Code Review and Practices

Week 6

Code is read much more often than it is written.

— Guido van Rossum

Objectives

- Understand the importance of code review
- Try tools & techniques for effective reviews
- Engage in hands-on review practice

Contents

- Code review
- Practice
  - Git PR template setting
  - Linter set-up

Code Review

Code Review

- It is the systematic examination of software source code
- It is performed by developers other than the code author
- It aims to find and fix mistakes overlooked during development

Benefits of Code Review (1/2)

- Improved code quality
  - Code reviews catch mistakes, leading to more robust code
  - Encourages adherence to coding standards and best practices
- Reduced errors and vulnerabilities
  - Many eyes on the code mean a higher chance of catching errors
  - Reduces the risk of security vulnerabilities slipping through

Benefits of Code Review (2/2)

- Knowledge sharing
  - New team members can learn from experienced developers
  - Facilitates a shared understanding of the codebase
- Collaborative team culture
  - Code reviews promote a culture of collaboration and openness
  - Developers learn to give and receive feedback constructively
- Cost efficiency
  - Finding and fixing issues during review is far cheaper than after software goes live
  - Reduces technical debt by addressing issues in their infancy

Code Review Best Practices (1/3)

- Be constructive, not critical
  - Focus on the code and its quality, not on the individual developer
  - Provide feedback that is actionable and positive
- Review regularly & keep it manageable
  - Review code frequently to prevent the buildup of changes
  - Limit the amount of code to be reviewed in one session
- Automate
  - Utilize tools (like linters) to catch trivial issues automatically
  - This allows to focus on deeper, architectural, or logical issues

Code Review Best Practices (2/3)

- Start with a clear understanding
  - Before diving deep, understand the purpose of the changes
  - Use PR descriptions or initial comments to get context
- Prioritize important issues over coding style
  - Prioritize significant issues like potential bugs, security vulnerabilities, or performance concerns over coding style

Code Review Best Practices (3/3)

- Ensure good communication
  - Clarify doubts rather than making assumptions
  - Encourage a two-way conversation
  - Remember, it is a review discussion, not a monologue
- Close the loop
  - Ensure all raised issues are addressed
  - Use a system to track and manage feedback
  - Ensure nothing slips through

Code Review Checklist

1. **Design**. Is the code well-designed for the system?
2. **Functionality**. Does the code behave as intended?
3. **Complexity**. Could the code be made simpler?
4. **Tests**. Does the code have automated tests?
5. **Coding Styles**
    a. Naming: Did the developer choose clear names?
    b. Comments: Are the comments clear and useful?
    c. Style: Does the code follow our style guides?
6. **Documentation**. Was relevant documentation updated?

Source: https://google.github.io/eng-practices/review/reviewer/looking-for.html

Types of Code Review

- Formal code review
  - Rigorous process involving multiple roles (e.g., author, reviewer, inspector, moderator, scribe)
- Lightweight code review
  - Over-the-shoulder: Look over the shoulder to check the code
  - Walkthroughs: The author explains the code gathering feedback
  - **Pull requests**: Review code before merging into the main branch
- **Pair programming**
  - Two developers work together at one workstation, continuously reviewing the code on the fly

Source: https://en.wikibooks.org/wiki/Introduction_to_Software_Engineering/Quality/Code_Review

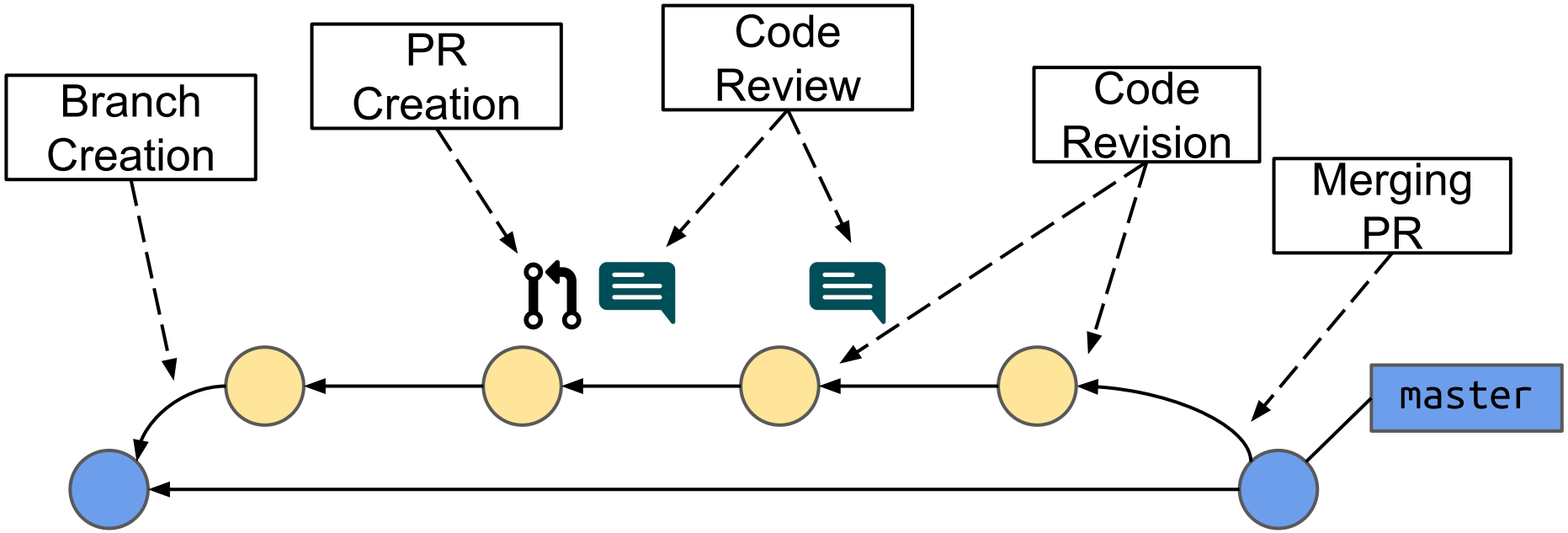
Pair Programming

- Collaboration in real-time
  - Pair programming is an instantaneous code review process
- Shared knowledge
  - Both partners bring their unique skills and knowledge
- Continuous feedback
  - The navigator provides immediate feedback to the driver
- Two sets of eyes
  - Reduces the likelihood of mistakes

