

# THE NINETEENTH W.J. BLUNDON MATHEMATICS CONTEST\*

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The Canadian Mathematical Society  
in cooperation with  
The Department of Mathematics and Statistics  
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1. Five years ago Janet was one sixth of her mother's age. In thirteen years she will be half her mother's age. What is Janet's present age?
2. If  $a + b + c = 0$ , prove that  $a^3 + b^3 + c^3 = 3abc$ .
3. A certain rectangle has area 6 and diagonal of length  $2\sqrt{5}$ . What is its perimeter?
4. Find all positive numbers  $x$  such that  $x^{x\sqrt{x}} = (x\sqrt{x})^x$ .
5. Rationalize the denominator:  $\frac{1}{\sqrt{2} + \sqrt{3} + \sqrt{6}}$ .
6. Points  $A$  and  $B$  are on the parabola  $y = 2x^2 + 4x - 2$ . The origin is the midpoint of the line segment joining  $A$  and  $B$ . Find the length of this line segment.
7. If  $\log_{125} 2 = a$  and  $\log_9 25 = b$ , find  $\log_8 9$  in terms of  $a$  and  $b$ .
8. Point  $P$  lies in the first quadrant on the line  $y = 2x$ . Point  $Q$  is a point on the line  $y = 3x$  such that  $PQ$  has length 5 and is perpendicular to the line  $y = 2x$ . Find the point  $P$ .
9. For what conditions on  $a$  and  $b$  is the line  $x + y = a$  tangent to the circle  $x^2 + y^2 = b$ ?
10. In  $\triangle ABC$ , we have  $\angle ACB = 120$  degrees,  $AC = 6$  and  $BC = 2$ . The internal bisector of  $\angle ACB$  meets the side  $AB$  at the point  $D$ . Determine the length of the line segment  $CD$ .

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