The following is a starting point of discussion for “game related” topics for you to consider.

1. **Foundation Standards – Computer Science**

   **Standard 1.1**  
   **Understanding of the computer environment**
   - CS1.1.01 History of computers
   - CS1.1.02 Analog to digital
   - CS1.1.03 Computer organization – identification of parts, operating systems and applications
   - CS1.1.04 Networking
   - CS1.1.05 Numbers – how computers represent everything in binary
   - CS1.1.06 Logical gates – building blocks used to create circuits to add and memory
   - CS1.1.07 The basic computer – the CPU, memory units, and I/O units and bus

   **Standard 1.2:**  
   **Structure programming**
   - CS1.2.01 Defining a “program” and survey of programming languages (both high and low level)
   - CS1.2.02 Basic program structure
   - CS1.2.03 Data variables – variable declarations; data types; type qualifiers; storage class/lifetime; scope visibility; constant declarations; type conversions; type aliasing (typedef)
   - CS1.2.04 Operators – relational and logical; arithmetic operators; assignment operators; increment and decrement operators; bitwise operators
   - CS1.2.05 Expressions – operators and operands; precedence and order of evaluation; logical; arithmetic; L-values and R-values
   - CS1.2.06 Statements – sentences of programming; compound statements
   - CS1.2.07 Control structures – conditional expressions, iteration, jump statements
   - CS1.2.08 Functions – call operator; arguments and parameters; return values; signature; using libraries; recursion
   - CS1.2.09 Arrays – one dimensional; character arrays; relationship of arrange and pointer types; iteration of arrays; arrays of pointers; passing arrays to functions; two dimensional arrays
   - CS1.2.10 Pointers – using and assigning pointers; dereferencing pointer; null pointer; generic pointers; pointer parameters in functions; pointers and arrays; pointer arithmetic
   - CS1.2.11 Structure – declaring structures; declaring variables; initialization; assigning values; operations; structures and functions; arrays or structure variables; pointers to structures.
   - CS1.2.12 Input/Output – characters; strings; escape sequences inside strings; floating point numbers; file input/output
   - CS1.2.13 Errors – syntax/logic

   **Standard 1.3:**  
   **Object oriented/Object based programming (OOP)**
   - CS1.3.01 Declaration and definition
   - CS1.3.02 Access specifiers – private; protected; public
   - CS1.3.03 Static/Class methods – static data members; static members functions/method
   - CS1.3.04 Instant members – data members/ variables; instance methods/ member functions, process/behavior, accessors/ getters
   - CS1.3.05 this keyword
   - CS1.3.06 Method overloading
   - CS1.3.07 Constructors
   - CS1.3.08 Destructors (C++)/ automatic garbage collection (java)
   - CS1.3.09 Friend function (C++)
   - CS1.3.10 Operators
   - CS1.3.10 Inheritance hierarchy – parent, child, grandparent
   - CS1.3.11 Implementing hierarchy – aggregation, inheritance
   - CS1.3.12 Inheritance Constructors – parent constructor and child constructor
   - CS1.3.13 Method overriding
### CS1.3.14 Declaring child objects
### CS1.3.15 Abstract/Virtual methods
### CS1.3.16 Type conversion
### CS1.3.17 Downcasting – single vs multiple inheritance; interfaces
### CS1.3.18 Polymorphism (static) – operator overloading, templates, function overloading
### CS1.3.19 Dynamic binding (late binding) – abstract class; abstract/virtual member functions
### CS1.3.20 Input/Output – strings; bytes; lines; file i/o (no access modes)
### CS1.3.21 Exceptions – exception class/object; standard exceptions; throw; try/catch/finally
### CS1.3.22 Standard classes – string; vector

#### Standard 1.4: Introduction to software development life cycle
- **CS1.4.01** Waterfall model
- **CS1.4.02** Spiral model

#### Standard 1.5: Standard data structures and algorithms
- **CS1.5.01** Simple data types
- **CS1.5.02** Classes
- **CS1.5.03** One-dimensional arrays
- **CS1.5.04** Two-dimensional arrays
- **CS1.5.05** Linked list (singly, doubly, circular) – stacks; queues; trees; heaps; priority queues; sets; maps
- **CS1.5.06** Operations of data structures – traversals; insertions; deletions; iterators
- **CS1.5.07** Searching – sequential; binary; hashing
- **CS1.5.08** Sorting – selection; insertions; Mergesort; Quicksort; Heapsort

