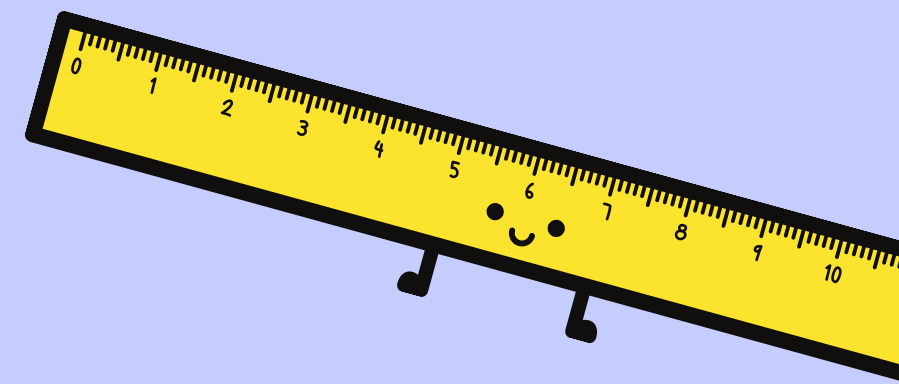


4

5

6



0

2



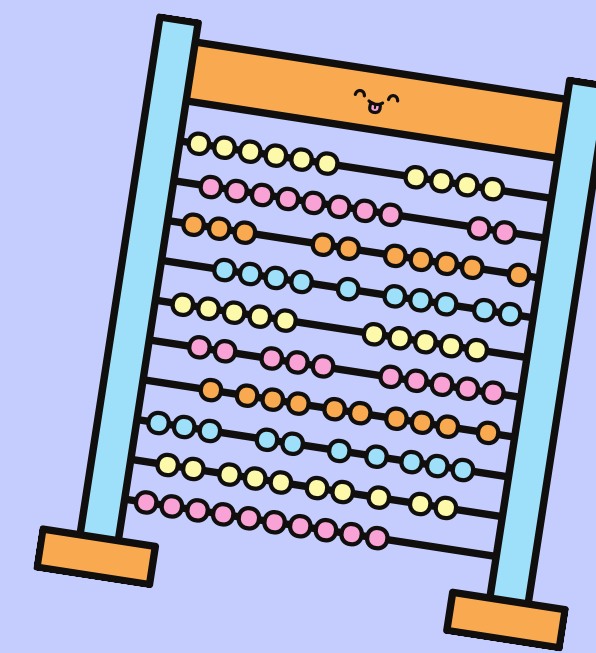
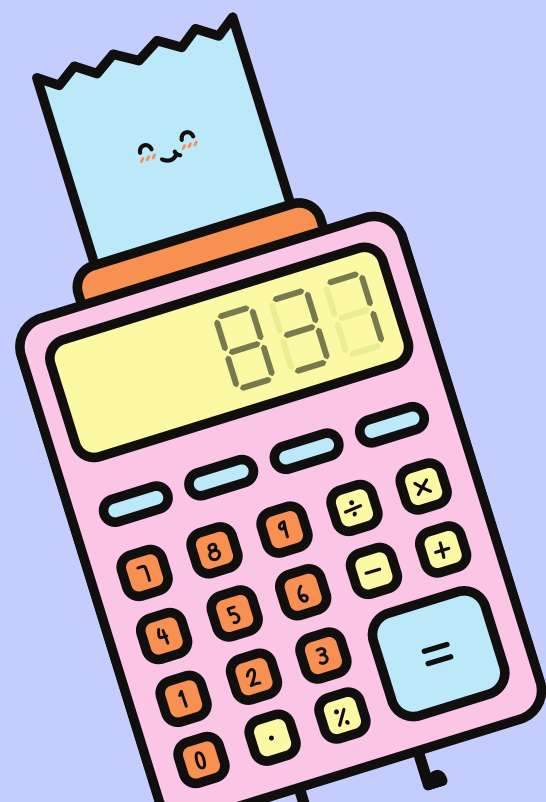
Parengė

