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# Budget Concepts for Non-Financial Leaders

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# BUDGET CONCEPTS FOR NON-FINANCIAL LEADERS



By

Richard Grimes

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## COURSE OVERVIEW

We designed this course for the non-financial leader who wants (or needs) to understand how budgets are developed, the more common terms used in budget discussions, and how they are useful for planning future expenditures based on historical data.

We will show you how to select and collect the data needed to forecast expenditures for greater efficiency in resource allocation.

Additionally, there are many questions designed to stimulate your thinking or discussion with peers or your leaders. The more you engage in researching how these topics are addressed in your organization will go a long way to increasing your retention of the concepts and make it easier to participate in budgetary discussions in the future.

## LEARNING OUTCOMES

You will increase your value to the project or your employer as a leader if you understand and can apply these concepts that you will learn in this course:

1. The Need For A Budget
2. Important Topics To Consider When Developing A Budget
3. The Questions to Consider When Developing a Budget
4. Other Little Considered Topics for Developing a Budget
5. Why the Quality of Leadership Skills Must Be Considered When Developing a Budget
6. How To Develop a Budget Using Historical Data
7. How To Use Various Data Forecasting Methods and When
8. The Organization's "General Ledger": What It Is And Why You Should Know
9. How and Why To Use "Break Even" Points in Determining Equipment and Staffing Needs
10. Understanding And Applying The Concepts Of "Capacity" And "Forecasting"
11. Each Department's Role And Responsibility In Managing Their Share Of The Budget
12. Developing A Budget Monitoring Process

**Please note:** This course does not pretend to be a resource for financial professionals. It is designed for those who need to understand the broad "why" of budgets but not the details of "how". It will help leaders delegate non-critical financial tasks to subordinates and help develop their confidence so that more of the leader's financial workload can be shifted to them.

## BUDGETING BASICS



The dictionary defines budgeting *as “a plan or schedule that estimates the cost of living or operating during a certain time period”*.

What budgeting do you do in your personal life? How do you manage it?

What similarities do we expect to see in a business or government organization?

The budget year is called a “**fiscal year**” abbreviated **FY**. It normally runs 12 months but not always January to December. The fiscal year is broken into four, three-month quarters.

Two critical topics for any organization’s survival are **income** and **expenses**. What are typical sources of these with your organization?

### **INCOME:**

This is typically from the sale of your organization’s products or services in the private sector or, in the public sector, from tax revenues.

### **EXPENSES:**

There are three broad categories of expenses that you must understand:

#### **1. Fixed:**

The *predictable and unchanging* expenses during the fiscal year such as building leases; (or mortgage payments); software licenses; insurance premiums; perhaps utilities flat rate costs.

2. **Variable:**

*Variable expenses are unscheduled events and their related expenses* such as weather, acts-of-God, fleet vehicles in wrecks, government legislation raising compliance requirements and, thus, the cost of compliance.

The Y2K computer programming projects that many companies undertook were examples of variable costs since they hadn't planned for it and weren't sure how much the "fix" would cost (if they chose to do it.)

3. **Semi-variable: *Somewhat predictable change*** based more on "when" than by "how much" such as fleet fuel expense, seasonal overtime, or the "flu season".

### The Y2K History

The Year 2000 problem (also known as the Y2K problem, the Millennium bug, the Y2K bug, or simply Y2K) was a problem for both digital (computer-related) and non-digital documentation and data storage situations which resulted from the practice of abbreviating a four-digit year to two digits.

In the first half of the 20th century, well before the computer era, business data processing was done using unit record equipment and punched cards, most commonly the 80-column variety employed by IBM, which dominated the industry. Many tricks were used to squeeze needed data into fixed-field 80 character records. Saving two digits for every date field was significant in this effort.

In the 1960s, computer memory and mass storage were scarce and expensive. Early core memory cost one dollar per bit. Popular commercial computers, such as the IBM 1401, shipped with as little as 2 Kbytes of memory. Programs often mimicked card processing techniques. Commercial programming languages of the time, such as COBOL and RPG, processed numbers in their character representations. Over time the punched cards were converted to magnetic tape and then disk files, but the structure of the data usually changed very little. Data was still input using punched cards until the mid-1970s. Machine architectures, programming languages and application designs were evolving rapidly. Neither managers nor programmers of that time expected their programs to remain in use for many decades. The realization that databases were a new type of program with different characteristics had not yet come.

- [http://en.wikipedia.org/wiki/Year\\_2000\\_problem](http://en.wikipedia.org/wiki/Year_2000_problem)

For example, if we are a business with many vehicles and are not planning any major changes in fleet size or coverage area, we can estimate about what to expect this year for fuel. We know what we paid last year and that gas prices will probably increase mid-spring and decrease after Labor Day but we do not know specifically how much like we know the fixed cost of insurance premiums.



Also, we can expect an **increase in overtime** during vacation periods (we can estimate with some confidence how much); an **increase in electricity costs** during the summer when we run more air conditioning, or the “flu season” may **decrease employees** at work thus **driving up the cost of temps** if we use them and what kind we need: i.e., generalist or specialist temps like accounting professionals.

Why should organizational leaders like you be aware of their employer’s budget process?

[The more you understand the budget process, the better prepared you become to help develop and manage it. [This increases your value to the organization](#) and gives you a chance for career growth by allowing your manager to shift some of their budget development process off their shoulders and over to you.]



What issues or topics do you think should be included in preparing a budget? Why?

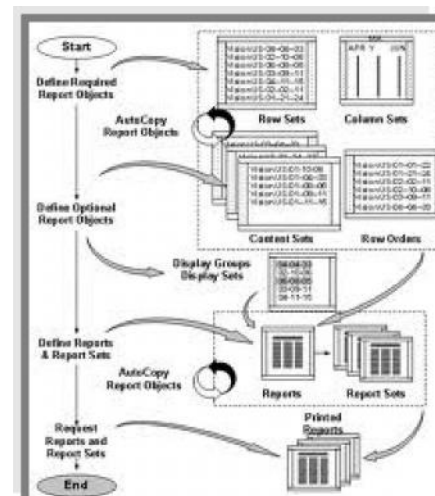
## THE “GENERAL LEDGER (G/L)”

It is the heart of an organization’s financial accounting system.

Not a single document but a *single system* of tracking all income and expenses relating to the organization. It contains many sub ledgers such as *Accounts Payable* and *Accounts Receivable*

All specific income or expenses eventually roll up to the G/L

- Auto expenses
- Insurance
- Payroll
- Supplies
- Cash sales
- Credit sales



## DEVELOPING A BUDGET - QUESTIONS



If a budget is a “a plan or schedule that estimates the cost of living or operating during a certain time period (page 6), what considerations - not just categories of income or expenses - must be included in the “plan” for the “certain time period”?

**Please take a few minutes and write in your answers.**

We think these are critical considerations that an organization must consider when developing a budget. Additionally, their leaders (and soon-to-be-leaders) at all levels should understand the process if they are expected to manage it through the upcoming year. Admittedly, some topics may seem to be non-conventional. What do you think?

1. The organization’s mission or purpose for existence.

What budgetary value is there in every leader and employee understanding his or her organization’s mission?

Think about the organization’s purpose for existence. If every employee doesn’t have a clear understanding of its purpose, it will be difficult to identify potential expenses that must be accounted for in the budget.

What expenses are associated with:

- a. Training employees to support the mission
  - b. To develop a marketing plan to tell the world about your organization
  - c. What special permits or licenses must it have?
  - d. Are their special insurance requirements associated with your organization’s purpose?
2. A clear, accurate, and unbiased understanding of where they (the department or organization as a whole) are now regarding (at least):

- a. How would you determine the amount of equipment and machinery available?
  - i. How would you determine its condition?
  - ii. How could you get line employees involved with equipment maintenance as a way to reduce expenses since reducing expenses is a major budgetary issue?
3. The quality of leadership skills from top-to-bottom.

