

Grade 12
Pre-Calculus Mathematics
Achievement Test

Booklet 2

January 2015

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Available in alternate formats upon request.

Instructions

Multiple-Choice Questions

- There are 10 questions each worth one mark.
- Calculators are **not** allowed for this part of the test.
- You may use the spaces beside each question for rough work.
- Provide only one answer per question.
- There is no penalty for guessing.
- Record your answers on the sheet provided.

Constructed Response Questions

- There are 20 questions worth a total of 47 marks.
- Calculators are **not** allowed for this part of the test.
- For full marks, your answer must show all pertinent diagrams, calculations, and explanations.
- Your solutions should be neat, clear, and well organized.
- Write each solution in the space provided.

No marks will be awarded for work done on this page.

Question 16**1 mark**

How many terms are there in the expansion of $(x^{12} + 3)^{10}$?

- a) 9
- b) 10
- c) 11
- d) 12

Question 17**1 mark**

A co-terminal angle for $\theta = \frac{11\pi}{3}$ in the domain $-2\pi \leq \theta \leq 0$ would be:

- a) $-\frac{5\pi}{3}$
- b) $-\frac{\pi}{3}$
- c) $\frac{\pi}{3}$
- d) $\frac{5\pi}{3}$

Question 18**1 mark**

The x -intercept of the graph of $y = 3^x - 1$ is:

- a) -1
- b) 0
- c) 1
- d) 2

Question 19**1 mark**

If ${}_n C_5 = {}_n C_3$, the value of n must be:

- a) 3
- b) 5
- c) 8
- d) 15

Question 20**1 mark**

What is the domain of the function $f(x) = \sqrt{-(x+1)}$?

- a) $\{x \mid x \in \mathbb{R}, x \neq -1\}$
- b) $\{x \mid x \in \mathbb{R}, x \geq -1\}$
- c) $\{x \mid x \in \mathbb{R}, x \leq -1\}$
- d) $\{x \mid x \in \mathbb{R}\}$

Question 21**1 mark**

Identify a non-permissible value of x for the expression $\frac{1}{\cos 2x}$.

- a) 0
- b) $\frac{\pi}{4}$
- c) $\frac{\pi}{2}$
- d) π

Question 22**1 mark**

The expression $2 \log x - \frac{1}{3} \log y$ as a single logarithm is:

- a) $\log \frac{x^2}{\sqrt[3]{y}}$
- b) $\log \frac{2x}{3y}$
- c) $-\log x^2 \sqrt[3]{y}$
- d) $\log(x^2 - \sqrt[3]{y})$

Question 23**1 mark**

The point $P(\theta)$ lies on the unit circle. What are the coordinates of the point if $\theta = 300^\circ$?

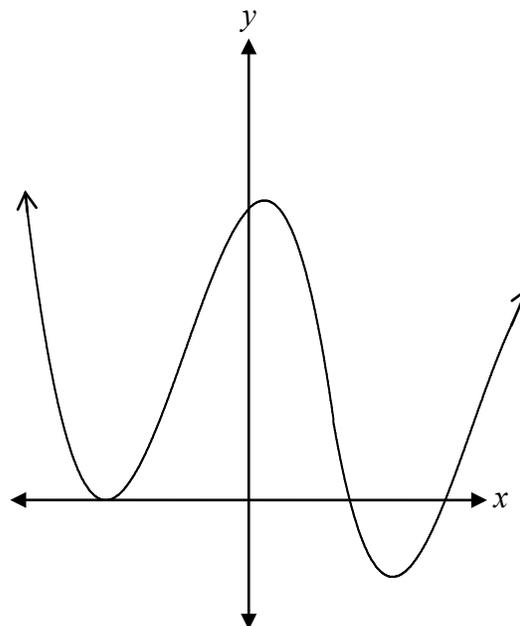
- a) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
- b) $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
- c) $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
- d) $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

Question 24

1 mark

What is the degree of the polynomial function represented by the graph below?

