

Computing Science  
2020-2021

**perfect**papers

Higher PAPER A

I.

Convert the 8-bit two's complement number 1010 0011 to a denary number.

-93

(1 mark)

2. State the formal parameters in the code above.

Lower, upper  
(1 mark for either)

State the actual parameters in the code above.

1, 100 (1 mark for either)

```
Line 68  FUNCTION numberKey(INTEGER lower, INTEGER upper) RETURNS INTEGER
Line 69      SET numberValue TO RANDBETWEEN(lower, upper)
Line 70      RETURN numberValue
Line 71  END FUNCTION
Line 72
...
Line 92  DECLARE randomValue AS INTEGER INITIALLY 0
Line 93  SET randomValue TO numberKey(1,100)
```

**formal parameter** — the identifier used in a method to stand for the value that is passed into the method by a caller.

**actual parameter** — the actual value that is passed into the method by a caller.

3. Describe how a tracking cookie may be a potential security risk.

Tracking cookies allow third-parties to follow the browsing history of the user **(1 mark)**.

This is a security issue as it may impact on personal privacy, disclosing activity the user may wish to keep private or allowing profiling of a user for targeting of advertising or other content. **(1 mark)**

**1 mark for the ability to track browsing history.**

**1 mark for how this impacts on the security of the individual.**

4. A program is used to create simple coded messages. The program takes a string from the user, converts each character to an ASCII code, adds 5 to the code value and then converts this back to an ASCII character in a new string. For example, the string “Lost” would become “Qtxy”.

|          |                                                        |    |
|----------|--------------------------------------------------------|----|
| Line 200 | FUNCTION encodeMessage (STRING message) RETURNS STRING |    |
| Line 201 |                                                        |    |
| Line 202 | DECLARE char AS STRING                                 |    |
| Line 203 | DECLARE charValue AS INTEGER                           |    |
| Line 204 | DECLARE newChar AS STRING                              |    |
| Line 205 | DECLARE newMessage AS STRING INITIALLY ""              |    |
| Line 206 |                                                        |    |
| Line 207 | FOR position FROM 0 to length(message)-1               | tr |
| Line 208 | SET char TO <get 1 character substring from position>  |    |
| Line 209 | SET charValue TO <ASCII code value of char>            |    |
| Line 210 | SET charValue TO charValue + 5                         |    |
| Line 211 | SET newChar TO <convert ASCII charValue to string>     |    |
| Line 212 | SET newMessage TO newMessage & newChar                 |    |
| Line 213 | END FOR                                                |    |
| Line 214 | RETURN newMessage                                      |    |
| Line 215 | END FUNCTION                                           |    |
| Line 216 |                                                        |    |
| Line 217 | DECLARE message AS STRING INITIALLY "This is a Test"   |    |
| Line 218 | DECLARE newMessage AS STRING                           |    |
| LINE 219 | DECLARE userText AS STRING                             |    |
| LINE 220 |                                                        |    |
| LINE 221 | RECEIVE userText FROM KEYBOARD                         |    |
| LINE 222 | SET newMessage TO encodeMessage (userText)             |    |

(a) Using a programming language of your choice, write code for line 208.

Python:

```
char = message[position:position]
```

Visual Basic

```
char = message.substring(position, l]
```

Java

```
char =  
message.substring(position, position)
```

**l mark for method of substring**

**l mark for correct parameters**

(b) Using a programming language of your choice, write code for line 211.

Python

```
newChar = chr(charValue)
```

Visual Basic

```
newChar = Chr(charValue)
```

Java

```
newChar = new Character((charValue)  
asciiVal).toString();
```

**1 mark for method of conversion**

**1 mark for correct parameters**

(c) During testing an error involving global and local variables is identified in the program. Read the code above and explain why this error has occurred.

Message is a global variable (line 217) and message is a local variable to receive parameter (Line 200) (**1 mark**).

Both will have different values and translator generates error when trying to resolve (**1 mark**).



5. An instruction to be executed is in memory address 1028.

Complete the steps of the fetch-execute cycle shown below.

Step 1 \_\_\_\_\_

Step 2 The processor activates the read line on the control bus.

Step 3 \_\_\_\_\_

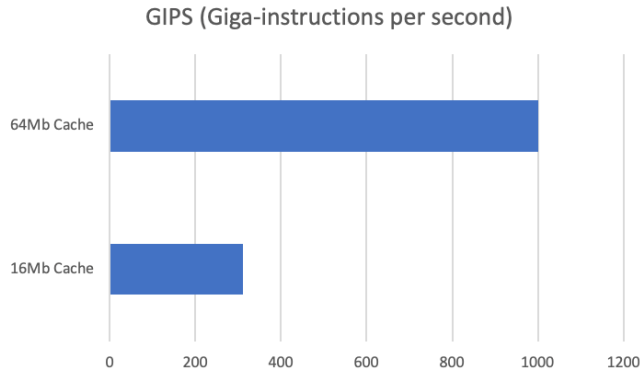
Step 4 The instruction in the instruction register is then interpreted by the decoder and carried out.

The processor sets up the address bus with the required address. **(1 mark)**

An instruction is fetched from the memory location using the data bus and stored in the instruction register. **(1 mark)**

*Can refer to 1028 as the required address.*

6. Two identical processors with different sizes of cache memory are compared.



Explain why the processor with a larger cache is able to process more instructions per second.

The chips used for cache have a faster read time than main memory (**1 mark**)  
the processor with the larger cache will need to make few reads on main memory so will complete operations more quickly (**1 mark**).

7. The details of competitors in a snowboard competition are held in two ID arrays. Some sample data is shown below.

Name: Yuka Fujimori

Time: 32.125

Name: Lesley McKenna

Time: 33.625

Name: Nimisha Popatia

Time: 38.875

Name: Liu Jiayu

Time: 34.50

There are 32 competitors in the competition.

(a) Using a recognised design technique, design an algorithm to display the competitor who took the least amount of time to complete the course.

For example, the output based on the data above would be “Fastest competitor: Yuka Fujimori”.

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Reference language:

SET min TO 0

SET minPosition to 0

SET minValue TO Time[minPosition]

FOR position FROM 1 TO 32 DO

    IF Time[position]< minValue THEN

        minPosition = position

        minValue = Time[position]

    END IF

END FOR

SEND "The competitor with who completed the course in the least time is " &  
Name[minPosition]

**I mark for initialisation**

**I mark for valid FOR loop with END FOR (or indentation to show structure)**

**I mark for valid condition**

**I mark for updating minValue and position**

**I mark displaying Name at min position.**

(b) The values for Time are stored using floating point representation. The processor uses 16-bits for the mantissa (with the sign bit) and 8-bits for the exponent.

