

# Problem Solving: A Level 1 and 2 Functional Skills maths guide

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Post-16 English and maths

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# Training Overview

1. Problem Solving vs Underpinning
2. A Plan For Problem Solving
3. Example 1
4. Example 2



# Maths





# **Problem Solving and Underpinning Skills**

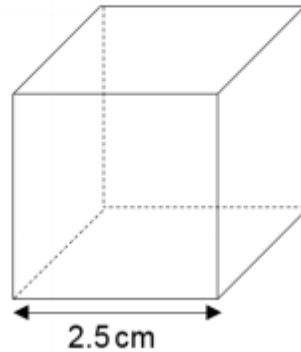
# Introducing underpinning skills and problem solving skills

In the new Reformed Functional Skills, problem solving skills and underpinning skills have been separated.

- Underpinning skills questions may be in a context but they are more structured than the problem solving questions.
- They assess the learners' knowledge and understanding rather than their ability to apply this knowledge and understanding.
- Underpinning skills form 25% of the marks across the paper.

# Underpinning vs Problem Solving

Here is a cube of side length 2.5 cm.



Work out the surface area of this cube.

This is a level 2 underpinning skills question.

Notice there is no context here, just a straightforward question on surface area.

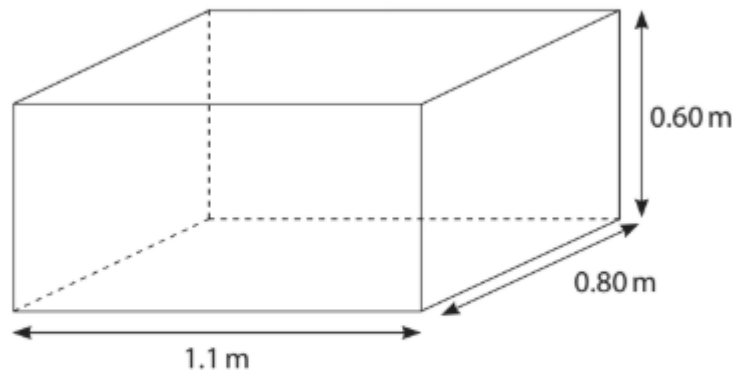
The learners are even told it is a surface area question.

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# Underpinning vs Problem Solving

James has a contract to paint 30 identical water tanks.  
He has to paint the outside surfaces of each tank, but not the top.

Each surface is rectangular.



James knows that 1 tin of paint

- is enough to cover  $12 \text{ m}^2$  of surface
- costs £26.99

Work out the total cost of the tins of paint he will need for all 30 water tanks.

This is a problem solving variation on the same topic. Notice first of all that there are a lot more marks involved in this question.

Also, it is not just looking at the learners' knowledge of surface area, other skills are involved here too.

Finally, the learners are not told in this question that they need to work out the surface area, understanding this is part of the problem solving aspect of the question.

(6)



# **A Plan For Problem Solving**



# Problem Solving Plan

Here is a five stage plan for problem solving in maths:

- Read the question carefully.
- Rewrite the question in your own words.
- Cross out any unnecessary information.
- Underline the important aspects of the question.
- Answer the question in stages.

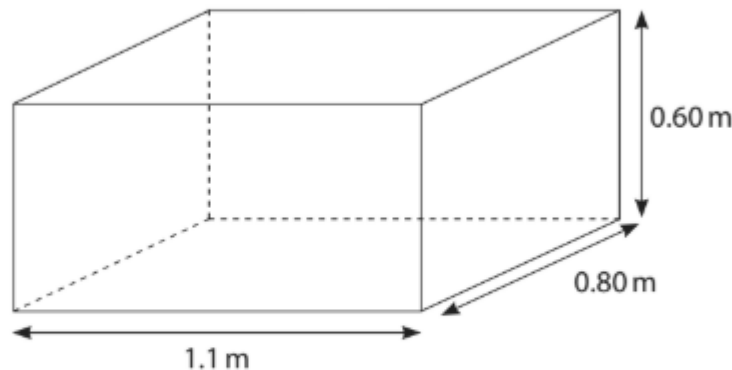
One tip is to act as the calculator while a group of learners take you through the stages of what they need to do, so the learners focus on what needs to be done (the problem solving) rather than the maths itself.

# **Example 1**

# Problem Solving example 1

James has a contract to paint 30 identical water tanks.  
He has to paint the outside surfaces of each tank, but not the top.

Each surface is rectangular.



James knows that 1 tin of paint

- is enough to cover  $12 \text{ m}^2$  of surface
- costs £26.99

Firstly, I have read the question.

Secondly, in my own words I need to work out how much paint I need to paint 30 water tanks and how much this will cost.

