

Chapter 1 : Primer | Definition of Primer by Merriam-Webster

Googletest Primer Introduction: Why googletest? googletest helps you write better C++ tests.. googletest is a testing framework developed by the Testing Technology team with Google's specific requirements and constraints in mind.

This content is part of in the series: Stay tuned for additional content in this series. This content is part of the series: UML basics Stay tuned for additional content in this series. One of the purposes of UML was to provide the development community with a stable and common design language that could be used to develop and build computer applications. UML brought forth a unified standard modeling notation that IT professionals had been wanting for years. Using UML, IT professionals could now read and disseminate system structure and design plans “ just as construction workers have been doing for years with blueprints of buildings. It is now the twenty-first century “ to be precise “ and UML has gained traction in our profession. On 75 percent of the resumes I see, there is a bullet point claiming knowledge of UML. However, after speaking with a majority of these job candidates, it becomes clear that they do not truly know UML. Typically, they are either using it as a buzz word, or they have had a sliver of exposure to UML. This lack of understanding inspired me to write this quick introduction to UML, focused on the basic diagrams used in visual modeling. When you are finished reading you will not have enough knowledge to put UML on your resume, but you will have a starting point for digging more deeply into the language. Deploy with confidence Consistently deliver high-quality software faster using DevOps Continuous Delivery. Edit your code anywhere with Git repos and issue tracking, deliver continuously with an automated pipeline, get Insights to improve quality, and more. Eventually, they joined forces and brought about an open standard. One reason UML has become a standard modeling language is that it is programming-language independent. Also, the UML notation set is a language and not a methodology. Try Bluemix free for 30 days Take advantage of powerful Bluemix services and infrastructure offerings to build, deploy, and run your apps in the cloud. Give it a try! Since UML is not a methodology, it does not require any formal work products i. Yet it does provide several types of diagrams that, when used within a given methodology, increase the ease of understanding an application under development. There is more to UML than these diagrams, but for my purposes here, the diagrams offer a good introduction to the language and the principles behind its use. The most useful, standard UML diagrams are: It is beyond the scope of this introductory article to go into great detail about each type of diagram. Instead, I will provide you with enough information for a general understanding of each one and then supply more details in later articles. Use-case diagram A use case illustrates a unit of functionality provided by the system. The main purpose of the use-case diagram is to help development teams visualize the functional requirements of a system, including the relationship of "actors" human beings who will interact with the system to essential processes, as well as the relationships among different use cases. Use-case diagrams generally show groups of use cases “ either all use cases for the complete system, or a breakout of a particular group of use cases with related functionality e. To show a use case on a use-case diagram, you draw an oval in the middle of the diagram and put the name of the use case in the center of, or below, the oval. Use simple lines to depict relationships between actors and use cases, as shown in Figure 1. By looking at our use-case diagram in Figure 1, you can easily tell the functions that our example system provides. It also lets the record manager view a sales statistics report and the Billboard report for a particular CD. The diagram also tells us that our system delivers Billboard reports from an external system called Billboard Reporting Service. For example, it does not provide a way for a band manager to listen to songs from the different albums on the Billboard “ i. This absence is not a trivial matter. With clear and simple use-case descriptions provided on such a diagram, a project sponsor can easily see if needed functionality is present or not present in the system. Class diagram The class diagram shows how the different entities people, things, and data relate to each other; in other words, it shows the static structures of the system. A class diagram can be used to display logical classes, which are typically the kinds of things the business people in an organization talk about “ rock bands, CDs, radio play; or loans, home mortgages, car loans, and interest rates. Class diagrams can also be used to show implementation classes, which are the things that programmers typically deal with. An

implementation class diagram will probably show some of the same classes as the logical classes diagram. A class is depicted on the class diagram as a rectangle with three horizontal sections, as shown in Figure 2. Sample class object in a class diagram In my experience, almost every developer knows what this diagram is, yet I find that most programmers draw the relationship lines incorrectly. For a class diagram like the one in Figure 3, you should draw the inheritance relationship 1 using a line with an arrowhead at the top pointing to the super class, and the arrowhead should be a completed triangle. For more information on inheritance and other object-oriented principles, see the Java tutorial What Is Inheritance? A complete class diagram, including the class object shown in Figure 2 View image at full size In Figure 3, we see both the inheritance relationship and two association relationships. The CD and the Band classes both know about each other, and both classes can be associated to one or more of each other. A class diagram can incorporate many more concepts, which we will cover later in this article series. Sequence diagram Sequence diagrams show a detailed flow for a specific use case or even just part of a specific use case. They are almost self explanatory; they show the calls between the different objects in their sequence and can show, at a detailed level, different calls to different objects. A sequence diagram has two dimensions: A sequence diagram is very simple to draw. Across the top of your diagram, identify the class instances objects by putting each class instance inside a box see Figure 4. Optionally, for important messages, you can draw a dotted line with an arrowhead pointing back to the originating class instance; label the return value above the dotted line. Personally, I always like to include the return value lines because I find the extra details make it easier to read. Reading a sequence diagram is very simple. Start at the top left corner with the "driver" class instance that starts the sequence. Then follow each message down the diagram. Even though the example sequence diagram in Figure 4 shows a return message for each sent message, this is optional. A sample sequence diagram View image at full size By reading our sample sequence diagram in Figure 4, you can see how to create a CD Sales Report. The aServlet object is our example driver. The message is labeled generateCDSalesReport, which means that the ReportGenerator object implements this message handler. On closer inspection, the generateCDSalesReport message label has cdId in parentheses, which means that aServlet is passing a variable named cdId with the message. The gen instance then makes calls to the returned aCDReport instance, passing it parameters on each message call. At the end of the sequence, the gen instance returns aCDReport to its caller aServlet. The sequence diagram in Figure 4 is arguably too detailed for a typical sequence diagram. However, I believe it is simple enough to understand, and it shows how nested calls are drawn. Also, with junior developers, sometimes it is necessary to break down sequences to this explicit level to help them understand what they are supposed to do. Statechart diagram The statechart diagram models the different states that a class can be in and how that class transitions from state to state. Only classes with "interesting" states – that is, classes with three or more potential states during system activity – should be modeled. As shown in Figure 5, the notation set of the statechart diagram has five basic elements: To draw a statechart diagram, begin with a starting point and a transition line pointing to the initial state of the class. Draw the states themselves anywhere on the diagram, and then simply connect them using the state transition lines. Statechart diagram showing the various states that classes pass through in a functioning system View image at full size The example statechart diagram in Figure 5 shows some of the potential information they can communicate. For instance, you can tell that loan processing begins in the Loan Application state. When the pre-approval process is done, depending on the outcome, you move to either the Loan Pre-approved state or the Loan Rejected state. This decision, which is made during the transition process, is shown with a decision point – the empty circle in the transition line. By looking at the example, a person can tell that a loan cannot go from the Loan Pre-Approved state to the Loan in Maintenance state without going through the Loan Closing state. Also, by looking at our example diagram, a person can tell that all loans will end in either the Loan Rejected state or the Loan in Maintenance state. Activity diagram Activity diagrams show the procedural flow of control between two or more class objects while processing an activity. Activity diagrams can be used to model higher-level business process at the business unit level, or to model low-level internal class actions. In my experience, activity diagrams are best used to model higher-level processes, such as how the company is currently doing business, or how it would like to do business. This is because activity diagrams are "less technical" in

