COSTS
REVENUES
BREAK-EVEN ANALYSIS
AND PROFIT

THE WORKBOOK!

NAME: ……………………………….

INTRODUCTION

When you look closely at many businesses (large and small) you will find they generally share a common objective, that is, to make a profit. This allows them to do other things such as expand their scale of production by buying new machinery or larger premises.

However, predicting how much profit you will make is not as easy as it sounds. You can use accounting techniques (such as budgeting) but that is not the only method. An important theory to learn is that of BREAK-EVEN ANALYSIS. Not only does this topic come up regularly in examinations, once you have mastered it, it lets you calculate all sorts of other important figures.
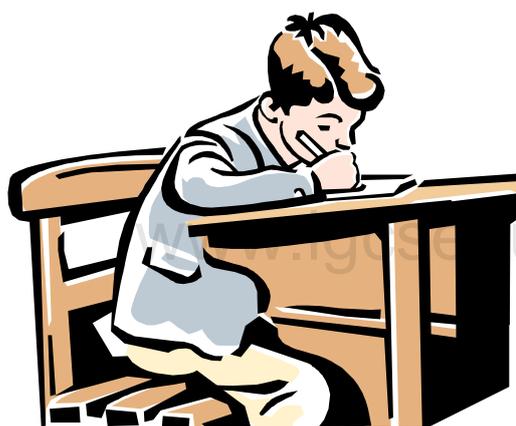
It is worth noting that several of the formulas are dependant on the answers gained from OTHER formulas you will calculate. Therefore, if you get the first answer wrong then ALL the other answers will be wrong too! But don't panic. Luckily, in the examination, your answers will be marked using the "own figure" rule. This means that, as long as you use the correct **method**, getting a wrong figure will only lose you marks once rather than all the way through the calculations. That is why it is important to write the formula you intend to use in WORDS at the start of each question. That way the examiner can be in no doubt that you really know what you are doing – you just made a silly mistake with your calculator. Phew!

Another thing to note about break-even analysis is that it generally involves drawing graphs. Therefore when tackling any break-even question you need to be well equipped with a sharp pencil, a long ruler, a rubber and a calculator. There is nothing worse to show an examiner than a scruffily drawn graph. It should be clearly labelled and contain all of the relevant details (but more on that later).

FIXED COSTS

Let us imagine a factory. For fifty weeks a year the factory is used to produce bicycles. However, for two weeks a year all of the employees of the factory go on holiday at the same time and the factory is closed. No bicycles are produced.

While the employees are enjoying their vacation, the factory is still incurring costs (or the owners still have to pay certain costs) even though <u>no bicycles</u> are being produced for them to sell. They still have to pay rent on the factory (or their mortgage repayments). They still have to pay the salaries of their managers. Maybe they have a loan to repay. They still have to meet these costs even though they may not have any income from sales of bicycles while the factory is closed for the holidays.

Similarly, when the workers return from their vacation and start producing bicycles again, the costs mentioned above have to be met. But, it doesn't matter how many units of output (bicycles) the factory produce, these costs remain the same. So whether they make zero units or whether they make the maximum number they can make at the moment with the factors of production they are employing (their capacity), these costs do not change – that is – as long as a business has the capacity to produce more units, the *fixed costs* do not change as output increased or decreases.

However, once the business has reached its capacity and all of its factors of production (land, labour and capital) are working as hard as they can (called being fully employed), in order to produce more units of output, they must increase their capacity. This means employing more factors of production (such as buying a bigger factory or more machines). This will make the fixed costs increase, but, it means the business can increase the scale of production and so benefit from "economies of scale".

> Fixed costs – costs that do not change as output increases as long as there is sufficient capacity to produce more units.
>
> Full capacity – the ability to produce as many units of production as possible from a given number of inputs.