Pair Programming Benefits

- Higher code quality
  - The continuous feedback can result in more maintainable code
- Shared responsibility
  - Spreads accountability, so no single person is responsible for mistakes
- Faster problem solving
  - Two heads often think better than one
- Reduced code review time
  - Code often needs fewer revisions after pair programming sessions
- Knowledge transfer
  - Share insights and learn from each other's experiences and perspectives

Pull Request (PR) Review Workflow



Pull Request (PR) Review Workflow

1. **Branch Creation**. Add features, fix bugs, refactor, etc.
2. **PR Creation**. Create a PR against the main branch
3. **Code Review**. Other members review the code
4. **Code Revision**. Revise and repeat from step 3 if needed
5. **Merging**. If reviewers approve the PR, and integration tests have passed, merge it and close the branch

Best Practices for Pull Request (1/3)

- Clear title
  - A concise and descriptive title that gives a snapshot of changes
  - "Add user authentication for the admin portal" instead of "Updates"
- Detailed description
  - A thorough explanation of what the PR does, why the change is necessary, and any relevant context
  - Include any related issues (e.g., "Related to issue #123")

Best Practices for Pull Request (2/3)

- Logical commits
  - Break down changes into smaller, logical commits
  - Each commit should represent a single "idea" or "change" and have a descriptive commit message
- Include relevant documentation
  - Prepare for a how-to-use documentation if the PR introduces a new feature
  - Update existing documentation if necessary

Best Practices for Pull Request (3/3)

- Visuals when relevant
  - Include screenshots or even demo videos for frontend changes
  - Provides a clear understanding of visual changes
- Testing
  - Describe what testing has been done and the results
  - Highlight any areas that need particular attention
- Request reviewers wisely
  - Choose reviewers who have expertise in the modified code
  - Include both someone deeply familiar with the project and someone less familiar to get diverse feedback

Git PR Template Exercise

Git PR Template

- A default markdown file(`.github/pull_request_template.md`) automatically included when creating a Pull Request
- Guides the author to provide all required information
- Ensures consistency and quality across all PRs

Git PR Template Example

```
### PR Title: [Descriptive title summarizing the change]

#### Related Issue(s):
Link or reference any related issues or tickets.

#### PR Description:
[Provide a brief summary of the changes made.]

##### Changes Included:
- [ ] Added new feature(s)
- [ ] Fixed identified bug(s)
- [ ] Updated relevant documentation

##### Screenshots (if UI changes were made):
Attach screenshots or GIFs of any visual changes. (Only for
frontend-related changes)

##### Notes for Reviewer:
Any specific instructions or points to be considered by the
reviewer.

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#### Reviewer Checklist:
- [ ] Code is written in clean, maintainable, and idiomatic form.
- [ ] Automated test coverage is adequate.
- [ ] All existing tests pass.
- [ ] Manual testing has been performed to ensure the PR works as
expected.
- [ ] Code review comments have been addressed or clarified.

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#### Additional Comments:
Add any other comments or information that might be useful for the
review process.
```
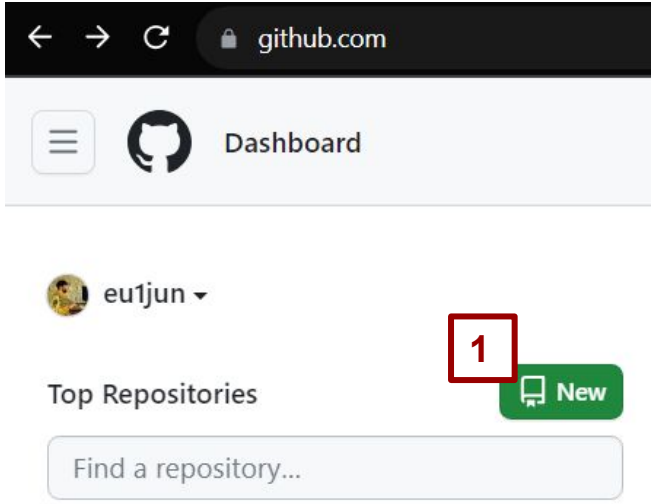
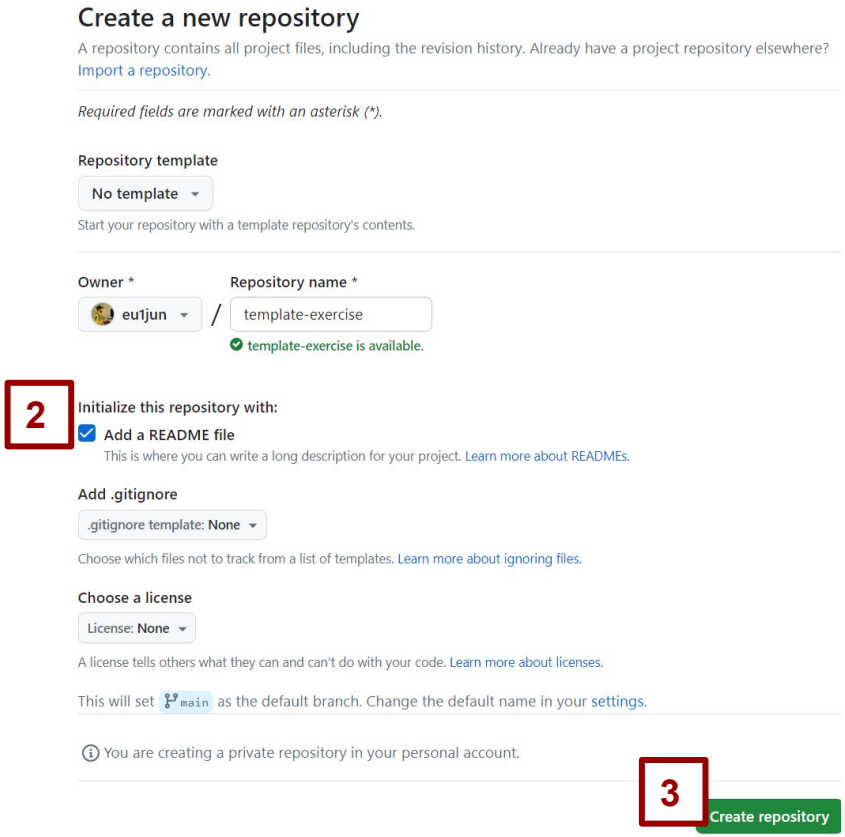