- a) 2
- b) 3
- c) 4
- d) 5



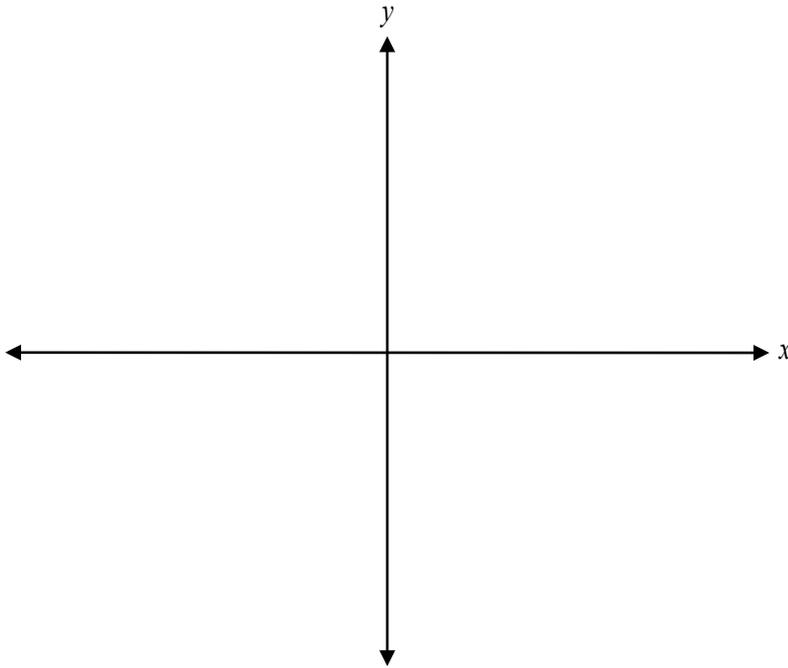
Question 25

1 mark

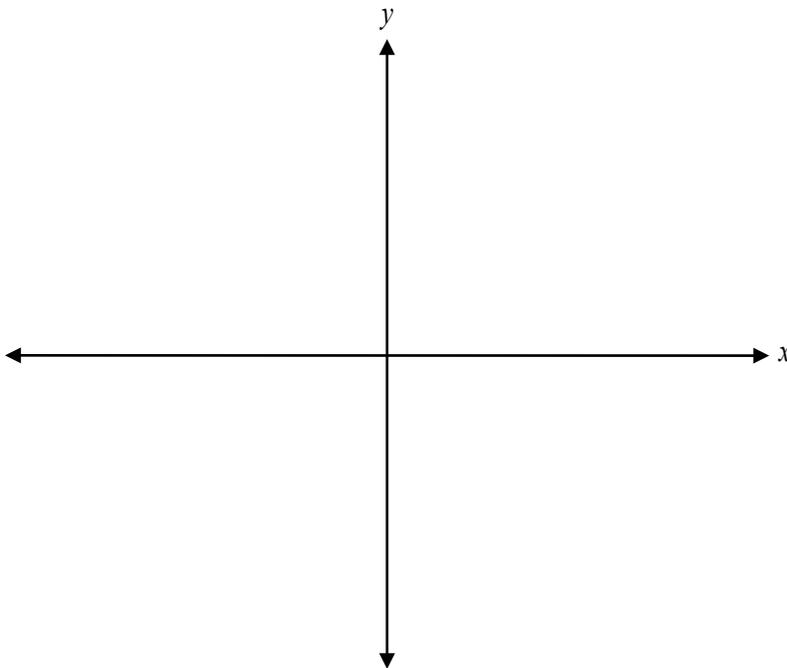
When the point $(-4, -3)$ is reflected in the line $y = x$, the coordinates of the new point are:

- a) $(-3, -4)$
- b) $(3, 4)$
- c) $(4, -3)$
- d) $(-4, 3)$

a) Sketch the graph of $y = \left(\frac{1}{4}\right)^x$.



b) Sketch the graph of $y = 2\left(\frac{1}{4}\right)^x$.

