

# Raport Javor – Test Driven Development (TDD)

## Informata të përgjithshme

Emri: Getoar Krasniqi

Java: 4 (e katërt)

Data e dorëzimit: 27/11/2025

Emri i projektit: Quiz Application

## 1 Përbledhje e javës

Në javën e katërt është bërë lidhja e aplikacionit me databazë in-memory dhe janë krijuar REST API për zgjerim të mundësive të përdorimit të Quiz App po ashtu edhe si web aplikacion.

Në README.md file gjendet hapat e instalimit të librarive të reja si dhe startimi i API serverit:

```
PS C:\Users\DELL\Documents\GitHub\quiz-app> python run_api.py
=====
🚀 Starting Quiz API Server
=====
📍 Server: http://127.0.0.1:8000
📘 API Docs: http://127.0.0.1:8000/docs
📘 ReDoc: http://127.0.0.1:8000/redoc
=====

💡 Press CTRL+C to stop the server

INFO:     Started server process [18392]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:     127.0.0.1:51796 - "GET /redoc HTTP/1.1" 200 OK
INFO:     127.0.0.1:51796 - "GET /openapi.json HTTP/1.1" 200 OK
INFO:     127.0.0.1:58304 - "GET /redoc HTTP/1.1" 200 OK
INFO:     127.0.0.1:58304 - "GET /openapi.json HTTP/1.1" 200 OK
[]
```

Po ashtu janë përditësuar statuset në fillim të README në përputhje me progresin e bërë në kod.

Gjenerimi i index.html me përqindje të mbulueshmërisë 100%.

Krijimi i “v4.0 Feature 3 Red Phase”: 10 testet e feature 3 të shkruara, të cilat kanë dështuar në mungesë të kodit të implementuar.

Krijimi i "v4.1 Feature 3 Green Phase": Implementimi i kodit në mënyrë që testet e feature 3 të kalojnë me sukses.

Krijimi i "v4.2 Improvements & Bug Fixes": Përmirësime në kod dhe teste, ndreqja e bugs.

Krijimi i branch-ave për versionet 4.0, 4.1 dhe 4.2 duke u bazuar në tag-at e krijuar paraprakisht.

## 2 Testet e zhvilluara

Nr	Përshkrimi i testit	Statusi (kalon/dështon)	Framework /
1	test_create_multiple_choice_question	kalon	pytest
2	test_check_correct_answer	kalon	pytest
3	test_question_requires_text	kalon	pytest
4	test_create_empty_quiz	kalon	pytest
5	test_add_question_to_quiz	kalon	pytest
6	test_cannot_add_duplicate_questions	kalon	pytest
7	test_get_question_by_index	kalon	pytest
8	test_submit_answer_and_track_score	kalon	pytest
9	test_perfect_score	kalon	pytest
10	test_passing_grade	kalon	pytest
11	test_result_summary	kalon	pytest
12	test_complete_quiz_flow	kalon	pytest
13	test_question_has_category	kalon	pytest
14	test_quiz_can_get_questions_by_category	kalon	pytest
15	test_quiz_get_score_by_category	kalon	pytest
16	test_question_has_difficulty_level	kalon	pytest
17	test_question_default_difficulty_is_medium	kalon	pytest
18	test_filter_questions_by_difficulty	kalon	pytest
19	test_get_incorrect_answers	kalon	pytest

