

St. Thomas Aquinas – Algebra Review

You will have 1 ½ hours to take the Algebra test. Please bring a calculator and a pencil.

The Algebra test has two sections. The first section is the NO Calculator section with about 25 problems. You may use a calculator on the second section which has about 40 problems.

You will be taking the test in March. We realize that you will still have two months left in your Algebra class. Therefore, we do not expect you to score 100%. There may be problems that you have not studied yet. Do the best that you can.

Show your work. We will give partial credit for the work that is correct. When a problem is left blank on the test, we can't tell if you studied this information and just don't remember how to start or if it is material that you have never seen before.

Please take time to work the problems in this packet. It is important to review.

NO CALCULATOR

1. $-4 \div 2^2 + 6$ 5	2. $2 \cdot 12 \div 4 \cdot 3$ 18	3. $4 + 6(12 - 5 \cdot 2)^2$ 28
4. $(2 - 4)^2 - 3(-2)(-3)$ -14	5. $ 23 + (-25) $ 2	6. -7^2 -49
7. $(-7)^2$ 49	8. $\frac{-4}{7} \cdot \frac{9}{16}$ $-\frac{9}{28}$	9. $\left(\frac{-2}{3}\right)^2$ $\frac{4}{9}$
10. $\left(\frac{-3}{4}\right)^{-2}$ $\frac{16}{9}$	11. $2\frac{3}{8} \div \frac{-1}{4}$ $-\frac{19}{2}$ or $-9\frac{1}{2}$	12. $-3\frac{3}{4} - 2\frac{3}{5}$ $-\frac{127}{20}$ or $-6\frac{7}{20}$
13. Evaluate when $x=4$ $2x+1$ 9	14. Evaluate when $y=-3$ $5y^2+4(y-3)$ 21	15. If $x=4, y=-3, z=-\frac{2}{3}$, evaluate $yz - x^2$. -14

16. Solve for x. $3x+4y=12$

$$x = -\frac{4}{3}x + 4$$

17. Write the property that is illustrated. Pick from the following:

Addition or Subtraction Property of Equality Multiplication or Division Property of Equality

Commutative Property

Inverse Property

Transitive Property

Identity Property

Associative Property

Distributive Property

a. $5 + x + (-5) = x + 5 + (-5)$

b. $x + 5 + (-5) = x + 0$

c. $x + 0 = x$

d. $\frac{2}{3} \cdot \left(\frac{3}{2}x\right) = \left(\frac{2}{3} \cdot \frac{3}{2}\right)x$

e. $\frac{2}{3} \cdot \frac{3}{2}x = 1 \cdot x$

f. $1 \cdot x = x$

g. $3(x + 5) = 3x + 15$

h. If $2x - 3 = 9$ then $2x = 12$

i. If $2x = 12$ then $x = 6$

Commutative

Inverse

Identity

Associative

Inverse

Identity

Distributive

Addition Prop. of Equality

Division Prop. of Equality

Simplify. Write with positive exponents only.

18. $(2p^2 - p + 6) - (p^2 + 3p - 2)$ $p^2 - 4p + 8$	19. $\frac{a^5}{x^4} \cdot \frac{x^3}{a^4}$ $\frac{a}{x}$	20. $\frac{10x^5y^{-5}z^2}{25x^3y^{-2}z^3}$ $\frac{2x^2}{5y^3z}$
21. $\left[\frac{(x^2y^{-2}p^0)^{-3} p^2}{x^2(x^{-4})^0(p^{-2}y^5)^{-2}} \right]^0$ 1	22. $(-5x^3y^5)(2x^7y)$ $-10x^{10}y^6$	23. $(-3x^3y^5)^2(-2x^7y)$ $-18x^{13}y^{11}$
24. $\left(\frac{3x^6y}{6z^2}\right)^4$ $\frac{x^{24}y^4}{16z^8}$	25. $\frac{10x^7 + 4x^5 - 8x^4}{2x^3}$ $5x^4 + 2x^2 - 4x$	26. $-4x^3y(5xy^5 + x^2)$ $-20x^4y^6 - 4x^5y$
27. $(x + 5)^2$ $x^2 + 10x + 25$	28. $(2y + 1)(y - 3)$ $2y^2 - 5y - 3$	29. $(x + 2)(2x^2 - x + 6)$ $2x^3 + 3x^2 + 4x + 12$

For problems 30-32 let: $g(t) = -t^2$ and $h(t) = 3t + 1$.

