Warm-up

1. Write the quadratic equation in standard form that one of its roots equal to $3 + \sqrt{5}$.

2. Write the quadratic equation in standard form that one of its roots equal to $2 - 4i$.

Objectives

Use the Binomial Theorem and Pascal's Triangle to expand binomials raised to any power.

Use the Binomial Theorem and Pascal's Triangle to find specific terms in a expansion polynomial expansion.

Homework

Hand out 5-7 page 65; problems 2, 4, 8, 10, 12, 18, 20 and 22

Hand out 5-3 page 23: 1-8 all

Homework? We'll check it later.

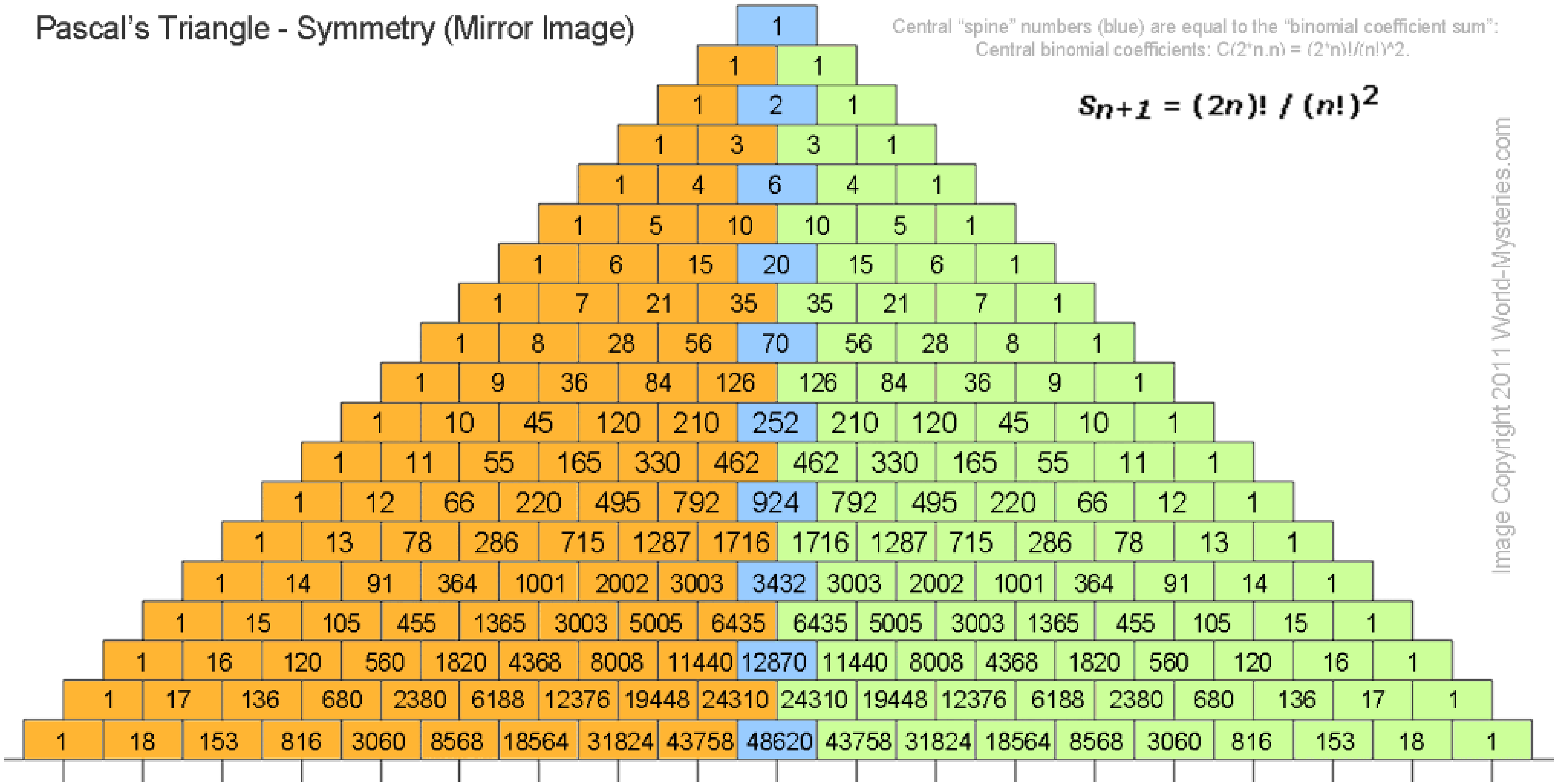
Let's to a little review. Remember this?

