

- Prove that the repeating decimal $0.\overline{719} = 0.719191919\dots$ represents a rational number by re-writing it as a quotient of two integers. You do not have to reduce the fraction.
- Compute the sum $158 + 163 + 168 + \dots + 398$
- Perform the given operations.
 - $(3\sqrt{2} - 1)(5\sqrt{2} + 7)$
 - $(\sqrt{5} - 2)^3$
 - $(\sqrt{5} - 2)^7(\sqrt{5} + 2)^7$
 - $(\sqrt{3} + 1)^2 - (\sqrt{3} - 1)^2$
 - $\sqrt{50} - \sqrt{8} + \sqrt{18}$
 - $(\sqrt{x} - 2)^2$
 - $(\sqrt{x - 2})^2$
 - $\sqrt[6]{x^3}$
- Compute the exact value of $-2x^2 + 3x - 8$ if $x = -\sqrt{3} + 1$
- Rationalize the denominator in each of the expressions. Simplify your answer.
 - $\frac{3}{\sqrt{5}}$
 - $\frac{12}{\sqrt{7} - 3}$
 - $\frac{12\sqrt{3}}{\sqrt{7} - \sqrt{3}}$
 - $\frac{x}{\sqrt{x} - 1}$
 - $\frac{2}{\sqrt{5} - 1}$
- Perform the given operations on the complex numbers as indicated.
 - $i(2 - i)$
 - $(3 - i)(2 + i)$
 - $|3 - 2i|$
 - $(3 + 4i)^2$
 - $(1 - i)^8$
 - i^{99}
 - $\frac{17 + i}{1 + 3i}$
 - $\frac{1 - 3i}{1 - i}$
 - $(3 - \sqrt{5}i)^2(3 + \sqrt{5}i)^2$
- Expand each of the following.
 - $(3n + m)(-2a + 5b)$
 - $(3x + 1)(-2x + 5)$
 - $(3\sqrt{2} + 1)(-2\sqrt{2} + 5)$
 - $(3\sqrt{2} + \sqrt{3})(-2\sqrt{2} + 5\sqrt{3})$
 - $(3 + i)(-2 + 5i)$
- Expand each of the following.
 - $(a + b)(a^2 - ab + b^2)$
 - $(a - b)(a^2 + ab + b^2)$
 - $(x^2 + x\sqrt{2} + 1)(x^2 - x\sqrt{2} + 1)$
- Simplify each of the following. Show all steps.
 - $\frac{-5^2 - 60 \div (-4) \cdot 3}{|-21 \div (-7)| - (-1)^6}$
 - $\frac{\frac{1}{5} + \left(-\frac{1}{2}\right)^2 \cdot \left(3\frac{2}{5}\right)}{\frac{1}{5} + \frac{1}{2}} - 2^{-1}$
 - $\frac{x^3 - x}{x + 1}$
 - $\frac{\sqrt{8} - \sqrt{5}}{\sqrt{8} + \sqrt{5}}$
 - $\frac{2a - \frac{1}{8a}}{4 + \frac{1}{a}}$
 - $\left(\frac{-x^3y^0x^{-5}}{y^{-3}}\right)^{-2}$
 - $\frac{(-x^3y^{-2})^4yx^{-1}(-2xy^{-3}x^{-2})^{-1}}{x^{-3}y^0(-3x^{-5}y^2)^{-2}y^{-3}}$
 - $\frac{a^{2/3}(b^{-4/3})^2}{(ab^2)^{-1/3}}$
 - $(\sqrt{5x} - 2)(\sqrt{5x} + 3)$
 - $2^{-1} - (3 - 2^{-1})^{-1}$
 - $\frac{14 - 13i}{2 + i}$
 - $(-8)^{-2/3}$
 - $-27^{-2/3}$
- Simplify each of the following.
 - $\frac{x^2 - 10x + 25}{x^2 - 5x + 4} \left(\frac{x^2 - 2x - 8}{x^2 - 6x + 5} \div \frac{x - 5}{x - 1} \right)$
 - $\frac{x - 5}{x + 2} - \frac{3}{2 - x} - \frac{14 - x}{x^2 - 4}$
- Completely factor each of the following expressions over the real numbers.
 - $3a^4x - 48x$
 - $21x^2 - 18ax^2 - 3a^2x^2$
 - $15ax - 5ay - 3bx + by$
- Solve the equation $9x^2 - 6x = 1$.
 - Check your solution using exact values.

