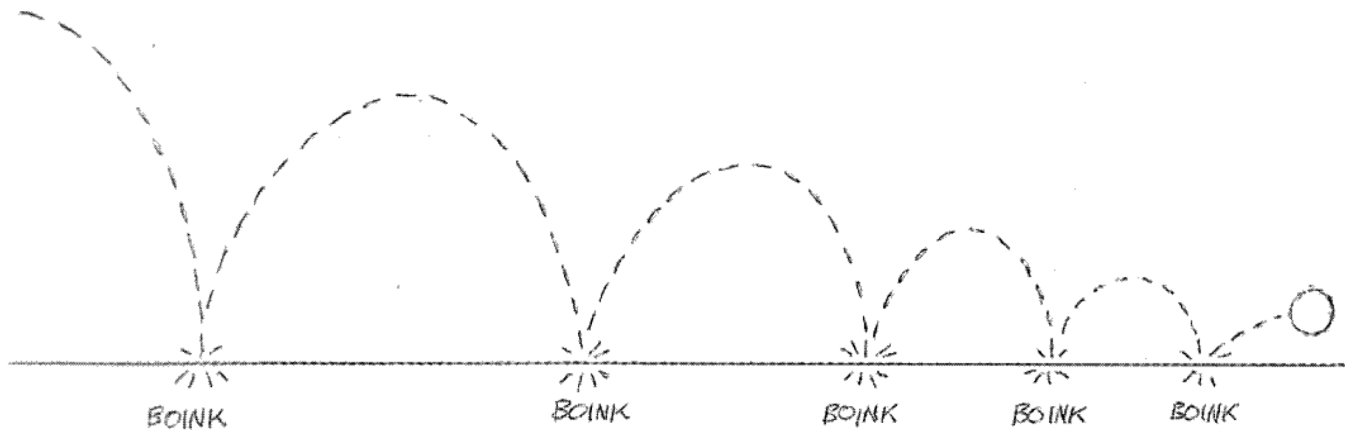The bouncing ball says it all.

The old bouncing-ball example is often used because it shows so many different aspects of animation.

A ball bounces along,

BOINK   BOINK   BOINK   BOINK   BOINK

and where it hits – the 'boinks' – that's the *timing*. The impacts – where the ball is hitting the ground – that's the *timing* of the action, the rhythm of where things happen, where the 'accents' or 'beats' or 'hits' happen.

And here's the *spacing*.
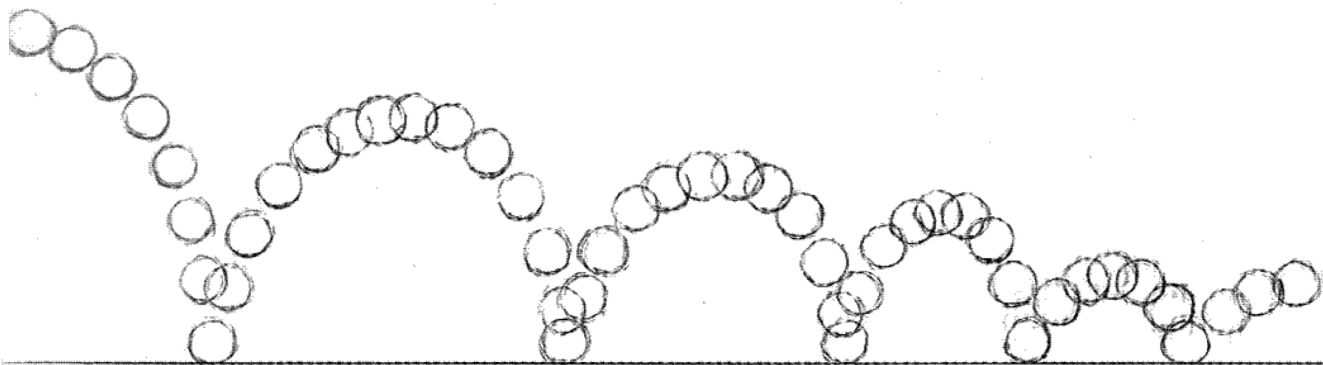
The ball overlaps itself when it's at the slow part of its arc, but when it drops fast, it's spaced further apart. That's the *spacing*. The spacing is how close or far apart those clusters are. That's it. It's simple, but it's important. The spacing is the tricky part. Good animation spacing is a rare commodity.