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

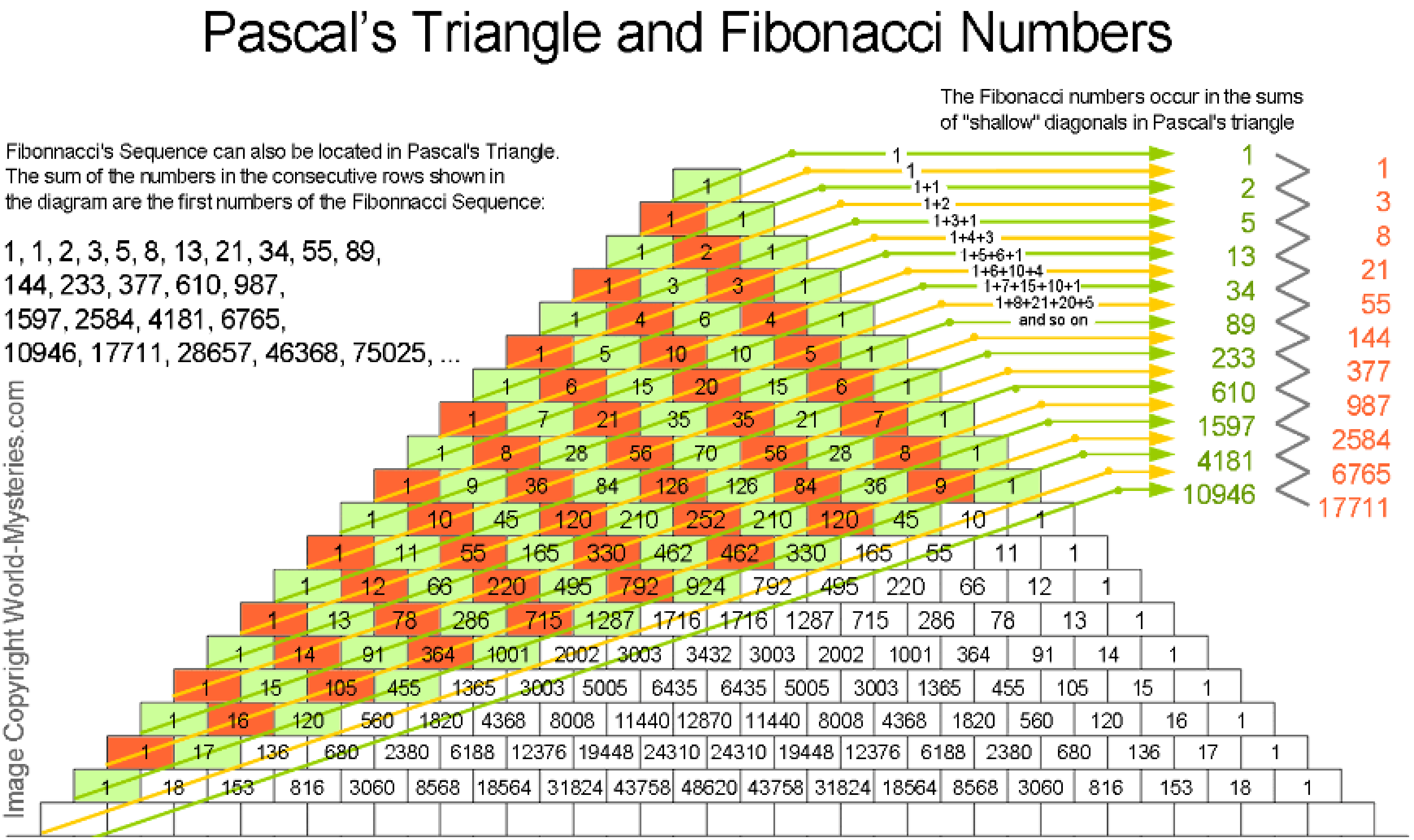
We had two tools to help us…

Pascal's Triangle and the Binomial Theorem

