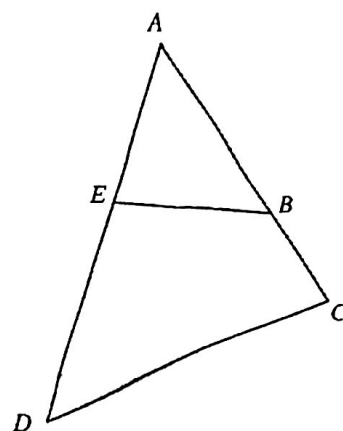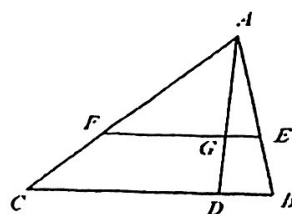**Example 7.** In the following diagram (not necessarily to scale), $\angle ABE = \angle ADC$, $AE = 6$, $BC = 2$, $BE = 3$, and $CD = 5$. $AB + DE$ is equal to

A. 46/3   B. 112/3   C. 13/2   D. 20   E. none of these

Example 10. A line parallel to the base of a triangle cuts the triangle into two regions of equal area. This line also cuts the altitude into two parts. Find the ratio of the two parts of the altitude.

A. $1 : 1$ B. $1 : 2$ C. $1 : \sqrt{2}$ D. $1 : \sqrt{2} + 1$ E. none of these

Example 14. In the sketch, $DE//BC$ and BD is the square of AD. If $AC = 21/4$ and EC $= 9/2$, what is BD ?
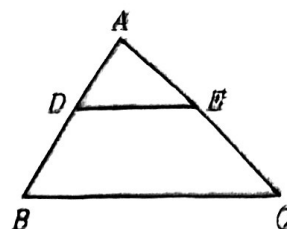
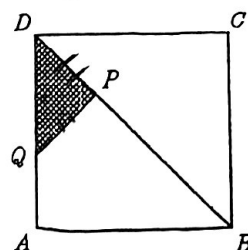A. 16   B. 36   C. 64   D. 144   E. none of these

Example 20. What fraction of the area of square $ABCD$ is represented by the area of $\triangle DPQ$? $BP = BA$; $DP = QP$.
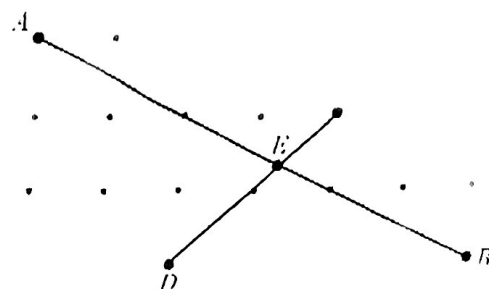
A. $\dfrac{1}{2}(\sqrt{2}-1)^2$ B. $\dfrac{1}{8}$ C. $\dfrac{\sqrt{2}}{2}$ D. $(\sqrt{2}-1)^2$ E. $\dfrac{\sqrt{2}}{6}$

☆**Example 22.** (2000 AMC 10 problem 16) The diagram shows 28 lattice points, each one unit from its nearest neighbors.
Segment AB meets segment CD at E. Find the length of segment AE.

A. $\dfrac{4\sqrt{5}}{3}$ B. $\dfrac{5\sqrt{5}}{3}$ C. $\dfrac{12\sqrt{5}}{7}$ D. $2\sqrt{5}$

E. $\dfrac{5\sqrt{65}}{9}$

Problem 3. Right triangles ABC and XYZ are similar, with A corresponding to X, B to Y, and C to Z. If $BC = 9$, $AC = 21$, and $YZ = 24$, then the length of $\overline{XZ}$ is:

A. 42   B.63   C. 49   D. 56   E. 72

Problem 6. A vertical wall 20 feet high casts a shadow 8 feet wide on level ground. If Alex is 5 feet, 5 inches tall, how far away from the wall can he stand and still be entirely in the shade?

A. 2 feet, 4 inches   B. 3feet, 9 inches C. 4 feet, 3inches D. 5 feet, 10 inches   E. 6 feet, 2 inches

Problem 7. The right triangles in the figure below are similar. Find the value of c.
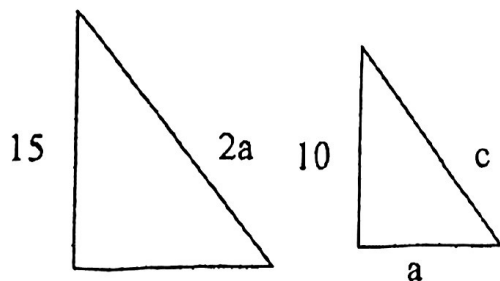
A. $5\sqrt{65}$ B. $\dfrac{4}{3}$ C. 20   D. $\dfrac{80}{3}$ E. $\dfrac{40\sqrt{7}}{7}$

Problem 8. Chord EF is the perpendicular bisector of chord BC, intersecting it in M. Between B and M, point U is taken and $\overline{EU}$ extended meets the circle at A. Then for any selection of U, as described, $\triangle EUM$ is similar to triangle

