



Magento 2 Certified Professional Developer Plus

Exam Study Guide



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Introduction

This exam is for a senior Magento 2 developer/architect with 2 years of experience in customizing different areas of Magento Commerce, leading teams of Magento developers, leading projects, making key technical decisions on a Magento project, and working with customers to build project requirements.

By passing this exam the developer will earn Magento 2 Certified Professional Developer Plus credential.

This exam will validate the skills and knowledge needed to customize Magento in these areas: core architecture, UI modifications, catalog, checkout, Magento Commerce features, and security.

The exam will also validate the ability to make architectural decisions and to forecast the impact of a customization, understanding of core mechanisms in the most important areas like price calculation for a product, checkout, and quote operations. The test is built for 2.2.x version of Magento Commerce software.

This exam consists primarily of scenario-based questions in a multiple-choice format.

This guide contains several sample questions at the end of the guide.

Exam topics and the percentage covered in the test.

- | | |
|--|-----|
| • Magento Architecture | 6% |
| • Magento UI | 7% |
| • Working with Databases | 14% |
| • Using the Entity-Attribute-Value (EAV) Model | 10% |
| • Developing with Adminhtml | 5% |
| • Customizing the Catalog | 23% |
| • Customizing the Checkout Process | 17% |
| • Magento Commerce Features | 13% |
| • Understanding Magento Security | 5% |

Topics and Objectives

1 Magento Architecture

1.1 Determine advanced uses of the Magento configuration system

- Understand how to create a custom config file. Demonstrate an understanding of the Magento Configuration files framework
- Understand how to create a custom config file with validation and a unique node that is overridden on merging
- Understand how to create a config file with a remote schema

1.2 Demonstrate an ability to design complex customizations using plugins and di.xml

- Plugins sort order, plugin on plugin scenario, plugin debugging techniques. Demonstrate an understanding of virtual types, shared objects, object instantiation process, proxies, factories
- How does an around plugin modify the plugin execution order?
- How do you debug a plugin that is not executed?
- Demonstrate Plugin on Plugin examples
- Which classes are instantiated outside of the ObjectManager so they cannot be customizing using di.xml?
- Demonstrate a use case for a virtual type (different instances of a class with a different set of arguments)

1.3 Demonstrate understanding of Magento events processing

- Demonstrate an understanding of the events processing flow. Influence of Staging on the event processing
- What is a modification of the event processing mechanism introduced by the staging module?

1.4 Demonstrate an ability to use the Magento command-line interface

- Create a new CLI command, emulate different areas within it
- Create a new CLI-command, configure it in di.xml, add optional/required options/keys
- Environment specification using Area class
- Environment emulation for a section of code

2 Magento UI

2.1 Demonstrate understanding UiComponents architecture

- UiComponent workflow, initialization, execution, configuration structure, data loading process
- Retrieving a UiComponent's instance from the uiRegistry
- Understand the difference between executing a data provider component and loading data
- Describe the role of UiComponent PHP classes
- Understand the uiClass instance, extending uiComponent

2.2 Demonstrate advanced use of Magento layouts

- Non-standard layouts, custom handles, debugging layouts
- Add a custom handle, obtain a list of handles loaded for a page
- Obtain the layout XML for a page
- Containers elements with a wrapping DIV tag
- Dynamically modify the layout tree

2.3 Demonstrate an ability to operate with Magento blocks and templates

- Block caching, fallback debugging, email templates, translations
- Cache all instances of the block, specific instance
- Assign an object to the email template. Render different images depending on a locale in the email template
- Identify the location of block instantiation
- Print out all places where Magento looks for a template
- Demonstrate an understanding of different types of translations working together (inline, phrase in JavaScript code, CSV file)

3 Working with Databases

3.1 Demonstrate understanding of the architectural layers of the database access classes, including models, repositories, and data mappers