30. Find $g(-3)$

-9

31. Find $g(2) + h(2)$

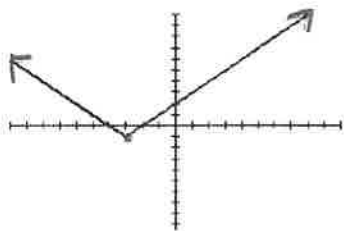
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32. Find $h(g(2))$

-11

33. Find the domain and range.

Domain: $(-\infty, \infty)$
Range: $[-1, \infty)$



Simplify the following. Leave the answers in standard radical form. Rationalize all denominators.

34. $\sqrt{48}$ $4\sqrt{3}$	35. $\sqrt{50x^3y^{26}z^{401}}$ $5xy^{13}z^{200}\sqrt{2xz}$	36. $3\sqrt{28} + \sqrt{63}$ $9\sqrt{7}$
37. $2\sqrt{6} \cdot 5\sqrt{10}$ $20\sqrt{15}$	38. $(5\sqrt{2})^2$ 50	39. $7\sqrt{3} + 8\sqrt{3}$ $15\sqrt{3}$

40. What two integers is $\sqrt{70}$ between?

8 and 9

Solve the following using the Quadratic formula. Write solutions in simple radical form.

41. $x^2 - 5x = -2$

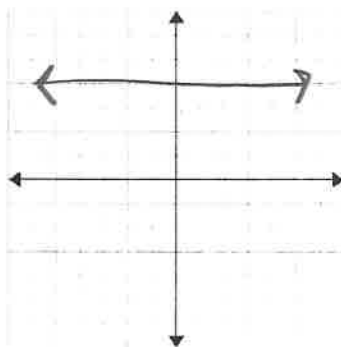
$x = \frac{5 \pm \sqrt{17}}{2}$

42. $2x^2 - 7x + 3 = 0$

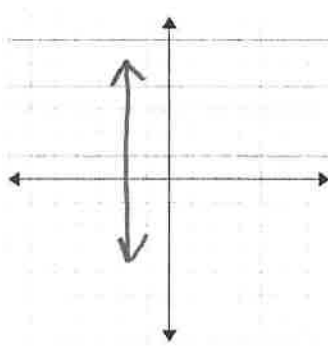
3 and $\frac{1}{2}$

43. Graph the following equations.

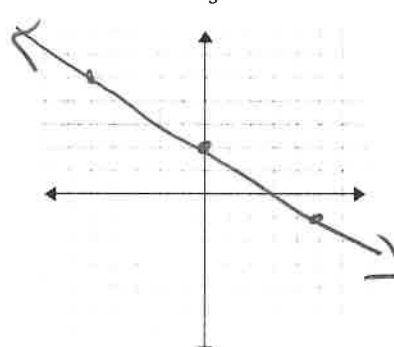
a) $y = 4$



b) $x = -2$

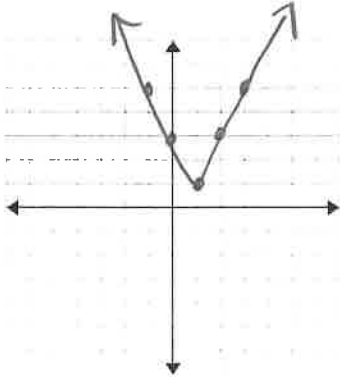


c) $y = -\frac{3}{5}x + 2$

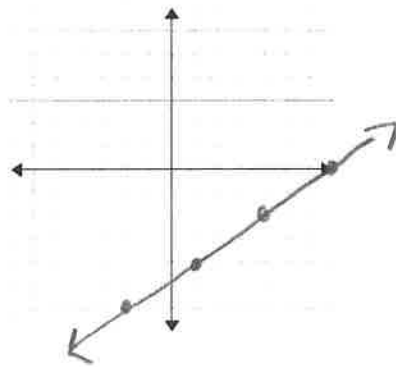


44. Graph.

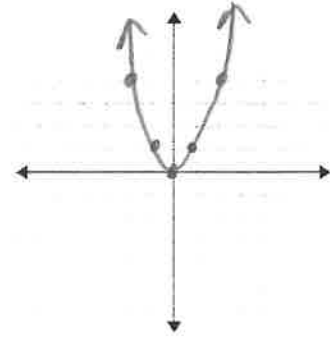
a) $y = 2|x - 1| + 1$



b) $y + 4 = \frac{2}{3}(x - 1)$

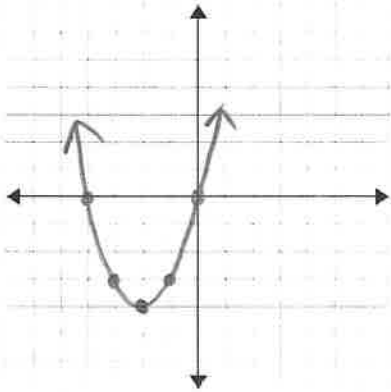


c) $y = x^2$

