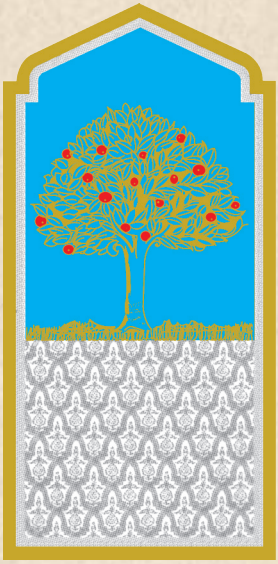

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VALIDITY EVIDENCE USING EXPERT JUDGMENT: A STUDY OF USING ITEM CONGRUENCE INVOLVING EXPERT JUDGEMENTS FOR EVIDENCE FOR VALIDITY OF A READING TEST[1]

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Ainol Madziah Zubairi
Kamal J I Badrasawi

Abstract

This study demonstrates the use of the Item Objective Congruence Method (IOC) for a content validation procedure to evaluate the congruence between reading test items constructed and the reading sub-skills they were intended to measure. The IOC allows for quantification of the content validity evidence of a test or an instrument. In this study, experts were asked to rate 96 reading comprehension test items against the sub-skills that the items were intended to measure. In line with the concept of justice in Islam, it is important that the evidence of justice is demonstrated. Using ten English language experts who were also experienced test writers, the study found different degrees of agreement between the experts in terms of what some of the items were supposed to measure. Items that showed considerable incongruence are those that test multiple subskills. Whereas, items that had high degree of congruence are those that clearly test a single subskill.

Keywords: Expert Judgement, Validity, Just, Test Construction

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Introduction

Reading is considered an important skill in establishing the proficiency of a person's language ability. In fact, the importance of reading was established from the early beginnings of the teachings of Islam. The Muslim *ummah* are constantly reminded of the importance of reading for all the beneficial knowledge it can contribute, including reading in languages other than the Arabic language. This is clearly indicated in the Noble Quran, "We sent not a messenger except (to teach) in the language of his (own) people, in order to make (things) clear to them" (Al-Qur'an, 14:4). A clear example today is where English language is not the native or first language of the majority of the people in the world, but has become the global lingua franca.[2] Additionally, students who are non-native speakers of English are encouraged to improve their English proficiency (EFL or ESL), mainly in their reading skill, to achieve success in their academic and future career.[3] Therefore, most language tests have included reading as a necessary skill to assess.

What do reading tests test? What are the skills that make up the ability to comprehend a reading text? It is maintained by many language testing experts that the view towards the nature of 'reading' affects the way it is assessed.[4] Therefore, test designers should be cognizant of the recent research on the nature of the reading skills in both L1 and L2 in order to come out with more valid reading tests.[5]

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[2] David Crystal, *English as A Global Language* (United Kingdom: Cambridge University Press, 2003); Pamela Farries, *Language Arts: Process, Product and Assessment,* 3rd edn. (Boston: McGraw Hill, 2001); David Garddol, "The Future of English? A Guide to Forecasting the Popularity of the English Language in the 21st Century," accessed October 11, 2018, www.ocol-clo.gc.ca/docs/f/Future_ of_English.pdf.

[3] Adina Levine, Orna Ferenz, and Thea Revez, "EFL Academic Reading and Modern Technology: How Can We Turn Our Students into Independent Critical Readers?" *Teaching English as Second and Foreign Language TESL-EJ* 4, no. 4 (2000), accessed October 12 2018, http://tesl-ej.org/ej16/a1.html.

[4] Charles Alderson, *Assessing Reading* (United Kingdom: Cambridge University Press, 2000); George Engelhard, "Historical View of Influences of Measurement and Reading Theories on the Assessment of Reading," *Journal of Applied Measurement* 2, no.1 (2001): 1-26; Jone Hedgcock and Dana Ferries, *Teaching Readers of English: Students, Texts, and Contents* (UK: Routledge, 2009).

[5] Alderson, *Assessing Reading* . . .

Rresearch on reading skills in L1and L2 context supports two main positions;[6] reading as a unitary skill that cannot be divided into identifiable sub skills[7] and reading as a multi-divisible skill that includes separable and identifiable sub skills.[8] However, to date there is no consensus on the number of subskills[9] nor the hierarchical order of these sub skills.[10] Hence a significant study would be to identify these reading sub skills and determine the hierarchical order of the skills. This study sets out to investigate the extent to which sub skills of reading can be identified and the level of agreement among expert item writers on the sub-skills identified through the use of the objective item congruence method.

