Homework for September 22, 2019.

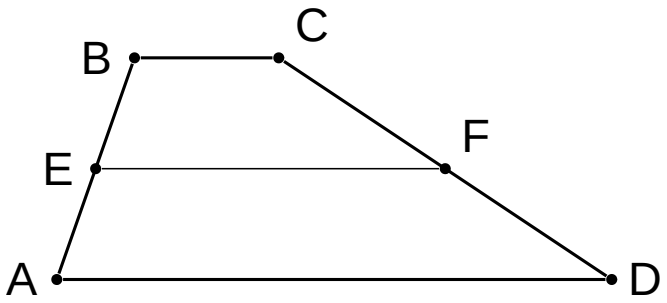
Welcome to the new semester at SchoolNova!

As usual, all HW assignments and other information will be posted online at http://www.schoolnova.com (click on Homeworks in the navigation bar on the left). I ask that each student brings a notebook (preferably quad ruled), pencils and a folder or binder to keep old assignments - you will need them!

Review the classwork handouts. Solve the problems from the previous years' math 9 placement tests listed below (if a problem repeats from year to year, you only need to solve it once). Some of these problems you might have already solved in class (you do not need to solve the problems that you have solved in the baseline review test).

Math 9 placement test 2019

1. Factor the following expressions
   a. $a^2 - b^2 =$
   b. $a^3 - b^3 =$
   c. $a^3 + b^3 =$
   d. $1 + a + a^2 + a^3 =$
2. Find the coefficient of x^7 in the polynomial $(1 + 2x)^9$.
3. Let x_1, x_2 be roots of the equation $x^2 = x + 1$. Find $\frac{1}{x_1} + \frac{1}{x_2}$.
4. Find the remainder upon division of 2^{2019} by 7.
5. Compute $(1 + i)^{16}$.
6. Let $ABCD$ be a trapezoid, with bases AD and BC, and let E, F be midpoints of sides AB, CD respectively. If $BC = 2\ cm, AD = 6\ cm$, then what is EF? Can you prove your answer?



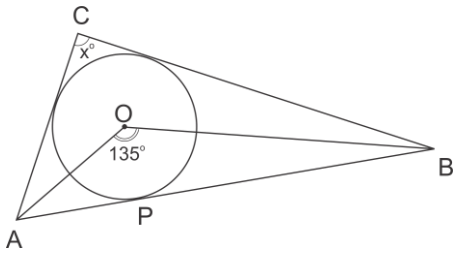
7. Solve the following inequality. Write your answer as a set of possible values for x.
$$\frac{(x+2)^2(x-7)}{x+3} \leq 0$$
8. It is known that one of the roots of polynomial $p(x) = x^3 + 5x^2 + 7x + 3$ is $x_1 = -1$. Find the other roots.
9. Poker is played with a deck of 52 cards: four suites (spades, clubs, hearts, and diamonds), each containing 13 cards: 2,. . . , 9, 10, 9, Jack, Queen, King, and Ace. If you are randomly dealt a hand (5 cards) from a freshly shuffled full deck, what is the probability of getting:
   a. 5 hearts
   b. Four of a kind (i.e., four cards with the same value, e.g. four Aces, or four threes) plus one more card of different value
10. For each of the following equations, determine if it has integer solutions. If yes, find at least one solution. If no, explain why.
    a. $6x + 15y = 13$
    b. $6x + 15y = 33$

Math 9 placement test 2018

11. Open brackets and expand the following expressions
    a. $(a+b)^2 =$
    b. $(a-b)^3 =$
12. Factor the following expressions
    a. $a^2 - b^2 =$
    b. $a^3 - b^3 =$
    c. $a^3 + b^3 =$
    d. $1 + a + a^2 + a^3 =$
13. Solve the following inequality. Write your answer as a set of possible values for x.

$$\frac{(x+2)^2(x-7)}{x+3} \leq 0$$

14. Find the remainder of 2^{2019} upon division by 7.
15. Let x_1, x_2 be roots of the equation $x^2 = x + 1$. Find $\frac{1}{x_1} + \frac{1}{x_2}$.
16. Find the remainder upon division of 2^{2019} by 7.
17. O is the center of the inscribed circle in triangle ABC. The angle AOB is 135 degrees. Find the angle ACB.



