Math 5e, Fall 2024 Homework 16
due January 29

Instructions: Some of the problems we solved in class, and some are new. Please try to solve all problems, do your best, and show your work. Write on separate sheets of paper, not between the lines of this handout!

Binary Numbers: Numbers represented by using only 0s and 1s.

The square root of a is a number whose square is equal to a. For example, the square root of 25 is 5 because $5^2 = 25$. Notation: square root of a number, a, is commonly denoted as $\sqrt{a}$.

Similarly to b^n $(ab)^n = a^n b^n$, $\sqrt{ab} = \sqrt{a}\sqrt{b}$.

For example, $\sqrt{36} = \sqrt{9 \times 4} = \sqrt{9} \times \sqrt{4} = 3 \times 2 = 6$. And we also know that $\sqrt{36} = 6$.

Theorem (Pythagorean theorem). In a right triangle with legs(sides) a, b and hypotenuse c, one has:

$$a^2 + b^2 = c^2$$

$$c = \sqrt{a^2 + b^2}$$

For example, in a square with side 1, the diagonal has length $\sqrt{2}$.

It is possible – but not easy – to find a right triangle where all the sides are whole numbers. The easiest such triangle is one with a,b,c = 3,4,5.

Homework problems

1. Find the following square roots: If you cannot find the number exactly, at least say between which two whole numbers the answer is (e.g. between 5 and 6)

   (a) $\sqrt{49}$ (c) $\sqrt{225}$ (e) $\sqrt{64}$

   (b) $\sqrt{169}$ (d) $\sqrt{121}$ (f) $\sqrt{8}$

2. Can you find a right triangle where all sides are whole numbers, and the hypotenuse is 13?

3. If, in a right triangle, one leg has length 1 and the hypotenuse has length 2, what is the other leg?

4. If in a triangle, one leg is 6 cm and the other leg is 8 cm, how much is the hypotenuse?

5. Find the height and area of the figure:
   Three sides are given and the two
   marked angles are right angles.

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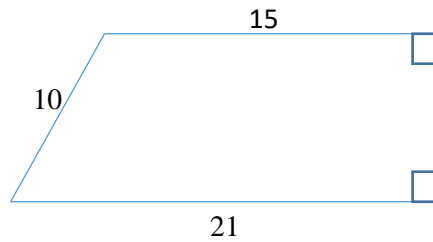
6. Find the following square roots. If you cannot find the number exactly, at least say
   between which two whole numbers the answer is, e.g. between 5 and 6.

   (a) $\sqrt{91+9}$ (d) $\sqrt{49}-\sqrt{144}$ (f) $\left(\sqrt{11}\right)^2$

   (b) $\sqrt{42+2}$ (e) $\sqrt{11^2}$

   (c) $\sqrt{36}+\sqrt{49}$

For the next two problems, write equations to solve!

7. A watermelon is three times as expensive as a honeydew. John can buy 2 watermelons
   and have 7 dollars left or 4 honeydews and have 13 dollars left. How much does the
   honeydew cost? How much is the watermelon?

8. Yesterday, Peter came to the store and gave the cashier 11 dollars for 3 pounds of grapes;
   he received some change. Today, Peter came to the same store again and gave the cashier
   15 dollars for 5 pounds of grapes. He again received some change. How much does each
   pound of grapes cost if the change he received is the same on both days?