Vilniaus lietuvių namų
matematikos mokytoja

3

Mariia Baranchykova

1



7

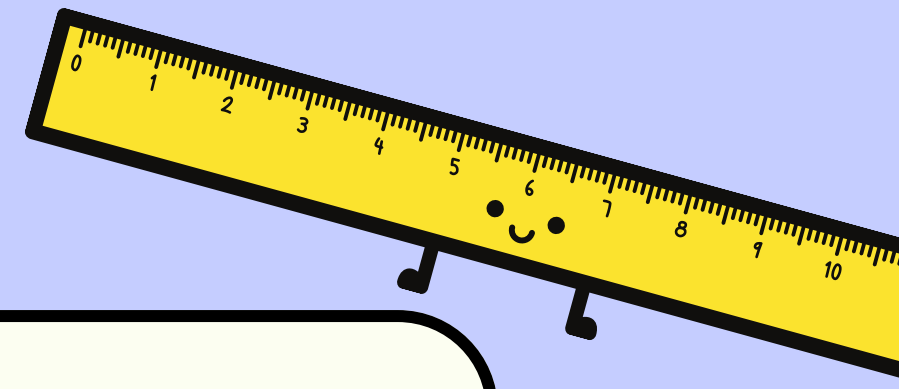
8

9

4

5

6

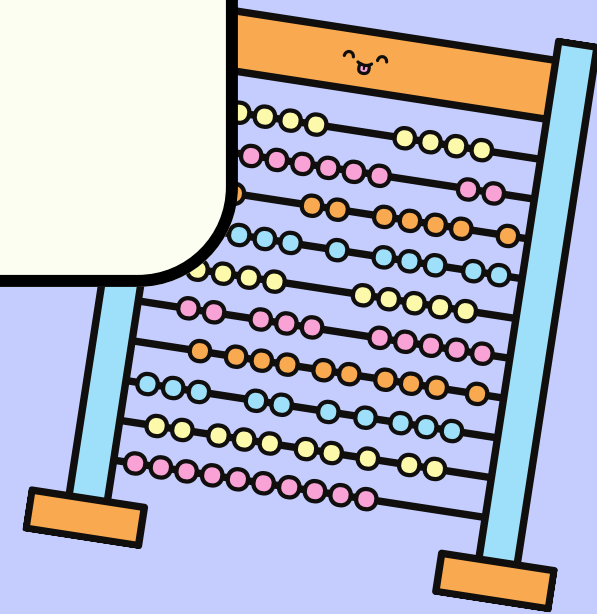


2

Laipsniai

3

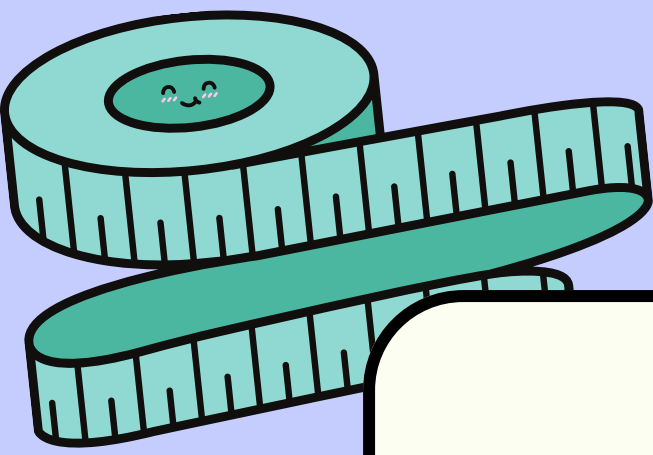
Laipsnių savybės ir uždaviniai



9

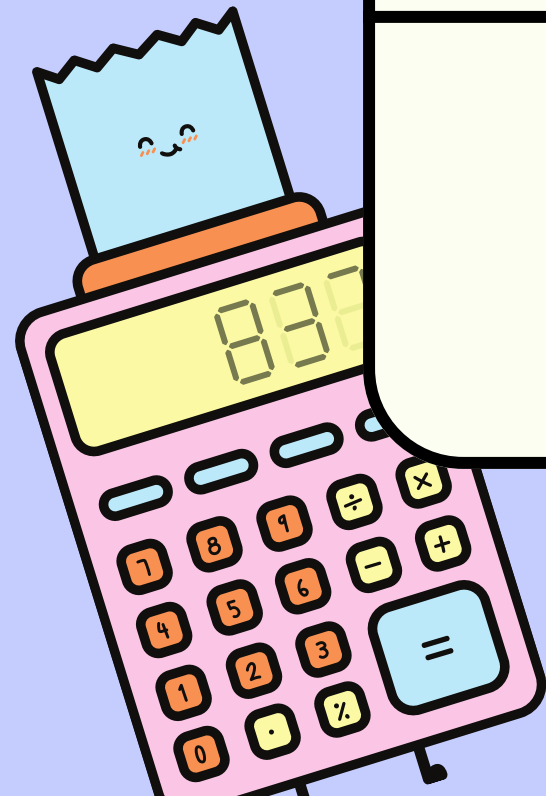
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7



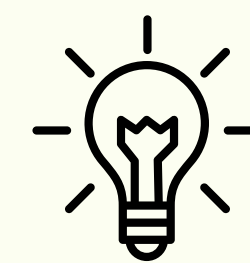
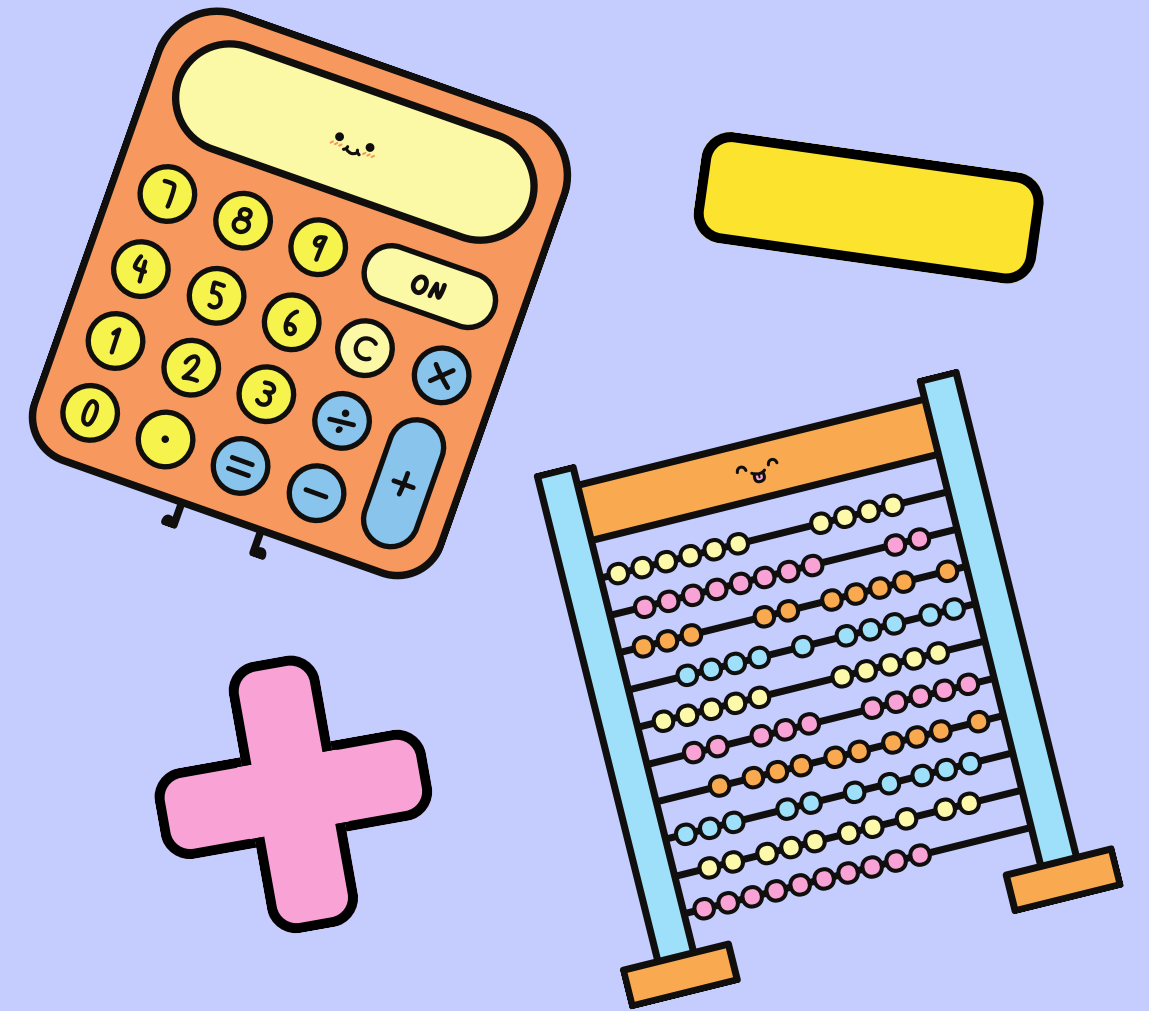
0

