Factoring GCF

Multiple Choice: Choose the best answer

Factor each completely.

1) $-2p^3 - 6p^2$

A) $-2p(p+1)$
B) $-2p^2(p+1)$
C) $-2p^2(p+3)$
D) $-2p^2(p-3)$

2) $2x^3 - 20x^2$

A) $2x^2(x-10)$ B) $2x(x+10)$
C) $2x(x+1)$ D) $2x^2(x+1)$

3) $5r^2 + 40r$

A) Not factorable B) $r(r+8)$
C) $5r(r+8)$ D) $5r(r+1)$

4) $-3x^2 - 12x$

A) $-3x(x+4)$ B) $-3x(x-4)$
C) $x(x+4)$ D) $-3x(x+1)$

5) $3n^2 + 6n$

A) $3n(n+1)$ B) Not factorable
C) $3n(n-2)$ D) $3n(n+2)$

6) $-4v^3 - 24v^2$

A) $-4v^2(v+6)$
B) $-4v(v+1)$
C) Not factorable
D) $v^2(v+6)$

7) $6a^2 + 18a$

A) $6a(a+3)$ B) Not factorable
C) $6a(a+1)$ D) $6a(a-3)$

8) $-2x^4 - 8x^3$

A) $-3(x-8)(x-9)$
B) $-2x^3(x+4)$
C) $-2x^3(x-4)$
D) $4x^3(x+8)$

9) $-4n^2 - 12n$

A) $-4n(n+3)$
B) Not factorable
C) $-4n(n-3)$
D) $-4n(n+1)$

10) $n^4 + 3n^3$

A) $n(n+1)$ B) $n^3(n+1)$
C) $6n^3(n+7)$ D) $n^3(n+3)$

Factoring with a leading coefficient of one

Factor each completely.

1) $a^2 + 11a + 28$

2) $x^2 + 14x + 48$

3) $r^2 + r - 30$

4) $n^2 - 7n + 10$

5) $n^2 - 8n - 9$

6) $k^2 + 14k + 45$

7) $k^2 + 5k - 24$

8) $x^2 - 17x + 70$

9) $x^2 - 17x + 70$

10) $m^2 - 4m + 3$

11) $n^2 - 5n + 4$

12) $x^2 - 5x - 24$

13) $p^2 + 8p + 7$

14) $k^2 + 8k - 20$

Factoring a difference of squares

Factor each completely.

1) $9n^2 - 169$

2) $64m^2 - 49$

3) $144r^2 - 169$

4) $x^2 - 25$

5) $4n^2 - 25$

6) $49x^2 - 36$

7) $196v^2 - 9$

8) $9n^2 - 16$

9) $49a^2 - 169$

10) $169k^2 - 81$

11) $169x^2 - 25$

12) $25n^2 - 16$

13) $25x^2 - 64$

14) $121m^2 - 1$

15) $144p^2 - 49$

16) $16x^2 - 169$

Factoring a trinomial with a leading coefficient that is not one

Factor each completely.

1) $3x^2 + 28x - 20$

2) $5r^2 + 19r - 30$

3) $5p^2 + 46p + 9$

4) $11x^2 + 139x + 84$

5) $3x^2 + 25x + 28$

6) $7n^2 + 52n - 99$

7) $5x^2 + 66x + 121$

8) $5k^2 - 58k + 80$

9) $7p^2 - 89p + 60$

10) $5k^2 + 54k - 11$

11) $9x^2 + 12x - 32$

12) $9n^2 + 31n + 12$

13) $9a^2 + 100a + 100$

14) $10x^2 + 17x + 6$

15) $9x^2 + 85x - 50$

16) $6v^2 - v - 15$

17) $4a^2 - 13a + 9$

18) $10x^2 + 49x + 18$

19) $6v^2 - 5v - 25$

20) $9n^2 - 51n + 70$

21) $9m^2 - 91m + 90$

A) $(2m - 3)(3m + 2)$
B) $(9m + 5)(m + 18)$
C) $(m - 9)(9m - 10)$
D) $(m - 7)(9m - 10)$

22) $10a^2 - 53a - 42$

A) $(a - 6)(10a - 7)$
B) $(a - 6)(10a + 7)$
C) $2(a + 7)(5a - 3)$
D) $10(a - 6)(a - 7)$

