Inquiry guide: what is in this Graphic Organiser pack?

Lesson	Description	Resources required and whether they are included in this Graphic Organisers pack
Lesson 1 CONNECT & WONDER	Introduction to topic and generating questions. Investigating names for numbers in different languages. Could move on to different counting systems.	☑ *Seeking patterns in number words* (see page 2 of Graphic Organisers pack) ☑ *Counting to 100* in 13 different languages (see pages 3-10 of Graphic Organisers pack). Print 1-2 packs per class , cut the sheets into a card for each language, and students share.
Lesson 2 CONNECT	Investigating different numerals and counting systems	☒ Not included in graphic organiser pack or slides. Lesson designed and run by Maths teacher.
Lesson 3 CONNECT & INVESTIGATE	Placing famous mathematicians from around the world on a map. Thinking about gender and time period as well. Choosing one mathematician to investigate (homework to gather resources – introduction to databases)	☑ World map (see page 11 of Graphic Organisers pack) ☒ Brief biographies of mathematicians (not included due to copyright issues). I printed a pack that the class used as a shared resources from https://www.thefamouspeople.com/mathematicians.php, and https://www.thefamouspeople.com/women-mathematicians.php but they could also work with them online if there was enough computer access for the whole class.
Lesson 4 INVESTIGATE	Investigating and making notes on their mathematician – how did their Maths influence the world? Do we still use it in our lives today?	☒ Students chose mathematicians and printed biography pages for homework from either MacTutor (https://mathshistory.st-andrews.ac.uk/) or Britannica School. ☑ *Investigating mathematicians* (see page 12 of Graphic Organisers pack). Intended to be scaled up and printed on A3.
Lesson 5 CONSTRUCT & EXPRESS	Use the evidence gathered to answer the question 'Is maths a universal language?' Produce a poster in a group (AND cue cards on their individual mathematician)	☑ *Constructing my argument* (see page 13 of Graphic Organisers pack) ☒ Large pieces of poster paper
Lesson 6 EXPRESS & REFLECT	Poster showcase with short talks on each mathematician. Individual reflection.	☑ *Reflecting on my inquiry (*see page 14 of Graphic Organisers pack). Two per page; cut page in half.

Name Class Date

Seeking patterns in number words

Language	Example: French	A:	B:
Numbers 10-20: What patterns can you see here that use the numbers 1-10? Are there any irregularities?	11-16 sound a little bit like 1-6 with -ze on the end (meaning + 10). 17-20 translate directly as ten-seven, ten-eight, and ten-nine.		
Numbers 20-29: Do these follow a regular pattern? Any exceptions?	Vingt is a new word (it isn't just 2x10). Vingt-et-un has an extra 'and' in it. All the rest follow a regular pattern and translate directly as twenty-two, twenty-three etc.		
Numbers 30-100: Can you spot any patterns here? Look very carefully at multiples of 20, for example.	From 30 to 60, all the multiples of 10 end in -ante (meaning x10), and start a bit like the numbers below 10. 70 translates as 60+10, 80 translates as 4x20, 90 translates as 4x20+10!!		
What do you think the word for the **number 99** would be ?	4x20+19 = quatre-vingt-dix-neuf		
Choose another number below 100: ____. Write this number in each language.			

Conclusion: All the languages are different, but can you see similar patterns? Given 1-20, would you be able to guess the English translations for bigger numbers?

English

0	zero	**10**	ten	20	twenty
1	one	11	eleven	21	twenty-one
2	two	12	twelve	22	twenty-two
3	three	13	thirteen	23	twenty-three
4	four	14	fourteen	24	twenty-four
5	five	15	fifteen	25	twenty-five
6	six	16	sixteen	26	twenty-six
7	seven	17	seventeen	27	twenty-seven
8	eight	18	eighteen	28	twenty-eight
9	nine	19	nineteen	29	twenty-nine

	counting up in 10's
10	ten
20	twenty
30	thirty
40	forty
50	fifty
60	sixty
70	seventy
80	eighty
90	ninety
100	one hundred

French

0	zéro	10	dix	20	vingt
1	un	11	onze	21	vingt-et-un
2	deux	12	douze	22	vingt-deux
3	trois	13	treize	23	vingt -trois
4	quatre	14	quatorze	24	vingt-quatre
5	cinq	15	quinze	25	vingt-cinq
6	six	16	seize	26	vingt-six
7	sept	17	dix-sept	27	vingt-sept
8	huit	18	dix-huit	28	vingt-huit
9	neuf	19	dix-neuf	29	vingt-neuf

	counting up in 10's
10	dix
20	vingt
30	trente
40	quarante
50	cinquante
60	soixante
70	soixante-dix
80	quatre-vingts
90	quatre-vingt-dix
100	cent

