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# O\*NET Level Scale Anchor Updates: Knowledge and Generalized Work Activities

## Final Report

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313 Chapanoke Road, Suite 130  
Raleigh, NC 27603

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**Authors:** Brittany F. Crawford, HumRRO  
Matthew C. Reeder, HumRRO  
Matthew T. Allen, HumRRO  
Phil Lewis, National Center for O\*NET Development

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## Background

The Occupational Information Network (O\*NET) is a comprehensive system developed by the U.S. Department of Labor that provides information for over 900 occupations within the U.S. economy. The database is maintained by the National Center for O\*NET Development (“the Center”), sponsored by the U.S. Department of Labor through a grant to the North Carolina Department of Commerce.

As a follow-up on efforts to modernize and streamline the level scales associated with the O\*NET Skills and Abilities domains (Crawford et al., 2021), the Human Resources Research Organization (HumRRO) and the Center discussed the need to update several of the level scale anchors included within the questionnaires used by job incumbents and occupational experts to populate and/or update data for the O\*NET Knowledge and Generalized Work Activities domains (O\*NET, 2021a). (For a description of the O\*NET Establishment and Occupational Expert data collection methodology, see: 2021 O\*NET Office of Management and Budget (OMB) clearance package [Supporting Statement Part A: Justification](#) (O\*NET OMB, 2021a) and [Supporting Statement Part B: Statistical Methods](#) (O\*NET OMB, 2021b)). The level anchors are also incorporated within generic questionnaires available for use within organization-specific job analysis projects and research (see: [O\\*NET Questionnaires](#); O\*NET, 2021b). Level anchors are often viewed as an additional source of clarity for the Knowledge and Generalized Work Activities descriptors. Hence, they are made available for use by application developers via the O\*NET Database (see: [O\\*NET 25.3 Database](#) (O\*NET, 2021c) and [Level Scale Anchors](#) (O\*NET, 2021d)) and O\*NET Web Services (see: [Reference Manual: Database Services](#); O\*NET, 2021e).

The level scales within the Knowledge domain provide ratings on “organized sets of principles and facts applying in general domains” (O\*NET, 2021a). The level scales within the Generalized Work Activities domain provide ratings on “work activities that are common across a very large number of occupations” (O\*NET, 2021a). Each domain is divided into multiple *elements*, or specific descriptors (O\*NET, 2021a). Ratings made on 7-point level scales indicate the degree, or point along a continuum, to which a particular descriptor is required or needed to perform a specific job. Each level scale is preceded by the following question: “What level of the [knowledge/activity] is needed to perform your current job?” Additionally, each level scale includes examples near the lower end, midpoint, and higher end of the scale to provide additional context for individuals who are completing the questionnaire. These examples are referred to as *level scale anchors* and the points they fall along the scale are called *anchor values*.

Level scale anchors have not been updated or modernized since they were originally developed in the mid-1990s (Peterson et al., 1995). The Center contracted with HumRRO to complete the following activities:

1. Review each level scale anchor within the Knowledge and Generalized Work Activities domains for issues with obsolescence and to identify other necessary revisions to address length, language that could be difficult to understand, grammar or spelling, redundancy, bias and sensitivity.
2. Write updated level scale anchors for those flagged for any of the previously listed revisions.

3. Scale each new level scale anchor while also ensuring a match to the originally intended element.

This resulted in HumRRO reviewing 222 level scale anchors across two domains and updating 60. The purpose of the current report is to document the technical support provided by HumRRO to update the occupation level scale anchors for the Knowledge and Generalized Work Activities domains.

## Identifying the Level Scale Anchors to Update

HumRRO staff and the Center reviewed 99 and 123 level scale anchors (hereafter, referred to as “anchors” for brevity) within the Knowledge and Generalized Work Activities domains, respectively, to identify potential issues with obsolescence and to identify other necessary revisions to address length, language that could be difficult to understand, grammar or spelling, redundancy, bias and sensitivity. After the initial review, the potential anchor updates were grouped into the following categories:

1. **Anchors flagged for replacement** – anchors requiring a complete reworking and/or modernization of the original anchor. HumRRO staff wrote replacement anchors to align with the same element and anchor value. Anchors requiring replacement were flagged for one or more of the following reasons:
  - a. **Obsolescence: Technology** – references to specific technology or equipment that could be considered outdated (e.g., Videocassette Recorder (VCR)).
  - b. **Obsolescence: Terminology** – specific words or phrases that could be considered outdated or no longer relevant (e.g., “TV program”).
2. **Anchors flagged for revision** – anchors requiring (compared to anchors requiring replacement) smaller, more straightforward revisions to the original anchor that are less likely to alter the original construct. As with the replacement anchors, HumRRO staff wrote revised anchors to align with the same element and anchor value. Based on their necessary revisions, anchors were flagged for one or more of the following reasons:
  - a. **Length** – exceeds the 70-character limit, excluding punctuation and spacing.
  - b. **Simplification** – contains words or language that could be difficult to understand or may not be generalizable to the larger population.<sup>1</sup>
  - c. **Grammar or spelling** – contains spelling or grammar that could be improved.
  - d. **Redundancy** – includes repetitive or unnecessary words or language.
  - e. **Bias and sensitivity** – contains roles, situations, or general language that, although considered neutral when the anchors were originally developed, could now be considered insensitive due to shifts in cultural norms.<sup>2</sup>

Once HumRRO staff completed initial reviews of the anchors for the issues noted above, the flagged anchors were reviewed again by the Center and a debriefing call was held to ensure all necessary updates were captured. Table 1 provides the frequency of flagged anchors for each of the categories. Although anchors could be flagged for more than one reason, in general, most anchors were only flagged once. By percentage, the anchors within the Knowledge domain required more replacements and the anchors within the Generalized Work Activities domain required more revisions. Specifically, for the Knowledge domain, 20.20% and 9.09% of the anchors were flagged for replacement and revision, respectively. For the Generalized Work

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<sup>1</sup> This included several anchors related to the Military, nuclear, missile, or spacecraft activities that would not be as applicable to the larger population.

<sup>2</sup> For example, “Gain cooperation from a culturally diverse group of executives hostile to your company.” In this situation, “hostile” could be considered insensitive phrasing when discussing the culturally diverse group of executives.

Activities domain, 8.94% and 20.33% of the anchors were flagged for replacement and revision, respectively.

**Table 1. Frequency of Flagged Level Scale Anchors by Update Category**

Category	Knowledge N (%)	Generalized Work Activities N (%)
<i>Replacement</i>		
Technology	10 (10.10)	5 (4.07)
Terminology	10 (10.10)	6 (4.88)
<b>Total</b>	<b>20 (20.20)</b>	<b>11 (8.94)</b>
<i>Revised</i>		
Length	0 (0.00)	4 (3.25)
Simplification	8 (8.08)	16 (13.01)
Grammar or spelling	0 (0.00)	3 (2.44)
Redundancy	0 (0.00)	1 (0.81)
Bias and sensitivity	1 (1.01)	1 (0.81)
<b>Total</b>	<b>9 (9.09)</b>	<b>25 (20.33)</b>
<i>Number of Flags</i>		
One	27 (27.27)	28 (22.76)
Two	1 (1.01)	4 (3.25)
Flagged	28 (28.28)	32 (26.02)
Not flagged	71 (71.72)	91 (73.98)

*Note.* Knowledge: 99 anchors, Generalized Work Activities: 123 anchors. Percentages are based on the number of anchors within each domain. Anchors could be flagged for more than one reason.

### Drafting Updated Anchors

With input from the Center, HumRRO developed a set of detailed guidelines for drafting replacement and revised anchors, then used these guidelines to develop new anchor content. Prior to drafting the new anchors, two HumRRO analysts attended a one-hour training session covering the necessary reference information (discussions of domains, elements, and the level scale), descriptions and examples of each of the update categories, and instructions for the drafting process.

HumRRO analysts were instructed to draft two replacement anchors for each original anchor flagged for replacement, but only one revised anchor for each anchor flagged for revision. This distinction is tied to the goals of the scaling activity. Each replacement anchor would eventually be rated for element and anchor value match; thus, we needed a larger pool of replacement anchors to select from in the event that some draft anchors received poor match ratings and needed to be dropped from consideration. We discuss this process in greater detail in the following section. Additionally, given the replacement anchors were completely reworked and modernized versions of the original anchors, it was likely that the analysts who were

independently drafting the new anchor content would produce replacement anchors that varied in content. Having the larger pool provided additional flexibility when it came to selecting final replacement anchors.

