L2/05-320

Arabic Mathematical Diverse Symbols,

Additional characters proposed to Unicode

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The majority of symbols used in Arabic mathematical presentation are the mirrored corresponding used in Latin presentation. Some symbols and there mirrored one are used together in Latin presentation [2] [3].

In the Unicode Standard, there is the mirrored propriety for some characters [1]. Then, characters that have the mirrored property can be displayed, through an available font and rendering engine, with a mirrored image in right-to-left text runs.

1 Mirrored symbols

They are some frequently used Arabic symbols that have appropriate mirrored characters in the Unicode Standard (see Table 1). As, the number of

those characters is not very important, many characters and their mirrored (e.g., < and >) are already both encoded and the presence of some names ambiguity, we propose them for addition to the Unicode Standard. That allow to obtained them directly.

The other symbols are not frequently in use. Of course, the corresponding regular character has the mirrored property, and then characters will be displayed with a mirrored image in right-to-left text runs.

⅁	REVERSED COMPLEMENT ≈ <reversed> 2201 ∁
ⅆ	REVERSED PARTIAL DIFFERENTIAL ≈ <reversed> 2202 ∂
∃	REVERSED THERE EXISTS ≈ <reversed> 2203 ∃
⅀	REVERSED N-ARY SUMMARY ≈ <reversed> 2211 ∑
√	REVERSED SQUARE ROOT ≈ <reversed> 221A √
∟	REVERSED RIGHT ANGLE ≈ <reversed> 221F ∟
∠	REVERSED ANGLE ≈ <reversed> 2220 ∠
<	REVERSED MEASURED ANGLE ≈ <reversed> 2221 <
⦣	REVERSED SPHERICAL ANGLE ≈ <reversed> 2222 ⦣
∫	REVERSED INTEGRAL ≈ <reversed> 222B ∫
∬	REVERSED DOUBLE INTEGRAL ≈ <reversed> 222C ∫∫
∭	REVERSED TRIPLE INTEGRAL ≈ <reversed> 222D ∫∫∫
∮	REVERSED CONTOUR INTEGRAL ≈ <reversed> 222E ∮

Table 1: Frequently used symbols with appropriate mirrored image

2 Not mirrored symbols

They are some Arabic symbols that have no appropriate mirrored characters in the Unicode Standard (see Table 2). We propose to be added in the Unicode Standard.

$\sqrt[3]{}$	REVERSED CUBE ROOT ≈ <reversed> 221B $\sqrt[3]{}$
$\sqrt[4]{}$	REVERSED FOURTH ROOT ≈ <reversed> 221C $\sqrt[4]{}$
$\sqrt[٣]{}$	REVERSED CUBE ROOT ≈ <reversed> 221B $\sqrt[3]{}$
$\sqrt[٤]{}$	REVERSED FOURTH ROOT ≈ <reversed> 221C $\sqrt[4]{}$

Table 2: Mathematical symbols with no appropriate mirroring

3 Diverse symbols

3.1 Negated symbols

Negated symbols are oriented in the Arabic mathematical presentation as they are in the Latin one. So, mirroring the negated symbol can sometimes lead to mistakes (see Table 3).

2260	≠	NOT EQUAL TO ≡ 003D = 0338 ◌̸
	∄	REVERSED THERE DOES NOT EXISTS ≈ <reversed> 2204 ∄
00BD	1/2	VULGAR FRACTION ONE HALF • bar may be horizontal or slanted ≈ 0031 1 2044 / 0032 2

Table 3: Negation symbols

3.2 Particular symbols

In Arabic, there are some symbols with no relation with the usual ones (see Figure 14 1 and Table 4). They can be proposed for addition to the Unicode Standard.

