

33.)

$$\begin{aligned}
 & \left(\frac{x y^{-1}}{x^{-3} y^2} \right)^2 \cdot \left(\frac{x^3 y^2}{2 y x^{-1}} \right)^{-2} \\
 &= \left(\frac{x x^3}{y^1 y^2} \right)^2 \cdot \left(\frac{x^3 x^1 y^2}{2 y} \right)^{-2} = \left(\frac{x x^3}{y^1 y^2} \right)^2 \cdot \left(\frac{2 y}{x^3 x^1 y^2} \right)^2 \\
 &= \left(\frac{x x x x}{y y y} \right) \left(\frac{x x x x}{y y y} \right) \cdot \left(\frac{2 y}{x x x x y y} \right) \left(\frac{2 y}{x x x x y y} \right) \\
 &= \frac{\cancel{4} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y}}{\cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y}} = \frac{4}{y^8}
 \end{aligned}$$

$$23. \left(\frac{2x^2y}{3y} \right)^{-3} \cdot \left(\frac{4y^3}{x^4} \right)^2$$

$$= \left(\frac{\cancel{3y}}{2x^2y} \right)^3 \cdot \left(\frac{\cancel{4y^3}}{x^4} \right)^2$$

$$= \left(\frac{\cancel{3y}}{\cancel{2}x\cancel{x}\cancel{y}} \right) \left(\frac{\cancel{3y}}{\cancel{2}x\cancel{x}\cancel{y}} \right) \left(\frac{\cancel{3y}}{\cancel{2}x\cancel{x}\cancel{y}} \right) \left(\frac{\cancel{4}y\cancel{y}\cancel{y}}{xxxx} \right) \left(\frac{\cancel{4}^2y\cancel{y}\cancel{y}}{xxxx} \right)$$

$$= \frac{54y^6}{x^{14}}$$

$$13. \left(\frac{4p^7}{7s^2} \right)^2$$

$$= \left(\frac{4p \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p}}{7s \cancel{s}} \right) \left(\frac{4p \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p}}{7s \cancel{s}} \right)$$

$$= \frac{16p^{14}}{49s^4}$$



In this year, Dr. Elizabeth Blackwell became the first woman to receive an M.D. degree. She attended the Medical Institute of Geneva, New York. Solve this puzzle to find the year.

- My units digit is equal to the number of sides in a nonagon.
- The two-digit number formed by my hundreds and tens digits is the value of w in $\frac{1}{4}w - 6 = 15$.
- The sum of all of my digits is the same as the number of pints in 2 gallons, 3 quarts.

hint: 2 Cups in a Pint
2 Pints in a Quart
4 Quarts in a Gallon

What year am I?

Page 43: Dr. Blackwell i

Thousands

Hundreds

Tens

Units

Chuck Norris remembers the future



$$27. \frac{7x^{-1}y^3}{x^2y^{-2}} \cdot \frac{(3xy^2)^{-1}}{xy}$$

$$= \frac{7y^3y^2}{x^2x^1} \cdot \frac{1}{xy(3xy^2)^1}$$

$$= \frac{7y^5y^2}{xxxxy3xy^3}$$

$$= \frac{7y^2}{3x^5}$$

$$\begin{aligned} \textcircled{8.} & (-x^4y)(3xy^3)^2 \\ &= (-1 \cdot x \cdot x \cdot x \cdot x \cdot y)(3xyyy)(3xyyy) \\ &= \textcircled{-9x^6y^7} \end{aligned}$$

$$(-x)^4 = -x \cdot -x \cdot -x \cdot -x$$

$$-x^4 = -1 \cdot x^4$$

$$-5^2 \stackrel{?}{=} (-5)^2$$

$$21) \frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$$

$$= \frac{2p^3}{(2pm^{-1})^4 2p^2 q^2 m^{-1}}$$

$$= \frac{2ppp}{2pm^{-1} 2pm^{-1} 2pm^{-1} 2pm^{-1} 2p^2 q^2 m^{-1}}$$

$$= \frac{\cancel{2pppp} \cancel{mmmm}}{\cancel{2ppppp} \cancel{qq} \cancel{m} 2 \cdot 2 \cdot 2 \cdot 2} = \frac{m^3}{16p^2 q^2}$$

