CD Exam

Texas A&M High School Math Contest

25 October, 2025

(NOTE: If units are appropriate, please include them in your answer. All answers must be simplified where possible.)

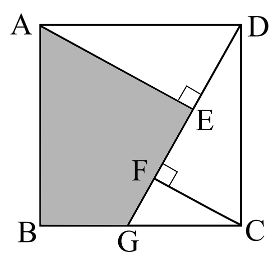
1. In a triangle ABC with $AB = 5, BC = 6$, and $AC = 7$, points D and E lie on $\overline{AC}$ with $AD = 1$ and $EC = 2$. Find the area of $\triangle BDE$.

2. Solve for x: $\quad 12x^{7/5} + 3x^{2/5} = 13x^{9/10}$.

3. Find the largest solution x of the equation $\big|3|x| - 2\big| = 1 - 2x$.

4. Given $b_1 > b_2$, let $f_1(x) = 20x^2 + b_1x + 250$ and $f_2(x) = 5x^2 + b_2x - 125$. Given that the parabolas intersect in exactly one point find the value of $b_1 - b_2$.

5. The figure below shows a square $ABCD$. Find the area of the shaded region if $EF = 3$ and $DG = 13$.



6. Find a real solution x of the equation $\sqrt{x\sqrt{x\sqrt{x}}} = 8\sqrt{2}$.

7. Among the 9 points with integer coordinates (x, y) with $0 \le x \le 2$ and $0 \le y \le 2$, how many distinct pentagons can be formed by choosing 5 of these points as vertices such that all interior angles are strictly less than $180°$?

8. Let $a > b > 0$, $a^2 + b^2 = 3ab$. Find the value of $\dfrac{a+b}{a-b}$. Write your answer as a single term with no sums or differences.

9. A polynomial $f(x) = x^5 - 2x^4 + ax^2 + bx$, where a and b are unknown coefficients, is divisible by $x^2 - 3x + 2$. Find ab.

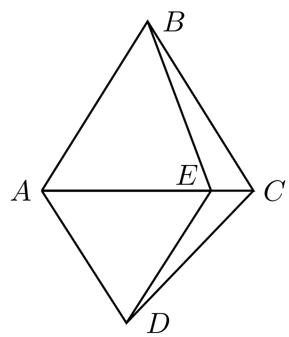
10. If $i = \sqrt{-1}$, find the sum

$$1 + i + i^2 + i^3 + \cdots + i^{2025}$$

11. Find all solutions x of the equation $\log_3 x + \log_x 27 = \log_3(9x^3) + \log_x(9/x)$.

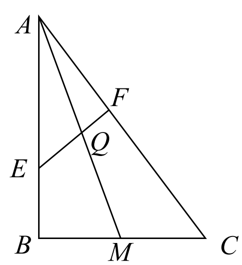
12. In a triangle ABC, points D and E lie on sides $\overline{AC}$ and $\overline{AB}$ respectively. It is given that $\angle ADE = 90°$ and $\angle AED = 30°$. If $\overline{BE} \cong \overline{ED} \cong \overline{DC}$, find the measure of $\angle ACB$.

13. For two equilateral triangles $\triangle ABC$ and $\triangle ADE$, find $\angle BEC$ if $\angle CDE = 14°$.



14. In a right triangle ABC with $\angle A = 60°$, the inscribed circle C_1 has radius 1. A circle C_2 is tangent to $\overline{AB}$, $\overline{AC}$, and externally tangent to C_1. Find the radius of C_2.

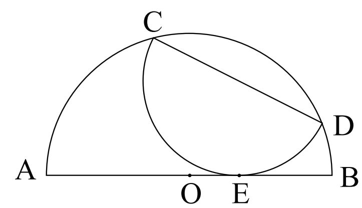
15. The triangle ABC has sides $BC = 3$, $BA = 4$, and $AC = 5$. Consider points E and F on $\overline{\text{AB}}$ and $\overline{\text{AC}}$ with $AE : AF = 3 : 2$. Find the ratio $\dfrac{QE}{QF}$ if $BM = MC$ and Q is the intersection of $\overline{\text{EF}}$ and $\overline{\text{AM}}$.



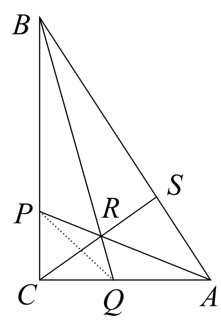
16. Find the sum of the solutions of the equation

$$\sqrt{x+\sqrt{4x-3}+\frac{1}{4}}+\sqrt{x-\sqrt{4x-3}+\frac{1}{4}}=x.$$

17. Points C and D lie on the arc of a semicircle with diameter $\overline{AB}$. Let O be the midpoint of $\overline{AB}$. The circle with diameter $\overline{CD}$ is tangent to the segment $\overline{AB}$ at a point E as in the figure below. Given $CD=12$ and $OE=1$, find the value of AB^2.



18. Let $\triangle ABC$ be the triangle with $AB=10$, $AC=6$ and $\angle C=90$. Take two points P and Q on sides of $\overline{\text{BC}}$ and $\overline{\text{CA}}$ with $CP=CQ=2$. Two lines $\overline{\text{AP}}$ and $\overline{\text{BQ}}$ intersect on R and the line $\overline{\text{CR}}$ and $\overline{\text{AB}}$ meet on S. Find TS if T is the intersection of $\overline{\text{PQ}}$ and $\overline{\text{BA}}$.



19. A cube moves along a straight line perpendicular to the front face, so that it collects rain only on its top and front faces—not on the lateral faces. The cube travels 12 meters with an initial speed of 1 m/s, while rain falls vertically at 6 m/s and is evenly distributed. If the cube's speed is increased by 50% to reduce the amount of rain collected, what is the percentage decrease in the total rain collected? Round your answer to the nearest tenth of a percent.

20. From a point A outside a circle C, two tangents are drawn to the circle, touching it at points P and Q. Through P, draw a line parallel to $\overline{AQ}$, which meets the circle again at R. Let the line $\overline{AR}$ intersect the circle again at S. If $AP:PR=2:3$ and the area of $\triangle ASQ$ is 50, find the area of quadrilateral $APRQ$.