

GCSE Foundation

Mathematics examination calculator 2013 A

Answers

LEVELS

- . **Basics** : you ought to know the answers without even having thought for a second.
- **English** : answers are more related to the language than properly addressing your level in mathematics. You ought to know this vocabulary.
- . **Niveau 3ème** : nothing to add.
- . **High school** : some subtlety, need to be mastered completely before the examination.
- . **Tricky** : don't be too harsh on yourself if you did not answer properly.

INSTRUCTIONS

- . Please do the test under the proper examination conditions. If I understood well, 1 hour for the calculator paper and 1 hour for the paper without calculator.
- . Do not spend too much time on a question if the answer does not come quickly : you will come back to it later.
- . Everyone should be able to do the questions which are of the **basic level in a blink**. I insist.
- . The questions of **niveau troisième** should not give you any problem if you can remember what you did for the *brevet des collèges* (memories will come back, do not worry). This level is the **strict minimum** to master in order to get the average on the test. If you find yourself having problems with these, it should be your top priority.
- . The questions of **high-school level** may give you some issues : if you are comfortable with the lower levels, focus on mastering these.
- . The **tricky questions** should not make you afraid : they are few, and should not disadvantage you that much. If you are at ease with the lower levels, a little abstraction effort should be sufficient to answer.
- . The goal is of course to obtain average marks on the test. Nevertheless, I am convinced a little work can make you obtain a proper mark. Good luck!

Question 1 - a), 1pt £2.80

Question 1 - b), 1pt £2.06

Indication : You should obviously get all marks on these.

Question 2 - a), 1pt "The sun will shine in July next year in London" : is a **likely event** (with a certain optimism regarding the British weather...)

Question 2 - b), 1pt "The next baby to be born will be a boy" is an event that has an **even chance** to happen. In other words, the probability to be born a boy is $\frac{1}{2}$, or there is 50% chance to be born a boy. (This is a classical simplification : biologically speaking, the chance to be born a boy is slightly higher, see <https://www.pewresearch.org/fact-tank/2013/09/24/the-odds-that-you-will-give-birth-to-a-boy-or-girl-depend-on-where-in-the>

world-you-live/. But not so many people are aware of this fact : please do answer "even chance" if confronted to this question.)

Question 2 - c), 1pt "There will be 50 days next month" is an **impossible event** : the maximum number of days in a month is 31.

Indication : Pay attention to the subtleties : a **certain event** is an event that cannot be avoided, e.g "Everyone eventually dies" is a certain event, while "everyone eventually dies after their first birthday" is a likely event, some babies dying unfortunately before this date.

Question 3, 2pt A two-stage machine is a "machine" (a factory) that, given an input number x (a material), will give you an output number y (a product). To keep the analogy with the factory, given apples (the material), my factory gives me fruit purée (the product). Mathematically speaking, we're working with functions. The "machine" gives you all of the instructions to obtain the output y solely knowing the input x .

Here, $f(x) = 10 \times x + 3$. Knowing that, you will perfectly be able to complete the table.

Indication : this is between the 3ème and 2nd class level. It is important to master this kind of questions.

Question 4, 3pt metres, stones, litres.

Indication : the only risk here is to be too uneasy with the imperial units.

Question 5, 2pt $5^2 = 25$, you should know your times tables. $\sqrt{3.24} = 1.8$, you should know how to compute the square root of a number using your calculator.

Indication : you should know how calculate simple multiplication and use a calculator at least for simple operations.

Question 6, 2pt You are asked to calculate only **one term** of the sequence. You should have noticed that starting from a number of the sequence, you have to add 3 to this number to get the following one.

Indication : Mathematically speaking, this is an *arithmetic sequence* : you have to add the same quantity to the current term to get the following one. This should have been seen in first year of high-school.

Question 7 - a), 2pt The right operation to do is to divide 20 by 0.85. One have :

$$\frac{20}{0.85} \simeq 23.5$$

23.5 is not an **integer**, in other words, "23.5 tulips" does not make sense, and you should consider the highest integer that is below 23.5. Sarah can thus buy up to 23 tulips.

