Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2011

Mathematics
(Project Maths – Phase 2)

Paper 2

Foundation Level

Monday 13 June   Morning 9:30 – 12:00

300 marks

Examination number

Centre stamp

Running total	

For examiner	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Grade

Instructions

There are **two** sections in this examination paper.

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	2 questions

Answer **all eight** questions, as follows:

In Section A, answer:

> Questions 1 to 5 and
>
> **either** Question 6A **or** Question 6B.

In Section B, answer Question 7 and Question 8.

Write your answers in the spaces provided in this booklet. There is space for extra work at the back of the booklet. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the booklet of *Formulae and Tables*. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

Marks will be lost if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

Answers should be given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Answer **all six** questions from this section.

Question 1 (25 marks)

(a) Give an example of an experiment with two outcomes that are *equally likely*, stating clearly what the two outcomes are.
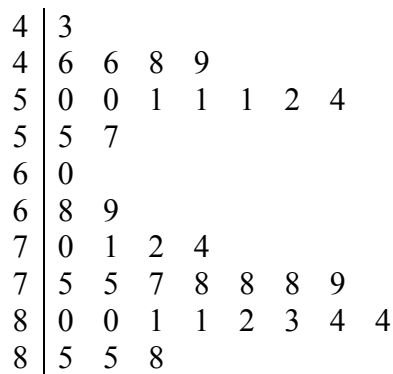
(b) Give an example of an experiment with two outcomes that are **not** equally likely, stating clearly what the two outcomes are.

Question 2 (25 marks)

A girl and a boy are each asked to think of a whole number from 1 to 10. The outcome of this experiment is recorded as a pair of numbers. For example, if the girl picks 3 and the boy picks 1, this is recorded as (3, 1).

(a) Write out **three** possible outcomes of this experiment.

(b) How many different possible outcomes are there?

(c) Write out all of the outcomes in which the two children pick the same number.

(d) Suppose that all numbers are equally likely, and that one child's choice has no effect on the other's choice. What is the probability that the two children will pick the same number?

Question 3 (25 marks)

Some scientists were studying a certain kind of ant. They selected a sample of 39 of these ants and measured the length of each ant's body, in millimetres. The results are shown in this stem-and-leaf plot:

```
4 | 3
4 | 6  6  8  9
5 | 0  0  1  1  1  2  4
5 | 5  7
6 | 0
6 | 8  9
7 | 0  1  2  4
7 | 5  5  7  8  8  8  9
8 | 0  0  1  1  2  3  4  4
8 | 5  5  8
```

Key: 4 | 3 means 4·3 mm.

(a) What is the length of the longest ant?

Answer: _____

(b) What is the median length of the ants in the sample?

Answer: _____

(c) Describe the shape of the distribution.

(d) Suggest a reason why the distribution might have this shape.

Question 4 (25 marks)

The points A, B, and C have co-ordinates as follows:

A (–4, 1)
B (–1, –5)
C (4, 5)

(a) Plot A, B, and C on the diagram, and show the triangle ABC.
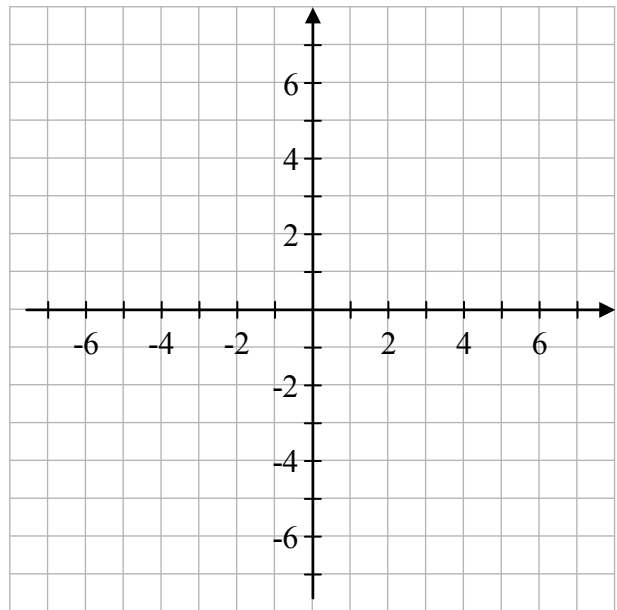
(b) Find the slope of AB and the slope of AC.

