Math 10C Final Review

Exponents and Radicals Practice

1. What is the value of each expression?

   (a) $\sqrt{4}$ (b) $\sqrt{16}$ (c) $\sqrt{144}$

2. Evaluate each of the following.

   (a) $\sqrt[3]{8}$ (b) $\sqrt[3]{27}$ (c) $\sqrt[3]{1000}$

3. State whether each number is a perfect square or a perfect cube. Show your work.

   (a) 1024 (b) 10 648

4. Simplify each expression.

   (a) $(x^6)(x)(x^3)$ (b) $(7x^7y^5)(-2x^4y^8)$ (c) $(-7a^7b^6)(2a^5b)$

   (d) $(4x^6y)(\frac{1}{2}x^7y^8)$ (e) $\frac{a^8b^4c^3}{a^5b^3c}$ (f) $\frac{-54a^6b^4}{9a^3b}$

5. Simplify each of the following as far as possible. Leave your answer with positive exponents.

a) 3^{-2} b) $\frac{1}{2^{-3}}$ c) $\left(\frac{4}{3}\right)^{-1}$ d) $4 \cdot 2^{-2}$

6. Simplify the following, leave all of your answers as powers using positive exponents, then evaluate.

(a) $2^{-6} \times 2^{2}$ (b) $3^{2} \div 3^{-2}$ (c) $\frac{(-3)^{-4}}{(-3)^{-2}}$ (d) $\frac{(-2)^{9} \times (-2)^{-6}}{(-2)^{2}}$

7. Simplify each of the following as far as possible. Leave your answer with positive exponents.

(a) $\left(a^{2}b^{4}\right)\left(a^{2}b^{-5}\right)$ (b) $\frac{x^{2}y^{-2}}{y^{-1}}$ (c) $\left(x^{-1}y^{-2}\right)\left(x^{-2}y^{-3}\right)$

8. Use the laws of exponents to simplify. Leave your answers with positive exponents, if applicable.

(a) $5^{\frac{3}{4}} \times 5^{\frac{1}{8}}$ (b) $\left(10^{\frac{3}{5}}\right)^{\frac{2}{5}}$ (c) $a^{\frac{2}{3}} \times a^{\frac{5}{4}}$

(d) $\left(27^{-\frac{2}{3}}\right)^{\frac{3}{2}}$ (e) $\left(m^{\frac{2}{3}} n^{-\frac{1}{4}}\right)^{\frac{1}{2}}$

9. Express each power as an equivalent radical and vice versa.

(a) $5^{\frac{3}{2}}$ (b) $\left(27^{2}\right)^{\frac{2}{3}}$ (c) $(-x)^{\frac{2}{3}}$ (d) $\left(\frac{1}{y}\right)^{-\frac{1}{3}}$

(e) $\sqrt{(9x)^3}$ (f) $\sqrt[3]{64x^6}$ (g) $\sqrt[3]{x^0 y^2}$

10. Express each mixed radical as an equivalent entire radical.

(a) $3\sqrt{2}$ (b) $-4\sqrt{3}$ (c) $5\sqrt{27}$

(d) $6\sqrt{8}$ (e) $2\sqrt[3]{3}$ (f) $2\sqrt[3]{9}$

11. Express each entire radical as an equivalent mixed radical.

(a) $\sqrt{32}$ (b) $\sqrt{48}$ (c) $-3\sqrt{27}$

(d) $-6\sqrt{150}$ (e) $\sqrt[3]{128}$

12. Arrange the following from least to greatest: $3\sqrt{6},\ 5\sqrt{2},\ 2\sqrt{15},\ 4\sqrt{3}$

13. Use estimation to order the following numbers from greatest to least.

$2\sqrt[3]{5},\ \sqrt{30},\ 4\sqrt{4},\ 3\sqrt{6}$

14. The pressure, P, in kilopascals, exerted on the floor by the heel of a shoe is given by the formula: $P = \frac{100m}{x^2}$, where m is the wearer's mass, in kilograms, and x is the width of the heel, in centimetres. Find the pressure exerted by a 60 kg woman wearing shoes with heels 2 cm wide.

15. The astronomer Johann Kepler found a formula which can be used to determine the number of Earth-days it takes each planet to travel once around the sun. The formula is: $N \approx 0.2R^{\frac{3}{2}}$, where R is the mean distance from the planet to the sun in millions of kilometers and N is the number of Earth-days. Determine the number of Earth-days in the year of Saturn if Saturn is 1600 million kilometers away from the sun.

16. The Japanese board game of Tai Shogi is an expanded version of chess. Like chess, it is played on a square board covered with small squares. If each small square has a side length of 2 cm, the diagonal of the whole board measures $\sqrt{5000}$ cm. How many squares are on the board?

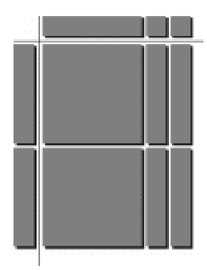
Polynomials Practice Questions

1. Write the prime factorization of 360.

2. Given the numbers 12, 54, and 72, determine the:
   (a) GCF (b) LCM

3. Use algebra tiles or a diagram to model each of the following binomial multiplication statements, then express the product of the multiplication as an expanded polynomial in simplest form.
   (a) $(2x+3)(x+1)$ (b) $(3x-1)(x+2)$

4. Write the multiplication sentence that is represented by the diagram at right.



5. Expand and collect like terms.

(a) $(a+1)(a+2)$ (b) $(n-3)(n-2)$ (c) $(a-2)^2$ (d) $(2x-3)(x-2)$

6. Use the distributive property to determine each product.

(a) $n(5n^2-n+4)$ (b) $-k(k^2-5k+1)$

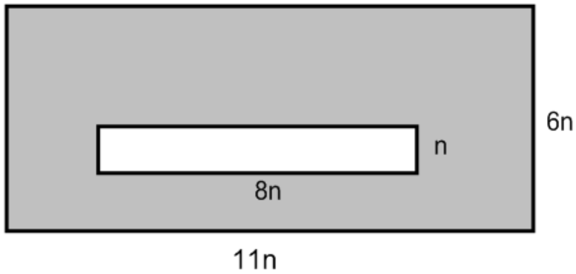
(c) $(a-2)\left(a^2+2a+4\right)$ (d) $\left(2x^2+3x-2\right)\left(5x^2+x+6\right)$

7. Multiply and then collect like terms.

(a) $(x-3)(x+2)+(2x-5)$ (b) $3(2a-3b)(a+2b)-2(3a-b)^2$

8. A side of a cube is $(x+2)$ cm long. Write a polynomial expression for the volume of the cube and then expand and collect like terms.