Literature Review

Assessing Reading

In order to design the specifications of a reading test, it is necessary to firstly establish the constructs or subskills of reading that the test intends to measure. As such, understanding the underlying skills in reading comprehension is a prerequisite to item writing. Alderson highlights some skills that are deemed necessary for ESL learners to develop. He states that "understanding main ideas, making inferences, predicting outcomes and guessing vocabulary from context are all reading skills that readers of English typically need to

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[6] Engelhard, "Historical View of Influences of Measurement . . .,", 1-26; Hedgcock and Ferries, *Teaching Readers of English: . . .*"

[7] Deflet Rost, "Assessing the Different Components of Reading Comprehension: Fact or Fiction," *Language Testing* 10, no. 1 (1993): 79-92; Charles Alderson, "Testing Reading Comprehension Skills (Part 1)," *Reading in a Foreign Language* 6, no.1 (1990): 425-438; Alderson, Charles, Testing Reading Comprehension Skills (Part 2): Getting Students to Talk About Taking a Reading Test, *Reading in a Foreign Language* 7, no. 1(1990): 465.

[8] Hussein Farhady and Gholam Hassamy "Construct Validity of L2 Reading Comprehension Skills," *Iranian Journal of Applied Linguistics (IJAL)* 8, no.2 (2005): 29-53; Marian Sainsbury, Colin Harison, and Andrew Watts, *Assessing reading from Theories to Classroom* (UK: Cambridge, 2006).

[9] Charles Alderson and Yasmeen Lukmani, "Cognition and Reading: Cognitive Levels as Embodied in Test Questions," *Reading in a Foreign Language* 5, no. 2 (1989): 253-270.

[10] Thom Hudson, *Teaching Second Language Reading* (Oxford: Oxford University Press, 2007).

develop."[11] Similarly, Dudley-Evans and John also listed reading skills deemed crucial in language learning, which include skimming for content and meaning, scanning for specifics, using cohesive and discourse markers, understanding relations within a sentence and between sentences, and identifying main ideas, supporting ideas and examples.[12]

Five commonly tested sub-skills were identified from the review. These reading subskills are ability to:

1. understand explicitly stated information (ESI)
2. comprehend reference by pronouns and substitution (REF)
3. derive meanings of unknown vocabulary (VOC)
4. skim to obtain the gist of the texts (main ideas) (MID)
5. make inference and draw conclusion (INF)

Validity in Testing

The most addressed form of validation in test construction is content validation. According to Haynes, Richard and Kubany, content validity refers to "the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose."[13] It is indeed important for test writers to ensure that "the test measure what it intends to measure." Crocker and Algina suggest the following steps to be taken in determining the content validity of an instrument.[14] They include:

a. defining the performance domain of interest
b. selecting a panel of qualified experts in the content domain
c. providing a structured framework for the process of matching items to the performance domain
d. collecting and summarising data from the matching process.

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[11] Alderson, *Assessing Reading* . . ., 1.

[12] Dudley-Evans Tony and John, Maggie, *Developments in ESP: A Multi-disciplinary Approach* (Cambridge: Cambridge University Press, 1998).

[13] Stephen Haynes, David Richard, and Edward Kubany, "Content Validity in Psychological Assessment: A Functional Approach to Concepts and Methods," *Psychological Assessment 7*, no. 3 (1995): 238-247.

[14] Linda Crocker and James Algina, *Introduction to Classical and Modern Test Theory* (New York: Harcourt Brace Jovanovich College Publishers, 1986).