20	test_get_answer_details	kalon	pytest
21	test_quiz_has_time_limit	kalon	pytest
22	test_quiz_starts_timer_on_first_answer	kalon	pytest
23	test_quiz_tracks_elapsed_time	kalon	pytest
24	test_quiz_can_check_if_time_expired	kalon	pytest
25	test_create_quiz_in_database	dështon -> (v4.0) kalon -> (v4.1)	pytest
26	test_read_quiz_from_database	dështon -> (v4.0) kalon -> (v4.1)	pytest
27	test_update_quiz_in_database	dështon -> (v4.0) kalon -> (v4.1)	pytest
28	test_delete_quiz_from_database	dështon -> (v4.0) kalon -> (v4.1)	pytest
29	test_list_all_quizzes	dështon -> (v4.0) kalon -> (v4.1)	pytest
30	test_get_nonexistent_quiz	dështon -> (v4.0) kalon -> (v4.1)	pytest
31	test_update_nonexistent_quiz	dështon -> (v4.0) kalon -> (v4.1)	pytest
32	test_delete_nonexistent_quiz	dështon -> (v4.0) kalon -> (v4.1)	pytest
33	test_database_generates_unique_ids	dështon -> (v4.0) kalon -> (v4.1)	pytest
34	test_clear_database	dështon -> (v4.0) kalon -> (v4.1)	pytest
35	test_quiz_id_is_stored_in_quiz_object	dështon -> (v4.0) kalon -> (v4.1)	pytest
36	test_quiz_id_persists_after_update	dështon -> (v4.0) kalon -> (v4.1)	pytest

### 3 Implementimi i bërë pas testeve

Implemetimet e bëra pas testeve të feature 3:

Moduli database.py

```
import uuid
from typing import List, Dict, Optional
from copy import deepcopy
from src.quiz import Quiz

class QuizDatabase:
    """
    In-memory database for storing and managing quizzes.

    Provides CRUD operations (Create, Read, Update, Delete) for Quiz objects.
    Data is stored in memory and will be lost when the application terminates.
    """

    def __init__(self) -> None:
        """Initialize an empty in-memory database"""
        self._storage: Dict[str, Quiz] = {}

    def add_quiz(self, quiz: Quiz) -> str:
        """
        Create - Add a new quiz to the database.

        Args:
            quiz: The Quiz object to store

        Returns:
            str: Unique ID assigned to the quiz
        """
        quiz_id = str(uuid.uuid4())
        # Store a deep copy and set the ID
        quiz_copy = deepcopy(quiz)
        quiz_copy.id = quiz_id
        self._storage[quiz_id] = quiz_copy
        return quiz_id

    def get_quiz(self, quiz_id: str) -> Optional[Quiz]:
        """
        Read - Retrieve a quiz from the database by ID.

        Args:
            quiz_id: The unique identifier of the quiz
        """

```

```
    Returns:
        Quiz object if found, None otherwise
    """
    if quiz_id not in self._storage:
        return None
    # Return a deep copy to prevent external modifications
    return deepcopy(self._storage[quiz_id])

def update_quiz(self, quiz_id: str, quiz: Quiz) -> bool:
    """
    Update - Modify an existing quiz in the database.

    Args:
        quiz_id: The unique identifier of the quiz to update
        quiz: The updated Quiz object

    Returns:
        bool: True if update successful, False if quiz not found
    """
    if quiz_id not in self._storage:
        return False
    # Store a deep copy and ensure ID is preserved
    quiz_copy = deepcopy(quiz)
    quiz_copy.id = quiz_id
    self._storage[quiz_id] = quiz_copy
    return True

def delete_quiz(self, quiz_id: str) -> bool:
    """
    Delete - Remove a quiz from the database.

    Args:
        quiz_id: The unique identifier of the quiz to delete

    Returns:
        bool: True if deletion successful, False if quiz not found
    """
    if quiz_id not in self._storage:
        return False
    del self._storage[quiz_id]
    return True

def list_quizzes(self) -> List[Quiz]:
    """
```

```

List all quizzes in the database.

Returns:
    List of all Quiz objects
    .....
    # Return deep copies to prevent external modifications
    return [deepcopy(quiz) for quiz in self._storage.values()]

def clear(self) -> None:
    """Remove all quizzes from the database"""
    self._storage.clear()

def __len__(self) -> int:
    """Return the number of quizzes in the database"""
    return len(self._storage)

def __repr__(self) -> str:
    """String representation for debugging"""
    return f"QuizDatabase(quizzes={len(self._storage)})"