Add PR Template to GitHub Repo (1/4)

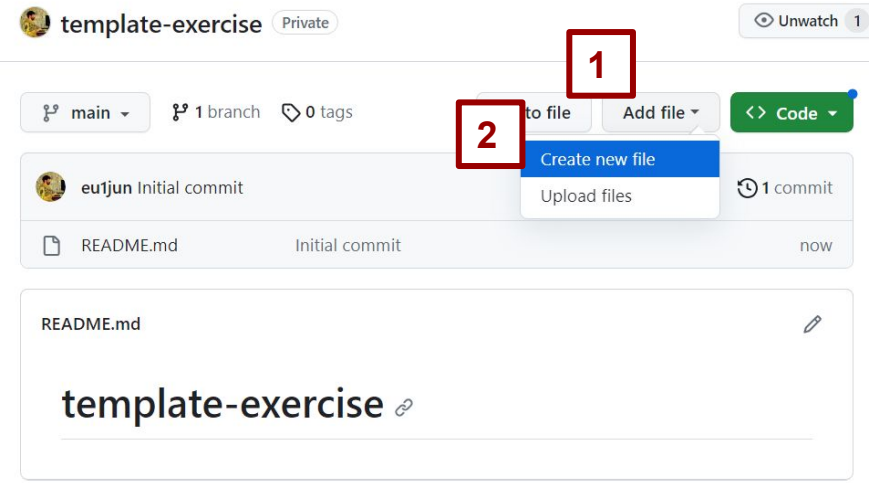
1. Make a new repository
   a. Create one with README

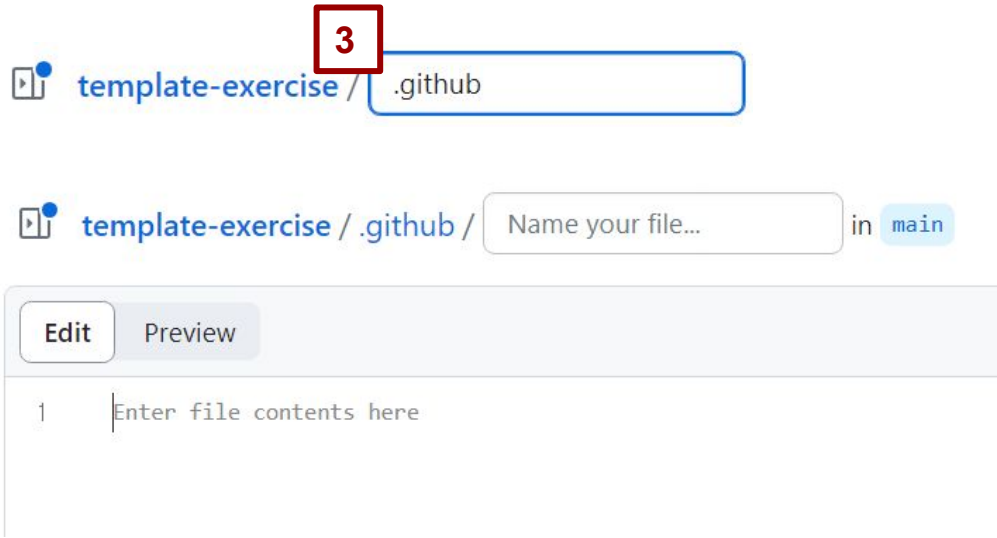




Add PR Template to GitHub Repo (2/4)

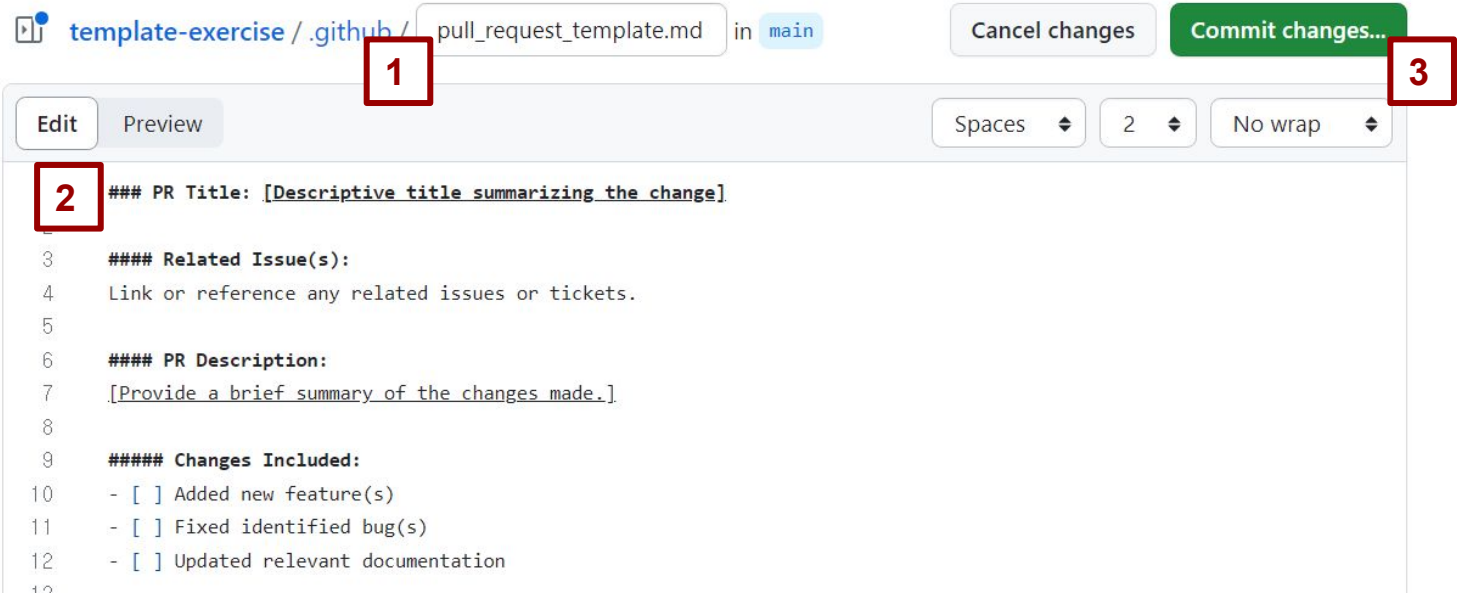
2. Create a `.github/` directory
   a. Type `.github/` in text box, don't forget '/'