Content validation is carried out to "assess whether the items adequately represent a performance domain or construct of specific interest."[15] It is an important element in measurement; however, as highlighted by Crocker:

> Unfortunately, in many technical manuals, content representation is dealt with in a paragraph, indicating that selected panels of subject matter experts (SMEs) reviewed the test content, or mapped the items to the content standards – and all is well.[16]

Content Validation Process

A number of methods are available to establish the agreements and disagreements in expert judgments. In these methods, items are retained, removed or revised based on the judgments made. In the case of this study, once the experts' opinion had been carefully reviewed and necessary changes were made, the items were subjected to further analysis to quantify the judgments of the experts. Crocker, Miller and Franks recommend two methods of validation.[17] One is assessing the overall fit between test and curriculum through the use of techniques such as percentage of items or index of relevance. Another method is by measuring the fit of individual items to a content domain. Techniques that fall under this second category include the item objective congruence, validity index and content validity ratio. This study utilizes the item objective congruence[18] as it enables individual items to be assessed quantitatively. Berk as cited in Turner, Mulvenon, Thomas and Balkin believes that the most important assessment in a content validation process is to evaluate

[15] Ibid., 218.

[16] Linda Crocker, "Teaching for the Test: Validity, Fairness, and Moral Action," *Educational Measurement: Issues and Practice* 22 (2003): 5–11, accessed December 20, 2018 https://bit.ly/2rGryPl.

[17] Linda Crocker, David Miller, and Elizabeth Franks, "Quantitative methods for assessing the Fit between Test and Curriculum," *Applied Measurement in Education*, 2 (1989): 179-194.

[18] Richard Rovinelli and Roland Hambleton, "On the Use of Content Specialists in the Assessment of Criterion-Referenced Test Item Validity," *Dutch Journal of Educational Research*, 2 (1977): 49-60.

the congruence between items and objectives.[19] In this respect, item objective congruence (IOC) method is a technique which enables content validity, otherwise a subjective process, to be quantified.[20] This method is also used to determine content representation of the items under study, whereby raters review the items and match them to the intended reading subskills.

Methodology

This study was part of larger study that intended to investigate the characteristics of a large number of items that were used for testing reading comprehension of university students of differing levels of proficiency. Before the construction of the reading comprehension items, a preliminary investigation was conducted starting from the text selection process. This step involved checking the readability indices for the passages that were included in the reading test; followed by categorization of the test items according to the reading sub-skills intended to be assessed based on subject matter experts' (SMEs) judgments.

Using the Flesch Kincaid Grade levels for all the passages, the reading texts used in the study were found to vary in their readability indices ranging from 51.01 (most difficult) to 79.81 (the easiest). The expository texts were consistently more difficult than the narrative texts. The easiest text was a narrative passage while the most difficult was an expository text. The length of the texts varied from 391 words to 905 words. However, based on the analysis, the two longest texts were not the most difficult passages. Similarly, the shortest text was not the easiest text either. This suggests that for the texts chosen for this study, the length of the text did not influence their readability very much although some studies found that the longer the texts, the more difficult they are for comprehension.[21]

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[19] R. C. Turner et al., "Computing Indices of Item Congruence for Test Development Validity Assessments," in *Proceedings of the SAS User's Group International Conference* (2003), accessed December 18, 2018, http://www2.sas.com/p roceedings/sugi27/p255-27.pdf.

[20] Rovinelli and Hambleton, "On the Use of Content Specialists . . . "

[21] Yasuhiro Ozuru et al., "Where's the Difficulty in Standardized Reading Tests: The Passage or the Question?" *Behaviour Research Methods* 40, no.4 (2008):1001-1015.

Determination of Reading Subskills

Once the passages were identified, test tasks that came with the passages were examined to ensure that only items relevant to the study were included. These items were examined to determine the relevance of the reading sub-skills tested based on what they require students to do; for example, whether they require students to find main ideas, define meanings of unknown words. The researchers together with two experts reviewed the items to determine the cognitive processes involved in getting the correct answer for each item.

Experts in the area of reading and assessment were consulted regarding the subskill tested by each item as well as the difficulty level of the item. Although Alderson and Lukmani were sceptical about the use of expert judgment,[22] it was felt that it is one of the best methods available to identify the level of items and also the skills tested.

Considering the large number of passages and items included in the tests, it was decided to split the rating tasks into smaller and more manageable groups so that each expert only rated a few passages and manageable number of items. This was done to ease the process for the experts/raters as they voluntarily did the task. However, when using expert judgments, an important consideration to address is the optimal number of judges needed to classify items in the instrument. Although the rule "the more the better" is often recommended, there are a number of constraints preventing the use of large number of raters or expert judges.

