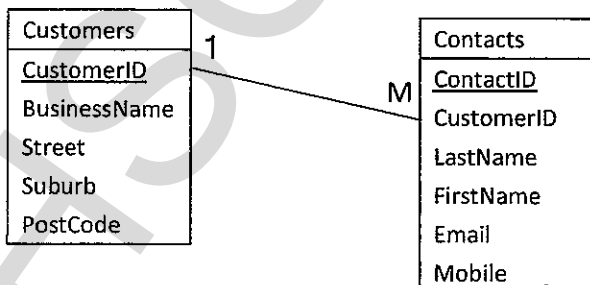
| Marking Criteria | Marks |
|--|-------|
| Substantially correct SQL statement including correct table links specified using either JOINS or a WHERE clause | 3 |
| THREE of the four SQL clauses specified correctly | 2 |
| TWO of the four SQL clauses specified correctly | 1 |

```
SELECT CommonName, PotSize, CurrentStock
FROM StockPlants, Plants, Pots
WHERE StockPlants.PlantID = Plants.PlantID AND StockPlants.PotSizeID = Pots.PotSizeID
ORDER BY CommonName, PotSize DESC
Or equivalent using SQL JOINS
```

Question 22 (e)

| Marking Criteria | Marks |
|---|-------|
| Extra table indicating attributes required, clear description and the nature of the required relationship | 3 |
| Extra table indicated with attributes required and limited description of the required relationship | 2 |
| Extra table indicated | 1 |

Create a new table called Contacts with an attribute ContactID as primary key, CustomerID as a foreign key and the attributes LastName, FirstName, Email and Mobile. Delete the attributes LastName and FirstName from the Customers table. Finally add a '1 to many' relationship between Customers.CustomerID and Contacts.CustomerID. The relevant portion of the revised schema will therefore be as follows.



Question 23 (d)

| Marking Criteria | Marks |
|--|-------|
| Identifies HTTP and TCP/IP protocols AND demonstrates excellent understanding of the essential processes each performs. | 3 |
| Identifies HTTP and TCP/IP protocols AND demonstrates general understanding of the essential processes each performs. | 2 |
| Identifies HTTP and TCP/IP protocols OR demonstrates general understanding of the role of the application level, and the communication, control and addressing level protocols | 1 |

At the application level the web browser on Paul's laptop issues an HTTP GET command with the URL of the webpage. When the HTTP command reaches the web server the web server responds by retrieving the page and sending it back to Paul's web browser, which makes sense of the file and displays it within the browser.

At the communication, control and addressing level TCP/IP operates to manage the delivery of the data packets involved in the transfer of the HTTP GET command and the transfer of the web page document back to the browser. TCP ensures messages reach their destination correctly, while IP manages the actual delivery through the network. Although TCP and IP operate together, each performs distinct functions.

A TCP communication session is initiated between sender and receiver. All TCP segments are sent continuously during a session (such as transmitting Paul's webpage document) and the receiver acknowledges receipt of each segment as they are received. If an acknowledgement is not received within a reasonable amount of time then the sender will retransmit that segment.

The IP manages the movement of data packets (datagrams) from sender to receiver. The receiver's IP address is used by routers to determine the most efficient route each datagram should follow. IP does not guarantee delivery of datagrams - in fact, datagrams found to have an error or other problem are simply discarded.

Question 24 (a)

| Marking Criteria | Marks |
|---|-------|
| All entities and processes are identified | 1 |

External Entities: Sending User, Receiving User

Processes: Encrypt message, Generate keys, Decrypt message

Question 24 (b)

| Marking Criteria | Marks |
|--|-------|
| Demonstrates excellent understanding of the encryption, transfer and decryption process shown in the diagram, including the generation and use of the two keys | 3 |
| Demonstrates excellent understanding of at least two significant processes comprising the encryption, transfer and decryption process shown in the diagram | 2 |
| Demonstrates limited understanding of at least one process shown in the diagram | 1 |

1. Sending user constructs the message
2. Sender requests the receiver's public key
3. Receiver generates a public/private key pair and sends the public key to the sender.
4. Sender uses the public key to encrypt the message to be sent
5. Encrypted message is transmitted from sender to receiver
6. The receiver uses the private key to decrypt the message
7. Message is viewed by receiving user