Convert 32.125 (100000.001 in binary) to floating point representation.

(c) The program uses two parallel ID arrays. Explain why this data structure may have been used rather than an array of records.

- Sign bit: 0
- Remaining 15 bits of mantissa
- 100 0000 0010 0000
- Exponent: 0000 0110

**1 mark for each bullet, max 3 marks**

Less code required to implement (**1 mark**)

**OR**

Code is less complex since only two ID arrays are required (**1 mark**)

(d) During development and testing breakpoints and watchpoints are used to debug the program.

(i) Describe how breakpoints can be used to debug a program.

A breakpoint is set at particular point in the program code and execution is suspended when that point is reached (**1 mark**)

Once suspended, the values of variables can be inspected and the code can be stepped-thru, one line at a time, to ensure it works as expected (**1 mark**)

**1 mark for stopping execution at required point.**

**1 mark for actions to debug program**

(ii) Describe how watchpoints can be used to suspend the execution of a program for debugging.

(e) A traffic control system is in use to manage the vehicles attending the competition.

Describe one environmental benefit of using a traffic control system.

A watchpoint suspends the execution of the program when a variable or variables match set conditions **(1 mark)**

Traffic control systems are designed to keep vehicles moving. Vehicles which are moving, rather than idling, has significantly less emissions **(1 mark)**

**Accept other valid**



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8. A company has a sweepstake for their customers. Each customer enters their name, telephone, and three numbers between 1 and 100. These details, for all the customers, are read from a csv file and stored in an array of records.

An extract from the file is shown below.

Yigol Mayer, 0772 827 718, 24, 100, 97

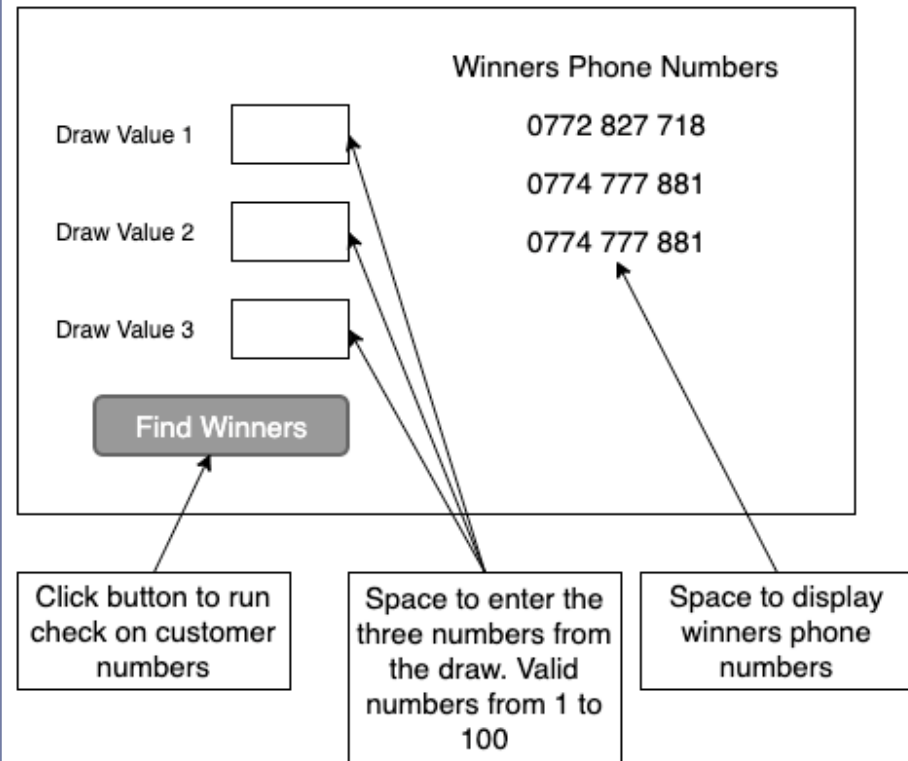
Tobie Laurens, 0744 000 023, 92, 24, 1

Robbie Smith, 0722 828 811, 25, 26, 27

Each month, three numbers are drawn at random and a program is required to check these three numbers against the customer numbers in the file.

All customers with three matching numbers, in any order, are winners and share a prize of £500.00.

(a) Using a wireframe, design a user interface for entering the drawn numbers, matching and displaying the winners. Ensure you include any design features and necessary validation.



**1 mark for space to enter draw results (with labelling/validation)**

**1 for button or means of starting comparison**

**1 mark for area to display results**

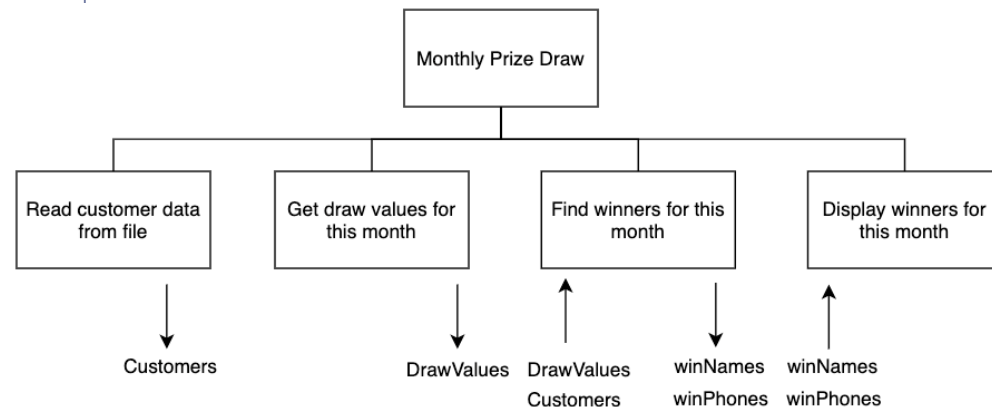
(b) The program will store data in the following arrays.

- Customers: an array of records containing the customer details from the file.
- drawValues: a 1D array holding the three numbers drawn for the month
- winNames: a 1D array of the winning names
- winPhones: a 1D array of the winning phone numbers

Complete the diagram below to show the missing data flows.

