

Reminder: 12.6 Notes

Factorial: $4! = (4)(3)(2)(1) \rightarrow 4! = 24$

$$n! = n(n-1)(n-2)\dots(1)$$

$$0! = 1 \text{ (special definition)}$$

NEW!! 12.6 notes

Factorial in graphing calculator:

MATH   **PROB 4: !**

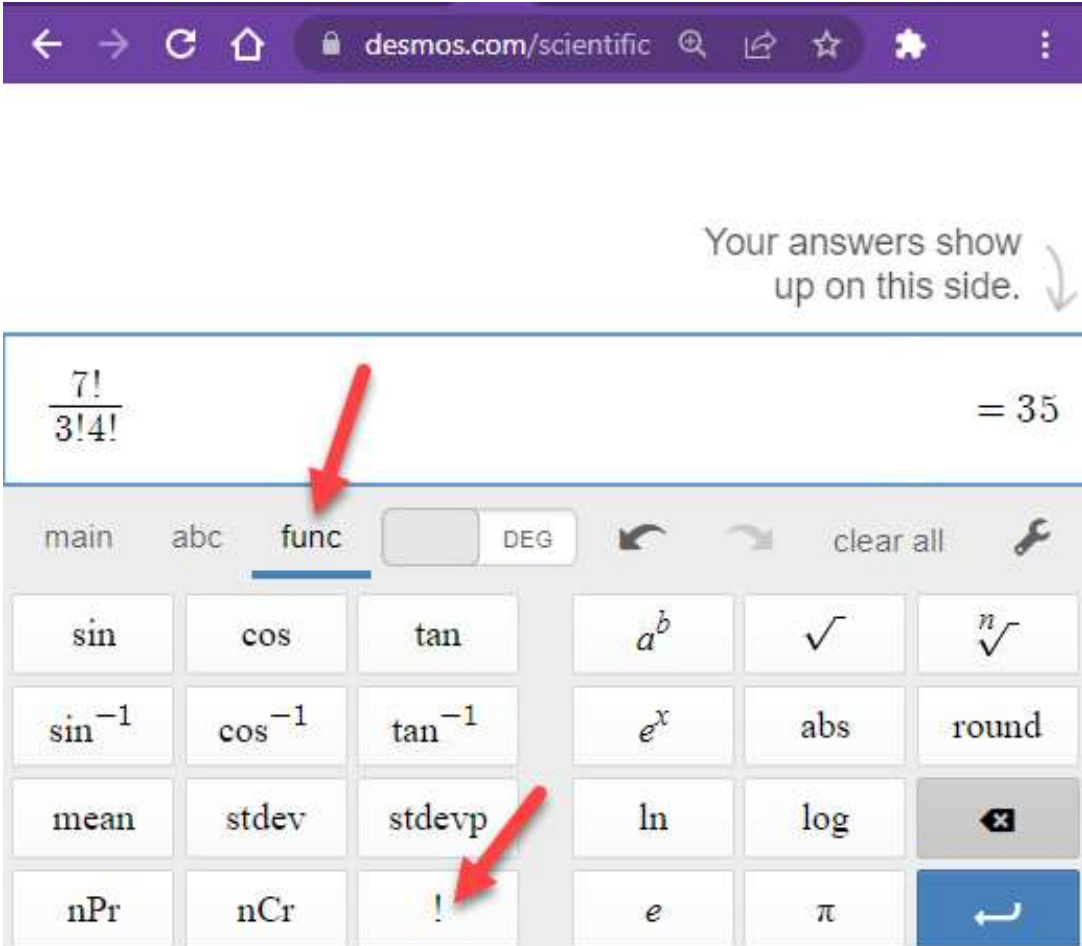
NEW!! 12.6 notes



Factorial in graphing calculator:

MATH   **PROB 4: !**

**OR use the
Desmos
scientific
calculator
func**



The screenshot shows the Desmos scientific calculator interface. The browser address bar at the top displays desmos.com/scientific. The calculator display shows the expression $\frac{7!}{3!4!}$ on the left and the result $= 35$ on the right. A red arrow points to the 'func' button in the top navigation bar. Another red arrow points to the factorial button (!) in the bottom row of the calculator keypad. The keypad includes various mathematical functions such as sin, cos, tan, a^b, √, ⁿ√, sin⁻¹, cos⁻¹, tan⁻¹, e^x, abs, round, mean, stdev, stdevp, ln, log, nPr, nCr, e, π, and a blue enter key.

