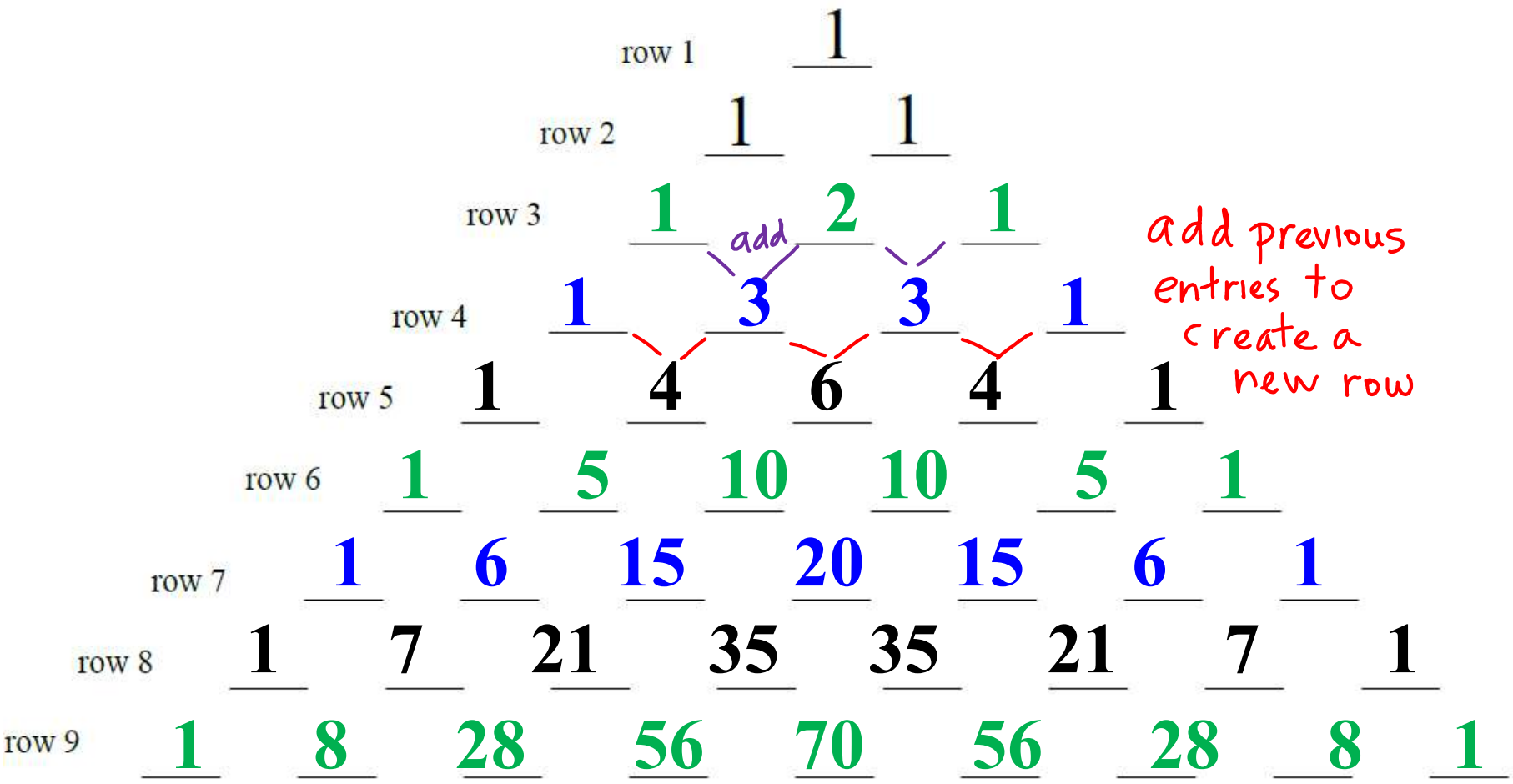
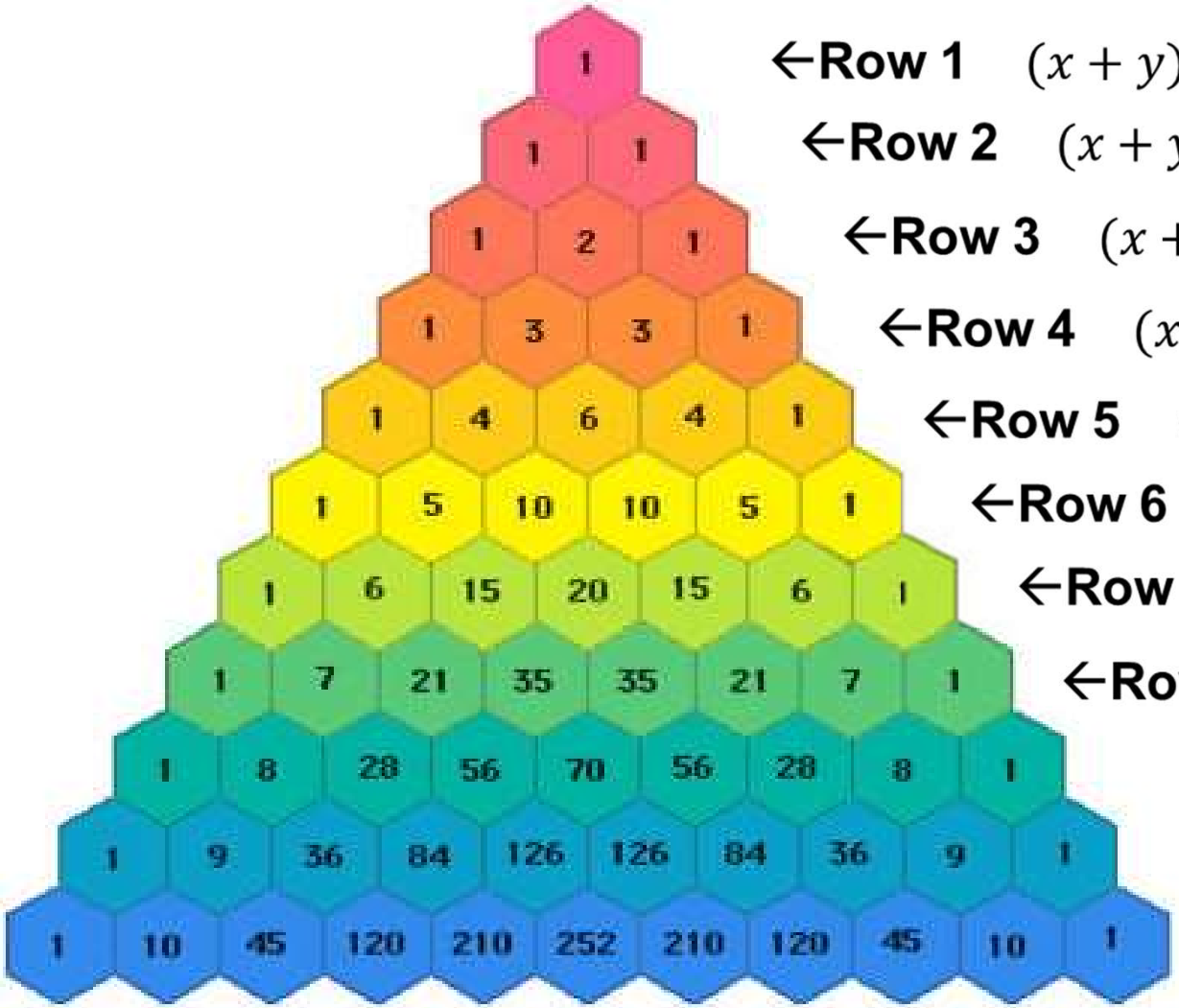
1. Write the first nine rows of Pascal's Triangle:



to find $(x+y)^n$ → use row n+1

or $(a+b)^n$ any two terms!



←Row 1 $(x+y)^0$

←Row 2 $(x+y)^1$

←Row 3 $(x+y)^2$

←Row 4 $(x+y)^3$

←Row 5 $(x+y)^4$

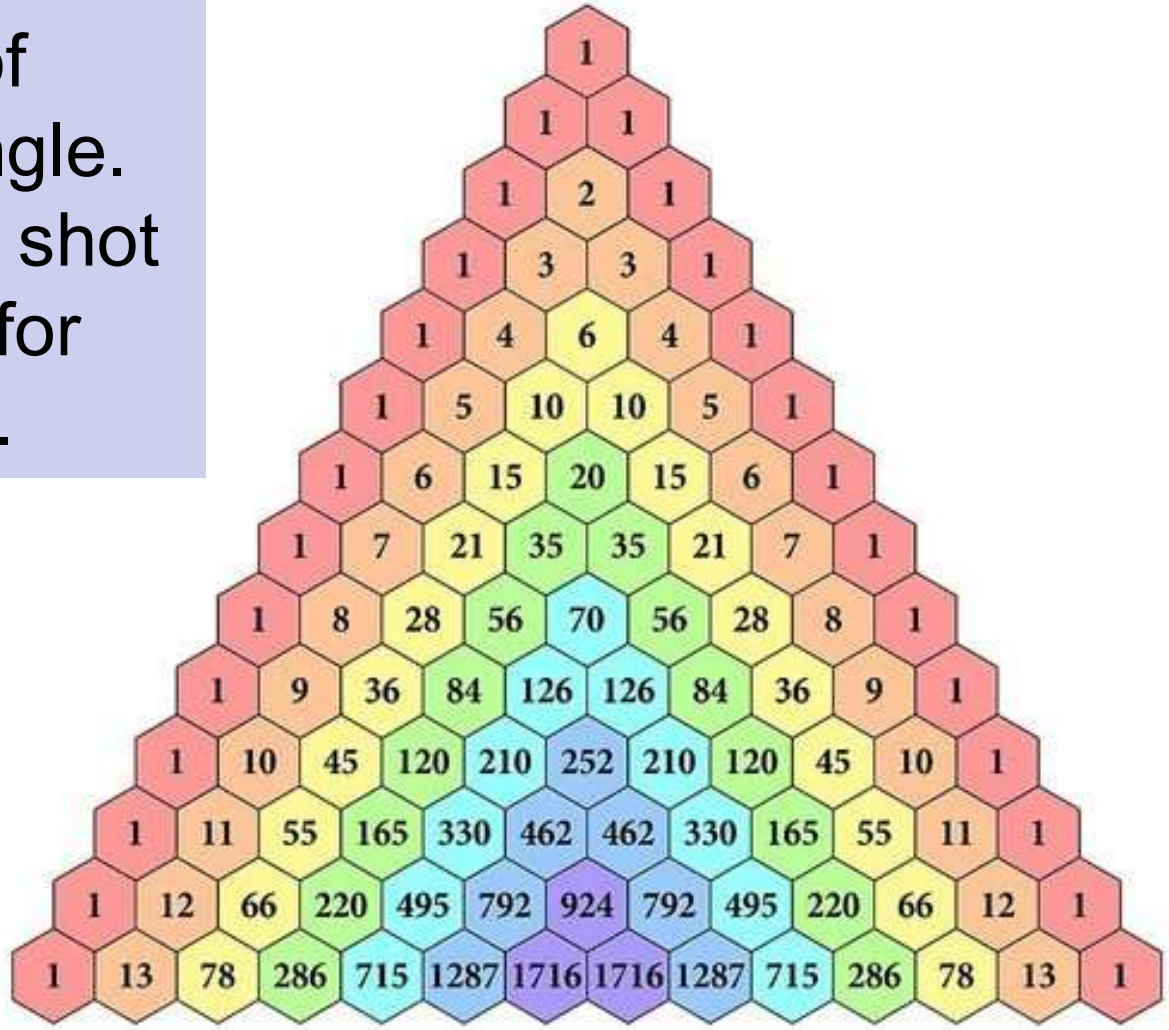
←Row 6 $(x+y)^5$

←Row 7 $(x+y)^6$

←Row 8 $(x+y)^7$

to find $(x+y)^n$ → use row n+1

Do a Google search to find similar versions of Pascal's triangle. Take a screen shot and save it for reference.