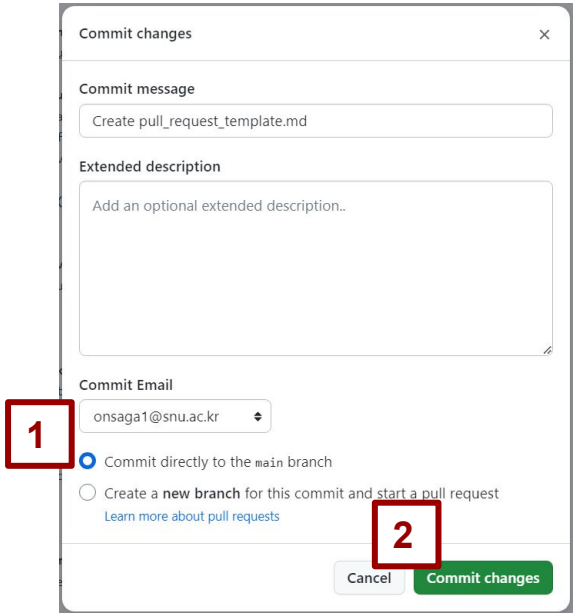
Add PR Template to GitHub Repo (3/4)

3. Name a file `pull_request_template.md`
   a. Paste the previous template
   b. Click `Commit Changes…`

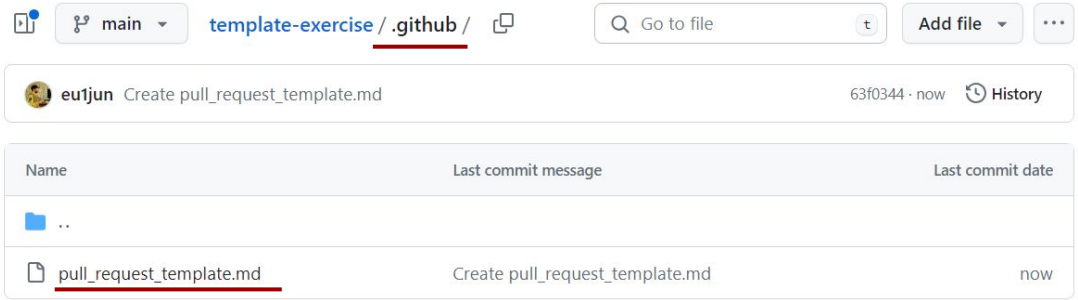


Add PR Template to GitHub Repo (4/4)

4. Commit (and push)
   a. In GitHub, commit directly to the `main` branch
   b. If you've working locally, commit and push them to repository

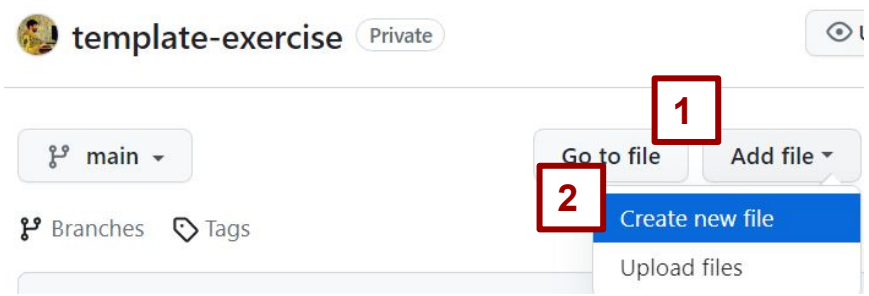


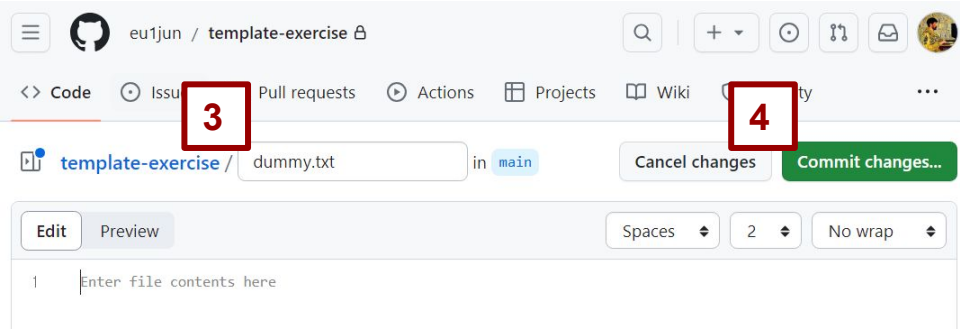

```
git add .github/pull_request_template.md
git commit -m "Add PR template"
git push origin main
```



Test PR Template (1/3)

