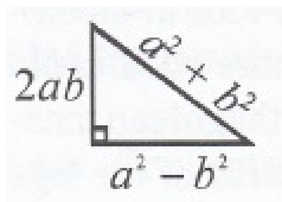
HOMEWORK 4 MATH 7B

OCT. 14, 2018

REVIEW

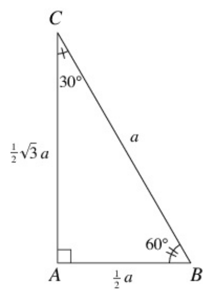
Pythagora's Theorem

In a right triangle with legs a and b, and hypotenuse c, the square of the hypotenuse is the sum of squares of each leg. $c^2 = a^2 + b^2$. The converse is also true, if the three sides of a triangle satisfy $a^2 + b^2 = c^2$, then the triangle is a right triangle. Some Pythagorean triples are: (3,4,5), (5,12,13), (7,24,25), (8.15,17), (9,40,41), (11,60,61), (20,21,29).
To generate such Pythagorean triples, choose two positive integers a and b, $(a > b)$. Then plug the values into the sides as shown:



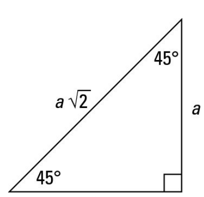
Can you explain why this method works?

The 30-60-90 Triangle



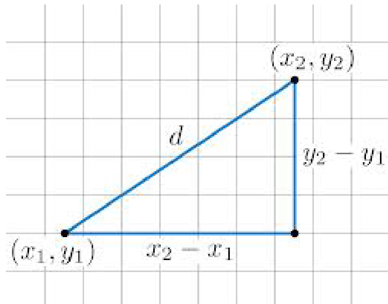
In a right triangle, if one of the angles is given as 30° or 60° then this triangle is called a 30-60-90 triangle and you know the ratio of the sides. If the smaller leg is $\dfrac{a}{2}$ then the hypotenuse is a and using Pythagora's theorem one can find the altitude to be $\dfrac{a\sqrt{3}}{2}$.
An equilateral triangle of side length a can be cut in 2 such triangles when you draw the altitude. Therefore, the total area of an equilateral triangle of side length a is $\dfrac{a^2\sqrt{3}}{4}$

The 45-45-90 Triangle



Given that an angle of a right triangle is $45°$, you can compute the other angle and it will also be $45°$. This triangle is half a square, when the square is folded along its diagonal. Given a square of side length a, the diagonal length is $a\sqrt{2}$.

Distance between Two Points



The distance between points (x_1, y_1) and (x_2, y_2) can be calculated using Pythagora's theorem in the given right triangle. If the hypotenuse is d then $d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$, $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Midpoint of a Line Segment

The midpoint of a segment with endpoints (x_1, y_1) and (x_2, y_2) is the point with coordinates $(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$

Homework

1. Simplify
   (a) $\frac{42^2}{6^2} =$
   (b) $\frac{6^3 \times 6^4}{2^3 \times 3^4} =$
   (c) $(2^{-3} \times 2^7)^2 =$
   (d) $\frac{3^2 \times 6^{-3}}{10^{-3} \times 5^2} =$

2. Simplify
   (a) $\frac{a}{2} + \frac{b}{4} =$
   (b) $\frac{1}{a} + \frac{1}{b} =$
   (c) $\frac{3}{x} + \frac{5}{xy} + \frac{5}{3a} =$

3. Using algebraic identities calculate
   (a) $299^2 + 598 + 1 =$
   (b) $199^2 =$
   (c) $51^2 - 102 + 1 =$

4. Expand
   (a) $(4a - b)^2 =$
   (b) $(a + 9)(a - 9) =$
   (c) $(3a - 2b)^2 =$

5. Factor

(a) $ab + ac =$

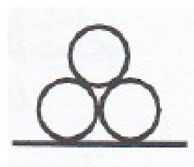
(b) $3a(a+1) + 2(a+1) =$

(c) $36a^2 - 49 =$

6. What is the area of a regular hexagon whose side is 5cm?

7. Find the distance between (5,-4) and (0,-1) on the coordinate plane. What is the midpoint?

8. What is the height of three congruent stacked circles with a radius of 12 cm?



9. In a trapezoid ABCD with bases AD and BC, $\angle A = 90°$, and $\angle D = 45°$. It is also known that $AB = 10$ cm, and $AD = 3BC$. Find the area of the trapezoid.

10. Given 2 concentric circles, chord AB is 8cm long and tangent to the smaller of two concentric circles. A and B are points on the larger circle. What is the area between the 2 circles?

11. In a right triangle ABC, BC is the hypotenuse. Draw AD perpendicular to BC, where D is on BC. The length of BC=13, and AB=5. What is the length of AD?

12. $$\frac{1}{1+\frac{2}{1+\frac{2}{6+12}}} =$$