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The examples and perspective in this US may not represent a worldwide view of the subject. You may improve this US, discuss the issue on the talk page, or create a new US, as appropriate. (February 2025) (Learn how and when to remove this message)System for defining and representing engineering tolerancesExample of true position geometric control defined by basic dimensions and datum featuresGeometric dimensioning and tolerancing (GD&T) is a system for defining and communicating engineering tolerances via a symbolic language on engineering drawings and computer-generated 3D models that describes a physical object's nominal geometry and the permissible variation thereof. GD&T is used to define the nominal (theoretically perfect) geometry of parts and assemblies, the allowable variation in size, form, orientation, and location of individual features, and how features may vary in relation to one another such that a component is considered satisfactory for its intended use. Dimensional specifications define the nominal, as-modeled or as-intended geometry, while tolerance specifications define the allowable physical variation of individual features of a part or assembly.There are several standards available worldwide that describe the symbols and define the rules used in GD&T. One such standard is American Society of Mechanical Engineers (ASME) Y14.5. This article is based on that standard. Other standards, such as those from the International Organization for Standardization (ISO) describe a different system which has some nuanced differences in its interpretation and rules (see GPS&V). The Y14.5 standard provides a fairly complete set of rules for GD&T in one document. The ISO standards, in comparison, typically only address a single topic at a time. There are separate standards that provide the details for each of the major symbols and topics below (e.g. position, flatness, profile, etc.). BS 8888 provides a self-contained document taking into account a lot of GPS&V standards.The origin of GD&T is credited to Stanley Parker, who developed the concept of "true position". While little is known about Parker's life, it is known that he worked at the Royal Torpedo Factory in Alexandria, West Dunbartonshire, Scotland. His work increased production of naval weapons by new contractors.In 1940, Parker published Notes on Design and Inspection of Mass Production Engineering Work, the earliest work on geometric dimensioning and tolerancing.[1] In 1956, Parker published Drawings and Dimensions, which became the basic reference in the field.[1]A dimension is defined in ASME Y14.5 as "a numerical value(s) or mathematical expression in appropriate units of measure used to define the form, size, orientation, or location, of a part or feature."[2]:3 Special types of dimensions include basic dimensions (theoretically exact dimensions) and reference dimensions (dimensions used to inform, not define a feature or part).The units of measure in a drawing that follows GD&T can be selected by the creator of the drawing. Most often drawings are standardized to either SI linear units, millimeters (denoted "mm"), or US customary linear units, decimal inches (denoted "IN"). Dimensions can contain only a number without units if all dimensions are the same units and there is a note on the drawing that clearly specifies what the units are.[2]:8Angular dimensions can be expressed in decimal degrees or degrees, minutes, and seconds.Every feature on every manufactured part is subject to variation, therefore, the limits of allowable variation must be specified. Tolerances can be expressed directly on a dimension by limits, plus/minus tolerances, or geometric tolerances, or indirectly in tolerance blocks, notes, or tables.Geometric tolerances are described by feature control frames, which are rectangular boxes on a drawing that indicate the type of geometric control, tolerance value, modifier(s) and/or datum(s) relevant to the feature. The type of tolerances used with symbols in feature control frames can be:equal bilateralunequal bilateralunilateralno particular distribution (a "floating" zone)Tolerances for the profile symbols are equal bilateral unless otherwise specified, and for the position symbol tolerances are always equal bilateral. For example, the position of a hole has a tolerance of .020 inches. This means the hole can move .010 inches, which is an equal bilateral tolerance. It does not mean the hole can move +.015/.005 inches, which is an unequal bilateral tolerance. Unequal bilateral and unilateral tolerances for profile are specified by adding further information to clearly show this is what is required.Main article: Datum referenceA datum is a theoretically exact plane, line, point, or axis.[2]:3 A datum feature is a physical feature of a part identified by a datum feature symbol and corresponding datum feature triangle, e.g., A | {\displaystyle {\displaystyle \Box }\!\!\!\!{\scriptstyle {\mathsf {A}}}\!-\!\!\!-\!\!\!\!blacktriangleleft \!\!\!|} These are then referred to by one or more 'datum references' which indicate measurements that should be made with respect to the corresponding datum feature. The datum reference frame can describe how the part fits or functions.The purpose of GD&T is to describe the engineering intent of parts and assemblies.[2] GD&T can more accurately define the dimensional requirements for a part, allowing over 50% more tolerance zone than coordinate (or linear) dimensioning in some cases. Proper application of GD&T will ensure that the part defined on the drawing has the desired form, fit (within limits) and function with the largest possible tolerances. GD&T can add quality and reduce cost at the same time through producibility.According to ASME Y14.5, the fundamental rules of GD&T are as follows,[2]:78All dimensions must have a tolerance. Plus and minus tolerances may be applied directly to dimensions or applied from a general tolerance block or general note. For basic dimensions, geometric tolerances are indirectly applied in a related feature control frame. The only exceptions are for dimensions marked as minimum, maximum, stock or reference.Dimensions and tolerancing shall fully define each feature. Measurement directly from the drawing or assuming dimensions is not allowed except for special undimensioned drawings.A drawing should have the minimum number of dimensions required to fully define the end product. The use of reference dimensions should be minimized.Dimensions should be applied to features and arranged to represent the function and mating relationship of the part. There should only be one way to interpret dimensions.Part geometry should be defined without explicitly specifying manufacturing methods.If dimensions are required during manufacturing but not the final geometry (due to shrinkage or other causes) they should be marked as non-mandatory.Dimensions should be arranged for maximum readability and should be applied to visible lines in true profiles.When geometry is normally controlled by gage sizes or by code (e.g. stock materials), the dimension(s) shall be included with the gage or code number in parentheses following the dimension.Angles of 90 are assumed when lines (including center lines) are shown at right angles, but no angle is specified.Basic 90 angles are assumed where center lines of features in a pattern or surfaces shown at right angles on a 2D orthographic drawing are located or defined by basic dimensions and no angle is specified.A basic dimension of zero is assumed where axes, center planes, or surfaces are shown coincident on a drawing, and the relationship between features is defined by geometric tolerances.Dimensions and tolerances are valid at 20C (68F) and 101.3kPa (14.69psi) unless stated otherwise.Unless explicitly stated, dimensions and tolerances only apply in a free-state condition.Unless explicitly stated, tolerances apply to the full length, width, and depth of a feature.Dimensions and tolerances only apply at the level of the drawing where specified. It is not mandatory that they apply at other levels (such as an assembly drawing).Coordinate systems shown on drawings should be right-handed. Each axis should be labeled and the positive direction should be shown.Geometric characteristic reference chart[2]ApplicationType of controlCharacteristicSymbolUnicode characterRelevant featureVirtual condition affectedReferences datumModified byAffected bySurfaceOfsizeBonusShiftIndividual featuresFormStraightnessU+23E4YesYesOf size[a]NoOf size[a]No[c][d]NoFlatness[3]U+23E5YesNoNoNoNoNo[c]NoNoCircularity[3]U+25CBYesNoNoNoNoNo[c]NoNoCylindricityU+232DYesNoNoNoNoNo[c]NoNoIndividual or related featuresProfileProfile of a lineU+2312YesNoNoYes[e]NoNo[c]NoDatum, [b]Profile of a surfaceU+2313YesNoNoYes[e]NoNo[c]NoDatum, [b]Related featuresOrientationPerpendicularityU+27C2YesYesOf size[a]YesOf size[a]YesOf size[a]No[c][d]Datum, [b]AngularityU+2220YesYesOf size[a]YesOf size[a]No[c][d]Datum, [b]ParallelismU+2225YesYesOf size[a]YesOf size[a]No[c][d]Datum, [b]LocationSymmetry[f][g]U+232FNoYesYesYesNoNoNoNoNoPositionU+2316NoYesYesYesYesYes[d]Datum, [b]Concentricity[f]U+25CENoYesYesYesNoNo[c]NoNoRun-outCircular run-outU+2197YesYesOf size[a]YesNoNo[c]NoNoTotal run-outU+2330YesYesOf size[a]YesNoNo[c]NoNo^ a b c d e f g h i j When applied to a feature of size.^ a b c d e f g When a datum feature of size is referenced with the maximum material condition modifier.^ a b c d e f g h i j k l Automatically[b]^ a b c d e When a maximal material condition modifier is used.^ a b Can also be used as a form control without a datum reference.^ a b In the 2018 revision, both concentricity and symmetry were eliminated and are no longer supported.