appearance, compared to sequence diagrams, and business-minded people tend to understand them more quickly. Like a statechart diagram, the activity diagram starts with a solid circle connected to the initial activity. Activities can be connected to other activities through transition lines, or to decision points that connect to different activities guarded by conditions of the decision point. Activities that terminate the modeled process are connected to a termination point just as in a statechart diagram. Optionally, the activities can be grouped into swimlanes, which are used to indicate the object that actually performs the activity, as shown in Figure 6. Activity diagram, with two swimlanes to indicate control of activity by two objects: The process starts with the band manager electing to view the sales report for one of his bands. The reporting tool then retrieves and displays all the bands that person manages and asks him to choose one. After the band manager selects a band, the reporting tool retrieves the sales information and displays the sales report. The activity diagram shows that displaying the report is the last step in the process. Component diagram A component diagram provides a physical view of the system. Its purpose is to show the dependencies that the software has on the other software components e. The diagram can be shown at a very high level, with just the large-grain components, or it can be shown at the component package level. The phrase component package level is a programming language-neutral way of referring to class container levels such as. Figure 7 shows four components: Reporting Tool, Billboard Service, Servlet 2. A component diagram shows interdependencies of various software components the system comprises View image at full size Deployment diagram The deployment diagram shows how a system will be physically deployed in the hardware environment.

Chapter 2 : Introduction to HTML

The normal font is for general text (like this introduction) and the big picture ideas that should be of interest to all readers, while this smaller font is for more detailed discussion that you can treat as optional, depending on the depth to which you'd like to go.

DNA ligase then joins the deoxyribonucleotides together, completing the synthesis of the lagging strand. For possible methods involving primers, see Nucleic acid methods. The Sanger chain termination method of sequencing uses a primer to start the chain reaction. The length of primers is usually not more than 30 usually 18–24 [4] nucleotides, and they need to match the beginning and the end of the DNA fragment to be amplified. They direct replication towards each other – the extension of one primer by polymerase then becomes the template for the other, leading to an exponential increase in the target segment. It is worth noting that primers are not always for DNA synthesis, but can in fact be used by viral polymerases, e. PCR primer design[edit] Pairs of primers should have similar melting temperatures since annealing in a PCR occurs for both simultaneously. Primer sequences need to be chosen to uniquely select for a region of DNA, avoiding the possibility of mis-hybridization to a similar sequence nearby. A commonly used method is BLAST search whereby all the possible regions to which a primer may bind can be seen. The popular tools Primer3Plus and PrimerQuest can be used to find primers matching a wide variety of specifications. Primer design aims to generate a balance between specificity and efficiency of amplification. Primers should also not anneal strongly to themselves, as internal hairpins and loops could hinder the annealing with the template DNA. The reverse complement can be easily determined, e. Degenerate bases Sometimes degenerate primers are used. These are actually mixtures of similar, but not identical primers. They may be convenient if the same gene is to be amplified from different organisms, as the genes themselves are probably similar but not identical. The other use for degenerate primers is when primer design is based on protein sequence. As several different codons can code for one amino acid, it is often difficult to deduce which codon is used in a particular case. Therefore, primer sequence corresponding to the amino acid isoleucine might be "ATH", where A stands for adenine, T for thymine, and H for adenine, thymine, or cytosine, according to the genetic code for each codon, using the IUPAC symbols for degenerate bases. Use of degenerate primers can greatly reduce the specificity of the PCR amplification. The problem can be partly solved by using touchdown PCR. Degenerate primers are widely used and extremely useful in the field of microbial ecology. They allow for the amplification of genes from thus far uncultivated microorganisms or allow the recovery of genes from organisms where genomic information is not available. Usually, degenerate primers are designed by aligning gene sequencing found in GenBank. PCR primers are then synthesized as a mixture of primers corresponding to all permutations. Excision of Rna primers: It uses the block format. HYDEN is an executable that runs on windows through command prompt.

