PLTW IED UNIT 6 TEST ANSWERS Latest Edition

Understanding the Importance of PLTW IED Unit 6 Test Answers

PLTW IED Unit 6 Test Answers serve as a critical resource for students navigating the Principles of Engineering (POE) course within the Project Lead The Way (PLTW) curriculum. These answers not only help students assess their understanding of complex engineering concepts but also prepare them for higher-level problem-solving and practical application. As students progress through the unit, mastering the content becomes essential for success in both assessments and future engineering endeavors. This article aims to provide an in-depth overview of the key topics covered in Unit 6, common questions, and effective strategies for utilizing test answers responsibly and effectively.

Overview of PLTW IED Unit 6

Unit 6 Objectives and Focus Areas

Unit 6 of the PLTW Introduction to Engineering Design (IED) course primarily focuses on mechanisms and their applications in engineering. The core objectives include understanding different types of mechanisms, analyzing their function, and designing systems that incorporate these mechanisms. Key topics covered are:

- Types of mechanisms such as gear trains, linkages, and cams
- Mechanical advantage and efficiency in mechanisms
- Design and analysis of mechanisms using free-body diagrams
- Application of mechanisms in real-world engineering problems
- Use of CAD software to model and simulate mechanisms

Importance of Accurate Test Preparation

Given the complexity of these topics, students often seek out **PLTW IED Unit 6 test answers** to aid their study process. While these answers can be valuable for review, they should be used as a supplement to understanding rather than a shortcut. Proper preparation involves mastering concepts, practicing problem-solving, and applying knowledge to design challenges.

Common Topics and Questions Covered in the Unit 6 Test

Types of Mechanisms and Their Functions

One of the fundamental areas assessed in the test involves identifying various mechanisms and understanding their purposes:

- **Gear Trains:** Understanding how gears transmit rotational motion and change speed or torque.
- **Linkages:** Analyzing systems of interconnected components that transfer or transform motion.
- **Cams and Followers:** Examining how cams convert rotary motion into linear or oscillating motion.

Mechanical Advantage and Efficiency Calculations

Questions often require students to calculate the mechanical advantage (MA) and efficiency of different mechanisms:

- Formulas for MA: *MA = Output Force / Input Force*
- Calculating efficiency: *Efficiency = (Mechanical Advantage / Actual Advantage) × 100%*
- Interpreting results to optimize mechanism design

Design and Analysis Using Free-Body Diagrams

Students may be asked to draw and analyze free-body diagrams to determine forces acting on components:

- Identifying forces such as tension, compression, and friction
- Applying Newton?s laws to solve for unknown forces
- Understanding how forces influence the movement and stability of mechanisms

Real-World Engineering Applications

Test questions may also focus on applying theoretical knowledge to practical situations, such as:

- Designing a mechanism to perform a specific task
- Analyzing a mechanism?s function within a machine
- Evaluating the efficiency and practicality of proposed designs

Strategies for Using PLTW IED Unit 6 Test Answers Effectively

Responsible Use of Test Answers

While it might be tempting to rely solely on **PLTW IED Unit 6 test answers**, it's crucial to approach them ethically and responsibly:

- Use answers as a learning tool to identify areas where understanding is lacking.
- Cross-verify answers with course materials, textbooks, and instructor guidance.
- Avoid copying answers verbatim; instead, analyze the reasoning behind each solution.

Complementing Test Answers with Active Learning

To truly grasp the content, students should:

- Practice drawing and analyzing mechanisms manually.
- Engage in hands-on activities, such as building models or using CAD software.
- Participate in group discussions to challenge and refine understanding.
- Review past quizzes and homework to reinforce learning.

Preparing for the Test

Effective preparation involves a combination of studying, practice, and review:

- Review all vocabulary terms related to mechanisms.
- Practice solving mechanical advantage and efficiency problems.
- Complete practice tests or sample questions to familiarize oneself with question formats.
- Seek help from instructors or peers on challenging topics.