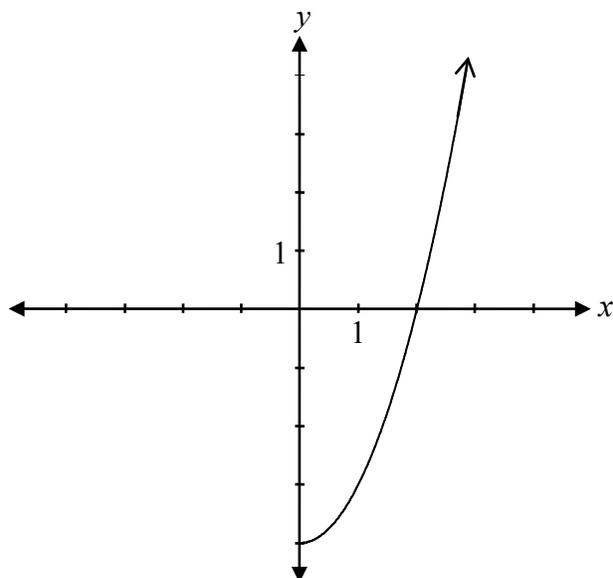


Question 27**2 marks**

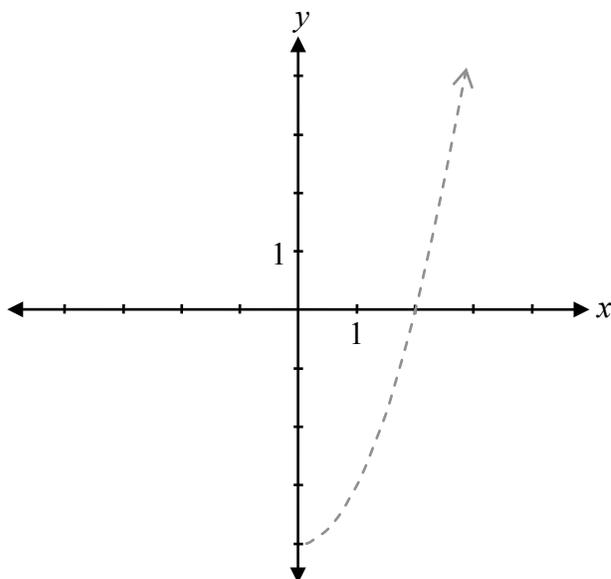
122

Determine all of the zeroes of the function $p(x) = x^3 - 5x^2 - 2x + 24$, given one of the factors of $p(x)$ is $(x - 3)$.

Given the graph of $f(x)$,

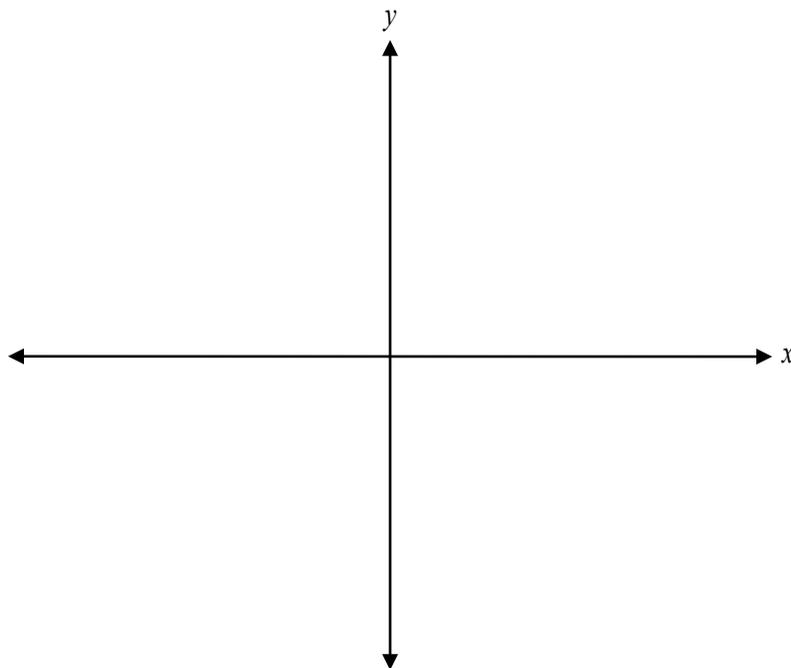


sketch the graph of $y = \sqrt{f(x)}$.