1.157437/E-22

$$1.15743171 \times 10^{-22} \approx 1.16 \times 10^{-22}$$

6,157,437

$O(.00000000060600000000 // 5743 / 7)$

17. 0.000435 $= 4.35 \times 10^{-4}$

29. $0.000345 \cdot 8,980,000,000$

$$= (3.45 \times 10^{-4})(8.98 \times 10^9)$$

$$= (3.45 \times 8.98)(10^{-4} \times 10^9)$$

$$(30.981)(10^5)$$

$$= 30,981,000 \leftarrow \text{Standard form}$$

or

$$3.0981 \times 10^6 \leftarrow$$

S.N. Form

$$3x + 4x = 7x$$
$$4xy + 5xy = 9xy$$

$$\begin{aligned} (17.) \quad & 7x^6y^4 + (x^3y^2)^2 \\ &= 7x^6y^4 + (xxxxyy)(xxxxyy) \\ &= 7x^6y^4 + 1x^6y^4 \\ &= 8x^6y^4 \end{aligned}$$

On January 28 of this year, Louis Brandeis became the first American Jew to be appointed to the United States Supreme Court. Solve this puzzle to learn the year.

- The two-digit number formed by my tens and units digits is equal to $-10 - (-26)$.
- The two-digit number formed by my thousands and hundreds digits is the largest prime less than 20.
- The sum of all of my digits is equal to the value of this expression: $(-x)^2 + y$, where $x = 3$ and $y = 8$.

What year am I?

1	9	1	6
Thousands	Hundreds	Tens	Units

Chuck Norris Can Break Air.

Justice Brandeis was appointed in 1891.

34.)

$$\frac{2x^2y}{x^3y^2} \cdot \frac{4x^7y^2}{2x^3}$$

$$= \frac{\cancel{8} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y}}{\cancel{2} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y}}$$

$$= \frac{4x^3y}{1}$$

35.)

$$\frac{-8x^6y^{-3}}{3x^{-2}y^{-5}} \cdot \frac{-6x^{-10}y}{-4x}$$

$$= \frac{-8x^6x^2y^5}{3y^3} \cdot \frac{-6y}{-4xx^{10}}$$

$$= \frac{\cancel{48} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y}}{\cancel{-12} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y}}$$

$$= \frac{-4y^3}{x^3}$$

36.)

$$\frac{(4x^2y^3)^{-1}}{3y} \cdot \frac{(2xy^2)^2}{x^{-3}}$$

$$= \frac{1}{(4x^2y^3) \cdot 3y} \cdot \frac{(2xy^2)^2 x^3}{1}$$

$$= \frac{(2xy^2)(2xy^2)xxx}{4xxx yyy 3y}$$

$$= \frac{4x^3}{12} = \frac{1x^3}{3}$$

37.)

$$\frac{5x^{-1}y^3}{xy^{-4}} \cdot \frac{(-2x^2)^{-3}}{y}$$

$$= \frac{5y^3y^4}{xx'} \cdot \frac{1}{(-2x^2)^3 y}$$

$$= \frac{5yyyyyy}{xx(-2xx)(-2xx)(-2xx)y}$$

$$= \frac{5y^6}{-8x^6}$$

$$21) \frac{(2pm^{-1}q^0)^{-4} \cdot 2m^{-1}p^3}{2pq^2}$$

$$= \frac{2p^3}{(2pm^{-1})^4 2pq^2 m^1}$$

$$= \frac{2ppp}{(2pm^{-1})(2pm^{-1})(2pm^{-1})(2pm^{-1}) 2pqqm}$$

$$\rightarrow = \frac{2mmmmppp}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2m ppppqq} = \frac{m^3}{16p^2q^2}$$

Using Scientific Notation

- a. Write 6.7239×10^{-4} in decimal form.

