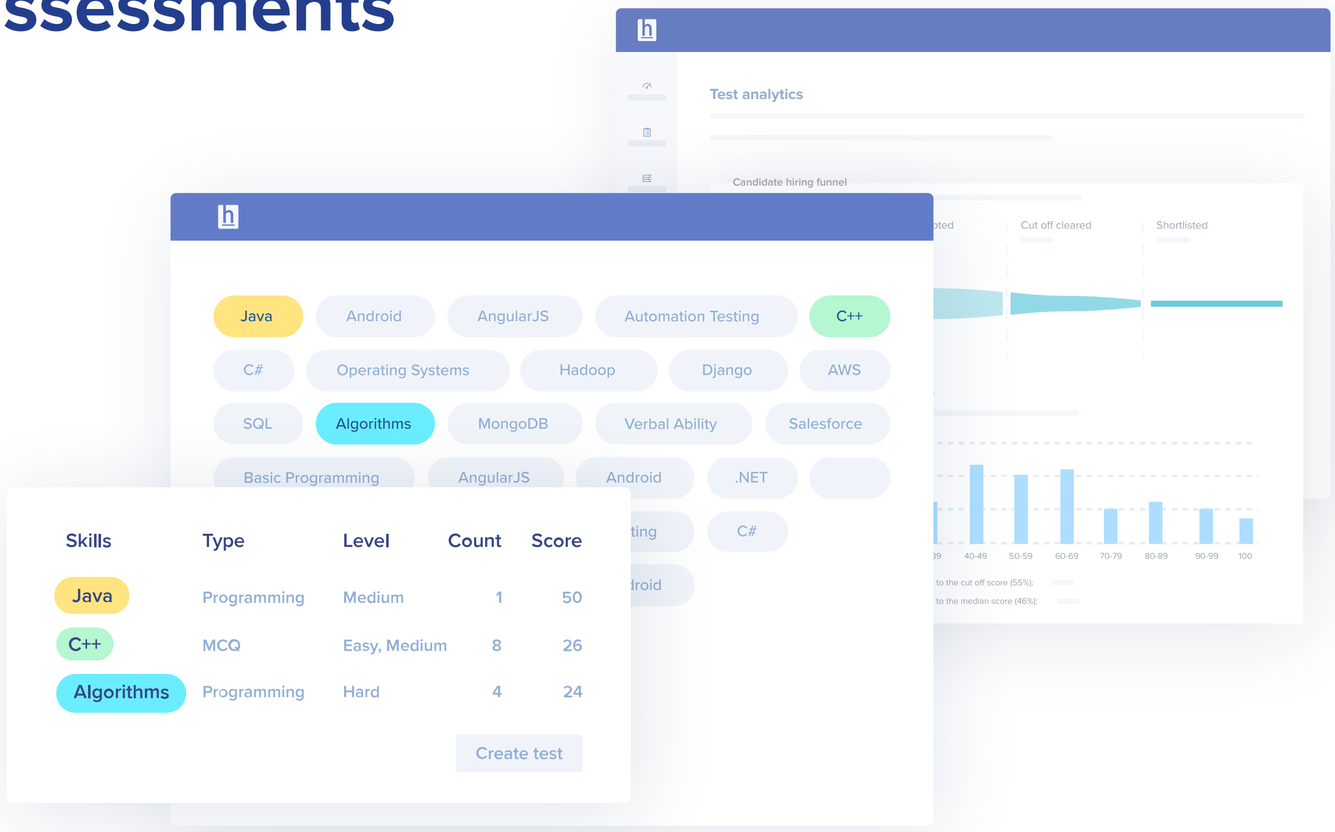
hackerearth

HackerEarth: Validity and reliability of assessments



Skills	Type	Level	Count	Score
Java	Programming	Medium	1	50
C++	MCQ	Easy, Medium	8	26
Algorithms	Programming	Hard	4	24

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Overview

HackerEarth Assessment is a technical skill assessment software that allows you to automatically evaluate the technical skills of applicants through online coding tests. It is used to improve the recruiting process by making it scalable and skill-driven. It is also used by organizations for skill-mapping and talent benchmarking.