The graph of $f(x)$ has already been drawn for your reference. No marks will be awarded for the graph of $f(x)$.

Sketch the graph of at least one period of the function $y = -2\sin(4x)$.



Evaluate:

$$\frac{1}{2} \log_3 144 - \log_3 4 + 2 \log_3 3$$

Match each function with its correct description.

- a) The graph of this function has a vertical asymptote at $x = -1$.
- b) The graph of this function has a point of discontinuity (hole) at $x = 3$.
- c) The graph of this function has a horizontal asymptote at $y = 4$.
- d) The domain of this function is $x \in \mathbb{R}$.

Place the appropriate letter in this column.

$$f(x) = \frac{4}{x^2 + 1} \quad \underline{\hspace{2cm}}$$

$$g(x) = \frac{4x}{x + 3} \quad \underline{\hspace{2cm}}$$

$$h(x) = \frac{4(x - 3)(x + 2)}{(x - 3)} \quad \underline{\hspace{2cm}}$$

$$k(x) = \frac{4(x - 3)}{(x + 3)(x + 1)} \quad \underline{\hspace{2cm}}$$

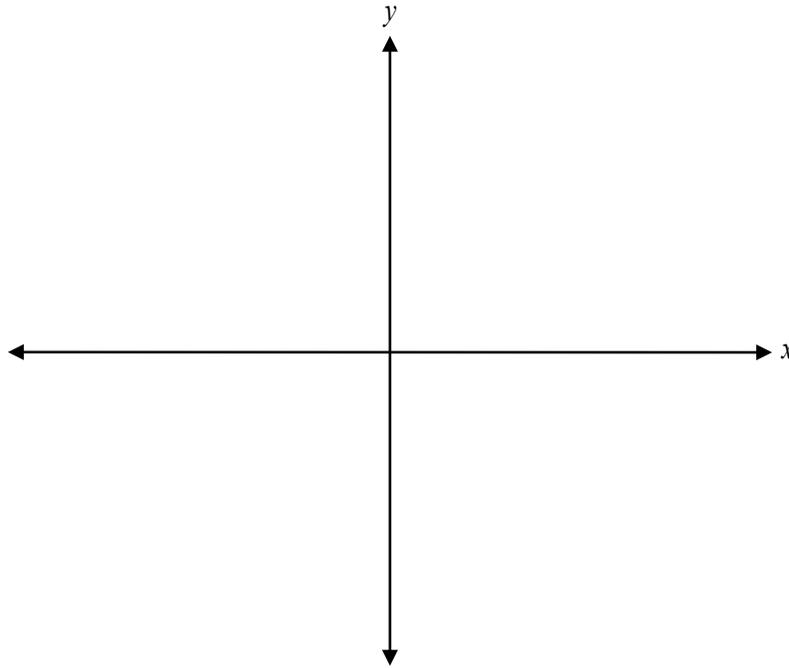
Question 32

1 mark 127

The point $(-3, 4)$ is on the graph of $y = \frac{1}{2}f(3x)$.

State the coordinates of the corresponding point on the graph of $y = f(x)$.

Sketch the graph of $y = -2(x - 1)(x - 3)(x + 1)$.



- a) Verify that the equation $\frac{1 - \sin^2 x}{\cos x} = \frac{\sin 2x}{2 \sin x}$ is true for $x = \frac{\pi}{3}$.