So we have:

SPACING

BOINK

TIMING

BOINK
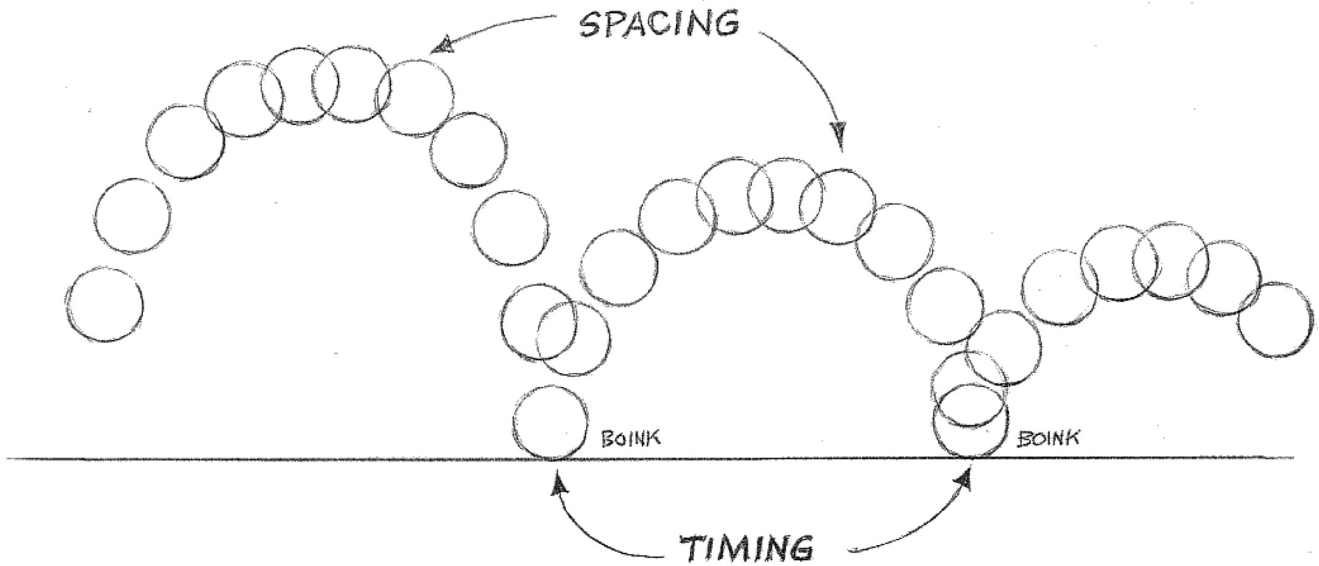
The two basic elements of animation.

To experience this, take a coin and film it in stages under a video camera.
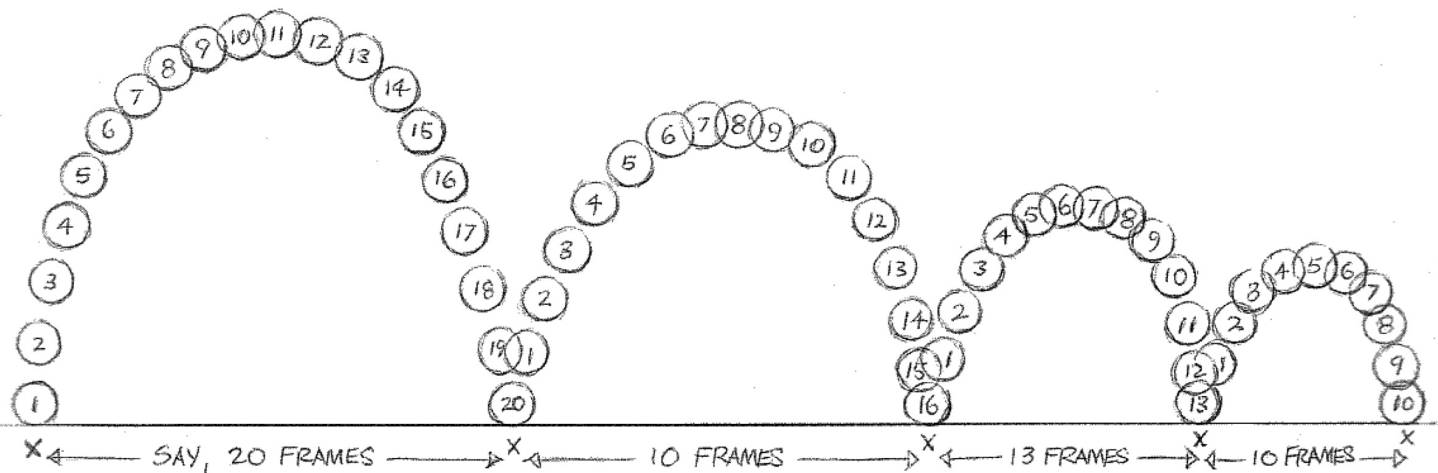
First plot out the *timing* – where you want the ball to hit the ground. Then push the coin around – taking a picture at each frame – and see what looks right or wrong. Try it with different timings and spacing. You're already animating. You're already dealing with the important fundamentals and you haven't even made a single drawing. You're doing pure animation without any drawings.

