

# Examiners' Report

November 2016

Pearson Edexcel Functional Skills  
Mathematics Level 2 (FSM02)

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## **Introduction**

This Level 2 paper included the contexts of a game of bowling, the fun of hot air ballooning and having a garden pond. The type of question in this paper often required the learner to take a more thoughtful approach when interpreting and responding to the questions. On occasion learners needed to combine Level 1 skills to answer a multistage question as demonstrated by question 1 where by a time plan or schedule needed to be combined with possible permutations when considering which pair of friends were bowling on each of the two lanes at a given time.

## **General comments**

Whilst many learners were able to successfully access this paper, and attempt and gain marks in the majority of questions, it was disappointing to note that a significant minority did not appear to be able to demonstrate that they possessed the mathematical skills required to attempt a Level 2 exam. Learners who are unable to use correct equivalences for finding one fifth of an amount or who are unable to show the process for calculating a quarter discount need further preparation before attempting an examination at this level.

Calculations involving discounted prices or time and interpreting given data were often successfully answered. Two multistage problems combining working with formulae or converting units were attempted by the majority with reasonable success. However, there were two questions for which most learners found the mathematics challenging, namely, a question involving the use of a scale and another requiring knowledge about speed, distance and time where the majority of learners simply failed to attempt to give a response. Both topics in these questions sit within the level 2 specification and centres would be advised to ensure that the skills required for such questions are practiced more both in a familiar and unfamiliar context. Particular attention should be given towards working with decimalised time.

Centres should remind learners to show all stages of their working, even when they are using a calculator, in order to avoid losing marks that could be awarded for demonstrating a valid process. Similarly, learners need to ensure that they have the correct equipment available prior to taking the examination as it was often evident that access to a calculator or pair of compasses was a barrier to achieving success.

Many learners often failed to gain full marks as a result of not reading the question demand fully and so didn't provide a decision or conclusion or show a reverse calculation or alternative method when a check was required.

## Section A

**Q1** – This multistage opening question required the learner to produce a bowling schedule between four friends in which each friend had to play against one another, with the constraints of a given time allowance of 20 minutes per game and two lanes being used. It was pleasing to see that the majority of learners were able to successfully gain credit by considering the possible combinations for the 10 games or by being able to calculate with time correctly and find the earliest finishing time. Most learners understood how to schedule using the 2 lanes at the same time but then failed to consider that one friend could not be scheduled on both bowling lanes at once, or scheduled games for two friends to play each other more than once in the evening. The most successful learners often began by dissecting the problem and started by listing the required combinations before beginning to write a schedule for the event. Scheduling an event when there are multiple constraints that need to be considered is an important element of time functionality and practice in planning or organising similar events would be beneficial.

**Q2** – It was pleasing to note that the majority of learners were able to successfully engage with this question about the time available to carry out activities and arrive at an event for a set time. The time durations for the activities were presented in different formats, such as hours and minutes and fractional time durations but this did not seem to faze many learners, with only a small minority addressing this problem in the wrong way by starting to add the decimalised time or by being unable convert three quarters to 45 mins. Learner tackled this question by either opting to add up all the minutes for each activity to find the time needed and then add their answer to 3.30 p.m., or use a time line from 3.30 with individual times being added as they went along. The main cause of credit being lost was for learners who omitted the addition of the time duration for one activity and learners would benefit from being encouraged to tick off or cross out events presented as a list of bullet points in order to ensure that they have used all of the information. It's a good idea to use time in as many lessons and contexts as possible, even if it is a tool for an exit question. At Level 2, students should be able to address time in both common time notation and decimal format and convert between the two. Therefore, simply providing simple time questions does not build these skills. Planning a journey with multiple stages, opening and closing hours for venues and working with time elapsed would help to prepare less successful learners for this type of problem.

**Q3(a)** – Learners found this question challenging. The problem required the learner to have a deeper level of understanding of a mean average and to use a previous mean bowling score to find what score would be needed in order to exceed the past mean in the present bowling game. The problem is in the idea that the player needed to score more to still achieve the same average. A small number of learners did not refer to 473 at all or began their calculations by finding a mean using this value. Only a small number realised that Andy was incorrect as he could score 160 and get a mean greater than 158. A substantial number of learners managed to add 160 to 473 and then go on to calculate that this would give a mean score of 158.25, but then failed to capitalise on this by not going on to a sensible conclusion within the context of the question. Centres need to keep in mind that all types of problem involving average may be assessed, and all types need to be studied in a wide variety of situations, especially with a view as to their function and suitability. The check at the end was reasonably well done, with many learners picking up a mark for showing a reverse process for part or all of their calculation. Credit was given even when the original calculations were erroneous. However, there were still too many learners who just repeated their previous calculations or ignored the check requirement completely.