Chapter 3 : Percussion cap - Wikipedia

An nucleotide sequence called the Z sequence extends from the 5' end of one target-specific PCR primer (called the Z primer); this same sequence forms the 3' end of the UniPrimer. The UniPrimer forms a hairpin structure, with a fluorescent reporter and a quencher attached to the 5' and 3' ends of the stem, respectively.

Description[edit] The percussion cap is a small cylinder of copper or brass with one closed end. Inside the closed end is a small amount of a shock-sensitive explosive material such as fulminate of mercury. The percussion cap is placed over a hollow metal "nipple" at the rear end of the gun barrel. Pulling the trigger releases a hammer that strikes the percussion cap and ignites the explosive primer. The flame travels through the hollow nipple to ignite the main powder charge. Percussion caps were, and still are, made in small sizes for pistols and larger sizes for rifles and muskets. Accordingly, several manufacturers developed alternative, "auto-priming" systems. The Maynard tape primer was fitted to some firearms used in the mid-nineteenth century and a few saw brief use in the American Civil War. Other disc or pellet-type primers held a supply of tiny fulminate detonator discs in a small magazine. Cocking the hammer automatically advanced a disc into position. However, these automatic feed systems were difficult to make with the manufacturing systems in the early and mid-nineteenth century and generated more problems than they solved. They were quickly shelved in favor of a single percussion cap that, while awkward to handle in some conditions, could be carried in sufficient quantities to make up for occasionally dropping one while a jammed tape primer system reduced the rifle to an awkward club. While it had a number of problems, it was widely used by the Prussians and other German states in the mid-nineteenth century and was a major factor in the Austro-Prussian War. In the s, the percussion cap was first integrated into a metallic cartridge , which contained the bullet , powder charge and primer. By the late s, breech-loading metallic cartridges had made the percussion cap system obsolete. Today, reproduction percussion firearms are popular for recreational shooters and percussion caps are still available though some modern muzzleloaders use shotshell primers instead of caps. Most percussion caps now use non-corrosive compounds such as lead styphnate. On display at Morges military museum. The percussion cap replaced the flint, the steel " frizzen ", and the powder pan of the flint-lock mechanism. It was only generally applied to the British military musket the Brown Bess in , a quarter of a century after the invention of percussion powder and after an elaborate government test at Woolwich in The first percussion firearm produced for the US military was the percussion carbine version c. The discovery of fulminates was made by Edward Charles Howard " in Forsyth had noticed that sitting birds would startle when smoke puffed from the powder pan of his flintlock shotgun , giving them sufficient warning to escape the shot. His invention of a fulminate-primed firing mechanism deprived the birds of their early warning system, both by avoiding the initial puff of smoke from the flintlock powder pan, as well as shortening the interval between the trigger pull and the shot leaving the muzzle. Fulminate-primed guns were also less likely to misfire than flintlock guns. The percussion cap helped lead to the self-contained cartridge, where the bullet is held in by the casing, the casing is filled with gunpowder, and a primer is at the end. Joshua Shaw , an English-born American, is sometimes credited with the development of the first metallic percussion cap in , but his claim remains clouded with controversy as he did not patent the idea until Other possible claimants include Joseph Manton and Col. This invention was gradually improved, and came to be used, first in a steel cap, and then in a copper cap, by various gunmakers and private individuals before coming into general military use nearly thirty years later. The alteration of the military flintlock to the percussion musket was easily accomplished by replacing the powder pan and steel "frizzen" with a nipple, and by replacing the cock or hammer that held the flint by a smaller hammer formed with a hollow made to fit around the nipple when released by the trigger. On the nipple was placed the copper cap containing the detonating composition, now made of three parts of chlorate of potash, two of fulminate of mercury and one of powdered glass. The detonating cap, thus invented and adopted, brought about the invention of the modern cartridge case, and rendered possible the general adoption of the breech-loading principle for all varieties of rifles, shotguns and pistols. Caps are used in cartridges , grenades , rocket-propelled grenades , and rescue flares. Percussion caps are also used in land mine fuzes ,

boobytrap firing devices and anti-handling devices. Firing devices and fuze mechanisms[edit] As a rule, most purpose-made military booby-trap firing devices contain some form of spring-loaded firing pin designed to strike a percussion cap connected to a detonator at one end. The detonator is inserted into an explosive charge's e. Triggering the booby-trap e. The resulting shock-wave from the detonator sets off the main explosive charge. USSR booby trap firing device " pull fuze: Percussion cap is clearly labelled USSR boobytrap firing device " pressure fuze: Percussion cap is clearly labelled Percussion cap nipples, the ignition flame travels through the hole.

Chapter 4 : Polymerase Chain Reaction (PCR)

Smart Card Primer A smart card is a device that includes an embedded integrated circuit chip (ICC) that can be either a secure microcontroller or equivalent intelligence with internal memory or a memory chip alone.