slope of AB = _____   slope of AC = _____

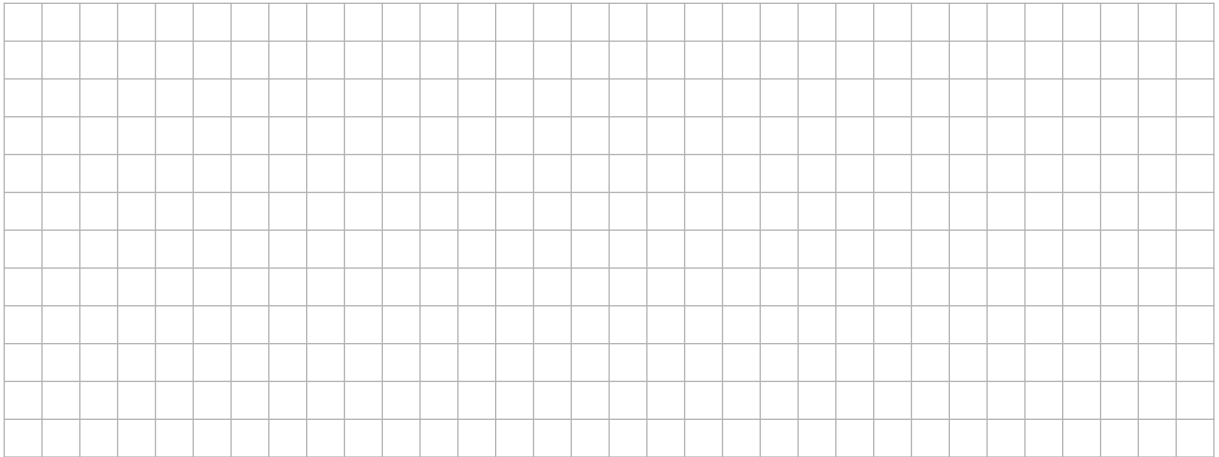**(c)** Show how to use your answers to part **(b)** to decide whether this triangle is right-angled at A.
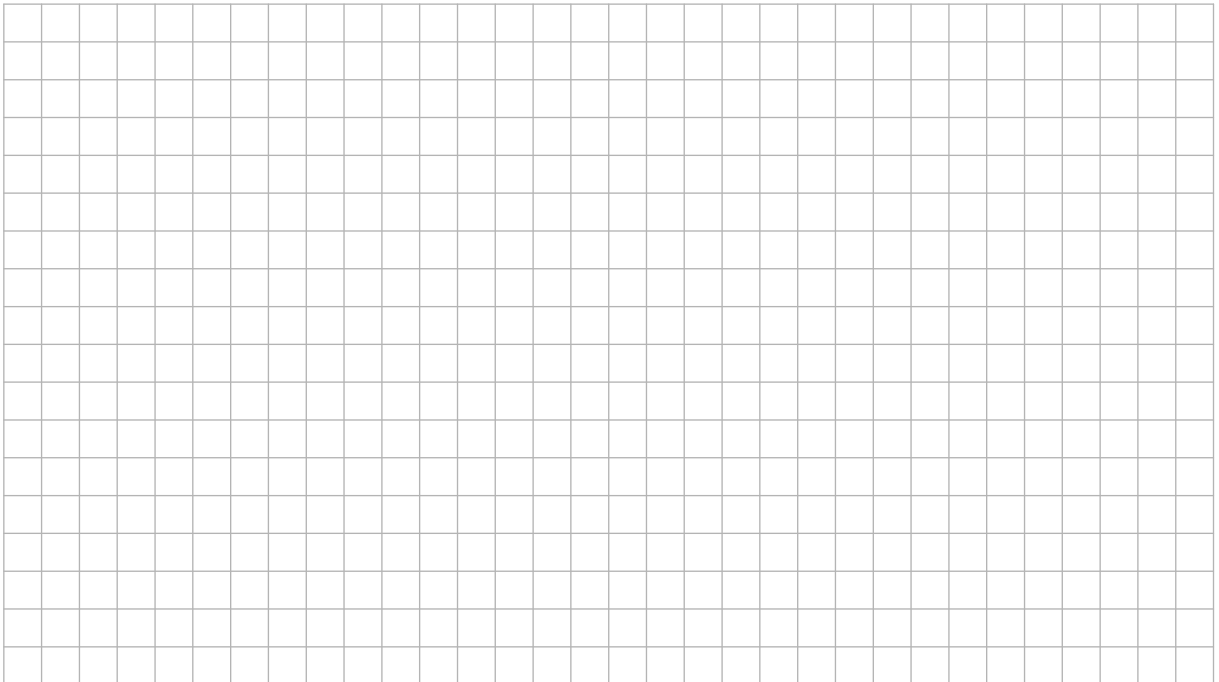
Question 5 **(25 marks)**

The line l has equation $5x + 12y - 60 = 0$. It cuts the x-axis at A and the y-axis at B.

