JOB TEST PREP

FREE GCSE MATHS

FOUNDATION LEVEL SAMPLE QUESTIONS

PRACTISE FOR THE 2017 GCSE MATHS PAPERS

FREE GCSE SAMPLE QUESTIONS: PRACTISE FOR THE 2017 GCSE MATHS PAPERS

Below you will find sample questions and answers replicating some of the major content areas that appear on the GCSE foundation tier Maths exam. For more information about the GCSEs, visit our [GCSE Past Papers page](#).

GCSE MATHS FOUNDATION LEVEL: NON-CALCULATOR QUESTIONS

The following questions are examples of a questions likely to appear on a GCSE Maths foundation level exam. Note, that the use of calculators would NOT be permitted for such questions.

Question 1

1) Ethan says,

   "If you halve a whole number that ends in a 6, the answer always ends in a 3."

a) Give an example to show that Ethan is wrong. (1)

   Su says,

   "Because 3 and 13 are both prime numbers, all whole numbers ending in 3 are prime."

b) Is Su correct? You must give a reason with your answer.

Question 2

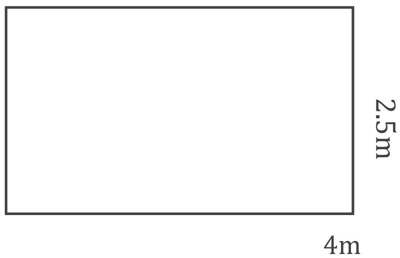
Solve the simultaneous equations

$$3x + 2y = 11$$

$$x - 4y = 13$$

Question 3

The diagram below shows a rectangular floor.



Ruth wants to cover the floor in a mosaic made from rectangular tiles. Each tile is 20 cm by 50 cm.

65% of the tiles will be red.

The remaining tiles will be black or gold.

The ratio of black to gold tiles will be 2:3.

a) Assuming there are no gaps between the tiles, how many tiles of each colour will Ruth need?

(5)

b) If Ruth chooses to leave gaps between the tiles, how could this affect the number of tiles she will need?

Answers & Explanations

Question	Answer	Notes
1. a)	Example	C1 for appropriate example shown, eg 16.
b)	Example	C1 for conclusion and appropriate example shown, eg 63.

a) If you halve 6, you will get 3, but with larger numbers this is not always the case. Work backwards and think if there are other numbers that will end in a 6 when they are doubled. 3 will always end in a 6, but so will 8, as $8 \times 2 = 16$.

Therefore, 16 is one example of a number that will not end in a 3 when it is halved. There are other examples here you could choose, for example 36, 56, etc.

b) For a number to be prime, it must have only two factors: itself and 1.

For example, the factors of 13 are 1 and 13. Thus, it is prime.
The factors of 15 are 1, 3, 5, and 15. As it has more than two factors, it is not prime.

Su thinks that all numbers which end in 3 are prime. To prove if she is correct or not, try out some numbers first.

23: This has only two factors, 1 and 23. Thus, it is prime.

33: This has four factors, 1, 3, 11, and 33. So, it is not a prime number.

Therefore, you can conclude that she is wrong, as you have found an example where a number ends in 3 but is not prime.

There are, in fact, an infinite number of examples to prove she is wrong. For example: 63, 93, 123, etc.

Question	Answer	Notes
2	$x = 5$ $y = -2$	M1 for correct process to eliminate one variable (condone one arithmetic error) M1 (dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error) A1 for both correct solutions.

Linear simultaneous equations such as these can be solved most easily using the elimination or substitution methods. Both methods aim to remove one of the variables in an equation so it can be solved.

Elimination Method

In this method, you must match up the numerical coefficients of either x or y by multiplying equations. The negative or positive signs need not match. If you choose to match up the x values, then multiply the second equation by 3 so that both equations contain $3x$.

Equation 1: $\boldsymbol{3x} + 2y = 11$

Equation 2: $3(x - 4y = 13) \to \boldsymbol{3x} - 12y = 39.$

Now the x coefficients match. As you have multiplied every value in the equation by 3, you have not changed the meaning of the equation. The values of x and y remain the same.

Writing the equations one on top of the other, it is possible to then see that if you subtract one from the other the x terms will disappear.

Equation 1: $\boldsymbol{3x} + 2y = 11$
Equation 2: $\underline{\boldsymbol{3x} - 12y = 39.}$
Subtract: $0 + 14y = -28$

Note: It is possible to subtract the equations in either order.

Be careful when subtracting the y terms. As you are subtracting an already negative number, the two negatives become a positive and the calculation becomes: $2y + 12y$.

