MAKE THINGS

Motion, Sound and Music

Why nothing in the world starts at full speed, and why a blanket beats a better microphone.

First edition, September 2026

Addaly

Series editor: Dr Mustafa Mun

Draft, open for academic review

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First edition, September 2026, build 62a26075.

Written by AI models to a written standard, with Dr Mustafa Mun as series editor. Exam keys checked blind by a second model: 3,665 of 3,666 agreed. Academic review invited.

The manuscript was drafted with the assistance of a large language model and was edited and published under his name. That is stated plainly here rather than left to be discovered, because a reader is entitled to know how a book they are trusting was made.

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Free to read, free to download, free to print, and free to teach from. There is no paid edition and there never will be.

Every diagram in it is drawn from data by code, not generated as a picture, so the numbers on the page are the numbers in the argument. The answers to every check, test and examination question are at the back.

8 modules · 72 lessons · 25 figures · 8 case studies · 69,137 words · about 12 hours

Brief contents

1

MODULE 1

How motion reads as real

Diagnose a piece of flat or floaty animation by reading its timing and spacing — naming whether the fault is the easing curve's influence, the spacing between frames, a missing arc, or an absent anticipation — and correct it by editing the value graph rather than adding an effect on top.

Lesson 1 · 9 min

Nothing in the world starts at full speed

THE ONE THING TO KEEP

Ease-out for anything arriving or responding, ease-in for anything leaving, and linear only for motion that never starts or stops.

The thing that makes homemade animation look homemade

Someone animates a logo sliding in from the left. The logo is fine, the typography is fine, and the whole thing looks cheap. It is almost never the design. It is that the logo travelled at exactly the same speed for every frame of the move, and nothing in the physical world does that.

Fix the speed curve and the same animation, unchanged in every other respect, stops looking amateur. This is the highest-return single idea in motion, so it is worth understanding rather than just switching on.

What a keyframe actually stores

A keyframe is a value at a moment. "At 0 seconds, x = -400. At 0.4 seconds, x = 0." That is two facts. Everything between them is invented by the software, and the rule it uses to invent them is called interpolation.

The default rule in almost every tool is linear: divide the distance evenly across the frames. At 24 frames per second, a 0.4-second move is about ten frames, and linear puts the logo 40 pixels further along on every single one. Constant speed. It starts instantly at full pace and stops dead.

Easing means reshaping that curve so the value changes slowly at one end and quickly at the other. The object accelerates and decelerates, which is what things with mass do.

The three curves worth knowing

- **Ease-out** — fast at the start, slowing into the finish. Use it for anything arriving, and for anything responding to a click or tap. It moves immediately, so it feels responsive, and it settles gently, so it feels controlled. If you learn one curve, learn this one.
- **Ease-in** — slow at the start, fast at the finish. Use it for things leaving. It gathers pace and is gone.
- **Ease-in-out** — slow at both ends. Use it for something crossing the screen from one visible position to another, where the viewer watches the whole journey.

Where to find them:

- **After Effects**: select the keyframes and press F9 for Easy Ease, then open the Graph Editor (the graph icon in the timeline) and drag the bezier handles. Pulling the outgoing handle far to the right makes a long, slow tail. Nothing teaches easing faster than watching that curve while the preview loops.
- **DaVinci Resolve** (free): right-click a keyframe in the Inspector for ease options; the Fusion page has a proper spline editor with the same handles.
- **Blender** (free): the Graph Editor, with Bezier interpolation and handles you drag.
- **CSS**: `transition: transform 240ms cubic-bezier(0.2, 0, 0, 1);`. That particular curve is a strong ease-out and is a good default for interface motion.
- **Canva** and **CapCut** give you named presets rather than curves. Less control, and for a title card that is often enough.

Duration, and why distance is not proportional

Rough starting points, then adjust by eye:

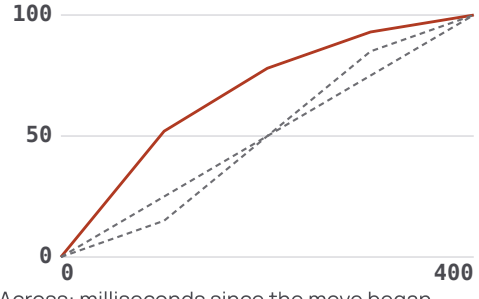
- Small interface changes — a toggle, a hover state, a colour change: 120–200 ms.
- A panel, a sheet, a modal appearing: 250–400 ms.

