

# The long hundred in medieval and early modern Scotland

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## ABSTRACT

*The 'long hundred' of 6 score was the norm in Scotland for non-monetary sums from the early middle ages to the middle of the 17th century. It existed together with a 'long thousand': where c = 120, m = 1200. It originated with the Germanic practice of counting in tens up to 120 ('twelvety'), that amount being roman numeral c; but it later came to be regarded as 6 score, occasionally as 10 dozen. It was not part of a 'duodecimal system', rather of a mixed-base system in which decimals predominated.*

*It is found in accounts of produce of various kinds, though it was not used for all commodities; wool, in particular, was reckoned by the short hundred until the early 16th century. An appendix lists the commodities for which use of long (and/or short) hundreds has been identified between 1200 and 1650.*

*Calculations in this period were carried out on the counting-board, the medieval version of the abacus. It was easy to use this for non-decimal bases, and it is shown by diagrams how the long hundred could have been handled. The long hundred disappeared when the counting-board was replaced by paper calculation using arabic numerals.*

## INTRODUCTION

During an earthquake in northern Scotland in 1597, 'a man in St Johnstoun laying compts with his compters, the compts lappe off the boord'.<sup>1</sup> The purpose of this article is to investigate what he was doing, focusing on one characteristic aspect of early accounting – the long hundred.

It has long been recognized that for non-monetary sums in medieval and early modern accounts, the roman numeral 'c' usually (though not invariably) represents not 100 but 120. Peter Goulesbrough has demonstrated this with admirable succinctness in connection with the *Exchequer Rolls of Scotland*.<sup>2</sup> He has also drawn attention to the unfortunate fact that the editors of the volumes covering the years 1379 to 1600 converted roman numerals to arabic taking 'c' erroneously as 100.<sup>3</sup> What I hope to do is to show more fully how the long hundred originated, what it was used for, and how calculations and audits were actually carried out with it. Finally I shall look at its demise.

The long hundred was part of a system which also included a long thousand. Where 'c' meant 120, 'm' meant 1200. To illustrate them, we may take the comptroller's accounts for

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1600–1, which give a figure for the charge of poultry, a slightly smaller figure for the discharge, and the ‘rests’ or balance, in roman numerals as follows. I give arabic figures, for comparison, beside them:<sup>4</sup>

Charge	ij <sup>m</sup> ii <sup>c</sup> liiii	2694
Discharge	i <sup>m</sup> ix <sup>c</sup> v <sup>xx</sup> v	2385
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Rests	ii <sup>c</sup> lxix	309

A further example, the addition of the charge of capons in the following year, will underline the point:<sup>5</sup>

	v <sup>c</sup> xlii	642
	i <sup>c</sup> xlii	162
	xvi	16
	lv	55
	i <sup>c</sup> lxx	190
	i <sup>c</sup> xx	140
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Total	i <sup>m</sup> v	1205

Evidence that the long hundred and long thousand were usages of speech, not merely peculiarities in the notation of roman numerals, comes from the Privy Council records of 1614. The customer depute of Leith held a licence to export ‘three thowsand stane weght’ of wool, and had exported ‘ane thowsand eyght hundreth and three stanes’ at the point when an order banning all export of wool was issued; there ‘restis yitt to be transportit ane thowsand ane hundreth fyvescoir xvii stanes’.<sup>6</sup> The arithmetic here is correct.

## THE DEVELOPMENT OF THE LONG HUNDRED

The most detailed account of the long hundred in the medieval period, by W H Stevenson, sees its genesis in a specific habit of Germanic cultures, firstly, to count in decades (20 was essentially  $2 \times 10$ , 30 was  $3 \times 10$ , and so on) and, secondly, to regard 11 and 12 (for this purpose, and this purpose only) as additional primary numbers. *Hund-* as a prefix in Anglo-Saxon meant ‘decade’, added to the decades from 70 (*hund-seofontig*) onwards, so that the end of the first decadal sequence went *hund-eahtatig* ( $8 \times 10$ , ‘eighty’), *hund-nigontig* ( $9 \times 10$ , ‘ninety’), *hund-teontig* ( $10 \times 10$ , ‘tenty’), *hund-endlefontig* ( $11 \times 10$ , ‘eleventy’) and finally *hund-twelftig* ( $12 \times 10$ , ‘twelvety’). This last number could be equated with *hund* (Latin *centum*), which as a noun meant ‘hundred’. Since the short hundred never disappeared, we find *hund-twelftig* and *hund-twentig* (‘a hundred and twenty’) both meaning what we would call 120, while *hund-teontig* was also sometimes equated with *centum*. For higher numbers, the long hundred in turn was multiplied by primaries from 1 to 10 only, producing a ‘thousand’ of 1200.<sup>7</sup> This system was never used for money or dates, and thus always had to coexist with a stricter decimal system of counting.

The Anglo-Saxon origin of the long hundred might seem to be confirmed by the appearance in *Domesday Book* of the following gloss on one of its figures: ‘hic numerus Anglice computatur, id est centum pro cxx’.<sup>8</sup> However, J H Round pointed out that this

passage related to Lincoln, and adduced other evidence to suggest that this long hundred existed in parallel with (though was not identical to) a ‘six-carucate unit’ in the Danelaw, while the rest of England was assessed in Domesday on a system of five hides: ‘we may fairly hold the *Anglicus numerus*, or long hundred, to have specially prevailed in the “Danish” districts, which were also assessed, we shall find, in sums of six and twelve’.<sup>9</sup>

The development of the long hundred in England is of interest to us in that it may provide clues as to when and how it arrived in Scotland. If it was favoured by the Danes and reached Scotland through them, this would imply a *terminus a quo* of the ninth century – and we know that in the early 10th century there was much interaction between the kingdom of the Scots and the Viking kingdom of York.<sup>10</sup> If, however, Danish influence were discounted, we might be allowed – or obliged – to look further back. Since there seems to have been little southern influence on the Pictish or Scottish lands in the eighth century, we might have to consider the impact of the Anglian expansion that took place in the century or so before the battle of Nechtansmere in 685.<sup>11</sup> But since the Scottish long hundred was, as we shall see, primarily a unit of reckoning of traded commodities, it would be unwise to push its origins too far back without direct evidence relating to trade. It is enough to conclude that it was a Germanic method of reckoning which reached Scotland from the south.

It has, however, been suggested that the long hundred in Scotland may have derived from Celtic systems of land assessment. In an impressive study of land assessments in medieval Scotland, Alexis Easson has argued convincingly that all the land units outside the south-east – particularly the western ounceland and the north-eastern davach – originated in the 20-‘house’ unit of the Scots of Dalriada. She cites examples of groups of six davachs and of six ounculands, and an example of a group of 120 ‘houses’ in Dalriada, and continues:

The significance of the twenty house unit in the system of assessment in the kingdom of Dalriada cannot be denied and the appearance of the 120 house grouping (six times the twenty houses) is a strong indication that the framework for the organisation of the later davach and ounculands into larger territorial units was already present in the seventh century in Dalriada. Was this framework based on a duodecimal system of counting, the precursor of what later became known as the long hundred (12 x 10 or 120)?<sup>12</sup>

The answer, regretfully, must be no. It is not a long hundred, or indeed a hundred of any kind, unless it is called a hundred. The ‘120 house grouping’ that Dr Easson cites is from a list in the seventh-century *Senchus Fer nAlbàn* of the numbers of *tech* (houses) held by branches of the Cenél nOengusa, the Islay kindred of the kingdom of Dalriada: ‘Odeich xx tech Freg cxx tech Cladrois lx tech Rois deorand xxx tech airdhes xxx tech loich rois xxx tech Aitha cassil xxx in sin ceniul oengusa xxx tech’.<sup>13</sup> The list in the *Senchus* of houses held by the Cenél Loairn, the Lorn kindred, contains a number of 20-house groupings but none of 120; a single example of ‘cxx tech’ is not much on which to construct a general theory, however tentative. But however many cases of ‘cxx’ we found, ‘c’ would still be 100; it would not be a long hundred.