Key phrases:

- Outside surfaces – this means surface area.
- Not the top – I can skip this bit.
- 30 tanks in total
- 1 tin of paint covers  $12 \text{ m}^2$  and costs £26.99

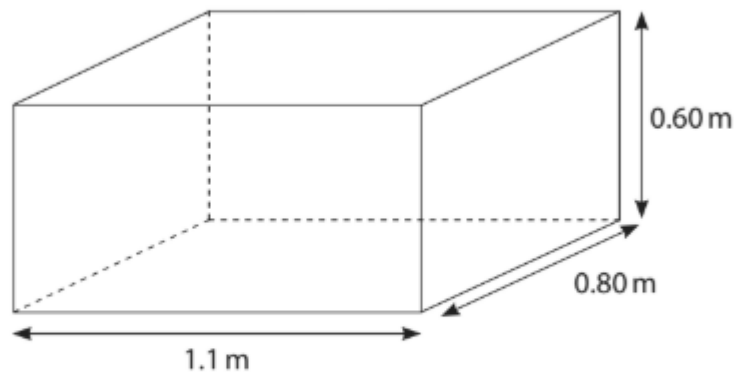
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First, I will find the surface area of 1 tank.

The front and back are 1.1 m by 0.6 m

- $1.1 \times 0.6 = 0.66 \text{ m}^2$

There are 2 sides...

- $0.66 \times 2 = 1.32 \text{ m}^2$

The two sides are 0.8 m by 0.6 m

- $0.8 \times 0.6 = 0.48 \text{ m}^2$

Again, there are 2 of these...

- $0.48 \times 2 = 0.96 \text{ m}^2$

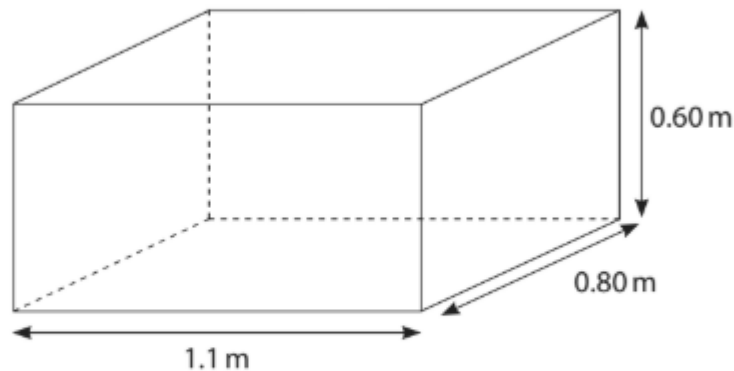
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Each surface is rectangular.



James knows that 1 tin of paint

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Finally I need to find the area of the bottom, which is 1.1m by 0.8m

- $1.1 \times 0.8 = 0.88$

The total surface for one tank is:

- $1.32 + 0.96 + 0.88 = 3.16$

Now I need to multiply this by 30 for the 30 tanks.

- $30 \times 3.16 = 94.8$

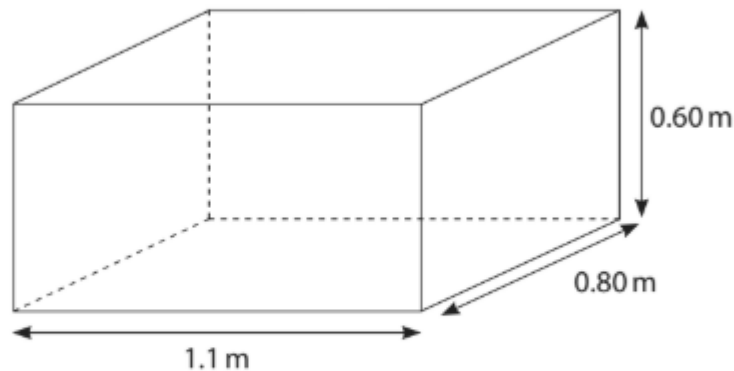
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(6)

# Problem Solving example 1

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He has to paint the outside surfaces of each tank, but not the top.

Each surface is rectangular.



James knows that 1 tin of paint

- is enough to cover  $12 \text{ m}^2$  of surface
- costs £26.99

I know that one tin of paint covers  $12 \text{ m}^2$ , so I need to work out how many tins I need.

$94.8$  divided by  $12 = 7.9$

So I need 8 tins.

The cost will therefore be:

$26.99 \times 8 = \text{£}215.92$

Work out the total cost of the tins of paint he will need for all 30 water tanks.

