

---

---

**Information technology — Guidance  
for the use of database language  
SQL —**

**Part 5:  
Row pattern recognition**

*Technologies de l'information — Recommandations pour l'utilisation  
du langage de base de données SQL —*

*Partie 5: Reconnaissance de formes de lignes*

**Document Preview**

[ISO/IEC 19075-5:2021](https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021>



**iTeh Standards**  
**(<https://standards.iteh.ai>)**  
**Document Preview**

[ISO/IEC 19075-5:2021](https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO/IEC 2021

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier; Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

## Contents

Page

Foreword.....	vii
Introduction.....	ix
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>2</b>
<b>3 Terms and definitions.....</b>	<b>3</b>
<b>4 Row pattern recognition: FROM clause.....</b>	<b>4</b>
4.1 Context of row pattern recognition.....	4
4.2 Introduction to the FROM clause in row pattern recognition.....	4
4.3 Example of ONE ROW PER MATCH.....	4
4.4 Example of ALL ROWS PER MATCH.....	7
4.5 Summary of the syntax.....	9
4.6 The row pattern input table.....	10
4.6.1 Introduction to the row pattern input table.....	10
4.6.2 The row pattern input name.....	11
4.6.3 The row pattern input declared column list.....	12
4.7 MATCH_RECOGNIZE.....	13
4.8 PARTITION BY.....	13
4.9 ORDER BY.....	13
4.10 Row pattern variables.....	13
4.11 MEASURES.....	14
4.12 ONE ROW PER MATCH vs ALL ROWS PER MATCH.....	15
4.12.1 Introduction to use of ROWS PER MATCH.....	15
4.12.2 Handling empty matches.....	15
4.12.3 Handling unmatched rows.....	19
4.13 AFTER MATCH SKIP.....	21
4.14 PATTERN.....	22
4.14.1 Introduction to the PATTERN syntax.....	22
4.14.2 PERMUTE.....	23
4.14.3 Excluding portions of the pattern.....	24
4.15 SUBSET.....	25
4.16 DEFINE.....	26
4.17 The row pattern output table.....	27
4.17.1 Introduction to the row pattern output table.....	27
4.17.2 Row pattern output name.....	28
4.17.3 Row pattern output declared column list.....	28
4.18 Prohibited nesting.....	29
4.18.1 Introduction to prohibited nesting.....	29
4.18.2 Row pattern recognition nested within another row pattern recognition.....	30

4.18.3	Outer references within a row pattern recognition query. . . . .	30
4.18.4	Conventional query nested within row pattern recognition query. . . . .	31
4.18.5	Recursion. . . . .	32
4.18.6	Concatenated row pattern recognition. . . . .	32
<b>5</b>	<b>Expressions in MEASURES and DEFINE. . . . .</b>	<b>33</b>
5.1	Introduction to the use of expressions in MEASURES and DEFINE. . . . .	33
5.2	Row pattern column references. . . . .	33
5.3	Running vs. final semantics. . . . .	34
5.4	RUNNING vs.FINAL keywords. . . . .	38
5.5	Aggregates. . . . .	39
5.6	Row pattern navigation operations. . . . .	39
5.6.1	The four operations. . . . .	39
5.6.2	PREV and NEXT. . . . .	39
5.6.3	FIRST and LAST. . . . .	41
5.6.4	Nesting FIRST and LAST within PREV or NEXT . . . . .	42
5.7	Ordinary row pattern column references reconsidered. . . . .	43
5.8	MATCH_NUMBER function. . . . .	44
5.9	CLASSIFIER function. . . . .	44
<b>6</b>	<b>Row pattern recognition: WINDOW clause. . . . .</b>	<b>48</b>
6.1	Introduction to the WINDOW clause. . . . .	48
6.2	Example of row pattern recognition in a window. . . . .	48
6.3	Summary of the syntax. . . . .	50
6.3.1	Syntax components. . . . .	50
6.3.2	Syntactic comparison to windows without row pattern recognition. . . . .	51
6.3.3	Syntactic comparison to MATCH_RECOGNIZE. . . . .	52
6.4	Row pattern input table. . . . .	52
6.5	Row pattern variables and other range variables. . . . .	52
6.6	Windows defined on windows. . . . .	54
6.7	PARTITION BY. . . . .	55
6.8	ORDER BY. . . . .	55
6.9	MEASURES. . . . .	55
6.10	Full window frame and reduced window frame. . . . .	55
6.10.1	Introduction to window framing . . . . .	55
6.10.2	ROWS BETWEEN CURRENT ROW AND . . . . .	56
6.10.3	EXCLUDE NO OTHERS. . . . .	56
6.11	AFTER MATCH SKIP. . . . .	56
6.12	INITIAL vs SEEK. . . . .	57
6.13	PATTERN. . . . .	57
6.14	SUBSET. . . . .	57
6.15	DEFINE. . . . .	57
6.16	Empty matches and empty reduced window frames. . . . .	57
6.17	Prohibited nesting. . . . .	59
6.17.1	Restrictions on nesting. . . . .	59
6.17.2	Row pattern recognition nested within another row pattern recognition. . . . .	60
6.17.3	Outer references within a row pattern recognition query. . . . .	60
6.17.4	Conventional query nested within row pattern recognition query. . . . .	61
6.17.5	Recursion. . . . .	61

