4

Reporting the Results of the Survey of Adult Skills (PIAAC)

This chapter examines the proficiency levels used to report the results of the Survey of Adult Skills (PIAAC). It provides information on the languages used and how results were reported in countries that conducted the survey in more than one language.

This chapter describes how the results from the Survey of Adult Skills (PIAAC) are reported. It shows how the literacy, numeracy and problem-solving items used in the assessment are categorised according to their difficulty, the cognitive strategies required of adults to answer the questions, the real-life contexts in which such problems/questions may arise, and the medium used to deliver the item to the respondent. The chapter also shows how the proficiency levels for each of the three domains are related to the scores, and describes in detail what adults can do at each of the proficiency levels. The chapter concludes with information about the languages in which the test was conducted and the approach to reporting in countries where the assessment was delivered in more than one language.

THE PROFICIENCY SCALES

In each of the three domains assessed, proficiency is considered as a *continuum of ability* involving the mastery of information-processing tasks of increasing complexity. The results are represented on a 500-point scale. At each point on the scale, an individual with a proficiency score of that particular value has a 67% chance of successfully completing test items located at that point.[1] This individual will also be able to complete more difficult items (those with higher values on the scale) with a lower probability of success and easier items (those with lower values on the scale) with a greater chance of success.

To illustrate this point, Table 4.1 shows the probability with which a person with a proficiency score of 300 on the literacy scale can successfully complete items of greater and lesser difficulty. As can be seen, a person with a proficiency score of 300 will successfully complete items of this level of difficulty 67% of the time, items with a difficulty value of 250, 95% of the time, and items with a difficulty value of 350, 28% of the time.

Table 4.1
Probability of successfully completing items of varying difficulty
for a person scoring 300 on the literacy scale

	Difficulty score (literacy scale)			
	200	**250**	**300**	**350**
Probability of success	0.97	0.95	0.67	0.28

PROFICIENCY LEVELS

The proficiency scale in each of the domains assessed can be described in relation to the items that are located at the different points on the scale according to their difficulty. Tables 4.2, 4.3 and 4.4 present the location of the test items used in the Survey of Adult Skills on the difficult scales in the three domains assessed. In addition to the difficulty score, unit name and ID, a description of the key features of the item is provided in relation to the relevant measurement framework.

To help interpret the results, the reporting scales have been divided into "proficiency levels" defined by particular score-point ranges. Six proficiency levels are defined for literacy and numeracy (Levels 1 through 5 plus below Level 1) and four for problem solving in technology-rich environments (Levels 1 through 3 plus below Level 1). These descriptors provide a summary of the characteristics of the types of tasks that can be successfully completed by adults with proficiency scores in a particular range. In other words, they offer a summary of what adults with particular proficiency scores in a particular skill domain can do.

With the exception of the lowest level (below Level 1), tasks located at a particular level can be successfully completed approximately 50% of the time by a person with a proficiency score at the bottom of the range defining the level. In other words, a person with a score at the bottom of Level 2 would score close to 50% in a test made up of items of Level 2 difficulty. A person at the top of the level will get items located at that level correct most of the time. The "average" individual with a proficiency score in the range defining a level will successfully complete items located at that level approximately two thirds of the time.