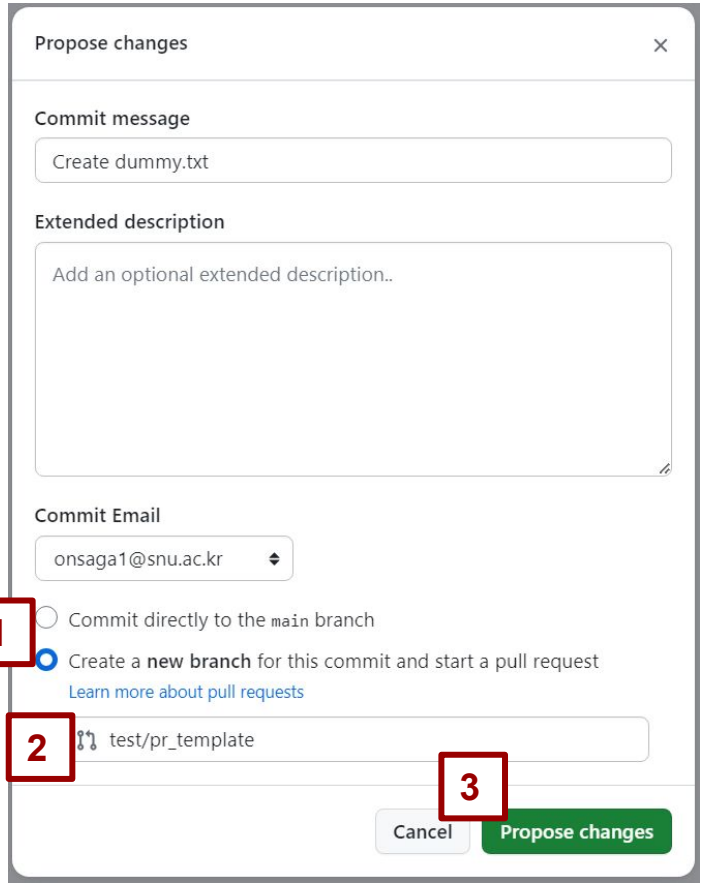
1. Create a new file to test the template
    a. Proceed to the next slide before the commit





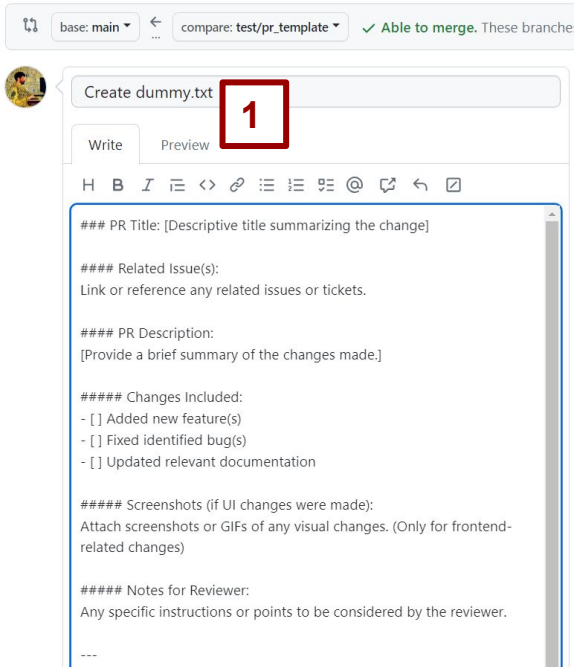
Test PR Template (2/3)

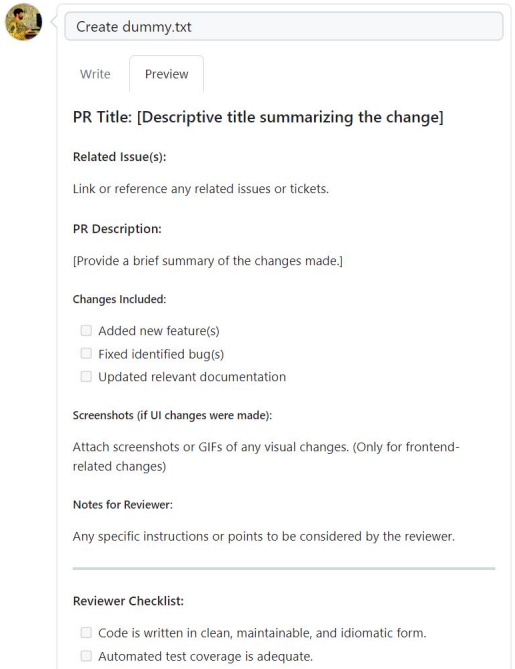
2. Commit and make PR
    a. Check the option for a new branch
    b. Set the branch name
    c. Propose changes



Test PR Template (3/3)

3. Now, you applied the template to your PR
   a. Check with the preview page, too





Linter

Linter

- Tools that analyze source code to detect programming errors, bugs, stylistic errors, and suspicious constructs

- Popular linters
  - JavaScript: ESLint
  - Python: Pylint
  - Kotlin: Ktlint
  - Java: Checkstyle
  - Ruby: RuboCop

Source: https://developer.android.com/studio/write/lint

Benefits of Linters

- Ensure coding standards are met
- Catch potential bugs or vulnerabilities early
- Reduce the number of issues during code reviews, allowing reviewers to focus on bigger-picture concerns

Real-time Linting in Android Studio

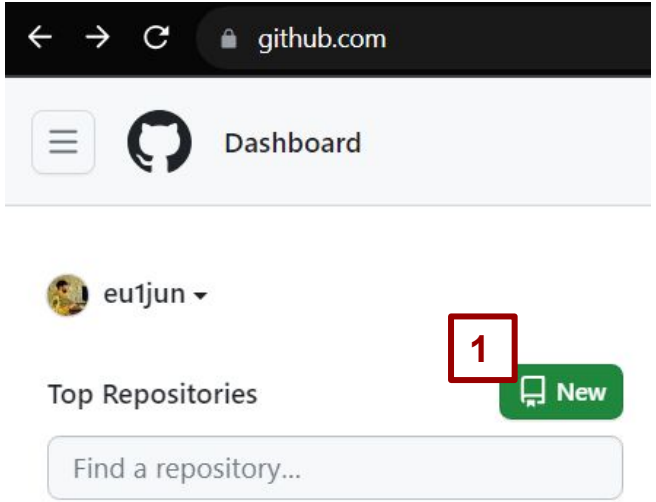
- Android Studio automatically runs lint checks while you write code and highlights potential issues
- You can see the lint warning or error message by hovering over the highlighted code

