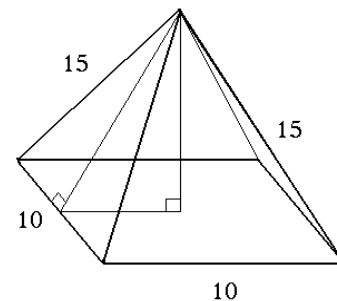


- Re-write $0.30\overline{72}$ as a fraction of integers.
- Simplify each of the following.
 - $(4\sqrt{3} - 2)^2$
 - $\sqrt{20} - 3\sqrt{180} + \sqrt{500}$
 - Rationalize the denominator in $\frac{6}{5 - \sqrt{7}}$
 - Find the exact value of $x^2 - 5x + 8$ if $x = 1 - 2\sqrt{3}$
- Simplify each of the following.
 - $\frac{2a^{-5}(2a^{-2})^{-3}(-4a^0)}{(2a^{-2})^{-3}(-4a)^2}$
 - $\frac{2^{-2} - 3^{-2}}{1 - 2^{-1}(3^{-1})}$
 - $\frac{3^{2x-3}2^{3x+1}}{6^{2x-1}}$
- Let x denote the number 2^{143} . Simplify the expression $2^{143} + 3 \cdot 2^{144} + 2^{145}$ and write it in terms of x .
- Solve each of the following equations. Make sure to check your solution.
 - $x^3 = 24x^2 + 217x$
 - $\frac{3-x}{4} - \frac{10-3x}{5} = x+2$
 - $(3x-2)(9-x) = 5x-2(x-3)^2$
 - $3(x-5) - 5(x-1) = -2x+1$
 - $18x^3 = 2x$
- Solve $3x^2 + 5x = 1$ by completing the square.
 - Check your solution(s), using exact values.
- Solve each of the following inequalities.
 - $12x - 2x^2 > 20$
 - $12x + x^2 \geq 45$
 - $\frac{1}{3}x^2 - 4x \leq -12$
 - $-x^2 + 6x > 1$
- Solve each of the following system of linear equations.
 - $\begin{cases} 3x - 5y = -12 \\ y - x = 4 \end{cases}$
 - $\begin{cases} 2x + 5y = -11 \\ 3x - y = -25 \end{cases}$
 - $\begin{cases} 2x + 3y = -1 \\ y = -\frac{2}{3}x + 2 \end{cases}$
- Completely factor each of the following.
 - $4 - 6x^2 - 2x$
 - $2x^2 - 12x + 20$
 - $a^3 - x^2 + a^3x^2 - 1$
 - $16y^4 - 1$
- Factor each of the following by completing the square.
 - $3x^2 - 4x - 319$
 - $3x^2 - 3x + 4$
 - $20x - 2x^2 - 46$
 - $-4x^2 + 3x + 7$
- Find all real numbers x with the following property: x is exactly 6 less than its own reciprocal.
- Graph each of the following equations.
 - $y = -\frac{2}{3}x + 1$
 - $y = 8x - 2x^2 - 6$
 - $2x - 3y + xy = 6$
- Suppose that x and y are real numbers with $x + 3y = 20$.
 - Find the smallest possible value of $x^2 + y^2$.
 - Find the greatest value of xy .
 - Find the smallest value of $(x - y)^2$.
 - Find the greatest value of $y^2 - x^2$.
- A citrus grower estimates that if 60 orange trees are planted, the average yield per tree will be 400 oranges. The average yield will decrease by 4 oranges per tree for each additional tree planted on the same acreage. Find the total number of trees the grower should plant to maximize yield.
- 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?

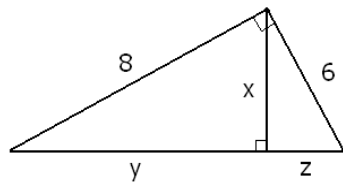
16. We invested \$10000 into two bank accounts. One account earns 14% per year, the other account earns 8% per year. How much did we invest into each account if the combined interest from the two accounts is \$1238 after the first year?
17. Sally worked 50 hours last week and made \$495 for the week. For every hour worked over 40 her job pays time and a half. What is Sally's regular hourly pay rate?
18. The cost of manufacturing q units of a product is given by $C(q) = 6q^2 + 10q$. Suppose we can sell all q units for a total of $142q + 1674$ dollars. Find the maximum profit we can achieve.
19. a) One number is four less than three times another number. Find these numbers if their sum is 64.
 b) One number is four less than three times another number. Find these numbers if their product is 160.
 c) One number is four less than three times another number. Find the smallest possible value of their product.
20. Find the distance between the points $A(-3, -5)$ and $B(3, 3)$.
21. A company finds that if they price their product at \$300, they can sell 5000 items of it. For every dollar increase in the price, the number of items sold will decrease by 5. Find the price that guarantees the maximum revenue. Find the maximum revenue.
22. Compute the exact value of the area of the triangle with sides 6, 6, and 8 units long.
23. a) Find the exact value of the area of a triangle with sides 8 m, 7 m, and 7 m long.
 b) Find the exact value of the area of a regular triangle with sides 5 meters long.
24. An arch is in the shape of a semicircle. At a point along the base 1 foot from an end of the arch, the height of the arch is 5 feet. Find the maximum height of the arch. Present exact value of the answer.