<u>Examples of fixed costs</u>

- Rent
- Salaries
- Loan repayments
- Telephone bill
- Computer maintenance
- Rates

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Question 1

For the following businesses, calculate their **TOTAL FIXED COSTS for the year.**
*(N.B. for **ALL** calculations in this workbook, assume a fifty week year).*

BUSINESS A		Results	Calculations
Rent per month	£300		
Salaries per month	£24,000		
Loan repayment per month	£2,700		
Annual fixed costs			

BUSINESS B		Results	Calculations
Rent per week	£75		
Salaries per month	£6,000		
Telephone bill per quarter	£250		
Annual fixed costs			

VARIABLE COSTS

We have seen how *some* costs stay the same even if we produce more units of output. However, this must mean that some costs *change* depending on how many units of production we make. These are variable costs.

Variable costs – costs that change as output changes.

Examples of variable costs

      Wages   Packaging

      Raw materials   Transport

We can refer to variable costs as either per unit (or average variable costs) or as total variable costs.

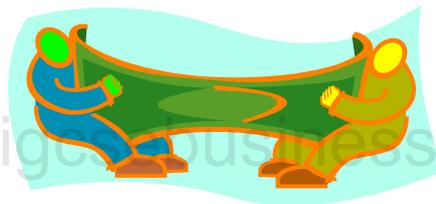$$\text{Average variable costs} = \frac{\text{Total Variable Costs}}{\text{Output}}$$

Total variable costs = variable costs per unit x output

Question 2

For the following businesses calculate their total variable cost and the average variable cost.

BUSINESS C		Results	Calculations
Number of employees	50		
Average yearly wage	£10,000		
Raw materials per unit	£3		
Packaging per unit	£1		
Yearly output (units)	350,000		
Total variable costs			
Average variable cost			

BUSINESS D		Results	Calculations
Number of employees	75		
Average weekly wage	£350		
Raw materials per unit	£6		
Transport per unit	£0.50		
Weekly output (units)	700		
Total variable costs			
Average variable cost			

BUSINESS E		Results	Calculations
Labour cost per unit	£2		
Raw materials per unit	£4		
Packaging per unit	£0.50		
Weekly output (units)	1,600		
Total variable costs			
Average variable cost			

A FURTHER NOTE ABOUT IDENTIFYING COSTS

So now we know about fixed costs and variable costs, and we have seen some examples of each. However, what if a question gives you a cost and you haven't come across it before – lets say the cost of widgets! How do you tell if it is a fixed or variable cost?

If the question says:

Cost of widgets <u>per year</u> = £15,000   …………..   this will be a fixed cost.

However, if the questions says

Cost of widgets <u>per unit</u> = £1.50   …………..   this will be a variable cost

Therefore:

If a cost is given for a period of time = fixed

If a cost is given per unit = variable

However, there is always the exception that proves the rule. You may get costs which you *know* are variable (the best example being wages) but they might be quoted per week or per month. They are still variable costs so try not to get too confused!

Question 3

In the following table, identify which costs you think are fixed and which are variable.

Item	Fixed or variable?	Item	Fixed or variable?
Rent per week		Telephone bill	
Maintenance on machines per annum		Managers salaries per month	
Labour costs per unit		Raw materials per unit	
Packaging per unit		Transport per unit	
Mortgage payments per month		Depreciation per annum	

TOTAL COSTS

So far we have split costs into two distinct categories – fixed and variable. We have done this so that we can tell which costs vary as output changes (and therefore will increase as output increases) and which costs do not change until capacity is reached.

However, now we have split them apart and analysed them, it is time to put them back together and find the total costs.

Total cost – the entire cost of production at a given level of output.

Total costs = fixed costs + variable costs

This can be abbreviated to:

$$TC = FC + TVC$$

This is all very well when you know the total of the variable costs incurred by a business. But what if you only know the variable cost per unit? You might end up with the classic mistake made by many students. Here is an example:

A business has annual fixed costs of £100,000 and has variable costs per unit of £7. Many would therefore state:

$$TC = FC + TVC$$

$$= £100,000 + £7$$

$$\underline{\underline{= £100,007}}$$

Now, the ONLY time this would be correct is if the factory made 1 unit of output. However, the likelihood of this being true is remote! What the student should have done is:

$$TC = FC + (VC\ per\ unit\ x\ OUTPUT)$$

This way we actually find the true value of total costs. In the example used above, let's say the business makes 10,000 units a year. The total cost would therefore be:

$$TC = FC + (VC\ per\ unit\ x\ OUTPUT)$$

$$= 100,000 + (7\ x\ 10,000)$$

$$= 100,000 + 70,000$$

$$\underline{\underline{= £170,000}}$$

This calculation brings up another important issue when performing calculations in an exam or test. Students LOVE to get to the exciting (?) number part of the question. In doing this you leave yourself open to making silly mistakes. In ANY calculation in business studies, you should use a three-stage approach.