## THE CONCEPT OF THE LONG HUNDRED

The general concept of the long hundred has provoked much confusion. On first discovering it, historians are liable to set off excitedly in pursuit of an early medieval ‘duodecimal system’, which (according to one writer) was superseded only by the allegedly revolutionary introduction of the abacus in the 11th century.<sup>14</sup> The temptation to find a ‘duodecimal system’

in every example of reckoning in groups of 12 is so strong that it is as well to be clear about what it would involve. In the duodecimal system, the ‘hundred’ is not 120 but 144 (notated ‘100’ in arabic); the ‘thousand’ is not 1200 but 1728 (notated ‘1000’ in arabic). For efficient duodecimal calculation, two additional arabic numerals are needed to represent decimal 10 and 11.<sup>15</sup> An 18th-century textbook did give a method for duodecimal calculation without such numerals, observing that ‘this method is chiefly in use among workmen; by it they cast up the contents of their superficial and solid works’. Their arithmetic had to cope, for instance, with a cubic foot of  $12 \times 12 \times 12$  cubic inches. Using only decimal numerals, this *duodecimal method* was cumbersome, and the authors bleakly observed that ‘we would recommend the decimal calculation, as greatly preferable both for facility and dispatch’.<sup>16</sup>

Many things were indeed reckoned in twelves, partly because 12 was conveniently divisible by a larger number of integers than 10, partly because (as a result) some goods were easier to pack in dozens, and partly because the twelve apostles had symbolic significance. Many burgh councils consisted of ‘xii of the lelest burges and of the wysast of the burgh’, or at least were thought of as doing so, so that the term ‘the dusane’ could be used for burgh councils of any size.<sup>17</sup> The convention of royal burghs as late as 1552 tried to rectify the ‘grete variance’ in elections and to get all burghs to adopt ‘ane new counsale to the nowmer of twelf personis’.<sup>18</sup> Many things (though not, presumably, councillors) were even reckoned by the gross. Gloves were counted in a ‘groce conteining tuelff dusane’ by the committee revising the customs rates in 1612.<sup>19</sup> But roman numerals precluded a full-blown duodecimal system.<sup>20</sup> It may not be immediately obvious that the ‘vii<sup>xx</sup> iiiii’ ashlar stones purchased by the master of works in 1529–30 in fact totalled a gross: the term did not enter the accounting system.<sup>21</sup>

What we have in medieval arithmetic, therefore, is an interlocking series of mixed-base systems, using mainly base 10 (decimals) but incorporating a rich variety of other bases of which 12 was merely the most common. This was quite normal until the rise of metrication in modern times, while time, for instance, is still reckoned in a mixed-base system. One only has to think of the large variety of bases for computation in the standard Scottish weights and measures; thus the grain measures were largely in base 4.<sup>22</sup> The decimal system nevertheless remained the basis for most people’s counting systems. One traditional reckoning method was strictly limited to the decimals: finger reckoning, which could deal in a sophisticated way with numbers at least up to thousands.<sup>23</sup> Even when people started with non-decimal quantities, they would sooner or later end up multiplying them by tens, as with the 144,000 souls ( $12 \times 12 \times 10 \times 10 \times 10$ ) redeemed from the earth in Revelation xiv:1–3, who would no doubt have been familiar to all numerate people in this period. The long thousand (10 long hundreds) exemplifies this well.

Once established, the long hundred became an independent unit of reckoning, and its original structure as a unit based on the 12th decade was forgotten. The long hundred in Scotland could occasionally be regarded as 10 dozen ( $10 \times 12$ ), which is only coincidentally the same as 12 decades ( $12 \times 10$ ). The master of works in 1535–6 paid 27s 6d for ‘ic vi dosane vi ladis sand, price ilk dosane xx d.’<sup>24</sup> The arabic figure is 198 loads, which seems to have been thought of as  $16\frac{1}{2}$  dozen.

Normally, however, the Scots when not reckoning in tens did so in scores. The long hundred thus came to be thought of as 6 score. The primacy of scores occasionally gives rise to what appear at first sight to be inconsistencies, as in the figure of ‘vi<sup>xx</sup> ix’ (129) chalders of oatmeal in the comptroller’s accounts of 1601–2.<sup>25</sup> There are even ‘viii<sup>xx</sup> xii’ (172) poultry recorded in the new augmentations accounts of 1593–4, and still larger numbers of scores

may be found.<sup>26</sup> We shall see shortly how these may have arisen. We also find curiosities like 'lxxxxxxvi', which would normally have been thought of as 5 score 16 and written 'v<sup>xx</sup> xvi'.<sup>27</sup> The long hundred, however, was more than merely a convenient way of denoting 6 score: the long thousand, clearly reckoned as 10 'hundreds', proves this.

If the long hundred was early detached from its Germanic roots, did it have some other function enabling it to continue for so long? At this point we should consider the general pre-industrial approach to systems of measurement. A statute of 1581 ordered a table of goods to be issued to customers, 'ordaning that everie sek of woll sall contene bot twentie foure stanes, everie hundreth skynnis sex scoir, and everie dosand of clayth twelf ellis allanerlie'.<sup>28</sup> Over time, many units of reckoning (not just hundreds, but sacks, dozens and others) tended to inflate themselves in a slightly surreptitious way, which the statute aimed to restrain. This gave those familiar with the system an advantage; moreover, those with political power could demand rents and other fixed duties from their tenants using larger units. And, as the statute suggests, customs duties (which were levied *pro rata*, so much per 'hundred' skins, rather than *ad valorem*) would fall if merchants could convince the customers that a larger unit should be used to assess them. The 'hundred' of 6 score may owe its popularity in the 14th century, when customs duties began to bear heavily on trade, to this factor.<sup>29</sup>

Keith Thomas approaches the concept differently, seeing the English long hundred as one of the 'stylised quantities, like the baker's dozen, into which there entered an element of gift exchange or "complimentary excess", like the modern tradesman's discount'. He cites examples of 'hundreds' of 104, 112 (the hundredweight), 120, 124 and 180.<sup>30</sup> However, Sir Keith may be wrong to conflate his 'hundred' of 104 (the London system of 'tret', an allowance of 4 on top of the short hundred) with the other examples which were all units of reckoning in their own right. On the whole the related but distinct concept of inflation in units of reckoning seems more useful. It would be misleading to regard the Scottish long hundred as 'complimentary excess', for this would be analogous (in modern supermarket jargon) to an 'extra 20% free' added to the ordinary hundred – which, of course, it was not. The choice of a 'hundred' of 6 rather than 5 score may initially have been made through a preference for larger units, but it never grew any larger. The English long hundred may have developed too many complex variations to be workable, but in Scotland it was always clearly a single unit of 120. As a result, it worked well and lasted a long time.

## THE LONG HUNDRED IN USE

What, then, was the long hundred used for – and in which periods? We may look for it in assessments of land, and in reckonings of traded commodities, both in domestic and overseas trade. In trade, we shall find the long hundred universally in operation, so much so that the search for it becomes rather a search for exceptions to it. The point to make at the outset is that long and short hundreds operated in parallel, but like parallel lines they did not meet. Each individual category of produce was reckoned either in long hundreds or in short hundreds, but not in both – otherwise the term 'hundred' would have become meaningless. (At least that was the theory; there were exceptions.) Although my investigations cannot claim to be exhaustive, they may serve as a model to show other researchers what kind of environment the long hundred inhabited, so that they will recognize it when they come across it.

Long or short, 'hundreds' in Scottish charters are not common. The usual Scottish ploughgate was 104 acres, and a 12th-century charter granting a ploughgate in Heton (Roxburghshire) enumerated this as 'quinquies viginta acris et quatuor'.<sup>31</sup> Why not 'centum

et quatuor' – would the term 'centum' have been understood as a long hundred in the context of reckonings of acres? Or was the clerk simply reluctant to use the term for less than two hundreds, in the same way that one shilling was always 'xii d.'? We do find 'centum' for a single hundred in a grant including pasture in Dalgarnock (Dumfriesshire) for 'centum oues'.<sup>32</sup> On the other hand, there is an example of a grant by the Scottish crown of 'vii viginti acras' in Tottenham, which could have been notated as 'cxl' (short hundred) or 'cxx' (long hundred).<sup>33</sup> The existence of a long hundred in reckoning acres must be regarded as unproven. What we have in land assessments, it seems, is a system including some groups of 120, but these were understood as 'a hundred and twenty' and not as a (long) 'hundred'.

Later assessments of land tended to use monetary terms – 'poundlands', 'merklands' and so on. At the outset at least, these terms were regarded as denoting actual sums of money, as appears in the reference in 1328 to a money income for Princess Johanna of 'deux mille liuereez de terre et de rente par an par resnable extente'.<sup>34</sup> As a result no tradition of using the long hundred for them developed.

In counting sheep, the royal clerks must have been awake to what kind of hundred was current, since there is no hint of definition in the frequent enumeration of 'ducentas matrices oues', 'mille ouium' and so on.<sup>35</sup> That these numbers meant something more precise than 'a lot', and that there were other ways of reckoning them, appears in a late 12th-century grant in Mow (Roxburghshire) including 'pasturam quingentis ovibus, et aisiamenta pasture ceteris animalibus quantum pertinet ad unam carucatam terre (pasture for five hundred cows, and easement of pasture for as many other animals as pertain to one ploughgate of land)'.<sup>36</sup> What kind of hundreds these were does not appear, but it seems likely that long hundreds were meant, for they were in use for sheep in the early 14th century.<sup>37</sup> It is a problem that recurs. Only when an arithmetical sum is given (typically 'x hundreds, price of each y, total z'), or when a clerk explicitly records the fact, can we tell what was meant. When so few goods were reckoned in such large quantities, we have a regrettable gap in our information.

But although the medieval long hundred may be a slippery fish to catch, we can finally land it in 1260, in the accounts of the keeper of the bishopric of Glasgow:

Summa ... xi<sup>c</sup> anguille. Expense in servicio regis, vii<sup>c</sup> anguille. Item, in servicio regine, ix<sup>xx</sup> anguille. Summa expense, viii<sup>c</sup> et lx anguille. Et debet cc et lx anguillas.

