Paper 1: Principles of Computer Science Mark Scheme

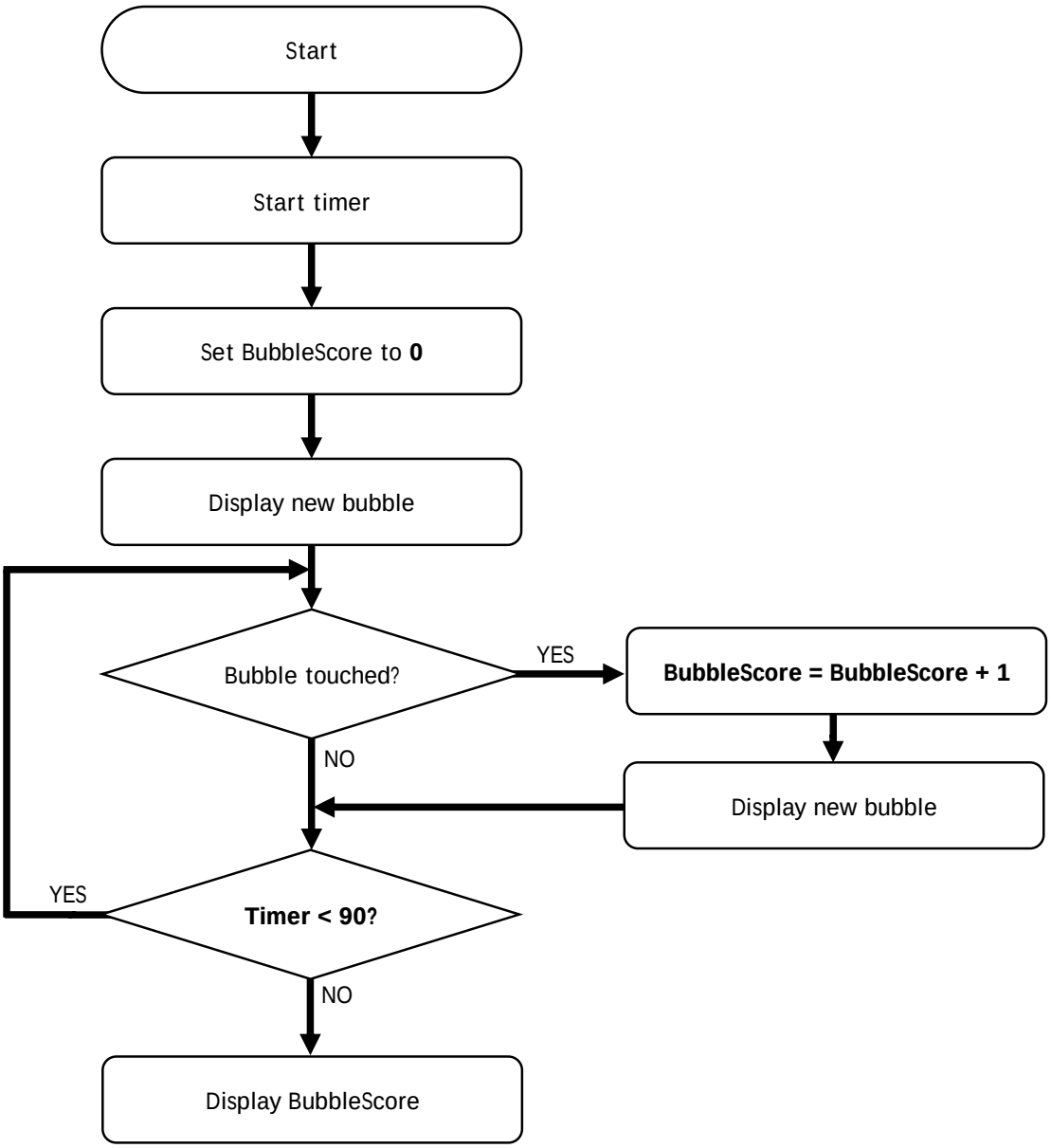
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners must mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgment is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer		Mark
1 a)(i)	Any **two** of: • Large storage capacity • Non-volatile • Fast data access speed • Portable		2 (1,1)
1 a)(ii)	A temporary store (1) for data and instructions/programs (1)		2 (1,1)
1 b)(i)	Any **one** of: • To reduce download time/increase transfer speed • To reduce amount of storage space required		1 (1)
1 b)(ii)	Any **one** of: • R4B2R1Y3 • R4B2RY3 • 4R2BR3Y • 4R2B1R3Y With one incorrect character or digit award a maximum of **1** mark.		2 (2/1)
1 c)	Any **two** of: • Not all pixels are recorded • Quality/detail reduced • Only suitable when images have lots of the same pixels • Cannot reproduce original using the lossy data		2 (1,1)
1 d)(i)	Each character is shifted in the alphabet (1) by a fixed number of positions (1)		2 (1,1)
1 d)(ii)	E – A (1), A – W (1) LAW		2 (1,1)
1 (e)	Any **two** of: • Images stored in (an array of) pixels • Number of pixels determines the quality of the image • The number of bits in each pixel determines how many colours/shades • Can be encoded to reduce the file size		2 (1,1)
1 f)(i)	16		1 (1)
1 f)(ii)	Number of bits = 5 x 2000 x 1024 x 1024 (1) Time = Number of bits/transfer rate OR Time = Number of bits/bps (1)		2 (1,1)
			18 marks