Hidden in this simple test is the weight of the ball – how it feels, light or heavy; what it's made of. Is it large or small, moving fast or slow? This will all emerge if you do several tests – which only take a few minutes to do. The importance of the timing and the spacing will become obvious.

Because *you* did it, a certain amount of personality will creep into the action – whether the ball is deliberate, slow, jaunty, erratic, cautious, even optimistic or pessimistic.

And all this, before you've made a single drawing. This reveals how important and dominant the timing and the spacing is. Even if the ball positions were drawn in detail by Michelangelo or Leonardo da Vinci, the timing and the spacing of the drawings will still dominate.

Another interesting way to experience the difference between timing and spacing right away is this:

Let's put a coin under the video camera and move it across the page (or screen) in one second – 24 frames of screen time. That's our *timing*.

We'll space it out evenly – and that's our *spacing*.
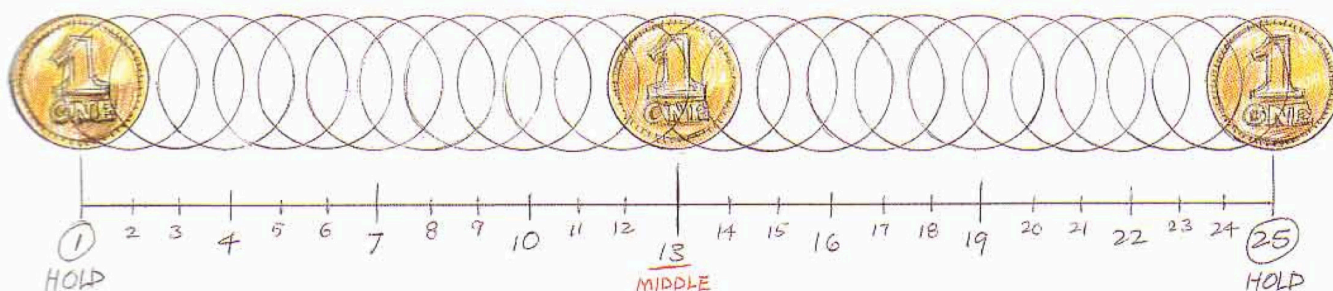
Now we'll keep the same *timing* – again taking one second for the coin to move across the page. But we'll change the *spacing* by slowly easing out of position number 1 and easing gradually into position number 25.
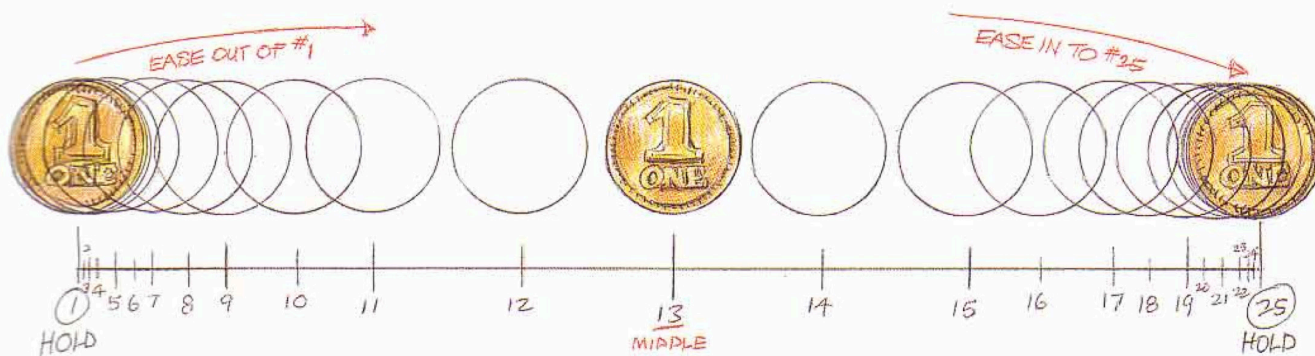