Table 4.2
Literacy item map

Difficulty score	Unit name	Item ID	Cognitive strategies	Context	Medium	Format
376	Library Search	C323P005	Evaluate and reflect	Education and training	Digital	Multiple
374	Work-related Stress	C329P003	Integrate and interpret	Work-related	Digital	Multiple
372	CANCO	C306B111	Access and identify	Work-related	Print	Continuous
371	Baltic Stock Market	C308A116	Access and identify	Personal	Print	Mixed
359	Apples	P317P001	Integrate and interpret	Personal	Print	Continuous
350	Summer Streets	C327P004	Evaluate and reflect	Community	Digital	Mixed
349	Work-related Stress	C329P002	Evaluate and reflect	Work-related	Digital	Multiple
348	Library Search	C323P002	Integrate and interpret	Education and training	Digital	Multiple
347	Milk Label	P324P002	Integrate and interpret	Personal	Print	Mixed
337	Baltic Stock Market	C308A118	Access and identify	Personal	Print	Mixed
329	Generic Medicines	C309A322	Integrate and interpret	Personal	Print	Mixed
329	Library Search	C323P004	Evaluate and reflect	Education and training	Digital	Multiple
324	International Calls	C313A410	Access and identify	Personal	Print	Mixed
320	Summer Streets	C327P003	Integrate and interpret	Community	Digital	Mixed
318	Distances-Mexican Cities	C315B512	Integrate and interpret	Community	Print	Non-continuous
316	Civil Engineering	C318P003	Integrate and interpret	Education and training	Digital	Mixed
315	International Calls	C313A411	Access and identify	Personal	Print	Mixed
312	Memory Training	C310A407	Integrate and interpret	Personal	Print	Continuous
312	Milk Label	P324P003	Access and identify	Personal	Print	Mixed
309	TMN Anti-Theft	C305A218	Integrate and interpret	Community	Print	Continuous
306	Summer Streets	C327P002	Evaluate and reflect	Community	Digital	Mixed
304	Contact Employer	C304B711	Integrate and interpret	Work-related	Print	Continuous
303	Civil Engineering	C318P001	Access and identify	Education and training	Digital	Mixed
298	Summer Streets	C327P001	Integrate and interpret	Community	Digital	Mixed
297	Baltic Stock Market	C308A119	Access and identify	Personal	Print	Mixed
294	Lakeside Fun Run	C322P003	Access and identify	Personal	Digital	Mixed
293	Lakeside Fun Run	C322P004	Access and identify	Personal	Digital	Mixed
289	Library Search	C323P003	Access and identify	Education and training	Digital	Multiple
288	MEDCO Aspirin	C307B402	Access and identify	Personal	Print	Continuous
286	Discussion forum	C320P003	Evaluate and reflect	Work-related	Digital	Multiple
286	International Calls	C313A413	Access and identify	Personal	Print	Mixed
286	Contact Employer	C304B710	Access and identify	Work-related	Print	Continuous
285	Discussion forum	C320P004	Evaluate and reflect	Work-related	Digital	Multiple
283	Lakeside Fun Run	C322P001	Integrate and interpret	Personal	Digital	Mixed
281	Discussion forum	C320P001	Integrate and interpret	Work-related	Digital	Multiple
279	Baltic Stock Market	C308A121	Access and identify	Personal	Print	Mixed
272	Memory Training	C310A406	Access and identify	Personal	Print	Continuous
272	Generic Medicines	C309A319	Access and identify	Personal	Print	Mixed
272	International Calls	C313A414	Access and identify	Personal	Print	Mixed
265	Apples	P317P003	Evaluate and reflect	Personal	Print	Continuous
262	Apples	P317P002	Integrate and interpret	Personal	Print	Continuous
260	TMN Anti-theft	C305A215	Access and identify	Community	Print	Continuous
257	International Calls	C313A412	Access and identify	Personal	Print	Mixed
254	Baltic Stock Market	C308A120	Access and identify	Personal	Print	Mixed
251	Internet Poll	C321P001	Integrate and interpret	Community	Digital	Multiple
244	CANCO	C306B110	Access and identify	Work-related	Print	Continuous
244	Lakeside Fun Run	C322P005	Access and identify	Personal	Digital	Mixed
240	Lakeside Fun Run	C322P002	Evaluate and reflect	Personal	Digital	Mixed
239	Baltic Stock Market	C308A117	Access and identify	Personal	Print	Mixed
239	Generic Medicines	C309A320	Access and identify	Personal	Print	Mixed
238	Internet Poll	C321P002	Access and identify	Community	Digital	Multiple
219	Generic Medicines	C309A321	Integrate and interpret	Personal	Print	Mixed
207	Guadeloupe	P330P001	Access and identify	Community	Print	Mixed
201	Dutch Women	C311B701	Access and identify	Community	Print	Mixed
169	MEDCO Aspirin	C30B7401	Access and identify	Personal	Print	Continuous
162	Election Results	C302BC02	Access and identify	Community	Print	Mixed
136	Employment Ad	C300AC02	Access and identify	Work-related	Print	Continuous
75	SGIH	C301AC05	Access and identify	Community	Print	Non-continuous

