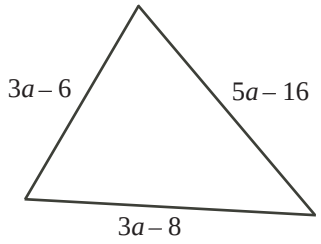
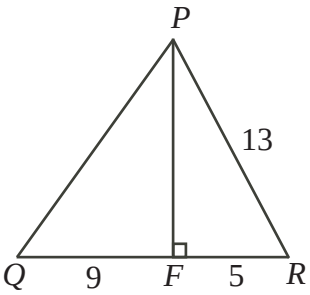
Intermediate Math Circles
Wednesday 17 October 2012
Problem Set 2

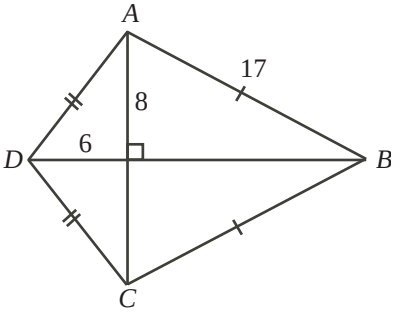
1. Determine the number of different values of a for which the given triangle is isosceles.



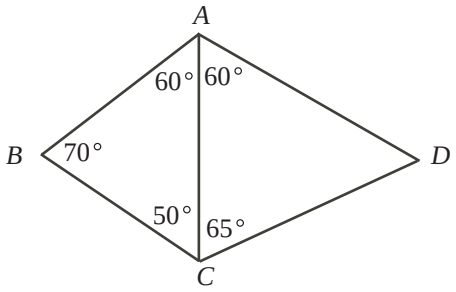
2. In triangle PQR, F is the point on QR so that PF is perpendicular to QR. If $PR = 13$, $RF = 5$, and $FQ = 9$, what is the perimeter of $\triangle PQR$?



3. Calculate the area of figure $ABCD$.



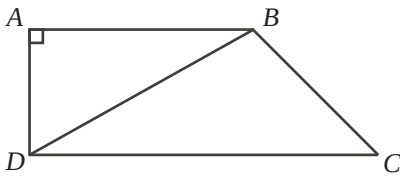
4. In the diagram, which side is the longest: AB, BC, AC, CD, or AD?



5. If a 3 m stake casts a shadow 7 m long, what is the height of a tree that casts a shadow 63 m long?

6. A *scalene* triangle is a triangle whose side lengths are all different. Determine the side lengths of all possible scalene triangles with integer side lengths and perimeter less than 13.

7. In the diagram, $AB = 4$, $DC = 6$, and AB is parallel to DC. If $\angle C = 45°$, determine the length of BD.

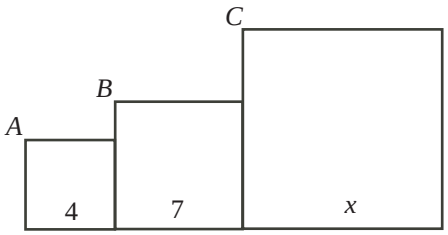


8. $\triangle ABC$ is similar to $\triangle XYZ$. If $AB = 4$, $YZ = 9$, and $BC = XY = p$, determine the value of p.

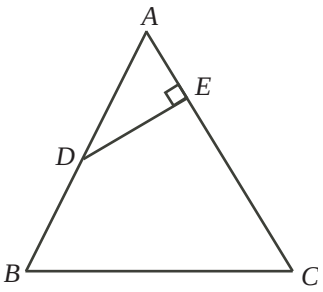
9. A triangle can be formed having side lengths 4, 5 and 8. It is impossible however, to construct a triangle with side lengths 4, 5 and 10. Using the side lengths 2, 3, 5, 7 and 11, how many different triangles *with exactly two equal sides* can be formed?

10. A triangle can be formed having side lengths 4, 5 and 8. It is impossible however, to construct a triangle with side lengths 4, 5 and 10. Ron has eight sticks, each having an integer length. He observes that he cannot form a triangle using any three of these sticks as side lengths. What is the shortest possible length of the longest of the eight sticks?

11. In the adjacent squares shown, the vertices A, B and C lie in a straight line. What is the value of x?



12. In the diagram, $AD = BD = 5$, $EC = 8$ and $AE = 4$. Determine the length of BC.



Answers

1. 2 2. 42 3. 168 4. AD 5. 27 m 6. $(2, 3, 4)$, $(2, 4, 5)$, $(3, 4, 5)$

7. $\sqrt{20} = 2\sqrt{5}$ 8. $p = 6$ 9. 14 10. 21 11. $\frac{49}{4}$ 12. $2\sqrt{13}$