Marginal Costing.

2008 Q.8

Break-Even Point.

Before tackling a marginal costing question, it's first of all crucial that you understand what is meant by 'break-even point'. What this means is that a firm needs to sell a certain number of products in order to cover all of their costs. Unfortunately there is a slight complication in that there are two types of costs – Fixed costs (that always stay the same no matter how many products the company makes) and variable costs (that change depending on how many products the company makes). So to work out what the break-even point for a company is we use this simple formula:

$$\frac{\text{Total Fixed Costs}}{\text{Selling Price of the Product} - \text{Variable Cost per Product}}.$$

Really what the formula is saying is that if you divide the profit you make on each sale (the selling price minus what each product costs you to make) into the overall fixed costs, you'll find out how many you need to sell to cover these costs (or in other words, break-even).

PART (A).

In part (a) we're asked all of the standard marginal costing questions. In a slightly bizarre move though it really helps if we do something else before we dive into our actual answer. Since all of the things we're going to be asked are related to each other, doing a bit of preliminary lay-out will be very useful as you'll see in a minute. So what we're going to do is just rearrange the info we've already been given in the question. Table 1 below is what we were given in the question and Table 2 is the way I've rearranged it (Don't worry, I'll explain in a minute what I've done, but have a look at the two tables and see if you can make any sense of it yourself first).

Table 1 - From the Question.	€	€	€
Sales (14,000 Units)			560,000
Materials		120,000	
Direct Labour		140,000	
Factory Overheads		90,000	
Administration Expenses		112,000	462,000
Net Profit			98,000

Table 2 - 'Marginal Statement'.	€	€	€
Sales			560,000
Minus Variable Costs.			
Materials		120,000	
Direct Labour		140,000	
Factory Overheads		30,000	
Administration Expenses		49,500	339,500
= Contribution			220,500
Minus Fixed Costs.			
Factory Overheads		60,000	
Administration Expenses		62,500	122,500
			98,000

Anyone who knows anything about the 'Flexible Budget' topic will probably recognise what I've done in Table 2. It's just what's called a 'Marginal Statement'. The sales figure is the same as the one from the question and the profit at the end is the same – so what's the difference? The only difference is that instead of recording all of the costs in one list, I've split them into two categories, namely the variable and fixed costs (if you're not sure how I knew which was which, have a look at the sentence underneath the net profit in the question).

So how many marks have we earned so far you ask? That's right, absolutely none. So let's get on with it then (and hopefully you'll understand in a minute why we went to the bother of doing out the marginal statement above).

(i) First we're asked to work out the break-even point and the margin of safety. If you can remember (or just look back up at) the formula I showed you at the top of the page, this should be quite easy.

The fixed costs are €122,500 (check out the marginal statement to see where I got that from). The selling price per product is €40 (that's the €560,000 total sales divided by the 14,000 products we sold) and the variable cost per unit is €24.25 (which is the total variable cost divided by the 14,000 products we made). So you should see that by doing out the marginal statement earlier we saved ourselves a lot of hassle here. And now to the brilliant moment where we'll actually earn some marks…..!

Break-Even Point:

$$\frac{\text{Total Fixed Costs}}{\text{Selling Price of the Product} - \text{Variable Cost per Product}}.$$

$$\frac{122{,}500}{40 - 24.25}$$

= 7,778 Products.

This tells us that the company must sell 7,778 products in order to break-even. For any smarty pants people who tried this themselves I know you would have actually gotten 7,777.77 but since you can't sell .77 of a product, you always round your answer up when calculating the break-even point.

Don't forget that we were also asked to show the 'Margin of Safety'. This is really easy. It's just the number of sales given to us in the question minus the break-even point.

In other words: 14,000 – 7,778 = **6,222 Products.**
If you've any interest, this means that if they sell any number of products between their break-even point and their current sales, they'll be safe (or in simple terms, they'll make a profit).

(ii) The second question we're asked is one of those ones that looks more complicated than it actually is. Essentially all that's happening here is that we're being asked what profit we'd make if a couple of changes were made to our sales income and our costs. Remember that the fixed costs will stay the same (because that's what 'fixed' means) so we just need to work out what our sales will be and what our variable costs will be. In other words the profit will be the sales figure (?) minus the variable costs (?) and minus the fixed costs (€122,500).

The sales figure should be easy to work out. We're told that we are going to reduce the selling price by 5% and will sell 20,000 products. So what's the current selling price? Well we know the current sales figure is €560,000 and this is what we got from selling 14,000 products (both of these figures are given to us in the original figures from the question), so if we divide one into the other we see that the current selling price must be €40 per unit. Reducing that by 5% gives us a new selling price of €38 and if we sell 20,000 products at this price we'll get €760,000. So now we know that the profit (and more importantly the answer to part ii) will be the sales figure (€760,000) minus the variable costs (?) and minus the fixed costs (€122,500).

All we need now is a figure for the variable costs. Remember that the original variable costs came to a total of €339,500 (see the marginal statement we did out at the very beginning). This is the cost of making 14,000 products. If we want to know the cost of making 20,000 products therefore we just divide by 14,000 and multiply by 20,000: i.e. €485,000.

