C/Y = 12

3ci.

$$A = 40\ 000 \times \left(1 + \frac{7.8}{1200}\right)^{12}$$

3cii.
$281.02

New balance = $43 234

$$I = 43\ 234 \times \frac{7.8}{1200} = 281.021...$$

Many students did not answer this question.

Question 4a–c.

Marks	0	1	2	3	Average
%	54	22	14	9	**0.8**

4a.
6.3%

$$\frac{1260 \times 4}{80\ 000} \times \frac{100}{1} = 6.3$$

This question was poorly answered. A common incorrect answer was $\frac{1260}{80\ 000} \times \frac{100}{1} = 1.575\%$.

4b.
$80 000

Most students did not show an understanding of a 'perpetuity', in which payments are calculated so that its original value (capital) is always preserved.

The most common incorrect answer was 80 000 – 20 × 1260 = $54 800.

4c.
$35 208

N = 40
I % = 9.4
PV = **–35 208.002 54…**
PMT = 1260
FV = 7000
P/Y = 4
C/Y = 4

Module 5 – Networks and decision mathematics

Question 1ai.–bii.

Marks	0	1	2	3	4	5	Average
%	3	10	23	31	24	10	**3**

1ai.
160 m

This question was not answered well by many students.

Incorrect answers included 70 + 60 + 80 = 210 and 50 + 40 + 60 + 80 = 230.

1aii.
2

A large number of incorrect responses ranged between 1 and 7 inclusive.

1aiii
1250 m

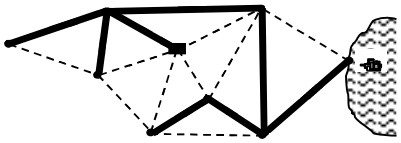
1180 + 70 = 1250

An Euler circuit would be an ideal solution but this is not possible due to the presence of two odd vertices: one at the house and one at the end of the edge marked 70, leading from the house. However, an 1180-metre long Euler path commencing at the house is possible, provided it ended at the other odd vertex. To return to the house, we must then add 70 metres for the length of the shortest path between these two odd vertices.

This question was very poorly answered, with a common incorrect answer of 1180.

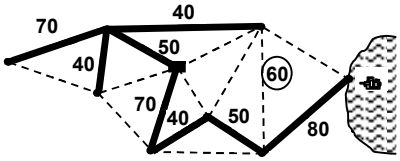
Some students wrote out all, or most of, the edge lengths and showed their (sometimes incorrect) total, despite this being given in the question.

1bi.



This question was not well done by many students.

The following is a common incorrect answer.



This answer may have been found by starting at the pump and then selecting the shortest edge from only the very last vertex connected, rather than any of the already-connected vertices.
After choosing the third edge (from the pump) marked 40, the edge marked 60 should have been selected next rather than just choosing the smallest edge that immediately followed the 40.

The apparent inability of many students to apply the algorithm for determining a minimal spanning tree is a weakness that needs to be addressed.

1bii
Minimal spanning tree

Many students provided incorrect answers such as maximum flow, Hamiltonian path, minimum cut, shortest path and others.

Question 2a.–e.

Marks	0	1	2	3	4	5	Average
%	14	26	16	13	17	14	**2.4**

2a.
12

2b.
Activity *F* has only activity *B* as a predecessor, while activities *G* and *H* have both *B* and *C* as predecessors. As there cannot be two activities called *B*, a dummy activity (with zero time) is drawn as a form of extension of *B* to the start of *G* and *H* to indicate that *B* is a predecessor for these two activities as well.

Many unacceptable answers seemed to be direct excerpts from notes about dummy activities in general, rather than clear explanations of the purpose of the specific dummy activity in the given context. Most of these did not include an explanation or demonstrate any clear understanding of what was being written.

Many students said that '… we cannot have parallel activities …', without an explanation of what this meant in the context of the question.

Similarly, many students stated that the dummy was used 'in order to satisfy the two conventions', without explaining what these conventions were and how they related to this context.

2c.
15

Few students were able to answer this question correctly. Many ignored the dummy activity and obtained the incorrect answer of 13.

2d.
A B H I L M

Common incorrect answers included *ABFJ* and *ACGM*.

2e.
25 days

A consequential mark was available for a correct calculation that showed the addition of the times, in days, for each of the activities in an incorrect critical path given for Question 2e. Instead, most students wrote a single number here without showing the calculation and were ineligible for the consequential mark.

Question 3a.–b.

Marks	0	1	2	Average
%	13	42	45	**1.4**

3a.
17

3b.
Four lines are needed before an allocation of four tasks to four people may be attempted and there are only three at the moment.

This question was answered quite poorly by many students.

Question 3c.–d.

Marks	0	1	2	3	Average
%	23	11	9	56	**2**

3c.

Task	Worker: Julia	Ken	Lana	Max
W	0	0	4	0
X	2	2	0	10
Y	1	3	0	0
Z	7	0	3	5

3d.

Worker	Task
Julia	*W*
Ken	*Z*
Lana	*X*
Max	*Y*

Module 6 – Matrices

Question 1a.–1d.

Marks	0	1	2	3	4	Average
%	2	5	15	30	48	**3.2**

1a.
On this airline, you can fly directly from Berga to Anvil and Dantel.

1b.
Anvil – Berga – Dantel – Cantor

1c.

$$G = KF = \begin{bmatrix}1 & 1 & 1 & 1\end{bmatrix}\begin{bmatrix}0 & 1 & 0 & 0\\ 1 & 0 & 1 & 0\\ 0 & 0 & 0 & 1\\ 0 & 1 & 0 & 0\end{bmatrix} = \begin{bmatrix}1 & 2 & 1 & 1\end{bmatrix}$$

1d.
The matrix *G* lists, for each city, the total number of direct flight connections from that city to another city in the network. It refers specifically to the number of direct flights out of each of the four cities to another city in the network, not the inward flights or just 'connections'.

The matrix $K = \begin{bmatrix}1 & 1 & 1 & 1\end{bmatrix}$ is an example of a 'summing matrix' that finds the sum of each column of the 4×4 matrix labelled *F*.

Question 2ai.–2b.

Marks	0	1	2	3	Average
%	9	18	37	36	**2**

2ai.

$$\begin{bmatrix}1 & 3 & 2\\ 3 & 9 & 6\end{bmatrix}$$