Total [of charge] ... eleven hundred eels. Expended in the service of the king, seven hundred eels. Item, in the service of the queen, nine score eels. Total of discharge, eight hundred and sixty eels. And there are owing two hundred and sixty eels.<sup>38</sup>

After this, in which the long hundred is manifest in the arithmetic, we can next identify it in use for marts in 1266, which the clerk has kindly explained: 'ccc carcosiis vaccarum, scilicet, xviii<sup>xx</sup> (three hundred carcasses of cows, that is to say, eighteen score)'.<sup>39</sup> In the same year, during the establishment of the park of Kincardine, 'peticatarum' (perches, a measurement of length) were counted by the long hundred.<sup>40</sup> In 1290, there is mention of cheese in 'vi<sup>ix</sup> tonegall [casks] pro quolibet centum'.<sup>41</sup> Between 1328 and 1331 the unusually full chamberlain's and sheriffs' accounts show the long hundred used for salmon, oatmeal, sheep, dried fish, herring, sheep carcasses, stones of wax, pounds of dates, and ells of linen cloth.<sup>42</sup> Later in the century the long hundred is on record for chickens, gallons of ale, gallons of wine, and chalders of coal; in the 15th century we can add building stone, white fish and chalders of salt.<sup>43</sup> Although dried fish also were usually counted in long hundreds, in 1330 we find: 'et de viii<sup>m</sup>, ... quorum quodlibet mille faciunt per centenam, sexies viginti, mille et

ducentos pisces. Et sic est numerus ix<sup>m</sup> vi<sup>c</sup>. (And of eight thousand, of which each thousand, with a hundred of six score, has one thousand two hundred fish. And so the number is nine thousand six hundred.)<sup>44</sup> Evidently at least one clerk in the service of David II was unhappy with the long hundred and was determined to translate it.

With the growth of overseas trade must have come a greater familiarity with the units of reckoning familiar on the Continent – at least for Continental commodities imported to Scotland. As a result there was a falling-off in the use of the long hundred for commodities such as ginger, and the beginnings of a divergence between Scottish and Continental practice. Scottish merchants seem to have been as happy to buy goods reckoned by the short hundred as their counterparts were to buy Scottish goods in long hundreds – so long as the price was right, no doubt.

The clerk of the wardrobe bought linen cloth and canvas by the long hundred in 1364 and 1374, as appears from the enumeration of ‘trescentarum quinquies viginti et decem ulnarum tele lineae strictae (three hundred, five score and ten ells of narrow linen)’ and ‘v<sup>c</sup> v<sup>xx</sup> iiii vlnis canubii’.<sup>45</sup> But a handbook for merchants trading to Flanders about 1400 gave a table of unspecified cloth or canvas prices at which ‘v<sup>xx</sup> of eln makis the C’.<sup>46</sup> This cloth may well have been for import to Scotland. Andrew Halyburton was often buying canvas in Flanders at the end of the 15th century, and it was sold by the short hundred: ‘Item bocht ... in Handwerp 220 ell canvas, price of the C. 23 s. 6 g. Som of this canvas, 2 li. 11 s. 8.’<sup>47</sup> His imports were many and varied, and where it is possible to tell, they were also reckoned thus.<sup>48</sup> It seems that people ceased to recalculate the goods they imported in terms of domestic units. Thus rice and almonds were still accounted for in long hundreds in 1375; but saltpetre and sulphur, imported by James II in 1457, arrived in short hundreds.<sup>49</sup>

Turning to Scottish exports, we can see that the long hundred continued. The earliest customs accounts, in 1327, show woolfells reckoned by the long hundred.<sup>50</sup> But the merchants’ handbook of 1400 gave tables for ‘The reknyng of the skyns that v<sup>xx</sup> makis the C, that is to say woll skyns, schorlingis & hogrell’, and ‘The reknyng of the skyns at the C makis vi<sup>xx</sup>’; these latter were unspecified.<sup>51</sup> This distinction must remain mysterious; the handbook may also relate to imports, but it is unlikely that commodities such as woolfells were to be imported to Scotland, while the customs accounts show woolfells and all other skins invariably exported by the long hundred.

Andrew Halyburton also recorded exports of skins, thus: ‘Item in Apryll anno 94, rasait out of James Makisson 2 sekis of skynis, contenand 462 and 443 skyns. Item rasait out off Wyllyem Peterson at that samyn tym a sek contenand 469 skyns, in al 1354 skyns.’<sup>52</sup> Not only did he receive skins by the long hundred, as the arithmetic here shows despite its unusual arabic notation (he had 1614 skins by our reckoning), but he sold them to Flemish merchants thus. Later on, in 1588, new imposts on Scottish goods imported into France included ‘fyve solz for ilk hundreth skynnis’ and ‘fourty fyve solz for ilk hundreth cairsy’; in the circumstances the French authorities must have meant the Scottish long hundred.<sup>53</sup>

Skins were enumerated individually, but hides were packed in lasts, and we thus have to look for hundreds of lasts. Even the customers of Edinburgh were not handling such large quantities until 1498, when ‘5 score 18’ lasts were exported, a formula usually (though not always) signalling that the ‘hundred’ was regarded as 6 score. In 1523 we have confirmation: custom of £321 was paid on ‘centum lastarum et undecim dacrarum cum dimedio corriorum (a hundred lasts, eleven and a half dakers of hides)’.<sup>54</sup>

Andrew Halyburton mentioned ‘Pabyllis quhit’ (Peebles white cloth) measured in ells by the short hundred.<sup>55</sup> However, ells of cloth were reckoned by the long hundred in Dundee

in 1592.<sup>56</sup> According to Sir John Skene's memorandum on the customs, drawn up in 1597, 'sex scoir of skynnys ar reknit to be the hunder ... Sex scoir elnis wollin claith is lykvayis reknit for the hunder'.<sup>57</sup> The customs book of Dumfries in 1621 also shows ells of linen cloth in long hundreds, as well as sheep, lambs, cattle and woolfells.<sup>58</sup>

By the 16th century, domestic trade and accounts of monasteries and landlords can broaden the picture. It should be remembered that for many goods there was no unified market system in pre-industrial times, and this may explain some of the apparently contradictory domestic evidence. If there were local weights and measures, there could equally well have been local customs on numerical reckoning. Further local research might shed light on this.<sup>59</sup>

The monks of Dunkeld seem to have been reluctant to use the long hundred, but their accounts show that they had to say when they were not doing so. The editor of *Rentale Dunkeldense* has translated the roman numerals into arabic, but we can see that the purchase of '720' loads of peat at 2d each for £7 3s 4d indicates the long hundred.<sup>60</sup> However, the summations of the abbey's receipts of poultry, chickens, capons and salmon show that the short hundred was being used, and in fact this was noted as 'computando nonaginta decem pro centum (counting ninety ten for the hundred)'.<sup>61</sup> Bere, oatmeal and sheep were also enumerated by the short hundred.<sup>62</sup> Candles, however, were purchased by the long hundred.<sup>63</sup> In paying a workman's wages for '288½' days, the enumeration of days was specified as 'computando nonaginta decim pro centum', whereas loads of peat were again 'computando centum viginti pro centum (counting a hundred and twenty for the hundred)'.<sup>64</sup> The unusual language of this formula – not 'six score for the hundred' – indicates a strong commitment to the short hundred but also perhaps an awareness that this was not universal. Later accounts were confused, with examples of both long and short hundreds for loads of peat,<sup>65</sup> loads of clay,<sup>66</sup> and loads of sand.<sup>67</sup>

It was perhaps to avoid this kind of confusion that the priory of St Andrews eschewed the term 'hundred' altogether, accounting for example for 'xii<sup>xx</sup> xiiii' chalders of oats.<sup>68</sup> Another possible reason is that their clerks recorded receipts of grain using 'c.' as an abbreviation for 'chalder', and one can see that confusion might have arisen over an entry like, for instance, 'xx c. ii b. i p. orde'.<sup>69</sup> In the 1590s the household books of the Campbells of Glenorchy show salmon and cheese, and (in 1621) bread, being reckoned by the long hundred.<sup>70</sup>

Weights of bullion and other metal are complicated. Iron was reckoned by the long hundred in 1329.<sup>71</sup> In 1593, accounts of lead ore were given 'comptand sex scoir to the hundreth'.<sup>72</sup> But in the early seventeenth century, both iron and lead were reckoned in short hundreds: '1194 stane 4 lib. wecht of Scottis irone at ii merk stane: i<sup>m</sup> v<sup>c</sup> lxxxii lib. vi s. viii d.'; 'ii<sup>c</sup> xviii staine of gade leide at xxvi s. viii d. the staine: ii<sup>c</sup> iiiii<sup>xx</sup> x lib. xiii s. iiiii d.'.<sup>73</sup> As for bullion, ounces of silver in 1438 were reckoned 'centenario computato quinquies viginti (counting five score for the hundred)', but the accounts of the master of the mint generally used the long hundred for bullion in the 15th century.<sup>74</sup> But gold and silver in a contract of 1568 were specified as 'comptand fyve scoir to everie hundrith'.<sup>75</sup> The mint account for 1582–3 give a charge of silver in both roman and arabic: 'vi<sup>c</sup> vii st. vii p.: 607 st. 7 p.'.<sup>76</sup> The most likely explanation for the early long hundred for iron is that it derives from a period when people still recalculated imports in terms of domestic units, but the divergent usages for lead must remain a mystery.

