Name:		Index Number:		Class:	

DUNMAN HIGH SCHOOL
Preliminary Examination
Year 6

COMPUTING 9597

(Higher 2)

Paper 2

25 September 2015
3 hours

Additional Materials: -

READ THESE INSTRUCTIONS FIRST

Answer **all** questions.

This question paper consists of 6 questions in 6 printed pages (inclusive of this page).

The number of marks is given in brackets [ ] at the end of each question or part question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

1. A young family decides to purchase a new car. The following precedence table shows the constituent activities with their preceding activities and durations.

Activity	Description	Preceding Activity	Duration (days)
A	Decide feasibility of purchase	-	3
B	Find buyer for existing car	A	14
C	Decide on possible models	A	1
D	Investigate decided models	C	2
E	Discuss with knowledgeable friends	C	1
F	Get information from dealers	C	2
G	Put together all information	D, E, F	1
H	Shortlist three options	G	1
I	Test drive shortlisted options	H	3
J	Get finance information	H	2
K	Confirm car model	I, J	2
L	Compare dealers and choose one	K	2
M	Decide on colour	L	4
N	Test drive chosen model	L	1
O	Buy new car	B, M, N	3

(a) Discuss how the family can conduct a feasibility study for the purchase. [3]

(b) Construct a PERT chart for this project. [4]

(c) State the critical path and the total time required for the project. [2]

(d) Name a floating task and state its role in the project. [2]

(e) Explain the significance of dummy activities in this project. [3]

(f) Construct the corresponding Gantt chart for the project. [3]

(g) Why should one derive the PERT chart before the Gantt chart? [2]

(h) How does a Gantt chart help in the project? [3]

(i) Suggest two reasons why activity M requires 4 days. What can be done to speed this up? [3]

(j) In activity E, the family decides to use a cross-platform mobile messaging app which allows users to exchange messages without having to pay for SMS. Communication with its network of knowledgeable friends requires the use of TCP/IP sockets.

What is a TCP/IP socket and how does it help in network communication? [3]

(k) A number of activities require the use of an Internet search engine. Explain how an Internet search engine works and how cloud computing is used in implementing an Internet search engine. [8]

(l) After the car purchase, the family decides to share their experience using either a personal blog post or a social network post to benefit other potential car buyers. Compare the relative pros and cons of using these approaches. [4]

2. In a social network, each user has a public profile name and can make zero or more posts. Each post contains a message and can be liked by the poster and/or other users.

(a) Draw an E-R diagram that shows the tables and the relationships between them. [3]

(b) Design a normalised relational database schema. [6]

(c) Using your answer in (b), explain the concepts of

(i) primary key [2]

(ii) composite key [2]

(iii) foreign key [2]

3. Some game tournament such as badminton, bridge, chess, Pokemon, Scabble, and many eSports employ the Swiss system of play, in which players are not eliminated after each round and are paired with players with the same number of wins or as close as possible. The following shows an example of a 16-player Scrabble tournament. Assume that all games have a winner and there are no draws.

First round pairing is by random draw i.e there will be 8 random pairs.
After round 1, there will be a group of 8 players with a score of 1 (win), and a group of 8 players with a score of 0 (loss).

For the second round, players in each scoring group will be paired against each other – 1's versus 1's and 0's versus 0's.

After round 2, there will be three scoring groups:

- 4 players who have won both games and have 2 points
- 8 players who have won a game and lost a game and have 1 point
- 4 players who have lost both games and have no points.

Again, for the third round, players are paired with players in their scoring group.
After round 3, the typical scoring groups will be:

- 2 players who have won 3 games (3 points)
- 6 players with 2 wins (2 points)
- 6 players with 1 win (1 point)
- 2 players with no wins (0 points)

For the fourth (and in this case final) round, the process repeats, and players are matched with others in their scoring group. Note that there are only 2 players who have won all of their games so far – they will be matched against each other for the "championship" game.
After the final round, we will have something that looks like this:

- 1 player with 4 points – the winner!
- 4 players with 3 points – tied for second place
- 6 players with 2 points
- 4 players with 1 point
- 1 player with 0 points

The Swiss system produces a clear winner in just a few rounds, no one is eliminated and almost everyone wins at least one game, but there are many ties to deal with.

(a) Propose and justify a suitable data structure to store and initialise the player names, intermediate and final opponents, points and results of the 16-player tournament. You may denote the players' names with the alphabets A – P. [3]

(b) Devise an algorithm to update the data structure in (a) and determine the final ranks of the players. Players who are tied will have their names output in alphabetical order. The next rank after 2 is 3. [7]

4. A durian specialty business sells its different breeds of durians via two modes currently:

- phone order via calling in to its sales hotline
- web order via making an online order on its website

For phone order, a sales agent will record the order details (breed, quantity, customer name and phone number). Payment terms will be cash on collection only.
For web order, the customer will register for an account using his/her email address and select the breed and quantity, and enter his/her phone number. Payment terms will be either cash on collection or by entering credit card details upon checkout.