(a) Find the co-ordinates of A and the co-ordinates of B.

(b) The point P has co-ordinates $(5, 3)$. Show the point P and the line l on a co-ordinate diagram.

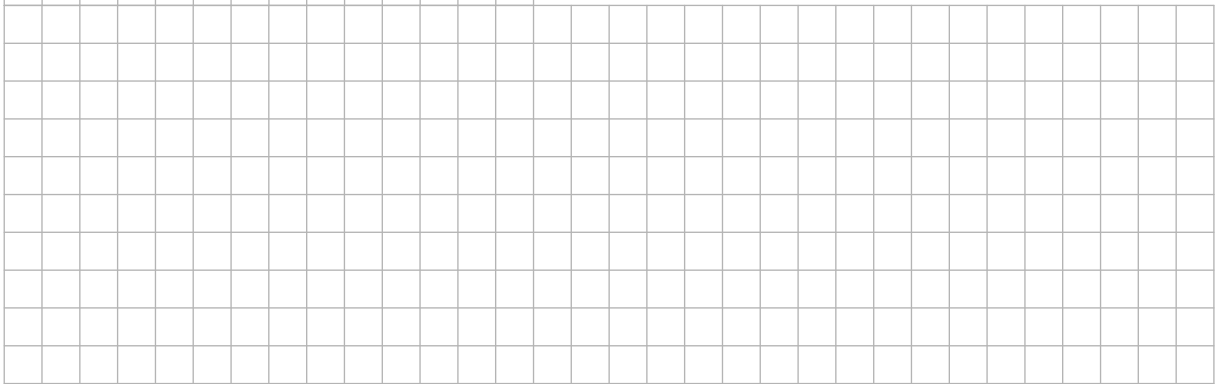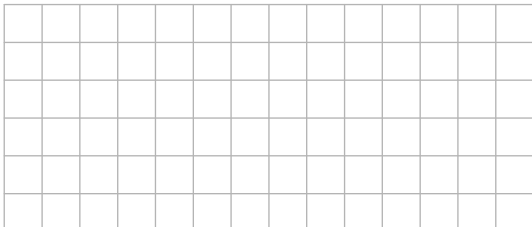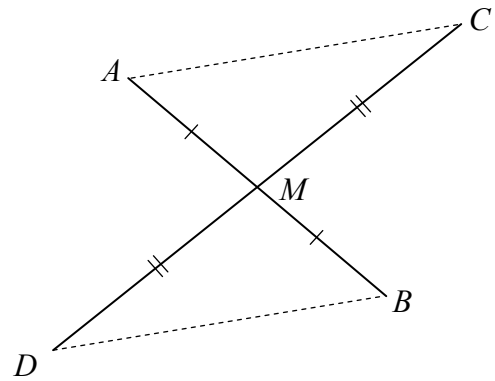**(c)** Prove that P does not lie on l.

Question 6 **(25 marks)**

Answer **either** 6A **or** 6B.

Question 6A

(a) In the diagram, *M* is the midpoint of [*AB*] and
is also the midpoint of [*CD*].

Show that |*AC*| must be equal to |*BD*|.

(b) Construct an angle of 60°, without using a protractor or setsquare.

Show all construction lines clearly.

OR

Question 6B

(a) The diagram below shows a triangle with one side extended.

(i) Find the value of x.

(ii) The other two angles in the triangle are equal. Each is $y°$. Find the value of y.

(b) The diagram below shows another triangle with one side extended.
Find the value of s and the value of t.

Answer **Question 7** and **Question 8**.