Table 4.3
Numeracy item map

Difficulty score	Unit name	Item ID	Content	Cognitive strategies	Context
375	Dioxin (MOD)	C612A518	Pattern, relationships, change	Interpret, evaluate	Community and society
354	Educational Level	C632P001	Data and chance	Interpret, evaluate	Community and society
348	Compound Interest	P610A515	Pattern, relationships, change	Act upon, use	Education and training
341	Wine	P623A618	Data and chance	Interpret, evaluate	Community and society
332	Weight history	C660P004	Pattern, relationships, change	Act upon, use	Community and society
326	Cooper test	C665P002	Pattern, relationships, change	Act upon, use	Personal
324	Amoeba	C641P001	Pattern, relationships, change	Act upon, use	Education and training
320	BMI	C624A620	Pattern, relationships, change	Act upon, use	Personal
318	Peanuts	C634P002	Pattern, relationships, change	Act upon, use	Personal
317	NZ Exports	C644P002	Pattern, relationships, change	Act upon, use	Community and society
315	Study fees	C661P002	Data and chance	Interpret, evaluate	Community and society
315	Package	C657P001	Dimension and shape	Interpret, evaluate	Work-related
314	Fertilizer	C651P002	Pattern, relationships, change	Interpret, evaluate	Work-related
308	Study fees	C661P001	Data and chance	Interpret, evaluate	Community and society
308	Inflation	C620A612	Data and chance	Act upon, use	Community and society
307	Orchestra tickets	C664P001	Pattern, relationships, change	Act upon, use	Work-related
305	Peanuts	C634P001	Pattern, relationships, change	Act upon, use	Personal
303	Map	C617A605	Dimension and shape	Interpret, evaluate	Work-related
301	Classified	C622A615	Pattern, relationships, change	Act upon, use	Work-related
297	SixPack1	C618A608	Quantity and number	Act upon, use	Education and training
296	Temp Scale	C611A517	Dimension and shape	Interpret, evaluate	Community and society
294	Lab Report	C636P001	Quantity and number	Interpret, evaluate	Personal
287	Map	C617A606	Dimension and shape	Act upon, use	Work-related
282	Tiles	C619A609	Dimension and shape	Act upon, use	Personal
276	Wine	C623A617	Quantity and number	Act upon, use	Community and society
276	Weight history	C660P003	Data and chance	Interpret, evaluate	Personal
273	Solution	C606A509	Dimension and shape	Act upon, use	Work-related
267	Inflation	C620A610	Data and chance	Identify, locate or access	Community and society
266	Educational Level	C632P002	Data and chance	Interpret, evaluate	Community and society
261	Temp Scale	C611A516	Dimension and shape	Interpret, evaluate	Community and society
260	Urban Population	C650P001	Data and chance	Interpret, evaluate	Community and society
260	Tree	C608A513	Dimension and shape	Act upon, use	Personal
259	Photo	C605A506	Dimension and shape	Act upon, use	Personal
259	Price Tag	C602A503	Quantity and number	Act upon, use	Personal
258	Wine	C623A616	Quantity and number	Act upon, use	Community and society
256	Rug Production	C646P002	Data and chance	Act upon, use	Community and society
250	Logbook	C613A520	Pattern, relationships, change	Act upon, use	Work-related
249	Path	C655P001	Pattern, relationships, change	Act upon, use	Personal
242	Photo	C605A507	Dimension and shape	Interpret, evaluate	Personal
240	Rope	P666P001	Dimension and shape	Act upon, use	Work-related
239	TV	C607A510	Pattern, relationships, change	Act upon, use	Personal
238	Price Tag	C602A502	Quantity and number	Act upon, use	Personal
234	Cooper test	C665P001	Data and chance	Interpret, evaluate	Personal
231	Candles	C615A603	Dimension and shape	Act upon, use	Work-related
231	Airport Timetable	C645P001	Dimension and shape	Act upon, use	Work-related
228	Gas Gauge	C604A505	Quantity and number	Act upon, use	Personal
227	Photo	C605A508	Quantity and number	Act upon, use	Personal
221	BMI	C624A619	Data and chance	Identify, locate or access	Personal
221	Candles	C615A602	Dimension and shape	Interpret, evaluate	Education and training
217	SixPack1	C618A607	Quantity and number	Act upon, use	Personal
195	Odometer	P640P001	Dimension and shape	Act upon, use	Personal
185	Watch	C614A601	Quantity and number	Interpret, evaluate	Personal
179	Parking Map	C635P001	Dimension and shape	Identify, locate or access	Work-related
168	Price Tag	C602A501	Quantity and number	Act upon, use	Personal
155	Election results	C600AC04	Quantity and number	Act upon, use	Work-related
129	Bottles	C601AC06	Dimension and Shape	Interpret, evaluate	Personal