You have now eliminated the x terms and are just left with an equation in terms of y, which can be solved more easily, to find your first variable.

$14y = -28$ // divide both sides by 14.
$\underline{\boldsymbol{y = -2.}}$

Finally, substitute this value into either equation 1 or equation 2 to find x.

Equation 1: $3x + 2(-2) = 11$ // simplify the equation
$3x - 4 = 11$ // add 4 to both sides
$3x = 15$ // divide both sides by 3
$\underline{\boldsymbol{x = 5}}$

You now have your two answers: $\boldsymbol{y = -2}$ and $\boldsymbol{x = 5}$.

It is also possible to have first matched the y coefficients by multiplying equation 1 by 2 and then adding both equations to get rid of y. Now, as one of the values of y is positive and one is negative, the only way they will cancel to zero is by adding.

Equation 1: $6x + 4y = 22$
Equation 2: $\underline{x - 4y = 13}$
Add: $7x = 35$

Now, solve for x and then find y using the same methods as shown.

<u>Substitution Method</u>

In this method, you are required to first rearrange one equation to make x or y the subject, and then substitute into the second equation to solve. In equation two, you can make x the subject by moving the y term to the other side:

$x - 4y = 13$ // add 4y to both sides
$x = 4y + 13.$

This expression for x can now be substituted into equation 2, to leave you with an equation all in terms of y. This can then be solved.

$3x + 2y = 11$ // replace x with $4y + 13$
$3(4y + 13) + 2y = 11$ // expand brackets
$12y + 39 + 2y = 11$ // simplify
$14y + 39 = 11$ // subtract 39 from both sides
$14y = -28$ // divide both sides by 14
$\underline{\boldsymbol{y = -2}}$

You can continue to find x in the way shown previously.

Question	Answer	Notes
3a)	Red = 65 Black = 14 Gold = 21	P1 for process to start to solve the problem Eg $400 \div 20$, or 4×2.5 P1 for a complete process to find the total number of tiles (=100) P1 for 65% x 100 (= 65) P1 for $(100 - 65) \div 5$ A1 for correct answer only
b)	Correct statement	C1 for eg "fewer tiles may be needed"

Questions such as these are multi-step problems and can look daunting. But, it is always worth attempting to get at least a few marks, even if you cannot see how to solve the problem to completion.

Break down the process into logical steps. These steps are often how the mark scheme awards marks.

Step 1:
Calculate how many tiles are needed in total.

Step 2:
Calculate how many red tiles are needed.

Step 3:
Calculate how many tiles are remaining.

Step 4:
Calculate how many black and gold tiles there will be.

Step 1:
To calculate how many tiles are needed, you can divide the area of the floor by the area of each tile. Take care to convert everything into either centimetres or metres first.

Area of floor: $400\text{ cm} \times 250\text{ cm} = 100{,}000\text{ cm}^2$
Area of tile: $20\text{ cm} \times 50\text{ cm} = 1{,}000\text{ cm}^2$
Number of tiles: $100{,}000 \div 1{,}000 =$ **100 tiles**

Alternatively, work out how many tiles would fit along and across the floor. If the length of the floor is 4m = 400cm, and the length of each tile is 20cm, then divide to calculate how many tiles you can tile along.

$400 \div 20 = 20$ tiles

If the width of the floor is 2.5 m = 250 cm, and the length of each tile is 50cm, then divide to calculate how many tiles you can tile across.

$$250 \div 50 = 50 \text{ tiles}$$

So, if you could fit 20 tiles along the length and 50 tiles across the width, then altogether you could fit 100 tiles on the floor, as $50 \times 20 = 100$ tiles.

Step 2:
65% of the tiles are red, so calculate 65% of 100. As percent means out of 100, then 65% of 100 is simply 65 tiles.

Step 3:
To find the number of remaining tiles, subtract the number of red tiles from the total.

$100 - 65 = 35$ tiles.

Step 4:
Those 35 tiles are split in the ratio 2: 3. For every two black tiles, there are three gold tiles.

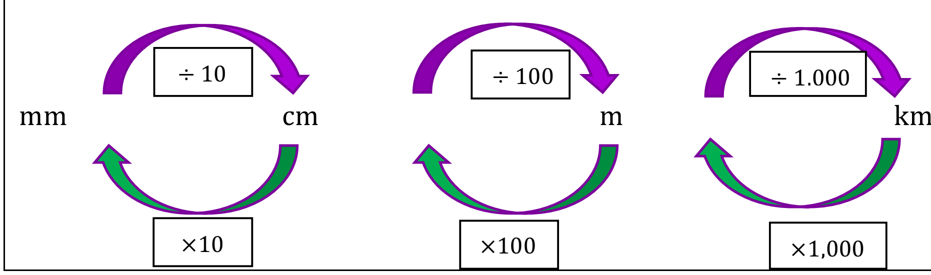
One way to look at it is to see each section as five tiles and work out how many sections would fit.
As there are 35 tiles, $35 \div 5 = 7$.
So, this pattern would repeat seven times.