**Q3(b)** – The next question required learners to draw graph to compare the highest and lowest scores of the five friends bowling scores. Learners struggled to find a suitable scale, with too many using scales that were far too small for this question, commonly resulting in 1 square being worth 5, or 25 or 100 or more, thus they were unable to correctly interpret the scale they had chosen, which in turn lead to them not being able to plot the data accurately. There were examples of two different graphs being drawn which were not useful in being able to easily make a comparison of the highest and lowest scores achieved or a key was not present to distinguish which data set was which. The main points that centres need to focus on here are correct and fully labelled axes and titles, as well as accurate plotting and sensible scales. Learners should be encouraged to use scales of 1 square being 2 units or better. Obviously this depends on the data being displayed, so correct units and sensible scales should be considered at all times. Learners must be encouraged to graph information in a methodical way. Graphs are meant to be a simpler way of reading information and in a lot of responses this was not entirely the case. Learners should be able to address this problem in the classroom by discussing their graphs within their group and allowing their peers to highlight problems that create a difficult to read or inaccurate graph. Being able to draw a bar chart should not be the limits of the learner's skills. They should also be able to assess whether their

representation is appropriate and accurate enough for the information they are representing.

**Q3(c)** – The final question in this section required the learner to comment on who was the most consistent bowler based on the highest and lowest scores. This could be approached by either calculating the range or by interpreting the graph drawn in the previous part of the question by considering the difference in height of the bars. Most managed to identify that Dom was the most consistent player and were then also able to explain why. Each approach to answering this question was used evenly, with neither method being favoured more than the other. This was a good use of the concept of range, but some learners based their response on unsuitable reasons such as using the mean or simply choosing the player with the highest score. However, giving an explanation was part of the question and learners can demonstrate these skills by being encouraged via questioning. Why did you do that? Was there anything that could be done differently? Did your method get the results you expected?

## **Section B**

**Q4(a)** – This question assessed learners' knowledge and understanding of calculating with both a fractional and a percentage discount for different offers and then making a decision on which was the best value for money. There were a substantial number of correct answers, with responses structured clearly and accurately. However, in the cases where the response was not completed successfully, it was generally noted that the learner had not actually completed the processes required. Returning to the question can allow learners the opportunity to consider whether they have completed the required tasks and whether their answer is enough to gain all marks. Centres need to remind their students that applying a discount requires an amount to be taken off, or the original amount needs to be multiplied by a fraction, in this case 0.75 and 0.55. There are still too many learners who think that "1/4 off" means "-25p", or "-£2.50" or "-£25". They should also deal with the idea that  $\frac{1}{4}$  is not 0.14. These learners usually compounded their error by thinking that "45% off" means "-45p" etc. This showed a fundamental lack of understanding of equivalence with fractions, decimals and percentages. The check at the end was reasonably well done, with many learners picking up a mark for reverse process. However, there were still too many learners who just repeated their previous calculations.

**Q4(b)** – It was disappointing to see the high volume of blank responses to this question which required the use and interpretation of a map scale followed by identifying and drawing the locus of points where the hot air balloon could land. Scale as a task must be included in the teaching of FS Maths. Learners must be able to show that they understand the basic principles of scale and its uses. In this case, most learners could not start to address the problem, although a few managed a totally correct answer and some found 6cm on the map was equivalent to 30km, but then did not have compasses to draw the required circle. There were many freehand circles drawn, most were not the correct size. Planning for an examination must include bringing the correct equipment if it is not provided by the centre. Of those who attempted this question, few were able to convert km to m to cm correctly. In order to prepare learners, there should be a mix of tasks when addressing this subject. Centres need to look at scale on maps and practice using real life situations, for example search and rescue missions or using scale on blueprints. Learning opportunities could include tasks that require the student to draw to a chosen scale or read a scale in order to solve a problem. How far away is...? Can you fit this item into this space given a scale? Design a workshop, shop, flat, bedroom and so on... using a chosen scale.