Table 4.4 [1/2]
Problem solving in technology-rich environments item map

Difficulty score	Item name	Item ID	Content		Cognitive strategies	Context	Description
			Technology	Task			
374	Class Attendance	U04A	Spread-sheet, e-mail	▪ Multiple steps ▪ Single constraint ▪ Explicit problem statement	▪ Goal setting and progress monitoring ▪ Planning, self-organising ▪ Acquiring and evaluating information ▪ Making use of information	Work-related	Using information embedded in an e-mail message, establish and apply the criteria to transform the e-mail information to a spreadsheet. Monitor the progress of correctly organising information to perform computations through novel built-in functions.
355	Locate E-mail – File 3 e-mails	U11B	E-mail	▪ Single step ▪ Single constraint ▪ Implicit problem statement	▪ Goal setting and progress monitoring ▪ Planning, self-organising ▪ Acquiring and evaluating information ▪ Making use of information	Personal	Infer the proper folder destination in order to transfer a subset of incoming e-mail messages based on the subject header and the specific contents of each message.
346	Meeting Rooms	U02	E-mail, Internet	▪ Multiple steps ▪ Multiple constraints ▪ Implicit problem statement	▪ Goal setting and progress monitoring ▪ Planning, self-organising ▪ Acquiring and evaluating information ▪ Making use of information	Work-related	Using information from a novel Internet application and several e-mail messages, establish and apply criteria to solve a scheduling problem where an impasse must be resolved, and communicate the outcome.
342	Sprained Ankle – Site Evaluation Table	U06A	Internet	▪ Single step ▪ Single constraint ▪ Explicit problem statement	▪ Acquiring and evaluating information	Personal	Evaluate several entries in a search engine results page given an explicit set of separate reliability criteria. A
325	Sprained Ankle – Reliable/ Trustworthy Site	U06B	Internet	▪ Multiple steps ▪ Single constraint ▪ Explicit problem statement	▪ Goal setting and progress monitoring ▪ Acquiring and evaluating information ▪ Making use of information	Personal	Apply evaluation criteria and then navigate through multiple websites to infer the most reliable and trustworthy site. Monitoring throughout the process is required.
320	Tickets	U21	Internet	▪ Multiple steps ▪ Multiple constraints ▪ Explicit problem statement	▪ Goal setting and progress monitoring ▪ Planning, self-organising ▪ Acquiring and evaluating information	Personal	Use a novel Internet-based application involving multiple tools to complete an order based on a combination of explicit criteria.
321	Lamp Return	U23	Internet, e-mail	▪ Multiple steps ▪ Single constraint ▪ Explicit problem statement	▪ Goal setting and progress monitoring ▪ Planning, self-organising ▪ Acquiring and evaluating information	Personal	Enact a plan to navigate through a website to complete an explicitly specified consumer transaction. Monitor the progress of submitting a request, retrieving an e-mail message, and filling out a novel online form.

…

Table 4.4 [2/2]
Problem solving in technology-rich environments item map

Difficulty score	Item name	Item ID	Content		Cognitive strategies	Context	Description
			Technology	Task			
316	CD Tally	U03A	Internet, spreadsheet	■ Single step ■ Single constraint ■ Implicit problem statement	■ Goal setting and progress monitoring ■ Planning, self-organising ■ Making use of information	Work-related	Organise large amounts of information in a multiple column spreadsheet and determine a value based on a single explicit criterion; use a drop-down menu in a novel Internet application to communicate the result.
305	Digital Photography Book Purchase	U07	Internet	■ Multiple steps ■ Multiple constraints ■ Implicit problem statement	■ Goal setting and progress monitoring ■ Acquiring and evaluating information	Work-related	Choose an item on a web page that best matches a set of given criteria from a search engine results page; the information can be made available only by clicking on links and navigating through several web pages; based on a search engine results page, navigate through several Internetsites in order to choose an item on a web page that best matches a set of given criteria.
299	Party Invitations Accommo-dations	U01B	E-mail	■ Single step ■ Multiple constraints ■ Implicit problem statement	■ Planning, self-organising ■ Making use of information	Personal	Categorise a small number of messages in an e-mail application by creating a new folder; evaluate the contents of the entries based on one criterion in order to file them in the proper folder.
296	Club Membership – Eligibility for Club President	U19B	Spreadsheet, e-mail	■ Single step ■ Multiple constraints ■ Implicit problem statement	■ Goal setting and progress monitoring ■ Planning, self-organising ■ Acquiring and evaluating information ■ Making use of information	Society-community	Organise large amounts of information in a multiple-column spreadsheet using multiple explicit criteria; locate and mark relevant entries.
286	Party Invitations – Can/Cannot Come	U01A	E-mail	■ Single step ■ Single constraint ■ Implicit problem statement	■ Planning, self-organising ■ Making use of information	Personal	Categorise a small number of messages in an e-mail application into existing folders according to one explicit criterion.
286	Reply All	U16	E-mail	■ Single step ■ Single constraint ■ Explicit problem statement	■ Acquiring and evaluating information ■ Planning, self-organising	Personal	With a defined goal and explicit criteria, use e-mail and send information to three people.
268	Club Membership – Member ID	U19A	Spreadsheet, e-mail	■ Single step ■ Single constraint ■ Implicit problem statement	■ Planning, self-organising ■ Acquiring and evaluating information	Society-community	Locate an item within a large amount of information in a multiple-column spreadsheet based on a single explicit criterion; use e-mail to communicate the result.