Additional Resources for Success in Unit 6

Official PLTW Resources

PLTW provides numerous resources to aid student learning, including:

- Curriculum guides and lesson plans
- Student handouts and practice problems
- Video tutorials explaining mechanisms and analysis techniques

Supplementary Materials and Online Platforms

Students can also utilize other tools to enhance understanding:

- CAD software such as Autodesk Inventor for modeling mechanisms
- Educational websites offering interactive simulations
- YouTube channels dedicated to engineering concepts and tutorials

Conclusion: Mastering the Concepts Beyond Test Answers

While **PLTW IED Unit 6 test answers** can serve as valuable study aids, they should be integrated into a broader learning strategy emphasizing comprehension and application. Understanding the principles behind mechanisms, practicing problem-solving, and engaging in hands-on activities will ultimately lead to greater success and a deeper appreciation of engineering design. Remember, the goal of the course is to foster critical thinking and innovative problem-solving skills?traits that cannot be fully developed through rote memorization of answers alone. Use test answers responsibly, seek out additional resources, and strive to understand the 'why' behind every concept for a truly rewarding learning experience.

PLTW IED Unit 6 Test Answers: A Comprehensive Guide for Success

When preparing for the PLTW IED Unit 6 Test, students often seek detailed insights and strategic approaches to confidently navigate the assessment. Understanding the core concepts, common question types, and effective study strategies can make a significant difference in achieving a high score. This guide aims to provide a thorough breakdown of key topics, typical answers, and tips to help you excel in your evaluation.

Understanding the Focus of Unit 6 in PLTW IED

PLTW (Project Lead The Way) Innovation and Engineering Design (IED) is a rigorous course that introduces students to the engineering design process, CAD modeling, and systems thinking. Unit 6 typically centers on advanced CAD applications, including assemblies, working with constraints, and preparing detailed technical drawings.

Key themes in Unit 6 often include:

- Assembly modeling
- Constraints and mates
- Exploded views and section views

- Drawing annotations
- Troubleshooting CAD models
- Real-world application of design principles

A solid grasp of these topics is essential for success on the test.

Common Topics and Concepts Covered in the Test

Understanding what is typically tested can help you focus your study efforts. Below are core concepts and skills often assessed in the Unit 6 test.

1. Assembly Modeling and Construction

- Creating assemblies from individual parts
- Using the assembly environment to position components
- Understanding the difference between parts and assemblies
- Saving and managing large assemblies effectively

2. Mates and Constraints

- Types of mates: coincident, concentric, distance, and angle
- Applying mates to correctly assemble components
- Troubleshooting over-constrained or under-constrained assemblies
- Recognizing the effect of mates on motion and functionality

3. Exploded Views and Section Views

- Creating exploded views to visualize assembly order
- Generating section views to reveal internal features
- Using exploded views for presentation and documentation

4. Technical Drawings and Annotations

- Creating detailed drawings from assemblies
- Adding dimensions, notes, and labels
- Understanding standard drawing conventions and symbols
- Exporting drawings for manufacturing or presentation

5. Troubleshooting and Optimization

- Identifying and fixing common assembly errors
- Improving model efficiency
- Ensuring models meet design specifications

Sample Questions and Model Answers

To illustrate what to expect, below are sample question types with detailed explanations and answers.

Question 1: What is the purpose of applying mates in an assembly?

Answer:

Mates are used to define the positional relationship between parts within an assembly. They constrain parts relative to each other, ensuring correct alignment and movement. Common types include coincident (surfaces or points), concentric (axes), distance (fixed gap), and angle (specific rotation). Proper use of mates ensures the assembly functions as intended and accurately reflects the real-world design.

Question 2: How do you create an exploded view in CAD software?

Answer:

To create an exploded view:

- Select the assembly or individual components.
- Use the "Explode" or "Exploded View" tool in your CAD software.
- Drag components along axes or planes to separate them in a logical manner, showing the order of assembly.
- Adjust distances for clarity.
- Optionally, add annotations or arrows to illustrate assembly steps.
- Save the exploded view as part of your drawing or presentation.

Question 3: What are the key considerations when adding dimensions to a technical drawing?

