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Probability and Possibility Calculation Statistics for Data Variables (VDOIHI); Statistical Methods for Combined Stage Percentage Calculation*

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Abstract

This article examines probability and possibility calculation statistics for data variables (VDOIHI), statistical methods for combined stage percentage calculation and how to do the scoring. Combined stage percentage calculation statistics is the division of one section (variable) of an experiment, observation or any measurement to the three stages of positive, negative and neutral, and the calculation of the % effect of these stages to the result. In addition, it explains how to make calculations for the same sections of an experiment, an observation or a measurement conducted or repeated. In this statistical method, 'akp's of the same stages of a section are combined and turned into a single stage. Akp's that should be present and that are present in this statistical method were given the scores of -1, 0 and 1. In scorings others than akp, scores of 0 and 1 were used.

Key Words: Statistical Methods for Combined Stage Percentage Calculation, Scoring and Calculation Instructions, The Required Scoring Procedure, Evaluation Instructions, Score Calculations

Introduction

There is insufficient use of the mathematical infrastructure in the analysis of probability and possibility calculations for the effect of the variables of an experiment, observation or measurement on the result. The uncertainty associated with the possibilities of n events with a possibility of m is the subject matter of information theories, but uncertainty calculations in information theories do not seek to find out the possibilities for the uncertainty of events. In probability and possibility calculation statistics for data variables (**V**eri **D**eğişkenlerinin **O**lasılık ve **I**htimal **H**esaplama **I**statistiği "VDOIHI"), calculation of the possibilities for the uncertainty in variables are included in the analysis for variable uncertainty, as well as the uncertainty calculations of information theories. In addition,

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this statistical methods can be used to find out about the combinations and probability of n events with a possibility of m. In VDOIHI, each event with a possibility of m will be called a smallest meaningful unit "**a**nlamlı en **k**üçü **p**arça, akp≡smu". n events or the totality of akp's will be called a "stage". The stage or the totality of stages that make up a single effect upon an experiment, observation or measurement will have called a "variable" or a "section". In combined stage percentage calculations statistics, the term "section" will be used in lieu of variable. Combines stage percentage calculation statistics is the division of one section of an experiment, observation or measurement to the three stages of positive, negative and neutral, and the calculation of the % effect of these stages to the result. Negative and positive scores of the negative stages are calculated separately. The separate calculation of the scores of negative stages reduces a possibility of m to a possibility of 2. In addition, it explains how to make calculations for the same sections of an experiment, an observation or a measurement conducted or repeated. In this statistical method, 'akp's of the same stages of a section are combined and turned into a single stage. This article also explains how to do the scoring.

Education studies use different methods for the analysis of qualitative data. In one of these methods, rubrics, a scale is prepared by dividing the performance definition expected of students into different dimensions and levels. In analyses using this scale, it is possible to assign scores to these dimensions and levels according to some criteria defined (Sezer, 2005). In some rubrics, analysis was conducted by giving scores to the dimensions and levels of students' understanding, knowledge strategies and knowledge representations (Park, Jang, Chen & Jung, 2010). For example, in a study by Ergün (2010), dimensions and levels of some physics subjects were identified, and analysis was conducted by giving scores to these dimensions and levels. In another study, Khalick, Waters and Le (2008) made an analysis by assigning scores to the dimensions and levels of the nature of science in university chemistry subjects. In Aydın's (2009, pp: 76-79) PhD dissertation, the "Group Embedded Figures Test" was used to examine the psychological factors of field dependent, field moderate and field independent cognitive styles of prospective teachers, and the test was evaluated by giving each correct figure a score of 1. In general, systematic

encoding is done for qualitative data, as in the study of Yıkmış and Ozbey (2009). In their study that makes use of information theories, Haussler, Kearns and Schapire (1994) made information calculations using the scores of 1-0 for their learning model.

Knowledge can be defined like the definitions of bits in classical information theories and it does not necessarily include the details of information analyses, but a similar and simple classification technique might be used (Guan & Bell, 1998). Data at the beginning of a system is a subject related to information theories rather than a physical subject, and these data might be explained by the concept of information entropy (Jaynes, 1957a, 1957b, 1982).

In data analysis using VDOIHI combined stage percentage calculation, the questions of the measurement tool used for data collection are divided into sections based on the structure of the question. These sections are then divided into stages, and the stages are divided into smallest meaningful units. Data analysis via VDOIHI is conducted by giving scores of -1, 0, and 1 to these **s**mallest **m**eaningful **u**nits "**a**nlamlı en **k**üçü **p**arça, akp≡smu"s, and by combining the scores of the same stages of a section.

