Virginia Western Community College

WE'LL TAKE YOU THERE

Virginia Placement Test

Practice Questions and Answers Units 1-9

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Practice Problems for MTE 1 – Operations with Positive Fractions

1. If you have four quarters, three dimes, two nickels, and two pennies, what fraction of the whole coin collection is in dimes?

2. Write $5\frac{7}{8}$ as an improper fraction.

3. Write $\frac{29}{5}$ as a mixed number.

4. Express $3 \cdot 3 \cdot 3 \cdot 5 \cdot 5$ using exponents.

5. Find the prime factorization of 180. Express your answer in exponential form.

6. Write $\frac{24}{90}$ in simplest form.

7. Write the ratio of 14 days to 3 weeks in simplest form.

8. Write the ratio of 4 teachers to 134 students in simplest form.

9. Write the ratio of 400 miles in 8 hours in simplest form.

10. Find the LCM for 8, 12, *and* 36.

11. Find the LCD for $\frac{1}{5}, \frac{1}{4}, and \ \frac{1}{9}$.

12. Enter the correct symbol: (< , > , =). $\frac{3}{4}$? $\frac{11}{15}$

13. Add or subtract. $\frac{3}{16} + \frac{5}{16}$

14. Add or subtract. $\frac{25}{64} - \frac{17}{64}$

15. Add or subtract. $4\frac{1}{4} - 2\frac{3}{4}$

16. Add or subtract. $\frac{3}{12} + \frac{4}{50}$

17. Add or subtract. $\frac{7}{18} - \frac{5}{24}$

18. Add or subtract. $41 - 23\frac{3}{7}$

19. Multiply. $\frac{12}{56} \cdot \frac{14}{42}$

20. Multiply. $1\frac{5}{16} \cdot \frac{3}{4}$

21. Divide. $\frac{\frac{4}{15}}{\frac{5}{6}}$

22. Divide. $4\frac{3}{7} \div 1\frac{2}{9}$

23. Simplify the expression. $\frac{3}{4} - \frac{2}{5} \cdot \frac{7}{12}$

24. Simplify the expression. $\frac{3}{4} + \frac{5}{9} \cdot \frac{12}{15}$

25. If 15 of the students are male and 18 of the students are female in a math class, what fractional part of the class is female?

26. The depth of tire tread on a new tire is $\frac{9}{32}$ of an inch. After two months use, $\frac{1}{16}$ inch has been worn off. What is the depth of the remaining tire tread?

27. If you lose $3\frac{1}{2}$ pounds the first week of your diet and $2\frac{2}{3}$ pounds the second week, how many pounds do you still need to lose to reach your goal of losing 10 pounds?

28. If you are paid $5.50/hour for mowing yards, and you take $3\frac{1}{3}$ hours to mow a yard, how much money are you owed?

29. If a full oil barrel holds $53\frac{3}{4}$ gallons of oil, and $10\frac{3}{4}$ gallons are used every week, how many weeks will the oil last?

30. Your new iPod Shuffle holds 500 songs. You have loaded 310 of your favorite tunes onto your iPod. Represent the number of songs on your iPod as a fraction of the total of number of songs it will hold. Simplify if possible.

31. A surgery patient needs to lose 24 pounds before her upcoming surgery. Your patient lost $6\frac{1}{2}$ pounds at the first two week checkup and $8\frac{2}{5}$ pounds at the next visit. How much more does the patient need to lose to achieve the weight loss needed for surgery?

32. You are purchasing the ingredients for your first cooking project in culinary school. You are making a new salmon dish. Salmon costs $6.00 per pound. Find the cost of $3\frac{2}{3}$ pounds.

33. You have budgeted $\frac{2}{5}$ of your monthly income for rent and utilities. Your monthly income is $2100.00.
    a. What amount have you budgeted for rent and utilities?
    b. What amount is left over for other expenditures during the month?

34. Your car uses $15\frac{1}{2}$ gallons of gasoline on a 310 mile trip. Find your car's miles per gallon.

35. The nurse's orders are to give the child $3\frac{1}{2}$ tablespoons of medicine per day in 4 equally divided doses. How much medicine is to be given at each dose?

36. To maintain financial aid, a student must pass at least $\frac{2}{3}$ of their attempted credits each semester. If you are taking 15 credits this semester, how many credits must you pass?
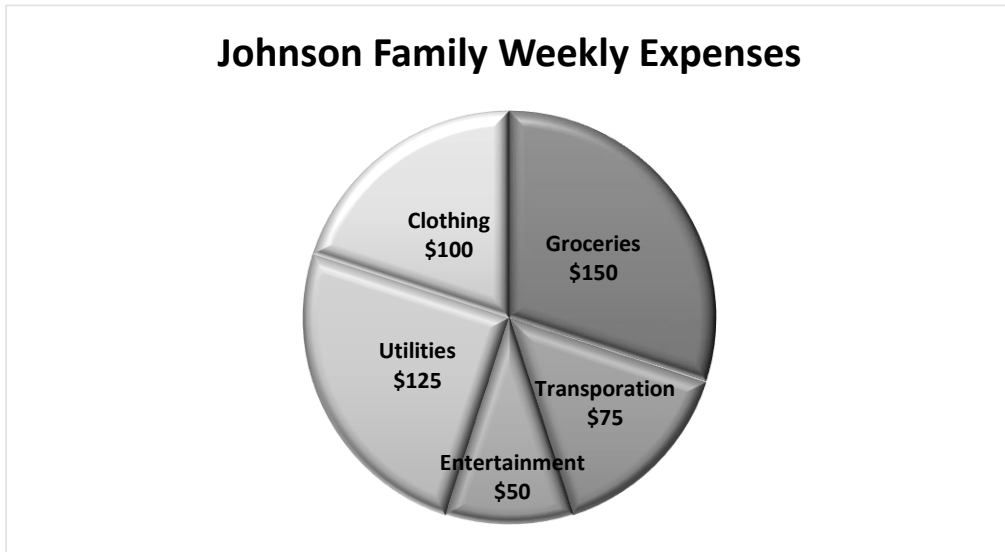
Practice Problems for MTE 2 – Operations with Positive Decimals and Percents

1. Write "twenty-one and fifty-six thousandths" as a number.

2. Identify the place value of the digit 7 in the number 0.4715.

3. Add. 9.69 + 1.4

4. Multiply 0.35 and 2.9.

5. Divide 52.7 by 3.4.

6. Simplify. 2.4 + 3.15 · 2.

7. Round 0.4327 to the nearest hundredth.

8. Estimate 8.24 + 6.4705 by first rounding each number to the nearest whole number. Give your estimate as a whole number.

9. Estimate 3.49 x 7.508 by first rounding each number to the nearest whole number. Give your estimate as a whole number.

10. The square below contains 100 smaller squares, and 25 of them are shaded. What percent of the whole is shaded?
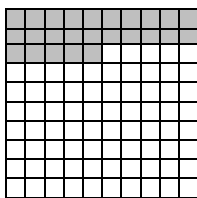
11. Write $\frac{5}{8}$ as a percent.

12. Convert $\frac{3}{16}$ to a decimal.

13. Convert 0.83 to a fraction.

14. Write 20% as a fraction in simplest form.

15. Write 12.5% as a decimal.

16. Order the list of fractions and decimals from smallest to largest. $\frac{5}{6}, 0.658, \frac{7}{10}, 0.75$

17. 30 is what percent of 150?

18. Mrs. Toner's fifth-grade class increased from 16 students last year to 20 students this year. What percent increase is this?

