Students have a lot of information to assimilate and decisions to make, and potentially a lot of information to convey in their solution. One aspect of the solution will be the calculations regarding costs, another will be the actual design. The cost obviously depends on the design. The following example is therefore just given to show the types of calculations that may need to be made. The design could be shown on a scale drawing or sketch.
Example

Lawn calculations

Area of garden = 10 m x 15 m = 150 m²

The client would like around half of the garden to be lawn so the lawned area should be around 75 m². An area of 75 m² could be achieved by splitting the garden in various ways:

Suppose we choose the first of these.

If 75 m² of turf is used, the cost of the turf is £2.49 per square metre.

So materials costs for the lawn would be 75 x £2.49 = £186.75, i.e. £187

(This figure may vary as the student will not necessarily split the garden exactly in half.)

Labour costs for the lawn are made up of a charge for preparing the ground and the cost of actually laying the turf.

Preparing the ground: 4 hours at £15 per hour = 4 x £15 = £60

Laying the turf: 75 m² of turf would take about 75/40 = 1.875 hours to lay.

Students may realise that this is too precise for an estimate and round to 2 hours.

E.g. 1.875 x £15 = £28.13 or 2 x £15 = £30

So total labour costs for the lawn are around £60 + £30 = £90
Paving calculations

Students will now have an area left to use for paving and planting.

E.g. in our example they will have an area 7.5 m by 10 m.

They would need to come up with a design that uses 15 slabs down the side and 20 slabs across the top.

E.g.

Number of slabs per complete row = 20
Number of slabs per planted row = 12
Total number of slabs = 8 x 20 + 7 x 12
= 160 + 84
= 244

The cheapest way to buy the slabs is to buy 4 blocks of 60 and 4 single slabs.

Cost of slabs = 4 x £198.72 + 4 x £3.68 = £809.60

Micky needs enough sand/cement mix to lay a 5 cm layer under each of the 244 slabs.
Volume of mix under one slab = 50 cm x 50 cm x 5 cm = 12500 cm³
Total volume of mix required = 244 x 12500 cm³ = 3050000 cm³

Sand and cement are used in the ratio 9 : 1

Ignoring the volume of water required for damping:

Volume of sand required = 3050000 cm³ x 9/10 = 2745000 cm³
A 25 kg bag of sand has a volume of 15000 cm³
Number of bags of sand = 2745000 / 15000 = 183
Sand costs £1.52 per bag or £13.60 for 10 bags.
The cheapest way to buy the sand is to buy 18 lots of 10 bags and 3 single bags.
Cost of sand = 18 x £13.60 + 3 x £1.52 = £249.36

Volume of cement required = 3050000 cm³ x 1/10 = 305000 cm³
A 25 kg bag of cement has a volume of 16600 cm³
Number of bags of cement = 305000 / 16600 = 18.37, i.e. 19
Cement costs £3.08 for a 10 kg bag or £5.16 for a 25 kg bag.
Cost of cement = 19 x £5.16 = £98.04

(Alternatively you could use 18 of the 25 kg bags and 1 of the 10 kg bags as this is equivalent to 0.4 of a 25 kg bag.)

Total materials cost for the paved area = £809.60 + £249.36 + £98.04 = £1157

Micky is allowing 10 minutes per slab for the labour which means he can lay 6 slabs per hour.
Hours taken to lay the paving = 244/6 = 40.67, i.e. 41 hours
Labour costs for laying the paving = 41 x £15 = £615

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### Planting calculations

In our design there are 28 areas to be planted, each measuring 50 cm by 1 m. Students could pick out 28 or more plants, either from the list given or their own research. They may justify their choices by thinking about the height or spread or the types of plants.

Cost using the list given could be anywhere from around £126 upwards, i.e. anything in excess of 28 plants at £4.50 each.

Labour costs consist of a charge for preparing the area and the cost of actually planting out.

Preparing the area:
4 hours at £15 per hour = 4 x £15 = £60

Planting out:
If Micky takes 5 minutes per plant he will get through 12 plants an hour. Assuming a minimum of 28 plants the planting could take anywhere upwards of around 2.5 hours.
2.5 hours at £15 per hour = 2.5 x £15 = £37.50

Total labour costs for planting = £60 + £37.50 = £97.50, say a minimum of £100

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### Total cost

The total cost for our example would be of the order:

<table>
<thead>
<tr>
<th></th>
<th>Materials</th>
<th>Labour</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lawn</strong></td>
<td>£187</td>
<td>£90</td>
</tr>
<tr>
<td><strong>Paving</strong></td>
<td>£1157</td>
<td>£615</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td>£126</td>
<td>£100</td>
</tr>
<tr>
<td><strong>Design fee</strong></td>
<td></td>
<td>£200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>£1470</td>
<td>£1005</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td>£2475</td>
</tr>
</tbody>
</table>

In these calculations the cost of planting one 50 cm square is cheaper than the cost of laying a slab, so the total would be lower if the planting area were increased and higher if the paving area were increased.