Why would this be useful to know when preparing a budget?

*How would you determine the quality of the leadership skills?*
4. The current national and local economic conditions.

Why would this be useful to know when preparing a budget?
5. The general marketing plan or theme of the organization.

Why would this be useful for leaders at all levels to know when preparing a budget?
6. The availability and skills of their workforce.

Why would this be useful to know when preparing a budget?

How would you discover this?
7. The need to develop or maintain those skills (the workforce above) this fiscal year.

Why would this be useful to know when preparing a budget?
8. Their current levels of production capacity.

Why would this be useful to know when preparing a budget?
9. A clear, accurate, and unbiased understanding of where the employees want to be in 6, 12, 18, 24, 30, 36, 48, or 60 months in the future.
10. A clear business plan that is well communicated throughout the organization so every employee knows their role in helping achieve the future organizational goals.

## DEVELOPING A BUDGET – ANSWERS

These are our thoughts on a few of the budget questions above.

**1** The organization's mission or purpose for existence

What value is there in every employee understanding his or her organization's mission?

The more that an employee understands his or her role in their organization's mission means they can be more confident when making decisions that are not specifically covered in a procedure manual. This means they can act now instead of waiting for their leader to "get back to them". Acting now may conserve resources and reduce waste which impacts the budget. Also, it helps them understand the budget's priorities because the budget is what funds the activities of the organization.

**2** A clear, accurate, and unbiased understanding of where they are now regarding (at least):

a) How would you determine the amount of equipment and machinery available?

This can be a physical inventory.

b) How would you determine its condition?

Give it a "physical" and check every part of it, examine breakdown and repair records, or preventive maintenance records.

c) How could you get line employees involved with equipment maintenance as a way to reduce expenses?

Give them a sense of ownership in it. In the military, the ground crew looks at an aircraft as theirs and they only "let" the pilot fly it. Typically, the crew chief's name is on the aircraft just like the pilot's.

Ask yourself this question about line employees and their equipment: “What incentive do they have to keep the machine running and them working as opposed to letting it burnout, and they wait for its replacement?” If the reason is not very obvious, it may be something to discuss with that department’s manager.

- d) The quality of leadership skills from top-to-bottom.

Why would this be useful to know when preparing a budget?

We may have to invest in their professional development training to learn new skills; meet government or industry compliance initiatives; and maintain existing skills or licenses like many employers who reimburse this course for professionals wanting to maintain their professional credentials. Also, if they collectively seem unskilled, you can probably expect expensive employee turnover, potential employee vandalism or sabotage, and/or potential sexual harassment and discrimination lawsuits]

*How would you determine the quality of the leadership skills?*

Conduct an organizational self-assessment with your Human Resources Department regarding policies and procedures you have in place dealing with sexual harassment, discrimination, ethics, and exit interviews with employees that have resigned.

If there are no such policies, that alone indicates poor leadership because there are federal laws against doing those things. Exit interviews will give you a good snapshot of the organization if its leadership at various levels is chasing employees away.

- e) The current national and local economic conditions.

Why would this be useful to know when preparing a budget?

At the least, we will have to plan for more or less resources in relation to which way the economy goes that includes raw materials, skilled and unskilled employees, transportation expenses, expansion of facilities (or not), etc.

f) The general marketing plan or theme of the organization.

Why would this be useful for leaders at all levels to know when preparing a budget?

[Will our employees have the skills or knowledge to support that plan? Will they require any new training or equipment? For example, if the new plan is about “Zero Errors”, do we have the skilled workforce and equipment to support it?

g) The availability and skills of their workforce.

Why would this be useful to know when preparing a budget?

A local, well-educated, and trained workforce costs less than having to recruit them from elsewhere and pay their relocation expenses.

h) The need to develop or maintain those skills this fiscal year.

Why would this be useful to know when preparing a budget?

What kind of training (if any) will our workforce need to maintain their skills? Can we do it internally or have to bring in specialists from outside. How many have to be trained for compliance issues or are the minimum needed to **maintain status quo**. This is in contrast to what kind of and how much training is needed if we **want to grow this year**.

i) Their current levels of production capacity.

Why would this be useful to know when preparing a budget?

If we are at capacity and expect demand to exceed it, we will have to budget for more equipment, new staff, or overtime of existing staff. If we are below capacity, we may only have to deal with overtime to meet the demand.

**3** A clear, accurate, and unbiased understanding of where they want to be in 6, 12, 18, 24, 30, 36, 48, or 60 months in the future.

The line manager is in the best position to know the current skills and productivity of the existing staff. Therefore, he or she is in the best position to have a feel for what is needed by their department in terms of equipment, staffing, or skill levels to help the organization get where they want to be in the future.

The plan to get there requires budgeting. The more the department leader knows about the future expectations and the budgeting process, their contribution to the budget will be of a higher quality and the better they will be able to manage their share of the budget later.

- 4** A clear business plan that is well communicated throughout the organization so every employee knows their role in helping achieve the future organizational goals.

This is tied back to helping them prioritize their budget requests and expenditures if they know where the organization wants to go in the future. If they do not understand the organization's business plan (or at least their share of contributing to it), they cannot use their creativity and insight to bridge the inevitable gaps between plan and execution. They will feel like faceless ciphers that are kept in the dark and just told what to do. That is not a great foundation for motivation and productivity.

## THE ORGANIZATION'S MISSION OR PURPOSE



Why is it important that an organization have a clearly defined and understood mission statement?

If every employee does not know why their organization exists, its priorities, and core values - the *mission* - it is impossible for them to be as productive and supportive as they could

be. They become “clock watchers” with very little motivation or loyalty.

What is the mission or purpose of your organization?

How does (or would) knowing that help you do your job?

How would knowing the mission statement help in the budget process?

It would help you determine the *essential few* needs versus the *trivial many* that often appear in departmental budget requests. It is essential for prioritization of tasks.



## A CLEAR UNDERSTANDING OF WHERE WE ARE NOW

It is very easy to inspect the physical plant (the buildings) and equipment to determine their amount and condition.

However, it is more difficult to analyze *trends* that will help leaders get a better understanding of their department's current capacity so they can do intelligent *forecasting* for the next budgetary needs.



We will learn how to analyze existing data to:

- ▶ Identify trends for forecasting production (*production* can be making things such as consumer products or design drawings or providing services such as surveying or responding to RFPs.)
- ▶ Calculating break-even points for expenses
- ▶ Analyze workflows for improvement in efficiency, effectiveness, or productivity.
- ▶ Determining optimum staffing levels

## DETERMINING CURRENT PRODUCTION CAPACITY

Our ability to define current production capacity of goods or services results from a combination of several factors including (at least):

- 1) The quality of our new hire training programs that get new hires minimally productive in the least amount of time.

Why do we say *minimally*? Should we not want them to become as productive as possible before we put them on the production floor?

New employees in training are not as productive as they will be after they have “learned the ropes” of what your organization expects from them, what they can expect from it, the way you do things, the “network” of who to ask for help, and where to find everything needed.

Typically, this training also requires someone to conduct it. If the “trainer” is helping the new person get oriented to the organization, their normal job is not getting done. Therefore, the best approach is a specific training plan that focuses on the *least they need to know to become minimally productive as quickly as possible*.

The least-they-need-to-know approach must include safety, equipment operation, and documentation (if any) issues before they are turned loose to be productive. We do not want to take such a short cut in training that they could hurt themselves or others because we did not give them time to comprehend something. The best way to make sure they understand is to require them to demonstrate the understanding through performance or explanation.

This gets the trainer back to work quickly and the trainee gets to demonstrate what they can do as quickly as possible. Remember, they are on the payroll to be PRODUCTIVE, not to be trained.

Does your organization have an effective new-hire training program that gets new hires as productive as quickly as possible?)

If not, it is worth considering because it is difficult to terminate the employment of a savvy employee if they fail to perform some activity that you cannot prove you taught them to do.