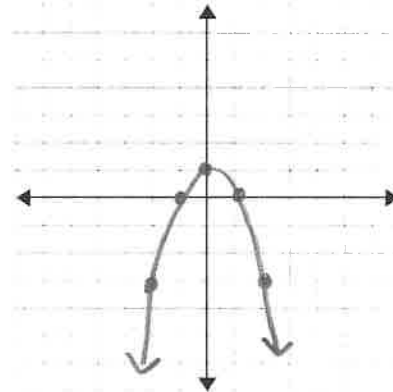


Identify the vertex of the parabola then graph.

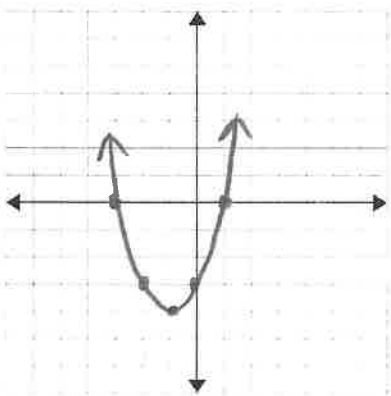
45. $y = (x + 2)^2 - 4$ vertex $(-2, -4)$



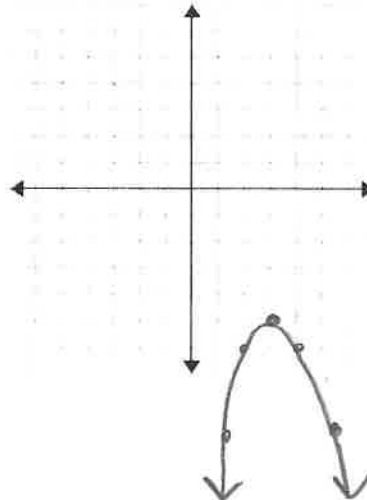
46. $y = -x^2 + 1$ vertex $(0, 1)$



47. $y = x^2 + 2x - 3$ vertex $(-1, -4)$



48. $y = -(x - 3)^2 - 5$ vertex $(3, -5)$



CALCULATOR REVIEW. Please show all work for full credit.

Write the sentences as equations or inequalities. Solve.

1. Seven subtracted from twice a number is fourteen.

$$2x - 7 = 14$$

$$x = \frac{21}{2} \text{ or } 10\frac{1}{2}$$

2. Five more than the product of a number and six is less than thirty-seven.

$$6x + 5 < 37$$

$$x < \frac{16}{3} \text{ or } x < 5\frac{1}{3}$$

3. A number squared is greater than or equal to twice the sum of four and another number.

$$x^2 \geq 2(y+4)$$

Write an equation and solve. Round to the nearest percent.

4. Sixteen is what percent of 12?

$$16 = x \cdot 12 \quad x = 133\%$$

5. What percent of 35 is 28?

$$x \cdot 35 = 28 \quad x = 80\%$$

6. A \$55 jacket is on sale for 20% off. What is the sale price?

$$\$44$$

7. Find two consecutive integers such that the sum of the first and four times the second is 104.

$$x + 4(x+1) = 104 \quad 20 \text{ and } 21$$

Solve the following equations. Exact answers only.