19. At the local paper mill, the number of industrial accidents decreased from 15 accidents last month to just 9 accidents this month. Find the percent decrease.

20. A laptop computer is priced at $650.00. If the sales tax is 5%, find the total cost of the computer, including sales tax.

21. Scott Samuels had pharmaceutical sales of $42,500.00 last month. If his commission rate is 9%, find the amount of his commission.

22. Bill and Sue Maples borrowed $8,000.00 for 2 years at a simple interest rate of 18% per year. How much interest will they pay?

23. In the pie chart below, what percent of the Johnson's weekly expenses are spent on clothing?

Johnson Family Weekly Expenses

Clothing $100
Groceries $150
Utilities $125
Transporation $75
Entertainment $50

24. The pie chart below shows sales by quarter for Smith Plumbing. If the total sales for the year are $360,000.00 calculate the sales for the 3rd Quarter.

Yearly Sales for Smith Plumbing

4th Qtr 9%
3rd Qtr 10%
2nd Qtr 23%
1st Qtr 58%
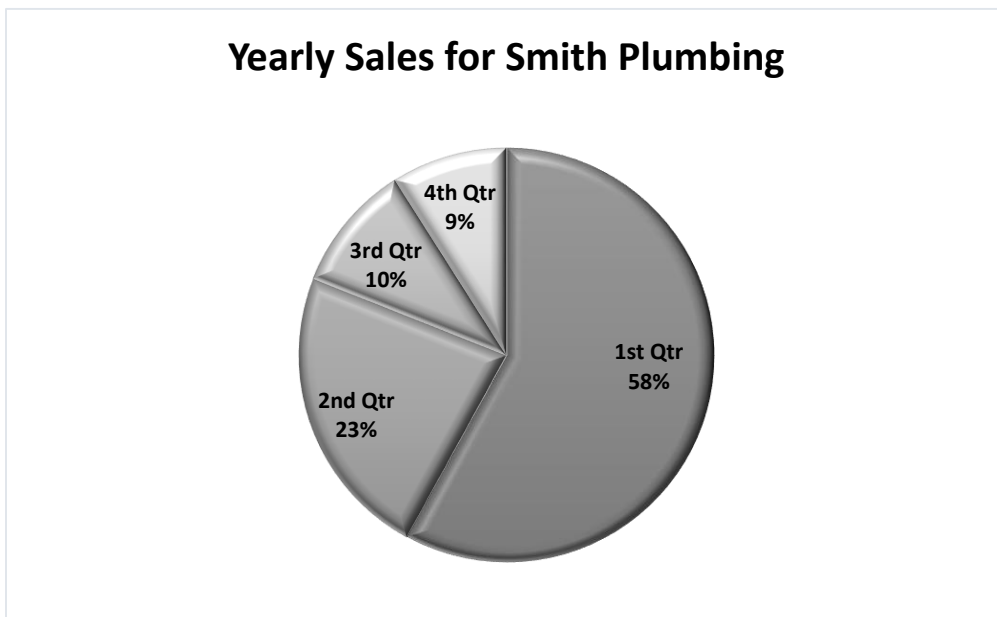
25. Using the bar graph below, determine how many Juniors are taking a math class if there are a total of 450 Juniors at the high school.

Students Taking a Math Class

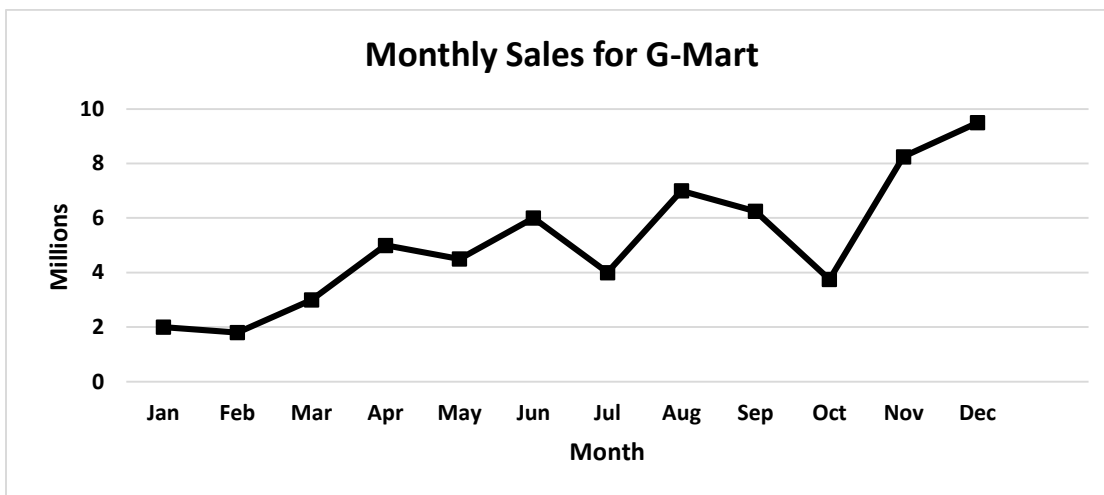(Bar graph: Percent on y-axis (0 to 100), categories: Freshman ≈ 95, Sophomores ≈ 90, Juniors ≈ 60, Seniors ≈ 35)
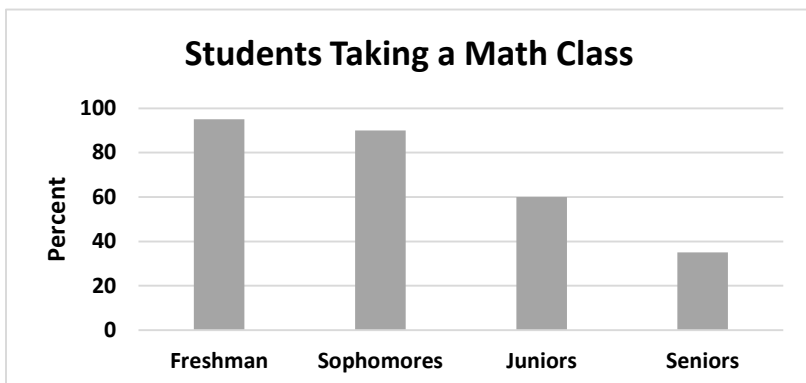
26. Using the line graph below, which month shows the greatest increase in sales for G-Mart?

Monthly Sales for G-Mart

(Line graph: Millions on y-axis (0 to 10), Month on x-axis Jan–Dec. Values approximately: Jan 2, Feb 1.8, Mar 3, Apr 5, May 4.5, Jun 6, Jul 4, Aug 7, Sep 6.2, Oct 3.8, Nov 8.2, Dec 9.5)

27. Convert 7 feet to inches.

28. Convert 24 ounces to pounds.

29. Convert 1.28 meters to centimeters.

30. Convert 2.6 kilograms to grams.

31. Convert 750 milliliters to liters.

32. Convert 5 quarts to liters.

33. Convert 10 centimeters to inches.

34. Convert $2\frac{1}{2}$ hours to minutes.

35. Convert 68 degrees Fahrenheit to Celsius, using the formula: $°C = \frac{5}{9}(°F - 32)$.

36. Convert 15 degrees Celsius to Fahrenheit, using the formula: $°F = \frac{9}{5}°C + 32$.

37. Jason is serving a 10-kilogram turkey to 28 people. How many grams of meat is he allowing for each person? Round to the nearest whole gram.

38. Dan orders supplies for the science labs. Each of the 24 stations in the chemistry lab needs 2 feet of rubber tubing. If rubber tubing sells for $8.75 per yard, how much will it cost to equip all the stations?