Question 7   **(75 marks)**

Whenever a baby is born, one of the things measured and recorded is the baby's weight. The birth-weights of a sample of babies are summarised in the table below.
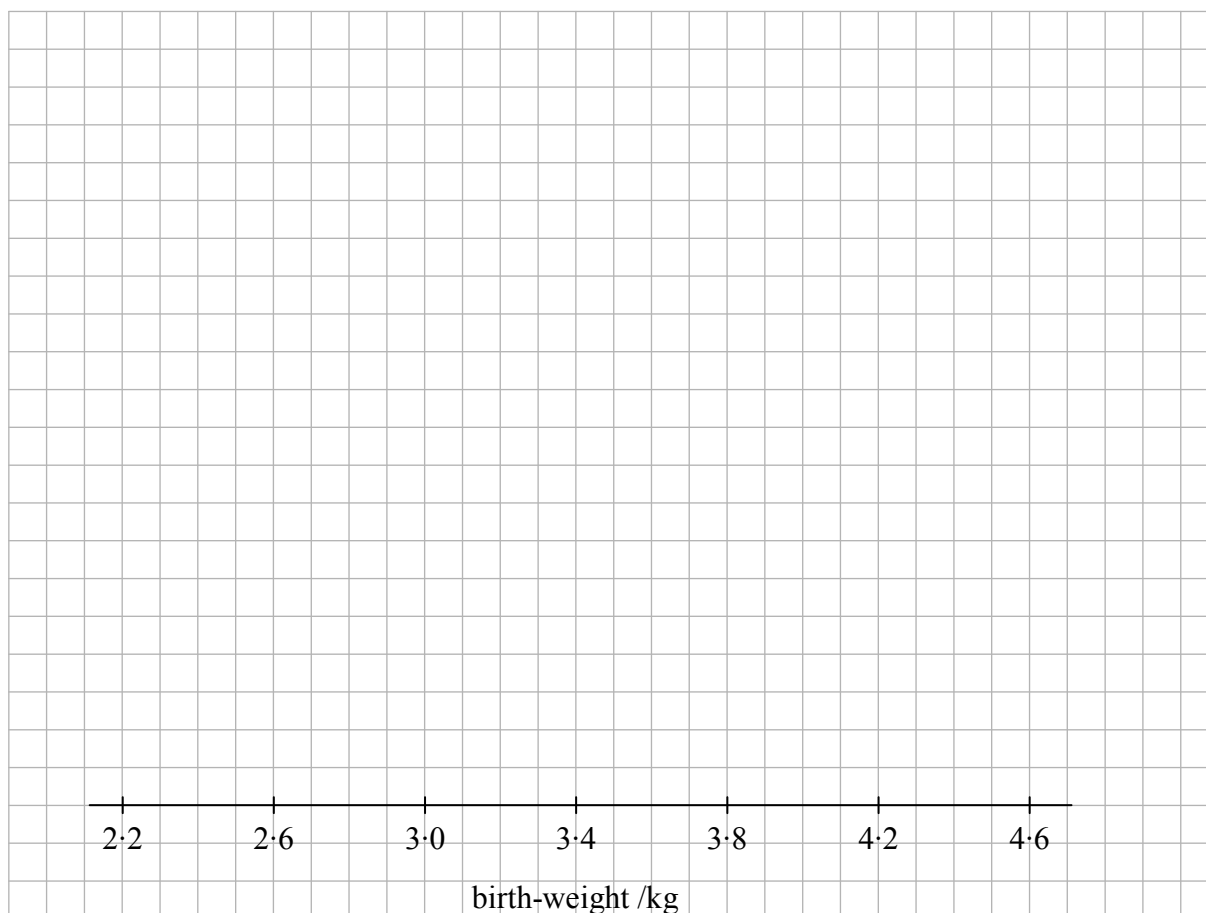
Weight in kg	2·2 – 2·6	2·6 – 3·0	3·0 – 3·4	3·4 – 3·8	3·8 – 4·2	4·2 – 4·6
Number of babies	12	40	64	56	24	4

(Source: simulated data, based on multiple sources)

(a) How many babies were in the sample?

Answer: _____

(b) Draw a histogram of the data.

birth-weight /kg

(c) Complete the following sentence, by using the table and/or the histogram to make an estimate:

"On average, these babies weighed about _____ kg at birth."

(d) One of the babies weighed 3·675 kg when she was born. How would you describe this baby's weight in comparison to the other babies?

(e) A weight of less than 2·5 kg is called a "low birth-weight".
Estimate the number of low-birth-weight babies in this sample.