Section III - Options

Question 25 – Transaction Processing Systems

Question 25 (a) (i)

| Marking Criteria | Marks |
|---|-------|
| Provides excellent description of the purpose of validation with a relevant example | 2 |
| Provides a good description of the purpose of validation OR a relevant example | 1 |

Validation is performed by the software when data is entered to ensure that the data entered is reasonable. It does this by checking the entered data against defined rules for that data. An example could be the checking of a product number against a list of allowed or existing product numbers.

Question 25 (a) (ii)

| Marking Criteria | Marks |
|---|-------|
| Correct identification of two relevant media with relevant examples of their use | 2 |
| Correct identification of one relevant medium with relevant example of its use OR Correct identification of two relevant media | 1 |

There are a number of different backup media, depending on the amount of data to be backed up, the portability required for the backed up data, and storage requirements for the backed up data. Relevant media could include:

- USB key for small amounts of data (such as student work)
- CD's for up to 640MB of data, easily transported and stored
- DVD's for up to 17GB of data, easily transported and stored
- External hard drives for up to many TB of data, easily transported but larger to store than DVD's
- Tape cartridges for up to many GB of data, very fast to transfer data and easily transported and stored

Question 25 (b) (i)

| Marking Criteria | Marks |
|--|-------|
| Correctly identifies most data AND all participants in this system | 2 |
| Correctly identifies most data OR most participants in this system | 1 |

The participants are:

- members of the public who browse or book available flights
- management who use the occupancy reports at the end of each month
- the air hostess who scans the barcode

Data includes:

- flight details (departure and arrival time, from and to cities, date of flight, flight company, flight number), booking number, seat number, total number of seats available on the flight, customer name, customer contact number, credit card details

Question 25 (b) (ii)

| Marking Criteria | Marks |
|---|-------|
| Demonstrates excellent understanding of the technology required to read the barcode and use this number to verify the booking against the booking record stored | 3 |
| Demonstrates good understanding of the technology required to read the barcode OR good understanding of how this number is used to verify the booking against the booking record stored | 2 |
| Demonstrates limited understanding of the role of the barcode on the boarding pass | 1 |

Question 25 (c) (i)

| Marking Criteria | Marks |
|---|-------|
| Demonstrates excellent understanding of technology requirements (hardware and software) including large secondary storage, webserver, well designed user interface with web-based forms for data entry, software such as DBMS at the webjet office, browser at the customer computer, and barcode reader at the airport and the use of these in the collecting, storage and displaying processes | 4 |
| Demonstrates good understanding of most technology requirements (hardware and software) including most of large secondary storage, webserver, well designed user interface with web-based forms for data entry, software such as DBMS at the webjet office, browser at the customer computer and barcode reader at the airport but with some omissions and the use of these in the collecting, storage and displaying processes | 3 |
| Demonstrates some understanding of technology required, identifying at least five relevant items of hardware or software with a limited discussion of their role in at least two of the collecting, storage and displaying processes | 2 |
| Demonstrates limited understanding of technology required, identifying at least two relevant items of hardware or software with a limited discussion of their role in at least one of the collecting, storage and displaying processes | 1 |

At the webjet office (or wherever the webjet site is hosted) there needs to be a webserver where all of the relevant web pages and database is stored on a large capacity fast access hard drive system (**storage**). This webserver needs to be connected to a firewall and router (to allow access to and from the Internet). A DBMS is required to manage the data base, and an application using that DBMS is required to manage and process the data appropriately.

When a prospective customer wishes to browse or book a flight, they key in the webjet URL into their browser (**collecting**) which is converted to its equivalent IP address by DNS servers located by the router. The relevant webpages are retrieved from the webserver using the HTTP protocol and transmitted using the TCP/IP protocol to their computer for display on their screens (**display**). To browse selected flights, the customer keys in the preferred date and times as well as their originating and destination airport using their keyboard (**collecting**), and these are used to select specific records from the database using a query to be transmitted back to the customers screen for display.