	Stars, asterisks and snowflakes
☆	OUTLINED WHITE STAR
	• Morocco sign
	Miscellaneous symbols
☾	LEFT CRESCENT
☽	RIGHT CRESCENT
	Letter-like symbols
؏	ARABIC RAY
	General punctuation
٪	ARABIC-INDIC PERMILLE SIGN
	→ 2030 ‰ permille sign
٫	ARABIC-INDIC PER TEN THOUSAND SIGN
	→ 2031 ‱ per ten thousand sign

Table 4: New symbols

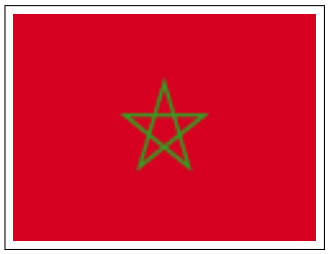


Figure 1: Morocco sign

3.3 Arrows

The signs listed in the range U+2790-27FF don't include symmetrical signs oriented right-to-left. So, supplemental arrows in Dingbat should be added. In particular, symmetrical signs for all symbols from 2794 to 27BE can be proposed with the specification LEFTWARDS, in contrast to RIGHTWARDS.

References

[1] http://www.unicode.org/Public/UNIDATA/BidiMirroring.txt.

[2] Azzeddine Lazrek and Khalid Sami, *Arabic mathematical symbols in Unicode*, Submitted, 2004, http://www.ucam.ac.ma/fssm/rydarab/doc/communic/unicodem.pdf.

[3] Arabic mathematical symbols for Unicode, http://www.ucam.ac.ma/fssm/rydarab/english/unicode.htm.

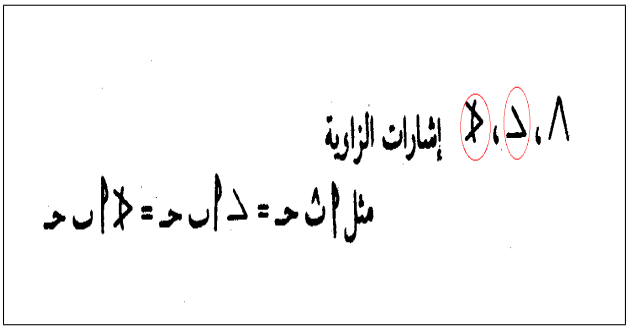


Figure 2: Angle symbol in Amman Convention [1.1]

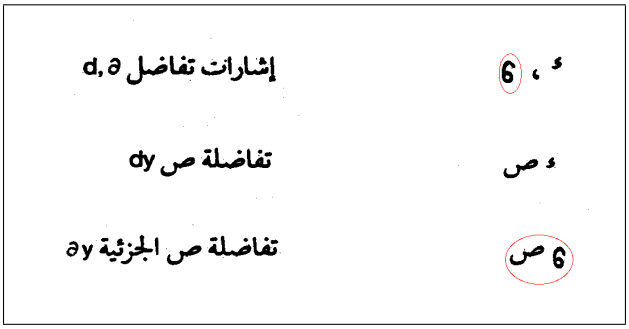


Figure 3: Differential symbol in Amman Convention [1.1]

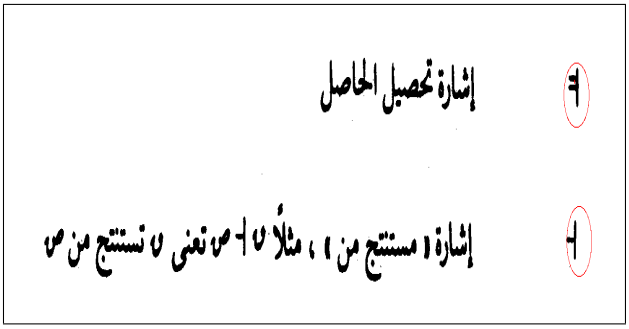


Figure 4: Consequece symbol in Amman Convention [1.1]