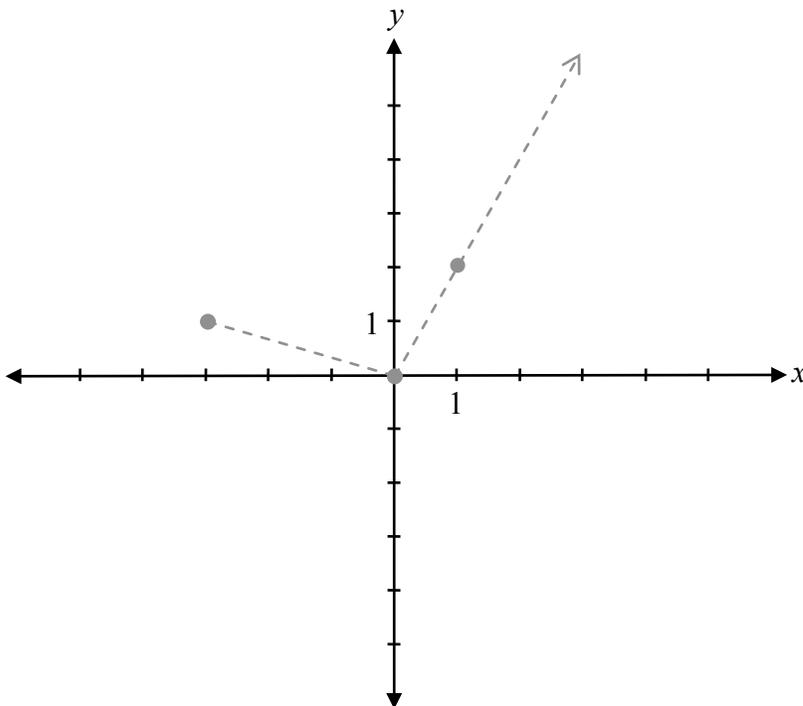
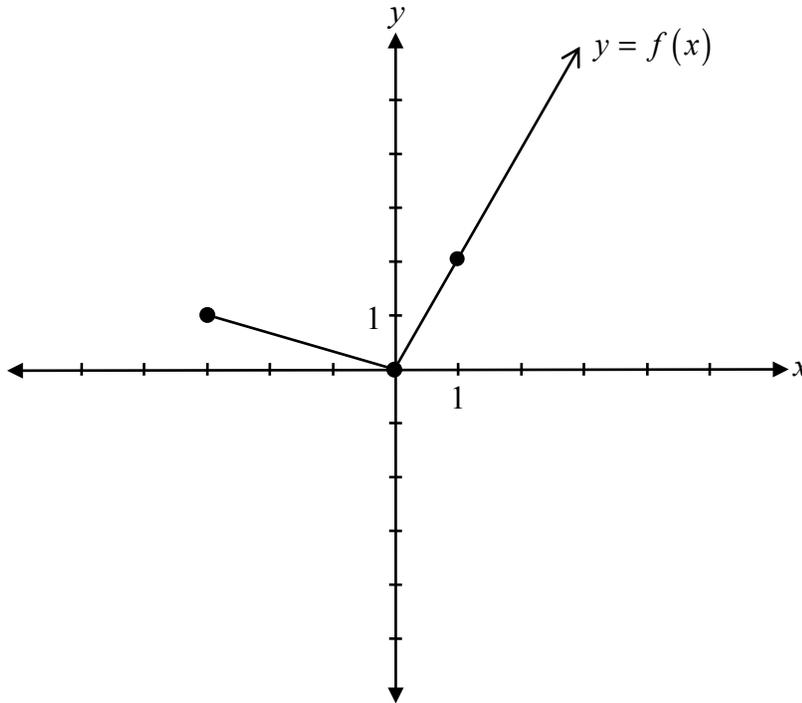
Left-Hand Side	Right-Hand Side

- b) Explain why verifying the equation for $x = \frac{\pi}{3}$ is insufficient to conclude that the equation is an identity.

Evaluate:

$$\frac{{}_7P_2}{{}_7P_5}$$

Use the graph of $y = f(x)$ to sketch the graph of $y = f(3x) + 1$.



The graph of $f(x)$ has already been drawn for your reference. No marks will be awarded for the graph of $f(x)$.