^ The symmetry symbol's characteristics were not included in the version of the chart that this chart is derived from. The symmetry symbol was dropped from the Y14.5M standard around 1982 and re-added around 1994.The following table shows only some of the more commonly used modifiers in GD&T. It is not an exhaustive list.Symbols used in a "feature control frame" to specify a feature's description, tolerance, modifier and datum referencesSymbolUnicode characterModifierDefinition[2]:27NotesU+24BBFree state"The condition of a part free of applied forces"Applies only when part is otherwise restrainedU+24C1Least material condition (LMC)"The condition in which a feature of size contains the least amount of material within the stated limits of size"Useful to maintain minimum wall thicknessU+24C2Maximum material condition (MMC)"The condition in which a feature of size contains the maximum amount of material within the stated limits of size"Provides bonus tolerance only for a feature of sizeU+24C5Projected tolerance zoneUseful on threaded holes for long studsU+24C8Regardless of feature size (RFS)"Indicates a geometric tolerance applies at any increment of size of the actual mating envelope of the feature of size"Not part of the 1994 version. See para. A5, bullet 3. Also para. D3. Also, Figure 38.U+24C9Tangent plane"A plane that contacts the high points of the specified feature surface"Useful for interfaces where form is not requiredContinuous featureIdentifies "a group of features of size where there is a requirement that they be treated geometrically as a single feature of size"Identifies a group of features that should be "treated geometrically as a single feature"Statistical toleranceIndicates that features "shall be produced with statistical process controls".Appears in the 1994 version of the standard, assumes appropriate statistical process control.U+24CAUnequal bilateralAdded in the 2009 version of the standard, and refers to unequal profile distribution. Number after this symbol indicates tolerance in the "plus material" direction.The American Society of Mechanical Engineers (ASME) provides two levels of certification:[4]Technologist GDTP, which provides an assessment of an individual's ability to understand drawings that have been prepared using the language of Geometric Dimensioning & Tolerancing.Senior GDTP, which provides the additional measure of an individual's ability to select proper geometric controls as well as to properly apply them to drawings.Exchange of geometric dimensioning and tolerancing (GD&T) information between CAD systems is available on different levels of fidelity for different purposes:In the early days of CAD, exchange-only lines, texts and symbols were written into the exchange file. A receiving system could display them on the screen or print them out, but only a human could interpret them.GD&T presentation: On a next higher level the presentation information is enhanced by grouping them together into callouts for a particular purpose, e.g. a datum feature callout and a datum reference frame. And there is also the information which of the curves in the file are leader, projection or dimension curves and which are used to form the shape of a product.GD&T representation: Unlike GD&T presentation, the GD&T representation does not deal with how the information is presented to the user but only deals with which element of a shape of a product has which GD&T characteristic. A system supporting GD&T representation may display GD&T information in some tree and other dialogs and allow the user to directly select and highlight the corresponding feature on the shape of the product, 2D and 3D.Ideally both GD&T presentation and representation are available in the exchange file and are associated with each other. Then a receiving system can allow a user to select a GD&T callout and get the corresponding feature highlighted on the shape of the product.An enhancement of GD&T representation is defining a formal language for GD&T (similar to a programming language) which also has built-in rules and restrictions for the proper GD&T usage. This is still a research area (see below reference to McCaleb and ISO 10303-1666).GD&T validation: Based on GD&T representation data (but not on GD&T presentation) and the shape of a product in some useful format (e.g. a boundary representation), it is possible to validate the completeness and consistency of the GD&T information. The software tool FBTol from the Kansas City Plant is probably the first one in this area.GD&T representation information can also be used for the software assisted manufacturing planning and cost calculation of parts. See ISO 10303-224 and 238 below.ISO 129 Technical drawings Indication of dimensions and tolerancesISO 7083 Symbols for geometrical tolerancing Proportions and dimensionsISO 13715 Technical drawings Edges of undefined shape Vocabulary and indicationsISO 15786 Simplified representation and dimensioning of holesISO 16792:2021 Technical product documentationDigital product definition data practices (Note: ISO 16792:2006 was derived from ASME Y14.41-2003 by permission of ASME)In ISO/TR 14638 GPS Masterplan the distinction between fundamental, global, general and complementary GPS standards is made.Fundamental GPS standardsISO 8015 Concepts, principles and rulesGlobal GPS standardsISO 14660-1 Geometrical featuresISO/TS 17, orientation and locationISO 1101 Geometrical tolerancing Tolerances of form, orientation, location and run-outAmendment 1 Representation of specifications in the form of a 3D modelISO 1119 Series of conical tapers and taper anglesISO 2692 Geometrical tolerancing Maximum material requirement (MMR), least material requirement (LMR) and reciprocity requirement (RPR)ISO 3040 Dimensioning and tolerancing ConesISO 5458 Geometrical tolerancing Positional tolerancingISO 5459 Geometrical tolerancing Datums and datum systemsISO 10578 Tolerancing of orientation and location Projected tolerance zoneISO 10579 Dimensioning and tolerancing Non-rigid partsISO 14406 ExtractionISO 22432 Features used in specification and verificationGeneral GPS standards: Areal and profile surface textureISO 1302 Indication of surface texture in technical product documentationISO 3274 Surface texture: Profile method Nominal characteristics of contact (stylus) instrumentsISO 4287 Surface texture: Profile method Terms, definitions and surface texture parametersISO 4288 Surface texture: Profile method Rules and procedures for the assessment of surface textureISO 8785 Surface imperfections Terms, definitions and parametersForm of a surface independent of a datum or datum system. Each of them has a part 1 for the Vocabulary and parameters and a part 2 for the Specification operators:ISO 12180 CylindricityISO 12181 RoundnessISO 12780 StraightnessISO 12781 FlatnessISO 25178 Surface texture: ArealGeneral GPS standards: Extraction and filtration techniquesISO/TS 1661 FiltrationISO 11562 Surface texture: Profile method Metrological characteristics of phase correct filtersISO 12085 Surface texture: Profile method Motif parametersISO 13565 Profile method; Surfaces having stratified functional propertiesASME Y14.41 Digital Product Definition Data PracticesASME Y14.5 Dimensioning and TolerancingASME Y14.5.1M Mathematical Definition of Dimensioning and Tolerancing PrinciplesASME is also working on a Spanish translation for the ASME Y14.5 Dimensioning and Tolerancing Standard.ISO 10303 Industrial automation systems and integration Product data representation and exchangeISO 10303-47 Integrated generic resource: Shape variation toleranceISO/TS 10303-1130 Application module: Derived shape elementISO/TS 10303-1050 Application module: Dimension toleranceISO/TS 10303-1051 Application module: Geometric toleranceISO/TS 10303-1052 Application module: Default toleranceISO/TS 10303-1666 Application module: Extended geometric toleranceISO 10303-203 Application protocol: Configuration controlled 3D design of mechanical parts and assembliesISO 10303-210 Application protocol: Electronic assembly, interconnection, and packaging designISO 10303-214 Application protocol: Core data for automotive mechanical design processesISO 10303-224 Application protocol: Mechanical product definition for process planning using machining featuresISO 10303-238 Application protocol: Application interpreted model for computerized numerical controllers (STEP-NC)ISO 10303-242 Application protocol: Managed model based 3D engineeringDimensional instrumentsEngineering fitEngineering toleranceGauge (instrument)Geometrical Product Specification and VerificationPosition sensorSpecification of surface finishThis article includes a list of general references, but it lacks sufficient corresponding inline citations. Please help to improve this article by introducing more precise citations. (April 2010) (Learn how and when to remove this message)^ a b MacMillan, David M.; Krandall, Rollande (2014). "Bibliography for Dimensioning and Tolerancing". Circuitous Root. Archived from the original on 27 March 2019. Retrieved October 24, 2018.^ a b c d e f g Dimensioning and Tolerancing, ASME Y14.5-2009. NY: American Society of Mechanical Engineers. 2009. ISBN978-0-7918-3192-2.^ a b "GD&T, Geometric Dimensioning and Tolerancing, GD&T, Flatness, Circularity, Flatness Tolerance, Circularity Tolerance". cobanengineering.com. Retrieved 2020-04-02.^ "Resources". Technical Training Consultants. 2020. Retrieved 2020-09-20.McCaleb, Michael R. (1999). "A Conceptual Data Model of Datum Systems". Journal of Research of the National Institute of Standards and Technology. 104 (4): 349400. doi:10.6028/jres.104.024. PMC4880403.Henzold, Georg (2006). 