Question number	Answer		Mark
2 a)(i)	0/zero inserted in Box A (SET BubbleScore to 0)	See Flowchart (2a)	1 (1)
2 a)(ii)	Any **one** of (inserted in Box B): • < • <= • NOT >=90	Response must match yes, no connectors given	1 (1)
2 a)(iii)	Any one of (inserted in Box C): • BubbleScore (1) + 1 (1) • increment by 1 (1), BubbleScore (1) • add 1 (1), to BubbleScore (1)	Do not accept: 'Increment' without value 1 mark for naming variable BubbleScore and 1 for incrementation	2 (1,1)
2 a)(iv)	Connector D goes between 'Set BubbleScore to 0' and 'Display new bubble' or into 'Display new bubble'	Above or into process box	1 (1)
2 a)(v)	Display BubbleScore in a box (1) Connector from timer decision Box B to new process box (1), correct direction shown (arrow)(1)	Stop box not required	3 (1,1,1)
2 a)(vi)	If/conditional statement		1 (1)

Flowchart (2a)



Question number	Answer		Mark
2 b)(i)	A named (1) storage/memory location (1)		2 (1,1)
2 b)(ii)	Integer (1) Any **one** of: • Type integer allows only whole numbers (1) • Integer data type allows calculations (1)		2 (1,1)
2 c)	Any **one** of: Incorrect comparison (1) should be < (1) OR Replaces HighestScore with BubbleScore if BubbleScore is less than HighestScore (1) should be greater than (1)		2 (1,1)
2 d)(i)	Because all the items in the list have the same data type (1) It is more efficient to access and process data (1)		2 (1,1)
2 d)(ii)	Alex		1 (1)
			18 marks

Question number	Answer		Mark
3 a)(i)	1001 0101		1 (1)
3 a)(ii)	72		1 (1)
3 b)(i)	Provides small amount of storage (in the processor)(1) holds an instruction/memory address/data value (1)		2 (1,1)
3 b)(ii)	Any **four** of: • Puts the heart rate into register 3 (1) • Sets value/flag/register 2 to 0 (1) • Compares heart rate with maximum safe level (1) • If heart rate too high sets value/flag/register 2 to 1 (1) • Returns a value 0 if heart rate is within safe region or 1 if heart rate is too high (1)		4 (1,1,1,1)
3 b)(iii)	0111 0011 (1)		1 (1)
3 c)(i)	Specifies a memory address/uniquely identifies a memory location (1)		1 (1)
3 c)(ii)	The more lines/wires/bits the address bus has (1) the more memory locations can be uniquely identified (1)	A valid example that demonstrates understanding is acceptable, e.g. 8-bit address bus generates 256 different addresses, a 16-bit address book generates 65,536 different addresses	2 (1,1)
3 c)(iii)	6E		1 (1)
3 d)(i)	Alarm = (Heart Rate AND Temperature) OR (Heart Rate AND Movement) OR (Temperature AND Movement) With one minor error in the logic award a maximum of **1** mark, providing answer demonstrates at least one correct use of logical OR and logical AND between pairs.		2 (2/1)

