



THE UNIVERSITY OF VERMONT
DEPARTMENT OF MATHEMATICS AND STATISTICS
SIXTIETH ANNUAL HIGH SCHOOL PRIZE EXAMINATION
MARCH 15, 2017

THIS EXAMINATION IS TO BE ADMINISTERED ON WEDNESDAY, MARCH 15, 2017 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 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.

ANSWER SHEET (2017)

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. _____ $-1/180$ _____

2. _____ 194 _____

3. _____ 18 _____

4. _____ 28 _____

5. _____ $1/3$ _____

6. _____ $2/3$ _____

7. _____ 31 _____ degrees

8. _____ $5/32$ _____

9. _____ $5/2$ _____ units

10. _____ $13/3$ _____

11. _____ $19/8400$ _____

12. _____ 5 _____ ounces

13. $A = 2$ $B = 6$ _____

14. _____ 2 _____

15. _____ 28 _____ feet

16. _____ $1/12$ _____

17. _____ 40 _____ degrees

18. _____ 64π _____ square units

19. _____ -31 _____

20. _____ 20 _____

21. _____ 12 _____ minutes

22. _____ 4 _____

23. _____ $4/5$ _____ square units

24. _____ $48\sqrt{3}$ _____ cm

25. _____ $3/5$ _____

26. _____ $\sqrt[3]{10}$ _____

27. _____ 2296 _____ integers

28. _____ -1 _____

29. _____ $9/2$ _____ cubic feet

30. _____ 9 _____

31. _____ 6 _____ units

32. _____ 1009 _____

33. _____ 55 _____ square units

34. _____ $2/3$ _____

35. _____ $3\pi/2$ _____

36. _____ $3(1 + \sqrt{5})$ _____ units

37. _____ 12 _____ percent

38. _____ -11 and -8 _____

39. _____ $32/3$ _____

40. _____ $1/15$ _____

41. _____ $27/2$ _____ units