Literacy and numeracy

Six proficiency levels are defined for the domains of literacy and numeracy. The score-point ranges defining each level and the descriptors of the characteristics of tasks located at each of the levels can be found in Table 4.5. In the case of literacy and numeracy, the score-point ranges associated with each proficiency level are the same as those that apply in the International Adult Literacy Survey (IALS) and the Adult Literacy and Life Skills Survey (ALL) for document and prose literacy and in ALL for numeracy. However, the descriptors that apply to the proficiency levels in the domains of literacy and numeracy differ between the Survey of Adult Skills (PIAAC) and IALS and ALL.

Table 4.5 [1/2]
Proficiency levels: literacy and numeracy

Level	Score range	Literacy	Numeracy
Below Level 1	Below 176 points	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive. The respondent may be required to locate information in short continuous texts. However, in this case, the information can be located as if the text was non-continuous in format. Only basic vocabulary knowledge is required, and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. Tasks below Level 1 do not make use of any features specific to digital texts.	Tasks at this level require the respondents to carry out simple processes such as counting, sorting, performing basic arithmetic operations with whole numbers or money, or recognising common spatial representations in concrete, familiar contexts where the mathematical content is explicit with little or no text or distractors.
1	176 to less than 226 points	Most of the tasks at this level require the respondent to read relatively short digital or print continuous, non-continuous, or mixed texts to locate a single piece of information that is identical to or synonymous with the information given in the question or directive. Some tasks, such as those involving non-continuous texts, may require the respondent to enter personal information onto a document. Little, if any, competing information is present. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognising basic vocabulary determining the meaning of sentences, and reading paragraphs of text is expected.	Tasks at this level require the respondent to carry out basic mathematical processes in common, concrete contexts where the mathematical content is explicit with little text and minimal distractors. Tasks usually require one-step or simple processes involving counting; sorting; performing basic arithmetic operations; understanding simple percentages such as 50%; and locating and identifying elements of simple or common graphical or spatial representations.
2	226 to less than 276 points	At this level, the medium of texts may be digital or printed, and texts may comprise continuous, non-continuous, or mixed types. Tasks at this level require respondents to make matches between the text and information, and may require paraphrasing or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to ■ cycle through or integrate two or more pieces of information based on criteria; ■ compare and contrast or reason about information requested in the question; or ■ navigate within digital texts to access-and-identify information from various parts of a document.	Tasks at this level require the respondent to identify and act on mathematical information and ideas embedded in a range of common contexts where the mathematical content is fairly explicit or visual with relatively few distractors. Tasks tend to require the application of two or more steps or processes involving calculation with whole numbers and common decimals, percentages and fractions; simple measurement and spatial representation; estimation; and interpretation of relatively simple data and statistics in texts, tables and graphs.
3	276 to less than 326 points	Texts at this level are often dense or lengthy, and include continuous, non-continuous, mixed, or multiple pages of text. Understanding text and rhetorical structures become more central to successfully completing tasks, especially navigating complex digital texts. Tasks require the respondent to identify, interpret, or evaluate one or more pieces of information, and often require varying levels of inference. Many tasks require the respondent to construct meaning across larger chunks of text or perform multi-step operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate content to answer accurately. Competing information is often present, but it is not more prominent than the correct information.	Tasks at this level require the respondent to understand mathematical information that may be less explicit, embedded in contexts that are not always familiar and represented in more complex ways. Tasks require several steps and may involve the choice of problem-solving strategies and relevant processes. Tasks tend to require the application of number sense and spatial sense; recognising and working with mathematical relationships, patterns, and proportions expressed in verbal or numerical form; and interpretation and basic analysis of data and statistics in texts, tables and graphs.

...

Table 4.5 [2/2]
Proficiency levels: literacy and numeracy

Level	Score range	Literacy	Numeracy
4	326 to less than 376 points	Tasks at this level often require respondents to perform multiple-step operations to integrate, interpret, or synthesise information from complex or lengthy continuous, non-continuous, mixed, or multiple type texts. Complex inferences and application of background knowledge may be needed to perform the task successfully. Many tasks require identifying and understanding one or more specific, non-central idea(s) in the text in order to interpret or evaluate subtle evidence-claim or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.	Tasks at this level require the respondent to understand a broad range of mathematical information that may be complex, abstract or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes. Tasks tend to require analysis and more complex reasoning about quantities and data; statistics and chance; spatial relationships; and change, proportions and formulas. Tasks at this level may also require understanding arguments or communicating well-reasoned explanations for answers or choices.
5	Equal to or higher than 376 points	At this level, tasks may require the respondent to search for and integrate information across multiple, dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a requirement. Tasks often require respondents to be aware of subtle, rhetorical cues and to make high-level inferences or use specialised background knowledge.	Tasks at this level require the respondent to understand complex representations and abstract and formal mathematical and statistical ideas, possibly embedded in complex texts. Respondents may have to integrate multiple types of mathematical information where considerable translation or interpretation is required; draw inferences; develop or work with mathematical arguments or models; and justify, evaluate and critically reflect upon solutions or choices.

