THE UNIVERSITY OF VERMONT
DEPARTMENT OF MATHEMATICS AND STATISTICS
FIFTY-NINTH ANNUAL HIGH SCHOOL PRIZE EXAMINATION
MARCH 9, 2016

THIS EXAMINATION IS TO BE ADMINISTERED ON WEDNESDAY, MARCH 9, 2016 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 nth 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 $\textbf{log}_a$ 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 nonintegral 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.

PLEASE PRINT CLEARLY

STUDENT'S FULL NAME_____

STUDENT'S ADDRESS _____

NAME OF SCHOOL _____

TOWN (OR CITY) OF SCHOOL _____

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

1. ___5 / 11_____

2. ___7_____

3. ___1 / 2_____

4. ___30_____ degrees

5. ___28 / 3_____ mph

6. ___−14_____

7. ___39/7_____

8. ___40_____ squares

9. ___16 / 17_____ square units

10. $\dfrac{75\sqrt{3}}{2}$ _____ square units

11. ___108_____ paths

12. ___$4\sqrt{3}$_____ units

13. ___5_____ meters

14. ___35_____ circles

15. ___$35\sqrt{2}$_____ square units

16. ___271_____

17. ___−1 / 3_____

18. ___840_____ square cm

19. ___$5t − 3$_____

20. ___36_____ integers

21. ___5_____

22. ___24 / 25_____

23. ___− 405_____

24. ___64 / 9_____

25. ___− 4_____

26. ___2_____

27. ___58 / 3_____ cm

28. ___3528_____

29. ___668_____

30. ___56_____ palindromes

31. ___3 and − 41 / 12_____

32. ___32 / 3_____ square units

33. ___3 / 16_____

34. ___$3 + \sqrt{3}$_____ square units

35. ___3 / 4_____

36. ___45_____

37. ___126_____

38. ___47_____

39. ___10001_____

40. $\dfrac{1 + \sqrt{5}}{2}$ _____

41. ___$2\sqrt{10}$_____ square units