- “Get draw values for this month”: Output DrawValues
- “Find winners for this month”: Inputs DrawValues, Customers
- “Find winners for this month”: Outputs winNames, winPhones
- “Display winners for this month”: Input winNames, winPhones

**I mark each bullet, max 4 marks**



(c) The data will be read from the file and stored in a record structure.

```
RECORD customer IS {  
    STRING name, STRING phone,  
    INTEGER num1, INTEGER num2,  
    INTEGER num3 }
```

Using a programming language of your choice, declare an array, called Customers, to store the information of 500 customers, using this record structure.

```
DECLARE Customers  
AS ARRAY OF customer INITIALLY [] *  
500
```

**1 mark for an array of the record type**

**1 mark for declaration of required size**

(d) Using a programming language of your choice and the data structure from (c), write code to read and store the contents of a csv file, “customers.csv”.

**I mark: open file using given name, with close file**

**I mark read file contents**

**I mark process rows in file**

**I mark delimitate rows in file**

**I mark loop through rows allocating to data structure.**

## Python:

```
from csv import reader

with open ('customers.csv','r') as read_obj:
    csv_reader = reader(read_obj)

read_obj.close

rowCount = 0
for row in csv_reader:
    cust[rowCount].name = row[0];
    cust[rowCount].phone = row[1];
    cust[rowCount].num1 = row[2];
    cust[rowCount].num2 = row[3];
    cust[rowCount].num3 = row[4];
    rowCount += 1
```

## Visual Basic:

```
Dim Path As String = "customers.csv"  
fileC = New StreamReader(Path)  
Dim line As String = fileC.ReadToEnd()  
fileC.Close()
```

```
Dim separators() As String = (",")
```

```
Dim output() As String = line.Split(separators, StringSplitOptions.RemoveEmptyEntries)
```

```
Dim rowC As Integer
```

```
rowC = 0
```

```
For Each line In Output
```

```
    Customers[rowC].name = output(0)
```

```
    Customers[rowC].phone = output(1)
```

```
    Customers[rowC].num1 = output(2)
```

```
    Customers[rowC].num2 = output(3)
```

```
    Customers[rowC].num3 = output(4)
```

```
    rowC = rowC + 1
```

```
Next
```

---

9. Logie Community Council want a program to help manage community council meetings. Interviews with some community council members are shown below.

“We have members and residents that attend meetings. For meetings to be allowed to proceed, we need 8 of our 15 members to be present. Our meeting room has a limited capacity so if more than 15 people attend, we prioritise members over residents.”

Soha Azzam, Chairperson

“When people arrive, I give them a number and I make a note of this and if they are members or residents. If there are more than 15 people, I count the number of members and then allocate any remaining seats to the residents with the lowest numbers first. Once the room is full, I ask anyone not allocated a seat to leave.”

Ron Barclay, Secretary



(a) State two boundaries for the system described above that would be identified during the analysis phase.

- Capacity of room is 15
- Attendees either member or resident
- Members get seats before residents
- 8 members must be present for meeting to proceed.
- Attendees cannot be zero
- Validation required

**1 mark each bullet, max 2 marks**

(b) The following code has been developed to count attendees.

|         |                                                         |
|---------|---------------------------------------------------------|
| Line 10 | DECLARE attendee AS ARRAY OF STRING                     |
| Line 11 | DECLARE atNumber AS INTEGER INITIALLY 0                 |
| Line 12 | DECLARE mCount AS INTEGER INITIALLY 0                   |
| Line 13 | DECLARE rCount AS INTEGER INITIALLY 0                   |
| Line 14 |                                                         |
| Line 15 | WHILE response = "Y" DO                                 |
| Line 16 | SEND "Member (M) or Resident (R)? X to Exit" TO DISPLAY |
| Line 17 | RECEIVE type FROM KEYBOARD                              |
| Line 18 | SET attendee[atNumber] TO type                          |
| Line 19 | SET atNumber TO atNumber + 1                            |
| Line 20 | IF type = "M" THEN                                      |
| Line 21 | SET mCount TO mCount + 1                                |
| Line 22 | ELSE                                                    |
| Line 23 | SET rCount TO rCount + 1                                |
| Line 24 | END IF                                                  |
| Line 25 | END WHILE                                               |

A logic error in the code means rCount is always incorrect. Identify the cause of this error and how it can be corrected.

X to Exit is always counted in rCount because of the ELSE in the IF structure (**1 mark**).

Can be corrected by using another IF statement with a condition to remove X from the count (**1 mark**).

*Do not accept responses which don't correct the error but do correct the count as these retain the original logic error and don't correct it.*

(c) Using a recognised design technique, design a solution to allocate seats at meetings. Assume the error in (b) has been corrected.

**1 mark for considering initial attendance (line 1)**

**1 mark for calculating seats available (line 2)**

**1 mark for traversing array while spare seats are allocated with indexes incremented as need**

**1 mark for identifying residents (line 6)**

**1 mark for message/allocation of seat (lines 7/8)**

```
1  IF atNumber > 15 THEN
2      sparePlaces = 15 - mCount
3      spareAllocated = 0
4      posNumber = 0
5      WHILE spareAllocated < sparePlaces DO
6          IF attendee[posNumber] = "R" THEN
7              SEND "Number " & posNumber & "is allocated a seat"
8              SET spareAllocated TO spareAllocated + 1
9          END IF
10         posNumber = posNumber + 1
11     END WHILE
12 END IF
```

(d) The community council members provide some feedback on the program.

“If I enter ‘m’, ‘x’, ‘r’ or any other letter other than the ones asked for the program seems to do something and then asks me for another letter. Is this supposed to happen?”

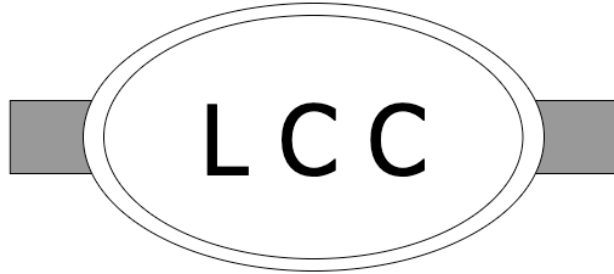
“When I run the program at the start of the meeting, the first thing it displays is “Member (M) or Resident (R)? X to Exit”.

Describe two ways that the usability of the program could be improved.