25. The picture shows a straight pyramid with a square base. The sides of the base are 10 in long. The other sides are 15 in long.

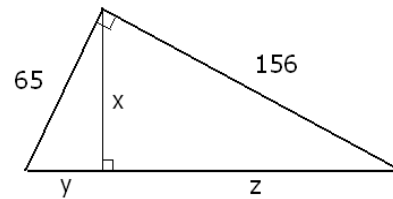


- a) Find the height of a triangular face.
 b) Use part a) to find the height of the pyramid.
26. a) List all three-digit numbers that can be formed using only the digits 2, 5, 7 and 9.
 b) List all three-digit numbers that can be formed using only the digits 2, 5, 7 and 9 and repetition of digits is not allowed. (For example, 225 is not allowed.)
27. There are 60 men and 100 women in a large conference room.
 a) How many handshakes would take place if all person shook hands with all other people in the room?
 b) How many handshakes would take place if all men shook hands with all other men in the room, and all women shook hands with all women in the room, but no man shook hands with any woman?
 c) How many handshakes would take place if all men shook hands with all woman, but no two men or two women man shook hands?
28. A 5.5 feet tall person is standing 20 feet away from a street light that is 18 feet tall. How long is her shadow?

29. Find the exact value of x , y , and z based on the pictures given.

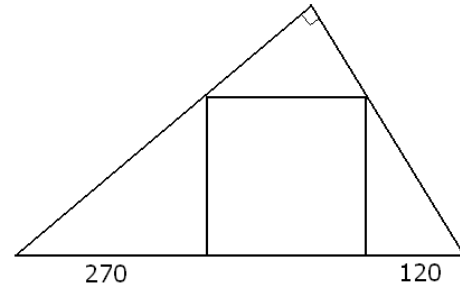


(a)



(b)

30. The picture shows a square within a right triangle. Find the length of the sides in the square.



Answers

1. $\frac{3042}{9900}$ 2. a) $52 - 16\sqrt{3}$ b) $-6\sqrt{5}$ c) $\frac{\sqrt{7} + 5}{3}$ d) $6\sqrt{3} + 16$

3. a) $-\frac{1}{2a^7}$ b) $\frac{1}{6}$ c) $\frac{4}{9} \cdot 2^x$ 4.) $11x$

5. a) $-7, 0, 31$ b) -5 c) $0, 12$ d) no solution e) $-\frac{1}{3}, 0, \frac{1}{3}$ 6. a) $\frac{-5 \pm \sqrt{37}}{6}$

b) if $x = \frac{-5 + \sqrt{37}}{6}$, then

$$\begin{aligned} \text{LHS} &= 3x^2 + 5x = 3 \left(\frac{-5 + \sqrt{37}}{6} \right)^2 + 5 \left(\frac{-5 + \sqrt{37}}{6} \right) = 3 \cdot \frac{25 + 37 - 10\sqrt{37}}{36} + 5 \cdot \frac{-5 + \sqrt{37}}{6} \\ &= \frac{62 - 10\sqrt{37}}{12} + \frac{-25 + 5\sqrt{37}}{6} = \frac{31 - 5\sqrt{37}}{6} + \frac{-25 + 5\sqrt{37}}{6} = \frac{31 - 5\sqrt{37} + 25 + 5\sqrt{37}}{6} = \frac{6}{6} = 1 = \text{RHS} \end{aligned}$$

7. a) no solution b) $x \leq -15$ or $x \geq 3$ c) $x = 6$ d) $3 - 2\sqrt{2} < x < 3 + 2\sqrt{2}$