- Models, resource models, and collections in Magento, their impact on performance. Repositories, SearchCriteria, WebAPI, WebAPI access, extension attributes
- How to create an entity that supports extension attributes
- How to implement SearchCriteria processing in the repository::getList method
- How to perform bulk save operations in Magento

- How to extend the Magento data object (Data API class) with an attribute that has values in a remote system
- How to extend existing WebAPI calls with a new parameter
- How to create a dynamic WebAPI ACL
- The difference between extension attributes and custom attributes

3.2 Demonstrate understanding of the staging workflow

- Staging modification to the Magento database operations (row_id, entity managers)
- How does data versioning work?
- Different possibilities of data versioning (row/table/database level) and how this is implemented in Magento
- The role of the entity manager
- High level staging implementation overview

3.3 Demonstrate an ability to use different types of setup scripts in Magento

- Schema and data setup scripts, uninstall scripts, recurring scripts, uninstall schema vs. uninstall data
- What happens when an uninstall script is executed: data version change, deleted tables, etc.
- Recurring scripts and their order in the setup:upgrade process
- Accessing areas and system configuration values in setup scripts

4 Using the Entity-Attribute-Value (EAV) Model

4.1 Describe the EAV data access process in Magento

- Getting an attribute instance, impact of attribute sets, large number of attributes and attribute sets
- What is the impact of 10,000 attribute sets? 1,000 attributes in a set?
- How to get information about an attribute
- How to perform attribute operations programmatically: assign it to a set/group, update properties, etc.

4.2 Describe the database tables for EAV entities and how to create them

- The EAV database structure, performance considerations, entity-level attribute properties (catalog_eav_attribute)
- Where are catalog-specific attribute properties stored and what are they used for?
- How does Magento store the attribute to attribute group association?
- What backend types are available? How do you add a new backend type?
- Specifics around static attributes

4.3 Demonstrate an ability to operate with attribute options

- Different ways to store attribute options. Using eav_attribute_option_* tables
- Config base, database base options
- The eav_attribute_option_table: tables that contain shared options between different entities, pros and cons of using the table

4.4 Demonstrate an ability to use non-catalog EAV entities

- Adding an attribute to Customer, Customer Address and Sales entities. Making an attribute visible in the Admin or the storefront. Pitfalls in attributes operations in non-catalog EAV attributes
- Adding an attribute to customers, saving and loading the attribute, problems related to the save process. What is the role of attribute sets and groups for customer attributes?
- Adding an attribute to customer addresses, the role of the "is_system" property and why it only works for the Customer Address entity
- How to make a customer or customer address attribute visible in the My Account, Checkout, and Admin pages
- What is the purpose of the SalesSetup class and why do you use the addAttribute method for sales entities?

5 Developing with Adminhtml

5.1 Demonstrate ability to use ACL

- Complex cases of ACL setup. WebAPI ACL, ACL process customization and debugging
- How to debug an ACL record
- How does a row-based ACL or IP-based ACL work in Magento?
- The connection between admin ACL and WebAPI ACL
- Different ways to access WebAPI resources including admin access

5.2 Demonstrate understanding of the admin login process and admin actions processing

- Admin login, customizing and debugging issues related to admins logging into Magento, the Admin Action class
- Debugging the login process
- Logging in an admin user programmatically
- Customizing the login process: for example, adding 2-factor authentication
- Operations performed by the Magento\Backend\App\Action class, for example, the secret key

5.3 Demonstrate an ability to create complex forms and grids

- Complex forms with custom elements and with tabs. Complex grids with custom columns and inline editing customizations
- Create custom elements for forms
- Create a form with tabs
- Create a form with a grid inside of a tab
- Forms for editing related/nested data
- Customization of inline editing in a grid; for example, a file uploader
- Bookmark filters selection for a grid
- Grid meta information: adding a new column that requires a join to another table