Item Objective Congruence Method

This method is used to determine the content representation of the items under study, whereby items are reviewed and matched to the intended reading sub skills. Judges were informed of the sub-skills of interest. They then read each item and classified the items into the specific sub-skills. The IOC indices were calculated for all the items to determine the fitness of each item against its intended objective.

[22] Alderson and Lukmani, "Cognition and Reading: . . ."

The calculation of the IOC index was based on the degree to which an item measures (or does not measure) a specific objective.

The rating tasks were made of testlets that consist passages followed test items. Each testlet had a number of items deemed manageable for raters to rate. An important consideration to address is the optimal number needed to classify items in the instrument. Because of this, studies are often more concerned with the minimum requirement to obtain useful estimate for inter judge agreement. Crocker, Llabre and Miller recommend the use of at least three judges for each task.[23] Based on this recommendation, a total of 10 judges were used. The test items were rated by a minimum of three judges. Another important consideration in recruiting judges is the amount of knowledge and experience they have in the area of language testing.[24]The judges selected in this study had between 6 and 22 years of experience in teaching English at different higher learning institutions, and all of them had experiences in test development at their respective institutions.

Before the judges performed the task, they were briefed on the procedure. They were not told "which item is meant to be matched with which objective."[25] Rather, they were briefed of the operational definitions of the sub-skills. Subsequently, they read each item and classified the items into specific sub-skills. The ratings of each item were done independently rated and once done, the form was returned to the researchers for further action.

From their ratings, an item objective congruence index was calculated to determine the fitness of each item against its intended objective. The calculation of IOC index was done based on the degree to which an item measures (or does not measure) a specific objective. In deciding the cut off score, Rovinelli and Hambleton propose that "if one-half of the content specialists judged an item to be a perfect match to an objective, while the others were not able to

[23] Linda Crocker, Maria Llabre, and David Miller, "The Generalizability of Content Validity Ratings," *Journal of Educational Measurement* 25, no.4 (1988): 287-299.
[24] Ibid.
[25] Steven Osterfind, *Constructing Test Items: Multiple-Choice, Constructed-Response, Performance and Other Formats* (Hingham, US : Kluwer Academic Publisher, 1998): 259.

make a decision, the computed value of the index would be .50."[26]

A sample of the calculation of the item congruence is provided below:

Table 1: Example of IOC calculation

Content specialist(j)	Objectives (i)				
	1 (explicitly stated info)	2 (ref)	3 (vocab)	4 (main idea)	5 (inf)
A	+1	-1	-1	-1	-1
B	-1	-1	-1	+1	-1
C	-1	-1	-1	+1	-1
S_k	+1	-3	-3	+2	-3

$I_{ik} = (M-1)\ S_k - S'_k/2N(M-1)$

I_{ik} = the index of the item objective congruence for item i and objective k

M = the number of objectives

Findings

This section provides the results of the item objective congruence (IOC) analysis performed on all the MCQ items included in the eight testlets to ensure that the items were measuring the sub-skills they intend to measure. In this Item Objective Congruence (IOC) technique, a team of experts comprising ten raters (three experts for each item) were asked to match each item to the specific sub-skill. The index was computed using the item congruence index to measure the agreement among the judges.

In determining the rating, the following criteria are considered:[27]

+1 is given if an item clearly measures the objective

[26] Rovinelli et al., "On the Use of Content Specialists . . ., 1.

[27] Ronna Turner and Laurie Carlson, "Indices of Item-Objective Congruence for Multidimensional Items," *International Journal of Testing* 3, no.2 (2003): 163-171.

given while -1 if it clearly does not measure the objective. However, if the degree to which it measures the objective is unclear, then 0 will be given.

The judges' ratings are attached in Appendix 1. Similarly, the item objective congruence (IOC) indices performed by the 10 subject matter experts, are displayed in Appendix 2. The rating for IOC ranged from -1 to +1; +1 being total agreement as to what an item measures while the value of -1 means just the opposite, total agreement that an item does not measure the sub-skill. Thus, in order to be certain of the sub-skill, the indices have to record high positive values on the sub-skill it intends to measure and indices of close to -1 on other sub-skills.[28] The ratings were then computed to obtain the congruence indices using the formula proposed by Martuza.[29] A value of 1.0 indicates total agreement among the experts regarding the sub-skills the items intend to measure while a value of 0.0 indicates otherwise.