Yaruba (Sengalese dialect)

0	òdo	10	ẹwa	20	ogun
1	ọkan	11	ọkanla	21	ọkanlelogun
2	eéji	12	ejila	22	ejilelogun
3	ẹta	13	ẹtala	23	ẹtalelogun
4	ẹrin	14	ẹrinla	24	ẹrinlelogun
5	aárùn	15	aárùndinlogun*	25	aárùndinlọgbọn
6	ẹfà	16	ẹrindinlogun	26	erindinlọgbọn
7	èje	17	ẹtadinlogun	27	etadinlọgbọn
8	ẹjọ	18	eéjidinlogun	28	eejidinlọgbọn
9	ẹsan	19	ọkandinlogun	29	okandinlọgbọn

* usually contracted to ẹdogun. Sources: https://polyglotclub.com/wiki/language/yoruba/grammar/onka-yoruba-%28counting-and-numbers-in-yoruba%29 and https://yorubatranslatornetwork.blogspot.com/2015/10/yoruba-numbering-system-1-100-in-yoruba.html

Group B

	counting up in 10's
10	ẹwa
20	ogun
30	ọgbọn
40	Ogoji (short for ogun meéji)
50	aadọta
60	ọgọta (short for ogun mẹta)
70	adọrin
80	ọgọrin (short for ogun mẹrin)
90	adọrun
100	ọgọrùn (short for ogun maárùn)

German

0	null	10	zehn	20	zwanzig
1	eins	11	elf	21	einundzwanzig
2	zwei	12	zwölf	22	zweiundzwanzig
3	drei	13	dreizehn	23	dreiundzwanzig
4	vier	14	vierzehn	24	vierundzwanzig
5	fünf	15	fünfzehn	25	fünfundzwanzig
6	sechs	16	sechszehn	26	sechsundzwanzig
7	sieben	17	siebenzehn	27	siebenundzwanzig
8	acht	18	achtzehn	28	achtundzwanzig
9	neun	19	neunzehn	29	neunundzwanzig

Group B

	counting up in 10's
10	zehn
20	zwanzig
30	dreißig
40	vierßig
50	fünfßig
60	sechsßig
70	siebßig
80	achtßig
90	neunßig
100	Einhundert

Italian

Group B

0	zero	10	dieci	20	venti
1	uno	11	undici	21	ventuno
2	due	12	dodici	22	ventidue
3	tre	13	tredici	23	ventitré
4	quattro	14	quattordici	24	ventiquattro
5	cinque	15	quindici	25	venticinque
6	sei	16	sedici	26	ventisei
7	sette	17	diciassette	27	ventisette
8	otto	18	diciotto	28	ventotto
9	nove	19	dicianove	29	ventinove

Source: https://www.woodwarditalian.com/lesson/numbers-1-to-100-in-italian/

	counting up in 10's
10	dieci
20	venti
30	trenta
40	quaranta
50	cinquanta
60	sessanta
70	settanta
80	ottanta
90	novanta
100	cento

Guernésiais? (Language specific to Guernsey, related to Norman French)

Group B

0		10	di(x)	20	vingt
1	ieune	11	aonze	21	vingt-ieune
2	daeux/daoux	12	douze	22	vingt-daeux/daoux
3	treis	13	treize	23	vingt-treis
4	quate(r)	14	quatorze	24	vingt- quate(r)
5	chin(q)(s)	15	tchinze	25	vingt- chin(q)(s)
6	si(x)	16	seize	26	vingt- si(x)
7	saept/sé/sept	17	dix-saept	27	vingt- saept/sé/sept
8	huit	18	dix-huit	28	vingt-huit
9	neuf	19	dix-neuf	29	vingt-neuf

With thanks to the Guernsey Language Commission for the translation. Guernésiais was historically largely an oral language so there are no set spellings for some words.

	counting up in 10's
10	dix
20	vingt
30	trente
40	tchéràante
50	chinquànte
60	seissànte
70	septànte
80	huitànte/octànte/quatre-vingts
90	nonànte
100	chent

Hindi (India)

Group B

0	shuniye	10	das	20	bees
1	ek	11	gyaarah	21	ikis
2	dow	12	baarah	22	bais
3	teen	13	terah	23	teis
4	chaar	14	chaudah	24	chaubis
5	paanch	15	pandrah	25	pachis
6	cheh	16	saulah	26	chabbis
7	saat	17	satarah	27	stais
8	aath	18	atharah	28	athais
9	nau	19	unnis	29	unatis