23) $9p^2 - 31p + 12$

A) $(p - 3)(9p - 4)$
B) $9(p - 3)(p + 4)$
C) $(9p + 2)(p + 6)$
D) $(p + 3)(9p - 4)$

24) $9n^2 - 30n + 16$

A) $(3n - 8)(3n - 2)$
B) $(3n + 8)(3n - 2)$
C) Not factorable
D) $9(n - 8)(n + 2)$

25) $9r^2 + 42r + 40$

A) $9(r + 4)(r - 10)$
B) $(3r + 4)(3r + 10)$
C) $(3r + 5)(3r + 8)$
D) $(9r + 4)(r + 10)$

26) $9p^2 + 61p - 14$

A) Not factorable
B) $(9p + 2)(p - 7)$
C) $9(p + 7)(p + 2)$
D) $(p + 7)(9p - 2)$

27) $6p^2 + 59p - 10$

A) $(p + 10)(6p - 1)$
B) $(p + 6)(4p - 7)$
C) $(6p + 5)(p - 2)$
D) $(p + 2)(9p - 2)$

28) $4r^2 - 41r + 72$

A) $(r + 8)(4r - 9)$
B) $(r + 8)(4r + 9)$
C) $4(r + 3)(r + 6)$
D) $(r - 8)(4r - 9)$

29) $8k^2 - 29k - 12$

A) $(k - 4)(8k + 3)$
B) $4(2k - 1)(k - 3)$
C) $2(4k + 1)(k - 6)$
D) Not factorable

30) $4a^2 - 8a + 3$

A) $(a + 6)(9a + 2)$
B) $(2a - 1)(2a - 3)$
C) $(2a - 1)(2a + 3)$
D) $4(a - 1)(a + 3)$

Exponents Practice

Use your rules from the previous pages to simplify

Simplify.

1) $v^4 \cdot 2v^2$

2) $3x^3 \cdot 2x^5$

3) $6x^3 \cdot 4x^2$

4) $a \cdot 5a^4$

5) $3k^5 \cdot k$

6) $6p^6 \cdot p^5$

7) $(4x^2)^3$

8) $(4n^4)^3$

9) $(4m^3)^2$

10) $(4r)^3$

11) $(2x^3)^4$

12) $(3n^4)^4$

Simplify. Your answer should contain only positive exponents.

13) $\frac{-2b^4}{-3b^4}$

14) $-\frac{v^2}{v^4}$

15) $\frac{3x^3}{3x^4}$

16) $\frac{-3n}{-3n^2}$

17) $\frac{2a^4}{-a^3}$

18) $\frac{2k^4}{2k^3}$

19) $\left(\frac{2x^3}{x^4x^3}\right)^4$

20) $\left(\frac{x^2 \cdot 2x \cdot x}{2x}\right)^2$

21) $\left(\frac{2n^2 \cdot n^2}{n^4}\right)^4$

22) $\frac{2m^3 \cdot (2m^4)^4}{2m}$

23) $\frac{p^4 \cdot 2p^3}{(2p^2)^3}$

24) $\frac{2x^4}{x^3(2x^4)^2}$

25) $\frac{(n^3)^4}{2n^3 \cdot 2n^3}$

26) $\frac{b^4 \cdot 2b^3}{(2b)^3}$

27) $3r^{-3}$

28) $3x^{-4}$

29) $4n^{-4}$

30) $3x^{-2}$

31) $\left(\dfrac{x^{-1}y^{3}\cdot x^{4}y^{2}}{2x^{4}y^{2}}\right)^{3}$

32) $\left(\dfrac{2y^{3}\cdot 2x^{4}}{yx^{-3}}\right)^{-4}$

33) $\left(\dfrac{2u^{-3}v^{4}}{v^{3}\cdot 2v}\right)^{2}$

34) $\dfrac{y^{-1}\cdot 2x^{-3}}{\left(2x^{2}y^{-1}\right)^{4}}$

35) $\left(\dfrac{2u^{4}v^{-3}\cdot u^{3}v^{-2}}{\left(v^{-3}\right)^{-2}}\right)^{2}$

36) $\dfrac{2x^{-3}y^{3}\cdot 2y^{4}}{\left(2x^{3}y^{-2}\right)^{-1}}$

Simplify the radicals

Find the largest perfect square!

Simplify.