The result indicates the IOC indices for all the items rated by the three judges ranged from 0.33 to 1.0. To determine the cut off point for a valid IOC index, Brown's suggestion was used as the guiding principle.[30]

IOC rating range	**Interpretation**	**Decision**
0.5 to 1.00	Acceptable	Item to be retained to measure intended sub-skill
Less than 0.5	Not Acceptable	Item should be reviewed or removed.

The results show that majority of the items that were rated by the judges had very high index values indicating they clearly measure

[28] Ibid.

[29] Victor Martuza, *Applying Norm-Referenced and Criterion-Referenced Measurement in Education* (Boston: Allyn & Bacon, 1977).

[30] James Brown, *Testing in Language Programmes* (NJ: Prentice Hall Regents, 1996).

what they have been designed to measure. In fact, quite a large number of items (n = 16) were unanimously rated as measuring the intended sub-skills based on the 1.0 perfect score obtained in the IOC.

A small number of items (n=7), however, reported low item objective congruence indices of less than 0.5. This resulted from a situation whereby judges either rated more than one objective or were not sure of the valid sub-skill for those items. However, this is common as some items could be categorised as measuring more than one cognitive categories.[31] Based on the results of the IOC, items that were clearly found to be measuring the sub-skill they intended to measure could be retained in the reading test. The IOC procedure provided satisfactory validity evidence to indicate that the items 'measure the construct they intend to measure.'

Conclusion

This paper demonstrates the use of experts judges in the IOC method for validity evidence that test items measure the construct that they were intended to measure. Validity in assessment is of paramount importance as test setters are accountable for the test they set and to ascertain fairness in assessment. Both *'Adl* (justice) and accountability are central values in Islam.

'Adl (justice) is a noble or supreme virtue[32] that Islam urges its followers to adopt to make right and fair decisions. Allah (s.w.t) says, "We sent Our Messengers with clear signs and sent down with them the Book and the Measure in order to establish justice among the people…" (Al-Qur'an 57:25). It was narrated from 'Abdullah bin 'Amr bin Al-'As that: The Prophet (s.a.w) said, "Those who are just and fair will be with Allah, Most High, on thrones of light, at the right hand of the Most Merciful, those who are just in their rulings and in their dealings with their families and those of whom they are in

[31] Helen Kim, "Assessing Attainment of Bloom's Cognitive Levels Using Testlets and Multi Categorical IRT," (presentation, ERA-AARE Joint Conference, Singapore, 1996).

[32] Shams al-Din Sarkhasi, "al-Mabsut," 14 cited in Muhammad Abdullah and Muhammad Junaid, "Understanding the Principles of Islamic World-View," *The Dialogue* 6, no.3 (2011): 268-289.

charge." Muhammad (one of the narrators) said in his Hadith: "And both of His hands are right hands."[33] Prophet Mohammad (S.A.W) also said, "If you make a judgment, then be just…Verily, Allah the Exalted is excellent and He loves excellence."[34]

Abdullah and Nadvi quote that Allah (S.W.T) has provided guidelines on how to achieve justice, and all the means, procedures, and methods used to accomplish justice must be valid (i.e. in line with Islamic law).[35]

> He has neither prescribed a fixed means by which it can be obtained, nor has He declared invalid any particular means or methods that can lead to justice. Therefore, all means, procedures, and methods that facilitate, refine, and advance the cause of justice, and do not violate the Islamic Law are valid.

In conclusion, justice and fairness are two concepts in Islam that is very applicable in educational assessment. This is especially so as any educational assessment most often than not impact the test takers. This in turns provide more accurate/reliable interpretations on the intended construct or trait, for example, 'reading ability.'

[33] Sunan an-Nasa'i 5379 Book 49, Hadith 1, (English Translation, 6, Book 49, Hadith 5381. https://sunnah.com (Accessed October 10, 2018).

[34] Quoted in Abu Amina Elias, "The Meaning of Spiritual Excellence in Islam," *Faith in Allah*, last modified August 29, 2015, https://abuaminaelias.com/the-meaning-of-spiritual-excellence-in-islam/.

[35] Muhammad Abdullah and Muhammad Junaid, "Understanding the Principles of Islamic World-View . . ."