Our company, Outsource Training Online.com can help you develop one.

- 2) The efficiency of our workflows.

Are we sure, we are getting the most out of our current production method before we think about asking for money to get new equipment or facilities? Do we know how to measure that efficiency?

- 3) Our interpretation of historical production data that helps us understand how we got to today's capacity and what we will need for the future.

What degree of confidence do we have in our historical data? Were we measuring the same items in the same ways then as we are now? If not, we risk comparing "apples and oranges" resulting in unreliable data.

- 4) The amount and condition of our production equipment.

The same comments we made back on page 10.

- 5) The space available and condition of our physical plant (the buildings)

There are many ways to determine current production capacity from creating a major project for extensive, in-depth analysis (called *Industrial Engineering*) to practical, common-sense methods of asking, "*Is there a way we can be more efficient with this without it becoming a big project?*"

This course will look at a few useful and easy methods of analyzing the current situation and reviewing available data before we make our budgetary recommendations for next year.

Remember, if you ask you leader for a new addition to your work flow that would increase productivity (equipment, floor space, a new hire), there is a good chance he or she may ask you, "*Before we get the new \_\_\_\_, how do you know you are getting the most out of the existing situation now?*"

This course will give you a few tips on effective ways to do your homework well enough beforehand to support your recommendations.

## EFFICIENCY OF OUR WORKFLOWS: CONDUCTING AN ANALYSIS

A simple workflow analysis can be conducted using the example in this section.

It is really nothing more than watching, listing, timing, and documenting the components of a workflow. The more times you observe and document the components in the process will give you a credible average that will strengthen your case.

Try to observe without being too obvious, though. People will sometimes work artificially harder if they think someone is watching them or giving them special attention.

(Take a moment to read about the Hawthorne Studies in the text box below.)

The Hawthorne Studies (or Hawthorne Experiments) were conducted from 1927 to 1932 at the Western Electric Hawthorne Works in Cicero, Illinois (a suburb of Chicago), where Harvard Business School professor Elton Mayo examined productivity and work conditions.

These experiments started by examining the physical and environmental influences of the workplace (e.g. brightness of lights, humidity) and later, moved into the psychological aspects (e.g. breaks, group pressure, working hours, managerial leadership).

The major finding of the study was that almost regardless of the experimental manipulation, worker production seemed to improve continually. One reasonable conclusion is that the workers were happy to receive attention from the researchers who expressed an interest in them.

For example, if step #6 (see the comments on the next page) causes too much waiting time, your budget request for next year may include a request for a new printer. Remember though, you must be able to show that the cost of the time saved in wages and materials, if any, would be more than the cost of the new printer.

Department: Accounts Payable Date observed: June 23-24

Job Observed: Reimbursing expense reports Observer: Logan Grant

### OBSERVATION CODES

W = Working (doing what they are paid to do)    M = Moving from work station  
 I = Idle (any time waiting or not working)        F = Filing (Or storing something)

What comments can be made about improving the workflow based on this example?

Step #	Describe the Step	Code	Distance in feet	Time in min sec	Comments
1.	Goes to incoming mail area to get expense reports and returns to work station (desk)	M	70' r/t	0:45	
2.	Opens envelope, organizes receipts.	W	-	1:15	
3.	Notices some expense code fields are empty, looks up proper codes.	W	-	2:10	
4.	Completes authorization to reimburse form on PC. Sends to shared printer.	W	-	0:15	
5.	Goes to shared printer to get form.	W	25	0:10	
6.	Waits while admin assistant finishes printing new parking policy. (Admin assistance goes to get more paper.)	I	60' r/t for admin	2:15	
7.	Takes printed form to boss for review and approval.	M	45'	0:20	
8.	Boss on the phone – clerk waits.	I	-	3:15	
9.	Goes to copier to make 2 copies of approved form.	W	35'	0:25	
10.	Copier toner low. Must find new cartridge and refill.	W/I	-	3:50	
11.	Makes copies and back to desk.	W	35'	0:20	
12.	Cuts reimbursement check and places it into I/O envelope.	W	-	2:00	
13.	Starts at step 1 again.				

Summary: Time (minutes) for 1 complete work cycle: = **17:00**

## COMMENTS ABOUT THE WORKFLOW

Step #	Describe the Step	Code	Distance in feet	Time in min:sec	Comments
1.	Goes to incoming mail area to get expense reports and returns to work station (desk)	M	70' r/t	0:45	Bring mail to them?
2.	Opens envelope, organizes receipts.	W	-	1:15	
3.	Notices some expense code fields are empty, looks up proper codes.	W	-	2:10	Print most common codes on the form? On-line reference?
4.	Completes authorization to reimburse form on PC. Sends to the shared printer.	W	-	0:15	Put a printer at her desk?
5.	Goes to the shared printer to get form.	W	25	0:10	
6.	Waits while admin assistant finishes printing new parking policy. (Admin assistance goes to get more paper.)	I	60' r/t for admin	2:15	Store paper at printer? Dedicated printer for accounts payable?
7.	Takes printed form to boss for review and approval.	M	45'	0:20	Authorize clerks to OK up to a threshold?
8.	Boss on the phone – clerk waits.	I	-	3:15	
9.	Goes to copier to make 2 copies of approved form.	W	35'	0:25	
10.	Copier toner low. Must find new cartridge and refill.	W/I	-	3:50	Check all copiers at end of day for toner and paper to be ready for next day?
11.	Makes copies and back to desk.	W	35'	0:20	
12.	Cuts reimbursement check and places it into I/O envelope.	W	-	2:00	
13.	Starts at step 1 again.				

What suggestions do you have for improvement of the workflow?

Why would we include a workflow analysis in a course about understanding budgeting?

We must be sure we are getting the most out of existing conditions before we make a budget request for more. **Our credibility is at stake and, once damaged, it is very difficult to regain.**

If you implemented these changes to the workflow and the cycle time was now 14 minutes, how much time have you saved? (3 minutes)

What % of time savings is this? \_\_\_\_\_% (It was 17 minutes, is now 14 minutes. It takes 3/17 less time or is or 17.6% more efficient from a time only perspective.)

If your organization predicted a 3% increase in wages expense next year, what could this percentage of timesavings mean in relation to that expected wage increase?

## THE BREAK EVEN ANALYSIS

A “break even” analysis is probably nothing new to you.

If you ever got tired of getting your old car repaired or towed home and decided to buy a new one, you made a “break even” analysis although it may not have been totally based on economics.



Or you may have thought, “instead of renting this \_\_\_\_\_ (insert anything “rentable” here), I’ll probably save money if I just buy one!” There is a mathematical way to determine when it is smarter to pick one alternative over another. That is what we will learn next.

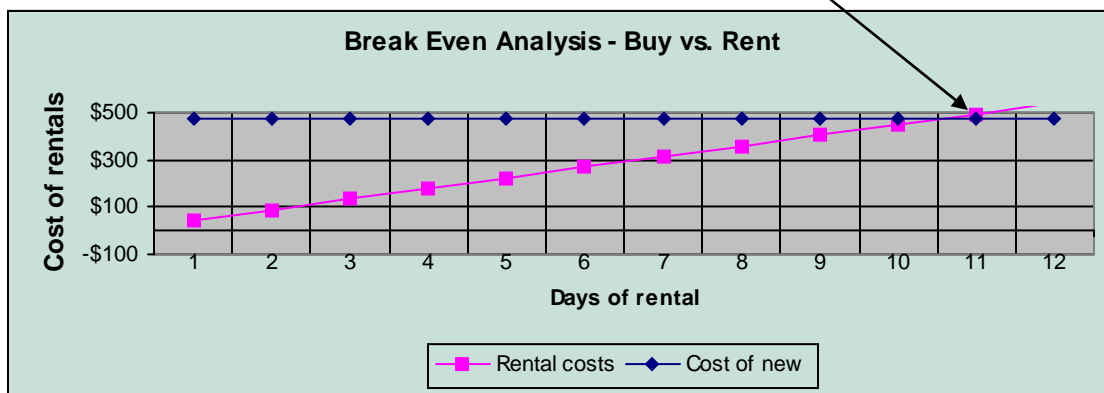


Suppose your department is going to start making a product that requires monthly steam cleaning of the production floor. You can either rent a steam cleaner for \$45/day or buy a new one for \$475.