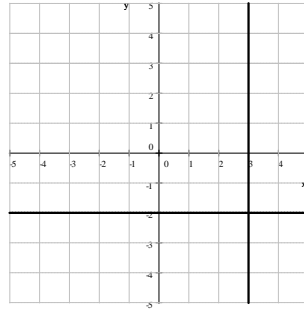
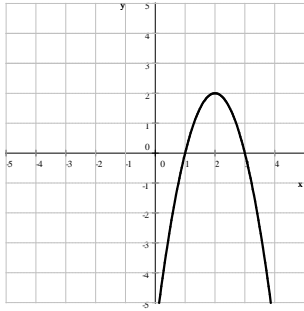
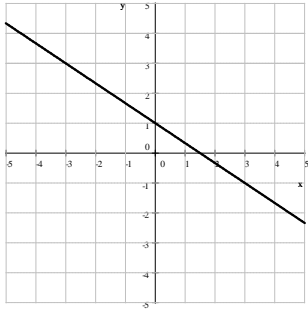
8. a) $x = -4, y = 0$ b) $x = -8, y = 1$ c) no solution

9. a) $-2(3x - 2)(x + 1)$ b) $2(x^2 - 6x + 10)$ c) $(x^2 + 1)(a - 1)(a^2 + a + 1)$ d) $(4y^2 + 1)(2y - 1)(2y + 1)$

10. a) $3 \left(x + \frac{29}{3} \right) (x - 11)$ b) can not be factored c) $-2(x - 5 + \sqrt{2})(x - 5 - \sqrt{2})$ d) $-4(x + 1) \left(x - \frac{7}{4} \right)$

11. $-3 + \sqrt{10}$ and $-3 - \sqrt{10}$

12. a) $y = -\frac{2}{3}x + 1$ b) $y = 8x - 2x^2 - 6$ c) $2x - 3y + xy = 6$



13. a) 40 when $x = 2, y = 6$ b) $\frac{100}{3}$ when $x = \frac{10}{3}, y = \frac{10}{3}$ c) 0 when $x = 5, y = 5$

d) 50 when $x = -\frac{5}{2}, y = \frac{15}{2}$ 14. if we plant 80 trees, then we will obtain a maximal yield of 25 600 oranges.

15. 19 chickens and 34 cows 16. \$7300 at 14% and \$2700 at 8% 17. \$9 18. \$2400

19. a) 17 and 47 b) 8 with 20 and $-\frac{20}{3}$ with -24 c) $-\frac{4}{3}$ 20. 10 units

21. \$2112 500 with a price of \$650 22. $8\sqrt{5}$ 23. a) $4\sqrt{33}\text{m}^2$ b) $\frac{25}{4}\sqrt{3}\text{m}^2$ 24. 13 ft

25. a) $10\sqrt{2}\text{in} \approx 14.142\,136\text{in}$ b) $5\sqrt{7}\text{in} \approx 13.228\,757\text{in}$

26. a) There are 64 numbers as listed below.

222	252	272	292	522	552	572	592	722	752	772	792	922	952	972	992
225	255	275	295	525	555	575	595	725	755	775	795	925	955	975	995
227	257	277	297	527	557	577	597	727	757	777	797	927	957	977	997
229	259	279	299	529	559	579	599	729	759	779	799	929	959	979	999

b) There are 24 such numbers. 27. a) 12 720 b) 6720 c) 6000 28. 8.8 feet

257	527	725	925
259	529	729	927
275	572	752	952
279	579	759	957
295	592	792	972
297	597	795	975

29. a) $x = \frac{24}{5}$ $y = \frac{32}{5}$ $z = \frac{18}{5}$ b) $x = 60$ $y = 25$ $z = 144$ 30. 180

References

1. Fractions and Decimals
2. Radical Expressions
3. Exponents 1, 2 and Complex Fractions
4. Exponents 1
5. Linear Equations, Factoring 1
6. Completing the Square Part 4, Radical Expressions
7. Quadratic Inequality
8. Systems of Linear Equations (substitution, elimination)
9. Factoring A, Factoring 1
10. Completing the Square 1, 2, 3, 4
11. Completing the Square 4
12. Graphing Lines, Graphing Parabolas 1, 2,
13. Optimization
14. Optimization
15. Systems of Linear Equations (substitution, elimination)
16. Systems of Linear Equations (substitution, elimination)
17. Linear Word Problems
18. Optimization
19. a) Linear Word Problems
b) Factoring 1
c) Optimization
20. Pythagorean Theorem
21. Optimization
22. Pythagorean Theorem
23. Pythagorean Theorem
24. Pythagorean Theorem
25. Pythagorean Theorem
26. Combinatorics 1
27. Combinatorics 1
28. Similar Triangles
29. Similar Triangles
30. Hint: try similar triangles!

Last revised: September 21, 2017