Question number	Answer					Mark
3 d)(ii)	**INPUTS**			**OUTPUT**		2 (2/1)
	HeartRate	**Temp**	**Movement**	**Alarm**		
	0	0	0	0		
	0	0	1	0		
	0	1	0	0		
	0	1	1	1		
	1	0	0	0		
	1	0	1	1		
	1	1	0	1		
	1	1	1	1		
	Award a maximum of **1** mark if input values for three sensors are not all correct but Alarm values are correct for stated inputs.					
						17 marks

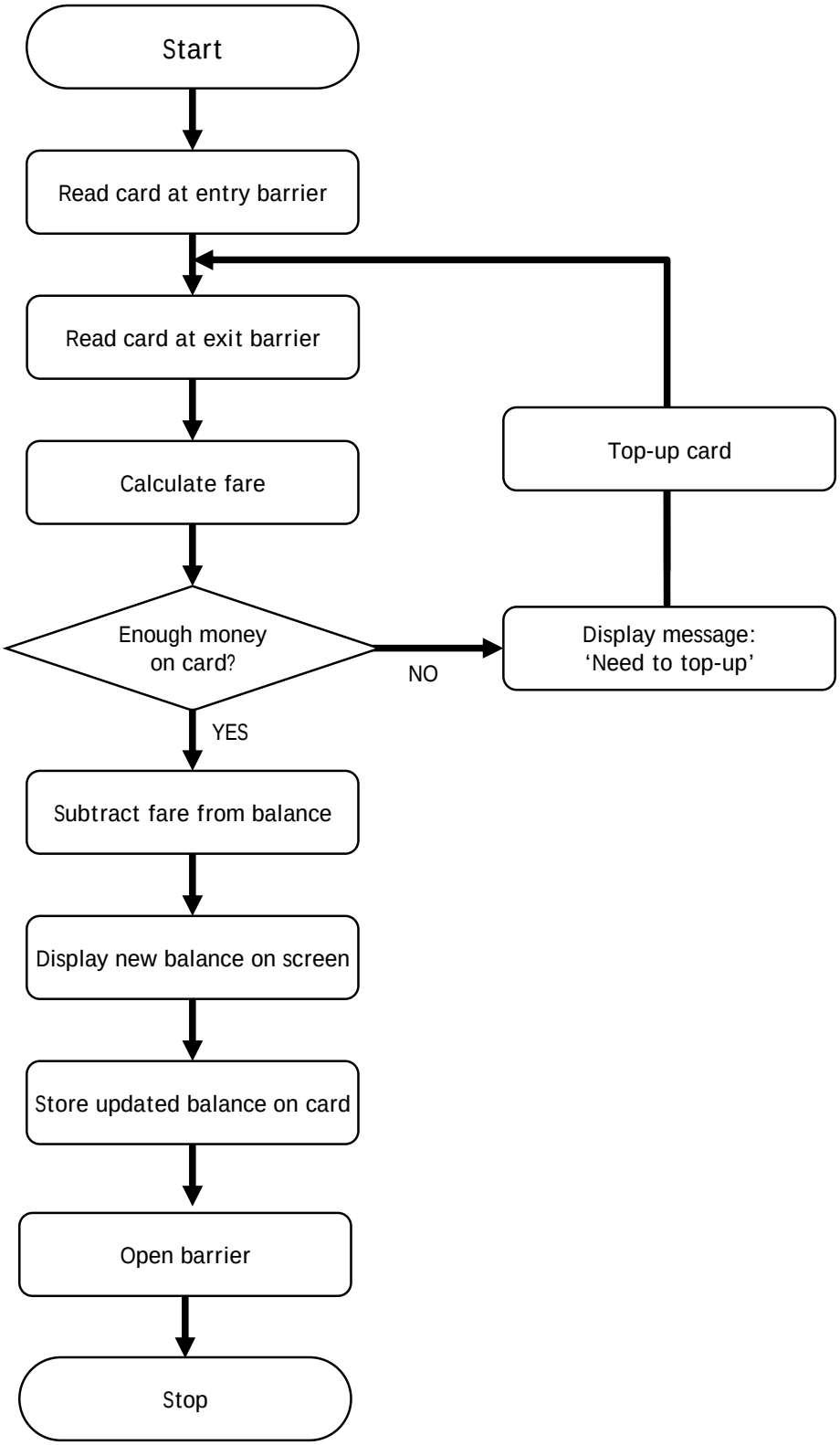
Question number	Answer		Mark
4 a)	Correct calculation using variables (1) For example: • DIVIDE TotalTime by NumberLaps (1) • TotalTime/NumberLaps (1) Use of variable for result (1) For example: • SET AverageTime (1) • STORE AverageTime (1)	One mark for correct calculation One mark for correct variable name	2 (1,1)
4 b)(i)	Any **one** suitable benefit with expansion: • makes code easier to understand (1) because it uses user-friendly language (1) • quicker to write subprogram (1) because standard routines (wizards) available (1) • easier to modify (maintain)(1) because of meaningful variable names/ clarifying comments (1) • machine independent/can run on a variety of hardware (1) because program can be compiled as required for particular computers		2 (1,1)
4 b)(ii)	Any **one** of: • Can be reused • Improves readability of program • Easier to debug a small chunk of code rather than a whole program • Make it easier to divide the task up between a number of programmers		1 (1)