If they choose to book a flight, then CGI, ASP or PHP scripts will be used to create and/or update a booking record on the database using a uniquely generated booking number as the primary key (**storage**). That booking number together with the booking details are transmitted back to the customer's screen for display and subsequent printing on their local printer. (**displaying**)

At the airport, information kiosks attached to the local area network through a NIC are required to allow self check-in. That same network will need to be connected to the DBMS storing the database so that when a passenger keys in their booking number (**collecting**), the booking record with that primary key is retrieved and displayed. Passengers can then choose seats from the appropriate layout for that flight, as the system will then retrieve the other passenger records for that same flight showing all seats already selected by other passengers (**displaying**). As the passenger clicks on a vacant seat image on the screen (**collecting**), their seat selection will then be stored in their booking record (**storing**). A boarding pass containing all of these details can then be printed at the kiosk using the included printer (**displaying**).

At the entry to the flight gate, the barcode on the boarding pass can be scanned (**collecting**), and the generated booking number used to retrieve the booking record (as discussed in the answer to (b) (ii)). Relevant messages indicating validation or otherwise of the boarding pass will be displayed on the hostess's display screen (**displaying**).

At the end of each month, the flight and booking records for that month can all be retrieved and sorted into date order. In the detail line for this report will appear the flight details for each day together with the total number of seats available (from the aircraft record for that flight) and the total number of seats allocated (from all of the booking records for that flight that have a seat number allocated). This report is printed by the manager on their local printer (**displaying**)

Question 26 – Decision Support Systems

Question 26 (a) (i)

| Marking Criteria | Marks |
|--|-------|
| Correct definition for MIS together with a good description of the type of decisions that are made using MISs. | 2 |
| Correct definition for MIS OR a good description of the type of decisions made using MISs. | 1 |

Management Information Systems are systems that summarise the data collected from other operational systems such as transaction processing systems to help managers make day to day structured decisions. They usually produce reports or answers to queries that highlight exception conditions, and which produce averages and totals providing a useful overview of the monthly, quarterly or annual figures for the company or department. These reports allow management to respond quickly to operational situations and to determine any required changes to improve these figures for the next period.

Question 26 (a) (ii)

| Marking Criteria | Marks |
|---|-------|
| Demonstrates clear understanding of the role of a human expert in building an expert system | 2 |
| Demonstrates a limited understanding of the role of a human expert in building an expert system | 1 |

The human expert is the person supplying the facts and rules in narrative form to the knowledge engineer so that they can use this provided information to build a relevant expert system that will produce the correct output. It is essential that the human expert is experienced in their field of knowledge and is a recognised expert so that the expert system built based on their input appropriately produces the 'correct' line of questioning and answers.

Question 26 (b) (i)

| Marking Criteria | Marks |
|--|-------|
| Correct description of all of the data input, with a good explanation of why 2 years data is required | 3 |
| Almost correct description of all of the data input, OR a good explanation of why 2 years data is required | 2 |
| Demonstrates limited understanding of the data input requirements to this system | 1 |

The data input is the measured levels of iron, lead and copper from various different points in the local stream. The data would likely come from a machine that analyses water samples from each of the different points in the stream, and then keyed into the ANN system. The other data required is an identification of the point on the stream where each water sample was taken.

The first year's figures were used in the training cycle, where the known results (that is, the groundwater pollution levels for each of the three metals) were used to allow the ANN to correctly adjust the weightings and threshold values of the neurons in the input, hidden and output layers so that the output produced by the ANN for each point in the stream most closely matches the actual groundwater values.

The second year's figures were used in the execution cycle, where rather than using the output as further training, the system was asked to display the output using the weightings and threshold values set the previous year.

When the output was produced, it was compared to the actual measured figures for the groundwater pollution to check the validity / accuracy of the ANN system.

Question 26 (c) (i)

| Marking Criteria | Marks |
|---|-------|
| Demonstrates excellent understanding of the advantages of this particular ANN system | 3 |
| Demonstrates good understanding of some of the advantages of this particular ANN system | 2 |
| Demonstrates limited understanding of at least one advantage of ANN systems in general | 1 |

There are many advantages of this particular system.

