



ECIS Mathematics League Bernoulli League 2007

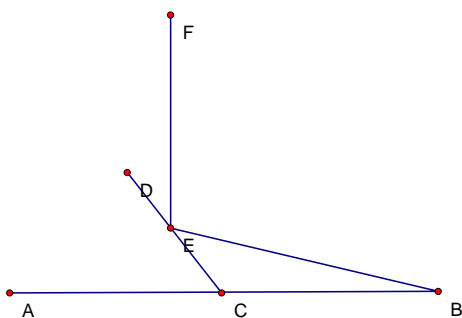
Suggested age 14-16

Section One

**Calculators are not
allowed**

Time: 40 minutes

- (1) A beam of light shines from point B and reflects off a mirror (DC) at point E so that angle DEF is the same as angle CEB ($m(\angle DEF) = m(\angle CEB)$). The light reaches F so that its path (EF) is perpendicular to the line AB. If angle CBE is 26° ($m(\angle CBE) = 26^\circ$) find angle DEF ($m(\angle DEF)$)



- (2) The digits 1, 2, 3, and 4 can be arranged to form twenty-four different four-digit numbers. No digit is used twice. If these twenty-four numbers are listed from smallest to largest, in what position is 3142?
- (3) Five integers have an average of 69. The middle integer (the median) is 83. The most frequently occurring integer (the mode) is 85. When I subtract the smallest integer from the biggest integer (the range) I get 70. What is the second smallest of the five integers?
- (4) Find the next number in the sequence: 729, 243, 81,
- (5) One solution of the equation $3x + y = 100$ is $x = 5$ and $y = 85$. This solution can be written as $(5, 85)$. How many **different solutions** (x, y) , where x and y are positive integers (not zero), are there?
- (6) A square has perimeter of 64 centimetres, find its area.



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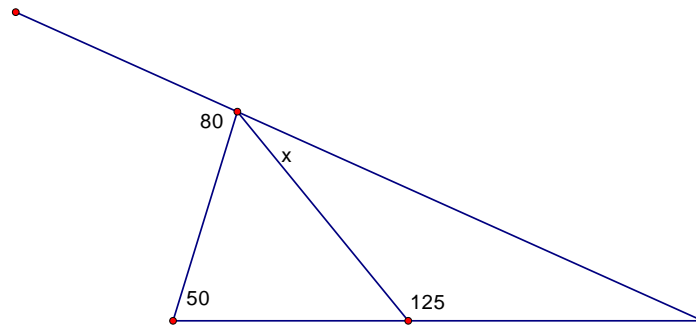
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Section Two

**Calculators are not
allowed**

Time: 40 minutes

- (1) Three rugs have a combined area of 200 square metres. By overlapping the rugs to cover a floor area of 140 square metres, the area that is covered by exactly two layers is 24 square metres. What is the area that is covered with three layers of rug?
- (2) The length of each side of a regular hexagon is 6π inches. A circle has a circumference equal to the perimeter of the hexagon; find the radius of the circle.
- (3) Find the next number in the sequence: 0, 3, 8, 15, 24.
- (4) Find the value of x .



- (5) A student buys \$100 of shares in the stock market and at the end of the first year loses 10%. The student invests for a second year and has 5% more than the amount at the end of the first year. How much does the student have at the end of the second year?
- (6) A wheel rotates at a rate of **12 degrees per second**, how many revolutions (turns) will the wheel have rotated after **40 seconds**? Give your answer as a fraction in its lowest form.



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Section Three

**Calculators are not
allowed**

Time: 40 minutes

- (1) The numbers 1 to 6 are written on a die. I throw **two dice** and add the numbers together. What is the probability that I get a sum of seven?

- (2) Find the next number in the sequence: 156, 143, 130, 117....

- (3) A cube has edges length n , where n is an integer. Three faces that meet at a corner are painted red. The cube is cut into n cubed smaller cubes of unit length. If exactly 125 of these cubes have no faces painted red, determine the value of n .

- (4) When the expression $15^6 \times 28^5 \times 55^7$ is evaluated, it ends with a string of consecutive zeroes. How many zeroes are in that string?

- (5) The vertex of the parabola $y = (x - a)^2 + a + b$ has co-ordinates (2,5). What is the value of b ?

- (6) If $A = 5^{2007} + 5^{-2007}$ and $B = 5^{2007} - 5^{-2007}$, what is $A^2 - B^2$?



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Answers

Section 1

- (1) 32 degrees
- (2) 14th
- (3) 77
- (4) 27
- (5) 33
- (6) 256 sq. cm

Section 2

- (1) 18 sq m
- (2) 18 inches
- (3) 35
- (4) 25
- (5) \$94.50
- (6) 1½ revolutions

Section 3

- (1) one sixth
- (2) 104
- (3) 6
- (4) 10
- (5) 3
- (6) 4