HackerEarth Assessment contains an exhaustive questions library, supports 38+ programming languages, and has an in-built code evaluation engine to evaluate submissions automatically.

It also helps you reduce the time spent in filtering and shortlisting valid applicants and makes the process objective because it is skill-based.

Using this software, you can create tests that are based on specific skills or job roles for which you want to assess applicants automatically.

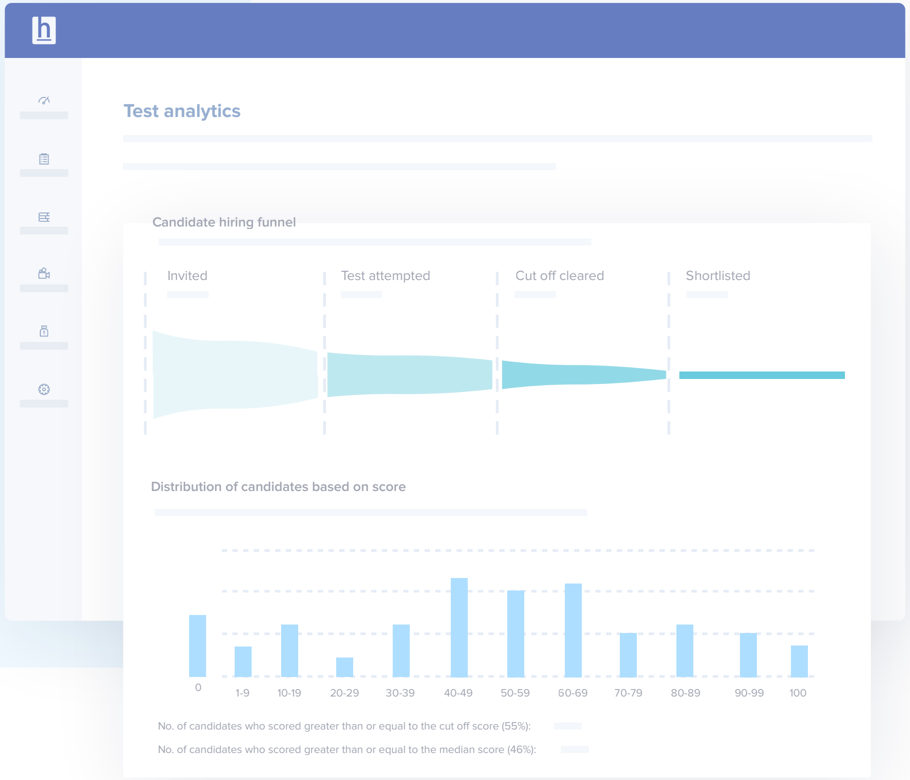
Purpose

In today's competitive marketplace, one of the main challenges faced by organizations is to hire the right personnel for the number of jobs in the organization. This is where a skill-assessment software with a library of questions is helpful.

The purpose of this document is to provide information about the validity and reliability of HackerEarth's assessments to hiring managers and human resource professionals.

Assessments

An assessment comprises various types of questions used to test applicants for a specific role. You can also use these assessments internally to assess the level of knowledge of your current employees. An assessment is used to measure an individual's skills and their eligibility for a specific job. In this document, from here onwards, test is used as a generic term to refer to an assessment that contains questions and is used to determine an individual's eligibility for a job in an organization.



No. of candidates who scored greater than or equal to the cut off score (55%):

No. of candidates who scored greater than or equal to the median score (46%):

HackerEarth's questions and tests are checked for validity and reliability by our internal team and external SMEs or connections. The internal team of HackerEarth consists of the following:

- Problem Setting team: This team is required to create all the questions that are added in the library.
- Problem Testing team: This team is required to test all the questions that are created and added to the library.

Valid tests

The validity of a test is determined by whether the skills that are being assessed in the test are related to the job requirements. Tests are used to establish a relationship between an applicant and the job. An applicant’s score on a test is directly related to the abilities that will enable them to fulfill the job requirements. For example, if your test has programming questions, restricted to Python 3, then you will be able to assess the applicant's ability to code in Python 3 along with other key skills.

