

MATH 7
PRESIDENTIAL PARDON TEST

DUE: FEBRUARY 20, 2021

This test is designed for those of you who either did not submit many of the previous homework assignments or for those of you who got a score of 1 on them. If you are unsure whether you have to do the test, please contact me at antonenko@schoolnova.org.

In order to pass this course and transfer to the next level of Math at SchoolNova, students must submit at least 80% of homework assignments. We are aware that some of you have fallen behind on it – completing this test would allow you to get back on track. Doing this will excuse you from having to submit all previous homework assignments (up to Handout 15) that you have not yet submitted or did not do well on to be able to transfer to the next level of Math.

1. ALGEBRAIC EXPRESSIONS

1. Factor the following expressions:

(a) $9x^2 + 12x + 4$

(b) $64x^3y^5 - 9xy^3$

(c) $x^4 - 16$

(d) $4(x + 5)^2 - 20(x + 5) + 25$

2. Simplify the following expressions:

(a) $\frac{x}{x+1} - \frac{x}{x-1}$

(b) $\left(1 + \frac{1}{x}\right) \div \left(x - \frac{1}{x}\right)$

3. Simplify the following expressions:

(a) $x^2(3xy^3)^2(2x^2y)^3$

(b) $\frac{a^3(2b^2c^3)^2}{(a^2b)^4c^5}$

4. Expand the following expressions:

(a) $(x - 2)^2(x + 3)$

(b) $(a - 2)^2(a + 2)^3$

5. Write each of the following expressions in the form $a + b\sqrt{5}$, with rational a, b :

(a) $(1 + \sqrt{5})^2$

(c) $\frac{1 + 2\sqrt{5}}{\sqrt{5}}$

(b) $\frac{1 + \sqrt{5}}{1 - \sqrt{5}}$

2. SEQUENCES

6. In an arithmetic sequence, $a_1 = 5$ and $a_5 = 11$. Find the common difference and the sum of the first 10 terms of this sequence.

7. Find the sum of the first 100 numbers that are divisible by 3 (that is, $\underbrace{3 + 6 + 9 + \dots}_{100 \text{ numbers}}$).

8. There are 10 trees at equal distances of 6 meters in a line with a well, the distance of the well from the nearest tree being 5 meters. A gardener waters all trees separately starting from the well and he returns to the well after watering each tree to get water for the next. Find the total distance the gardener will cover in order to water all the trees.

9. The third term of a geometric sequence is 15 and the seventh is 60. Find the common difference, the first term, and the sum of the first 5 terms.

10. Calculate the following:

$$1 - 3 + 3^2 - 3^3 + \dots + 3^{10}$$

3. COMBINATORICS

11. Explain in your own words what you have learned or reviewed about combinatorics in this class.
12. How many different sequences of letters could you make from the letters of the word “paper”?
13. There are 6 people in a house. This is over capacity: the fire capacity of the house is 5. How many ways are there to kick one person out of the house?
In how many ways could you get the house down to capacity if the fire capacity were 4 instead of 5?
14. How many ways are there to choose a committee of three people from a group of six people? What if one of the committee members must be selected to be president?
15. The probability that it rains on any given day is $p = 1/3$. During a given week, what is:
(a) the probability that it will rain every day?
(b) the probability that it will rain on exactly one day?
(c) the probability that at least one day will be sunny?

4. QUADRATIC EQUATIONS

16. Solve the following equation using completion of the square method:

$$x^2 - 12x + 30 = 0.$$

17. Determine the number of solutions of the following equations. You do not need to solve them!

(a) $2x^2 + 5x - 1 = 0$

(c) $3x^2 - 24x + 48 = 0$

(b) $3x^2 - 4x + 10 = 0$

(d) $5x^2 + 7x + 6 = 0$

18. Solve the following equation using quadratic formula:

$$3x^2 - 10x + 7 = 0.$$

19. For the equation $x^2 - 9x + 11 = 0$ determine the following:

(a) x_1x_2

(c) $x_1^2 + x_2^2$

(b) $x_1 + x_2$

(d) $\frac{1}{x_1} + \frac{1}{x_2}$