

# French vigesimal

## cultural differences in counting

DeChicchis デキキス

# counting in French

## 90 is surprising!

0	zéro	30	trente	60	soixante	90	quatre-vingt-dix
1	un	31	trente et un	61	soixante et un	91	quatre-vingt-onze
2	deux	32	trente-deux	62	soixante-deux		
3	trois	33	trente-trois	63	soixante-trois		
4	quatre	34	trente-quatre	64	soixante-quatre		
5	cinq	35	trente-cinq	65	soixante-cinq		
6	six	36	trente-six	66	soixante-six		
7	sept	37	trente-sept	67	soixante-sept		
8	huit	38	trente-huit	68	soixante-huit		
9	neuf	39	trente-neuf	69	soixante-neuf		
10	<b>dix</b>	40	<b>quarante</b>	70	<b>soixante-dix</b>		
11	onze	41	quarante et un	71	soixante et onze		
12	douze	42	quarante-deux	72	soixante-douze		
13	treize	43	quarante-trois	73	soixante-treize		
14	quatorze	44	quarante-quatre	74	soixante-quatorze		
15	quinze	45	quarante-cinq	75	soixante-quinze		
16	seize	46	quarante-six	76	soixante-seize		
17	dix-sept	47	quarante-sept	77	soixante-dix-sept		
18	dix-huit	48	quarante-huit	78	soixante-dix-huit		
19	dix-neuf	49	quarante-neuf	79	soixante-dix-neuf		
20	<b>vingt</b>	50	<b>cinquante</b>	80	<b>quatre-vingts</b>		
21	vingt et un	51	cinquante et un	81	quatre-vingt-un		
22	vingt-deux	52	cinquante-deux	82	quatre-vingt-deux		
23	vingt-trois	53	cinquante-trois	83	quatre-vingt-trois		
24	vingt-quatre	54	cinquante-quatre	84	quatre-vingt-quatre		
25	vingt-cinq	55	cinquante-cinq	85	quatre-vingt-cinq		
26	vingt-six	56	cinquante-six	86	quatre-vingt-six		
27	vingt-sept	57	cinquante-sept	87	quatre-vingt-sept		
28	vingt-huit	58	cinquante-huit	88	quatre-vingt-huit		
29	vingt-neuf	59	cinquante-neuf	89	quatre-vingt-neuf		

# counting in French

90 is surprising!

70 and 80 are too!

$$\text{trente } 30 = 3 \times 10$$

$$\text{quarante } 40 = 4 \times 10$$

$$\text{cinquante } 50 = 5 \times 10$$

$$\text{soixante } 60 = 6 \times 10$$

$$\text{soixante-dix } 70 = 6 \times 10 + 10$$

$$\text{quatre-vingts } 80 = 4 \times 20$$

$$\text{quatre-vingts-dix } 90 = 4 \times 20 + 10$$

0	zéro	30	trente	60	soixante	90	quatre-vingt-dix
1	un	31	trente et un	61	soixante et un	91	quatre-vingt-onze
2	deux	32	trente-deux	62	soixante-deux		
3	trois	33	trente-trois	63	soixante-trois		
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10	dix	40	quarante	70	soixante-dix		
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17	dix-sept	47	quarante-sept	77	soixante-dix-sept		
18	dix-huit	48	quarante-huit	78	soixante-dix-huit		
19	dix-neuf	49	quarante-neuf	79	soixante-dix-neuf		
20	vingt	50	cinquante	80	quatre-vingts		
21	vingt et un	51	cinquante et un	81	quatre-vingt-un		
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23	vingt-trois	53	cinquante-trois	83	quatre-vingt-trois		
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25	vingt-cinq	55	cinquante-cinq	85	quatre-vingt-cinq		
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28	vingt-huit	58	cinquante-huit	88	quatre-vingt-huit		
29	vingt-neuf	59	cinquante-neuf	89	quatre-vingt-neuf		

# counting in French

## different French speakers count differently

10	20	30	40	50	60	70	80	90	DIALECT AREA
dix	vingt	trente	quarante	cinquante	soixante	<b>soixante-dix</b>	<b>quatre-vingts</b>	<b>quatre-vingt-dix</b>	Paris
dix	vingt	trente	quarante	cinquante	soixante	<b>septante</b>	<b>quatre-vingts</b>	<b>nonante</b>	Belgium
dix	vingt	trente	quarante	cinquante	soixante	<b>septante</b>	<b>huitante</b>	<b>nonante</b>	Switzerland
dix	vingt	trente	quarante	cinquante	soixante	<b>septante</b>	<b>octante</b>	<b>nonante</b>	Occitania