```

## 4 Refaktorimi i bërë

Refaktorime nuk ka pasur këtë javë. Një përmirësim i nevojshëm ishte shtimi i fushës id për objektin Quiz. Paraprakisht në mungesë të variablës id në databazë objekti Quiz është ruajtur pa id, duke e bërë të pamundur të kryhen thirrjet e API ku quiz\_id qe e nevojshme (GET, PUT, DELETE by quiz\_id). Me shtimin e quiz\_id janë shtuar edhe dy teste në krahasim me v4.1 (Feature 3 Green Phase), duke e quar totalin e testeve në 36.

## 5 Probleme të hasura

Gjatë shkrimit të testeve dhe implementimit të kodit për feature 3 nuk kam hasur në ndonjë problem.

## 6 Plani për javën e ardhshme

Javën tjetër është raporti dhe prezentimi final. Do të punoj në përgatitjen finale të kodit, raportit dhe prezentimit në mënyrë që të aspiroj drejt vlerësimit maksimal.

## 7 Mbulesa e testimit (nëse aplikohet)

- % e mbulesës aktuale: 100%
- Vegla e përdorur: pytest-cov

## 8 Komente / reflektimi të grupit

Të gjitha pikat e secilës javë deri më tani janë mbuluar. Ndryshime në kod nuk planifikohet të ketë më, përveq nëse gjendet ndonjë gabim apo bug. Puna do të fokusohet në përgatitjen sa më të mirë për prezantimin final.