Question 7 - b), 2pt Now that you know she can buy 23 tulips, calculate the price of 23 tulips :

$$23 \times 0.85 = \text{£}19.55$$

To calculate the change she will get, since she pays with a £20 note :

$$\text{£}20 - \text{£}19.55 = \text{£}0.45$$

Now, £0.45=45p.

Indication : The reasoning itself is not tricky, but be careful with the fact that the answer asks you to write the change in pences, not in pounds.

Question 8 - a), 1pt There are 12 boxes in total, and 5 out of them are shaded. The answer is $\frac{5}{12}$. **This is basic.**

Question 8 - b), 2pt Check that $\frac{2}{10} = \frac{2 \times 1}{2 \times 5} = \frac{1}{5}$, $\frac{4}{20} = \frac{4 \times 1}{4 \times 5} = \frac{1}{5}$, $\frac{5}{25} = \frac{5 \times 1}{5 \times 5} = \frac{1}{5}$.

On the other hand, $\frac{10}{20} = \frac{1 \times 10}{2 \times 10} = \frac{1}{2}$ and $\frac{3}{10}$ cannot be reduced further : the answer is $\frac{10}{20}$ and $\frac{3}{10}$. **Middle school level**

Question 8 - c), 2pt Calculate

$$\frac{3}{4} \times 64 = \frac{3 \times 4 \times 16}{4} = 3 \times 16 = 3 \times (10 + 6) = 3 \times 10 + 3 \times 6 = 30 + 18 = 48$$

Indication : The first two questions should be easy. The last one is tricky, for there can be some confusion over the term "out of". In question 8-a), "5 out of 12" means you consider 5 (students) over 12 (students), it will give you a percentage. In question 8-c), $\frac{3}{4}$ out of 64" means taking a percentage ($\frac{3}{4}$) out of a total quantity (64). Using a calculator is allowed.

Question 9 - a), 3pt

	Law	Engineering	Medicine	Total
Male	6	15	4	25
Female	5	6	14	25
Total	11	21	18	50

The quantities in **red** are the ones you can find first, by considering rows or lines which are lacking only one information. The quantities in **blue** follow. **Middle school level**

Question 9 - b), 2pt There is 11 law students, 6 out of them are males. The probability to be a male and to study law is $\frac{6}{11}$. **High school level, can be tricky if you think too much.**

Question 10 - a), 1pt $x = 5 \times 3 = 15$

Question 10 - b), 2pt

$$2y = 9 + 4$$

$$\Leftrightarrow 2y = 13$$

$$\Leftrightarrow y = \frac{13}{2}$$

Indication : These are taught in 3ème. Please make yourself practice resolving simple equations and inequations.

Question 11 - a), 1pt 11 gallons

Question 11 - b), 1pt 28 litres

Indication : Be careful with reading the graph, and counting the graduations.

Question 11 - c), 2pt Cross-multiplication problem (la fameuse "règle de trois"!)

$$50L \times £1.35 = £67.50$$

Question 11 - d), 2pt Same concept.

50L	?
11 gallons	1 gallon

and $? = \frac{50}{11} \simeq 4.55$ L .

Now, the price x of 1 gallon is the price of 4.55L : $x = 4.55 \times 1.35 \simeq £6.13$

A very rough estimate is £6 as the answer sheet suggests.

Indication : many people are uneasy with cross-multiplication problems. Be careful!

Question 12 - a), 1pt Answer E. This is elementary school level, you should be at ease with calculations involving hours and minutes.

Question 12 - b), 2pt You can solve this problem without having to convert minutes into hours and vice-versa as done in high school!

To go from 7h30 to 8h30 you need $1h = 60min$.

To go from 8h30 to 9h00 you need $30min$

To go from 9h00 to 9h04 you need $4min$.

Adding up yields $60 + 30 + 4 = 96min$.

Question 12 - c), 2pt Answer C. No comment

Question 13 - a), 2pt Answer : 0,506329114 Please make yourself practice using a calculator

Question 13 - b), 2pt You just have to get rid of the extra decimals (numbers after the coma) : 0.50. Careful with decimals! Many A-level students in France are still uneasy with them.

Question 14 - a), 2pt Cross-multiplication problem.

£	620	1
euros	?	1.15

and $? = 620 \times 1.15 = 713$ euros.