Practice Problems for MTE 3 – Algebra Basics

1. Find the absolute value: $|-3|$

2. Find the absolute value: $|18|$

3. Write in exponential form: $13 \cdot 13 \cdot 13$

4. Write in exponential form: $1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$

5. Evaluate: 2^3

6. Evaluate: 4^2

7. Evaluate: $\sqrt{16}$

8. Perform the indicated operations and simplify: $6 + (-10)$

9. Perform the indicated operations and simplify: $\frac{1}{8} - (-\frac{4}{3})$

10. Perform the indicated operations and simplify: $-7(-3.1)$

11. Perform the indicated operations and simplify: $-72 \div (-9)$

12. Perform the indicated operations and simplify: $-4^2 + 6$

13. Perform the indicated operations and simplify: $-5 + (-10) - (-4) - 13$

14. Perform the indicated operations and simplify: $-32 - 8 \div 4 - (-2)$

15. Perform the indicated operations and simplify: $2 + \sqrt{4}(10 - 2) + 3^2$

16. Write as a decimal number: 10^{-3}

17. Write in scientific notation: 2,061,000,000

18. Write in standard notation: 9.3×10^{-2}

19. Identify the property of real numbers that is being illustrated

    a. $3n + 5 = 5 + 3n$
    b. $2x + (y + z) = (2x + y) + z$
    c. $a(b + c) = ab + ac$
    d. $b + (-b) = 0$
    e. $a + 0 = a$
    f. $a \cdot 1 = a$
    g. $a \cdot \frac{1}{a} = 1$

20. Combine like terms: 19n + 30b − 9b + 4n

21. Simplify completely: 5+3 (x - 1)

22. Evaluate when x is -5: $x^2 + 2x − 1$

23. In the formula $A = \frac{1}{2}h (B + b)$, find A when h = 10, B = 20, and b = 16.

24. Solve n + 7 = -16

25. Solve $-\frac{2}{3} + x = -\frac{1}{6}$

26. Solve: -8x = -72

27. Solve: -2.4 + t = 5.6

28. To obtain her bachelor's degree in nursing, Judy must complete 130 credit hours of instruction. If she has completed 60% of her requirement, how many credits did Judy complete?

29. A factory manufacturing low voltage relays found 4 defective relays in a lot of 80 relays. At this rate, how many defective relays can be expected in a lot of 740 relays?

30. The population of Lewisburg was 10,820. It decreased by 320 each year for 5 consecutive years. What was the population after 5 years?

31. The baggage compartment of a bus is a rectangle prism. The dimensions of the baggage compartment are 8 ft. by 4 ft. by 6 ft. What is the volume of the compartment? What is the perimeter of the floor? What is the area of the floor?

    a. Volume _____

    b. Perimeter _____

    c. Area of floor _____

8 ft.

4 ft.

6 ft.

floor
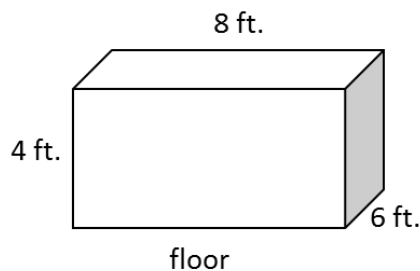
Practice Problems for MTE 4 – First Degree Equations and Inequalities in One Variable

1. Solve the equation $x − 2 = 9$

2. Solve the equation $5x = 40$

3. Solve the equation $5x + 7 = 42$ for x.

4. Solve the equation $\frac{x}{−2.26} + 8.31 = −8.43$ for x. Round your answers to two decimal places.

5. Solve the equation $−3(y + 6) = 9$ for y

6. Solve the equation $5 + 7t = 23 + t$ for t.

7. Solve the equation $3(x + 2) = −9(x − 7)$ for x.

8. Solve the equation $-7(y + 4) = -5y - 2y - 3$ and identify the solution as finite, the empty set, or all real numbers.

9. Solve the equation $S = A - D$ for A.

10. Solve the equation $D = rt$ for t.

11. Solve the equation $P = 2l + 2w$ for w.

12. Solve $|15 - 5t| = 55$, if possible.

13. Solve $2.5x + 5 \leq 16.4$. State the solution using inequality notation.

14. Solve the inequality $5(x + 2) \geq 3(x + 9)$. State the solution using inequality notation.

15. Solve the inequality $-\frac{3}{8}t \leq 5$. State the solution using interval notation.

16. Write the solution using interval notation.
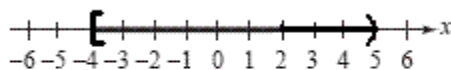
17. Solve the inequality $x + 3 \leq -2$.

18. A company pays its sales representatives 35 cents per mile if they use their personal cars. A sales representative submitted a bill to be reimbursed for $148.05 for driving. How many miles did the sales representative drive?

19. If an object traveled 230 miles at a rate of 25 miles per hour, how long (in hours) did it take to travel this distance?

20. A hardware store is having a 20%-off sale. If an item has a list price of $14.40, what is the item's sale price?

21. Tickets for a college baseball game are $9.00 for lower level seats and $5.00 for upper level seats. For a particular game, 850 lower level seats were sold. The total revenue from the ticket sales was $9650.00. How many upper level seats were sold?

22. The bill for repairing a car was $345.00. The cost for parts was $160.00. The cost for labor was $37.00 per hour. How many hours did the repair work take?

Practice Problems for MTE 5 – Linear Equations, Inequalities, and Systems of Equations in Two Variables

1. Determine the coordinates of the point labeled 7.
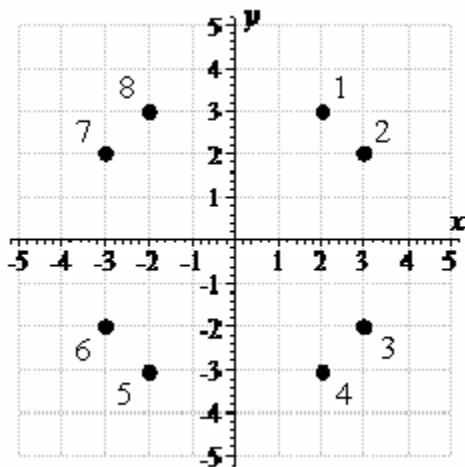
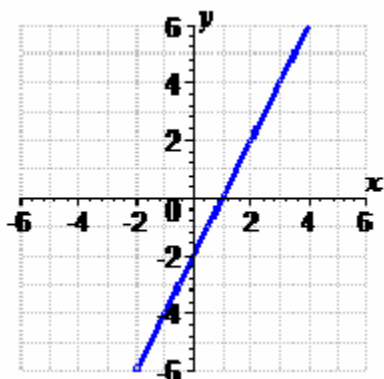2. Determine which of the ordered pairs is a solution of the equation: $x + 5y + 10 = 0$.

     a) (-3,4)

     b) (0,-2)

     c) (-5,10)

     d) (4,5)

3. Graph the linear equation by completing the table.

| x	-2	-1	0	1	2
$y = -2x + 1$					

4. Evaluate $f(x) = 2x - 1$ at $x = 6$.

5. Estimate the *x*- and *y*-intercepts of the graph.

6. Graph the linear equation by plotting the x- and y-intercepts. $-2x + 4y - 16 = 0$

7. Sketch the graph of the equation $y = \frac{2}{3}x + 2$ and label three points on the graph. Answers for points may vary.