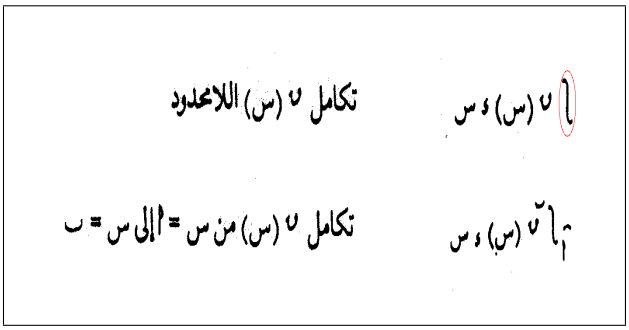


Figure 5: Integral symbol in Amman Convention [1.1]

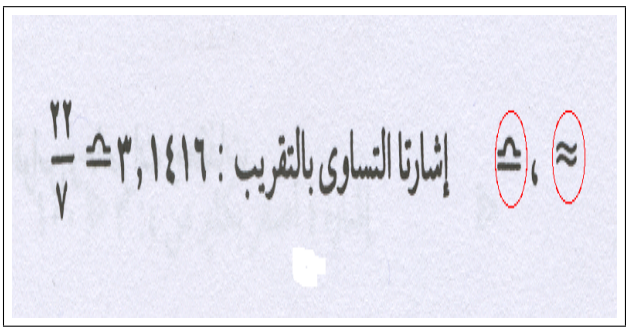


Figure 6: Asymptotically equal to symbol in Amman Convention [1.1]

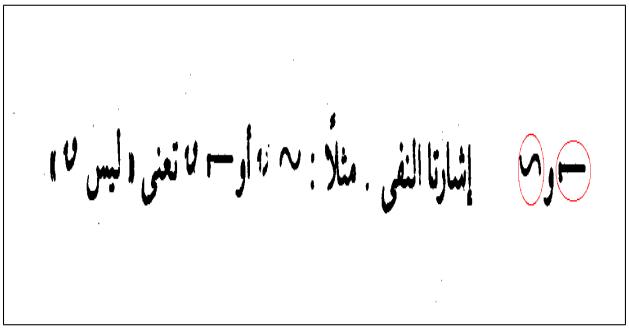


Figure 7: Negation symbol in Amman Convention [1.1]

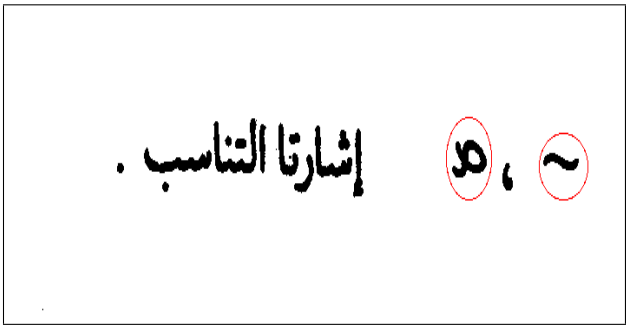


Figure 8: Proportional symbol in Amman Convention [1.1]

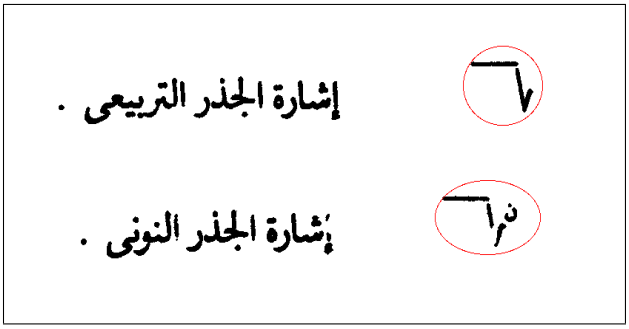


Figure 9: Root symbol in Amman Convention [1.1]