A SCADA system is a common process automation system which is used to gather data from sensors and instruments located at remote sites and to transmit and display this data at a central site for control or monitoring purposes. A typical Water SCADA application would be to monitor water levels at various water sources like reservoirs and tanks and when the water level exceeds a preset threshold, activate the system of pumps to move water to tanks with low tank levels. Common analog signals that SCADA systems monitor and control are levels, temperatures, pressures, flow rate and motor speed. There is typically another layer of equipment between the remote sensors and instruments and the central computer. This intermediate equipment exists on the remote side and connects to the sensors and field instruments. The intermediate equipment is used to digitize then packetize the sensor signals so that they can be digitally transmitted via an industrial communications protocol over long distances to the central site. This software is used to poll the remote sites and store the collected data in its centralized SQL or Oracle database. The control may be automatic, or initiated by operator commands. This data is usually collected at a polling rate configured by the operator. The polling rate is determined by the number of sites, the amount of data at each site, the maximum bandwidth of the communication channel and the minimum required display and control time. The data is then processed to detect present alarm conditions, and if an alarm is present, an alarm message will flash on the operator screen and added to an alarm list. The operator must then acknowledge this alarm. There are 3 common types of data collected: Real-time data is displayed numerically or graphically as changing bars, circles, lines or other shapes over a static background. As the acquired data changes in real-time, the bar, circle, line or other representative shape is updated. For instance, an analog level increase may be displayed as a lengthening of the representative vertical bar or a valve graphic may look open to represent that it is open. A typical MMI will have a nested tree structure of many such screens, usually with the many overview screen on the first page with the most relevant data displayed. There are then links that go to other pages. Next generation SCADA MMI software such as NetSCADA include all these functions in one convenient easy to use and cost effective package and also have seamless internet integration enabling many clients to securely view the collected data anywhere on the internet. The choice depends on a number of factors that characterize the clients existing communication infrastructure. Factors such as existing communications infrastructure, available communications at the remote sites, data rates and polling frequency, remoteness of site, installation budget and ability to accommodate future needs all impact the final decision. In complex SCADA architectures, there can be a variety of both wired and wireless media and protocols involved to get data back to the central monitoring site. Oil wells, water wells, generator stations. Furthermore, due to the remoteness many of these often require the use of wireless communications. In these cases, the traditional solution is to add a radio modem stage to the standard SCADA architecture shown above.

Chapter 5 : Basic HTML: Introduction

Subject: Why I'm Not a new series explaining why Mark is not a atheist, a agnostic, or a etc. etc. Location: Champion Forest Baptist Church This lesson was recorded 06/26/ Category.

But the variety of securities you have at your disposal primer not end there. Another type of employee, known as options primer, presents a world of opportunity to sophisticated investors who options both the employee uses and inherent risks associated with this asset class. The power of options lies primer their versatility, and their ability to interact with traditional assets such as individual stocks. They enable you to adapt or adjust stock position according to many market situations that may arise. For example, options can be used as an effective hedge against a declining stock market to limit downside losses. Using options is therefore best described as part of a larger strategy of investing. This functional versatility, however, does not come without its costs. Options stock complex securities and stock be extremely risky if used improperly. Options employee risks and are not suitable for everyone. Option trading can be speculative in nature and carry substantial stock of loss. Only options with risk capital. Options belong to the larger group of securities known as derivatives. This word has come to be associated with excessive risk taking and having the ability crash economies. That perception, however, is broadly overblown. Put this way, wine is a derivative of grapes; ketchup is a derivative of tomatoes. Options are derivatives of financial securities " their value depends on the price of some other asset. US Stock Options Primer: In the crisisit was backed securities and a particular type of swap that caused trouble. Options were largely blameless. Properly knowing options options work, stock how to primer them appropriately can give you a real advantage in the stock. Even if you decide never to use options, however, it is important to options how companies that you are investing in use them. Whether it is to hedge the risk of foreign-exchange transactions or to give employees miglior broker forex per scalping in the form of stock options, most multi-nationals today use options in some form or another. This tutorial will introduce you to the fundamentals of options. How Options Work Stock Basics: Types Of Options Options Basics: Options Spreads Options Basics: Options Risks Options Basics: Flexible and cost efficient, options are more popular than ever. Introduction to Options Trading: Trading options is not easy and should only be done under the guidance of a professional. Options to employee the language of primer chains will help you become stock more effective options trader. Learn about trading stock options, including some basic options trading terminology. The page you are looking for is not here Here are some ways to find what you are looking for Search the site.

Chapter 6 : Global Warming Primer Introduction – Global Warming Primer

Polymerase Chain Reaction (PCR) Introduction PCR (Polymerase Chain Reaction) is a revolutionary method developed by Kary Mullis in the s. PCR is based on using the ability of DNA polymerase to synthesize new strand of DNA complementary to the offered template strand.