Why is it important to have valid tests?

Valid tests are important because of the following reasons:

- Provide information about the applicant based on their test score. A valid test derives a relationship between test performance and job performance. Based on the test score, you can conclude that applicants with a high score are more suited for the job than applicants with a low score

- Measures the usefulness of the test to fulfill your job requirements.

- Reduces the time that you spend on shortlisting applicants.

Reliable tests

The reliability of a test is based on its dependability and consistency of assessing applicants based on specific skills. A test that yields similar scores for the same group of applicants who repeat the test is considered reliable. If a test cannot produce consistent and reliable results, then it can affect the validity of the test. This results in the shortlisting of applicants who are not right for the job.

Why is it important to have reliable tests?

Reliable tests are important because of the following reasons:

- Reuse the same test with guaranteed results. Use one test for a specific job requirement, across participants. For example, if a Java programmer test is considered to be a reliable test for assessing newly-graduated students, then you can use this test repeatedly to evaluate the Java skills of various groups of newly-graduated students.

- Reduce the time that you spent on shortlisting applicants and filling an open role.

Fundamentals of creating valid and reliable tests

The questions in the HackerEarth library and tests created using these questions are validated by different groups.

Reference group

- Educational researchers: These include professors or the heads of departments of reputed colleges who have the knowledge about the required skills, mentors to students studying these skills, and have a clear insight on the practical approach that the students can apply to solve a question.
- Professional subject matter experts (SMEs): They are industry professionals who have more than 5 years of work experience in a field that requires specific skills. Also, these professionals have the expertise in conducting tests for their respective companies, interviewing candidates, and recruiting them based on their performance.

Sample group

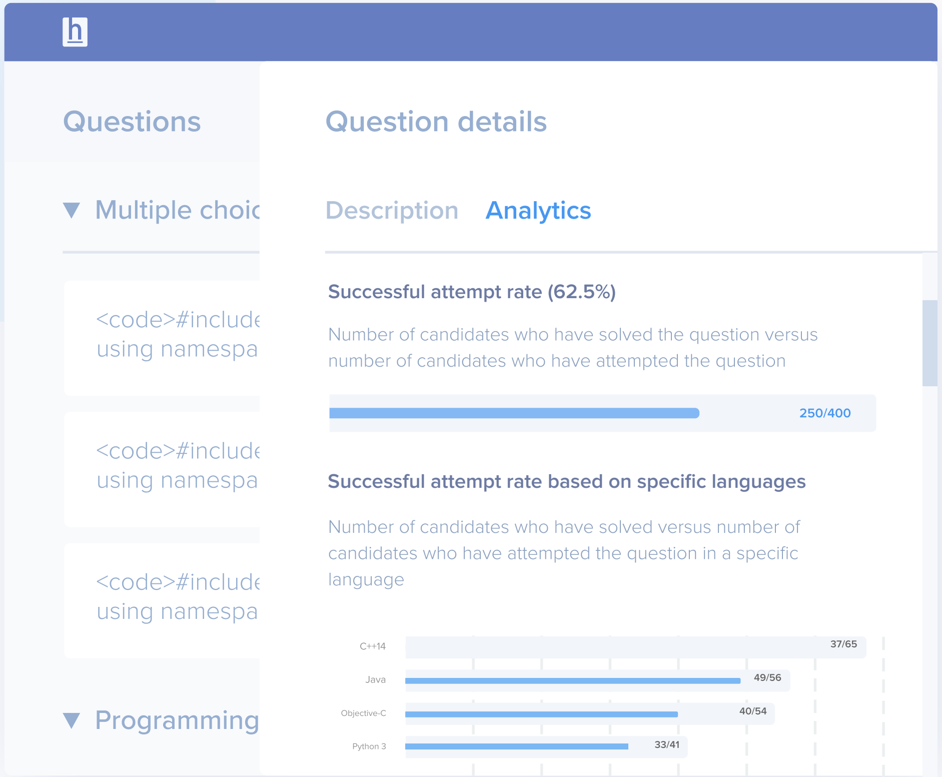
This group contains industry professionals with 3 to 5 years of work experience who are active participants of the HackerEarth Developer Community. The educational researchers test their performance and skills about various concepts through tests.