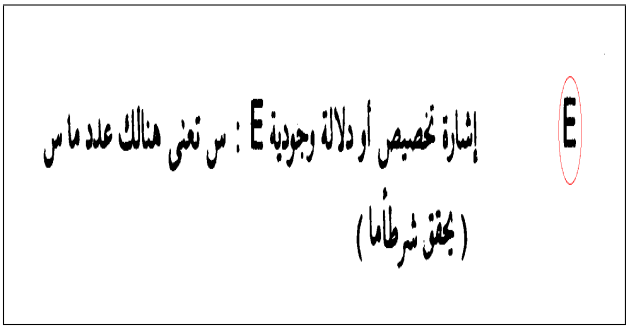
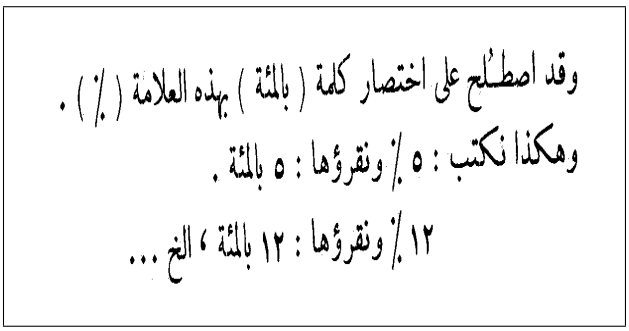
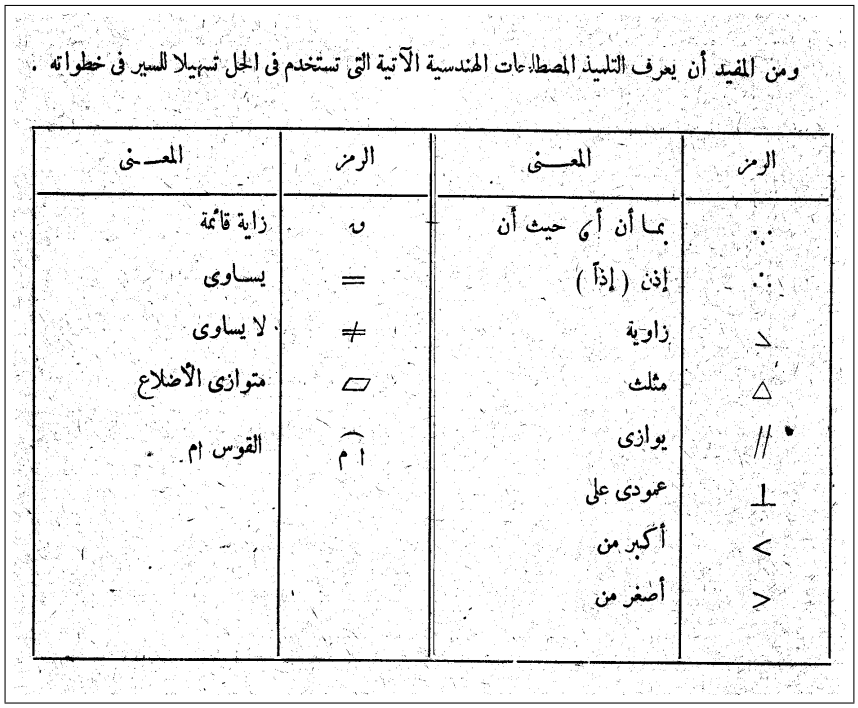


Figure 10: There exists symbol in Amman convention [1.1]



وقد اصطُلح على اختصار كلمة (بالمئة) بهذه العلامة (٪) .
وهكذا نكتب : ٥ ٪ ونقرؤها : ٥ بالمئة .
١٢ ٪ ونقرؤها : ١٢ بالمئة ، الخ ...