- A logo sting or a title card: 600 ms to a second, because you want it noticed.

Anything the user triggers repeatedly should sit at the short end. A 500 ms animation is delightful once and a tax on the fortieth use.

Figure 1.1

The same 400-millisecond move, three curves



Across: milliseconds since the move began
Up: per cent of the distance covered

—— Ease-out
– – Linear
– – Ease-in-out

Same start, same end, same duration. At the halfway moment the linear move is halfway across, the ease-out is roughly three-quarters of the way, and the ease-in-out is also halfway but has spent its first hundred milliseconds barely moving — which is what a user reads as lag after they have clicked. Step your own animation to its middle frame and read off which of the three you actually made.

Distance matters, but not proportionally. Double the travel and you want roughly 1.4 times the duration, not double. A thing crossing twice the distance in the same time simply moves faster, which is what your eye expects of something further away.

Where this goes wrong

Ease-in-out on everything. It is the pleasant-sounding default, and on anything the user initiates it is wrong. A dropdown with a 400 ms ease-in-out spends its first hundred milliseconds barely moving. The user has clicked and seen nothing. They register that as lag, not as elegance. Use ease-out so it starts the instant they act.

Easing something too short to see it. Below about 100 ms there are not enough frames for a curve to read, and every curve looks the same. If you want a snappy feel at 80 ms, just make it linear and stop fiddling.

Assuming linear is always wrong. It is right whenever there is no start and no stop: a loading spinner rotating forever, a scrolling ticker, a looping background. Easing those makes them lurch.

Easing the wrong property. A fade has no mass. Opacity going from 0 to 1 with a heavy ease-in-out reads as hesitant rather than weighty. Ease movement and scale; keep opacity simple.

Check your own work today

Screen-record any animation you have made and step through it a frame at a time. Find the frame at the exact middle of the move. If the object is halfway across, the motion is linear, whatever the software told you. If it is roughly three-quarters of the way, you have a real ease-out, and it will already look better than it did.

BEFORE YOU MOVE ON

A designer gives a dropdown menu a 400 ms ease-in-out on click. Testers say the interface feels sluggish, even though a 400 ms panel slide elsewhere in the same app feels fine. What is the most likely cause?

A. 400 ms is too long for any interface animation, and every transition in the app should be brought under 200 ms.

B. The menu is animating its height and position rather than a transform, so the browser is dropping frames.

C. Ease-in-out starts slowly, so almost nothing visibly moves for the first hundred milliseconds after the click; that gap before any feedback is what reads as lag. Ease-out would move immediately.

D. The curve is too gentle to signal that the click registered, and a small overshoot at the end would make it feel snappier.

The answer and why: p. 449

Lesson 2 · 9 min

Motion blur will not fix a floaty logo

THE ONE THING TO KEEP

Weight is uneven distance-per-frame plus a small anticipation and settle; effects added afterwards cannot supply it.

Motion blur will not fix a floaty logo

The usual sequence: an animation feels weightless, so the animator switches on motion blur, then lengthens the duration, then adds a glow. It still feels weightless, because none of those things is what creates weight.

Weight comes from spacing — how much distance the object covers on each individual frame. The classic animation principles were worked out for pencil drawings decades before computers, and they transfer directly to a logo sting or an interface transition. They are not about cartoons. They are about how eyes read movement.

Timing and spacing are two different things

Timing is how many frames the move takes. Spacing is how the distance is distributed across those frames. Easing, from the last lesson, is spacing seen from the curve's side.

A heavy object covers little ground on the first frames and a lot in the middle. A light object snaps. A thing landing covers most of its distance early and then takes a long, quiet settle. If you draw the object's position on each frame down a strip of paper, weight is visible as the gaps between the marks. Uneven gaps look alive. Even gaps look mechanical, no matter how long the animation runs.