Target group

This group contains the actual applicants who will attempt the questions in a test.

Tests in HackerEarth Assessment

HackerEarth Assessment creates automated tests to assess applicants based on specific skills and requirements. These tests are reliable and valid in nature because they are tailor-made based on your requirements.



<code>#include
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Successful attempt rate (62.5%)

Number of candidates who have solved the question versus number of candidates who have attempted the question

Successful attempt rate based on specific languages

Number of candidates who have solved versus number of candidates who have attempted the question in a specific language

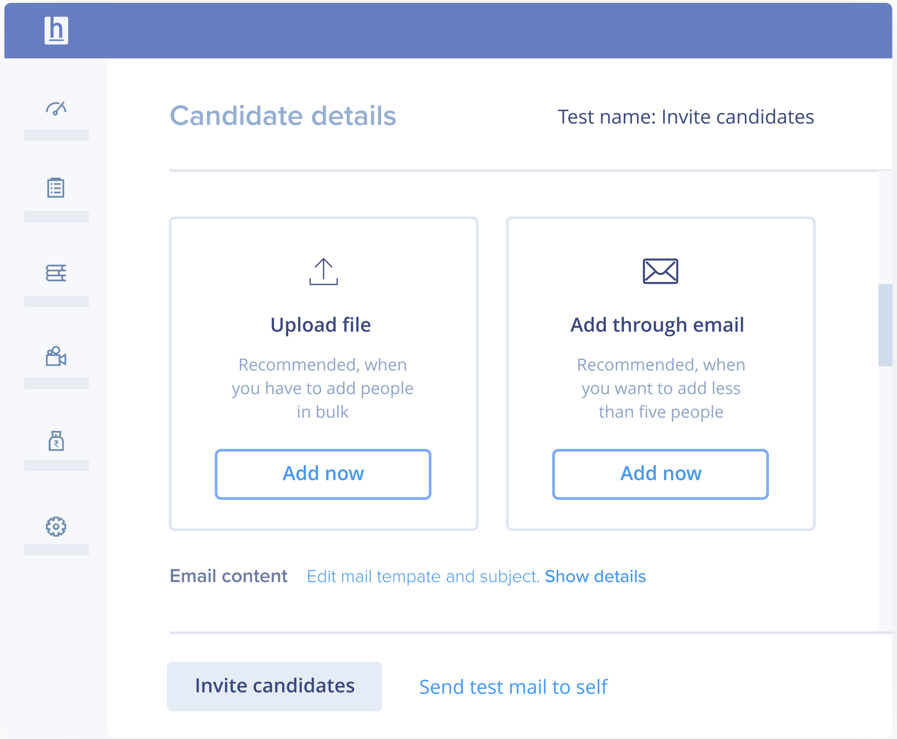
Test creation methods

The tests on HackerEarth are created based on the following:

Job roles

You can create tests based on the specific profiles that your organization is looking to fill. This is an efficient way to assess applicants with respect to the skills that are required for a specific job. Each job role contains a predefined set of skills. These skills are then used to select specific questions from the HackerEarth library.

For example, if you want to assess an applicant for a Software Developer's role, then the platform collects the crucial skills required for a software developer and creates a test based on those skills.



Candidate details

Test name: Invite candidates

Upload file
Recommended, when you have to add people in bulk
Add now
Add through email
Recommended, when you want to add less than five people
Add now

Email content Edit mail tempate and subject. Show details

Invite candidates
Send test mail to self

This approach of creating tests ensures that a test is valid and reliable for assessing specific pools of applicants because of the following reasons:

- We only collect those skills that are required for a specific role, which ensures that the test covers all the required skills. HackerEarth's Problem Setting team performs an extensive market analysis to determine the skills that are required for each of the job roles that are listed on HackerEarth Assessment. Also, these skills are verified by our professional subject matter experts. Thus, the job role to skill selection is based on industry-relevant practices. The market analysis is performed by the team every 3 months to update (if required) the list of skills for a job role

- The number of questions, difficulty levels of the questions, and time duration of the test are decided based on the experience level of the applicants that you want to assess. This ensures that the applicants have enough time to finish the test.