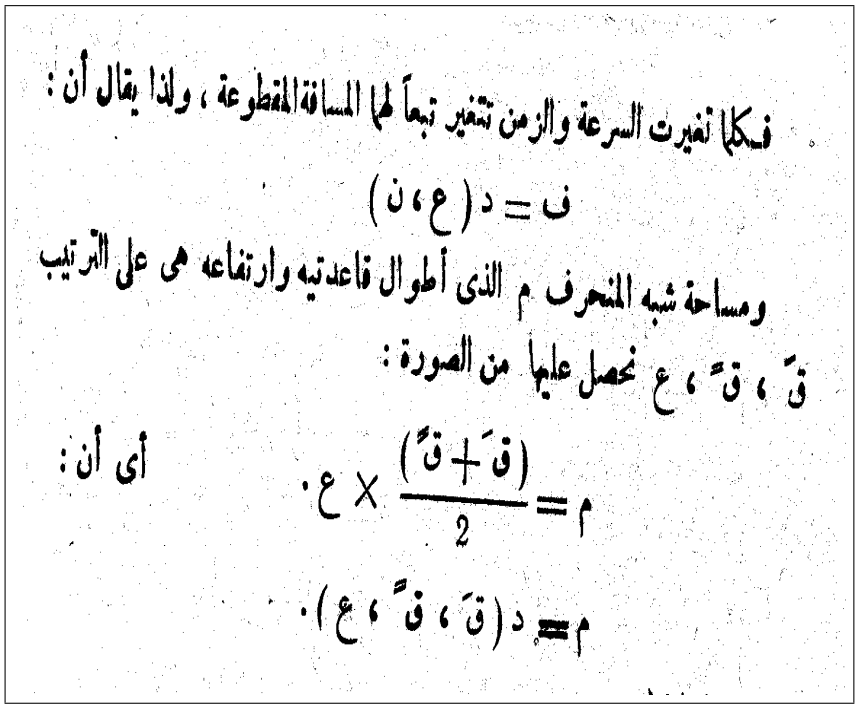
Figure 11: Percente symbol in Handbook [3.6]



ومن المفيد أن يعرف التلميذ المصطلحات الهندسية الآتية التي تستخدم في الحل تسهيلا للسير في خطواته .

الرمز	المعنى	الرمز	المعنى
∴	بما أن أي حيث أن	ق	زاوية قائمة
∴	إذن (إذاً)	=	يساوي
∠	زاوية	≠	لا يساوي
△	مثلث	▱	متوازي الأضلاع
//	يوازي	$\overset{\frown}{\text{ا م}}$	القوس ام .
⊥	عمودي على		
<	أكبر من		
>	أصغر من		

Figure 12: Some symbols in Handbook



فكلما تغيرت السرعة والزمن تتغير تبعاً لها المسافة المقطوعة ، ولذا يقال أن :

ف = د (ع ، ن)

ومساحة شبه المنحرف م الذى أطوال قاعدتيه وارتفاعه هى على الترتيب

قَ ، قً ، ع نحصل عليها من الصورة :

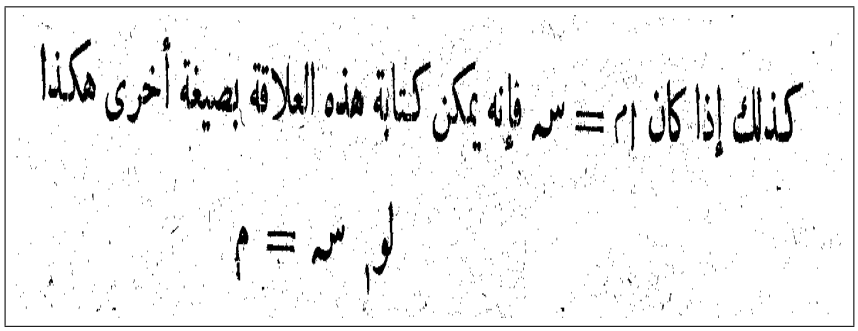
أى أن : $م = \frac{(قَ + قً)}{2} \times ع$.

م = د (قَ ، قً ، ع) .

