12 Basic Principles of Animation

Sources: http://en.wikipedia.org/wiki/12_basic_principles_of_animation
http://www.siggraph.org/education/materials/HyperGraph/animation/character_animation/principles/prin_trad_anim.htm

1.) Squash and stretch
The most important principle is "squash and stretch", the purpose of which is to give a sense of weight and flexibility to drawn objects. It can be applied to simple objects, like a bouncing ball, or more complex constructions, like the musculature of a human face. Taken to an extreme point, a figure stretched or squashed to an exaggerated degree can have a comical effect. In realistic animation, however, the most important aspect of this principle is the fact that an object's volume does not change when squashed or stretched. If the length of a ball is stretched vertically, its width (in three dimensions, also its depth) needs to contract correspondingly horizontally.

2.) Anticipation
Anticipation is used to prepare the audience for an action, and to make the action appear more realistic. A dancer jumping off the floor has to bend his knees first; a golfer making a swing has to swing the club back first. The technique can also be used for less physical actions, such as a character looking off-screen to anticipate someone's arrival, or attention focusing on an object that a character is about to pick up.

3.) Staging
This principle is akin to staging as it is known in theatre and film. Its purpose is to direct the audience's attention, and make it clear what is of greatest importance in a scene; what is happening, and what is about to happen. Johnston and Thomas defined it as "the presentation of any idea so that it is completely and unmistakably clear", whether that idea is an action, a personality, an expression or a mood. This can be done by various means, such as the placement of a character in the frame, the use of light and shadow, and the angle and position of the camera. The essence of this principle is keeping focus on what is relevant, and avoiding unnecessary detail.

4.) Straight ahead action and pose to pose
These are two different approaches to the actual drawing process. "Straight ahead action" means drawing out a scene frame by frame from beginning to end, while "pose to pose" involves starting with drawing a few, key frames, and then filling in the intervals later. "Straight ahead action" creates a more fluid, dynamic illusion of movement, and is better for producing realistic action sequences. On the other hand, it is hard to maintain proportions, and to create exact, convincing poses along the way. "Pose to pose" works better for dramatic or emotional scenes, where composition and relation to the surroundings are of greater importance. A combination of the two techniques is often used. Computer animation removes the problems of proportion related to "straight ahead action" drawing; however, "pose to pose" is still used for computer animation, because of the advantages it brings in composition. The use of computers facilitates this method, as computers can fill in the missing sequences in between poses automatically. It is, however, still important to oversee this process, and apply the other principles discussed.
5.) **Follow through and overlapping action**

These closely related techniques help render movement more realistic, and give the impression that characters follow the laws of physics. "Follow through" means that separate parts of a body will continue moving after the character has stopped. "Overlapping action" is the tendency for parts of the body to move at different rates (an arm will move on different timing of the head and so on). A third technique is "drag", where a character starts to move and parts of him take a few frames to catch up. These parts can be inanimate objects like clothing or the antenna on a car, or parts of the body, such as arms or hair. On the human body, the torso is the core, with arms, legs, head and hair appendices that normally follow the torso's movement. Body parts with much tissue, such as large stomachs and breasts, or the loose skin on a dog, are more prone to independent movement than bonier body parts. Again, exaggerated use of the technique can produce a comical effect, while more realistic animation must time the actions exactly, to produce a convincing result.

Thomas and Johnston also developed the principle of the "moving hold". A character not in movement can be rendered absolutely still; this is often done, particularly to draw attention to the main action. According to Thomas and Johnston, however, this gave a dull and lifeless result, and should be avoided. Even characters sitting still can display some sort of movement, such as the torso moving in and out with breathing.

6.) **Slow in and slow out (Ease In and Ease out)**

The movement of the human body, and most other objects, needs time to accelerate and slow down. For this reason, an animation looks more realistic if it has more frames near the beginning and end of a movement, and fewer in the middle.

This principle goes for characters moving between two extreme poses, such as sitting down and standing up, but also for inanimate, moving objects, like the bouncing ball in the above illustration.

7.) **Arts**

Most human and animal actions occur along an arched trajectory, and animation should reproduce these movements for greater realism. This can apply to a limb moving by rotating a joint, or a thrown object moving along a parabolic trajectory. The exception is mechanical movement, which typically moves in straight lines.

8.) **Secondary action**

Adding secondary actions to the main action gives a scene more life, and can help to support the main action. A person walking can simultaneously swing his arms or keep them in his pockets, he can speak or whistle, or he can express emotions through facial expressions. The important thing about secondary actions is that they emphasize, rather than take attention away from the main action. If the latter is the case, those actions are better left out. In the case of facial expressions, during a dramatic movement these will
often go unnoticed. In these cases it is better to include them at the beginning and the end of the movement, rather than during.

9.) **Timing**
Timing in refers to the number of drawings or frames for a given action, which translates to the speed of the action on Film. On a purely physical level, **correct timing makes objects appear to abide to the laws of physics**; for instance, an object's weight decides how it reacts to an impetus, like a push. **Timing is critical for establishing a character's mood, emotion, and reaction.** It can also be a device to communicate aspects of a character's personality.

10.) **Exaggeration**
Exaggeration is an effect especially useful for animation, as perfect imitation of reality can look static and dull in cartoons. **The level of exaggeration depends on whether one seeks realism or a particular style, like a caricature or the style of an artist.** The classical definition of exaggeration, employed by Disney, was to remain true to reality, just presenting it in a wilder, more extreme form. Other forms of exaggeration can involve the supernatural or surreal, alterations in the physical features of a character, or elements in the storyline itself. It is important to employ a certain level of restraint when using exaggeration; if a scene contains several elements, there should be a balance in how those elements are exaggerated in relation to each other, to avoid confusing or overawing the viewer.

11.) **Solid drawing**
The principle of solid drawing means taking into account forms in three-dimensional space, giving them volume and weight. The animator needs to be a skilled draughtsman and has to understand the basics of three-dimensional shapes, anatomy, weight, balance, light and shadow etc. For the "classical" animator, this involved taking art classes and doing sketches from life. One thing in particular that Johnston and Thomas warned against was creating "twins": characters whose left and right sides mirrored each other, and looked lifeless. Modern-day computer animators in theory do not need to draw at all, yet their work can still benefit greatly from a basic understanding of these principles.

12.) **Appeal**
Appeal in a cartoon character corresponds to what would be called charisma in an actor. A character that is appealing is not necessarily sympathetic — villains or monsters can also be appealing — the important thing is that the viewer feels the character is real and interesting. There are several tricks for making a character connect better with the audience; for likable characters a symmetrical or particularly baby-like face tends to be effective.

**Personality in character animation is the goal of all of the above principles.**