8. $21 = 2(x-3) + 7x$

$$x = 3$$

9. $\frac{1}{2}(4x+6) - 3(x+4) = 3(x-7)$

$$x = 3$$

10. $\frac{2x+3}{3} = \frac{3x-7}{5}$

$$x = -36$$

11. $\frac{3}{8} + \frac{x+2}{6} = \frac{7}{4}$

$$x = \frac{25}{4}$$

12. $\frac{x}{4} + 2 = \frac{5}{6}$

$$x = -\frac{14}{3}$$

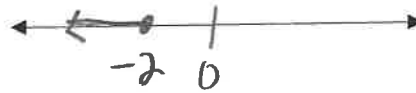
13. $14x + 3x - 5x - (-2x) + 27 = 13 - 5x - 63$

$$x = -\frac{77}{19}$$

Solve the equations and inequalities. Graph your answers on a number line.

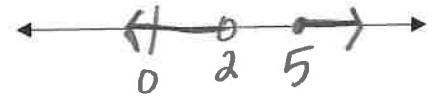
14. $-3x + 4 \geq 10$

$x \leq -2$



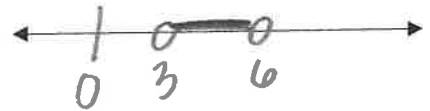
15. $2x + 7 < 11$ or $5 - 3x \leq -10$

$x < 2$ or $x \geq 5$



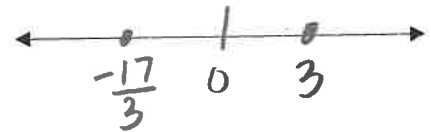
16. $3 < 3x - 6 < 12$

$3 < x < 6$



17. $|3x + 4| = 13$

$x = 3$ and $x = -\frac{17}{3}$



18. $3|2x + 3| - 5 = 10$

$x = 1$ and $x = -4$



19. $|2x - 11| < 13$

$-1 < x < 12$



20. $4|x - 8| \geq 16$

$x \leq 4$ or $x \geq 12$



21. $|x - 3| \geq -2$

all real numbers



For problems 22-25, use the following set of scores for 10 Chemistry labs.

10, 7, 5, 5, 6, 8, 9, 10, 5, 8

22. Find the mean. 7.3

23. Find the median. 7.5

24. Find the mode for the lab scores.

5

25. Write the equation of the line through the points (6,8) and (10,-2) in

- a) point-slope form $y - 8 = \frac{-5}{2}(x - 6)$ or $y + 2 = \frac{-5}{2}(x - 10)$
- b) slope-intercept form $y = \frac{-5}{2}x + 23$
- c) standard form. $5x + 2y = 46$

26. Write the equation of the line that is parallel to $y = 2x + 5$ and passes through point (-4, 3).

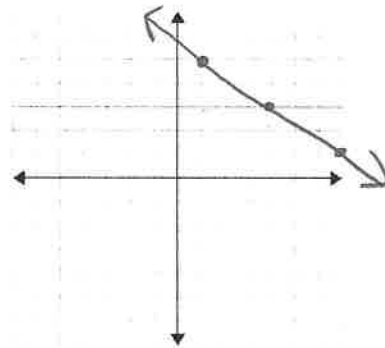
- a) point-slope form $y - 3 = 2(x + 4)$
- b) slope-intercept form $y = 2x + 11$
- c) standard form. $-2x + y = 11$

27. Write the equation of the line perpendicular to $3x - 4y = 12$ and passes through (6, 7).

- a) point-slope form $y - 7 = \frac{-4}{3}(x - 6)$
- b) slope-intercept form $y = \frac{-4}{3}x + 15$
- c) standard form. $4x + 3y = 45$

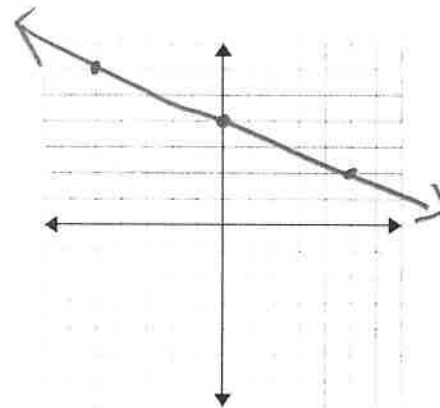
28. Write the equation of a line whose slope is $-\frac{2}{3}$ and passes through the point (1, 5).