That would give $7 \times 2 = 14$ black tiles.
$7 \times 3 = 21$ gold tiles.

In general, divide the total by the total parts of the ratio and then multiply by each individual ratio.

So, altogether, there are:
65 red tiles, 14 black tiles, and 21 gold tiles.

<u>Solving Tip:</u>
Learn the conversion rules between metric units. There are 10 mm in 1 cm. There are 100 cm in 1 m. There are 1,000 m in 1 km.



GCSE MATHS FOUNDATION LEVEL: CALCULATOR QUESTIONS

The following questions are examples of a questions likely to appear on a GCSE Maths foundation level exam. Note, that the use of calculators is permitted for these questions.

Question 4

Here are the ingredients needed to make 12 gingerbread men.

Gingerbread Men

Ingredients to make **12**:

250 g butter

2 teaspoons ground ginger

200 g brown sugar

300g flour

1 egg

Nikisha wants to make 30 gingerbread men.

Work out how much of each ingredient she needs.

Question 5

Bobby thinks of a whole number.

He multiplies it by 5.

His answer is 37.

a) Explain how you know Bobby's answer is wrong. (1)

Here is a number machine.

input → $\boxed{\div 3}$ → $\boxed{+ 8}$ → output

Chelsea says that when the output is 24, the input is 0.

Here is her working.

$$24 \div 3 = 8$$
$$8 - 8 = 0.$$

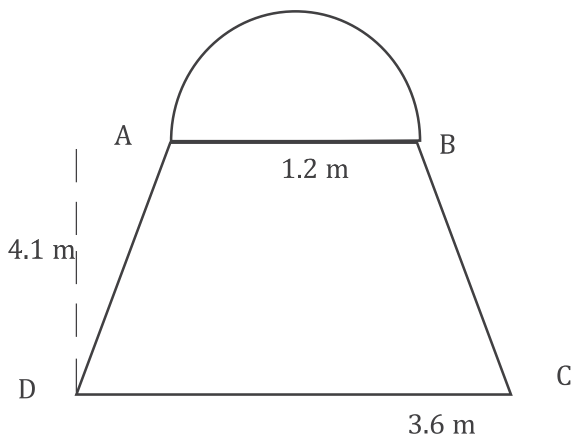
Chelsea is wrong.

b) Explain what she has done wrong.

Question 6

A flowerbed is in the shape of a trapezium, ABCD, and a semicircle.

AB is the diameter of the semicircle.



Jim is going to cover the flowerbed in seeds.
A packet of seeds costs £2.99.
Jim has been told that one packet of seeds will cover 1.5 m^2 of soil.

a) Work out the cost of covering the whole flowerbed in seeds. (5)

Jim discovers that one packet will cover less than 1.5 m^2 of soil.

b) Explain how this might affect the number of packets of seeds he will need to buy. (1)

Answers & Explanations

Question	Answer	Notes
4)	625g butter 5 tsp ginger 500g sugar 750g flour 2.5 eggs	M1 for $\div 12 \times 30$ oe or $30 \div 12$ ($= 2.5$) A1 for 2 or 3 correct A1 cao.

This question is about keeping the same proportional relationship throughout. This means multiplying all the ingredients by the same number, or otherwise the recipe will taste different.

Currently, the ingredients make 12 gingerbread men. If Nikisha wants to make 30, one option is to first calculate the ingredients needed for one gingerbread man and then multiply up to make 30.

<u>Option 1:</u>
To make one gingerbread man: ÷ by 12.

To make 30 gingerbread men: × answer by 30.

For example: $\mathbf{300\ g\ flour \div 12 = 25\ g\ flour.}$
$\mathbf{25\ g\ flour \times 30 = 750\ g\ flour.}$

<u>Option 2:</u>
The second option is to find out how to get from 12 to 30 in one step. Do this by dividing 30 by 12.

$30 \div 12 = 2.5$

This means, as 30 is 2.5 times bigger than 12, you need to multiply all the ingredients by 2.5.

For example: $\mathbf{300\ g\ flour \times 2.5 = 750\ g\ flour.}$

The result should be the same, whether you use method 1 or 2.