Stage 1   -   Write the formula IN WORDS

Stage 2   -   Substitute in numbers and perform any intermediate calculations i.e. calculating the contents of brackets.

Stage 3   -   CLEARLY state the answer, remembering the correct units.

Using this approach you are maximising the number of marks you can obtain – even if you actually get the maths wrong, you have shown the examiner that you know the formula. In most cases, this will get you at least 1 mark.

Question 4

Calculate the total costs for the following businesses. Show your workings out in the spaces provided.

BUSINESS F		Results	Calculations
Labour cost per unit	£5		
Raw materials per unit	£4		
Rent per month	£600		
Weekly output (units)	3,000		
Total costs			

BUSINESS G		Results	Calculations
Labour cost per unit	£7		
Raw materials per unit	£12		
Rent per month	£800		
Weekly output (units)	500		
Total costs			

BUSINESS H		Results	Calculations
Number of employees	10		
Average weekly wage	£200		
Raw materials per unit	£9		
Rent per month	£750		
Telephone bill per quarter	£150		
Weekly output (units)	2,000		
Total costs			

DIRECT AND INDIRECT COSTS

OK, so you know about fixed costs, variable costs and even total costs. Surely there can't be any other types? Well, yes there is – several different types in fact!

Some of the costs (like average or unit cost) are the results of calculations. However, some are another way of classifying the costs like we did with fixed and variable. This time however, the distinction is not dependent on output, but on whether a cost can be directly related to the production of an item or not. These are called direct and indirect costs.

> Direct costs – a cost that can be clearly identified with a
> particular unit of output

Examples of direct costs

- 🏭 Raw materials
- 🏭 Packaging
- 🏭 Direct labour (i.e. production workers)

As you can see this is very similar to variable costs but technically they are not the same. For instance, we would take anyone being paid a wage as being a variable cost, but we would only take production workers as a direct cost – not cleaners for instance.

The opposite of direct costs are indirect costs. Another word for these is OVERHEADS. These are costs for which it is <u>not possible</u> to associate them directly with particular products.

> Indirect costs – a cost that cannot be identified with a particular
> unit of output. They are incurred by the whole
> organisation or by a department.

Examples of indirect costs

- 🏭 Rent
- 🏭 Insurance
- 🏭 Salaries of office staff
- 🏭 Wages of non-production workers

As you can see these are very similar to fixed costs. It can be pretty difficult to understand the difference between a fixed cost and an indirect cost. Imagine how difficult it is for businesses to actually calculate them. For example, it would be very time-consuming to relate precisely the amount of electricity used to make one item! Also usage of some materials (such as for cleaning and maintenance) may increase the more units we make, but it would take too long to figure out by exactly how much. The information gained would not be worth the time taken.

AVERAGE COSTS

Costs …. The story so far. We now know that there is more than one way to classify costs. We have also analysed costs by breaking them down into fixed and variable types and then, added them up again to find the total costs. All of that information is useful to a business. However, there is a piece of information that may prove to be even more useful. That is, finding out how much ONE unit of production costs to make. This is the average or the unit cost.

Why would this be so useful? Well, firstly, businesses would like to know if they are going to make a profit. If they do not know how much one good costs them to make, how can they set a selling price above that cost? They may end up making a loss without realising it.

Also, as we are about to discover, the more units we make, the lower the average cost (this is the concept of *economies of scale*). However, this only works up to a point. If we make too many units then we start to suffer from *diseconomies of scale* which means the average cost starts to rise. A business will want to make enough units to benefit the most from economies but not so many that they slip into diseconomies and start to become inefficient.

$$\text{Average (or unit) cost} \quad = \quad \frac{\text{Total Costs}}{\text{Output}}$$

Question 5

Using the information below, fill in the table on the next page and calculate the average cost at each level of output

Item	Cost	Fixed or variable
Rent on premises	£450 per week	
Hire of machinery	£150 per week	
Heating and lighting	£100 per week	
Repayment of bank loan	£300 per week	
Materials	£7 per cushion	
Packaging	£1 per cushion	
Labour	£2 per cushion	

N.B. Show all your calculations in the spaces provided.