With the advent of printing, books were reckoned by the short hundred. Perhaps the long hundred could only be used for commodities for which there was a medieval tradition of



doing so. Or it might simply be that the short hundred was used because most books were imported. The position here is analogous to that for the metals.<sup>77</sup> One notary, Robert Lauder in North Berwick, paginated his first two protocol books (covering the periods 1540–62 and 1563–9) in long hundreds, but his third book (1569–73) used short hundreds for this purpose. This is the only known pagination in long hundreds. Lauder may have been a nonconformist, since his form for numbers such as ‘99’ was ‘xcix’ – conventional today, but not then. His ‘199’ followed the usual form, ‘c iiii<sup>xx</sup> xix’.<sup>78</sup>

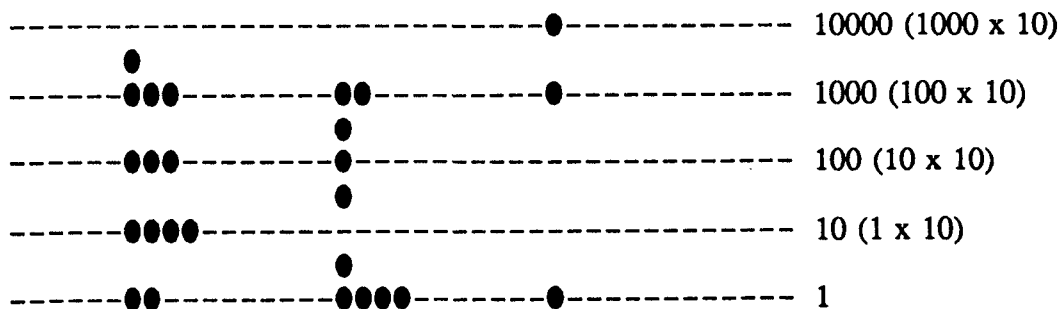
It will not have escaped notice that I have not yet mentioned wool, the chief export of medieval Scotland. Wool was an important exception to the reign of the long hundred. Lasts of wool were explicitly enumerated ‘computando centenari ad quinquies viginti’ in the Edinburgh customer’s accounts of 1375, and these accounts show a pattern of exclusive use of the short hundred back to 1362.<sup>79</sup> Like the last of hides, the last of wool was an enormous quantity, and the Edinburgh customs administration was virtually the only institution ever to have as many as 100 lasts. The earliest surviving customs accounts, for the late 1320s and early 1330s, show no actual ‘hundreds’ of lasts of wool; instead we get ‘quinquies viginti octo lastarum’ (Edinburgh, 1327) and ‘septies viginti et quinque lastarum’ (Berwick, 1330). On one occasion, 1329, the Berwick wool customs were accounted for in sacks – ‘millium quingentorum trium saccorum’ – but the account is not detailed enough to see what kind of hundred was being used.<sup>80</sup>

In the next century there were occasional deviations from the rule: 117 lasts were notated as ‘quinquies viginti septemdecim lastarum’ in 1410, and in 1413 an example of a long hundred occurred. However, with some exceptions the short hundred remained the norm for the rest of the century. In the early sixteenth century there were more examples of the ‘5 score’ formula in the customs accounts, and the last customer of Edinburgh to account for her wool using the short hundred appears to have been Janet Paterson in 1515. Thereafter the long hundred took over.<sup>81</sup> Because custom was payable per sack, not per hundred, this had no effect on the customs duties, and it is not clear why the long hundred was adopted at this point.<sup>82</sup>

But there was nothing obviously perverse about the adoption of the long hundred for wool in the early 16th century; on the contrary, the change brought wool into line with most other commodities. Enough has been said to show that the long hundred of 120 (never any other amount, unlike in England) was a well-understood and well-nigh universal unit of reckoning for traded commodities, both in domestic and international trade, in the late middle ages. What may seem perverse is that people persisted in an arithmetical system that appears so unnecessarily complicated to use; it will be the object of my next section to show that it was a good deal simpler than it may seem.

## THE COUNTING BOARD

The primary purpose of the accounts of the crown, or of the large institutions such as monasteries, that we have been considering, was to demonstrate to the auditors that the correct amounts of money or produce had been received and spent. The auditing process consisted largely of adding up the figures and checking, or sometimes inserting, the totals. Roman numerals could not be used for calculation; the process of recording numbers on paper, and the process of calculation, were two separate things. The merchant with whom we began used a counting-board for working out his accounts; how did it operate, and how were calculations using the long hundred carried out?



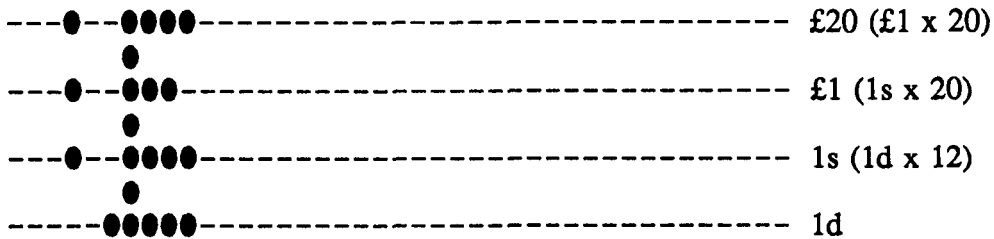
ILLUS 1 Decimals

For our understanding of calculations on the counting-board we are indebted to Robert Recorde's *Ground of Arts*, the first popular English arithmetic treatise in the vernacular, first published between 1540 and 1542 and frequently reissued for the next century and a half.<sup>83</sup> Before considering the counting-board's use for monetary calculations or long hundreds, it is best to begin by establishing the basic system of calculating in tens (illus 1). For this, the first five lines of the board represented (counting from the bottom) units, tens, hundreds, thousands and ten thousands. Up to four counters could be placed on one line; a further one was then placed above the line to represent 5. It was thus like an abacus turned on its side. Recorde gives as an example the addition of 8342 and 2659, to produce the answer 11001; here I give just the three figures, though Recorde illustrates all intermediate stages.

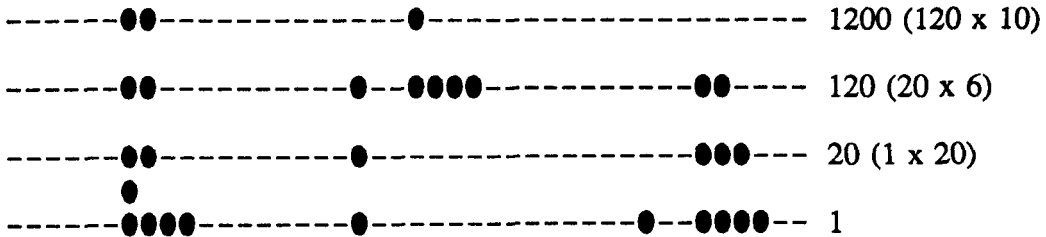
More lines could be added for larger numbers, although in fact numbers with more than five figures (of pounds, units of produce or anything else) were rare, indeed practically non-existent before the 17th century. The Roman-derived tradition of numeration did not envisage numbers as large as a million, and had no way of notating them on paper.<sup>84</sup> I have not seen any millions in Scottish accounts before the great switch to arabic numerals in the mid-17th century.

For pounds, shillings and pence the system was more complicated (illus 2). The first line represented pence, followed by shillings, pounds, scores of pounds, and hundreds of pounds. Again no more than four counters were allowed on the line, except for the pence where five were permitted; a single counter above the line for all columns but the first represented 10 (for the first it represented 6 pence), while 5 (except for the pence) was represented by a single counter placed on the line a little to the left. Recorde gives as an example £198 19s 11d. The counters to the left represented 5s on the second line, £5 on the third and £100 (ie £20 × 5) on the fourth.

The basic counting-board, when calibrated in tens like its close relative the abacus, could add, subtract, multiply, divide and extract roots.<sup>85</sup> It must have been slower than an abacus with beads strung on wires, but had the advantage of an unlimited supply of counters for laying out many numbers at once. Recorde (who preferred the emergent method of paper calculation) recommended only addition and subtraction in the monetary version. It ought to have been possible to multiply using the method of 'duplation and mediation', repeatedly halving the first number and doubling the second. But whether or not this was done, the auditor's overwhelming need was for a system which would add up accurately and clearly, and the counting-board was well suited to this.