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ISBN978-1-59070-328-1.Wikimedia Commons has media related to Geometric dimensioning and tolerancing.General tolerances for linear and angular dimensions according to ISO 2768What is GD&TThe importance of GD&TGD&T symbols and definitionsGD&T Glossary of Terms and Definitions Archived 2008-09-15 at the Wayback MachineGDT: IntroductionASME CertificationChanges and Additions to ASME Y14.5MNIST MBE PMI Validation and Conformance Testing Project Tests implementations of GD&T in CAD softwareSTEP File Analyzer and Viewer - Analyze GD&T in a STEP fileRetrieved from " Also found in: Dictionary, Thesaurus, Medical, Financial, Encyclopedia, Wikipedia. Category filter: Show All (85)Most Common (2)Technology (8)Government & Military (13)Science & Medicine (23)Business (11)Organizations (13)Slang / Jargon (24)AcronymDefinitionGDGroundGDGrateful Dead (band)GDGoodGDG-Dragon (South Korean recording artist)GDGoal Difference (soccer)GDGoal Differential (soccer)GDGeneral DynamicsGDGold(en) DollarGDGradeGDGuardGDGeometry Dash (video game series)GDGraphic Design(er)GDGroup Discussion(s)GDGreen Day (band)GDGrenada (country code, top level domain)GDGood DayGDGold DiggerGDGadoliniumGDGuangdong (China)GDGraph DrawingGDGardner Denver, Inc. (pneumatic products company)GDGeneric DrugGDGroundhog DayGDGraves' Disease (also seen as GRD)GDGoDaddy (domain registrar)GDSoman (nerve agent)GDGestational DiabetesGDGod DamnGDGolden Delicious (apple)GDGranddaughterGDGraduate DegreeGDGeneral Delivery (postal)GDGedo (postal region, Somalia)GDGolden DawnGDGreat Divide (Everquest, gaming)GDGarment District (various locations)GDGeneral DutyGDGestational DayGDGangster Disciples (Gang)GDGraphic DisplayGDGosh DarnGDGlobal DeliveryGDGeneral Deployment (Cisco)GDGod Delusion (book)GDGrodeutschland (German WWII Panzer division)GDGlobal Dynamics (Eureka science fiction)GDGeorgia Dome (Atlanta, GA)GDGood Draw (Pictionary game slang)GDGender Dysphoria (medical syndrome)GDGun DogsGDGreen Depth (golf)GDGeneral DiaryGDGospel DoctrineGDGeologic DivisionGDGas Discharges (and their Applications; International Conference)GDGoverning DocumentGDGlucose DrinkGDGenetically DivergentGDGemcitabine Plus DocetaxelGDGeneral DischargeGDGlasdach (German: skylight, glass roof)GDGravely Disabled (mental health)GDGap DistributionGDGrowth DurationGDGlobal DefectGDGumboro Disease (Infectious Bursal Disease)GDGiant Drop (amusement park ride)GDGum Disturbance (philately)GDGravity DrainGDGrid Dynamics LLC (industrial design firm)GDGrand Dplacement (French)GDGraded DopingGDGasoline Dion (band)GDGameDrift (website)GDGalleryDriverGDGeographic DistrictGDGender Disappointment (family planning)GDGodavari Delta (India)GDGeothermal DivisionGDGlasser's Disease (swine medicine)GDGaseous DielectricGDGravimetric DensityGDGrupo de Dilogo (Spanish)GDGuided Expansion BearingGDGuidance DrawingCopyright 1988-2018 AcronymFinder.com, All rights reserved. Want to thank TFD for its existence? Tell a friend about us, add a link to this page, or visit the webmaster's page for free fun content. Link to this page: "Group" is a collection of individuals who have regular contact and frequent interaction and who work together to achieve a common set of goals. "Discussion" is the process whereby two or more people exchange information or ideas in a face-to-face situation to achieve a goal. The goal, or end product, maybe increased knowledge, agreement leading to action, disagreement leading to competition or resolution or perhaps only a clearing of the air or a continuation of the status-quo."Group Discussion", popularly labeled as GD, is a popular methodology used by an many organizations (company, institute, business school, etc.) these days to gauge whether the candidate has certain personality traits such as interpersonal communication skills, confidence in public speaking, team spirit, leadership abilities, social behaviour and problem-solving skills. GDs form an important part of the short-listing process for recruitment or admission in a company or institution. In this methodology, there are usually 7-12 participants in a group. The the group of candidates is given a topic or a situation which could be either factual, abstract or case based, and typically given some time to think and make notes about the same. After this, the group of candidates is, and then asked to discuss it the topic among themselves for a specific duration ranging between 10-40 minutes (which may vary from one organization to another). While the group discusses the pertaining issue at hand, the Moderators/ Panelists silently observe each candidate on various pre-determined parameters. The Panelists assign scores to every candidate based on his/her individual performance as well as how he performed within the group. As in a football game, where you play like a team, passing the ball to each team member and aim for a common goal, GD is also based on teamwork, incorporating views of different team members to reach a common goal. So, a group discussion refers to a communicative situation that allows its participants to share their views and opinions with other participants. It is a systematic exchange of information, views and opinions about a topic, problem,issueor situation among the members of a group who share some common objectives. Over the recent years, Group Discussion became a popular method of assessing a candidates soft skills. The contenders who are shortlisted on basis of written exams have qualified with their intelligence quotient, i.e., aptitude and knowledge. However, since the significance of emotional quotient arose, new tools such as GD were devised to gauge candidates social and interpersonal skills. Organizations conduct GDs to find out whether you possess the critical qualities/skills to contribute effectively to the goal accomplishment process. Group discussion tips to avoid mistakes It helps evaluate whether a candidate is the right fit for the organisation. It helps assess how a participant performs under different situations in a group. It helps to judge how one conceptualizes and manoeuvres his ideas through the discussion. It helps in analysing the candidates attitude towards fellow members through ones communication and interpersonal skills, listening ability, humility and tolerance to others ideas. It helps in shedding light on candidates leadership and managerial skills, problem-solving aptitude, creative thinking and knowledge on diverse topics. Since, team work is an essential element of business management and corporate work-sphere, a persons ability to perform well in a GD is very critical for a successful career. A GD helps to achieve group goals as well as individual goals. The examiner can evaluate both the personality traits and groupskills of candidatesparticipating in a G.D. It is basically a situation test wherein a sample of a candidates group worthiness and potential as a worker comes out quite explicitly. A detailed list of GD Topics under different categories Group Discussion (GD) is a technique where the group of participants share their views and opinions on a topic for a specific duration. Companies conduct this evaluation process because business management is essentially a team activity and working with groups is an essential parameter in organisations. What is Group Discussion GD is an opportunity for an organisation to evaluate a candidates communication skills, knowledge, leadership skills, listening skills, social skills, ability to think on the spot and improvise. A typical GD has about 8-12 participants and 2 or more assessors. The assessors sit where they can clearly see and hear all the candidates. They record the behaviour of participants during the group discussion. Then, they evaluate the recorded observations against the desired traits and finalise a few candidates from the group. Group discussion is a communication process that involves the exchange of ideas, information, and opinions among a group of people. It is a powerful tool for problem-solving, decision-making, and generating new ideas. Stephen P. Robbins, author of Organizational Behavior A group discussion is an interactive process where a group of individuals come together to exchange ideas, opinions, and information on a specific topic. The goal of a group discussion is to arrive at a collective decision or solution that is acceptable to all members of the group. The Indian Institute of Technology (IIT) Group discussion is a method of communication in which a small group of people come together to discuss a topic or problem. The group members share their ideas and perspectives with one another in order to arrive at a solution or decision that benefits the group as a whole. The American Psychological Association (APA) Group discussion is an effective means of exploring and analyzing complex issues, generating creative ideas, and arriving at consensus among participants. It provides a platform for individuals to express their views, clarify their understanding, and learn from the perspectives of others. The National Institute of Standards and Technology (NIST) Group discussions are conducted to serve various purposes. It is a two-way communication process through which recruiters get to assess the soft skills of candidates, while the candidates can gain clarity about their own thoughts, opinions and views. The following are some of the objectives of a group discussion activity: To collect data To breed fresh ideas and take inputs from a particular group To perceive the common ideas of people on a particular topic To identify the solution of a specific problem or issue To select a candidate for hiring in a company To select candidate for admission in an educational institute To arrive at a consensus regarding a common concern A group discussion delineates how a candidate participates, behaves and contributes in a group. There are three