Level 2 Data representation and manipulation (7540-003)

Systems and Principles (QCF)
Assignment guide for Candidates
Assignment B

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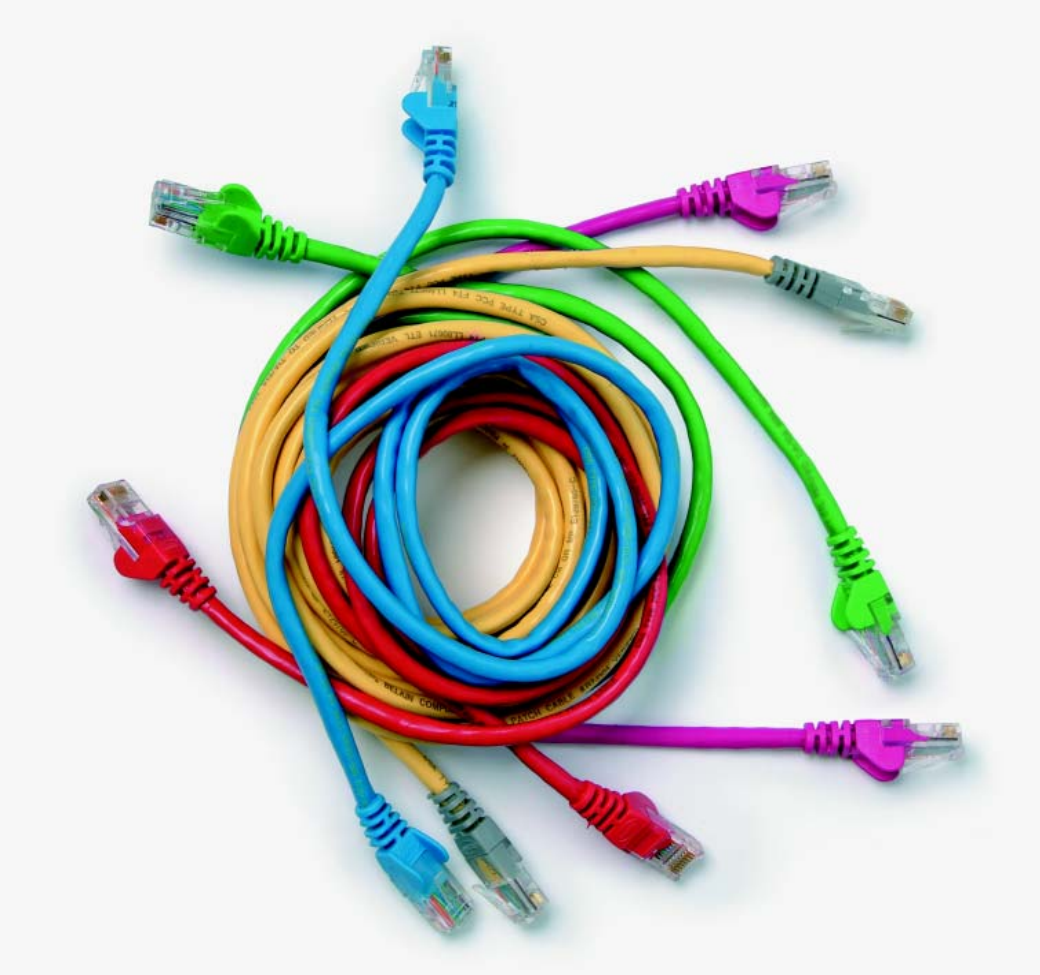

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Contents

Data representation and manipulation (7540-003)

Assignment B

Introduction – Information for Candidates	2
Candidate Instructions	3

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

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 **3 hours**.

Level 2 Data representation and manipulation (7540-003)

Candidate Instructions

Time allowance: 3 hours

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 CAD 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

- a pen with black or blue ink
- a pencil and eraser
- a 30cm ruler
- graph paper
- a calculator

- You may use a protractor.
- You may use a dictionary.

