# List 1 of Questions from 2006
Provincial Competition

From Bull's Eye Stage

1. A math contest consists of two stages. The Bull's-eye Stage has 12 questions, worth 2 points each, and the Blitz Stage has 26 questions, worth 1 point each. Alicia answered 28 of the 38 questions correctly, and got 35 points. How many Blitz Stage questions did she answer correctly?

   1. _____ questions

2. If the price of eggs was increased by N cents per dozen, where N is a positive integer, it would cost $10N$ more cents to buy $N+1$ eggs than it would cost if their price was reduced by N cents per dozen. What is the value of N?

   2. _____

3. Suppose that $a_1 = 1/2$, $a_2 = (2/3)(a_1 + 1)$, $a_3 = (3/4)(a_2 + 1)$, $a_4 = (4/5)(a_3 + 1)$, and so on. What is the value of a_{13}? Express your answer as a common fraction.

   3. _____

4. Triangle ABC below is isosceles and right-angled at A. A circle with center A and radius 1 unit intersects the hypotenuse BC at points P and Q, where $BP = PQ = QC$. What is the area of $\triangle ABC$? Express your answer as a common fraction.

   4. _____ units^2
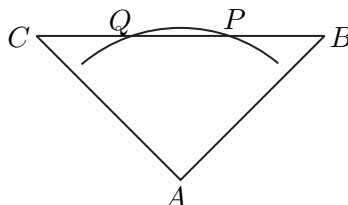
From Blitz Stage

1. The population of a country increased by 25%, and food production increased by 20%. By how many percent did food production per person decrease?

   1. _____ %

2. If $x^{64} = 64$, what is x^{32}?

   2. _____

3. Two equilateral triangles, each with area equal to 1, are placed so as to form a six-pointed star, with a regular hexagon as their part in common. What is the area of the star? Express your answer as a common fraction.

   3. _____ units^2
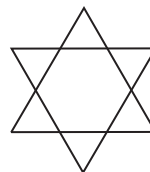

4. What is the largest integer that always divides the difference between the squares of any two odd multiples of 3?

   4. _____

5. In an election, everyone voted for Alan or for Beth. After 60% of the votes had been counted, Alan was leading 60% to 40%. What percentage of the rest of the vote must Beth get in order to end up tied with Alan?

5. _____ %

6. How many positive integers less than 2006 are divisible by 20 or by 25 but not by both?

6. _____ integers

7. Suppose that $f(n+2) = f(n) + 2f(n+1)$ for all n. Given that $f(2) = 9$ and $f(3) = 25$, what is the value of $f(1)$?

7. _____

8. A stadium is divided into two sections, Section A and Section B. Section A has 2000 less than three-quarters of the total number of seats in the stadium. Section B has 1000 less than one-third of the total number of seats in the stadium. What is the total number of seats in the stadium?

8. _____ seats

9. The number in each square is the sum of the numbers in the two squares immediately "above" it. So for example the number in the leftmost square of the second row must be 6. Given the information in the diagram below, what is the value of x?

_____

| 1 | 5 | x | 5 | 1 |

| 0 |
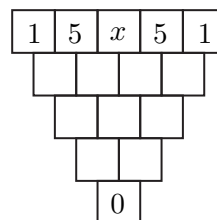
From Co-op Stage

1. Call an integer *unlucky* if the sum of its decimal digits is equal to 13. How many unlucky integers are there between 1 and 888?

1. _____

2. How many digits in total are there in the decimal representation of $(5^5)^5$?

2. _____ digits

3. The figure below is a 5 by 5 grid of points. Each point is $1\,\text{cm}$ from its nearest horizontal and vertical neighbours. How many ways are there to choose two distinct grid points that are an integer number of cm from each other? Note that choosing P and Q is to be considered the same as choosing Q and P.

3. _____ ways
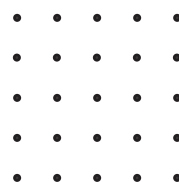
From Face-off Stage

1. If $5x + 6y + 2 = \dfrac{5}{7}$, what is the value of $10x + 12y + 3$?

1. _____

2. Let $\lfloor x \rfloor$ denote the greatest integer which is less than or equal to x. What is the value of
$$\left\lfloor \frac{22}{7} \right\rfloor - \left\lfloor -\frac{22}{7} \right\rfloor ?$$

2. _____

3. A turntable makes 45 revolutions per minute. Through how many degrees does the turntable rotate per second?

3. _____

4. What is the product of the first five positive odd integers?

4. _____

5. There are pheasants and rabbits in a barn, 78 animals altogether. Pheasants have 2 feet and rabbits have 4. If I remove half of the rabbits, how many feet remain in the barn?

5. _____

6. The sum of all the edge lengths of a cube is 36 cm. What is the surface area of the cube, in cm^2?

6. _____
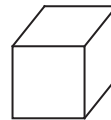
7. If Alicia loses one and a half pounds a week, how many weeks will it take her to go from 154 pounds to 130 pounds?

7. _____

8. If $3x - 1 = \dfrac{1}{4}$, express x as a common fraction.

8. _____

9. A cubic centimetre of gold has mass 19.32 grams. How many kilograms are in the mass of a 1 metre by 1 metre by 1 metre cube of gold?

9. _____

10. Alicia's restaurant meal cost \$125. She decided to leave a 12% tip. What total number of dollars did she pay (bill plus tip)?

10. _____

11. Simplify:
$$(2^{10} + 2^{10} + 2^{10} + 2^{10})^{1/3} .$$

11. _____

12. How many positive factors of $2^4 \times 5^4$ are perfect squares?

12. _____

13. Alice can paint a room in one day, and Bob can paint a room in two days. Working together, how many days will it take for them to paint 15 rooms?

13. _____

14. What is the value of
$$(\sqrt{10} + \sqrt{5})^2 + (\sqrt{10} - \sqrt{5})^2 ?$$

14. _____

15. In an election, Alfie got 65% of the votes and Beth got the rest. If Alfie got 120 more votes than Beth, how many people voted?

15. _____

16. The sum of the positive integers from 1 to n (inclusive) is greater than 275. What is the smallest possible value of n?

16. _____

17. Alphonse and Beti walk side by side. Alphonse averages 120 steps per minute and each of his steps is 90 cm long. Beti's steps are 75 cm long. How many steps does Beti average per minute?

17. _____

18. In the right-angled triangle below, the hypotenuse has length 17 units, and one of the legs has length 15 units. How many units^2 are in the area of the triangle?

18. _____
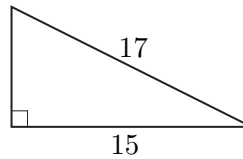
19. Let A be the sum of the 25 integers from 0 to 24, and let B be the sum of the 25 integers from 76 to 100. What is the value of $A + B$?

19. _____

20. Suppose that $4^{x+3} = 8^{x-3}$. What is the value of x?

20. _____