- It makes the knowledge easily available both in the industrial area where the system was originally developed, and in other similar areas, even if the number of human experts is limited and they find it hard to travel to remote or country areas.
- The performance of this system should be quicker, and with better consistency than if it were performed manually by specialist scientists testing the water and making predictions based on traditional scientific methods.
- It is difficult to introduce bias into this system, as the human interpretation of scientific results is not required. This means that large industrial companies cannot exert pressure on scientists to produce results that are sympathetic to the companies needs.
- Presumably once developed, this system would be much cheaper to run than employing numbers of highly qualified scientists to perform the same job.
- The effect of a cheap easy to run system that quickly produces results describing the pollution expected to be present in the groundwater must improve the quality of water for the local population and give notice to the industries that they cannot continue to pollute as they have been,

Question 26 (c) (ii)

| Marking Criteria | Marks |
|--|-------|
| Demonstrates excellent understanding of the relevance of this system for predictions 15 years out, and the role of those responsible for making decisions based on these predictions | 4 |
| Demonstrates good understanding of the relevance of this system for predictions 15 years out, and a good understanding of the role of those responsible for making decisions based on these predictions | 3 |
| Demonstrates limited understanding of the relevance of this system for predictions 15 years out, and a limited discussion of the role of those responsible for making decisions based on these predictions | 2 |
| Demonstrates limited understanding of the relevance of this system for predictions 15 years out, OR a limited discussion of the role of those responsible for making decisions based on these predictions | 1 |

This system is fairly basic, and makes some very large assumptions about the causes of groundwater pollution. It is possible that the groundwater is polluted from sources other than the industrial run-off into the local streams. It is also possible that the source of the water samples from the local streams is not sufficient or not representative of the water quality in the stream in general. It may well be necessary to include other input data such as the weather on the day of the water collection, for example.

If the system is to be used to make predictions about groundwater levels 5, 10 and 15 years into the future then it will require a significant redesign. At present the system has only been shown to be accurate when predicting groundwater levels for the following year. This may not be a reasonable task to achieve using an ANN.

Even if the current system can be redesigned to apparently predict the future then it may not remain relevant over the next 15 years. As environmental conditions, soil and rock quality and constitution and weather conditions change, this may all lead to different flow characteristics in the streams and water retention in the ground may change significantly. All of these changes would mean that it would be essential for the ANN to continually be retrained with more current data to ensure that the model retains its ability to correctly forecast pollution from the input data.

soil or commencing a sharp turn) the controller sends a message to cause the stepping motor to increase the throttle slightly so that the required speed is achieved. Once the cause of the speed reduction has passed the tractor will begin to increase its speed again. When this happens the controller causes the step motor to turn so that the throttle, and hence the engine speed reduces to slow the tractor back to its required speed.

Question 27 (b) (iii)

| Marking Criteria | Marks |
|--|-------|
| Discussion demonstrates an excellent understanding of different types of damping applied to the speed control of the tractor | 3 |
| Discussion demonstrates a good understanding of different types of damping applied to the speed control of the tractor | 2 |
| Discussion demonstrates a limited understanding of different types of damping applied to the speed control of the tractor | 1 |

If the speed control is underdamped:

- When the tractor encounters mud or anything that causes it to slow the controller will increase the throttle such that the speed increases above the required speed. The controller then detects the over speed condition and reduces the throttle such that speed reduces to below the required speed. Hence the tractor will fluctuate between over and under speed for some time before the required speed is stabilised. A similar process occurs to slow the tractor when it encounters conditions that require less power to maintain the required speed.

If the speed control is overdamped:

- When the tractor encounters mud or anything that causes it to slow the controller will increase the throttle by a small amount such that the speed increases slightly towards the required speed. The controller then detects that speed is still too slow and increases the throttle again. This process continues until eventually the required speed is attained. Hence the tractor will take an unnecessarily long time to regain the required speed. A similar process occurs to slow the tractor when it encounters conditions that require less power to maintain the required speed.

