

ALGEBRA 2/TRIGONOMETRY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA 2/TRIGONOMETRY

Friday, June 17, 2016 — 9:15 a.m. to 12:15 p.m., only

Student Name: _____

School Name: _____

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for Part I has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 39 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in Parts II, III, and IV directly in this booklet. All work should be written in pen, except for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc.

The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice...

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

ALGEBRA 2/TRIGONOMETRY

Part I

Answer all 27 questions in this part. Each correct answer will receive 2 credits. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [54]

Use this space for
computations.

1 The expression $\frac{3}{4}\sqrt{-80}$ is equivalent to

(1) $3i\sqrt{5}$

(3) $-3\sqrt{5}$

(2) $2i\sqrt{15}$

(4) $-2\sqrt{15}$

2 In $\triangle RST$, $m\angle S = 135$, $r = 27$, and $t = 19$. What is the area of $\triangle RST$ to the nearest tenth of a square unit?

(1) 90.7

(3) 256.5

(2) 181.4

(4) 362.7

3 The expression $\frac{\sqrt{5}}{7 - \sqrt{5}}$ is equivalent to

(1) $\frac{7\sqrt{5} + 5}{54}$

(3) $\frac{7\sqrt{5} + 5}{44}$

(2) $\frac{7\sqrt{5} - 5}{54}$

(4) $\frac{7\sqrt{5} - 5}{44}$

Use this space for computations.

4 A multiple-choice test has 4 possible choices for each question. A person guesses on 10 questions. What is the probability the person gets *exactly* 8 questions correct?

(1) ${}_{10}C_8 \left(\frac{1}{4}\right)^2 \left(\frac{3}{4}\right)^8$

(3) ${}_{10}C_8 \left(\frac{1}{10}\right)^2 \left(\frac{9}{10}\right)^8$

(2) ${}_{10}C_8 \left(\frac{1}{4}\right)^8 \left(\frac{3}{4}\right)^2$

(4) ${}_{10}C_8 \left(\frac{1}{10}\right)^8 \left(\frac{9}{10}\right)^2$

5 The summation $2 \sum_{n=3}^6 \cos\left(\frac{\pi}{n-2}\right)$ equals

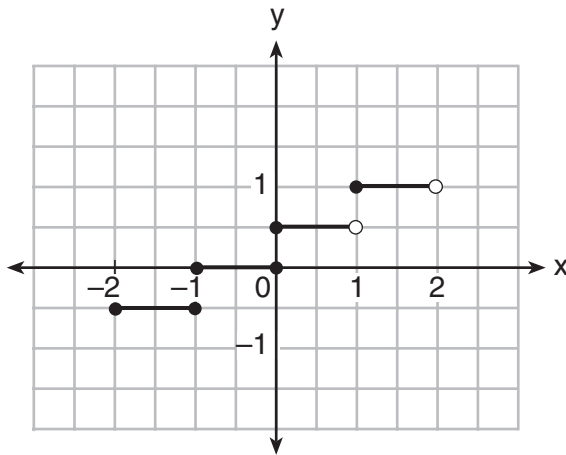
(1) $-\frac{2 + \sqrt{2}}{2}$

(3) $-\frac{1 + \sqrt{2}}{2}$

(2) $-2 + \sqrt{2}$

(4) $-1 + \sqrt{2}$

6 The graph of a relation is shown below.



What is the domain of this relation?

(1) $\{-2, -1, 0, 1\}$

(3) $\{x \mid -2 \leq x < 2\}$

(2) $\left\{-\frac{1}{2}, 0, \frac{1}{2}, 1\right\}$

(4) $\{x \mid -2 \leq x \leq 2\}$

**Use this space for
computations.**

11 The solution of $8^{1-p} = 16^{2p-1}$ is

(1) $\frac{7}{11}$

(3) $\frac{4}{9}$

(2) $\frac{3}{5}$

(4) $\frac{2}{5}$

12 Which relation is *not* a function?

(1) $\{(x,y):y = |x|\}$

(3) $\{(x,y):y = x\}$

(2) $\{(x,y):y = -x^2\}$

(4) $\{(x,y):y = \pm\sqrt{x}\}$

13 What does the correlation coefficient of -0.975 on a linear regression indicate?

(1) The slope is positive.

