**Levels 7/8 HISTORY Activity**

**Romans and their numerals**

**Introduction to Numeracy in History**

The Victorian Curriculum and Assessment Authority (VCAA, n.d.-f) explains that “awareness of history is an essential characteristic of any society, and historical knowledge is fundamental to understanding ourselves and others,” clarifying that historical knowledge is developed through use of “evidence derived from remains of the past.” While few would dispute these statements, the inclusion of numeracy in history requires a broader definition of the term *evidence* than the common definition of “artefacts, visual, written, audio” (VCAA, n.d.-a, VCHHC099). To incorporate numeracy in history, teachers need to embrace the often-overlooked sources of numbers and symbols, and demonstrate how each can be located within curriculum documents. Additionally, teachers need to demonstrate that numbers and symbols can be sources of evidence as potent as history’s widely-accepted written word.

Six historical thinking concepts, defined by the Canadian Historical Thinking Project (Centre for the Study of Historical Consciousness [CSHC], n.d.), have found acceptance in Australia: historical significance, primary source evidence, continuity and change, cause and consequence, historical perspectives, and ethical dimensions. Only minimally adapted for use in Australia, ‘thinking historically’ refers to looking beyond the past, connecting with the present, and considering a selection of possible futures. Although each concept has distinctive elements, the six are interrelated, and numeracy can be found within each.

A history education rich in historical thinking equips students with the knowledge, skills, and dispositions for lifelong learning: to communicate clearly and ask informed questions about evidence. In the early 21st century, teachers and students of history are expected to think historically and establish historical significance. CSHC (n.d.) explains that “significant events [and outcomes] include those that resulted in great change over long periods of time for large numbers of people… [if able to be linked] to larger trends and stories.” In terms of identifying cause and consequence, teachers and students need to understand “the actions, beliefs, and circumstances” that had consequences, as well as to see consequences as “multiple and layered, involving both long-term ideologies, institutions, and conditions, and short-term motivations, actions and events” (CSHC, n.d.).

The development of numeracy can be related to human agency and the gamut of positive and negative outcomes for humans, other life forms, and artificial environments. The disciplines of mathematics and history, often considered distant, sit comfortably together. Each can illuminate the other and engage teachers as well as students who might not otherwise have been so engaged, prompting deeper thinking and, ideally, informed, positive, and active global citizenship in the present, based on knowledge of the past and the skills developed in acquiring that knowledge.

**Developing Numeracy Understanding in History**

Studying history helps students to appreciate how the world and its people have changed, as well as the significant continuities through to the present day. In achieving and implementing these understandings, the study of the past “provides opportunities to develop transferable skills of critical and creative thinking, such as the ability to explore questions, imagine possibilities and construct arguments” (VCAA, n.d.-f).

VCAA actively promotes the use of primary source evidence: “Primary sources are the building blocks of historical thinking and are fundamental to students’ understanding and interpretation of the past” (VCAA, n.d.-d). However, the primary sources are not ‘stuck in the past’; VCAA prompts students to understand them and determine historical significance.
At Levels 7 and 8, in terms of Historical Concepts and Skills, specifically Cause and Effect, students “analyse the causes and effects of significant events that caused change and/or a decline over the period” (VCAA, n.d.-b, VCHHC103). A teacher of history is encouraged to infuse their teaching with numeracy across the multiple history strands, sub-strands, content descriptions, and context choices. Early opportunities, for example, arise in the sub-strand of the Ancient World and Early Civilisations 60 000 BC (BCE) – c. 650 AD (CE), and within the context choices of Europe and the Mediterranean World, namely Rome. For instance, students can understand that the scale of Roman agency across time, with both positive and negative outcomes for Rome and for other peoples and environments, would not have occurred without the Romans developing a form of mathematics. Per the Levels 7 and 8 achievement standard, by the end of Level 8, students should be able to “locate and select historical sources and identify their origin, content features and purpose… They compare and contrast historical sources and ask questions about their accuracy, usefulness and reliability” (VCAA, n.d.-e).

At Levels 9 and 10, the opportunities to develop numeracy through studying history are rich. In terms of the strands Historical Concepts and Skills, and Historical Sources as Evidence, students are prompted to “analyse and corroborate sources and evaluate their accuracy, usefulness and reliability” (VCAA, n.d.-a, VCHHC099). Teachers and students can ‘find the numbers’ when working with the sub-strand of The Making of the Modern World. Per the Levels 9 and 10 achievement standard, by the end of Level 10, students should be able to “compare and contrast historical sources and evaluate their accuracy, usefulness and reliability” (VCAA, n.d.-c, VCHHK111). Students achieve this standard when they, for instance, perform calculations related to Australian and other nations’ staggering numbers of casualties as the consequence of World War I, with the war being an event that contributed to the spread of the Spanish flu.