- Implement input validation with feedback to the user
- Use function to capitalise input so program accepts upper and lowercase
- Add buttons for user input
- Provide improved feedback to set the context for use.

**I mark each bullet, max 2 marks**

(e) The logo for the community council can be stored as either a bit-mapped or vector graphic.



Describe two advantages of storing this graphic as a vector rather than as a bit-mapped graphic.

- Generally, smaller file size (as stores vector data rather than bitmaps)
- Scalable without losing quality
- Can edit individual objects with the file

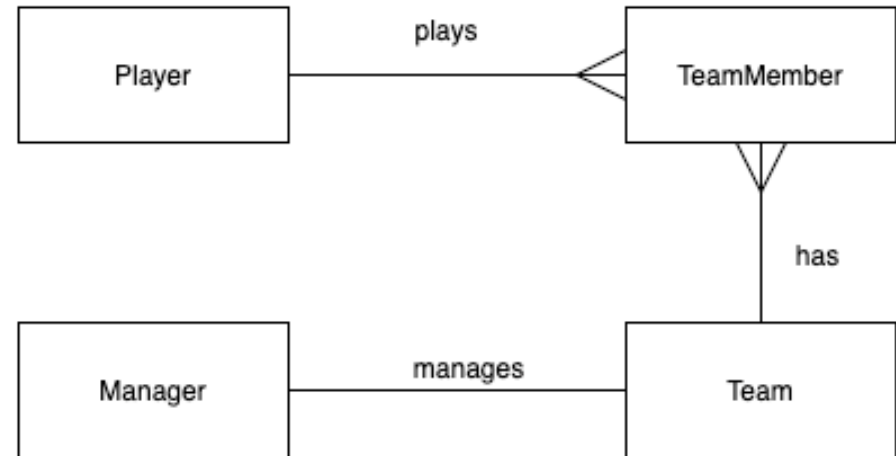
**I mark each bullet, max 2 marks.**

10. A database for teams in a sports club has the following tables.

| Player          | TeamMember       | Team          | Manager          |
|-----------------|------------------|---------------|------------------|
| <u>playerid</u> | <u>playerid*</u> | <u>teamid</u> | <u>managerid</u> |
| pname           | <u>teamid*</u>   | tname         | mname            |
| pmobile         | position         | managerid*    |                  |
| pemail          | captain          |               |                  |

A player can be a member of several teams. A team can only have one manager. A team has one or more players.

Draw a labelled entity-relationship diagram for this database. Attributes are not required on the diagram.



**1 mark for each relationship, with correct cardinality and labelled.**

**Max 3 marks**

11. A database table is shown below.

| Table: Skateboard |              |           |        |        |
|-------------------|--------------|-----------|--------|--------|
| ItemNo            | Manufacturer | Style     | Length | Cost   |
| 187               | Birdhouse    | Cruiser   | 29     | 119.95 |
| 188               | D-Street     | Longboard | 39     | 74.95  |
| 189               | Lush         | Longboard | 42     | 135.50 |
| 190               | Loaded       | Cruiser   | 30     | 99.99  |
| 191               | Santa Cruz   | Cruiser   | 31     | 149.95 |
| 192               | Lush         | Longboard | 41     | 199.95 |

Complete the table below showing the output from the following SQL statement.

```
SELECT Style, MAX(Length) AS "Longest Item"
FROM Skateboard
GROUP BY Style
```

| Style     | Longest Item |
|-----------|--------------|
| Cruiser   | 31           |
| Longboard | 42           |

1 mark for each correct row,  
max 2 marks



12. State the feature of SQL that allows the calculation to be called “Bonus Days”.

```
SELECT (membership_days + 50) AS  
"Bonus Days"  
FROM membership, transaction  
WHERE membership.mid =  
transaction.mid
```

Alias (**1 mark**)

13. Some sample data from a database is shown below.

| Table: Ticket |             |           |            |                                     |
|---------------|-------------|-----------|------------|-------------------------------------|
| TicketNo      | FromStation | ToStation | Valid From | AnyRoute                            |
| 271981        | GLQ         | DEE       | 15/03/2020 | <input checked="" type="checkbox"/> |
| 271982        | KNT         | INR       | 23/03/2020 | <input type="checkbox"/>            |
| 271982        | WCK         | INV       | 05/04/2020 | <input checked="" type="checkbox"/> |

| Table: Station |           |
|----------------|-----------|
| Code           | Station   |
| GLQ            | Glasgow   |
| DEE            | Dundee    |
| KNT            | Kintore   |
| INR            | Inverurie |

Complete this data dictionary.

| Entity  | Attribute   | Key | Type | Size | Validation |
|---------|-------------|-----|------|------|------------|
| Ticket  | TicketNo    | A   |      |      |            |
| Ticket  | FromStation | B   |      |      | C          |
| Ticket  | AnyRoute    |     | D    |      |            |
| Station | Code        | E   |      |      |            |

- A PK (primary key)
- B Foreign Key
- C Lookup from Station
- D Boolean
- E PK (primary key)

1 mark for identification of both primary keys

1 mark for foreign key with correct validation

1 mark for D, Boolean

14. A database has been developed for a tourist agency. It provides details of landmarks to visit around Scotland.

**Landmark**

| SiteNo | Location                 | Cost  | Access     |  | Rating |
|--------|--------------------------|-------|------------|--|--------|
| 01     | Edinburgh Castle         | 18.00 | Accessible |  | 4.8    |
| 02     | Loch Ness Visitor Centre | 12.00 | Accessible |  | 4.5    |
| 03     | Royal Mile               | 0.00  | Accessible |  | 4.6    |
| 04     | Loch Lomond              | 0.00  | Restricted |  | 4.8    |
| 05     | Arthur's Seat            | 0.00  | Varies     |  | 4.7    |
| ...    | ...                      | ...   | ...        |  | ...    |

(a) Urquhart Castle is to be added to the Landmark table. An SQL statement for this purpose is shown below.

```
INSERT INTO Landmark (Location)
VALUES ("Urquhart Castle")
```

Evaluate this query in terms of fitness for purpose.

The query is fit for purpose as it does add “Urquhart Castle” (but leaves other columns without values). **(1 mark)**

(b) This query will have an impact on the accuracy of the data produced from the database.

Describe what could be done to prevent the query in (a) from updating the database.

Validation rules could be set (**1 mark**)

Example of specific validation rules (**1 mark**) e.g.