8. Graph. $y = 4$ What type of line is it? What is the slope of the line?

9. Graph. $x = -3$ What type of line is it? What is the slope of the line?

10. Sketch the graph of the linear inequality. $3x - 2y \geq 6$.

11. Find the slope (if possible) of the line passing through the points (4,7) and (5,10).

12. Find the slope of the graph of the equation $y = -\frac{1}{6}x + 1$.

13. Find the slope of the graph of the equation by converting to slope-intercept form. $5x + 8y = -7$

14. Find the slope of the given line.
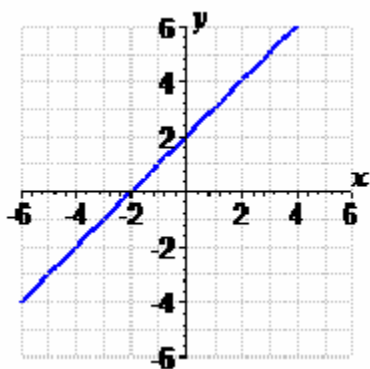
15. Find the slope of $x = -8$, if possible.

16. Find the slope of $y = 3$, if possible.

17. Write the equation of the line that passes through the point $\left(0, \frac{4}{9}\right)$ and has slope $m = -\frac{9}{7}$. Write the equation in slope-intercept form.

18. Write the equation of the line that passes through the point (5, -5) and has slope $m = -5$. Write the equation in slope-intercept form.

19. Write an equation of the line that passes through the points (-1, -10) and (-5, 2). Write the equation in slope-intercept form.

20. Write an equation of the line passing through the points (-5, 7) and (-5, 2).

21. Write an equation of the line passing through the points (1, 2) and (14, 2).

22. Write an equation of the line through the point (4, -2) that is parallel to the line $-5x + 6y = -2$.

23. Write and equation of the line through the point (5, 3) that is perpendicular to the line $-3x + 7y = 5$.

24. Determine whether (-4, 6) , (7, -4) , (-4 ,5) , (-1, -1), or (5, 8) is a solution of the system of equations below.

$$\begin{cases} 4x + 7y = 0 \\ 2x + 9y = -22 \end{cases}$$

25. Sketch the graph of the equations $\begin{cases} x - y = 2 \\ x + y = 2 \end{cases}$ and approximate any solutions of the system of linear equations.

26. If possible, solve the system below by elimination using substitution. $\begin{cases} 2x - 3y = -9 \\ x + y = -2 \end{cases}$

27. If possible, solve the system below by elimination using addition. $\begin{cases} a - 2b = 7 \\ 4a + 2b = 8 \end{cases}$
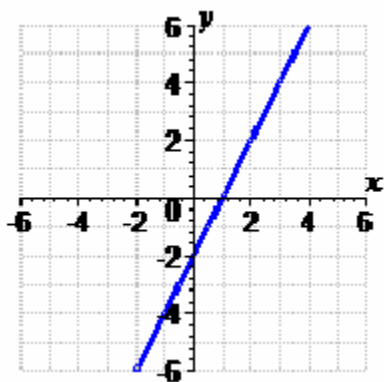
28. Identify the system of linear equations as consistent and independent, consistent and dependent, or inconsistent. $\begin{cases} 4x - 4y = 4 \\ 2x - y = 6 \end{cases}$

29. Given $f(x) = 3x - 6$ Evaluate each of the following: $f(5), f(-2), f\left(\frac{2}{3}\right), f(0), f(6.2)$

30. Given the graph of $y = F(x)$ below, evaluate $f(-6), f(0), f(-2), f(1)$
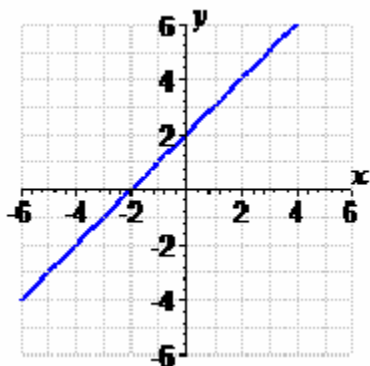
31. Given the graph of $y = f(x)$ Below, find x such that $f(x) = 4$.

32. A hot-air balloon at 1020 feet descends at a rate of 85 feet per minute. Let y represent the height of the balloon and let x represent the number of minutes the balloon descends. Write an equation that relates the height of the hot-air balloon to the number of minutes it descends.

33. You invest a total of $5800 in two investments earning 3.5% and 5.5% simple interest. Your goal is to have a total annual interest income of $283. Write a system of linear equations that represents this situation where x represents the amount invested in the 3.5% fund and y represents the amount invested in the 5.5% fund. Solve this system to determine the smallest amount that you can invest at 5.5% in order to meet your objective.

Practice Problems for MTE 6 – Exponents, Factoring, and Polynomial Equations

1. Simplify the expression $(-7x^8)x^3$.

2. Simplify the expression $\frac{5^6 u^6 v^8}{5^8 u^6 v^4}$. Assume that neither u nor v is zero.

3. Simplify the expression $(s^6 t)^2$.

4. Find the value of $(-2)^{-6}$.

5. Rewrite the expression $\frac{5w^3}{4z^{-3}}$ using only positive exponents. Assume that z is not zero.

6. Use the rules of exponents to simplify the expression $(2x^9 y^8)^{-4}$ using only positive exponents. Assume that neither x nor y is 0.

7. Rewrite the expression using only positive exponents, and simplify. Assume that any variables in the expression are nonzero. $\frac{(2a^{-2}b^4)^4 b}{(6a^2 b)^3}$

8. Perform the indicated operations. Write each answer in scientific notation and then without exponents.

    a. $\frac{9.5 \times 10^4}{5.3 \times 10^{-3}}$

    b. $(9.3 \times 10^{-5})(6 \times 10^3)$

9. Is the polynomial below a monomial, binomial, trinomial, or none of these?

    $$8x^3 + 4x$$

10. Find the sum $17x + 5x$

11. Multiply $(-5y^3)(-3y^4)$

12. Perform the division $\frac{10z^3 + 3z^2 - 2z}{2z}$

13. Find the sum $(9x + 4) + (6x - 6)$

14. Find the difference $(-5x + 4) - (-3x + 7)$

15. Multiply $(5x + 6)(9x + 7)$ and simplify.

16. Find the difference $(5x^2 - 2x - 3) - (3x^3 - 9x^2 - 3)$.

17. Perform the indicated operations and simplify $(-5x^4 + 8x^2 + 2) + 7(5x^4 - 3x^2)$

18. Find the difference of $(-7x^2 - 7x - 7) - (7x^3 - 9x^2 - 20 + 4x - 11)$.

19. Multiply $(x^2 + 4x - 3)(5x^2 + 7)$ and simplify.

20. Find the greatest common factor of $9g^8h^7$, $3g^9h^8$, $3g^2h^8$.

21. Factor the polynomial, if possible. $3xy + 15x^2y - 21x^6y^6$.

22. Factor the polynomial by grouping, if possible. $4y^3 + 3y^2 + 28y + 21$

23. Factor the trinomial, if possible. $z^2 + 14z + 48$

24. Factor the trinomial, if possible. $m^2 - 7m - 120$

25. Factor the given polynomial, if possible. $3z^2 + 30z + 27$ completely.

26. Factor the trinomial, if possible. $20g^2 - 63g - 21$

27. Factor the difference of two squares, if possible.: $25x^2 - 81y^2$

28. Factor the polynomial, if possible. $27m^3 + 64n^3$

29. Factor the polynomial, if possible. $z^3 - 125$

30. Solve the equation $2x^2 = 76x$ by factoring.

31. Solve the equation below by factoring. $a^2 + 8a + 29 = 13$

32. Solve the equation below by factoring. $x^3 - 17x^2 + 72x = 0$

33. An object is thrown upward from a height of 192 feet with an initial velocity of 64 feet per second. The height h (in feet) of the object after t seconds is modeled by the equation.