2. $(a+b)^2$ → We know how to use FOIL to multiply binomials

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

ab
+ab

$= 1a^2+2ab+1b^2$

Compare coefficients to row #3

Same!

row 1 1

row 2 1 1

row 3 1 2 1

row 4 1 3 3 1

row 5 1 4 6 4 1

row 6 1 5 10 10 5 1

row 7 1 6 15 20 15 6 1

row 8 1 7 21 35 35 21 7 1

row 9 1 8 28 56 70 56 28 8 1

to find $(x+y)^n$ → use row n+1

3. $(x+y)^6$ ← use row 7

exponents are decreasing for x

$= 1x^6y^0 + 6x^5y^1 + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6x^1y^5 + 1x^0y^6$

exponents are increasing for y

not necessary since = 1

not necessary since = 1

row 1	1						
row 2	1	1					
row 3	1	2	1				
row 4	1	3	3	1			
row 5	1	4	6	4	1		
row 6	1	5	10	10	5	1	
row 7	1	6	15	20	15	6	1
row 8	1	7	21	35	35	21	7	1
row 9	1	8	28	56	70	56	28	8	1

coefficients

6+1 = row 7

to find $(x+y)^n$ → use row n+1

note all pairs of exponents add to 6 for #3

6 5+1 4+2 3+3 etc

note: each term has a pair of exponents that add to 4

CHECK ANSWERS:

$56x^5y^3$ $2940x^2y^4$ $-340,200\sqrt{5}\,x^3$ $a^4 - 4a^3b^1 + 6a^2b^2 - 4a^1b^3 + b^4$

(4) = (4) 3+1=(4) 2+2=(4) 1+3=(4)

$x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$ (3)

$a^{10} - 20a^8b + 160a^6b^2 - 640a^4b^3 + 1280a^2b^4 - 1024b^5$

$a^4b^4 - 12a^3b^3c + 54a^2b^2c^2 - 108abc^3 + 81c^4$

$a^2 + 2ab + b^2$ (2)

$64a^6 + 192\sqrt{5}\,a^5 + 1200a^4 + 800\sqrt{5}\,a^3 + 1500a^2 + 300\sqrt{5}\,a + 125$

4. $(a-b)^4$

5. $(2a+\sqrt{5})^6$

6. $(a^2-4b)^5$

7. $(ab-3c)^4$

For #4-7 and beyond:
USE PARENTHESES WHEN EXPANDING!!

Set up problem using given values, then solve and combine constant numbers into one coefficient per term.
No decimals!!!

See hints on next few slides →

4. $(a-b)^4$ ← see row 5 (use 1 4 6 4 1)

set up

$= 1a^4 + 4a^3(-b)^1 + 6a^2(-b)^2 + 4a(-b)^3 + 1(-b)^4$

simplify

$= a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$

because $4 \cdot a^3(-b)^1 = -4a^3b$

because $(-b)(-b) = b^2$

row 1: 1

row 2: 1 1

row 3: 1 2 1

row 4: 1 3 3 1

row 5: 1 4 6 4 1

row 6: 1 5 10 10 5 1

row 7: 1 6 15 20 15 6 1

row 8: 1 7 21 35 35 21 7 1

row 9: 1 8 28 56 70 56 28 8 1

*Combine negative & all numbers into one coefficient

to find $(x + y)^n$ → use row n+1

5. $(2a+\sqrt{5})^6$

Problem #5 can be solved like #3 and #4 in a horizontal manner OR the terms can be organized vertically using a chart like the one listed below. Both techniques are shown on the next 2 slides. Use whichever method makes the most sense to you!

coefficient	"a"	"b"

coefficient	"a"	"b"	
1	$(2a)^6$	$(\sqrt{5})^0$	$\rightarrow 1 \cdot 64a^6$
6	$(2a)^5$	$(\sqrt{5})^1$	$\rightarrow 6 \cdot 32a^5 \cdot \sqrt{5}$
15	$(2a)^4$	$(\sqrt{5})^2$	$\rightarrow 15 \cdot 16a^4 \cdot 5$
20	$(2a)^3$	$(\sqrt{5})^3$	$\rightarrow 20 \cdot 8a^3 \cdot 5\sqrt{5}$
15	$(2a)^2$	$(\sqrt{5})^4$	
6	$(2a)^1$	$(\sqrt{5})^5$	
1	$(2a)^0$	$(\sqrt{5})^6$	