Answer:

Key considerations include:

- Ensuring all critical features are dimensioned for manufacturing
- Using appropriate dimensioning standards (e.g., ASME or ISO)
- Avoiding clutter by placing dimensions clearly and logically
- Using extension lines and leader lines correctly
- Including tolerances where necessary
- Verifying that dimensions are consistent with the CAD model

Strategies for Success on the Unit 6 Test

Achieving a high score requires more than memorizing answers; it involves strategic preparation and understanding. Here are essential tips:

1. Review Key Concepts and Definitions

- Understand the purpose and types of mates
- Be familiar with common CAD tools used for assemblies
- Know the steps to create exploded and section views
- Recognize standard drawing symbols and annotations

2. Practice Hands-On CAD Exercises

- Complete all assigned CAD modeling tasks
- Practice creating assemblies from multiple parts
- Experiment with applying different mates
- Generate exploded views and detailed drawings
- Revisit your assignments to reinforce skills

3. Use Practice Tests and Quizzes

- Find or create practice questions based on previous assessments
- Time yourself to simulate test conditions
- Review incorrect answers to understand mistakes

4. Develop a Systematic Approach During the Test

- Read each question carefully
- Identify whether it asks for a concept, procedure, or identification
- Use process-of-elimination for multiple-choice questions
- Sketch quick diagrams if needed to visualize solutions
- Manage your time to complete all questions confidently

5. Prepare Your Workspace and Tools

- Ensure your CAD software is functioning properly
- Have your notes or cheat sheets (if allowed) organized
- Keep your workspace free of distractions

Additional Resources for Mastery

To supplement your study, consider utilizing:

- Online tutorials specific to your CAD software (SolidWorks, Inventor, etc.)
- YouTube channels focused on CAD modeling and assembly
- Class notes and project documentation
- Study groups to discuss challenging concepts
- Practice assignments provided by your instructor

Conclusion: Key Takeaways for the PLTW IED Unit 6 Test

Success on the PLTW IED Unit 6 Test hinges on a thorough understanding of assembly modeling, constraints, and technical drawing principles. Focus your preparation on mastering the use of mates, creating clear exploded views, and annotating drawings accurately. Practice hands-on CAD exercises regularly, review key concepts, and develop a strategic approach to answering questions efficiently. With diligent preparation and a clear understanding of the core topics, you'll be well-positioned to excel on your test and demonstrate your engineering design skills confidently.

QuestionAnswer What are common topics covered in the PLTW IED Unit 6 test? The Unit 6 test typically covers topics such as geometric modeling, dimensioning and tolerancing, and creating technical drawings using CAD software. How can I prepare effectively for the PLTW IED Unit 6 test? To prepare, review your class notes, complete practice problems, use online tutorials for CAD software, and ensure you understand key concepts like geometric constraints and dimensioning standards. Are there specific answers or solutions available for PLTW IED Unit 6 test questions? Official answer keys are usually provided by teachers or through authorized study resources. It's best to use these to verify your understanding rather than seeking out unofficial answer sets. What

skills are assessed in the PLTW IED Unit 6 test? The test assesses skills such as creating and modifying CAD models, understanding geometric constraints, applying dimensioning standards, and interpreting technical drawings. Where can I find reliable resources to study for the PLTW IED Unit 6 test? Reliable resources include your class textbook, the PLTW student portal, online tutorials related to CAD and engineering drawings, and study groups with classmates.

Related keywords: PLTW IED Unit 6 test, PLTW IED Unit 6 solutions, PLTW IED Unit 6 practice questions, PLTW IED Unit 6 review, PLTW IED Unit 6 quiz answers, PLTW IED Unit 6 concepts, PLTW IED Unit 6 key, PLTW IED Unit 6 assessment, PLTW IED Unit 6 exam tips, PLTW IED Unit 6 troubleshooting

Microsoft test manager tutorial

Microsoft Test Manager Tutorial: A Comprehensive Guide to Efficient Test Management

In the world of software development, ensuring the quality and reliability of your applications is paramount. Microsoft Test Manager (MTM) is a powerful tool designed to streamline the testing process, enabling teams to plan, execute, and track testing efforts with ease. Whether you're a beginner or looking to enhance your testing workflows, this **Microsoft Test Manager tutorial** will provide you with a step-by-step guide to harnessing MTM's full potential for your projects.

Understanding Microsoft Test Manager

Before diving into the tutorial, it's essential to grasp what Microsoft Test Manager is and how it integrates into the broader Visual Studio ecosystem.

What is Microsoft Test Manager?

Microsoft Test Manager is a test management tool integrated with Visual Studio Team Services (VSTS) and Azure DevOps. It provides an intuitive interface for managing test plans, creating and executing test cases, and tracking testing progress. MTM supports both manual and exploratory testing, making it versatile for various testing scenarios.