9. Write a simplified expression for the area of the shaded region:



10. Factor $2x^2 + 6x$.

11. Use algebra tiles or a diagram to factor the trinomial $x^2 - 7x + 6$.

12. Factor the following polynomials.

(a) $5y - 10$

(b) $3x^2 + 5x^3 + x$

(c) $51x^2y + 39xy^2 - 72xy$

13. Factor, if possible.

(a) $x^2+14x+40$ (b) $x^2+2x-15$ (c) $2y^2-6y+4$

(d) $6m^2+18m-24$ (e) $2x^2+3x+1$ (f) $3x^2+7xy+2y^2$

(g) $6y^2-11y-10$

14. Factor the following, if possible.

(a) x^2-81 (b) $4x^2-25y^2$ (c) $81+x^2$

(d) $x^2-18x+81$ (e) $x^2+14x+49$ (f) $5x^2-10x+5$

15. What is the factored form of the trinomial $30x^2 - 25xy - 30y^2$?

16. The CN Tower in Toronto has a base area that can be expressed as $5x^2 + 13x - 6$ square units. Factor $5x^2 + 13x - 6$ to find binomials that could represent the length and the width of the base of the tower.

17. The area of a children's playground measures $2a^2 + 8a - 10$ square units.

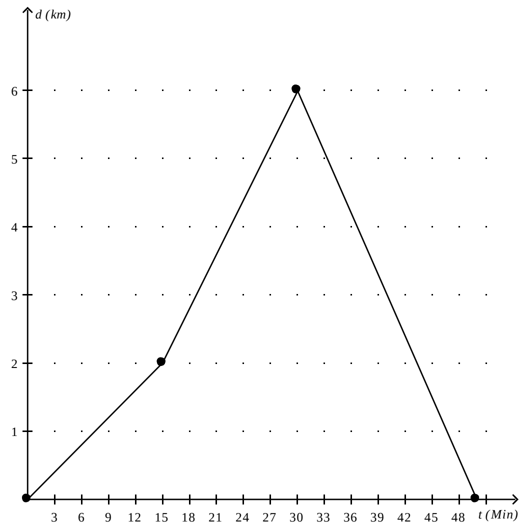
(a) Factor the polynomial to find the binomials that could represent the length and the width of the playground.

(b) If a represents 13 m, what are the length and the width of the playground, in metres.

18. The area of a square can be given by the expression $9x^2 - 12x + 4$, where x represents a positive integer. Write a possible expression for the perimeter of the square.

Relations and Functions Practice Questions

1. The following distance-time graph represents the distance (in kilometres) a person bicycled during a 50-min period. Describe a possible scenario.



2. The table of values shows the cost of movie tickets at a local theatre.

Number of Tickets	Cost ($)
1	12
2	24
3	36
4	48

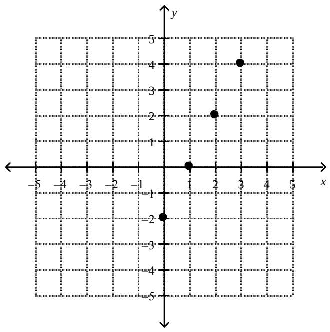
(a) Is this a linear or non-linear relationship? Explain how you know.

(b) Assign a variable to represent each quantity in the relation. Which variable is the dependent variable and which is the independent variable?

(c) Are the data discrete or continuous? Explain how you know.

(d) Graph the data.

3. Determine whether each relation is linear or non-linear. Explain your decision.

(a) 

(b) $A = \pi r^2$ (c) {(-2, 5), (1, 3), (4, 1), (10, -3)}

4. At the bowling alley Angela rented shoes for \$3. It cost her \$2.50 to bowl each game.

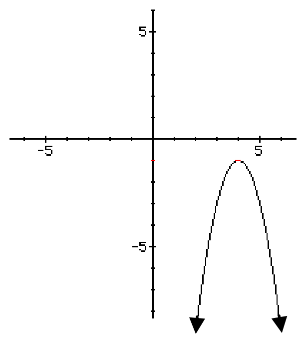
(a) Develop an equation that represents the cost of bowling. Use the form $C(x) = mx + b$, where $C(x)$ is the total cost, and x, is the number of games bowled.

(b) Is this relation a function? Explain.

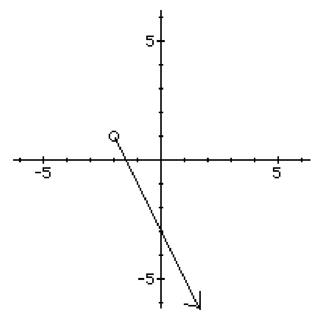
(c) How much did it cost Angela to bowl four games?