If the speed control is critically damped:

- When the tractor encounters mud or anything that causes it to slow the controller will increase the throttle smoothly so that the required speed is reached without over speed but in a smooth and timely manner. A similar process occurs to slow the tractor when it encounters conditions that require less power to maintain the required speed.

Question 27 (c) (i)

| Marking Criteria | Marks |
|--|-------|
| Identifies a motor as a suitable actuator AND an excellent explanation of how the system uses the motor to steer the tractor | 2 |
| Identifies a motor as a suitable actuator OR a limited explanation of how the system uses the actuator to steer the tractor | 1 |

The roller must spin at a reasonably fast speed to rotate the steering wheel. This will require an electric motor with a reasonable amount of torque and since the roller must rotate in both clockwise and anticlockwise direction a DC motor would be the best choice. Such motors cannot be powered directly by the controller hence a relay would be used to activate the power to the motor using the low powered controller signal. When the controller requires the tractor to turn left then the motor will be turned on so it rotates in an anticlockwise direction. To turn right the motor spins in a clockwise direction. The controller, based on coordinates from the GPS, adjusts the amount of time the motor is turned on to adjust the radius of the turn. Clearly to complete a turn requires the wheel to be turned then held in that position and then the wheel is returned to the straight ahead position to complete the turn.

Question 28 (a) (ii)

| Marking Criteria | Marks |
|--|-------|
| Detailed explanation that include the concepts gases and electrodes, how voltages is used to modify brightness and that each cell is made up of red, green and blue sub-cells. | 2 |
| Simplistic explanation indicating the use of gases to produce light. | 1 |

Plasma screens work through thousands of tiny cells made up of gases such as xenon, neon, and helium gas. Electrodes are placed in front of and behind the cells, creating a voltage difference. This creates plasma, which in turns produces photons. Each cell has a red, blue and green sub-cell, which through Pulse Width Modulation is used to vary the brightness of each cell, thus enabling it to achieve different colours.

Question 28 (b) (i)

| Marking Criteria | Marks |
|---|-------|
| Three elements are indicated with example | 2 |
| Two elements are indicated with example | 1 |

Three elements are:

- Text e.g. Visit Buzz Lightyear
- Pictures/Graphics e.g. Picture of Woody
- Link to Video. E.g. Button on left hand side "Videos"

Question 28 (b) (ii)

| Marking Criteria | Marks |
|--|-------|
| The domain name and directories are clearly indicated. The purpose of the default file is described, and how that determines where the SWF files will be placed on the page. | 3 |
| The purpose of the default file is described, and how that determines where the SWF files will be placed on the page without reference to the domain name and directories | 2 |
| Simplistic explanation of how a webpage will determine which SWF will be displayed. | 1 |

On the server *www.disney.com* there is a directory called *toystory*. Since no specific file has been indicated, the web server would select a default page, such as *index.html*. This page would then contain code that indicates which flash files are to be presented on the page, as well as their location, size, and the physical location of the SWF files on the server.

Question 28 (b) (iii)

| Marking Criteria | Marks |
|--|-------|
| Differences in the interactivity aspects of SWF and HTML files are clearly outlined, with developments of how they have or may change in the future indicated. | 3 |
| Differences in the interactivity aspects of SWF and HTML files are clearly outlined. | 2 |
| Some aspects of SWF and/or HTML are discussed. | 1 |

Traditionally SWF files have enabled web designers to create sites that have more interactivity than what was possible to create in a HTML constructed site. Specifically SWF files enabled the combining and sequencing of all five different media types in an environment that would allow the user to have a lot of control over the path that they follow. The adding of interactivity has been harder to achieve in HTML web pages, although it should be recognised that scripting languages such as Javascript has improved this. In fact, Apple does not allow SWF files to work on their iPhones/iPads, and are encouraging developers to work in a new version of HTML, called HTML 5, which should increase the ease of introducing interactivity to HTML pages.

HIGHER SCHOOL CERTIFICATE
TRIAL EXAMINATION

2010

Information Processes and Technology

Student Name/Number:

Section I. Multiple Choice Answer Sheet.

Place a cross in the box that corresponds to the best answer.

| Question | A | B | C | D |
|----------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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| 18 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |