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| **COURSE NAME / CODE** | | | BTEC National Subsidiary / Diploma / Extended Diploma in IT |
| **UNIT(s) No / Name** | | | Unit 26 Mathematics for IT Practitioners |
| **LEVEL** | 3 | Assignment No & Title | Assignment 2: Probability, Sequences, Number Systems and Statistics |

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| --- | --- | --- | --- | --- | --- |
| **LECTURER/ASSESSOR** | Gargi Gupta/E Oladipo | | | | |
| **ISSUE DATE** | 22/02/17 | **DEADLINE DATE** | | 15/03/17 | |
| **SUBMISSION DATE** |  | |  | | |
| **RESUBMISSION AUTHORISATION**  BY LEAD INTERNAL VERIFIER\* |  | | **Authorisation Date (By iv)** | |  |
| **RESUBMISSION DATE\*\*** |  | |  | | |

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| **\***All resubmissions must be authorised by the **Lead Internal Verifier**. Only **one** resubmission is possible per assignment, providing:   * The learner has met the initial deadlines set in the assignment, or ha met an agreed deadline extension * The tutor considers that the learner will be able to provide improved evidence without further guidance * Evidence submitted for assessment has been authenticated and accompanied by a signed and dated declaration of authenticity by the learner   \*\*Any resubmission evidence **must** be submitted within 10 working days of receipt of assessment |

**Student declaration**

*I declare that this assignment is all my own work and the sources of information and material I have used (including the internet) have been fully identified and properly acknowledged as required.*

|  |  |
| --- | --- |
| **STUDENT NAME** | **SIGNATURE** |
|  |  |

**ASSESSMENT DETAILS & GRADING CRITERIA**

(NB: Columns 1 &2 of the table below will be completed once the assignment has been submitted) Please note that criteria & evidence should be aimed to give the learner the maximum grade available within their qualification (i.e. A, Pass, Distinction)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Learning Aims Covered** | | |  | | |  | |  |
| LO2, L03, L04 | | Be able to apply sequences and series, probability and recursion  Be able to apply number systems  Be able to interpret data. | | | | | | | | | |
| **GRADING CRITERIA FOR TASK** | | | **EVIDENCE** | **EVIDENCE SEEN** | | **Page No#** | **CRITERIA MET** | | | | |
| **Y** | **N** | **Y** | | **I** | **N** | **IV** |
| P6 | apply sequence and series,  probability and recursion  techniques to develop  solutions to a range of  problems | | Task 1: Maths problems |  |  |  |  | |  |  |  |
| P7 | carry out basic operations on number systems | | Task 3: Maths problems |  |  |  |  | |  |  |  |
| P8 | carry out conversion  operations between number  systems | | Task 2: Maths problems |  |  |  |  | |  |  |  |
| P9 | plan for and gather data for  defined purpose | | Task 4: Data Task |  |  |  |  | |  |  |  |
| P10 | interpret trends and/or  patterns in data. | | Task 4: Data Task |  |  |  |  | |  |  |  |
| M3 | explain the stages of a  recursive algorithm showing  how the termination  condition is reached | | Task 5: short report |  |  |  |  | |  |  |  |
| M4 | discuss how number systems are used in IT applications | | Task 6: short report |  |  |  |  | |  |  |  |
| M5 | recognise the factors  influencing the validity of  information derived from  collected data. | | Task 4: Data task |  |  |  |  | |  |  |  |
| D1 | design an addressing scheme for a network with multiple subnets, utilising CIDR, justifying your choices | | Task 7: Subnet task |  |  |  |  | |  |  |  |
| D2 | reflect on the results of  a study that involved the  collection and analysis of data. | | Task 4: Data Task |  |  |  |  | |  |  |  |