6 Customizing the Catalog

6.1 Demonstrate an ability to understand and customize Magento products

- Selecting the right product type for a given requirement (configurable with custom options, bundle with grouped). Deciding to use non-standard products: for example, for licenses, subscriptions, courseware, or glasses. Product relations (related, upsells).
- Select a product type for a subscription/subscription bundled with a physical product
- Select a product type for courseware
- Select a product type for glasses with a prescription
- Compare custom options with configurable products
- Configurable product with custom options for the associated simple products
- Bundled product with custom options for its associated simple products
- What is the related products database structure? Understand the performance impact of having many related products
- Compare related with upsells
- Programmatically access related products, custom options, configurable parameters
- Dynamic related products

6.2 Demonstrate an ability to perform complex operations with the Magento pricing framework

- Understand the pricing calculation and rendering framework. Which classes are involved in rendering/calculation? What is the role of indexing? How do different price modifiers work together?
- How is a price calculated on the product detail page, the product listing page? Price calculation classes. Relation to the price indexer

- The Magento\Framework\Price* component and its extension in the Catalog module
- How to render a product price: which class to use, which data needs to be provided
- Indexed price vs. prices calculated on the fly
- Price configuration: tier prices, special price, custom option, configurable adjustment, catalog rules, cart rules
- How to change the price rendering process for a given product type/product instance
- How to add a custom price adjustment to modify the calculation process. What happens if the price index is not aligned with this change?

6.3 Customize catalog price rules

- Programmatically create a catalog price rule, the impact of catalog price rules on performance, extending catalog price rule conditions with custom entities

6.4 Determine how to use Magento categories

- Advanced category features: hierarchy, custom attributes, impact on performance
- What happens if a project has many categories?
- Dynamic rules for the order of products in category
- The category is_anchor attribute and its effect on performance

6.5 Demonstrate an understanding of catalog indexers

- The indexing framework, the price indexer, the inventory indexer, the EAV indexer. How does Magento use indexed data?
- Estimate indexing customization efforts when making architectural decisions. Estimate indexing process complexity and time for different given conditions. The impact of indexing for frequent catalog updates.
- What steps does Magento perform when indexing? What is the role of the indexer_state table
- How to register a new indexer
- How does the price indexer work? Which events trigger it? How do different product types declare their indexers? How important is an order of indexers in price indexing?
- Inventory indexer overview, inventory indexing for different product types
- What is the scope of a price in the price index? How difficult is it to extend the scope of an index?
- Impact of many stores/websites on price indexing
- Custom price modifiers: Pros and cons of customizing the index versus adjusting the native features like price rules or custom options

6.6 Demonstrate understanding of catalog staging and its impact on the system

- Flow modifications introduced by staging (triggers, row_id, data versions). Staging-related modifications of the indexing process

- Issues related to different row_id and entity_id
- Catalog triggers

6.7 Demonstrate an understanding of the product search framework

- How to customize Elastic search

6.8 Demonstrate understanding of importing products and categories in Magento

- Frequent imports, massive imports, import with many attributes
- Issues related to a frequent import, for example every minute
- Compare importing products using the native import, save by model, or custom SQL
- Specifics of importing a catalog with many attributes and attribute sets
- Importing categories and product relations

7 Customizing the Checkout Process

7.1 Understand the Magento quote architecture and customizing quote-related functionality

- Quote-related objects, total models and the price calculation process, the add to cart process, custom add to cart operations, customizations of the price calculation, taxes and discount, various display settings
- The quote merge functionality
- Programmatically add a free gift when a certain condition is met
- Programmatically set a price for a product
- Taxes with discounts calculation
- The impact of many shopping cart price rules on performance
- Programmatically create shopping cart price rules
- Importing coupon codes
- Extend the shopping cart price rules with custom entities
- Programmatically separate line items in the shopping cart so there are two line items instead of one with qty=2
- Adding a new total model and evaluating its impact on taxes and discounts
- Shipping discounts behavior and customizations
- WebAPI for quote operations. Create a quote, add an item, create a coupon, add a discount