1



Laipsnis su natūraliuoju rodikliu

Kuomet turime duotą skaičių a ir jo n laipsnį, toks reiškinys yra skaičiaus a kartotinė daugyba, kuri kartojama n kartų, t.y. $a^n = a * a * a * a * a * \dots * a$, kur bus n dauginamųjų. Toks veiksmas vadinamas skaičiaus a kėlimas n -tuoju laipsniu.



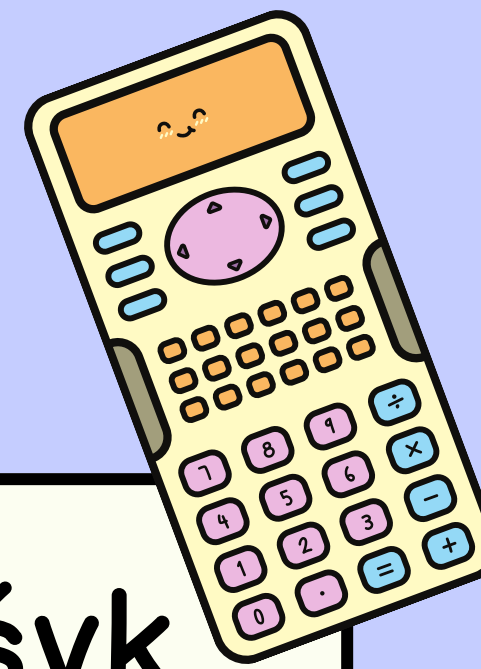
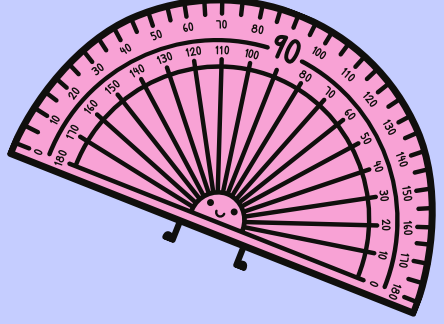
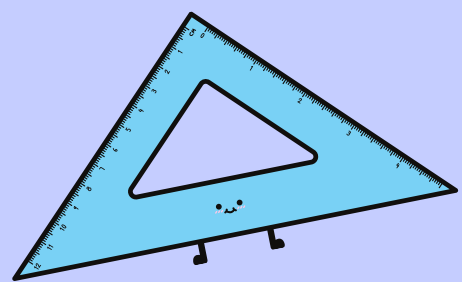
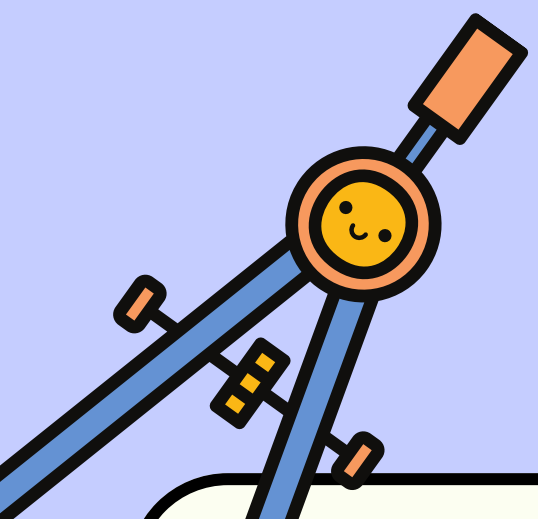
Vaizduojame taip:

a^n , kur

a^n – laipsnis

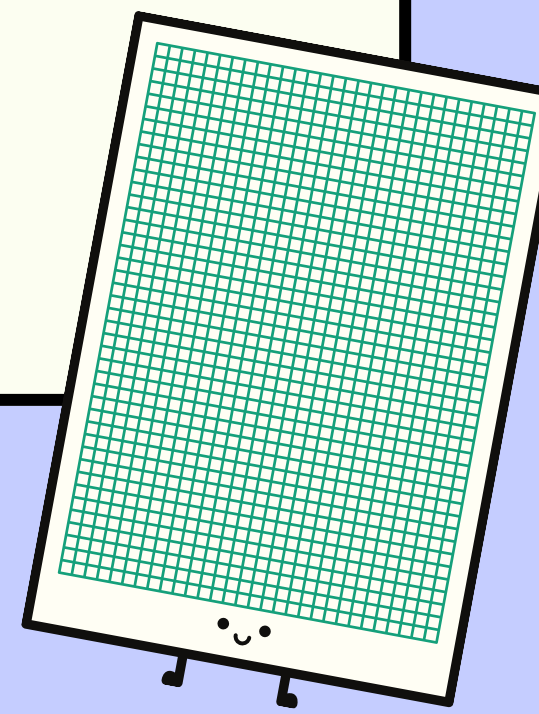
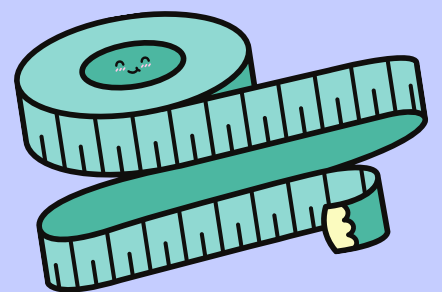
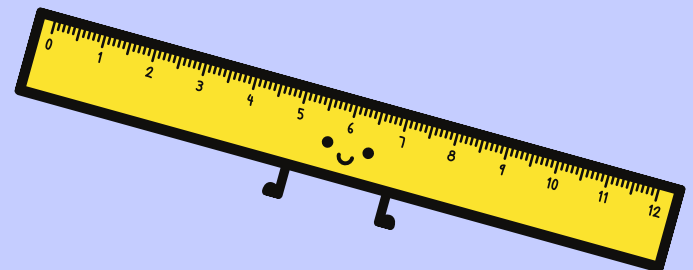
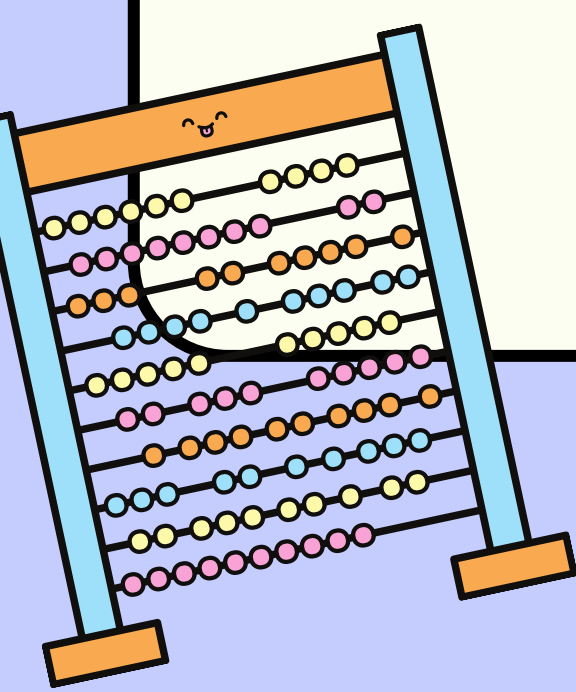
a – laipsnio pagrindas

n – laipsnio rodiklis



Apskaičiuokite šių skaičių n-tąjį laipsnį ir užrašyk leituviškai kokiu laipsniu pakeliame skaičių:

2^3	3^2	4^2	8^2	7^3	12^2	2^6	15^2
5^4	4^3	6^3	3^4	9^2	11^3	3^5	6^4
3^5	7^2	10^2	2^5	5^5	4^4	10^3	2^8



SVARBU!

Taisyklė

Svarbu! Jeigu $a > 0$, $a^n > 0$

Svarbu! Jeigu $a < 0$:

$a^n > 0$, kaip n – lyginis

$a^n < 0$, kaip n – nelyginis

a) $2^2 =$

a) $(-3)^4 =$

a) $(-4)^3 =$

b) $3^3 =$

b) $(-2)^6 =$

b) $(-3)^3 =$

c) $5^2 =$

c) $(-4)^2 =$

c) $(-1)^9 =$

Taisyklė

Svarbu! $1^n = 1$

Svarbu! $a^1 = a$

a) $(-2)^1 =$

b) $1^3 =$

c) $100^1 =$

Nulinis laipsnis

Skaičius (nelygus nuliui), pakeltas nuliniu laipsniu, lygus vienetai: $a^0 = 1$, kur $a \neq 0$

a) $(-7)^0 =$

b) $1000^0 =$

c) $25^0 =$

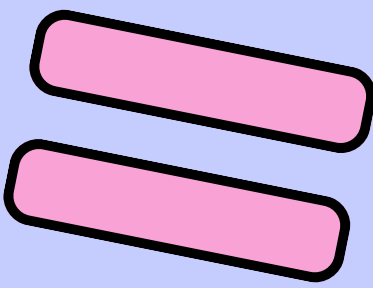
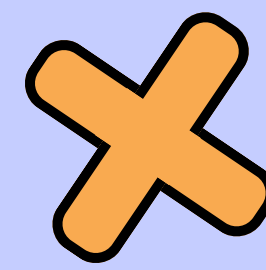
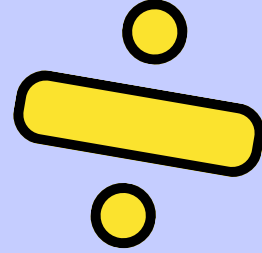
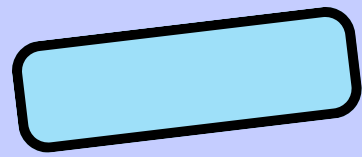
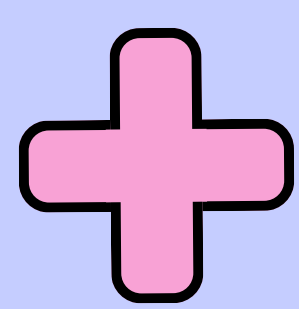
d) $0^0 =$

f) $1^0 =$

Neigiamas laipsnis

Keldami skaičių (nelygų nuliui) neigiamu laipsniu, gauname trupmeną, t.y. vienetas padalinta iš šio skaičiaus, pakeltu teigiamu laipsniu: $a^{-n} = 1/a^n$, kur $a \neq 0$

$$a^{-n} = \frac{1}{a^n} \quad 4^{-2} = \frac{1}{4^2} = \frac{1}{16}; \quad (-3)^{-2} = \frac{1}{(-3)^2} = \frac{1}{9};$$



Užduotis A

1. 4^{-2}
2. 6^{-3}
3. 2^{-4}

Užduotis B

1. $\frac{1}{3^2}$
2. $\frac{1}{4^3}$
3. $\frac{1}{2^5}$

Užduotis C

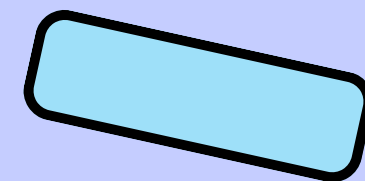
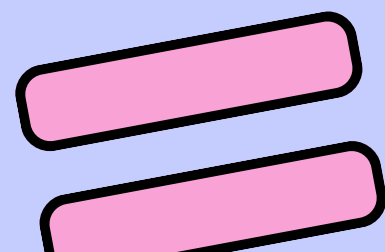
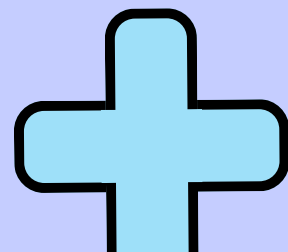
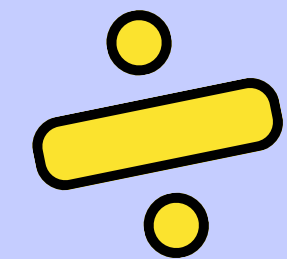
1. $\frac{1}{5^2} = 5^{-}$
2. $\frac{1}{6^3} = 6^{-}$
3. $\frac{1}{10^4} = 10^{-}$