ILLUS 2 Money



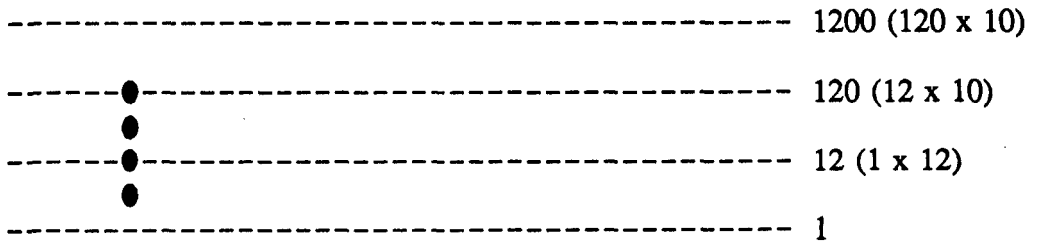
ILLUS 3 The long hundred as 6 score

Recorder did not mention reckoning by the long hundred, no doubt because by then it was not so prominent in English usage. But Scottish clerks certainly used it on their counting-boards, and it is possible to reconstruct how they must have done so. Knowing that they tended to reckon the long hundred as 6 score, and seeing from the above monetary example how scores were handled, we can see that they must have taken the first line as units, the second as scores, the third as (long) hundreds, and the fourth as (long) thousands. Illus 3 returns to the example with which this article began, and reconstructs how the comptroller reckoned his poultry:  $ii^m ii^c liiii$  (2694) less  $i^m ix^c v^{xx} v$  (2385) equals  $ii^c lxix$  (309). In the middle figure (the discharge), the counters to the left represent 5, 5 score and 5 hundreds on the first, second and third lines respectively.

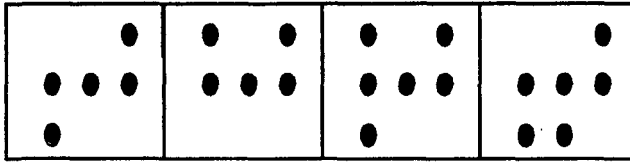
Apart from the minor inconvenience of having to represent the ‘liiii’ as 2 score 14 and ‘lxix’ as 3 score 9 (as had also to be done with money), we can see that the counters followed the roman numerals closely – and unlike roman numerals, they could be used for computation. The comptroller would have had no difficulty in convincing the exchequer auditors that his figures were correct. Those who wish to check this should note that subtraction on the counting-board began with the *highest* numbers.

Three score and 4 score, though reckoned thus on the counting-board, were usually written ‘lx’ and ‘lxxx’. A minority of clerks seem to have had a preference for ‘iii<sup>xx</sup>’ and ‘iiii<sup>xx</sup>’, and they may have been the ones who continued up to ‘xii<sup>xx</sup>’ or more, or (in the hundreds) up to, say, ‘xii<sup>c</sup> lx’.<sup>86</sup> But a more likely explanation is that they were reluctant to create an extra group on the counting-board, preferring to add extra counters to the highest one.

What of the fact, noted above, that a few clerks seem to have regarded the long hundred as 10 dozen? Probably this arose because they took the second line of the board to represent



ILLUS 4 The long hundred as 10 dozen



ILLUS 5 Money in 'Auditor's accompt'

not scores but dozens, which was actually simpler than using scores. Each line was only 10 times the one above it (12 in the case of the second), so that the intermediate counter could be regarded as 5 (6 in the case of that between the first and second). The extra counters at the left could be dispensed with. The 'ic vi dosane vi ladis sand' mentioned above would have appeared on the counting-board as in illus 4.

I have given all these examples in what *Recorde* calls 'merchants use', because its system of lines on a counting-board approximates more closely to what we understand by the abacus. However, he describes an alternative system, 'auditors accompt', which is probably the one used in the exchequer. Accounts in the exchequer were laid out on a green cloth;<sup>87</sup> lines were ruled on it to form a series of boxes. On this, the reckoning was made in a fashion which, although it looked quite different from the counting-board, employed identical principles. Instead of a series of lines, there was a series of boxes or groups, the right-hand one representing the units. Counters could be placed on three lines within each box; on the middle and lower lines they counted as 1, but a counter at top left represented 10, and one at top right 5 (6 with the pence). Illus 5 gives *Recorde's* explanation of how to notate £198 19s 11d. The groups represent (reading from right to left) pence, shillings, pounds and scores of pounds.

How this worked in practice may be gathered from the classic account of the medieval English exchequer, the *Dialogus de Scaccario*:

A cloth is laid on the Exchequer table ruled with lines, and ... the coins used as counters are placed in the spaces between them. The Accountant [ie the sheriff or other officer presenting his account to the auditors] sits in the middle of his side of the table, so that everybody can see him, and so that his hand can move freely at its work. In the lowest space, on the right, he places the heap of pence, eleven or fewer. In the second the shillings, up to nineteen. In the third he puts the pounds; and this column should be directly in front of him ... In the fourth is the heap of the scores of pounds. In the fifth, hundreds, in the sixth, thousands, in the seventh, but rarely, tens of thousands. ... He must take care that his hand does not outrun his tongue or *vice versa*; but as he reckons, he must put out the counters and state the number simultaneously, lest there should be a mistake in the number.<sup>88</sup>

The *Dialogus* describes actual coins being used as counters, but soon special brass counters or jetons were being produced in great numbers, mainly in Nuremberg, for a European market. Many governments also had special silver tokens struck, possibly for use in central government accounting, and (sometimes in sets of 100) for presentation purposes. One such Scottish token, issued in 1588, is in the National Museum of Scotland.<sup>89</sup> The master of works' accounts record the purchase of 'paper ink and sex stand of counters to lay and mak thir comptis with' in 1619, and 'twa stand of counteres for laying of the comptis in exchaker' in 1633.<sup>90</sup> We find the Bishop of Orkney checking his rental with counters in 1614:

I have spent almost this day in perusing and laying this rental, wrettin be David Hart, according to the takismen comptis, and findis, be my counters, if they have not deceaved me, that the wholl rent ... will not exceid eight thowsand merkis beyond the thriddis. Your lordship may try my compt, and teach me if I have erred.<sup>91</sup>

## DECLINE

The decline of the long hundred has been linked erroneously to the influence of 'the abacus, which was based on tens and hundreds'.<sup>92</sup> As we have seen, users of the counting-board (ie the abacus) were just as much at home with dozens and scores, and could easily use the long hundred. What really encouraged the shift to reckoning by the short hundred was the rise of paper calculations using arabic numerals, thus combining the hitherto separate functions of calculation and writing accounts. When deployed properly, arabic numerals never used the long hundred, and although there was an attempt by some clerks to do so, it did not take root. The story of the demise of the long hundred thus has to be told within the context of the replacement of roman numerals by arabic.

By 1600, arabic numerals had been known in western Europe for over four centuries, but they had never achieved the respectability of the roman system. Their earliest use in Scotland seems to have been for 15th-century monumental inscriptions.<sup>93</sup> Central government, with well-established bureaucratic traditions, adhered strongly to the old system. On the rare occasions when arabic numerals appeared in accounts of the crown before about 1600 they were always in subordinate positions, for example in dates within the text (not the more important dates at the head of the account), 'upoun Mononday the xxvii day of August 1599 ...', or in the values of pence only, 'xviii lib. i s. 8 d.'<sup>94</sup>

Related to the rise of the new numerals, there grew up two modes of thought in connection with arithmetic. The older one saw it as a specialized skill handed down by oral tradition within closed bureaucracies; the other, as part of a movement of scientific enquiry and popularization. Christopher Hill has noted that the two were often in conflict, and locates the vernacular arithmetics published by the likes of Recorde (who was a London physician, not a crown bureaucrat or university teacher) within the latter model.<sup>95</sup> It began to be realised that arabic numerals and decimal calculation were powerful tools. This is not the place to discuss John Napier of Merchiston, but logarithms could not have been invented on the counting-board.

Reckoning by counters thus began to seem old-fashioned. It did not require the user to be literate, and so began to be despised as the illiterate's method of reckoning. Those who were literate (an increasing number) wanted to use paper calculation.<sup>96</sup> Not that they could necessarily do so in an advanced way.<sup>97</sup> Alexander Hunter, whose 1624 treatise on measures was aimed at landlords wanting to conduct surveys of their property, remarked: 'There is

none so ignorant, but they doe, or may easilie know, the names of these ten figures, 1.2.3.4.5.6.7.8.9.0. with their strength in the first and second place.’ However, because ‘there is not many that can multiplie and divide numbers’, he provided lengthy tables allowing people to work out areas without having to do so.<sup>98</sup> Thus was born the ready reckoner, a genre of aids to computation that would continue until the advent of the pocket calculator. Hunter did not suggest the use of a counting-board, nor did he mention roman numerals or the long hundred. It is arguable that the counting-board, at least, was being discarded prematurely.

