1. Simplify each of the following expressions.

a) $(-2)^4$

b) -2^4

c) a^3a^4

d) $\left(a^3\right)^4$

e) $\left(2a^3\right)(2a)^2$

f) $\dfrac{8a^2}{16a^3}$

g) $\dfrac{(8a)^2}{16a^3}$

h) $(-2x)^2\left(-2x^2\right)$

i) $\dfrac{-3x^4}{(-3x)^2}$

j) $2^{143}\cdot 2^{143}$

k*) $2^{143}+2^{143}$

2. Simplify each of the following expressions.

a) $(2x-5)^2$

b) $-(x-3)^2$

c) $\left(2x^3-5\right)\left(2x^3+5\right)$

d) $(3a-1)^2-(2a-7)(3a-5)$

e) $\left(3m^7-1\right)^2$

f) $(2a+3b)-(3a-5b)$

g) $(x-4)^2+(x+4)^2$

3. Convert each of the following decimal to a fraction. You do NOT have to simplify the fraction.

a) 1.27

b) $1.\overline{5}$

c) $0.14\overline{6}$

d) $0.5\overline{26}$

4. a) Expand $(2m-3)^2$

b) Expand $(-2m+3)^2$

c) Explain your results from parts a) and b)

5. Completely factor each of the following over the integers.

a) $80x-5x^5$

b) $135x-6x^2-x^3$

c) $12x^2+3x^4$

d) $45y^6-5$

e) $-2x^2+4x-20$

f) $(5t-s)^2-(3t+5s)^2$

g) x^6-10x^5

6. Factor over the real numbers by completing the square.

a) $2x^2-8x-42$

b) x^2-2x-4

c) $-x^2+4x-13$

7. Solve each of the following equations. Make sure to check your solutions.

a) $x^2=16$

b) $x^2=16x$

c) $3(x-5)-(2x+1)=4-5(x-2)$

d) $\dfrac{2}{5}(x-3)=\dfrac{5}{6}(3x-6)+8$

e) $\dfrac{2x-5}{3}-\dfrac{3x-1}{5}=x-8$

f) $(2x-1)(3x+2)(x-4)=0$

g) $x^2-(2x-1)^2=4-(3x+1)(x-5)$

8. Graph each of the following.

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

b) $2y=-12$

c) $y=-\dfrac{2}{3}x+4$

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

9. Graph the parabola $y=y=x^2+4x-5$. Clearly label the coordinates of five points on the parabola, including vertex and intercepts.

10. We throw an object upward from the top of a 1200 ft tall building. The height of the object, (measured in feet) t seconds after we threw it is

$$h(t)=-16t^2+160t+1200$$

a) Where is the object 3 seconds after we threw it?

b) How long does it take for the object to hit the ground?

11. The area of a rectangle is $1260\,\mathrm{m}^2$. Find the dimensions of the rectangle if we know that one side is $48\,\mathrm{m}$ longer than three times the other side.

12. Simplify each of the following expressions.

    a) $\left(\sqrt{3}-1\right)^2$ b) $\left(\sqrt{3}-1\right)^3$ c) $\left(\sqrt{5}+1\right)\left(\sqrt{5}-1\right)$ d) $\sqrt{50}-2\sqrt{18}+\sqrt{72}$ e) $\left(2\sqrt{7}-3\right)^2$

13. Rationalize the denominator in each of the following expressions.

    a) $\dfrac{3}{\sqrt{2}}$ b) $\dfrac{1}{\sqrt{5}-2}$ c) $\dfrac{2}{3-\sqrt{10}}$ d) $\dfrac{12}{\sqrt{7}-1}$

14. Find the exact value of $2x^2-5x+1$ if $x=1+\sqrt{2}$.

15. Compute $\left(\sqrt{7}-2\right)^2\left(\sqrt{7}+2\right)^2$

16. Solve each of the following system of equations.

    a) $\begin{cases} 2x-y=-1 \\ 5x-2y=2 \end{cases}$ b) $\begin{cases} 2x-5y=-9 \\ x-y=-3 \end{cases}$ c) $\begin{cases} 3x+5y=-20 \\ \frac{1}{3}x-\frac{1}{2}y=2 \end{cases}$

17. Solve each of the following word problems.

    a) We invested a total of \$4000 in two bank accounts. One account earns an annual interest of 3%, the other account earns an annual interest of 5%. How much was invested into each account if the combined interest from the two accounts after one year was \$183?

    b) The sum of three consecutive integers is -75. Find these numbers.

    c) Fatuma invests a total of \$27 000 in two accounts. The first account earned a rate of return of 10% (after a year). However, the second account suffered a 4% loss in the same time period. At the end of one year, the total amount of money gained was \$1370. How much was invested into each account?

    d) Children's tickets cost \$7 each and adults' tickets cost \$12 each. We purchased 60 tickets for a total of \$460. How many of each tickets did we buy?

    e) We have 120 coins in a jar, all nickels and dimes. How much of each coins do we have if the the total value of all coins is \$8.10?