(2) One variable causes the other.

(3) The scatterplot shows no association of the variables.

(4) One variable has a strong relationship with the other.

14 Which angle has the same terminal side as an angle of 155° ?

(1) -205°

(3) 25°

(2) -155°

(4) 335°

Use this space for
computations.

19 When $f(x) = \frac{x-7}{2}$, what is the value of $(f \circ f^{-1})(3)$?

- (1) $2x + 7$
- (2) -2
- (3) 3
- (4) x

20 What is the equation of the circle passing through the point $(-5, -2)$ whose center is at $(-2, 3)$?

- (1) $(x + 5)^2 + (y + 2)^2 = 34$
- (2) $(x + 5)^2 + (y + 2)^2 = 50$
- (3) $(x + 2)^2 + (y - 3)^2 = 34$
- (4) $(x + 2)^2 + (y - 3)^2 = 50$

21 If $a = -2$ and $b = -3$, what is the value of the expression

$$\frac{c^a}{c^b} - \frac{c^b}{c^a}, \text{ when } c \neq 0?$$

- (1) 0
- (2) $\frac{c^2+1}{c}$
- (3) $2c$
- (4) $\frac{c^2-1}{c}$

22 What is the fourth term in the expansion of $(2x - 1)^6$?

- (1) $-160x^3$
- (2) $-40x^3$
- (3) $16x^4$
- (4) $240x^4$

**Use this space for
computations.**

26 Which equation is *not* true?

- (1) $\cot^2 \theta = 1 - \sec^2 \theta$ (3) $\sec^2 \theta = \tan^2 \theta + 1$
(2) $\sin^2 \theta = 1 - \cos^2 \theta$ (4) $\csc^2 \theta = 1 + \cot^2 \theta$

27 Which quadratic equation has roots whose sum is $-\frac{9}{4}$ and product is $\frac{2}{3}$?

- (1) $12x^2 + 8x + 27 = 0$ (3) $12x^2 - 8x - 27 = 0$
(2) $12x^2 - 27x + 8 = 0$ (4) $12x^2 + 27x + 8 = 0$
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Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

28 Factor $6x^3 + 33x^2 - 63x$ completely.

29 Five thousand dollars is invested at an interest rate of 3.5% compounded quarterly. No money is deposited or withdrawn from the account. Using the formula below, determine, to the *nearest cent*, how much this investment will be worth in 18 years.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = amount

P = principal

r = interest rate

n = number of times the interest rate compounded annually

t = time in years

30 A colony of bacteria grows exponentially. The table below shows the data collected daily.

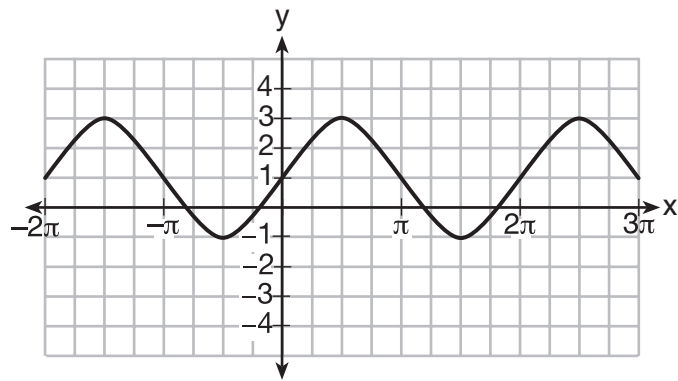
Day (x)	Population (y)
0	200
1	425
2	570
3	800
4	1035
5	1650
6	2600

State the exponential regression equation for the data, rounding all values to the *nearest hundredth*.

