3. PROBLEMS

Problem 1. If two lines intersect at point *P*, and two triangles are formed by two parallels cutting the intersecting lines above and below their intersection *P*, the resulting triangles are necessarily:

A. congruent B. similar C. isosceles D. equilateral E. right triangles

Problem 2. A light pole is 30 feet tall. How long is the shadow cast by a woman 6 feet tall who is standing 8 feet from the pole?

A. 1.6 ft. B. 2 ft. C. 10 ft. D.16 ft. E.3ft.

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

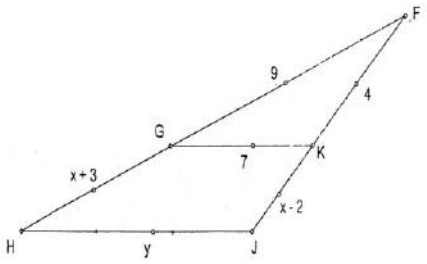
Problem 4. If $\Delta ABC - \Delta FED$, which of the following proportions is *not* true for this pair of similar triangles?

A. $\frac{AB}{FE} = \frac{AC}{FD}$. B. $\frac{AB}{FE} = \frac{BC}{ED}$. C. $\frac{CB}{DE} = \frac{CA}{DF}$. D. $\frac{DE}{CB} = \frac{FD}{AC}$.

E. $\frac{AB}{ED} = \frac{CB}{DE}$.

Problem 5. Given: $\overline{GK} // \overline{HJ}$, with lengths as shown. Find the perimeter of ΔHJF.

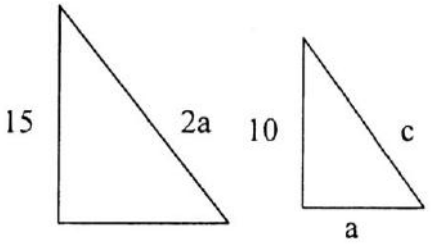
A. 40. B. 38. C. 35. D. 49. E. 50.



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?

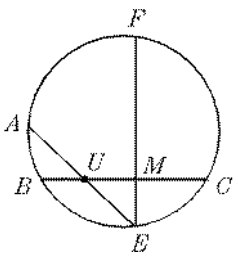
A. 2 feet, 4 inches B. 3feet, 9 inches C. 4 feet, 3inches D. 5 feet, 10 inches E. 6 feet, 2 inches

Problem 7. The right triangles in the figure below are similar. Find the value of c.



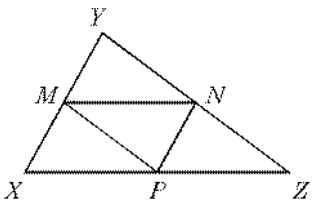
A. $5\sqrt{65}$ B. $\frac{4}{3}$ C. 20 D. $\frac{80}{3}$ E. $\frac{40\sqrt{7}}{7}$

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, ΔEUM is similar to triangle



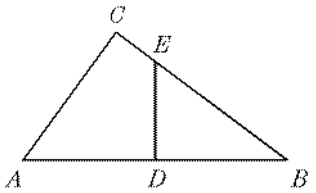
A. EFA B. EFC C. ABM D. ABU E. FMC

Problem 9. In ΔXYZ, points M, N, and P are midpoints. If $XY = 10$, $YZ = 15$ and $XZ = 17$, what is the perimeter of ΔMNP ?



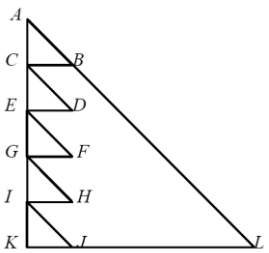
A. 14 B. 16 C. $10\frac{2}{3}$ D. 21 E. cannot be determined

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

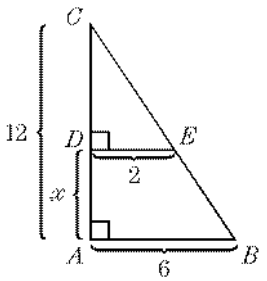
Problem 11. The triangles ΔABC, ΔCDE, ΔEFG, ΔGHI, ΔIJK in the figure above and to the right are congruent to each other and are similar to ΔAKL. If the area of ΔABC is 4, then the area of ΔAKL is:



A. 25 B. 60 C. 100 D. 120 E. none of these

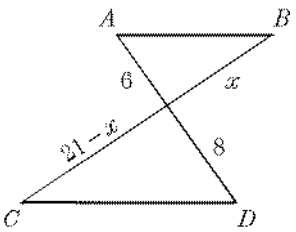
Problem 12. If ΔABC is a right triangle, and $DE \perp AC$. then x equals

A. 8 B. 4 C. 1 D. 3 E. 10



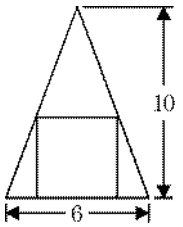
Problem 13. AB is parallel to CD. The value of x is:

A. 6 B. 7 C. 8 D. 9 E. 10



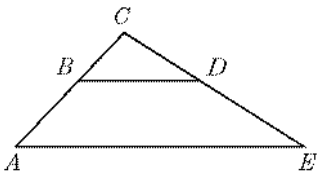
Problem 14. In a triangle with height 10 and base 6 a square is inscribed with a side along the base of the triangle as shown. The length of a side of the square is:

A. $3\frac{1}{2}$ B. $3\frac{3}{4}$ C. 4 D. $4\frac{1}{4}$ E. $4\frac{1}{2}$



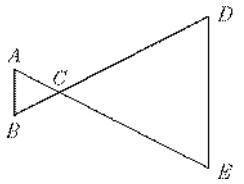
Problem 15. In the triangle, BD // AE. $BD = \frac{3}{8}AE$ .The ratio of the area of ΔBDC to ΔAEC is:

A. $\frac{9}{64}$ B. $\frac{3}{8}$ C. $\frac{\sqrt{6}}{4}4$ D. $\frac{3}{5}$ E. $\frac{9}{25}$



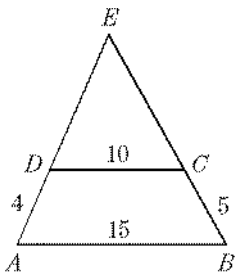
Problem 16. If AB is parallel to DE with $AC = a$, $CE = b$, and $AB = c$, then DE is:

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



Problem 17. Sides AD and BC of trapezoid $ABCD$ are extended to point E. If $AB = 15$, $DC = 10$, $AD = 4$, and $BC = 5$, then DE is:

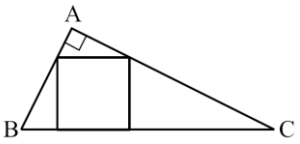
A. $2\frac{2}{3}$ B. 4 C. 8 D. 12 E. none of these



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

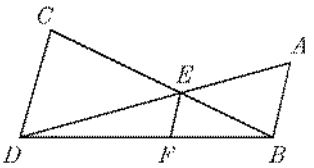
Problem 19. In the figure ΔABC is a right triangle with legs $AB = 6$ and $AC = 8$. A square is drawn as shown, with a side along AC and corners on AB and CB. Find the length of the side of the square.



A. 9/2 B. $\sqrt{19}$ C. $\frac{\sqrt{57}}{2}$ D. 120/27 E. 120/37

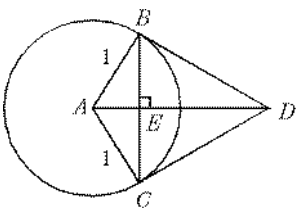
Problem 20. In the diagram $AB//FE//DC$, and $AB = 4$ with $CD = 8$. Find the length of EF.

A. 4/3 B. 2 C. 8/3 D. 3 E. none of these



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:

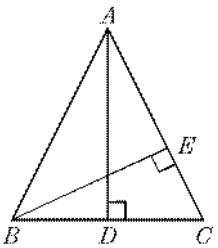
A. $\frac{\sqrt{3}}{2}$ B. $\frac{\sqrt{5}}{2}$ C. $\sqrt{3}$ D. $\frac{1}{\sqrt{3}}$ E. none of these



Problem 22. Suppose you are given isosceles triangle ABC, with perpendiculars AD and BE drawn to sides BC and AC. You can conclude that $\Delta ADC \sim \Delta BEC$ because:

A. $AB = AC$ B. $\angle ABC = \angle ACB$ C. The sides are proportional

D. The triangles have two pairs of congruent angles E. The altitudes of a triangle are proportional to the sides opposite



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:

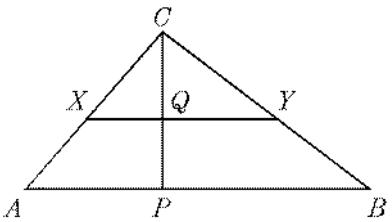
A. 9 : 7 B. $\sqrt{3}$: 2 C. 7 : 4 D. 3 : 2 E. 16 : 9

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

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* ?

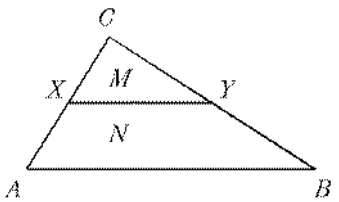
A. $1/\sqrt{2}$ B. 1/2 C. 1 D. $\sqrt{2}$ E. 2



Problem 27. Let *ABC* be a triangle with *X* and *Y* midpoints of the sides as shown. Let area of $\Delta CXY = M$, and area trapezoid $AXYB = N$. How are *M* and *N* related?

A. $N = M$ B. $N = \sqrt{2}\,M$ C. $N = 2M$

D. $N = 3M$ E. $N = 4M$



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. $3-\sqrt{5}$