13. Solve each of the following equations. Make sure to check your solution(s).

a) $\frac{3x+17}{2} = x-1 + \frac{x+19}{2}$

d) $\frac{2}{3}(x-7) = \frac{4}{5}(x+1)$

h) $\left|\frac{1}{2}x-2\right| = |x+1|$

b) $|3-2x|+2=5$

e) $x^5 = x^4$

i) $\sqrt{2x-1}+4=1$

c) $2x^2+x^3=2x$

g) $|x-5|=3-x$

j) $\sqrt{5x-4}-3=8$

k) $4-(2x-5)(x+1)=18-2x^2$

n) $7x^2+(x+3)(2x-1)=(3x+1)^2$

l) $\sqrt{3x+19}-\sqrt{x+10}=1$

m) $\frac{x}{x-8} + \frac{7}{x-4} = \frac{2x+16}{x^2-12x+32}$

o) $3x^2-30x+69=0$

14. Solve each of the following system of linear equations.

a) $\begin{cases} 2x-y=11 \\ 3x+2y=6 \end{cases}$

b) $\begin{cases} x-y=-3 \\ (y-1)^2+2x=y^2 \end{cases}$

c) $\begin{cases} \frac{1}{2}x - \frac{1}{5}y = -5 \\ \frac{1}{3}x + \frac{1}{2}y = 3 \end{cases}$

15. Solve each of the following the inequalities.

a) $\frac{1-3x}{4} - \frac{2x+1}{3} \geq x-17$

b) $-2(3x-1)-(x-3) < 12$

c) $(x-2)^2 > x^2$

16. Solve each of the following compound inequalities.

a) $\frac{3-x}{-2} < 5$ or $2(x-1) \leq 3(x+2)$

b) $\frac{3-x}{-2} < 5$ and $2(x-1) \leq 3(x+2)$

17. Suppose that $f(x)$ is a function given by $f(x) = x^2 - 2x + 7$. Find the value of

a) $f(0)$

b) $f(5)$

c) $f(-5)$

d) $f(2-3)$

e) $f(2) - f(3)$

f) $(f(1))^2$

18. a) Compute the perimeter and area of the parallelogram determined by the points $A(-5, -3)$, $B(2, -3)$, $C(-2, 1)$ and $C(5, 1)$.

19. Write an equation of the line if it

a) passes through the points $A(-1, 5)$ and $B(3, -3)$.

b) passes through $P(-6, 1)$ and is perpendicular to the line $2x - 3y = 7$.

20. Compute the exact value of the distance between the points $A(3, 8)$ and $B(6, -1)$.

21. Find the greatest value of the expression $-2x^2 + 20x - 54$.

22. Graph the parabola $y = -x^2 + 6x - 5$. Clearly state the coordinates of five points on the parabola, including vertex and intercepts.

23. Express a 20% increase and a 12% decrease as a single change. (Hint: it is NOT 8% increase).

24. After a 20% increase, the budget was \$268 800. What was the budget before the increase?

25. The hypotenuse of a right triangle is 74 ft. The difference between the other two sides is 46 ft. Find the sides of the triangle.

26. There is an animal farm where chickens and cows live. All together, there are 53 heads and 174 legs. How many chickens, how many cows?

27. The area of a rectangle is 1260 m^2 . Find the dimensions of the rectangle if we know that one side is 48 m longer than three times the other side.
28. How many gallons of a 9% acid solution must be mixed with 15 gallons of a 30% acid solution to obtain an acid solution that is 24%?
29. Johanna can paint the room in 6 hours. Susan can paint the room in 4 hours. How long would it take for the two of them to paint the room?
30. A boat's crew rowed 72 kilometers downstream, with the current, in 6 hours. The return trip upstream, against the current, covered the same distance, and it took 9 hours. Find the crew's rowing rate in still water.
31. We invested \$10000 into two bank accounts. One account earns 14% per year, the other account earns 8% per year. How much did we invest into each account if the combined interest from the two accounts is \$1238 after the first year?
32. We traveled for 4 hours. Then we increased our velocity by 4 miles per hour and traveled an additional 5 hours. What was our original velocity if all together we have traveled 290 miles?
33. Ann started to walk southbound in the morning, with a rate of $120 \frac{\text{ft}}{\text{min}}$ (feet per minute). Ten minutes later, Betty followed her with a rate of $150 \frac{\text{ft}}{\text{min}}$. How long will it take for Betty to catch up with Ann?
34. A 6.4 ft tall person is standing 20 ft away from a street light that is 25 ft tall. How long is his shadow?