5. Give the domain and range of each graph. Use words, interval notation, and set notation.

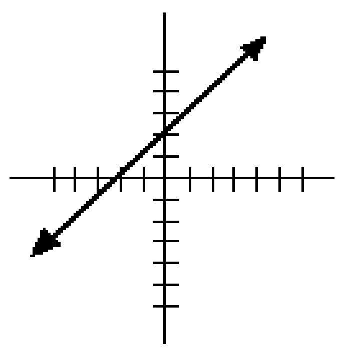
(a)



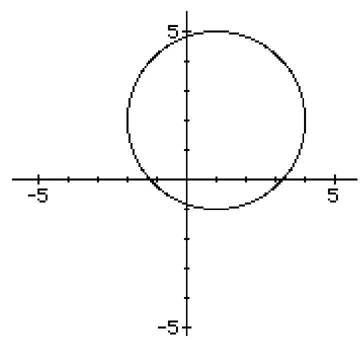
(b)



(c)



(d)



6. Determine whether or not each relation is a function.

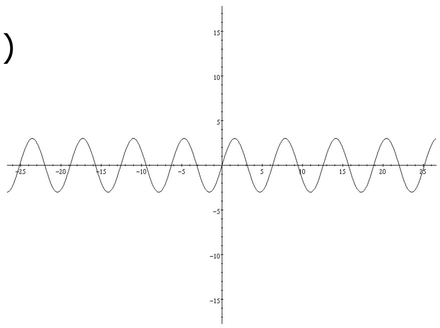
(a) (2,5), (4,3), (6,1), (8,-1), (9,-2)

(b) (3,2), (5,6), (6,8), (3,-2), (6,-4)

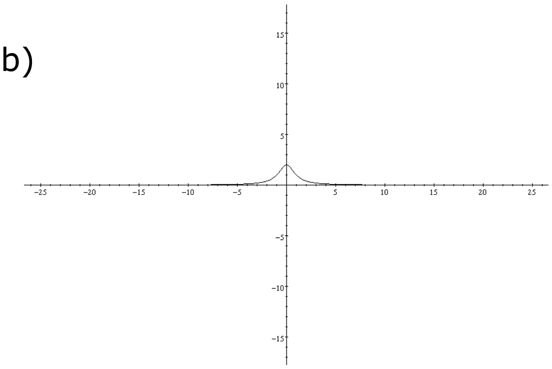
(c) (8,1), (7,1), (-3,1), (-4,1)

7. Determine whether or not each relation is a function. Explain your answer.

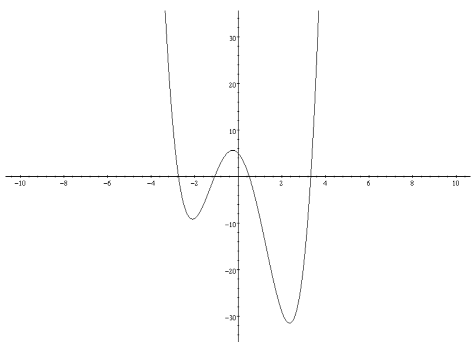
(a)



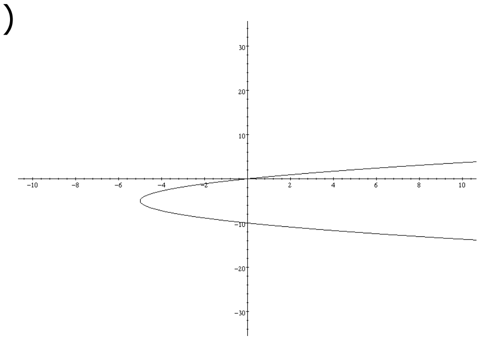
(b)



(c)



(d)



8. If $f(x) = 4x - 5$, find:

(a) $f(5)$ (b) $f(-1)$ (c) $f(0)$ (d) $f(1000)$

9. Consider the function $f(x) = \frac{2}{3}x - 1$

(a) What is the value of $f(0)$?

(b) Determine x so that $f(x) = 5$

10. A typical adult dosage for an antihistamine is 24 mg. Young's rule for determining the dosage size $c(a)$ for a typical child of age *a* is $c(a)=\frac{24a}{a+12}$. What should the dosage be for a typical 8-year-old child?

Linear Equations & Graphs Practice Questions

1. Determine the slope given the rise and the run.

   (a) rise = 1, run = 2

   (b) rise = 4, run = −1

   (c) rise = −3, run = −4

   (d) rise = −10, run = −2

2. Determine the slope of the line containing each pair of points.

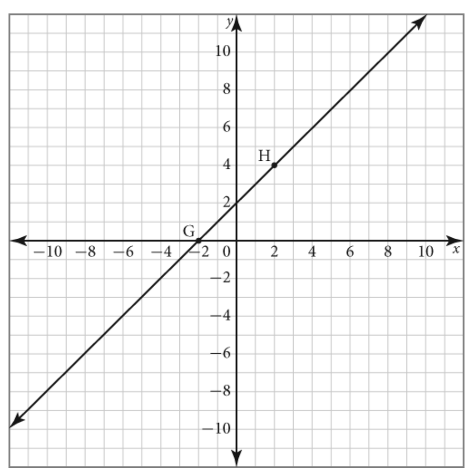
   (a) A(0, 5) and B(−3, 2)

   (b) C(−2, −3) and D(−6, −11)

   (c) E(12, 4) and F(9, 16)

   (d) G(−100, 50) and H(−200, 100)

3. Use the graph to answer parts a) to d).



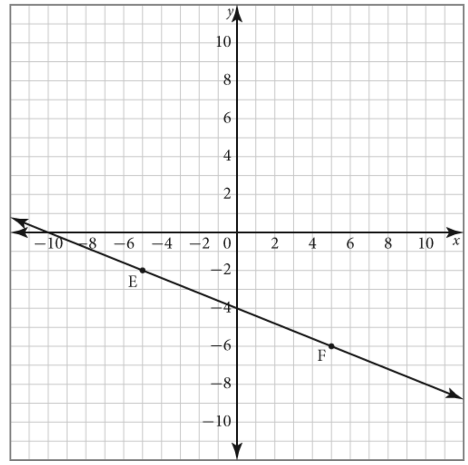
   (a) Identify the coordinates of points G and H.

   (b) Identify the rise of the line through points G and H.

   (c) Identify the run of the line through points G and H.

   (d) Identify the slope of the line through points G and H

4. Use the graph to answer parts a) to f).



(a) State the coordinates of points E and F.