- All the questions are fairly and thoroughly evaluated using HackerEarth’s automatic evaluation method.

Job description

HackerEarth Assessment allows you to create tests based on a job description. It is an efficient way to create tests because the tests are created based on your specific requirements.

The platform automatically extracts the necessary details from your job description to create a relevant test. This extraction takes place through natural language processing (NLP) and natural language understanding (NLU) techniques. While the skills provided in the job description are selected through NLP whereas the tasks that you want candidates to perform during the job are selected through NLU. NLU essentially understands the underlying meaning of the keywords that are provided in the job description.

For example, if you have the following job description for a Software Developer role:

- Researching, designing, implementing and managing software programs
- Testing and evaluating new programs
- Writing and implementing efficient code
- Knowledge of Python, Java, and object-oriented programming (OOPs)

Then, then the required skills are inferred through the NLP technique as:

- Python
- Java
- OOPs
- Software testing
- Programming in any languages

The details that are required to create the test are inferred through NLU as:

- Job title
- Summary of the role
- Desired professional experience
- Skills required for the job
- Education level and desired qualifications
- Other details like a company overview, responsibilities, work environment, perks, etc

Note: The structure and details of a job description can vary based on your requirements.

Reliability of tests created based on a job description

- The tests are created based on the skills and experience mentioned in the job description.
- The necessary skills provided in the job description are automatically extracted by the platform. The tests are generated by using these skills.
- The numbers of the questions, difficulty level of the questions, and time duration of the test are decided based on the experience level of applicants that you want to assess.

Note: The validity of questions is described in the question-creation process section.

User bias testing of the tests

The questions that are available in HackerEarth's questions library also play a vital role in determining the validity and reliability of tests. These questions also do not contain any bias with respect to applicants.

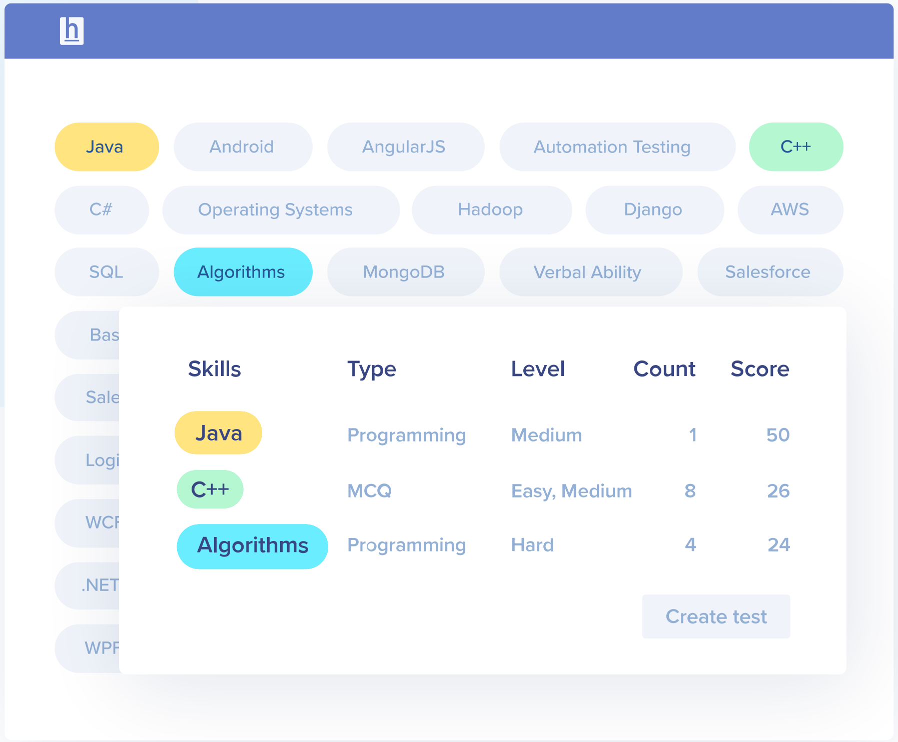
We conducted an adverse impact study on HackerEarth assessments to evaluate whether the tests have any kind of bias based on age, gender, ethnicity, etc. The report exhibited that there is no bias in the way our assessments were created. The summary of the user bias report is as follows:

- There is no significant difference between the ethnic groups with respect to the time taken to complete a test or the number of questions attempted.
- There are no statistically significant differences between the ethnic groups of applicants on the perceived relevance of tests and the difficulty of tests.
- There is no statistical evidence of any gender, age, or educational attainment bias (graduates and undergraduates students) in the total score of the test, time spent on the test, and the numbers of questions attempted.