Units made per week	Total Fixed costs	Total Variable costs	Total costs	Average Cost
0				----------
100				
200				
300				
400				
500				
600				
700				
800				
900				
1000				

Describe your results

What you should have found is that the more units of output are produced, the lower the average cost becomes. However, the difference between each output level becomes smaller and smaller. For example:

The average cost at 100 units is £20 but the average cost at 200 units is £15. The difference between the two is £5.

However ......

The average cost at 900 units is £11.11 but the average cost at 1000 units is £11. The difference between the two is only £0.11p.

Therefore we can see that when a small amount of units is made, an increase in the scale of production will decrease costs by a large amount. But when a large amount of units are already being produced, an increase in the scale of production lowers average cost by a significantly smaller amount.

If we were to plot the average costs on a graph, it has a special shape. This is known as the average cost curve and a typical example is given below.
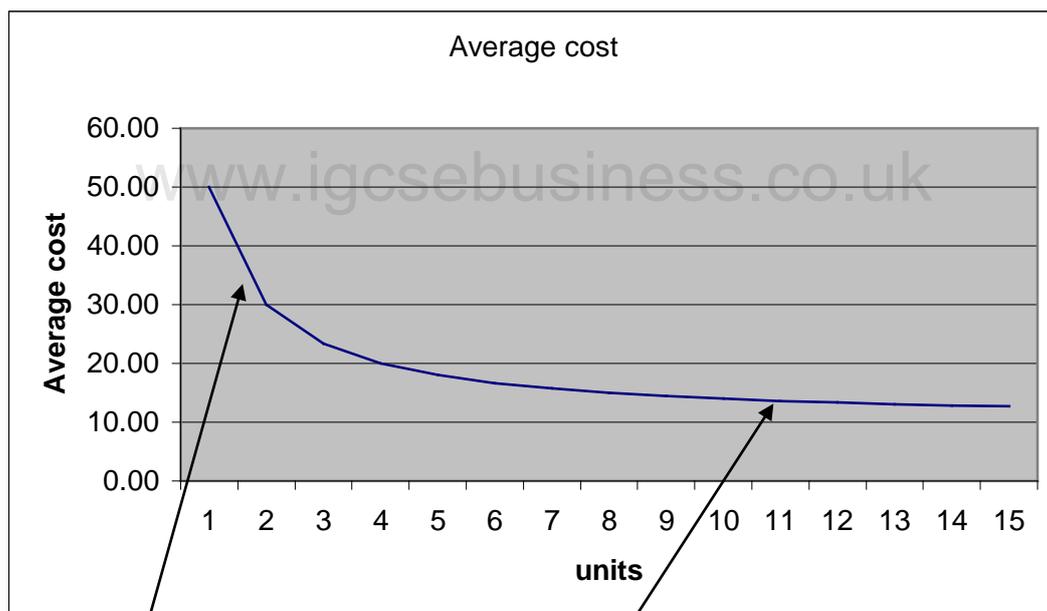
Steep curve at start

Shallow curve at end

Question 6

Plot the average costs you obtained in the table on the previous page on a piece of graph paper and stick it into your workbook. Make sure you label all relevant details.

TOTAL REVENUE

So, lets leave costs behind for the moment and concentrate not on money *leaving* the firm to pay for items, but on money being *received* by the firm in return for the sale of goods and services. This is called revenue.

> **Revenue** - The income that a business receives, as a result of selling its products. It is calculated as price multiplied by the quantity sold.

However, there are other words which mean the same as revenue and which are used interchangeably in questions. They could be:

- £ Sales
- £ Turnover
- £ Income

- £ Selling price
- £ Takings
- £ Receipts

Now, just like variable costs, sometimes we talk about revenue in terms of selling price per unit (the price a customer pays to buy one item) and sometimes we talk about *total* revenue i.e. the selling price per item multiplied by the quantity sold.