The three moves that create weight

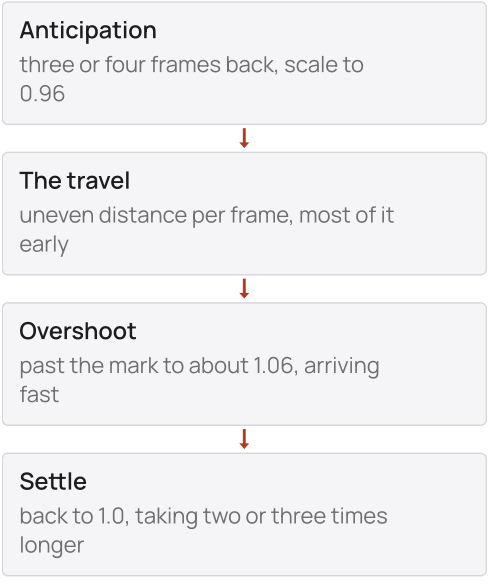
Anticipation

Before a thing moves forward, it moves back. A person about to jump crouches. A bat swings back before it swings through.

On a logo, this is tiny and lasts three or four frames: scale down to 0.96, then up past 1.0. On a button press, the button dips 2 pixels before the panel opens. On a card sliding in from the right, it slides 8 pixels further right first.

Figure 1.2

The four parts of a logo move that has weight



None of these is an effect. Weight is the distribution of distance across frames plus a wind-up before and a settle after, and a piece that has none of them stays weightless however much blur and glow are added. Motion blur has one real job — stopping fast motion strobing — and supplying mass is not it.

The reason it works is that it tells the eye where to look before the movement happens. Without it, motion arrives unannounced and the viewer spends the first frames finding it.

Overshoot and settle

Things with momentum do not stop exactly on their mark. They go past and come back.

A workable logo scale: 1.0 → 1.06 → 0.99 → 1.0, with the overshoot arriving fast and the settle taking two or three times as long as the overshoot did. For interface elements keep it far smaller — 1 or 2 per cent — or skip it entirely.

That last point is the honest limitation. Overshoot is decoration. On a checkbox someone ticks forty times a day it is charming once and irritating thereafter, and on text it is nearly always bad, because a bouncing glyph is measurably harder to read. Save springiness for once-per-session moments: a launch screen, a payment succeeding, a celebration.

Follow-through and overlapping action

Parts do not all stop at the same instant. A tagline under a logo should start moving three to five frames after the logo does, and arrive after it. A list of items should stagger by 30–50 ms each, not 200 — beyond about 60 ms the list stops reading as one gesture and starts reading as a queue.

- **After Effects**: select layers and use **Animation → Keyframe Assistant → Sequence Layers**, or offset the layers in the timeline by hand.
- **CSS**: `animation-delay: calc(var(--i) * 40ms)` with an index set per item.
- **Resolve Fusion** (free): offset the keyframes in the Spline editor.

A useful test: if you switch off every element except one, does that one element's motion still make sense on its own? If the whole thing only works as a synchronised block, it will feel stiff.

What motion blur is actually for

Motion blur is a consequence of a camera shutter being open while something moves. It does two real jobs: it stops fast motion from strobing, and it matches synthetic motion to live footage.

At 24 or 30 frames per second, an object crossing a large part of the frame in two or three frames will strobe — the eye sees separate copies rather than a movement. Blur solves that. It does not create mass, and adding it to a floaty animation gives you a floaty animation that is now slightly soft.

In After Effects, motion blur has to be enabled twice: on the layer and on the composition. Resolve's Fusion page has a MotionBlur node and per-transform blur settings. Blender renders it from the shutter setting. CSS has no motion

blur, which is fine, because web motion is usually short enough not to need it.

One exercise

Take any twelve-frame move you have already made. Do not add a single effect. Move the middle keyframe so that the object is three-quarters of the way across at frame six instead of half. Add a four-frame anticipation at the start. Watch both versions back to back.

That is the entire difference between motion that reads as designed and motion that reads as a slide transition.

BEFORE YOU MOVE ON

A client says a logo animation feels floaty and weightless. The animator switches on motion blur and extends the duration from 0.6 to 1.2 seconds. It still feels weightless. What is the actual fix?

A. Redistribute the distance across the frames — cover most of the travel in the first few frames and give it a long settle — and add a few frames of anticipation before the move.

B. Extend the duration further, since a heavier object should take longer to complete the same move.

C. The motion blur was applied at the wrong shutter angle, so it is not reading as real camera blur.

D. Add a soft drop shadow and a slight perspective tilt so the logo reads as a physical object in space.

The answer and why: p. 450

CASE STUDY · MODULE 1

The sting the client kept calling cheap

An illustrative case, built from documented patterns.

A two-person motion studio in Indore, three days before a co-operative bank's rebrand goes live.