Užduotis E

1. 3^{-2}
2. 5^{-3}
3. 7^{-1}

Užduotis E palyginti

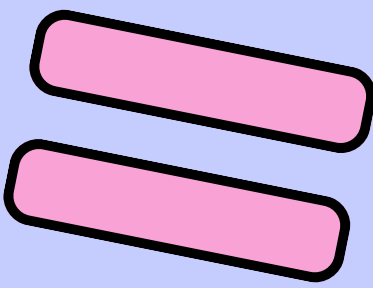
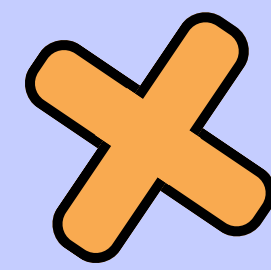
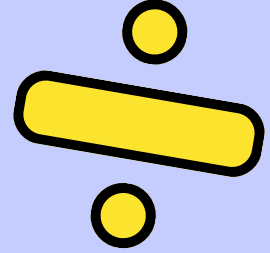
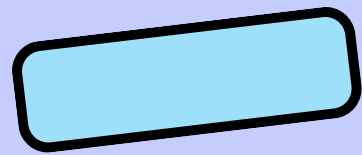
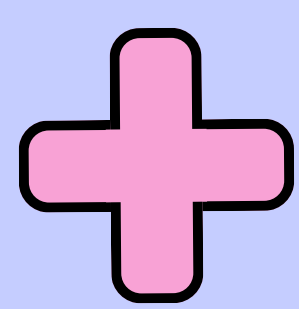
1. 2^{-3} ir $\frac{1}{2^3}$
2. 4^{-2} ir $\frac{1}{4^2}$
3. 10^{-1} ir $\frac{1}{10}$



Laipsnių savybės

Kai tas pats skaičius a keliamas skirtingais laipsniais (m ir n), šis skaičius a keliamas laipsnių m ir n suma

$$a^m * a^n = a^{m+n}, \text{ kur } a \neq 0$$



Užduotis C

1. $3^2 \times 3^5 = 3^{\quad}$

2. $6^4 \times 6^1 = 6^{\quad}$

3. $10^2 \times 10^3 = 10^{\quad}$

Užduotis A

1. $2^3 \times 2^4$

2. $5^2 \times 5^3$

3. $3^1 \times 3^5$

Užduotis B

1. $4^2 \times 4^3$

2. $7^1 \times 7^2$

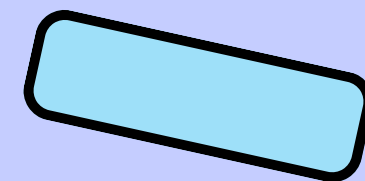
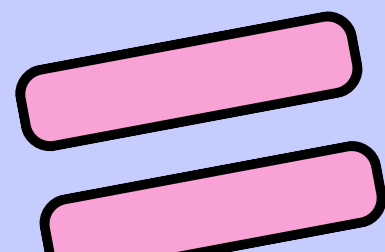
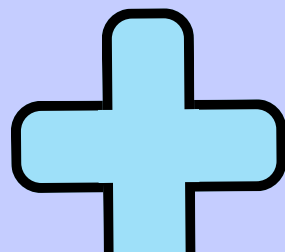
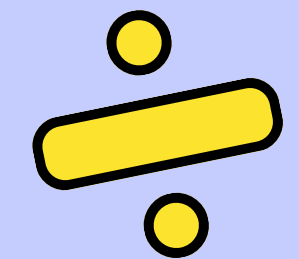
3. $10^3 \times 10^4$

Užduotis D

1. $5^2 \times 5^3$

2. $4^1 \times 4^2 \times 4^3$

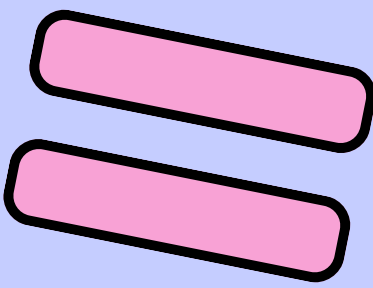
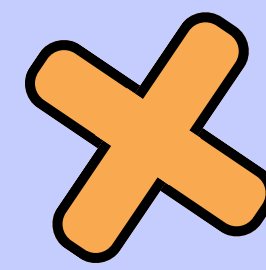
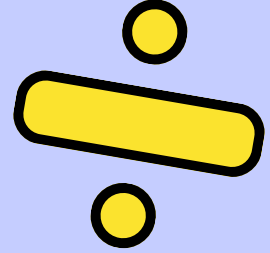
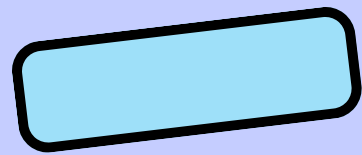
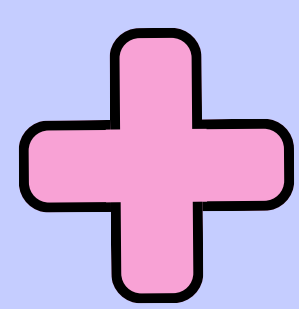
3. $2^4 \times 2^2 \times 2^1$