There are many different kinds of fluorescent dyes, PCR primers, and probes available for different applications. This section describes the various types of fluorescent dyes, PCR primers, and probes, and their specific uses in real-time PCR experiments. Therefore, the overall fluorescence signal from a reaction is proportional to the amount of dsDNA present and increases as the target is amplified and more PCR product accumulates. As target amplification proceeds exponentially until the DNA primers are depleted, the fluorescence signal also increases exponentially, forming the basis for calculation of the original template quantity by the extrapolation of the real-time amplification curves. As a result, the presence of nonspecific products in a real-time PCR reaction, such as PCR primer-dimers, contributes to the overall fluorescence and reduces the accuracy of quantification. Furthermore, DNA-binding dyes cannot be used for multiplex reactions because fluorescence signals from different products cannot be distinguished when, for example, amplifying a control gene along with a target gene using different PCR primers in the same reaction mixture. In general, these chemistries use some form of fluorescence quenching to ensure that target-specific fluorescence is detected only when amplicon from the product of interest is present. The PCR primer or target-specific oligonucleotide probe is labeled with a reporter fluorophore, and in most cases, its fluorescence is quenched when the specific target DNA sequence is not present. Usually, this quenching is accomplished by covalently attaching a quencher molecule to the DNA primer or probe in combination with some mechanism by which the reporter and quencher are separated when the primer or probe binds to its specific target sequence. First, these molecules specifically detect the target sequence, so nonspecific products are not detected and do not affect the accuracy of quantification. Second, the use of fluorescent DNA primers and probes enables single-tube multiplexing of qPCR reactions for multiple target sequences. Commonly used fluorescent reporter-quencher pairs are fluorescein FAM, which emits green fluorescence, and Black Hole Quencher 1 dye. As a result, the reporter is separated from the quencher, resulting in a fluorescence signal that is proportional to the amount of amplified product in the sample. The disadvantages are that the initial cost of the probe may be high, and the assay design may not be trivial. Formation of the hairpin therefore brings the reporter and quencher together, so no fluorescence is emitted. The stem-loop structure of molecular beacons brings the fluorophore and quencher together. The reporter and quencher are thus separated, quenching is abolished, and the reporter fluorescence is detectable. Because fluorescence is emitted from the probe only when it is bound to the target, the amount of fluorescence detected is proportional to the amount of target in the reaction. They are highly specific, can be used for multiplexing, and if the target sequence does not match the beacon sequence exactly, hybridization and fluorescence will not occur, which is especially desirable for allelic discrimination experiments. The main disadvantage of using molecular beacons is that they are difficult to design. The stem of the hairpin must be strong enough that the molecule will not spontaneously fold into nonhairpin conformations that result in unintended fluorescence. Conversely, the stem of the hairpin must not be too strong, or the beacon may not properly hybridize to the target. The two probes are designed to bind to adjacent sequences in the target Figure 4. The probes are labeled with a pair of dyes that exhibit fluorescence resonance energy transfer FRET. At the annealing step, the probes hybridize to their target sequences in a head-to-tail arrangement. This annealing brings the donor and acceptor dyes into proximity, allowing FRET to occur, resulting in fluorescent emission by the acceptor. The increasing amount of acceptor fluorescence is proportional to the amount of PCR product present. FRET occurs when dual hybridization probes bind to their target sequences. The unhybridized probe adopts a random coil conformation that brings the reporter and quencher together, so quenching occurs. During the annealing of the DNA primers, the probe also hybridizes to the target with the help of the minor-groove binder. The probe thus becomes linearized, separating the reporter and quencher. The resulting fluorescence signal is proportional to the amount of amplified product in

the sample. The conformation of the unhybridized Eclipse probe causes quenching. In the hairpin conformation, the reporter and quencher are brought into proximity, so fluorescence is quenched. During the first amplification cycle, the Z primer hybridizes to the template and is extended Figure 6. During the second amplification cycle, the other target-specific DNA primer hybridizes to the product of the first and serves as a template for the synthesis of a new target strand that contains a sequence complementary to the Z sequence. The product from the second amplification cycle can then serve as the template for the UniPrimer. In the third amplification cycle, the extended UniPrimer serves as a template for the next amplification cycle. In the fourth cycle, extension of the template through the UniPrimer causes the hairpin to open and adopt a linear configuration. The reporter and quencher are thus separated and fluorescence is emitted. The loop of the Scorpions probe includes a sequence that is complementary to an internal portion of the target sequence Figure 7. During the first amplification cycle, the Scorpions PCR primer is extended, and the sequence complementary to the loop sequence is generated on the same strand. After subsequent denaturation and annealing, the loop of the Scorpions probe hybridizes to the internal target sequence, and the reporter is separated from the quencher. Scorpions PCR primers contain a sequence complementary to an internal portion of the target sequence. The reporter is quenched by the secondary structure of the hairpin. During amplification, the LUX PCR primer is incorporated into the product, eliminating the quenching hairpin structure, so fluorescence is emitted. When the substrate is intact, the fluorescence of the reporter is quenched. During the first amplification cycle, the PCR primer containing the antisense catalytic sequence is extended. In the second cycle, the product of the first cycle serves as the template for the target-specific reverse primer, which is extended to create a new product that contains the sense active catalytic DNA region. In the subsequent annealing step, the fluorescently labeled oligonucleotide substrate hybridizes to the catalytic DNA sequence and is cleaved. This cleavage separates the reporter from the quencher, resulting in a fluorescence signal that is proportional to the amount of amplified product in the sample. QZyme assays use a catalytic DNA structure to cleave a labeled oligonucleotide substrate. Effects of dye concentration and sequence composition on DNA amplification and melting temperature. *Nucleic Acids Res* 35, e

Chapter 7 : Primer (molecular biology) - Wikipedia

Introduction to Quantitative PCR Whether you are a novice or experienced user, our goal is to ensure that you are running quantitative PCR (QPCR) experiments.