99 = Ninyaanave. It's really hard to construct new numbers for this language! Ask your teacher for the full list so that you can find your chosen number.

sources: https://blogs.transparent.com/hindi/hindi-numbers-1-100/

	counting up in 10's
10	das
20	bees
30	tis
40	chalis
50	pachas
60	saadh
70	sattar
80	assi
90	nabbe
100	ek sow

Danish

0	nul	10	ti	20	tyve
1	en	11	elleve	21	enogtyve
2	to	12	tolv	22	toogtyve
3	tre	13	tretten	23	treogtyve
4	fire	14	fjorten	24	fireogtyve
5	fem	15	femten	25	femogtyve
6	seks	16	seksten	26	seksogtyve
7	syv	17	sytten	27	syvogtyve
8	otte	18	atten	28	otteogtyve
9	ni	19	nitten	29	niogtyve

In Danish 'first half' = 0.5, 'second half' = 1.5, 'third half' = 2.5 etc. How confusing is that!?

sources: https://www.languagesandnumbers.com/how-to-count-in-danish/en/dan/

Group A

	counting up in 10's
10	ti
20	tyve
30	tredive
40	fyrre
50	halvtreds short for *halvtredje-sinds-tyve*, meaning "third half (2.5) times twenty"
60	tres short for *tre-sinds-tyve*, which means "three times twenty"
70	halvfjerds short for *halv-fjerd-sinds-tyve*, meaning "fourth half (3.5) times twenty"
80	firs short for *fire-sind-styve*, meaning "four times twenty"
90	halvfems short for *halv-fem-sinds-tyve*, meaning "fifth half times twenty"
100	hundred

Navajo (Indigenous people of North America)

0	názbas	10	neeznáá	20	naadiin
1	t'ááłá'í	11	łá'ts'áadah	21	naadjįnłá'
2	naaki	12	naakits'áadah	22	naadjįnaaki
3	táá'	13	táá'ts'áadah	23	naadjįntáá'
4	djį'	14	djį'ts'áadah	24	naadiindjį'
5	ashdla'	15	ashdla'áadah	25	naadiinashdla'
6	hastáą	16	hastą'áadah	26	naadiinhastáą
7	tsosts'id	17	tsosts'idts'áadah	27	naadiintsosts'id
8	tseebíí	18	tseebííts'áadah	28	naadiintseebíí
9	náhást'éí	19	náhást'éíts'áadah	29	naadiinnáhást'éí

Group A

	counting up in 10's
10	neeznáá
20	naadiin
30	tádiin
40	dízdiin
50	ashdladiin
60	hastądiin
70	tsosts'idiin
80	tseebídiin
90	náhást'édiin
100	t'ááłáhádí neeznáádiin

sources: https://www.languagesandnumbers.com/how-to-count-in-navajo/en/nav/ , https://www.lingalot.com/numbers-in-navajo/
Numbers between 41 and 49 are formed just as for 20, above (e.g. dízdiinashdla' is 45). But for all the other numbers you have to add "dóó ba'aan" (meaning in addition to) between the ten and the unit e.g. tádiin dóó ba'ąą ashdla' is 35.

Turkish

0	sıfır	10	on	20	yirmi
1	bir	11	on bir	21	yirmi bir
2	iki	12	on iki	22	yirmi iki
3	üç	13	on üç	23	yirmi üç
4	dört	14	on dört	24	yirmi dört
5	beş	15	on beş	25	yirmi beş
6	altı	16	on altı	26	yirmi altı
7	yedi	17	on yedi	27	yirmi yedi
8	sekiz	18	on sekiz	28	yirmi sekiz
9	dokuz	19	on dokuz	29	yirmi dokuz

Group A

	counting up in 10's
10	on
20	yirmi
30	otuz
40	kırk
50	elli
60	altmış
70	yetmiş
80	seksen
90	doksan
100	yüz

sources: https://www.languagesandnumbers.com/how-to-count-in-turkish/en/tur/

Welsh

0	sero	10	deg	20	daudeg
1	un	11	undeg un	21	daudeg un
2	dau	12	undeg dau	22	daudeg dau
3	tri	13	undeg tri	23	daudeg tri
4	pedwar	14	undeg pedwar	24	daudeg pedwar
5	pump	15	undeg pump	25	daudeg pump
6	chwech	16	undeg chwech	26	daudeg chwech
7	saith	17	undeg saith	27	daudeg saith
8	wyth	18	undeg wyth	28	daudeg wyth
9	naw	19	undeg naw	29	daudeg naw

