



THE UNIVERSITY OF VERMONT
DEPARTMENT OF MATHEMATICS AND STATISTICS
SIXTY-SECOND ANNUAL HIGH SCHOOL PRIZE EXAMINATION
MARCH 13, 2019

THIS EXAMINATION IS TO BE ADMINISTERED ON WEDNESDAY, MARCH 13, 2019 BEGINNING BETWEEN 8:00 AM AND 1:00 PM. 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. The answer sheets will be collected at the end of the examination. You may keep the examination questions. If you would like to retain a copy of your answers, record them on a separate piece of paper. 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 π .

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 which 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 (2019)

PLEASE PRINT CLEARLYSTUDENT'S FULL NAME _____ ANSWERS _____

STUDENT'S ADDRESS _____

NAME OF SCHOOL _____

TOWN (OR CITY) OF SCHOOL _____

WHAT GRADE ARE YOU IN? 9th 10th 11th 12th Other _____

1. 35 / 13

22. 4 / 3 units

2. 32

23. 105 degrees

3. 40 inches

24. 1 / 8580

4. 19 pounds

25. 35 / 6 minutes

5. 3 / 4

26. 1299

6. 16 minutes

27. 1 / 8

7. 1478₉

28. 26 units

8. 3 / 4

29. 197 lattice points

9. 70

30. 9 / 11

10. 22

31. 1170 ways

11. $\sqrt{5}$

32. 1 / 8

12. 1010 / 2019

33. $3\sqrt{10}$ cubic cm

13. 30 units

34. -11 / 21

14. 28 square feet

35. 502

15. 7 / 4 hours

36. 8 / 9

16. 5 students

37. $\sqrt{3}$ and 1/9

17. 48

38. -11 and 65

18. 8

39. -504

19. 102 trees

40. 8 / 3 units

20. 12 / 31

41. 152

21. 1 / 5