RLP-GAMEA · RLP Video Game Design A — Play, Prototypes, Engines and Worlds

Unit 3: Engines and Tools: Building in Godot 4

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 3.1 — Choosing an Engine: Godot, Unity, Unreal and the License Question

FLUENCY

1. For each engine give its license type and main programming language: Godot, Unity, Unreal Engine.

2. Match the free prototyping tool to its use: Twine, Scratch, paper and cards.

3. What is version control, and what is the minimum a solo developer should do instead if they do not use it?

APPLICATION

4. Choose the fastest tool for each design question and say why: (a) "Do players care which of three endings they get?" (b) "Is a dice-based combat rule fair?" (c) "Does a simple dodge mechanic feel fun on screen?"

5. Summarize the Unity runtime-fee case in three sentences: what was announced, why developers objected and how it ended.

6. A developer leaves Unity for Godot after the 2023 case; another stays. Explain why the lesson calls both reasonable.

7. Explain how the platform shapes the design for (a) a phone game and (b) a console game, using input and play situation.

8. You are comparing engines and find a page on an engine company's own website claiming it is "the best engine for beginners." How should you treat it?

REVIEW

9. Review (Lesson 2.2): in the coin game, the coin emits its own *collected* signal instead of changing the score. What is the advantage?

Lesson 3.2 — Build: A Platformer Character with Gravity and Collision

FLUENCY

1. Name the body type: (a) a floor; (b) a crate the physics engine pushes around; (c) a character moved by your code that stops at walls.

2. What values can *Input.get_axis("move_left", "move_right")* return on a keyboard, and why does the lesson use named actions instead of checking keys directly?

3. A character image is 128 × 128 pixels and your level is built from 32-pixel steps. What scale shows it one step tall? What scale shows it two steps tall?

APPLICATION

4. With gravity 980 px/s² and jump_velocity −350 px/s, find the rise time and the predicted peak height.

5. Your ledge is four 32-pixel steps tall (128 px). With gravity 980, what jump_velocity reaches exactly 128 px? Round to the nearest whole number.

6. With gravity 980, jump_velocity −420 and speed 300 px/s, the jump lasts about 0.86 s. How far does the character travel sideways during one jump?

7. Find the bug. A student sets *@export var jump_velocity: float = 420.0* and the character never leaves the ground. Why, and what is the fix?

8. A sprite sheet has a row of 32 × 32 drawings. What region_rect crops out the second drawing from the left in the top row?

CHALLENGE

9. You double gravity to 1960 but want the jump to stay 100 px high. What jump_velocity do you need, and how will the jump feel compared with gravity 980?

REVIEW

10. Review (Lesson 2.3): what is the probability of rolling a sum of 7 with two six-sided dice, and why?

Lesson 3.3 — Game Feel: Controls, Input Devices and Usability

FLUENCY

1. Define functionality and usability, and say how each is tested.
2. Define coyote time and jump buffering.
3. Compare keyboard input with an analog stick and with a touch screen in one sentence each.

APPLICATION

4. Using *move_toward* with acceleration 900 px/s², how long does a character take to reach a top speed of 270 px/s from rest?

5. Coyote time is 0.1 s and the game runs physics 60 times a second. About how many frames of grace does a player get? What if you raise it to 0.15 s?

6. Code reading: in the coyote-time code, the jump sets *coyote_timer = 0.0* right after *velocity.y = jump_velocity*. What would go wrong if that line were deleted?

7. Your game's text reads well on a laptop but the game will also be played on a television across a room and on a phone. What should you check, and why?

8. A tester's note says only: "Controls bad." Rewrite it in the three-part playtest format.

REVIEW

9. Review (Lesson 3.2): the peak height of a jump is predicted by $h = v^2 \div (2g)$. What is the peak for $v = 420$ and $g = 980$, and why does the real jump come out a few pixels higher?

Lesson 3.4 — Build: The Rotate-and-Thrust Ship

FLUENCY

1. Convert: (a) 180° to radians; (b) 90° to radians; (c) at rotation_speed 2.0 rad/s, how long is a full turn?
2. Give transform.x for a ship at rotation 0°, 180° and −90°, and say which way each points on screen.
3. What do these mean in the ship lesson: collision normal, impulse, TAU?

APPLICATION

4. The ship starts at rest facing 90° (down the screen) with thrust 300 px/s². What is its velocity after holding thrust for 0.5 s?

5. A ship moving at (150, 200) hits a floor whose normal is (0, −1). What is its velocity after bounce(), and after the 0.8 factor?

6. With thrust 250 px/s² and max_speed 400 px/s, how long does the ship need to thrust from rest to reach the cap? Which line enforces the cap?

7. The rock script sets *linear_velocity = Vector2.RIGHT.rotated(randf_range(0.0, TAU)) * randf_range(30.0, 90.0)*. Describe in words the slowest and fastest a rock can drift, and in which directions.

8. Write the build as task cards for a To do / Doing / Done board (at least five cards), and say what you record in the build log when something breaks.

CHALLENGE

9. A ship moving at (200, 100) hits a right-hand wall whose normal is (–1, 0). Give the velocity after the bounce with the 0.8 factor, and explain in one sentence why only one component changed sign.

REVIEW

10. Review (Lesson 3.3): what is coyote time for, and what usability problem does it solve?

Unit 3 checkpoint

1. Under Godot's MIT license, a student who sells a game made with it owes…
   A. A 5% royalty
   B. A per-install fee
   C. No fee or royalty, but must keep the license notice with the engine
   D. Nothing, and cannot sell it
2. True or false: In 2024 Unity announced it was canceling the runtime fee it had announced in September 2023.

3. Which free tool builds branching interactive stories with no programming?
   A. Blender
   B. Twine
   C. Audacity
   D. Inkscape

4. Which body type should a wall that never moves use?
   A. RigidBody2D
   B. CharacterBody2D
   C. StaticBody2D
   D. Area2D

5. With gravity 980 px/s² and jump_velocity −280 px/s, the peak height is 280² ÷ 1960 = _____ px.

6. True or false: Doubling gravity while keeping jump_velocity the same doubles the jump height.

7. Every option in a menu works, but testers cannot find the volume slider. This is a problem of…
   A. Functionality
   B. Usability
   C. Licensing
   D. Collision

8. With coyote_time 0.1 s at 60 physics frames per second, a player has about _____ frames of grace after running off a ledge.

9. A ship's rotation is π (180°). Which way does transform.x point?
   A. Right
   B. Left
   C. Up
   D. Down

10. A ship moving at (0, 250) hits a floor with normal (0, −1). After bounce() and the 0.8 factor its velocity is (0, _____).

11. True or false: Editing Rock.tscn and saving updates every rock instance in the arena, except properties overridden on one instance.

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