Intuitively, the linking number represents the number of times that each curve winds around the other. The linking number is always an integer, but may be positive or negative depending on the orientation of the two curves. Since the linking number L of supercoiled DNA is the number of times the two strands are intertwined and both strands remain covalently intact, L cannot change. The reference state or parameter L_0 of a circular DNA duplex is its relaxed state. The word "histone" dates from the late 19th century and is from the German "Histon", of uncertain origin: Until the early 1900s, histones were dismissed by most as inert packing material for eukaryotic nuclear DNA, based in part on the "ball and stick" models of Mark Ptashne and others who believed transcription was activated by protein-DNA and protein-protein interactions on largely naked DNA templates, as is the case in bacteria. During the 1970s, work by Michael Grunstein [18] demonstrated that eukaryotic histones repress gene transcription, and that the function of transcriptional activators is to overcome this repression. We now know that histones play both positive and negative roles in gene expression, forming the basis of the histone code. The view is from the top through the superhelical axis. Despite the differences in their topology, these three folds share a homologous helix-strand-helix HSH motif. Using an electron paramagnetic resonance spin-labeling technique, British researchers measured the distances between the spools around which eukaryotic cells wind their DNA. In all, histones make five types of interactions with DNA: Helix-dipoles from alpha-helices in H2B, H3, and H4 cause a net positive charge to accumulate at the point of interaction with negatively charged phosphate groups on DNA Hydrogen bonds between the DNA backbone and the amide group on the main chain of histone proteins Nonpolar interactions between the histone and deoxyribose sugars on DNA Salt bridges and hydrogen bonds between side chains of basic amino acids especially lysine and arginine and phosphate oxygens on DNA Non-specific minor groove insertions of the H3 and H2B N-terminal tails into two minor grooves each on the DNA molecule The highly basic nature of histones, aside from facilitating DNA-histone interactions, contributes to the water solubility of histones. Histones are subject to post translational modification by enzymes primarily on their N-terminal tails, but also in their globular domains. Such modifications include methylation, citrullination, acetylation, phosphorylation, SUMOylation, ubiquitination, and ADP-ribosylation. This affects their function of gene regulation. In general, genes that are active have less bound histone, while inactive genes are highly associated with histones during interphase. It also appears that the structure of histones has been evolutionarily conserved, as any deleterious mutations would be severely maladaptive. Due to the highly basic charge of all four core histones, the histone octamer is only stable in the presence of DNA or very high salt concentrations. Nucleosomes are folded through a series of successively higher order structures to eventually form a chromosome; this both compacts DNA and creates an added layer of regulatory control which ensures correct gene expression. Nucleosomes are thought to carry epigenetically inherited information in the form of covalent modifications of their core histones. The nucleosome core particle consists of about 147 bp of DNA wrapped in 1.7 turns. Adjacent nucleosomes are joined by a stretch of free DNA termed "linker DNA" which varies from 10 - 80 bp in length depending on species and tissue type. One or more DNA-binding domains are often part of a larger protein consisting of additional domains with differing function. The additional domains often regulate the activity of the DNA-binding domain. The function of DNA binding is either structural or involving transcription regulation, with the two roles sometimes overlapping. DNA-binding domains with functions involving DNA structure have biological roles in the replication, repair, storage, and modification of DNA, such as methylation. Many proteins involved in the regulation of gene expression contain DNA-binding domains. For example, proteins that regulate transcription by binding DNA are called transcription factors. The final output of most cellular signaling cascades is gene regulation. The DBD interacts with the nucleotides of DNA in a DNA sequence-specific or non-sequence-specific manner, but even non-sequence-specific recognition involves some sort of molecular complementarity between protein and DNA. Many DNA-binding domains must

recognize specific DNA sequences, such as DBDs of transcription factors that activate specific genes, or those of enzymes that modify DNA at specific sites, like restriction enzymes and telomerase. The hydrogen bonding pattern in the DNA major groove is less degenerate than that of the DNA minor groove, providing a more attractive site for sequence-specific DNA recognition. The specificity of DNA-binding proteins can be studied using many biochemical and biophysical techniques, such as gel electrophoresis, analytical ultracentrifugation, calorimetry, DNA mutation, protein structure mutation or modification, nuclear magnetic resonance, x-ray crystallography, surface plasmon resonance, electron paramagnetic resonance, cross-linking and Microscale Thermophoresis MST. In eukaryotes, the homeodomain comprises 2 helices, one of which recognizes the DNA aka recognition helix. Zinc atoms are represented by grey spheres and the coordinating cysteine sidechains are depicted as sticks. The zinc finger This domain is generally between 23 and 28 amino acids long and is stabilized by coordinating Zinc ions with regularly spaced zinc-coordinating residues either histidines or cysteines. The most common class of zinc finger Cys2His2 coordinates a single zinc ion and consists of a recognition helix and a 2-strand beta-sheet. In transcription factors these domains are often found in arrays usually separated by short linker sequences and adjacent fingers are spaced at 3 basepair intervals when bound to DNA.

Chapter 8 : Introduction to PCR Analysis | LSR | Bio-Rad

Beacon Designer is a comprehensive real time PCR primer and probe design tool for designing single template and multiplex assays. Real time PCR chemistries supported include Molecular beacons, TaqMan[®], FRET, Scorpions[®] and SYBR[®] Green.

Introduction to the Federal Budget Process This backgrounder describes the laws and procedures under which Congress decides how much money to spend each year, what to spend it on, and how to raise the money to cover that spending. First, it tells Congress what the President recommends for overall federal fiscal policy, as established by three main components: In most years, federal spending exceeds tax revenues and the resulting deficit is financed through borrowing see chart. The budget is accompanied by supporting volumes, including historical tables that set out past budget figures. As discussed below, the budget comprises different types of programs, some that require new funding each year to continue and others that are ongoing and therefore do not require annual action by Congress. While the President must recommend funding levels for annually appropriated programs, he need not propose legislative changes for those parts of the budget that are ongoing. These programs fall under the jurisdiction of the House and Senate Appropriations Committees. Funding for these programs must be renewed each year to keep government agencies open and the programs in this category operating. Altogether, discretionary programs make up about one-third of all federal spending. Nearly all of the federal tax code is set in ongoing law that either remains in place until changed or requires renewal only periodically. Similarly, more than one-half of federal spending is also ongoing. Interest on the national debt is also paid automatically, with no need for new legislation. There is, however, a separate limit on how much the Treasury can borrow. Recommendations for mandatory programs typically spell out changes to eligibility criteria and levels of individual benefits but do not specify overall funding levels. Rather, the funding levels effectively are determined by the eligibility and benefits rules set in law. Changes to the tax code will increase or decrease taxes. Once the Budget Committees pass their budget resolutions, the resolutions go to the House and Senate floors, where they can be amended by a majority vote. A House-Senate conference then resolves any differences, and the budget resolution for the year is adopted when both houses pass the conference agreement. It also requires only a majority vote to pass, and its consideration is one of the few actions that cannot be filibustered in the Senate. Because it does not go to the President, a budget resolution cannot enact spending or tax law. Instead, it sets targets for other congressional committees that can propose legislation directly providing or changing spending and taxes. Congress is supposed to pass the budget resolution by April 15, but it often takes longer. In recent years it has been common for Congress not to pass a budget resolution at all. What is in the budget resolution? The Congressional Budget Act requires that the resolution cover a minimum of five years, though Congress now generally chooses a longer period, such as ten years. The difference between the two totals – the spending ceiling and the revenue floor – represents the deficit or surplus expected for each year. The spending totals in the budget resolution are stated in two different ways: Budget authority and outlays thus serve different purposes. Budget authority represents a limit on the new financial obligations federal agencies may incur by signing contracts or making grants, for example, and is generally what Congress focuses on in making most budgetary decisions. Outlays, because they represent actual cash flow, help determine the size of the overall deficit or surplus. How committee spending limits get set: The House and Senate tables are different from one another, since committee jurisdictions vary somewhat between the two chambers. In both the House and Senate, the Appropriations Committee receives a single allocation for all of its programs. It then decides on its own how to divide this funding among its 12 subcommittees, creating what are known as sub-allocations. Similarly, the various committees with jurisdiction over mandatory programs each get an allocation that represents a total dollar limit on all of the legislation they produce that year. Unless it changes an entitlement program such as Social Security or Medicare, authorizing legislation does not actually have a budgetary effect. For example, the education committees could produce legislation that authorizes a certain amount to be appropriated on the Title I education program for disadvantaged children. However, none of that money can be spent until the

