



Section A

Question 1

Well answered but many candidates prevented the number_of_items dropping below 0 rather than 1. Candidates need to read the questions carefully.

- (a) **When 'decrease' button is pressed**
if number_of_items not equal to 1
 number_of_items = number_of_items - 1;
Display number_of_items
- (b) Add the following lines to the end of the 'scanned' algorithm.
transaction = 'add';
number_of_items = 1;
- (c) **When item is 'scanned'**
item_cost = value of scanned item
if transaction = **'add'**
 total_cost = total_cost + item_cost * number_of_items
else
 total_cost = total_cost - item_cost * number_of_items
 if total_cost < 0
 total_cost = 0
transaction = 'add';
number_of_items = 1;
Display number_of_items, transaction, total_cost

Question 2

Common errors were:

- Player2 = 2 ??
- Not toggling the Boolean variable playerOne from true to false correctly after each turn.
- No-one thought to display whose turn was next

- (a) Add the following to the end of the 'proceed' algorithm:

```
if player1 >=100
    playerOne = true
    player1 = 1
    one_die = false
    dice = 0
    Display 'player 1 wins!!'
```

(b)

Initially

```
playerOne = true
player1 = 1
player2 = 1
one_die = false
dice = 0
```

When 'rollOne' button is pressed

```
if dice is zero
    set dice to a random value between 1 and 6
    one_die = true
    Display dice
```

When 'rollTwo' button is pressed

```
if dice is zero
    set dice to a random value between 1 and 12
    one_die = false
    Display dice
```

When 'proceed' button is pressed

```
if dice is not equal to zero
    if playerOne
        player1 = player1 + dice;
        if player1 is a multiple of 7 and one_die = true
            player1 = player1 + 20
            Display 'Bonus!'
    else
        player2 = player2 + dice;
        if player2 is a multiple of 7 and one_die = true
            player2 = player2 + 20
            Display 'Bonus!'
    playerOne = not playerOne
    dice = 0;
    Display dice
    Display player1, player2
    if player1 >=100
        Display 'player 1 wins!!'
        playerOne = true
        player1 = 1
        player2 = 1
        one_die = false
        dice = 0
    if (player2 >=100
        Display 'player 2 wins!!'
        playerOne = true
        player1 = 1
        player2 = 1
```

```
    one_die = false
    dice = 0
    if (playerOne)
        Display 'It is Player 1's turn'
    else
        Display 'It is Player 2's turn'
```

Question 3

Many candidates misinterpreted the question thinking that the algorithm should cater for groups of people rather than just one person. There were some commendable efforts to then solve this more complex problem. A common fault was to try and calculate the cost of entry as each button was pressed. This led to all sorts of problems (considering that the buttons could be pressed in any sequence). It is much better to collect all the information first and then calculate the cost when the CHECK button is pressed. Below is a suggested algorithm. The weight and locker button can be toggled but the adult, child and observer button can not be toggled.

Initially

```
total = 0
rides = 0
set isChild_Pool to false
set isAdult_Pool to true
set isObserver to false
set isWeight to false
set isLocker to false
Display current status
```

When 'adult' button is pressed

```
set isChild_Pool to false
set isAdult_Pool to true
set isObserver to false
set isWeight to true
rides = 0
Display current status
```

When 'child' button is pressed

```
set isChild_Pool to true
set isAdult_Pool to false
set isObserver to false
set isWeight to false
Display current status
```

When 'observer' button is pressed

```
set isChild_Pool to false
set isAdult_Pool to false
set isObserver to true
set isWeight to false
```

```
rides = 0;
Display current status
When 'ridesUp' button is pressed
    if isChild_Pool
        rides = rides + 1
    if rides > 10)
        rides = 10
    Display current status
When 'ridesDown' button is pressed
    if isChild_Pool
        rides = rides - 1
    if rides is less than zero
        rides = 0
    Display current status
When 'weight' button is pressed
    if not isChild_Pool and not isObserver
        set isWeight to not isWeight
    Display current status
When 'locker' button is pressed
    if not isObserver
        set isLocker to not isLocker
    Display current status
When 'check' button is pressed
    if isObserver
        total = 2
    else
        if isChild
            total = 4
        else
            total = 7
    if isWeight
        total = total + 10
    if isLocker and not isWeight
        total = total + 5
    total = total + rides
    Display current status
    Display total
When 'clear' button is pressed
    total = 0
    rides = 0
    set isChild_Pool to false
    set isAdult_Pool to true
    set isObserver to false
    set isWeight to false
    set isLocker to false
    Display current status
```

Section B**Question 4**

- (a) The letter 'A' will be drawn such that the bottom left corner of the letter will be 160 pixels from the left hand edge of the window and 200 down from the top.
- (b) The if condition will be true so the statement $r = i + 1$ will be executed giving a final value of r of 0.
- (c) The loop will execute 10 times and the final value of count will be 10.