You estimate you will not need it more than a day at a time when you rent it.

However, you realize at some point it will be smarter to buy the machine than keep renting it.

**QUESTION: When does it become smarter to buy instead of rent?**





## BREAK EVEN EXERCISE



You are the manager of the production department and have been given the required production schedule below. You have permanent employees who can produce 150 items per hour.

Part-time employees are also available but they typically produce 70% of what you can get from the permanents.

Permanents cost \$165 day and you must pay them for full-day periods only. Part-timers cost \$16 per hour. They must work in whole-hour increments.

**Fill in the rest of the data table.**

Required Production Amounts	FT hourly production = 150		PT production @ 70% = 105		
	FT/Hrs Needed	Cost to produce this amount	70% PT/Hrs	PT Full Hours	Cost to produce this amount
		\$165/day			\$16/hr.
400					
600					
800					
1000					
1200					
1400					
1600					
1800					
2000					
2200					
2400					

Why would it be useful to do a staffing break-even analysis as you prepare your budget requests for next year? *It would help you know when to bring in temps, plan for overtime, or hire full-time employees.*

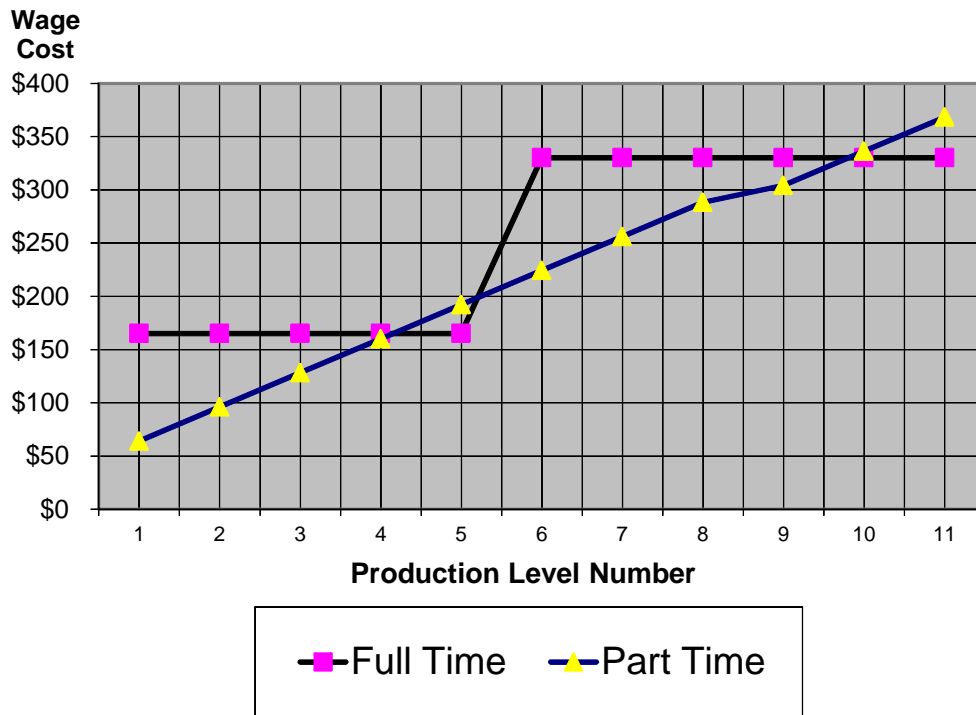
This is what our data looks like.

Required Production Amounts	FT hourly production = 150		PT production @ 70% = 105		
	FT/Hrs Needed	Cost to produce this amount	70% PT/Hrs	PT Full Hours	Cost to produce this amount
		\$165/day			\$16.00/hr.
400	2.7	\$165	3.8	4	\$64.00
600	4.0	\$165	5.7	6	\$96.00
800	5.3	\$165	7.6	8	\$128.00
1000	6.7	\$165	9.5	10	\$160.00
1200	8.0	\$165	11.4	12	\$192.00
<b>This is the end of an 8-hour shift for a full-time employee.</b>					
1400	9.3	\$330	13.3	14	\$224.00
1600	10.7	\$330	15.2	16	\$256.00
1800	12.0	\$330	17.1	18	\$288.00
2000	13.3	\$330	19.0	19	\$304.00
2200	14.7	\$330	21.0	21	\$336.00
2400	16.0	\$330	22.9	23	\$368.00

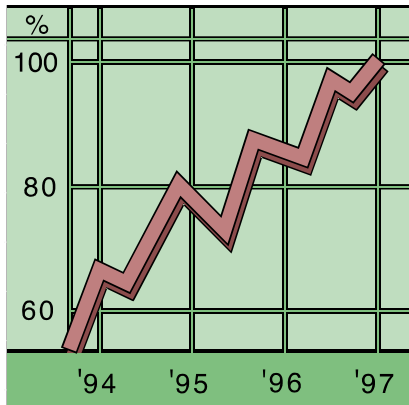
This table to the right summarizes the full-time and part-time analysis. The graph below comes from this table. You can see that part-time is less expensive up to production level #4. (\$165 vs. \$160) Then PT is more expensive until production level 6. It remains less expensive until production level 10 (\$330 vs. \$336)

Production	Level	FT	PT
Levels	Number	Wages	Wages
400	1	\$165	\$64.00
600	2	\$165	\$96.00
800	3	\$165	\$128.00
1000	4	\$165	\$160.00
1200	5	\$165	\$192.00
<b>This is the end of an 8-hour shift for a full-time employee.</b>			
1400	6	\$330	\$224.00
1600	7	\$330	\$256.00
1800	8	\$330	\$288.00
2000	9	\$330	\$304.00
2200	10	\$330	\$336.00
2400	11	\$330	\$368.00

## FT vs PT Production Break Even Analysis



## MEASURABLE FORECASTING METHODS



We will look at some simple but powerful methods of making future estimates based on past data analysis: we call this *data forecasting*.

Effective measurable forecasts are based on the wise selection of the best methods of analyzing past data while non-measurable predictions are usually “best guess” thoughts based on experience and educated opinion.

We will look at four prediction methods and you will quickly understand when to use each.

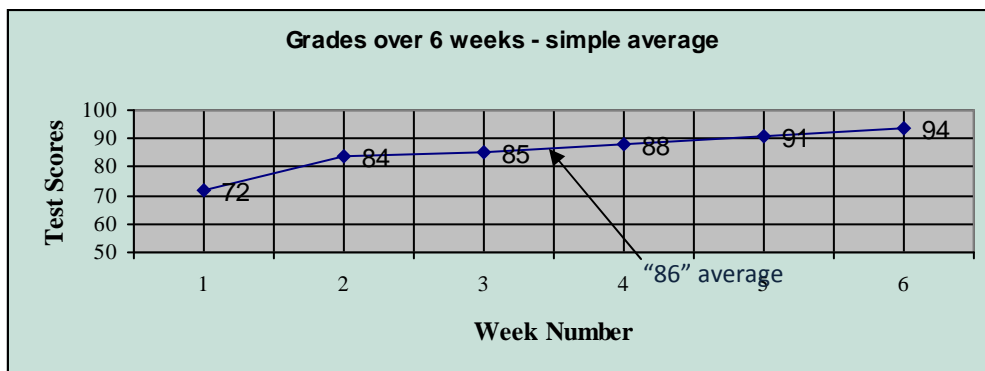
### SIMPLE AVERAGE (“SA”)



This is what we used in grade school to determine how we would do on the next report card. Although the report card was in our future, it only told us about our past.