# counting in French

## southern and eastern French speakers count like Italians

10	20	30	40	50	60	70	80	90	DIALECT AREA
dix	vingt	trente	quarante	cinquante	soixante	soixante-dix	quatre-vingts	quatre-vingt-dix	Paris
dix	vingt	trente	quarante	cinquante	soixante	<b>septante</b>	quatre-vingts	<b>nonante</b>	Belgium
dix	vingt	trente	quarante	cinquante	soixante	<b>septante</b>	<b>huitante</b>	<b>nonante</b>	Switzerland
dix	vingt	trente	quarante	cinquante	soixante	<b>septante</b>	<b>octante</b>	<b>nonante</b>	Occitania
dieci	venti	trenta	quaranta	cinquanta	sessanta	<b>settanta</b>	<b>ottanta</b>	<b>novanta</b>	Milan

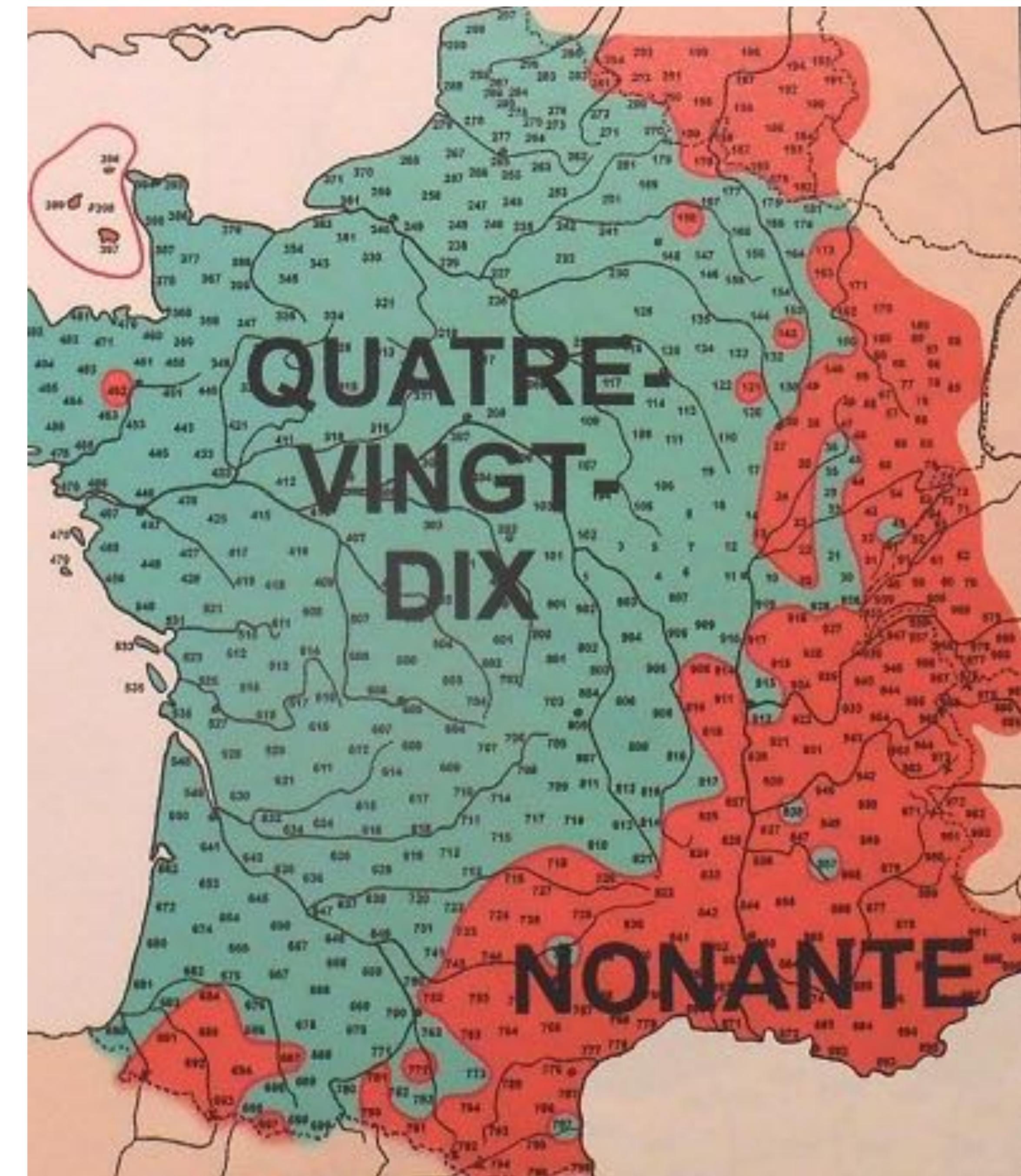
$$\begin{aligned} \text{quatre-vingts} &= 4 \times 20 \\ \text{huitante} &= 8 \times 10 \\ \text{octante} &= 8 \times 10 \\ \text{ottanta} &= 8 \times 10 \end{aligned}$$