- a) point-slope form $y - 5 = \frac{-2}{3}(x - 1)$
- b) Then Graph



29. Describe a line whose slope is:

- a) Undefined *vertical line* \updownarrow
- b) Positive *The line increases* \nearrow
- c) Negative *The line decreases* \searrow
- d) Zero *horizontal line* \longleftrightarrow

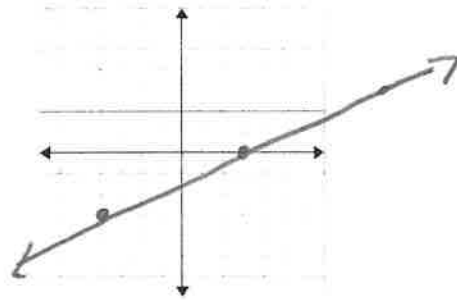


30. Given the equation $2x + 5y = 20$

- a) State the x-intercept as an ordered pair. $(10, 0)$
- b) State the y-intercept as an ordered pair. $(0, 4)$
- c) State the slope. $-\frac{2}{5}$
- b) Graph the line.

31. Given the equation $3x - 7y = 9$

- a) State the x-intercept as ordered pair. $(3, 0)$
- b) State the y-intercept as an ordered pair. $(0, -\frac{9}{7})$
- c) State the slope. $\frac{3}{7}$
- d) Graph the line.



Write an equation and solve.

32. Eric is planting a garden. Its length is 3 feet less than twice its width. Its area is 170 square feet. Find the dimensions of the garden.



$$w(2w-3) = 170$$

10ft by 17ft

33. A square pool has length p . The border of the pool is 1 foot wide. The combined area of the pool and the border is 400 square feet. Find the area of the pool.



$$(p+2)(p+2) = 400$$

$$p = 18$$

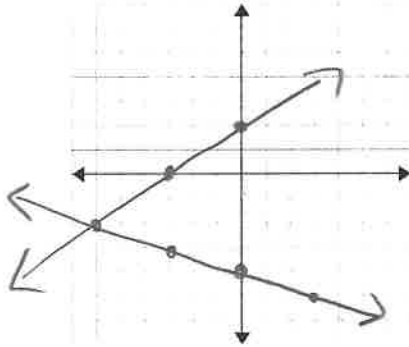
$$\text{Area} = 324 \text{ ft}^2$$

Solve the following systems of equations using the indicated method.

34. Solve by graphing:

$$2x - 3y = -6$$

$$y = \frac{-1}{3}x - 4$$



Solution
 $(-6, -2)$

35. Solve each system using indicated methods.

Substitution:

$$x + y = 14$$

$$3x + 2y = 48$$

$(20, -6)$

Substitution:

$$x - 5y = 4$$

$$-3x + 15y = 7$$

no solution

Elimination:

$$x - 5y = 2$$

$$2x + y = 4$$

$(2, 0)$

Elimination:

$$-2x + 6y = 10$$

$$3x - 9y = -15$$

all points
on the line

Write a system of equations and solve using the method of your choice.

36. Tommy has a coin collection consisting of nickels and quarters. He has 24 coins worth \$5.00. How many of each does Tommy have?

$$\begin{aligned} n + q &= 24 \\ .05n + .25q &= 5 \end{aligned}$$

5 nickels
9 quarters

37. The sum of two numbers is 6 less than twice the first number. The difference is 10 less than four times the second number. Find each of the numbers.

$$\begin{aligned} x + y &= 2x - 6 \\ x - y &= 4y - 10 \end{aligned}$$

10 is the first number
4 is the second number

Factor each expression completely.

38. $x^2 + 9x + 20$
 $(x+5)(x+4)$

39. $3x^2 - 12$
 $3(x+2)(x-2)$

40. $12x^2y^3 - 18xy^2 - 6xy$
 $6xy(2xy^2 - 3y - 1)$

41. $3x^2 - 5x - 2$
 $(3x+1)(x-2)$

Simplify.

42. $\frac{x+3}{x^2+x-6} \cdot \frac{1}{x-2}$

43. $\frac{x^2-3x-28}{x^2-16} \cdot \frac{x-7}{x-4}$

Perform the indicated operations and simplify.