It still takes one second for the coin to get over there. It has the same timing – but there is very different movement because of the different spacing. Both start together – and both hit the middle together – but the spacing is quite different. And so the action is very different.

38

In the 1920s, animators did most of the work themselves. Dick Huemer was the top New York animator and was working for Max and Dave Fleischer on their *Mutt and Jeff* series. Dick told me they said to him, 'Your work is great, Dick, but we can't get enough of it.' So Dick said to them, 'Give me someone to put in the in-between drawings and I'll do two to three times as much work.' And that was the invention of the 'inbetweener'.

Dick later said in an interview that it had been the Fleischers' idea and that he just went along with it. But Dick actually told *me* that he had invented the inbetween and the inbetweener, the helper or assistant.

The main drawings or extreme positions came to be called *extremes* and the drawings in between the extremes were called the *inbetweens*.
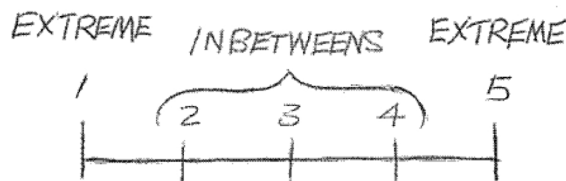
The chart shows the spacing.

We'll put in three even inbetweens between the two extremes.

Number 3 is smack in the middle between 1 and 5. Then we put number 2 right in the middle between 1 and 3 – and number 4 in the middle between 3 and 5. We've got the inbetweens spaced evenly.
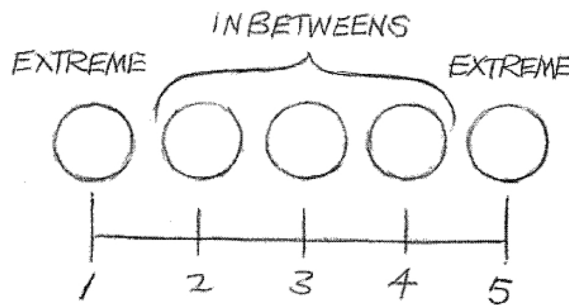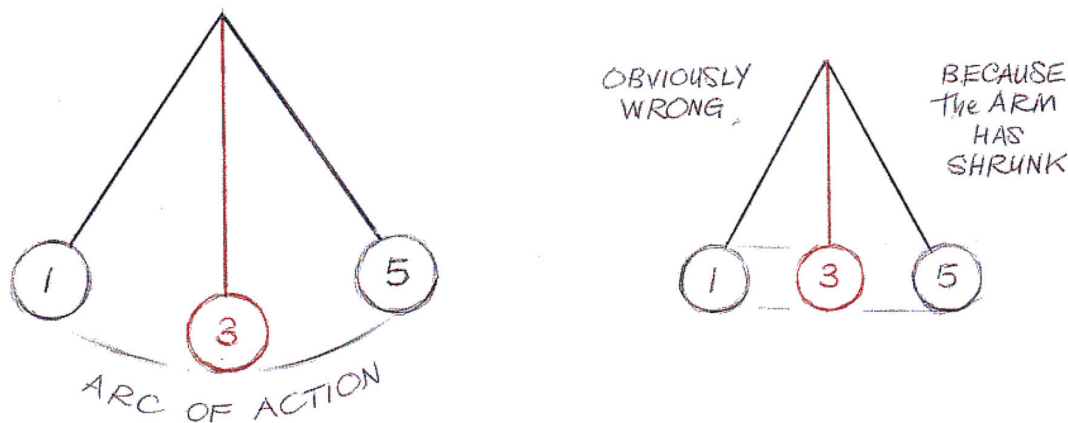
EXTREMES and BREAKDOWNS