In VDOIHI combined stage percentage calculation, the question prepared tor the issue to be measured is scored by dividing it into sections, which are further divided into stages, similar to the analysis of dimensions and levels used in previous studies in the literature mentioned above. Scoring of the smallest meaningful units of the stages is different from the scoring used for rubrics in the literature. Akp's are given standard scores. Thus, it becomes possible to make a standard measurement independent of the issue to be measured and independent of the measurement tool used.

When the scores of 1–0 or -1–0 are used to score akps, the possibility of the akp being ±1 or 0 is 2. The possibility of more than one akps being ±1 or 0 is 2^n. Besides making a standard measurement by giving akps scores of ±1 or 0, theories of Turing Machines (Copeland, 2004, p: 1) can also be used, which were firs used by Alan Mathison Turing (1912-1954), inventor of the digital computers (modern computers). Problems concerning the sufficient and efficient transmission of the message in Turing Machines are the subject matter of

information theories. Information theories are based on calculations of probability and possibility (Klir, 2006, p: 7; Bradshaw & Boose, 1988).

This article aims to examine the probability of the effect of variables of an experiment, observation or measurement, measured by a measurement tool, on the result. This article also aims to develop a standard method of scoring. A possibility of m associated with the experiment, observation or measurement is reduced to a probability of 2 by combining akps of the same stages of each of the variables that affect the result into a single stage, and by calculating the negative and positive scores of the negative stage separately.

Importance of VDOIHI of Qualitative Data

1) It allows an evaluation which is parallel to the structure of scientific knowledge.
2) It allows determination of the information of the respondent to the interview (experiment).
3) It allows determination of the information energies of the respondent to the interview.
4) Determined probability allows determination of Individual Intellectual Functions.
5) It allows scoring of the interview realized with written and/or verbal qualitative questions and evaluation between these scores which have cause-effect relationship.
6) If there is a negative score (negative akp) in the scoring of a phase then it constitutes a negative phase.
7) Negative and positive scores of negative phase are calculated and evaluated separate from positive phases.
8) It allows performing evaluation individually for sections and questions.
9) It allows evaluation of qualitative data with quantitative data.

Scoring and Calculation Instructions

The Required Scoring Procedure

- Score one (1) is used for akp which should be in an answer or answer phase of a question.
- Answers of every question are scored one (1).

- If more than one items are requested as an answer (or the answer is composed of several steps), each requested answer is scored one (1) and this is "Cb" score. By summing Cb scores in a question the required "CB" score is found.
- Each question should have at least one part.
- Each part is scored one (1) and this is "BS" score. By summing BS scores in a question the required "AGSS" score is found.
- Parts of a question are composed of variables such as; a) given and requested things b) figure, graph and drawing (for example, a free body diagram for physics) c) definition d) formula e) operation, which are suitable for the studied discipline or subject and which should be utilized by the learning individual in the solution of the questions. Formation of the parts shall be realized such that the research status of the individual is clearly revealed and the parts shall support one another.
- It is not mandatory that number of parts and type of the questions are identical.
- If more than one definition (the definition may be scientific knowledge as well as a more comprehensive notion which covers the data that do not constitute scientific knowledge but facilitates the solution) or formula should be used in a part these definitions and formulas constitute the phases of the part.
- Each part should have at least one phase.
- In cases where there are several phases forming the same phase or there are two ways (choices) that lead to the solution, for the required score what the respondent should know or the definition or formula used by the interview respondent is selected as a phase. For example: A physics question, in cases where it can be solved with both kinetic and potential energy change formulas, can be given as an example for the selection. The selection of this phase by examining the interview data may contribute to making the interview learning individual-centered.
- Each phase is scored one (1) and this is "AS" score. By summing AS scores in a part the required "AAGS" score is found. AAGS score does not have an upper limit but it should be at a minimum level which provides a way to the solution.
- Phase is divided into the smallest meaningful portion (akp).
- Every phase should have at least one (1) akp.