(b) Determine the rise between points E and F.

(c) Determine the run between points E and F.

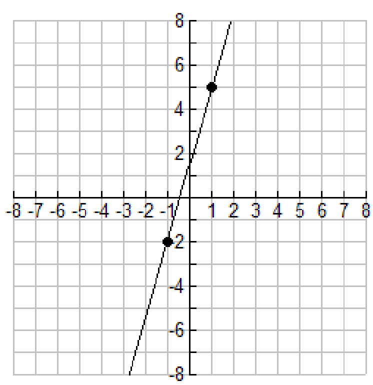
(d) Determine the slope of the line containing points E and F.

(e) State the *y*-intercept of the line containing points E and F.

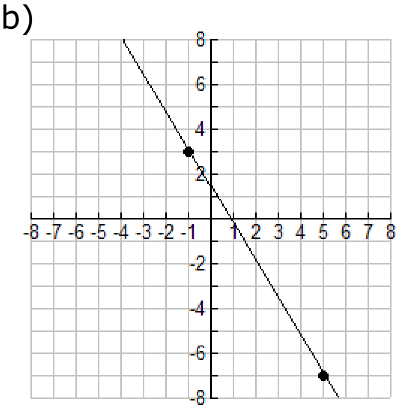
(f) State the equation of the line containing points E and F.

5. Determine the slope of each line.

(a)



(b)



6. Determine the slope and draw the graph of a line with x-intercept 5 and y-intercept −3.

7. Sketch the lines described below.

(a) $(3, -1)$ and $\mathrm{m} = -5$

(b) $(-6, -2)$ and $\mathrm{m} = \frac{1}{4}$

8. Find the slope and the y-intercept of each line. Then, sketch the line.

(a) $y = 2x - 5$

(b) $y = -7$

9. Write the equation of each line in the form $y = mx + b$

(a) slope = 2; y-intercept = 3

(b) slope = $\frac{1}{2}$; y-intercept = -2

10. Determine the x-intercept and y-intercept of the line $y = 1 - x$. Then, graph the line.

11. Determine the x- and y-intercepts of each line.

(a) $x - y - 5 = 0$ (b) $4x - 3y - 24 = 0$ (c) $2x + 5y - 6 = 0$

12. (a) What is the equation of the vertical line that passes through the point (3, 4)?

(b) What is the equation of the horizontal line that passes through the point (3, 4)?

13. Express each of the following in slope and y-intercept form.

(a) $x + y = 5$ (b) $x + y - 7 = 0$ (c) $4x + 2y = 3$

14. Express each of the following in slope and y-intercept form, then sketch the line.

(a) $3x+2y+6=0$ (b) $x-3y-9=0$

15. Consider the equation $y=4x+b$. What is each value of b if a graph of the line passes through each point?

(a) (4, 11) (b) (-2, -9)

16. Express each of the following in general form, $Ax+By+C=0$.

(a) $y=8x-3$ (b) $y=-\frac{5}{2}x+\frac{7}{2}$ (c) $y=\frac{1}{3}x+\frac{1}{2}$

17. Write an equation of the line that passes through the given point and has the given slope. Express the equation in general form.

(a) $(3,-1)$ and $\mathrm{m}=-5$ (b) $(-6,-2)$ and $\mathrm{m}=\frac{1}{4}$

18. Write an equation of the line that passes through the given points. Express the equation in general form.

(a) $(5, 2)$ and $(-1, 3)$

(b) $(1, 5)$ and $(6, -4)$

19. Write an equation in point-slope form of the line through $(-2,5)$ and $(-6,7)$.

20. What is the value of the unknown parameter in each equation?

(a) $Ax+5y-6=0$ passing through $(-3,2)$

(b) $4x-3y+C=0$ passing through $(-2,-6)$

21. Given the slopes of the two lines, determine whether the lines are parallel, perpendicular, or neither.

(a) $m_1 = 2$; $m_2 = -\frac{1}{2}$

(b) $m_1 = -\frac{2}{3}$; $m_2 = -\frac{2}{3}$

(c) $m_1 = 5$; $m_2 = -5$

(d) $m_1 = \frac{2}{3}$; $m_2 = -1.5$

22. Find the slope of a line perpendicular to a line with the given slope:

(a) $m = \frac{1}{2}$

(b) $m = -3$

(c) undefined

23. The slopes of two parallel lines are -3 and $\frac{m}{5}$. Find the value of *m.*

24. The slopes of two perpendicular lines are $\frac{k}{2}$ and $\frac{8}{10}$. Find the value of *k.*

25. Write an equation of the line in general form through the point $(4,5)$ that is parallel to the line with the equation $3x+2y+4=0$.

26. Determine if the lines $7x+5y=35$ and $y=\frac{7}{5}x-5$ are parallel, perpendicular, or neither.

27. Determine an equation for the line, in general form, passing through $(-3,-2)$ and perpendicular to $2x-3y-3=0$.

28. Jamie's grandmother gave her $40 when she started high school. Jamie decided to add $5 a week toward the cost of a digital music player. Write an equation in the form
Ax + *By* + *C* = 0 to represent Jamie's savings.

Systems of Equations Practice Questions

1. (a) Explain how graphing can be used to solve a linear system of two equations.

   (b) Explain how you could check your solution.

2. Solve the following linear system graphically.

$$y = 5$$
$$3x + y = 3$$

3. Solve each system of equations graphically and verify your solutions.

(a) $y = x - 4$
$y = 2 - x$

(b) $x + y = 5$
$x - y = -7$

(c) $x + 2y = 2$
$x + y = 3$

(d) $x + 3y = -1$
$2x + 6y + 2 = 0$

4. Determine the point of intersection of the lines $y = -\frac{5}{2}x$ and $y = -x + 3$ by graphing.

5. Determine the number of solutions for the following linear system.

$y = 3x - 2$
$12x - 4y - 8 = 0$

6. Determine the number of solutions for the following linear system using a graph.

$3x - 2y = -6$
$y = \frac{3}{2}x - 3$

7. Determine the equation of a line in the form $y = mx + b$ that together with the equation $x + 3y = 9$ forms a linear system that has no solution.