For example, if we received these scores on our weekly tests, 72, 84, 85, 88, 91, and 94 over the past six weeks, we would add them up (514), divide by 6 (the number of scores), and expect an average grade of 86 (85.66) on our report card.

Look at our scores. Do you see a trend over the past six weeks? What is it? (Slowly getting better – higher scores)



Look at the increasing trend you see emerging from the past 6 weeks.

Let us assume this trend continues into the 7<sup>th</sup> week. What score do you expect to see on the seventh weekly test?

(We expect – **not a guarantee** - a score of “97” because the past five have been 3 points better than the one just before it.)

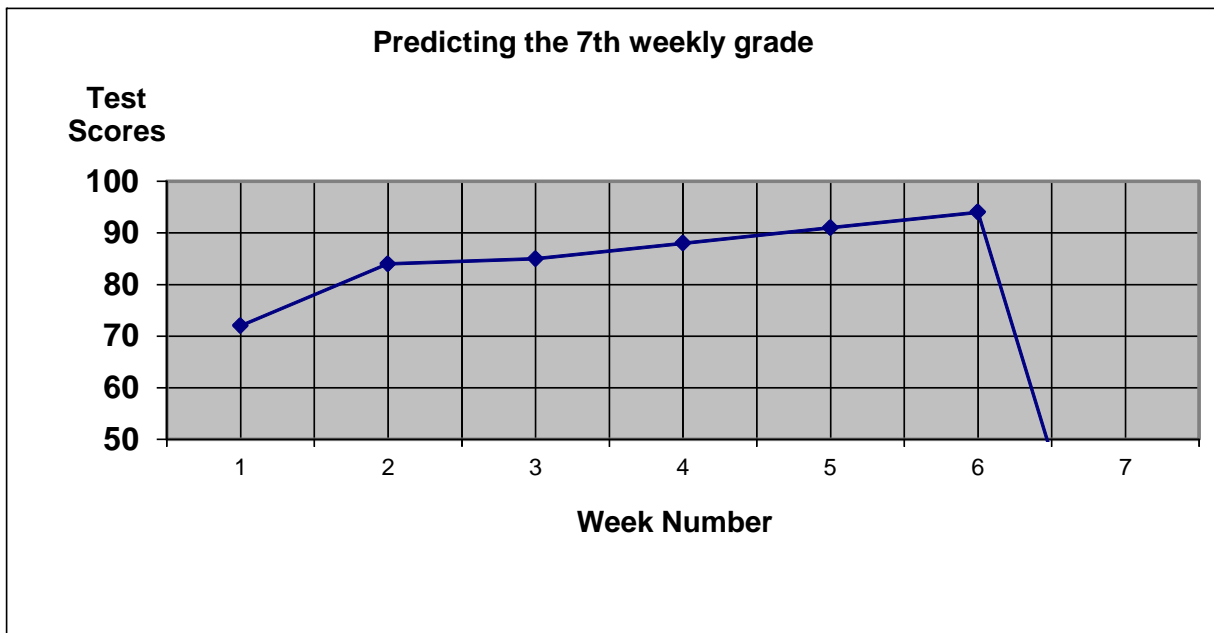
How does it compare to the simple average?

(The expected score of 97 based on this trend is 11 points higher than the average.)

Do you think the simple average will be a good predictor of what to expect next week? (No)

Why?

(Because it only averages all the numbers, it does not consider the human element of improvement making each week’s score better.)



## SIMPLE MOVING AVERAGE ("SMA")



Each week that goes by means that our test scores have gotten better.

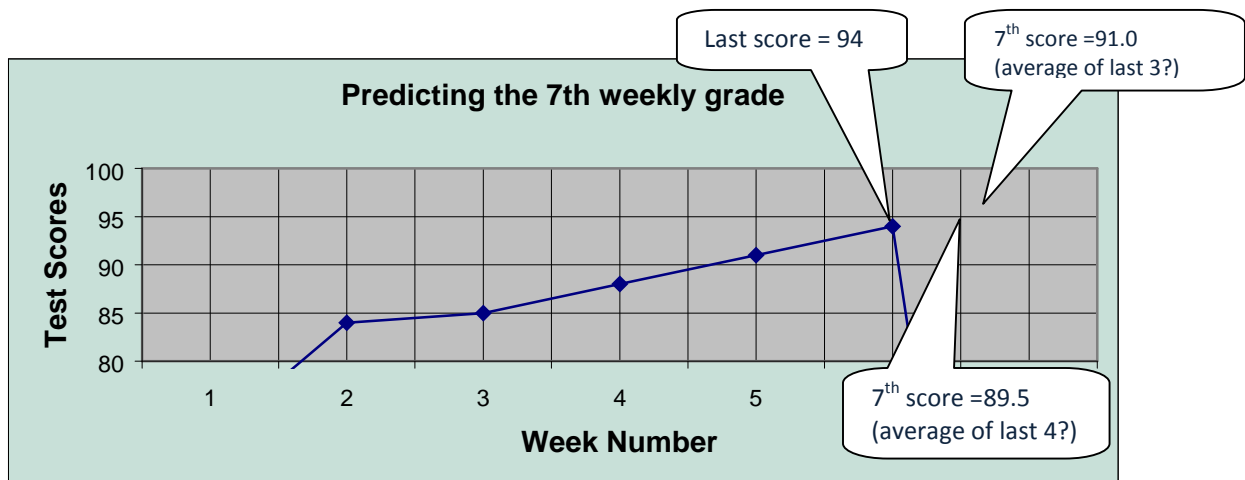
Instead of averaging the entire period to include the “ancient history” of six weeks ago, maybe we should consider the more recent scores because they seem to have more in common with where we are today instead of how we were six weeks ago.

If we just count the last 2 scores, we may not have enough for a fair sampling of test scores. Averaging three will be better. If we average the last four, are we going too far back? There is no way to be certain whether three or four are better. We will try them both.

Our last four scores from the most recent have been 94, 91, 88, and 85. The average of the last 3 is **91.0**. The average of the last 4 is **89.5**.

Since our last score was 94 and the trend shows that we are improving steadily, has the moving average score helped our prediction for next week’s score? (Yes)

Why? (It is because we are expecting it to improve in the same amount. Realistically speaking, we are assuming that all of the conditions that produced the previous increases are present in the last one. This assumes the test taker studied at least as much as before, they were rested, the material was not more difficult than the previous, etc. All of these are variables which can affect the outcome in the real world.)



## WEIGHTED MOVING AVERAGE (“WMA”)

We will leave the prediction about the 7<sup>th</sup> test grade alone for a few minutes and recall another aspect of grade school, the dreaded “SEMESTER PROJECT”.

The teacher would always say something like, “The semester project is very important and your score on it will be weighted 4 times as much (or some amount that she decided) in relation to your test grades”.

This means that if you received a 93 on the semester project, she would count it as four 93’s when she figured your semester grade.