6.17.6	Concatenated row pattern recognition. . . . .	61
<b>7</b>	<b>Pattern matching rules. . . . .</b>	<b>63</b>
7.1	Regular expression engines. . . . .	63
7.2	Parenthesized language and preferment. . . . .	64
7.2.1	Introduction to parenthesized language and preferment. . . . .	64
7.2.2	Alternation. . . . .	65
7.2.3	Concatenation. . . . .	65
7.2.4	Quantification. . . . .	66
7.2.5	Exclusion. . . . .	67
7.2.6	Anchors. . . . .	68
7.2.7	The empty pattern. . . . .	68
7.2.8	Infinite repetitions of empty matches. . . . .	68
7.3	Pattern matching in theory and practice. . . . .	70
<b>Index. . . . .</b>		<b>73</b>

# iTeh Standards (<https://standards.iteh.ai>) Document Preview

[ISO/IEC 19075-5:2021](https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021>

## Tables

<b>Table</b>	<b>Page</b>
1 Sample data. . . . .	7
2 Results of ONE ROW PER MATCH. . . . .	7
3 Results of ALL ROWS PER MATCH. . . . .	8
4 Row pattern recognition syntax summary. . . . .	9
5 Analysis of sample data permitting empty matches. . . . .	16
6 Result of query permitting empty matches. . . . .	16
7 Results of query using SHOW EMPTY ROWS. . . . .	18
8 Results of query using OMIT EMPTY ROWS. . . . .	18
9 Results of ALL ROWS PER MATCH. . . . .	20
10 Original and renamed column names. . . . .	29
11 Ordered row pattern partition of data. . . . .	35
12 RUNNING and FINAL in MEASURES. . . . .	36
13 Ordered row pattern partition of data. . . . .	37
14 Ordered row pattern partition of data. . . . .	37
15 Example data set and mappings for FIRST and LAST. . . . .	41
16 Data set and mappings for nesting example. . . . .	43
17 Window example query results. . . . .	50
18 Row pattern recognition in windows — syntax summary. . . . .	51
19 Results for empty match and no match. . . . .	58
20 Computation of matches and window function results. . . . .	59
21 Input data. . . . .	71
22 Mapping of first element. . . . .	71
23 Mapping of second element. . . . .	72
24 Mapping of third element. . . . .	72

[ISO/IEC 19075-5:2021](https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021)

<https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021>

## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)), or the IEC list of patent declarations received (see [patents.iec.ch](http://patents.iec.ch)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). In the IEC, see [www.iec.ch/understanding-standards](http://www.iec.ch/understanding-standards).

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*. [19075-5:2021](https://standards.iteh.ai/catalog/standards/iso/f753ca23-4b3c-4c9f-8a0a-1113f39bc404/iso-iec-19075-5-2021)

This first edition of ISO/IEC 19075-5 cancels and replaces ISO/IEC TR 19075-5:2016.

This document is intended to be used in conjunction with the following editions of the parts of the ISO/IEC 9075 series:

- ISO/IEC 9075-1, sixth edition or later;
- ISO/IEC 9075-2, sixth edition or later;
- ISO/IEC 9075-3, sixth edition or later;
- ISO/IEC 9075-4, seventh edition or later;
- ISO/IEC 9075-9, fifth edition or later;
- ISO/IEC 9075-10, fifth edition or later;
- ISO/IEC 9075-11, fifth edition or later;
- ISO/IEC 9075-13, fifth edition or later;
- ISO/IEC 9075-14, sixth edition or later;
- ISO/IEC 9075-15, second edition or later;
- ISO/IEC 9075-16, first edition or later.