Basic Business

Projects.

Projects.

You need to produce a portfolio of evidence to show how you applied your skills and understanding to an engineering project. It should include:

- Logbook of what you have done while carrying out your project including:
  - Who you spoke to.
  - Meetings you were involved in.
  - The outcome of your project.
  - Suggestions for improvement.
  - Verbal and written presentation.

Projects.

Standard ways of working.

- Plan your work to produce what is required to given deadlines.
- When amending software or configuration files save work regularly, particularly previous versions.
- Use file names that are sensible and that help to remind you of the contents.
- Store files where you can easily find them in the directory/folder structure.
- Keep a log of any ICT problems you encounter and how you solve them.

Projects.

Standard ways of working.

- Keep information secure (e.g. protection from theft, loss, viruses, fire).
- Protect confidentiality (e.g. prevention of illegal access to medical or criminal records).
- Observe copyright laws (e.g. not using the work of others without permission).
- Keep dated backup copies of files on another disk and in another location.
- Evaluate your work and suggest how it might be improved.

Projects.

Standard ways of working.

- Proof-read your products (on screen) to ensure accuracy and economic use of material.
- Work safely and recognise all of the health and safety legislation that applies.

Handout sheet ICT_SWW.doc

Projects.

The 80 , 20 rule

and

other hints.

Projects.

- Remember the 80 / 20 project rule.
- With most Projects the Documentation take 80% of the time with 20% being used for developing the actual project.
- With the actual project 80% of the work is usually completed in 20% of the time. It is the last 20% of the work that takes 80% of your effort.
- **A Project that is not planned, plans to fail.**
- Nearly all projects throw up some unexpected problem that takes a significant amount of time and effort to resolve. (Always leave some slack)

Projects.

Design Tools

Design Methods

- Black Art or Bottom Up Design.
- Flowcharts and Block Diagrams.
- HIPO Hierarchical Input Process Output.
- Top Down Design (Decomposition).
- Data Centered or Data Focused Design .
- SSADM Structured System Analysis and Design Methodology (or Jackson Method)
- YOURDON
  - Context, State Diagrams, Pseudo Code.
- UML Unified Modeling Language

Project Specific.

Project Specific.

- Identify what you want to do
  - This gives you the Project proposal.
- Planning and preparation
- Initial ideas
- Develop a final design
- Implement the design
- Test the design
- Report on your project

Project Specific.

- The Project Proposal will contain :-
  - What it is you want to do.
- The Project Proposal may also contain :-
  - The Project Title.
  - Name/s of Customer/s.
  - Any significant Budget constraints.
  - Any significant Time constraints.
  - Any special Resources that are needed.
- The Proposal **MUST BE AGREED** before you start working on the Project.

Project Specific.

- Planning and preparation:
  - Find a customer
  - Work out what the customer wants
  - This is the Customer Specification.
  - Gain your supervisor's approval
  - Work out what tasks need to be carried out
  - Work out how much time is needed for each.
  - This is part of the Feasibility Study.

Project Specific.

- Initial ideas :
  - Convert the customer requirements into a technical specification.
  - Think of different ways of solving the problem
  - Work out two or three feasible ways of solving the problem
  - Chose the best way of solving the problem.
  - Produce a plan of your project.
  - This is the remainder of the Feasibility Study.

Project Specific.

- Develop a final design :
  - Work out the details of the design.
  - Produce engineering drawings and specifications.
  - Select materials and components.
  - Order any materials and components which are not immediately available.
  - Produce the test procedures from the specification.

Project Specific.

- Implement the design :
  - Build the design or solution to the problem.
- Test the design:
  - Produce a test plan
  - Test the design
  - Fault find and make it work
  - Work out how to improve the design.

Project Specific.

- Report on your project:
  - Write a report
  - Produce illustrations for the report
  - Word process the report
  - Prepare to give a presentation
  - Give a presentation to your class or supervisor.

Documentation.

Documentation.

- Project Documentation should consists of :-
- A Project Requirement Specification.
- A Project Log.
- A Feasibility, Risk and Cost analysis study.
- A Resources, Allocation Plan (Gantt Chart).
  - Time, Materials, Delivery, Milestones
- A Full set of Test procedures and Results.
- The Final Project Outcome.
- A Project Report (with conclusion).

Documentation.

- Programme Documentation consists of :-
- A Overall Specification consisting of :-
  - A Full customer requirements specification.
  - A full functional description which may also contain :-
    - Flowcharts. Block diagrams.
    - Pseudo code. State diagrams.
    - Decision tables. Structure charts (for data areas).
  - Specification for all Input and Output requirements.
- A Fully Modular Commented Programme Source.
- A Full set of Test procedures (System and Module).
- A Full set of Test procedure Results.

Documentation.

- The Project Report should consist of :-
  - Title Page followed by an optional Abstract
  - System Design and used Methodology
  - System Specification
  - Project Plan
    - Project Activities, Project Evaluation
    - Risk Analysis, Decision Analysis, Cost Analysis
  - Module Design (as appropriate)
  - User interface
  - System testing
  - Conclusion
  - References and Appendix

Documentation.

- Programme Documentation should consists of :-
  1. A programme introduction section.
     (**Why**) do we need the programme.
  2. A customer specification and requirements.
     (**What**) does the customer require or need.
  3. A design plan.
     (**How**) are we going to implement the requirements.
     (**When**) are we going to complete.
  4. A programme description which includes :-
     Resources used, calculations etc (all the **Details**).

Documentation.

- Programme Documentation should consists of :-

  5. A fully commented modular programme.
  6. A set of test procedures defining.

     (**How**) are the tests are to be performed.

     (**Why**) are the tests are needed

     (**What**) are we checking for.
  7. A set of test results showing.

     (**What**) has happened **and**

     (**Why**) did it happen.
  8. A final programme report and conclusion on how requirements and specification were met.

Documentation.

- Within a document it is often necessary to define "**Data Structures**" in detail.
- The definition is often called a Data Template and the following Syntax is in common usage.
  - **<item>**
    - Item enclosed in angle brackets is a single entity.
  - **[item]**
    - Items enclosed in square brackets are optional
  - **{item 1 ¦ item 2 ... }**
    - Braces and a broken vertical bar indicate a choice among two or more items. You must choose one of the items unless the choices are enclosed in square brackets.

Documentation.

- Example Template of a Month description
- <Date> = <Day>/<Month>/<Year>
- <Month> = [<Day Digit 1>]<Day Digit 2>
- <Day Digit 1> = { 0 ¦ 1}
- <Day Digit 2> = { 0 ¦ 1 ¦ 2 ¦ 3 ¦ 4 ¦ 5 ¦ 6 ¦ 7 ¦ 8 ¦ 9}
- Examples of **Valid** Template formats:-
  - dd/1/yy , dd/01/yy , dd/11/yy , dd/19/yy , dd/00/yy
  - **Note.** Just because the template format is correct does **Not** imply that the contents are correct.
- Examples of **Invalid** Template formats:-
  - dd/Jan/yy , dd/20/yy

Testing

Documentation.

- Using Templates with Test procedures definitions.
- Points to **Remember**:-
- When testing validity of data you need to check that:-
  - The data meets the expected data format (Template).
  - The data is meaningful in the context:-
    - Numbers are within valid ranges (between +44 and -66).
    - Number of appropriate type
      - (Integers with decimal point ?)
      - Exponent / scientific format (2.3E+5 or 55.6E-2).
      - Using the correct number base (011% , AF2H, +5).
  - Sequences of information are appropriate.
    - The actual Messages sequence order is correct.
    - Start blocks come before End blocks.

Templates

Preparing Specifications and Test procedures.

Specifications and Test Procedures.

- Basic Test Report Structure.
  - A Front page (with No Header or Footer)
  - Introduction.
  - The Specification.
  - Test Procedures.
  - Conclusion.
- In the Headers section of your document place
  - The Report Title
- In the Footers section of your document place
    - Optionally the Document Filename.
  - Your name
  - Page number (Especially for long documents)
  - Date of Last Update (or Revision identity)

Specifications and Test Procedures.

- The Introduction will :-
- Identify what it is you are testing.
- Identify why you are testing the system.
- Contain a very brief description of the testing method/s or processes you will be using.
- Contain a very brief description of expectations from the testing procedure.

Section Structure : Descriptive text.

Specifications and Test Procedures.

- The Specification will :-
- Identify what the system should do.
  - What are the :-
    - Maximums , Minimums , Limits , Constraints of the testing.
- What calculations that may be needed to support the testing. For example :-
  - Predicted Voltages , Current , Power , frequency , gain.
- What are the :-
  - Inputs , Outputs , Processes involved , Connections.
- Identify and Health and Safety considerations.

Section Structure : Mainly Bullet Points

Specifications and Test Procedures.

- The Testing Procedure will :-
- Identify type of testing.
  - Destructive / Non Destructive testing
  - Physical Checks
  - Electrical Checks
  - Mechanical Checks
- Identify how equipment is set up and connected.
- Identify what is to be measured.
  - Fixed Input Conditions to give Fixed Outputs.
- Identify presentation of results.
  - Tables , Graphs , Sketches, Calculations

Section Structure : Mainly Bullet Points, Diagrams

Specifications and Test Procedures.

- The Test Procedure :-
- Needs to identify and initially fix all possible input variables of the system.
- The Test procedure then changes just one variable at a time and identifies what the expected output should change to.
- The presentation table normally has 3 columns :-
  1 The input test condition control settings
  2 A description of what should happen.
  3 Space to describe what actually happened. (Hand Written)

Section Structure : Normally in Tabular form

Specifications and Test Procedures.

- The Conclusion will :-
- Compare Calculated results with Measured results.
- Compare predicted results with observations.
- Identify any observed differences and explain why they may have occurred or what caused them.
- Did test procedures give the expected results and if difference occurred what may be responsible ?
- Discuss any potential failings in the test procedures and how you could improve them.
- Summarize your findings.

Section Structure : Mainly Text, Bullet Points

Project Plan Structure.

Project Plan Structure.

- What activities might I need to develop a project ?
- A Project proposal.
  - The proposal will identify an outline or scope for the project.
  - I could identify who the sponsor is.
  - It could identify why the project is needed.
  - It could identify some typical outcomes.
  - It may be used to identify if the project is acceptable to be developed for the sponsor organization.

Project Plan Structure.

- What activities might I need to plan a project ?
- A Project proposal.
- Customer specification and its constraints.
  - What the customer requires.
    - Size, Weight, Performance, Cost, Features, Finish...
  - When the customer requires it.
  - How it is delivered.
  - Special constraints
  - Health and Safety, Quality management
    - BS5750, ISO9000, (*CE*)

Project Plan Structure.

- What activities might I need to plan a project ?
- A Project proposal.
- Customer specification and its constraints.
- Feasibility study which may include:-
  - Outline design plans to select best option.
  - Cost Analysis.
  - Resources Analysis.
  - Risk Analysis.
  - Project Plan (Time Analysis)

Project Plan Structure.

- What activities might I need to plan a project ?
- A Project proposal
- Customer specification
- Feasibility study
- Product Development
- Product Production
- Product Testing

Profit, Costing and Break-Even Analysis.

Profit Analysis.

- Which could be the best company to invest in ?
  - Company “A”
    - **Income = £10,500K**
    - **Outgoings = £9,400K**
    - **Profit £ =**
    - **Profit% =**
  - Company “B”
    - **Income = £6,300K**
    - **Outgoings = £5,200K**
    - **Profit £ =**
    - **Profit% =**

Profit = Total Income - Total Outgoings

Profit% = Profit / Total Outgoings *100%

Profit Analysis.

- Which could be the best company to invest in ?
  - Company “A”
    - **Income = £10,500K**
    - **Outgoings = £9,400K**
    - **Profit £ = £1,100K**
    - **Profit% = £1,100K / 9,400K = 11.7%**
  - Company “B”
    - **Income = £6,300K**
    - **Outgoings = £5,200K**
    - **Profit £ = £1,100K**
    - **Profit% = £1,100K / 5,200K = 21.2%**

Profit Analysis.

Profit = Total Income - Total Outgoings

Profit% = Profit / Total Outgoings *100

End Trading Period Calculations

Assets = Building + Stock + Cash etc

Profit = End Valuation - Assets

Profit% = Profit / Assets *100%

Profit Analysis.

- Which could give the best **Return** on capital ?
  - Company "A"
    - **Buildings = £6,278K**
    - **Stock = £1,457K**
    - **End Value = £8,299K**
    - **Profit £ =**
    - **Profit% =**
  - Company "B"
    - **Buildings = £4,835K**
    - **Stock = £0,534K**
    - **End Value = £5,959K**
    - **Profit £ =**
    - **Profit% =**

Profit Analysis.

- Which could give the best **Return** on capital ?
  - Company "A"
    - **Buildings = £6,278K**
    - **Stock = £1,457K**
    - **End Value = £8,299K**
    - **Profit £ = £8,299-(6,278+1,457) = £564K**
    - **Profit% = 564 / (6,278+1,457)*100 = 7.3%**
  - Company "B"
    - **Buildings = £4,835K**
    - **Stock = £0,534K**
    - **End Value = £5,959K**
    - **Profit £ = £5,959-(4,835+534) = £590K**
    - **Profit% = 590 / (4,835+534)*100 = 11%**

Profit Analysis.

- Which could give the best **Return** on capital ?
  - Company "A" (Stock reduced by 40%)
    - **Buildings = £6,278K**
    - **Stock = £1,457K -40% = £874K**
    - **End Value = £8,299K**
    - **Profit £ =**
    - **Profit% =**
  - Company "B" (Stock reduced by 40%)
    - **Buildings = £4,835K**
    - **Stock = £0,534K -40% = £320K**
    - **End Value = £5,959K**
    - **Profit £ =**
    - **Profit% =**

Profit Analysis.

- Which could give the best **Return** on capital ?
  - Company "A" (Stock reduced by 40%)
    - **Buildings = £6,278K**
    - **Stock = £1,457K -40% = £874K**
    - **End Value = £8,299K**
    - **Profit £ = £8,299-(6,278+874) = £1,147K**
    - **Profit% = 1147 / (6,278+874)*100 = 16.0%**
  - Company "B" (Stock reduced by 40%)
    - **Buildings = £4,835K**
    - **Stock = £0,534K -40% = £320K**
    - **End Value = £5,959K**
    - **Profit £ = £5,959-(4,835+320) = £804K**
    - **Profit% = 804 / (4,835+320)*100 = 15.6%**

Profit Analysis.