**Lesson Plan: Romans and Their Numerals**

The purpose of this lesson plan is for students to become familiar with Roman numerals and to understand how the advancement of the Roman Empire would not have been possible without the development of a numeral system. Students will explore the use of Roman numerals in contemporary society. By studying the mathematical needs of the Roman Empire, students will develop the capacity to better understand our current numeral system.

At the end of the lesson plan, an appendix is provided with background information. It is recommended that the teacher familiarise themselves with this overview before teaching the lesson.

**Prerequisite/Corequisite Knowledge: History**

* Critical appraisal of online resources (e.g., checking for quality of authorship and scholarship, reliability, sourcing of evidence, accuracy of spelling, presentation)
* Commonly stated dates pertaining to the duration of the Roman Empire in world history, as well as the area that it occupied and the date of its peak
* Names on modern-day maps of countries that were once part of the Roman Empire
* Reasons why Roman numerals were developed
* How, for better (e.g., advances in the arts) or worse (e.g., means of organising armies and taking slaves), the Roman Empire’s expansion was facilitated by the use of Roman numerals
* Limitations of Roman numerals in terms of complex calculations and records
* Understanding why knowing Roman numerals is worthwhile in modern daily life and where Roman numerals can be found
* Knowing what each Roman numeral represents and how to convert Roman numerals to Hindu-Arabic numeral equivalents
* Being able to perform simple addition and subtraction calculations with Roman numerals

**Background Mathematical Skills and Understandings**

Teachers of History are not expected to teach the mathematical knowledge and skills that students will draw on when engaging with this activity. The students will have learnt and should be adept with the required mathematical knowledge and skills to complete the activity. According to the Victorian Curriculum: Mathematics, the required mathematical knowledge and skills should have been developed in earlier years of schooling, that is, by the end of Level 6.

For this activity, the background mathematical skills and knowledge are:

* Knowledge of the Hindu-Arabic number system

N.B. Students may be aware of Roman numerals, but may need assistance in converting from Hindu-Arabic numerals to Roman numerals and vice-versa.

* Knowledge of basic mathematical operations (addition, subtraction, multiplication, and division)
* Knowledge of zero
* Knowledge of measurement units (metric and non-metric): time, distance, area, money, and weight (mass)
* Knowledge of compass directions
* Ability to interpret information on maps

**Lesson Description**

There is the possibility of two lessons in the following, depending on what activities teachers select and perhaps unpack more fully.

Teachers should familiarise themselves with the information and visuals, ideally photographs of objects, in either students’ textbooks or on the following three reputable websites:

1. The British Museum’s Rome collection (The British Museum, 2020c): The information provided on the website demonstrates the sophistication and power of the Roman Empire that could only have been achieved through the development of a numeral system. Teachers might visit (and perhaps use with students) the museum’s general public pages and conduct keyword searches (The British Museum, 2020c) or head directly to the school-related pages, which include downloadable PowerPoints that can be used in the following activities (The British Museum, 2020b).
2. The National Museum of Australia (NMA): In 2018–2019, the NMA hosted a travelling exhibition of selected objects from the British Museum; the NMA maintains an online presence regarding this exhibition (NMA, 2018a). Conveniently, selected NMA catalogue pages are available (NMA, 2018d), as well as podcasts with transcripts. One podcast, Rome after Dark, references time as understood by the Romans in terms of hours in a day and on sundials (NMA, 2018e). Another, In Conversation with ABC Radio National on Ancient Rome, refers specifically to Rome’s achievements and what knowledge, understandings, and dispositions, positive as well as negative, were necessary to ensure Rome’s hold of a vast land area along with the capacities to build the Roman Baths and Hadrian’s Wall (NMA, 2018b). A further podcast, Roman Discoveries, adds to the aforementioned understandings (NMA, 2018c). Teachers can collect visuals and text excerpts to suit their and their students’ needs.
3. The National Archives of the United Kingdom (NAUK): On this website, information is provided about what Roman numerals mean, as well as additive and subtractive notation related to our modern-day place value system (NAUK, n.d.).