The only complication is that there is a new charge of €10,000 that the company intends to spend on advertising. Technically this is probably a fixed cost, so you can add it to the fixed costs figure we already have or list it separately – either way you'll get the same answer.

So the profit will be:	€
Sales	760,000
- Variable Costs:	(485,000)
- Fixed Costs:	(122,500)
- New Advertising Cost:	(10,000)
= **Profit**	**€142,500**

(iii) This one just involves a quick sum and once you know what you're doing, should take about 30 seconds. If you remember the formula for break-even point: Fixed Cost divided by (Selling Price – Variable Cost), you'll know that this tells us how many products we need to sell to cover our costs. What we're been asked to do though is work out how many we need to sell not just to break-even, but to make a certain profit. The way to think about this then is to imagine that the profit they want us to make is another cost (in other words, they want us to cover all our costs and also to make enough money to cover this profit).

So instead of doing the basic break-even sum of:

$$\frac{122{,}500}{40 - 24.25}$$

…we need to make some changes based on what we're told in the question. The fixed costs will stay the same (because they're 'fixed') but the selling price and variable cost will change. They tell us in the question that the selling price is changing to €36 and the variable cost will be the old one *plus* the profit they want us to make (which in this case is 20% of €36, or €7.20). So we get:

$$\frac{122{,}500}{36 - 31.45}$$

= 26,924 Products.

(iv) Again, this part simply involves re-jigging the original figures to take account of the changes they're suggesting. This is why doing the marginal statement out before you start is a good idea, because it makes questions like this much easier. To work out the profit we just do what we always do – work out how the sales, variable costs and fixed costs change.

Luckily the fixed costs involved no working out because as always, they remain 'fixed' (€122,500).

The sales figure is pretty much given to us – "increasing the sales to 19,000 units at €42 each". Therefore €798,000

And the variable costs shouldn't be that hard. Don't forget that the original variable cost per unit was €24.25 (€339,500 divided by 14,000 units). Now we just need to add the new variable costs of €1 packaging per unit and €2.10 sales commission (5% of each €42 sale). So the total variable cost per unit is €27.35. If we're selling 19,000 units this gives us a total variable cost of 19,000 x €27.35 = €519,650

So our profit will be:

Sales	798,000
- Variable Costs:	(519,650)
- Fixed Costs:	(122,500)
= **Profit**	**€155,850**

(v) The word 'contribution' describes the figure that goes at the bottom of the break-even formula, in other words the answer to 'Sales – Variable Cost'. It's basically saying that the money we get for each sale minus what it costs us to make that sale (i.e. sales minus variable cost), leaves us with a 'contribution' that we can put towards paying off our fixed costs. Break-even point tells us how many of these 'contributions' we need to get to break even. The question therefore asks us for what reason we might regularly use the 'contribution' figure and the obvious answer is:

- To calculate the break-even point, by dividing this contribution figure into the fixed costs.

We're also asked, "when is the use of this ratio essential"? and the answer is:

- When we want to work out how changes in costs or revenue might affect the break-even point (like in parts ii, iii and iv above).

PART (B).

Marginal costing rarely fills an entire question and so normally is joined by some other topic in part (B). In this case we basically have a flexible budget question, which although it's a totally separate topic, has been squished down in this particular question.

(i) In this first part we need to master the famous 'HIGH-LOW' method. This means looking at two sets of numbers – the units at the top of the question and the three

figures opposite 'Production Overheads' (because it's these production overheads that we're being asked to do something with). In the list of 'Units' we have 10000, 15000, and 18000. In the 'Production Overhead' figures we have 66000, 96000, and 114000. For the purposes of the 'High-Low' method we only need the highest and lowest of each of these. So we get:

	High	Low
Units:	18000	10000
Production Overhead:	114000	66000

The next step is to take one figure from the other and divide the answers. i.e.

	High		Low		
Units:	18000	-	10000	=	8000
Production Overhead:	114000	-	66000	=	48000

48000 Divided By 8000 = 6.

This tells us that production overheads have a variable cost of €6 per product - or simply that every time we make a product we incur a €6 production overhead cost. Checking this with the figures in the question might seem to cause a problem though. Look at the first column of figures (under 10,000 units) and you'll see that it says €66,000 for production overheads. With our workings we would have thought that it should be €60,000 (10,000 units x €6 per unit). So we seem to be wrong by €6000. A quick look at the second column will show you that a pattern is emerging. If the second column is showing us the costs when producing 15,000 units we can see that production overheads say €96,000. Again this is €6,000 more than we would have thought if we just multiplied our €6 per unit by 15,000 units. What's going on then? All this means is that to know how much production overheads will be at any level of production; we need to first multiply the number of units we want to produce by €6 and then add €6000 to our answer. Or in accounting terms:

Production Overheads = €6 Variable Cost + €6000 Fixed Cost.