- Conclusion and Observations.
- The level of stock held by a company can effect the overall profitability of the company.
- By ordering just the correct amount of stock to support the immediate manufacturing operations will ensure the company cash flow is most effectively managed.
- This management of stock and production control is known as the "Just in Time" method.
- The Assets not held in the form of stock could be Invested, further Increasing Company profitability.

Cost Analysis Definitions.

- A Fixed Cost
  - is a cost that will largely fixed and will not be affected by the volume of production (This includes cost of design, maintenance, management, rent, transport costs, equipment etc).

- A Variable Cost (also called Prime Cost)
  - is a cost that changes depending upon the number of products produced. This includes cost of materials, labour, energy, packaging, variable overheads etc.

Cost Analysis Definitions.

- A Semi-Variable Cost
  - These are costs where a part of the cost acts as a variable cost, and part acts as a fixed cost. Some fuel bills are semi-variable: there is a fixed 'Standing Charge' and a variable 'unit charge'

- A Prime Cost (can also called Variable Cost)
  - an amount included in a bill of quantities to cover a particular bit of work or supply of materials to be carried out by a nominated sub-contractor or a supplier. (A term more often used in the Building industry)
  - Prime Cost = Direct (Material + Labour + Expenses)

Cost Analysis Definitions.

- A Marginal Cost
  - In economics and finance, marginal cost is the change in total cost that arises when the quantity produced changes by one unit.
  - In general terms, marginal cost at each level of production includes any additional costs required to produce the next unit. If producing additional vehicles requires, for example, building a new factory, the marginal cost of those extra vehicles includes the cost of the new factory. In practice, the analysis is segregated into short and long-run cases, and over the longest run, all costs are marginal. At each level of production and time period being considered, marginal costs include all costs which vary with the level of production, and all other costs are considered fixed costs.

Cost Analysis Definitions.

- A Production Cost
  - is the factory cost of manufacturing the product.
  - Production Cost = Prime Cost + Factory Over Heads.
- An Total Cost or Total Expenditure
  - is Production cost plus office overheads.
- An Absorption Cost
  - Absorbs the Total Cost of the whole business into each cost unit.
  - is sometimes termed ‘the cost of one unit of output’

Break-Even Analysis.

- The Total Income
  - is the Selling price of the product times the number of products sold.

- The Profit of the business
  - is the Total Income less Total Expenditure.

- The Break-Even Point
  - is the number of products that must be produced so that Total Income = Total Expenditure (Profit = 0)

Break-Even Analysis.

- A Profit = Total Income - Total Expenditure
- Where :-
  - Total Income = Selling Price * Number Sold
  - Total Expenditure = Fixed Costs + Variable costs
  - Variable Costs = Variable Unit Cost * Number Sold

Break-Even Analysis.

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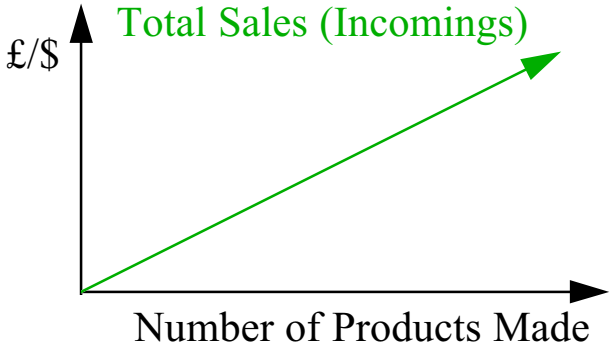

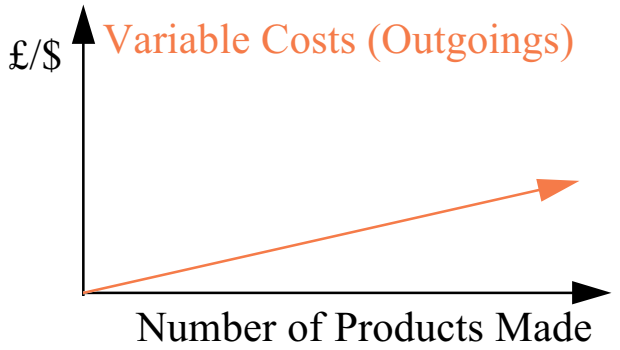

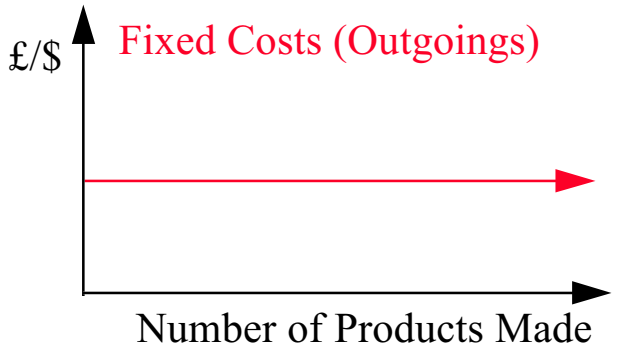

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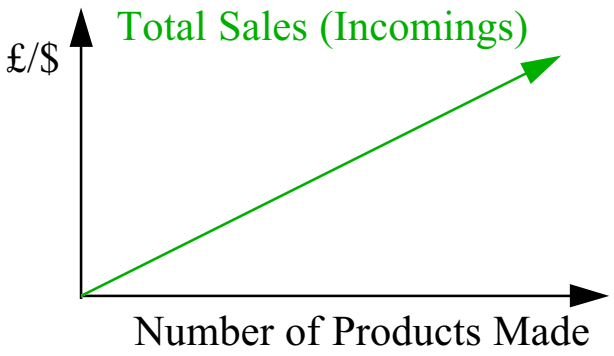
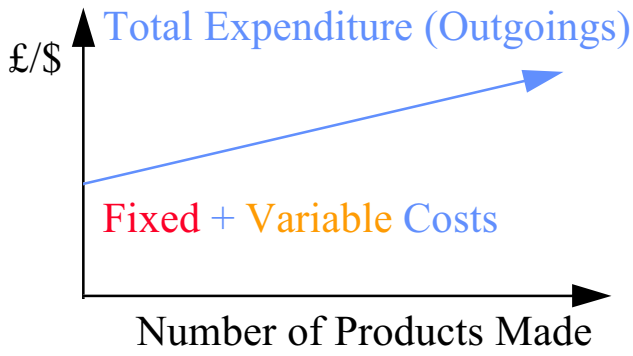
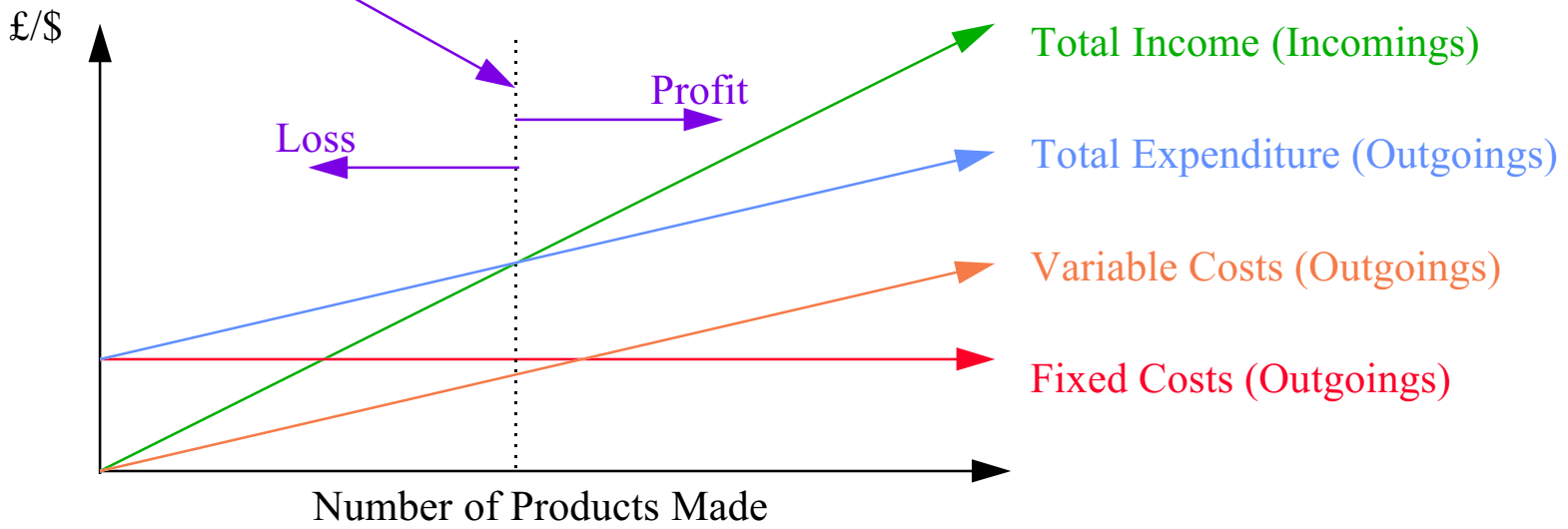




Break-Even Analysis.

- A Profit = Total Income - Total Expenditure
- Where :-
  - Total Income = Selling Price * Number Sold
  - Total Expenditure = Fixed Costs + Variable costs
  - Variable Costs = Variable Unit Cost * Number Sold

$$\text{Break-Even Point} = \frac{\text{Total Fixed Costs}}{\text{Selling Price - Variable Unit Cost per product}} = \text{Number Sold}$$



Break-Even Analysis.

- Presentation Methods :-
- 1. Calculation Method.
  - is a quick to use and convenient for seeing the effect of different cost structures on Break-Even point.
- 2. Table Method. (Suitable for Spreadsheets)
  - shows the amounts of fixed and variable costs, sales revenue, and profit at different level of production.
- 3. Graph Method.
  - is used for presentations - it shows, in a visual form, the relationship between, costs and sales revenue, and the amount of profit or loss at different levels of production.

Break-Even Analysis.

- Calculation Method
  - Sales price of a Power unit £65
  - Workshop rental Cost £2,500
  - Components and Case £22.50
  - Labour assembly charge £6.25 per Unit
- Calculate
- Fixed Costs = £2500
- Variable Costs = £22.5 + £6.25 = £28.75
- Break Even = Fixed Cost / (Sales - Variable)
- Break Even = £2500 / (£65 - £28.75)
- Break Even = 69.965 = actually 70 Units

Break-Even Analysis.

- Table Method
  - Sales price of a Power unit £65
  - Workshop rental Cost £2,500
  - Components and Case £22.50
  - Labour assembly charge £6.25 per Unit
- Calculate

Break-Even Analysis.

- Table Method
  - Sales price of a Power unit £65
  - Workshop rental Cost £2,500
  - Components and Case £22.50
  - Labour assembly charge £6.25 per Unit
- Calculate

Units	Fixed Costs	Variable Costs	Sales	Profit
40	2500	1150.00	2600.00	-1050.00
50	2500	1437.50	3250.00	-687.50
60	2500	1725.00	3900.00	-325.00
70	2500	2012.50	4550.00	37.50
80	2500	2300.00	5200.00	400.00

Break-Even Analysis.

- Graph Method
  - Sales price of a Power unit £65
  - Workshop rental Cost £2,500
  - Components and Case £22.50
  - Labour assembly charge £6.25 per Unit
- Draw graph from calculated Results

Break-Even Analysis.

- Graph Method
  - Sales price of a Power unit £65
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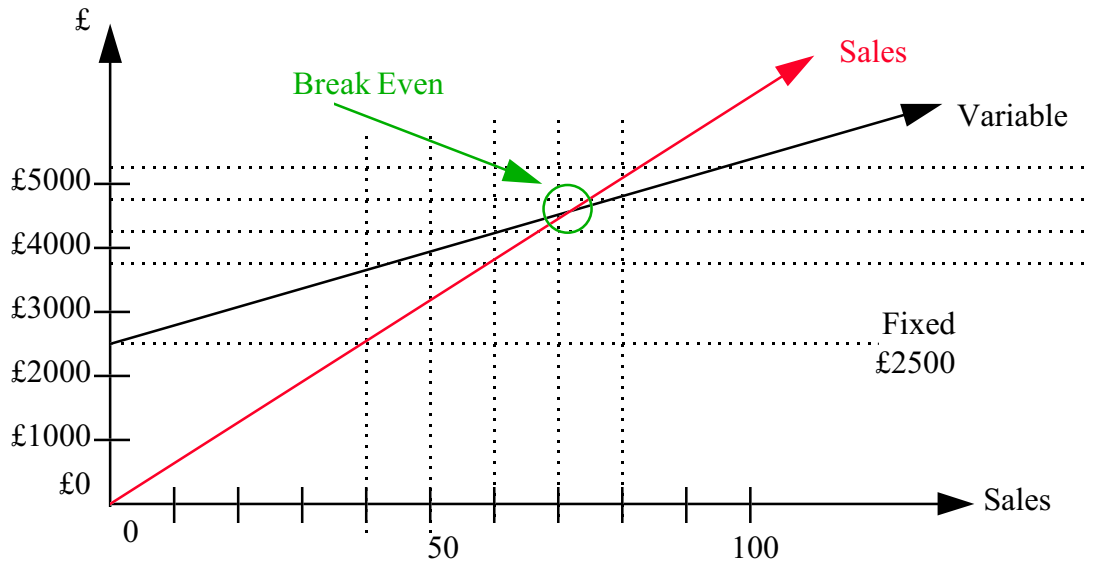

Break-Even Analysis.

- Margin of Safety
  - is especially important in times of recession as it shows management the amount of 'cushion' which current production/sales gives beyond the break-even point.
- Presented in one of three ways :-
  - A number of Units.
  - A Sales revenue amount.
  - As a percentage, (Using formulae shown below).

Break-Even Analysis.

- Margin of Safety
  - is especially important in times of recession as it shows management the amount of 'cushion' which current production/sales gives beyond the break-even point.
- Presented in one of three ways :-
  - A number of Units.
  - A Sales revenue amount.
  - As a percentage, (Using formulae shown below).

The Margin of Safety % is Calculated by :-

$$\frac{\text{Current Output} - \text{Break-Even Output}}{\text{Current Output}} * \frac{100}{1} = \text{Percentage Margin of Safety}$$

Break-Even Analysis.

