Warm Up

New books!

1. Put your old book in the corner of your next.

2. Write your name in your new book using a PEN.

Homework Questions?

What Is Special About a Radioactive Cat?

Choose the correct answer for each exercise and circle the letter pair next to it. Write the uppercase letter in the box containing the lowercase letter.

In Exercises 1-2, choose the number that is written in scientific notation.

1. r • Y 34.5×10^5 m • B 3.45×10^6 y • P 0.345×10^7
2. b • G 0.77×10^{-3} i • R 7.7×10^{-4} s • L 7.7×10^{-4}

In Exercises 3-6, find the value of n.

3. $94{,}000{,}000 = 9.4 \times 10^n$ n=7
4. $555{,}500{,}000{,}000 = 5.555 \times 10^n$ n=11
5. $0.00006 = 6 \times 10^n$ n= -5
6. $0.0000000000375 = 3.75 \times 10^n$ n= -11

n • O 8 e • A 7
i • I 11 k • C 10
w • S −4 j • G −11
f • U −12 y • E −5

In Exercises 7-12, write the number in decimal form.

7. 3.8×10^5 w - I
8. 3.8×10^{-5} b - T
9. 3.80×10^7 r - A
10. 6.25×10^4 n - E
11. 6.25×10^{-3} z - S
12. 6.25×10^{-8} k - H

r • A 38,000,000 p • R 0.00038
d • L 3,800,000 w • I 380,000
h • T 0.000038 o • D 38,000
a • A 0.000000625 n • E 62,500
v • M 625,000 k • H 0.0000000625
z • S 0.00625 h • L 0.00062

In Exercises 13-18, write the number in scientific notation.

13. 72,000 a - I
14. 7,200,000,000,000 f - S
15. 0.00000072 o - N
16. 41,900,000 d - H
17. 0.00419 v - L
18. 0.0000000000419 h - E

q • F 7.2×10^{10} q • W 7.2×10^5
f • S 7.2×10^{12} o • N 7.2×10^{-7}
a • I 7.2×10^4 t • D 7.2×10^{-6}
v • L 4.19×10^{-3} x • T 4.19×10^{-5}
i • R 4.19×10^{-10} d • H 4.19×10^7
c • S 4.19×10^6 h • E 4.19×10^{-11}

In Exercises 19-22, write the number in scientific notation.

19. 22.2×10^3 t - F
20. 0.222×10^8 I - T
21. 0.54×10^{-4} x - V
22. 54×10^{-15} q - H

p • O 2.22×10^5 t • T 2.22×10^7
t • F 2.22×10^4 c • S 2.22×10^9
g • L 5.4×10^{-6} u • P 5.4×10^{-16}
q • H 5.4×10^{-14} x • V 5.4×10^{-5}

a b c d e f g h i j k l m n o p q r s t u v w x y z
I T HAS E I GHTEEN HALF LIVES

19. 22.2×10^3

$2.22 \times 10^{3+1} = 2.22 \times 10^4$

took away a place value by dividing by 10

need to add it here

+1

Another way: Expand out

$22.2 \times 10^3 = 22{,}000$

$22.200 = 22{,}000$

Now put 22,000 into scientific notation:

$22{,}000 = 2.2 \times 10^4$

#21 0.54×10^{-4}

Expand $0.54 \times 10^{-4} = 0.00054$

$= 0.000054$

5.4×10^{-5}

0.54×10^{-4}

$0.54 \xrightarrow{\times 10} 5.4 \longrightarrow 5.4 \times 10^{-5}$

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c • S 2.22×10^9
u • P 5.4×10^{-16}
x • V 5.4×10^{-5}

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
I	T		H	A	S		E	I	G	H	T	E	E	N		H	A	L	F		L	I	V	E	S

Exponential Growth

In this Investigation, you will explore *exponential growth*. You will cut paper in half over and over to experience exponential growth. You will read a story about the land of Montarek. That story shows how exponential growth can be used. Finally, you will explore exponential patterns and compare them to linear growth patterns with tables, graphs, and equations.