- Akp does not depend on the amount of letters or words.
- Akp can be maximum letter-word composition or a symbol in a formula which leads to the solution as well as a region in a figure or graph that is meaningful for the subject.
- In definition, a group of words that can be expressed with a single word which does not have a meaningful contribution to the solution of the question constitutes a akp.
- All symbols in a formula that represent a symbol which does not have a meaningful contribution to the solution constitutes one (1) akp (for example, when mass and acceleration are given in a question and the force is requested, writing $\vec{F} = m\frac{\vec{v}}{t}$ does not have a meaningful contribution to the solution. Because knowing the velocity has nothing to do with the solution of this question. v and t together constitute a akp and that is a, v and t are not scored individually. $\vec{a} = \frac{\vec{v}}{t}$ equation here can be a different research subject about the knowledge of the question's procedures which supports the question).
- At a phase, akps which are negligible as compared to other akps or which do not affect the meaning of the phase when they are removed are not scored.
- Akp repetitions which do not contribute to the meaning of the phase are not scored.
- Every akp is scored one (1) and this is "GP" score. By summing GP scores in a part the required "BGS" score is found. BGS score does not have an upper limit but it should be at a minimum level which provides a way to the solution.
- In case, by featuring "importance", arbitrary values are given in scoring for akp, phase, part and result the values of IS, APS, ANS, NAPS, SS, ISS, APSS, ANSS, NAPSS, ASSS and ASS calculations performed for the interviewer will be in $-1 \leq \text{Score} \leq 1$ interval similar to the values obtained when one (1) score is given. Although this type of scoring reflects the value of the concepts according to individuals, it does not represent the importance of this concept for the biological structure of a learning individual or it does not make the biological structure give priority to concepts with high importance. Furthermore, scoring difference or importance difference of akps does not affect learning (importance difference given by the learning individual will make a difference for learning) or the speed of learning.

- Using negative one (-1) score, does not change 2^n possibility to 3^n possibility. Using negative score is a condition that is related to individual intellectual functions. Negativity means that the individual can not project onto the knowledge set. Not being able to project onto knowledge set and projecting more than the required amount have the same value (0). However, learning individual's inability to project or wrong projections, methods and processes vary for correct projection.
- In this statistical method, -1 will also be represented as 0 in combinations. The differentiation of wrong (-1) and absences (0) will be done with APS, ANS, NAPS and SS calculations.

Scoring Interviewer Responses Procedure

- In scoring interviewer responses; 1, 0, -1 are used.
- Unnecessary repetitions in the response are not scored.

Phase Scoring and Calculation Procedure

- If the akps in a certain phase of the response are not related to the akps that are required in the phase, negative one (-1) score is given and this phase becomes a negative phase. This negative akp is "-PS" score. By summing –PS's in the phases N score of the phase is found.
- In the akp sequence in a certain phase of the response, the required response along with akps that distort the meaning or that block the way to the answer are scored negative one (-1).
- By summing the required phase corresponding akps "BGP" of negative phases, the "NAGS'score which is required to be achieved in the part is found. (NAGS score is positive).
- NAGS score can be, at maximum, as much as BGS score.
- Correct akps in a negative phase are given one (1) score. These positive scores are (1) "±PS" score and these positive scores are calculated independently from positive phases. Bu summing ±PS's in the phases "NP" score of the part is found.

- In negative and positive phases akps that should exist but do not exist are given score zero (0).
- If the absolute value of the sum of negative scores in a phase is equal to the required score ("BGP" sum of the phase's akps), this stage is irrelevant phase and it is scored one (1). This is "IHA" score.
- By summing all IHA's in the same part, "IA" score is found. Although the score of this phase is positive it constitutes a wrong answer. IA is calculated independently from the calculations performed for positive and negative phases and included in the evaluation.
- If the phase answer is not related to the required answer, then without scoring the akps of the answer given, score one (1) is given and this phase also represents an irrelevant phase.
- IA score can not be larger than AAGS score.
- If there is no negative score in a phase then this phase is positive and its akps are scored one (1). These akps are "+PS" score. By summing +PS's in the phases "P" score of the part is found.
- P score can not be larger than BGS score.
- Akps that do not exist in positive phases are scored zero (0).

Part Score Calculation Procedure

- The negative score "ANS" taken from the part is found as follows: the ratio of part's N score to NAGS score is divided by AAGS score and the result is multiplied by the number of negative phases "NA".
- The positive score taken in the negative phases "NAPS" of the part is found as follows: the ratio of part's NP score to NAGS score is divided by AAGS score and the result is multiplied by the number of negative phases "NA".
- "IS" score is found from the ratio of IA score to AAGS score.
- The positive score taken from the part "APS" is found from the ratio of P score to BGS score.

- By summing P, NP and "negative of N score" scores and subtracting this amount from BGS and taking its ratio to BGS, zero score taken from the part "SS" is calculated.

Result Score Calculation Procedure

- By summing all the same scores in a question (ANS, NAPS, IS, APS and SS) and taking their ratio to the AGSS of the question, result scores are found.

Scoring and Calculating of the Answer Given to the Question Procedure

- If the answer given is the desired/expected answer, then one (1) score is given. If the answer given is not the desired/expected answer or no answer is given, then zero (0) score is given.
- If there are more than one requested items in the answer, answer scoring is performed for each requested item, as defined before. By adding these scores interviewer score "GS" is found. GS score's ratio to CB score yields "ASS" score.