- Using previous example assume current sales stands at 80 units
  - Break-Even output = 70
  - Sales price = £65
- Margin of Safety :-

Break-Even Analysis.

- Using previous example assume current sales stands at 80 units
  - Break-Even output = 70
  - Sales price = £65
- Margin of Safety :-

Units = 80 - 70 = 10 units

Revenue = 10 * £65 = £650

Percentage = (80 - 70)/80 * 100/1 = 12.5%

Absorption and Marginal Costing.

Absorption and Marginal Cost Analysis.

- Initial Information.
  - Sales price of a Power unit £65
  - Weekly production = 80 units : (Max possible = 120)
  - Workshop rental Cost £2,500
  - Components and Case £22.50
  - Labour assembly charge £6.25 per Unit

- Calculate
  - Absorption Cost.
  - Marginal Cost.

Absorption and Marginal Cost Analysis.

- Absorption costs are sometimes termed :-
  'the cost of one unit of output'.

- Calculate Absorption cost
- Material cost = £22.50 * 80 = £1800
- Labour Costs = £6.25 * 80 = £500
- Fixed Overheads = £2500
- Variable Costs = £1800 + £500 = £2300
- Total Costs = £2300 + £2500 = £4800
- Number of Units = 80
- Absorption cost = £4800 / 80 = £60

Absorption and Marginal Cost Analysis.

- The marginal cost is :-
  "the cost of producing one additional unit".

- Calculate Marginal Cost
- Material cost = £1800
- Labour Costs = £500
- Additional Costs = £0
- Total Marginal cost = £1800 + £500 + £0
  = £2300
- Marginal Cost = £2300 / 80 = £28.75

Make or Buy Decisions.

Make or Buy.

- Make or Buy is a management decision whether to make a product, or supply a service, in-house, or to buy from an outside supplier.
- Whilst there are a number of things to consider before taking a Make or Buy decision, the costs involved in the decision and the effect on profit are usually the things most likely to be uppermost in the mind of management.

Make or Buy.

- The effect on fixed and variable costs.
  - Expand its own production facilities - which will mainly affect its fixed costs (rent of premises, depreciation of new machinery and equipment), with a lesser effect on variable costs.

    or

  - Buy in from outside suppliers - which will mainly affect its variable costs (bought out units are generally classed as direct materials), with a lesser effect on fixed costs.

Make or Buy.

- The first course of action - expansion - is taking a long-term view and assumes that the increase in production will be sustained for a number of years.
- The second course of action - buy from outside - could be seen as more flexible, where the number of units can be varied to suit the requirements of the business.
- It can be a long or short-term arrangement.

Make or Buy.

- The use of Marginal Costing.
- When considering make or buy decisions, comparisons need to be made between -
  - the marginal cost of the product from in-house supply

    and
  - the price quoted buy the outside supplier.
- The lower price is not always the best choice. There may be non-financial aspects to consider, such as quality, reliability, service, delivery, own personnel, etc.

Make or Buy.

- Opportunity cost is the benefit that is lost when a particular course of action is taken.
  - For instance, in Make or Buy the resources to be used - factory, office space, machinery, etc - must be considered.
- The use of these resources may cause other work to be lost, delayed or cut back.
- The loss of contribution from this other work needs to be added to the Marginal Cost in order to make the decision.

Make or Buy.

- The Make or Buy decision is expressed now as a comparison between -
  - The Marginal cost of making the product in-house, plus the contribution from the lost or cut-back work

    and

  - The price quoted by the outside supplier
- The lower price is better choice in financial terms.

PSU Ltd. Make or Buy. Case Study

- Until now all units have been made in-house, but with the increase in demand the company is finding it difficult to keep up with orders. The point has been reached where a decision needs to be made regarding buying some parts from outside suppliers.
- The purchasing department has found a potential source for the supply of Power supply cases made from sheet metal.

PSU Ltd. Make or Buy. Case Study

- There are two alternatives.
  - 1. Buy in from supplier.
  - 2. Continue to make in-house.
- Calculate number of units required :-
  - 80 Cases per week
  - 48 Working weeks per year
  - Total Cases required = 80 * 48 =

PSU Ltd. Make or Buy. Case Study

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PSU Ltd. Make or Buy. Case Study

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  - 1. Buy in from supplier.
  - 2. Continue to make in-house.
- Calculate number of units required :-
  - 80 Cases per week
  - 48 Working weeks per year
  - Total Cases required = 80 * 48 = 3840

Option 1

- Use an outside supplier who has quoted a price of £5.18 per unit based on the requirement of 3,840 units per year.

PSU Ltd. Make or Buy. Case Study

- The cost of making each control box in-house at the current level of 3840 units each year is -

Direct materials	£0.73
Direct labour	£2.25
Variable overheads	£0.48
Fixed overheads	£1.69
Total cost (Calculate this value)	

- There is no other use for the sheet metal production machinery required to produce this product.

Option 2

PSU Ltd. Make or Buy. Case Study

- The cost of making each control box in-house at the current level of 3840 units each year is -

Direct materials	£0.73
Direct labour	£2.25
Variable overheads	£0.48
Fixed overheads	£1.69
Total cost	£5.15

- There is no other use for the sheet metal production machinery required to produce this product.

Option 2

PSU Ltd. Make or Buy. Case Study

- Solution
- The marginal cost of producing a case is :-

PSU Ltd. Make or Buy. Case Study

- Solution
- The marginal cost of producing a case is :-

Direct materials		£0.73
Direct labour		£2.25
Variable overheads		£0.48
Marginal Cost	(Calculate)	£

- In house cost = £ * 3840 = £(Calculate)
- Supplier cost = £5.18 * 3840 = £(Calculate)
- Difference = £(Calculate)

PSU Ltd. Make or Buy. Case Study

- Solution
- The marginal cost of producing a case is :-

Direct materials	£0.73
Direct labour	£2.25
Variable overheads	£0.48
Marginal Cost	£3.46

- In house cost = £3.46 * 3840 = £
- Supplier cost = £5.18 * 3840 = £
- Difference = £

PSU Ltd. Make or Buy. Case Study

- Solution
- The marginal cost of producing a case is :-

Direct materials	£0.73
Direct labour	£2.25
Variable overheads	£0.48
Marginal Cost	£3.46

- In house cost = £3.46 * 3840 = £13286.40
- Supplier cost = £5.18 * 3840 = £19891.20
- Difference = £ 6604.80

PSU Ltd. Make or Buy. Case Study

- Conclusion
- If there is no other use for the sheet metal production machinery, the decision should be taken to continue to manufacture case in-house.
- However, If there was alternative work for the machinery, then the comparison becomes :-
  - marginal cost of in-house manufacture, plus contribution from alternative work.
  - price quoted by outside supplier.
- so :-

PSU Ltd. Make or Buy. Case Study

- Conclusion
- A Contribution of more than £6604.80 per year from the production machinery would make the buy-in a better financial proposition.

- Definition: Contribution is the additional value a resource could bring into a company if it was being used for some other activity.

Make or Buy.

- Additional Contribution Notes :-

- Contribution to Sales Ratio or C/S Ratio
- C/S Ratio calculated by :-

$$\text{C/S Ratio} = \frac{\text{Contribution (£)}}{\text{Selling Price (£)}}$$

Standard Costing.

Standard Costing.

- Is used where :-
  - cost of materials, labour and overheads are determined before operations begin.
- Is used to :-
  - check costs before production - particularly high volume - car production.
- It is less complicated accounting procedure for many manufacturer's inventories and cost of goods sold will begin with amounts reflecting the standard costs.

Standard Costing.

- Detailed predictions are made for :-
  - costs of direct material
  - direct labor
  - manufacturing overhead.
- These are the standard (planned, expected) costs.
- Variance :-
  - differences between the actual costs and the standard costs.

Standard Costing.

- Standard costing and the related variances is a valuable management tool. If a variance arises, management becomes aware that manufacturing costs have differed from the standard (planned, expected) costs.
  - If actual costs are greater than standard costs the variance is unfavorable. An unfavorable variance tells management that if everything else stays constant the company's actual profit will be less than planned.
  - If actual costs are less than standard costs the variance is favorable. A favorable variance tells management that if everything else stays constant the actual profit will likely exceed the planned profit.

Activity Based Costing.

Activity Based Costing.

- In manufacturing industry competition from competitor and customers require companies to become more cost effective in their attempt to hold on to or improve market share in their field of business.
- These days many companies try to order their resource requirements in a Just in Time manner this implies that in many cases Batch sizes may be on the smaller size.
- Remember: that the more stock you hold the more money is tied up in the business.

Activity Based Costing.

- The main goal of this method to try to accurately predict the true cost of production of batches of products.
- Most manufacturing consists of producing batches (sets) of products.
- Each Batch incurs two distinct costs :-
  - Manufacture cost (machine hours)
  - Equipments/System Setup cost
- To continue producing the same number of products as the sizes of batches reduce then the number of setups will increase.

Activity Based Costing.

- From a companies perspective if you loose a high volume easy to produce product to a competitor because they have quoted a lower price per item it may threaten the whole viability of your manufacturing operation.
- The loss of the work could mean that you have to increase the price of all your remaining products.
- Remember the cost of maintaining a current customer is significantly less than the cost of finding a new customer.

Activity Based Costing.

- In the 1980s, companies developed a costing method that would eliminate product cost distortions caused by allocating overhead costs solely on the basis of machine hours.
- Manufacturers realised that all activities generated overhead costs and there were many more activities involved in manufacturing than just production machine hours.
- Other activities included such things as setting up the production machines and new product and processes development.

Activity Based Costing.

- The process that is used is :-
  - (1) Define the activities that cause company resources to be used up.
  - (2) Measure the costs of those activities.
  - (3) Assign the costs of the activities to those products and customers that were actually requiring the activities.
- This process became known as

  ABC Activity Based Costing.

Activity Based Costing.

- Example
- Assume a company has :-
  - £750,000 of machine manufacturing overhead .
  - 100,000 hours of machine time.
  - £50,000 which can be directly associated with the 250 machine setups performed each year.
  - Production capability of 50 item per hour.
  - Batch sizes that vary considerably in size.
- Calculations :-
- Cost per setup = £50,000/250

Activity Based Costing.

- Example
- Assume a company has :-
  - £750,000 of machine manufacturing overhead .
  - 100,000 hours of machine time.
  - £50,000 which can be directly associated with the 250 machine setups performed each year.
  - Production capability of 50 item per hour.
  - Batch sizes that vary considerably in size.
- Calculations :-
- Cost per setup = £50,000/250 = £200

Activity Based Costing.

- Cost implications Example 1.
  - If a batch of 80000 items is produced then the set up cost is £200/80000 or per item.

- Cost implications Example 2.
  - if a batch of 4000 items is produced then the set up cost is £200/4000 or per item.

Activity Based Costing.

- Cost implications Example 1.
  - If a batch of 80000 items is produced then the set up cost is £200/80000 or £0.0025 per item.

- Cost implications Example 2.
  - if a batch of 4000 items is produced then the set up cost is £200/4000 or £0.05 per item.

Activity Based Costing.

- With ABC and Without ABC comparison.

	With ABC	Without ABC
Overhead Costs	£50,000	£0
Number of Setup	250	N/a
Cost per setup	£200	£0
Manufacturing Cost	£750,000	£750,000
Less Setup Costs	£50,000	£0
Machine costs (a)	£700,000	£750,000
Machine hours (b)	100,000	100,000
Mfg. Cost = (a) / (b)	£7	£7.5
Cost Allocation	£200 + £7 per machine Hour	£7.5 per machine hour

Activity Based Costing.

- With ABC and Without ABC comparison.

Example Costing for batch of 4000 items

	With ABC	Without ABC
Cost per setup	£200	£0
Batch Size	4000	N/a
Overhead per unit	£0.05	£0
Cost per machine hour	£7	£7.5
Units per hour	50	50
Unit Manufacture cost	£0.14	£0.15
Cost per unit	£0.19	£0.15

Activity Based Costing.

- With ABC and Without ABC comparison.

Example Costing for batch of 80000 items

	With ABC	Without ABC
Cost per setup	£200	£0
Batch Size	80000	N/a
Overhead per unit	£0.0025	£0
Cost per machine hour	£7	£7.5
Units per hour	50	50
Unit Manufacture cost	£0.14	£0.15
Cost per unit	£0.1425	£0.15

Depreciation.

Depreciation.

- Two Main Methods used :-
  - Straight Line depreciation.
    - is the simplest and most often used technique, in which the company estimates the scrap value of the asset after the length of time over which it is depreciated, and assumes the drop in the asset's value is in equal, constant yearly increments over that amount of time.
  - Reducing balance method.
    - is suitable for items that loose value quickly in the first few years but still retain some resale value.
- The results can be presented in :-
  - Calculation, Tabular or Graphical forms.

Depreciation.

- Straight Line depreciation (Calculation).
- This uses a linear calculation presentation method and results can be obtained from the following formula :-

Depreciation.

- Straight Line depreciation (Calculation).
- This uses a linear calculation presentation method and results can be obtained from the following formula :-

$$\text{Depreciation Rate} = \frac{\left(\frac{(\text{Initial Cost} - \text{Final Value})}{\text{Number of Years}} \right)}{\text{Initial Cost}} * 100\ \%$$

Depreciation.

Example

- Straight Line depreciation (Calculation).
- Initial Cost £10,000, Final Value = £2000 over a period of 7 Years
- Depreciation Rate %

  = (((10000 - 2000) / 7) / 10000) * 100%

  = ((8000 / 7) / 10000) * 100%

  = ((1142.857) / 10000) * 100%

  = (0.1142857) * 100%

  = 11.42857 %

- Annual Depreciation = £10000 * 11.42857 %

  = £1142.857 per Year

Depreciation.