Guidelines for addressing the revisions for each update category were mostly straightforward. When drafting replacement anchors for obsolete technology or terminology, it was not always possible for the analysts to choose a similar type of technology or scenario. Instead, the analysts focused on drafting replacement anchors that aligned with the target element and anchor value. To address length, analysts were instructed to provide simplified alternatives to complex or “wordy” language to shorten the anchors to 70 or fewer characters. Similarly, for simplification, analysts revised anchors to ensure that words and the context could be easily understood by a larger audience. In situations where an analyst encountered a word with a simpler alternative, they were instructed to use the alternative. Electronic writing resources were provided to assist with revisions to anchors related to spelling and grammar. For issues with redundancy, the analysts were instructed to remove excessive or unnecessary words or phrases from the anchor. Finally, to address issues with bias and sensitivity, we suggested that the analysts research the most current or widely accepted language when drafting revised anchors.

After discussing guidelines for drafting anchors, we covered several important reminders. These included:

- Anchors could be flagged for more than one update category. If an anchor had multiple flags, the analysts were instructed to consider the guidelines for each applicable flag.
- If an anchor was flagged for replacement *and* revision, the analysts were instructed to draft two replacement anchors that addressed obsolescence and other necessary revisions (as opposed to only drafting a single revised anchor). In general, addressing obsolescence was given precedence over other identified issues.
- As previously discussed, the goal of the anchor revision/replacement process was to draft anchors that aligned with the original element and anchor value. Analysts were asked to flag draft anchors where they felt the anchor value may have shifted due to their revisions (e.g., complete makeovers, unavoidable changes). Flagged anchors were then reviewed and further revised by the project lead and technical advisor to maintain a comparable anchor value or to determine if rescaling was required.
- Finally, in situations where analysts did not feel confident drafting a revised or replacement anchor because they felt they lacked the needed knowledge and understanding of the element in question (e.g., elements that were highly technical or complex), they were asked to make note of these anchors for discussion as a team. It was expected that drafting replacement and revised anchors would require independent research. For the more technical anchors, we set aside time for periodic internal meetings to discuss our independent research related to these anchors.

The drafting process took place over the course of a month. Each analyst was provided with their own version of an Excel workbook containing information for the original anchors (element ID, element name, anchor description, and anchor value), indicators for whether the anchor was flagged for each update category, and notes from the earlier reviews conducted by HumRRO and the Center. After the analysts finished drafting the new anchor content, the replacement and revised anchors were combined into a single Excel workbook and provided to the Center for review. At that point, the Center was able to “veto” any of the new anchor content. They were

also provided the opportunity to add any revised anchors with potential anchor value mismatches for inclusion in the scaling activity. This resulted in two revised anchors being included in the scaling activity. We discuss this process in the next section.

## Scaling

The purpose of the scaling activity was to evaluate each of the replacement anchors and a smaller subset of the revised anchors based on their alignment with the original element and anchor value. Initially, we had planned to only scale the newly drafted replacement anchors because these anchors had undergone substantial updates that could have potentially shifted the new anchor away from the intended construct associated with the original anchor. We anticipated that the revised anchors would include mostly smaller revisions that would be less likely to alter the original element or anchor value. However, after HumRRO and the Center reviewed the compiled list of replacement and revised anchors, two revised anchors were added to the list of anchors to include in the scaling activity. Both teams agreed the revisions were substantial enough to potentially result in a mismatch for the anchor value.

Over the course of approximately two weeks, independent ratings were completed by five HumRRO analysts. Of the five analysts, four have a master's degree and one has a doctoral degree in Industrial-Organizational Psychology with a range of 1-5 years of experience in their current roles. Each of the analysts has experience either leading or supporting ongoing updates and revisions to various components of the O\*NET occupational database. To remove the chance of bias or conflation with original revised item development, the five analysts did *not* include either of the individuals who drafted the new anchor content. Each analyst rated 20 replacement anchors within the Knowledge domain. They also completed ratings for 11 replacement anchors and two revised anchors within the Generalized Work Activities domain. The activity was preceded by a one-hour training session where the project lead and technical advisor assisted the analysts in making practice ratings for three of the replacement anchors and one revised anchor.