1) $\sqrt{864}$

2) $\sqrt{2548}$

3) $\sqrt{1573}$

4) $\sqrt{245}$

5) $\sqrt{500}$

6) $\sqrt{396}$

7) $\sqrt{16}$

8) $\sqrt{100}$

9) $\sqrt{2250}$

10) $\sqrt{1440}$

11) $\sqrt{200}$

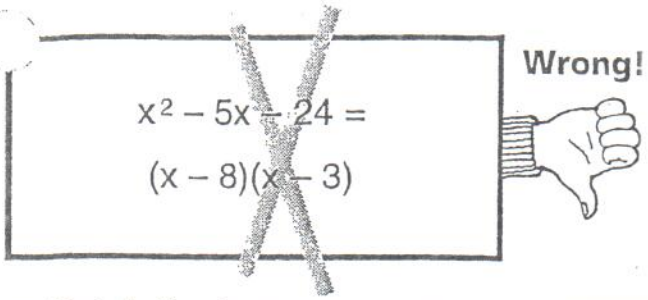
12) $\sqrt{392}$

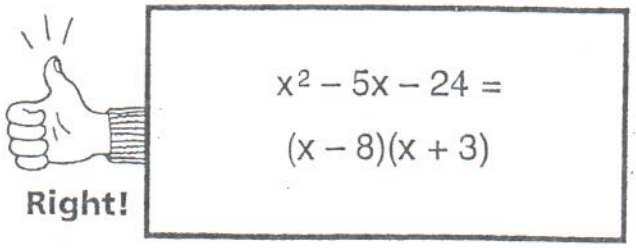
13) $\sqrt{441}$

14) $\sqrt{729}$

Name _____

Factoring $x^2 + bx + c$

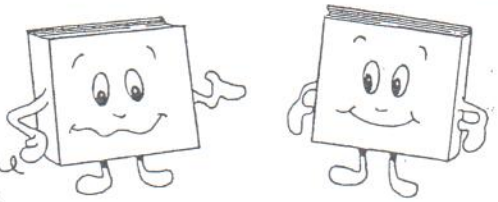




Quick Review

When the last term is positive, the signs in both factors will match the middle term of the trinomial. When the last term is negative, the factors will have opposite signs.

Factor each expression.
Use the code to answer this riddle:
What did the algebra book say to the biology book?



Multiply to the last, add to the middle

middle last

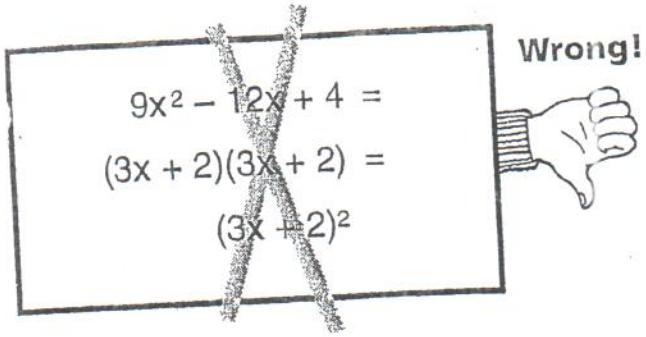
1. $x^2 - 5x + 6 =$
2. $x^2 + 13x + 42 =$
3. $x^2 - 11x + 30 =$
4. $x^2 + 10x + 21 =$
5. $x^2 + 14x + 45 =$
6. $x^2 - 12x + 32 =$
7. $x^2 - 11x + 18 =$
8. $x^2 + 8x - 48 =$
9. $x^2 - 8x - 33 =$
10. $x^2 + 11x + 10 =$
11. $x^2 - x - 56 =$
12. $x^2 + 2x - 15 =$
13. $x^2 + 15x + 54 =$
14. $x^2 - 3x - 40 =$
15. $x^2 + 2x - 63 =$

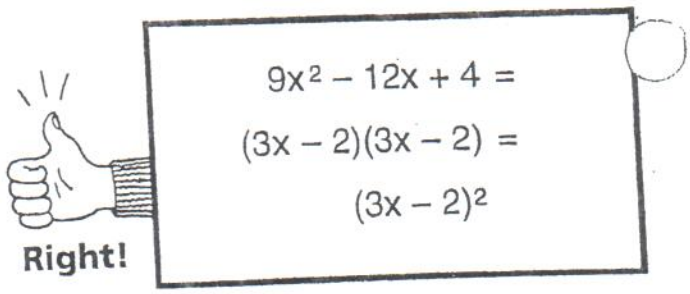
A $(x - 5)(x - 6)$
B $(x + 9)(x + 5)$
E $(x - 2)(x - 3)$
G $(x + 6)(x + 7)$
H $(x - 4)(x - 8)$
I $(x + 3)(x - 11)$
L $(x + 7)(x + 3)$
M $(x + 12)(x - 4)$
O $(x - 3)(x + 5)$
P $(x - 2)(x - 9)$
R $(x - 8)(x + 5)$
S $(x + 9)(x + 6)$
T $(x + 9)(x - 7)$
V $(x + 10)(x + 1)$
W $(x + 7)(x - 8)$