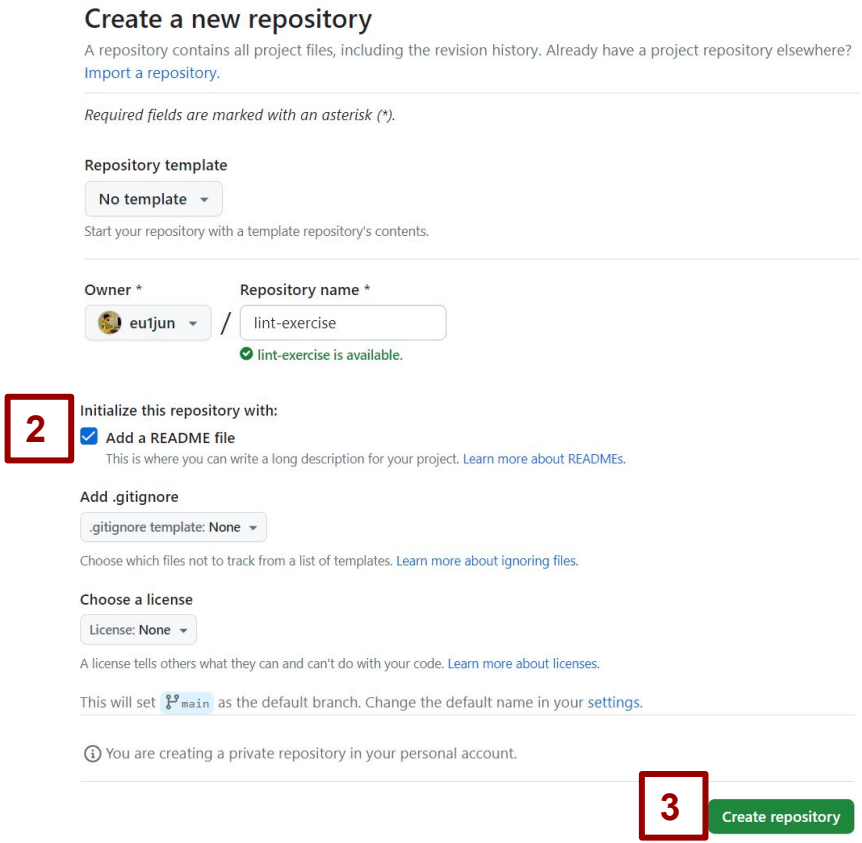
Manual Linting in Android Studio

- Navigate to `Analyze > Inspect Code...` from top menu
- Choose to inspect your entire project or a specific module
- Upon completion of inspection, a report is presented in the Inspection Results window, categorizing identified issues

Set Linting with GitHub Actions (1/4)

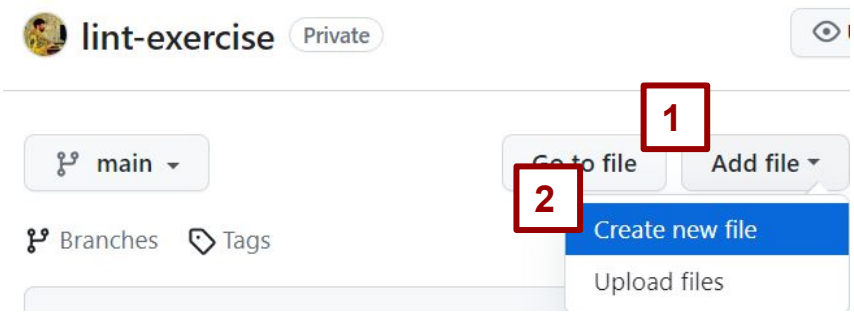
1. Make a new repository
   a. Create one with README

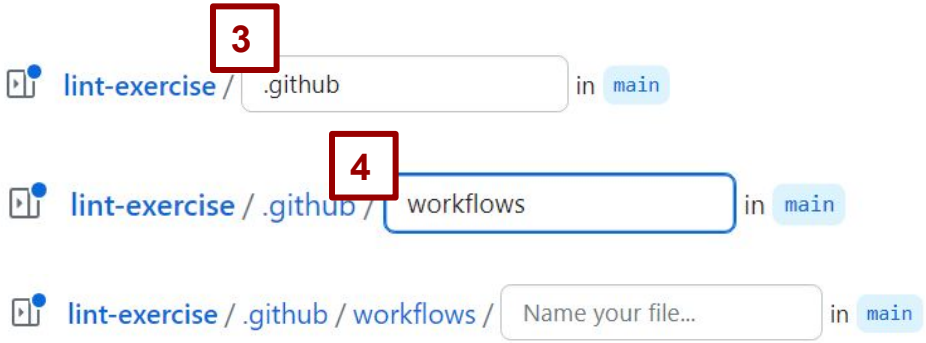




Set Linting with GitHub Actions (2/4)

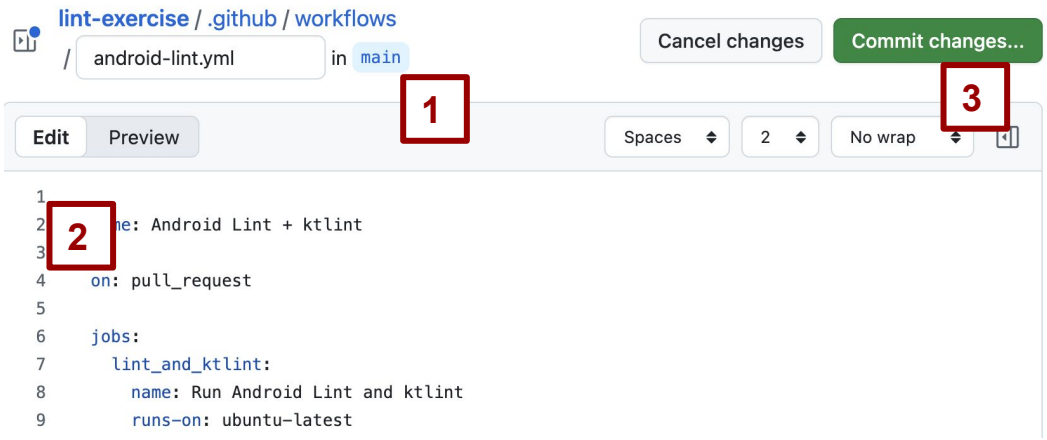
2. Create a `.github/workflows/` directory
   a. Type `.github/` in text box, don't forget '/'
   b. Type `workflows/` in text box, don't forget '/'





Set Linting with GitHub Actions (3/4)