$$\begin{aligned} \text{quatre-vingts-dix} &= 4 \times 20 + 10 \\ \text{nonante} &= 8 \times 10 \\ \text{novanta} &= 8 \times 10 \end{aligned}$$

# old base-20 pattern

## the spread from Normandy

- Comparative linguistic analysis suggests that a Viking pattern of base-20 number words was introduced to Normandy, from where it spread and displaced some Roman base-10 number words.
- This was a re-introduction, because the pre-Roman Gauls also counted in base-20.
- We can still find base-20 numerals in modern Welsh (*ugain* "20", *deugain* "40", *pedwar ugain* "80") and in modern Danish.



# counting in Danish

## 50, 70, and 90 show base-20

A **decimal** system is a counting system based on 10.

A **vigesimal** system is based on the number 20.

Danish is not as vigesimal as French, but Danish shows signs of a vigesimal system in the higher number words.

Also, the number words for 50, 70, and 90 are anticipatory.

Old Norse and Celtic had many vigesimal features.

Proto-Indo-European counting was decimal, so we wonder:

Why do these Indo-European languages have vigesimal number words?

Note: a score = 20  
(cf. “Four score and seven years ago”)

13	tretten	3+10	
14	fjorten	3+10	
15	femten	3+10	
16	seksten	3+10	
17	sytten	3+10	
18	atten	3+10	
19	nitten	3+10	
20	tyve	$2 \times 10$	
21	enogtyve	$1 + 2 \times 10$	
22	toogtyve	$2 + 2 \times 10$	
23	treogtyve	$3 + 2 \times 10$	
24	fireogtyve	$4 + 2 \times 10$	
25	femogtyve	$5 + 2 \times 10$	
30	tredive	$3 \times 10$	
31	enogtredive	$1 + 3 \times 10$	
40	fyrre	$4 (\times 10)$	4 of them
50	halvtreds		halfway to 3 score
60	tres	$3 \times 20$	3 score
70	halvfjerds		halfway to 4 score
80	firs	$4 \times 20$	4 score
90	halvfems		halfway to 5 score

# Decimal, vigesimal, quinary, duodecimal, etc.

## Vigesimal counting in Mayan and Ainu

Historically, the counting systems of the world's languages have been typically based on the numbers **10** (decimal), **20** (vigesimal), **5** (quinary), and **12** (duodecimal). A base-10 system with subbases 2 and 5 is called biquinary, and a base-20 system with subbases 4 and 5 is called quadquinary. To create complex number words from basic number words, languages use multiplicative, additive, subtractive, and anticipatory strategies.

The Mayan languages have perhaps the most famous vigesimal counting systems, and the written Maya numerals are quadquinary.

The Ainu language has a vigesimal counting system, but nowadays the Ainu people speak Japanese.

Because of influence from English, Spanish, Chinese, and other dominant languages, many languages with original vigesimal counting systems have become or are becoming decimal.

# **anticipatory vigesimal counting in Q'eqchi' Mayan**

anticipatory vigesimal counting in Q'eqchi' Mayan			
	<i>written</i>	<i>spoken phrase</i>	<i>meaning of spoken phrase</i>
58		kwaqxaqlajuh roxk'aal	18 on the way to $3 \times 20$ (18 of the 3rd 20)
59		belelajuh roxk'aal	19 on the way to $3 \times 20$ (19 of the 3rd 20)
60		oxk'aal	$3 \times 20$
61		jun xkaak'aal	1 on the way to $4 \times 20$ (1 of the 4th 20)
62		kwiib xkaak'aal	2 on the way to $4 \times 20$ (2 of the 4th 20)

# **ethnomathematics**

**studying the relationships between mathematics and culture**

Topics studied in ethnomathematics include:

systems of counting

systems of mapping

pastimes and games of skill: board games, string patterns, graphic drawings

symmetry in art, aesthetics of proportion, patterns of weaving, tiling patterns

musical tunings

The mathematics of how different cultures do similar things can be interesting.