Figure 13: Prime symbol in Handbook [3.5]

نصف القطر س

Figure 14: Ray symbol in Amman convention [1.1]



كذلك إذا كان ام = س فإنه يمكن كتابة هذه العلاقة بصيغة أخرى هكذا

لو س = م

Figure 15: Logarithm symbol in Handbook [3.3]

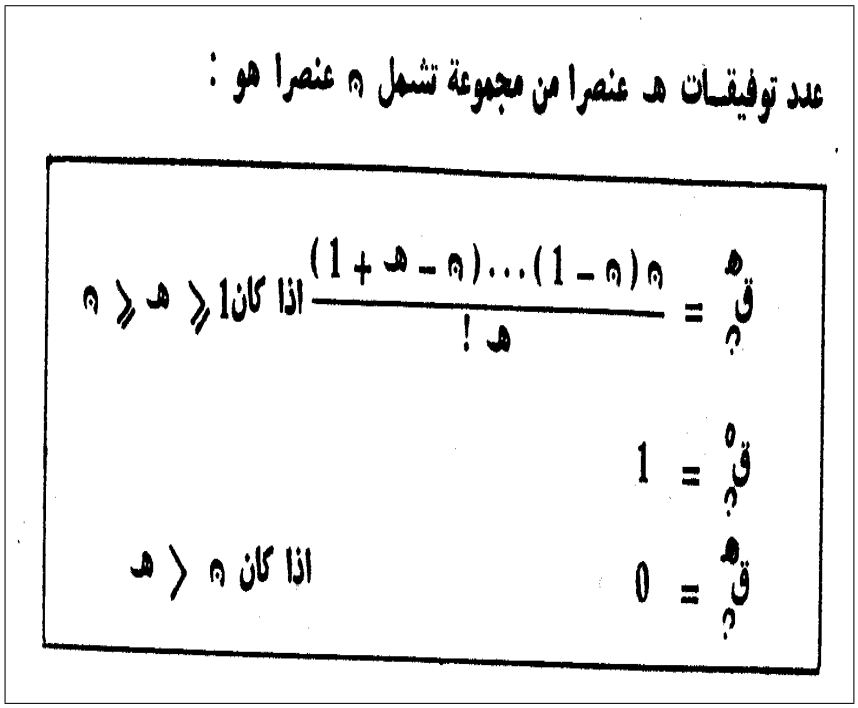


Figure 16: symbol in Handbook [3.12]

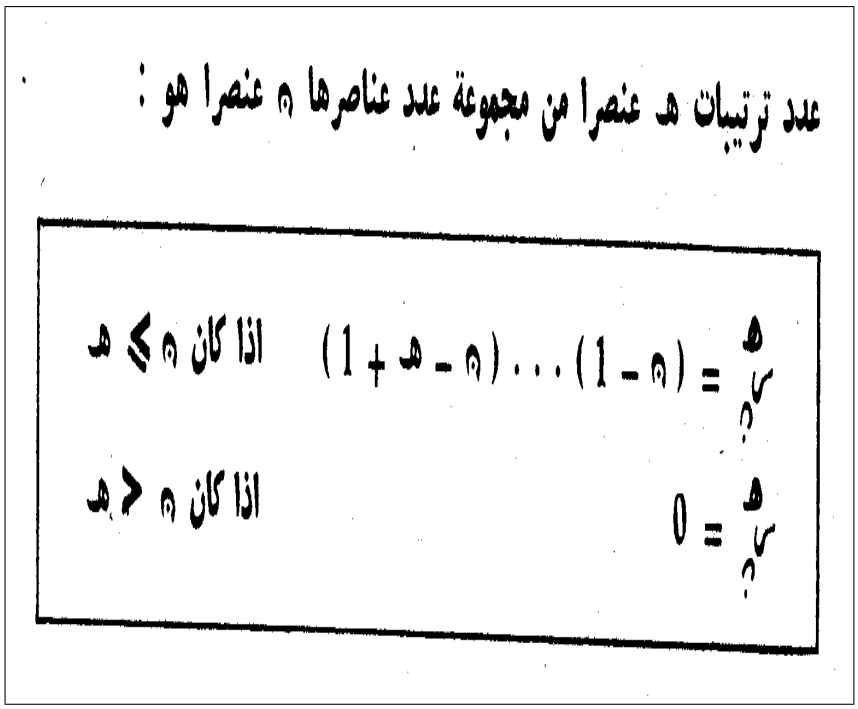


Figure 17: symbol in Handbook [3.12]