Ritu and Anand had five days and forty thousand rupees to make a five-second logo sting. It would run at the head of every branch video and on the idle screen of a hundred and forty ATMs, so it would be seen by the same tellers several hundred times a year. The contract included two revisions. A third would be at the studio's cost.

The first cut was competent. The logo slid in from the left over twenty frames at twenty-five frames a second, the tagline faded up underneath, the colours matched the brand sheet and the typography had already been approved by the bank's agency. The marketing head watched it twice and said it looked cheap. Asked what he meant, he could not say. Asked what would fix it, he could: motion blur on the logo, a light sweep across the letters, and a few drifting particles behind them.

Anand could do all three in an afternoon. He had the presets.

Ritu opened the graph editor instead, which she admits she did not usually do. The speed graph was a rectangle. The logo covered exactly twenty-four pixels on every one of the twenty frames, went from nothing to seven hundred and twenty pixels a second in no time at all, and stopped dead. The tagline started and stopped on the same frames as the logo, so the two elements moved as one rigid block.

That gave them a decision with three days left, and both answers cost something.

Doing what the client asked was four hours. It was visible, it was pointable-at in the next review, and it would have produced a floaty animation that was now slightly soft. Motion blur exists to stop fast motion strobing and to match synthetic motion to live footage; it does not create mass, and neither does a glow.

The other answer was to tell a paying client that the three things he had asked for would not fix his problem, and then to hand back something that looked, in the timeline, almost identical to the version he had rejected. The changelog would say "adjusted easing". There would be nothing to point at. If it came back a third time, the studio would be working for nothing against a live date.

Ritu re-spaced the move: a four-frame anticipation in which the logo scaled down to ninety-six per cent, most of the travel in the first third, an overshoot to about a hundred and six per cent arriving fast, and a settle back to a hundred taking two and a half times as long as the overshoot. She offset the tagline three frames behind the logo and let it arrive after it. Nothing else changed — same colours, same type, same five seconds.

Then she hedged. She rendered three versions: the original with the requested effects, the re-spaced version with no effects at all, and the re-spaced version with the effects on top. She took all three to the review and did not say which was which.

There was one more decision buried in this, and it was about where the sting would live. On a branch video it is watched once. On an ATM idle screen it loops in front of a teller for six hours a day. Anticipation and overshoot are exactly the principles that make a single viewing memorable and the four-hundredth unbearable, so Ritu built the ATM cut with the same spacing and the overshoot reduced from six per cent to two — small enough to be felt rather than seen. Two files, one decision, and it added twenty minutes.

YOUR ANSWERS

1. The client asked for motion blur, a light sweep and particles. Why would none of the three have fixed the sting?

2. Ritu showed three versions without labelling them. What did that buy her that an explanation would not have?

3. What would have made the whole argument unnecessary?

STOP HERE

Write your answers before you turn the page. How it played out starts on p. 52.

CASE STUDY · MODULE 1

How it played out

The marketing head picked the re-spaced version with no effects, and described it as "the one where the logo has some weight to it" — a word nobody in the studio had used in front of him. He then asked whether the shimmer could go on top of that one. Ritu played the third version, he watched it twice, and he dropped the idea himself. The invoice went out at two revisions. Six months later the bank commissioned the branch-induction series and named the sting when they did. Anand now opens the graph editor before he opens the effects panel; he estimates the habit costs him thirty seconds a shot and has saved him about a week a year.

The questions, discussed

1. The client asked for motion blur, a light sweep and particles. Why would none of the three have fixed the sting?

All three are applied on top of a move whose distance is spread evenly across every frame. Weight comes from spacing — uneven distance per frame, plus a wind-up before the move and a settle after it. Motion blur has two real jobs, stopping fast motion strobing and matching synthetic motion to filmed footage, and supplying mass is not one of them. Adding it to a floaty animation gives you a floaty animation that is slightly soft.

2. Ritu showed three versions without labelling them. What did that buy her that an explanation would not have?

The client had a real perception — it looks cheap — and a wrong diagnosis. Explaining the diagnosis puts the studio's authority against the client's, three days before a live date. Showing the versions unlabelled let him keep the perception and drop the diagnosis by himself, and it tested the claim rather than asserting it. If he had picked the effects version, Ritu would have been wrong and would have known in ten seconds.

