MATH 100   PRACTICE FINAL   DECEMBER 5, 2019

1. Consider the expression $\frac{6a-3b-ab+2a^2}{2a-b} - 3$.

   Evaluate this expression if a = 5 and b = 1. *Simplify* your answer.

2. The number of grams of carbohydrates ingested is proportional to the number of crackers eaten. If 3 crackers cause 36 grams of carbohydrates to be ingested, how many grams of carbohydrates are ingested if 8 crackers are eaten? What are the units of k, the constant of proportionality?

3. Rationalize the denominator of the expression $\frac{1+2\sqrt{3}}{3-4\sqrt{3}}$ and simplify your result.

4. You plan to drive 300 miles at 55 miles per hour, stopping for a two-hour rest. You want to know t, the number of hours the journey is going to take. Which of the following equations would you use?

   A. $55t = 190$
   B. $55 + 2t = 300$
   C. $55(t + 2) = 300$
   D. $55(t - 2) = 300$

5. The *development time* of an insect is how long it takes the insect to develop from egg to adult. Typically, development time goes down as the ambient temperature rises. The table below gives the values of T = g(H), the development time in days at an ambient temperature H °C for the bluebottle blowfly.

H	10	11	12	13	14	15	16	17	18	19	20
T	68	58	50	43	37	32	29	26	24	22	21

   (a) Evaluate g(14).

   (b) Estimate the solution to g(H) = 23.

   (c) What do you notice about the pattern of the numbers in the table?

6. If m is the number of males and f is the number of females in a population, which of the following expresses the fact that 47% of the population is male and 53% of the population is female?

(a) $P = 0.47m + 0.53f$
(b) $P = 0.53m + 0.47f$
(c) $m = 0.47P$ and $f = 0.53P$
(d) $P = 0.47m$ and $P = 0.53f$

7. Albertine has p pennies, n nickels, d dimes, and q quarters.

  (a) Write an expression for the total number of coins.

  (b) Write an expression for the dollar value of these coins.

  (c) Write an expression for the total number of coins if you change your quarters into

    nickels and your dimes into pennies.

8. Determine the points of intersection of the line $y = 3x + 2$ and the parabola $y = 4x^2 - 9x + 1$. How many points of intersection are there?

9. Solve the system of equations
    $3x - 8y = -33$
    $5x + 9y = 79$

10. A passenger's tram ride to go up Pike's Peak begins at an elevation of 900 meters. One minute after

  (a) Find a linear function for the passenger's elevation, h, in meters, t minutes after starting the ride.

  (b) Give the units of t and h.

      Units of t are: _____

      Units of h are: _____

  (c) What is the practical interpretation of the vertical intercept?

  (d) What is the practical interpretation of the slope?

11. Write the following in slope-intercept form.

    $4(x - y - 1) - 5(x + y + 1) = 5 + 8y - 3x$

12. When the carnival comes to town, a group of students wants to attend. The cost of admission and going on 4 rides is $21.50, while the cost of admission and going on 6 rides is $ 37.
  (a) How much does it cost to go on only one ride?
      What if any assumptions have you made?
  (b) Write a linear function to represent the cost C(n) of entering the carnival and going on n rides.
  (c) Express this function in slope-intercept form.

13. For each of the following parabolas, find the vertex.

(i) $y = 3(x-7)^2 - 8$

(ii) $y = -9(x-11)^2 + 9 = 0$

(iii) $y = 4x + 6x^2 - 14$

(iv) $y = (x-1)(x-3) + x(x-1)$

14. Solve for x in the following equation:

$$179 - 18(x-10) = 158 - 3(x-17)$$

15. The perimeter of a triangular garden is 99 meters. Find the length of each of the three sides if one side is 8 meters greater than *twice* the length of the smallest side, and the third side is 5 meters less than *three* times the length of the smallest side. (Set up the equation using one-variable; do not solve unless you are using more than one variable.)

