

For each question, choose the best answer from the four choices. All answers must be written clearly in the correct blanks on the answer sheet and in simplest form. Exact answers are to be given unless otherwise



4. In the diagram, $\overline{EB} \perp \overline{AC}$ and points A, B , and C are collinear. \overline{BF} bisects $\angle CBE$. If $\angle CBE = 38^\circ$ and $\angle CBD = 14^\circ$, find the value of $\angle EBD$.



5. If the parallelogram has a transversal line intersecting the parallel bases, then the sum of the measures of the interior angles on the same side of the transversal line is _____.

17. Let ℓ be a line intersecting the x -axis at $(p, 0)$ and the y -axis at $(0, q)$, where $p > 0$ and $q > 0$. If the area of the triangle formed by the x -axis, the y -axis, and ℓ is 120, what is the value of $p + q$?

Correct Answer: 20

18. A right circular cone has a base with diameter 10 and height 12. A smaller right circular cone is inscribed in the larger cone so that its base lies in the base of the larger cone and its top passes through the midpoint of the larger cone's altitude. What is the volume of the smaller cone?

Correct Answer: 125 π

19. In the figure, \overline{AB} is a horizontal line segment with length 10. Point C is located in the interior of $\triangle ABC$.

The area of $\triangle ABC$ is 12, and the area of $\triangle ACD$ is 3. What is the area of $\triangle CBD$?

Correct Answer: 9

20. Circle A has center $(6, -2)$ and radius 5. Circle B has center $(-3, 4)$ and radius 3. Find the exact length of the common external tangent line segment connecting the two circles.

Correct Answer: 16

19. If $\frac{a}{3-\sqrt{3}} = \frac{b}{d}$ where a , b , c , and d are integers and $a > 0$, and the minimum possible value of b is 12, what is the value of c ?

Correct Answer: 10

20. Circle A has center $(6, -2)$ and radius 5. Circle B has center $(-3, 4)$ and radius 3. Find the exact length of the common external tangent line segment connecting the two circles.

Correct Answer: 16

2013 John C. Hogan Mathematical Competition

Written Competition Test

1. _____

11. _____

2. _____

12. _____

5. _____

15. _____

6. _____

16. _____

7. _____

17. _____

8. _____

18. _____

10. _____

20. _____



1000

1234

Dollar sign optional

125

21

Ans

Must be in this form

1/2

7. $\underline{342}$ Dollar sign optional

$\underline{17}$ $\underline{1000}$

8. $\underline{3}$

$\underline{18}$ $\underline{1680}$

9. $\underline{507}$

$\underline{19}$ $\underline{324}$

10. $\underline{360}$

$\underline{20}$ $\sqrt{53}$

Must be in
this form