RLP-AIDB · RLP AI Design B — Case Studies, Prototypes, Patents and Capstone

Unit 3: Engineering Design and the Patent Drawing

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

Name _____ Period _____

Lesson 3.1 — The Art of the Patent Drawing and the Inventor's Process

FLUENCY

1. Match each inventor to the invention and year the lesson gives: Patricia Bath; Marie Van Brittan Brown (with Albert Brown); Wilson Greatbatch; Delbert E. Day (with Gary J. Ehrhardt).

2. List the eight stages of the engineering design process in the order the lesson gives them.

3. Name four drawing conventions required by the USPTO rules (37 CFR 1.84) as the lesson describes them.

APPLICATION

4. Explain what changed in 1880 for U.S. patents and why it matters to anyone studying patent drawings today.

5. The Day-Ehrhardt microspheres are smaller than about 75 micrometers. How many millimeters is that? About how many such beads, side by side, would span 1 mm?

6. The Day-Ehrhardt patent's five figures are a composition diagram and graphs, not pictures of a device. What does the lesson say this shows about patent drawings?

7. Map the pacemaker story onto the design process: at which stage did Greatbatch's wrong resistor fit, and why is it an example of looping back?

REVIEW

8. Review (Semester A, Unit 3): Patent drawings shade with lines, not gray tones. Which Semester A panel rule also asks designers to make images work without relying on color?

Lesson 3.2 — Drawing to Patent Standard: Views, Numerals and Line

FLUENCY

1. In aligned orthographic views, which two dimensions does each view show? (a) front; (b) top; (c) right side. Where is each drawn?

2. Define *isometric drawing*, *construction line*, *line weight* and *mock-up*.

3. Give the line weights the lesson recommends for (a) visible edges and (b) lead lines and surface shading.

APPLICATION

4. A pill organizer is 20 cm wide, 4 cm deep and 3 cm tall. Give the dimensions shown in its front, top and right-side views. In an isometric drawing at full scale, how long are the three edge lines from the nearest corner?

5. Your device has parts numbered 10 (housing), 20 (sensor), 30 (spring). You add a light source that sits between housing and sensor and a hinge pin on the housing. Assign numerals that follow the lesson's convention.

6. Describe an exploded view of a finger pulse oximeter clip as the lesson does: which parts, and along which axis?

7. The USPTO rule requires reference characters at least about 0.32 cm (1/8 inch) high. Check the conversion: 1 inch = 2.54 cm. Is a numeral 3 mm high acceptable?

8. Your card mock-up shows the hinge on the wrong side, so the clip cannot open toward the finger. Explain why the lesson calls this iteration in miniature, and name one accessibility or ergonomic decision you could add while redrawing.

REVIEW

9. Review 3.1: Which USPTO convention ties a part in FIG. 2 to the written description, and what kind of line connects it to the part?

Lesson 3.3 — Reading a Real Patent: Claims, Drawings and What Can Be Owned

FLUENCY

1. List the parts of a utility patent in the order they appear, as the lesson describes.

2. Define *independent claim*, *dependent claim* and *non-obvious*.

3. Match each case to its holding: Mayo v. Prometheus (2012); AMP v. Myriad Genetics (2013); Alice v. CLS Bank (2014); Thaler v. Vidal (2022).

APPLICATION

4. An invented claim 1 reads: 'A device comprising: a housing; a light source; a sensor; and a processor configured to estimate oxygen level.' List its elements. A competitor's device has a housing, light source and sensor but no processor. Based on the lesson, might it infringe claim 1?

5. Write a dependent claim that adds one detail to the invented claim 1 above.

6. A utility patent is generally granted exclusive rights for 20 years from filing. An invented patent was filed in 2009 and issued in 2012. In about what year do its rights end, and what does the public receive in exchange?

7. Apply the four requirements (category, useful, novel, non-obvious) and the court decisions to decide which of these is more likely patentable, with a reason: (a) the natural relationship between a blood marker and a disease; (b) a new finger clip with a spring-loaded housing and a sensor.

8. Write the strongest case, in 2-3 sentences, for allowing patents on AI-assisted medical inventions, then restate the opposing view in one sentence its holders would accept.

REVIEW

9. Review (Semester A, Unit 2): The Copyright Office requires human authorship; Thaler v. Vidal requires a human inventor. State the parallel in one sentence.

Lesson 3.4 — From Sketch to Prototype: Engineering a Biomedical Design

FLUENCY

1. Define *problem statement*, *weighted decision matrix*, *data-flow diagram* and *fidelity*.

2. Sort into criteria or constraints for a medication reminder device: (a) easy for users with limited dexterity; (b) must fit in a hand; (c) gives a clear reminder; (d) runs on batteries; (e) protects privacy.

3. Name the three kinds of job the lesson says an AI component might do, with the pill-box example of each.

APPLICATION

4. With weights safety 0.35, usability 0.25, cost 0.20, feasibility 0.20, compute the totals for Concept D (scores 2, 5, 5, 4) and Concept E (scores 5, 3, 3, 3). Which wins?

5. In the lesson's worked example (A 3.55, B 3.95, C 3.70), move 0.05 of weight from safety to cost (safety 0.30, cost 0.25). Recompute all three totals. Does the winner change?

6. Rewrite as a problem statement that names a user and a need without a solution: 'I will build an AI inhaler tracker.'

7. Draw (in words) a data-flow diagram for a pill-box camera classifier: input, model output, who sees it, what happens next, where a human checks, and one failure with how the design limits harm.

8. Write a test plan for one criterion of your pill-box prototype: what, how, with whom, and what counts as success.

REVIEW

9. Review 2.2: Your pill-box classifier is tested on 20 compartments: TP 8, FN 2, FP 1, TN 9 (full counts as positive). What is its accuracy and sensitivity?

Unit 3 checkpoint

1. Until what year did the U.S. Patent Office generally require a working model with a patent application?
   A. 1790
   B. 1880
   C. 1969
   D. 1988
2. True or false: USPTO drawing rules call for gray-tone shading to show curved surfaces.
3. Patricia Bath patented a device and method that used a _____ to remove cataracts.
4. In aligned orthographic views, the right-side view shows which two dimensions?
   A. Width and depth
   B. Height and width
   C. Height and depth
   D. Width only
5. Each patent view is labeled as a figure; the first view is labeled _____ 1 (abbreviation).
6. What defines the legal boundary of a patent?
   A. The title
   B. The representative drawing
   C. The claims
   D. The abstract
7. True or false: Under Myriad (2013), naturally occurring DNA can be patented once it has been isolated.
8. Under Thaler v. Vidal (2022), who can be named as an inventor on a U.S. patent?
   A. Any AI system
   B. Only a natural person
   C. Only a company
   D. The USPTO
9. With weights 0.35, 0.25, 0.20, 0.20, a concept scores 4, 4, 3, 3. What is its weighted total?
   A. 3.60
   B. 3.40
   C. 14
   D. 3.75

10. True or false: 'I will build a smart pill box' is a well-formed problem statement.
11. How closely a prototype resembles the final product is its _____.