Pascal's Triangle has some interesting properties



Pascal’s Triangle has some interesting properties



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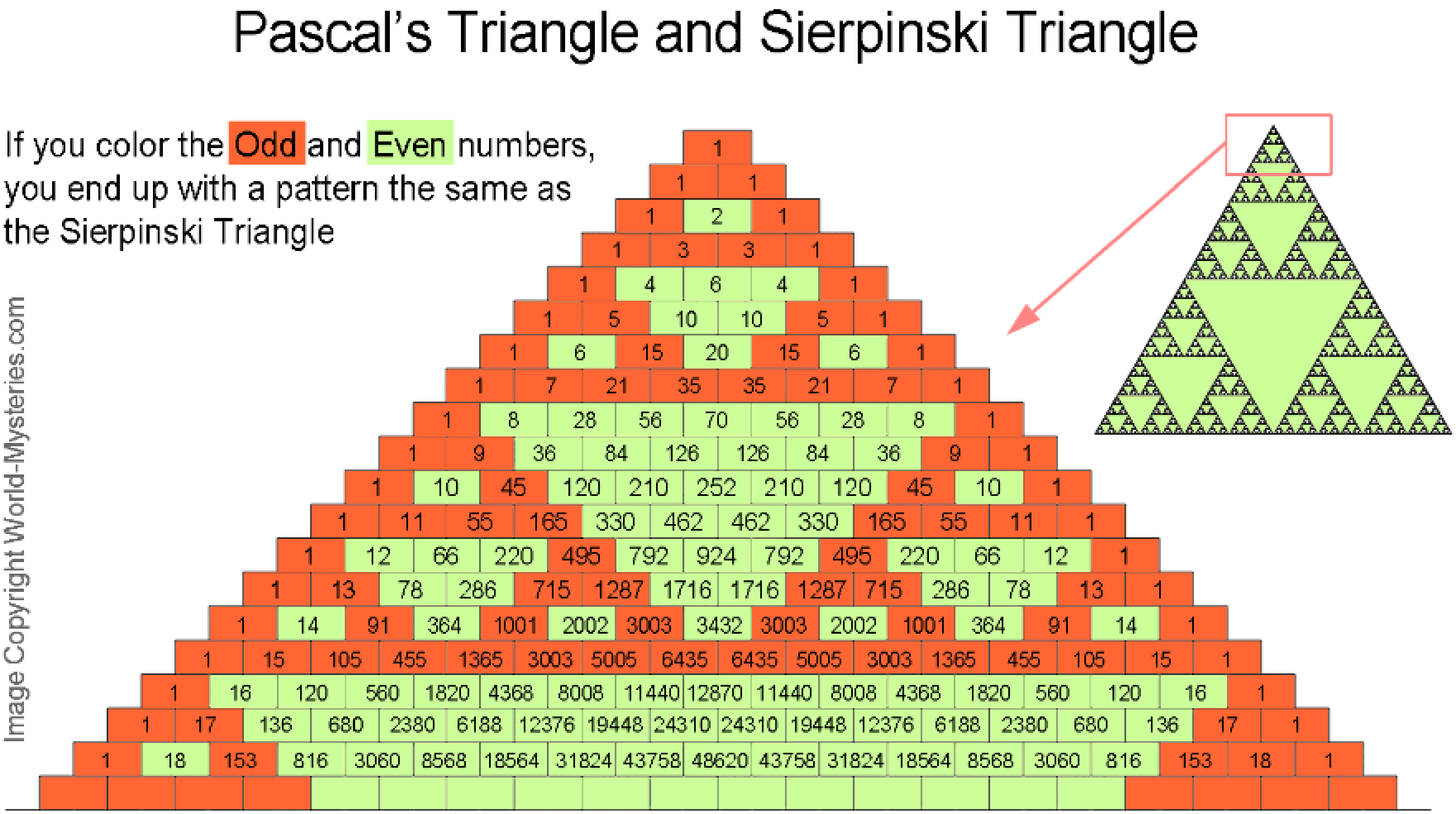