Set up

combine into one term

evaluate ✓

multiply all whole numbers together, keep roots as is

5. $(2a+\sqrt{5})^6 = 64a^6 + 192\sqrt{5}a^5 + 1200a^4 +$ now finish on your own

Simplify

5. $(2a+\sqrt{5})^6$ or solve horizontally as in #3,4

set up

$= 1(2a)^6 + 6(2a)^5(\sqrt{5})^1 + 15(2a)^4(\sqrt{5})^2 + 20(2a)^3(\sqrt{5})^3 + \ldots$ etc

evaluate parentheses

$= 64a^6 + 6\cdot 32a^5\cdot\sqrt{5} + 15\cdot 16a^4\cdot 5 + 20\cdot 8a^3\cdot 5\sqrt{5}$

no decimals!

now simplify by combining numerical values

$\sqrt{5}\cdot\sqrt{5}\cdot\sqrt{5} = 5\sqrt{5}$

$= 64a^6 + 192\sqrt{5}\,a^5 + 1200a^4 + \ldots$ etc

(Same values as previous slide, just organized in a different way!)

Don’t forget to check your answers!!

CHECK ANSWERS:

$56x^5y^3$ $2940x^2y^4$ $-340,200\sqrt{5}\,x^3$ $a^4 - 4a^3b + 6a^2b^2 - 4ab^3 + b^4$

$x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$

$a^{10} - 20a^8b + 160a^6b^2 - 640a^4b^3 + 1280a^2b^4 - 1024b^5$

$a^4b^4 - 12a^3b^3c + 54a^2b^2c^2 - 108abc^3 + 81c^4$ $a^2 + 2ab + b^2$

$64a^6 + 192\sqrt{5}\,a^5 + 1200a^4 + 800\sqrt{5}\,a^3 + 1500a^2 + 300\sqrt{5}\,a + 125$

8. Find the 4th term of $(x + y)^8$ ← row 9

Just find this ↑

Don't solve for all terms!

$= 56x^5y^3$ ✓ done!

exponents must add to 8

row 1: 1

row 2: 1 1

row 3: 1 2 1

row 4: 1 3 3 1

row 5: 1 4 6 4 1

row 6: 1 5 10 10 5 1

row 7: 1 6 15 20 15 6 1

row 8: 1 7 21 35 35 21 7 1

row 9: 1 8 28 56 70 56 28 8 1

1st term x^8y^0 | 2nd x^7y^1 | 3rd x^6y^2 | 4th term coefficient x^5y^3

think about the decreasing pattern for x →

to find $(x + y)^n$ → use row n+1

9. Find the 6th term of $(x - 3\sqrt{5})^8$

row 9

$= 56(x)^3(-3\sqrt{5})^5$ ← 3+5=8

$= 56 \cdot x^3 \cdot -3^5 \cdot \sqrt{5}^5$

$= 56 \cdot x^3 \cdot -243 \cdot 25\sqrt{5}$

$= \boxed{-340{,}200\sqrt{5}x^3}$

row 1: 1

row 2: 1 1

row 3: 1 2 1

row 4: 1 3 3 1

row 5: 1 4 6 4 1

row 6: 1 5 10 10 5 1

row 7: 1 6 15 20 15 6 1

row 8: 1 7 21 35 35 21 7 1

row 9: 1 8 28 56 70 56 28 8 1

① ② ③ ④ ⑤ ⑥

x^8 x^7 x^6 x^5 x^4 x^3 ...

y^0 y^1 y^2 y^3 y^4 y^5

10. Find the 5th term of $(2x-\sqrt{7}y)^6$

11. Find the 7th term of $(-3x+2y)^7$

12. Find the 4th term of $(-4x-\sqrt{5})^6$