Laipsnių savybės

Kai tas pats skaičius a keliamas laipsniu m dalinamas iš šio skaičiaus a laipsniu n , skaičius a keliamas šių laipsnių skirtumu, t.y. $m-n$

$$a^m : a^n = a^{m-n}, \text{ kur } a \neq 0$$



Užduotis A

1. $6^4 \div 6^2 = 6^{\quad}$

2. $9^5 \div 9^3 = 9^{\quad}$

3. $2^7 \div 2^4 = 2^{\quad}$

Užduotis B

1. $5^4 \div 5^2$

2. $3^6 \div 3^3$

3. $2^5 \div 2^1$

Užduotis C

1. $8^3 \div 8^1$

2. $10^5 \div 10^3$

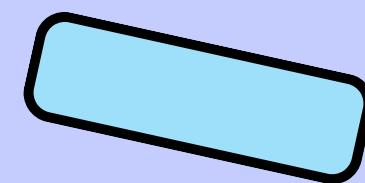
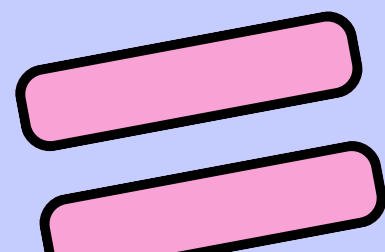
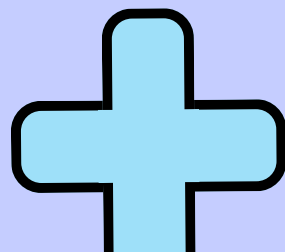
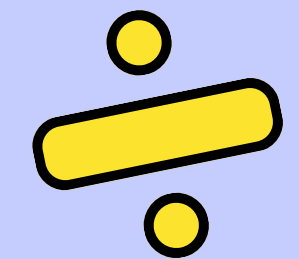
3. $6^4 \div 6^2$

Užduotis D

1. $7^6 \div 7^3$

2. $10^8 \div 10^5$

3. $4^9 \div 4^4$



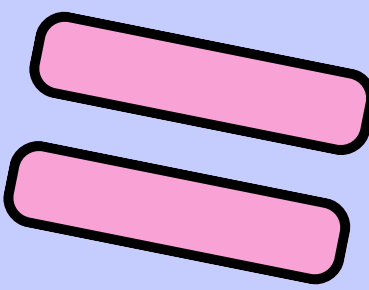
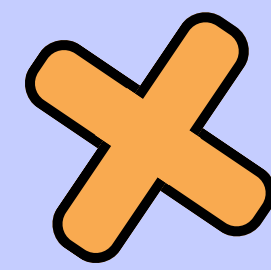
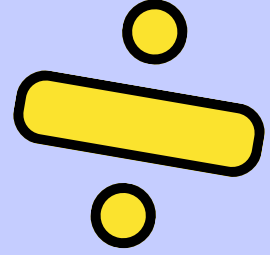
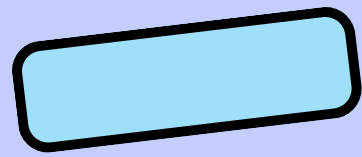
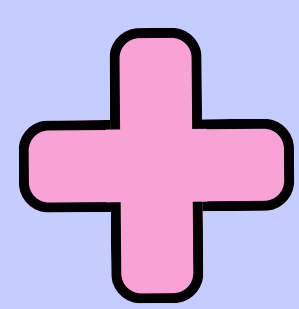
Kitos savybės: $(a^m)^n = a^{m \cdot n}$, kur $a \neq 0$

$$a^n \cdot b^n = (a \cdot b)^n, \text{ kur } a \neq 0, b \neq 0$$

$$a^n : b^n = (a : b)^n, \text{ kur } a \neq 0, b \neq 0$$

$$a^n / b^n = (a / b)^n, \text{ kur } a \neq 0, b \neq 0$$

$$(a / b)^{-n} = (b / a)^n, \text{ kur } a \neq 0, b \neq 0$$



$$(a^m)^n = a^{m \cdot n}, \text{ kur } a \neq 0$$

Užduotis A

1. $(2^3)^2$

2. $(5^2)^3$

3. $(3^4)^2$

Užduotis B

1. $(4^2)^3$

2. $(6^1)^5$

3. $(7^3)^2$

Užduotis C

1. $(8^3)^2$

2. $(9^4)^1$

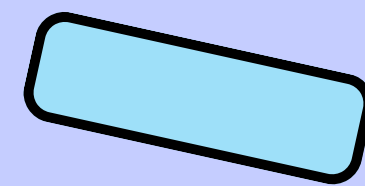
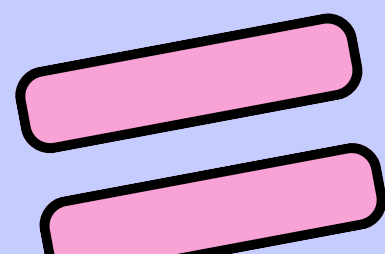
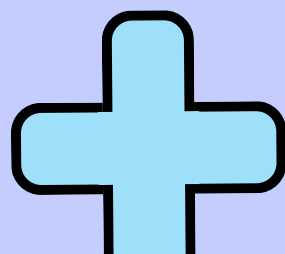
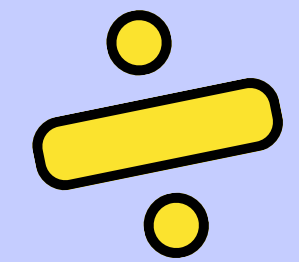
3. $(11^2)^3$

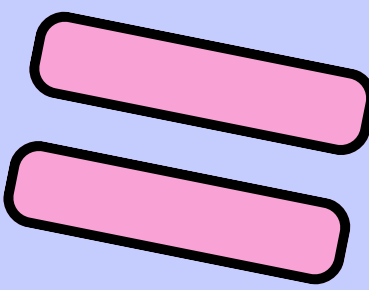
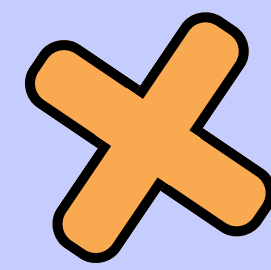
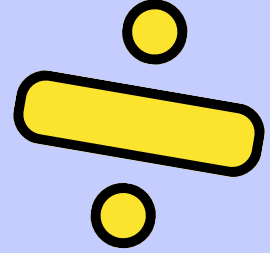
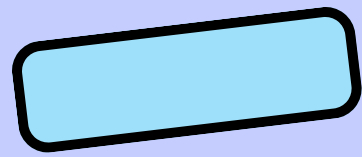
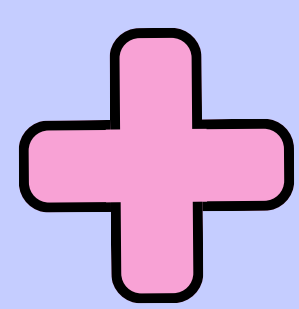
Užduotis D