- Rating must be value from 0 to 5;
- Access to be restricted choice from Accessible, Restricted,Varies;
- Cost cannot be null

15. Events Hire is a company that provide services for special occasions such as birthdays and weddings.They have a stock of equipment, such as bouncy castles, hot tubs etc. that customers can hire.

| RentalItem |                |                                                            |
|------------|----------------|------------------------------------------------------------|
| itemid     | itemname       | notes                                                      |
| 71         | Bliss          | Inflatable hot tub, supplied with lights, cover and gazebo |
| 72         | Scandic        | Rigid hot tub, Access width: 85cms, Height: 205cms         |
| 73         | Cube Castle    | 5m x 5m space required. Toddler safe bouncy castle         |
| 74         | Pep Piggie     | 4.5, x 6m space required. Toddler safe bouncy castle       |
| 75         | OctoPool       | 3m x 3m ball pool. Supplied with 500 plastic balls.        |
| 76         | Assault Course | 12m x 40m inflatable assault course for adults.            |
| ...        | ...            |                                                            |

| Rental   |        |            |              |          |            |
|----------|--------|------------|--------------|----------|------------|
| rentalid | itemid | date       | deliverytime | duration | customerid |
| 135      | 71     | 05/02/2021 | 14:00        | 5        | 25         |
| 136      | 71     | 11/02/2021 | 10:00        | 3        | 28         |
| 137      | 72     | 03/02/2021 | 16:00        | 7        | 26         |
| 138      | 73     | 10/02/2021 | 18:00        | 4        | 27         |
| 139      | 74     | 02/02/2021 | 12:00        | 3        | 25         |
| 140      | 76     | 06/02/2021 | 08:00        | 1        | 28         |
| 141      | 75     | 05/02/2021 | 10:00        | 2        | 28         |
| ...      | ...    |            |              |          |            |

| Customer   |       |          |             |               |          |
|------------|-------|----------|-------------|---------------|----------|
| customerid | fname | lname    | mobile      | address       | postcode |
| 25         | Toni  | Vosser   | 0719 827189 | 31 West Wall  | DD12 9YY |
| 26         | Ian   | Jones    | 0728 928111 | 19 Doomstaid  | AT88 1UT |
| 27         | Colin | Walker   | 0719 827711 | 99 Janey Lane | FY16 8AY |
| 28         | Jamie | Scullion | 0777 928982 | 11 North St   | FY12 1TT |
| ...        | ...   |          |             |               |          |

(a) Design a query to show customer names with the number of items on hire to each one from 05/02/2021 to 11/02/2021.

|                             |                                               |
|-----------------------------|-----------------------------------------------|
| Field(s) and calculation(s) | fname, lname, COUNT(*)                        |
| Table(s)                    | Customer, Rental, RentalItem                  |
| Search criteria             | Date >= '05/02/2021' AND Date <= '11/02/2021' |
| Grouping                    | customerid                                    |
| Sort order                  |                                               |

1 mark for **COUNT** (with name details)

1 mark for **Date conditions with AND**

1 mark for **Grouping**

(b) Design a query to show the name of each item, with its itemID, and the total duration of rentals for the item. This table should have the longest rental total at the top.

|                             |                                        |
|-----------------------------|----------------------------------------|
| Field(s) and calculation(s) | Itemid, itemname, <b>SUM(duration)</b> |
| Table(s)                    | RentalItems, Rental                    |
| Search criteria             |                                        |
| Grouping                    |                                        |
| Sort order                  | SUM(duration) DESC                     |

**1 mark for use of SUM**

**1 mark for tables (RentalItems and Rental)**

**1 mark for correct sort**

***Accept answers that use alias***

(c) The “Bliss” hot tub has been replaced with a new model called, “Paradise”. The notes remain as they are.

Write the SQL statement to make this change.

```
UPDATE RentalItem  
SET itemname TO "Paradise"  
WHERE itemid = 71;
```

**I mark for use of `UPDATE` and correct table**

**I mark for setting the correct column to “Paradise”**

**I mark for using `itemid = 71`**

***Do not award mark for `itemname = “Bliss”` as this may not be unique.***



(d) Hot tubs are charged at £100 per rental, plus £25 multiplied by the duration. The following table is a list of fees that customers will pay for hot tub rentals, generated for each rental for a hot tub.

| Hot Tub Fees |
|--------------|
| 225          |
| 175          |
| 275          |
| ...          |

(i) Write SQL that will generate the result above from the data in the tables Rental and RentalItem.

(ii) Explain how the example table of data could be used in testing.

```
SELECT 100+(25*duration)
FROM Rental, RentalItem
WHERE Rental.itemid =
RentalItem.itemid AND
Notes LIKE "%hot tub%";
```

**1 mark for correct calculation**  
**1 mark for correct tables**  
**1 mark for Equi-join with AND**  
**1 mark for hot tub wildcard condition**

The table can be compared to the actual results to ensure they are as expected.  
**(1 mark)**

## 16. An image and text from a web site are shown below.

CLAUDIO

And what have I to give you back, whose worth May counterpoise this rich and precious gift?

DON PEDRO

Nothing, unless you render her again.

CLAUDIO

Sweet prince, you learn me noble thankfulness. There, Leonato, take her back again: Give not this rotten orange to your friend; She's but the sign and semblance of her honour. Behold how like a maid she blushes here! O, what authority and show of truth Can cunning sin cover itself withal! Comes not that blood as modest evidence To witness simple virtue? Would you not swear, All you that see her, that she were a maid, By these exterior shows? But she is none: She knows the heat of a luxurious bed; Her blush is guiltiness, not modesty.