To read our extensive User bias report, click here.

Question creation

HackerEarth has an exhaustive library that comprises Multiple Choice Questions (MCQs), Programming questions (you can restrict the submissions to 35+ programming languages), SQL questions, Machine Learning questions, Data Science questions, etc. These questions are created by HackerEarth.



Skills	Type	Level	Count	Score
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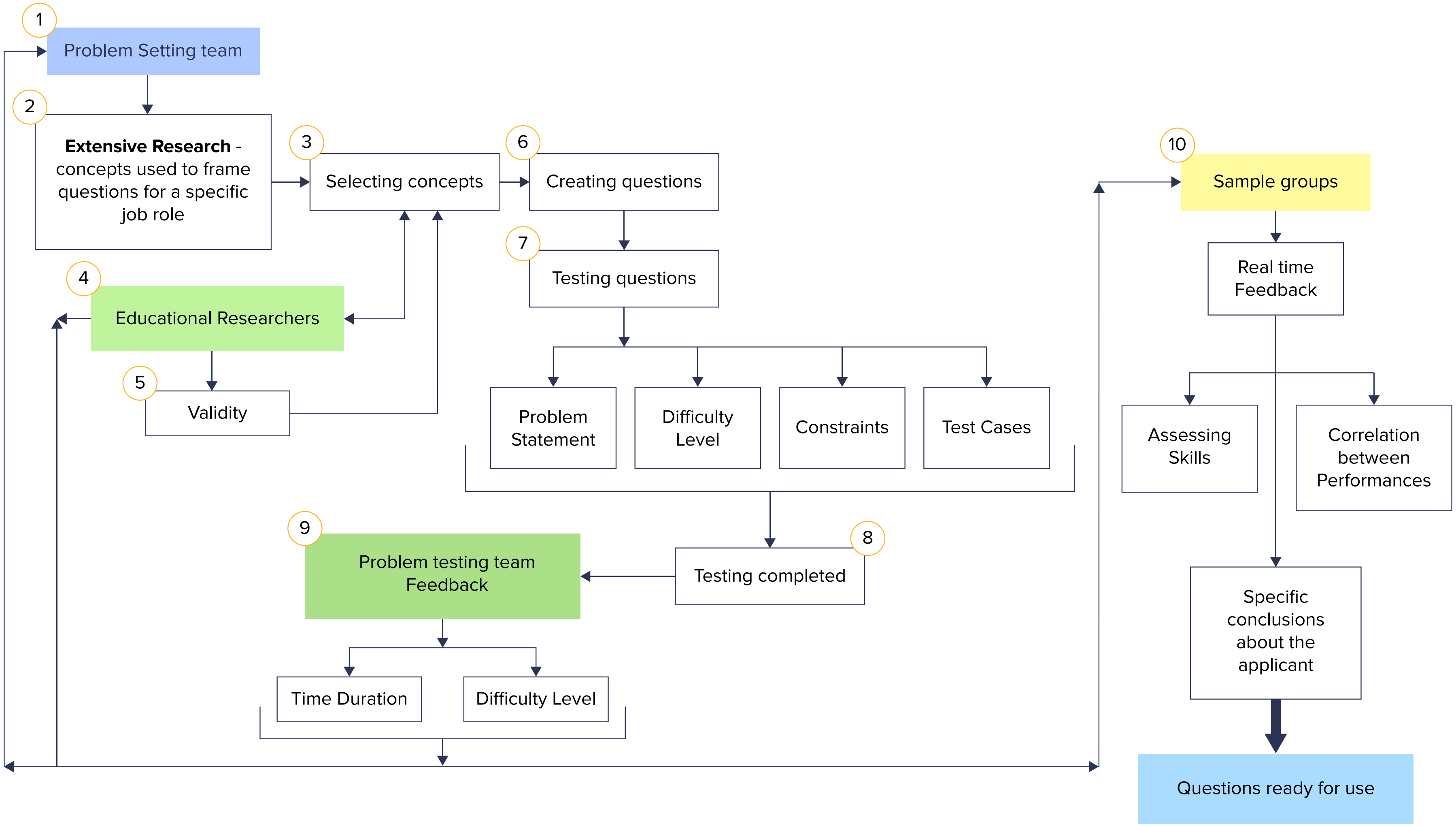
Test creation methods