Key Features of Microsoft Test Manager

- Test Planning: Create and organize test plans, test suites, and test cases.
- Test Execution: Execute manual tests and record results efficiently.

- Test Tracking: Monitor testing progress and generate detailed reports.
- Exploratory Testing: Conduct ad-hoc testing sessions with session-based testing capabilities.
- Integration: Seamlessly connects with Azure DevOps for continuous testing workflows.

Setting Up Microsoft Test Manager

Getting started with MTM involves installing and configuring the tool for your environment.

Prerequisites

- Visual Studio Enterprise or Professional edition (with test management features).
- Azure DevOps account or TFS (Team Foundation Server) setup.
- Appropriate permissions to access test management features.

Installing Microsoft Test Manager

- Download the Visual Studio Installer from the official Microsoft website.
- Choose the edition that includes testing tools (e.g., Visual Studio Enterprise).
- During installation, select the "Testing Tools" workload to install MTM.
- Complete the installation and launch Visual Studio.
- Connect to your Azure DevOps project or TFS server within Visual Studio.

Creating and Managing Test Plans

A well-structured test plan is the foundation of successful testing. MTM simplifies organizing your testing efforts through test plans and suites.

Creating a Test Plan

- Open Microsoft Test Manager from Visual Studio or the Azure DevOps portal.
- Navigate to the "Test Plans" section.
- Click "New Test Plan" and provide a descriptive name, description, and start/end dates.
- Associate the test plan with a specific build or release if needed.
- Save the test plan to begin adding test cases.

Organizing Test Suites

Test suites help categorize test cases based on features, modules, or testing strategies.

- **Static Test Suites:** Manually organize test cases into logical groups.
- **Requirement-Based Test Suites:** Link test cases to specific requirements or user stories.
- **Query-Based Test Suites:** Dynamically generate test cases based on queries.

Adding Test Cases

- Within your test suite, click "New Test Case" or import existing cases.
- Define the test case steps, expected results, and associated requirements.
- Assign priority, owner, and other metadata to facilitate management.
- Save the test case to include it in your suite.

Executing Tests with Microsoft Test Manager

Once your test cases are organized, the next step is executing tests and recording results.

Manual Test Execution

- Open the test plan and select the test suite to execute.
- Click "Run" on the test case you wish to execute.
- Follow the test steps as documented, marking each step as "Passed" or "Failed."
- If a test fails, record detailed bug information directly from the test runner.
- Complete the test run, and the results will be saved automatically.

Using Action Recording and Data Collection

MTM allows capturing detailed logs and screenshots during test execution, aiding in defect analysis and reproducibility.

Exploratory Testing

For ad-hoc testing, MTM offers session-based testing:

- Schedule a testing session with session details.
- Conduct testing while documenting observations and findings.
- Record bugs and issues discovered during the session.

Tracking and Reporting Testing Progress

Effective test management requires insight into testing status and quality metrics.

Monitoring Test Results

- Navigate to the "Test Results" section in MTM or Azure DevOps.
- Review individual test case outcomes and overall progress.
- Filter results by tester, status, or test plan for detailed analysis.

Generating Reports

MTM provides various built-in reports to visualize testing status:

- Test Results Summary
- Test Case Progress and Trends
- Bugs and Defects Reports

Integrating with Bug Tracking

During testing, bugs can be logged directly from MTM, linked to specific failed test cases, ensuring traceability and quick resolution.

Advanced Tips and Best Practices

Maximize your testing efficiency with these expert tips:

Automate Repetitive Tests

Integrate MTM with automated testing frameworks like MSTest, NUnit, or Selenium to run automated tests alongside manual efforts.

Maintain Test Cases Regularly

Keep your test cases updated with application changes to ensure relevance and accuracy.

Use Tags and Filters

Leverage tags and filters to quickly locate and execute specific test cases based on criteria like priority, feature, or owner.

Collaborate Effectively

Encourage team collaboration by sharing test plans and results, and conducting regular review meetings to discuss testing progress.

Conclusion

Microsoft Test Manager is an essential tool for teams aiming to implement structured and efficient testing workflows. From creating comprehensive test plans and organizing test suites to executing tests and tracking outcomes, MTM provides a centralized platform that enhances test visibility and quality assurance. By following this **Microsoft Test Manager tutorial**, you can streamline your testing process, improve defect detection, and deliver higher-quality software products. Remember to stay updated with the latest features and best practices to maximize your testing success with MTM.