Scenario

You are employed as a final year IT Apprentice with a Publishing Company that produces a range of learning materials for the IT sector.

Your line manager will shortly be giving a presentation to outline potential new materials for a training package designed for junior programmers. As she is aware of the college component of your Apprenticeship, she has requested that you provide the answers for a series of demonstration problems that she will be using in the presentation. Given that your line manager acknowledges that her maths is a "little rusty", it is important that you clearly show your working out where possible, to enable your line manager to answer questions from the audience.

You are not required to produce slides for the presentation, that is your line manager's task, using the answers and working out that you provide.

Please use the Answer Sheet provided to complete all tasks.

Formulae sheet Level 2

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 – Real numbers and integers - as used when working with databases

1 Describe the difference between real numbers and integers.

2 Express the following numbers given in power notation:

- 16 as a square number
- 125 as a cube number
- 16 as a number raised to the power of four

3 Express the numbers given below in scientific notation:

- 3111
- 0.00111
- 0.0000022

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

A	7^6	5^4	8^{-3}
B	7^3	5^6	8^7

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

C	1.3×10^3	4.4×10^6
D	1×10^3	6.1×10^6

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.

7.63	4.24	3.21	2.67

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

Task B – Using co-ordinate systems and vectors – as used within simple programming in CAD applications

1 Briefly describe two-dimensional co-ordinate systems.

2 Draw the shape represented by the coordinate vertices given below:

Shape 1	4,4	1,1	1,3	4,4

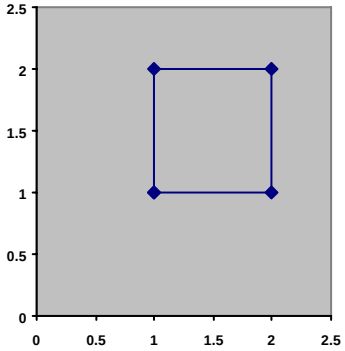
3 Briefly describe what is meant by the term 'vector'.

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

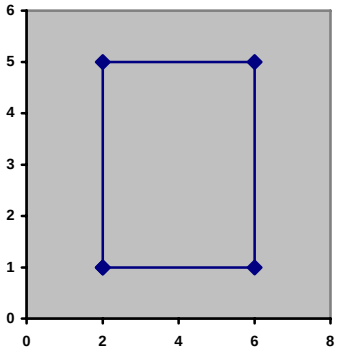
$$\mathbf{t} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

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	1
F	2

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

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

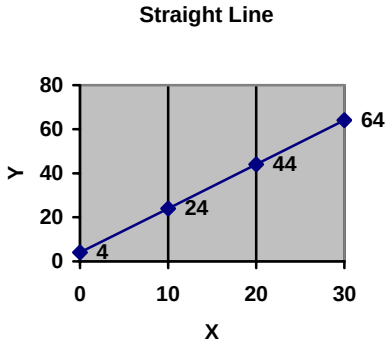
1 Express the situation described below in terms of a simple equation:

- At my friends home there are eight CDs on the living room shelf and a quantity, d, of CDs on each of their two bedroom shelves. My friend has three times as many computer games as I have. Write down a simple equation, using appropriate algebraic terms, relating how many CDs I have compared to my friends collection.

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

$$6T + 2K = 4L$$

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

Angle	60	45
Sine		
Cosine		
Tangent		

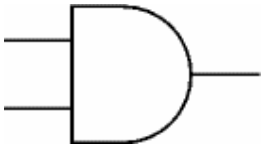
6 Complete the grid below by finding the angles for the inverse trigonometric values given.

Value	0.866	0.5
$Sine^{-1}$		
Cos^{-1}		
Tan^{-1}		

Task D – Apply Boolean algebra to problem situations – 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 **AND** representation.

Inputs		Output

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

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

5 Simplify the following Boolean equation

F = B.(B+A)

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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