main types of GDs: Topic-based GDs Case-based GDs Article-based GDs These are based on certain practical topics, such as the harmful effects of plastics on the environment or the need of college degree for entrepreneurship. These GDs can be further classified into: Factual GDs: These are informative GDs that require comprehensive knowledge about a subject. For example, the economic growth of India since independence. Controversial GDs: These GDs are based on controversial topics, which test the ability of a candidate to handle a situation, control anger, display patience and think critically. For example, arranged marriage vs. love marriage. Abstract GDs: These GDs are based on certain conceptual topics that are used to evaluate a candidates creative thinking and analytical ability. For example, challenges before humanity. In these GDs, a case study is presented to group members to read and analyse in a given period. Candidates need to discuss the case study among themselves and reach on a com- mon consensus to solve the given situation. This helps to evaluate their problem solving, analytical ability, critical thinking and creative thinking skills. Candidates are presented with an article on any field, such as politics, sports, or technology, and asked to discuss the given situation. There are some essential requirements for gaining success in a group discussion. The following are some important requirements to be fulfilled by a candidate in order to ensure a successful GD: A candidate with in-depth knowledge and command over the topic initiates the discussion. He/she gets noticed and usually selected in a group discussion. However, starting the discussion does not guarantee the selection and also it does not show the leadership qualities. Therefore, one should start a discussion only when he/she is well acquainted with the topic. In case, one is not well acquainted with the topic, he/she should first listen to others and then speak. Only good listeners can be active participators in a discussion. Such persons listen to others and remain attentive and active throughout the discussion. Therefore, a listener is more likely to imbibe knowledge than a speaker. By listening carefully, a candidate can contribute by formulating his/her own thoughts that can be verbally delivered. Candidates should have good communication skills and they should take care of the overtones. One should be able to understand other participants perception and thoughts. Then, accordingly, Agree to or refute the ideas or viewpoints presented by other candidates. Therefore, healthy and clear thoughts should be exchanged while pursuing a group discussion to gain attention of the assessors. Gestures, facial expressions, eye contact and tone of voice show the amount of interest a candidate has in a group discussion. It is important to maintain eye contact with the evaluator(s) when starting a discussion. The coordinator notices the body language of the candidates to assess their confidence level. A GD is a method used by organisations to analyse the skills of candidates and decide whether their personality traits are desirable for the job or not. While facing a GD, the following steps should be performed: If you want to quickly grab the attention of assessors, then start the GD. However, you must have good knowledge or understanding of the subject being discussed. To make your speech more interesting, you can start with a relevant quote or a short/interesting story; but keep track of time. There might be a situation when you do not have enough knowledge to start a discussion. In that case, wait, watch and listen to others. As soon as you get an opening, jump in and take charge. Move the conversation forward to make it impactful. However, remember not to over-drag the topic. Sometimes, less is more. Closing a GD is another opportunity to get the attention of the evaluators. Recap the discussion, connect the dots, highlight the key points and summarise them. Make sure that the summary includes both the positive and negative viewpoints on the topic presented by the candidates. In this section, we will discuss some Dos and Donts to be taken care of by all the candidates who wish to perform well in a GD. Some Dos to be kept in mind during a GD are: Be a good listener by being patient. Acknowledge everyone else and what they say. Articulate views in a way that is comprehensible to others. Structure your thoughts and present them logically. Read newspapers, current affairs, essays and articles to develop thought structuring. Respect others for what they are. Be open-minded and acknowledge the fact that people think differently about issues. Train your mind for analytical thinking by taking all aspects into consideration. It is also important to avoid doing certain things while participating in a GD. Some Donts to be aware of while pursuing a GD are: Avoid irrelevant talk. Avoid interrupting others while they are talking. If you need to cut short a speaker, then do so politely and with due apology. Avoid dominating the conversation. Ask others to contribute. Acknowledge their viewpoints. Avoid getting into an argument. Try to express clearly in a healthy manner. Do not show lack of interest and negative attitude. Avoid stating only your viewpoint. Avoid dwelling only on one aspect of the GD. Each group discussion exercise is assessed by one or more individuals who are trained to observe and assess behavioural traits relevant for a specific job. The four main behavioural traits assessed through a group discussion are shown in Figure Let us discuss these behavioural traits in detail. These skills are judged on the basis of how a participant is getting his/her message across, how he/she is using his/her body language and also listening skills. Assessors draw conclusions about a participants interpreting and analysing skills by observing how he/she uses facts and data, considers complex problems and issues, suggests solutions, etc. Assessors observe the participants interactions with one another, how they allow one another to express themselves, etc. The influencing skills of participants are as- sessed based on how well they are able to persuade one another, convince others about a viewpoint or impact others behaviour. A Group Discussion generally involves a group of 8-10 participants who are evaluated by a selection panel. GDs are used to evaluate whether a candidate is a perfect fit for an organisation or not. Be it college placements, MBA courses, job interviews or general researches, GDs are conducted almost in every field to gauge whether the candidate possesses the required skills and personality traits to be a part of the concerned institution. A facilitator has to take care of all the nitty-gritties of organising a GD. In order to conduct a successful GD, the following aspects need to be taken into consideration: Every GD has a specific purpose such as selecting deserving candidates for admission in professional course or gaining new talented employees in an organisation. Therefore, the objective of a GD should be clear to all the members of the selection panel in order to select the most deserving candidate. An appropriate venue should be set up to conduct a GD. The venue should not be overcrowded, which may make the participants feel uncomfortable. The space selected for conducting the GD should be well-ventilated, equipped with proper lighting and should have a proper seating arrangement. A stipulated time limit should be set for each participant to present his/her views. Firstly, participants are given a topic and some time to understand the topic and organise their thoughts. Thereafter they start presenting their views and opinions over the given topic. The time provided to the participants should be logical and it should start at that time only with no delay and waiting. Prior communication with the participants should be properly conducted along with mentioning the time allotted to one participant to speak. The topic of discussion should be specified clearly along with the instructions and timings of when to start and stop. Big MNCs have their well-panned GD guide that provides instructions to the participants. There are various parameters based on which a candidate is evaluated. Some of these parameters are listening power, level of confidence, decision-making ability, analytical skills, leadership skills, etc. Candidates can speak whatever they like on the subject under discussion. The assessors note down their observations for each candidate. Once the discussion is over, the assessors review the information recorded against the desired behaviour. Therefore, a proper evaluation sheet should be maintained for writing down observations so that no errors occur while the selection of candidates. The results should be announced clearly post the GD. The facilitator should ensure that the participants should not be made to wait for too long for the results. The following are some points that you should take care of while preparing for a group discussion: Ensure your contribution to the group: Candidates need to make sure that they contribute to the conversation. Candidates having avoiding behaviours or actions do not contribute to the discussions outcome. Such behaviours need to be avoided and involvement in the GD is necessary to make a mark. Manage conflicts effectively: In case of any disagreement with members of the group, ensure that you persuade them without getting rude and aggressive. Assessors will pick such arrogant behaviour and highlight it as your negative aspect. Manage your time: Candidates need to stick to the timeline al- lotted for the discussion as the same would suggest that they are punctual and follow the timeline persistently. Include others: Encourage those who do not speak up during the discussion and urge them to give their opinions. This will gain assessors praise and group members appreciation. Be a team player: Generally, group discussion exercises require that the members come to an agreement on the topic being discussed. However, ensure that you do not impose your ideas on others. A better way is to include everyones ideas and centre it around the organisation rather than express something that might only benefit one member. Are you looking for the meanings of GD? On the following image, you can see major definitions of GD. If you want, you can also download image file to print, or you can share it with your friend via Facebook, Twitter, Pinterest, Google, etc. To see all meanings of GD, please scroll down. The full list of definitions is shown in the table below in alphabetical order. The following image presents the most commonly used meanings of GD. You can down the image file in PNG format for offline use or send it to your friends by email. If you are a webmaster of non-commercial website, please feel free to publish the image of GD definitions on your website. As previously mentioned, the image associated with the acronym GD is formatted in PNG, which stands for Portable Network Graphics. This image has specific dimensions, with a length of 669 pixels and a width of 350 pixels. The file size of the image is approximately 60 kilobytes. This format and size are chosen to ensure that the image maintains high quality while remaining efficient in terms of storage and loading times. What does GD mean? This page is about the various possible meanings of the acronym, abbreviation or slang term. If you find this information useful or interesting, please feel free to share it on your favorite social media platforms. If you wish for your visitors to access a comprehensive list of all possible meanings of the acronym GD, it is recommended that you incorporate the acronym into your bibliography using proper citation formats. All Definitions of GD As mentioned above, you will see all meanings of GD in the following table. Please know that all definitions are listed in alphabetical order. You can click links on the right to see detailed information of each definition, including definitions in English and your local language. In this introductory article we will be equipping you with a foundational understanding of geometric dimensioning and tolerancing (GD&T) so that you can apply it to your part designs. Well be covering the following:What is GD&T and how does it help?Getting started with datums - understanding datum reference frames and datum featuresTolerance zones and feature symbolsBasic dimensionsBuilding feature control framesintroduction to material condition modifiersInspectionWhat is GD&T and how does it help?Geometric dimensioning and tolerancing (GD&T) is a system for defining and communicating both the desired nominal dimensions and the allowable geometric tolerances of manufactured parts. GD&T establishes a shared symbolic language that can be used on engineering drawings and computer-generated three-dimensional solid models that explicitly describe nominal geometry and its allowable variation. In doing so, GD&T provides a precise and comprehensive means for defining parts and assemblies, allowing manufacturers and inspectors to ensure that they are produced consistently and accurately. It is an international standard that is used in almost every industry, including aerospace, automotive, and medical devices.Simply put, GD&T helps transform design intent into functional manufactured output.Primary benefit and pros/consThe primary benefit of GD&T is that it ensures your design intent is specified and communicated in such a way that you guarantee proper part function in the assembly context. For complicated assemblies this is daunting process, but GD&T gives you a language and a rule set to do so, but it is not without cost. The table below highlights the pros and cons of GD&T at a high level.GD&T is a language and rule setGD&T is standardized by the ASME Y14.5-2018 Dimensioning and Tolerancing standard. This standard lays out, in exhaustive detail, all of the ways that part geometry can be controlled in drawings. The important thing to know is that GD&T is a set of basic rules and an associated symbology that define a language for specifying geometry and geometric variance. You dont need to memorize every symbol, but you should have a framework or mental model for how it works. Before we dive into the symbols and their application, you need to understand how ideal part geometry is communicated. That leads to the concept of the datum reference frame and datum features on your parts.Getting started with datums - understanding datum reference frames and datum featuresThe foundational question that datum reference frames and datum features help us answer is, what do we measure against? If every face and feature of a manufactured part is not perfect, how do we use relative and absolute measurements to check the part? We need to establish a universal way to check all of the features and their associated dimensional tolerances. Thats where the concept of the datum reference frame comes in handy.Datum reference framesIn GD&T, the datum reference frame (DRF) is an important concept because it defines the coordinate system in which all other dimensions and tolerances are specified. This allows for the use of geometric tolerances, which are tolerances that specify the allowable deviation of a feature from its ideal shape or orientation, rather than just specifying the allowable deviation of a single linear dimension. Heres the definition:The datum reference frame (DRF): A datum reference frame is three mutually perpendicular intersecting datum planes**.** The datum reference frame establishes a shared set of orthogonal planes that is leveraged by all subsequent feature controls and tolerances that you specify. Without a properly constructed DRF, your feature controls may not communicate your design intent.Datum featuresIn GD&T, a datum feature is a physical feature on a part that is used to establish a datum reference frame (DRF). Its important to remember that datum features refer to actual part features; things like faces, edges and vertices.Building a datum reference frameA DRF is composed of three datums: primary, secondary and tertiary datum planes. These datums are defined by selecting datum features on the part (note: the datum features do not necessarily have to be planes themselves). The simplest possible DRF is defined by three orthogonal part faces, as shown on the prismatic part below.*Pro tip: For more on selecting datum features and constructing datum reference frames check out our Mastering GD&T: Building Datum Reference Frames article.*Feature controls, tolerance zones and feature symbolsNow that we have a DRF to measure against, we need a way to control the geometry of the part. GD&T uses a language of symbols to establish feature controls with associated tolerance zones that define the allowable geometric variation of the manufactured part.Tolerance zonesBefore we go over the various symbols to define geometry controls, it helps to understand tolerance zones with a simple example. A tolerance zone explicitly defines where and how part geometry is permitted to vary. It does this by setting limits, usually in the form of boundaries, within which the controlled feature must remain.Lets look at the tolerance zone for a controlled part profile. In a part with a simple 2D profile, the tolerance zone is constructed by offsetting the part profile inward and outward to establish minimum and maximum material boundaries. The manufactured part profile must lie within this tolerance zone.SymbolsGD&T feature control symbols are used to establish different types of tolerance zones, each tailored toward ensuring different aspects of part and assembly functionality. Some of them require datum features to reference in order to use properly. For example, position requires datums in order to locate a hole center within a cylindrical tolerance zone.Other control symbols do not require datums. Flatness for example, controls the relative high and low spots of a single face. Given that the geometric control is self refer

as a crucible where the mettle of candidates is tested and their suitability for coveted positions is assessed. Whether it be the hallowed halls of Business Schools or the corporate echelons, GDs are omnipresent, providing a unique platform for individuals to articulate their thoughts, engage in dynamic discourse, and showcase a spectrum of skills that transcend mere verbal proficiency. This article delves into the multifaceted dimensions of Group Discussions, unraveling their intricacies and elucidating why they wield such influence in competitive fields.I. The Anatomy of Group Discussion: Setting the StageA. Participation Dynamics:In the typical landscape of a Group Discussion, an average of 10 candidates converges to partake in a verbal symphony. The seating arrangement, ideally configured in a circle or semicircle, fosters an environment conducive to dynamic interactions. As the panelists unveil the discussion topic, candidates are accorded a grace period of 3 to 5 minutes for contemplation and note-taking, setting the stage for the ensuing intellectual exchange.B. Verbal Artistry:The crux of a GD lies in the participants ability to articulate their viewpoints effectively. It is not merely about the frequency of ones interventions but the substance and relevance that permeate their verbal contributions. This sets the tone for a dynamic interplay of ideas, perspectives, and arguments.C. Real-Time Engagement:Once the figurative curtain rises, candidates have a