**Q5 (a)** – This unit conversion question was answered extremely well by the majority of learners, with many successfully demonstrating that they could use the conversion factor between metres and feet and could reach

a final correct answer with relative ease. Marks were lost by learners who confused their units in the answer and there were a few who did not consider how sensible their answer was. The balloon was at 4000 feet, so learners who responded by stating that the balloon was actually 2,544,000 feet above the mountain top was not sensible and demonstrated that there may be confusion as to when to multiply by the conversion rate or when to divide.

It was also very encouraging to note that the majority of learners did show a check of their working, with many using an alternative method by means of converting the figures to the other unit used.

**Q5(b).** – The final question in this section challenged learners to work with distance, time and speed without being provided with the formula for this compound measure. Not only are learners required to know this formula, they are also required to know how to convert between decimal time and base 60 time which also caused the majority of learner's difficulty in being successful with this question. The main cause of lost marks came from learners who thought that 1 hour 24 minutes equated to 1.24 as a decimalised time. However, such learners were able to gain some credit for being able to correctly make use of the speed, distance and time formula in this instance. Many got confused with their formulae – getting their calculations upside down or completely wrong. Others showed the SDT triangle, but it wasn't helpful for learners who then did not attempt a substitution. Teaching students that 0.1 of an hour is 6 mins as a rule so that they are then able to see this link and find solutions when give decimalised time would be of great benefit for learners.

## Section C

**Q6(a)** – This first question in the final section required learners to use units consistently and then make a substitution into a formula to identify the most suitable pond liner based upon size. Many fundamental mistakes were made when engaging with the formula. Some learners thought that “2d” meant “d × d” – evidenced by  $0.75 \times 0.75$ , and there were a few that used  $2 \times 0.75 \times 4.2$  or  $2 \times (0.75+4.2)$  – thus misinterpreting the formula. There were too many instances of using inconsistent units with many learners then only being credited for the substitution element. Some learners used cm all the way through, which was fine, but they then needed to then convert back to metres at the end. However, in general, this question was answered reasonably well. Centres should be encouraged to continue with their practice of formula substitution and unit consistency in order to prepare learners fully with the knowledge they require. Building unit conversion into multistage problems such as this or when working functionally with area and perimeter would be useful for learners rather than to teach unit conversion as a standalone topic.

**Q6(b)** – This next question required the learner to calculate with money and a fractional discount for 1 item and showing a check of working. It was well attempted by a large number of learners, with many gaining full marks. Errors in the main were finding a total cost for all items and then taking 1/5 off the total cost rather than only apply the discount to the single item. This shows that some learners rush through the problem and then misinterpret what is being asked as the question clearly stated that the discount was for the pond liner, not all of the other items in the list. There were a few learners who thought that -20% means -20p or -£20, with some also assuming that one fifth meant a discount of 5%, and centres need to address this misconception.

**Q6(c)** - It was encouraging to see that so many learners were able to approach this less familiar question using a variety of methods. Learners were required to combine converting between litres and gallons and also consider a rate of flow over a period of time. Finding figures to compare is being done much better by more learners. The conversion of units was attempted well, with many establishing that they needed to begin solving the problem by either converting the litres to gallons, calculating the rate of flow per minute in litres or combining two steps and calculating how many gallons would flow per hour. Some learners fell at the last hurdle by not completely understanding what was being asked and usually failing to compare 131 minutes required to the 120 minutes suggested as the time needed. Centres should encourage their students to look at their answers when they have finished a question and compare their response with what is being asked.

**Q7** – The majority of learners were able to begin to substitute the given values into the formula correctly and successfully continue on to find a selection of fish that met the constraints of the maximum total length for the size of the pond combined with number and type of each fish required. Units were important in this question, and it was clear that the formula required dimensions in metres, not centimetres in the substitution. There was understandable confusion here as the fish lengths were given in centimetres. However, there was no ambiguity. Several learners used centimetres when substituting into the formula and then proceeded to calculate fish lengths based on their answer to the first stage of the problem. This gave them a rather large total length and demonstrated an answer that was not a sensible outcome or a realistic possibility. Learners should therefore be encouraged to check whether their response is realistic in the context of the question. Learners who successfully engaged with the first stage or partially succeeded then continued but a large number of learners lost credit as they interpreted “more than 12” as “equal to 12”. Many saw the 12 and skim read and used 12 instead of 13 or more. A few used less than 4 of any one type of fish, another constraint that should not have been ignored. A full method of calculating the total length of fish was required for this question and all too often a total length was not given and thus a comparison could not be made. Centres need to emphasise that functional skills solutions should contain evidence of process, together with a reasonable explanation of their answer when needed.

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