3. What would have made the whole argument unnecessary?

Opening the speed graph before the first review. A rectangular speed graph is the signature of the linear default and it is visible in two seconds. The disagreement came from shipping a review cut that nobody had checked in

the one panel that says what the software is doing between the keyframes.

MODULE 1 TEST

Check what stuck

6 questions, one right answer each. This one is for you, not for a record. The answers, and the reason behind each, are in the key on p. 448. If two go wrong, re-read the module before the exam.

1 You step through a twenty-frame move and find the object exactly halfway across at frame ten. What does that tell you?

A. The motion is linear, whatever easing the software reports
B. The motion has a correct ease-out and will read as responsive
C. The frame rate is wrong for the duration you chose
D. Motion blur is disabled on the layer or the composition

2 A dropdown opens with a 400 ms ease-in-out and users report that the app feels laggy. What is the mechanism?

A. Four hundred milliseconds is past the one-second limit for thought
B. Ease-in-out is defined only for opacity, and behaves unpredictably on position changes
C. It barely moves for its first hundred milliseconds, so nothing answers the tap
D. The dropdown animates a property the compositor cannot handle

3 Why is a spring the wrong animation for a download progress bar?

A. A spring cannot be interrupted once it has started
B. An underdamped spring overshoots, so the bar passes one hundred per cent
C. Springs are main-thread only and cannot run on the compositor
D. Spring duration is fixed by the library and cannot be matched to the download time

4 A finished 24 fps composition is changed to 25 fps in After Effects. What happens to the spacing you set by hand?

A. Keyframes keep their frame numbers, so the animation gets shorter
B. Nothing changes, because keyframes are stored in seconds and a second is a second
C. The software refuses the change until every keyframe is re-timed by hand
D. Keyframes keep their time values and get resampled to the nearest frame

5 Why is a three-frame lag on the button a user has just pressed a bug rather than a flourish?

A. Secondary elements must always move before the primary one, never after
B. A three-frame lag desynchronises the button from its own press sound effect
C. Follow-through only works on elements that travel more than 600 pixels
D. Perceived responsiveness is measured from input to first visible change

6 An element exits screen-right at frame forty and the next enters screen-left at frame forty-two. What is missed, and why?

A. Nothing, because peripheral vision detects motion onset immediately
B. The new element's first frames: a saccade takes 150 to 250 ms to begin
C. The exit, because the eye has already travelled to the left of the frame
D. Both, because two animations cannot be processed in the same second

Lesson 11 · 9 min

How long an animation should take

THE ONE THING TO KEEP

Durations come from a small named set rather than from feel, exits run at roughly three-quarters of entrance time, and distance scales duration sub-linearly — but perceived length is set by the shape of the curve's tail more than by the number.

The question everybody guesses at

"How long should this animation be?" gets answered by feel, and feel drifts. The person who has watched their own transition four hundred times finds it too slow at 250ms and cuts it to 120ms, at which point it is a flicker for everybody who has never seen it before.

There are defensible numbers. They come from two facts: the eye needs a minimum exposure to register that something moved, and attention has a budget.

Working durations

These ranges match what the large design systems publish, and more importantly they match what survives testing.

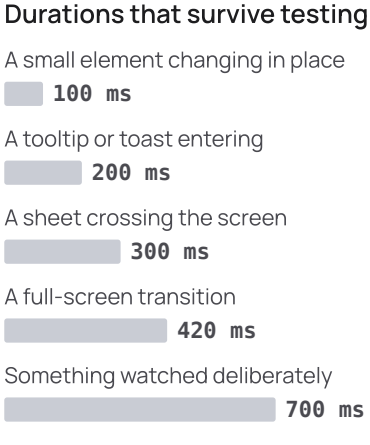
- **70 to 120ms** — a small element changing in place. A checkbox filling, a button's background shifting on press, an icon swapping. Below about 60ms the change is perceived as instantaneous rather than as a movement, which is often exactly what you want for a press state.
- **150 to 250ms** — a small element entering or leaving. A tooltip, a dropdown, a toast.
- **250 to 350ms** — a panel, sheet, or dialogue crossing a meaningful part of the screen.

- **350 to 500ms** — a full-screen transition, a page change, something covering most of the viewport.
- **Above 500ms** — reserve for something the user is watching deliberately: an onboarding illustration, a data visualisation building, a celebration. Not for anything that sits between a person and their task.

Two adjustments that matter more than the base number:

Exits are faster than entrances. Roughly 70 to 80 per cent of the entry duration. An arriving element is new information and the eye needs time to find it. A leaving element is already understood; lingering just makes the interface feel sticky.