Score Calculation of Questions (one interviewer) Procedure

- By adding up the same scores from the same parts of the questions and taking their ratio to the sum of BS scores in the same part ($AGSS_{th}$) interviewer's same score sum for the same part is found.
- By summing same result scores for parts and taking the ratio to number of questions interviewer's same result scores sum is found.
- By summing answer scores of the questions and taking the result's ratio to number of questions interviewer's answer score sum is found.

Part and Result Score Calculation of Interviewers Procedure

- By taking the ratio of scores calculated from same parts to number of interviewers the sum of interviewers' part/result same scores is found.

Score Calculation of Interviewers in a Specific Question Procedure

- By adding interviewer scores calculated in the same parts of a specific question and taking its ratio to number of interviewers the sum of part/result same scores is found.

Evaluation Instructions

Evaluation for a Question

- By performing between scores calculated for each part and ASS score, the contribution of that part to the answer is determined.
- By performing between result scores and ASS score the combined contribution of parts to the answer is determined.
- These evaluations reflect the knowledge of the interviewer and how he uses this knowledge.

Evaluation for an Interviewer

- It is performed between the same score sums of the same part and ASS score sums.
- It is performed between score sums calculated for the results and ASS score sums.
- This evaluation reflects the knowledge of interviewer about the interview and how he uses this knowledge.

Evaluation for Interviewers

- Performed between the same score sum of the same part in calculations done for interviewers and ASS score sum of interviewers.
- This evaluation is a generalization of interviewers' knowledge about the interview and how they use this knowledge.

Evaluation of Interviewers for a Specific Question

- Performed between the same score sum of the same part in calculations done for interviewers in a specific question and ASS score sum of interviewers for the same question.
- This evaluation is a generalization which reflects the interviewers' knowledge and how they use this knowledge.

Score Calculations (Mathematical Expression/Equalities):

Score Calculation for a Question

Possible/ "Required" Calculations

AGSS (Result Score that is Required to be taken in Parts (Bölümlerden **A**lınması **G**ereken **S**onuç **S**kor "AGSS")): Parts in a question (BS) are given score one (1) and it is found by summing these scores.

1)

$$AGSS = \sum_{i=1}^{h} BS_i$$

i = 1, 2, 3, ……, h (h is the number of parts in a question)

BS = 1

2) The Required Result Score that should be taken from the same parts of the interviewer;

$$\mathrm{AGSS}_{th} = \sum_{i=0}^{ha} BS_i$$

i = 0, 1, 2, 3, ……, ha (ha = number of interviewer's same parts)

AAGS (The Required Score that should be taken from the phases of the part (Bölümün **A**şamalarından **A**lınması **G**ereken **S**kor "AAGS")): Each phase in the part is scored one (1) (AS) and it is found by summing the phases. If there is no part (i = 0 = AAGS), then AAGS has also zero score. Similarly NAGS, BGS, SS, P, N, NP, IA have zero score.

$$\mathrm{AAGS} = \sum_{i=0}^{a} \mathrm{AS}_i$$

i = 0, 1, 2, 3, ……., a (a = number of phases in a part)

AS = 1

AAGS = a

i = 0 ⟹ AAGS, NAGS, BGS, SS, P, N, NP, İA = 0

NAGS (The Required Score when there is a negative phase or there are negative phases in the part (Bölümde **N**egatif Aşama veya Aşamalar Olduğunda **A**lınması **G**ereken **S**kor "NAGS")): The portions that should exist (BGP) in each negative phase are scored one. If there is no negative phase (i = 0 = NAGS) then NAGS has 0 score. Similarly, N and NP have zero scores. If the part has one phase and it is a negative phase then NAGS score is equal to BGS score.

$$\mathrm{NAGS} = \sum_{i=0}^{b} \mathrm{BGP}_i$$

i = 0, 1, 2, 3, ……, b (b = number of akps that are required in a negative phase or negative phases)

BGP = 1

$i = 0 \Rightarrow \mathrm{NAGS, N, NP} = 0$

BGS (The required score that should be taken from the part (**B**ölümden Alınması **G**ereken **S**kor "BGS")): Portions that should exist in a part (GP) are scored one (1) and it is found by summing the scores of these portions. If AAGS score is larger than zero (0) then BGS should have at least one (1) score.