1. $(6^2)^3$

2. $(2^4)^2$

3. $(10^1)^5$





$$a^n * b^n = (a * b)^n, \text{ kur } a \neq 0, b \neq 0$$

Užduotis A

1. $6^2 \times 2^2 = (6 \times 2)^-$

2. $3^3 \times 5^3 = (3 \times 5)^-$

3. $8^4 \times 2^4 = (8 \times 2)^-$

Užduotis B

1. $2^3 \times 3^3$

2. $4^2 \times 5^2$

3. $6^4 \times 7^4$

Užduotis C

1. $3^5 \times 2^5$

2. $5^3 \times 6^3$

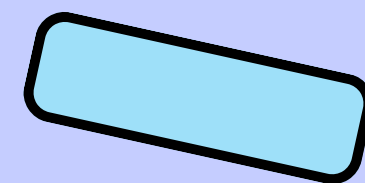
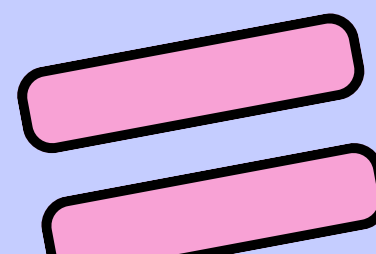
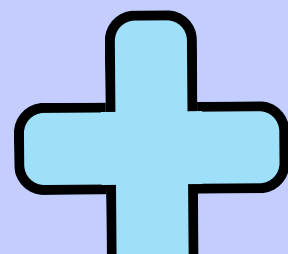
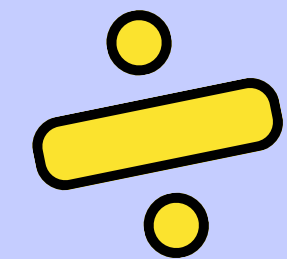
3. $7^2 \times 8^2$

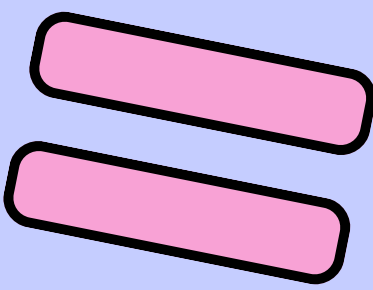
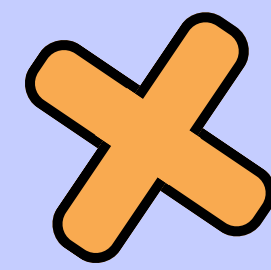
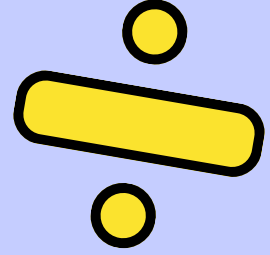
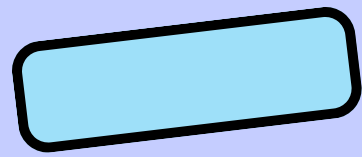
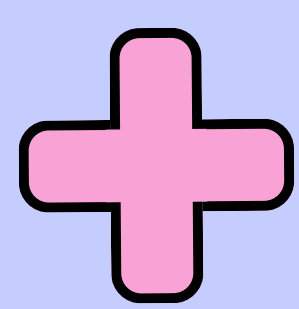
Užduotis D

1. $4^3 \times 5^3$

2. $2^2 \times 7^2$

3. $6^5 \times 3^5$





$$a^n : b^n = (a : b)^n, \text{ kur } a \neq 0, b \neq 0$$

Užduotis A

1. $8^2 : 2^2 = (8 : 2)^-$

2. $15^3 : 5^3 = (15 : 5)^-$

3. $18^4 : 6^4 = (18 : 6)^-$

Užduotis B

1. $6^3 : 2^3$

2. $8^2 : 4^2$

3. $9^4 : 3^4$

Užduotis C

1. $10^5 : 2^5$

2. $12^3 : 4^3$

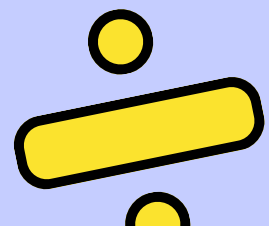
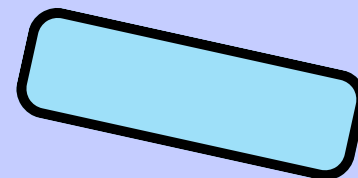
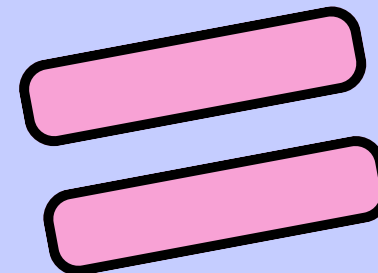
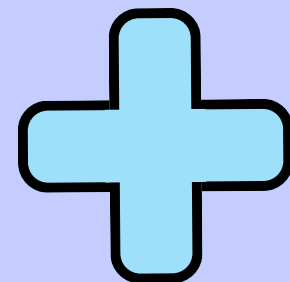
3. $16^2 : 8^2$

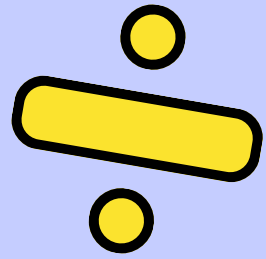
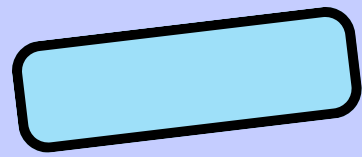
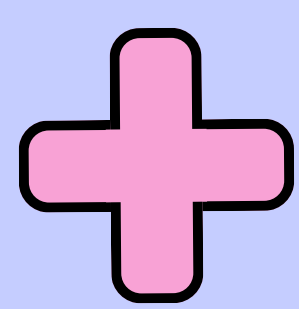
Užduotis D

