

MATH 7
ASSIGNMENT 24: REVIEW PART I
MAY 3, 2020

REVIEW OF THIS SCHOOLNOVA YEAR

We have learned a lot this year. Here are some of the topics:

- Algebra: manipulating algebraic expressions, factorization, solving equations and inequalities of first and second degree
- Trigonometry: similarity of triangles, trigonometric functions, equations and identities
- Other topics: vectors in 2 dimensions, principles of probability, combinatorics, Pascal's triangle

Let us do a review of some of these topics. We will also learn a bit more about them along the way. And the review will be done by solving problems.

HOMEWORK

When doing these problems, you will have to refresh a few things we studied this year. You can look back at your homework or you can open the previous assignments on the SN website. Try to do all of the problems, but you don't have to finish all of them. Hand in what you can do. Some of these might be challenging and we will discuss them in class.

1. Factor (i.e., write as a product) the following expressions:

- (a) $a^2 - 2a + 1$
- (b) $a^2 + 4ab + 4b^2$
- (c) $9x^2 - 25$
- (d) $x^2 - 7$ [Hint: $7 = (\sqrt{7})^2$.]
- (e) $256 - a^8b^8$
- (f) $3x^3 - x^2y + 6x^2y - 2xy^2 + 3xy^2 - y^3$
- (g) $a^2 - b^2 - 10b - 25$
- (h) $x^4 + 4$ [Hint: add and then subtract $4x^2$.]
- (i) $a^9 - 27$

2. Find the value of

$$x = \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$$

3. Solve the following equations:

- (a) $x^2 - 5x + 6 = 0$
- (b) $x^2 = 1 + x$
- (c) $\sqrt{2x + 1} = x$
- (d) $x + \frac{1}{x} = 3$

4. A couple of eagles fly away from their nest in perpendicular directions at 20 mph and 40 mph, respectively. The second eagle takes off an hour later than the first one. Find the time taken for them to be 100 miles apart.

5. Bob opened a small company to sell personalized pens. He realised that he can produce very cheap pens, but they were not very popular. Very expensive pens were not very popular either. He thinks that a quadratic function can describe the number of pens he can sell as a function of the price. Assuming that this assumption is correct,

- (a) At what price would Bob end up selling only 1000 pens? Bob wrote down that, when he produced pens which were sold for 3 dollars each, he could sell 2246 pens. When the price was 10 dollars, he sold 2400 pens, and when the price was 20 dollars, he sold 1600 pens.
- (b) What price should the pens cost for Bob to sell the most? How many would he be able to sell in this case?

- (c) What price should the pens be for Bob to make the largest profit? This question is a challenge. You can simply do an estimate by trying some values. You can also try to draw on the computer the graph of the profit as a function of the price. Is the answer the same as in part (b)? Why?

6. Solve the following equations and inequalities.

(a) $x^2 + 2x - 3 = 0$, $x^2 + 2x - 3 > 0$, $x^2 + 2x - 3 \leq 0$

(b) $x^2 + 2x + 3 = 0$, $x^2 + 2x + 3 \geq 0$, $x^2 + 2x + 3 < 0$

(c) $-x^2 + 6x - 9 = 0$, $-x^2 + 6x - 9 \geq 0$, $-x^2 + 6x - 9 < 0$

(d) $3x^2 + x - 1 = 0$, $3x^2 + x - 1 \geq 0$, $3x^2 + x - 1 \leq 0$

7. Consider a square and a rectangle such that one side of the rectangle is five inches larger than twice the length of the side of the square and the other side of the rectangle is 6 inches smaller than the side of the square. What values can the length of the square be such that it has a larger area than the rectangle?

8. Prove that for any point P on the parabola $y = \frac{x^2}{4} + 1$, the distance from P to the x -axis is equal to the distance from P to the point $(0, 2)$.