1)

$$\mathrm{BGS} = \sum_{i=0}^{c} \mathrm{GP}_i$$

i = 0, 1, 2, 3, ……, c (c = number of akps required in a part)

GP = 1

AAGS > 0 ⟹ BGS ≥ AAGS

2) BGS sum of the reviewer in the same part;

$$\mathrm{BGS}_t = \frac{\sum_{i=0}^{ha} BGS_i}{\mathrm{AGSS}_{th}}$$

i = 0, 1, 2, 3, ……, ha (ha, same part number of the interviewer "AGSS_{th}")

Interviewer Part Calculations

IS (Irrelevant Score taken from the Part (Bölümden Alınan **I**lişkisiz **S**kor "IS")): If in a part of interview data the answer is not related to the solution of the question (IHA), one (1) is scored and this constitutes an irrelevant phase. At the same time this phase is a wrong answer. If irrelevant score is more than one in a part by summing (IA) each irrelevant phase (IHA), and by taking its ratio to AAGS, IS is found. If the score of IA is larger than AAGS then IS should be equivalent to one (1). Because, IA score is independent from the requested and depends on the will of the respondent to the interview. At the same time, IS being larger than one (IS>1) is same as IS being equal to one in evaluation. This shows us that the respondent uses (has) totally wrong knowledge about this question (part). IS being larger than one does not warranty that the respondent will have a wrong answer to this question (part). Because the probability to receive P score is independent of IS score. If there is no irrelevant answer with the part ($i = 0$), IA becomes zero (0).

1)

$$IS = \frac{\sum_{i=0}^{d} IHA_i}{AAGS} = \frac{IA}{AAGS}$$

$i = 0, 1, 2, 3, \ldots\ldots, d$ (d = number of irrelevant phases)

IHA = 1

$0 \leq IA \leq AAGS$

$0 \leq IS \leq 1$

2) IS sum of the reviewer in the same part;

$$IS_t = \frac{\sum_{i=0}^{ha} IS_i}{AGSS_{th}}$$

$i = 0, 1, 2, 3, \ldots\ldots, ha$

APS (Positive Score taken from the Part (Bölümden **A**lınan **P**ozitif **S**kor "APS")): It is found by summing all partial scores (+PS) from each positive score in the interview data (P) and taking its ratio to BGS.

1)

$$APS = \frac{\sum_{i=0}^{e} +PS_i}{BGS} = \frac{P}{BGS}$$

$i = 0, 1, 2, 3, \ldots\ldots., e$ (e = number of akps in positive phases)

+PS = 1

$0 \le P \le BGS$

$0 \le APS \le 1$

2) APS sum of the reviewer in the same part;

$$\mathrm{APS}_t = \frac{\sum_{i=0}^{ha} APS_i}{\mathrm{AGSS}_{th}}$$

i = 0, 1, 2, 3, ……, *ha*

3) P sum of the reviewer in the same part;

$$\mathrm{P}_t = \frac{\sum_{i=0}^{ha} P_i}{\mathrm{AGSS}_{th}}$$

i = 0, 1, 2, 3, ……, *ha*

ANS (Negative Score taken from the Part (Bölümden **A**lınan **N**egatif **S**kor "ANS")): It is found by summing all partial scores (-PS) from each negative score (N), taking its ratio to NAGS, then, taking its ratio to AAGS and, finally, multiplying the result by the number of negative phases "NA".

1)

$$\mathrm{ans} = \frac{\frac{\sum_{i=0}^{fb} -\mathrm{PS}_i}{\mathrm{NAGS}}}{\mathrm{AAGS}} \quad \text{or} \quad \mathrm{ans} = \frac{\frac{\mathrm{N}}{\mathrm{NAGS}}}{\mathrm{AAGS}}$$

$$\mathrm{ANS} = \sum_{i=0}^{fa} \mathrm{ans}_i \quad \text{or} \quad \mathrm{ANS} = \frac{\frac{\sum_{i=0}^{f} -\mathrm{PS}_i}{\mathrm{NAGS}}}{\mathrm{AAGS}} \times NA \quad \text{or} \quad \mathrm{ANS} = \frac{\frac{\mathrm{N}}{\mathrm{NAGS}}}{\mathrm{AAGS}} \times NA$$

i= 0,1, 2, 3, ……., *fa* (*fa* = number of negative phase)

i= 0,1, 2, 3, ……., *fb* (*fb* = number of negative akps in negative phase)

i = 0, 1, 2, 3, ……, *f* (*f* = number of negative akps in negative phases)

-PS = -1

$0 \le |\mathrm{N}| < \mathrm{NAGS}$

$|\mathrm{N}| = \mathrm{NAGS} \Longrightarrow$ IHA

2) ANS sum of the reviewer in the same part;

$$\mathrm{ANS}_t = \frac{\sum_{i=0}^{ha} ANS_i}{\mathrm{AGSS}_{th}}$$

i = 0, 1, 2, 3, ……, *ha*

NAPS (Positive Scores Received from Negative Phase/Phases (**N**egatif Aşamadan/Aşamalardan **A**lınan **P**ozitif **S**korlar "NAPS")): It is found by summing all partial positive scores (±PS) from each positive score (NP) and taking its ratio to NAGS and then taking the result's ratio to AAGS and, finally, multiplying the result by the number of negative phases "NA".