$h = -16t^2 + 64t + 192$

How long will it take for the object to reach the ground?

34. The revenue R from the sale of x cameras is given by $R = 55x - x^2$. The cost C of producing x cameras is given by $C = 99 + 35x$. How many cameras must be produced and sold in order to break even?

Practice Problems for MTE 7 – Rational Expressions and Equations

1. Identify all the values of x that make this expression undefined. $\frac{x-3}{4x-7}$

2. Identify all the values of x that make this expression undefined. $\frac{v-2}{v^2-7v+12}$

3. Rewrite this expression without negative exponents. $a^{-4}b^2c^{-2}$

4. Simplify. $\frac{2x-6}{4x-12}$

5. Given p=2 and t=-3, evaluate $\frac{p^2-t^2}{4p+4t}$.

6. Perform the indicated operations and simplify. $\frac{w}{w^2+6w-7} + \frac{7}{w^2+6w-7}$

7. Identify the Least Common Denominator of the two rational expressions. $\frac{4}{x-2}$ and $\frac{6}{x+2}$

8. Perform the indicated operations and simplify. $\frac{4}{x-2} - \frac{6}{x+2}$

9. Perform the indicated operations and simplify. $\frac{1}{7y} + \frac{2}{9y^2}$

10. Perform the indicated operations and simplify. $\frac{m+7}{m^2+7m+6} + \frac{2m+1}{m^2+5m+4}$

11. Perform the indicated operations and simplify. $\frac{x^2-x}{x^2-6x+8} \cdot \frac{x-4}{x^2+4x} \div \frac{4x}{x^2-6x+8}$

12. Perform the indicated operations and simplify. $\frac{8}{4-5p} - \frac{2}{5p-4} + \frac{p-4}{5p^2+16p-16}$

13. Simplify. $\frac{\frac{w}{6w-7}}{\frac{w^2}{12w-17}}$

14. Simplify. $\frac{\frac{w}{w^2-6w-7} + \frac{-7}{w^2-6w-7}}{\frac{w}{w^2-2w-3} - \frac{4}{w^2-2w-3}}$

15. Divide. $\frac{18j^4+45j^2+27j}{3j}$

16. Use long division to find the quotient and express the remainder (if any) as a fraction.

    $(20p^3 + 17p^2 + 26p + 50) \div (4p + 5)$

17. Solve. $\frac{4}{x-2} = 1 + \frac{6}{x+2}$

18. The current in the Red Cedar River is 6 mph. A canoe can travel 7 miles downstream in the same time that it takes to travel 3 miles upstream when paddled at the same rate. Set up (but do not solve) a rational equation that could be used to find the rate the canoe is paddled, using x as this rate.

19. A loaded moving truck is traveling 30 mph faster than a freight train. In the time it takes the train to travel 135 miles, the truck travels 225 miles. Find the speed of the truck.

20. To estimate the number of fish in a lake, a park ranger catches 220 fish, tags them, and returns them to the lake. Later, 72 fish are caught, and it is found that 20 of them are tagged. Estimate the number of fish in the lake.

21. Heat Source A will melt a pound of ice in 2 hours and Heat Source B will melt a pound of ice in 5 hours. How long will it take to melt a pound of ice if both sources are used at the same time?

Practice Problems for MTE 8 – Rational Exponents and Radicals

1. Rewrite the following using radical notation. Simplify, if possible. $16^{\frac{1}{2}}$

2. Rewrite the following using radical notation. Simplify, if possible. $-125^{\frac{1}{3}}$

3. Rewrite the following using radical notation. Simplify, if possible. $(9x+2)^{\frac{2}{5}}$

4. Use the calculator to approximate the radical $\sqrt{38}$ to three decimal places.

5. Fill in the blanks. The square root of 73 is between the consecutive integers ___ and ___ since 73 is between ___ and ___.

6. Use the calculator to approximate the radical $\sqrt[3]{103}$ to three decimal places.

7. Use the properties of exponents to simplify each expression.

    Write answer with positive exponents. $\dfrac{a^{\frac{7}{8}}}{a^{\frac{3}{8}}}$

8. Use the properties of exponents to simplify each expression.

    Write answers with positive exponents. $(x^{\frac{-4}{3}}y^{\frac{3}{5}})^{15}$

9. Simplify. Assume that all variables represent any real numbers (positive or negative). $7\sqrt{45}$

10. Simplify. Assume that all variables represent any real numbers (positive or negative). $\sqrt{16x^2}$

11. Simplify. Assume that all variables represent any real numbers (positive or negative). $\sqrt[5]{-m^{18}p^{20}}$

12. Simplify. Assume that all variables represent any real numbers (positive or negative). $\sqrt[3]{56x^5}$

13. Simplify. Assume that all variables represent any real numbers (positive or negative). $\sqrt{5}\cdot\sqrt{10}$

14. Simplify. Assume that all variables represent any real numbers (positive or negative). $\dfrac{\sqrt{66}}{\sqrt{3}}$

15. Simplify. Assume that all variables represent any real numbers (positive or negative). $-\sqrt{\dfrac{17}{64}}$

16. Which of the following are like radicals? Circle your answers. $\sqrt{72},\ 5\sqrt{2},\ \sqrt{28},\ \sqrt{50},\ \sqrt{12}$

17. Perform the indicated operation. Simplify if possible. $4\sqrt{20}+\sqrt{49}-\sqrt{180}$

18. Perform the indicated operation. Simplify if possible. $\dfrac{\sqrt[3]{72}}{12} - \sqrt[3]{\dfrac{7x}{27}}$

19. Perform the indicated operation. Simplify if possible. $\sqrt{3}\,(\sqrt{3} - \sqrt{6x}\,)$

20. Perform the indicated operation. Simplify if possible. $(4 - \sqrt{7}\,)\,(1 - 2\sqrt{7}\,)$

21. Rationalize the denominator. $\dfrac{-14}{\sqrt{8x}}$

22. Rationalize the denominator. $\dfrac{10}{\sqrt[3]{2}}$

23. Rationalize the denominator. $\dfrac{1+\sqrt{6}}{3-\sqrt{6}}$

24. Solve. $4 + \sqrt[3]{x} - 7 = 0$

25. Solve. $\sqrt{3x - 2} = x - 4$

26. What is the mathematical symbol for $\sqrt{-1}$?

27. Which of the following represent imaginary numbers?

$$\sqrt{-9},\;\; 7i,\;\; -\sqrt{5},\;\; (-3)^{1/2},\;\; 4^{\frac{-1}{2}},\;\; \sqrt[3]{-64},\;\; i\sqrt{2}$$

28. Simplify each of the following using the imaginary unit.

$$\sqrt{-72},\;\; 5\sqrt{-2},\;\; \sqrt{-288},\;\; \sqrt{-50},\;\; \sqrt{-12}$$

29. Simplify using the imaginary unit. $\dfrac{-6\pm\sqrt{-32}}{2}$

30. A wire is needed to support a vertical pole 18 feet high. The cable is to be anchored 8 feet from the base of the pole. How much cable is needed? Approximate the answer to three decimal places.