Example

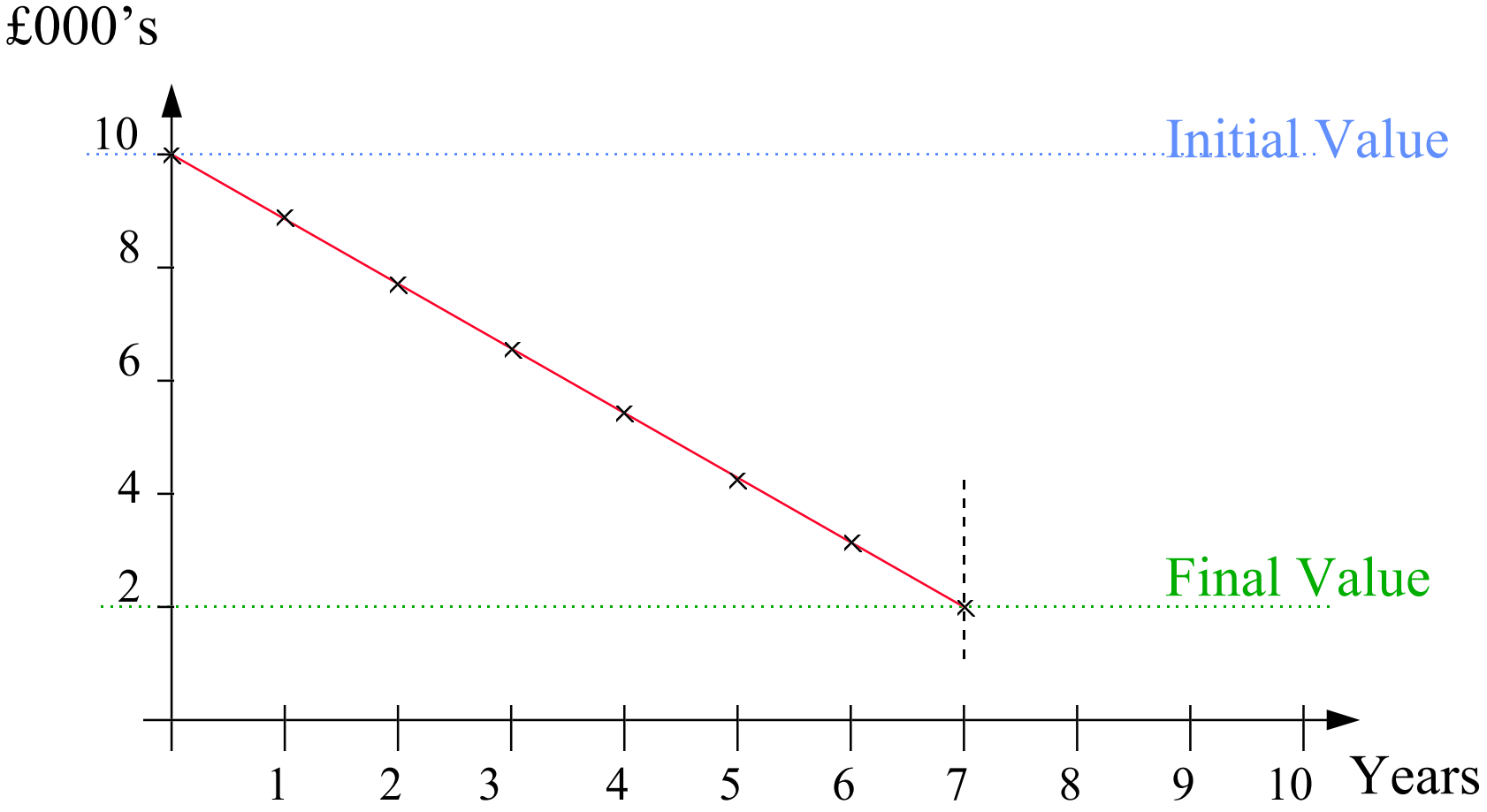
- Straight Line depreciation (Tabular).

Year	Depreciation Value	Final Value
1	£1142.857	£8,857.14
2	£1142.857	£7,714.29
3	£1142.857	£6,571.43
4	£1142.857	£5,428.57
5	£1142.857	£4,285.72
6	£1142.857	£3,142.86
7	£1142.857	£2,000.00
8	£1142.857	£857.14
9	£1142.857	£0.00
10	£1142.857	£0.00

Depreciation.

Example

- Straight Line depreciation (Graphical).



Depreciation.

- Reducing balance method.
- This uses a non-linear calculation method and results can be obtained from the following formula :-

Depreciation.

- Reducing balance method.
- This uses a non-linear calculation method and results can be obtained from the following formula :-

$$\text{Depreciation Rate} = 1 - \left(\frac{\text{Final Value}}{\text{Initial Cost}}\right)^{\left(\frac{1}{\text{Years}}\right)}$$

or

$$\text{Depreciation Rate} = 1 - \sqrt[\text{Years}]{\left(\frac{\text{Final Value}}{\text{Initial Cost}}\right)}$$

Depreciation.

Example

- Reducing balance method (Calculation).
- Initial Cost £10,000, Final Value = £2000 over a period of 7 Years
- Depreciation Rate
  - = 1 - ((2000 / 10000) ^ (1 / 7))
  - = 1 - ((0.2) ^ (0.142857))
  - = 1 - (0.794597)
  - = 0.205402595
- Annual Depreciation = 0.205402595 * 100 %
  - = 20.5402595%
  - = Year 1 = £10000 - (£10000*20.54%) = £7945.97

Depreciation.

Example

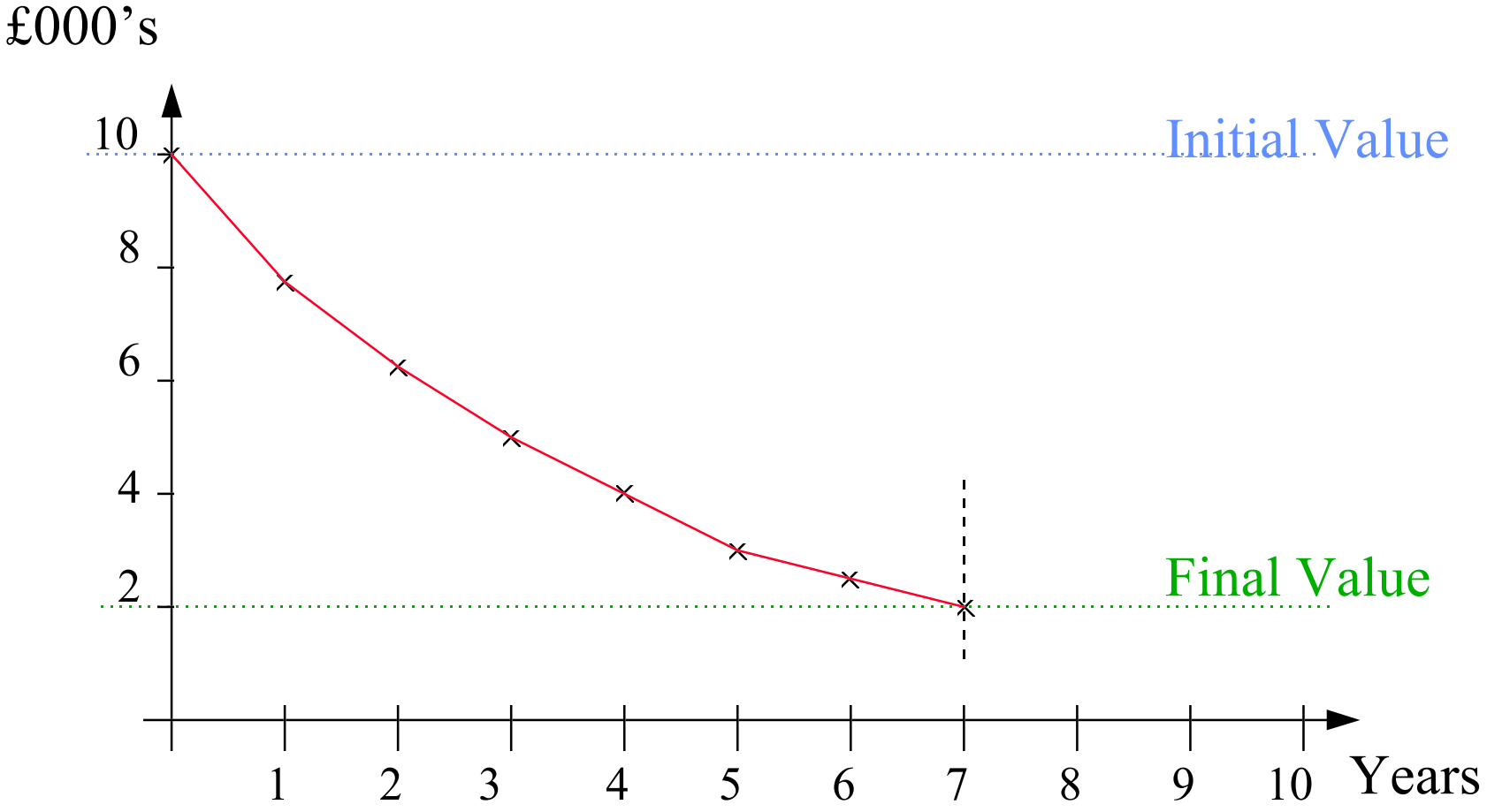
- Reducing balance method (Tabular).

Year	Depreciation Value	Final Value
1	£2054.03	£7945.97
2	£1632.12	£6313.85
3	£1296.88	£5016.97
4	£1030.50	£3986.47
5	£818.83	£3167.64
6	£650.64	£2517.00
7	£517.00	£2000.00
8	£410.81	£1589.19
9	£326.42	£1262.77
10	£259.38	£1003.39

Depreciation.

Example

- Reducing balance method (Graphical).



Finance.
Investment
Decision Making.

Payback Method

Example

Finance.

- A business is investing in a new assembly system and has to make the choice between System “A” and System “B”.
- The initial cost and the net cash flow (income less expenses but not depreciation) to the business have been calculated over a period five years for each project.
- Only one system can be employed and at the end of five years it will have no value.
- To finance the selected system, the business can borrow money at 10% per annum.

Example

Finance.

- Which project should be chosen ?
- Three Methods are commonly used to appraise a capital investment project such as this :

	System "A"	System "B"
Initial Cost	£20,000	£28,000
Net Cash flow:		
Year 1	£8,000	£10,000
Year 2	£12,000	£10,000
Year 3	£5,000	£8,000
Year 4	£4,000	£9,000
Year 5	£2,000	£9,000

Finance.

Example

- This method sees how long it takes for the initial outlay to be repaid by the net cash flow coming in.
- System "A" costs £20,000 and it is expected that the net cash flow over the first two years will equal the cost
- The payback time for System "A" is two years, while System "B" it is three years.
- So: using Payback System "A" is preferable.

Payback Method

Comments

Finance.

- The faster the **Payback** the better, particularly where high technology or fashion projects are concerned - they may be out of date before they reach the end of their useful lives.
- Earlier cash flows are likely to prove more accurate estimates than later cash flows.
- Therefore, if two projects have the same payback, the one with the greater cash flow in earlier years is preferred.

Payback Method

Finance.

Example

- Consider two projects with a Payback of two years from the following cash flow :-

Net Cash flow:	Project "C"	Project "D"
Year 1	£8,000	£12,000
Year 2	£12,000	£8,000

- While both projects have the same payback period of two years, Project "D" is the preferred project under the Payback method because of the earlier cash flows.

Payback Method

Finance.

- Advantages of payback
  - it is easy to calculate.
  - it is easy to understand.
  - it places emphasis on earlier cash flows, which are more likely to be accurate than later cash flows.
  - an ideal capital investment appraisal method for high technology projects.

Payback Method

Finance.

- Disadvantages of payback
  - all cash flows after the payback period are ignored.
  - within the payback period it fails to take into account the timing of net cash flows, eg. System "A" would still have had a payback of two years even if the cash flows for years one and two had been reversed (as noted, greater cash flows in earlier years are to be preferred).

Payback Method

ARR Method

Finance.

- The Accounting Rate of Return method uses the profit over the life of the project to calculate the percentage rate of return, based on the Average cost of the project.
- The Accounting Rate of Return uses the following formulae :-

Average Cost = (Initial Cost - Residual Value)/2

$$\text{ARR\%} = \frac{\text{Total estimated cash flow}^{*} - \text{Initial Cost}}{\text{Estimated life of project}} * \frac{100\ \%}{\text{Average Cost}}$$

* Scrap value or Residual value, if any, at the end of the project would be taken into account

Accounting Rate of Return (ARR)

Finance.

- Using Accounting Rate of Return compare System "A" and "B" using the following formulae :-

Average Cost = (Initial-Residual)/2

$$\text{ARR\%} = \frac{\text{Total estimated cash flow}^{*} - \text{Initial Cost}}{\text{Estimated life of project}} * \frac{100\ \%}{\text{Average Cost}}$$

System "A" = ((31K-20K)/5) * 100%/((20K-0K/2)) = 22%

System "B" = ((46K-28K)/5) * 100%/((28K-0K)/2) = 25.7%

* Scrap value or Residual value, if any, at the end of the project would be taken into account

Accounting Rate of Return (ARR)

For Information Only

Finance.

Do NOT use for Assignments

- The Average Rate of Return
  - A measure of an investment's profitability. A drawback is that it does not consider the timing of earnings.
- The Average Rate of Return uses the following formula :-

$$\text{ARR\%} = \frac{\text{Net return (Profit or savings) per annum}}{\text{Capital outlay (Cost)}} * 100\ \%$$

Examples

System "A" = ((31K-20K)/5) / 20K * 100% = 11%

System "B" = ((46K-28K)/5) / 28K * 100% = 12.86%

Average Rate of Return (ARR)

Finance.

- Advantages of ARR
  - It is relatively easy to calculate.
  - All cash flows are used in the calculation of profit.
  - It is easy to understand the results.

Comments

Finance.

- Disadvantages of ARR
  - The timing of cash flows is completely ignored.
  - ie. the same result would have been reached if the cash flows for System "A" had been £1,000, £1,000,£1,000, £1,000 for each of the first four years, and £27,000 in year five (as noted under payback, greater cash flows in earlier years are to be preferred).

Accounting Rate of Return (ARR)

Discounted Cash Flow (DCF)

Finance.

- Discounted Cash Flow (DCF) is a capital investment appraisal method that recognises that money has a time value.
- For example, supposing that today, a friend asks to borrow £1 and offers repayment either tomorrow, or in one years time, which would you choose?

Discounted Cash Flow (DCF)

Finance.