Question 5

- (a) If the value of x is greater than 0 then i will be given the value $x-1$ otherwise i will be given the value of x .
- (b) When density has the value of 5 then the possible values of r are 1,2,3,4,5,6.
- (c) The contents of the array board are as shown in the diagram

	0	1
0	'1'	'2'
1	'3'	'4'
2	'5'	'6'
3	'7'	'8'

Question 6

- (a) Local : int count, i, j, Global: char[] [] board Parameters: int x, y
- (b) The parameter i in the method is either using the value of x or y depending on where it is called. This means it cannot be replaced with a global variable which would mean there would be a need for two separate methods. One for x and one for y . Taking the code for 'before' out as its own method makes the code easier to read, and makes it more modular. It simplifies the counter method by removing the repeating code.
- (c) **density** would need to be declared globally so it could be accessed by both methods and the local declaration of **density** in **actionPerformed** would have to be removed so that it would not block access to the global version.

Main problems with this section were in answering 6b and 6c. Discussion and explanation was required, but most provided simple or no answers.

Majority of questions were very clear cut.

Many weren't aware of how the random function works – this is something that should be covered in class exercises. Rather than seeing it as providing upper bounds for the range of random numbers, many thought that the possible numbers would be factors of 7.

FOR loops, majority of people can't count a for loop's cycles, many answered 9 as the total count of cycles.

Question 5a, x needs a starting value.

Section C

Generally well answered section. In Question 7 candidates need to ensure they give the values stored in the fields not indicate the changes that have occurred. In question 8 candidates need to be careful about the char data type the letter B needed to be given as 'B' not 'B' or just B. In question 9 (b) candidates need to ensure that they cover a range of errors and not base them all on the 'out of range problem'.

Question 7

- (a) textRed: off, textYellow: on, textGreen: off.
- (b) textRed: off, textYellow: on, textGreen: off.
- (c) textRed: on, textYellow: off, textGreen: off.

Question 8

- (a) `Game game = new Game();`
- (b) `game.place(0,0,'B');`
`game.place(3,4,'W');`
- (c)

```
public Game()
{
    for(int r = 0; r<4; r++)
        for(int c = 0; c<5; c++)
            board[r][c]='*';
    place(0,0,'B');
    place(3,4,'W');
}
```

Question 9

- (a) The game allows movement by one place in the x direction only and allows taking by moving one place in the y direction only.

ie.

```
game.move(0, 0, 1, 3);  
game.take(1, 3, 3, 4);
```

- (b) There is no check to make sure that the place method will actually place the piece on the board. eg. The x value between 0 and 4.

There is no check to make sure that game.place will only place a 'B' or 'W'.

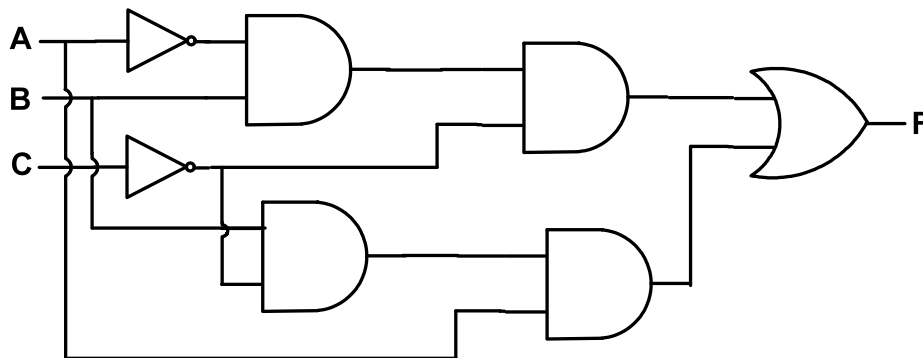
There is no check to ensure that there is a piece in the position specified to move from.