8. Identify the equation of a line in the form $y = mx + b$ that together with the equation $2x + 2y = 12$ forms a linear system with an infinite number of solutions.

9. Determine whether each linear system has infinitely many solutions, no solution, or exactly one solution. Justify your answers:

(a) $3x + 5y = 10$
$6x + 10y = 5$

(b) $-5x + 2y = 5$
$-10x + 4y = 10$

(c) $x + 3y = 9$
$2x - y = 4$

10**.** Explain how the substitution method is used to solve a linear system of two equations.

11. Use the substitution method to solve each linear system.

(a) $x - 2y = 7$
$y = -x + 1$

(b) $x + 3y = 5$
$-2x + y = 4$

(c) $-x + 3y + 1 = 0$
$3x - y + 1 = 0$

(d) $4x - 3y = -13$
$-2x + y = 4$

12. The three lines $y = x + 1$, $y = 4 - 2x$, and $y = -x - 5$ intersect to form a triangle. Determine the coordinates of the vertices of the triangle.

13. For what values of the coefficients a and b is the ordered pair (2, −1) the solution to the linear system $ax + by = -7$ and $2ax - 3by = 1$?

14. For which of these solutions is $(2,-1)$ a solution?

(a) $x+2y=0$
$2x+4y=0$

(b) $3x-y=7$
$x+4y=-3$

(c) $2x-3y=7$
$x+5y=-3$

15. Sea otters are found along the shores of the North Pacific. Sea otters were almost extinct in1910, because they had been over-hunted for their fine, silky brown fur. They are now protected by an international treaty. The two main populations of sea otters are along the coasts of California and Northern BC-Alaska. If *n* represents the approximate number of sea otters in the north, and *s* represents the approximate number of sea otters in the south, the following two equations show how these numbers are related:

$$n + s = 130\,000$$
$$n = 25s$$

Solve the system of equations to find the approximate number of sea otters in each population.

16. For the following questions, assign a variable to each unknown quantity. Then translate the problem into a system of linear equations that could be used to determine each unknown. **Do not solve the system**.

(a) Three footballs and one soccer ball costs $155. Two footballs and three soccer balls costs $220. Determine the cost of one football and the cost of one soccer ball.

(b) Two shirts and one sweater costs $60. Three shirts and two sweaters costs $104. Determine the prices of one shirt and one sweater.

(c) At a sale, all CDs are one price and all tapes are another. Three CDs and two tapes cost \$72. One CD and three tapes cost \$52. What are the prices of one CD and one tape?

(d) An aerobics club has an initial fee and a monthly fee. The cost for a six-month membership of \$220 and the cost for a one-year membership is \$340. Write equations to determine the initial fee and the monthly fee.

(e) Evan invested \$2050 in the stock market. Part of the money was invested in a stock worth \$5 per share and the rest was invested in a stock worth \$8 per share. He purchased 350 shares altogether. Write equations to determine the number of shares purchased at each price.

17. Solve each of the following by using the substitution method:

(a) $\begin{aligned} y &= 12 \\ 2x - y &= 8 \end{aligned}$

(b) $\begin{aligned} -x + y &= 2 \\ x + y &= 4 \end{aligned}$

(c) $\begin{aligned} -4x + y &= 3 \\ 2x + 3y &= -5 \end{aligned}$

(d) $x + y = 3$
$3x + 4y = 8$

(e) $x + y = -5$
$-4x + 2y = 2$

18. The highest point in British Columbia, f metres above sea level is on Fairweather Mountain. The highest point in Manitoba, b metres above sea level is on Baldy Mountain. The heights are related by the following system of equations:

$$f - b = 3831$$
$$f = 6b - 329$$

Solve the system of equations by substitution to find the height of each mountain.

19. A chocolate manufacturer has found by consumer research the most popular mix of hard and soft-centered chocolates. The best profit is given by the equations:

$$3s-2h=41$$
$$2s+h=53$$

where s is the number of soft-centered chocolates and h is the number of hard-centered chocolates. Solve the system of equations by using substitution to find the number of each kind of chocolate.

20. Solve each of the following by using the elimination method:

(a) $x+3y=7$
$x+2y=5$

(b) $2x-y=-5$
$5x+y=-2$

(c) $4x+2y=6$
$4x-3y=1$

(d) $2x+y=7$
$4x-3y=9$

(e) $x+3y=2$
$3x-2y=-6$

21. At the cafeteria, three hamburgers and three Cokes cost \$9.00. Two hamburgers and one Coke cost \$4.75. Use the elimination method to determine the cost of one hamburger and the cost of one Coke.

22. The receipts from 550 people attending a play were \$9184. The tickets cost \$20 for adults and \$12 for students. Use the elimination method to find the number of adults and student tickets sold.

23. Solve the following system of equations by elimination and explain the result.

$$\begin{aligned} 3x+2y&=7 \\ 12x+8y&=16 \end{aligned}$$

24. An aircraft travels 5432 km from Montreal to Paris in 7 hours and returns in 8 hours. The wind speed is constant. Determine the wind speed and the speed of the aircraft in still air.

25. A plane flew 9000 km from Seoul, South Korea to London, England with the wind in 10 hours. The return flight against the wind took 11.25 hours. Find the wind speed and the speed of the plane in still air.

26. Sir John A. Macdonald and William Lyon Mackenzie King are two of the longest serving Prime Ministers of Canada. King's three periods in office totaled three more years than Macdonald's two periods. Together, Macdonald and King served for 41 years. Determine the number of years that Mackenzie King served in office.