The spread of paper calculation was linked to the spread of basic arithmetic treatises in the vernacular, notably that of *Recorde*. This was known in 16th-century Scotland, but it had not reached the élite. The only mathematical book in James VI’s early library seems to have been the *Scholarum Mathematicarum* by Peter Ramus, a philosophical work which was not primarily designed as an arithmetic textbook.<sup>99</sup> It may have been a copy of Ramus that the poet William Drummond of Hawthornden presented to Edinburgh University library in 1605.<sup>100</sup> Meanwhile an Edinburgh bookseller was selling *Recorde*’s work, as well as two other unidentified (but cheaper) vernacular arithmetics, in 1580.<sup>101</sup> The Dundee merchant David Wedderburn lent ‘ane Inglis buik of Arithmetik’ to a colleague in 1607.<sup>102</sup>

The earliest systematic use of arabic numerals in the accounts of the Scottish crown seems to have been in a new and minor branch of the records, created in 1614: the accounts of bullion received in the mint.<sup>103</sup> (The receiver of bullion was Alexander Hunter, author of the treatise referred to above.) Figures were written in ruled columns for stones, pounds, ounces and deniers. A dash, rather than a zero, was placed in any column with a nil figure. Even in these accounts, the final, formal totals for the charge, and all the figures for the discharge, were in roman. These accounts exhibit an example of a clerk still counting in scores, where the figure of ‘sax scoir fyve stane’ is given.<sup>104</sup> But another new branch of the accounts, for the lordship of Dunfermline and other lands assigned to Prince Charles in 1619, was launched completely in the traditional form, with exclusively roman numerals and, of course, long hundreds for produce.<sup>105</sup> A further example, the accounts of expenditure on the Hilderstone silver mines, had long hundreds for nails (‘ane thowsand great naillis to the bellows at xii d. the peice: lx li.’) but short hundreds for goods (melting pots) bought in London.<sup>106</sup>

Meanwhile, something odd was happening in the accounts of the master of works. In the 16th century these had been kept in the conventional way. However, in 1616 we find the following:

Item to Cuthbert Wilsoun i<sup>c</sup> xliiii laidis of lyme out  
of Kirklistoun to the castell of Edinburgh at xii s.  
the laid inde lxxxv lib. ...<sup>107</sup>

The final total is mutilated but it must have been £85 16s, making the ‘c’ a short hundred. This is the earliest example of a short hundred in such a context that I have seen. Perhaps it was just a mistake, since the same accounts offer an example of the long hundred and another of the long thousand.<sup>108</sup> But one later entry looks as though the clerk may actually have translated three long hundreds into 360.<sup>109</sup> In another volume of accounts, covering 1616–19, one early entry ran as follows:

Item to the querriers of Innerleith craig for  
wining of i<sup>c</sup> lx futtes of hewen wark for  
the castell led be our awin cairtes at xvi d. the  
futte inde x lib. xiii s. iiii d.<sup>110</sup>

One would normally expect 'i<sup>c</sup> lx' to be 1½ long hundreds, but here the arithmetic shows that once again the short hundred was in use. The quarriers of Inverleith supplied hewn stones by the short hundred again the following week, but on the same day we also find flooring nails purchased by the long hundred.<sup>111</sup> This may have had something to do with contracts concluded with different suppliers, but even the quarriers of Inverleith were paid by the long hundred two weeks later.<sup>112</sup> Thereupon the long hundred was used on every occasion, but the clerks at this time were using quite a few arabic numerals, so that we get entries like this (in 1619):

Item for scharping of 520 maisone irones at viii s.  
the hundreth xli s. iiii d.<sup>113</sup>

After that even the arabic numerals disappeared for a while, returning the accounts to their 16th-century appearance. When they came back, in the accounts for the repair of Stirling Castle in 1628–9, they were recorded by an incompetent clerk – something almost unheard of in earlier centuries, at least for the staff of central government. Take the following series of entries, for example:

Item fra Johne Smith the 22 of Julii 100 and 20 cast  
fluring naill at 16s. the 100 inde xxiiii s.  
Item 1700 and 30 cast lang sklait naill at 12 s. the 100  
inde x lib. xiii s.  
Item 100 and 30 cast plainscheour naill at x s. the 100  
inde xvii s. vi d.<sup>114</sup>

The arithmetic in all these is wrong, whichever hundred was being used. This is conceivably an early case of the 'administrative decay' of the mid-1630s, noted by David Stevenson.<sup>115</sup> Or it may be a symptom of the transition from the counting-board to paper calculations, with some people not fully understanding either. All the sums above would come out correctly if the 'hundred' were regarded as 40; perhaps the clerk somehow confused the 'hundred' with 2 score. (The error benefited the suppliers rather than the master of works.) Another peculiar entry, also producing the wrong answer, illustrates the pitfalls of arabic numerals to those who were more familiar with roman ones:

Item come fra Johne Grahame the 18 of October  
100 . 80 . 16 skailye at liii s. iiii d. the 100  
inde iiii lib. vi s. vi d.<sup>116</sup>

Six months later, the short hundred was once more in use for purchases of loads of stone and of sand.<sup>117</sup> A parallel account book for works at Falkland Palace used few arabic numerals, and also mixed long and short hundreds – only the last of these entries uses the short hundred:

Item for carying of ane hundreth xlii kairtfull  
of wall stanes at iii s. ilk kairtfull inde xxiiii lib. vi s.  
Item for leading of 166 kairtfull of wall stanes  
and paithement at iii s. ilk kairtfull inde xxvii lib. xviii s.  
Item mair to the said David [Masterton] for  
xi<sup>c</sup> lxxiiii fute of glass at v s. ilk fute wrocht  
be him in the pallace of Falkland inde ii<sup>c</sup> iiii<sup>xx</sup> xiii lib. x s.<sup>118</sup>

The parallel accounts for Dumbarton Castle, however, used only the long hundred, as

did all the copious 1633 accounts for all the royal buildings, which again used hardly any arabic numerals:

Item to Alexander Flabairne for ane hundereth  
huikes at ii s. the peice xii lib.<sup>119</sup>

But these were the last identifiable long hundreds in this branch of the accounts. The next series of accounts relates to 1639, after the Covenanters had taken power, and we find:

Item to James Stewinsone for a hunderth stane weyght  
of iron being five schoir ...  
Item to Robert Huntar for ane hunder four schoir  
xiiii laid of lyme at xii s. the laid is i<sup>c</sup> xvi lib. viii s.<sup>120</sup>

It is not entirely clear why the first entry needed to be qualified by the phrase 'being five schoir', since iron was normally reckoned by the short hundred in this period; presumably the clerks had not yet shaken off the legacy of the past. But in the 1649 accounts the arabic numerals, arranged neatly in columns, using exclusively the short hundred, testified to the fact that a revolution had taken place.<sup>121</sup>

The master of works' accounts are instructive in illustrating the decay of the long hundred, but they were a minor branch of the crown's fiscal records. More important were the comptroller's accounts, and these continued in their traditional course, new ideas on arithmetic notwithstanding. They did, however, begin to betray a slight self-consciousness about the long hundred. From 1624–5, although summations of produce still used it, a note 'compting sex scoir to the hundreth' was usually added.<sup>122</sup> All the major accounts of the crown continued to use the long hundred, and roman numerals, up to the Covenanting revolution. The draft discharge part of the 1636–7 treasury accounts did use arabic numerals, but it was not compiled until 1658.<sup>123</sup>

The Covenanters did not change all the royal accounts overnight. Rather, indeed, they tried to keep the traditional accounts in their traditional form – it was the best way to keep track of all that was due, and there was anyway massive bureaucratic inertia. For centuries clerks had been sewing lengths of parchment together to create the exchequer rolls, and mere civil war, revolution and military conquest were not going to stop them.<sup>124</sup> The contemporary treasury accounts of the 1640s used largely long hundreds.<sup>125</sup> But roman numerals were on the retreat, and many of these accounts used arabic numerals for the sub-totals and totals – the most prestigious positions. And the crown lands, the produce income from which kept the long hundred going, were increasingly marginalized in the fiscal system. No new series of accounts used roman numerals or long hundreds; the royal household book set up for Charles II in 1650 used arabic numerals, and the only hundreds (for gallons of ale) were short ones.<sup>126</sup> The trend seems to have continued under the English occupation, though this is an even more under-researched topic than Covenanting finance. A draft exchequer roll (in book form), compiled by English clerks, exists; it has no produce accounts, and so no long hundreds would have been possible, but the use of columns fully exploited the potential of arabic numerals.<sup>127</sup>

With the Restoration, the transition to the short hundred was swiftly completed. The accounts of the crown lands were reorganized to convert produce income to cash locally, thus keeping most figures below 100. The remaining long hundreds were recalculated as short ones or simply forgotten. Sir William Purves wrote a treatise in 1681 to identify how far the rents were 'altered diminished or converted from the old rentalls preceeding 1603', and he quoted all the totals – now in arabic numerals, of course. All but one of his 'hundreds' were



short, and he did not realize that (for instance) the ‘390 pair Cunings att 13s 4d the pair’ which he calculated as worth ‘£260 00 00’ had originally been ‘iii<sup>c</sup> lxxxx’, ie 450 pairs, worth £300. He mentioned one figure ‘compting 5 score to the 100’, and must have known about the long hundred; but it is not clear that he was fully aware that it had been so universally used in the period to which he looked back across the turbulent mid-century. It is surprising that his eagle eye for the crown’s rights did not spot the fact that modern arithmetic had reduced some rents by a sixth, but this does show forcefully that the long hundred was now a thing of the past.<sup>128</sup>