Microsoft Test Manager tutorial: A Comprehensive Guide to Streamlining Your Testing Process

Microsoft Test Manager (MTM) is a powerful tool integrated within the Azure DevOps suite, designed to facilitate efficient test planning, management, and execution. Whether you are a QA professional, a developer, or a project manager, mastering MTM can significantly enhance your testing workflows, improve defect detection rates, and ensure higher quality software releases. This tutorial aims to provide an in-depth overview of Microsoft Test Manager, guiding you through its features, setup, best practices, and real-world applications.

Introduction to Microsoft Test Manager

Microsoft Test Manager is a dedicated testing management environment that helps teams plan, execute, and track testing activities seamlessly. Originally part of Visual Studio Test Professional, MTM is now integrated within Azure DevOps, offering a unified platform for Agile testing, exploratory testing, and manual test case management.

Key Features of Microsoft Test Manager

- Test Planning: Create and organize test plans, test suites, and test cases.
- Test Execution: Run manual tests, record results, and capture screenshots.
- Test Management: Track defects, manage test configurations, and generate reports.
- Integration: Seamlessly connect with Azure DevOps for continuous integration and automated testing workflows.
- Exploratory Testing: Record exploratory sessions with detailed notes and recordings.

Setting Up Microsoft Test Manager

Before diving into testing, proper setup of MTM is essential.

Prerequisites

- A valid Azure DevOps account with appropriate permissions.
- Installed Visual Studio Test Professional or access via Azure DevOps.
- Access to a test environment or lab machines.

Installation and Configuration

- Download and Install: Download Microsoft Test Manager from the Visual Studio downloads page or via Azure DevOps.
- Connect to Azure DevOps: Launch MTM and connect it to your Azure DevOps project by signing in with your credentials.
- Configure Test Environments: Set up test machines, configurations, and network environments to align with your testing needs.

Tips for Effective Setup

- Organize your test plans hierarchically for easier management.
- Maintain a clear mapping between test environments and real-world configurations.
- Regularly update test artifacts to ensure they reflect current application versions.

Creating and Managing Test Plans

Test planning is the foundation of effective testing.

Creating a Test Plan

- In MTM, navigate to the "Test Plans" section.
- Click "New Test Plan" and provide a descriptive name, start/end dates, and any relevant details.
- Assign ownership and stakeholders.

Organizing Test Suites

- Static Test Suites: Manually added test cases grouped logically.
- Requirement-based Suites: Linked to user stories or requirements for traceability.
- Query-based Suites: Dynamic grouping based on queries.

Best Practices

- Break down large test plans into smaller, manageable suites.
- Link test cases to user stories or bugs for better traceability.
- Regularly review and update test plans to reflect current project scope.

Designing and Managing Test Cases

Creating effective test cases is critical to uncovering defects early.

Writing Test Cases

- Clear, concise steps with expected results.
- Use descriptive titles and tags for easy filtering.
- Include preconditions and postconditions.

Reusing Test Cases

- Modularize test steps for reuse across different test cases.
- Attach relevant documentation, screenshots, or scripts.

Organizing Test Cases

- Group related test cases into shared test suites.
- Use labels and tags for categorization.

Tips for Effective Test Cases

- Prioritize test cases based on risk and impact.
- Keep test cases up-to-date with application changes.
- Incorporate exploratory testing notes within test cases or as separate sessions.

Test Execution and Result Recording

Executing tests efficiently and accurately recording results is vital.

Running Manual Tests

- Select a test case from your test suite.
- Follow each step, observing the actual behavior.
- Record outcomes: Passed, Failed, Blocked, or Not Applicable.
- Capture screenshots or record videos if needed.

Recording Defects

- Link defects directly to failed test cases.
- Provide detailed descriptions, steps to reproduce, and severity.
- Attach logs or screenshots to aid debugging.

Managing Test Runs

- Use test configurations to run multiple test cases under different environments.
- Schedule and assign test runs to team members.
- Monitor real-time progress and results.

Pros and Cons of Test Execution Features

Pros:

- Streamlined process for manual testing.
- Rich media capture for detailed documentation.
- Easy defect linkage and traceability.