- For example, supposing that today, a friend asks to borrow £1 and offers repayment either tomorrow, or in one years time, which would you choose?
- The answer is clear; you would want the money back sooner rather than later because, even if you don't intend to spend it, you can always save it in a bank or building society, where it will earn interest. Thus the rate of interest represents the time value of money.

Discounted Cash Flow (DCF)

Example

Finance.

- Using £1 as an example, if it is invested with a bank or building society at an interest rate of 10 per cent per year, it will increase as follows :-

Activity	Calculations
Original investment	£1.00
Interest at 10% on £1	£0.10
Value of investment at end of 1st year	£1.10
Interest at 10% on £1.10	£0.11
Value of investment at end of 2nd year	£1.21
and so on	

Finance.

Example

- However, suppose a £1 was received at the end of year one, what is it worth now? This can be determined by the following calculation

Year Start Value

$$£1 * \frac{100\%}{110\%} = £0.91$$

Year End Value

*100%, plus the rate of interest (in this example, 10 per cent).

Discounted Cash Flow (DCF)

Finance.

Example

- It can be seen that the present value of £1 receivable in one years time is £0.91. In the same way, £1 receivable in two years time is £0.83, calculated as follows -

$$£1 * \frac{100\%}{110\%} * \frac{100\%}{110\%} = £0.83$$

or

$$\text{Value} = \text{Principle} * (\text{Interest Rate factor})^{\text{Periods}}$$

Discounted Cash Flow (DCF)

Finance.

Example

- A table of factors can be build up (for 10 per cent interest rate) as shown below :-

Present Value		Calculations
Original investment	* 1.000	£1.00
Value after 1 Year	* 0.909	£0.91
Value after 2 Year	* 0.826	£0.83
Value after 3 Year	* 0.751	£0.75
Value after 4 Year	* 0.683	£0.68
Value after 5 Year	* 0.621	£0.62

Discounted Cash Flow (DCF)

Comments

Finance.

- The table of factors is a reminder of the basic principle that money has a time value and, from this, the further into the future that the receipt of money is expected, the lower is its present value.
- Therefore, the present value (or discount) factors relate to interest rates that represent the cost of capital (ie the rate of return that the business expects on its money or the rate of interest it has to pay when borrowing).

Discounted Cash Flow (DCF)

Net Present Value Method

Comments

Finance.

- Using the previous example of Systems “A” and “B” and a cost of capital of 10% :-
- Then, for each project, the expected net cash flows are multiplied by the relevant factors to give the discounted cash flow; the difference between total discounted cash flow and the initial cost is the Net Present Value (NPV) of the project.

Net Present Value Method (NPV)

Finance.

Example

- System “A”

Year	Cash Flow		Discount Factor		Discounted Cash Flow
Year 0	(£20,000)	*	1.000	=	£-20,000
Year 1	£8,000	*	0.909	=	£7,272
Year 2	£12,000	*	0.826	=	£9,912
Year 3	£5,000	*	0.751	=	£3,775
Year 4	£4,000	*	0.683	=	£2,732
Year 5	£2,000	*	0.621	=	£1,242
Net Present Value (NPV)					£4,913

Net Present Value Method (NPV)

Finance.

Example

- System “B”

Year	Cash Flow		Discount Factor		Discounted Cash Flow
Year 0	(£28,000)	*	1.000	=	£-28,000
Year 1	£10,000	*	0.909	=	£9,090
Year 2	£10,000	*	0.826	=	£8,260
Year 3	£8,000	*	0.751	=	£6,008
Year 4	£9,000	*	0.683	=	£6,147
Year 5	£9,000	*	0.621	=	£5,589
Net Present Value (NPV)					£7,094

Net Present Value Method (NPV)

Comments

Finance.

- The Tables show with a cost of capital at 10 per cent, System “B” is better, producing a considerably higher Net Present Value (NPV) than System “A”.
- Note: that both projects give a positive Net Present Value (NPV) at 10 per cent.
- This means that both projects will be of benefit to the organisation but System “B” is preferable

Net Present Value Method (NPV)

Comments

Finance.

- A negative NPV would indicate that a project should not go ahead.
- Therefore using a discounted cash flow method, future cash flows are brought to their value now; this means that, the further on in time that cash flows are receivable, the lower is the Net Present Value (NPV).

Net Present Value Method (NPV)

Finance.

- Advantages of Discounted Cash Flow :-
  - all cash flows are used.
  - the timing of cash flows is taken into account.
  - using a table of factors the calculations are easy to make.

Finance.

- Disadvantages of Discounted Cash Flow :-
  - the cost of capital rate is, in practice, difficult to ascertain and may also vary over the life of the project
  - the meaning of Net Present Value (NPV) is not always clear to users of the information
  - the project with the higher Net Present Value (NPV) does not always represent the better project for the business or organisation

Discounted Cash Flow (DCF)

Specifications, Plans, Risks and Testing.

Specifications.

Specifications (Two Levels).

- Level 1 (Top) Specification (May be informal)
  - This is an analysis of the user requirement.
- This process will consist of :-
  - Identification of what the customer wants and why.
  - Offering suggestions and reasons that will meet all or most of the customers needs in a written form and with explanation diagrams as appropriate.
  - Explanation what might cause difficulties and how you are going to achieve a suitable outcome.
  - Use of prototypes, demonstrations simulation etc.
  - Agreement to a mutually acceptable solution.
  - Summary documentation explaining the solution.

Specifications (Two Levels).

- Level 2 (Technical) Specification (Formal)
  - This is a detailed analysis of agreed User requirements presented in writing.
- This process will formally define :-
  - What is going to be delivered in detail.
  - When and how it is going to be delivered in detail.
  - Constraint and limitation of use in detail.
  - User and other system interfaces.
  - References to test, commissioning and acceptance.
  - Special requirements that have been agreed.

Plans.

Plans, Risk and Tests.

- **How do I plan a project ?**
- Stage sketch out activities you think you may need to perform

Plans, Risk and Tests.

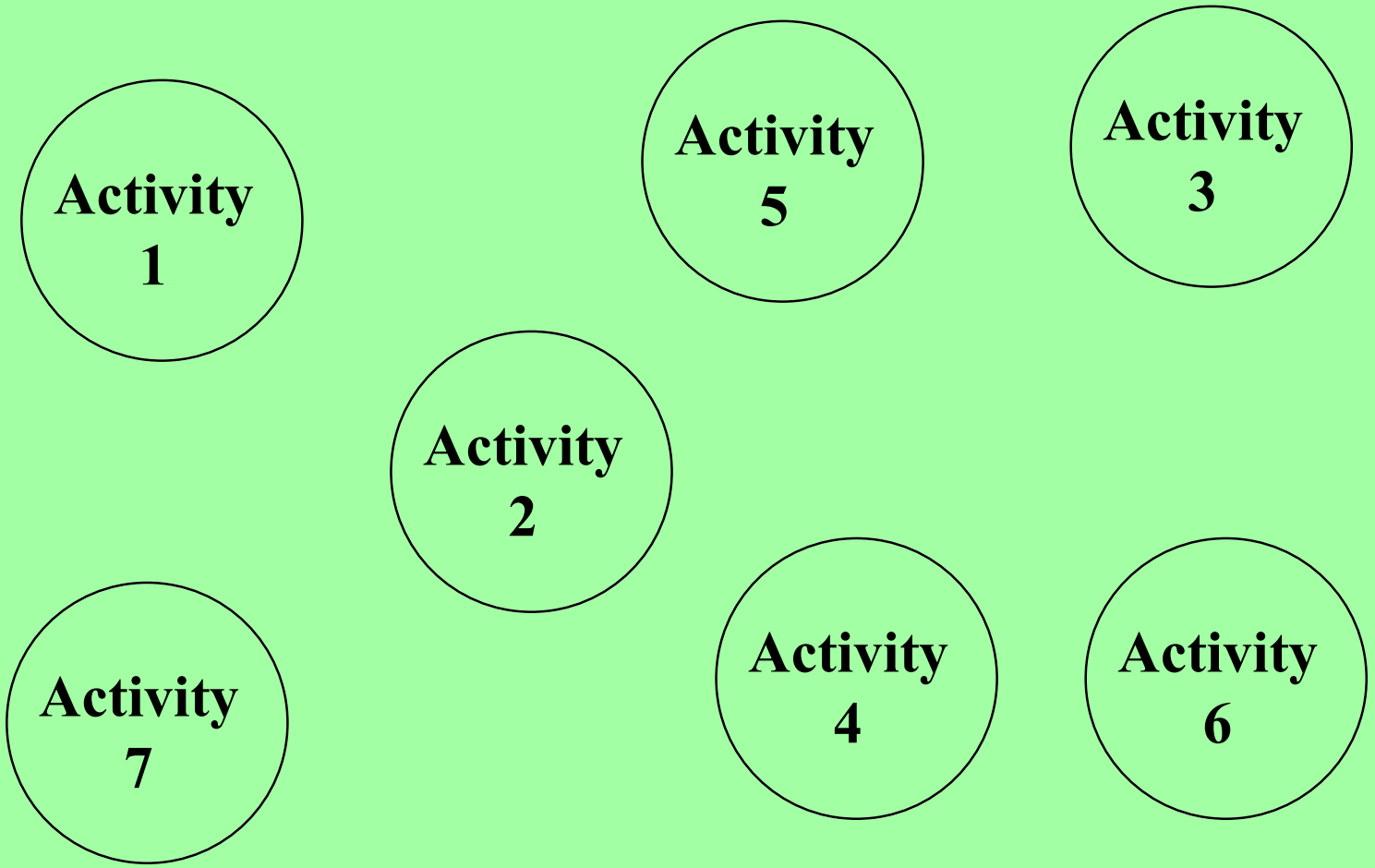


Diagram of Activities that need to be performed.

Plans, Risk and Tests.

- How do I plan a project ?
- Stage sketch out activities you think you may need to perform.
- Add relationships to the activities for example indication data flows, messages that might be passed or resources needed.

Plans, Risk and Tests.

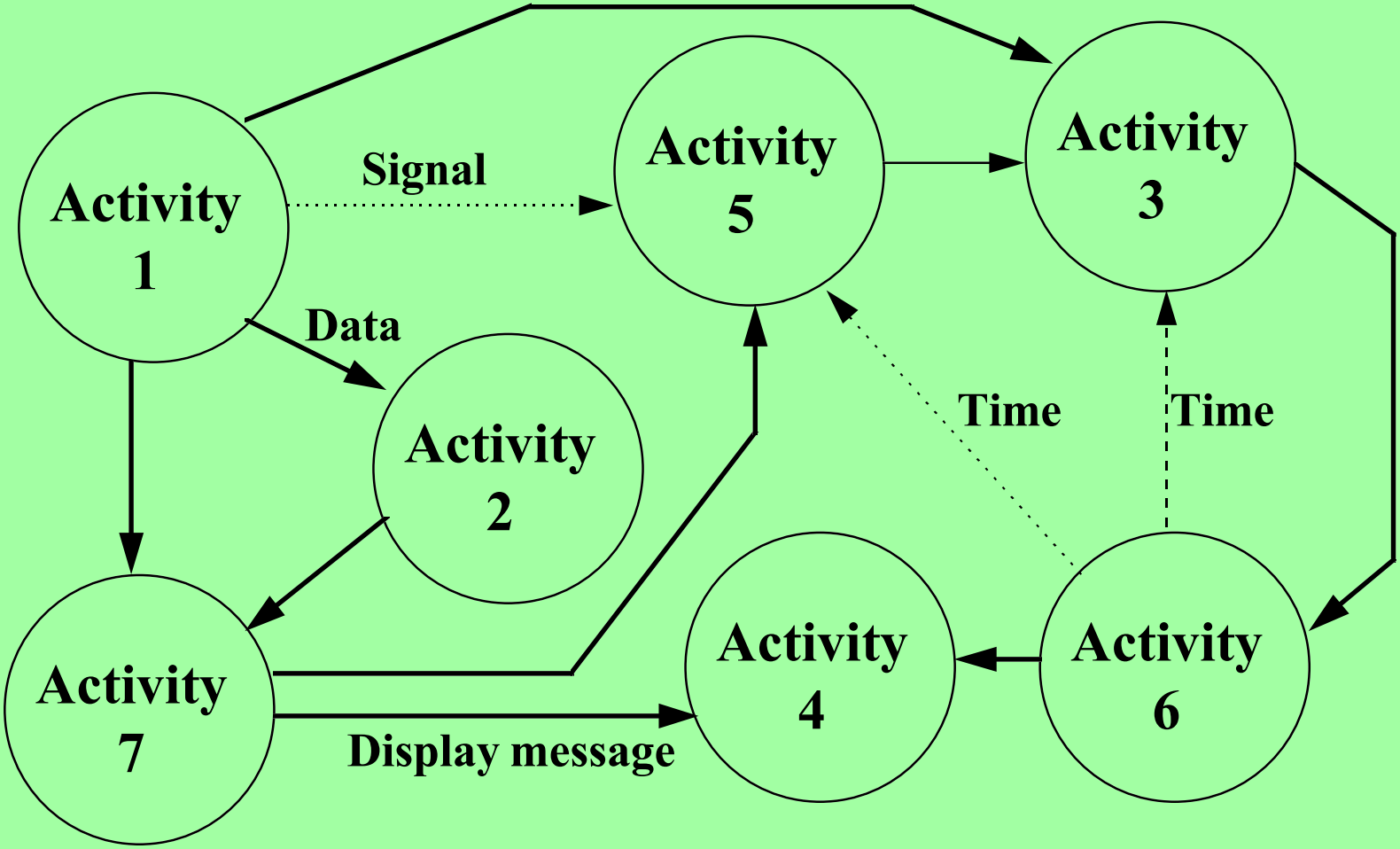


Diagram showing relationship between Activities.

Plans, Risk and Tests.

- How do I plan a project ?
- Stage sketch out activities you think you may need to perform.
- Add relationships to the activities for example indication data flows, messages that might be passed or resources needed.
- Build a table of all activities that need to be performed with time estimates: Then ...
- Calculate Expected times ..

  (1*Slow + 4*Average + 1*Fast)/6

Plans, Risk and Tests.

- Using Example 1
  - Calculate Expected Time of activities.

Plans, Risk and Tests.