The analysts were instructed to review a description of each element and the associated level scale before making each rating. This information was provided in separate PDF documents for each domain. Analysts were also provided with their own Excel workbook to make independent ratings. The workbook included the element ID, element name, original anchor value, and original anchor description to help make their ratings. The replacement anchors were presented in four columns (two replacement anchors drafted by two independent analysts), each followed by three additional columns that provided a drop-down list for analysts to make the following ratings:

1. **Element match:** Analysts selected “Y” to indicate that the updated anchor aligned with the original element or “N” to indicate that the updated anchor did not align with the original element.
2. **Anchor value match:** Analysts selected “Y” to indicate that the updated anchor aligned with the original anchor value or “N” to indicate that the updated anchor did not align with the original anchor value.
3. **Adjusted anchor value:** *If* an analyst indicated that the updated anchor *did not* align with the original anchor value (i.e., if they selected “N” in the previous column), then they were instructed to select the appropriate anchor value. (This is generally expected to be either one unit above or below the original anchor value given the intent to draft all anchors to align with the original anchor value). *If* an analyst indicated that the updated



anchor *did* align with the original anchor value (i.e., if they selected “Y” in the previous column), then this column was to be left blank.

The revised anchors were presented in two columns (one revised anchor drafted by two independent analysts) on a separate sheet within the same workbook and followed the same guidelines and format. Each sheet contained a separate column for notes where the analysts could list any questions or concerns that they had about a particular anchor. They were also able to list which of the anchors they felt provided the strongest replacements or revisions to the original anchors.

After the analysts finished making their ratings, a consensus meeting was held to discuss any discrepancies. The ratings were compiled into a single Excel workbook and shared with each of the analysts. Only the original anchors that did not have at least one replacement or revised anchor with 100 percent agreement (i.e., all five analysts indicated a match) for both element and anchor value match were discussed. This was the case for two replacement anchors within the Knowledge domain and three replacement anchors within the Generalized Work Activities domain. For each of these cases, we began by discussing the new anchor with the highest ratings (closest to 100 percent agreement) for both element and anchor value match. In a few cases, more than one of the new anchors were tied for the highest ratings. When this occurred, each anchor was discussed as a potential alternative.

Table 2 provides an overview of the frequency of the anchors by highest element and anchor value match ratings. Overall, across both domains, most original anchors had at least one replacement anchor that received 100 percent agreement from the analysts (Knowledge: 90.00%, Generalized Work Activities: 72.73%).

**Table 2. Frequency of Level Scale Anchors by Highest Match Ratings**

Highest Rating (Element Match/Anchor Value Match)	Knowledge N (%)	Generalized Work Activities N (%)
<i>Replacement</i>		
5/5	18 (90.00)	8 (72.73)
5/4	1 (5.00)	3 (27.27)
5/3	1 (5.00)	--
<i>Revised</i>		
5/5	--	2 (100.00)

*Note.* Knowledge: 20 replacement anchors; Generalized Work Activities: 11 replacement and 2 revised anchors. Percentages are based on the number of anchors within each update category for each domain. Five analysts rated each new anchor separately on element match and anchor value match.

For all anchor value mismatches, analysts indicated in their independent ratings that the adjusted anchor value should be one unit lower than the original anchor value. Throughout our discussion, it became apparent that many of the anchor value mismatch ratings were rooted in comparison to the original anchor content. Several analysts mentioned lowering the anchor value for the new anchor by one unit when the original anchor referenced Military, nuclear, missile, or spacecraft activities because these types of activities appeared more “complex” than the newer anchor content. As a result, we shifted our discussions away from comparison to the original anchors and, instead, focused on comparisons to the anchors positioned at the extreme

ends of the corresponding level scale or to the anchor near the scale midpoint. In the end, analysts were able to reach 100 percent agreement on all replacement and revised anchors within the Knowledge and Generalized Work Activities domains.

### Finalizing the Updated Anchors

Once the ratings from the scaling activity were finalized, a single replacement or revised anchor was selected for each flagged original anchor. Original anchors with more than one new anchor with 100 percent agreement were replaced by the anchor that was the most simple and modern alternative and that best aligned with the intended element and anchor value as determined by the project lead and technical advisor. All other anchors were replaced by the anchor agreed upon by the analysts during the consensus meeting.