take note

Theorem Binomial Theorem

For every positive integer n,

$$(a + b)^n = P_0a^n + P_1a^{n-1}b + P_2a^{n-2}b^2 + \cdots + P_{n-1}ab^{n-1} + P_nb^n$$

where $P_0, P_1, \ldots, P_n$ are the numbers in the nth row of Pascal's Triangle.

The Binomial Theorem just pointed out the patterns we can use when we expand a polynomial.

Some other things to keep in mind…

The number of terms in an expansion is always the degree of the polynomial plus 1.

The first term of an expansion is always the first term of the binomial raised to the indicated power.

The last term of an expansion is always the last term of the binomial raised to the indicated power.

Expand the polynomial $(3x + 2)^4$

Terms: 5

$a = 3x$ $b = 2$

Pascal's Coefficients: 1 4 6 4 1

a^4	+	$4\,a^3\,b$	+	$6\,a^2\,b^2$	+	$4\,a\,b^3$	+	b^4

What are our **first** and **last** terms?

Write **Pascal's** coefficients in the interior terms.

Working left to right, fill in the a terms with **descending** powers.

Working left to right, fill in the b terms with **ascending** powers.

Now substitute our values for a and b.

$(3x)^4$	+	$4(3x)^3(2)$	+	$6(3x)^2(2)^2$	+	$4(3x)(2)^3$	+	$(2)^4$

Simplify.

$81x^4$	+	$216x^3$	+	$216x^2$	+	$96x$	+	16

Terms: 5

$a = 3x$ $b = 2$

Pascal's Coefficients: $1\ 4\ 6\ 4\ 1$

OK, now you expand $(2x - 4)^5$

What is the **<u>third</u>** term of $\mathbf{(2x+1)^5}$.

1. How many terms?

□ + □ + □ + □ + □ + □

1a. How many terms do I care about?

What is the **eleventh** term of $\mathbf{(2x + y^2)^{10}}$.

1. How many terms?

1a. How many terms do I care about?

The eleventh term is the last term and the only term we care about.

The last term is just ***b*** raised to the 10th power!

So the last term, the eleventh term is $(y^2)^{10} = y^{20}$

OK, You try problems 9 and 13 on your handout.

9. third term of $(x + 3)^{12}$

13. seventh term of $(x - 4y)^{6}$

Remember our first special case? The Difference of Squares?

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

Factor the expression $x^2 - 16 = (x - 4)(x + 4)$

There are two more special cases; the Sum and Difference of Cubes.

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$
$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Factor $x^3 - 8$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$
$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$a = \sqrt[3]{x^3} = x$$
$$b = \sqrt[3]{8} = 2$$

$$x^3 - 8 = (x - 2)(x^2 + x2 + 2^2)$$
$$= (x - 2)(x^2 + 2x + 4)$$

Factor $8x^3 + 27$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$a = \sqrt[3]{8x^3} = 2x$$

$$b = \sqrt[3]{27} = 3$$

$$8x^3 + 27 = (2x + 3)((2x)^2 - 2x(3) + 3^2)$$

$$= (2x + 3)(4x^2 - 6x + 9)$$

Factor and then solve.

1. $8x^3 - 27 = 0$

2. $x^3 + 64 = 0$

Now it’s time to torture you neighbor.

Depending in which group you are in…

1. **Create an expansion problem. Keep you exponent under 9.**

2. **Create a problem in which you have to find a specific term in an expansion.**

Now exchange problems. Then you have to check their answers are correct!