Suppose your test grades were the six we used back on the “simple average” topic on page 27 and we had an average of 86. Now she adds 93, 93, 93, and 93 to that (*the actual score of 93 you received repeated four times to give it a weight of 4 times*) which brings your semester score total to 886. (72, 84, 85, 88, 91 and  $94+93+93+93+93 = 886$ )

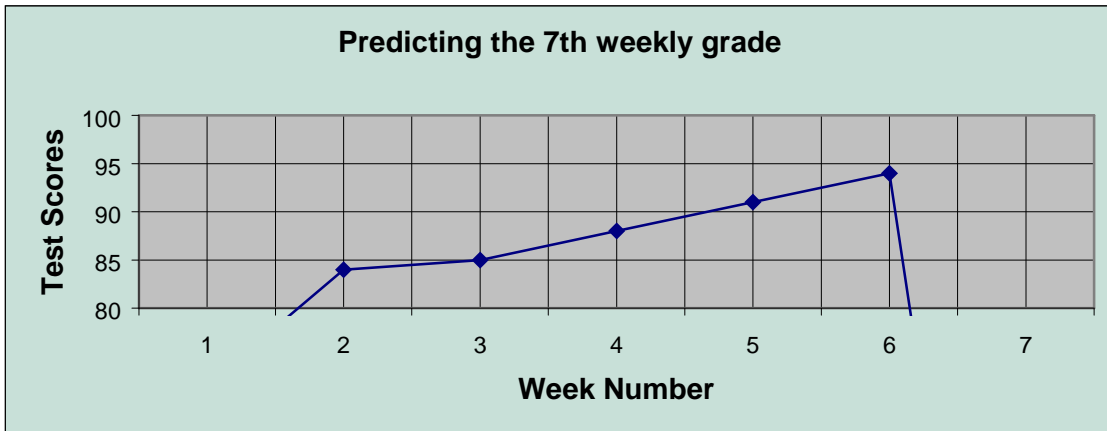
If you divide the semester total score of 886 by 10 scores (*the six test scores plus the project score repeated four times*), your semester average will be **88.6**.

Compare this to your semester average of six tests alone that was **85.6**

You can see how the WEIGHTED score pulled the average higher from 85.6 to 88.6.

We will use this same “weighted” concept that pulled our semester average higher in predicting what our next test score will be. Soon, we will apply this same model to collecting data for budget preparation.





We see that our weekly test scores have been improving steadily. So, if we want to add a weighted number into our calculation for the future, we would be smart to use the latest number (“94”). We can add it into our calculation as many times as we want. There is no “best number” of times you should add a number for proper weighting.

Look at this model to see what we mean.

Average	EXTRA 94'S	1	2	3	4	5	6	7	8	9	10	11	12
85.67	0	72	84	85	88	91	94						
93.55	104	72	84	85	88	91	94	94	94	94	94	94	94
92.33	24	72	84	85	88	91	94	94	94	94	94	94	94
89.83	6	72	84	85	88	91	94	94	94	94	94	94	94

The shaded scores are the first six tests.

This is how the prediction for the next test score changed as we added different weights of 94's to the calculation.

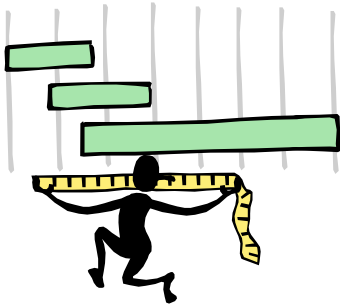
We added this amount of extra 94's to our calculations to show you how the average changes with more higher grades “weighing” the average.



You can see that the more times we include another “94” to add weight to the calculation, the average increases slightly. You will have to decide through experience how many times you want to add a “weight” to your calculations.

Our weighted prediction for our next test score ranges from 85.67 – 93.55.

## CHANGE MEASUREMENT AVERAGE (CMA)



Another method we can consider for use in predicting what our next grade will be is *Change Measurement Average*.

This is used if we are confident that a trend that we have seen in the recent past will continue into the next month.

Let's look back at our grades to see how this works.

Test #	1	2	3	4	5	6
Score	72	84	85	88	91	94
Change from prior		12	1	3	3	3
Average change =	4.4					

We added the 5 change amounts and found their average to be 4.4.

We had 6 test scores but only divided by 5. Why?

(We divided by 5 because there were 5 changes between the 6 scores.)

If our grades have changed *an average of 4.4 points better* on each test, **we can add that average change to our last test score** and predict the next test score.

We add 4.4 to the last score of 94 and get a prediction of 98.4. (We round that down to 98.)

## STOP AND REVIEW

Take a few minutes to consider the value of each forecasting method in your daily work. Consider when it is best used and when it is not useful.

Forecasting Method	Useful for this..	Not useful for this..
Simple Average		
Simple Moving Average		
Weighted Moving Average		
Change Measurement Average		

## REVIEW

This is a review of the forecasting methods. Plot the data on the graph.

### Exercise A.

**Directions:** Follow the directions for creating the graph, computing the forecasts, and answering the questions for the situation below.

The Accounts Payable Department has been processing payment accounts for 12 months. You are the manager and must do forecasting to help make decisions about staffing and equipment purchase for the next budget cycle.

#### Number of New Accounts Processed

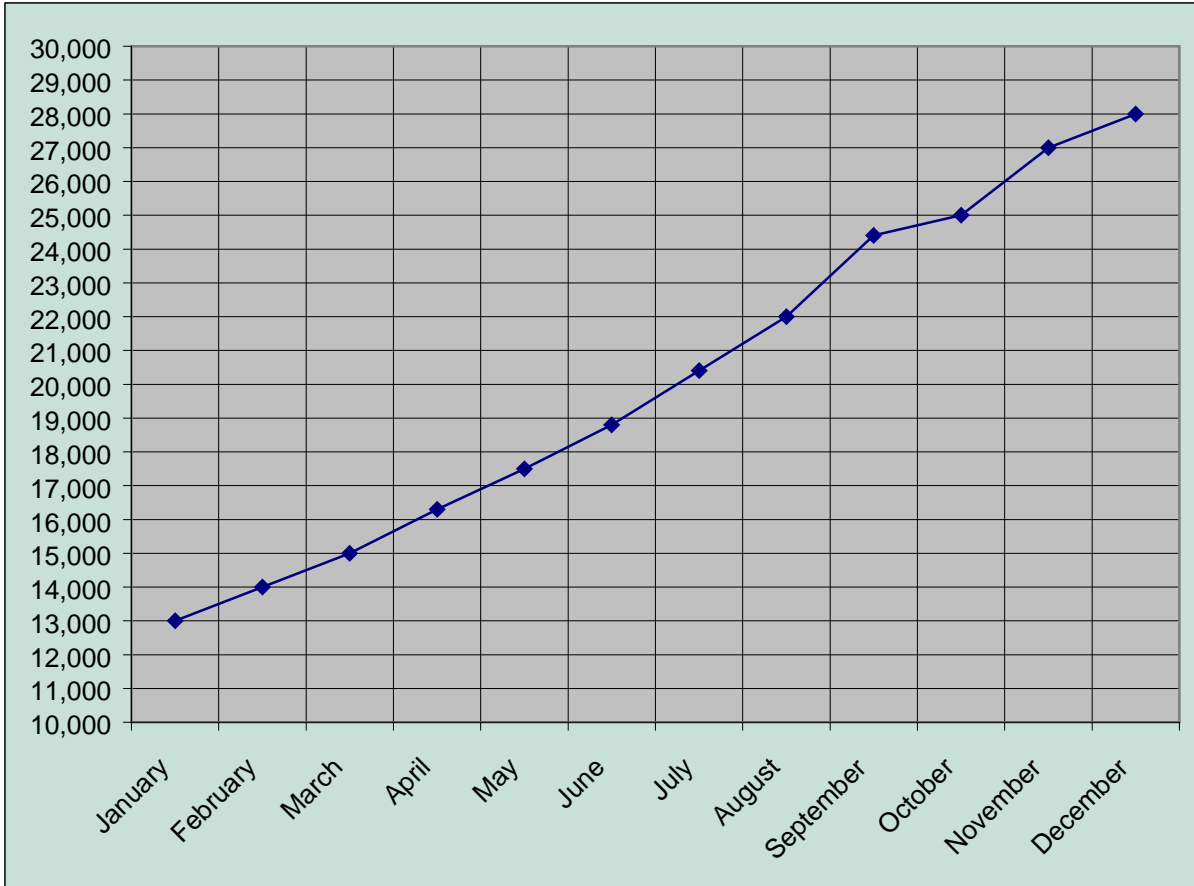
There is a grid on the next page. Use it for this exercise.