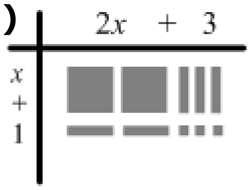
Exponents & Radicals Practice Answer Key

1. (a) 2 **(b)** 4 **(c)** 12
2. (a) 2 **(b) 3 (c)** 10
3. (a) Perfect Square **(b)** Perfect Cube
4. (a) x^{10} **(b)** $-14x^{11}y^{13}$ **(c)** $-14a^{12}b^{7}$ **(d)** $2x^{13}y^{9}$ **(e)** $a^{3}bc^{2}$
(f) $-6a^{3}b^{3}$
5. (a) $\frac{1}{9}$ **(b)** 8 **(c)** $\frac{3}{4}$ **(d)** 1
6. (a) $\frac{1}{2^4}=\frac{1}{16}$ **(b)** $3^4=81$ **(c)** $\frac{1}{(-3)^2}=\frac{1}{9}$ **(d)** -2
7. (a) $\frac{a^4}{b}$ **(b)** $\frac{x^2}{y}$ **(c)** $\frac{1}{x^3y^5}$
8. (a) $5^{\frac{7}{8}}$ **(b)** $10^{\frac{6}{25}}$ **(c)** $a^{\frac{23}{12}}$ **(d)** $\frac{1}{27}$ **(e)** $\frac{m^{\frac{1}{3}}}{n^{\frac{1}{8}}}$
9. (a) $\left(\sqrt{5}\right)^3$ *or* $\sqrt{5^3}$ **(b)** $\left(\sqrt[3]{27}\right)^4$ *or* $\sqrt[3]{27^4}$ **(c)** $\left(\sqrt[3]{-x}\right)^2$ *or* $\sqrt[3]{(-x)^2}$
(d) $\sqrt[3]{y}$ **(e)** $(9x)^{\frac{3}{2}}$ **(f)** $\left(64x^6\right)^{\frac{1}{3}}$ **(g)** $\left(y^2\right)^{\frac{1}{3}}$
10. (a) $\sqrt{18}$ **(b)** $-\sqrt{48}$ **(c)** $\sqrt{675}$ **(d)** $\sqrt{288}$ **(e)** $\sqrt[3]{24}$ **(f)** $\sqrt[3]{72}$
11. (a) $4\sqrt{2}$ **(b)** $4\sqrt{3}$ **(c)** $-9\sqrt{3}$ **(d)** $-30\sqrt{6}$ **(e)** $4\sqrt[3]{2}$
12. $4\sqrt{3},5\sqrt{2},3\sqrt{6},2\sqrt{15}$ **13.** $4\sqrt{4},3\sqrt{6},\sqrt{30},2\sqrt[3]{5}$
14. 1500 kPa **15.** 12800 days **16.** 625 squares

Polynomials Practice Answer Key

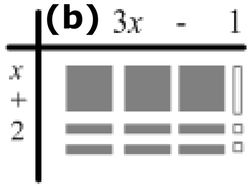
1. $360=2^3\cdot 3^2\cdot 5$ **2. (a)** 6 **(b)** 216

3. (a)



$2x^2+5x+3$

(b)



$3x^2+5x-2$

4. $(x+2)(2x)=2x^2+4x$

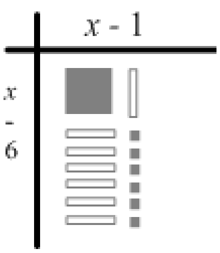
5. (a) a^2+3a+2 **(b)** n^2-5n+6 **(c)** a^2-4a+4 **(d)** $2x^2-7x+6$

6. (a) $5n^3-n^2+4n$ **(b)** $-k^3+5k^2-k$ **(c)** a^3-8
(d) $10x^4+17x^3+5x^2+16x-12$

7. (a) x^2+x-11 **(b)** $-12a^2+15ab-20b^2$

8. $x^3+6x^2+12x+8$ **9.** $58n^2$ **10.** $2x(x+3)$

11.



$(x-1)(x-6)$

12. (a) $5(y-2)$ **(b)** $x(5x^2+3x+1)$ **(c)** $3xy(17x+13y-24)$

13. (a) $(x+4)(x+10)$ **(b)** $(x+5)(x-3)$ **(c)** $2(y-2)(y-1)$
(d) $6(m+4)(m-1)$ **(e)** $(2x+1)(x+1)$ **(f)** $(3x+y)(x+2y)$
(g) $(3y+2)(2y-5)$

14. (a) $(x+9)(x-9)$ **(b)** $(2x+5y)(2x-5y)$ **(c)** not possible
(d) $(x-9)^2$ **(e)** $(x+7)^2$ **(f)** $5(x-1)^2$

15. $5(2x-3y)(3x+2y)$

16. $5x-2$ *and* $x+3$

17. $2a+10$ *and* $a-1$ *OR* $a+5$ *and* $2a-2$ **(b)** 36×12 *or* 18×24

18. $12x-8$

Relations & Functions Practice Answer Key

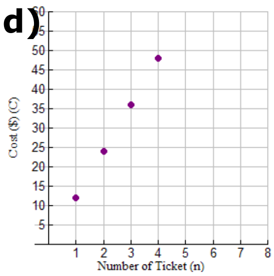
1. Answers will vary - For Example:
A cyclist biked away from the starting point at a constant rate for the first 15 min. For the next 15 min, the cyclist pedaled at an increased constant rate. The cyclist then turned around and travelled at a constant speed, returning to the starting point.

2. (a) Linear Relation – dependent values increase at a constant rate of 12 for every increase in the independent value.

(b) *n* = number of tickets (Independent variable); *C* = Cost (Dependent Variable)

(c) Data is discrete- independent values must be whole numbers greater than 0.

(d)



3. (a) This is a linear relation. With each increase of 1 in the independent variable, *x*, the dependent variable, *y,* increases by 2.

(b) This is a non-linear relation.With each increase of 1 in the independent variable, *r*, the
dependent variable, *A,* does not increase by the same amount. It increases by the square
of the increase in r^2.

(c) This is a linear relation. With each increase of 3 in the independent variable, *x*, the dependent variable, *y,* decreases by 2.