31 Express $\frac{2 + \frac{6}{x-3}}{\frac{x}{x-3}}$ in simplest form, when $x \neq 0$ and $x \neq 3$.

32 A central angle whose measure is $\frac{2\pi}{3}$ radians intercepts an arc with a length of 4π feet.
Find the radius of the circle, *in feet*.

33 A sine function is graphed below.



Determine and state the amplitude and period of this function.

34 On the Algebra 2/Trigonometry midterm at Champion High School, the scores of 210 students were normally distributed with a mean of 82 and a standard deviation of 4.2.

Determine how many students scored between 79.9 and 88.3.

35 Given $\tan \theta = -\frac{5}{12}$ and $\frac{\pi}{2} < \theta < \pi$, determine the *exact* value of the expression $\sin \theta \cot \theta$.

Part III

Answer all 3 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [12]

36 The lengths of the sides of a triangle are 6 cm, 11 cm, and 7 cm. Determine, to the *nearest tenth of a degree*, the measure of the largest angle of the triangle.

37 Solve algebraically for c :

$$\left| \frac{3}{2}c - 10 \right| - 9 \leq -1$$

38 Solve $2\cos^2 \theta = \cos \theta$ for all values of θ in the interval $0^\circ \leq \theta < 360^\circ$.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. A correct numerical answer with no work shown will receive only 1 credit. The answer should be written in pen. [6]

39 Solve for p algebraically: $\log_{16}(p^2 - p + 4) - \log_{16}(2p + 11) = \frac{3}{4}$

Reference Sheet

Area of a Triangle

$$K = \frac{1}{2} ab \sin C$$

Functions of the Sum of Two Angles

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

Functions of the Difference of Two Angles

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Sum of a Finite Arithmetic Series

$$S_n = \frac{n(a_1 + a_n)}{2}$$

Binomial Theorem

$$(a + b)^n = {}_n C_0 a^n b^0 + {}_n C_1 a^{n-1} b^1 + {}_n C_2 a^{n-2} b^2 + \dots + {}_n C_n a^0 b^n$$

$$(a + b)^n = \sum_{r=0}^n {}_n C_r a^{n-r} b^r$$

Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Functions of the Double Angle

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos 2A = 2 \cos^2 A - 1$$

$$\cos 2A = 1 - 2 \sin^2 A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

Functions of the Half Angle

$$\sin \frac{1}{2} A = \pm \sqrt{\frac{1 - \cos A}{2}}$$

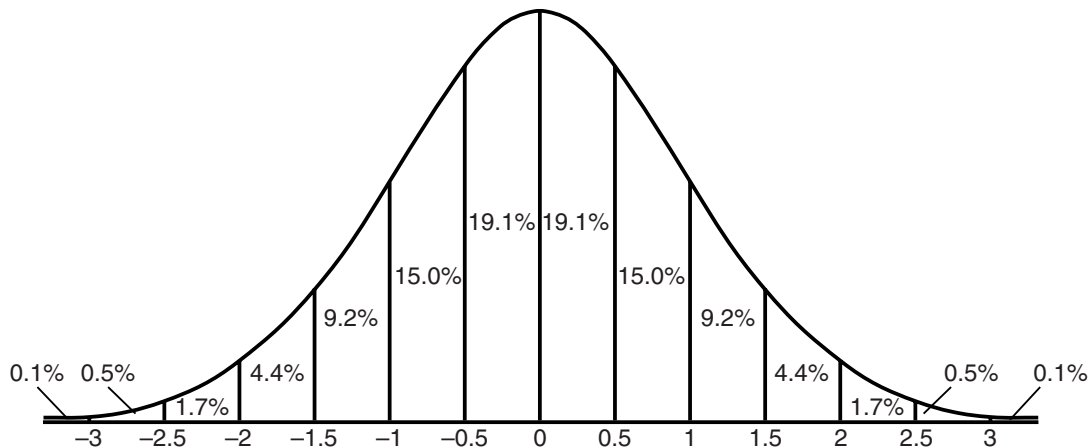
$$\cos \frac{1}{2} A = \pm \sqrt{\frac{1 + \cos A}{2}}$$