Solve the following equation:

$$\log_4(x+2) + \log_4 3 = \log_4 x$$

Question 38**1 mark** 134

Determine the coordinates of the point of discontinuity (hole) for the graph of the function

$$y = \frac{(2-x)(x-3)}{(x-2)}.$$

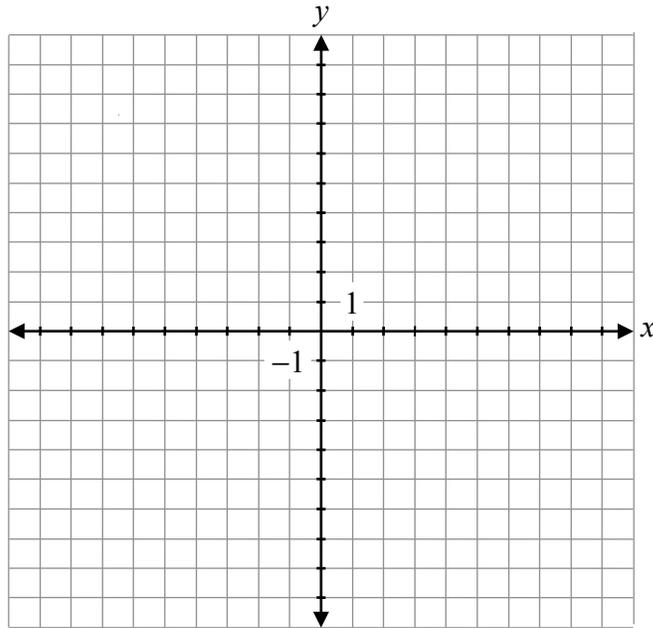
Evaluate and simplify $\sec\left(\frac{5\pi}{6}\right) \cdot \tan\left(-\frac{\pi}{6}\right)$.

Question 40

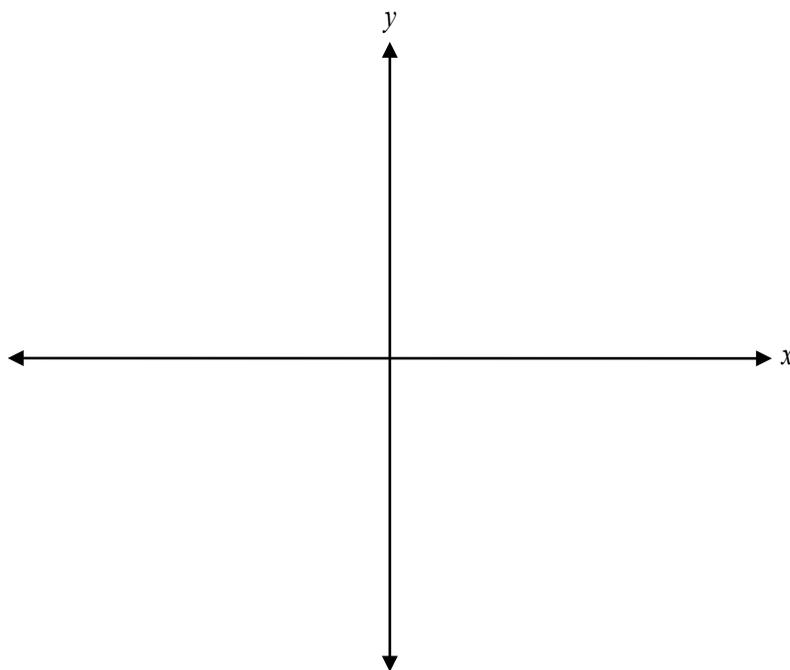
4 marks 136

Sketch the graph of the following function:

$$y = -2\sqrt{x-3}$$



Sketch the graph of $f(x) = \frac{2x+3}{x+2}$.



a) Given the functions $f(x) = \sqrt{4+x}$ and $g(x) = |3x-6|$, evaluate $f(g(-5))$.

b) Is it possible to evaluate $g(f(-5))$?

Justify your answer.

Question 43

1 mark 140

Identify which of these values is greater. Justify your answer.

$$\log_5 80 \quad \text{or} \quad \log_3 30$$

Question 44**3 marks**

141

Given $\cos \alpha = \frac{3}{5}$, where α is in quadrant IV, and $\cos \beta = -\frac{2}{3}$, where β is in quadrant II, determine the exact value of $\sin(\alpha - \beta)$.