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# **Example 1**

# Problem Solving example 2

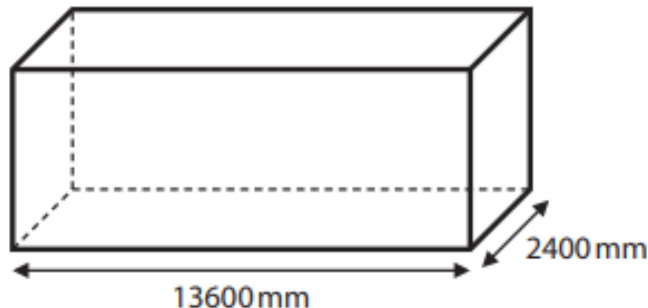
A team of workers deliver identical fridges.

The team will use the average time to fully load an old lorry to predict the time to fully load a new lorry.

The table shows the times it took to fully load the old lorry with 24 fridges.

Time (mins)	52	60	55	59	54	63	56
-------------	----	----	----	----	----	----	----

The diagram shows the space available for fridges in the new lorry. The space is in the shape of a cuboid.



Each fridge needs a rectangular floor space 1000 mm by 800 mm.

The team do not stack fridges.

They think it will take less than 90 minutes to fully load the new lorry.

Are they correct?

Firstly, I have read the question.

Secondly, in my own words I need to work out how long it will take to load the fridges on the new lorry

Key phrases:

- Average time
- 24 fridges
- Lorry 13600mm by 2400mm
- Fridge 1000mm by 800mm
- 90 minutes

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# Problem Solving example 2

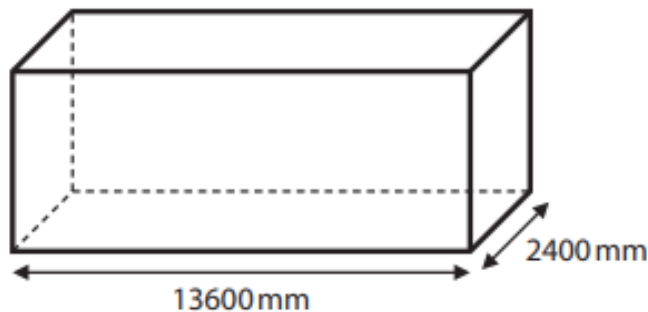
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Are they correct?

Firstly, I need to work out the average time to load one fridge on the lorry.

The question uses the word average, so I can choose the average I use. I am going to use the median as it an easier number to work out.

Median = 56 minutes.

For one fridge this would be 56 divided by 24 = 2.3 recurring.

Remember this is time so this is 2min 20 sec.

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# Problem Solving example 2

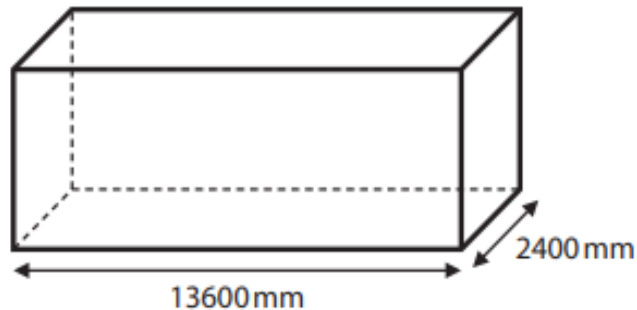
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Are they correct?

Now I need to work out how many fridges will go on the new lorry. I cannot cut up a fridge so I cannot work out the area of a fridge and the lorry and use that info.

So I can work out how many go down the long side

- $13600$  divided by  $1000 = 13$

And on the short side...

- $2400$  divided by  $800 = 3$

By multiply 13 by 3 I can work out the number of fridges.

- $13 \times 3 = 39$

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# Problem Solving example 2

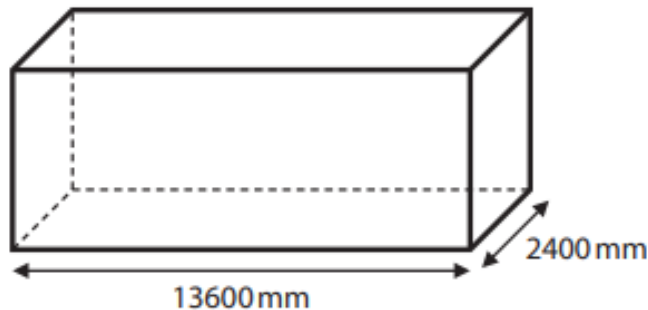
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Each fridge needs a rectangular floor space 1000 mm by 800 mm.

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Are they correct?

So, each fridge takes 2min 20 seconds and there are 39 fridges.

- $39 \times 2 = 78$  minutes
- 20 sec  $\times$  39 fridges is more complicated.

However if I say 3 fridges equals 1 minute then this is:

- $1 \times 39/3 = 13$  minutes

So the total time is 91 minutes, and they are incorrect.

(6)



**There's so much  
more to learn**

ALWAYS LEARNING