Total Revenue = Price per item x Quantity sold.

This can be abbreviated to:

$$TR = P \times Q$$

Obviously, revenue is always measured in monetary terms. Make sure you use the right unit (e.g. £, $, ¥) and be careful with the amount of zero's as very often questions are asked which give answers in millions – one zero too few or too many makes a BIG difference!

Question 6

Calculate the total revenue for the firm below.

| Item sold	Price per item	Number sold	Revenue per item
Eggs (1 dozen)	£1.20	15 dozen	
Cheese (per Kilo)	£2.99	9 kilos	
Milk (per pint)	£0.80	60 pints	
Bread (per loaf)	£0.70	50 loaves	
Butter (per block)	£1.50	6 blocks	
Total			

CONTRIBUTION

OK, so things are going to start to get a little more complicated now. So far we have seen costs and revenues separately. NOW we have to start putting them together and performing some more calculations.

There are two ways of performing break-even calculations. One way involves total costs being equal to total revenues (TC = TR). We will look at this later. It is more long winded and involves more calculations but you have to know how to do it.

The other way is the contribution method. This LOOKS more complicated at first but is much quicker and gives you more information in the long run. So what is contribution? It is best illustrated with an example.

Imagine a toy that is sold in the shops for £15 each.

£10 out of every £15 received goes to pay off the VARIABLE COSTS of making the toy such as paying the wages of production workers, raw materials and packaging. That leaves £5.
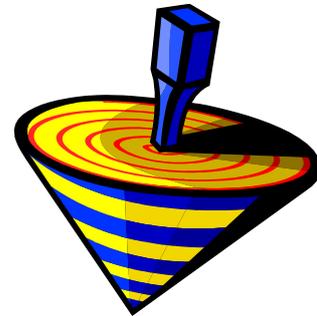
That £5 could have two uses. For the first toys that are sold, the remaining £5 goes towards paying off the FIXED COSTS of the business such as rent, rates and salaries for management.

When all of the fixed costs are paid then the remaining £5 from each toy sold will be **PROFIT**. From this we can conclude that the formula for contribution must be:

CONTRIBUTION = SELLING PRICE – VARIABLE COST
PER UNIT PER UNIT

Which can be abbreviated to:

Cont. = P - VC

Question 7

a)   Draw a profit calculating machine on a piece of plain A4 paper to illustrate this example with an output of 12,000 units and fixed costs of £50,000 (it doesn't have to be a masterpiece)! Stick this into your workbook.

b)   Draw a profit calculating machine for the following example related to birthday cakes:

Selling price per unit = £25
Variable costs per unit = £15
Fixed costs = £25,000
Output = 4000 units

CALCULATING THE BREAK EVEN POINT

We have seen from Question 7 above that by using a profit calculating machine we can work out not just the contribution but also the break-even point, the margin of safety and the profit achieved. Let's look at break even in more detail.

Break-even   This is the level of sales/output where neither a profit nor a loss is being made.

The break-even point is measured in **units of output** *not* in money terms. This is one of the most common mistakes made on these types of questions.

We saw from our work on contribution that when we have paid the variable costs of a product we should have some revenue left over. This has two possible uses: to pay for fixed costs <u>or</u> to make a profit. As the definition of break even is where no loss or profit is made, we need to find the number of units we have to sell in order to cover all of the fixed costs but before we start to make a profit. Therefore, the formula required is:

$$\text{Break even point} = \frac{\text{fixed costs}}{\text{contribution}}$$

This gives us an EXACT number of units required to break even. Sometimes you may get a decimal place (such as 10.5 units). In this case your answer is 10.5 units but then, on the next line of your calculation, round UP to the next unit (even if the answer was 10.1 units ALWAYS round up as at 10 units you haven't technically broken even yet!)

Question 8

Calculate the break-even point for the following firms.