4. (a) In $C(x) = mx + b$, the fixed cost is $3, so *b* = 3. The slope is the rate per game, so *m* = 2. $C(x) = 2.5x + 3$

(b) Yes, this is a function because for every value of *x* there is only one corresponding value for *C*(*x*).

(c) *C*(4) = 2.5(4) + 3
C(4) = 10 + 3
C(4) = 13 The cost to bowl four games is $13.

5. (a) *Domain*: *x* is a member of the Real Number System
Interval: $(-\infty, \infty)$ Set: $\{x \mid x \in \mathbb{R}\}$
Range: *y* is a less than or equal to -1 and *y* is a member of the Real Number System
Interval $(-\infty, -1]$ Set: $\{y \mid y \le -1, y \in \mathbb{R}\}$

(b) *Domain:* x is greater than -2 and x a member of the Real Number System

Interval $(-2,\infty)$ Set: $\{x \mid x > -2, x \in \mathbb{R}\}$

Range: y is a less than 1 and y is a member of the Real Number System

Interval $(-\infty,1)$ Set: $\{y \mid y < 1, y \in \mathbb{R}\}$

(c) *Domain:* x is a member of the Real Number System

Interval: $(-\infty,\infty)$ Set: $\{x \mid x \in \mathbb{R}\}$

Range: y is a member of the Real Number System

Interval: $(-\infty,\infty)$ Set: $\{y \mid y \in \mathbb{R}\}$

(d) *Domain:* x is greater than or equal to -2 but is less than or equal to 4 and x is a member of the Real #'s

Interval: $[-2,4]$ Set: $\{x \mid -2 \le x \le 4, x \in \mathbb{R}\}$

Range: y is greater than or equal to -1 but is less than or equal to 5 and y a member of the Real Number System Interval: $[-1,5]$

Set: $\{y \mid -1 \le x \le 5, y \in \mathbb{R}\}$

6. (a) yes **(b)** no **(c)** yes

7. (a) yes **(b)** yes **(c)** yes **(d)** no

8. (a)15 **(b)** -9 **(c)** -5 **(d)** 3995 **9. (a)** -1 **(b)** 9

10. $c(8) = 9.6\,mg$

Linear Equations & Graphs Practice Answer Key

1. (a) $m=\frac{1}{2}$ **(b)** $m=-4$ **(c)** $m=\frac{3}{4}$ **(d)** $m=5$

2. (a) $m=1$ **(b)** $m=2$ **(c)** $m=-4$ **(d)** $m=-\frac{1}{2}$

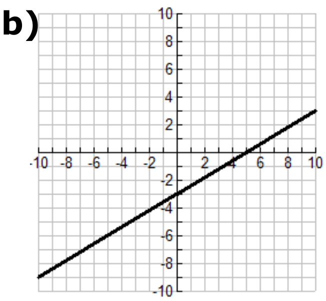
3. (a) *G*(-2,0), *H*(2, 4) **(b)** rise = 4 **(c)** run = 4 **(d)** ***m*** = 1

4. (a) *E*(-5, -2) *F*(5, -6) **(b)** rise = -4 **(c)** run = 10 **(d)** $m=-\frac{2}{5}$

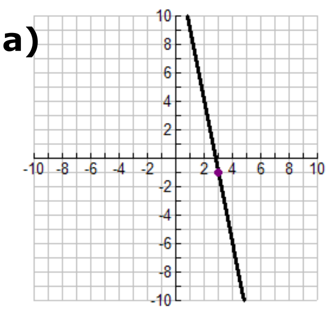
(e) *y*-int = -4 **(f)** $y=-\frac{2}{5}x-4$

5. (a) $m=\frac{7}{2}$ **(b)** $m=-\frac{5}{3}$

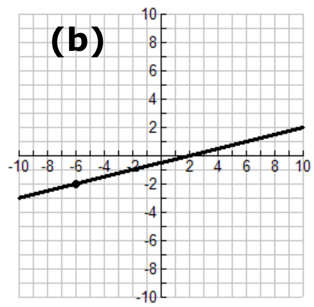
6. (a) $m=\frac{3}{5}$ **(b)**



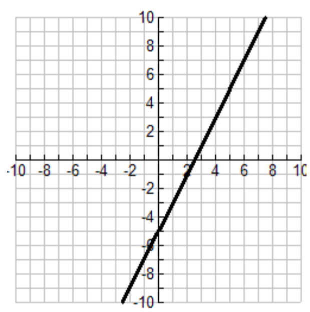
7. (a)



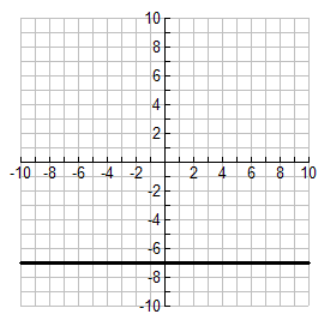
(b)



8. (a) $m=2; b=-5$

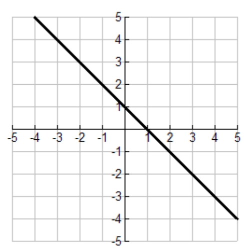


(b) $m=0; b=-7$



9. (a) $y=2x+3$ **(b)** $y=\frac{1}{2}x-2$

10. *x-int*: 1; *y-int:*1

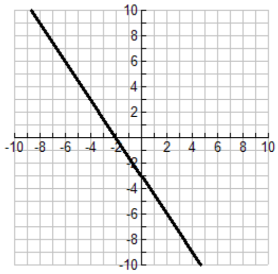


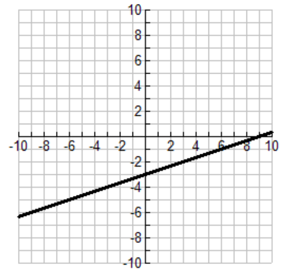
11. (a) *x-int:* 5 *y-int:* -5
(b) *x-int:* 6 *y-int:* -8
(c) *x-int:* 3 *y-int:* 1.2