The Center completed a thorough review of each new anchor and then met with HumRRO to discuss feedback. As a result, we drafted an alternative for one replacement anchor within the Generalized Work Activities domain and then analysts were asked to rate the anchor value and element match of the newly drafted anchor. Ultimately, the analysts reached 100 percent agreement and the new replacement anchor was included in the final list of anchors. For the other flagged anchors, minor edits were made to ensure the intended element was evident or the anchor was replaced with an alternative anchor that had also received 100 percent agreement. The revisions made to the latter set of anchors were not significant enough to warrant collecting updated scaling ratings from HumRRO's analysts. After all the revisions were addressed, a final list of anchors that were best for inclusion for the Knowledge and Generalized Work Activities domains was provided to the Center in a format suitable for publication. For a comparison of new versus original descriptions for anchors that were updated, see Appendix A (Knowledge) and Appendix B (Generalized Work Activities).

### Summary

Through collaboration with the Center, HumRRO updated 28 level scale anchors within the Knowledge domain and 32 level scale anchors within the Generalized Work Activities domain (28% and 26% of all level scale anchors within each domain, respectively). Many of these updates required minor revisions to address issues such as excessive length, language that was difficult to understand or not generalizable to the larger population of occupations, spelling or grammar, words that were repetitive or unnecessary, and potential issues with bias and sensitivity. Other anchors required a complete reworking and/or modernization to the original level scale anchor to address issues with obsolescence related to technology and/or terminology. The newly developed level scale anchors provide modernized and simplified alternatives to the original anchors.

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## Appendix A: New Versus Original Anchor Descriptions: Knowledge Domain

**Table A1. Knowledge Domain: Original and Final Level Scale Anchors**

Element	Anchor Value	Original Anchor Description	Final Anchor Description
Administration and Management	2	Sign a pay voucher	Approve a reimbursement request
Administration and Management	6	Manage a \$10 million company	Manage a multimillion-dollar company
Clerical	2	File letters alphabetically	Direct phone calls to the appropriate staff member
Clerical	5	Organize a storage system for company forms	Organize a digital storage system for company forms
Communications and Media	4	Be a radio disk jockey	Host a music radio show
Computers and Electronics	1	Operate a VCR to watch a pre-recorded training tape	Operate a media player to watch a training video
Computers and Electronics	3	Use a word processor	Use a computer to format a document
Computers and Electronics	6	Create a program to scan computer disks for viruses	Create a program to scan a computer for viruses
Customer and Personal Service	2	Process customer dry-cleaning drop off	Process a customer's dry-cleaning drop off
Customer and Personal Service	4	Work as a day care aide supervising 10 children	Be responsible for 10 children at daycare
Design	4	Draw plans for remodeling a kitchen	Design plans for remodeling a kitchen
Engineering and Technology	4	Design a more stable grocery cart	Design a custom office chair
English Language	4	Edit a feature article in a local newspaper	Edit an article for a news website
Fine Arts	5	Design an artistic display for a major trade show	Design an exhibit for a major art show
Food Production	2	Keep an herb box in the kitchen	Grow herbs in the kitchen
Food Production	6	Run a 100,000-acre farm	Run a large production farm
Geography	4	Identify Turkey on a world map	Find a specific country on a world map
Law and Government	2	Register to vote in a national election	Describe the length of a U.S. presidential term

Element	Anchor Value	Original Anchor Description	Final Anchor Description
Personnel and Human Resources	3	Interview applicants for a secretarial position	Interview applicants for an administrative position
Philosophy and Theology	2	Watch a TV program on family values	Watch a TV show on family values
Physics	4	Calculate water pressure through a pipe	Calculate the speed of a falling object
Psychology	6	Treat a person with severe mental illness	Treat a person with a severe mental illness
Sales and Marketing	4	Call a list of clients to introduce them to a new product line	Introduce clients to a new line of products
Sales and Marketing	6	Develop a marketing plan for a nationwide telephone system	Develop a marketing plan for a new nationwide high-speed internet system
Sociology and Anthropology	5	Write a pamphlet about cultural differences	Write an article about cultural differences
Telecommunications	1	Dial a phone	Send an email
Telecommunications	2	Install a satellite TV dish	Install a wireless internet router
Transportation	5	Steer a large freighter through a busy harbor	Drive a semi-truck through a busy city