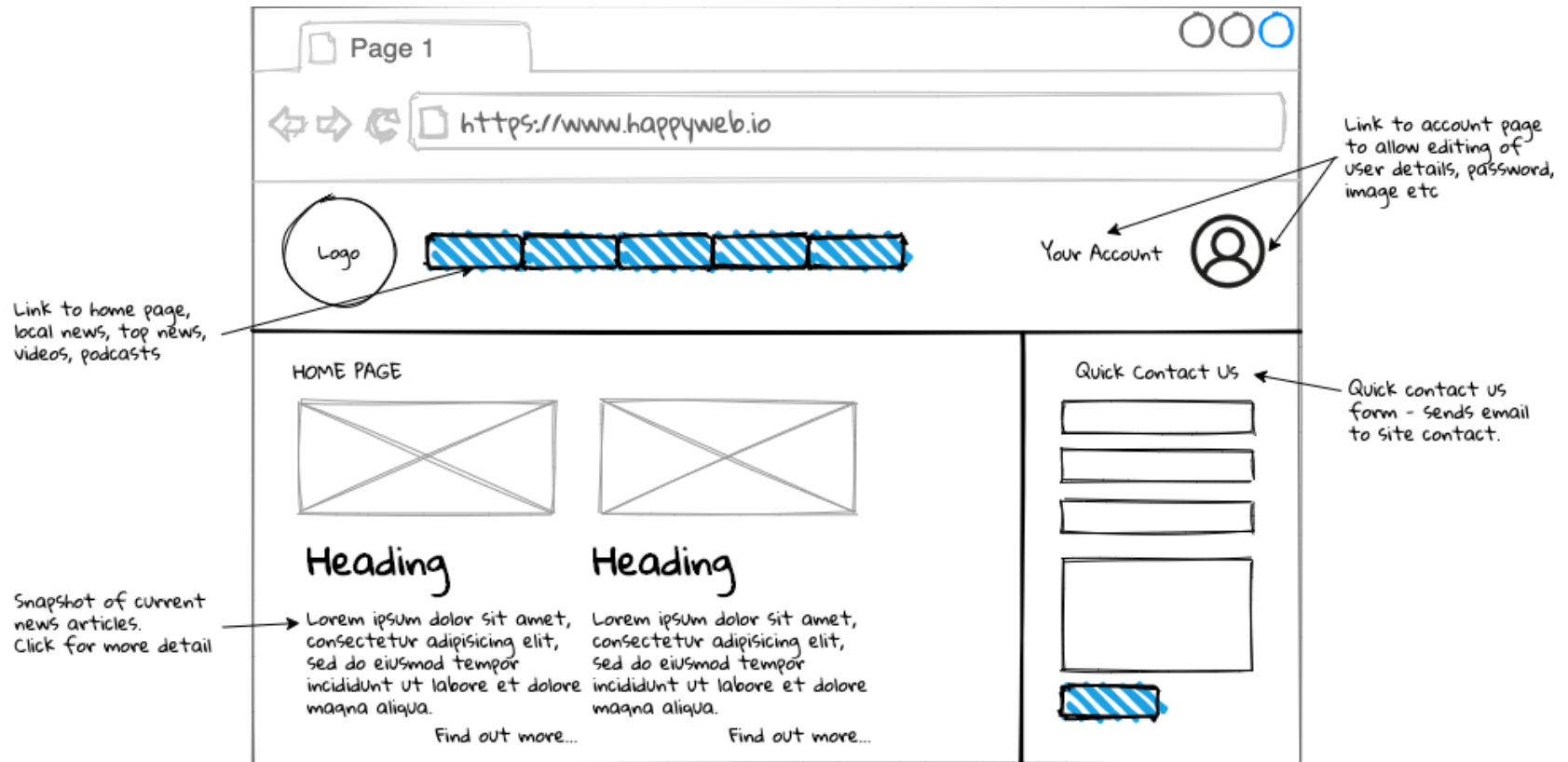


State the CSS property and value that has been used to place the image.

float: right

**I mark for property, I mark for value**

17. Describe which areas of this wireframe would be suitable to implement in a low fidelity prototype.



Accept any of the following for implementation in low fidelity prototype:

- Main navigation
- Quick form
- Your account

1 mark each, max 2 marks

18. A web page contains the following form element.



Write HTML for this element which is named "UserOpt".

```
<input type="radio" name="UserOpt" value="Option 1" checked> Option 1
```

**1 mark for INPUT element name as given**

**1 mark for value (with label text)**

**1 mark for checked**

**19. Describe the role of a persona when carrying out usability testing.**

A persona represents a major group of users and sets out the users' expectations for the site (**1 mark**).

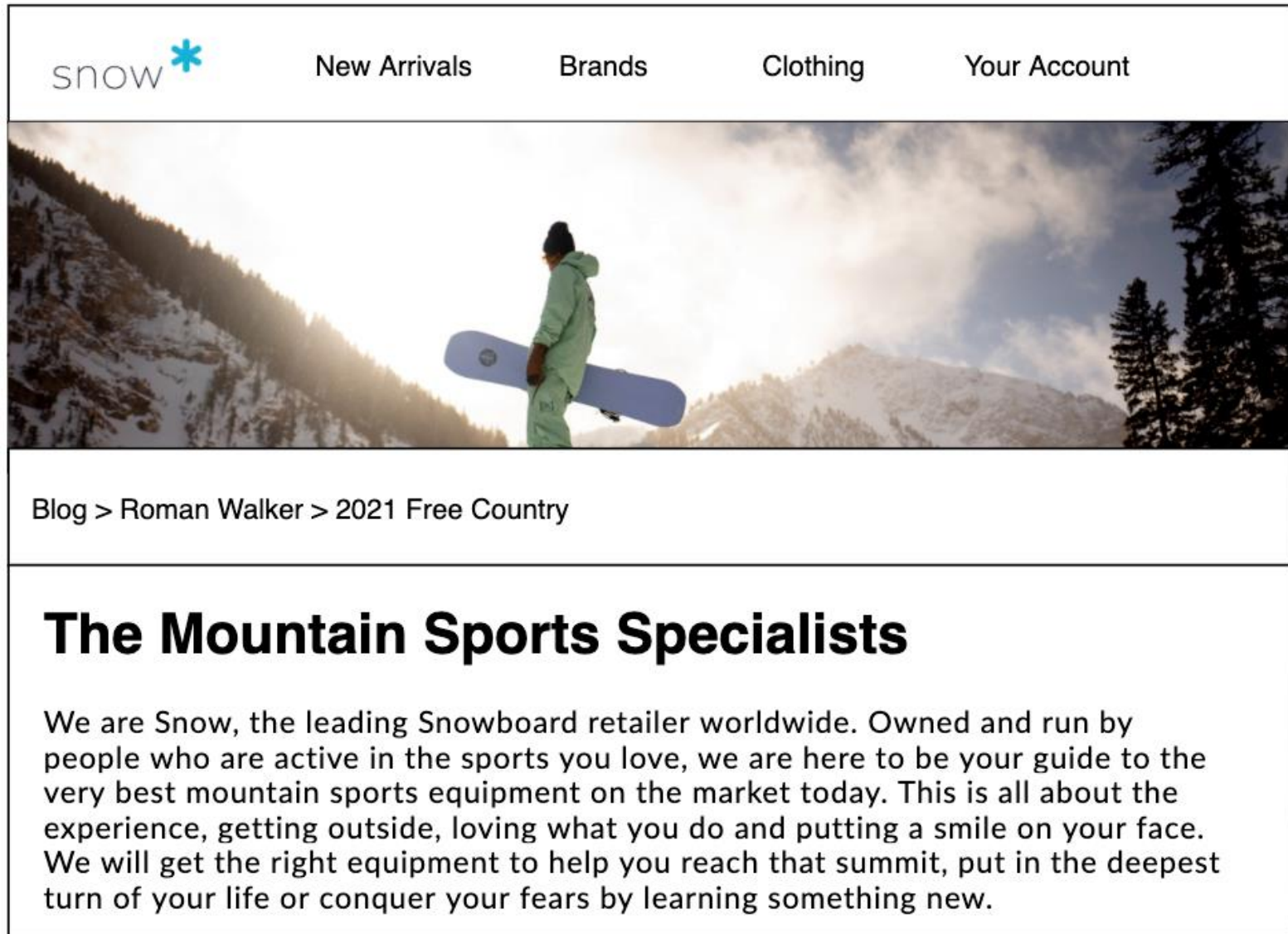
Personas help developers understand how users would use the site and help ensure the site is appropriate for that user group (**1 mark**)

