

**2009 MathEdge+ Contest: Advanced Level**

25 problems in 45 mins. No Calculator.

Please box the answer. Only correct answer counts. No partial credit.

- 1) What is the smallest possible sum for all Tuesday dates in the month of August?
- 2) A line of ducks was walking along a single file with 2 ducks in front of a duck and 2 ducks behind a duck. What is the fewest number of ducks that could be in this line?
- 3) What could be the biggest product obtained by placing the digits 1, 2, 3, 4, and 5 in the boxes?

$$\begin{array}{r} \square \square \square \\ \times \quad \square \square \\ \hline \end{array}$$

- 4) I am a palindrome number. I am greater than 200, but less than 400. My tens digit is the quotient of my hundreds digit and my units digit. I am an odd number. What number am I?
- 5) The sum of the squares of two positive integers is 193. The product of two integers is 84. What is the sum of the two integers?
- 6) If  $x$  is a positive real number such that  $x + \frac{1}{x} = 4$ , what is the value of  $x^3 + \frac{1}{x^3}$ ?
- 7) Suppose that  $40!$  has  $m$  divisors and  $41!$  has  $n$  divisors. Find  $\frac{m}{n}$ .

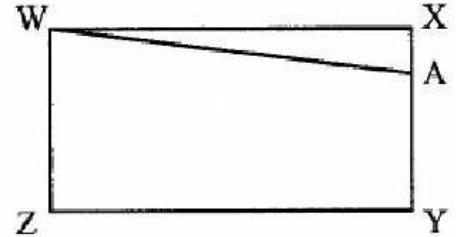
## 2009 MathEdge+ Contest: Advanced Level

25 problems in 45 mins. No Calculator.

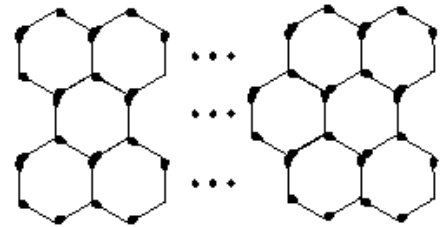
Please box the answer. Only correct answer counts. No partial credit.

8) What positive integer is 56 less than its square?

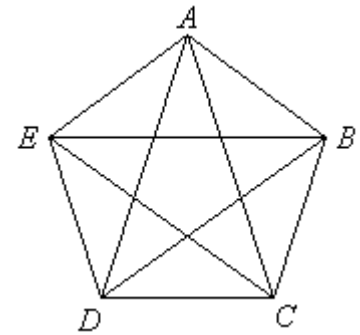
9) If  $WA$  divides rectangle  $WXYZ$  into two parts whose areas are in the ratio of 7:1, what is the ratio  $XA / AY$ ? Express your answer as a common fraction.



10) A net with 32 hexagonal spaces in three rows was made out of matches (see the picture.) How many matches were used to make this net?



11) How many triangles of any size are in the picture below?



12) What is the area of a triangle with sides 13, 14, and 15?

13) Express the following sum as a common fraction:

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \cdots + \frac{1}{9 \cdot 10}$$

**2009 MathEdge+ Contest: Advanced Level****25 problems in 45 mins. No Calculator.****Please box the answer. Only correct answer counts. No partial credit.**

14) If  $x \geq 1$  then  $\sqrt{x\sqrt{x\sqrt{x}}} =$

- a)
- $x\sqrt{x}$
- b)
- $x^4\sqrt{x}$
- c)
- $\sqrt[8]{x}$
- d)
- $\sqrt[8]{x^3}$
- e)
- $\sqrt[8]{x^7}$

15) Suppose you draw 100 distinct horizontal lines and 100 distinct vertical lines in the same plane. How many pieces of the plane are formed, by cutting along all of these lines? Note that some of the pieces will have infinite area.

16) In the sequence  $\dots, a, b, c, d, 0, 1, 1, 2, 3, 5, 8, \dots$ , each term is the sum of the two preceding terms. What is  $a$ ?17) How many integers are there between  $6 \times 10^{98}$  and  $5 \times 10^{100}$  (not counting  $6 \times 10^{98}$  and  $5 \times 10^{100}$ )? Express your answer in scientific notation.18) Express  $0.\overline{823}$  (i.e.,  $0.8232323232323 \dots$ ) as a simplified fraction. What would be the sum of this fraction's numerator and denominator?19) Which statement is true about  $[\frac{7}{8}]^{600} \times [\frac{8}{7}]^{500}$  ?

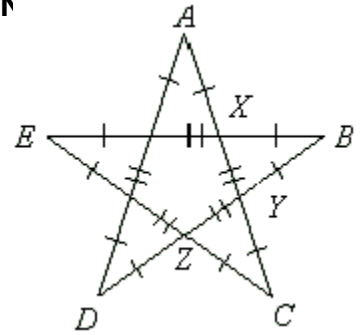
- The product is greater than 2,100.
- The product is greater than 700 but less than 1000.
- The product is greater than 3 but less than 700.
- The product is greater than 1 but less than 3.
- The product is less than 1 but greater than 0.

# 2009 MathEdge+ Contest: Advanced Level

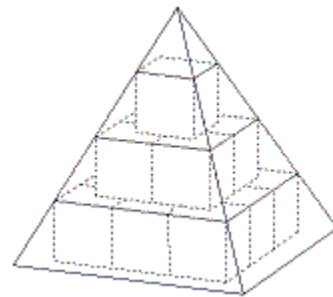
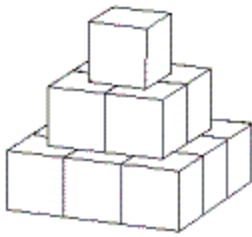
25 problems in 45 mins. No Calculator.

Please box the answer. Only correct answer counts. N

20) What is the sum of the measures of the angles A, B, C, D, and E in the figure below?



21) The left-hand picture shows the beginnings of a small pyramid made out of 14 cubic blocks of stone, each 1 m on a side. Additional stone will be added to form a smooth-faced pyramid as shown on the right. What additional volume of stone will be added to the original  $14 \text{ m}^3$  to get the final pyramid?



22) If the rectangle shown here represents  $\frac{2}{3}$ , which picture below best represents 3?



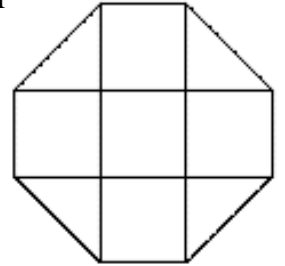
- a.
- b.
- c.
- d.
- e.

## 2009 MathEdge+ Contest: Advanced Level

25 problems in 45 mins. No Calculator.

Please box the answer. Only correct answer counts. No partial credit.

- 23) If the area of the center square is 4 square units, what is the area of the regular octagon (round to the nearest tenth)?



Not drawn to scale

- 24) There are three tribes on an island. Members of the Liar Tribe always lie. Members of the Truthful Tribe always tell the truth. Members of the Alternator Tribe always alternate their statements: they tell one lie, then one true statement, then one lie, and so on. Which situation is impossible?
- A Liar says, "I am a Liar."
  - A Truthful says, "I am a Truthful."
  - An Alternator says, "I am a Liar."
  - A Liar says, "I am a Truthful."
  - An Alternator says, "I am an Alternator."

- 25) Grace starts at point S and walks at a steady pace once around the perimeter of a square park. Which graph best represents her distance (position) from S as time passes?