Figure 2.1



Two adjustments matter more than the base number. Exits run at roughly three-quarters of the entrance, because a leaving element is already understood. And distance scales duration sub-linearly — about 1.4 times the time for each doubling of travel — so an 800-pixel move at 500 ms feels the same speed as a 200-pixel move at 250 ms.

Distance scales the duration, but not linearly. Doubling the travel distance does not mean doubling the time — that produces a crawl on large screens. Material Design's published approach is a distance-based curve where duration grows roughly with the square root of distance; in practice, scaling time by about 1.4× for each doubling of distance keeps perceived speed

EXAMINATION

Motion, Sound and Music — final examination

This paper covers the whole course:

- reading timing and spacing
- motion that carries meaning in an interface
- choosing and shipping a delivery format
- compositing two images so the seam does not show
- codecs and colour and delivery
- capturing a voice in an ordinary room
- shaping and mixing it
- using generative and analytic models honestly

56 questions, the whole pool. The site draws 25 for a sitting, pass mark 70%. Work any 25 under your own conditions. Answers from page 496.

1 Module 1 · How motion reads as real

Which of these is genuinely better with linear interpolation?

A. A loading spinner rotating continuously
B. A modal appearing after a tap
C. A card settling into a list
D. A drawer sliding open from the screen edge

2 Module 1 · How motion reads as real

A 200-pixel move reads well at 250 ms. What duration keeps the perceived speed for an 800-pixel move?

A. 1000 ms, in proportion to the distance
B. 250 ms, because duration should not follow distance
C. About 500 ms, since duration scales sub-linearly
D. About 350 ms, because exits run faster than entrances

3 Module 1 · How motion reads as real

The one-key ease sets about a third of influence on both sides. Why does the move still feel mushy?

A. Symmetric easing is only valid on rotation, scale and opacity changes
B. Both ends are slow, so all the travel is crammed into the middle
C. The influence value is too high for a short duration
D. The spatial interpolation has defaulted to bezier

4 Module 1 · How motion reads as real

A spring has a damping ratio of exactly one. How does it behave?

A. It oscillates three or four times before settling
B. It creeps in slowly and never reaches the target
C. It overshoots once and settles in about half a second
D. It arrives as fast as possible with no overshoot

5 Module 1 · How motion reads as real

Elements moving in two dimensions arc and elements moving in one do not. Why should a horizontal drawer not arc?

A. Because arcs are only visible on moves longer than 600 pixels

B. Because a curve would trigger a layout recalculation

C. Because bowing upward always reads as a heavy object

D. Because an arc implies a freedom the drawer does not have

6 Module 1 · How motion reads as real

Which principle is most damaged by the fact that an interface is watched hundreds of times?

A. Timing, the primary carrier of weight

B. Exaggeration

C. Staging, which controls where the eye goes

D. Arcs, still true and still ignored

7 Module 1 · How motion reads as real

A small animated badge sits in a corner while a large static headline is meant to be read. What happens?

A. The badge wins, because onset of motion beats everything else

B. The headline wins, because text captures attention once fixated

C. Both are read, because the fovea covers about ten degrees

D. Neither, because peripheral vision cannot detect small motion

8 Module 2 · Motion that carries meaning

A row slides out and the rows below close the gap. Which job is that motion doing?

A. Saying the system is alive

B. Saying where the thing came from

C. Saying what just happened

D. Nothing; it is decoration

Module 1 · How motion reads as real

The module starts on p. 11.

MODULE 1 TEST

Module 1 test, Q1, p. 54
You step through a twenty-frame move and find the object exactly halfway across at frame ten. What does that tell you?
Answer A: The motion is linear, whatever easing the software reports
Why: Linear interpolation spreads the distance evenly, so the midpoint in time is the midpoint in space. A real ease-out puts the object roughly three-quarters of the way across by then. The panel can say Easy Ease while the spacing says otherwise, which is why the frame test beats the label.

Module 1 test, Q2, p. 54
A dropdown opens with a 400 ms ease-in-out and users report that the app feels laggy. What is the mechanism?
Answer C: It barely moves for its first hundred milliseconds, so nothing answers the tap
Why: Ease-in-out is slow at both ends, so on anything a user initiates the first hundred milliseconds carry almost no movement. The user has clicked and seen nothing, and they register that as lag rather than as elegance. Ease-out starts the instant they act, which is why it is the curve to learn first.