			,																				!
11	12	11		6	3	10	1		9		2	12	15		7	14	12	5	4	1	8	13	

Name _____

Factoring Trinomial Squares





Quick Review

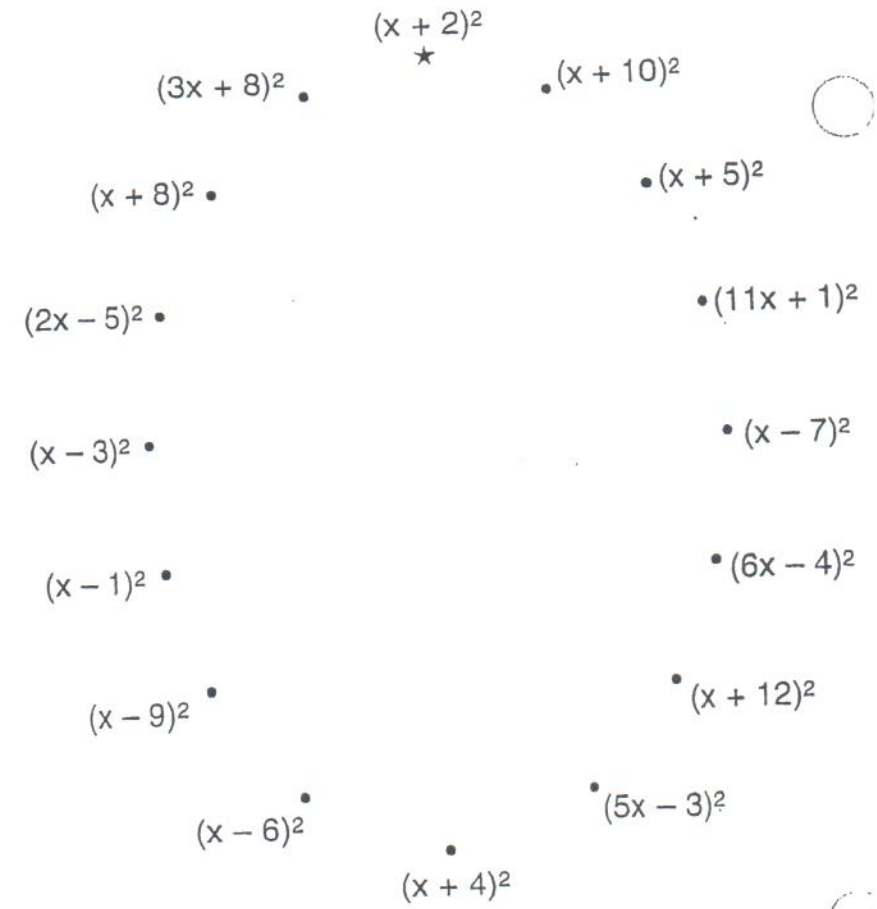
There are two forms of perfect square trinomials.

$a^2 + 2ab + b^2 = (a + b)^2$ $\quad 9x^2 + 12x + 4 = (3x)^2 + 2(3x)(2) + (2)^2 = (3x + 2)^2$

$a^2 - 2ab + b^2 = (a - b)^2$ $\quad 9x^2 - 12x + 4 = (3x)^2 - 2(3x)(2) + (2)^2 = (3x - 2)^2$

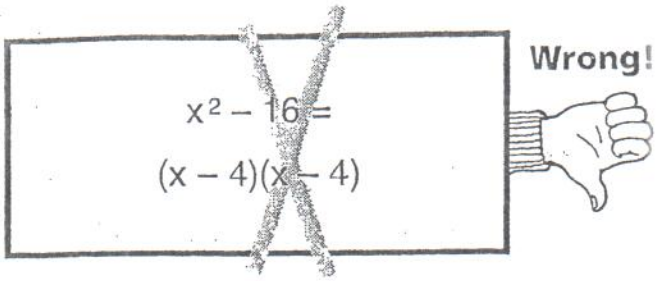
Factor each expression. Then connect your answers in the order of the problems to create a design. Begin and end at the star.