- 1 Enter the data from the table into the grid.
- 2 **Forecast the predicted volume for January of the New Year using:**

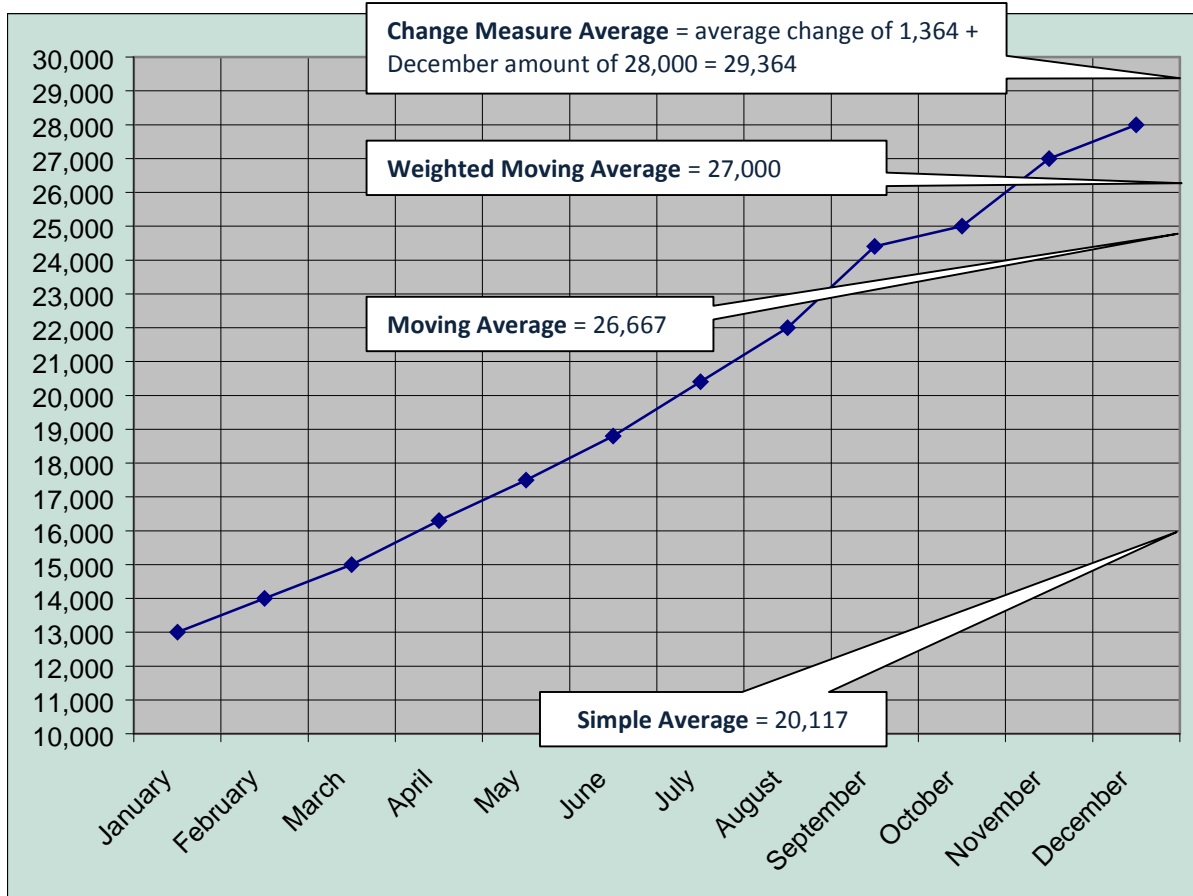
- a) **Simple Average (SA)** of the previous 12 months
- b) **Moving Average (MA)** (use the last three months)
- c) **Weighted Moving Average (WMA)** for the last three months (use 5x for the most recent month, 4 x for the next most recent and 2 x for the most distant of the last three months.)
- d) **Change Measurement Average (CMA)** using all 12 previous months

January	13,000
February	14,000
March	15,000
April	16,300
May	17,500
June	18,800
July	20,400
August	22,000
September	24,400
October	25,000
November	27,000
December	28,000

We have placed the data on the grid for you. Please use it to plot your answers for A-D above.



Here is where your answers should be.



Look at the results plotted along the “January of New Year” vertical line. Do you see why the “*Change Measurement Average*” is the best predictor for January based on the steady growth we have seen during the past year?

Which of these measurements would do the most for your credibility if you were submitting data for next year’s budget based on last year’s data?

The “*Change Measurement Average*” because that is closest to a line extended along the past year data line into January of the New Year.

## Exercise B.

Using the data table below, what would you forecast for **February 2013** using:

- **Simple Average** = \_\_\_\_\_
- **Moving Average** (most recent 3 periods) = \_\_\_\_\_
- **Weighted Moving Average** (using 4x, 3x, and 2x for the most recent 3 periods) = \_\_\_\_\_
- **Change Measure Average** = \_\_\_\_\_

Before you start, what data will you examine?

Look at the data table first *vertically* within each of the four years. You see that every year starts low in January and grows steadily until a peak in December. Then it starts low again in January of the next year.

Next, look at the data *horizontally* for the same month across years. The data

growth *across the table* for the same month of each new year grows slightly while the data vertically within a year grows rapidly.

What data will you select to predict the February 2013 amount:

- going across all four previous Februarys
- or the entire 48 months of the previous four years?

The four Februarys across the table have more in common for predicting the fifth February in 2005 than by going through all 48 months.

**Note:** Exercise A only used data within the year that increased every month. We did not have the benefit of the history shown in this table to see that it peaks in December and starts low again the following January. If we had known this, our *Change Measurement Average* prediction strategy would have used the three previous Februarys, not the three previous months.

	2012	2011	2010	2009
January	13,000	12,500	12,250	11,750
February	14,000	13,375	13,500	12,990
March	15,000	14,680	14,500	14,000
April	16,300	16,250	16,000	15,950
May	17,500	17,425	17,250	17,000
June	18,800	18,475	18,395	18,300
July	20,400	19,950	19,750	19,500
August	22,000	21,780	20,244	20,100
September	24,400	24,344	24,200	24,100
October	25,000	24,350	24,300	24,200
November	27,000	26,850	26,700	26,000
December	28,000	27,900	27,400	27,000

## PREDICTING SEASONAL TRENDS



We look at predicting seasonal trends in a similar way that we look at predicting our next grade on a test. We will use the holiday shopping season as an example.

Instead of looking at the previous months of this year to predict what kind of a holiday season we can expect, we will look at the *previous holiday seasons over the past few years* to make a prediction.

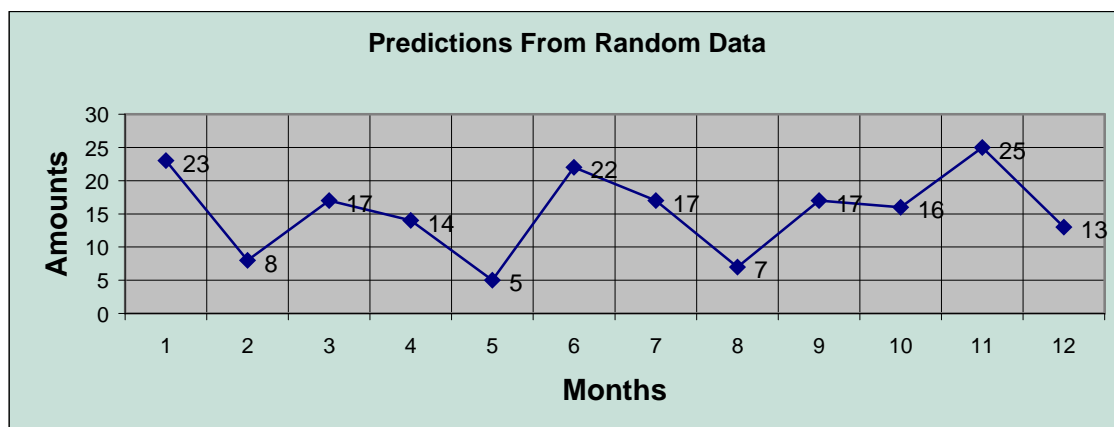
There are conditions outside of our control, of course, such as the economy in general, the weather, and possible shortages of a particular item that we must always consider in addition to the pure math data of past seasons.