### ⌚ Ngjitjet (opcionale)

- Screenshots nga testet që kalojnë / dështojnë

V4.0 Feature 3 Red Phase (testet e krijuara dështojnë):

```
PS C:\Users\DELL\Documents\GitHub\quiz-app> pytest
=====
platform win32 -- Python 3.13.7, pytest-9.0.1, pluggy-1.6.0 -- C:\Users\DELL\AppData\Local\Programs\Python\Python313\python.exe
cachedir: .pytest_cache
rootdir: C:\Users\DELL\Documents\GitHub\quiz-app
configfile: pyproject.toml
testpaths: tests
plugins: asyncio-4.11.0, cov-7.0.0
collected 34 items

tests/test_integration.py::TestQuizIntegration::test_complete_quiz_flow PASSED
[ 2%]
tests/test_question.py::TestQuestion::test_create_multiple_choice_question PASSED
[ 5%]
tests/test_question.py::TestQuestion::test_check_correct_answer PASSED
[ 8%]
tests/test_question.py::TestQuestion::test_question_requires_text PASSED
[ 11%]
tests/test_quiz.py::TestQuiz::test_create_empty_quiz PASSED
[ 14%]
tests/test_quiz.py::TestQuiz::test_add_question_to_quiz PASSED
[ 17%]
tests/test_quiz.py::TestQuiz::test_cannot_add_duplicate_questions PASSED
[ 20%]
tests/test_quiz.py::TestQuiz::test_get_question_by_index PASSED
[ 23%]
tests/test_quiz.py::TestQuiz::test_submit_answer_and_track_score PASSED
[ 26%]
tests/test_quiz_categories.py::TestQuizCategories::test_question_has_category PASSED
[ 29%]
tests/test_quiz_categories.py::TestQuizCategories::test_quiz_can_get_questions_by_category PASSED
[ 32%]
tests/test_quiz_categories.py::TestQuizCategories::test_quiz_get_score_by_category PASSED
[ 35%]
tests/test_quiz_database.py::TestQuizDatabase::test_create_quiz_in_database FAILED
[ 38%]
tests/test_quiz_database.py::TestQuizDatabase::test_read_quiz_from_database FAILED
[ 41%]
tests/test_quiz_database.py::TestQuizDatabase::test_update_quiz_in_database FAILED
[ 44%]
tests/test_quiz_database.py::TestQuizDatabase::test_delete_quiz_from_database FAILED
[ 47%]
tests/test_quiz_database.py::TestQuizDatabase::test_list_all_quizzes FAILED
[ 50%]
tests/test_quiz_database.py::TestQuizDatabase::test_get_nonexistent_quiz PASSED
[ 52%]
tests/test_quiz_database.py::TestQuizDatabase::test_update_nonexistent_quiz FAILED
[ 55%]
tests/test_quiz_database.py::TestQuizDatabase::test_delete_nonexistent_quiz FAILED
[ 58%]
tests/test_quiz_database.py::TestQuizDatabase::test_database_generates_unique_ids FAILED
[ 61%]
tests/test_quiz_database.py::TestQuizDatabase::test_clear_database FAILED
[ 64%]
tests/test_quiz_difficulty.py::TestQuestionDifficulty::test_question_has_difficulty_level PASSED
[ 67%]
tests/test_quiz_difficulty.py::TestQuestionDifficulty::test_question_default_difficulty_is_medium PASSED
[ 70%]
tests/test_quiz_difficulty.py::TestQuestionDifficulty::test_filter_questions_by_difficulty PASSED
[ 73%]
tests/test_quiz_review.py::TestQuizReview::test_get_incorrect_answers PASSED
[ 76%]
tests/test_quiz_review.py::TestQuizReview::test_get_answer_details PASSED
[ 79%]
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_has_time_limit PASSED
[ 82%]
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_starts_timer_on_first_answer PASSED
[ 85%]
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_tracks_elapsed_time PASSED
[ 88%]
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_can_check_if_time_expired PASSED
[ 91%]
tests/test_result.py::TestQuizResult::test_perfect_score PASSED
[ 94%]
tests/test_result.py::TestQuizResult::test_passing_grade PASSED
[ 97%]
tests/test_result.py::TestQuizResult::test_result_summary PASSED
[ 100%]

: \Users\DELL\AppData\Local\Programs\Python\Python313\Lib\site-packages\coverage\inorout.py:521: CoverageWarning: Module quiz was never imported.
  module-not-imported); see https://coverage.readthedocs.io/en/7.11.3/messages.html#warning-module-not-imported
    self.warn(F"Module {pkg} was never imported.", slug="module-not-imported")
C:\Users\DELL\AppData\Local\Programs\Python\Python313\Lib\site-packages\coverage\control.py:950: CoverageWarning: No data was collected. (no-data-collected); see https://coverage.readthedocs.io/en/7.11.3/messages.html#warning-no-data-collected
    self._warn("No data was collected.", slug="no-data-collected")
```