12. (a) $x = 3$ **(b)** $y = 4$

13. (a) $y = -x + 5$ **(b)** $y = -x + 7$ **(c)** $y = -2x + \frac{3}{2}$

14. (a) $y = -\frac{3}{2}x - 3$ **(b)** $y = \frac{1}{3}x - 3$





15. (a) $b = -5$ **(b)** $b = -1$

16. (a) $8x - y - 3 = 0$ **(b)** $5x + 2y - 7 = 0$ **(c)** $2x - 6y + 3 = 0$

17. (a) $5x + y - 14 = 0$ **(b)** $x - 4y - 2 = 0$

18. (a) $x + 6y - 17 = 0$ **(b)** $9x + 5y - 34 = 0$

19. $y - 5 = \frac{-1}{2}(x + 2)$ or $y - 7 = -\frac{1}{2}(x + 6)$

20. (a) $A = \frac{4}{3}$ **(b)** $C = -10$

21. (a) Perpendicular **(b)** Parallel **(c)** Neither **(d)** Perpendicular

22. (a) $m = -2$ **(b)** $m = \frac{1}{3}$ **(c)** $m = 0$

23. $m = -15$ **24.** $k = -\frac{5}{2}$ **25.** $3x + 2y - 22 = 0$ **26.** Neither

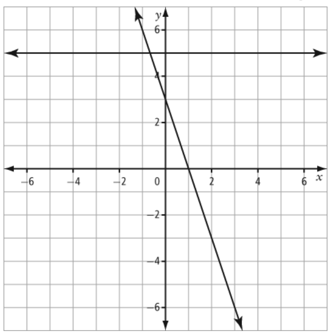
27. $3x + 2y + 13 = 0$ **28.** $5x - y + 40 = 0$

Systems of Equations Practice Answer Key

1. (a) Example: A linear system can be solved by graphing the lines and then reading the point of intersection from the graph.

(b) Example: To check the solution to a linear system, substitute the coordinates of the point of intersection into the original equations. The solution is correct if the value of the left side of the equation is equal to the value of the right side for both equations.

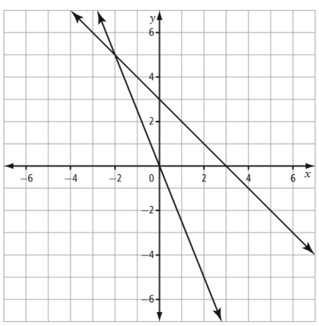
2.



Solution: $\left(-\frac{2}{3}, 5\right)$

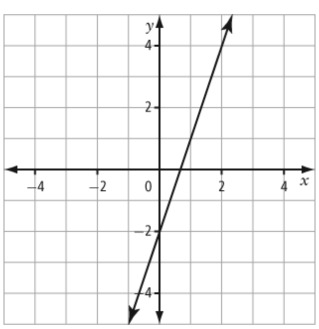
3. (a) $(3, -1)$ (b) $(-1, 6)$ (c) $(4, -1)$ (d) infinite solutions

4.

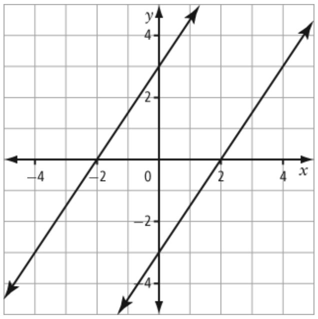


Point of intersection: (−2, 5)

5.



Because both equations have the same graph, there are an infinite number of solutions.

6. 

Because the lines are parallel, the linear system has no solution.

7. A parallel line is needed, so the other equation must be $y = -\frac{x}{3} + b$ where *b* can be any value except 3.

8. An equivalent equation of the same line is needed. Example: *y* = 6 − *x*

9. **(a)** no solutions **(b)** infinite solutions **(c)** one solution

10. Example: To solve a linear system by substitution, solve the first equation for one variable, and then substitute that expression into the second equation and solve for the second variable. Substitute the value of the second variable into one of the equations and solve for the value of the first variable.

11. **(a)** (3, −2) **(b)** (−1, 2) **(c)** $\left(-\frac{1}{2}, -\frac{1}{2}\right)$

(d) $\left(\frac{1}{2}, 5\right)$

12. (1, 2) & (−3, −2) & (9, −14)

13. *a* = −2 and *b* = 3.

14. **(a)** yes **(b)** no **(c)** yes

15. south sea otters = 5000; north sea otters = 125 000

16 **(a)** $\begin{aligned}3f+s&=155\\2f+3s&=220\end{aligned}$ **(b)** $\begin{aligned}2x+y&=60\\3x+2y&=104\end{aligned}$ **(c)** $\begin{aligned}3c+2t&=72\\c+3t&=52\end{aligned}$

(d) $\begin{aligned}i+6m&=220\\i+12m&=340\end{aligned}$ **(e)** $\begin{aligned}x+y&=350\\5x+8y&=2050\end{aligned}$

17. **(a)** $(10,12)$ **(b)** $(1,3)$ **(c)** $(-1,-1)$ **(d)** $(4,-1)$

(e) $(-2,-3)$

18. $\begin{aligned}f&=4663m\\b&=832m\end{aligned}$ **19.** $\begin{aligned}s&=21\\h&=11\end{aligned}$

20. **(a)** $(1,2)$ **(b)** $(-1,3)$ **(c)** $(1,1)$ **(d)** $(3,1)$

(e) $\left(-\frac{14}{11},\frac{12}{11}\right)$

21. hamburger = \$1.75; Coke = \$1.25
22. 323 adults; 227 students
23. $0 = 12$ This is not possible, therefore there are no solutions
24. wind speed = $48.5\,km/h$; speed of aircraft in still air = $727.5\,km/h$
25. wind speed = $50\,km/h$; speed of aircraft in still air = $850\,km/h$
26. Macdonald = 19 years; King = 22 years