31. Find the missing side. Give the exact answer as a simplified radical.
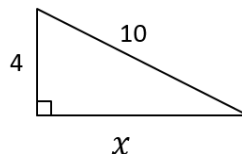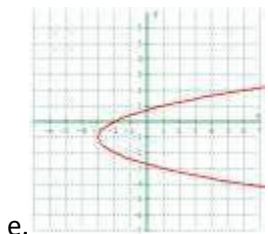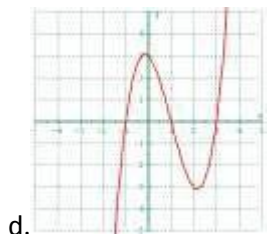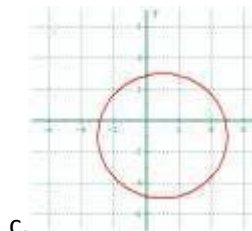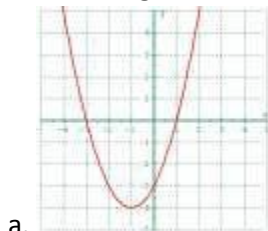

32. Find the distance between the points (9, 4) and (-9,10). Give the exact answer as a simplified radical.

Practice Problems for MTE 9 – Functions, Quadratic Equations, and Parabolas

1. Of the following relations, circle those that represent functions:
    a. $x = y^2$
    b. $y = x^2$
    c. (1, 1), (1, 2)
    d. (1, 1), (2, 1)
    e. $x = y$

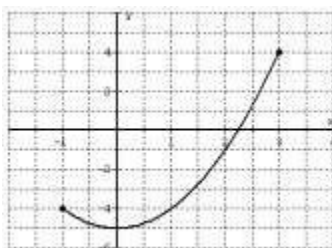2. Of the following relations, circle those that represent functions.

   a.   b.   c.

   d.   e.

3. State the domain of the function defined by the set of ordered pairs.
$$\{(-3,2), (-1,0), (4,5), (7,-8)\}$$

4. State the range of the function defined by the set of ordered pairs.
$$\{(-3,2), (-1,0), (4,5), (7,-8)\}$$

5. State the domain and range of the function defined by the graph.

6. State the domain of the function $f(x) = \sqrt{x-1}$
7. State the domain of the function $f(x) = \frac{x-1}{x+2}$
8. Given $f(x) = 3 - 2x - x^2$, evaluate $f(-1)$
9. For the function $f(x) = x^2 - 1$, evaluate $f(a)$.
10. For the function $f(x) = 3x^2 - 2x + 4$, evaluate $f(x + h)$.
11. Find the roots of $2x^2 - 4 = 0$
12. Find the roots of $3x^2 + x - 2 = 0$

13. Find the roots of $x^2 - x - 1 = 0$
14. Find the roots of $x^2 - 4x + 4 = 0$
15. Find the roots of $x^2 + 4x + 6 = 0$

16. Describe the roots of a quadratic function by matching the following where $D = b^2 - 4ac$ Is the discriminant of the quadratic formula:

a) $D > 0$ and is not a perfect square

_____ (I.) The quadratic has no real roots.

b) D is a perfect square

_____ (II.) The vertex of the graph of the quadratic function is on the x-axis.

c) $D = 0$

_____ (III.) The quadratic can be factored.

d) $D < 0$

_____ (IV.) The quadratic has two distinct irrational roots.

17. Write $f(x) = x^2 + 6x + 6$ in vertex form and indicate the coordinates of the vertex.
18. Write $f(x) = 2x^2 + 4x + 1$ in vertex form and indicate the coordinates of the vertex.
19. Identify the vertex of $f(x) = 2x^2 + 12x + 17$ by using the formula method.

For questions 20 through 26 you are given $f(x) = x^2 - 6x + 8$

20. Does the graph representing this equation open upward or downward? How do you know?
21. Determine the vertex of the parabola by putting the equation in vertex form.
22. Determine the axis of symmetry of the parabola.
23. Determine the x-intercepts of the parabola.
24. Determine the y-intercepts of the parabola.
25. Determine the point on the parabola where $x = 1$ and where $x = -1$.
26. On the grid given, make a sketch of the parabola. Be sure to indicate the vertex, axis of symmetry, x-intercepts, and y-intercept. Label the graph appropriately.
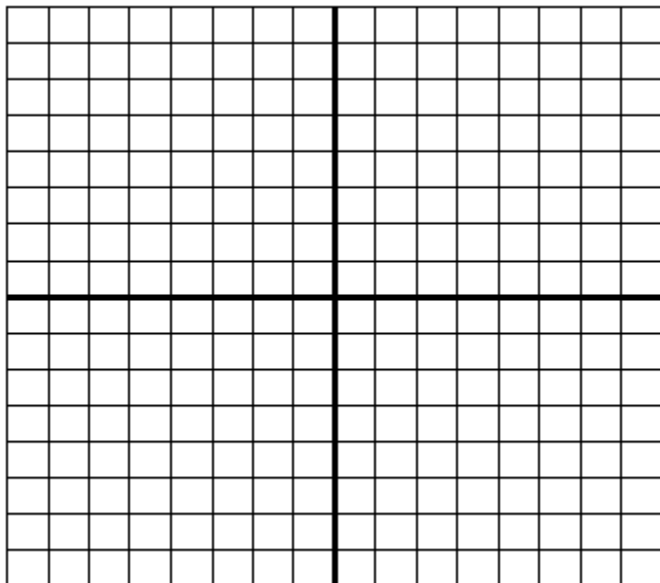
27. A rectangular-shaped vegetable garden next to a barn is to be fenced on three sides with 120 total feet of fencing. Find the dimensions of the garden that will maximize the area.

Barn | Garden

28. If the revenue function for a market gardener growing a crop of tomatoes is given by $R(x) = -x^2 + 50x$ where x is the number of bushels grown, what is the maximum revenue possible? How many bushels are sold to yield this maximum revenue?

29. A flare is fired directly upward into the air from a boat that is experiencing engine problems. The height of the flare (in feet) above the water, t seconds after being fired is given by the model $h(t) = -16t^2 + 96t + 5$. If the flare is designed to explode when it reaches its highest point, at what height will this occur? How many seconds after the flare is fired does it explode?

30. Can a function have two y-intercepts? Explain your answer.

31. Is it possible for the range of a quadratic function to equal all real numbers? Explain your answer.

Answers to Practice Questions for MTE 1 – Operations with Positive Fractions

1. $\frac{3}{11}$

2. $\frac{47}{8}$

3. $5\frac{4}{5}$

4. $3^3 \cdot 5^2$

5. $2^2 \cdot 3^2 \cdot 5$

6. $\frac{4}{15}$

7. $\frac{2}{3}$

8. $\frac{2}{67}$

9. $\frac{50}{1}$

10. 72

11. 180

12. >

13. $\frac{1}{2}$

14. $\frac{1}{8}$

15. $\frac{3}{2} = 1\frac{1}{2}$

16. $\frac{33}{100}$

17. $\frac{13}{72}$

18. $17\frac{4}{7}$

19. $\frac{1}{14}$

20. $\frac{63}{64}$

21. $\frac{8}{25}$

22. $3\frac{48}{77}$

23. $\frac{31}{60}$

24. $1\frac{7}{36}$

25. $\frac{18}{33} = \frac{6}{11}$

26. $\frac{7}{32}$ inches

27. $3\frac{5}{6}$

28. $18.33

29. 5

30. $\frac{31}{50}$

31. $9\frac{1}{10}$ pounds

32. $22.00

33. A. $840.00 B. $1260.00

34. 20 mpg

35. $\frac{7}{8}$ tablespoon

36. 10

Answers to Practice Questions for MTE 2 – Operations with Positive Decimals and Percents