3. Name a file `android-lint.yml`
   a. Paste the right workflow
   b. Click `Commit Changes...`

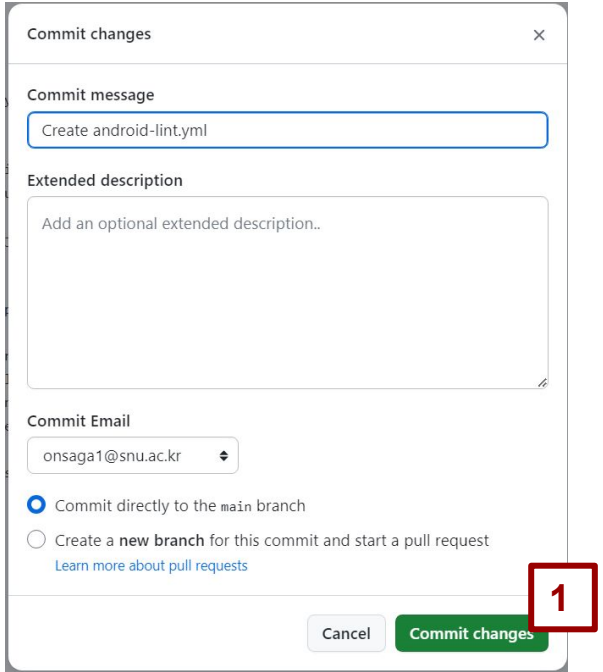


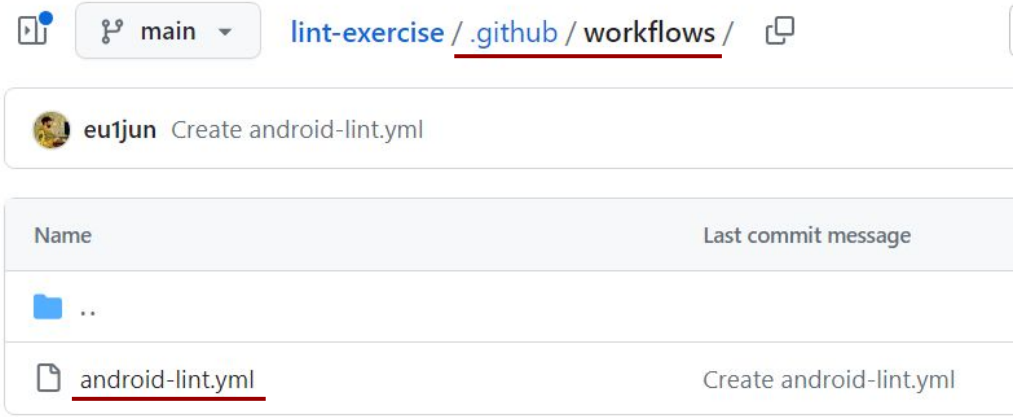

```yaml
name: Android Lint + ktlint
on: pull_request
jobs:
  lint_and_ktlint:
    name: Run Android Lint and ktlint
    runs-on: ubuntu-latest
    steps:
      - name: Checkout repository
        uses: actions/checkout@v4
      - name: Set up JDK 17
        uses: actions/setup-java@v4
        with:
          distribution: 'temurin'
          java-version: '17'
      - name: Grant execute permission for gradlew
        run: chmod +x ./gradlew
      - name: Android Lint (debug)
        run: ./gradlew lintDebug
      - name: ktlint check
        run: ./gradlew :app:ktlintMainSourceSetCheck
```

Set Linting with GitHub Actions (4/4)

4. Commit changes

a. Directly to the `main` branch





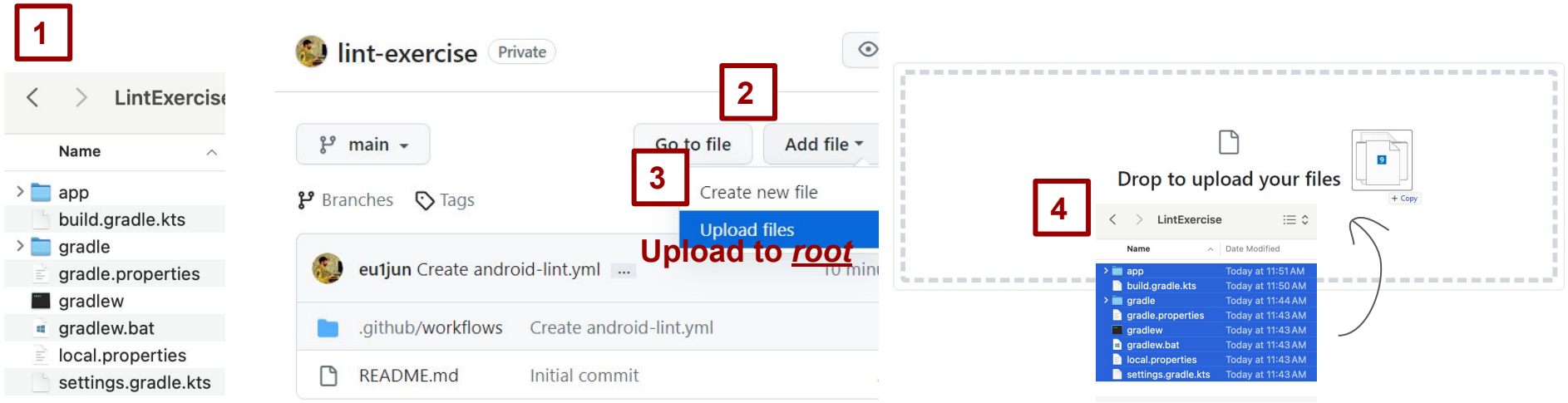
Test Linting with GitHub Actions (1/4)

1. Download `LintExercise` zip from github [link]
   a. It has wrong style

```
class MainActivity : ComponentActivity() {
    // ❌ Lint: Class body should not start with a blank line
    // (→ remove the empty line below this line)

    override fun onCreate(savedInstanceState: Bundle?) {
        super.onCreate(savedInstanceState)
        setContent {

            // ❌ Lint issues:
            // - Missing newline after "("
            // - Each argument should be on a separate line
            // - Unexpected indentation (should be 16 spaces)
            // - Missing newline before ")"
            // - Missing trailing comma before ")"
            // - Trailing spaces detected
            Text(text = "Hello", // ← Arguments should not start on the same line as the function call
                style = MaterialTheme.typography.bodyLarge, // ← Incorrect indentation
                maxLines = 1) // ← Missing newline and trailing comma before ")"

    ..
```