Binomial coefficient: for $(a + b)^n$

overall exponent →
(given)

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

Exponent for "b" →
when expanding
each term

Exponent
for "b"

Exponent
for "a"

when expanding

NEW!! 12.6 notes

Binomial coefficient example:

$$\binom{7}{3} (2x)^4 (-y)^3$$

$$\downarrow$$
$$\frac{7!}{3!4!} (2x)^4 (-y)^3 = \frac{7 \cancel{6} 5 \cancel{4}!}{\cancel{3} 2 1 \cancel{4}!} \cdot 2^4 x^4 \cdot -y^3$$

$$= 35 \cdot 16 \cdot x^4 \cdot -y^3$$

Combine into one coefficient

$$= \boxed{-560x^4y^3}$$

$$\binom{n}{r} = \frac{n!}{r!(n-r)!}$$

↓ No calculator

12.6 #1-4, 11,12, 17-19, 27-29, 33

(Note: only use Pascal's Triangle for #2 and #12)

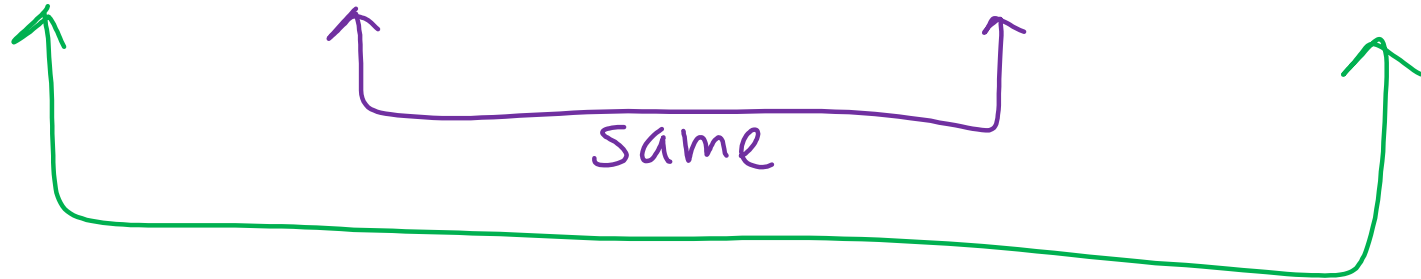
4. To expand $(a + b)^n$, we can use the _____ Theorem. Using this theorem, we find the expansion

$$(a + b)^4 = \binom{\square}{\square} a^4 + \binom{\square}{\square} a^3b + \binom{\square}{\square} a^2b^2 + \binom{\square}{\square} ab^3 + \binom{\square}{\square} b^4$$

Answer ↓

$$(a + b)^4 = \binom{4}{0} a^4 b^0 + \binom{4}{1} a^3 b^1 + \binom{4}{2} a^2 b^2 + \binom{4}{3} a^1 b^3 + \binom{4}{4} a^0 b^4$$

$$\frac{4!}{0!4!} \quad \frac{4!}{1!3!} \quad \frac{4!}{2!2!} \quad \frac{4!}{3!1!} \quad \frac{4!}{4!0!}$$



same = 1

↓ No calculator

12.6 #1-4, 11, 12, 17-19, 27-29, 33

(Note: only use Pascal's Triangle for #2 and #12)

11. $(x^2y - 1)^5$ Change the instructions to "use Binomial Theorem"

Set up

decreasing pattern

Increasing pattern

$$\binom{5}{0}(x^2y)^5(-1)^0 + \binom{5}{1}(x^2y)^4(-1)^1 + \binom{5}{2}(x^2y)^3(-1)^2 \dots$$

$$+ \binom{5}{3}(x^2y)^2(-1)^3 + \binom{5}{4}(x^2y)^1(-1)^4 + \binom{5}{5}(x^2y)^0(-1)^5$$

see next slide ↓

$$= \frac{5!}{0!5!} \cdot X^{10} y^5 + \frac{5!}{1!4!} X^8 y^4 + \frac{5!}{2!3!} X^6 y^3 + \dots \text{etc}$$

↓
1st term
always = 1

combine — ok to solve by hand
or with a calculator

$$= 1 X^{10} y^5 + 5 X^8 y^4 + 10 X^6 y^3 + \text{etc} \dots$$

12.6 CHECK EVENS

12. $99+70\sqrt{2}$

18. 56

28. $16A^4 + 32A^3B^2 + 24A^2B^4 + 8AB^6 + B^8$

More homework examples will be posted after class on Monday!!!