APPENDIX 1:
ITEM OBJECTIVE RATING SHEET (Example)

Text/ Type	No	Item	SUB-SKILLS					Item difficulty					Remark
			Explicitly stated info	Reference	Vocabulary	Main idea	Inference/ direction	1 very easy	2	3	4	5 Very difficult	
Blindness (descriptive)	1	Paragraph 1 suggests the eye disease in the developing world is											
	2	Thorns were placed across the entrance of the hut probably to											
	3	In the long run, what is the most effective preventive measure for trachoma?											
	4	The fight against blindness is a problem due to											
	5	Blindness in children results from											
	6	The word "inevitably" (line 13) tells readers that the disease											
	7	the main idea of the last paragraph is that the											
	8	The word *this* (line 19) refers to											
	9	*its* (line 7) refers to											

Text/ Type	NO	Item	SUB-SKILLS					Item difficulty					Remark
			Explicitly stated info	Reference	Vocabulary	Main idea	Inference direction	1 very easy	2	3	4	5 Very difficult	
Mobile phones	1	Paragraph 2 mainly discusses											
	2	The main idea of paragraph 5 is											
	3	*these changes* ... (line 18) refer to											
	4	*These* (line 45) refers to											
	5	People are worried about radio waves transmitted by hand phones because they											
	6	Most scientists say radiation from mobile phones is not harmful because											
	7	Why is the microwave oven similar to a mobile phone?											
	8	Attempts to sue mobile phone companies for damage have failed probably because											
	9	What conclusion can you form about the use of mobile phones from the passage?											
	10	The phrase "give off" (line 14) in paragraph 3 means											

APPENDIX 2:
SAMPLE OF ITEM OBJECTIVE CONGRUENCY EVALUATION

ITEM NO			UNDERSTANDING EXPLICITLY STATED INFORMATION (ESI)	UNDERSTANDING REFERENCE (REF)	DEDUCING MEANING OF UNKNOWN WORDS/ EXPRESSIONS (VOC)	UNDERSTANDING MAIN IDEAS OF A PARAGRAPH/ PASSAGE (MID)	DERIVING INFERENCES/ CONCLUSIONS (INF)
1	2	0.75	+1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1	0 +1 +1
2	8	1.0	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1	+1 +1 +1
3	7	0.83	+1 +1 0	-1 -1 -1	-1 -1 -1	-1 -1 -1	+1-1 -1
4	4	1.0	+1 +1 +1	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1
5	1	1.0	+1 +1 +1	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1
6	5	0.58	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1
7	9	0.62	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1	-1 -1 -1
8	6	1.0	-1 -1 -1	+1 +1 +1	-1 -1 -1	-1 -1 -1	-1 -1 -1
9	3	1.0	-1 -1 -1	+1 +1 +1	-1 -1 -1	-1 -1 -1	-1 -1 -1

ITEM NO			UNDERSTANDING EXPLICITLY STATED INFORMATION (ESI)	UNDERSTANDING REFERENCE (REF)	DEDUCING MEANING OF UNKNOWN WORDS/ EXPRESSIONS (VOC)	UNDERSTANDING MAIN IDEAS OF A PARAGRAPH/ PASSAGE (MID)	DERIVING INFERENCES/ CONCLUSIONS (INF)
1	1	0.54	-1 +1 +1	-1 -1-1	-1 -1 -1	+1 -1 -1	0 -1 -1
2	5	0.54	-1+1 +1	-1 -1-1	0-1-1	-1 -1-1	+1 -1 -1
3	4	0.83	-1-1 -1	-1 -1-1	-1 -1-1	-1 -1-1	+1 +1 0
4	8	0.58	-1-1 -1	+1 -1 -1	-1 +1 -1	-1 -1-1	+1 -1 +1
5	3	0.52	+1 -1 -1	-1+1 +1	-1 -1 -1	-1 -1-1	0 -1 -1
6	6	0.87	0-1 -1	-1 -1 -1	-1 -1 -1	+1+1 +1	+1 -1 -1
7	9	0.91	-1-1 -1	-1 -1 -1	-1 -1 -1	+1+1 +1	+1 -1 -1
8	7	0.58	-1-1 -1	-1-1 -1	-1 +1 +1	-1 -1-1	+1 -1-1
9	2	0.33	-1-1 -1	-1 -1 -1	-1 +1 0	+1-1-1	+1 -1-1

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Contents

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