Firm	Selling price (£)	Variable costs (£)	Fixed costs (£)	Contribution	Break even point
A	20	10	15,000		
B	5	3	788		
C	1,500	1,000	30,000		
D	20,000	17,500	35,000		
E	44	34	1,800		
F	60	30	300		
G	120	100	4,800		

However, this is not the only way of calculating the break-even point. There is also the formula

$$Break\ even = Total\ cost = Total\ revenue$$

Let us have another look at the table on page 14. On it we calculated the total cost of manufacturing a product – in order to find the average cost. If we replace the last column with one entitled TOTAL REVENUE and assume a selling price per unit of £12.

Units made per week	Total Fixed costs	Total Variable costs	Total costs	Total revenue
0	1000	0	1000	
100	1000	1000	2000	
200	1000	2000	3000	
300	1000	3000	4000	
400	1000	4000	5000	
500	1000	5000	6000	
600	1000	6000	7000	
700	1000	7000	8000	
800	1000	8000	9000	
900	1000	9000	10,000	
1000	1000	10,000	11,000	

Luckily, we can see that TC = TR at 500 units. But what if it had been 505 units? Would we have been able to tell EXACTLY as we could with the contribution method? No, we would have to use trial and error. Alternatively, we could draw a graph!

PLOTTING A BREAK-EVEN GRAPH

When you have calculated the break-even point using either the contribution method or the TC = TR method, very often you are asked to draw a graph to illustrate the break-even point.

Luckily, break-even graphs all look pretty similar to each other – that is – there is a *classic* shape to them and some double checks we can make to ensure we are doing it right.

Break-even graphs are line graphs. To make it a little more complicated we have 4 lines on the same graph. This means it is VERY important to label everything correctly. In fact, you get the majority of your marks for graphs in business studies for labelling correctly! Here is a guide to correctly drawing a break-even chart.

STEP 1)   First, the axis. What we are actually plotting are costs and revenues over a certain number of units of output. Therefore you need the continuous data (output) along the x –axis (horizontal) and the dependant data (costs and revenues) on the y-axis (vertical).

Finding the correct **scale** for your graph is probably the hardest part and MANY students have problems with this. However, there is a good rule of thumb. Before you draw a graph you should have worked out the break-even point (using the contribution method). You will therefore know how many units you need to produce for TC to equal TR. However, we want to show MORE units than we actually need to break even (as you will see later) so, label the x axis output and then either:

a) Add 50% on to the break even point and make that your maximum number on the x-axis

or

b) Use information from the question to find the MAXIMUM output of the firm in question (their capacity). For example, in the data we have on page 20, we can assume the maximum output is 1000 units.

STEP 2)   That is the x-axis taken care of, but what about the y-axis. This is easier once you know your maximum output (or the biggest number on the x-axis). We know that revenue is equal to price x quantity (TR = P x Q) and, as you will see in a minute, the highest point on a break-even graph is the last point on the revenue line. This means that if we find the revenue gained from selling the maximum output on our x-axis, this is the biggest number we need to go up to on our y-axis!. Don't forget to label the axis costs and revenues and put the appropriate currency symbol too (£,$, ¥ etc).

STEP 3)   Now our axis are in place and labelled we can plot our first line –
fixed costs.

This is the easiest line to plot as it is a horizontal line straight
across the graph! Remember, it doesn't matter how many units
of output we make, fixed costs remain the same. Label the line
FC.

STEP 4)   Next comes **variable costs**. This is trickier as we may or may
not have worked out the data for this already.

If you have a table of figures which includes a column for VC
(see page 20) then plotting the figures is straightforward.

If, however, you have used the contribution method what should
you do? Well, to plot a straight line you *really* only need 2
points on that line (the first and last). We know that if we make
zero units of output that our variable costs are zero. We should
also know the variable cost *per unit*. Knowing these two facts
we can find what the *total variable costs* would be at our
maximum output (the last number on the x-axis). This is the last
point on our line. Simply join this up to zero. You can plot a
point in the middle as well, if you want to be certain your line is
correct. It should be a straight, diagonal line. Label this VC.

STEP 5)   We can now plot our final cost line which is **total costs**. This
has a couple of special characteristics, which makes it easier to
plot accurately.

First, the TC line does not start at zero. It starts from the same
place the fixed cost line does.

