

Directions:

- Carefully answer each of the following questions. Show the steps leading to your answers.
- You may use a calculator on all parts of this exam.
- There are 14 questions worth a total of 62 points.

1. [2 points] Write the equation of a line with a slope of $\frac{3}{5}$ going through the point $(7, -3)$.

2. [2 points] Write the equation of a line that goes through the points $(3, 6)$ and $(7, 6)$.

Hint: This is a horizontal line.

3. [3 points] Consider the function $f(x) = -2x + 7$.

a. Find the value of $f(6)$.

b. Find the coordinates of the y -intercept.

c. Find the coordinates of the x -intercept.

- 4. [6 points]** Mr. McGee and Mr. Verner were grading the Algebra 2 final exam. After 20 minutes of grading, they still had 63 exams left to grade. After 60 minutes of grading, they still had 13 exams left to grade.

Let x = the number of minutes they were grading, y = the number of exams left to grade.

a. Write a formula for y .

b. What was the total number of exams they had to grade?

c. How many minutes did it take them to grade all of the exams?

- 5. [4 points]** Harry owns a motorcycle. The current value of the motorcycle is \$6,000 and every year, it loses 4% of its value.

a. What will the value be in two years?

b. How many years will it take before the value is less than \$4,800?

Hint: Solve graphically on the calculator.

6. [4 points] The population of Lexington is growing at 2% each year. The town's current population is 50,000.

a. What will the population be in three years?

b. What was the population two years ago?

7. [3 points] Mr. McGee gave his class a long test with a mix of short questions and long questions. Each of the short questions were worth 2 points and each of the long questions were worth 5 points. The test had 18 questions worth a total of 66 points. How many long questions did the test have? How many short questions?

8. [3 points] The height of a rectangle is $x+2$ and the base is $x-3$. The area of the rectangle is 24. Find the value of x . Then find the perimeter of the rectangle.

Hint: The area of the rectangle is given by the formula $A = bh$.

9. [2 points each] Solve each of the following equations.

a. $\frac{1}{4}x + \frac{1}{2} = 2$

b. $x^2 + 7x = 0$

c. $x^2 = 2x + 63$

d. $(x - 4)(x + 1)(x - 7) = 0$

e. $x^3 + 12x^2 = 13x$

f. $3x^2 - 2 = 13$

g. $2(x+4)^2 + 3 = 19$

h. $3x^2 + 2x - 2 = 0$

10. [9 points] Simplify each of the following expressions. Your final answers should not include any negative exponents or parentheses.

a. $x^2 \cdot x^8$

b. $(x^3)^5$

c. x^{-3}

d. $(\sqrt{x})^4$

e. $\sqrt{x} \cdot x^{\frac{3}{4}}$

f. $\left(\frac{5}{6}\right)^{-1}$

g. $(2x)^4$

h. $100^{1/2}$

i. $x^5 \cdot x^3 \cdot x^{-8}$

11. [2 points] A computer requires a password. The password must consist of 4 letters and none of the letters may be repeated. How many passwords are possible?

12. [2 points] Jack is coaching a youth basketball team. There are 12 players on the team and Jack needs to choose three of them to be the team captains. How many ways are there for Jack to choose the three captains?

13. [3 points] Here are the numbers of students in each grade at Lexington High School.

	boys	girls	
Grade 9 (freshman)	240	255	
Grade 10 (sophomore)	235	241	
Grade 11 (junior)	252	230	
Grade 12 (senior)	210	220	

Suppose you pick a student from this school at random. Find these probabilities.

- Probability of picking a sophomore boy.
- Probability of picking a junior boy or senior girl.
- Suppose all of the boys are together in the gym and you pick one of them randomly. What is the probability that you choose a senior?

14. [3 points] A bag contains 3 red marbles, 7 blue marbles and 5 green marbles.

- If a marble is drawn what is the probability it is red?
- If a marble is drawn what is the probability it is not green?
- If two marbles are taken out, what is the probability they are both blue?

Formula Sheet

$$\text{Slope: } m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Equation of a line (slope-intercept form): } y = mx + b$$

$$\text{Equation of a line (point-slope form): } y = m(x - h) + k$$

$$\text{Equation of an exponential function: } f(x) = ab^x$$

$$\text{Quadratic formula: } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$