Source: https://www.languagesandnumbers.com/how-to-count-in-welsh/en/cym/
sources: https://polyglotclub.com/wiki/language/yoruba/grammar/onka-yoruba-%28counting-and-numbers-in-yoruba%29 and https://yorubatranslatornetwork.blogspot.com/2015/10/yoruba-numbering-system-1-100-in-yoruba.html

Group A

	counting up in 10's
10	deg
20	daudeg
30	trideg
40	pedwardeg
50	pumdeg
60	chwedeg
70	saithdeg
80	wythdeg
90	nawdeg
100	cant

Māori (Indigenous people of New Zealand)

0	kore	10	tekau	20	rua tekau
1	tahi	11	tekau mā tahi	21	rua tekau mā tahi
2	rua	12	tekau mā rua	22	rua tekau mā rua
3	toru	13	tekau mā toru	23	rua tekau mā toru
4	whā	14	tekau mā whā	24	rua tekau mā whā
5	rima	15	tekau mā rima	25	rua tekau mā rima
6	ono	16	tekau mā ono	26	rua tekau mā ono
7	whitu	17	tekau mā whitu	27	rua tekau mā whitu
8	waru	18	tekau mā waru	28	rua tekau mā waru
9	iwa	19	tekau mā iwa	29	rua tekau mā iwa

sources: https://www.languagesandnumbers.com/how-to-count-in-maori/en/mri/

Group A

	counting up in 10's
10	tekau
20	rua tekau
30	toru tekau
40	whā tekau
50	rima tekau
60	ono tekau
70	whitu tekau
80	waru tekau
90	iwa tekau
100	kotahi rau