(ii) In this part we're being asked to do exactly what we just did with production overheads but this time for 'Other Overheads'. So first we do the 'High-Low' sum:

Units:	18000	-	10000	=	8000

Other Overheads: 99000 - 57000 = 42000

42000 Divided By 8000 = 5.25.

This tells us that other overheads have a variable cost of €5.25 per unit (i.e. every time we make a product it costs us €5.25 in 'other overheads'). To work out the fixed cost part we have to do like we did with production overheads – try out the figure we already have and see how much we're wrong by. In the 10,000 units column in the question for example it says that other overheads are €57,000. But if we multiply 10,000 by the €5.25 we just worked out we'd only get €52,500 and so we're wrong by €4,500. The good news is that you'll see that if you try the same with either of the other two columns we'll always be wrong by this same €4,500 (e.g. in the second column of 15,000 units other overheads are €83,250, which is exactly €4,500 higher than what we would get if we multiplied our original €5.25 per unit by 15,000). So in accounting terms:

Other Overheads = €5.25 Variable Cost + €4500 Fixed Cost.

(iii) Finally, we're asked to prepare a flexible budget (this means that we need to show what each of the 5 costs would be if a different number of units were produced – i.e. not 10000, 15000, or 18000). In this case we want to know what the costs would be if we made 19,000 products. How do I know that? Because we're asked to work out the cost of 95% activity level and since they've given us the % of activity for the other three units it's easy to work out. For example, look at the column that says 10,000 units. Just above that we can see that this is 50% activity. So if you divide 10,000 by 50 to get 1% and then multiply this by 95 to get 95%, your answer will be 19,000 units – easy!

Ok, but how do we know what each cost will be if we make 19,000 units. Well the 'Administration Expenses' are a fixed cost (because in the question they stay the same in each of the three columns). So if we make 19,000 units the administration expenses will still be €25,000. The Production Overheads will follow the pattern we worked out in part (i) – 19,000 units x €6 variable cost, plus a €6000 fixed cost = €120,000. Similarly the Other Overheads will follow the pattern we worked out in part (ii) – 19,000 units x €5.25 variable cost, plus a €4,500 fixed cost = €104,250.

The Direct Materials and Direct Labour are both completely variable costs. We know this because in each column they divide evenly into the number of units. If you look

at Direct Materials for example all you have to do is multiply the number of units by €14 to get the cost in each column. The cost for 19,000 units will therefore be 19,000 x €14 = €266,000. Direct Labour on the other hand has a variable cost of €8 per unit (because you just have to multiply the number of units by €8 to get the figure for direct labour in each column). For 19,000 units therefore direct labour will be 19,000 x €8 = 152,000. So if we make 19,000 units our total costs will be:

	€
Direct Materials:	266,000
Direct Labour:	152,000
Production Overheads:	120,000
Other Overheads:	104,250
Administration Expenses:	25,000
Total Costs:	667,250

Now what we've actually been asked to do is to lay this out in a 'Marginal Statement' – where instead of putting all of the costs in one list, we split them into the variable bits and the fixed bits. This should sound familiar because we did this at the very beginning of the entire question in order to help us with the marginal costing stuff we were asked to do in part (A). So the variable costs will be the direct materials and direct labour (which are both completely variable), and also the variable bits of the production overheads and other overheads (which had a bit of variable in them and a bit of fixed). The fixed costs will be the administration expenses (which are totally fixed), as well as the fixed bits of the production overheads and other overheads. The marginal statement will look like this:

Marginal Statement.	€	€	€
Sales			?
Minus Variable Costs.			
Direct Materials		266000	
Direct Labour		152000	
Production Overheads		114000	
Other Overheads		99750	631750
= Contribution			?

Minus Fixed Costs.		
Production Overheads	6000	
Other Overheads	4500	
Administration Expenses	25000	35500
= Profit		?

You'll notice three question marks in the marginal statement above and that's because we're missing three figures (or really we're only missing one because once we get the sales figure, the rest will just slot in). So how do we know what the figure for sales will be if we make 19,000 units? The answer to this is in the sneaky little line below the figures in the question: "Profit is budgeted to be 15% of sales". This tells us that every time we sell a product, 15% of the money that comes in is our profit. The question is what is the other 85% and the answer is that it must be our costs. Think about that for a minute – if we sell something for €1 and I tell you that 15c of this is our profit, then it must mean that 85c is our costs. How does that help us? Well we know that our total costs if we make 19,000 units are €631,750 variable costs and €35,500 fixed costs, or overall €667,250. And we know from the sneaky little sentence that these costs are 85% of our sales. So if we divide €667,250 by 85 and multiply by 100, we magically get our sales figure (€785,000)!

Now we can actually put in the final answer to part (iii) showing exactly what we've been asked to show - the sales, the contribution (sales minus the variable costs) and the profit we'll make if we sell 19,000 units (which we know is correct by the way because it works out as being exactly 15% of sales – brilliant!).

Marginal Statement.	€	€	€
Sales			785000
Minus Variable Costs.			
Direct Materials		266000	
Direct Labour		152000	
Production Overheads		114000	
Other Overheads		99750	631750

= Contribution		153250
Minus Fixed Costs.		
Production Overheads	6000	
Other Overheads	4500	
Administration Expenses	25000	35500
= Profit		117750