**KEY: Y = Yes, I = Incomplete, N = No**

**BREAKDOWN OF HOW GRADES WILL BE AWARDED:**

(NB: Please tick as appropriate)

|  |  |  |
| --- | --- | --- |
| **TYPE OF QUALIFICATION** | **TICK** | **DESCRIPTION** |
| **BTECS / WORKSKILLS** | **√** | Pass / Merit / Distinction / Fail |
| **A LEVELS / A2** |  | A-U |

**Internal Verification of Assignment Brief**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **IV Full Name** |  | **Signed** |  | **Date:** | 02/12/15 |
| **LIV Full Name** |  | **Signed** |  | **Date:** |  |



**BTEC Sample Material**

**Learner Consent Declaration**

|  |  |  |
| --- | --- | --- |
| **Centre No & Name** | **51330 – UTC Reading** | |
| **Subject & Level** | **BTEC National Subsidiary / Diploma / Extended Diploma in IT** | **3** |
| **Unit No & Title** | **Unit 26: Mathematics for IT practitioners** | |
| **Learner No & Name** |  | |

I agree to the learner work identified above, after having been made anonymous, being used to support any of the following activities, which may involve the display of work online through the BTEC website or through publications:

* Professional Development and Training
* Centre Assessment Example Material
* Standardisation Support
* Publication Materials

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| --- | --- |
| **Assessor Signature** |  |
| **Name** (block capitals please) |  |
| **Job Title** | Teacher |
| **Date**: |  |

|  |  |
| --- | --- |
| **Learner Signature** |  |
| **Name** (block capitals please) |  |
| **Parent/Guardian consent if under 16 years of age** |  |
| **Date**: |  |

Please ensure that this sheet is completed on submission of your assignment.

Please note that your assignment **MUST** have the following (unless otherwise stated):

1. Cover page
2. Table of Contents
3. Introduction
4. Conclusion
5. Bibliography & References

**Scenario**

You are applying for a job and at interview. To test your mathematical ability, the interviewer gives you these Mathematical questions for you to attempt.

**TASK 1 Series and Sequences and Probability**

i) Find a **formula for the nth term** of this sequence and **find the 17th term** using your nth term formula. Also calculate the **sum of the first 17 terms of this sequence**.

ii) Find a **formula for the nth term** of this sequence and find the 10th term using your nth term formula. Also calculate the **sum to the 5th term** and the **sum to infinity** of this sequence.

iii) Find

iv) Five balls are in a bag, 3 are red and 2 are yellow. Once a ball is chosen at random the ball is put back into the bag and the bag is shaken well.

1. What is the probability that a yellow ball is selected?
2. What is the probability 2 yellow balls are selected consecutively?
3. Draw a probability tree and use it to find the probability that a yellow ball is selected 4 times in a row?

v) In a year group;

* 70 students study only Computer Science
* 83 study only Engineering
* 15 study A Level Maths and Computer Science
* 12 Study A Level Maths and Engineering
* 10 study no A Level Maths, Engineering or Computer Science

1. Draw a Venn diagram to represent this information.
2. What is the probability that a randomly selected student studies Computer Science but not Maths?
3. What is the probability a randomly selected student studies Engineering (with or without other subjects)?

vi) A betting game involves 1 player throwing a 6 sided die to represent an attack and the other player throwing a 4 sided die to represent a defence. Draw a probability space diagram for this game. What is the most likely total score(s) from both dice? What is the least likely score(s) and why?

**TASK 2 Number Systems**

Complete this table and add two rows of your own choice

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Denary** | **Binary** | **Octal** | **Hexadecimal** |
| a | 22 |  |  | 16 |
| b |  |  | 13 |  |
| c | 41 |  |  |  |
| d |  | 10100 |  |  |
| e |  |  | 36 |  |
| f |  |  |  | 2A |
| g | 271 |  |  |  |
| h |  |  |  |  |
| I |  |  |  |  |

**TASK 3 Number Systems calculations**

Now compute the following:

* a + f in hexadecimal
* g.f in hexadecimal
* f – b in hexadecimal
* a + e in octal
* e – b in octal
* a + d in binary
* a.d in binary

+ 2 more of your choice

**TASK 4 Data Task**

**What is your hypothesis** for this data set? What data will you need? Where can you get the data from? Are there any alternative sources of the data? Will the data be sufficiently reliable?

