BRITISH COLUMBIA COLLEGES

Senior High School Mathematics Contest

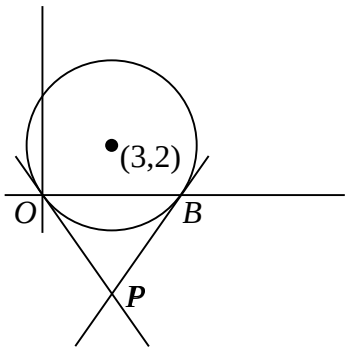
Preliminary Round March 8, 2000

1. Antonino sets out on a bike ride of 40km. After he has covered half the distance he finds that he has averaged 15km/hr. He decides to speed up. The rate at which he must travel the rest of the trip in order to average 20km/hr for the whole journey is:

   (a) 25km/hr (b) 30km/hr (c) 35km/hr (d) 36km/hr (e) 40km/hr

2. A circle with centre at $(3, 2)$ intersects the x-axis at the origin, O, and at the point B. The tangents to the circle at O and B intersect at the point P. The y-coordinate of P is:

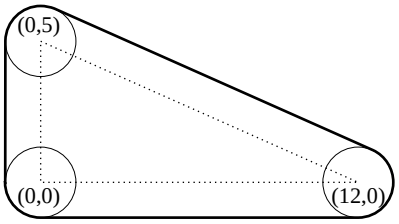
   (a) $-3\frac{1}{2}$ (b) -4 (c) $-4\frac{1}{2}$ (d) -5 (e) none of these



3. From five students whose ages are 6, 7, 8, 9, and 10, two are randomly chosen. The probability that the difference in their ages will be at least 2 years is:

   (a) $\frac{1}{2}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{7}{10}$ (e) $\frac{3}{4}$

4. The centres of three circles of radius 2 units are located at the points $(0, 0)$, $(12, 0)$ and $(0, 5)$. If the circles represent pulleys, what is the length of the belt which goes around all 3 pulleys as shown in the diagram?



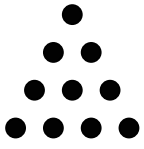
   (a) $30 + \pi$ (b) $30 + 4\pi$ (c) $36 + \pi$ (d) $60 - 4\pi$ (e) none of these

5. If Mark gets 71 on his next quiz, his average will be 83. If he gets 99, his average will be 87. How many quizzes has Mark already taken?

   (a) 4 (b) 5 (c) 6 (d) 7 (e) 8

6. While 10 pin bowling (see diagram) Sam left 3 pins standing which formed the vertices of an equilateral triangle. How many such equilateral triangles are possible?

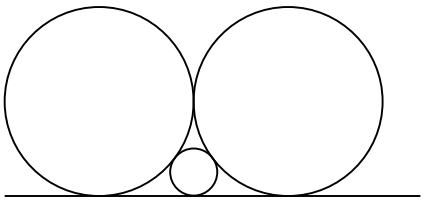
   (a) 15 (b) 14 (c) 12 (d) 10 (e) none of these



7. If I place a 6 cm $\times$ 6 cm square on a triangle, I can cover up to 60% of the triangle. If I place the triangle on the square, I can cover up to $\frac{2}{3}$ of the square. What is the area, in cm^2, of the triangle?

   (a) $22\frac{4}{5}$ (b) 24 (c) 36 (d) 40 (e) 60

8. Two circles, each with radius 10 cm, are placed so they are tangent to each other and a straight line. A smaller circle is nestled between them so that it is tangent to the larger circles and the line. What is the radius, in centimetres, of the smaller circle?



(a) $\sqrt{10}$ (b) 2.5 (c) $\sqrt{2}$ (d) 1 (e) none of these

9. Arrange the following in ascending order:

$$2^{5555} \quad 3^{3333} \quad 6^{2222}$$

(a) 2^{5555} 3^{3333} 6^{2222} (b) 2^{5555} 6^{2222} 3^{3333} (c) 6^{2222} 3^{3333} 2^{5555}
(d) 3^{3333} 6^{2222} 2^{5555} (e) 3^{3333} 2^{5555} 6^{2222}

10. Given that $0 < x < y < 20$, the number of integer solutions (x, y) to the equation $2x + 3y = 50$ is:

(a) 25 (b) 16 (c) 8 (d) 5 (e) 3

11. Suppose A, B, and C are positive integers such that

$$\frac{24}{5} = A + \frac{1}{B + \dfrac{1}{C+1}}$$

The value of $A + 2B + 3C$ equals:

(a) 9 (b) 12 (c) 15 (d) 16 (e) 20

12. A box contains m white balls and n black balls. Two balls are removed randomly without replacement. The probability one ball of each colour is chosen is:

(a) $\frac{mn}{(m+n)(m+n-1)}$ (b) $\frac{mn}{(m+n)^2}$ (c) $\frac{2mn}{(m+n-1)(m+n-1)}$ (d) $\frac{2mn}{(m+n)(m+n-1)}$ (e) $\frac{m(m-1)}{(m+n)(m+n-1)}$

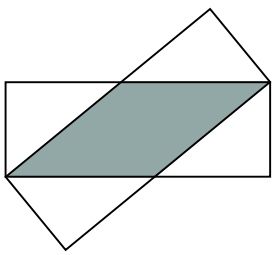
13. If it takes x builders y days to build z houses, how many days would it take q builders to build r houses? Assume these builders work at the same rate as the others.

(a) $\frac{qry}{xz}$ (b) $\frac{ryz}{qx}$ (c) $\frac{qz}{rxy}$ (d) $\frac{xyr}{qz}$ (e) $\frac{rz}{qxy}$

14. If $x^2 + xy + x = 14$ and $y^2 + xy + y = 28$, then a possible value for the sum of $x + y$ is:

(a) -7 (b) -6 (c) 0 (d) 1 (e) 3

15. Two congruent rectangles each measuring 3cm×7cm are placed as in the figure. The area of overlap (shaded), in cm^2, is:



(a) $\frac{87}{7}$ (b) $\frac{29}{7}$ (c) $\frac{20}{7}$ (d) $\frac{21}{2}$ (e) none of these