Cons:

- Manual process can be time-consuming for large test suites.
- Limited automation capabilities within MTM itself.

Integrating Automated Testing with Microsoft Test Manager

While MTM excels at manual testing, integration with automated testing frameworks enhances overall efficiency.

Integration with Visual Studio Test Automation

- Use Visual Studio Test tools to develop automated test scripts.
- Link automated tests to test cases in MTM.
- Run automated tests as part of continuous integration pipelines.

Benefits of Integration

- Reduces manual effort.
- Ensures consistency between manual and automated testing.
- Facilitates comprehensive test coverage.

Limitations

- Setup can be complex for beginners.
- Requires scripting knowledge for automation.

Reporting and Tracking

Effective reporting provides insights into testing progress and quality metrics.

Built-in Reports

- Test Run Summary
- Test Results Trend
- Defect Status and Age
- Requirements Traceability Matrix

Custom Reports

- Use Azure DevOps Analytics or Power BI for tailored dashboards.

- Export data for external analysis.

Best Practices

- Regularly review reports to identify bottlenecks.
- Use metrics to prioritize testing efforts.
- Maintain up-to-date dashboards for stakeholder visibility.

Best Practices for Using Microsoft Test Manager

- Plan Early: Incorporate testing early in the development lifecycle.
- Maintain Test Artifacts: Keep test cases and plans updated with application changes.
- Leverage Linkages: Connect requirements, test cases, defects, and build versions.
- Automate Where Possible: Use automation to handle repetitive and regression testing.
- Collaborate: Engage team members through shared test plans and results.
- Review Regularly: Conduct test reviews and retrospectives for continuous improvement.

Common Challenges and How to Overcome Them

Challenge: Managing Large Test Suites

Solution: Break down into smaller, manageable suites; use query-based suites for dynamic grouping.

Challenge: Keeping Test Cases Up-to-date

Solution: Establish a review cycle aligned with development sprints; assign ownership.

Challenge: Integration Complexity

Solution: Invest in automation and continuous integration pipelines; use documentation and training.

Challenge: Limited Automation within MTM

Solution: Use external automation tools integrated with Azure DevOps, such as Selenium or Coded UI.

Conclusion

Microsoft Test Manager is a robust tool that, when used effectively, can significantly boost your testing efficiency, coverage, and traceability. Its comprehensive features for test planning, execution, defect management, and reporting make it indispensable for teams adopting Agile and DevOps practices. While there are challenges, especially around automation and managing large test repositories, with proper setup, training, and best practices, MTM can become a cornerstone of your software quality assurance process.

By following this tutorial, you should now have a clear understanding of how to leverage Microsoft Test Manager to streamline your testing operations, improve collaboration, and ultimately deliver higher quality software to your users. Remember, continuous learning and adaptation are key to maximizing the benefits of MTM in your projects.

QuestionAnswer What are the main features of Microsoft Test Manager (MTM)? Microsoft Test Manager (MTM) provides features such as test planning, manual test execution, test case management, bug tracking integration, and collaboration tools to streamline the testing process within Visual Studio and Azure DevOps. How do I create and organize test plans in Microsoft Test Manager? In MTM, you can create test plans by navigating to the 'Test Plans' hub, clicking 'New Test Plan,' and defining its name and details. You can then add test suites and test cases to organize tests based on requirements, features, or test types for better management. Can I automate tests using Microsoft Test Manager, and how is it integrated with other tools? While MTM primarily supports manual testing, it integrates seamlessly with Visual Studio and Azure DevOps, enabling automation through test scripts and frameworks like MSTest, Selenium, or CodedUI. Automated tests can be linked to test cases for comprehensive test management. What are the best practices for using Microsoft Test Manager effectively? Best practices include maintaining detailed and reusable test cases, organizing tests into logical suites, utilizing shared steps for common actions, integrating with bug tracking, and regularly updating test plans based on project changes to ensure thorough testing coverage. Is Microsoft Test Manager suitable for Agile development environments? Yes, MTM is well-suited for Agile teams as it supports iterative testing, easy integration with Azure DevOps Agile tools, and flexible test planning, allowing teams to adapt testing activities to sprint cycles and continuous delivery workflows.

Related keywords: Microsoft Test Manager, TFS testing, test planning, test case management, automated testing, test execution, bug tracking, test lab management, test reporting, test automation tools

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