#### V4.1 Feature 3 Green Phase (të gjitha kalojnë):

```
PS C:\Users\DELL\Documents\GitHub\quiz-app> pytest --cov
===== test session starts =====
platform win32 -- Python 3.13.7, pytest-9.0.1, pluggy-1.6.0 -- C:\Users\DELL\AppData\Local\Programs\Python\Python313\python.exe
cachedir: .pytest_cache
rootdir: C:/Users/DELL/Documents/GitHub/quiz-app
configfile: pyproject.toml
testpaths: tests
plugins: asyncio-4.11.0, cov-7.0.0
collected 36 items

tests/test_integration.py::TestQuizIntegration::test_complete_quiz_flow PASSED
tests/test_question.py::TestQuestion::test_create_multiple_choice_question PASSED
tests/test_question.py::TestQuestion::test_check_correct_answer PASSED
tests/test_question.py::TestQuestion::test_question_requires_text PASSED
tests/test_quiz.py::TestQuiz::test_create_empty_quiz PASSED
tests/test_quiz.py::TestQuiz::test_add_question_to_quiz PASSED
tests/test_quiz.py::TestQuiz::test_cannot_add_duplicate_questions PASSED
tests/test_quiz.py::TestQuiz::test_get_question_by_index PASSED
tests/test_quiz.py::TestQuiz::test_submit_answer_and_track_score PASSED
tests/test_quiz_categories.py::TestQuizCategories::test_question_has_category PASSED
tests/test_quiz_categories.py::TestQuizCategories::test_quiz_can_get_questions_by_category PASSED
tests/test_quiz_categories.py::TestQuizCategories::test_quiz_get_score_by_category PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_create_quiz_in_database PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_read_quiz_from_database PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_update_quiz_in_database PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_delete_quiz_from_database PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_list_all_quizzes PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_get_nonexistent_quiz PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_update_nonexistent_quiz PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_delete_nonexistent_quiz PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_database_generates_unique_ids PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_clear_database PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_quiz_id_is_stored_in_quiz_object PASSED
tests/test_quiz_database.py::TestQuizDatabase::test_quiz_id_persists_after_update PASSED
tests/test_quiz_difficulty.py::TestQuestionDifficulty::test_question_has_difficulty_level PASSED
tests/test_quiz_difficulty.py::TestQuestionDifficulty::test_filter_questions_by_difficulty PASSED
tests/test_quiz_review.py::TestQuizReview::test_get_incorrect_answers PASSED
tests/test_quiz_review.py::TestQuizReview::test_get_answer_details PASSED
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_has_time_limit PASSED
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_starts_timer_on_first_answer PASSED
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_tracks_elapsed_time PASSED
tests/test_quiz_timer.py::TestQuizTimer::test_quiz_can_check_if_time_expired PASSED
tests/test_result.py::TestQuizResult::test_perfect_score PASSED
tests/test_result.py::TestQuizResult::test_passing_grade PASSED
tests/test_result.py::TestQuizResult::test_result_summary PASSED

===== tests coverage =====
coverage: platform win32, python 3.13.7-final-0

Name     Stmts  Miss  Cover  Missing
----- 
src\__init__.py      5      0   100%
src\database.py     35      0   100%
src\question.py     19      0   100%
src\quiz.py         70      0   100%
src\result.py       14      0   100%
----- 
TOTAL          143      0   100%
Coverage HTML written to dir htmlcov
===== 36 passed in 0.75s =====
```

- Link i GitHub-it <https://github.com/Geti23/quiz-app>

- Raporti i CI/CD ose code coverage (në faqen tjetër):

## V4.0 Feature 3 Red Phase

The screenshot shows a CI pipeline interface with a dark theme. At the top, a header bar displays the title "Feature 3 Red Phase #10". Below this, a "Summary" card provides an overview of the build status:

- Triggered via push 1 hour ago
- Status: **Failure**
- Total duration: **28s**

The main content area is divided into two sections: "main.yml" and "Matrix: test".

- main.yml**: on: push
  - lint: Status is **Failure**, duration 13s.
- Matrix: test**: 12 jobs completed. A "Show all jobs" link is present.

On the left sidebar, under the "Jobs" section, there is a list of 13 items, each preceded by a red "X" icon, indicating they failed:

- test (ubuntu-latest, 3.9)
- test (ubuntu-latest, 3.10)
- test (ubuntu-latest, 3.11)
- test (ubuntu-latest, 3.12)
- test (windows-latest, 3.9)
- test (windows-latest, 3.10)
- test (windows-latest, 3.11)
- test (windows-latest, 3.12)
- test (macos-latest, 3.9)
- test (macos-latest, 3.10)
- test (macos-latest, 3.11)
- test (macos-latest, 3.12)
- lint

## V4.1 Feature 3 Green Phase

The screenshot shows a CI pipeline interface with a dark theme, similar to the previous one but with a green checkmark icon. At the top, a header bar displays the title "Feature 3 Green Phase #11". Below this, a "Summary" card provides an overview of the build status:

- Triggered via push 1 hour ago
- Status: **Success**
- Total duration: **51s**

The main content area is divided into two sections: "main.yml" and "Matrix: test".

- main.yml**: on: push
  - lint: Status is **Success**, duration 12s.
- Matrix: test**: 12 jobs completed. A "Show all jobs" link is present.