Secondly, the VC and TC lines are parallel. That is, they are the
same distance apart all the way along.

Finally, the distance they are apart is the same distance as the FC
line is from the x-axis. If you think about it this makes sense as
what does TC equal? FC + VC! Therefore, when you have
plotted your TC line, you should be able to count the same
number of squares on your graph paper between the two sets of
lines. This is a great way to check and make sure you are
plotting accurately.

So we know the characteristics of the line and, if we have a table
of figures, we can plot it easily. But, what if we are using the
contribution method? Again you would have to work out the
first and last points of the line.   We know the line STARTS at
the junction of the FC line and the y-axis but where does it
finish? You would need to use the formula TC = FC + VC to
work out the TC for the maximum output (or the biggest number
on the x-axis of your graph). Obviously label the line you have
just plotted TC.

STEP 6) We are now ready to plot our final line – the revenue line. Luckily, this should be straightforward whatever method you have chosen.

If you have a table of figures then, as with the previous lines, it is simply a case of plotting the figures you have.

If you are using the contribution method then you will already have the two points needed to plot your line. If we sell no units then we get zero revenue – so the line starts at zero.

You have already worked out the maximum revenue obtained and used this as the top figure on your y-axis (see step 1 earlier). It is simply a matter of joining these two points up. Label the line TR.

STEP 7) If you have completed step 5 correctly, the TR line should have crossed the TC line at some point – HOPEFULLY at the same number of units that you calculated the break-even point to be. (What a coincidence!) This is obviously because the break-even point is where TC = TR.

To show the break-even point on your graph, draw a dotted line (with a ruler please!) DOWN to indicate the number of UNITS required to break-even on the x-axis and label this BEP (Break-Even Point). Remember, we don't think of the break-even point in terms of money so DO NOT draw a dotted line ACROSS to the y-axis.

STEP 8) We have a couple more labels to add. These are the areas of profit and loss. We know that – until we reach the BEP – we are making a loss. Therefore, from the y-axis moving right across the graph the TC line is higher than the TR line UNTIL THE BEP IS REACHED. The area of the graph between these two lines is the area of loss. Shade it in and write LOSS in the area.

STEP 9) Immediately after the BEP the TR line will become higher than the TC line. The area between these lines moving right towards the edge of your graph is the area of profit. Shade in the area between the lines and label it profit.

STEP 10) Give your graph a title – something like "Graph to show the break-even point of …………" (add whatever product the firm in question makes or, if you don't know the product, the name of the firm).

Phew! You have now completed a break-even chart. Congratulations.

Question 9

Complete a summary below, in the form of a flow chart, of the ten-step process of producing a break-even chart. Illustrate it with examples of the graph at each stage. This will be a handy revision tool later on in the course.

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Question 10

Using the following data, construct a break-even chart using the contribution method and stick it in your workbook.

Firm	Selling price (£)	Variable costs (£)	Fixed costs (£)	Capacity (units)
A	20	10	15,000	2,300

THE MARGIN OF SAFETY

Wow, we have come a long way since we started to look at the very basics of fixed and variable costs! But, our journey is only half way complete. After having calculated the contribution and the break-even point, we can now move on to the nitty-gritty of most businesses – profit!

When we drew our profit calculating machines on page 18 we came across a term MARGIN OF SAFETY. Write a definition of this term below.

Margin of safety ....

....

....

Therefore the formula for calculating margin of safety is:

Margin of safety = Output – Break-Even Point

If using the contribution method to calculate profit then you need to know the margin of safety. If we know how many units above the break-even point a business is producing, and we know the contribution each unit makes to the profit, then it is simple to calculate what that level of profit should be.

You may be asked to mark a margin of safety on a break-even graph. This can be achieved by drawing a line or an arrow below the x-axis from the break-even point to the level of output mentioned in the question, and writing below the line or arrow what the margin is (the answer is in units of output remember).

Question 11

Calculate the break-even point and the margin of safety for the following companies.