Mandarin Chinese

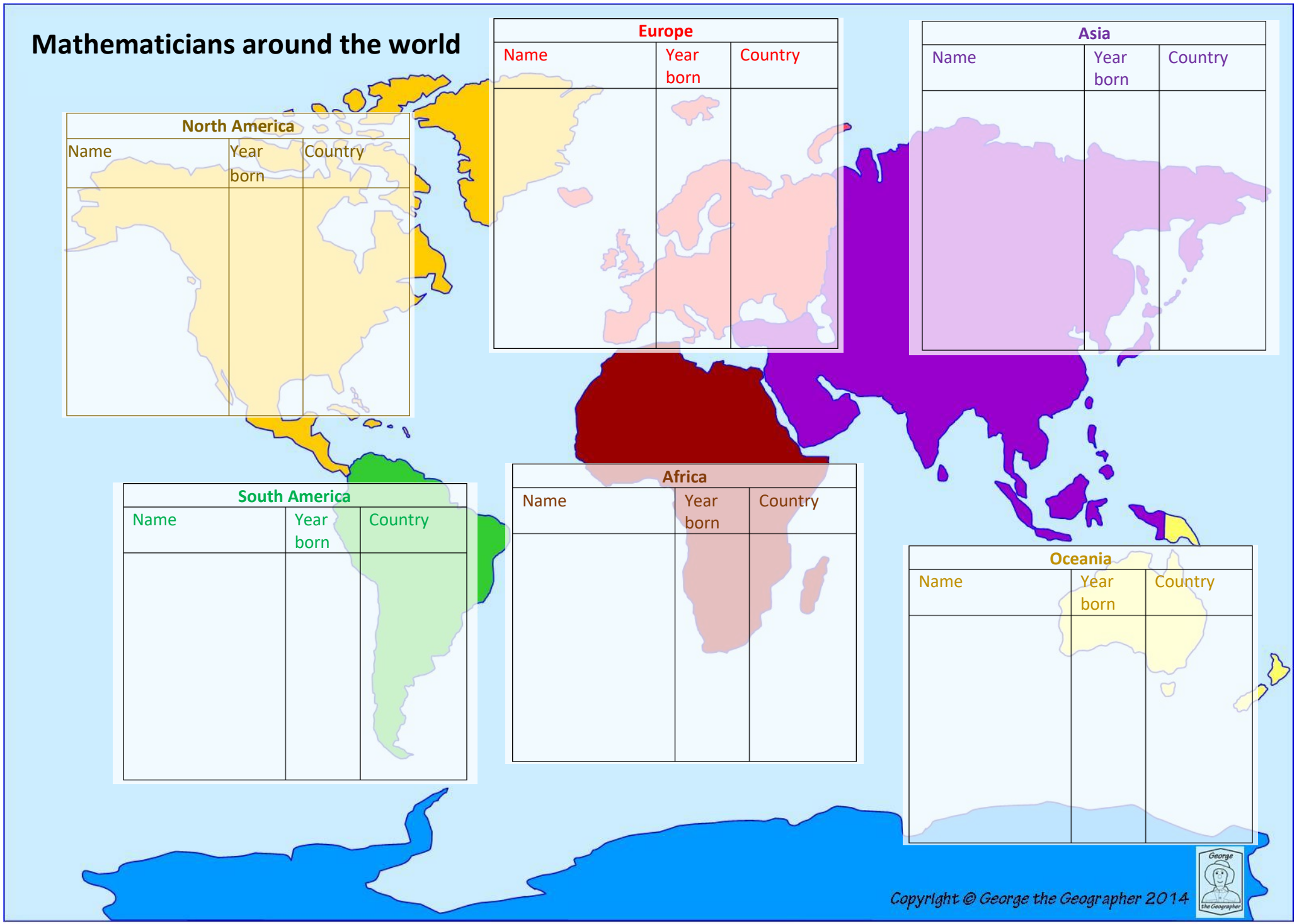
Group A

0	líng	10	shí	20	èr shí
1	yī	11	shí yī	21	èr shí yī
2	èr	12	shí èr	22	èr shí èr
3	sān	13	shí sān	23	èr shí sān
4	sì	14	shí sì	24	èr shí sì
5	wǔ	15	shí wǔ	25	èr shí wǔ
6	liù	16	shí liù	26	èr shí liù
7	qī	17	shí qī	27	èr shí qī
8	bā	18	shí bā	28	èr shí bā
9	jiǔ	19	shí jiǔ	29	èr shí jiǔ

sources: https://www.berlitz.com/blog/count-chinese-numbers-mandarin

	counting up in 10's
10	shí
20	èr shí
30	sān shí
40	sì shí
50	wǔ shí
60	liù shí
70	qī shí
80	bā shí
90	jiǔ shí
100	yī bǎi

Mathematicians around the world



Europe

Name	Year born	Country

Asia

Name	Year born	Country

North America

Name	Year born	Country

South America

Name	Year born	Country

Africa

Name	Year born	Country

Oceania

Name	Year born	Country

Investigating Mathematicians

Source:	Name of mathematician: Where is your info from? ☐ Britannica School ☐ MacTutor ☐ Another site (give details):		
What information have I found?		**Why is it relevant to my inquiry?**	
WHERE was my mathematician born and where did they live and work?		Does the country matter? Any idea of the wider context for that country? If they moved around, why do you think that happened?	
WHEN were they born/ did they die? How old were they when they died?		Does the time period matter? Any idea of the wider context for that time period?	
What maths were they famous for?		Why is this maths important? Can you explain it? Can you give examples of how it is used?	
Are they famous for anything other than maths? What?		Did this other work relate to their maths? Do you think older mathematicians are more or less likely to work in a wide range of different fields?	
Anything else interesting about their life and work?			

Constructing my argument

	No, this is evidence that Maths is NOT a universal language	Yes, this is evidence that Maths IS a universal language
Counting in different languages		
Counting in ways from different countries (e.g. base 60)		
Mathematicians from different countries		
My conclusion: Would I describe Maths as a universal language?		

Now produce a poster in your group. You might want to produce different sections on small pieces of paper and stick them on. Your poster should have:

- ☐ A large, clear, bold title (*Is Maths a universal language?)*
- ☐ Something about counting in different languages (could you write the same number in several languages)
- ☐ Something about different systems of counting (again, could you write the same number in several systems)
- ☐ A panel on each of your mathematicians
- ☐ Your group's answer to the question

You will also need to talk about your mathematician, so make sure you have each produced some cue cards.

Reflecting on my inquiry

Something interesting I learnt in this topic (or maybe something that surprised me)	
What I thought I did well	
What I thought I could do better	
Something I would have liked to find out more about if we had more time	
How did I feel about doing extended inquiry in Maths? [Did it change the way I relate to Maths? Was it exciting/ interesting/ uncomfortable/liberating/ boring/ challenging etc]	

Reflecting on my inquiry

Something interesting I learnt in this topic (or maybe something that surprised me)	
What I thought I did well	
What I thought I could do better	
Something I would have liked to find out more about if we had more time	
How did I feel about doing extended inquiry in Maths? [Did it change the way I relate to Maths? Was it exciting/ interesting/ uncomfortable/liberating/ boring/ challenging etc]	

FOSIL: Learning by finding out for yourself.