16. Simplify fully by removing brackets. *Show every step!* Circle your final answer.
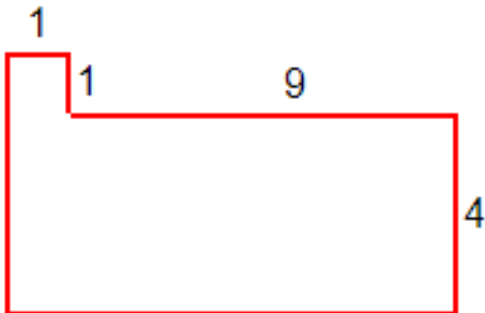
$$8(b-c) - [-\{a-b-3(c-b+a)\}]$$

17. If Albertine was x years old y years ago, *how old* will Albertine be z years from today?

(Express your answer in terms of the constants x, y, and z.)

18. Consider the following geometric figure. Assume that units are in cm.

(a) Find the perimeter (use appropriate units).

(b) Find the area (use appropriate units).

19. If avocados sell for x dollars per dozen and grapefruits sell for y dollars per half-dozen, how much (in dollars) will it cost to buy 3 avocados and 5 grapefruits?

20. Jack and Jill went shopping to purchase a tent. Patagonia had a sale in which the price of every tent is reduced by 27%. They selected a tent and paid $234.56. Find the *original* cost of the tent.

21. One number exceeds another by 48, and their sum is 4086; find the smaller number. (You need not solve unless you are using more than one variable.) Guessing will receive little or no credit.

22. Find four consecutive *even* numbers whose sum is 8108. Guessing will earn minimal credit.

Introduce your variable; you need not solve unless you choose to use more than 1 variable.

23. The town of LostVille is experiencing a catastrophic event due to the degradation of air quality and drinking water. Now there are 1234 residents of LostVille. Next year the town will lose 34% of its population. The following year the town will lose 33% of those left. During the third year, the town will lose 19% of its inhabitants. Find the population of LostVille after 3 years have passed.

24. The points (1, -2), (3, t), and (7, 22) lie on a straight line. Find the value of t.

25. Find the *domain* of each of the following functions. Show your work! You need not use interval notation.

(a) $f(x) = \dfrac{x^2 + 4}{x - 1}$

(b) $g(x) = 3\sqrt{x - 9} + 5\sqrt{13 - x}$

(c) $h(x) = \dfrac{x^3 - 1}{(x+7)(x-9)(2x+5)}$

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27. Evaluate each of the following.

(a) $\left(\dfrac{121}{49}\right)^{-\frac{1}{2}}$ (b) $\left(\dfrac{25}{16}\right)^{-\frac{3}{2}}$

28. Express with non-negative exponents.

$$\left(\frac{15xy^3}{5x^2y^4}\right)^{-2}$$

29. Odette has $500 to spend on papayas and pumpkins for a Halloween party. Each organically grown papaya costs $4, and each pumpkin costs $9. The number of pumpkins, *y*, is a function of the number of papayas she decides to buy, *x*.

(a)   Find an equation relating *x* and *y*.

(b)   Interpret the practical meaning of the *x* and *y*-intercepts in the context of the   party.

Answers: The x-intercept represents _____

The y- intercept represents _____

30.   Express using *only positive* exponents. Simplify fully.

$$\frac{a^{-9}c^8b^3c^{-7}}{a^{-1}b^{-5}c^7a^{-2}c^5b^{-1}}$$

31. Which of the following lines is *perpendicular* to the line: $x + 2y = 9$?

Circle your choice.   Explain!

(a) $x - 2y = 2001$

(b) $x + 2y = 1234$

(c) $9x - 2y = 1492$

(d) $x - y = 1789$

(e) $2x - y = 2017$

32.   In 2016, the population of Betaville was 8,697 and declining by 43 people *each year.* Find a formula, *P*, for the town's population, in terms of *t*, the *number of years since 2016.*