#### Standard 1.6: Introduction to programming in a network environment
- **CS1.6.01** Peer-to-peer
- **CS1.6.02** Client/server

## 2. Foundation Standards – Production Art

#### Standard 2.1: Development of knowledge and proficiency in traditional art skills
- **CS2.1.01** Basic drawing skills development including study of drawing elements such as line, shape, perspective, proportion, scale, lighting
- **CS2.1.02** Basic understanding of human & animal anatomy
- **CS2.1.03** Understanding of color theory
- **CS2.1.04** Composition theory

#### Standard 2.2: Knowledge of art history and appreciation for art as a resource.
- **CS2.2.01** Basic art history
- **CS2.2.02** Art appreciation, with focus on the nature of art, cultural differences, different media and artists.

#### Standard 2.3: Development of traditional 2D animation skills
- **CS2.3.01** Knowledge of history of animation
- **CS2.3.02** Understanding of animation production process including concepts of storyboarding, keyframing and in-betweening.
- **CS2.3.03** Fundamental principles of animation including timing, staging, anticipation, squash & stretch, follow through, overlapping action, exaggeration, and secondary action
- **CS2.3.04** Understanding of basic acting principles with focus on posture and movement.
- **CS2.3.05** Study of bipedal animation
- **CS2.3.06** Production of animation cycles

#### Standard 2.4: Knowledge of character and environment design
- **CS2.4.01** Knowledge of qualities of good character design for games as well as creation of character turnabouts
- **CS2.4.02** Basic understanding of environment design
- **CS2.4.03** Research & sources for reference material
Standard 2.5: **Knowledge of graphic design as it applies to interface design**

- CS2.5.01 Understanding of basic human perception theory
- CS2.5.02 Use of color
- CS2.5.03 Typography
- CS2.5.04 Iconography
- CS2.5.05 Composition, with emphasis of understanding of balance and use of contrast
- CS2.5.06 Basic knowledge of photography principles

Standard 2.6: **Understanding of basic computer graphics and game art theory**

- CS2.6.01 Pixels and image resolution
- CS2.6.02 Vector versus raster art
- CS2.6.03 Comparison of additive versus subtractive color; RGB vs. CYMK
- CS2.6.04 Common image file formats
- CS2.6.05 Color depth theory with focus on impact on file size
- CS2.6.06 Coordinate systems
- CS2.6.07 Concept of “key” color
- CS2.6.08 Concept of color and parallax as applied to illusion of depth of game backgrounds
- CS2.6.09 Understanding of the term “sprite”

Standard 2.7: **Basic proficiency with digital 2D paint tool as applied to creating assets for games.**

- CS2.7.01 Understanding of basic software workflow including setting resolution, color depth, importing drawings or digital images, resizing, appropriate file formats, and saving image files.
- CS2.7.02 Understanding concept of using “layers”
- CS2.7.03 Proficiency with basic software tools such selection and color fill
- CS2.7.04 Working with color palettes including process for defining colors.
- CS2.7.05 Working with channels, particularly with regards to masking
- CS2.7.06 Effective use of filters and effects
- CS2.7.07 Proficiency with peripheral tools such as digital cameras, scanners.

Standard 2.8: **Basic proficiency with digital 2D animation tool as applied to creating assets for games.**

- CS2.8.01 Understanding of basic software workflow including setting resolution, setting length of animation, color depth, importing images, resizing, appropriate file formats, and saving animation movies.
- CS2.8.02 Understanding of how to set keyframes and adjust timing

Standard 2.9: **Basic proficiency with 3D animation tool as applied to creating assets for games.**

- CS2.9.01 Understanding of basic software workflow including setting resolution, setting length of animation, color depth, importing images, resizing, appropriate file formats, and saving files.
- CS2.9.02 Understanding of basic 3D production process including modeling, application of materials/textures, lighting, camera composition, animation, and rendering.
- CS2.9.03 Understanding orthographic versus perspective views
- CS2.9.04 Understanding of 3D coordinate system
- CS2.9.05 Vertices, faces, objects
- CS2.9.06 Proficiency with modeling of 3D objects using methods such low polygonal/face modeling, extrusion/lathing, NURBS/splines modeling, Boolean modeling.
- CS2.9.07 Proficiency with creation and effective use of virtual lights including lighting schemes and color
- CS2.9.08 Proficiency with creation and effective use of virtual cameras including understanding of camera terminology (zoom, pan, track, focal length)
- CS2.9.09 Understanding of rendering process including set up of resolution, file formats, alpha/key color channel, and atmospheric effects
- CS2.9.10 Proficiency with creation of 3D animation including understanding of keyframing, motion curves/keyframe, interpolation methods, bracketing, hierarchy linking, pivot points, rigging of characters with skin/bones, inverse kinematics versus forward kinematics, morphing/deformation.
CS2.9.11 Understanding of the process for creating special effects, particularly with regards to particles and compositing.