The same pattern is visible in private accounts. Lady Grisell Baillie and Sir John Foulis of Ravelston both kept their accounts (covering 1692–1733 and 1691–1707 respectively) entirely in arabic numerals, using columns and zeros. Hens, threaves of straw, herring, pounds of pork, paving-stones, and bolls of grain were all reckoned by the short hundred; there were no long hundreds.<sup>129</sup> Herring, it should be noted, seems still to have been normally reckoned in long hundreds in 1673, with a ‘maise’ of herring containing five long hundreds.<sup>130</sup> Herring could still be reckoned by the long hundred in Ireland in the 19th century.<sup>131</sup>

However, examples of the long hundred after the 1640s are rare. A building contract of 1677 shows that it was now becoming a ‘stylised quantity’, as in England, rather than an independent unit of reckoning:

al and haill the number of ane thowsand peace of ruch stones for heweing, accompting fyvescore and ten peace of good and suficient singell eixylrys and ten peace of lang stones, being of four foots and fyve foots stones, to ilk hundreth.<sup>132</sup>

Here the contracting parties were adopting their own definition of a ‘hundred’: 5 score 10 of one kind of stone plus 10 of another kind. A concept that could be redefined to include non-homogeneous units had clearly been marginalized for the ordinary purposes of computation. A reckoning system that had survived almost unchanged from medieval times had been swept away in a matter of decades in the mid-17th century.

## APPENDIX

### GOODS RECKONED BY THE LONG HUNDRED

This appendix provides an overview of the goods that were (and were not) reckoned by the long hundred. References will be found in the text, except that I have not thought it necessary to provide references to every century for all the goods in the *Exchequer Rolls* that continued to be reckoned by the long hundred after their first appearance. Goods were reckoned individually (eg cattle) if units are not given. Some goods were reckoned in other ways which did not give rise to hundreds – for instance, pipes or tuns of wine, lasts of salmon or lasts of herring. Further research would no doubt fill in some of the blanks, but most blanks are for less important commodities, or for ones that did not exist in such quantities in the period.

The following symbols are used:

●●● Found in long hundreds;

\*\*\* Found in short hundreds.

In cases where both are found more than once, the predominant balance is indicated by

●●\* or \*\*●.

	1200-99	1300-99	1400-99	1500-99	1600-49
Ale (gallons)		●●●			
Books				***	***
Bread (lb)				●●●	
Bullion (stones)			***	***	***
Cattle	●●●	●●●	●●●	●●●	●●●
Cheese (casks)	●●●				
Cheese (lb)				●●●	
Clay (loads)				●●*	
Cloth (ells)		●●●	●●●	●●●	●●●
Coal (chalders)		●●●	●●●	●●●	
Dates (lb)		●●●			
Dried fish		●●●			
Eels	●●●				
Ginger (lb)		●●●			
Grain (chalders)		●●●	●●●	●●*	●●●
Herring		●●●			
Hides (lasts)			●●●	●●●	●●●
Iron (stones)		●●●		***	***
Lead (stones)				**●	***
Marts	●●●	●●●	●●●	●●●	●●●
Nails				●●●	●●*
Peat (loads)				●●*	
Perches (of length)	●●●				
Poultry & capons		●●●	●●●	●●*	●●●
Rabbits (pairs)				●●●	●●●
Rice (lb)		●●●			
Salmon		●●●		●●*	
Salt (chalders)			●●●	●●●	
Sand (loads)				●●*	
Sheep		●●●	●●●	●●*	●●●
Sheep carcasses		●●●	●●●	●●●	●●●
Skins	●●●	●●●	●●●	●●●	●●●
Stones (building)			●●●	●●●	●●*
Wax (stones)		●●●			
White fish			●●●	●●●	
Wine (gallons)		●●●			
Wool (lasts)		***	**●	●●*	●●●
Woolfells	●●●	●●●	●●●	●●●	●●●

## ACKNOWLEDGEMENTS

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## NOTES

- 1 Calderwood 1842–9, v, 655.
- 2 Goulesbrough 1967, 79–82.
- 3 *Exch Rolls*, 23 vols. Some figures only were converted in vols. iii–xvii (1379–1542) but almost all of them were in vols. xviii–xxiii (1543–1600). Another much-used work making the same mistake is Donaldson 1949.
- 4 Scottish Record Office [SRO], MS comptroller’s accounts, E24/22, ff. 15r.–16r.
- 5 SRO, E24/23, f. 13r.
- 6 *Reg Privy Council*, x, 287–8.
- 7 Stevenson 1890. For the Anglo-Saxon numerals see also Bosworth & Toller 1898, s.vv; I am grateful to Prof. G W S Barrow for drawing my attention to this source.
- 8 Domesday Book, i, 336a, quoted by Round 1964, 66.
- 9 Round 1964, 67. Round’s argument on the five-hide unit has been challenged, but on the evidence of the debate so far it would seem premature to reject it. See Leaver 1988, and references there cited. The debate has not yet reached the ‘Danish’ districts, but further research may shed light on the Scottish long hundred.
- 10 Smyth 1984, 195–207.
- 11 Lynch 1991, 23; Smyth 1984, 28–32, 65–6.
- 12 Easson 1987, 153–4. I am grateful to Dr Easson for permission to quote from her thesis.
- 13 Bannerman 1974, 42. I am not qualified to comment on the many complexities of this text, and Dr David Brown is currently undertaking a reassessment of the names to whom these groupings of houses should apply; but the point which I wish to establish about the statistics is, I hope, clear.
- 14 Poole 1912, 45–6. In fact it was quite simple to use the abacus or counting-board in a duodecimal version, as we shall see, but quite impossible to use roman numerals, the only ones current in medieval usage.
- 15 Modern British duodecimalists recommend ζ and ε: Moon 1969, 5.
- 16 Gordon & Dobson 1771, 121.
- 17 *Leges Quatuor Burgorum*, c. 112, in *Acts Parl Scot*, i, 355; *Scott Burgh Recs Soc Miscellany*, p. lxiv.
- 18 *Burghs Convention Recs*, i, 3.
- 19 *Reg Privy Council*, ix, 727. The entry immediately following is ‘Ane hundreth pair of worsett hoise, compting sax scoir to the hundreth’. Other items reckoned by the ‘hundreth’ lack this qualification; most likely the clerk was inspired to add a note explaining the hundred because he had just done so for the gross. For a full list of commodities reckoned by the dozen or gross, see the Book of Rates of Customs, 1612, appended to Innes 1867. Most of these were imported commodities, thus showing that the dozen (unlike the long hundred) was not a peculiarly Scottish unit of reckoning.
- 20 In theory they could have been adapted for such a system, making ‘v’ 6, ‘x’ 12, ‘1’ 72, ‘c’ 144 and so on, but this did not happen.
- 21 *Works Accts*, i, 17. It might be noted here that the strictures on the clerks’ arithmetic in the introduction to this volume (p. xi) arise largely from a failure to recognize the long hundred.
- 22 4 lippies to a peck, 4 pecks to a firloft, 4 firlofts to a boll, 16 bolls to a chaldar.
- 23 Murray 1930, 396–8.
- 24 *Works Accts*, i, 192.
- 25 SRO, E24/23, f. 46r.
- 26 SRO, E49/1, f. 32v.
- 27 *Works Accts*, i, 176; cf. *ibid.*, 18.
- 28 *Acts Parl Scot*, iii, 216, c. 12.
- 29 My thoughts on this subject have been shaped by discussions with Dr Allen Simpson, who is working on a comprehensive study of the Scottish weights and measures. For the tendency to ‘progressive enlargement’ of the grain measures, see Simpson 1992.