Example 1

Activity		Fast	Avr	Slow	Expected	Comments
1	Documentation	3	4	7		
2	Order Parts	1	1	2		No Problem
3	Develop Code	5	9	25		Low Risk
4	Write report	2	5	16		Cut and Paste ?
5	Process 1	1	4	5		
6	Process 2	7	14	19		Research needed
7	Process 3	2	3	5		Usually easy
8	Process 4	1	3	7		Ditto
9	Process 5	22	42	45		Could give problems
10	Process 6	16	17	22		Audio player needed
11	Process 7	4	6	17		
12	System Design	3	5	7		
13	Job Completed	0	0	0		
14		0	0	0		

Table of activities with Time estimates.

Plans, Risk and Tests.

Example 1

Activity		Fast	Avr	Slow	Expected	Comments
1	Documentation	3	4	7	4.33	
2	Order Parts	1	1	2	1.16	No Problem
3	Develop Code	5	9	25	11	Low Risk
4	Write report	2	5	16	6.33	Cut and Paste ?
5	Process 1	1	4	5	3.66	
6	Process 2	7	14	19	13.67	Research needed
7	Process 3	2	3	5	3.17	Usually easy
8	Process 4	1	3	7	3.33	Ditto
9	Process 5	22	42	45	39.16	Could give problems
10	Process 6	16	17	22	17.67	Audio player needed
11	Process 7	4	6	17	7.5	
12	System Design	3	5	7	0	
13	Job Completed	0	0	0	0	
14		0	0	0	0	

Table of activities, Time estimates and Calculations.

Plans, Risk and Tests.

- How do I plan a project ?
- Stage sketch out activities you think you may need to perform.
- Add relationships to the activities for example indication data flows, messages or resources that might be passed.
- Build a table of all activities that need to be performed with time estimates.
- **Finally decide dependency order the activities need to be "performed in" with any specific resources that need to be available.**

Plans, Risk and Tests.

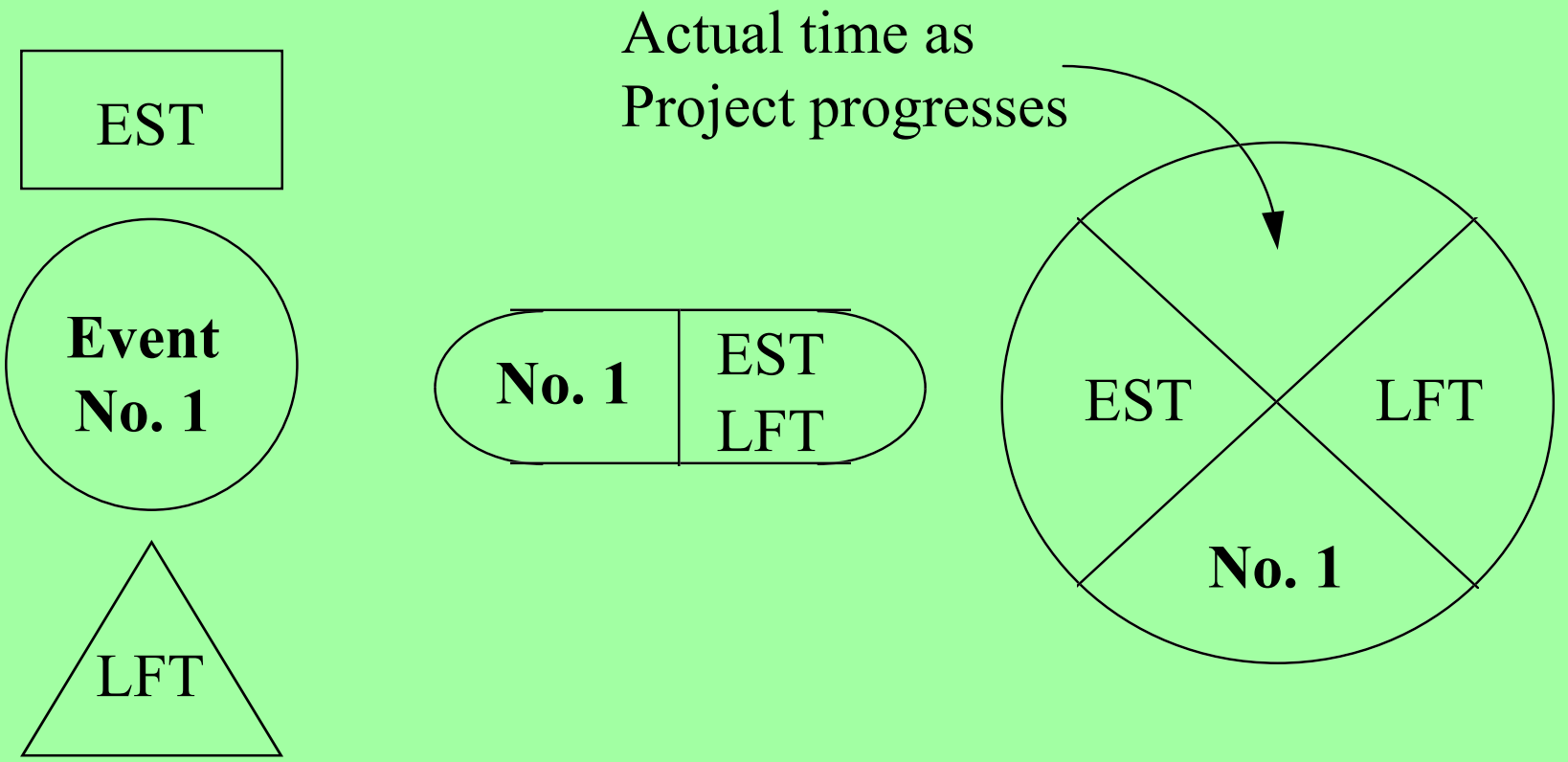
Example 1

Activity		Fast	Avr	Slow	Expected	Dependence order
1	Documentation	3	4	7	4.33	12,4
2	Order Parts	1	1	2	1.16	12,7
3	Develop Code	5	9	25	11	10
4	Write report	2	5	16	6.33	12
5	Process 1	1	4	5	3.66	12
6	Process 2	7	14	19	13.67	3,5
7	Process 3	2	3	5	3.17	5
8	Process 4	1	3	7	3.33	2, 6
9	Process 5	22	42	45	39.16	12
10	Process 6	16	17	22	17.67	11
11	Process 7	4	6	17	7.5	12
12	System Design	3	5	7	5	Start Activity
13	Job Completed	0	0	0	0	All activities 1,9,8
14		0	0	0	0	

Table of activities with Dependencies.

Critical Path Analysis.

Critical Path Analysis.



Balancing Act **Beetle** **Hot Cross Bun**

Standard Symbols for Critical Path Analysis.

Example

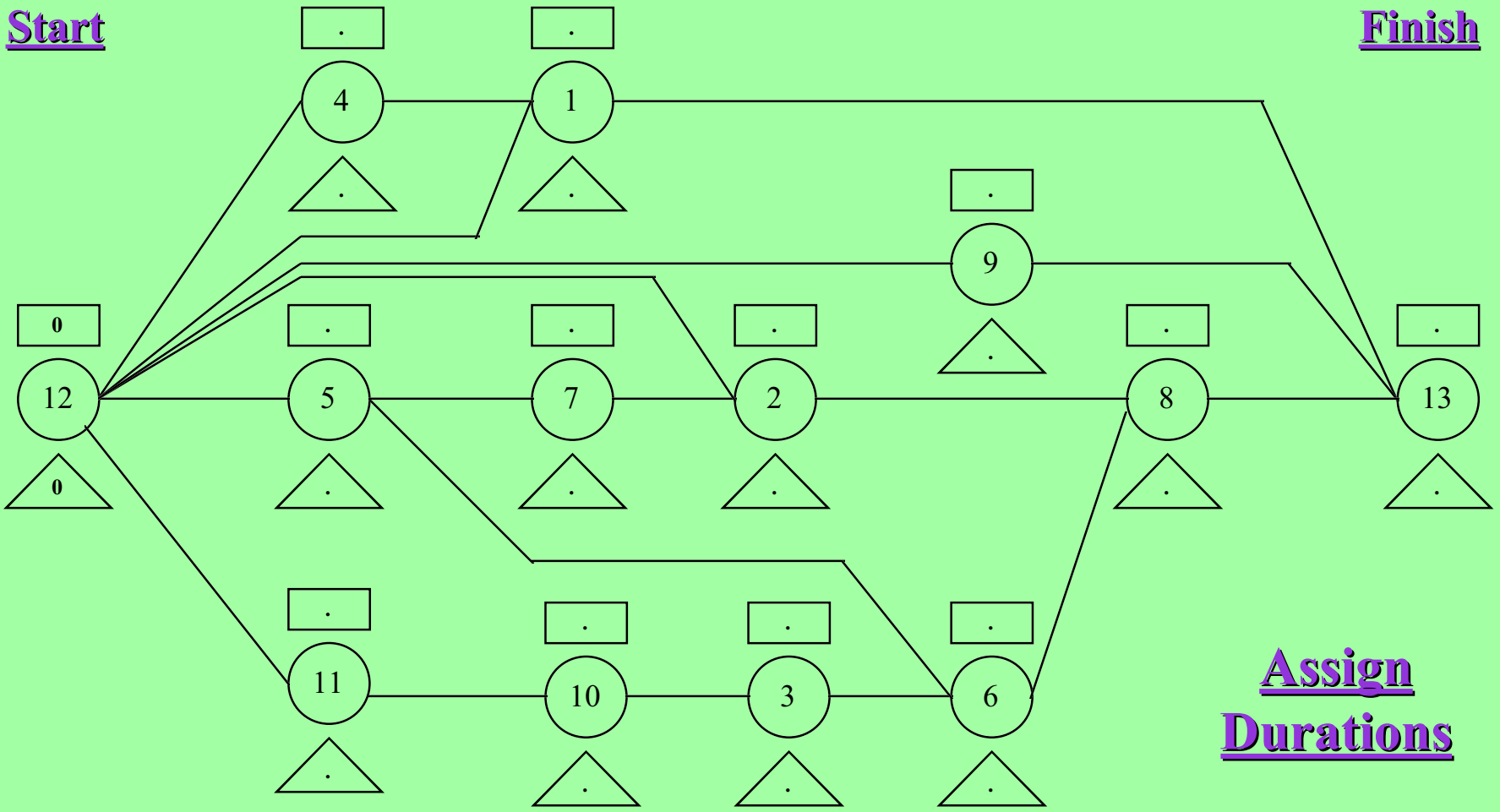
Critical Path Analysis.

- Where :-
- EST = Earliest Start Time
  - Starting from the initial event we mark the earliest time at which an event can take place and to the EST of each immediately preceding event ADD the duration of the connecting activity and select the highest value.
- LFT = Latest Finish Time
  - From the latest time of each succeeding event SUBTRACT the duration of connecting activity and select the smallest value.
- The Critical Path is the Route where EST = LFT.

Plans, Risk and Tests.

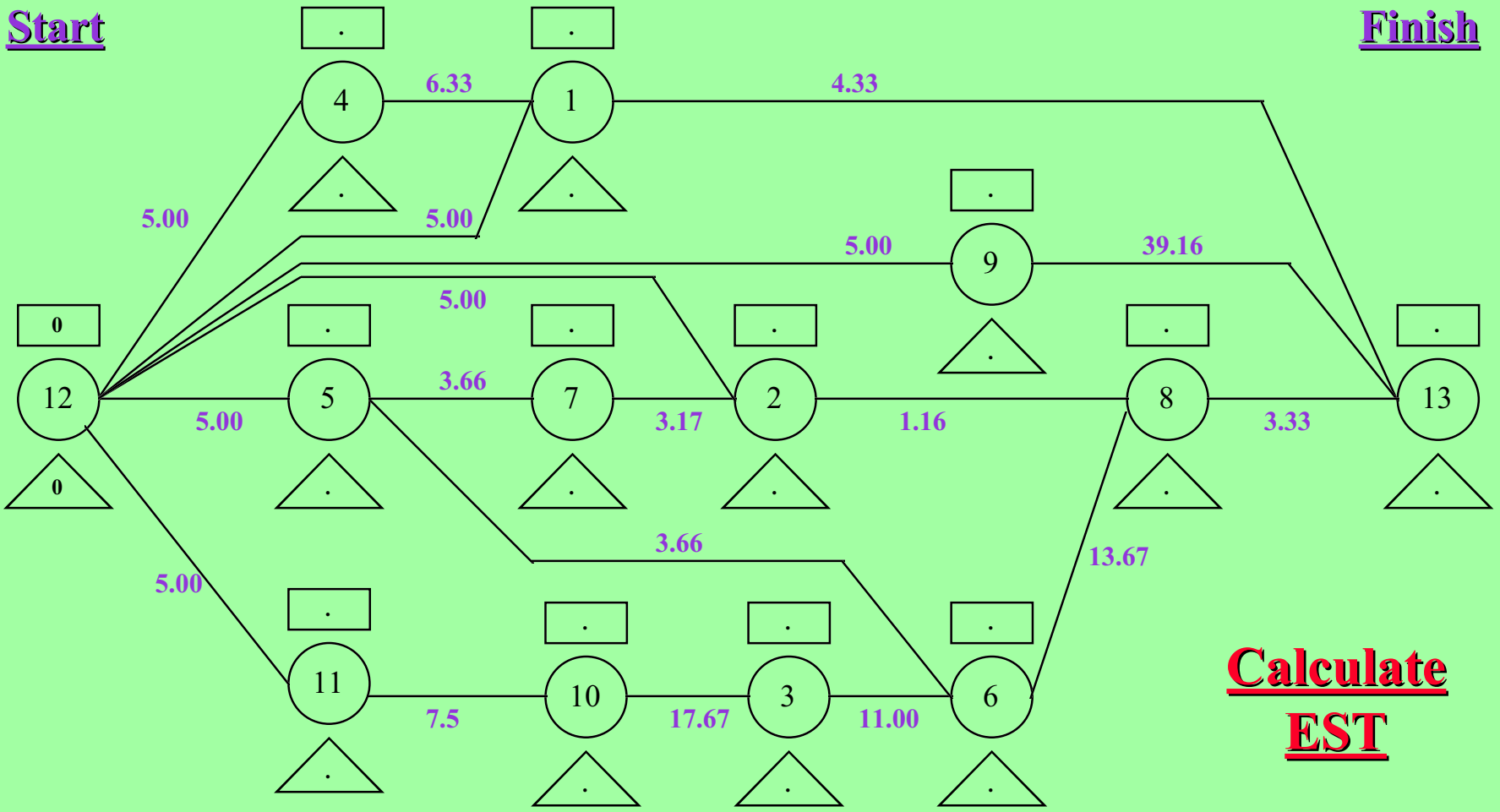
- Using Example 1
  - Sketch out an activity chart using the specified dependency relationships.
  - Annotate diagram with EST and LFT boxes.
  - Add durations to your diagram.
  - Calculate **EST** for each Activity.
  - Calculate **LFT** for each Activity.
  - Identify the **Critical Path** on your diagram.