The question-creation process is as follows:



Details

- HackerEarth's Problem Setting team performs extensive research to determine which concepts are specific to a job role. This research includes collecting data from various sources.
- The selected concepts are verified by our educational researchers for validity and reliability.
- The Problem Setting team creates questions based on these concepts.

    - The details related to the question such as difficulty level and time required to solve the question are mutually decided by our Problem Setting team and the educational researchers.
    - These details are finalized based on the market analysis of the concept, framing questions based on various pools of concepts, the time required to solve each question, constraints or conditions, and tasks that are specified in the problem.

- HackerEarth's Problem Testing team tests these questions based on the following parameters:

    - **Problem statement**: The problem statement must be clear and concise. It must not contain any ambiguous information to enable all the applicants to interpret the concepts that the question aims to assess.

- **Difficulty level of the problem**: The difficulty level of the problem must be set according to the score and time duration defined to solve the problem.

- **Constraints**: The tester must verify the conditions and the defined range of the variables that are used in the problem. If these constraints are not correct, they can cause the errors that can be related to the usage of excessive memory, exceeding the time limit, and many more, thus, resulting in an inefficient problem.

- **Tasks (or test cases)**: The tasks that are provided in the problem must be in line with the score, time duration, and difficulty level of the problems. These tasks must cover all the corner cases that can occur while solving the problem. The corner cases majorly test the problem-solving ability of the applicants.

The feedback provided by the Problem Testing team related to the difficulty level and time duration defined to solve the problem is mutually verified by the Problem Setting team and educational researchers. These changes are then incorporated into the problem by the Problem Setting team.

- The problem is provided to the sample group to attempt to collect real-time feedback and analyze the performance of the problem to determine whether:

  - It assesses the skills that are related to job qualifications and requirements.
  - The assigned score establishes a basic relationship between the performance of applicants in the problem and job performance.
  - It helps you to make specific conclusions about the applicant based on his or her score.

The feedback provided by this group with respect to the difficulty level and time duration defined to solve the problem is mutually verified by the Problem Setting team and educational researchers. These changes are then incorporated into the problem by the Problem Setting team.

Testing questions

The questions undergo rigorous technical testing and language review to remove errors.

Technical testing

All the types of questions are intensively checked for any technical issues. This testing includes:

- Removing runtime errors that can occur while solving a question
- Checking for plagiarism i.e. whether a similar problem, the solution of the problem, or the hint to the problem is already available on the Internet
- Removing any technical ambiguity in the question such as time limit, exceeding memory, etc.
- Adding proper explanations of the question to enhance its understanding

Language review

After the questions are technically verified, they are reviewed for language errors. This testing includes:

- Removing grammatical errors in the questions
- Ensuring that the information flow is correct
- Formatting the question properly to enhance its readability
- Checking whether the content adheres to the following rules that were set to ensure that there is no bias in the questions:
    - Content is gender-neutral content by using words such as they and their instead of his, hers, etc.
    - No geography-specific backstory or specific names, places, and events that are not familiar or are offensive to a global audience (audiences that include both native and non-native English speakers)
    - All cultural references from specific territories must be avoided
    - Content must always be politically correct
    - Sexist, racist, or religiously offensive remarks, as well as lines that promote any kind of political ideology, regionalism, or community-based generalization, are avoided
    - All references to politics, religion, and other controversial topics are not written or included in the content

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