- 30 Thomas 1987, 123.
- 31 Lawrie 1905, no. 251 (1152x53).
- 32 *Regesta Regum Scottorum*, ii, no. 492 (1209x11).
- 33 *Regesta Regum Scottorum*, i, no. 34 (1136x52); cf. no. 206. This is a grant of lands in England held by the Scottish crown, and whether it represents Scottish or English practice would be hard to say.
- 34 *Regesta Regum Scottorum*, v, no. 342.
- 35 *Regesta Regum Scottorum*, ii, nos. 365 (1193x95), 39 (1165x70).
- 36 *Ibid.*, no. 184 (1173x77).
- 37 *Exch Rolls*, i, 147.
- 38 *Ibid.*, 7.
- 39 *Ibid.*, 17.
- 40 *Ibid.*, 21.
- 41 *Ibid.*, 50.
- 42 *Ibid.*, 121, 129, 147, 194, 198, 225, 290, 342, 408.
- 43 *Exch Rolls*, ii, 41, 451; iii, 107, 41; v, 58, 271; vii, 213 (custom was 12d per chalder).
- 44 *Exch Rolls*, i, 294.
- 45 *Exch Rolls*, ii, 181, 466.
- 46 Hanham 1971, 116–18.
- 47 Innes 1867, 151.
- 48 The sole exception is some ‘pillaris of bras’, weighed in pounds reckoned by the long hundred: *ibid.*, 160.
- 49 *Exch Rolls*, ii, 508; vi, 308–9.
- 50 *Exch Rolls*, i, 80: ‘octo millium quingentarum quinque viginti et nouemdecim pellium lanutarum (eight thousand five hundred five score nineteen woollfells)’. The mere mention of ‘5 score’ does not necessarily indicate that the hundred was 6 score, but the formula here, ‘5 hundred and 5 score’, is a sure sign.
- 51 Hanham 1971, 116–18.
- 52 Innes 1867, 19.
- 53 *Burghs Convention Recs*, i, 269.
- 54 *Exch Rolls*, xi, 121; xv, 51. The rate of custom was £2 13s 4d per last of 20 daces. There is an example of ‘140’ hides in 1454, but the customs rate appears to be wrong, so we cannot work out what kind of hundred it was: *Exch Rolls*, v, 609.
- 55 Innes 1867, 275.
- 56 Millar 1898, 51.
- 57 Quoted in Murray 1961b, app. 17a; the original is in SRO, E75/10.
- 58 Murray 1965, 127–30.
- 59 Dr Simpson’s study of the Scottish weights and measures will be immensely valuable in this field.
- 60 Hannay 1915, 21.
- 61 *Ibid.*, 29, 31.
- 62 *Ibid.*, 77, 186.
- 63 *Ibid.*, 217.
- 64 *Ibid.*, 164.
- 65 *Ibid.*, 211, 231, 236.
- 66 *Ibid.*, 290, 295.
- 67 *Ibid.*, 280, 297.
- 68 Hannay 1913, 11.
- 69 *Ibid.*, 28.
- 70 Innes 1855, 307, 308, 315.
- 71 *Exch Rolls*, i, 135–6.
- 72 Cochran-Patrick 1873, 89.
- 73 *Works Accts*, ii, 65, 370.

- 74 *Exch Rolls*, v, 66; Challis 1977, 176–7.
- 75 Cochran-Patrick 1873, 15.
- 76 SRO, MS mint accounts, E101/2, f. 1r.
- 77 ‘Collection of the wills of printers and booksellers in Edinburgh, 1577–1687’, *Bannatyne Miscellany*, ii (1836). The sole exception is on p. 197: ‘fyve hundreth and fyve David Lyndesayis, unbund, price of the pece, iii s., summa, lxxxx l. xv s.’
- 78 SRO, MS protocol books of North Berwick, B56/1/1–3.
- 79 *Exch Rolls*, ii, 474; *ibid.*, 89. In 1362, £1,930 4s 7d was collected as custom on ‘centum octoginta tresdecim lastarum vnus sacce quinque petrarum et dimidie petre lane . . . custuma sacci stante ad viginti solidos (a hundred and eighty thirteen lasts, one sack, five and a half stones of wool, the custom per sack twenty shillings)’. There were 10 sacks in a last.
- 80 *Exch Rolls*, i, 81, 319, 173.
- 81 Short hundreds after 1410: 1412, 1414, 1416, 1428, 1430, 1446, 1447, 1456, 1460, 1462, 1463, 1465, 1467, 1468, 1469, 1474, 1475, 1476, 1515 (*Exch Rolls*, iv, 141, 200, 251, 435, 506; v, 216, 271; vi, 113, 580; vii, 144, 211, 362, 500, 588, 663; viii, 252, 311–12, 390; xiv, 102). 5 score: 1410, 1431, 1434, 1435, 1445, 1452, 1480, 1500, 1503, 1511, 1522, 1535 (*Exch Rolls*, iv, 114, 540, 573, 619; v, 178, 496; ix, 78; xi, 273; xii, 162; xiii, 390; xiv, 442; xvi, 374). Long hundreds: 1413, 1425, 1448, 1537 (*Exch Rolls*, iv, 175, 380; v, 343; xvii, 48); all thereafter are long hundreds. Over 100 but arithmetic wrong: 1426, 1429, 1464 (*Exch Rolls*, iv, 409, 471; vii, 283). The rate of custom was £1 6s 8d per sack.
- 82 The use of the short hundred for wool may have marginal implications for the export statistics compiled by Isabel Guy, since she claims to have taken all hundreds as long. See Guy 1982, 18, 24; cf. Guy 1986.
- 83 No copy of the first edition is known to exist. For what follows, see *Recorde* 1648, second dialogue: ‘The accounting by counters’. Some further works on the subject are discussed in Barnard 1916, part 3, but they add little to *Recorde* for our purposes.
- 84 Jenkinson 1926, 274.
- 85 Moon 1971, 28–9.
- 86 *Works Accts*, i, 138, 136. The last example was thought of, though not reckoned on the counting-board, as 12½ hundreds.
- 87 Murray 1961a, 95.
- 88 Richard son of Nigel 1950, 24–5.
- 89 Described in Hawkins *et al.* 1885, i, 150. Many more are illustrated in Mitchiner 1988–91. I am grateful to Mr Nick Holmes of the Museum for showing me a number of jetons and providing helpful information on them.
- 90 *Works Accts*, ii, 111, 336.
- 91 James Law, Bishop of Orkney, to Sir Gideon Murray of Elibank, treasurer depute, n.d. [June 1614], Laing 1851, i, 457\*–8\*.
- 92 Thomas 1987, 126.
- 93 *Scottish Antiquary*, iv (1889), 147–8; v (1890), 21–2.
- 94 *Works Accts*, i, 320.
- 95 Hill 1965, ch. 2.
- 96 For references to some 17th-century English literary evidence of the decline of the counting-board in prestige, see Yeldham 1926, 89; Smith 1923–5, ii, 187–8.
- 97 This does not seem to have changed much, since it was reported recently that one graduate in six has problems with basic numeracy: *Guardian*, 8 June 1992.
- 98 Hunter 1624, 11–12.
- 99 Warner 1893, p. xlii; Ramus 1569. Ramus dealt with arithmetic briefly in pp. 115–45, prefixing this section with a long philosophical introduction and following it with an equally lengthy exposition of Euclidean geometry.
- 100 MacDonald 1971, 70.
- 101 ‘Collection of the wills of printers and booksellers in Edinburgh’, 195, 196, 201.

- 102 Millar 1898, 87. He did not get the book back. Attitudes to numeracy might be illuminated by considering the circulation in Scotland of almanacs and chapbooks, which often contained arithmetical information. See Capp 1979, 201.
- 103 These are incorporated in the mint accounts: SRO, E103/3, ff. 6r.–8r.
- 104 SRO, E101/3, f. 20r.
- 105 SRO, E42/1.
- 106 SRO, E83/1, MS mines accounts, 1608–9, ff. 244r, 241r.
- 107 *Works Accts*, ii, 5.
- 108 *Ibid.*, 7, 19.
- 109 *Ibid.*, 28.
- 110 *Ibid.*, 49.
- 111 *Ibid.*, 50.
- 112 *Ibid.*, 52.
- 113 *Ibid.*, 132.
- 114 *Ibid.*, 232–3.
- 115 Stevenson 1973, 55.
- 116 *Works Accts*, ii, 238.
- 117 *Ibid.*, 250.
- 118 *Ibid.*, 278, 281, 283. Dr Simpson has pointed out to me that the quantification of the glass in the third entry here presents further difficulties; if the glass was English, the ‘foot’ would be 8 inches, if Scottish, 9 inches.
- 119 *Ibid.*, 329.
- 120 *Ibid.*, 405, 410.
- 121 *Ibid.*, 431.
- 122 SRO, E24/42.
- 123 SRO, E26/4.
- 124 SRO, E38 series.
- 125 SRO, E26/5–7 (1642–6), E26/10 (1648–9). An exception is the charge of marts in 1644, totalled using the short hundred: E26/6, f. 8r.
- 126 SRO, MS household book, 1650–1, E31/19, f. 30r.
- 127 SRO, MS exchequer roll, 1652–3, E38/646A.
- 128 Purves 1897, 33, 90, 103 and *passim*. The single long hundred (‘188 Capones att 6s 8d the peice: £69 06 08’) is at p. 79. See also SRO, MS treasury accounts, 1671, E26/11/1; and for short hundreds used for chalders of grain, SRO, MS accounts of the rents of Orkney and Shetland, 1669–70, E41/12/1.
- 129 Scott-Moncrieff 1911, 60, 79, 85, 115, 240; Hallen 1894, 454. This last item is only a partial payment, so its interpretation is not certain, but if previous instalments were in round figures (as was usually the case) then it must be the ordinary hundred: cf. *ibid.*, 209, 391.
- 130 *Reg Privy Council*, 3rd ser., iv, 40.
- 131 *Glasgow Herald*, 13 Sept. 1886, 4/2. The Irish herring fishery involved many Scottish boats.
- 132 Dunbar & Davies 1990, 301. ‘Eixylars’ = ashlar.

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