

# Angular – 100+ Lab Exercises (Basic, Intermediate, Advanced)

## □ Basic Level (30+ Exercises)

**Objective:** Build foundational skills in Angular components, templates, and core framework concepts.

### Getting Started & Environment Setup

- Install Angular CLI and create Angular projects.
- Understand Angular architecture and MVC pattern.
- Explore Angular workspace and file structure.
- Create and render Angular components.
- Use Angular template syntax: interpolation, property binding, event binding.

### Templates & Directives

- Use structural directives (\*ngIf, \*ngFor).
- Implement attribute directives (ngClass, ngStyle).
- Two-way data binding with [(ngModel)].
- Handle user input events and form controls.
- Create simple template-driven forms.

### Component Communication

- Pass data via @Input and @Output decorators.
- Use EventEmitter for child-to-parent communication.
- Implement ViewChild and ContentChild queries.
- Use lifecycle hooks (ngOnInit, ngOnDestroy).
- Organize components using modules.

## □ Intermediate Level (40+ Exercises)

**Objective:** Strengthen Angular proficiency with advanced forms, routing, services, and state management.



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## Forms & Validation

- Build reactive forms using FormBuilder.
- Implement custom validators and async validators.
- Manage form arrays and nested forms.
- Handle dynamic form controls.
- Display validation error messages.

## Routing & Navigation

- Configure Angular Router with routes and child routes.
- Use route guards (CanActivate, CanDeactivate).
- Manage route parameters and query params.
- Implement lazy loading for modules.
- Handle router events and navigation lifecycle.

## Services & Dependency Injection

- Create injectable services.
- Use Angular's DI system.
- Implement singleton services.
- Consume REST APIs with HttpClient.
- Handle HTTP interceptors for request modification.

## State Management & RxJS

- Work with Observables and Subjects.
- Use RxJS operators for stream transformations.
- Manage state with BehaviorSubject.
- Introduce NgRx for Redux-style state management.
- Implement effects for handling side-effects.

## Testing & Debugging

- Write unit tests with Jasmine and Karma.
  - Test components, services, and pipes.
  - Perform end-to-end testing with Protractor or Cypress.
  - Debug with Angular DevTools.
  - Use Angular CLI testing commands.
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## □ Advanced Level (40+ Exercises)

**Objective:** Master complex Angular patterns, performance, server-side rendering, and enterprise integration.

### Advanced Components & Patterns

- Create dynamic and programmatic components.
- Use content projection and ngTemplateOutlet.
- Implement Angular animations.
- Build reusable libraries and Angular packages.
- Use custom pipes and directives.

### Performance Optimization

- Analyze and optimize change detection strategies.
- Use OnPush change detection.
- Implement trackBy in ngFor for list rendering.
- Lazy load modules and components.
- Optimize bundle size with Angular CLI and Webpack.

### Server-Side Rendering & PWA

- Set up Angular Universal for SSR.
- Implement Angular Service Workers for PWA capabilities.
- Manage pre-rendering and SEO optimization.
- Use TransferState API for data hydration.
- Deploy Angular SSR apps on cloud platforms.

### Full-Stack Integration & DevOps

- Connect Angular with Node.js/Express backend.
- Implement authentication and authorization (JWT, OAuth).
- Use WebSockets for real-time features.
- Automate build and deployment pipelines (CI/CD).
- Containerize Angular apps with Docker.

### Capstone Projects

- Develop a full-featured CRM dashboard.
- Build a real-time collaborative editor.
- Create an enterprise-grade e-commerce platform.



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- Implement a data visualization dashboard with D3.js.
- Architect a multi-tenant SaaS Angular application.

## □ Tools & Ecosystem

- Angular 15+ with TypeScript
- Angular CLI, RxJS, NgRx
- Jasmine, Karma, Protractor/Cypress
- Angular Universal, Angular Material
- Docker, Jenkins/GitHub Actions for CI/CD