Quality Improvement Agency

Skills for Life Improvement Programme

# Training the Teacher Trainers

## Four-day residential course

# Numeracy materials for Day 3, afternoon

The Skills for Life Improvement Programme is delivered on behalf of the Quality Improvement Agency by CfBT Education Trust and partners

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|---|---|---|
| **3.7.1** | **OHT and Activity** | **Pre-session assignment marking activity** |

Consider the example assignment in relation to the assessment task and the assessment criteria.

Note on the marking sheet what you would want to include in written feedback to the candidate (and annotate the assignment itself, as a marker).

Bear in mind that the first and second markers do not always initially agree, particularly if an assignment is borderline, and would generally come to a decision following discussion.

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| **3.8.1** | **OHT** | **Aim and learning objectives** |

## Aim

For participants to:

- explore issues relating to marking assignments and giving written feedback to candidates.

## Learning objectives

By the end of the session, participants will have:

- identified and examined key issues relating to marking and giving written feedback
- related own ideas about marking and giving written feedback to key issues.

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| **3.9.1** | **OHT and Activity** | **Marking and giving written feedback: task, and key issues to consider** |

## Task:

In small groups, share your ideas from the notes you made for the pre-session task, i.e. what would you want to include in written feedback to the candidate?

Discuss with reference to the key issues below:

- a decision – would you pass this assignment? (does it meet the assessment criteria?)
- giving balanced feedback – in relation to strengths and weaknesses
- the extent of the feedback (i.e. length)
- clarity for the candidate (i.e. giving clear feedback about strengths and weaknesses, and if appropriate, what they need to do in order to pass).

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## 3.9.2c Activity Assignment task : numeracy

### Unit 6 Assessment task

This module is assessed through a report on the application of number concepts in the adult numeracy class. In their report participants must:

(a) describe how calculating in different number/numeral systems or bases aids an understanding of calculation in the numeracy classroom. Describe how performing these calculations can help you, as a teacher, understand the difficulties that learners might have in the numeracy classroom.

(b) discuss the significance of ONE of the rules of precedence or laws of arithmetic operations when teaching basic calculations in the numeracy class, and illustrate by showing examples of the calculations.

The report should be 1500–2000 words in length.

### Unit 6 Assessment criteria

Participants' work will need to:

1. have described TWO examples, using calculations from different number/numeral systems, demonstrating a conceptual understanding of arithmetic operations as well as a sound knowledge of computational procedures and number facts

2. have described the significance of ONE example of a rule or law of arithmetic in the numeracy class

3. provided a discussion of the implications of these calculations, laws or rules in numeracy provision, showing the ability to reason and draw conclusions from detailed numeric information.

**Notes**

- This does not mean getting learners to do binary arithmetic.
- Look for parallels in how YOUR working with different bases reflects similar issues for your learners eg what happened when you had to "carry over", how sure were you of your answer
- You could look at different number systems that we do use with learners eg time, imperial measures.

**Proposed Structure**

**Introduction**

Describes the purpose of the task and an overview of the examples chosen.

**Main body**

This should include

- A description of each of the three numeracy learning issues
- Sufficient detail/examples to show your understanding of the number concepts involved
- An analysis of the relevance to the numeracy class

**Conclusion**

**References**

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## 3.9.2c Activity Example Assignment: numeracy

# Candidate A

Unit 6: A report on the application of number concepts in the adult numeracy class.

**Introduction**

In prehistoric times, counting developed because people needed to know how many animals they had, so counting on fingers began. Fingers became the first symbols, which stand for numbers and the idea of counting numbers emerged. People needed to record the numbers they had counted, so they created numeral marks, which stand for numbers. The United Kingdom's (UK) present number system is based on the system, which stemmed from Arabs and Hindus, (The WorldBook Encyclopaedia 1991). For this report, I will explain how calculating in the different number and numeral systems varied to provide an appreciation for the usage of place value within the current system, which the UK adopts. I will also describe the laws of arithmetic operations when delivering numeracy and then I will provide a discussion of the implications on teaching numeracy to adults.