Question 14 - b), 3pt Same. First, work out the price of the perfume in Italy, in pounds.

£	?	1
euros	50	1.15

and $? = \frac{50 \times 1}{1.15} \simeq £43.48$.

Now work out the difference between costs :

$$£43.48 - £42.00 = £1.48$$

Indication : Cross-multiplication problems are to be mastered before the examination. Not tricky, but important! Be very careful in estimating values. Example : $1.542125 \simeq 1.54$ while $1.546125 \simeq 1.55$!

Question 15, 4pt

x	-2	-1	0	1	2
y	-2	1	4	7	10

and draw the graph accordingly.

Indication : This is taught in 3ème and 2nde. You have to practice computing with negative numbers $ex 3 \times (-2) + 4 = -6 + 4 = -2$ and be at ease the day of the examination.

Question 16 - a), 2pt The ribbon is **either** green, red, yellow, or white. It cannot be of another colour. In other words, the sum of the probabilities should give you a probability of 1. We will talk about this property together : when adding the chances (in %) of being of a certain color, you should get the chance of "being coloured", which is of %100.

Hence $p = 1 - (0.15 + 0.3 + 0.35) = 1 - (0.80) = 0.20$.

Question 16 - a), 2pt Probabilities can be viewed as percentages : the probability for the ribbon to be red is 0.3. It mean that you have 30 % chances for the ribbon to be red. In order to know the quantitiy of red ribbons among 500 ribbons, you should calculate how many ribbons is 30 % of the 500 ribbons. There are $0.3 \times 500 = 150$ red ribbons among

500 ribbons.

Indication : the hardest questions of the test are probably probability-related.

Question 17 - a), 1pt Easy, if you are careful with the graduations.

Question 17 - b), 1pt It shows a **positive correlation** : the more it rains, the more MR Jones sells umbrellas.

Question 17 - c), 2pt Reading on the graph, 7cm.

Indication : not too difficult, but you have to be precise when reading a graph.

Question 8, 3pt This is the Pythagorean theorem... Please do not mess it up, for the sake of all maths teachers.

Since ABC is a right-angled triangle in A , the Pythagorean theorem says :

$$BC^2 = AC^2 + AB^2$$

Now, you know the lengths of both BC and AC . Hence :

$$AB^2 = BC^2 - AC^2$$

$$\Leftrightarrow AB^2 = 18^2 - 12^2$$

$$\Leftrightarrow AB^2 = 324 - 144$$

$$\Leftrightarrow AB^2 = 180$$

which yields

$$AB = \sqrt{180} \simeq 13.42$$

The length of AB is of 13.42cm.

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Mathematics examination without calculator 2013 A

Answers

Question 1 - a), 1pt 15,672.

Question 1 - b), 1pt Three thousand and twenty.

Question 1 - c), 1pt 8200

Question 1 - d), 1pt 6000 six thousand.

Indication : Easy peasy.

Question 2 - a), 1pt $-6, -3, -2, 1, 7$

Question 2 - b), 1pt 0.06, 0.3, 0.35, 0.56, 0.63

Indication : Middle school level. you should be at ease with the negative number, and ordering quantities. Be careful with the second question, one tip is to write all the numbers with the same number of digits before ordering them. For exemple here 0.3 can actually be written 0.30, which facilitates the reasoning. (The classical confusion would be to think that 0.3 is less than 0.06...)

Question 3, 2pt Starting with milk : (MA), (MS), (MB). Starting with juice : (JA), (JS), (JB). And starting with water : (WA), (WS), and (WB). Which gives 9 combinations. (3 choices for drinks times 3 choices for snack = 9).

Indication : Combinations are not that difficult if you remain focused ! This question can be asked in elementary school to work on logical reasoning.

Question 4 - a), 1pt The length of PQ is 6cm.

Question 4 - b), 1pt The angle X is of 40° .

Question 4 - c), 1pt X is an acute angle.

Indication : please practice on using a ruler and a protractor. The vocabulary on angles is on the *brevet*'s programme.

Question 5 - a), 1pt Draw it.