7.2 Demonstrate an ability to customize and extend the checkout process

- Checkout steps, the REST API, customizations of the checkout API, the order placement process. The impact of many concurrent order placements
- Adding a step to the checkout after the payment step, or between the payment and shipping steps
- Implementing a "one-click" checkout, evaluate possible pitfalls such as discounts being applied or canceled when the order is placed
- The checkout REST API: Modifying the native flow (separate calls to save payment and to place the order)
- Extending the checkout REST API. Adding new parameters to different API endpoints. Using extension attributes
- Issues related to simultaneous order placement, inventory locking
- Determining the exact moment when the stock is decremented during an order placement
- Customizing the order placement such that it uses message queues
- Horizontal sharding of orders tables to improve order placement capacity. What challenges need to be resolved?

7.3 Create and debug shipping and payment methods in Magento

- Different types of payment methods: gateway, offline, hosted. The gateway payment methods framework. The payment method availability logic. The shipping rates calculation process, debugging shipping rates and table rates customizations
- The gateway framework vs. AbstractMethod
- The structure of offline payment methods. What makes them "offline"?
- Partial invoices/refunds for payment methods
- Add a hosted-type payment method (redirects, custom order review page)
- Add a new shipping method. Customize the logic for getting a list of available shipping methods
- The shipping rate calculation flow. Debug shipping rates, identify plugins that influence the shipping rate calculation process
- Customizing table rates. Add a new "column" to the "table", change the logic of selecting the rate.
- Gateway shipping methods. Remote call flow. How to avoid the remote call if it is unnecessary

8 Magento Commerce Features

8.1 Demonstrate an ability to use message queues

- Create a listener/publisher. Use cases for using message queues
- How to register a listener/publisher for a queue
- How to configure a queue
- What is a use case to use message queues?

8.2 Demonstrate understanding of customer segmentation

- Describe the customer segments functionality, its use cases, impact on performance, and programmatical operations with customer segments
- Programmatically create a customer segment
- Extend customer segments with new entities or attributes
- Understand the database structure of customer segments

8.3 Demonstrate understanding of advanced capabilities in Magento Commerce

- Store credits, reward points, RMA, gift cards
- Compare RMA with refunds
- Customizing the RMA process
- Customizing store credits/reward points accrual/spending

8.4 Demonstrate understanding of target rules

- Customer rules database structure, use cases, comparison to other product relations, operate with target rules programmatically
- Target rules vs. related products
- Extending target rules with a custom attribute or a custom entity
- Create a rule programmatically, understand the database structure of a rule
- What is the performance impact of having many target rules in the system?
- How does editing a product or adding new products affect existing target rules?

9 Understanding Magento Security

9.1 Demonstrate understanding of frontend security with Magento

- Filter input and escape output; password and sensitive data hashing; validate user file uploads; how to prevent cross site scripting vulnerabilities
- How to validate field values before inserting them into the database
- How to escape output to remove HTML tags
- Using secure encryption and hashing functions to store sensitive values in the database
- Validate file uploads, the file type, the file contents, and the file metadata

9.2 Demonstrate understanding Adminhtml security with Magento

- CSRF tokens; stored XSS; adminhtml secret key; security configuration; securing email from injection; preventing admin privilege escalation

- How to prevent CSRF attacks; the importance of the form_key field in forms
- How is the admin secret key generated in URLs?
- Security related admin configurations
- Security by obscurity, the custom admin path

9.3 Demonstrate understanding of different types of attacks and preventing them with Magento

- Remote code execution; local and remote file inclusions; session hijacking; SQL injection; insecure functions; directory traversal attacks
- PHP functions that should never be used, per Magento recommendations (eval, serialize, etc.)
- How to prevent directory traversals attacks when uploading a file
- Importance of the HttpOnly property when setting a cookie
- Serving Magento from the base vs. the pub/ directory
- Retrieving the user IP from the REMOTE_ADDR header vs. the X-Forwarded-For header
- File operations influenced by user-submitted request parameters, how to stop directory traversal attacks and restrict access to dirs/files
- How to write secure SQL queries

Magento 2 Certified Professional Developer Plus Exam Example Questions

See the Answer Key following the questions for answers and references.