3. **Foundation Standards – Mathematics**

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Standard 3.9: Determinants

CS3.9.01 Definition of determinant – determinant of a 2x2 matrix; determinant of a 3x3 matrix; determinant of special square matrices (determinant of a diagonal matrix, determinant of \(I_n\)).

CS3.9.02 Determinant applications – inverse of a square matrix (minors and cofactors, transpose of a matrix); solution of a linear system of two equations in two unknowns (existence of a single, unique solution); solution of a linear system of three equations in three unknowns.

Standard 3.10: 2D Geometric Vectors

CS3.10.01 Definition of vectors
CS3.10.02 Notation
CS3.10.03 Operations on vectors (addition of two vectors; subtraction of two vectors; scalar multiplication)
CS3.10.04 Zero-vector
CS3.10.05 Unit vector
CS3.10.06 Parallel vectors
CS3.10.07 Opposite vectors – opposite of a vector; equal vectors; properties of vectors (head-to-tail theorem)

Standard 3.11: Introduction to Trigonometry

CS3.11.01 Arcs and Angles
CS3.11.02 Angle measure units (degrees, radians, relation between degrees and radians)
CS3.11.03 Pythagorean Theorem
CS3.11.04 Trigonometric Functions – cosine of an angle; sine of an angle; tangent and cotangent of an angle
CS3.11.05 Trigonometric functions in a right triangle
CS3.11.06 Trigonometric identities

4. Foundation Standards – Creative Writing

Standard 4.1: Understanding of basic creative writing concepts.

CS4.1.01 Story structure
CS4.1.02 Narrative
CS4.1.03 Character development

Standard 4.2: Knowledge of creative writing resources and appreciation for classical literature as a resource

CS4.2.01 Awareness of impact of various English literary works and mythological stories
CS4.2.02 Awareness of modern works produced for digital and theatrical release.
CS4.2.03 Awareness of impact of historical events and use of creative license

Standard 4.3: Responsible game development.

CS4.3.01 System reliability
CS4.3.02 Legal issues – copyright law and intellectual property
CS4.3.03 Social and ethical ramifications of game content

Standard 4.4: Proficiency with digital tools used for creation of game production documents.

CS4.4.04 Familiar with basic design and publication tools including word processors, 2D graphics software, and spreadsheet programs.

5. Foundation Standards – Production & Design

Standard 5.1: Knowledge of game industry and terminology.

CS5.1.01 Survey of game industry from both historical and business perspectives.
CS5.1.02 Critical analysis of industry titles, with emphasis on play mechanics, game anomalies, artistic appeal, and overall fun factor.

CS5.1.03 Understanding of basic game terminology (1st/2nd/3rd party, game genres, etc.)

Standard 5.2: Knowledge of process for creating game design and technical design documents.

CS5.2.01 Gathering of data to identify game requirements and to define scope of work.
CS5.2.02 Understanding of the key elements of a Game Design Document (GDD) – high concept description; competitive product analysis; player character overview; storyline/gameflow.
CS5.2.03 Understanding of the key elements of a Technical Design Document (TDD) – specification of the roles within the production team; identification of target platform(s); definition of the production pipeline and production schedule; definition of file management system and version control mechanism; defining game architecture; defining coding standards to be followed; defining game objects; identification of state and behaviors of objects; defining art elements and formats.

Standard 5.3: Implementation of game project

CS5.3.01 Project management – meeting milestones; file management; team task management
CS5.3.02 Implementation of program code, art assets, sound assets based on pre-production documents
CS5.3.03 Play balancing to ensure understanding of game objectives (user interface design); and play control evaluation of learning curve and level of difficulty
CS5.3.04 Quality assurance of unit object testing, integration testing, and final release candidate testing.