Therefore, the ingredients Nikisha should use are:

625g butter
5 tsp ginger
500g sugar
750g flour
2.5 eggs

Question	Answer	Notes
5)	Explanation Explanation	C1 for 37 is not a multiple of 5. Or multiples of 5 end in a 5 or a 0 C1 explains order of operations not correct C1 explains the inverse of $\div 3$ not used oe.

a) Bobby thinks of a whole number and then multiplies it by 5. This means he should now have a number in the five times table. The answer he gets is 37. However, 37 is not in the five times table, so he must have made a mistake.

This can be shown in two ways. Firstly, consider the numbers in the five times table to see if 37 appears:

5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, ….

Here, it can be seen that 37 is not in the five times table.

Furthermore, you can see that all the numbers in the five times table end in 5 or a 0. Therefore, 37 does not fit that pattern and Bobby must be wrong.

b) This number machine can work in either direction. If you input a number in the left side of the machine and follow the operations, you will get a different number as the output.

If you were to put a number in the right side of the machine as an output, and work to the left, then you must reverse the operations as you are moving in the reverse direction.

You must also keep everything in the order it appears in the machine. So, if you were travelling right to left, the machine should look like this:

$$\text{input} \longleftarrow \boxed{\times 3} \longleftarrow \boxed{-8} \longleftarrow \text{output}$$

This is because the inverse of addition is subtraction, so the inverse of $+8$ is -8. Similarly, the inverse of division is multiplication, so the inverse of $\div 3$ is $\times 3$.

When Chelsea went through the function machine backwards, she made two mistakes:

(i) She forgot to find the inverse operation of $\div 3$ and used $\div 3$ when she should have used $\times 3$.

(ii) She changed the order in which the operations appear. If you are putting in a number as an output, then you use the operations right to left, while she used them left to right.

The correct process would have been:

$$24 - 8 = 16$$

$$16 \times 3 = 48$$

If the output was 24, the input should have been **48**. Therefore, Chelsea was wrong.

Question	Answer	Notes
6 a)	£20.93	P1 process to find area of circle or semicircle $\pi \times 0.6^2$ ($\div$ 2) P1 process to find area of trapezium (= 9.84 m^2) P1 process to find number of packets "10.41" ÷ 1.5 P1 process to find cost "7" × 2.99 A1 cao
b)	Correct statement	C1 eg. He might need to buy more boxes.

a) This question should be solved in logical stages.
 (i) Find the area of the trapezium.
 (ii) Find the area of the semicircle.
 (iii) Find the total area of the flowerbed.
 (iv) Work out the number of packets needed.
 (v) Work out the total cost.

First, recall the formula for the area of a trapezium: $\boxed{A = \frac{1}{2}(a + b)\, h}$

In this formula, a and b are the parallel sides and h is the perpendicular height.

Therefore, $A = \frac{1}{2}(1.2 + 3.6) \times 4.1 = \mathbf{9.84\ m^2}$.

Next, find the area of a semicircle. This will be half the area of a circle: $\boxed{A = \pi r^2}$

Here, r is the radius of the circle. If the diameter is 1.2 m, then the radius is half the diameter, which is 0.6 m. You must also halve the formula above as you only want a semicircle.

So, the area of the semicircle is: $A = \frac{1}{2}(\pi \times 0.6^2) = \mathbf{0.57\ m^2}$ (2 dp).

Therefore, the total area of the flowerbed is $9.84 + 0.57 = \mathbf{10.41\ m^2}$.

Jim must cover an area of 10.41 m^2, and each packet of seeds will cover 1.5 m^2, so to determine how many packets he will need, you must calculate how many lots of 1.5 m^2 are in 10.41 m^2. This can be done by dividing.

$10.41 \div 1.5 = 6.94$ packets

It is not possible to buy part of a packet of seeds. Therefore, Jim must buy **seven packets** to ensure he has enough to cover the flowerbed.

The final step is to calculate the total cost of buying seven packets of seeds. Each packet costs £2.99, so to find the cost of seven packets, you must multiply:

$7 \times 2.99 = 20.93$.

Therefore, Jim must pay £20.93.

Solving Tip:

In the new GCSE, you are no longer provided with a formula booklet. Therefore, you must learn the formulae for areas and volumes of shapes. However, if you forget a formula, for example the area of a trapezium, you can split the trapezium up into simpler shapes like triangles and rectangles and find its area that way.

b) If Jim discovers that each packet of seeds covers less than 1.5 m^2 of soil, then he might have to buy more packets to cover the whole flowerbed. It is not certain that he will need to buy more as he already has slightly more seeds than he needed. This was because he was not able to buy part of a pack, so he bought seven packets when he needed 6.94.

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