Question number	Answer					Mark
4 c)	Correct bubble sort Pass 1 (1), Pass 2 (1): **Time** **Pass 1** **Pass 2** **Pass 3** 48 40 40 40 40 47 42 42 47 42 47 47 42 48 48 48 **or** **Time** **Pass 1** **Pass 2** **Pass 3** 48 40 40 40 40 48 42 42 47 42 48 47 42 47 47 48					2 (1,1)
4 d)(i)	SELECT Forename, EmailAddress FROM Member WHERE RenewalMonth = 'September'; 1 mark for correct two fields in SELECT clause 1 mark for FROM clause 1 mark for correct WHERE clause					3 (1,1,1)
4 d)(ii)	INSERT into Run (1234, 2013-05-12, 18.4) 1 mark for INSERT INTO Run 1 mark for correct statement including values					2 (1,1)

Question number	Answer		Mark
4 d)(iii)	SELECT DateOfRun,Time FROM Run WHERE MemberId = 0012 ORDER BY Time 1 mark for correct two fields in SELECT clause 1 mark for ORDER BY 1 mark for correct WHERE clause		3 (1,1,1)
4 e)	Request from club member handled by a script server side (1). Server accepts request and retrieves training data from database (1) Constructs web page to display results of search (1) and sends to client computer (1)		3 (1,1,1)
			18 marks

Question number	Answer		Mark
5 a)	See flowchart (5a) For each of these in logical position: • Swipe card and establish fare (1) • Decision for top-up with yes/no labelled (1) • Correct loop for top-up with display message (1) • Subtract fare/update balance (1) • Display balance and complete logical process (1)		5 (1,1,1,1,1)

Flowchart (5a)



Question number	Answer		Mark
5 b)	Indicative content: **Security**: a private WAN is more secure because the railway company is the only user; a VPN uses a public network such as the internet, therefore is more vulnerable to attack. Encryption required. **Performance, reliability and control**: Network/bandwidth solely for the railway company's use **Control**: as sole user of the private WAN the railway company has complete control over how it is set up and run; if using a VPN the railway company will have far less control since the network service provider will need to balance the needs of all users of the network. **Cost**: the railway company must bear all the cost of setting up and running the private WAN; the VPN uses a public network so the costs are spread between many users. **Expertise**: setting up and running a private WAN requires technical/managerial expertise which the railway company may not have; using a VPN on a public network outsources these activities to a service provider.		6
	Quality of Written Communication		
1-2 marks QWC i-ii-iii	• Some basic points from at least one of the above examples. • No recommendation is made or a recommendation is made but not justified. • Response shows basic attempt to structure and control expression and meaning. Basic accuracy in spelling and punctuation hinders meaning.		
2-4 marks QWC i-ii-iii	• Relevant points are provided from more than one of the above examples • Response includes a recommendation, but does not fully justify it. • Sentences show some attempt to structure and control expression and meaning. Spelling and punctuation sometimes accurate with meaning hindered on occasion.		
5-6 marks QWC i-ii-iii	• A balanced response with sound and relevant points from more than one of the above examples • Response includes a recommendation that is fully justified with regard to the rail company. • Response is clearly structured, with sound control of expression and meaning. Spelling and punctuation are mostly accurate, with some errors.		