This is because the domain of *literacy* in the Survey of Adult Skills replaces the previously separate domains of prose and document literacy used in IALS and ALL, and because the survey defines proficiency levels differently than the other surveys do. An explanation of these changes and their impact is provided in Annex A.

Tables 4.6 and 4.7 show the probability that adults with particular proficiency scores will complete items of different levels of difficulty in the domains of literacy and numeracy. For example, an adult with a proficiency score of 300 in literacy (i.e. the mid-point of Level 3) has a 68% chance of successfully completing items of Level 3 difficulty. He or she has a 29% chance of completing items of Level 4 difficulty and a 90% probability of successfully completing items of Level 2 difficulty.

Table 4.6
Probability of successfully completing items at different difficulty levels by proficiency score: literacy

Item difficulty	Proficiency score											
	150	175	200	225	250	275	300	325	350	375	400	425
Level 1	0.56	0.68	0.78	0.86	0.92	0.95	0.97	0.98	0.99	0.99	1.00	1.00
Level 2	0.08	0.15	0.27	0.44	0.63	0.80	0.90	0.95	0.98	0.99	0.99	1.00
Level 3	0.01	0.03	0.06	0.13	0.26	0.46	0.68	0.83	0.92	0.96	0.98	0.99
Level 4	0.01	0.01	0.02	0.05	0.09	0.16	0.29	0.47	0.65	0.80	0.90	0.95

Table 4.7
Probability of successfully completing items at different difficulty levels by proficiency score: numeracy

Item difficulty	Proficiency score											
	150	175	200	225	250	275	300	325	350	375	400	425
Level 1	0.47	0.60	0.72	0.82	0.89	0.93	0.96	0.98	0.99	0.99	1.00	1.00
Level 2	0.11	0.20	0.33	0.49	0.66	0.80	0.89	0.94	0.97	0.98	0.99	1.00
Level 3	0.02	0.04	0.08	0.15	0.26	0.43	0.63	0.80	0.90	0.95	0.98	0.99
Level 4	0.02	0.03	0.05	0.08	0.14	0.24	0.37	0.54	0.69	0.80	0.88	0.93

Problem solving in technology-rich environments

The problem-solving proficiency scale was divided into four levels. The problem solving in technology-rich environments framework (PIAAC Problem Sloving in Technology-Rich Environment, 2009) identifies three main dimensions along which problems vary in quality and complexity. These are (1) the technology dimension, (2) the task dimension and (3) the cognitive dimension. Variations along each of these dimensions contribute to the overall difficulty of a problem.

Table 4.8
Technology, task and cognitive features of problems
at each of the three main levels of proficiency

Level	Technology features	Task features	Cognitive processes
1	▪ Generic applications ▪ Little or no navigation required ▪ Relevant information is directly available ▪ Use of facilitating tools not required	▪ Few steps ▪ Single operators	▪ Reach a given goal ▪ Apply explicit criteria ▪ Minimal monitoring demands ▪ Simple relevance match ▪ Categorical reasoning ▪ No integration or transformation
2	▪ Both generic and novel applications (e.g. web-based services) ▪ Some navigation required to acquire information or perform actions ▪ Use of tools facilitates operations	▪ Multiple steps ▪ Multiple operators	▪ Goal may need to be defined ▪ Apply explicit criteria ▪ Generally higher monitoring demands ▪ Generally involves resolving impasses ▪ Some evaluation of relevance ▪ Some integration or transformation ▪ Inferential reasoning
3	▪ Generic and novel applications ▪ Some navigation required to acquire information or perform actions ▪ Use of tools required to efficiently solve the problem	▪ Multiple steps ▪ Multiple operators	▪ Goal may need to be defined ▪ Establish and apply criteria ▪ Generally high monitoring ▪ High inferential reasoning and integration ▪ Evaluate relevance and reliability ▪ Generally involves resolving impasses

