Level 2 Data representation and manipulation (7540-003)

Systems and Principles
Assignment guide for Candidates
Assignment A

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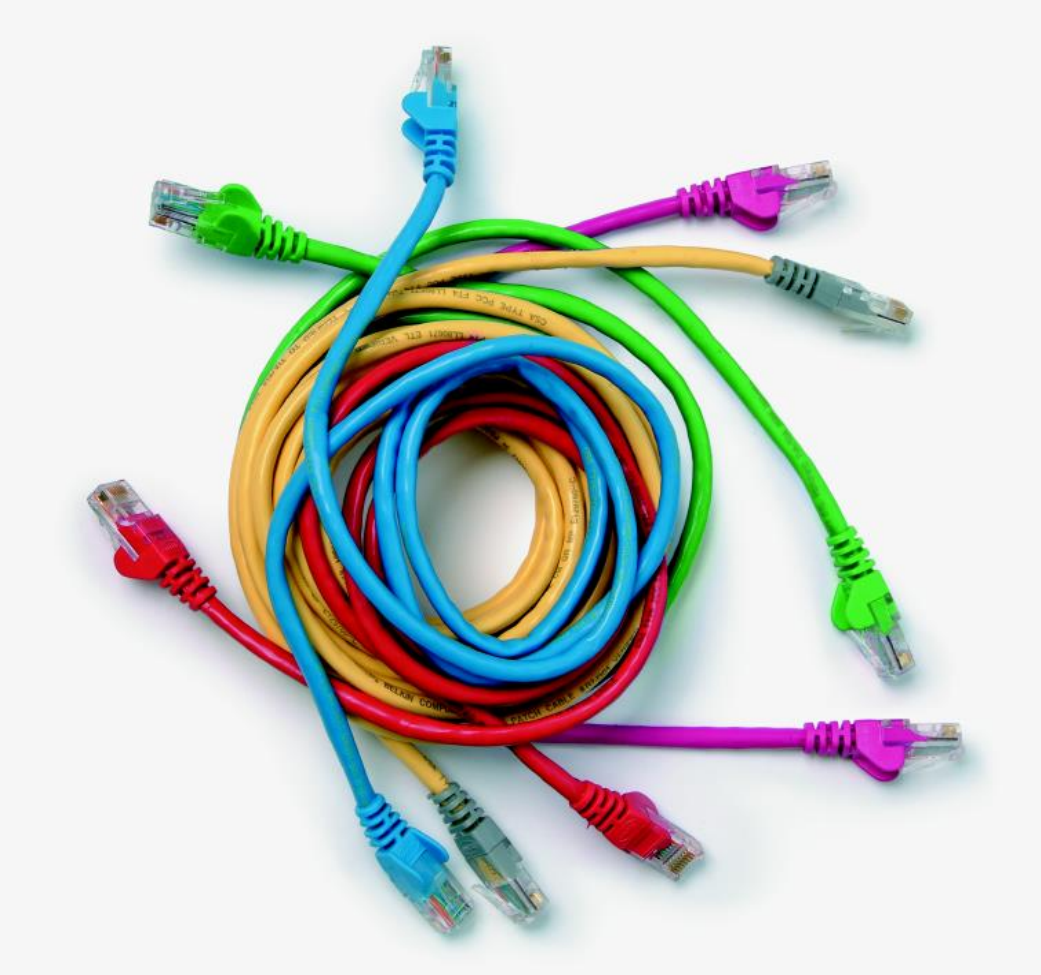

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Level 2 Data representation and manipulation (7540-003) Assignment A

Introduction – Information for Candidates

About this document

This assignment comprises all of the assessment for Level 2 Data representation and manipulation (7540-003).

Health and safety

You are asked to consider the importance of safe working practices at all times.

You are responsible for maintaining the safety of others as well as your own. Anyone behaving in an unsafe fashion will be stopped and a suitable warning given. You will **not** be allowed to continue with an assignment if you compromise any of the Health and Safety requirements. This may seem rather strict but, apart from the potentially unpleasant consequences, you must acquire the habits required for the workplace.

Time allowance

The recommended time allowance for this assignment is **2 hours 30 minutes**.

Level 2 Data representation and manipulation (7540-003)

Candidate Instructions

Time allowance: 2 hours 30 minutes

Assignment set up:

This assignment is made up of **four** tasks:

- Task A: Manipulating real numbers and integers – as used when working with databases
- Task B: Co-ordinate systems, vectors and linear transformations – as used within simple programming in graphics applications
- Task C: Simple functions and basic algebraic operations – as used when programming simple robots
- Task D: Boolean Algebra – as used when creating logic controllers e.g. temperature

You should have the following for this assessment

- Answer Sheet
- a pen with black or blue ink
- a pencil and eraser
- a 30cm ruler
- graph paper
- a non-programmable calculator
- You may use a protractor
- formula sheet

Scenario

You are employed as an IT Technician in a Comprehensive School and the school has provided for you to attend a College Course to increase your knowledge and skills, where you have been improving your understanding of Maths used within the computing environment.

Recently the school has updated the internal Virtual Learning Environment of their website and have added a section demonstrating "Maths for Computing" They have found some example questions and need you to provide the correct answers before they go on the website.

It is important that you show your 'working out' when proving the answers, so the school can effectively judge the suitability of the questions for the website.

It is not required for you to produce web pages, that is the responsibility of the website administrator, using the answers and working out that you provide.

Please use the Answer Sheet provided to complete all tasks.