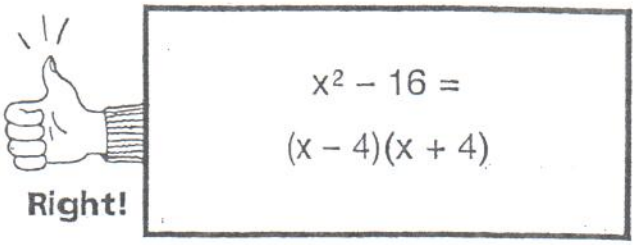
1. $x^2 + 4x + 4 =$
2. $x^2 - 12x + 36 =$
3. $x^2 + 10x + 25 =$
4. $x^2 - 2x + 1 =$
5. $x^2 - 14x + 49 =$
6. $4x^2 - 20x + 25 =$
7. $x^2 + 24x + 144 =$
8. $9x^2 + 48x + 64 =$
9. $x^2 + 8x + 16 =$
10. $x^2 + 20x + 100 =$
11. $x^2 - 18x + 81 =$
12. $121x^2 + 22x + 1 =$
13. $x^2 - 6x + 9 =$
14. $36x^2 - 48x + 16 =$
15. $x^2 + 16x + 64 =$
16. $25x^2 - 30x + 9 =$



Name _____

Factoring the Difference of Two Squares





Quick Review

If there is no middle product in the difference of two squares, the operations in the binomial factors must be opposite.

$a^2 - b^2 = (a - b)(a + b)$

Factor each expression. Then use the code to discover the name of an English mathematician and one of his areas of study. Boolean algebra was named in honor of him and relates to that study.

1.	$x^2 - 9 =$	O	$(x + 9)(x - 9)$
2.	$x^2 - 25 =$	B	$(x - 3)(x + 3)$
3.	$x^2 - 81 =$	C	$(x - 1)(x + 1)$
4.	$x^2 - 100 =$	E	$(x + 5)(x - 5)$
5.	$x^2 - 1 =$	G	$(3x - 2)(3x + 2)$
6.	$9x^2 - 4 =$	I	$(8x + 8)(8x - 8)$
7.	$4x^2 - 49 =$	L	$(x + 10)(x - 10)$
8.	$144x^2 - 16 =$	O	$(4x - 5)(4x + 5)$
9.	$64x^2 - 64 =$	E	$(2x + 7)(2x - 7)$
10.	$x^2 - 36 =$	G	$(12x - 4)(12x + 4)$
11.	$81x^2 - 121 =$	L	$(5x + 3)(5x - 3)$
12.	$16x^2 - 25 =$	O	$(x - 2)(x + 2)$
13.	$100x^2 - 1 =$	R	$(x - 6)(x + 6)$
14.	$25x^2 - 9 =$	E	$(9x + 11)(9x - 11)$
15.	$x^2 - 4 =$	G	$(6x - 12)(6x + 12)$
16.	$36x^2 - 144 =$	O	$(10x + 1)(10x - 1)$

						;										
6	2	3	10	8	11		1	12	15	4	7		14	13	16	9	5

Name _____

Factoring $ax^2 + bx + c$

$12x^2 - 2x - 4 =$

$(12x + 4)(x - 1)$

Wrong!

Right!

$12x^2 - 2x - 4 =$

$(3x - 2)(4x + 2)$

Quick Review

Use the FOIL method to test your answer and check that the middle term is correct.

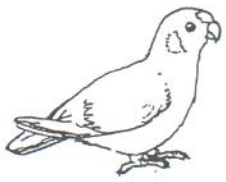
$(12x + 4)(x - 1) = 12x^2 - 12x + 4x - 4 = 12x^2 - 8x - 4$ Wrong!

$(3x - 2)(4x + 2) = 12x^2 + 6x - 8x - 4 = 12x^2 - 2x - 4$ Right!

Factor each expression. Use the code to answer this riddle: What did the distraught geometry teacher keep repeating when he found the empty parrot cage?