44. $\frac{x}{12} + \frac{6}{15}$
 $\frac{5x+24}{60}$

45. $\frac{5}{2x} + \frac{3}{x-1}$
 $\frac{11x-5}{2x(x-1)}$

46. $\frac{3}{x} - \frac{5}{2x}$
 $\frac{1}{2x}$

47. $\frac{x+2}{3} + \frac{x+1}{5}$
 $\frac{8x+13}{15}$

48. $\frac{5}{2x} - \frac{3x^5}{4}$
 $\frac{-15x^4}{8}$

49. $\frac{6x+3}{2x} \cdot \frac{9x}{16x^5}$
 $\frac{8x^3(2x+1)}{3}$

50. $\frac{x^2-2x-8}{x^2+4x} \cdot \frac{x^2-16}{2x+4}$
 $\frac{(x-4)^2}{2x}$

51. $\frac{x^2-36}{x^2+4x-12} \div (3x-18)$
 $\frac{1}{3(x-2)}$

Solve each equation.

52. $\frac{3}{x+4} = 2$

$x = -\frac{5}{2}$

53. $\frac{1}{5} - \frac{3x}{4} = \frac{x+5}{10}$

$x = -\frac{6}{17}$

Solve the following using the Quadratic formula. Write solution in radical form.

56. $x^2 + 10x + 17 = 0$

$$x = 5 \pm 2\sqrt{2}$$

57. $2x^2 - 17x + 33 = 0$

$$x = 3, x = \frac{11}{2}$$

Solve the following.

58. $3x(x-4)(3x+4) = 0$

$$x = 0, x = 4, x = -\frac{4}{3}$$

Solve by factoring

59. $4x^2 + 7x = 0$

$$x = 0, x = -\frac{7}{4}$$

60. $x^2 - 25 = 0$

$$x = 5, x = -5$$

61. $x^2 + x - 6 = 0$

$$x = -3, x = 2$$

62. $3x^2 - 7x - 6 = 0$

$$x = -\frac{2}{3}, x = 3$$

63. $x^2 - 3x - 2 = 2$

$$x = 4, x = -1$$

64. $8x^2 - 18x - 5 = 0$

$$x = -\frac{1}{4}, x = \frac{5}{2}$$

65. $3x^3 + 9x^2 - 30x = 0$

$$x = 0, x = -5, x = 2$$

Solve. Express your answers as simplified radicals.

66. $25x^2 = 36$

$$x = \pm \frac{6}{5}$$

67. $(3x-4)^2 - 16 = 9$

$$x = 3, x = -\frac{1}{3}$$

Solve the following radical equations.

68. $\sqrt{5x} - 2 = 3$

$$x = 5$$

69. $3\sqrt{7x-3} + 2 = 8$

$$x = 1$$

70. $\sqrt{4x} = x + 1$

$$x = 1$$

Modeling problems

71. A plumber charges a \$65 fee for a repair plus \$35 per hour. Write an equation to model the total cost y of a repair that takes x hours.

$$y = 35x + 65$$

72. A backyard swimming pool has 25 gallons of water in it when Nathan begins filling it. The water flows at a rate of 10 gallons per minute.

a. The function that represents for x minutes is $f(x) = \underline{10x + 25}$

b. Evaluate each. $f(2) = \underline{45}$ $f(8) = \underline{105}$ $f(20) = \underline{245}$

c. How much water is in the pool after 30 minutes? $\underline{325 \text{ gal}}$

d. The pool capacity is 500 gallons. How many minutes will it take to fill it?

$$\underline{47.5 \text{ mins}}$$

73. The function below shows the cost of an ice cream sundae with x number of toppings. $f(x) = 2.25 + 0.75x$

a. What is the y -intercept, and what does it mean? $(0, 2.25)$ The cost is \$2.25 without toppings.

b. What is the slope, and what does it mean? 0.75 \$0.75 per topping

c. If Kaye paid \$6.00 for a sundae, how many toppings were on Kaye's sundae?

$$\underline{5 \text{ toppings}}$$

Probability and Odds

74. Sally rolls a 6-sided die.

a. What is the probability that she rolls a 5? $\frac{1}{6}$

b. What is the probability that she rolls an even number? $\frac{1}{2}$

c. What are the odds that she rolls a number less than 3?

$$\frac{1}{2}$$

75. There are 10 marbles in a bag. 7 are blue and 3 are gold. Sally reaches into the bag and selects one marble without looking.

a. What is the probability that she selects a blue marble? $\frac{7}{10}$

b. What are the odds that she selects a blue marble?

$$\frac{7}{3}$$