1. $12^3 : 4^3$

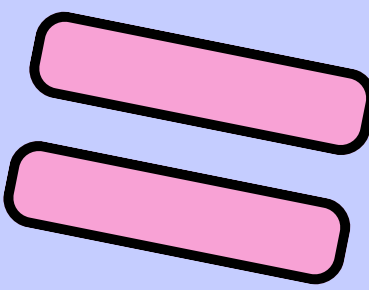
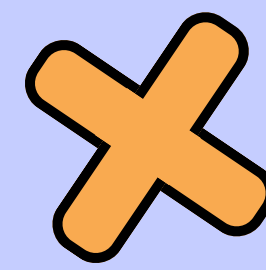
2. $21^2 : 7^2$

3. $30^4 : 10^4$





$$\frac{a^n}{b^n} = \left(\frac{a}{b}\right)^n$$



Užduotis A

1. $\frac{8^2}{2^2} = \left(\frac{8}{2}\right)^{-}$

2. $\frac{15^3}{5^3} = \left(\frac{15}{5}\right)^{-}$

3. $\frac{18^4}{6^4} = \left(\frac{18}{6}\right)^{-}$

Užduotis B

1. $\frac{6^3}{2^3}$

2. $\frac{8^2}{4^2}$

3. $\frac{9^4}{3^4}$

Užduotis C

1. $\frac{12^3}{4^3}$

2. $\frac{21^2}{7^2}$

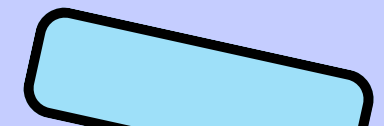
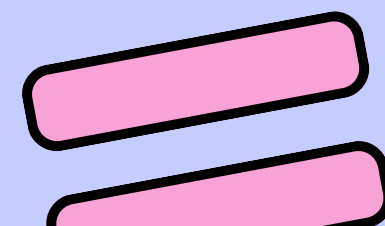
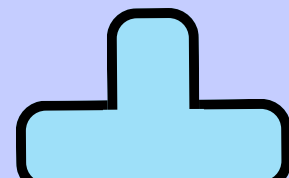
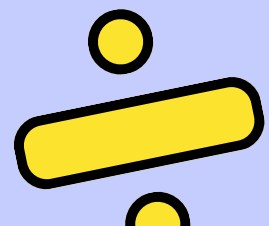
3. $\frac{30^4}{10^4}$

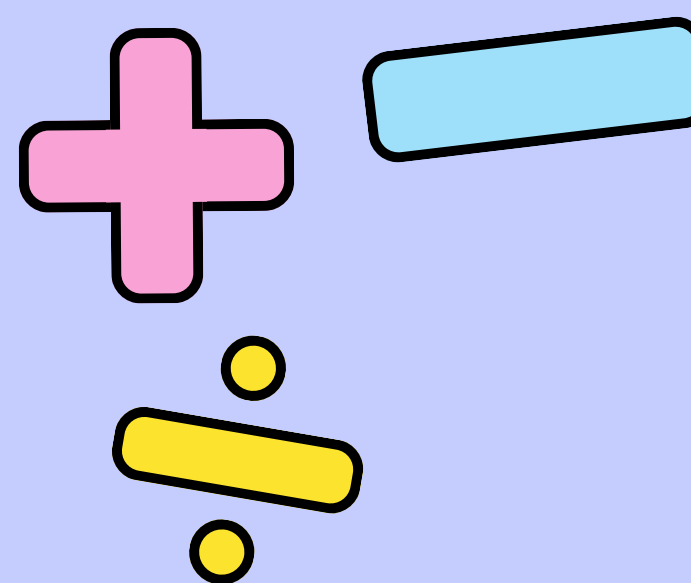
Užduotis D

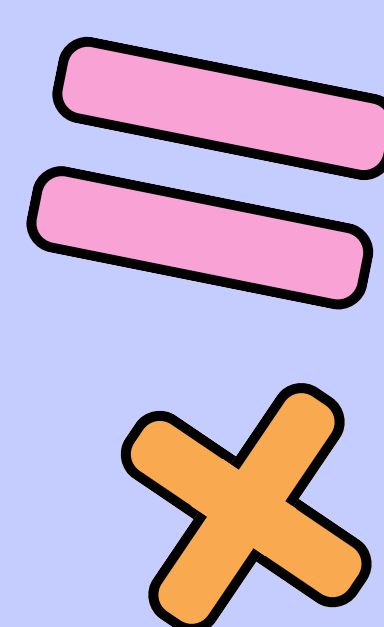
1. $\frac{9^2}{3^2}$

2. $\frac{14^3}{7^3}$

3. $\frac{25^4}{5^4}$




$$(a / b)^{-n} = (b / a)^n, \text{ kur } a \neq 0, b \neq 0$$

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$


Užduotis A

1. $\left(\frac{2}{5}\right)^{-3} = \left(\frac{-}{-}\right)^3$

2. $\left(\frac{4}{7}\right)^{-2} = \left(\frac{-}{-}\right)^2$

3. $\left(\frac{6}{3}\right)^{-1} = \left(\frac{-}{-}\right)^1$

Užduotis B

1. $\left(\frac{2}{3}\right)^{-2}$

2. $\left(\frac{5}{4}\right)^{-3}$

3. $\left(\frac{7}{2}\right)^{-1}$

Užduotis C

1. $\left(\frac{4}{3}\right)^{-2}$

2. $\left(\frac{8}{5}\right)^{-3}$

3. $\left(\frac{10}{6}\right)^{-1}$

Užduotis D

1. $\left(\frac{8}{3}\right)^{-2}$

2. $\left(\frac{9}{5}\right)^{-3}$

3. $\left(\frac{7}{2}\right)^{-1}$