**1 mark for expectations of site**

**1 mark for way users make use of site.**

**Accept other valid responses.**

20. A web site is being developed for a Snowboard Shop. The site will allow them to sell online and keep in touch with customers. The homepage is shown below.



(a) The navigation under the main image has the following HTML.

```
<nav class="breadnav">
  <ol>
    <li class="breadcrumb"><a href="blog">Blog</a></li> &gt;
    <li class="breadcrumb"><a href="blog/rwalker">Roman
Walker</a></li> &gt;
    <li class="breadcrumb">2021 Free Country</li>
  </ol>
</nav>
```

Write the CSS styles to implement this navigation.

```
.breadnav ol {
  list-style-type: none;
  padding-left: 0px;
}
```

```
.breadcrumb {
  display: inline;
}
```

**I mark for use of BOTH selectors**

**I mark for use of list style**

**I mark for display inline**

(b) The header and the main element of the home page have the similar CSS styles. Both styles are shown here.

|                          |                          |
|--------------------------|--------------------------|
| header {                 | main {                   |
| background-color: white; | background-color: white; |
| margin-top: 30px;        | margin-top: 30px;        |
| padding-left: 20px;      | padding-left: 20px;      |
| margin-bottom: 20px;     | margin-bottom: 20px;     |
| height: 120px;           | font-family: Arial;      |
| }                        | }                        |

Use grouping selectors to make these CSS rules more efficient.

**I mark for grouping of selectors (header, main) with correct CSS**

**I mark for BOTH separate rules for header and main.**



(c) A page on the site has the following headings.

***Snow Adventures - 2021***

**Snow Park Text**

font-style: normal;  
font-size: small;

font-style: italic;

The HTML for these headings is shown below.

```
<h1>Snow Adventures -  
2021</h1>
```

```
<section class="maintext">  
    <h1>Snow Park Text</h1>  
</section>
```

Write CSS rules to implement the styles show making use of descendant selectors.

```
h1 {  
    font-style: italic;  
}  
  
.maintext h1 {  
    font-style: normal;  
    font-size: small  
}
```

**I mark for h1 rule**

**I mark for h1 rule descendent from .maintext**

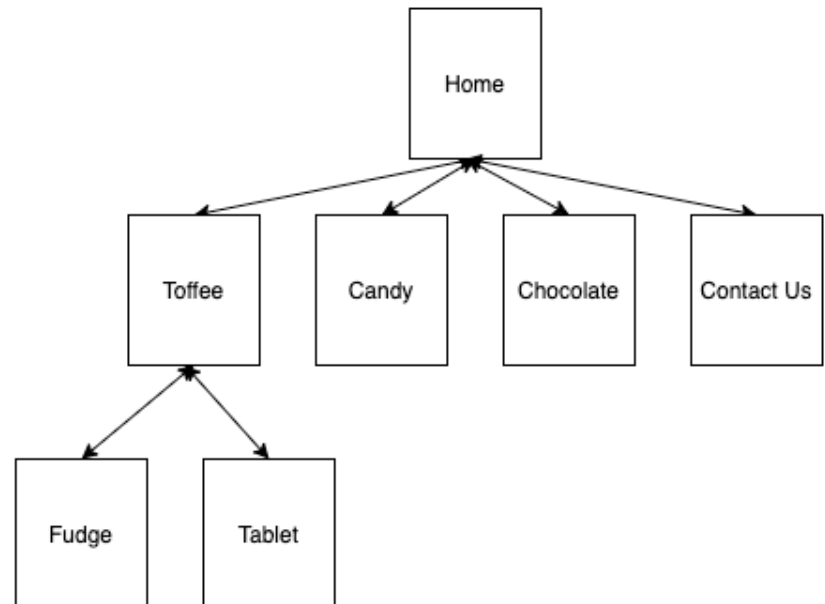
21. Bob's Sweets is developing a web site. The web site will have a multi-level structure, consisting of a home page that links to four web pages: Candy, Toffee, Chocolate and Contact Us.

The Toffee web page will have links to two subpages showing Fudge and Tablet.

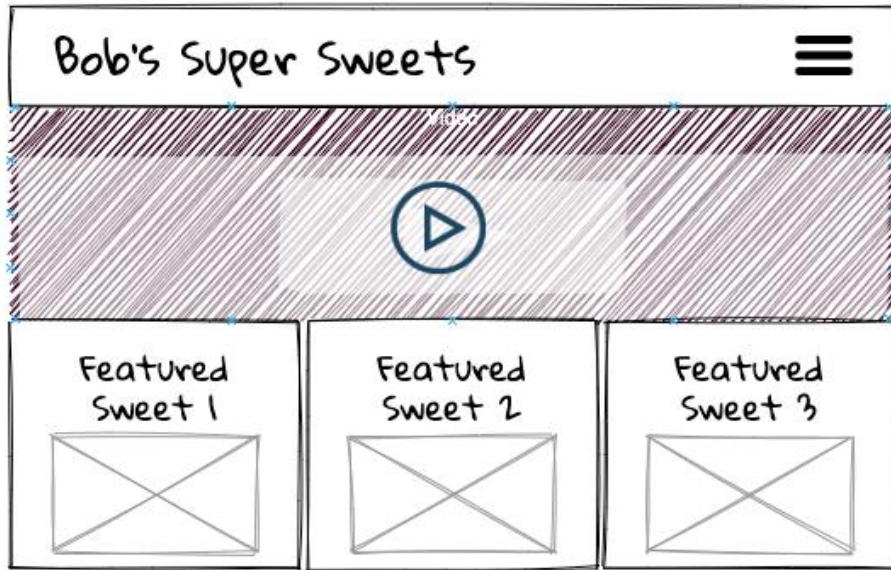
(a) Design a multi-level structure for this web site.