compact timeframe of 10-15 minutes to actively engage in the discourse. This involves not only speaking but, perhaps more crucially, attentive listening. In the crucible of a GD, the ability to absorb, process, and respond to the evolving discussion is a skill that distinguishes adept participants. II. Decoding the Significance of Group Discussions: A Deep DiveA. Communication Skills:At the heart of the GD lies the litmus test for communication skills. The business landscape places immense value on individuals who can not only convey information vividly but also cultivate meaningful relationships through their communicative prowess. GDs serve as a microcosm of this reality, where participants are scrutinized not just for what they say but how they say it.B. Body Language and Gestures:Non-verbal cues are the silent orchestrators of communication, and a GD is a fertile ground for decoding these unspoken signals. Whether its the crossing of arms indicating disinterest or affirmative nods and sustained eye contact expressing active engagement, candidates must navigate the delicate dance of body language with finesse.C. Leadership Skills:In the crucible of a GD, the spotlight often falls on leadership attributes. How a candidate steers the discussion, articulates logical and effective points, and adeptly integrates the perspectives of fellow participants becomes a testament to their leadership acumen. The ability to guide without dominating and to foster a collaborative atmosphere is paramount.D. Analytical Skills:Numbers, facts, and figures weave seamlessly into the fabric of a GD, serving as critical elements that underscore analytical prowess. Candidates who demonstrate a deft hand in navigating numerical aspects, coupled with a well-rounded knowledge base, stand out in the evaluation process, showcasing their analytical finesse.E. Team Player Qualities:Collaboration is the cornerstone of success in the corporate milieu. GDs offer a unique lens through which panelists gauge a candidates comfort level in team dynamics. The willingness to trust and delegate tasks, coupled with an understanding of the collective goal, becomes pivotal in this assessment.F. Handling Stressful Situations:The crucible of a GD is not merely an intellectual exercise; it is a stress test of composure and resilience. Amidst the cacophony of disparate voices vying for attention, candidates who maintain a calm demeanor and articulate themselves with poise rise above the fray, showcasing an ability to handle stressful situations with grace.G. Group Dynamics:The ability to adapt to the ever-shifting landscape of group dynamics is a litmus test for flexibility. As the discussion traverses diverse terrains, candidates must navigate the nuanced art of when to enter and exit the discourse, showcasing an astute awareness of group dynamics.H. Problem-Solving Abilities:A GD is not a mere forum for intellectual sparring; it is a crucible where problems are presented, discussed, and solutions are sought. The ability to move beyond a mere exposition of issues and actively contribute to the derivation of solutions distinguishes candidates who emerge as catalysts in problem-solving. III. Unveiling the Comprehensive Evaluation: Beyond Surface AssessmentIn essence, the success of a candidate in a GD hinges on the manifestation of a diverse array of skills. It transcends the superficial layer of eloquence, venturing into the realms of effective communication, leadership, analytical acumen, teamwork, stress management, adaptability, and problem-solving prowess. A candidates journey through a GD is akin to navigating a labyrinth, where each turn reveals new facets of their capabilities.A. Communication Mastery:Beyond the basic articulation of thoughts, effective communication involves the art of persuasion, clarity in expression, and an innate ability to connect with the audience. In the context of a GD, where diverse perspectives converge, this mastery of communication takes center stage.B. Leadership Epitomized:Leadership, in the context of a GD, is not synonymous with dominating the discourse but rather with steering it in a direction that fosters inclusivity and coherence. A candidate who can strike this delicate balance emerges as a beacon of leadership potential.C. Analytical Dexterity:The analytics within a GD extend beyond a mere recitation of facts and figures. It delves into the strategic deployment of information, the ability to glean insights from data, and the aptitude to contribute substantively to the ongoing discourse.D. Team Synergy:While individual brilliance is laudable, the true litmus test lies in a candidates ability to synergize with the team. Trust, collaboration, and a collective commitment to the objective become the hallmarks of a team player, traits that reverberate in the corporate milieu.E. Stress as a Crucible:Stress, far from being an adversary, becomes a crucible that separates the composed from the flustered. The GD, in its inherent chaos, becomes a microcosm of real-world scenarios where grace under pressure is a prized attribute.F. Adapting to Group Dynamics:Navigating the ebb and flow of group dynamics demands an acute sense of situational awareness. The adept candidate discerns the opportune moments to contribute, listens actively, and adapts seamlessly to the evolving tenor of the discussion.G. Catalyst in Problem-Solving:Problem-solving, within the context of a GD, is not a solitary endeavor but a collaborative venture. The candidate who catalyzes the transition from issue identification to solution derivation emerges as a strategic thinker and a problem-solving asset. IV. The Culmination: Wishing Success in the GD OdysseyIn conclusion, Group Discussions serve as a microcosm of the professional arena, encapsulating within their discourse a holistic evaluation of an individuals potential. The journey through a GD is not amere formality; it is a transformative odyssey that unveils the layers of a candidates capabilities. Beyond the verbal interplay, it is the synthesis of communication, leadership, analytics, teamwork, stress management, adaptability, and problem-solving that defines success.To all those embarking on the GD odyssey, may your articulation be profound, your leadership sagacious, your analytics astute, your teamwork harmonious, your composure unassailable, your adaptability agile, and your approach to problem-solving transformative. In the crucible of Group Discussions, may you not only articulate but also illuminate, not only speak but also resonate, for it is in these arenas that the true essence of your professional mettle is unfurled. Wishing you success and excellence in your GD endeavors! Must ExploreHow to Crack GD Step by Step Guide10 Group Discussion Tips & TricksSkills required for Group Discussion100 GD Topics with Answers Also found in: Dictionary, Thesaurus, Medical, Financial, Encyclopedia, Wikipedia. Category filter: Show All (85)Most Common (2)Technology (8)Government & Military (13)Science & Medicine (23)Business (11)Organizations (13)Slang / Jargon (24)AcronymDefinitionGDGroundGDGrateful Dead (band)GDGoodGDG-Dragon (South Korean recording artist)GDGoal Difference (soccer)GDGoal Differential (soccer)GDGeneral DynamicsGDGold(en) DollarGDGradeGDGuardGDGeometry Dash (video game series)GDGraphic Design(er)GDGroup Discussion(s)GDGreen Day (band)GDGrenada (country code, top level domain)GDGood DayGDGold DiggerGDGadoliniumGDGuangdong (China)GDGraph DrawingGDGardner Denver, Inc. (pneumatic products company)GDGeneric DrugGDGroundhog DayGDGraves' Disease (also seen as GRD)GDGoDaddy (domain registrar)GDSoman (nerve agent)GDGestational DiabetesGDGod DamnGDGolden Delicious (apple)GDGranddaughterGDGraduate DegreeGDGeneral Delivery (postal)GDGedo (postal region, Somalia)GDGolden DawnGDGreat Divide (Everquest, gaming)GDGarment District (various locations)GDGeneral DutyGDGestational DayGDGangster Disciples (Gang)GDGraphic DisplayGDGosh DarnGDGlobal DeliveryGDGeneral Deployment (Cisco)GDGod Delusion (book)GDGrodeutschland (German WWII Panzer division)GDGlobal Dynamics (Eureka science fiction)GDGeorgia Dome (Atlanta, GA)GDGood Draw (Pictionary game slang)GDGender Dysphoria (medical syndrome)GDGun DogsGDGreen Depth (golf)GDGeneral DiaryGDGospel DoctrineGDGeologic DivisionGDGas Discharges (and their Applications; International Conference)GDGoverning DocumentGDGlucose DrinkGDGenetically DivergentGDGemcitabine Plus DocetaxelGDGeneral DischargeGDGlasdach (German: skylight, glass roof)GDGravely Disabled (mental health)GDGap DistributionGDGrowth DurationGDGlobal DefectGDGumboro Disease (Infectious Bursal Disease)GDGiant Drop (amusement park ride)GDGum Disturbance (philately)GDGravity DrainGDGrid Dynamics LLC (industrial design firm)GDGrand Dplacement (French)GDGraded DopingGDGasoline Dion (band)GDGameDrift (website)GDGalleryDriverGDGeographic DistrictGDGender Disappointment (family planning)GDGodavari Delta (India)GDGeothermal DivisionGDGlasser's Disease (swine medicine)GDGaseous DielectricGDGravimetric DensityGDGrupo de Dilogo (Spanish)GDGuided Expansion BearingGDGuidance DrawingCopyright 1988-2018 AcronymFinder.com, All rights reserved. 