The point we want to make here is that we compare similar data when making a prediction of a future measurable event. That is why we compare similar previous holiday seasons instead of previous months on this year's calendar.

## MAKING PREDICTIONS WITH RANDOM DATA

Sometimes we may be asked to make a prediction when there is no discernable pattern to the past. What analysis measurement strategy of this past data would you use to make a prediction for the 13<sup>th</sup> month from this chart below?

[None! The data are too random to make a credible prediction using any method. Do not let anyone put you in a position where they expect you to make a credible prediction from random data!]





## MONITORING YOUR DEPARTMENT'S BUDGET

It is easy to monitor your department's budget throughout the year using "date math" if you have access to a spreadsheet application such as Microsoft Excel.

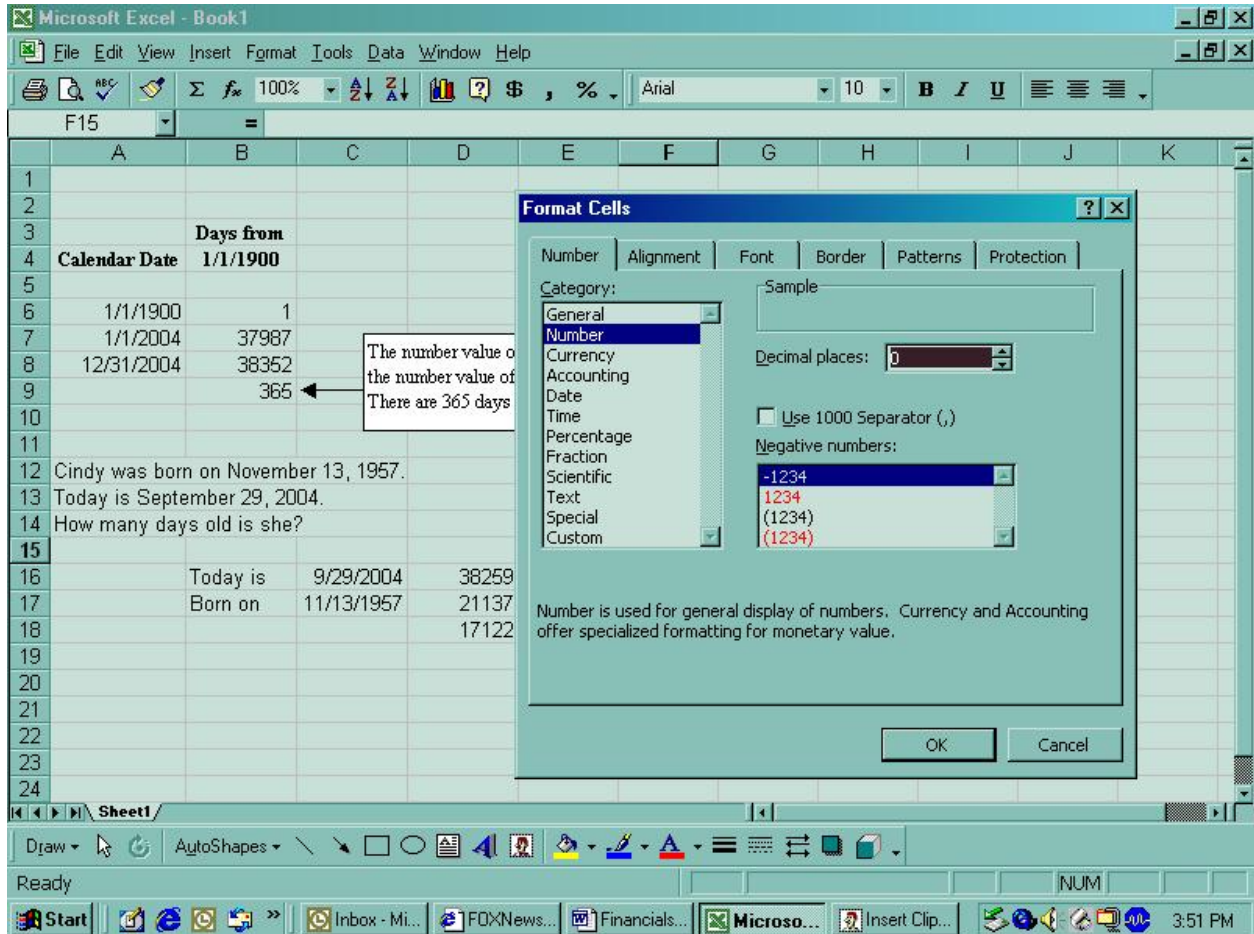


Here is how "date math" works. The spreadsheets electronically count the number of days that have passed since January 1, 1900 – the century in which computers were invented.

If you know the "date number" – the number of days since January 1, 1900 – of the date at the beginning of a period and the "date number" of the date at the end of the period, you can subtract the earlier date from the later date to discover how many days have transpired.

	Days from				
Calendar Date	1/1/1900				
1/1/1900	1				
1/1/2004	37987				
12/31/2004	38352				
	365				
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">                     The number value of 12/31/2004 (38352) <u>minus</u> the number value of 01/01/2004 = 365.                      There are 365 days in the year 2004                 </div>					
<b>A house was completed on November 13, 1957.</b>					
<b>It burned down on September 29, 2004.</b>					
<b>How many days old was it?</b>					
<b>How many years old was it?</b>					
	<b>Burned down on</b>	<b>9/29/2004</b>	<b>38259</b>	} ← <b>Date numbers</b>	
	<b>Finished on</b>	<b>11/13/1957</b>	<b>21137</b>		
			<b>17122</b>	<b>days old</b>	
	<b>Years old = days/365 =</b>		<b>46.9</b>		

Change a date entry you made into a cell by formatting the cell with the “number” format and selecting “0” decimal places.



## BUDGET MONITORING EXAMPLE

The Mail Services Department had a budget in 2004 of:

- ✓ \$450,000 for regular wages;
- ✓ \$25,000 for overtime during year-end mail outs;
- ✓ \$243,000 for transportation costs (courier vehicle fuel and maintenance);
- ✓ \$1,430,000 for postage.

The department manager asked the Accounting Department to send monthly updates to her of what has been spent in these categories. Here is the situation as of August 31, 2004:

1/1/2004	37987	"Date number" for the beginning of this budget period	
8/31/2004	38230	"Date number" for 8/31/2004	
	243	The number of days from 1/1/2004 until 8/31/2004	
	243	Days have transpired this year	
	365	Days in this year	
	67%	The % of the year that has passed	
	33%	The % of the year remaining	
		<b>Actual Balance Remaining</b>	<b>Proportional Balance</b>
			Calculate your budget status to see if you are ahead or behind and by how much \$ and %.
		<b>8/31/2004</b>	<b>Bal on 8/31/04</b>
Regular wages	\$450,000	\$103,452	\$150,411
Over Time	\$25,000	\$22,758	\$8,356
Transportation	\$243,000	\$62,357	\$81,222
Postage	\$1,430,000	\$360,450	\$477,973

What do these "proportional" numbers tell us about our department's budget as of 8/31/2004?

They tell us where we should be 'proportionally' which assumes a steady use of resources in each category. Regular wages, transportation, and postage *may* be predictable assuming no mergers or major changes have occurred.

"Overtime" is less predictable because that has to consider the flu season, vacations, and acts-of-God, etc. These items are usually not predictable enough to rely on a proportional estimation.

When is it useful to use a “proportional” analysis of your budget?

Only when you are confident of a steady use of resources or a steady production rate.

When is it not useful to use a “proportional” analysis?

When you are less confident of steady trends such as the severity of “flu season” and how much overtime you will need; how long it will take for your crew to master the new equipment; or estimating a new type of project that you have never done before.