.00067239

- b. Write 1.884×10^5 in decimal form.

188,400

- c. Write 26,645 in scientific notation.

2.6645×10^4

- d. Write 0.00829 in scientific notation.

8.29×10^{-3}

write in standard form

e. 2.345×10^8

234,500,000

write in S.N. form

f. 0.008367

8.367×10^{-3}

write in Standard form then in S.N. form

g. $8 \times 10^4 \cdot 10 \times 10^{-1}$
 $80,000 / 8 \times 10^4$

Algebra

$P = 72''$

$w+10$

Thousands

Hundreds

Tens

Units

45

On January 31 of this year, the first daytime soap opera, *These Are My Children*, was broadcast from the NBC studios in Chicago. Solve this puzzle to learn the year.

- The square root of the two-digit number formed by my tens and units digits is equal to 7.
- My hundreds digit is equal to the number of inches in $\frac{3}{4}$ of a foot.
- The sum of all of my digits is equal to the length of a rectangle with a perimeter of 72 whose length is 10 greater than its width.

What year am I?

The First Law of Thermodynamics states that energy can neither be created nor destroyed... unless it meets Chuck Norris.

19. $k^0(k^4)(k^{-6}) =$

$$\frac{1(\cancel{k}\cancel{k}\cancel{k}\cancel{k})}{\cancel{k}\cancel{k}\cancel{k}\cancel{k}kk} = \left(\frac{1}{k^2} \right)$$

$$5) \frac{2x^2y^4 \cdot 4x^2y^4 \cdot \cancel{3x}}{\cancel{3}x^{-3}y^2}$$

~~8xxxxxxxxxyyyyyy~~

$= 8x^8y^6$

$$(17.) \quad 7x^6y^4 + (x^3y^2)^2$$

$$7x^6y^4 + x^6y^4$$

$$= (8x^6y^4)$$

~~Ex~~

$$2x + 3x = 5x$$

$$4xy + 5xy = 9xy$$

$$3xy + 2x$$

$$5\heartsuit + 7\heartsuit = 12\heartsuit$$

$$20\cup - 5\cup = 15\cup$$

$$3x^2yz + 5x^2yz$$

$$1x^6 + 1x^6 = 2x^6$$

$$x + x = 2x$$

Write in S.N.

h. Use properties of exponents to evaluate $(2.6 \times 10^6)(4.7 \times 10^{-2})$.

$$ab=ba$$

$$\begin{aligned} & 12.22 \times 10^4 = \\ & \underline{1.222 \times 10^5} \end{aligned}$$

i. $4 \times 10^{-6} \cdot 2 \times 10^5$

$$\underline{8 \times 10^{-1}}$$

j. $12 \times 10^3 \cdot 3 \times 10^{-6}$

$$\begin{aligned} & 36 \times 10^{-3} = 0.036 \\ & \underline{3.6 \times 10^{-2}} \end{aligned}$$

k. $\frac{9.3 \times 10^7}{3.7 \times 10^9} \approx$

2.513513514

$\approx 2.51 \times 10^{-2}$

l. $\frac{1.99 \times 10^{30}}{7.36 \times 10^{22}} \approx$

0.27×10^8

$27,000,000$

2.7×10^7

$$270 \times 10^8 = 2.7 \times 10^?$$

$$? = 16$$

QUIZ:

Question 1 Write in scientific notation: 0.000467 and 32000000

Question 2 Express 5.43×10^{-3} as a number. 0.00543

Question 3 $(4.5 \times 10^{-14}) \times (5.2 \times 10^3) = ?$ 2.34×10^{-10}

Question 4 $(6.1 \times 10^5) / (1.2 \times 10^{-3}) = ?$ 234×10^{-11}

Question 5 $(3.74 \times 10^{-3})^4 = ?$

Question 6 The Earth's radius is 6.37×10^3 km. Express this in scientific notation.



