

✕ Multiplying polynomials

- ✓ FOIL multiplies two binomials: first, outside, inside, last
- ✓ $(b + 2)(b + 3) = b^2 + 3b + 2b + 6 = b^2 + 5b + 6$
- ✓ For longer polynomials, multiply **each term by each term**, then combine like terms

🧩 Factoring

- ✓ **Greatest common factor first:** $12x^3 + 8x^2 = 4x^2(3x + 2)$
- ✓ **Trinomials:** for $x^2 + bx + c$, find two numbers that multiply to c and add to b
- ✓ $x^2 - 2x - 15 = (x + 3)(x - 5)$: $3 \times -5 = -15$ and $3 + (-5) = -2$
- ✓ A negative c means one number is positive and one negative
- ✓ Check by FOILing the factors back out
- ✓ **Solve by factoring:** set each factor to zero: $(x + 3)(x - 5) = 0$ gives $x = -3$ or $x = 5$

🔑 Systems of equations

- ✓ **Elimination:** multiply so one variable's coefficients match, then **add** the equations if those terms have opposite signs and **subtract** if the same
- ✓ **Substitution:** solve one equation for a variable and put that into the other
- ✓ Then plug the value you found back in for the other variable
- ✓ A variable already alone: substitution; coefficients that match or nearly do: elimination
- ✓ $x + y = 6$ and $x - y = 2$: add to get $2x = 8$, so $x = 4$ and $y = 2$

⚙️ Functions

- ✓ $f(x)$ is the output for the input x (often called y)
- ✓ $f(x) = x^3 + 4x$: replace every x with 2, so $f(2) = 8 + 8 = 16$, the point $(2, 16)$

∞ Complex numbers

- ✓ $i = \sqrt{-1}$, so $i^2 = -1$ and $\sqrt{-16} = 4i$
- ✓ **Complex number:** $a + bi$, with real part a and imaginary part bi ; $19 = 19 + 0i$, $3i = 0 + 3i$
- ✓ **Add or subtract:** combine like terms: $(10 + 3i) - (-7 + i) = 17 + 2i$
- ✓ **Multiply:** FOIL, then replace i^2 with -1 : $(2 - 5i)(7 + 4i) = 34 - 27i$

➔ Consecutive integers

- ✓ $n, n + 1, n + 2, \dots$: consecutive even or odd: $n, n + 2, n + 4, \dots$
- ✓ Four that sum to 22: $4n + 6 = 22$, so $n = 4$: 4, 5, 6, 7

📊 Statistics and factorials

- ✓ **Mean:** the sum of the values $\div$ how many there are
- ✓ **Median:** the middle value once they are in order; with an even count, the mean of the middle two
- ✓ **Mode:** the value that occurs most; there can be more than one
- ✓ **Range:** the largest value $-$ the smallest
- ✓ 3, 3, 4, 6, 8, 12: mean 6, median 5 (the mean of 4 and 6), mode 3, range 9
- ✓ **Factorial:** $n! = n \times (n - 1) \times \dots \times 1$; $5! = 120$
- ✓ Cancel before multiplying: $\frac{8!}{5!} = 8 \times 7 \times 6 = 336$