

## College of Engineering and Mathematical Sciences Mathematics and Statistics

### SIXTY-EIGHTH ANNUAL HIGH SCHOOL PRIZE EXAMINATION TUESDAY, MARCH 11, 2025

# THIS EXAMINATION IS TO BE ADMINISTERED DURING SCHOOL HOURS ON MARCH 11, 2025. AN EXAMINATION GIVEN AT ANY OTHER TIME WILL BE DISQUALIFIED.

#### THE TIME LIMIT ON THIS EXAMINATION IS 2 HOURS.

#### **INSTRUCTIONS TO THE CONTESTANTS:**

Do not begin the examination until the examiner tells you to do so.

The answer sheet is on the reverse side of this page. Before beginning the examination, carefully print your full name, your address, the complete name of your school and the town/city in which your school is located on the appropriate lines of the answer sheet. Check the circle corresponding to your grade level in school.

Answers must be written on the answer sheet in pencil or ink. You may work on problems in any order, but be sure that each answer is entered in the proper space on the answer sheet. (For example, if you solve number 12 first, make sure the answer is placed beside the 12 on the answer sheet.) All questions are weighted equally. Answer as many questions as you can in the allotted time. No contestant is expected to solve all of the problems.

#### CALCULATORS, COMPUTERS AND/OR ANY OTHER ELECTRONIC DEVICES ARE NOT PERMITTED.

#### UNLESS OTHERWISE INDICATED, ALL ANSWERS MUST BE EXPRESSED IN SIMPLEST FORM.

A radical expression of index *n* is in simplest form if the radicand is not a fraction, denominators are rationalized and integer radicands do not have any factors that are *n*th powers of a prime. For example,  $\sqrt{\frac{5}{12}}$  simplifies to  $\frac{\sqrt{15}}{6}$ .

Do NOT approximate the number  $\pi$ .

Do NOT approximate radicals.

The notation **log** is logarithm to the base 10.

The notation  $\log_a$  is logarithm to the base *a*. The notation ln is logarithm to the base *e*.

The symbol ! is the factorial symbol. For example,  $3! = 3 \cdot 2 \cdot 1 = 6$ .

The symbol *i* is the complex unit  $\sqrt{-1}$ .

All numbers are in base 10 unless otherwise indicated (e.g.,  $1001_2$  is the base 2 representation of the decimal number 9).

Any answer that is a non-integer rational number must be expressed in the form  $\frac{a}{b}$ , where *a* and *b* are integers that have no common divisor other than 1.

#### ANSWER SHEET (2025)

PLEAS	E PRINT CLEARLY			
STUDENT'S FULL NAME An		wers		
STUDI	ENT'S ADDRESS			
NAME	OF SCHOOL			
TOWN	(OR CITY) OF SCHOOL			
WHAT	GRADE ARE YOU IN?	O 9th O 10th O 11th	O 12th O Other	
1	26/33		221080	integers
2	50		23. <u>b = 48</u>	
3	60	dollars	24. <u></u>	units
4	4		25. <u>15 / 4</u>	
5	5400		26. <u>35√3</u>	square units
6	32π/3	cubic cm	27	
7	8/9		28108	
8	3456	hours	29. $\beta = \pi / 12 \text{ or } 15^{\circ}$	
9	77		3020	units
10	23		3175	ways
11	7	cubic inches	32. 76	
12.	115	degrees	33. <u>305</u>	ordered pairs
13	-1/5		34. <u>1 / 66</u>	
14	9π / 16	cubic feet	35114	
15	(0,18)		36. $\frac{\pi}{2} - 1$	square units
16	$\sqrt{2} - 1$		37196	
17	x = 1/2, -3/2		384	
18.	4		3976776	
19	$10 \pm 2\sqrt{5}$	units	40. 38	degrees
20	$3\pi - 10$		41. $x = (3\sqrt{11} + \sqrt{3})/2$	2
21.	683 / 1024			