**Collect** and **analyse** the data. **Compare** data sets using **stem and leaf diagrams** or **Histograms**. Produce **mean**, **median** and **modes** explaining the significance of each. You must also identify **inter-quartile ranges** and consider **variance** and **standard deviation**.

Finally you need to draw a **conclusion** (or conclusions) from the exercise. Did you identify any **trends** or **patterns**? Did you prove your hypothesis?

Develop the report you have written for to consider any factors that may have influenced the **validity** of the information that was derived from the collected data.

You need to extend the work you have done and **reflect** of the results of the study you have carried out. **Discuss** your findings.

**TASK 5 Recursion**

Most computer programming languages support recursion by allowing a function to call itself within the program text.

The [binary search](http://en.wikipedia.org/wiki/Binary_search) algorithm is a method of searching an ordered array for a single element by cutting the array in half with each pass. The trick is to pick a midpoint near the centre of the array, compare the data at that point with the data being searched and then responding to one of three possible conditions: the data is found at the midpoint, the data at the midpoint is greater than the data being searched for, or the data at the midpoint is less than the data being searched for.

For such a search (or any another suitable example that uses recursion e.g. Fibonacci’s Sequence or Factorial), explain the stages of the recursive algorithm and show how the termination condition is reached.

**TASK 6 Use of Number Systems**

Produce a short report that identifies at least three (1 from Hex, Octal and Binary) examples for how number systems are used and applied in an area of Computing, e.g. ASCII (binary); MIME (hexadecimal); UNIX file permissions (octal).

Consider a network with three subnets containing 000, 200 and 30 hosts respectively. Design subnet addresses and masks to optimise the allocation of IP addresses.

**TASK 7 Network Planning**

Consider a network with three subnets containing 000, 200 and 30 hosts respectively. Design subnet addresses and masks to optimise the allocation of IP addresses. Use a diagram to demonstrate this addressing system.

In your report, explain and justify your addressing system, making sure that you also clearly explain the following concepts:

* the difference between IP v4 and IP v6
* subnet addressing
* subnet masking
* Class A, B and C addresses
* Classless Inter Domain Routing (CIDR)

You must fully reference your sources of information.

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| **SUMMATIVE ASSESSMENT RECORD SHEET** | | | | | | |
| **Programme** | BTEC National Subsidiary / Diploma / Extended Diploma in IT | | **Learner Name** |  | **Assessor Name** |  |
| **Unit No. & Title** | Unit 26 – Mathematics for IT Practitioners | | **Target Learning Aims** | **LO1** | **Issue Date** | Click here to enter a date. |
| **Assignment No & Title** | Assignment 2 | | | | **Final Submission Date** |  |
| **Target criteria** | **Criteria Achieved** | **Final Assessment Comments** | | | | |
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|  |  | More rows | | | | |

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| **Summative comments** | | | |
|  | | | |
| **Assessors declaration** | | | |
| I certify that the evidence submitted for this assignment is the student's own and the learner will be able to provide improved evidence without guidance. I understand that any false declaration is a form of malpractice. | | | |
| **Resubmission authorisation\*** |  | **Resubmission Date:** | Click here to enter a date. |
| \* All resubmissions must be authorised. Only 1 resubmission is possible per assignment. | | | |
| **Assessor Signature** |  | **Date:** |  |
| **Learner comments** |  | | |
| **Learner Signature** |  | **Date:** |  |

**Indicative reading for learners**

**Websites**

1. <http://www.mathsisfun.com>
2. <http://www.purplemath.com>
3. <http://www.wikihow.com/Add-Binary-Numbers>
4. <http://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html>
5. <https://en.wikipedia.org/wiki/Recursion_(computer_science)>