Firm	Selling price (£)	Variable costs (£)	Fixed costs (£)	Capacity (units)	Break-even point	Margin of safety
A	5	1	4,000	17,000		
B	25	3	66,000	7,500		
C	33	3	9,000	1,050		
D	67	17	94,000	6,400		
E	98	48	5,550	150		

CALCULATING PROFIT

Using the costs and revenues

If you have so far used calculations to find fixed costs, variable costs, total costs and total revenue then you need to continue using these figures to calculate profit.

The formula to calculate profit is:

PROFIT = TOTAL REVENUE – TOTAL COSTS

Profit is the difference between the money coming into a firm, and the money leaving the firm in the same period of time.

Using contribution

If, however, you have so far used the contribution method to calculate break even, then you must continue and use the information gathered so far to calculate profit.

The formula to use in this case is:

PROFIT = MARGIN OF SAFETY x CONTRIBUTION

You have already calculated both of these figures previously, it is simply a case of multiplying them together.

Question 12

Calculate the profit earned in the following businesses. Use the given method of calculation in each case and show all your workings on the back of the page.

Firm	Selling price (£)	Variable costs (£)	Fixed costs (£)	Capacity (units)	Profit	Method to use
A	20	7	13,000	1,500		Contribution
B	60	22	114,000	6,500		Costs
C	110	75	17,500	1,050		Contribution
D	55	25	210,000	9,450		Costs
E	102	39	37,800	1,200		Contribution

FORMULA SHEET

Average variable costs   = $\dfrac{\text{Total Variable Costs}}{\text{Output}}$

Total variable costs = variable costs per unit x output

$$TC = FC + TVC$$

Or

$$TC = FC + (VC \text{ per unit} \times OUTPUT)$$

Average (or unit) cost   = $\dfrac{\text{Total Costs}}{\text{Output}}$

Total Revenue = Price per item x Quantity sold.

Or

$$TR = P \times Q$$

CONTRIBUTION = SELLING PRICE – VARIABLE COST
                  PER UNIT   PER UNIT

Or

$$Cont. = P - VC$$

Break even point   = $\dfrac{\text{fixed costs}}{\text{contribution}}$

Or

Break even = Total cost = Total revenue

Margin of safety = Output – Break-Even Point

PROFIT = MARGIN OF SAFETY x CONTRIBUTION

Or

PROFIT = TOTAL REVENUE – TOTAL COSTS

GLOSSARY TERMS

Average cost	Also called unit cost. The total costs of producing a product divided by the number of units produced. Over a short period of time it is expected that as output increases, average costs will fall to start with and then rise again as the factory moves towards full capacity. See economies/diseconomies of scale
Break-even	This is the level of sales/output where neither a profit nor a loss is being made. It is a simple model, often represented in the form of a graph, which can show a business the level of sales/output required if its total revenue is going to cover its total costs. Can be calculated using the formula Break even point = fixed costs ÷ contribution
Capacity	A general term given for the resources that are available in a business for production including machinery, plant and labour. Or, the maximum amount of output that can be achieved with a specified level of the factors of production.
Contribution	Calculated using the following formula: Selling price per unit – variable costs per unit The contribution is used to pay for fixed costs. Once these are paid, any remaining contribution is profit.
Costs	The money a business spends in order to produce goods and services for its consumers. They can be classified as variable, fixed, direct, indirect, total, average (or unit) and marginal.
Cost plus pricing	The basis of a pricing decision. The costs of production are calculated and then a percentage mark-up is added to make sure a profit is made.
Direct costs	The costs which are allocated specifically to a product, machine or department in a business, and which will increase or decrease in relation to the output of that section. These include raw materials and labour costs.
Fixed costs	Those costs of a business, which remain unchanged at whatever level of output the business is producing at over a period of time. These include rent, depreciation and salaries.
Indirect costs	Those costs that cannot be directly identified with a particular cost centre in a business. The costs of energy, administration and security are examples.
Margin of safety	The number of units of production above the break-even point produced by a firm. Calculated by: Output – break-even point
Price	The element of the marketing mix that refers to pricing policies. Price is the market value of goods and services that are bought by consumers and firms.
Sales revenue	The income that a business receives as a result of selling its products. It is calculated as price multiplied by the quantity sold.
Variable costs	The costs that change directly with the output of a business. They are likely to include wages and raw materials.