1. $8x^2 - 2x - 1 =$
2. $3x^2 + 10x + 8 =$
3. $5x^2 + 24x + 27 =$
4. $4x^2 - 12x + 8 =$
5. $6x^2 - 7x - 10 =$
6. $9x^2 + 37x + 4 =$
7. $7x^2 + 5x - 2 =$
8. $3x^2 - 8x - 3 =$
9. $2x^2 - 8x + 8 =$
10. $12x^2 + 8x + 1 =$
11. $8x^2 + 11x - 10 =$
12. $6x^2 + 10x + 4 =$
13. $3x^2 + 6x - 9 =$
14. $2x^2 + 27x + 81 =$

G	$(2x - 2)(2x - 4)$
G	$(2x - 1)(4x + 1)$
O	$(6x + 5)(x - 2)$
L	$(5x + 9)(x + 3)$
L	$(3x + 4)(x + 2)$
Y	$(2x - 4)(x - 2)$
Y	$(6x + 1)(2x + 1)$
N	$(9x + 1)(x + 4)$
O	$(7x - 2)(x + 1)$
N	$(8x - 5)(x + 2)$
O	$(2x + 9)(x + 9)$
P	$(3x + 1)(x - 3)$
O	$(2x + 2)(3x + 2)$
P	$(3x - 3)(x + 3)$



8	5	2	10	4	14	11	,	13	7	3	9	1	12	6	!

Factoring Trinomials: $x^2 + bx + c$

$$x^2 + 7x + 10 = (x)^2 + (2 + 5)\,x + (2)\,(5) = (x + 2)\,(x + 5)$$

Factor, write prime if prime.

1. $x^2 + 6x + 8$
2. $c^2 + 5c + 6$
3. $y^2 - 9y + 14$
4. $x^2 - 10x + 16$
5. $a^2 + 12a + 27$
6. $x^2 - 14x + 24$
7. $x^2 - 15x + 36$
8. $y^2 + 21y + 54$
9. $m^2 + 13m - 36$
10. $x^2 - 8x + 15$
11. $y^2 - 4y - 32$
12. $x^2 - x - 6$
13. $y^2 + 3y - 18$
14. $b^2 + 7b - 18$
15. $a^2 + a - 56$
16. $c^2 - 4c - 12$
17. $x^2 - 9x - 36$
18. $y^2 + 4y - 21$
19. $x^2 - 22x - 75$
20. $x^2 - 3x - 40$
21. $45 + 14y + y^2$
22. $x^2 - 13x + 36$

Factoring Trinomials: $ax^2 + bx + c$

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

Factor, write prime if prime.

1. $2x^2 - 5x - 3$
2. $3x^2 + 10x - 8$
3. $2y^2 + 15y + 7$
4. $7a^2 - 11a + 4$
5. $5n^2 + 17n + 6$
6. $4y^2 + 8y + 3$
7. $3x^2 + 4x - 7$
8. $2x^2 + 13x + 15$
9. $9y^2 + 6y - 8$
10. $6x^2 - 7x - 20$
11. $2n^2 - 3n - 14$
12. $5n^2 + 2n + 7$
13. $10x^2 + 13x - 30$
14. $12y^2 + 7y + 1$
15. $2n^2 + 9n - 5$
16. $2x^2 + 7x + 6$
17. $5a^2 - 42a - 27$
18. $15x^2 - 28x - 32$
19. $8a^2 - 10a + 3$
20. $2y^2 - 3y - 20$

ame _____

Multiplying & Dividing Monomials

uick Review

1. To **multiply** powers with the same base, multiply the coefficients and add the exponents.
   $a^m \cdot a^n = a^{m+n}$
2. To **divide** powers with the same base, divide the coefficients and subtract the exponent in the denominator from the exponent in the numerator.
   $\frac{a^m}{a^n} = a^{m-n} \quad a \neq 0$

Examples:

$2^3 \cdot 2^2 = 2^5 = 32$

$x^2 \cdot x = x^3$

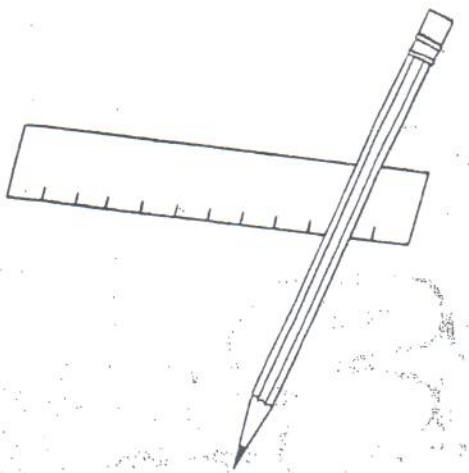
$3x^5 \cdot -5x^4 = -15x^9$

$\frac{3^7}{3^5} = 3^2 = 9 \quad \frac{x^9}{x^3} = x^6 \quad \frac{8x^6y^3}{2xy^2} = 4x^5y$

ultiply or divide to simplify each expression. Then create a design by drawing straight lines connect your answers in the order of the problems. Begin at the star.