Table 4.9
Proficiency levels: problem solving in technology-rich environments

Level	Score range	The types of tasks completed successfully at each level of proficiency
Below Level 1	Below than 241 points	Tasks are based on well-defined problems involving the use of only one function within a generic interface to meet one explicit criterion without any categorical, inferential reasoning or transforming of information. Few steps are required and no sub goal has to be generated.
1	241 to less than 291 points	At this level, tasks typically require the use of widely available and familiar technology applications, such as e-mail software or a web browser. There is little or no navigation required to access the information or commands required to solve the problem. The problem may be solved regardless of the respondent's awareness and use of specific tools and functions (e.g. a sort function). The tasks involve few steps and a minimal number of operators. At the cognitive level, the respondent can readily infer the goal from the task statement; problem resolution requires the respondent to apply explicit criteria; and there are few monitoring demands (e.g. the respondent does not have to check whether he or she has used the appropriate procedure or made progress towards the solution). Identifying contents and operators can be done through simple match. Only simple forms of reasoning, such as assigning items to categories, are required; there is no need to contrast or integrate information.
2	291 to less than 341 points	At this level, tasks typically require the use of both generic and more specific technology applications. For instance, the respondent may have to make use of a novel online form. Some navigation across pages and applications is required to solve the problem. The use of tools (e.g. a sort function) can facilitate the resolution of the problem. The task may involve multiple steps and operators. The goal of the problem may have to be defined by the respondent, though the criteria to be met are explicit. There are higher monitoring demands. Some unexpected outcomes or impasses may appear. The task may require evaluating the relevance of a set of items to discard distractors. Some integration and inferential reasoning may be needed.
3	Equal to or higher than 341 points	At this level, tasks typically require the use of both generic and more specific technology applications. Some navigation across pages and applications is required to solve the problem. The use of tools (e.g. a sort function) is required to make progress towards the solution. The task may involve multiple steps and operators. The goal of the problem may have to be defined by the respondent, and the criteria to be met may or may not be explicit. There are typically high monitoring demands. Unexpected outcomes and impasses are likely to occur. The task may require evaluating the relevance and reliability of information in order to discard distractors. Integration and inferential reasoning may be needed to a large extent.

For instance, a problem is likely to be more complex if it involves the combined use of more than one computer application (e.g. e-mail and a spreadsheet); similarly, a problem is more complex if the task is defined in vague terms, as opposed to fully specified. Finally, a problem is likely to be more difficult if the respondent has to generate lots of deductions and inferences than if he or she just has to assemble or match different pieces of explicit information. The relationship between these dimensions and the proficiency levels is presented in Table 4.8. The descriptors of the levels are presented in Table 4.9.

Table 4.10 shows the probability of adults with particular proficiency in problem solving in technology-rich environments completing problem solving items of different levels of difficulty.

Table 4.10
Probability of successfully completing items at different difficulty levels by proficiency score: problem solving in technology-rich environments

Item difficulty	Proficiency score									
	190	215	240	265	290	315	340	365	390	415
Level 1	0.02	0.06	0.17	0.40	0.69	0.87	0.95	0.98	0.99	1.00
Level 2	0.03	0.05	0.10	0.19	0.35	0.56	0.76	0.88	0.94	0.97
Level 3	0.00	0.01	0.02	0.05	0.13	0.29	0.49	0.67	0.80	0.87

A note about the reporting of problem solving in technology-rich environments

The populations for whom proficiency scores for problem solving in technology-rich environments are reported *are not identical* across countries. Proficiency scores relate only to the proportion of the target population in each participating country that was able to undertake the computer-based version of the assessment, and thus meets the preconditions for displaying competency in this domain.

Four groups of respondents did not take the computer-based assessment[2], those who:

- indicated in completing the background questionnaire that they had never used a computer (group 1);

- had some experience with computers but who "failed" the ICT core assessment (see Chapter 3) designed to determine whether a respondent had the basic computer skills necessary to undertake the computer-based assessment (group 2);

- had some experience with computers but opted not to take the computer-based assessment (group 3); or

- did not attempt the ICT core for literacy-related reasons (group 4).

By definition, a minimum level of competency in the use of computer tools and applications and a minimum level of proficiency in literacy and numeracy is required in order to display proficiency in problem solving in technology-rich environments. Individuals in groups 1 and 2 are, thus, treated as not meeting the necessary preconditions for displaying proficiency and have no proficiency score in the domain of problem solving in technology-rich environments.

Respondents who did not attempt the ICT core for literacy-related reasons (group 4) have not been attributed a problem-solving score due to lack of sufficient information.

Respondents who opted not to take the computer-based assessment (group 3), however, represent a different category. They are individuals who, on their own initiative, decided to take the paper-and-pencil version of the assessment without going through the process designed to direct respondents to the computer-based or paper pathways of the assessment. As a result, it is not known whether or not they possessed the computer skills necessary to complete the computer-based assessment.