**Task A**

The Babylonian system has small marks shaped like arrowheads to label numbers 1 to 59. The Roman numerals used a system, which is similar to the Babylonians. The shortcomings of these two systems are that they do not have a symbol for zero therefore this could cause problems for learners when trying to decide on the values of numbers. Also, they would need more space when they write certain numbers, such as 347 contrary to the Hindu-Arabic system. In Roman numerals this sum would be written as follows, that is CCCLXII to represent the numbers above (347). Carrying out calculations with the Roman numerals system could be problematic if learners are not familiar with its principles and its operations. Using another number system would help learners to examine the importance of place value. A simple calculation such as 347+250 in the Roman numerals would be written as CCCXLVII+CCL, (The WorldBook Encyclopaedia 1991).

Consider calculating this in the conventional way from right to left; the learners would have to gather all the units, tens and hundreds together in the following ways:
Units= VII
Tens= XL+L= XLL=XC
Hundreds=CCC+CC=D
Solution=DXCVII
There are other number systems such as the binary number system which has a number based of 2 that is 0 and 1, (The WorldBook Encyclopaedia 1991). To calculate simple sum in the binary system the number box or powers can be used. In this case the choice will depend on how confident the practitioner is working within this number system. For visual purposes I chose the number box technique to avoid making unnecessary mistakes when converting 347 to the binary system.

Number box:

| $2^9$ | $2^8$ | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $1^0$ |
|---|---|---|---|---|---|---|---|---|---|
| 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | | |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |

Using the number box boosted my confidence level because I could see the numbers that were chosen and this made it easier to record the results as 111111 and felt certain that is was correct. In this instance the numbers that were chosen were: $2^8 + 2^6 + 2^4 + 2^3 + 2^1 + 1^0$ =111111. Notice the number 2 is not used in the binary system therefore, when the learners add a sum up to 2 they have to remember to start form the beginning again.

Carrying out the above calculations within these number systems was quite difficult because I have not used them since compulsory education; also, due to personal preferences to work with numbers instead of symbols. I felt nervous carrying out these calculations because I thought I had forgotten the basic concepts; but when I compared my working out in class with other trainees I realised I was on the right track and this reduced my anxiety level and boosted my confidence to engage in other tasks.

It was very nerve-racking trying to retrieve the information from previous learning to carry out the calculations correctly. I found it useful when I was able to retrieve some basic knowledge on number bonds and how to get ten, a hundred, a thousand and a hundred thousand and so on. Drawing on this knowledge made it easier to generate certain numbers, which do not have any symbols.

Personally using visual aids were more useful to the learning process because I could follow the sequence of events in the calculations. The UK uses a less complex system than the ones mentioned above. It uses the denary number system, which has a number based of 10, with the digits 0 to 9. This is the system I am familiar with and use with learners but they are introduced to the Roman numerals system but they mainly use it when they are reading time. Reflecting on the difficulties I had when calculating within the two systems above, I now have a better appreciation for the errors some learners make when doing simple sums such as 20*10, some learners tend to write 20 instead 200.

The learner has an idea about the principle but retrieved the wrong information for this calculation (error analysis). This may due in part to lack of practice or decay in the memory system, Petty's (1998) memory theories.

According to Plato, 'each individual performs tasks which are in keeping with their own unique talent', (Lea 2003, pg.6). For example, some learners may have some kind of phobias for maths that stemmed from their previous learning experience. This can sometimes reflect in their work when they are carrying out simple calculations in their numeracy classes. This awareness helps in how the topic is delivered and feedback is given to learners when they have completed a task.

## Task B

It is essential for learners to have the ideas associated with the arithmetic signs: addition (+), subtraction (-), multiplication (×) and division (÷). The arithmetic laws included the:

commutative, associative and distributive, (Llewellyn et al 1996). For this report only one will be focused on, that is the distributive law. Learners would be encouraged to use the distributive law as a conventional method for long multiplication:

```
          173
        ×35
173×5 →  865
173×30→ 5190
         6055
```

The learner has effectively split the numbers into 5, 30 and multiple 173 by 5 and 30. This can be represented in the following ways:

$a \times (b+c) = (a \times b) + (a \times c)$ or $173 \times (30+5) = (173 \times 30) + (173 \times 5)$.