Approximately 60 000 babies were born in Ireland in 2005. According to a survey, 20% of the mothers smoked cigarettes during the pregnancy. Suppose that our sample was chosen from among these babies whose mothers smoked.

(f) What is the size of the population from which the sample was drawn?

(g) Using the information from the sample, estimate the number of low-birth-weight babies in that population.

(h) Explain why the sample cannot tell us *exactly* how many such babies were in the population.

(i) The mean birth-weight for all babies born in Ireland that year was 3·51 kg. Do you think that the information from our sample shows that smoking during pregnancy affects the baby's birth weight? Explain your answer.

Question 8 (75 marks)

(a) A jeweller is making a pendant. The design consists of two silver triangles on a rectangular background of copper. The design is shown in the diagram.

The bigger triangle is an enlargement of the smaller triangle. The scale factor of the enlargement is 2.

3 cm
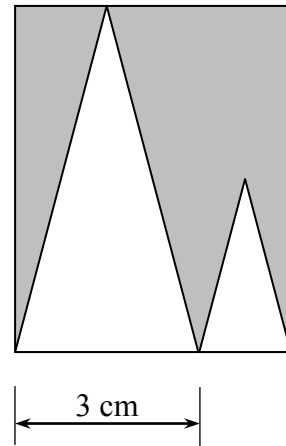
(i) On the diagram, find the centre of enlargement.

(ii) The width of the bigger triangle is 3 cm, as shown. Find the width of the smaller triangle.
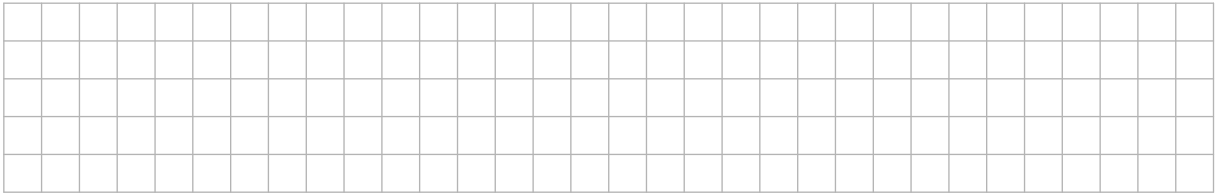
**(iii)** The height of the smaller triangle is 2·8 cm. Find the **area** of the bigger triangle.
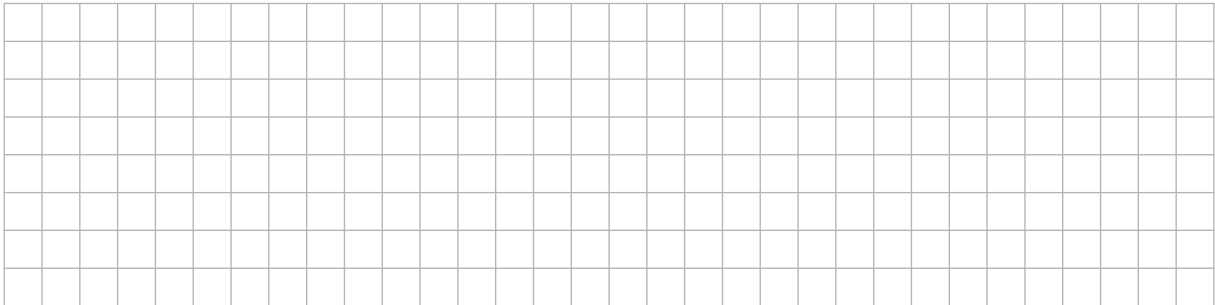
(iv) What fraction of the area of the copper rectangle is covered by the silver triangles?

(b) The jeweller is making some earrings to go with the
pendant. Each earring is an isosceles triangle. The
triangle is half copper and half silver, as shown in the
diagram. The measurements are as shown.

4 cm

d

α

2 cm
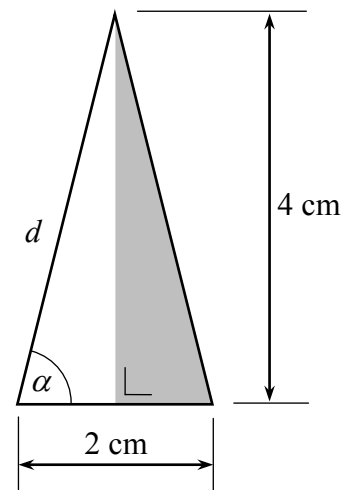
(i) Use Pythagoras' theorem to find d, the length of one of the sloping sides.
Give your answer correct to one decimal place.

d

(ii) Find $|\angle\alpha|$, correct to the nearest degree.

