Examiners' Report

May 2017

Pearson Edexcel Functional Skills
Mathematics Level 2 (FSM02)

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Introduction

This level 2 paper included questions based on the contexts of a swimming pool, a loft and a boat. Some of the questions required careful reading to understand the relationships between the given data, as illustrated in question 1. Many of the learners were unable to produce a fully correct schedule, which satisfied all the constraints given in the question. This type of question demonstrates the importance of checking the final solution against all the criteria given.

General comments

Many learners were able to access this paper successfully and gained marks in the majority of the questions. However, there was evidence from the number of blank answers throughout the paper that some learners found the more complex questions inaccessible. Centres should ensure that learners entered for this qualification are working at the level of mathematics required to successfully attempt a functional skills level 2 mathematics examination.

It was pleasing to note that there appeared to be relatively few learners who did not have access to a calculator for this paper. It must be emphasised that centres should support the effective use of calculators in preparation for functional maths skills assessment. Real-life contexts often involve calculations which can be time consuming without a calculator, for example when using conversion factors, such as in question 7(b).

Learners should be encouraged to read the questions carefully and check they have provided a full answer to the question. In this paper, having completed the correct calculations, many learners failed to write a conclusion thus losing a mark. They should understand that when they are asked to explain their answer, it is important to provide a decision and a reason for it. It is also worth pointing out to learners that the number of marks allocated for a question reflects the amount of work needed for a full solution and a verbal explanation is not sufficient. So, for example, a question worth 6 marks needs more than 1 line of working.

Learners should be encouraged to check all their working as well as consider whether their answers make sense. Questions 2(b) and 5(a) asked learners to show a check of their working. It was pleasing to see that many learners gained marks for producing a valid check. They should be reminded that a repeat of the initial calculation does not constitute a check, nor is finding the difference between the 2 values they may have found to compare.

Learners should be encouraged to check their work as good practice in the classroom. In exam questions, they can provide evidence of checking any part of their working. The following can be sufficient evidence of a check:
- a reverse calculation e.g. a multiplication following a division
- a different method for performing a calculation e.g. in a percentage question multiplying by 1.2 instead of finding 20% and adding it on
- an estimation, for example by rounding

Section A

Question 1
This question was about planning a swimming session schedule for trainers based on their availability. The question had a number of constraints which learners found it difficult to engage with. There were 3 different types of session with different time durations to be run by 3 trainers who were available to do 2 different types of session at different times of day.

The most successful responses had some organisation to the layout, either in terms of a two-way grid with names on one side and classes on the other with times in the cells, or a list in chronological order with columns for names and classes. Learners who were less organised tended to miss information such as the name of the class or the name of the trainer taking the class without the prompts to help them. Those who did not organise chronologically regularly overlapped classes. Centres need to ensure that learners understand it is important to produce a schedule which is fit for purpose and can be easily followed. When tackling timetabling questions, learners should be encouraged to return to the wording of the question and the information given to ensure they have considered and included all the constraints.

Question 2a
This question was about finding the total cost for a one-year gym membership with locker hire which involved 2 different offers. The question was generally well done with many learners arriving at the correct answer of, 'yes' and £874.89. The most common errors were:
misunderstanding the instruction, 'Pay now for 11 months and get one free' and working out £69.99 ×10 or £69.99 × 12; rounding early and losing the final accuracy mark; using the discount of £45 on the cost of the locker hire as the discounted cost.

This type of question is standard on L2 papers and centres need give their learners plenty of opportunity to practise working out practical problems involving percentage discount using a calculator. They should also encourage learners not to round their calculations early.

Question 2b
There were relatively few complete, correct solutions to this mean calculation question involving time. Many learners found this type of question easy to process but difficult to arrive at correct answers. The misconception of treating the times in minutes and seconds as decimals was widely seen. There were some learners who found the mean for weeks 1 and 2 together. Those who worked in seconds throughout were more successful in accurately finding the correct mean values.

Many learners seem to experience difficulty in processing questions which involve conversion between units of time and practice is recommended. However, many were able to produce a relevant check of their working.

Question 3

A significant number of learners did not recognise that this question involved finding the volume of water in the pool. The key here was spotting the '300 grams of powder per 50 m³ of water', which should have led learners to realising a volume calculation was required. Finding the volume of a cuboid by working out length × width × height should be familiar to all level 2 learners.