1. 21.056

2. Hundredths

3. 11.09

4. 1.015

5. 15.5

6. 8.7

7. 0.43

8. 14

9. 24

10. 25%

11. 62.5%

12. 0.1875

13. $\frac{83}{100}$

14. $\frac{1}{5}$

15. 0.125

16. 0.658, $\frac{7}{10}$, 0.75, $\frac{5}{6}$

17. 20%

18. 25%

19. 40%

20. $682.50

21. $3,825.00

22. $2,880.00

23. 20%

24. $36,000.00

25. 270

26. November

27. 84 in

28. 1.5 lbs

29. 128 cm

30. 2,600 g

31. 0.75 L

32. 4.73 L

33. 3.94 in

34. 150 min

35. 20 ℃

36. 59 ℉

37. 357 g

38. $140.00

Answers to Practice Questions for MTE 3 – Algebra Basics

1. 3
2. 18
3. 13^3
4. 1^5
5. 8
6. 16
7. 4
8. -4
9. $\frac{35}{24}$
10. 21.7
11. 8
12. -10
13. -24
14. -32
15. 27
16. 0.001
17. 2.061 x 10^9
18. 0.093
19. a. Commutative property of Addition
    b. Associative property of Addition
    c. Distributive
    d. Additive Inverse
    e. Additive Identity
    f. Multiplicative Identity
    g. Multiplicative Inverse
20. 23n+21b
21. 3x +2
22. 14
23. A=180
24. n = -23
25. $x = \frac{1}{2}$
26. $x = 9$
27. $t = 8$
28. 78 credits
29. 37
30. 9220
31. V=192 ft^3
    P = 28 ft
    A = 48 ft^2

Answers to Practice Questions for MTE 4 – First Degree Equations and Inequalities in One Variable

1. x=11
2. x=8
3. x=7
4. x=37.83
5. y=-9
6. t=3
7. $x = 4.75 = 4\frac{3}{4} = \frac{19}{4}$
8. The empty set
9. A=S+D
10. $t = \frac{D}{r}$
11. $w = \frac{P-2l}{2}$ or w=$\frac{P}{2} - l$
12. $t = -8, or\ 14$
13. $x \leq 4.56$
14. $x \geq 8.5\ or\ x \geq \frac{17}{2}$
15. $[-\frac{40}{3}, \infty)$
16. $[-4,5)$
17. $x \leq -5$
18. 423 miles
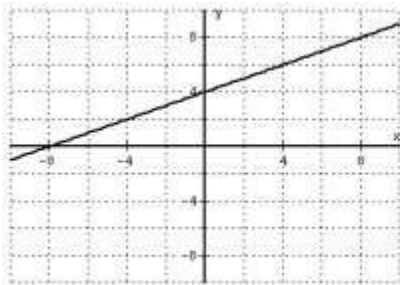19. 9.2 hours
20. $11.52
21. 400 upper seats
22. 5 hours

Answers to Practice Questions for MTE 5 – Linear Equations, Inequalities, and Systems of Equations in Two Variables
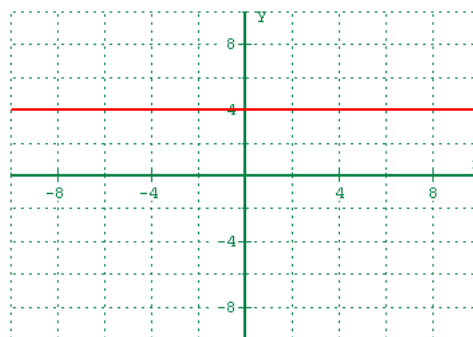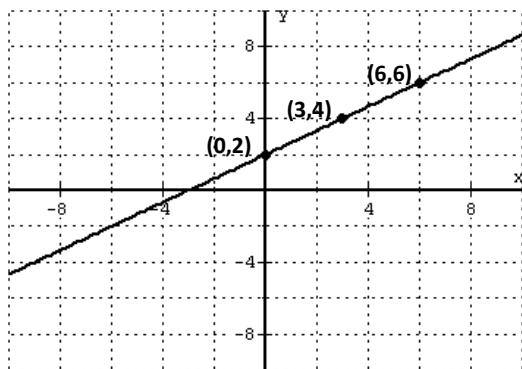
1. (-3, 2)

2. b) (0, -2)

3.
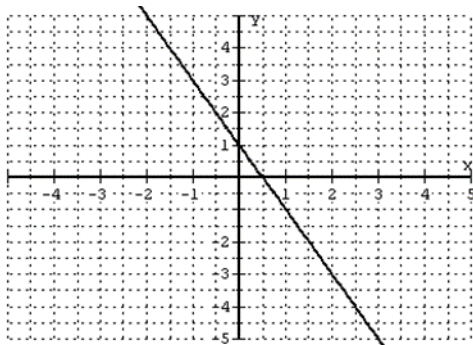
x	-2	-1	0	1	2
Y=-2x +1	5	3	1	-1	-3

4. $f(6) = 11$
5. *x*-int: (1,0) *y*-int: (0, -2)
6. *x*-int: (-8, 0) *y*-int: (0, 4)

7. (0, 2) (3, 4) (6, 6) (any three points on the line would be correct—answers will vary)

8. y=4 (horizontal line, slope = 0)

9. x= -3 (vertical line with undefined slope)
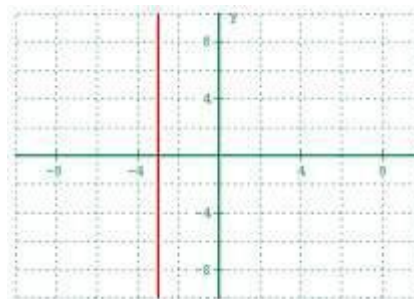
10. $y \leq \frac{3}{2}x - 3$
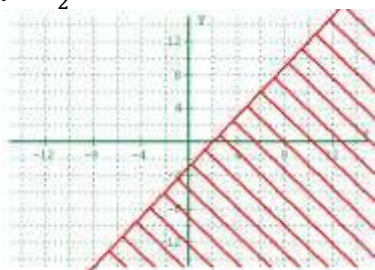
11. $m = 3$

12. $m = -\frac{1}{6}$

13. $m = -\frac{5}{8}$, $y = \frac{-5}{8}x - \frac{7}{8}$, $m = \frac{-5}{8}$

14. $m = 1$

15. m is undefined

16. $m = 0$

17. $y = -\frac{9}{7}x + \frac{4}{9}$
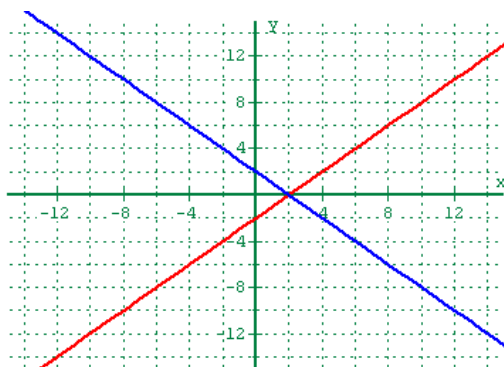
18. $y = -5x + 20$

19. y = -3x − 13

20. x = -5

21. y = 2

22. $y = \frac{5}{6}x - \frac{16}{3}$

23. $y = -\frac{7}{3}x + \frac{44}{3}$

24. (7,-4) is the only solution

25. (2,0)

26. (-3,1) or $x = -3, y = 1$

27. (3,-2) or $a = 3, b = -2$

28. Consistent and Independent

29. $f(5) = 9$, $f(-2) = -12$, $f\left(\frac{2}{3}\right) = -4$, $f(0) =$ -6, $f(6.2) = 12.6$