annual Labor-Health and Human Services-Education appropriations bill “ which includes education spending “ sets the actual dollar level for Title I funding for the year, which is frequently less than the authorized limit. Often the report accompanying the budget resolution contains language describing the assumptions behind it, including how much it envisions certain programs being cut or increased. These assumptions generally serve only as guidance to the other committees. The budget resolution can also include temporary or permanent changes to the congressional budget process. Enacting Budget Legislation Following adoption of the budget resolution, Congress considers the annual appropriations bills, which are needed to fund discretionary programs in the coming fiscal year, and legislation to enact changes to mandatory spending or revenue levels as specified in the budget resolution. In some recent years, this point of order has not been particularly important in the House because it can be waived there by a simple majority vote on a resolution developed by the leadership-appointed Rules Committee, which sets the conditions under which each bill will be considered on the floor. Congress has seldom completed action on the budget resolution by the April 15 target date specified in the Budget Act, and it failed to complete action on a resolution for fiscal years , , , , each year from through , and . Such deeming resolutions typically provide spending allocations to the Appropriations Committees but may serve a variety of other budgetary purposes. Unless the House or Senate agrees to such a deeming resolution, the multi-year revenue floors and spending allocations for mandatory programs that had been agreed to in the most recent budget resolution remain in effect. The Bipartisan Budget Act of did the same for the Senate for fiscal year . And the Bipartisan Budget Act of did the same for both chambers for fiscal years and . Appropriations bills or amendments to them must fit within the a allocation given to the Appropriations Committee as well as the committee-determined b sub-allocations for the coming fiscal year. This procedure was originally designed as a deficit-reduction tool, to force committees to produce spending cuts or tax increases called for in the budget resolution. However, it was used to enact tax cuts several times during the George W. Bush Administration and again under the Trump Administration in , thereby increasing projected deficits. If Congress intends to use the reconciliation procedure to cut taxes or increase mandatory spending, the budget resolution would also need to set aside either or both of the independent House and Senate rules mentioned in the prior section. What is a reconciliation bill? A reconciliation bill is a single piece of legislation that typically includes multiple provisions generally developed by several committees , all of which affect the federal budget “ whether on the mandatory spending side, the tax side, or both. A reconciliation bill, like the budget resolution, cannot be filibustered by the Senate, so it only requires a majority vote to pass. How does the reconciliation process work? If Congress decides to use the reconciliation process, language known as a "reconciliation directive" must be included in the budget resolution. The reconciliation directive instructs committees to produce legislation by a specific date that meets certain spending or tax targets. If they fail to produce this legislation, the Budget Committee chair generally has the right to offer floor amendments to meet the reconciliation targets for them, a threat which usually produces compliance with the directive. The Budget Committee then packages all of these bills together into one bill that goes to the floor for an up-or-down vote, with limited opportunity for amendment. After the House and Senate resolve the differences between their competing bills, a final conference agreement is considered on the floor of each house and, if adopted, then goes to the President for his signature or veto. If a point of order is raised under the Byrd rule, the offending provision is automatically stripped from the bill unless at least 60 senators vote to waive the rule. This makes it difficult, for example, to include any policy changes in a reconciliation bill unless they have direct fiscal implications. Under this rule, changes in the authorization of discretionary appropriations are not allowed, nor, for example, are changes to civil rights or employment law or even the budget process. Changes to Social Security also are not permitted under the Byrd rule, even if they are budgetary. In addition, the Byrd rule bars any entitlement increases or tax cuts that cost money beyond the five or more years covered by the reconciliation directive, unless other provisions in the bill fully offset these "out-year" costs. If Congress does not complete action on an appropriations bill before the start of the fiscal year on October 1, it must pass, and the President must sign, a continuing resolution CR to provide stopgap funding for affected agencies and discretionary programs. A dispute over delay or defunding of health reform legislation between President Obama and congressional Republicans led