Four main pages from top level (1 mark)

Two subpages from Toffee (1 mark)

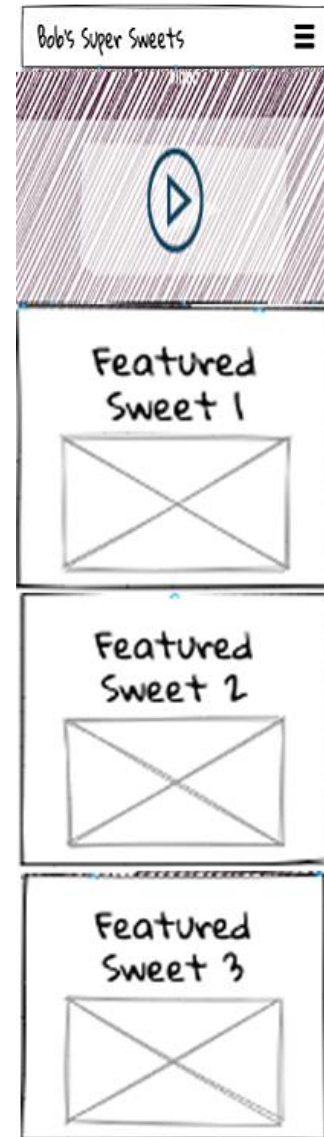


(b) A wireframe for the home page is shown below.

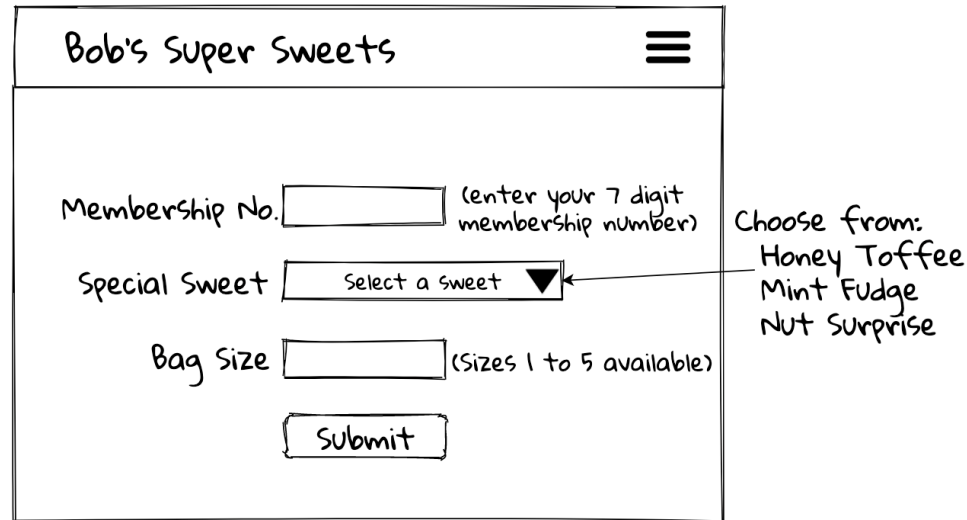


Redraw this layout so that it is suitable for a mobile device.

Elements arranged for mobile screen and vertical scrolling (**1 mark**)



(c) A wireframe for a page in the site is shown below.



The wireframe shows a page titled "Bob's Super Sweets" with a hamburger menu icon in the top right corner. Below the header, there are three input fields: "Membership No." with a text box and a note "(enter your 7 digit membership number)", "Special Sweet" with a dropdown menu showing "Select a sweet" and a downward arrow, and "Bag Size" with a text box and a note "(Sizes 1 to 5 available)". To the right of the "Special Sweet" dropdown, there is a list of options: "Choose from: Honey Toffee, Mint Fudge, Nut Surprise". At the bottom of the form is a "Submit" button.

Bob's Super Sweets

Membership No.  (enter your 7 digit membership number)

Special Sweet  ▼

Bag Size  (Sizes 1 to 5 available)

Submit

Choose from:  
Honey Toffee  
Mint Fudge  
Nut Surprise

Some of the code to implement this is shown below with placeholders for any missing code.

---

```
<form action="process.html" method="post">
```

```
  <p>Membership Number
```

```
    <input type="text" minlength="7" maxlength="7" name="memno" /></p>
```

```
</p>
```

```
<p>Special Sweet
```

```
  <HTML for special sweet
```

```
    </select></p>
```

```
<p>Bag Size
```

```
  <HTML for bag size
```

```
</p>
```

```
<p><input type="submit" value="Submit" /></p>
```

```
</form>
```

Enter the HTML code below to correctly validate the form.

***HTML for special sweet***

```
<select name="specialsweet">  
  <option value="">Select a  
sweet</option>  
  <option value="Honey Toffee">Honey  
Toffee</option>  
  <option value="Mint Fudge">Mint  
Fudge</option>  
  <option value="Nut Surprise">Nut  
Surprise</option>  
</select>
```

**I mark for select with first (empty) option**

**I mark for all other options with values**

## ***HTML for bag size***

(d) (i) Describe how the wireframes, developed during the design phase, can be used the testing phase.

## ***HTML for bag size***

```
<input type="number" min="1" max="5"
name="bagsize" />
```

**1 mark for element with validation.**

Wireframes can be used in the testing to:

- Verify input validation
- Ensure navigation works
- Media display correctly.

**1 mark each bullet, max 2 marks**

(ii) Explain how form validation, such as that in (c), improves usability.

Form validation allows faster recovery from potential errors which aids usability (by providing feedback to allow corrections to be made).

**(1 mark)**