Answers: (1) 4.67×10^{-4} , 3.2×10^7 (2) 0.00543 (3) 2.3×10^{-10} (2 significant figures) (4) 5.1×10^8 (2 significant figures) (5) 1.96×10^{-10} (3 significant figures)
(6) 3.73×10^4 (3 significant figures)

23. $(2.4 \times 10^2)(4 \times 10^{-10})$

tebook

9.6×10^{-8}
Scientific notation

.000000096
Standard form

$$\begin{aligned} 10^2 \times 10^{-10} &= \\ \frac{10^2}{10^{10}} &= \frac{10 \cdot 10}{10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10} \\ \frac{1}{10^8} &= 10^{-8} \end{aligned}$$

25. $\frac{5.1 \times 10^6}{1.5 \times 10^2}$

3.4×10^4 S.N. form
 34000 standard form

34000.
1 2 3 4

$$26. \frac{6x^{-2}y^2}{xy^{-3}} \cdot \frac{(4x^{-2}y)^{-2}}{xy^2} = \frac{6y^2y^3}{xx^2} \cdot \frac{1}{(4x^{-2}y)^2xy^2}$$

$$\rightarrow \frac{6y y y y y}{x x x (4x^{-2}y)(4x^{-2}y) x y y} = \frac{6 \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y}}{16 \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y}} = \frac{6y}{16} = \left(\frac{3y}{8} \right)$$

$$7. \frac{-52x^3y^2z}{13xy^2} =$$

$$\frac{-4\cancel{x^3}y\cancel{y^2}z}{1\cancel{x}y\cancel{y}} = \frac{-4x^2z}{1} = \boxed{-4x^2z}$$

$$5) \frac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$$

$$= \frac{24 \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y} \cancel{y}}{3}$$

$$= \frac{8x^8y^6}{1} = 8x^8y^6$$

$$\begin{aligned}
 23. \quad & \left(\frac{2x^2y}{3y} \right)^{-3} \cdot \left(\frac{4y^3}{x^4} \right)^2 \\
 &= \left(\frac{3y}{2x^2y} \right)^3 \cdot \left(\frac{4y^3}{x^4} \right)^2 \\
 &= \left(\frac{3y}{2xy} \right) \left(\frac{3y}{2xy} \right) \left(\frac{3y}{2xy} \right) \left(\frac{4yy}{xxx} \right) \left(\frac{4yy}{xxx} \right) \\
 &= \frac{432y^6}{8x^{14}} = \frac{54y^6}{x^{14}}
 \end{aligned}$$

23. $\left(\frac{2x^2y}{3y}\right)^{-3} \cdot \left(\frac{4y^3}{x^4}\right)^2$

$$\left(\frac{3y}{2x^2y}\right)^3$$

$$\left(\frac{3x^2y}{2y}\right)^3$$

$3x$ monomial

$4x + 3$ binomial

$x^2 + 2x - 4$ trinomial

$$\begin{aligned} 3) & \left(n^3\right)^3 \cdot 2n^{-1} \\ &= \frac{(nnn)(nnn)(nnn) \cdot 2}{n'} \\ &= 2n^9 \end{aligned}$$

$$\begin{aligned}(n^{-3})^{-3} &= \frac{1}{(n^{-3})^3} \\&= \frac{1}{(n^{-3})(n^{-3})(n^{-3})} \\&= \textcircled{n^9}\end{aligned}$$

$$\textcircled{21.} \frac{(2pm^{-1}g^0)^{-4} \cdot 2m^{-1}p^3}{2pg^2}$$

$$= \frac{2p^3}{2pg^2(2pm^{-1})^4 m^{-1}} = \frac{2ppp}{m^{-1}2pgg2pm^{-1}2pm^{-1}2pm^{-1}2pm^{-1}}$$

$$\rightarrow \frac{\cancel{2} \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p} \cancel{p}}{\cancel{m}^{-1} \cancel{2} \cancel{p} \cancel{g} \cancel{g} \cancel{2} \cancel{p} \cancel{m}^{-1} \cancel{2} \cancel{p} \cancel{m}^{-1} \cancel{2} \cancel{p} \cancel{m}^{-1} \cancel{2} \cancel{p} \cancel{m}^{-1}} = \frac{m^3}{16p^2g^2}$$