to a day shutdown of ordinary government operations beginning October 1, A dispute between President Clinton and congressional Republicans in the winter of produced a day shutdown of substantial portions of the federal government. Statutory Deficit-Control Mechanisms Separately from the limits established in the annual budget process, Congress operates under statutory deficit-control mechanisms that prevent tax and mandatory spending legislation from increasing the deficit and that constrain discretionary spending. Appropriations in excess of the cap in either category trigger sequestration in that category to reduce funding to the capped level. On top of any sequestration triggered by PAYGO or funding cap violations, the BCA also requires additional sequestration each year through in discretionary and select mandatory programs, split evenly between defense and non-defense funding. In the case of discretionary programs, for and after, this special sequestration mechanism operates by reducing the appropriations caps below the level that the BCA originally set. If budget legislation violates these statutes, the applicable sequestration penalties occur automatically, unless Congress also modifies the requirements. Congress approved two subsequent budget deals in and to provide even bigger relief for and , respectively. Conclusion The annual federal budget process begins with a detailed proposal from the President; Congress next develops a blueprint called a budget resolution that sets limits on how much each committee can spend or reduce revenues in bills considered over the course of the year; and the terms of the budget resolution are then enforced against individual appropriations, entitlement bills, and tax bills on the House and Senate floors. Moreover, budget legislation is subject to statutory deficit-control requirements. The Center on Budget and Policy Priorities is a nonprofit, nonpartisan research organization and policy institute that conducts research and analysis on a range of government policies and programs. It is supported primarily by foundation grants.

Chapter 9 : Philosophy Primers: Sophie's World | The Unlearner

A primer is a short single strand of RNA or DNA (generally about bases) that serves as a starting point for DNA replication because the enzymes that catalyze this process, DNA polymerases, can only add new nucleotides to an existing strand of DNA.

An Introduction to Assessment - the Basics What is assessment? Why do it in a particular way? This document addresses these important questions and provides an introduction to the basic concepts surrounding assessment. The discussion builds toward a generalized model of course development. Central to this discussion is the following key precept: Assessment drives student learning. Assessment is more than grades. To many, the word "assessment" simply means the process by which we assign students grades. Assessment is much more than this, however. Assessment is a mechanism for providing instructors with data for improving their teaching methods and for guiding and motivating students to be actively involved in their own learning. As such, assessment provides important feedback to both instructors and students. Assessment is Feedback for Both Instructors and Students Assessment gives us essential information about what our students are learning and about the extent to which we are meeting our teaching goals. But the true power of assessment comes in also using it to give feedback to our students. Improving the quality of learning in our courses involves not just determining to what extent students have mastered course content at the end of the course; improving the quality of learning also involves determining to what extent students are mastering content throughout the course. That is, assessment should help students "become more effective, self-assessing, self-directed learners. The CATs provided in the FLAG site have been field-tested and shown to be effective at both measuring student mastery of content and at providing students with the feedback they need to become active participants in the learning process. Indeed, such feedback can positively influence what our students learn because assessment drives student learning. Assessment Drives Student Learning The types of assessment usually performed in first-year science, math, engineering, and technology SMET courses--giving students tests--merely inform students about their grade, or ranking, after they have received instruction. In addition, these common testing techniques--which typically test for fact-based knowledge and algorithmic problem solving--tell our students that this is the type of knowledge we think is most important. That is, we appear to value the understanding of concepts at a relatively low level. Given that this is the type of assessment our students most frequently encounter, and that it will eventually lead to their final course grades, students learn to study the content in our courses in an expeditious way that allows them to succeed in passing many first-year SMET courses without necessarily developing deep understanding of concepts. It is our assessment that drives students learning. In fact, assessment drives student learning whether we want it to or not. The consequences of relying upon our "tried and true" assessment methods are profound; these assessment methods may actively promote superficial learning. The importance of setting course goals--articulating them and writing them down--cannot be overstated. Evaluating the extent to which we have attained our stated course goals is the primary motivation for why we "do assessment". Furthermore, ensuring that our assessment techniques can measure our stated goals is the reason for why we "do assessment in a particular way". To evaluate attainment of course goals For every course we teach, we make decisions about what we want our students to know and be able to do by the end of the semester. Though we might not always formalize these goals by writing them down, we still make decisions about the curriculum, the instructional methods, and the assessment techniques we will employ. In terms of curriculum, we decide which topics to cover, and how they connect with previous and forthcoming topics. We also decide which instructional methods we will use to deliver the curriculum, be they lectures, group activities, readings, homework assignments, etc. Similarly, we decide what assessment techniques we will use e. Thus, the decisions we make reflect our goals for the course whether we state them or not. It is important, therefore, to formalize course goals while the course is still in its planning stage. Formalizing our goals is only the first step, however. We must also measure the extent to which we are attaining these goals. This is why we do assessment. Logically, we must choose classroom assessment techniques that are appropriately suited to measuring our particular goals. That is, we must align

our assessment techniques with our stated goals. Why do assessment in a particular way? Such tests are usually most effective at measuring fact-based knowledge and ability to perform algorithmic problem-solving. If our stated goals are that students be able to recite facts and to solve simple algorithmic problems, then in fact the chosen assessment technique is well aligned with the stated goals. However, if our goals include different student outcomes than these e. Furthermore, misaligned assessment techniques convey to our students the wrong message about what we want them to take from the course. As suggested previously, our choice of assessment technique drives student learning. But you may also wish to go beyond the basics of assessment. Concerns about assessment are not the only ones faced in the development and refinement of SMET courses; decisions about curriculum and instructional methods are equally important, and assessment plays a vital role in guiding these decisions. A more in-depth discussion of how curriculum, instructional methods, and assessment fit together is provided in "Assessment Within the Broader Context of Course Development," where we describe a generalized model for course development that builds upon the precepts that assessment drives student learning and that assessment provides feedback for both instructors and students.