Formulae sheet

Indices

$a^n \times a^m \equiv a^{n+m}$
$a^n \div a^m \equiv a^{n-m}$
$(a^n)^m \equiv a^{nm}$

Rules for Boolean algebra

A + 0 = A
A + 1 = 1
A.0 = 0
A.1 = A
A.B = B.A
A+B = B+A
A(B+C)= A.B + A.C

Trigonometrical Functions

$$Cos\theta = \frac{Adjacent}{Hypotenuse} \qquad Sin\theta = \frac{Opposite}{Hypotenuse} \qquad Tan\theta = \frac{Opposite}{Adjacent}$$

Task A – Manipulating real numbers and integers – as used when working with databases

1 Briefly describe the difference between real numbers and integers.

2 Express the following numbers given in power notation:

- 25 as a square number
- 64 as a cube number
- 81 as a number raised to a power of four

3 Express the numbers given below in scientific notation:

- 0.003256
- 1110
- 2200000

4 For the three values given in rows A and B below, calculate for **each** A × B and A ÷ B giving the answers in power notation:

A	10^4	3^2	6^{-7}
B	10^3	3^5	6^5

5 For the two values given in rows C and D below, calculate for **each** C + D, C × D and C ÷ D:

C	1×10^3	3.2×10^6
D	1.2×10^3	7.2×10^6

6 Round the values shown below, then add the numbers together. Estimate the resulting error in the answer due to rounding. Show your working for estimating the error:

4.82	3.41	5.9	1.42

7 Briefly describe how real numbers and integers are represented in computer memory.

Task B – Co-ordinate systems, vectors and linear transformations – as used within simple programming in graphics application

1 Briefly explain the term 'two dimensional co-ordinate system'.

2 Draw the shape represented by the co-ordinate vertices given below:

Shape 1	1,1	1,3	3,3	1,1

3 Briefly describe what is meant by the term 'vector'.

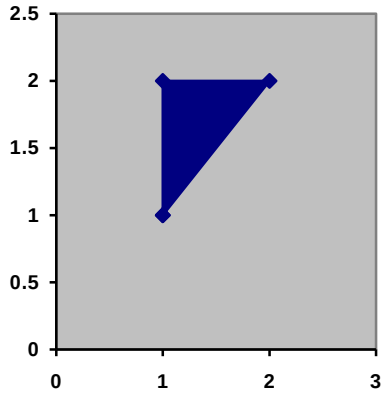
4 Produce the polar representation of vector **v** below:

Vector **v**

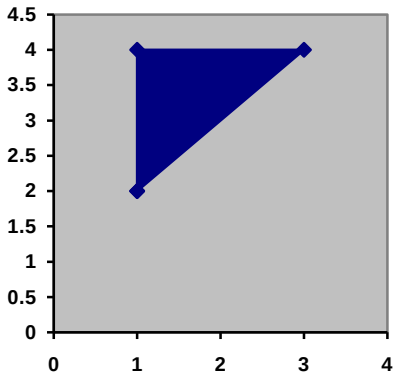
$$\begin{pmatrix} 3 \\ 4 \end{pmatrix}$$

5 The coordinate shape given below needs to be scaled and shifted as shown below. Write down the scaling and shift factors needed to produce the result.

Original shape



Shifted and rescaled shape



6 Convert the linear co-ordinates shown in rows E and F below into polar co-ordinates.

E	3
F	7

7 Briefly describe the co-ordinate systems used in programming output devices.

Task C – Simple functions and basic algebraic operations – as used when programming simple robots

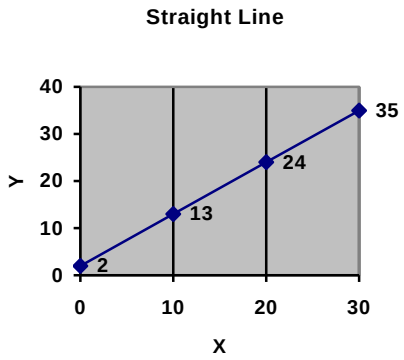
1 Express the situation described below in terms of a simple equation:

- At my home there is a quantity, **c**, of computer games on the living room shelf and four computer games on each of my two bedroom shelves. My friend has twice as many computer games as I have. Write down a simple equation, using appropriate algebraic terms, explaining how many games my friend has compared to my collection.

2 Rearrange and simplify the equation shown below to make K the subject:

$2L + 4K = 2T$

3 From the graph below, obtain the equation of the straight line.



4 Briefly describe the basic properties of a circle and a triangle.

5 Complete the grid below by finding the trigonometric values for the angles given.

Angle	45°	30°
Sine		
Cosine		
Tangent		

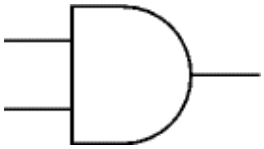
6 Complete the grid below by finding the angles for the inverse trigonometric values given.

Value	1	0.707
$Sine^{-1}$		
Cos^{-1}		
Tan^{-1}		

Task D – Boolean Algebra – as used when creating logic controllers e.g. temperature

1 Briefly describe how binary states are used to represent physical systems.

2 Identify and label inputs and outputs for the binary representation shown below:



3 Produce a Truth table for the binary **OR** representation.

Inputs		Output
A	B	Q

4 Express the Truth table given below as a Boolean equation:

Inputs		Output
A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

5 Simplify the following Boolean equation:

$F = A.(A+B)$

When you have finished working:

- Sign each document above your name and label all removable storage media with your name.
- Hand all paperwork and removable storage media to your assessor.

If the assignment is taken over more than one period, all paperwork and removable media must be returned to the test supervisor at the end of each sitting.

End of assignment

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