α

(c) The jeweller needs a drawing of the earring design. She wants the drawing to be bigger than the actual earring.

Construct, as accurately as you can, a drawing of the earring at a scale of 2:1. That is, each centimetre in reality should be 2 centimetres in your drawing.
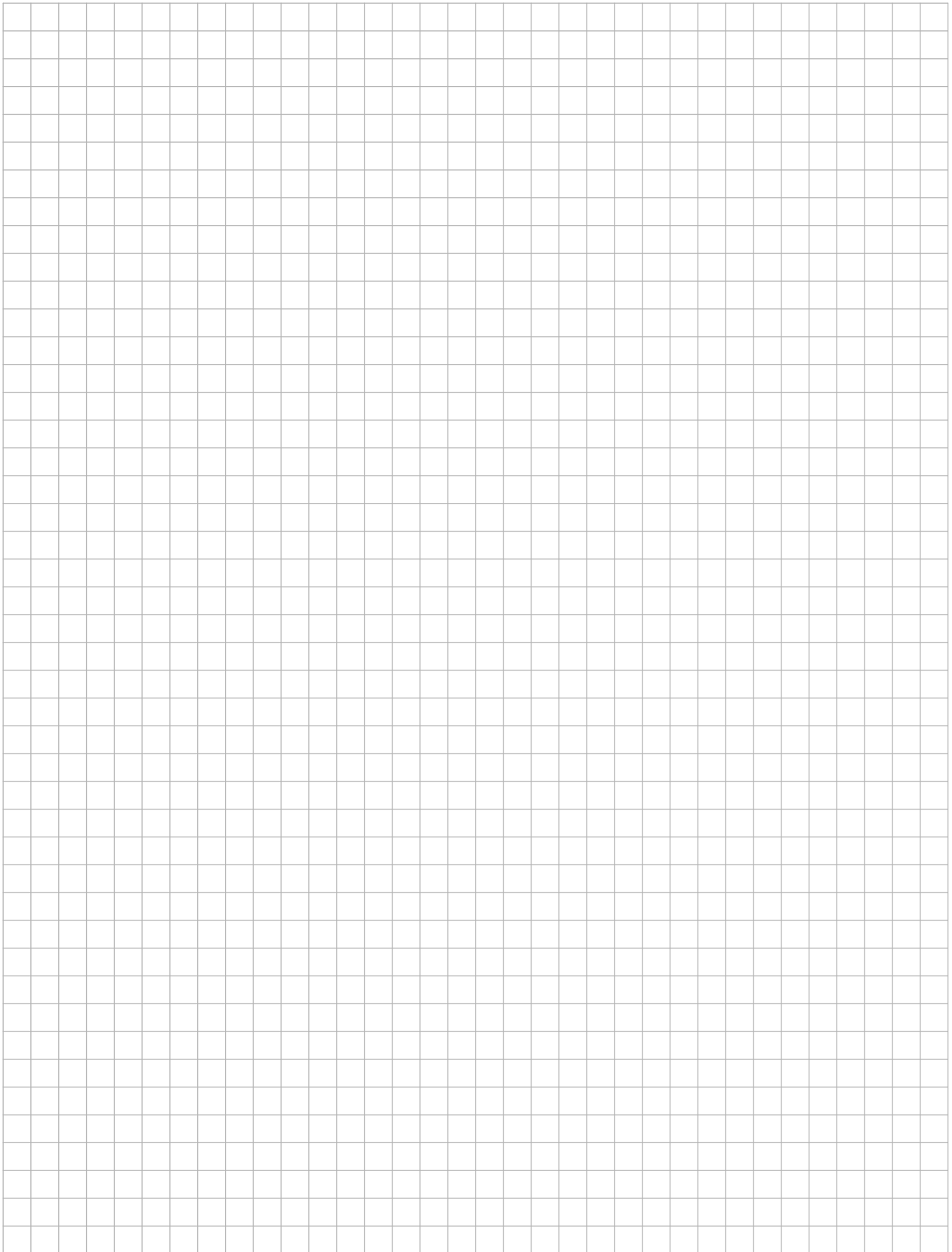
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