30. $f(-6) = -4$, $f(0) = 2$, $f(-2) = 0$, $f(1) = 3$

31. x = 3 that is $f(3) = 4$

32. y = 1020 - 85x or y = -85x + 1020

33. .035x + .055y = 283;

   x + y = 5800

   y = $4000

Answers to Practice Questions for MTE 6 – Exponents, Factoring, and Polynomial Equations

1. $-7x^{11}$

2. $\frac{v^4}{25}$

3. $s^{12}t^2$

4. $\frac{1}{64}$

5. $\frac{5w^3z^3}{4}$

6. $\frac{1}{16x^{36}y^{32}}$

7. $\frac{2b^{14}}{27a^{14}}$

8. A) 1.79245283×10^7; 17924528.3

   B) 5.58×10^{-1} ; 0.558

9. Binomial

10. $22x$

11. $15y^7$

12. $5z^2 + \frac{3}{2}z - 1$

13. $15x - 2$

14. $-2x - 3$

15. $45x^2 + 89x + 42$

16. $-3x^3 + 14x^2 - 2x$

17. $30x^4 - 13x^2 + 2$

18. $-7x^3 + 2x^2 - 11x + 24$

19. $5x^4 + 20x^3 - 8x^2 + 28x - 21$

20. $3g^2h^7$

21. $3xy(1 + 5x - 7x^5y^5)$

22. $(4y + 3)(y^2 + 7)$

23. $(z + 6)(z + 8)$

24. $(m-15)(m+8)$

25. $3(z+9)(z+1)$

26. prime

27. $(5x-9y)(5x+9y)$

28. $(3m+4n)(9m^2-12mn+16n^2)$

29. $(z-5)(z^2+5z+25)$

30. $x=0,38$

31. $a=-4$

32. $x=0,9,8$

33. $t=6\ sec$

34. 9 or 11 cameras

Answers to Practice Questions for MTE 7 – Rational Expressions and Equations

1. $x=\dfrac{7}{4}$

2. $v=3,4$

3. $\dfrac{b^2}{a^4c^2}$

4. $\dfrac{1}{2}$

5. $\dfrac{5}{4}$

6. $\dfrac{1}{w-1}$

7. $(x-2)(x+2)$ or x^2-4

8. $\dfrac{-2x+20}{(x-2)(x+2)}$ or $\dfrac{-2(x-10)}{(x-2)(x+2)}$

9. $\dfrac{9y+14}{63y^2}$

10. $\dfrac{3m^2+24m+34}{(m+6)(m+1)(m+4)}$

11. $\dfrac{(x-1)(x-4)}{4x(x+4)}$

12. $\dfrac{-9p-44}{(5p-4)(p+4)}$

13. $\dfrac{12w-17}{w(6w-7)}$

14. $\dfrac{w-3}{w-4}$

15. $6j^3+15j+9$

16. $5p^2-2p+9+\dfrac{5}{4p+5}$

17. $x=-6,4$

18. $\dfrac{7}{x+6}=\dfrac{3}{x-6}$

19. 75 mph

20. 792

21. $1\dfrac{3}{7}$ hours

Answers to Practice Questions for MTE 8 – Rational Exponents and Radicals

1. $\sqrt{16}=4$

2. $-\sqrt[3]{125}=$ -5

3. $\sqrt[5]{(9x+2)^2}$

4. 6.164

5. 8, 9 ; 64, 81

6. 4.688

7. $a^{\frac{1}{2}}$

8. $\dfrac{y^9}{x^{20}}$

9. $21\sqrt{5}$

10. $4|x|$

11. $-m^3p^4\sqrt[5]{m^3}$

12. $2x\sqrt[3]{7x^2}$

13. $5\sqrt{2}$

14. $\sqrt{22}$

15. $-\dfrac{\sqrt{17}}{8}$

16. $\sqrt{72},\ 5\sqrt{2},\ \sqrt{50}$

17. $2\sqrt{5}+7$

18. $\dfrac{\sqrt[3]{9}}{6}-\dfrac{\sqrt[3]{7x}}{3}$

19. $3-3\sqrt{2x}$

20. $18-9\sqrt{7}$

21. $\dfrac{-7\sqrt{2x}}{2x}$

22. $5\sqrt[3]{4}$

23. $\dfrac{9+4\sqrt{6}}{3}$

24. $x=-57$

25. $x=9$

26. i

27. $\sqrt{-9},\ 7i,\ (-3)^{\frac{1}{2}},\ i\sqrt{2}$

28. $6i\sqrt{2},\ 5i\sqrt{2},\ 12i\sqrt{2},$
    $5i\sqrt{2},\ 2i\sqrt{3}$

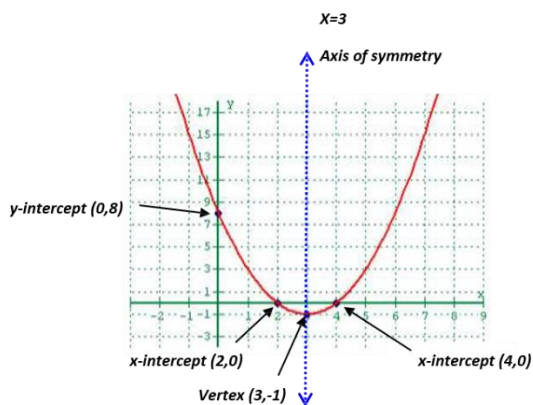29. $-3\pm2i\sqrt{2}$

30. 19.698 ft

31. $2\sqrt{21}$

32. $6\sqrt{10}$

Answers to Practice Questions for MTE 9 – Functions, Quadratic Equations, and Parabolas

1. b, d, e

2. a, b, d

3. $\{x|x = -3, -1, 4, 7\}$

4. $\{y|y = -8, 0, 2, 5\}$

5. D: $[-1, 3]$ R: $[-5, 4]$

6. $[1, \infty)$ or $\{x|x \geq 1\}$

7. $(-\infty, -2) \cup (-2, \infty)$ or $\{x|x \neq -2\}$

8. 4

9. $a^2 - 1$

10. $3x^2 + 6xh + 3h^2 - 2x - 2h + 4$

11. $x = \pm\sqrt{2}$

12. $x = \frac{2}{3}, -1$

13. $x = \frac{1 \pm \sqrt{5}}{2}$

14. $x = 2$

15. $x = -2 \pm i\sqrt{2}$

16. a. IV

    b. III

    c. II

    d. I

17. $f(x) = (x + 3)^2 - 3$; $(-3, -3)$

18. $f(x) = 2(x + 1)^2 - 1$; $(-1, -1)$

19. (-3,-1)

20. Up, since x^2 term is positive

21. (3,-1) $f(x) = (x - 3)^2 - 1$

22. $x = 3$

23. $(4, 0), (2, 0)$

24. $(0, 8)$

25. $(1, 3), (-1, 15)$

26. Graph

X=3

Axis of symmetry

y-intercept (0,8)

x-intercept (2,0)

x-intercept (4,0)

Vertex (3,-1)

27. The width is 60 feet and the length is 30 feet

28. 25 bushels must be sold to yield the maximum revenue of $625

29. The flare will reach its highest point of 149 feet at $t = 3$ sec.

30. A function cannot have two y-intercepts since no x-coordinate can have more than one y-coordinate for a function.

31. The range for a quadratic function can never equal all real numbers. Every quadratic function has either a maximum value (if $a < 0$) or a minimum value (if $a > 0$) So the range can never be (-∞, ∞).