Critical Path Analysis.



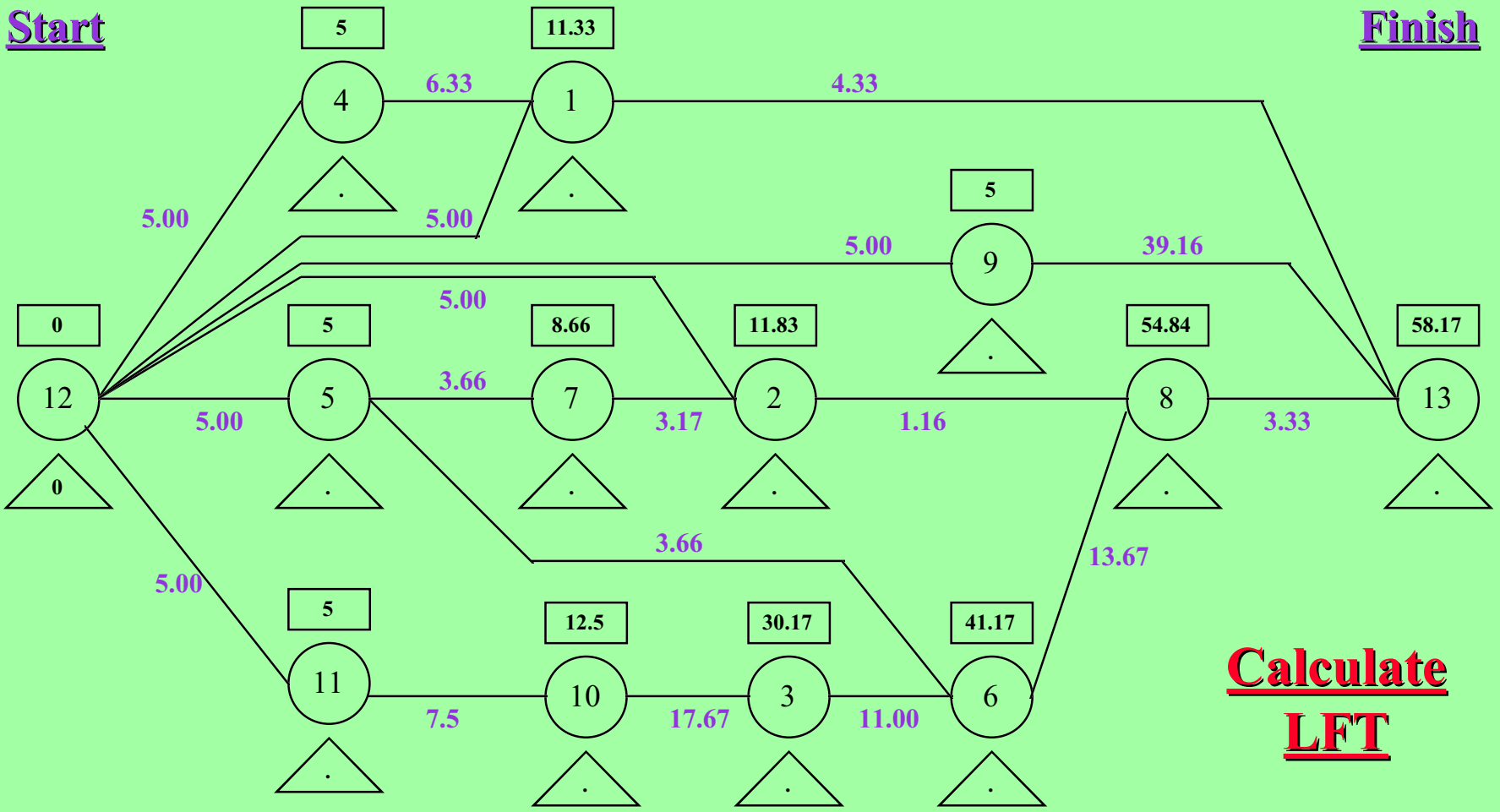
Relationship Diagram of Activities Using Example 1.

Critical Path Analysis.



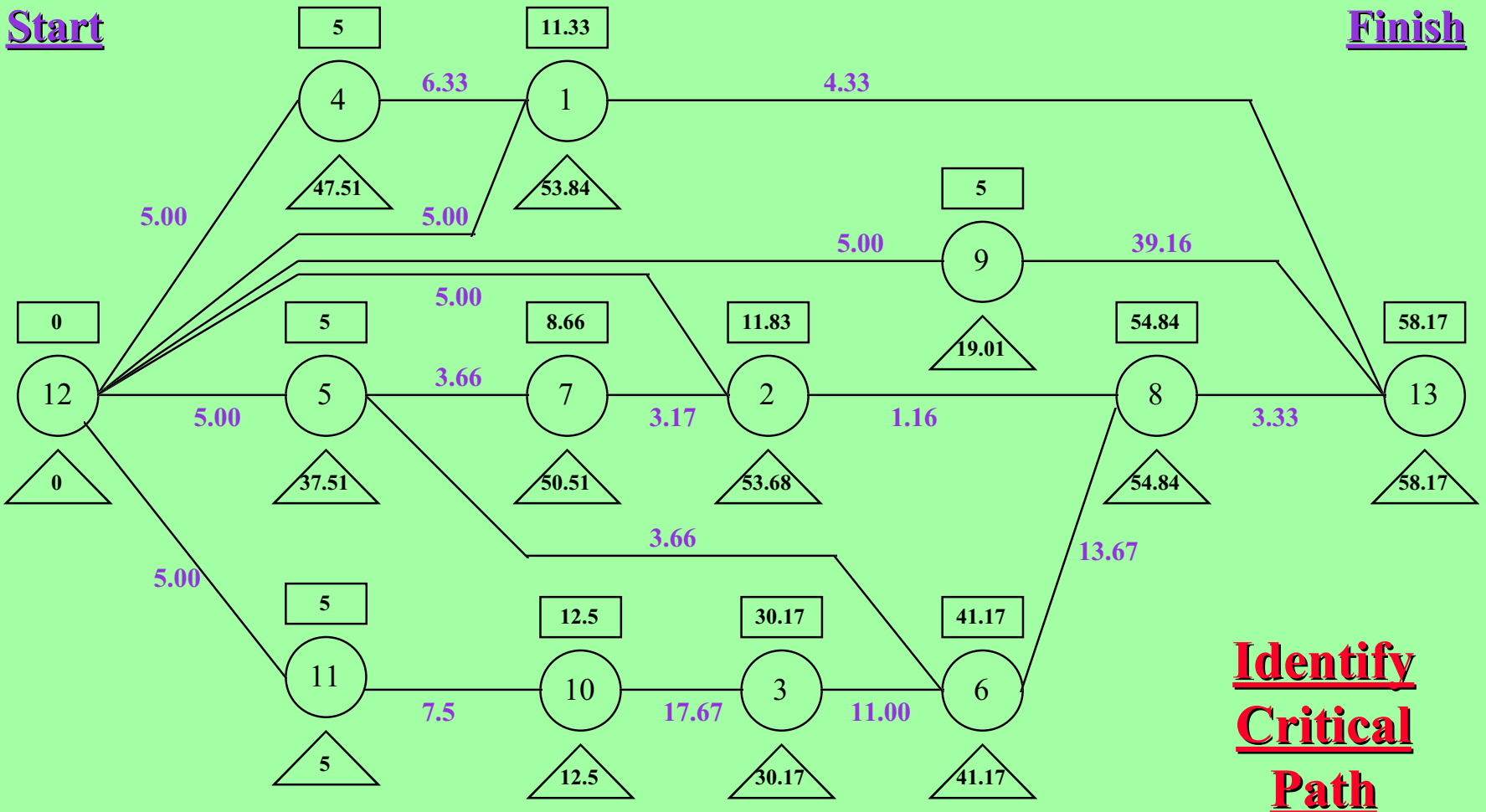
Relationship Diagram of Activities Using Example 1.

Critical Path Analysis..



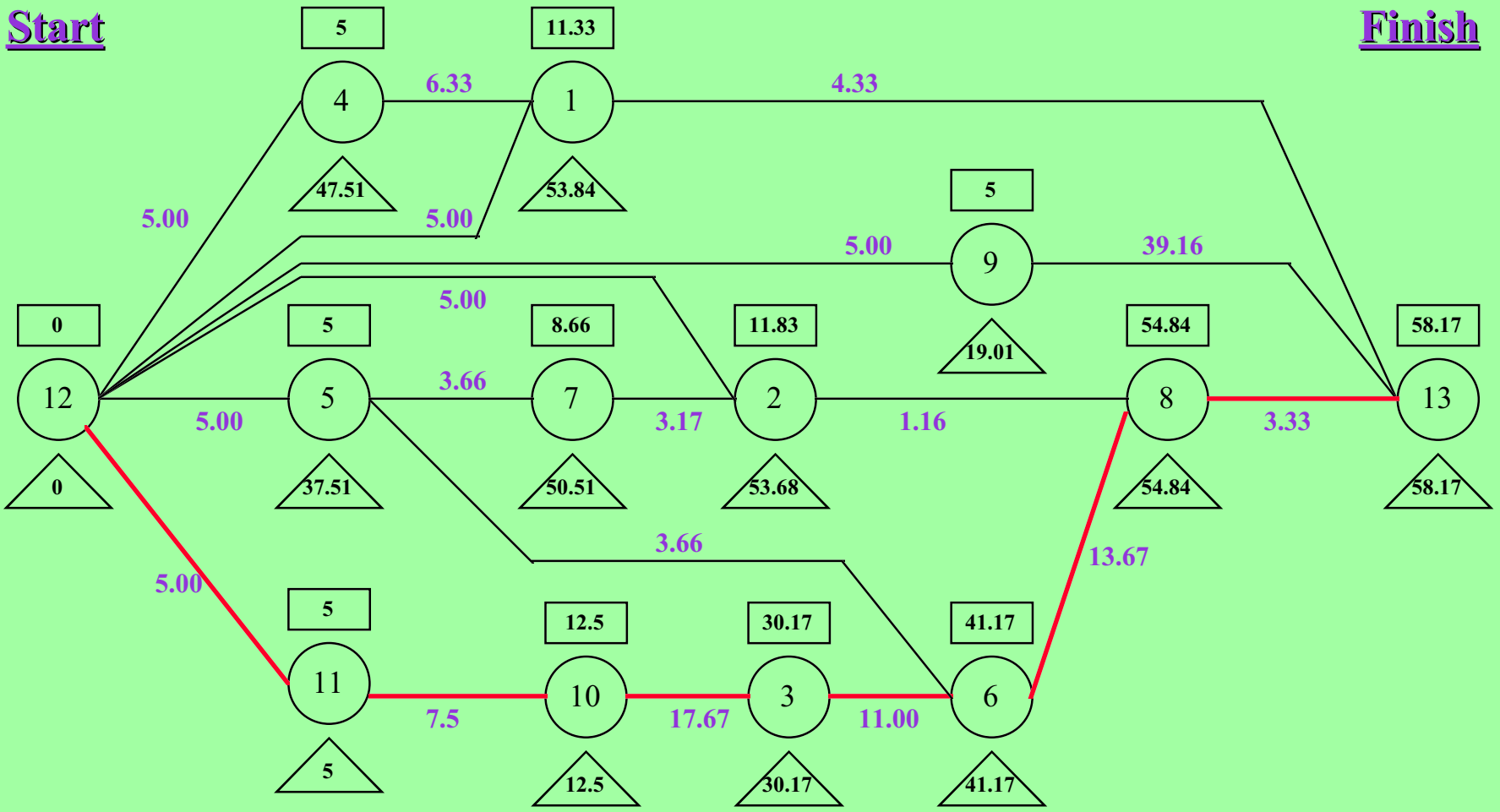
Relationship Diagram of Activities Using Example 1.

Critical Path Analysis.



Relationship Diagram of Activities Using Example 1.

Critical Path Analysis.



Relationship Diagram of Activities Using Example 1.

Gantt Charts.

Plans, Risk and Tests.

- How do I plan a project ?
- With the basic information of the plan and the calculated time allocations you can now draw a chart to plot your progress.

Gantt Charts.

Activity		Expected	Dependence order
1	Documentation	4.33	12,4
2	Order Parts	1.16	12,7
3	Develop Code	11	10
4	Write report	6.33	12
5	Process 1	3.66	12
6	Process 2	13.67	3,5
7	Process 3	3.17	5
8	Process 4	3.33	2, 6
9	Process 5	39.16	12
10	Process 6	17.67	11
11	Process 7	7.5	12
12	System Design	5	Start Activity
13	Job Completed		

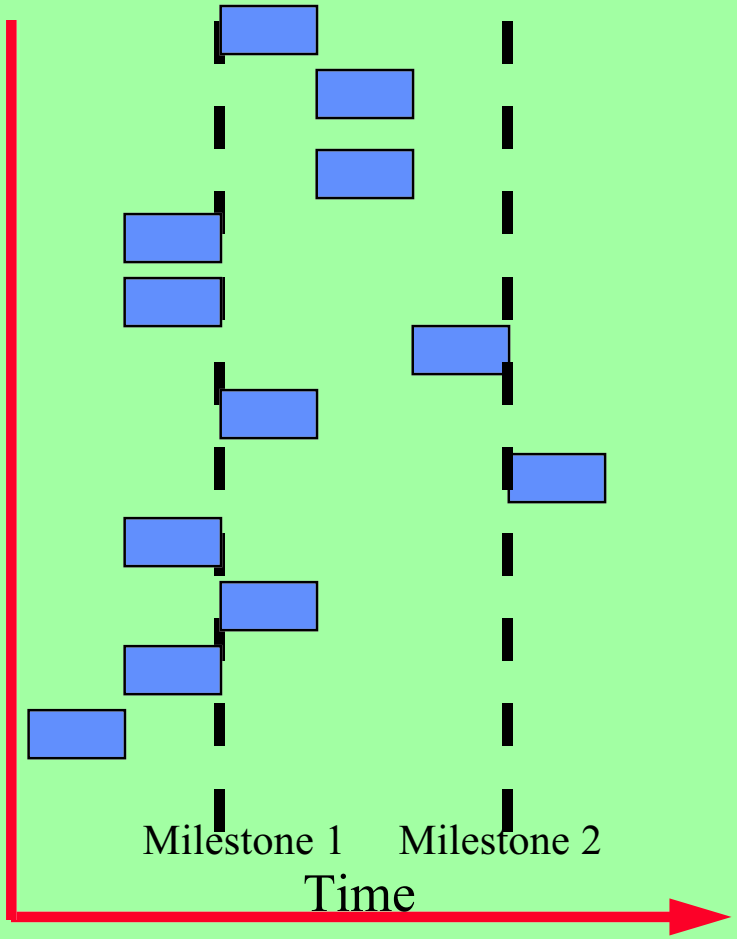


Table of activities with Dependencies.