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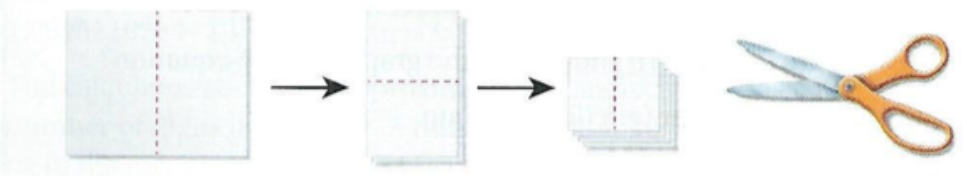
1.1 Making Ballots

Introducing Exponential Functions

Chen is the secretary of the Student Government Association. He is making ballots for a meeting. Chen starts by cutting a sheet of paper in half. Then, he stacks the two pieces and cuts them in half again. With four pieces now, he stacks them and cuts them in half. By repeating this process, he makes smaller and smaller paper ballots.



After each cut, Chen counts the ballots and records the results in a table.

Number of Cuts	Number of Ballots
1	2
2	4
3	8
4	16
5	32

+1 +1 +1 +1

×2 ×2 ×2 ×2

In your notebook:

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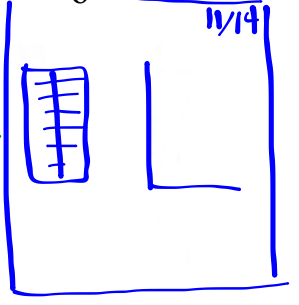


He wants to predict the number of ballots after any number of cuts.

Describe the pattern of change. How many ballots are there after n cuts?

Problem 1.1

A 1. Make a table to show the number of ballots after each of the first 5 cuts.

2. Look for a pattern in the way the number of ballots changes with each cut. Use your observations to extend your table to show the number of ballots for up to 10 cuts.

B 1. Graph the data and write an equation that represents the relationship between the number of ballots and the number of cuts.

2. How does the growth pattern show up in the graph and the equation?

3. Is this relationship a linear function? Explain.

C 1. Suppose Chen could make 20 cuts. How many ballots would he have? How many ballots would he have if he could make 40 cuts?

2. How many cuts would it take to make 500 ballots?

$y = 2^x$ ← # of cuts

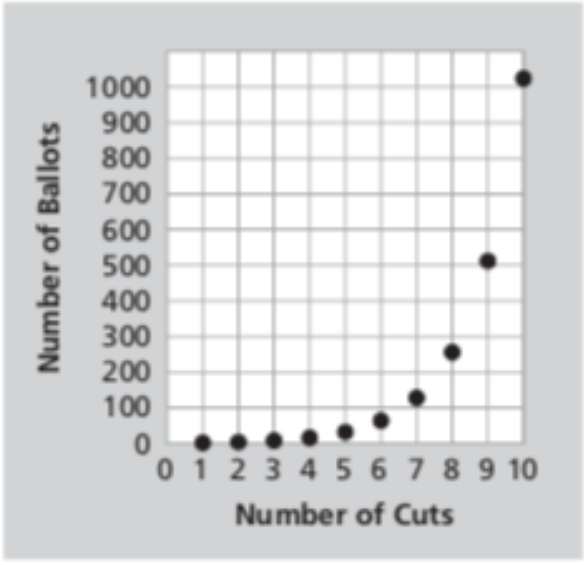
# of ballots

$y = 2^{20} = 1{,}048{,}576$

$y = 2^{40} = 1.099511628 \times 10^{12}$

Number of Cuts	Number of Ballots
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1,024

+1 +1 ×2 ×2 ×2



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6	64
7	128
8	256
9	512
10	1,024

+1 +1 +1 +2 +4 +8

Not linear $\frac{\Delta y}{\Delta x} = \frac{2}{1} \neq \frac{4}{1} \neq \frac{8}{1}$

Number of Cuts	Number of Ballots	Calculation
1	2	$2 = 2^1$
2	4	$2 \cdot 2 = 2^2$
3	8	$2 \cdot 2 \cdot 2 = 2^3$
4	16	$2 \cdot 2 \cdot 2 \cdot 2 = 2^4$
5	32	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$
6	64	
7	128	
8	256	
9	512	
10	1,024	

+1 +1 +1 +1

$y = 2^x$

Is $2^8 = 256$?

[2] [^] [8] [=] $= 256$ ✓

Additional Classwork

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