(a) Using suitable examples from this context, explain the concepts of

(i) validation [2]

(ii) verification [2]

(b) Draw a UML class diagram to show the relationship between the different types of orders. [4]

(c) Using suitable examples, explain the concepts of

(i) encapsulation [2]

(ii) inheritance [2]

(iii) polymorphism [2]

(d) To cater to an aging population and elderly who face difficulty using smartphones, it is proposed that an SMS application be developed to allow elderly to order durians using SMS. Design and justify a suitable user interface and workflow. Assume that the SMS sales number is 88387426 (88DURIAN). [3]

5. You have taken over the following program module A in an unnamed programming language written by an unnamed intern (who did not take A-level Computing) to determine the number of markers and their consecutive labels to be positioned on a newly completed highway. X is the length of the highway in kilometres. Makers should be spaced 500 metres apart from one another.

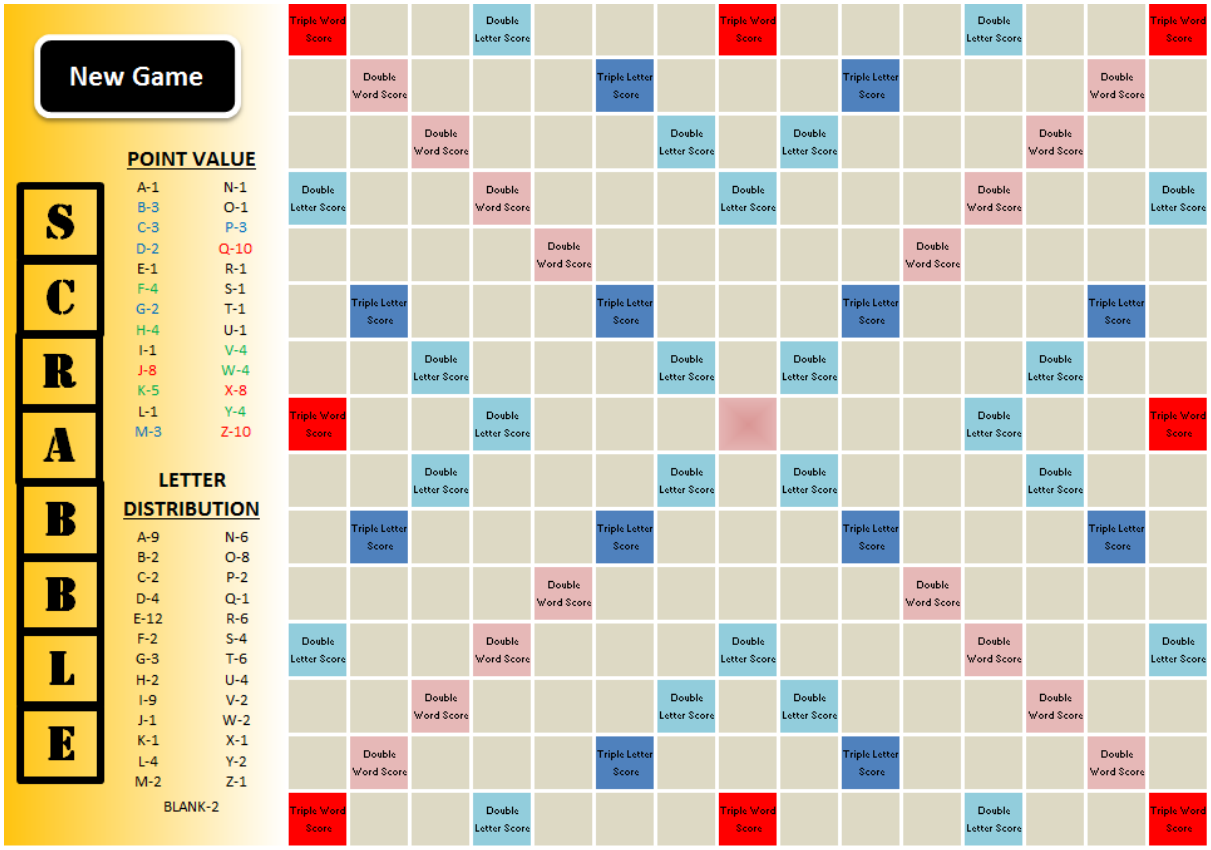
```
1 FUNCTION A(X : REAL)
2 FOR I FROM ONE TO X/500 DO
3 PRINT(I)
4 PRINT("NUMBER OF MARKERS = " + X /500)
```

(a) How can you improve on the programming style for the above program module? [2]

(b) Identify and correct the errors in the above program. Explain the different types of errors identified. [4]

(c) Design and justify suitable black box and white box tests for the above program module. [4]

6. The following figure shows a Scrabble game board.



Propose and justify

(a) an efficient data structure to store the letter point values [3]

(b) an efficient data structure to store the game board [3]

(c) an efficient algorithm to compute the score of a word [4]

END OF PAPER