Gantt Charts.

- How do I plan a project ?
- With the basic information of the plan and the calculated time allocations you can now draw a chart to plot your progress.
- If we scale the time allocation we can produce a Gantt chart to help monitor progress.
- Note we can allocate Milestones to our chart again to help us identify progress and any slippage within the project.

Gantt Charts.

	Activity	Expected
1	Documentation	4.33
2	Order Parts	1.16
3	Develop Code	11
4	Write report	6.33
5	Process 1	3.66
6	Process 2	13.67
7	Process 3	3.17
8	Process 4	3.33
9	Process 5	39.16
10	Process 6	17.67
11	Process 7	7.5
12	System Design	5
13	Job Completed	

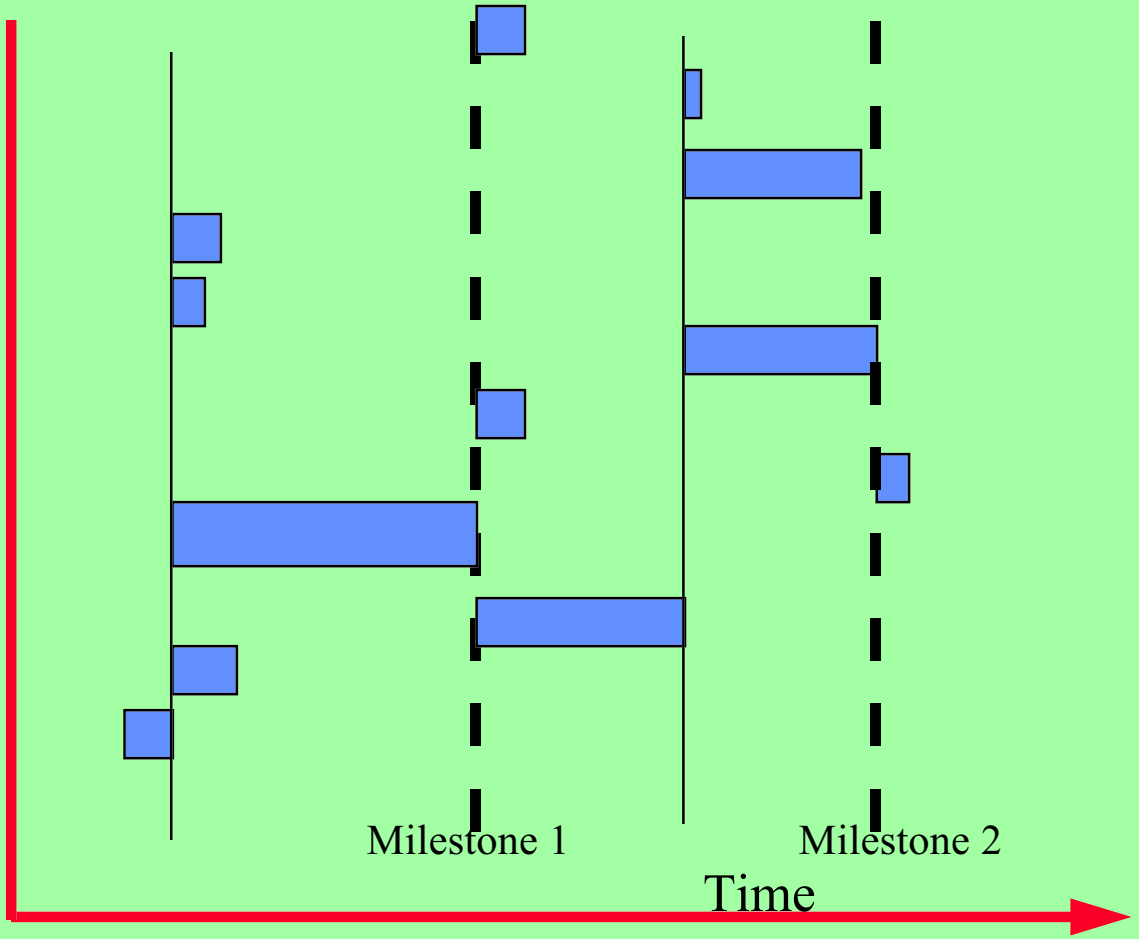
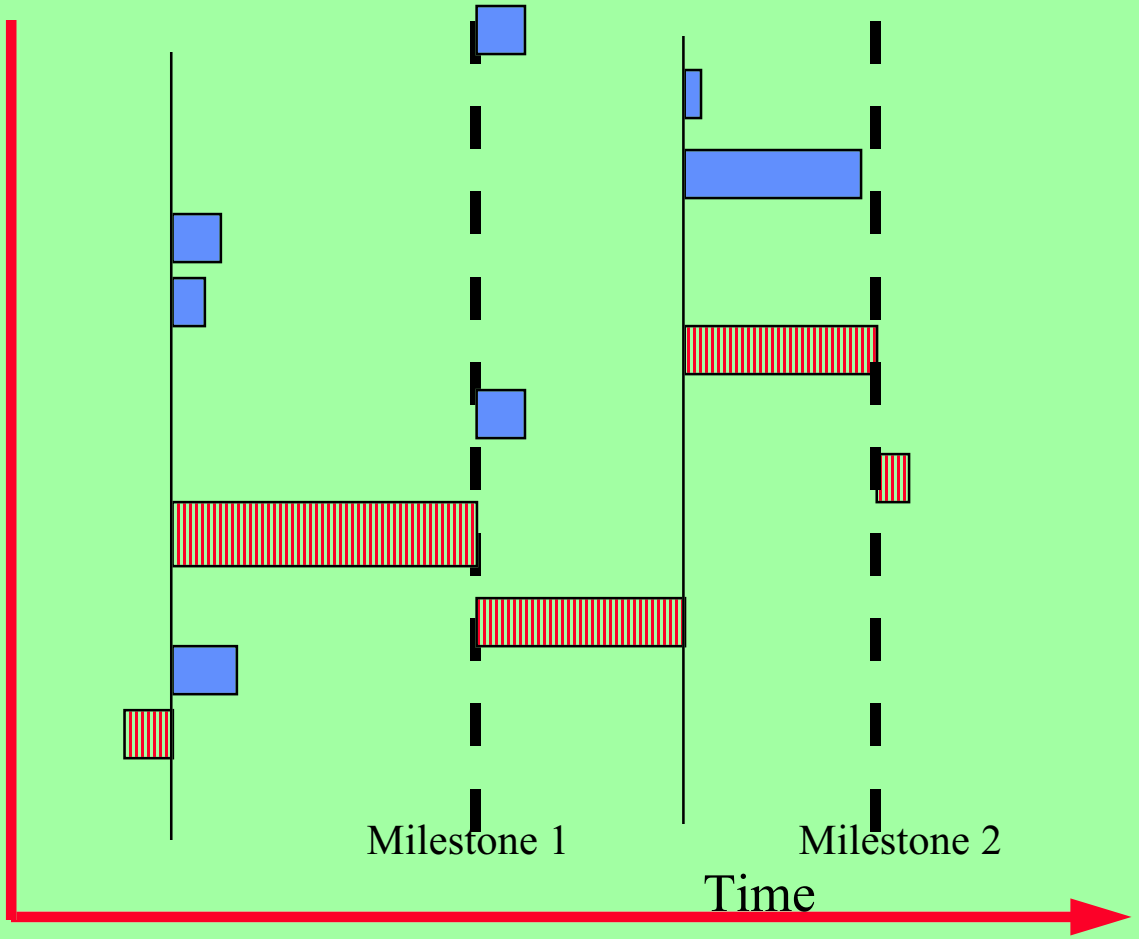


Table of activities with Gantt type display.

Gantt Charts.

Activity		Expected
1	Documentation	4.33
2	Order Parts	1.16
3	Develop Code	11
4	Write report	6.33
5	Process 1	3.66
6	Process 2	13.67
7	Process 3	3.17
8	Process 4	3.33
9	Process 5	39.16
10	Process 6	17.67
11	Process 7	7.5
12	System Design	5
13	Job Completed	



Gantt type display showing Critical Path.

Risk Analysis.

Risk Analysis.

- **How do I plan a project ?**
- **Risk Analysis**
- **It is considered that there are three categories of risk.**
- **Type 1 risk.**
  - The events that can be easily to overcome.
  - They cause minor delays.
  - They need additional resources
  - They have a reasonable likelihood of occurring.

Risk Analysis.

- **How do I plan a project ?**
- **Risk Analysis**
- **It is considered that there are three categories of risk.**
- **Type 2 risk.**
  - The events that can be difficult to overcome.
  - They can cause major delays.
  - They may need significant additional resources
  - They have a low probability of occurring.

Risk Analysis.

- **How do I plan a project ?**
- **Risk Analysis**
- **It is considered that there are three categories of risk.**
- **Type 3 risk.**
  - The Total Disaster.
  - The Project fails.
  - Compensation due to failure to deliver.
  - They are a very rare occurrence.

Risk Analysis.

- **How do I plan a project ?**
- **How do I assess Risk.**
  - Step 1. Assume a numeric range for risk for example say 1 to 5.
  - Step 2. Assume a numeric range for risk modification for example say +2 to -2 (For the unknown elements).
  - Step 3. Allocate a numeric risk value to each activity.
  - Step 4. Allocate a numeric risk modification value to each activity if this is appropriate.
  - Step 5. Calculate the risk value for each activity.
  - Step 6. Re-evaluate all activities that are above a threshold of acceptable risk for the project.

Risk Analysis.

- **How do I plan a project ?**
- **How do I assess Risk.**
  - **Possible risk value assignments.**
  - Risk value =1 No Problem.
  - Risk value =2 Should be OK.
  - Risk value =3 Acceptable.
  - Risk value =4 Cause for concern.
  - Risk value =5 May not succeed.
  - Risk Modify value = -1 Experienced at doing this.
  - Risk Modify value = 0 Situation normal.
  - Risk Modify value = +1 Unusual option.

Risk Analysis.

	Activity	Risk	Mod	Sum	Comments
1	Documentation	1	0	1	
2	Order Parts	1	0	1	No Problem
3	Develop Code	4	-2	2	Low Risk
4	Write report	1	0	1	Cut an Paste ?
5	Process 1	1	1	2	**RISK Concern**
6	Process 2	2	+1	3	Research needed
7	Process 3	2	-1	1	Usually easy
8	Process 4	1	1	2	Ditto
9	Process 5	3	+1	4	Could give problems
10	Process 6	2	-1	1	Audio player needed
11	Process 7	4	+1	5	
12	System Design	1	1	2	
13	Job Completed	0	0	0	
14		0	0	0	

25 = Sum , Average = 25/12=2.083

Overall project Risk
Should be OK (2.083)

Table of activities with Risk estimates.

Testing.

Testing.

- **How do I Test a project ?**
- **Identify from the specification all the constraints of the system.**
  - Verify the **System** works when all parameters are within the defined constraints.
  - Verify the **System** works when parameters approach any of the defined constraints.
  - Verify the **System** responds correctly when any or all parameters drift beyond the defined constraints. (Ensure non Destructive settings)

Conclusion.

Conclusion.

- **How do I plan a project ?**
- **In Conclusion**
  - Plan to succeed.
  - Monitor your progress (Log Book).
  - Log all activities so you can identify with hindsight where the project could have been improved.
  - Use the skills developed to improve future projects.

End Slide

Revision Page

Title	Business Systems Information
Author	R. J. Spriggs
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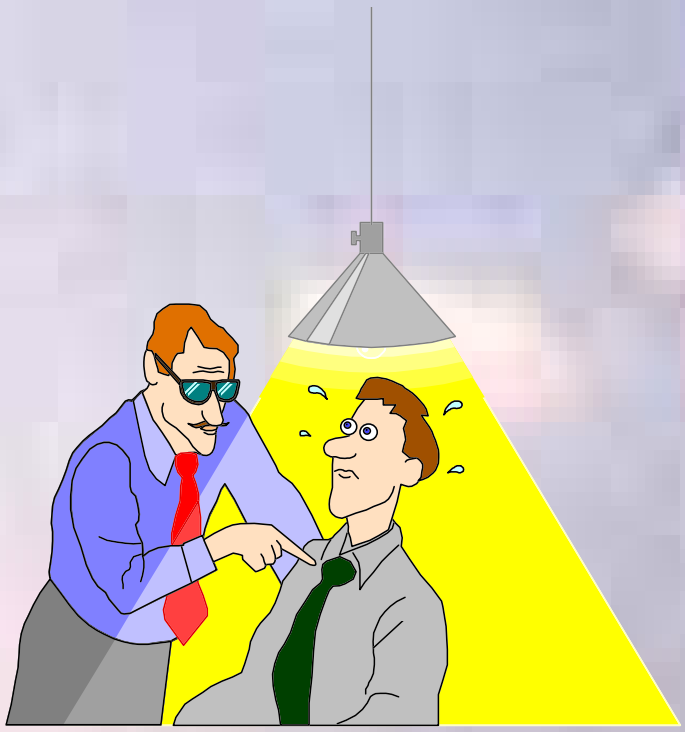
Version	1.13
Edit	0057



Thanks to Andrew Jeneson for help and support producing background information for costing resources.