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(February 2025) (Learn how and when to remove this message)System for defining and representing engineering tolerancesExample of true position geometric control defined by basic dimensions and datum featuresGeometric dimensioning and tolerancing (GD&T) is a system for defining and communicating engineering tolerances via a symbolic language on engineering drawings and computer-generated 3D models that describes a physical object's nominal geometry and the permissible variation thereof. GD&T is used to define the nominal (theoretically perfect) geometry of parts and assemblies, the allowable variation in size, form, orientation, and location of individual features, and how features may vary in relation to one another such that a component is considered satisfactory for its intended use. Dimensional specifications define the nominal, as-modeled or as-intended geometry, while tolerance specifications define the allowable physical variation of individual features of a part or assembly.There are several standards available worldwide that describe the symbols and define the rules used in GD&T. One such standard is American Society of Mechanical Engineers (ASME) Y14.5. This article is based on that standard. Other standards, such as those from the International Organization for Standardization (ISO) describe a different system which has some nuanced differences in its interpretation and rules (see GPS&V). The Y14.5 standard provides a fairly complete set of rules for GD&T in one document. The ISO standards, in comparison, typically only address a single topic at a time. There are separate standards that provide the details for each of the major symbols and topics below (e.g. position, flatness, profile, etc.). BS 8888 provides a self-contained document taking into account a lot of GPS&V standards.The origin of GD&T is credited to Stanley Parker, who developed the concept of "true position". While little is known about Parker's life, it is known that he worked at the Royal Torpedo Factory in Alexandria, West Dunbartonshire, Scotland. His work increased production of naval weapons by new contractors.In 1940, Parker published Notes on Design and Inspection of Mass Production Engineering Work, the earliest work on geometric dimensioning and tolerancing.[1] In 1956, Parker published Drawings and Dimensions, which became the basic reference in the field.[1]A dimension is defined in ASME Y14.5 as "a numerical value(s) or mathematical expression in appropriate units of measure used to define the form, size, orientation, or location, of a part or feature."[2]:3 Special types of dimensions include basic dimensions (theoretically exact dimensions) and reference dimensions (dimensions used to inform, not define a feature or part).The units of measure in a drawing that follows GD&T can be selected by the creator of the drawing. Most often drawings are standardized to either SI linear units, millimeters (denoted "mm"), or US customary linear units, decimal inches (denoted "IN"). Dimensions can contain only a number without units if all dimensions are the same units and there is a note on the drawing that clearly specifies what the units are.[2]:8Angular dimensions can be expressed in decimal degrees or degrees, minutes, and seconds.Every feature on every manufactured part is subject to variation, therefore, the limits of allowable variation must be specified. Tolerances can be expressed directly on a dimension by limits, plus/minus tolerances, or geometric tolerances, or indirectly in tolerance blocks, notes, or tables.Geometric tolerances are described by feature control frames, which are rectangular boxes on a drawing that indicate the type of geometric control, tolerance value, modifier(s) and/or datum(s) relevant to the feature. The type of tolerances used with symbols in feature control frames can be:equal bilateralunequal bilateralunilateralno particular distribution (a "floating" zone)Tolerances for the profile symbols are equal bilateral unless otherwise specified, and for the position symbol tolerances are always equal bilateral. For example, the position of a hole has a tolerance of .020 inches. This means the hole can move .010 inches, which is an equal bilateral tolerance. It does not mean the hole can move +.015/.005 inches, which is an unequal bilateral tolerance. Unequal bilateral and unilateral tolerances for profile are specified by adding further information to clearly show this is what is required.Main article: Datum referenceA datum is a theoretically exact plane, line, point, or axis.[2]:3 A datum feature is a physical feature of a part identified by a datum feature symbol and corresponding datum feature triangle, e.g., A | {\displaystyle {\displaystyle \Box }\!\!\!\!{\scriptstyle {\mathsf {A}}}}\!-\!\!\!-\!\!\!\!\blacktriangleleft \!\!\!\!} These are then referred to by one or more 'datum references' which indicate measurements that should be made with respect to the corresponding datum feature. The datum reference frame can describe how the part fits or functions.The purpose of GD&T is to describe the engineering intent of parts and assemblies.[2] GD&T can more accurately define the dimensional requirements for a part, allowing over 50% more tolerance zone than coordinate (or linear) dimensioning in some cases. Proper application of GD&T will ensure that the part defined on the drawing has the desired form, fit (within limits) and function with the largest possible tolerances. GD&T can add quality and reduce cost at the same time through producibility.According to ASME Y14.5, the fundamental rules of GD&T are as follows,[2]:78All dimensions must have a tolerance. Plus and minus tolerances may be applied directly to dimensions or applied from a general tolerance block or general note. For basic dimensions, geometric tolerances are indirectly applied in a related feature control frame. The only exceptions are for dimensions marked as minimum, maximum, stock or reference.Dimensions and tolerancing shall fully define each feature. Measurement directly from the drawing or assuming dimensions is not allowed except for special undimensioned drawings.A drawing should have the minimum number of dimensions required to fully define the end product. The use of reference dimensions should be minimized.Dimensions should be applied to features and arranged to represent the function and mating relationship of the part. There should only be one way to interpret dimensions.Part geometry should be defined without explicitly specifying manufacturing methods.If dimensions are required during manufacturing but not the final geometry (due to shrinkage or other causes) they should be marked as non-mandatory.Dimensions should be arranged for maximum readability and should be applied to visible lines in true profiles.When geometry is normally controlled by gage sizes or by code (e.g. stock materials), the dimension(s) shall be included with the gage or code number in parentheses following the dimension.Angles of 90 are assumed when lines (including center lines) are shown at right angles, but no angle is specified.Basic 90 angles are assumed where center lines of features in a pattern or surfaces shown at right angles on a 2D orthographic drawing are located or defined by basic dimensions and no angle is specified.A basic dimension of zero is assumed where axes, center planes, or surfaces are shown coincident on a drawing, and the relationship between features is defined by geometric tolerances.Dimensions and tolerances are valid at 20C (68F) and 101.3kPa (14.69psi) unless stated otherwise.Unless explicitly stated, dimensions and tolerances only apply in a free-state condition.Unless explicitly stated, tolerances apply to the full length, width, and depth of a feature.Dimensions and tolerances only apply at the level of the drawing where specified. It is not mandatory that they apply at other levels (such as an assembly drawing).Coordinate systems shown on drawings should be right-handed. Each axis should be labeled and the positive direction should be shown.Geometric characteristic reference chart[2]ApplicationType of controlCharacteristicSymbolUnicode characterRelevant featureVirtual condition affectedReferences datumModified byAffected bySurfaceOfsizeBonusShiftIndividual featuresFormStraightnessU+23E4YesYesOf size[a]NoOf size[a]No[c] [d]NoFlatness[3]U+23E5YesNoNoNoNoNo[c]NoNoCircularity[3]U+25CBYesNoNoNoNoNo[c]NoNoCylindricityU+232DYesNoNoNoNoNo[c]NoNoIndividual or related featuresProfileProfile of a lineU+2312YesNoNoYes[e]NoNo[c]NoDatum, [b]Profile of a surfaceU+2313YesNoNoYes[e]NoNo[c]NoDatum, [b]Related featuresOrientationPerpendicularityU+27C2YesYesOf size[a]YesOf size[a]No[c][d]Datum, [b]AngularityU+2220YesYesOf size[a]YesOf size[a]No[c][d]Datum, [b]ParallelismU+2225YesYesOf size[a]YesOf size[a]No[c][d]Datum, [b]LocationSymmetry[f][g]U+232FNoYesYesYesNoNoNoNoPositionU+2316NoYesYesYesYesYes[d]Datum, [b]Concentricity[f]U+25CENoYesYesYesNoNo[c]NoNoRun-outCircular run-outU+2197YesYesOf size[a]YesNoNo[c]NoNoTotal run-outU+2330YesYesOf size[a]YesNoNo[c]NoNo^ a b c d e f g h i j When applied to a feature of size.^ a b c d e f g When a datum feature of size is referenced with the maximum material condition modifier.^ a b c d e f g h i j k l Automatically[b]^ a b c d e When a maximal material condition modifier is used.^ a b Can also be used as a form control without a datum reference.^ a b In the 2018 revision, both concentricity and symmetry were eliminated and are no longer supported.