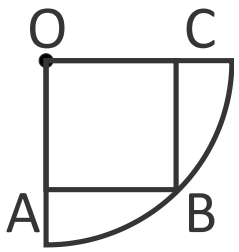
Math 9 placement test 2017

1. Open brackets and expand the following expressions
   a. $(a+b)^2 =$
   b. $(a-b)^3 =$
2. Factor the following expressions
   a. $a^2 - b^2 =$
   b. $a^3 - b^3 =$
   c. $a^3 + b^3 =$
   d. $1 + a + a^2 + a^3 =$
3. Find the remainder of 3^{2017} upon division by 4.
4. Solve the equation

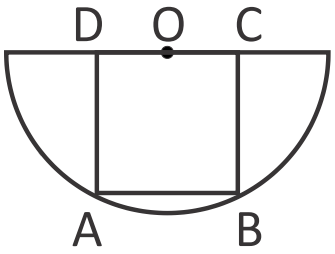
$$x + \frac{1}{x} = 7\frac{1}{7}$$

5. Eight teams have reached the quarter-finals of the soccer World Cup.
   a. How many ways are there for these teams to be paired to play the quarter-final games?
   b. How many different outcomes of which team wins which medal (gold, silver, bronze) are possible?
6. Find the area of a square inscribed in

   a. a quarter circle of radius r, as shown in the Figure below,



   b. a semicircle circle of radius r as shown in the Figure below.



Math 9 placement test 2016

1. Open brackets and expand the following expressions
   a. $(a+b)^2 =$
   b. $(a-b)^3 =$
2. Factor the following expressions
   a. $a^2 - b^2 =$
   b. $a^3 - b^3 =$
   c. $a^3 + b^3 =$
   d. $1 + a + a^2 + a^3 =$
3. Find the remainder of 3^{2016} upon division by 5.
4. Solve the equation

$$\frac{x^2+1}{x} - \frac{2x}{x^2+1} = 1$$

5. Eight teams have reached the quarter-finals of the soccer World Cup.
   a. How many ways are there for these teams to be paired to play the quarter-final games?
   b. How many different outcomes of which team wins which medal (gold, silver, bronze) are possible?
6. Four equal segments are cut off a circle of radius r so that a square is obtained. Find the area of each of these segments.

Math 8-9 placement test 2015

1. How many ways are there to choose a team captain and 6 team members out of 15 candidates?
2. If x_1, x_2 are roots of the square equation $x^2 + 2x - 7$, what is $x_1 x_2$? $\frac{1}{x_1} + \frac{1}{x_2}$?
3. Simplify the following expression

$$\frac{(a^2 - b^2)^3}{(a-b)(a+b)^2}$$

4. How many "words" can you form by permuting the letters of the word "letter"? (A "word" is any combination of letters, not necessarily meaningful)
5. Points $A = (0,0)$, $B = (2,0)$, and C on the coordinate plane form an equilateral triangle. What are the coordinates of point C?
6. Factor $a^4 - b^4$.
7. Corners of a square with the side a are cut off so that a regular octagon is obtained. Find the area of this octagon.
8. Solve the inequality

$$\frac{x+5}{x^2 - 2x - 3} > 0$$

9. If we write the polynomial $(x+2)^{10}$ in the usual form $x^{10} + a_1 x^9 + a_2 x^8 + \ldots$, what would be the coefficient of x^6?
10. Find all integer numbers which give remainder 2 upon division by 7 and remainder 5 upon division by 13.
11. Given triangle ABC, explain how to construct (using ruler and compass) a point which is at equal distance from points A, B, and C.

Math 9 placement test 2014

1. Open brackets and expand the following expressions
   a. $(a+b)^2 =$
   b. $(a-b)^3 =$
2. Factor the following expressions
   a. $a^2 - b^2 =$
   b. $a^3 - b^3 =$
   c. $a^3 + b^3 =$
   d. $1 + a + a^2 + a^3 =$
3. Find the coefficient of x^5 in the expression $(1+2x)^8$
4. Find the remainder of 3^{2014} upon division by 7.
5. Solve the equation

$$\frac{x^2+1}{2x} + \frac{2x}{x^2+1} = 2$$

6. Eight teams have reached the quarter-finals of the soccer World Cup.
   a. How many ways are there for these teams to be paired to play the quarter-final games?
   b. How many different outcomes of which team wins which medal (gold, silver, bronze) are possible?
7. Corners of a square with the side a are cut off so that a regular octagon is obtained. Find the area of this octagon.