Take the example of a swinging pendulum: The extremes are where there is a change in direction – the ends of the action where the direction changes.
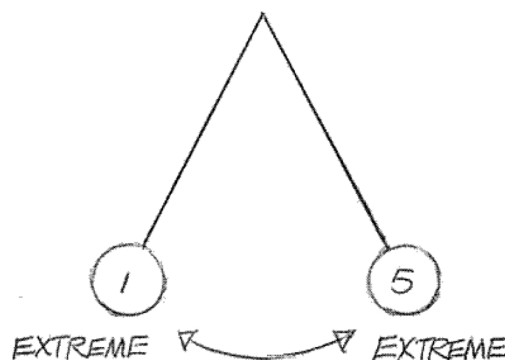
Because the pendulum's arm maintains its length as it swings, the middle position creates an arc in the action. We can see how important that middle position between the two extremes is going to be to us.


It's obvious how important this middle position is. In the 1930s they called this the 'breakdown' drawing or 'passing position' between two extremes.

We'll add two inbetweens.
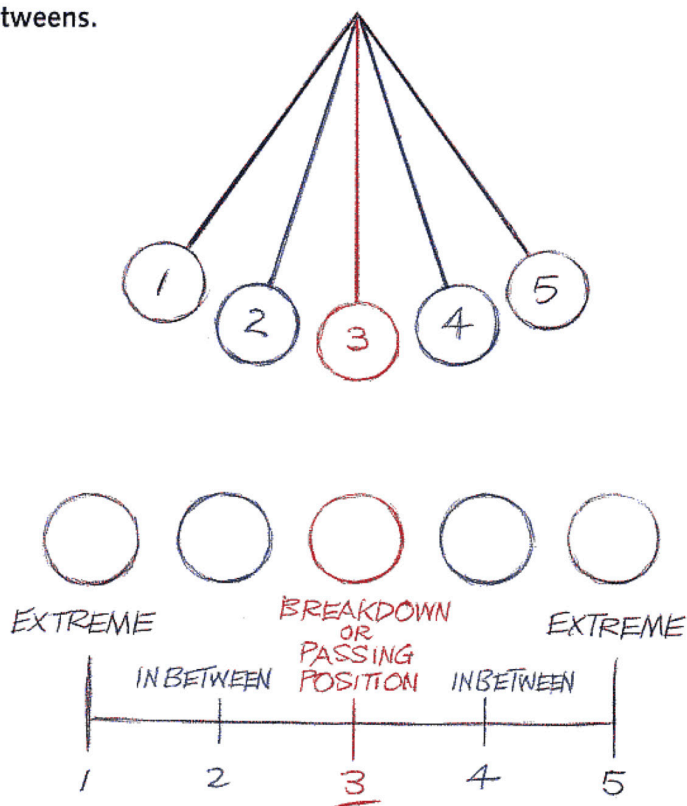
Some animators <u>underline</u> the breakdown or passing position because it's so important to the action. I have the habit of doing this because it's a position which is crucial to helping us invent. We're going to make tremendous use of this middle position later . . .

If we want to make our pendulum ease in and out of the extreme positions, we'll need a couple more inbetweens:
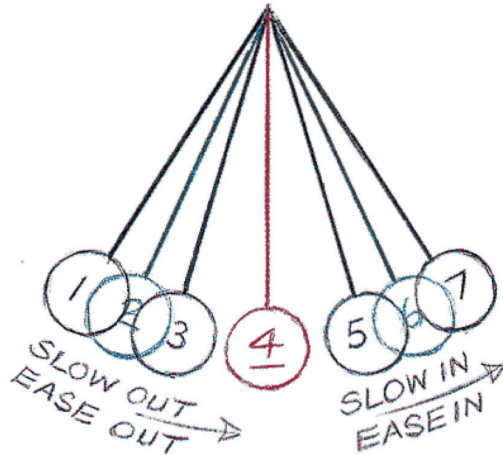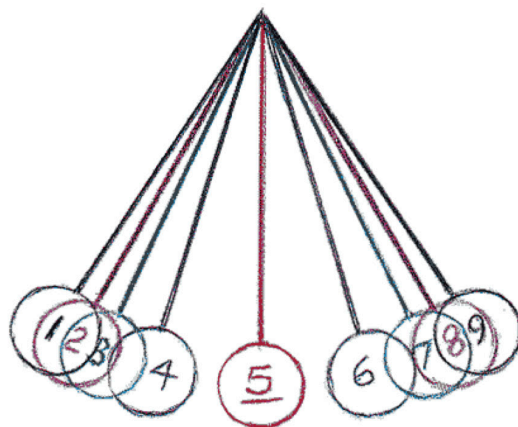
So our chart will look like this.
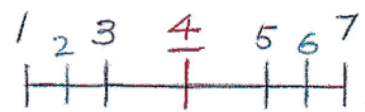
What we're doing is easing in or easing out of the extreme positions. 'Slowing in' or 'slowing out' is the classical terminology for it, but I prefer today's computer animators' term of 'easing in' and 'easing out'.