## Appendix B: New Versus Original Anchor Descriptions: Generalized Work Activities Domain

**Table B1. Generalized Work Activities Domain: Original and Final Level Scale Anchors**

Element	Anchor Value	Original Anchor Description	Final Anchor Description
Analyzing Data or Information	1	Determine the location of a lost order	Skim a short article to gather the main point
Assisting and Caring for Others	4	Assist a stranded traveler in finding lodging	Help a medical patient find in-home assistance or healthcare
Coaching and Developing Others	4	Provide on-the-job training for clerical workers	Provide on-the-job training for administrative workers
Communicating with People Outside the Organization	4	Make standard presentations about available services	Present information to potential clients about available services
Communicating with Supervisors, Peers, or Subordinates	1	Write brief notes to others	Write brief messages to others
Communicating with Supervisors, Peers, or Subordinates	6	Create a videotaped presentation of a company's internal policies	Create and deliver a presentation on a company's internal policies
Documenting/Recording Information	2	Record the weights of trucks that use the highways	Record the weight of a patient during a routine health exam
Documenting/Recording Information	6	Maintain information about the use of orbiting satellites for private industry communications	Maintain information about the use of satellites for industry communications
Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment	4	Specify the furnishings for a new school	Specify the furniture and equipment for a new school
Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment	6	Draw the electronic circuitry for a high-speed scientific computer	Draw the layout of a circuit board for a high-performance computer
Establishing and Maintaining Interpersonal Relationships	7	Gain cooperation from a culturally diverse group of executives hostile to your company	Gain cooperation from a diverse group of executives with competing interests
Estimating the Quantifiable Characteristics of Products, Events, or Information	2	Estimate the size of household furnishings to be crated	Estimate the size of household furniture to be shipped

Element	Anchor Value	Original Anchor Description	Final Anchor Description
Guiding, Directing, and Motivating Subordinates	4	Supervise a small number of subordinates in a well-paid industry	Manage a small team of employees in a dynamic workplace
Identifying Objects, Actions, and Events	4	Judge the acceptability of food products	Judge the suitability of food products for an event
Inspecting Equipment, Structures, or Material	6	Inspect a nuclear reactor	Conduct a thorough inspection of an aircraft engine
Judging the Qualities of Objects, Services, or People	6	Establish the value of a recently discovered ancient art work	Establish the value of a recently discovered ancient artwork
Making Decisions and Solving Problems	4	Select the location for a major department store	Select the location for a major retail store
Monitoring and Controlling Resources	2	Work as a housekeeper responsible for keeping track of linens	Work as a server responsible for keeping track of utensils
Organizing, Planning, and Prioritizing Work	4	Plan and organize your own activities that often change	Plan and adjust a personal to-do list according to changing demands
Performing Administrative Activities	2	Complete routine paperwork on standard forms	Complete routine paperwork
Performing Administrative Activities	4	Complete tax forms required of self-employed people	Complete tax forms for a small business
Performing for or Working Directly with the Public	1	Tend a highway toll booth	Check tickets at a concert
Performing for or Working Directly with the Public	4	Sell shoes in a popular shoe store	Sell shoes in a crowded shoe store
Performing for or Working Directly with the Public	6	Perform a monologue on national TV	Perform a monologue on TV
Performing General Physical Activities	1	Walk between work stations in a small office	Walk between workstations in a small office
Processing Information	2	Tabulate the costs of parcel deliveries	Calculate the costs for shipping packages
Repairing and Maintaining Electronic Equipment	1	Use knobs to adjust a television picture	Use display settings to adjust a television picture

Element	Anchor Value	Original Anchor Description	Final Anchor Description
Repairing and Maintaining Mechanical Equipment	4	Adjust a grandfather clock	Change the oil on a tractor
Selling or Influencing Others	4	Deliver standard arguments or sales pitches to convince others to buy popular products	Make a sales pitch to convince others to buy a product
Selling or Influencing Others	6	Deliver major sales campaign in a new market	Deliver a major sales campaign in a new market
Staffing Organizational Units	7	Direct a large recruiting and employment program for a large international manufacturing organization	Direct a recruiting program for a large international organization
Working with Computers	2	Enter employee information into a computer database	Enter employee information into a database