



ECIS Mathematics League Bernoulli League 2006

Suggested age 14-16

Section One

Calculators are not allowed

Time: 40 minutes

(1) Find the next two numbers in the sequence $-1, 1, -4, 8, -9, 27, -16, 64, \dots$

(2) In the cube drawn below, each small cube has a volume of 8 cm^3 . Find the **surface area** of the large cube.



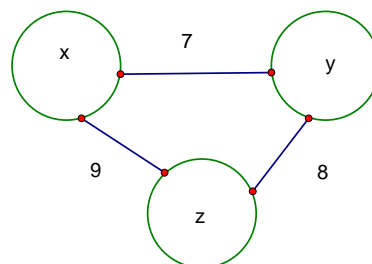
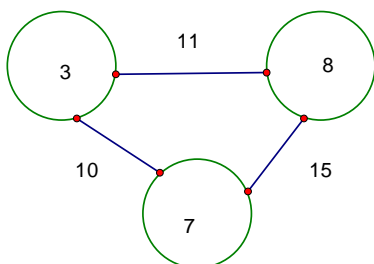
(3) What is the probability of rolling a prime number with a six-sided dice?

(4) Each different letter represents a different digit. Find what digit S represents.

$$\begin{array}{r} \text{N I B} \\ \text{B I N} \\ \hline \text{S U N G} \end{array}$$

(5) After dinner a quarter of the cake is left and put in the kitchen. A hungry teenager eats a third of the cake in the kitchen. What fraction is left to put in the freezer?

(6) The numbers in the circles are added to give the value of the path (see the diagram below). Find x.





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Section Two

Calculators are not allowed

Time: 40 minutes

- (1) What number comes next in the pattern 0, 2, 8, 18, 32, 50.....?
- (2) Find the volume of a Coca Cola tin that is 12cm high and has a diameter of 6cm. Leave π in your answer.
- (3) In the microwave one meal takes 6 minutes to cook. Two meals take 50% longer. How long does it take to cook two meals?
- (4) Can the sum of two prime numbers be a prime number? Yes or no. If yes, give an example. If no, give a reason.
- (5) What is the size of each of the angles of an isosceles right-angled triangle?
- (6) The mean of the test scores of two students is 80. The mean test score of three other students is 85. What is the mean test score of all five students?



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Section Three

Calculators are not allowed

Time: 40 minutes

- (1) Given $1 + \frac{1}{a} = 3$, find $\frac{1}{a} - a$
- (2) If the circumference of a circle is 20π m, find the area of the circle. Leave π in your answer.
- (3) For what values of x and y is the value of the expression $2x^2 + 4xy + 5y^2 - 4x + 2y + 5 = 0$.
- (4) A 30% discount is made on the price of each ticket for a play. How many more tickets need to be sold (give your answer as a percentage) so that you make exactly the same amount of money from the tickets sales as you did before the 30% discount?
- (5) The distance between points A and B is 30, between B and C is 80, between C and D is 236, between D and E is 86 and between E and A is 40. Find the distance between points E and C?
- (6) A bird is sitting on top of a 10 m tall tree on one side of a river. Another bird is sitting on top of a 6 m tall tree on the other side of the river. Both see a fish in the river and dive straight towards it at the same time. They fly at the same speed and reach the fish at the same time, meeting each other at a right angle. How wide is the river?



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Answers

ROUND 1

- (1) -25 and 125 (alternating sequences of negative squares and cubes).
- (2) 216 cm^2
- (3) 0.5 or $\frac{3}{6}$ or $\frac{1}{2}$
- (4) 1
- (5) $\frac{2}{12}$ or $\frac{1}{6}$
- (6) 4

ROUND 2

- (1) 72
- (2) $108\pi \text{ cm}^3$
- (3) 9 minutes
- (4) Yes $2+3=5$
- (5) 90° , 45° , 45°
- (6) 83

ROUND 3

- (1) $\frac{3}{2}$ or $1\frac{1}{2}$ or 1.5
- (2) 100π
- (3) $x=2$ and $y=-1$ and $x=-2y$
- (4) $42\frac{6}{7}\%$
- (5) 150.
- (6) 16m