Section D

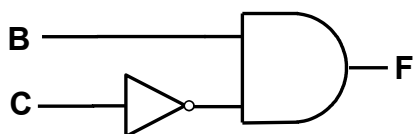
Question 10

- (a) (i) 43 (ii) -12

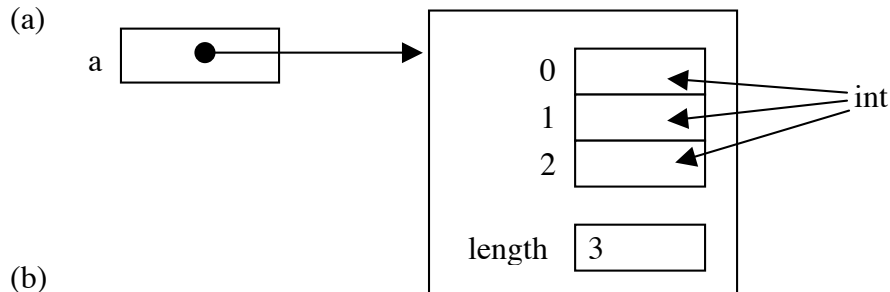
- (b) Either



Or $B \wedge \sim C$



- (c) Because JVMs are available for many hardware and software platforms, the use of the same bytecode for all platforms allows Java to be described as 'compile once, run anywhere', as opposed to 'write once, compile anywhere', which describes cross-platform compiled languages.

Question 11

Memory Address	Contents	Pseudocode	Explanation
00	unknown	data	used to store the value of A
01	unknown	data	used to store the value of B
02	unknown	data	used to store the value of C
10	7101	$R[1] \leftarrow 01$	stores 1 in register 1
11	7202	$R[2] \leftarrow 02$	stores 2 in register 2
12	8300	$R[3] \leftarrow \text{mem}[00]$	store A in register 3
13	8401	$R[4] \leftarrow \text{mem}[01]$	store B in register 4
14	2331	$R[3] \leftarrow R[3] - R[1]$	Subtract 1 from register 3
15	C317	If $(R[3] = 0)$ goto 17	if contents of register 3 is zero goto 17
16	C01C	goto 1C	set pc to 1C
17	2441	$R[4] \leftarrow R[4] - R[1]$	Subtract 1 from register 4
18	C41B	If $(R[4] = 0)$ goto 1B	if contents of register 3 is zero goto 1B
19	9202	$\text{mem}[02] \leftarrow R[2]$	stores 2 in C
1A	C01C	goto 1C	set pc to 1C
1B	9102	$\text{mem}[02] \leftarrow R[1]$	stores 1 in C
1C	0000	halt	

Question 12

- (a) Using *8-bit Truecolour* the file size will be $3 \times 8 \times 290 = 6960$ and for *8-bit Indexed-colour* the file size will be $8 \times 290 + 3 \times 8 \times 200 = 7120$.

Thus the *8-bit Truecolour* will be the smaller file size.

OR

- (b) (i) Machine code for:

```
if ((a < 2) || (a > 7))
    x = 0;
```

Memory Address	Pseudocode	Explanation
00	data	used to store the value of a
01	data	used to store the value of x
10	R[1] ← 02	R[1] = 2
11	R[2] ← 07	R[2] = 7
12	R[3] ← mem[00]	
13	R[3] ← R[1]-R[3]	
14	If (R[3] > 0) go to 1A	test for (a < 2)
15	go to 1B	
16	R[3] ← mem[00]	
17	R[3] ← R[3]-R[2]	
18	If (R[3] > 0) go to 1A	test for (a >7)
19	go to 1B	
1A	mem[01] ← R[0]	x = 0
1B	halt	

- (ii) Machine code for:

```
if ((a >= 2) && (a <= 7))
    x = 0;
```

Memory Address	Pseudocode	Explanation
00	data	used to store the value of a
01	data	used to store the value of x
10	$R[1] \leftarrow 02$	$R[1] = 2$
11	$R[2] \leftarrow 07$	$R[2] = 7$
12	$R[3] \leftarrow \text{mem}[00]$	
13	$R[3] \leftarrow R[3] - R[1]$	
14	If $(R[3] > 0)$ go to 17	test for $(a > 2)$
15	If $(R[3] = 0)$ go to 17	test for $(a=2)$
16	go to 1D	
17	$R[3] \leftarrow \text{mem}[00]$	
18	$R[3] \leftarrow R[2] - R[3]$	
19	If $(R[3] > 0)$ go to 1C	test for $(a < 7)$
1A	If $(R[3] = 0)$ go to 1C	test for $(a = 7)$
1B	go to 1D	
1C	$\text{mem}[01] \leftarrow R[0]$	$x = 0$
1D	halt	

- (iii) The OR code branches directly to the $x=0$ code from each of the conditions. The AND code branches from one condition to the other and then to the $x=0$ code.