Answers

1. $\frac{712}{990}$
2. 13622
3. a) $16\sqrt{2} + 23$ b) $17\sqrt{5} - 38$ c) 1 d) $4\sqrt{3}$ e) $6\sqrt{2}$ f) $x - 4\sqrt{x} + 4$ g) $x - 2$ h) \sqrt{x}
4. $-13 + \sqrt{3}$
5. a) $\frac{3\sqrt{5}}{5}$ b) $-6\sqrt{7} - 18$ c) $3\sqrt{21} + 9$ d) $\frac{x(\sqrt{x} + 1)}{x - 1}$ e) $\frac{\sqrt{5} + 1}{2}$
6. a) $1 + 2i$ b) $7 + i$ c) $\sqrt{13}$ d) $-7 + 24i$ e) 16 f) $-i$ g) $2 - 5i$ h) $2 - i$ i) 196
7. a) $-6an + 15bn - 2am + 5bm$ b) $-6x^2 + 13x + 5$ c) $13\sqrt{2} - 7$ d) $3 + 13\sqrt{6}$ e) $-11 + 13i$
8. a) $a^3 + b^3$ b) $a^3 - b^3$ c) $x^4 + 1$
9. a) 10 b) 1 c) $x^2 - x$ d) $\frac{13 - 4\sqrt{10}}{3}$ e) $\frac{4a - 1}{8}$ f) $\frac{x^4}{y^6}$ g) $-\frac{9}{2}x^5y^3$ h) ab^2
- i) $5x + \sqrt{5x} - 6$ j) $\frac{1}{10}$ k) $3 - 8i$ l) undefined m) $-\frac{1}{9}$
10. a) $\frac{x + 2}{x - 1}$ b) $\frac{x - 1}{x + 2}$
11. a) $3x(a^2 + 4)(a + 2)(a - 2)$ b) $-3x^2(a + 7)(a - 1)$ c) $(3x - y)(5a - b)$

12. a) $\frac{1-\sqrt{2}}{3}$ and $\frac{1+\sqrt{2}}{3}$ b) If $x = \frac{1-\sqrt{2}}{3}$, then

$$\begin{aligned} \text{LHS} &= 9\left(\frac{1-\sqrt{2}}{3}\right)^2 - 6\left(\frac{1-\sqrt{2}}{3}\right) = 9 \cdot \frac{3-2\sqrt{2}}{9} - 6 \cdot \frac{1-\sqrt{2}}{3} \\ &= 3 - 2\sqrt{2} - 2(1-\sqrt{2}) = 3 - 2\sqrt{2} - 2 + 2\sqrt{2} = 1 = \text{RHS} \end{aligned}$$

and if $x = \frac{1+\sqrt{2}}{3}$, then

$$\begin{aligned} \text{LHS} &= 9\left(\frac{1+\sqrt{2}}{3}\right)^2 - 6\left(\frac{1+\sqrt{2}}{3}\right) = 9 \cdot \frac{3+2\sqrt{2}}{9} - 6 \cdot \frac{1+\sqrt{2}}{3} \\ &= 3 + 2\sqrt{2} - 2(1+\sqrt{2}) = 3 + 2\sqrt{2} - 2 - 2\sqrt{2} = 1 = \text{RHS} \end{aligned}$$

13. a) all real numbers b) 0, 3 c) $-1-\sqrt{3}, 0, -1+\sqrt{3}$ d) -41 e) 0, 1 f) -1, 0, 1 g) no solution
 h) $-6, \frac{2}{3}$ i) no solution j) 25 k) 3 l) -1 (-6 does not work) m) -9 (8 does not work)
 n) -4 o) $5-\sqrt{2}, 5+\sqrt{2}$

14. a) (4, -3) b) no solution c) (-6, 10)

15. a) $(-\infty, 7]$ b) $(-1, \infty)$ c) $(-\infty, 1)$

16. a) \mathbb{R} b) $[-8, 13]$

17. a) 7 b) 22 c) 42 d) 10 e) -3 f) 36

18. $P = 24$ unit $A = 28$ unit²

19. a) $y = -2x + 3$ b) $y - 1 = -\frac{3}{2}(x + 6)$ or $y = -\frac{3}{2}x - 8$

20. $3\sqrt{10}$ unit

21. -4

22.

23. 5.6% increase

24. \$224 000

25. 24 ft and 70 ft

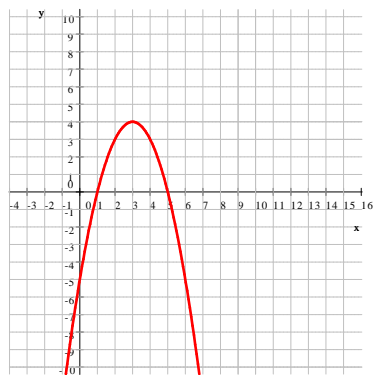
26. 19 chickens and 34 cows

27. 14 m by 90 m

28. 6 gallons

29. 2.4 hours (2 hours and 24 minutes)

30. $10 \frac{\text{km}}{\text{h}}$



31. \$7300 at 14% and \$2700 at 8% 32. $30 \frac{\text{mi}}{\text{h}}$ 33. 40 minutes 34. $\frac{640}{93} = 6.881720$