***Student Activities***

1. Ask students what they know about ancient Rome and its Empire, and where they obtained their information. Students will likely refer to the Colosseum, Pompeii, and gladiators, and sources such as feature films, documentaries, family background, holidays, and the comic book series, *Asterix*. There might be a reference to Roman numerals. Record all suggestions on the whiteboard. A definition of the term, empire, could be included: a large group of countries or states controlled by another power.
2. Ask students if they know which countries today were once part of the Roman Empire.
Some students might name Italy and Mediterranean countries due to the aforementioned examples.
3. With support, enable students to:
4. review any maps commonly found in history textbooks as well as through Google searches for “Roman Empire at its peak.”
5. compare the ‘peak’ map with a separate modern map of Europe and northern Africa
6. Place students into four groups. After locating Rome in central Italy, assign each group a separate direction: north-west, south-west, south, or east. You might need to draw and explain points of the compass on the whiteboard. Each group ‘expands from Rome’ to the extremities of England, Morocco, Egypt, and Azerbaijan, and lists the countries by modern names encountered in the group’s directional movement.
7. Students share their findings in a whole-class discussion. These, too, are recorded on the whiteboard.
8. The lesson has two possibilities at this juncture.
9. Students work individually, in pairs, or in small groups and select any one country of interest to them—perhaps related to family background or the discussion points above. Then, students search their textbooks and/or Google for Roman ruins or objects found in the country. Almost certainly, references to ruins will be accompanied by objects. Students select any one object of interest.
10. Present students with any of the British Museum or National Museum of Australia websites that contain rich visuals of Roman objects. You might choose from several possibilities but good examples are the PowerPoint and PDF items (British Museum, 2020a) or the Rome catalogue (NMA, 2018b). Following the searches students select any one object of interest.

N.B. The British Museum is amending its website during COVID-19 lockdown.
If students are given the recommended PDF in addition to the PowerPoint (British Museum, 2020a), some links might not take them directly to the object. Students will need to replace ‘www’ in the URL with the word ‘research.’ Alternatively, for less confusion during the lesson, you might locate and then cut and paste the final correct URLs into a new document for students.

In either case students, where possible, list:

1. the location of the object
2. the precisely known or approximate year (decade, century) when it was made
3. the materials of which the object is known to have been made (or that students can infer)
4. the types of workers who were likely involved in the process of:
	1. finding the raw material for the object
	2. transporting the raw material
	3. manufacturing the raw material into the new object
	4. selling the object
	5. using the object

For instance, if the object is a solid silver armlet: Miners mine rocks, which hold silver; leaders of donkey teams carry the rocks to smelters where other men melt and mould the silver into blocks; traders or silversmiths buy the blocks; they or other jewellers re-smelt the silver and pour molten liquid into circular moulds to create the armlet; the same jewellers or other agents and traders sell the armlet in the Forum; and a wealthy Roman man buys and wears the armlet.

1. Students share the information about their object in a whole-class discussion.
2. After the students share their information, ask them to volunteer thoughts on what knowledge, skills, and personal qualities any one or more people in the process would have needed to find, transport, manufacture, sell, or use the object.
3. Acknowledge all responses but mentally note any that rely on people in the process needing to be numerate. If no opportunities arise, contemplate possibilities.

For instance, using the provided example, if the miners, donkey team leaders, and first smelter workers were not slaves, they would have been poorly paid workers, but would have known what to expect to be paid or given a written or visual estimate. The jewellers and traders might also have been slaves or better-paid workers, but more likely would have been educated or at least would have known how to measure amounts, such as weights or quantities of silver, and calculate costs during manufacture and/or when selling and giving change in the Forum. The wealthy Roman purchasing the armlet would have probably been educated and thus might have thought to ask questions or see evidence of its weight, or he might bargain regarding cost.