To make the action even slower at the ends, let's add a couple more inbetweens.
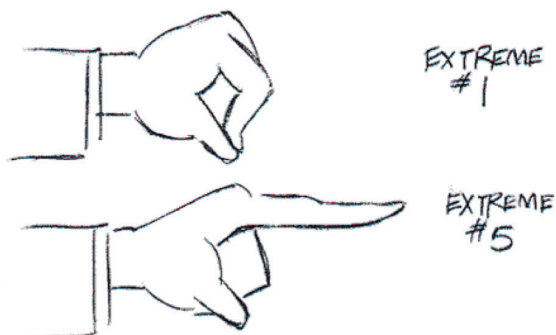
Now our chart will look like this.

Ken Harris always called it 'cushioning' – which is a nice way to think of it.

Master animator Eric Larson – who became the instructor of the younger Disney animators – says that what animation has to have is a change of shape.
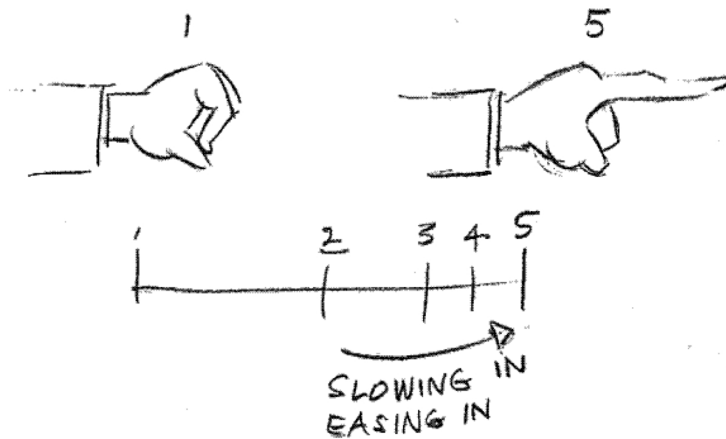
So, let's change from a closed hand to a pointing finger.

EXTREME #1

EXTREME #5

If we 'ease out' of number 1 in order to point – number 5 – the chart will be:
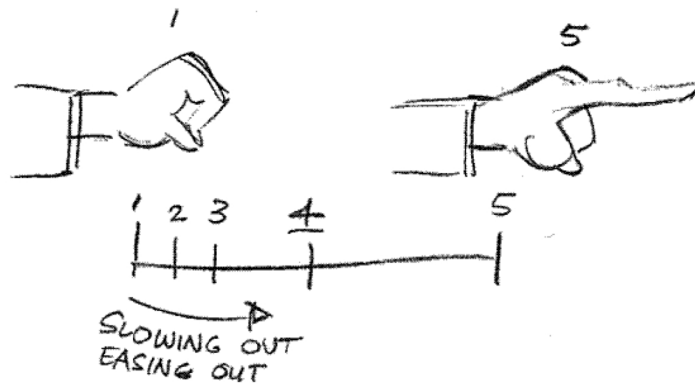
Alternatively, if we 'snap out' or 'speed out' of the closed hand and 'ease in' or 'cushion in' to the pointing finger the chart will be:

For a more relaxed, slower action we could add more inbetweens and ease out of the closed hand, and speed through the middle, and then ease in to the pointing finger.