The most common errors were:

confusing 50 m³ to mean 50 × 50 × 50; rounding early and losing the accuracy mark, the most common example being rounding 5.76 to 6; adding the dimensions of the base of the pool and the height of the water instead of multiplying.

Centres should provide opportunities for learners to work with problems involving volume calculations, emphasising the units used and the difference between units for length, area and volume.

Section B

Question 4

Most learners attempted this question about working out the BTU for an air conditioning unit in a loft and a significant number gained full marks. Of those who did not gain full marks there were 2 main types of error:
- Engaging with the area but failing to engage with the table, often continuing to multiply their floor area by 1.1 then adding 1800 BTU, which scored 1 out of 4 marks
- Engaging with the table but failing to engage with the area. Some learners appeared to be using a trial and improvement type of method, others just randomly picked a value from the table to multiply by 1.1 and add 1800 BTU, which scored 2 of the 4 marks or, if they also picked the correct value from the table, 3 out of 4.

Centres should encourage learners to read the question carefully, highlighting relevant information, and, when they have answered the question, to check their answers against the key information in the question to ensure they have addressed all main points.

Question 5a

Most learners attempted this question about finding out the amount of paint needed to give 3 coats of paint to a wall, but very few gained full marks.
The main error was an inability to find the area of a compound shape. Common mistakes included:
multiplying all 3 given lengths together; adding the given lengths or, if they did realise they could work out the total area by splitting it into a rectangle and a triangle, failing to halve the product of the 2 sides to find the area of the triangle.

Most learners realised that they had to multiply their area by 3 and compare it with the number of litres available, although some multiplied both their area and the 16 litres by 3. Many were able to provide a relevant check of their working.

Centres need to ensure learners are able to distinguish between perimeter, area and volume. They need to have the opportunity to practice finding the area of compound shapes within problem solving questions involving area.

Question 5b
Most learners attempted this question about working out a time plan for painting 2 walls and some achieved full marks.
The most common errors were:
- Not fully understanding the functional aspect of the problem that a decorator would not sit and wait for the walls to dry after the final coat of paint, or that one wall could be painted while the other one was drying so an extra 4 hours drying time often added. It may be that younger learners are not fully aware of real world concepts.
- Learners struggled to add or subtract the time they decided was needed starting from 12.30pm or working backwards from 6.00pm, or when they did succeed they went on to make an incorrect decision e.g. learners got to 5.45 and said "yes" Rory was correct.

Learners who used a time line were, overall, more successful.

Centres need to give learners plenty of practice in time addition/subtraction problems using a variety of methods including time lines. Learners also need to be given enough real-life functional problems to solve, so that they become used to thinking in a functional way, (particularly where time is involved).

Question 6
More learners attempted this question involving a scale drawing for the position of an air conditioning unit, however, of those only a minority scored full marks, with the majority scoring 1 out of 3 marks.

The main error was failing to engage with the scale correctly. Even those learners who scored 1 mark for conversion, ($75 \div 20$ or $45 \div 20$), failed to continue to produce a correct scale drawing in the correct position. Some learners managed to get one of the sides the correct length but not both. Most learners managed to draw a rectangle that satisfied one of the criteria for position.

Centres need to reinforce with learners that, before starting a scale drawing, they should always find the measurement value of 1 square on the grid. They can practise scale drawings in the classroom, for example producing a scale drawing of their teaching room. There are also many practice worksheets available on sites such as skills workshop.

Section C

Question 7a
This question was about drawing a graph to compare the income from renting out a boat in 2015 and 2016. Problems encountered with drawing a linear scale seen in previous papers were vastly reduced because the scale had been partially completed. However, learners still need to be reminded of the necessity for clear and full labelling for their graph. Many learners did not label the vertical axis or used inappropriate labels such as 'frequency' or 'y-axis'. Learners should be reminded that axis labels should always relate to the data they are plotting. Of those learners who completed the linear scale correctly, many went on to plot the points accurately.

Centres should ensure that learners understand that when a scale has been partially completed, learners must use it and must not cross it out and create their own scale. Learners also need plenty of practice with graphing large numbers e.g. in the thousands.