18. Ann and Betsy are friends. One day Betsy tells Ann: "*If you gave me five dollars, we would end up with the same amount of money.*" Ann responds: "*Yes, but if you gave me five dollars instead, then I would have twice as much money as you.*" How much money did they have?

Answers

1. a) 16 b) -16 c) a^7 d) a^{12} e) $8a^5$ f) $\dfrac{1}{2a}$ g) $\dfrac{4}{a}$ h) $-8x^4$ i) $-\dfrac{x^2}{3}$ j) 2^{286} k) 2^{144}

2. a) $4x^2-20x+25$ b) $-x^2+6x-9$ c) $4x^6-25$ d) $3a^2+25a-34$ e) $9m^{14}-6m^7+1$
   f) $-a+8b$ g) $2x^2+32$ 3. a) $\dfrac{127}{100}$ b) $\dfrac{14}{9}$ c) $\dfrac{132}{900}$ d) $\dfrac{521}{990}$

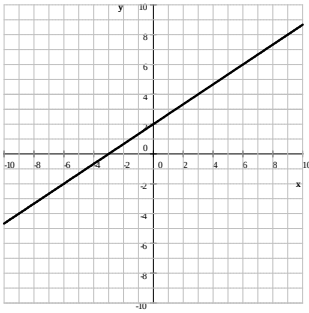
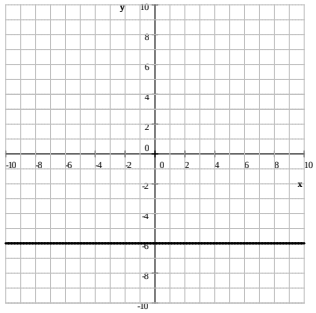
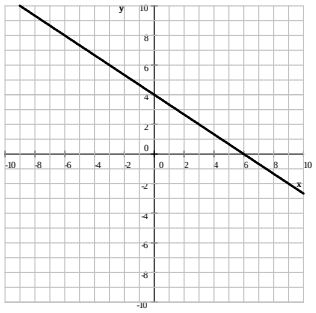
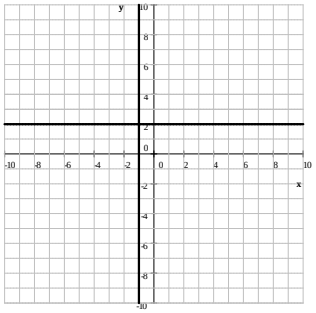
4. a) $(2m-3)^2=4m^2-12m+9$ b) $(-2m+3)^2=4m^2-12m+9$
   c) $2m-3$ and $-2m+3$ are opposites. When we square a number and its opposite, we get the same result.

5. a) $-5x\left(x^2+4\right)(x+2)(x-2)$ b) $-x(x-9)(x+15)$ c) $3x^2\left(x^2+4\right)$ d) $5\left(3y^3-1\right)\left(3y^3+1\right)$
   e) $-2\left(x^2-2x+10\right)$ f) $8(t-3s)(s+2t)$ g) $x^5(x-10)$

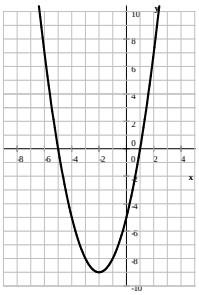
6. a) ± 4 b) $0, 16$ c) 5 d) -2 e) 7 f) $4, \dfrac{1}{2}, -\dfrac{2}{3}$ g) -1

7. a) $2(x+3)(x-7)$ b) $\left(x-1+\sqrt{5}\right)\left(x-1-\sqrt{5}\right)$ c) $-\left(x^2-4x+13\right)$

8. a) $2x-3y=-6$ b) $2y=-12$ c) $y=-\dfrac{2}{3}x+4$ d*) $(x+1)(y-2)=0$

9. Vertex: $(-2,-9)$
$y-$intercept:$(0,-5)$
$x-$intercepts: $(-5,0)$ and $(1,0)$
additional points: $(-1,-8)$, $(2,7)$



10. a) 1536 ft b) 15 11. 14 m by 90 m

12. a) $4-2\sqrt{3}$ b) $6\sqrt{3}-10$
c) 4 d) $5\sqrt{2}$ e) $37-12\sqrt{7}$

13. a) $\dfrac{3\sqrt{2}}{2}$ b) $2+\sqrt{5}$ c) $-6-2\sqrt{10}$ d) $2+2\sqrt{7}$ 14. $2-\sqrt{2}$ 15. 9

16. a) $(4,9)$ b) $(-2,1)$ c) $(0,-4)$

17. a) \$3150 at 5% and \$850 at 3% b) $-26,-25,-24$ c) \$17 500 at 10% and \$9500 at a 4% loss d) i) 8 adults and 52 children e) 78 nickels and 42 dimes

18. Ann had \$35 and Betsy had \$25

References

1. Exponents 2. Simplifying Algebraic Expressions 3. Fractions and Decimals
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8. Graphing Lines 9. Graph of a parabola 1 10. Factoring 1 11. Factoring 1
12-15 Radical Expressions 16. Systems of Linear Equations 17. Linear Word Problems and Systems of Linear Equations

Last revised: January 25, 2017