^ The symmetry symbol's characteristics were not included in the version of the chart that this chart is derived from. The symmetry symbol was dropped from the Y14.5M standard around 1982 and re-added around 1994.The following table shows only some of the more commonly used modifiers in GD&T. It is not an exhaustive list.Symbols used in a "feature control frame" to specify a feature's description, tolerance, modifier and datum referencesSymbolUnicode characterModifierDefinition[2]:27NotesU+24BBFree state"The condition of a part free of applied forces"Applies only when part is otherwise restrainedU+24C1Least material condition (LMC)"The condition in which a feature of size contains the least amount of material within the stated limits of size"Useful to maintain minimum wall thicknessU+24C2Maximum material condition (MMC)"The condition in which a feature of size contains the maximum amount of material within the stated limits of size"Provides bonus tolerance only for a feature of sizeU+24C5Projected tolerance zoneUseful on threaded holes for long studsU+24C8Regardless of feature size (RFS)"Indicates a geometric tolerance applies at any increment of size of the actual mating envelope of the feature of size"Not part of the 1994 version. See para. A5, bullet 3. Also para. D3. Also, Figure 38.U+24C9Tangent plane"A plane that contacts the high points of the specified feature surface"Useful for interfaces where form is not requiredContinuous featureIdentifies "a group of features of size where there is a requirement that they be treated geometrically as a single feature of size"Identifies a group of features that should be "treated geometrically as a single feature"Statistical toleranceIndicates that features "shall be produced with statistical process controls".Appears in the 1994 version of the standard, assumes appropriate statistical process control.U+24CAUnequal bilateralAdded in the 2009 version of the standard, and refers to unequal profile distribution. Number after this symbol indicates tolerance in the "plus material" direction.The American Society of Mechanical Engineers (ASME) provides two levels of certification:[4]Technologist GDTP, which provides an assessment of an individual's ability to understand drawings that have been prepared using the language of Geometric Dimensioning & Tolerancing.Senior GDTP, which provides the additional measure of an individual's ability to select proper geometric controls as well as to properly apply them to drawings.Exchange of geometric dimensioning and tolerancing (GD&T) information between CAD systems is available on different levels of fidelity for different purposes:In the early days of CAD, exchange-only lines, texts and symbols were written into the exchange file. A receiving system could display them on the screen or print them out, but only a human could interpret them.GD&T presentation: On a next higher level the presentation information is enhanced by grouping them together into callouts for a particular purpose, e.g. a datum feature callout and a datum reference frame. And there is also the information which of the curves in the file are leader, projection or dimension curves and which are used to form the shape of a product.GD&T representation: Unlike GD&T presentation, the GD&T representation does not deal with how the information is presented to the user but only deals with which element of a shape of a product has which GD&T characteristic. A system supporting GD&T representation may display GD&T information in some tree and other dialogs and allow the user to directly select and highlight the corresponding feature on the shape of the product, 2D and 3D.Ideally both GD&T presentation and representation are available in the exchange file and are associated with each other. Then a receiving system can allow a user to select a GD&T callout and get the corresponding feature highlighted on the shape of the product.An enhancement of GD&T representation is defining a formal language for GD&T (similar to a programming language) which also has built-in rules and restrictions for the proper GD&T usage. This is still a research area (see below reference to McCaleb and ISO 10303-1666).GD&T validation: Based on GD&T representation data (but not on GD&T presentation) and the shape of a product in some useful format (e.g. a boundary representation), it is possible to validate the completeness and consistency of the GD&T information. The software tool FBTol from the Kansas City Plant is probably the first one in this area.GD&T representation information can also be used for the software assisted manufacturing planning and cost calculation of parts. See ISO 10303-224 and 238 below.ISO 129 Technical drawings Indication of dimensions and tolerancesISO 7083 Symbols for geometrical tolerancing Proportions and dimensionsISO 13715 Technical drawings Edges of undefined shape Vocabulary and indicationsISO 15786 Simplified representation and dimensioning of holesISO 16792:2021 Technical product documentationDigital product definition data practices (Note: ISO 16792:2006 was derived from ASME Y14.41-2003 by permission of ASME)In ISO/TR 14638 GPS Masterplan the distinction between fundamental, global, general and complementary GPS standards is made.Fundamental GPS standardsISO 8015 Concepts, principles and rulesGlobal GPS standardsISO 14660-1 Geometrical featuresISO/TS 17, orientation and locationISO 1101 Geometrical tolerancing Tolerances of form, orientation, location and run-outAmendment 1 Representation of specifications in the form of a 3D modelISO 1119 Series of conical tapers and taper anglesISO 2692 Geometrical tolerancing Maximum material requirement (MMR), least material requirement (LMR) and reciprocity requirement (RPR)ISO 3040 Dimensioning and tolerancing ConesISO 5458 Geometrical tolerancing Positional tolerancingISO 5459 Geometrical tolerancing Datums and datum systemsISO 10578 Tolerancing of orientation and location Projected tolerance zoneISO 10579 Dimensioning and tolerancing Non-rigid partsISO 14406 ExtractionISO 22432 Features used in specification and verificationGeneral GPS standards: Areal and profile surface textureISO 1302 Indication of surface texture in technical product documentationISO 3274 Surface texture: Profile method Nominal characteristics of contact (stylus) instrumentsISO 4287 Surface texture: Profile method Terms, definitions and surface texture parametersISO 4288 Surface texture: Profile method Rules and procedures for the assessment of surface textureISO 8785 Surface imperfections Terms, definitions and parametersForm of a surface independent of a datum or datum system. Each of them has a part 1 for the Vocabulary and parameters and a part 2 for the Specification operators:ISO 12180 CylindricityISO 12181 RoundnessISO 12780 StraightnessISO 12781 FlatnessISO 25178 Surface texture: ArealGeneral GPS standards: Extraction and filtration techniquesISO/TS 1661 FiltrationISO 11562 Surface texture: Profile method Metrological characteristics of phase correct filtersISO 12085 Surface texture: Profile method Motif parametersISO 13565 Profile method; Surfaces having stratified functional propertiesASME Y14.41 Digital Product Definition Data PracticesASME Y14.5 Dimensioning and TolerancingASME Y14.5.1M Mathematical Definition of Dimensioning and Tolerancing PrinciplesASME is also working on a Spanish translation for the ASME Y14.5 Dimensioning and Tolerancing Standard.ISO 10303 Industrial automation systems and integration Product data representation and exchangeISO 10303-47 Integrated generic resource: Shape variation tolerancesISO/TS 10303-1130 Application module: Derived shape elementISO/TS 10303-1050 Application module: Dimension toleranceISO/TS 10303-1051 Application module: Geometric toleranceISO/TS 10303-1052 Application module: Default toleranceISO/TS 10303-1666 Application module: Extended geometric toleranceISO 10303-203 Application protocol: Configuration controlled 3D design of mechanical parts and assembliesISO 10303-210 Application protocol: Electronic assembly, interconnection, and packaging designISO 10303-214 Application protocol: Core data for automotive mechanical design processesISO 10303-224 Application protocol: Mechanical product definition for process planning using machining featuresISO 10303-238 Application protocol: Application interpreted model for computerized numerical controllers (STEP-NC)ISO 10303-242 Application protocol: Managed model based 3D engineeringDimensional instrumentsEngineering fitEngineering toleranceGauge (instrument)Geometrical Product Specification and VerificationPosition sensorSpecification of surface finishThis article includes a list of general references, but it lacks sufficient corresponding inline citations. Please help to improve this article by introducing more precise citations. (April 2010) (Learn how and when to remove this message)^ a b MacMillan, David M.; Krandall, Rollande (2014). "Bibliography for Dimensioning and Tolerancing". Circuitous Root. Archived from the original on 27 March 2019. Retrieved October 24, 2018.^ a b c d e f g Dimensioning and Tolerancing, ASME Y14.5-2009. NY: American Society of Mechanical Engineers. 2009. ISBN978-0-7918-3192-2.^ a b "GD&T, Geometric Dimensioning and Tolerancing, GD&T, Flatness, Circularity, Flatness Tolerance, Circularity Tolerance". cobanengineering.com. Retrieved 2020-04-02.^ "Resources". Technical Training Consultants. 2020. Retrieved 2020-09-20.McCaleb, Michael R. (1999). "A Conceptual Data Model of Datum Systems". Journal of Research of the National Institute of Standards and Technology. 104 (4): 349400. doi:10.6028/jres.104.024. PMC4880403.Henzold, Georg (2006). 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ISBN978-1-59070-328-1.Wikimedia Commons has media related to Geometric dimensioning and tolerancing.General tolerances for linear and angular dimensions according to ISO 2768What is GD&TThe importance of GD&TGD&T symbols and definitionsGD&T Glossary of Terms and Definitions Archived 2008-09-15 at the Wayback MachineGDT: IntroductionASME CertificationChanges and Additions to ASME Y14.5MNIST MBE PMI Validation and Conformance Testing Project Tests implementations of GD&T in CAD softwareSTEP File Analyzer and Viewer - Analyze GD&T in a STEP fileRetrieved from " is gdp stand for. What is gdp per capita. What is gdansk famous for. What is gds. What is gdp in economics. What is gd&t. What is gdv in dogs. What is gdp mean. What is gdpr uk. What is gdpr. What is gdd. What is gdp deflator. What is gdp. What is gdp of india. What is gdp of pakistan.

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