Learners should be encouraged to work out 'the value of one tiny square' before plotting their points. They should be given practice in creating their own 'sensible' scales for plotting points, as well as working with one that is partially given as in this question.

Question 7b

This complex multi-step question involved substituting in a formula finding a fractional discount and a conversion between pounds and euros. Many learners were unable to engage with the formula to find the total price in euros to rent out the boat for one day. The main error was not applying the BIDMAS rule and working out 990 + 70 before multiplying by (14 − 6).

Other errors included:

using $\frac{1}{5}$ of the answer they found using the formula as the discounted cost in euros instead of finding $\frac{4}{5}$; multiplying the cost in euros by 1.231 to convert to pounds instead of dividing; failing to write their answer in correct money notation, i.e. using the £ symbol and writing correct to 2 decimal places.

Centres need to give learners the opportunity to practise substituting values into formulae, particularly those involving brackets and powers where BIDMAS needs to be applied.

They should also be encouraged to compare the size of values when using conversion rates. For example, if £1 = 1.231 euros, should the answer in pounds be more or less than their answer in euros? This should tell them whether they need to multiply or divide their answer by the conversion rate and can also be used as a check of their answer.

£ €
1 : 1.231
? : 1240
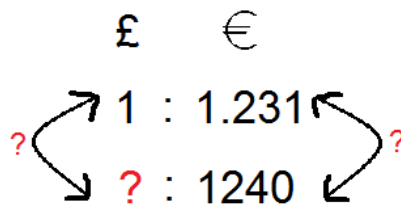
Learners could also investigate the '3 out of 4 rule' in which the initial ratio is explicitly written along with the third piece of known information, this allows learners to explore and discover the links and conversion process between the two similar data.

To help better prepare for this type of multi-step question, centres should encourage learners to read the question carefully to make sure they identify all the information they need to work out the solution. This can be done by highlighting the key points.

Question 8
This question involved working out profit as a percentage of income.
Most learners worked out the actual profit, mainly because the equation for profit was given in the question, but most were unable to progress from this point and work out the percentage profit.   Of the few who were able to work out the percentage profit, some failed to round their answer to one decimal place.

Centres need to do more work on percentage profit and loss calculations, with their learners preferably in real-life contexts, starting with small amounts and working towards to the size of the figures seen in the question.
Learners seem to be more receptive to expressing one number as a fraction of another, so the concept could be introduced by expressing the profit as a fraction of the income and then converting the fraction to a percentage by multiplying by 100. These calculations lend themselves well to rounding answers to a given number of decimal places which is assessed in level 2 papers.

Considering decimal places should be embedded within all calculations and practised throughout the learning programme. Discussions using money are a very effective way to embed knowledge of simple place value. Pose questions such as '*If I owe you £4.367, what is the closest amount I can actually pay you?* and '*What if I owe you 83p but I only have 10p pieces?*' or '*How close can I get to £137 using only £5 notes?*' This can be expanded to any place value but learners should be encouraged to discuss their findings.

Question 9a
This question about finding the number of litres of fuel needed for a 7 hour boat journey using a conversion factor between gallons and litres, was probably the best attemptd on the paper, with most learners arriving at the correct answer of 2129.26 litres.   The main errors here were again not knowing which way to apply the conversion factor – see question 7b to address this issue.

Question 9b

In this question, learners were asked to consider whether the answer they had found to 9a was sensible for 7 hours sailing. Many learners offered reasons which were not relevant to the question being asked such as it being too expensive or a health and safety risk. In this type of question, learners are expected to consider the practical question they are finding a solution for and basically apply their 'common sense'.

Learners should be encouraged to channel their thinking to a reflection of the content of the question.

Question 9a asked them to work out whether the amount of fuel they found for 7 hours sailing was sensible, addressing this should help learners arrive at conclusions based on whether the amount would be sufficient and the answers that were expected were along the lines of, 'he should take some extra in case of emergencies' or 'if he took any less he would not be able to make the journey'.

Some learners argued it would be a sensible amount as it had been calculated carefully, others that it would not be in the case of poor conditions, emergencies etc. but all valid statements were based on the central focus of the question which was the amount of fuel.

Again, rich discussion in class is the best way to advance this skill of evaluating their answers to problems.