1. Develop discussions so that students conclude for themselves that the Romans could not have claimed so much territory and created so many advances related to ‘civilisation’ (such as making silver jewellery)—with the negative as well as positive impacts for peoples and environments—without a form of mathematics. At this point, discuss that the Roman Empire relied a great deal on slave labour and that women, overall, were much less likely to be educated, including being numerate. Take the opportunity to discuss how the United Nations Universal Declaration of Human Rights declares that, in the 21st century, slavery is illegal, and women are entitled to an education and opportunities equal to those of men, including opportunities to be numerate. Share that, unfortunately, slavery and unequal treatment of women continue in many countries. However, organisations such as Amnesty International and the United Nations are acting for change. Instances of slavery and inequalities in opportunities to be numerate for women are less frequent than once they were (Amnesty International, 2016; United Nations, 1948).
2. Ask students what they already know about Roman numerals, such as:
3. what the symbols are (i.e., letters of the Romans’ Latin alphabet)
4. what the symbols represent (e.g., I = 1)
5. if students know or can guess how any numbers came to be represented as the symbols (e.g., one finger = I). Provide explanations if necessary.
6. where Roman numerals can be found in our lives today, 2,000 years after their creation (See Appendix)
7. After making best use of students’ responses, direct students to the website of the National Archives of the United Kingdom (n.d.). Discuss the additive and subtractive rules governing how Roman numerals work. Roman numerals are written in additive and subtractive notation. Additive notation means that the individual values in a Roman numeral are added together to arrive at the total value. In the case of VI, the values for V and I are added. V is 5 and I is 1, so 5 + 1 = 6. The position of the smaller number in relation to the larger number indicates an additive or subtractive. For instance, VI is 5 + 1 and additive; IV is 5 ₋ 1 and subtractive.
8. Ask the following questions:
9. What number is missing from Roman numerals? (zero)
10. What problems can arise in mathematical calculations if a numeral system does not possess zero? (Place value is difficult; no way of representing ‘nothing’)
11. What other problems can arise when using Roman numerals? (Large calculations are difficult to record; multiplication and division are difficult to complete)
12. Students perform one or more of the following activities:
13. look around the room for Roman numerals (e.g., on watches, clocks, or lists) and convert them to Hindu-Arabic numerals
14. look around the room for Hindu-Arabic numbers and convert them to Roman numerals
15. think of numbers that students see and use often (e.g., their ages, addresses, mobile numbers, friends’ and family members’ birthdates), and write them as Roman numerals
16. write simple mathematical problems (addition and/or subtraction) in Roman numerals for partners to complete
17. Conclude the lesson by presenting two questions for student responses in discussion or writing. Students will probably need definitions of the terms (e.g., *revolutionary* can mean ‘significant in changing history’; *romantic* can mean ‘attractive, elegant’). Students need to justify their answers, using evidence from the activities. A mix of ‘yes’, ‘no,’ and even ‘partially’ or ‘both’ answers is acceptable based on perspectives and justifications.
18. Were Roman numerals revolutionary in ancient times? Explain your thinking.
19. Are Roman numerals relevant, romantic, or both, in today’s world? Explain.

**Table 1: Links to the Victorian Curriculum – History**

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| Strand and Sub-Strand (if applicable) | Content Description (Code) | Adapted Elaboration(s) |
| Historical Concepts and Skills* Cause and Effect
 | Analyse the causes and effects of significant events that caused change and/or a decline over the period (VCHHC103) | N/A |
| Historical Concepts and Skills* Cause and Effect
 | Evaluate the role and achievement of a significant individual, development and/or cultural achievement that led to progress (VCHHC104) | Asking questions like ‘what makes this individual, development or achievement significant?’, ‘who decides historical significance?’, ‘how do you decide?’, ‘how significant was it to people who lived at that time?’, ‘how many people were affected?’, ‘to what extent were people’s lives changed?’, ‘how long lasting were the consequences?’, ‘how can the consequences still be felt today?’ and ‘what is its legacy?’ |
| Historical Knowledge * Ancient World and Early Civilisations 60 000 BC (BCE) – c. 650 AD (CE)
 | Significant beliefs, values and practices with a particular emphasis on changes to everyday life, cause and effect of warfare, and perspectives of deaths and funerary customs (VCHHK111) | Investigating… baths, and the forms of entertainment in theatres and amphitheatres  |
| Historical Knowledge * Ancient World and Early Civilisations 60 000 BC (BCE) – c. 650 AD (CE)
 | Causes and effects of contacts and conflicts with other societies and/or peoples, resulting in developments such as expansion of trade, colonisation and war, and spread of beliefs (VCHHK112) | Analysing the causes and effects of the rise and expansion of the Roman EmpireDescribing the furthest expansion of the Roman Empire |
| Historical Knowledge * Ancient World and Early Civilisations 60 000 BC (BCE) – c. 650 AD (CE)
 | The different methods and sources used by historians and archaeologists to investigate history and/or a historical mystery (VCHHK114) | Investigating a site such as the Colosseum, Herculaneum, Pompeii, and Roman ForumEvaluating the theories and hypothesis of archaeologists about the significance of the site’s social, political, economic features |