1)

$$\text{naps} = \frac{\frac{\sum_{i=0}^{gb} \pm \text{PS}_i}{\text{NAGS}}}{\text{AAGS}} \quad \text{or} \quad \text{naps} = \frac{\frac{\text{NP}}{\text{NAGS}}}{\text{AAGS}}$$

$$\text{NAPS} = \sum_{i=0}^{fa} \text{naps}_i \quad \text{or} \quad \text{NAPS} = \frac{\frac{\sum_{i=0}^{g} \pm \text{PS}_i}{\text{NAGS}}}{\text{AAGS}} \times NA \quad \text{or} \quad = \frac{\frac{\text{NP}}{\text{NAGS}}}{\text{AAGS}} \times NA$$

i = 0, 1, 2, 3, ……., gb (gb = number of positive akps taken in negative phase)

i = 0, 1, 2, 3, ……., g (g = number of positive akps taken in negative phases)

±PS = 1

2) NAPS sum of the reviewer in the same part;

$$\text{NAPS}_t = \frac{\sum_{i=0}^{ha} NAPS_i}{\text{AGSS}_{th}}$$

i = 0, 1, 2, 3, ……, ha

SS (Zero Score taken from the Part; it is calculated as follows (Bölümden **A**lınan **S**ıfır **S**kor "SS")): Akps of the interview data are added up and subtracted from BGS and the obtained score (ss), and its ratio to BGS is taken (calculation is performed as follows; all akp scores from every positive phase in the interview data (P) is summed with the inverted sum of all negative akp scores received in all negative phases (N) and positive akp scores received in each negative phase, the result is subtracted from BGS and the obtained score is divided by BGS).

1)

$$\text{SS} = \frac{\text{BGS} - (\text{P} + \text{NP} + |\text{N}|)}{\text{BGS}} \quad \text{veya} \quad \text{SS} = \frac{ss}{\text{BGS}}$$

2) SS sum of the reviewer in the same part;

$$SS_t = \frac{\sum_{i=0}^{ha} SS_i}{AGSS_{th}}$$

i = 0, 1, 2, 3, ……, *ha*

Calculation of Results for Interviewer

ISS (Irrelevant Result Score received from Parts (Bölümlerden Alınan **İ**lişkisiz **S**onuç **S**kor "ISS")): It is found by summing IS scores and dividing by AGSS.

1)

$$ISS = \frac{\sum_{i=0}^{j} IS_i}{AGSS}$$

i = 0, 1, 2, 3, ……., *j* (*j* number of IS parts)

2) ISS sum of the interviewer;

$$ISS_t = \frac{\sum_{i=0}^{ja} ISS_i}{ja}$$

i = 0, 1, 2, 3, ……, *ja* (*ja* = number of questions)

APSS (Positive Results Score from Parts (Bölümlerden **A**lınan **P**ozitif **S**onuç **S**kor "APSS")): It is found by summing APS scores and dividing by AGSS.

1)

$$APSS = \frac{\sum_{i=0}^{k} APS_i}{AGSS}$$

i = 0, 1, 2, 3, ……., *k* (*k* number of APS parts)

2) APSS sum of the interviewer;

$$APSS_t = \frac{\sum_{i=0}^{ja} APSS_i}{ja}$$

i = 0, 1, 2, 3, ……, *ja*

ANSS (Negative Results Score from Parts (Bölümlerden **A**lınan **N**egatif **S**onuç **S**kor "ANSS")): It is found by summing ANS scores and dividing by AGSS.

1)

$$ANSS = \frac{\sum_{i=0}^{l} ANS_i}{AGSS}$$

i = 0, 1, 2, 3, ……, l (l number of ANS parts)

2) ANSS sum of the interviewer;

$$\mathrm{ANSS}_t = \frac{\sum_{i=0}^{ja} ANSS_i}{ja}$$

i = 0, 1, 2, 3, ……, ja

NAPSS (Positive Results Score from Negative Parts (**N**egatif **B**ölümlerden **A**lınan **P**ozitif **S**onuç **S**korlar "NAPSS")): It is found by summing NAPS scores and dividing by AGSS.