Question 1

In your phtml template file you need to output a URL inside a JavaScript context.

```
var url = '<?= /* code here */ ?>';
```

Which two methods allow you to keep the output XSS-safe?

- A. `escapeUrl`
- B. `escapeHtmlAttr`
- C. `escapeHtml`
- D. `escapeJs`

Question 2

You are working on a custom form in the Admin and the form is too lengthy. To organize the form better, you decide to group the fields into multiple tabs.

How do you achieve this?

- A. Create a plugin for the method
`MyCompany\MyModule\Block\Adminhtml\Form\Edit\Tabs::toHtml()`
- B. Add the fields into `<tab>` nodes in the `customer_account_edit.xml` layout file
- C. Add the fields into a `<fieldset>` node in the existing form in the `ui_component` XML file
- D. Add a new form for the field group in the `ui_component` XML file

Question 3

You are making some changes to your existing action controller

`\MyCompany\MyModule\Controller\Index\Index`

```
public function __construct(
    \Magento\Framework\App\Action\Context $context,
    <new dependency here>,
    \Magento\Framework\View\Result\PageFactory $resultPageFactory
) {
```

You want to inject a new dependency to the controller, but you encounter the following error after flushing the cache and reloading the page:

Recoverable Error: *Argument 2 passed to MyCompany\MyModule\Controller\Index\Index::__construct() must be an instance of <new dependency class> ...*

How do you fix the error?

- A. New dependencies must be added at the end of the constructor signature because dependencies cannot be added in the middle of existing constructors
- B. Remove the generated child class from generated/code that is calling the parent constructor with the old signature
- C. Clean the config cache that contains all constructor signatures
- D. Configure the new argument in di.xml for the controller class

Question 4

You are working with an OMS that requires you to add an attribute to the order API.

How do you add a field to the existing sales API?

- A. You update `Magento\Sales\Api\OrderManagementInterface` and `Magento\Sales\Api\Data\OrderInterface` to add your field
- B. You add an extension attribute to `Magento\Sales\Api\Data\OrderInterface` to include the new field
- C. You create an install script to add a column to the sales table and Magento will automatically pull in the information
- D. You create an `etc/webapi.xml` file and add the new field as an item to the route, as shown in the following code:

```
<route url="/V1/orders" method="GET">
    <service class="Magento\Sales\Api\OrderRepositoryInterface" method="getList">
        <item name="my_new_attribute" xsi:type="string" />
    </service>
    <resources>
        <resource ref="Magento_Sales::sales" />
    </resources>
</route>
```

Question 5

You are exploring the customer segment module and find this code in frontend/di.xml:

```
<type name="Magento\Framework\View\Layout">
    <plugin name="customer-segment-session-depersonalize"
        type="Magento\CustomerSegment\Model\Layout\DepersonalizePlugin" sortOrder="15"/>
</type>
```

What effect does this plugin have for customer segments?

- A. It passes the segment information to the Knockout JS model from the customer session
- B. It passes the segment information to the HttpContext from the customer session
- C. It cleans the intermediate data of the segment-website and the segment-customer mapping in the tables to improve performance
- D. It cleans the segment and customer related entities from the session

Answer Key

Question 1

Answers: A and D

Reference:

<https://devdocs.magento.com/guides/v2.2/frontend-dev-guide/templates/template-security.html>

Question 2

Answer: C

Reference:

<https://www.magestore.com/magento-2-tutorial/how-to-insert-new-tab-into-customer-form-in-backend-magento-2/>

Question 3

Answer: B

Question 4

Answer: B

Question 5

Answer: D