**Table 2: Links to the 21st Century Numeracy Model (Goos et al., 2014)**

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| Aspect of the Model | How This Aspect is Addressed by the Lesson |
| **Attention to Real-Life Contexts*** Citizenship
* Work
* Personal and Social Life
 | Students learn about symbols—Roman numerals—that represent numbers, and what the symbols mean when encountered in historical but also daily life contexts. Roman numerals persist also because some people value their classically elegant appeal, hence the ability to purchase watches, clocks, and sundials with Roman numerals when other time-telling forms exist. Thus, by learning about Roman numerals, students will develop understandings that they can apply to personal and social life. |
| **Application of Mathematical Knowledge*** Problem Solving
* Estimation
* Concepts
* Skills
 | Students explore historical and mathematical concepts, and engage in problem-solving, calculating, and using critical and creative thinking in relation to Roman numerals. Students explore the use of Roman numerals to make sense of the life in ancient times. |
| **Use of Tools*** Physical
* Representational
* Digital
 | Students use representational tools (symbols, maps, diagrams, and drawings), and digital tools (internet, computers, and calculators) to mediate their historical and mathematical thinking. |
| **Promotion of Positive Dispositions*** Confidence
* Flexibility
* Initiative
* Risk
 | Students develop confidence in using symbols and numbers in the discipline for which the written word and visual, oral, and aural sources are more often the sources: history. Through compelling historical background, rich visuals, the engaging feature of Roman numerals, and in knowing the sources of the data, students might be inspired to take initiative in further historical and mathematical investigations. |
| **Critical Orientation*** Interpreting Mathematical Results
* Making Evidence-Based Judgements
 | Students perform mathematical calculations, but not only as an end in themselves. Students are asked questions to critically and creatively encourage them to think about real world contexts associated with symbols and objects of the past, what can be learned from the past, and what features of the past continue into the present.  |

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**Appendix: Teacher Background Information**

According to the British Society for the History of Mathematics (n.d.)**, “**Mathematics has been part of human culture since the beginnings of civilization. Its study and practice have gone hand in hand with the evolution and development of commerce, architecture, legal theory, cosmology, astrology, and countless other activities.” The growth of the Roman Empire from a small village on the banks of Italy’s Tiber River to an empire lasting for nearly 1,500 years and spanning approximately 5 million square miles (12.5 million square kilometres) at its peak in 100 A.D. would not have been possible without the ancient Romans’ development of mathematics and design of Roman numerals.

The history of how Roman numerals were developed is little known. The numbers understood today as 1, 2, and 3 (in the system of Hindu-Arabic numerals) were originally I, II, and III in Roman times, believed to have been taken from the most basic signs of showing one, two, or three fingers to an observer. Today’s numeral of 4 was represented by four fingers, hence IIII. Today’s numeral of 5 was represented by V, believed to have been an outstretched hand of five fingers.

The Romans would not have developed their civilisation with its expansive trade and military holds over vast areas of land, or developed skills and constructed sites that are today World Heritage protected, without the development of mathematics. Hallmark constructions most famously located in modern-day Rome include the Forum, Colosseum, and Pantheon, but, at its peak, the Roman Empire had expanded as far north-west as to build Hadrian’s Wall and the Roman Baths in England, as far south-west as to build another forum, roads, and triumphal arch in Rabat in Morocco, as far south as to trade with groups living in upper Egypt’s Nile River, and as far east as to leave a military inscription in Azerbaijan. Being able to count and record beyond five (V) became necessary. Thus, instead of using IIII, the Romans determined to place I before V, hence ‘one before five’ or 5 ₋ 1 = 4. Today’s number 10 is believed to have originally been shown in Roman times as two outstretched hands of five fingers, but, instead of using VV, the Romans decided to place a V on top of an upside-down V to create X. To continue exploring the origins of Latin alphabet as Roman numerals, see Hom (2013).

The question might be asked as to why anyone in the 21st century needs to know Roman numerals. An important answer is that Roman numerals exist not only in historical documents but as reference points in our daily lives. They can be found on building foundations or date stones in older-established towns, and can appear on sundials, clocks, and watches, including those made in the present day. Of note, watches and clocks that have Roman numerals on them can still often show 4 as IIII reputedly to overcome confusion if IV is viewed upside down or in a mirror. Roman numerals can be found in lists in the preliminary pages of books; in references to military corps, monarchs, and popes; as copyright dates on movies; and to number months.