Question 5 - b), 1pt The figure number 4 has 9 sticks, and the figure number 5 should have 11 sticks (you can draw it in order to count, but the idea is to infer the number of sticks of the n -th figure).

Question 5 - c), 1pt Idem, you can draw the 12-th figure in order to count, but the idea is to infer the result.

Question 5 - d), 1pt Now, denote by n the number of the figure. Given n , we wish to obtain the number of sticks used to build the n -th figure. You should observe that the number of sticks is given by :

$$n \times 2 + 1$$

Indication : Reasoning on sequences is taught in high-school, even though many students struggle with solving such problems. If this question is too difficult, do not waste too much time on it.

Question 6, 4pt 7 and 21 are an odd numbers. 10 and 20 are multiples of 5. $4 = 2^2$ and $16 = 4^2$ are squared numbers.

the number 12 can be decomposed in several manners : $12 = 6 \times 2$ and $12 = 2 \times 2 \times 3$ and $12 = 4 \times 3$. Only 4 appears in the list. 4 is thus the factor of 12 you are looking for.

Indication : keep in mind the difference between *odd* and *even*. Please revise your times table.

Question 7 - a), 2pt If one rectangle equals one centimeter **squared** (1cm^2), then the shaded triangle's area is of 15 cm^2 .

Question 7 - b), 1pt Counting the number of rectangles making the border of the shaded triangle yields a perimeter of 12cm. (The answer given in the official answer sheet is false.)

Indication : Here the wording of the problem should be considered carefully : it says the rectangle is drawn on a **centimeter grid**. Which means a small unit triangle is of length 1cm, even though with a proper ruler you will read 0.7cm. You **should not use your ruler** for this kind of exercise.

Question 8 - a), 1pt £1.55

Question 8 - b), 1pt Only the Cornflakes cereals box weights 375g.

Question 8 - c), 1pt Two boxes weight 600g : the Coco Pops' box and the Rice Krispies'

one. Now, only the Rice Krispies' box costs under £2.50.

Question 8 - d), 1pt One box of Coco Pops costs £2.79. Two boxes of Shreddies cost $2 \times 1.85 = £3.70$. Adding up :

$$2.79 + 3.70 = 6.49$$

Mark spends £6.49 on cereals.

Indication : this is an everyday life reasoning.

Question 9 - a), 1pt Point P has coordinates $(2, 3)$

Question 9 - b), 2pt First coordinate is on the x axis, second coordinate is on the y axis.

Indication : This is not too difficult but require having mastered the concept of points in the plane in high-school. We will review it.

Question 10 - a), 1pt The **mode** is the most represented figure in the data set. Here, 6 is the mode of this statistical sequence.

Question 10 - b), 1pt The **range** of a statistical sequence is equal to the difference between the highest number and the lowest number of said sequence. Here, the range is $15 - 4 = 11$.

Question 10 - c), 1pt the **median** of a statistical sequence is the number of the data set that separates it in two equal sets. To do so, you will have to reorganise the set starting from the lowest number :

$$4 \quad 6 \quad 6 \quad 8 \quad 9 \quad 12 \quad 15$$

There are 7 numbers in the set. We consequently take the number that will have 3 numbers before and after it. Here, it is 8.

Indication : We will revise statistics if you have problems with it. It is part of the middle school and high-school program but is not really mastered by most students, so do not worry.

Question 11 - a), 1pt Science fiction

Question 11 - b), 1pt $13\% = 0.13$ because $\frac{13}{100} = 13 \times 10^{-2} = 0.13$.

Question 11 - c), 1pt 24% actually means

$$\frac{24}{100} = \frac{2 \times 12}{2 \times 50} = \frac{12}{50} = \frac{2 \times 6}{2 \times 25} = \frac{6}{25}$$

Question 11 - d), 1pt Calculate :

$$\frac{15}{100} \times 3000 = \frac{15 \times 30 \times 100}{100} = 15 \times 30$$

Now

$$\begin{aligned} 15 \times 30 &= 15 \times 3 \times 10 = (15 \times 3) \times 10 \\ &= ((10 + 5) \times 3) \times 10 = (30 + 15) \times 10 = 45 \times 10 = 450 \end{aligned}$$

Hence $\frac{15}{100} \times 3000 = 450$.