Many candidates had difficulty with this section, particularly the TOY in questions 11 and 12 with many candidates not attempting it at all and ignoring the optional file storage section question 12, therefore limiting themselves to a C award. Candidates elected who attempted all questions, particularly question 12 usually achieved a much better award. Those who attempted 12 a) generally answered it well although many could have been put off as it was quite wordy, thinking it was a lot more complicated than it actually was. Question 11 a) was poorly answered, many not really understanding the question. Those who correctly simplified the logic expression in question 10 b) generally found it easy to draw the circuit, while those who did not ran into problems.

Section E**Question 13**

- (a) By using a cross over cable between the two computers, or by establishing an adhoc Wi-Fi network between the computers.
- (b) An IP address and a subnet mask.
- (c) PPP – Point-to-Point Protocol.

On the whole the majority of candidates answered this question satisfactorily. A large number of candidates did not recognise that a subnet mask is the additional information needed to work with IP addresses. Many mistakenly used MAC address for this.

Question 14

- (a) The benefit of installing the Cat 5 cable is that a star network can be wired through out the house to a central node. If wireless is used then once the building is completed it may be found that the sections of the house are blocked from wireless access by solid walls, concrete floors etc.

One problem with wiring with Cat 5 is that the cabling could become obsolete and the network applications of the future may need Cat 6 or even fibre. Wireless technology can be updated easily as new developments arrive.

There are devices on the LAN such as servers and shared printers that would run more reliably on a wired rather than wireless network.

There will be a need for wireless to allow laptops etc to be used freely in the house so you may as well make all connections wireless.

The wired network would be easier to secure against unauthorised access than a wireless network.

Wi-fi network connections also suffer from shared bandwidth issues: the more devices that use wireless simultaneously, the less each device receives in bandwidth.

Most candidates answered this question satisfactorily.

- (b) Possible concerns with changing from a land line to a VoIP phone are:

Adequate voice quality

While VoIP can deliver good quality with the right broadband plan, in general the reliability of VoIP isn't comparable to fixed-line services. Wireless broadband may not be good enough for VoIP.

Downloads

If you're downloading a file from the internet at the same time as making a call, the quality of your phone call could be affected. If you're on a restricted internet usage plan, you'll have to take into account the limits on downloads. If your connection is slowed when you go over your monthly usage limit, it could be difficult to make calls over the internet at the slower speed.

Calls during a blackout

Is your VoIP phone set up to work during a blackout? If it is connected through the computer it could be a problem.

Emergency calls

Ensure that the VoIP providers gives free 000 calls.

This question was generally answered poorly, with candidates basing their answers on very old versions of VoIP which relied upon computers, and not independent telephone handsets.

Question 15

(a)

- Old wooden house will mean that wireless connections are likely to be successful.
- Media candidates may wish to use cable connection to their printer to prevent the science candidates from accessing the printer.
- Need to ensure that security is set on wireless LAN to prevent access by other wireless LANs in the area.
- Other wi-fi LANs in the area will limit the use of wi-fi as a solution: 802.11n may be the only solution available.
- The two groups may wish to use different ISP plans as the Media candidates will want unlimited download for large media files and the science candidates will want high speed upload as well as download connection for games.
- Science candidates may get a router with both wired and wireless connection to allow the computers with wireless connections to use their computers anywhere while providing the non wireless computer with a cable connection.
- Science candidates can have wireless connection to laser printer allowing them to place the printer where it is required.
- The rented nature of the house may make cabling a limited option.

Candidates who answered this question achieved a better result than part (b). Candidates needed to sort through the issues described in the scenario, then arrive at a clear solution together with the rationale used. Diagrams were useful to describe the solutions. Overall, solutions from candidates were mediocre because they did not address many issues from the scenario.

OR

- (b) (i) The one-time password is sent to the user by the bank so that the user can then use it in order to verify the user's identity with the banking system. It is used at login time to prove that the person who entered the username and static password is the same person who has access to the user's mobile phone. This process is very similar to a digital signature.
- (ii) A private key is kept by the user and is not sent anywhere and is used to code data for sending to others or to decode data received from others. The one-time password is not used to do either of these.
- (iii) A public key is sent out like the password but it sent out from the user not to the user and once again it is used to code data which is not the case with the one-time password.

Few candidates were able to supply a good answer to this question. It appears that candidates may not have experienced the use of one-time passwords as used in online banking. This lack of experience may have limited the understanding required to draw comparisons required to digital signatures, public and private keys.

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