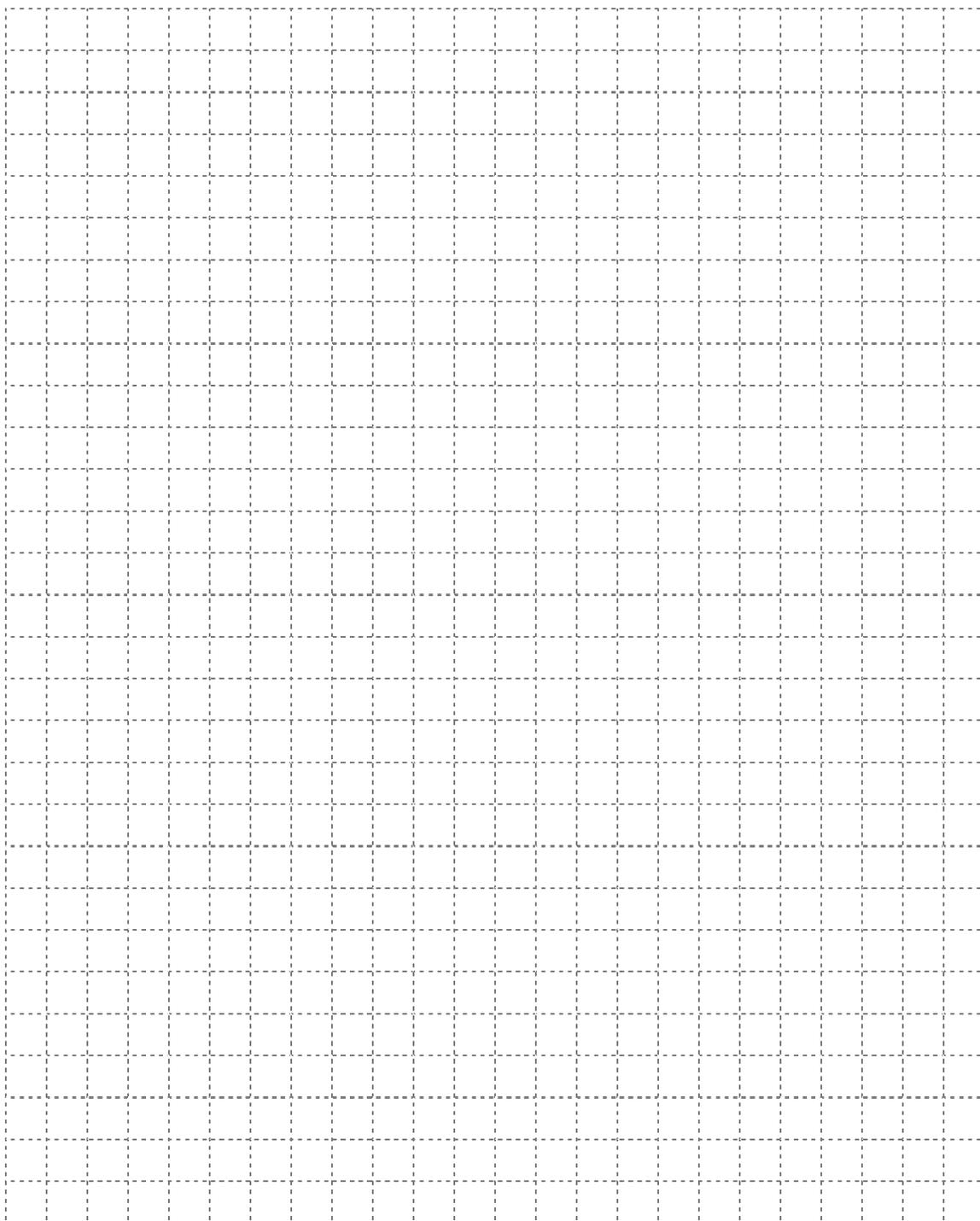
Determine the number of possible sandwiches from the following menu.

MENU

Select one item from each column:

<u>Bread</u>	<u>Sauce</u>	<u>Meat</u>	<u>Vegetable</u>
White	Mayo	Turkey	Tomato
Rye	Mustard	Ham	Onion
Brown		Roast Beef	Lettuce
		Chicken	

No marks will be awarded for work done on this page.



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