Indication : Practice mental arithmetic.

Question 12 - a), 1pt The value of X is 38° . It is an opposite angle.

Question 12 - b), 1pt Can't see the diagram correctly... I suppose the triangle is isoscele, and using the sum of the angles wich is always equal to 180° , you find the result.

Indication : Classical geometry, need to learn the proper vocabulary and everything should be fine.

Question 13 - a), 1pt $4p$

Question 13 - b), 1pt m^3

Question 13 - c), 2pt

$$B = 2k + 12 = 2 \times 5 + 12 = 10 + 12 = 22$$

Question 13 - d), 2pt $T = 4w - 2 = 22$ gives :

$$\begin{aligned} 4w - 2 &= 22 \\ \Leftrightarrow 4w &= 22 + 2 \\ \Leftrightarrow 4w &= 24 \\ \Leftrightarrow w &= \frac{24}{4} \\ \Leftrightarrow w &= 6 \end{aligned}$$

Indication : Practice and it should be OK.

Question 14 - a), 3pt First decompose the 135 minutes in hours and minutes. $135 = 2 \times 60 + 15$ so 135min=2h15min. Now add 2 hours to 18h which will give you 20h00. Then add the remaining minutes : $10 + 15 = 25$ min.

The film finishes at 20 :25.

Question 14 - b), 4pt You can divide the people present in the cinema in three **separate** sets : the girls, the boys, and the adults. Now, the proportion of girls p_g , of boys p_b and of adults P when summed up, should give you 100% of the people, in other words, 300.

$$p_g + p_b + P = 300$$

which gives you :

$$P = 300 - p_g + p_b$$

Now, the proportion of girls is $p_g = \frac{3}{10} \times 300 = 3 \times 30 = 90$.

The proportion of boys is $p_b = \frac{1}{6} \times 300 = \frac{3 \times 100}{2 \times 3} = \frac{100}{2} = 50$. Hence :

$$P = 300 - 90 - 50 = 300 - 140 = 160$$

There are 160 adults in the cinema.

Indication : Practice and it should be OK.

Question 15, 3pt Reading on the graph gives you **a)** 10 :10, then **b)** 14km and eventually **c)** 30 mins (you should work out the difference).

Indication : Be careful with the graduations and it should be OK.

Question 16, 3pt You have to understand that Anna will take 2 parts of the total and Bille 3 parts of the total which gives you a total made of $2 + 3 = 5$ parts.

Now, Alice will take $\frac{2}{5} \times 40 = \text{£}16$ and Bill $\frac{3}{5} \times 40 = \text{£}24$. You should be able to calculate these quantities by hand.

Indication : The formulation here is tricky (should I say questionable...)

Question 17, 3pt OK brace yourselves.

$$\begin{aligned}
 4.52 \times 36 &= 452 \times 10^{-2} \times 36 \\
 &= 452 \times 36 \times 10^{-2} \quad \text{the operation "multiplication" is permutative} \\
 &= (400 + 50 + 2) \times 36 \times 10^{-2} \\
 &= (400 \times 36 + 50 \times 36 + 2 \times 36) \times 10^{-2} \\
 &= ((400 \times (30 + 6)) + 50 \times (30 + 6) + 72) \times 10^{-2} \\
 &= (12\,000 + 2\,400 + 1\,500 + 300 + 72) \times 10^{-2}
 \end{aligned}$$

where I used the fact that :

$$400 \times 30 = 4 \times 10^2 \times 3 \times 10^1 = 4 \times 3 \times 10^3 = 12 \times 1\,000 = 12\,000$$

$$400 \times 6 = 4 \times 10^2 \times 6 = 4 \times 6 \times 10^2 = 24 \times 100 = 2\,400$$

etc... Which yields :

$$\begin{aligned}
 4.52 \times 36 &= (14\,400 + 1\,872) \times 10^{-2} \quad \text{step-by-step additioning just in case} \\
 &= 16\,272 \times 10^{-2} \\
 &= 162.72
 \end{aligned}$$

Indication : This question is tricky even for level A students (and science students at the bachelor level) since the use of the calculator is not prohibited in high-school. Please revise calculations involving decimals.