Three options for how to treat this group were considered: imputing their proficiency in problem solving on the basis of their proficiency in literacy and numeracy and their background characteristics; treating them as non-respondents; or reporting them as a separate category of the group that could not display competency. The latter option was adopted. Imputation was rejected on the grounds that refusals appeared to have different characteristics to respondents taking the computer-based assessment pathway. In fact, they appeared to be more similar to the respondents who did not have computer skills than to those who took the computer-based assessment. The option of treating them as non-respondents was rejected for similar reasons.

In reporting the results concerning problem solving in technology-rich environments, the following approach was adopted:

▪ When reporting proficiency in problem solving in technology-rich environments on the continuous scale at the country level, the proportion of the population displaying proficiency is reported in conjunction with country-level statistics (e.g. means, standard deviations, etc).

▪ When reporting distributions of the population by proficiency levels, information is presented for the entire adult population as a whole (i.e. those displaying proficiency plus those not displaying proficiency). The number or proportion of the population not displaying proficiency is always reported when results are presented by proficiency level.

TEST LANGUAGES AND REPORTING

In each participating country, the Survey of Adult Skills was administered in the official national language(s) of the country and, in some cases, in a widely used language in addition to the national language(s). A small number of countries administered the cognitive assessments in the national language only but administered the background questionnaire in the national language and a widely spoken language. The objective there was to minimise the number of respondents who failed to provide information for language-related reasons. Table 4.11 shows the languages in which the survey was administered.

Table 4.11
Test languages by country

National entities	Language(s) of the cognitive assessment	Language(s) of the background questionnaire
Australia	English	English
Austria	German	German, Bosnian/Serbian/Croatian, Turkish
Canada	English, French	English, French
Czech Republic	Czech	Czech
Denmark	Danish	Danish
Estonia	Estonian, Russian	Estonian, Russian
Finland	Finnish, Swedish	Finnish, Swedish
France	French	French
Germany	German	German
Ireland	English	English
Italy	Italian	Italian
Japan	Japanese	Japanese
Korea	Korean	Korean
Netherlands	Dutch	Dutch
Norway	Norwegian	Norwegian, English
Poland	Polish	Polish
Slovak Republic	Slovak, Hungarian	Slovak, Hungarian
Spain	Castilian, Catalan, Basque, Galician, Valencian	Castilian, Catalan, Basque, Galician, Valencian
Sweden	Swedish	Swedish
United States	English	English, Spanish

Sub-national entities		
Flanders (Belgium)	Dutch	Dutch
England (UK)	English	English
Northern Ireland (UK)	English	English

Partner		
Cyprus[1]	Greek	Greek

1. See notes at the end of this chapter.

For those countries that tested in more than one language, results are presented as a single proficiency score. In other words, the mean proficiency score for literacy in Estonia, for example, is the mean proficiency of Estonian adults in reading in either Estonian or Russian. In only one country, Canada, was the sample designed to allow for reliable proficiency estimates in each of the languages in which the test was administered (in this case, English and French). However, as is the case for all other countries in which the test was administered in more than one language, Canadian results are presented in the international report in the form of a single proficiency estimate rather than as separate estimates for English and French speakers.

The Survey of Adult Skills was designed to assess the proficiency of the adult population in reading, in working with numbers, and in solving problems in the language(s) that are most relevant to and/or commonly used in the economic and civic life (e.g. in interaction with public bodies and institutions, in educational institutions) of a participating country. Therefore, poor performance in the test language(s) among non-native speakers of those languages, such as immigrants and their children, is not necessarily indicative of poor performance, as such. In the case of non-native speakers of the test language(s), low proficiency cannot be assumed to indicate low proficiency in their native language. A Turkish immigrant in Germany, for example, may display poor skills in the test language (German) but be a proficient reader and have good problem-solving skills when working in Turkish.

Notes

1. This differs from the approach used in IALS and ALL in which a value of 0.80 was used to locate items and test takers on the relevant scales. Further information on the change in approach and its impact is provided in Annex A.

2. Defined as taking, at a minimum, the core literacy and numeracy assessments on the computer.

Notes regarding Cyprus

Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

References

OECD (2012), *Literacy, Numeracy and Problem Solving in Technology-Rich Environments: Framework for the OECD Survey of Adult Skills,* OECD Publishing.
http://dx.doi.org/10.1787/9789264128859-en

PIAAC Expert Group in Problem Solving in Technology-Rich Environments (2009), "PIAAC Problem Solving in Technology-Rich Environments: A Conceptual Framework", OECD Education Working Papers, No. 36, OECD Publishing.
http://dx.doi.org/10.1787/220262483674

From:

The Survey of Adult Skills
Reader's Companion

Access the complete publication at:
https://doi.org/10.1787/9789264204027-en