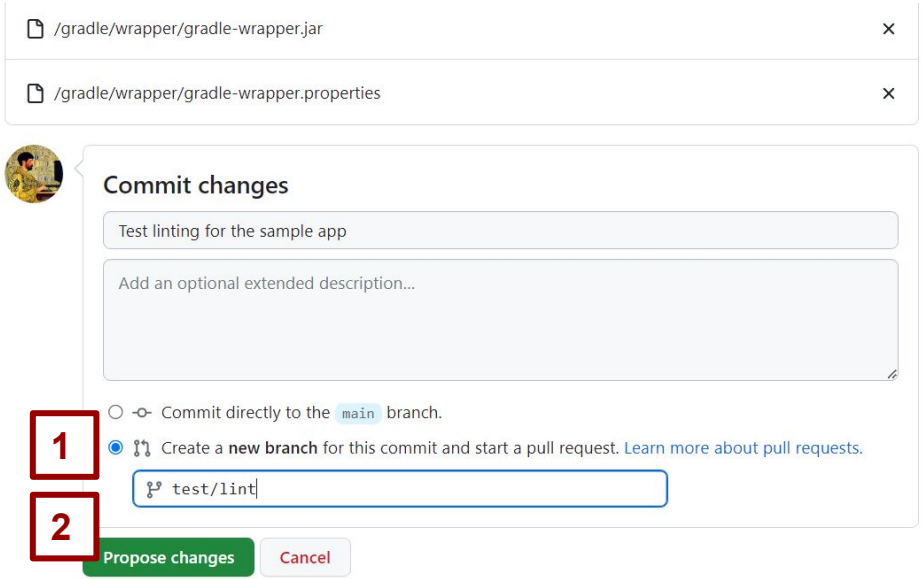
Test Linting with GitHub Actions (2/4)

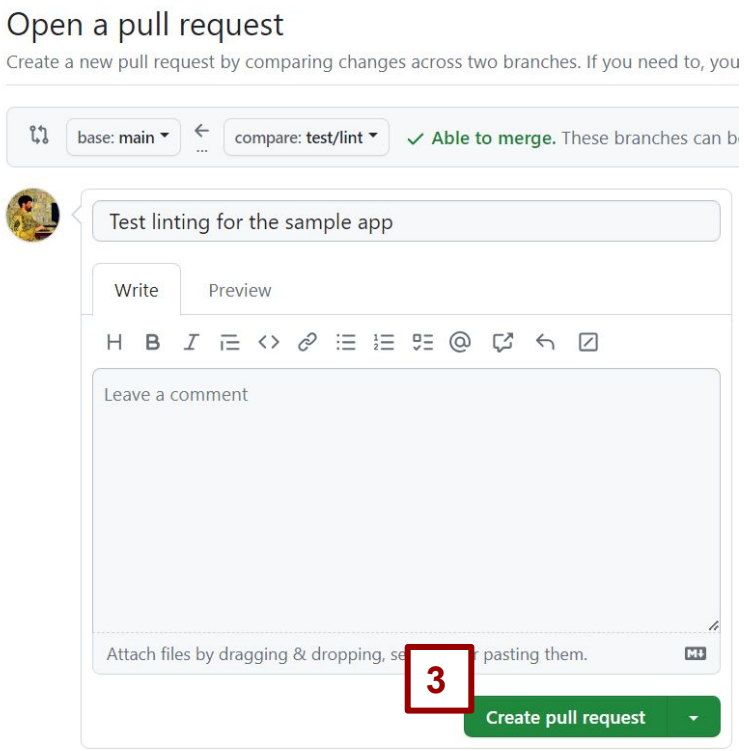
2. Extract and upload files
   a. Extract zipped folder
   b. Upload files (not `LintExercise`) by drag and drop into the `lint-exercise` repository root



Test Linting with GitHub Actions (3/4)

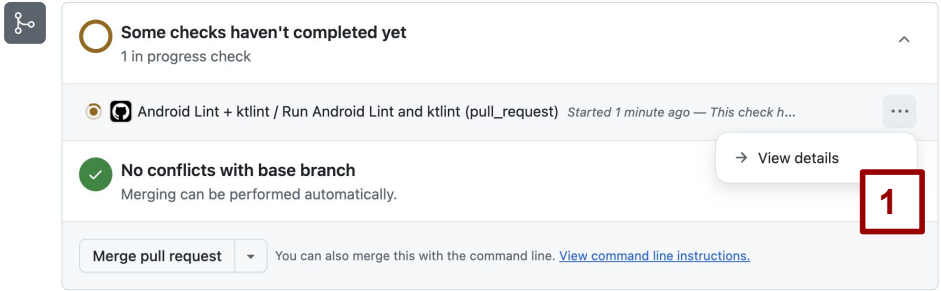
3. Create a branch and open PR
    a. Create PR, too





Test Linting with GitHub Actions (4/4)

4. Linting begins automatically
   a. Click `Details`




```
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:16:1 First line
in a method block should not be empty
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:24:18 Missing
newline after "("
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:24:18 Argument
should be on a separate line (unless all arguments can fit a single line)
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:24:34 A comment
in a 'value_argument_list' is only allowed when placed on a separate line (cannot be auto-corrected)
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:25:61 A comment
in a 'value_argument_list' is only allowed when placed on a separate line (cannot be auto-corrected)
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:26:28 Missing
newline before ")"
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:26:29 Missing
newline before ")"
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/MainActivity.kt:26:29 Missing
trailing comma before ")"
/home/runner/work/lint-exercise/lint-exercise/app/src/main/java/com/example/lintexercise/ui/theme/Color.kt:1:1 File must
```

Additional Resources

- "Software Engineering at Google" by Titus Winters, Tom Manshreck

Thank You.
Any Questions?