1)

$$NAPSS = \frac{\sum_{i=0}^{m} NAPS_i}{AGSS}$$

i = 0, 1, 2, 3, ……, m (m number of NAPS parts)

2) NAPSS sum of the interviewer;

$$\mathrm{NAPSS}_t = \frac{\sum_{i=0}^{ja} NAPSS_i}{ja}$$

i = 0, 1, 2, 3, ……, ja

ASSS (Result zero score from Parts (Bölümlerden **A**lınan **S**onuç **S**ıfır **S**kor "ASSS")): It is found by summing SS scores and dividing by AGSS.

1)

$$ASSS = \frac{\sum_{i=0}^{o} SS_i}{AGSS}$$

i = 0, 1, 2, 3, ……, o (o number of SS parts)

2) ASSS sum of the interviewer;

$$\mathrm{ASSS}_t = \frac{\sum_{i=0}^{ja} ASSS_i}{ja}$$

i = 0, 1, 2, 3, ……, ja

ASS (Result Score received from the question (Sorudan **A**lınan **S**onuç **S**kor "ASS")): The answer of the question is scored one (1). If the answer has parts or it has choices (CB), each part's answer is scored one (1) and by summing these, the score that should be taken from the question (CB) is found. If the answer given to the part/choice is correct then ASS is calculated as follows: (Cb) is scored one (1) and summed (GS) then its ratio to CB is taken. If the answer is wrong, zero (0) score is given. Moreover, since the Result Score received is not knowledge, rather it is a result for the question and a solution result unique to the answer, no negative (-) score is given. When ASS is given a negative (-) value, knowledge and decision are combined in a meaningless way. When the objective of the research is to determine factors that affect the decision knowledge and decision can not be combined.

1)

$$ASS = \frac{\sum_{i=0}^{r} Cb_i}{CB} \quad or \quad ASS = \frac{GS}{CB}$$

i = 0, 1, 2, 3, ……., r (r number of the answers requested/choices requested in a question)

Cb = 1

2) ASS sum of the interviewer;

$$\mathrm{ASS}_t = \frac{\sum_{i=0}^{ja} ASS_i}{ja}$$

i = 0, 1, 2, 3, ……, ja

Calculation of Interviewers' Scores Received from the Parts of the Questions

This calculation is performed separately for each score interviewers receive from each part. This calculation is found by summing all scores received from the same part of all questions and taking its ratio to the number of interviewers. P, BGS, IS, APS, ANS, NAPS, SS calculations for interviewers are as follows;

$$CALCULATED\ SCORE_{ty} = \frac{\sum_{i=1}^{y} skor_i}{y}$$

i = 1, 2, 3, ……, y (y number of interviewers)

Calculation of result score of interviewers is performed by individually summing result scores and taking its ratio to number of interviewers. P total, BGS total, ISS, APSS, ANSS, NAPSS, ASSS, ASS calculations for interviewers are as follows;

$$CALCULATED\ SCORE_{ty} = \frac{\sum_{i=1}^{y} skor_i}{y}$$

i = 1, 2, 3, ……, y (y number of interviewers)

Calculation of the Score Interviewers Received from a Specific Question

This calculation is performed separately for each score received from the parts of the same question. This calculation is found by summing all scores received by the interviewers from the same part of a specific question and taking its ratio to the number of interviewers. P, BGS, IS, APS, ANS, NAPS, SS calculations for interviewers are as follows;

$$CALCULATED\ SCORE_{tys} = \frac{\sum_{i=1}^{ys} skor_i}{ys}$$

i = 1, 2, 3, ……, ys (ys number of interviewers in a question)

Result score calculation of a specific question is performed by summing result scores individually and taking the result's ratio to number of interviewers. P total, BGS total, ISS, APSS, ANSS, NAPSS, ASSS, ASS calculations for interviewers are as follows;

$$CALCULATED\ SCORE_{tys} = \frac{\sum_{i=1}^{ys} skor_i}{ys}$$

i = 1, 2, 3, ……, y (ys number of interviewers in a question)

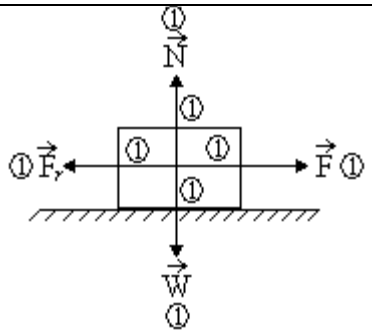
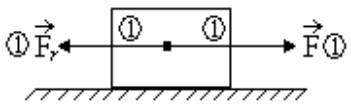
Exceptions

The first exception is appointing zero (0) score to negative value (-) of ASS. The second exception; when the given solution is not related to requested answer although the answer is wrong, each answer (phase) is scored one (IHA = 1) score and this constitutes the second exception. However, this is distinguished from positive and negative phases.