Module 1 test, Q3, p. 54
Why is a spring the wrong animation for a download progress bar?
Answer B: An underdamped spring overshoots, so the bar passes one hundred per cent
Why: Overshoot means going past the value, and on a progress bar the value means something — you have just told the user the download is a hundred and seven per cent done. Springs are excellent for gesture-driven motion because they carry velocity through an interruption, and wrong wherever the number being animated is a real quantity.

Module 1 test, Q4, p. 55
A finished 24 fps composition is changed to 25 fps in After Effects. What happens to the spacing you set by hand?
Answer D: Keyframes keep their time values and get resampled to the nearest frame
Why: After Effects keeps keyframes at their time values, so a key that sat exactly on frame seven at 24 lands between frames at 25 and is sampled to whichever is nearest. Blender does the opposite and keeps frame numbers, so the duration changes instead. Neither is a bug; set the rate before the first keyframe.

Module 1 test, Q5, p. 55

Why is a three-frame lag on the button a user has just pressed a bug rather than a flourish?

Answer D: Perceived responsiveness is measured from input to first visible change

Why: Delaying the thing under the finger by three frames adds about a hundred and twenty-five milliseconds to the perceived latency of every tap, and under about a hundred milliseconds is what reads as instantaneous. The split is simple: the control responds immediately, and the scenery follows through.

Module 1 test, Q6, p. 55

An element exits screen-right at frame forty and the next enters screen-left at frame forty-two. What is missed, and why?

Answer B: The new element's first frames: a saccade takes 150 to 250 ms to begin

Why: There is a latency of a hundred and fifty to two hundred and fifty milliseconds before the eye even starts to move, and twenty to forty more to get there. At 24 frames a second that is four to seven frames of an entrance nobody watched. Bring the next element in near where the last one left, or hold a beat.

THE LESSON CHECKS

Lesson 1, p. 16

A designer gives a dropdown menu a 400 ms ease-in-out on click. Testers say the interface feels sluggish, even though a 400 ms panel slide…

Answer C: Ease-in-out starts slowly, so almost nothing visibly moves for the first hundred milliseconds after the click; that gap before any feedback is what reads as lag. Ease-out would move immediately.

Why: Ease-out for anything arriving or responding, ease-in for anything leaving, and linear only for motion that never starts or stops.

A 400 ms is too long for…: Treats duration as the only variable, when the same duration reads fine elsewhere in the same product.

B The menu is animating its height…: Blames rendering performance for a problem the curve creates even at a perfect frame rate.

D The curve is too gentle to…: Adds decoration at the end of the move when the problem is at the beginning of it.

Lesson 2, p. 20

A client says a logo animation feels floaty and weightless. The animator switches on motion blur and extends the duration from 0.6 to 1.2 seconds…

Answer A: Redistribute the distance across the frames — cover most of the travel in the first few frames and give it a long settle — and add a few frames of anticipation before the move.

Why: Weight is uneven distance-per-frame plus a small anticipation and settle; effects added afterwards cannot supply it.

B Extend the duration further, since a…: Assumes weight is a function of how long a move takes rather than how its distance is distributed.

C The motion blur was applied at…: Treats a rendering setting as the source of perceived mass rather than a way of stopping fast motion strobing.

D Add a soft drop shadow and…: Confuses static depth cues with the temporal cues that make something feel heavy.

Lesson 3, p. 24

The same 300ms slide is built twice: once in a 24 fps composition and once at 60 fps, both travelling 600 pixels. Played back, the…

Answer A: At 24 fps the object covers roughly 83 pixels between consecutive frames instead of 33, so the gaps between its positions become visible unless motion blur fills them.

Why: Frame rate is a commitment made before the first keyframe, because a duration in milliseconds only becomes a real animation once it has been rounded to whole frames — and changing the rate afterwards silently resamples everything you spaced by hand.

B The 24 fps file has a…: Confuses a temporal sampling artefact with a compression artefact; the strobing appears in an uncompressed render too.

C 24 fps rounds 300ms down to…: Notices the rounding, which is real, but 8ms of duration cannot account for visible strobing — the per-frame displacement can.

D The easing curve is evaluated once…: Treats easing as something sampled into existence rather than a continuous function evaluated at whatever frames exist; the curve is identical in both.

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