1. $x^2 \cdot x^4 =$ _____
2. $\frac{7^5}{7^3} =$ _____
3. $y \cdot y^4 =$ _____
4. $3^3 \cdot 3 =$ _____
5. $\frac{x^{12}}{x^3} =$ _____
6. $4x^3 \cdot 2x^2 =$ _____
7. $\frac{x^7}{x^2} =$ _____
8. $3x^5 \cdot x^2 =$ _____
9. $\frac{16x^6}{8x^2} =$ _____
10. $x^2 \cdot x^5 \cdot x^3 =$ _____
11. $\frac{9x^7}{-3x^3} =$ _____
12. $-5x^5 \cdot -6x^4 =$ _____
13. $\frac{x^5y^3}{x^3y^2} =$ _____
14. $3y^2 \cdot 5y^9 =$ _____
15. $4^3 \cdot x^6 \cdot x^2 =$ _____
16. $\frac{x^4y^2}{x} =$ _____
17. $\frac{12x^2y^5}{4y^3} =$ _____
18. $x^5y^2 \cdot x^4y =$ _____
19. $\frac{6x^5y}{x^3y} =$ _____
20. $\frac{48x^3y^2z}{16yz} =$ _____

x^6 ★
y^5 •
x^9 •
x^5 •
$2x^4$ •
$-3x^4$ •
x^2y •
$64x^8$ •
$3x^2y^2$ •
$6x^2$ •



• • • • • • • • • • •

49 81 $8x^5$ $3x^7$ x^{10} $30x^9$ $15y^{11}$ x^3y^2 x^9y^3 $3x^3y$

Name _____

Powers of Monomials

Quick Review

1. To find the **power of a power**, multiply the exponents.
   $(a^m)^n = a^{m \cdot n}$

   To find the **power of a product**, find the power of each factor and multiply.
   $(a \cdot b)^m = a^m \cdot b^m$

2. To find the **power of a quotient**, find the power of the numerator and the denominator and divide.

   $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m} \quad b \neq 0$

Examples:

$(-3^3)^2 = (-3)^6 = 729$

$(x^2)^5 = x^{10}$

$(-5x)^3 = (-5)^3 \cdot x^3 = -125x^3$

$(2y^2)^4 = 2^4 \cdot (y^2)^4 = 16y^8$

$\left(\frac{3}{4}\right)^3 = \frac{3^3}{4^3} = \frac{27}{64}$

$\left(\frac{-2x^4}{x^3}\right)^2 = \frac{(-2)^2 \cdot (x^4)^2}{(x^3)^2} = \frac{4x^8}{x^6} = 4x^2$

Multiply or divide to simplify each expression.
Shade in your answers to find the formula for the area of a circle.

1. $(x^2)^4 =$ _____
2. $(2^3)^2 =$ _____
3. $(y^5)^3 =$ _____
4. $(2x)^3 =$ _____
5. $\left(\frac{2}{3}\right)^4 =$ _____
6. $(xy^2)^2 =$ _____
7. $\left(\frac{3}{x}\right)^3 =$ _____
8. $(x^2y^3)^6 =$ _____
9. $\left(\frac{x^3}{y}\right)^4 =$ _____
10. $(4x^2y)^3 =$ _____
11. $\left(\frac{x^7}{x^4}\right)^2 =$ _____
12. $(-5xy^4)^2 =$ _____
13. $\left(\frac{x^2y^3}{z}\right)^2 =$ _____
14. $(2x^2y^3)^5 =$ _____
15. $(-3xy^2)^3 =$ _____
16. $\left(\frac{6x^5}{3x}\right)^2 =$ _____
17. $(7x^4y)^2 =$ _____
18. $(3xy^6)^2 =$ _____
19. $\left(\frac{-4x^3y^2}{2y}\right)^3 =$ _____
20. $(-xy^3)^3 =$ _____
21. $\left(\frac{x^6y^2}{3xy}\right)^4 =$ _____