Conclusion and Discussion

Combined stage percentage calculation statistics that reduces a possibility of m to a possibility of 2 makes it possible to calculate the effect of the variables of an experiment, observation or measurement that consist of events with a possibility of 2 on the result. Standard scoring adds to the objectivity of the evaluation made. In addition, standard scoring contributes to the preservation of semantic consistency between the probability of the sum of same stages and sections, and the averages of these stages or sections. The separate calculation of the scores from positive stages and positive scores from negative stages makes it possible to examine the source of the effect of the variables on the result. The article explains probability and possibility calculations for the effect of the variables of an experiment, observation or measurement on the result. Table 1 reports a sample scoring.

Table 1: Scores of Example of Qualitative Data

Question	When a force is applied to a 20 kg object resting on a flat surface it moves with 2 m/s² acceleration. Throughout its motion a friction force of 10 N affects the object. Find the force that is applied to the object?	
	Scores Required to be	Possible Answer Scores
Given-Intended	① ① ①① $t_0 \Rightarrow \vec{v}_0 = 0$ ……..…1. Phase $\sum Skor = 4$ $t_n \Rightarrow \vec{a} = 2$ m/s² …...2. Phase $\sum Skor = 8$ $\theta = 0^0$……3. Phase $\sum Skor = 3$ m = 20 kg ……4. Phase $\sum Skor = 4$ $\vec{F}_r = 10$ N …..…….. 5. Phase $\sum Skor = 4$ $\vec{F}_N = 40$ N ……..…. 6. Phase $\sum Skor = 4$ $\vec{F}$ = ? ……. 7. Phase $\sum Skor = 1$ $\sum AAGS = 7$ $\sum BGS = 28$	SS = 28/28 = 1 = %100
Free-Body Diagram	 $\sum AAGS = 1$ $\sum BGS = 8$	 P = 4, ss = 4 APS = 4/8 = 0,5 = %50 SS = (8-4)/8 = 0,5 = %50
Definition	Newton's Second Law of Motion:	

	The acceleration produced by a net force on an object is ① directly proportional ① to the net force ①, is in the same direction ① as the net force ①, and is inversely ① proportional ① to the mass of the object ① 1. Phase $\sum Skor$= 9 Force: A force ① is a push ① or a pull ① 2. Phase $\sum Skor$= 3 Net Force: The net force ① is the combination of force ①. It is the net force that changes ① an object ①'s state of motion ① 3. Phase $\sum Skor$= 5 Support Force (normal force): a force ① that is applied ① by the surface in opposite direction ① and magnitude ① to the component of a force applied to a surface ①, which is perpendicular to the surface ①. 4. Phase $\sum Skor$= 6 The Force of Friction: The force of friction is a force ① that it always acts ① in a direction ① to oppose ① motion ① 5. Phase $\sum Skor$ = 5 Weight: The force ① upon ① an object ① due to ① gravity ① 6. Phase $\sum Skor$ = 5 Mass: The quantity of matter ① in an object ①. It is also the measure of the inertia ① or sluggishness ① that an object exhibits ① in response ① to any effort made ① to start ① it, stop ① it, or change ① its state of motion ① in any way ①	Mass: it is the amount of matter per unit volume

	7. Phase 2 ≤ $\sum Skor$ ≤ 13 Acceleration: Acceleration is velocity of change ① ① 8. Phase $\sum Skor$= 2 $\sum AAGS$ = 8 $\sum BGS$ = 37 or 48	IHA = 1 IS = 1/8 = 0,125 = %12,5
Formula	① ① ① ① ① ① ①$\vec{F}_N = (\vec{F}_1 + \vec{F}_2)$..... 1. Phase $\sum Skor$= 7 $\vec{F}_N = m\vec{a} - \vec{F}_r$ ..... 2. Phase $\sum Skor$= 8 $\sum AAGS$ = 2 $\sum BGS$ = 15	SS = 15/15 = 1 = %100
Process	$\vec{F}_N = \vec{F} - \vec{F}_r$ ① $\mathbf{40} = \vec{F} - 10$ ① $\vec{F} = 50$ N ① $\sum AAGS$ = 1 $\sum BGS$ = 3	$\vec{F}_N = m\vec{a} - \vec{F}$ ① $\vec{F}_N = 40 - 10$ -① $\vec{F}_N = 30$ -① NP = 1, N = -2 ANS = 2/3 = 0,66 = %66 NAPS = 1/3 = 0,34 = %34
Answer	50 ASS = 1	30 ASS = 0

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