$$\tan \frac{1}{2} A = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}}$$

Sum of a Finite Geometric Series

$$S_n = \frac{a_1(1 - r^n)}{1 - r}$$

Normal Curve Standard Deviation



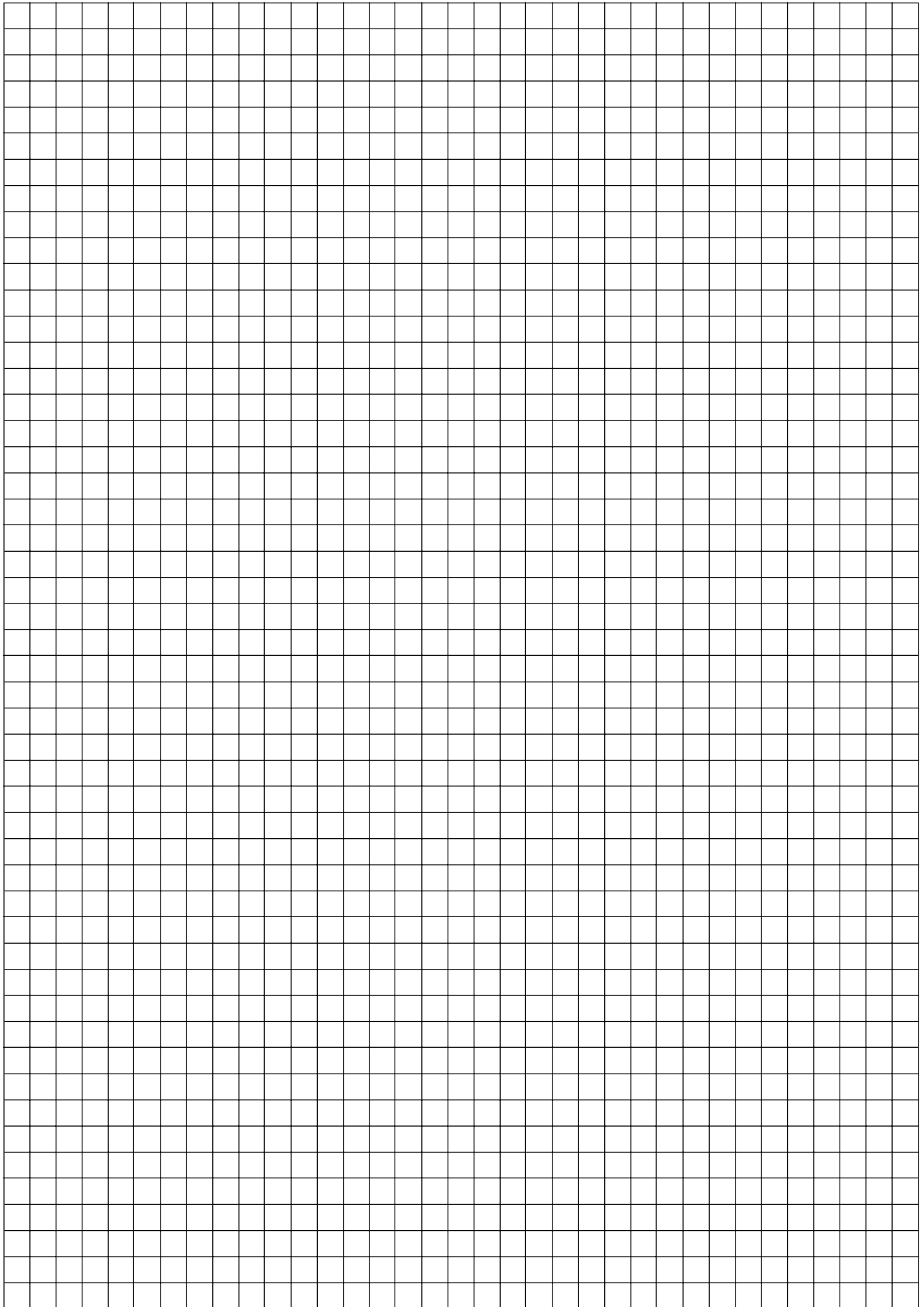
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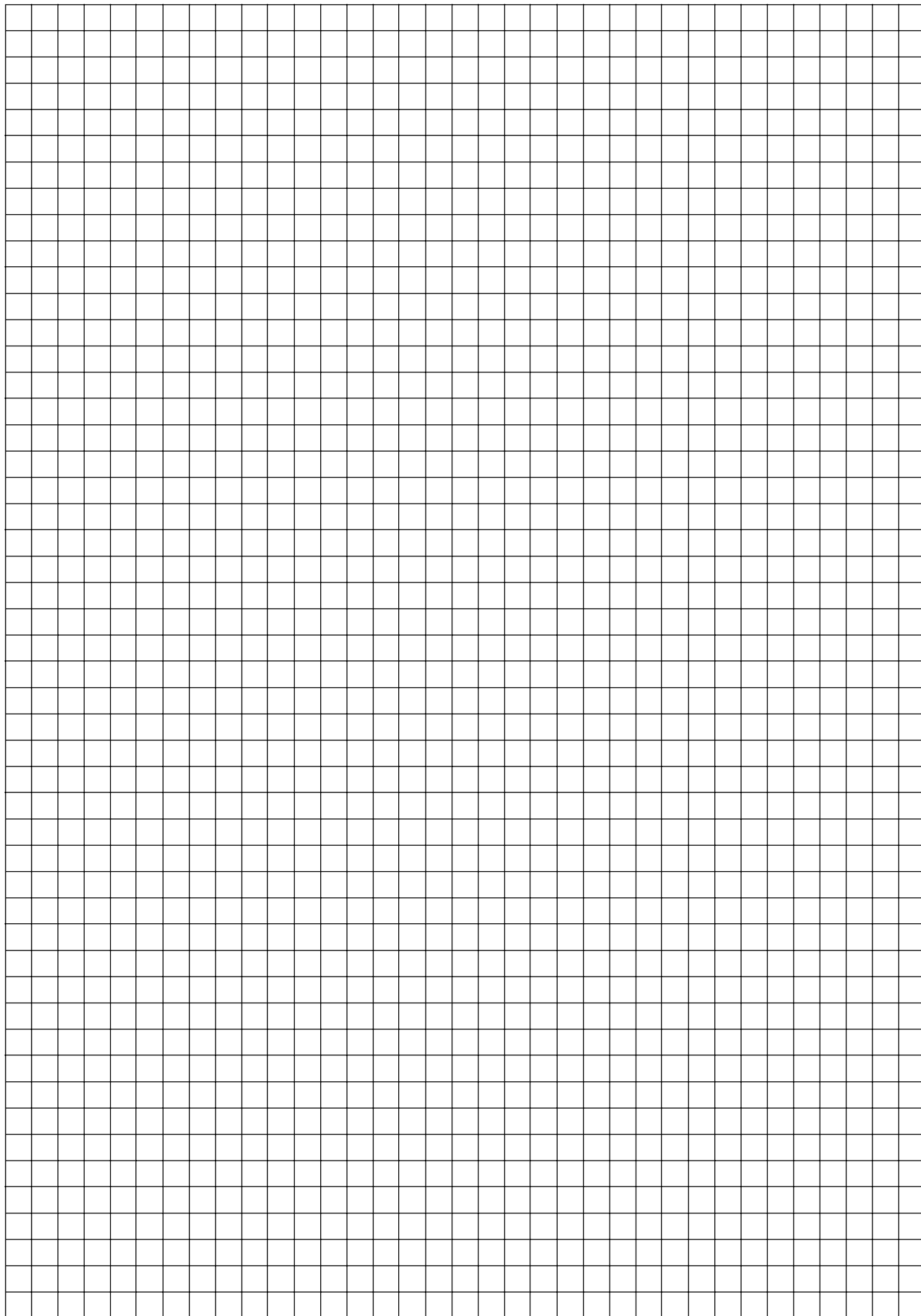
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