Question number	Answer		Mark

5 c)	Reading in StartStation from card (1)
	Choice of suitable data structure for station list (1)
	Using a loop to find StartStation in data structure (1) and stopping when station is found (1)
	Referencing the items in the data structure correctly (1)
	Using an appropriate structure, e.g. nested loop, to calculate fare (1)
	Correct expression to calculate the discount, i.e. if time >10:00 AND <17:00 OR day = 'Saturday' OR 'Sunday' (2)
	Calculating the discount correctly (1)
	Producing a suitable message (1)
	Use of meaningful variable names (1)
	
	Up to a maximum of 8 marks
	
	Example answer:
	
	RECEIVE StartStation from (STRING) CARD READER
	SET Index TO 0
	SET Found TO false
	WHILE Found = false DO
	IF ListOfStations.Station[Index] = StartStation THEN
	SET Found TO True
	ELSE
	SET Index TO Index + 1
	END IF
	END WHILE
	IF ListOfStations.Distance[Index] < 5 THEN
	SET CostOfJourney TO 2.50
	ELSE
	IF ListOfStations.Distance[Index] >12 THEN
	SET CostOfJourney TO 4.15
	ELSE
	SET CostOfJourney TO 3.25
	END IF
	END IF
	IF (Time >10.00 AND Time <17.00) OR (Day = Saturday OR Day = Sunday) THEN
	SET Cost TO Cost*0.9
	END IF
	SEND [“The cost of your journey is £”, CostOfJourney, “Thank you for travelling on our railway.”] TO DISPLAY
			8 (1,1,1,1,2, 1,1)

			19 Marks
		Total	**90 Marks**

Paper 1: Principles of Computer Science content mapping grid

Question	Sub-Question	Specification reference	Marks
1	a) (i)	4.2.4	2
	a) (ii)	4.2.1	2
	b) (i)	3.3.2	1
	b) (ii)	3.3.3	2
	c)	3.3.3	2
	d) (i)	3.4.2	2
	d) (ii)	3.4.2	2
	e)	3.2.2	2
	f) (i)	3.3.4	1
	f) (ii)	3.3.4	2
2	a) (i)	1.1.2	1
	a) (ii)	2.5.2	1
	a) (iii)	1.1.2	2
	a) (iv)	1.1.2	1
	a) (v)	1.1.2	3
	a) (vi)	1.1.2	1
	b) (i)	2.3.4	2
	b) (ii)	2.3.1	2
	c)	1.1.5	2
	d) (i)	2.3.2	2
	d) (ii)	2.3.2	1
3	a) (i)	3.1.3	1
	a) (ii)	3.1.3	1
	b) (i)	4.2.2	2
	b) (ii)	4.2.3	4
	b) (iii)	3.1.4	1
	c) (i)	4.2.2	1
	c) (ii)	4.2.2	2
	c) (iii)	3.1.5	1
	d) (i)	4.3.2	2
	d) (ii)	4.3.1	2
4	a)	1.1.2	2
	b) (i)	4.5.1	2
	b) (ii)	2.6.1	1
	c)	1.1.8	2
	d) (i)	3.5.3	3
	d) (ii)	3.5.3	2
	d) (iii)	3.5.3	3
	e)	5.2.4	3
5	a)	1.1.2	5
	b)	5.1.2	6
	c)	1.1.2	8
Total			**90**

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