A. EFA B. EFC C. ABM D. ABU E. FMC
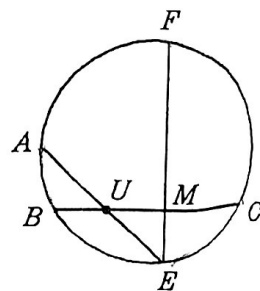
Problem 10. In the figure shown angle C is a right angle, line segments AD and DB are congruent, line segment AC has length 12, line segment AB has length 20 and DE is perpendicular to AB. Then the area of quadrilateral $ADEC$ is

A. 75   B. $58\frac{1}{2}$ C. 48   D. $37\frac{1}{2}$ E. none of these
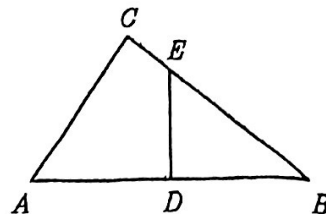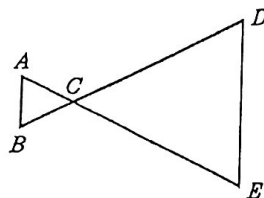
Problem 15. In the triangle, $BD \parallel AE$. $BD = \dfrac{3}{8} AE$. The ratio of the area of $\triangle BDC$ to $\triangle AEC$ is:

A. $\dfrac{9}{64}$ B. $\dfrac{3}{8}$ C. $\dfrac{\sqrt{6}}{4} 4$ D. $\dfrac{3}{5}$ E. $\dfrac{9}{25}$
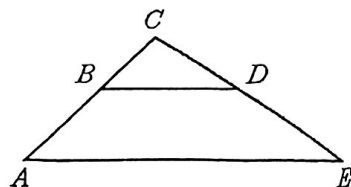
Problem 16. If AB is parallel to DE with $AC = a$, $CE = b$, and $AB = c$, then DE is:

A. $\dfrac{ac}{b}$ B. $\dfrac{bc}{a}$ C. $\dfrac{ab}{c}$ D. $\dfrac{a}{bc}$ E. $\dfrac{b}{ac}$

Problem 18. The base of a triangle is 24 inches. Two lines are drawn parallel to the base, terminating in the other two sides, and dividing the triangle into three equal areas. The length of the parallel closer to the base is:

A. $12\sqrt{3}$ inches   B. $12\sqrt{6}$ inches   C. 16 inches   D. $8\sqrt{6}$ inches E. 12 inches

Problem 19. In the figure $\triangle ABC$ is a right triangle with legs $AB = 6$ and $AC = 8$. A square is drawn as shown, with a side along AC and corners on AB and CB. Find the length of the side of the square.
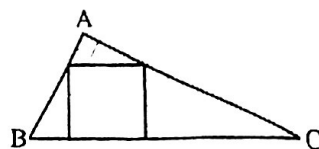
A. 9/2   B. $\sqrt{19}$ C. $\dfrac{\sqrt{57}}{2}$ D. 120/27   E. 120/37

Problem 21. If A is the center of the circle through B and C, and DC and DB are tangents, suppose that $AB = 1$, $BC \perp AD$, and $AD = 2$. Then AE equals:

A. $\dfrac{\sqrt{3}}{2}$ B. $\dfrac{\sqrt{5}}{2}$ C. $\sqrt{3}$ D. $\dfrac{1}{\sqrt{3}}$ E. none of these
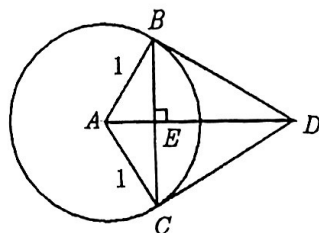
Problem 23. The perimeters of two similar figures are 16 and 24 units, respectively. What is the ratio of their areas?

A. 2 : 3   B 4 : 9   C. 4 : 6   D. 8 : 12   E. cannot be determined

Problem 24. A line intersects two sides of an equilateral triangle and is parallel to the third side. If this line divides the triangular region into a trapezoid and a smaller triangle having equal perimeters, then the ratio of the area of the smaller triangle to that of the trapezoid is:
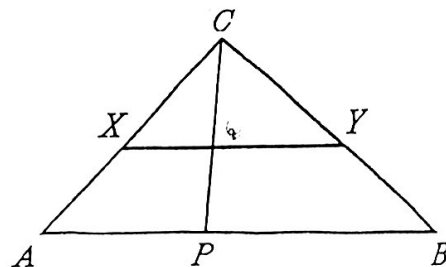
A. 9 : 7 B. $\sqrt{3}$: 2   C. 7 : 4   D. 3 : 2   E. 16 : 9

Problem 25. Let $\triangle ABC$ and $\triangle DEF$ be similar triangles such that $AB = 4$ and $DE = 10$. If the area of $\triangle ABC = 24$, what is the area of $\triangle DEF$?

A. 60   B. 240   C. 150   D. 96   E. 120

Problem 26. In triangle ABC, $XY//AB$ such that the area of triangle CXY is equal to the area of trapezoid $ABYX$. CP is an altitude of triangle ABC. What is the ratio CQ/CP ?

A. $1/\sqrt{2}$ B. 1/2 C. 1   D. $\sqrt{2}$ E. 2

Problem 28. An isosceles triangle ABC with point D on AB, has $AC = BC = BD$ and $AD = DC$. If $AB = 2$, find the length of CD.

A. 1   B. $\sqrt{2}$ C. $\sqrt{5} - 1$ D. $\sqrt{10} - 1$ E. $3 - \sqrt{5}$