Using the distributive law for mental multiplication can make the calculation relatively easier for learners to carry out.

Consider $7 \times 5$: $7\ (2+2+1) = (7\times2) + (7\times2) + (7\times1) = 14+14+7 = 35$; also, this law can be used with subtraction, for example: $6\times9 = 6\times10-6\times1 = 54$. The distributive law is an appropriate method when calculating division and subtraction as the learner can employ the same principles that are used for multiplying and subtracting, which is mentioned above.

## Implication for teaching

It should be evident from the examples given in this report showing how complicated calculations can be in the different number and numeral systems. Consider the denary number system: 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. It has a base of 10. That is, grouping numbers by tens, such as: 10 ones, are ten, 10 tens are one hundred, 10 hundreds are one thousand and so on. Consider writing 325, it is showing that this number is made up of 3 hundreds, 2 tens and 5 units. However, as established, the binary number system works differently for instance, to a denary learner 1 and 0 would written as 10 and would stand for ten but in the binary system it stands for two. When it records 2, it represents it as 10. Within the denary system eight is 8 but in the binary system it would be recorded as 1000. This seems unusual but it works. The binary system does not have places for ones, tens, hundreds and so on. However, it can be used to help learners to appreciate place value within the denary system, (The WorldBook Encyclopedia 1991).

Considering everything that has been said about the number and numeral systems, it is essential for teachers to teach learners the principles for the laws of arithmetic without becoming too bogged down with learning terminology. Having an idea about each learner's ability, the practitioners will decide the extent that they will develop the principles of operations when working out a problem within a given number system. Once learners are exposed to the different approaches to calculate a sum, it would be up to the individual to choose the most effective method to suit to solve the problem.

Learners need to be taught and encouraged to apply logical reasoning to the calculations being carried out. To make effective usage of all the information given, to identify all the necessary steps to solve a problem. Even though learners need to be able to use formal methods, they also need to be able to use mental methods for simpler calculations.

Therefore, it is important for learners to know the signs and symbols of mathematics but again the practitioner should teach numeracy without much emphasis on terminologies. Once learners learned how to group numbers and learn mathematical key concepts, they would be able to confidently engage in challenging calculations (applying knowledge, Bloom's taxonomy 1960).

## Summary

In summing up, the examples in this report have demonstrated some of the complexities involved when calculating in the different number systems (Roman numerals, denary and binary systems). That is, representing numbers by symbols and making logical connections between numbers and symbols. Working within some of these systems helps learners to know and appreciate the value of each digit within a number 347, means 3 hundreds, 4 tens and 7 units.

## Conclusion

In conclusion, learners could experience difficulties when using the different number systems to carry out simple calculations especially if they are unfamiliar with its concepts. For this reason, it is important for practitioners to get their learners familiar with the laws of arithmetic.

## References

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## 3.9.4c Activity Numeracy blank marking sheet

| Module 6 |
| --- |
| Number Concepts |

| Name | Candidate A |
| --- | --- |

| ASSESSMENT CRITERIA | Ach'd Yes/No | COMMENTS |
| --- | --- | --- |
| ■ have described TWO examples, using calculations from different number/numeral systems, demonstrating a conceptual understanding of arithmetic operations as well as a sound knowledge of computational procedures and number facts | | |
| ■ have described the significance of ONE example of a rule / law of arithmetic in the numeracy class | | |
| ■ provide a discussion of implications these calculations / laws / rules in numeracy provision, showing the ability to reason and draw conclusions from detailed numeric information | | |

| Action Points |
| --- |
| |

| | |
| --- | --- |
| **Pass** | |
| **Resubmit** | |

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### 3.12.1 Activity Developments in Teacher Education

## Task:

Group according to role e.g. teacher trainer for generic training, training for subject support, manager of Skills for Life courses.

Discuss questions that interest your group.

*Either*

- Find answers to queries from among the group members.

*Or*

- Use the documents given to find answers.

For the plenary session:

Note down

*Either*

- one question that you still feel needs answering

*Or*

- one point that you think should be raised with the whole group.