On the left sidebar, under the "Jobs" section, there is a list of 13 items, each preceded by a green checkmark icon, indicating they succeeded:

- test (ubuntu-latest, 3.9)
- test (ubuntu-latest, 3.10)
- test (ubuntu-latest, 3.11)
- test (ubuntu-latest, 3.12)
- test (windows-latest, 3.9)
- test (windows-latest, 3.10)
- test (windows-latest, 3.11)
- test (windows-latest, 3.12)
- test (macos-latest, 3.9)
- test (macos-latest, 3.10)
- test (macos-latest, 3.11)
- test (macos-latest, 3.12)
- lint

## Coverage report: 100%

[Files](#) [Functions](#) [Classes](#)

coverage.py v7.11.3, created at 2025-11-27 01:46 +0100

File	function	statements	missing	excluded	coverage
src\__init__.py	(no function)	5	0	0	100%
src\database.py	QuizDatabase.__init__	1	0	0	100%
src\database.py	QuizDatabase.add_quiz	5	0	0	100%
src\database.py	QuizDatabase.get_quiz	3	0	0	100%
src\database.py	QuizDatabase.update_quiz	6	0	0	100%
src\database.py	QuizDatabase.delete_quiz	4	0	0	100%
src\database.py	QuizDatabase.list_quizzes	1	0	0	100%
src\database.py	QuizDatabase.clear	1	0	0	100%
src\database.py	QuizDatabase.__len__	1	0	0	100%
src\database.py	QuizDatabase.__repr__	0	0	2	100%
src\database.py	(no function)	13	0	1	100%
src\question.py	Question.__init__	6	0	0	100%
src\question.py	Question.validate_text	2	0	0	100%
src\question.py	Question.check_answer	1	0	0	100%
src\question.py	Question.__eq__	2	0	1	100%
src\question.py	Question.__hash__	0	0	1	100%
src\question.py	Question.__repr__	0	0	2	100%
src\question.py	(no function)	8	0	1	100%
src\quiz.py	Quiz.__init__	6	0	0	100%
src\quiz.py	Quiz.add_question	2	0	0	100%
src\quiz.py	Quiz.get_question	1	0	0	100%
src\quiz.py	Quiz.submit_answer	2	0	0	100%
src\quiz.py	Quiz.start_timer_if_needed	2	0	0	100%
src\quiz.py	Quiz.get_elapsed_time	2	0	1	100%
src\quiz.py	Quiz.is_time_expired	2	0	1	100%
src\quiz.py	Quiz.get_result	3	0	0	100%
src\quiz.py	Quiz.calculate_score	5	0	0	100%
src\quiz.py	Quiz.is_answer_correct	2	0	1	100%
src\quiz.py	Quiz.get_incorrect_answers	5	0	0	100%
src\quiz.py	Quiz.get_answer_details	3	0	0	100%
src\quiz.py	Quiz.get_questions_by_difficulty	1	0	0	100%
src\quiz.py	Quiz.get_questions_by_category	1	0	0	100%
src\quiz.py	Quiz.get_score_by_category	5	0	0	100%
src\quiz.py	Quiz.get_category_question_indices	1	0	0	100%
src\quiz.py	Quiz.calculate_category_score	5	0	0	100%
src\quiz.py	Quiz.__repr__	0	0	2	100%
src\quiz.py	(no function)	22	0	1	100%
src\result.py	QuizResult.__init__	3	0	0	100%
src\result.py	QuizResult.calculate_percentage	1	0	0	100%
src\result.py	QuizResult.is_perfect	1	0	0	100%
src\result.py	QuizResult.is_passing	1	0	0	100%
src\result.py	QuizResult.get_summary	1	0	0	100%
src\result.py	QuizResult.__repr__	0	0	4	100%
src\result.py	(no function)	7	0	1	100%
<b>Total</b>		<b>143</b>	<b>0</b>	<b>19</b>	<b>100%</b>