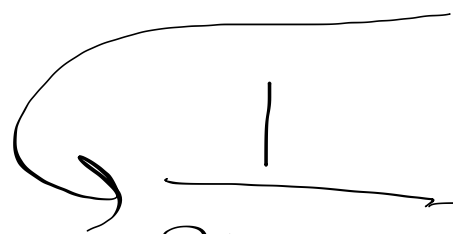
$$\left(\frac{2}{3}\right)^{-3} = \left(\frac{3}{2}\right)^3 = \left(\frac{3 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2}\right) = \frac{27}{8}$$

$ab = ba$

$$(3.1 \times 10^3)(2 \times 10^{-5})$$
$$6.2 \times 10^2$$

$$\begin{aligned} & (12 \times 10^3)(12 \times 10^{-5}) \\ &= 144 \times 10^2 = 14400 \\ &= \textcircled{1.44 \times 10^4} \end{aligned}$$

$$(3b^4)^{-2} = \frac{1}{(3b^4)^2}$$


$$\frac{1}{3b b b b b b b b \ 3 b b b b b b b b}$$

$$= \frac{1}{9b^{12}}$$



decay factor $\frac{y_2}{y_1}$

ex

x	1	2
y	72	50

 decay rate?
31%

$$\frac{50}{72} \approx 0.69 \quad 100 - 69 = 31$$

Number of Years	0	1	2	3	4	5
Number of Tribetts			4900	3430	2401	1681

- 1a. What is the decay factor for this relationship? How do you know?

$$\frac{y_4}{y_3} \text{ or } \frac{y_3}{y_2} \text{ or } \dots$$

$$\frac{3430}{4900} = 0.7$$

- 1b. What is the decay rate for this relationship? How do you know?

$$1 - 0.7 = 0.3$$

$$0.3 = 30\%$$

- 1c. Write an equation for the relationship between the number of years and the number of tribetts.

$$y = a(b)^x$$

$$y = 10,000(0.7)^x$$

- 1d. Explain what information the numbers and variables in your equation represent in

decay factor $\frac{y_2}{y_1}$

ex

x	1	2
y	72	50

 decay rate?
31%

$$\frac{50}{72} \approx 0.69 \quad 100 - 69 = 31$$

exponential decay

$$y = 16(0.8)^x$$

If you have decay rate, then
how do you find the decay factor?

a rate of decay $\Rightarrow 30\%$
then the decay factor is $0.7 \checkmark$

$y = 10000(0.7)^x$

of Tribbett

Starting Tribetts

Factor at which they are decaying

Years

Maggie Walker became the first African-American woman to establish and manage a bank in this year. Solve this puzzle to learn the date.

- My units digit is the square root of my hundreds digit.
- The two-digit number formed by my hundreds and tens digits is equal to the sum of the first 10 even numbers.
- The sum of all of my digits is equal to the number between $\sqrt{144}$ and $\sqrt{196}$.

What year am I?

1	9	0	3
Thousands	Hundreds	Tens	Units

Aliens are real, they're just hiding from Chuck Norris

2. Kai wants to purchase a new racing bike. After a lot of research, he finds a bike that suits him. The bike costs \$1500. Over the summer, Kai raises \$1000 by doing odd jobs and collecting contributions from his family and friends. He invests the money in an account that pays 8% interest per year on the balance in the account.

- 2a. Make a (number of years, account balance) table to determine how long it will take Kai's account to be worth \$1500.

- 2b. Write an equation that models this situation.

$$y = 1000(1.08)^x$$

- 2c. What is the growth factor? How do you know?

1.08

$$\frac{y_1}{y_0} = 1.08$$

growth factor

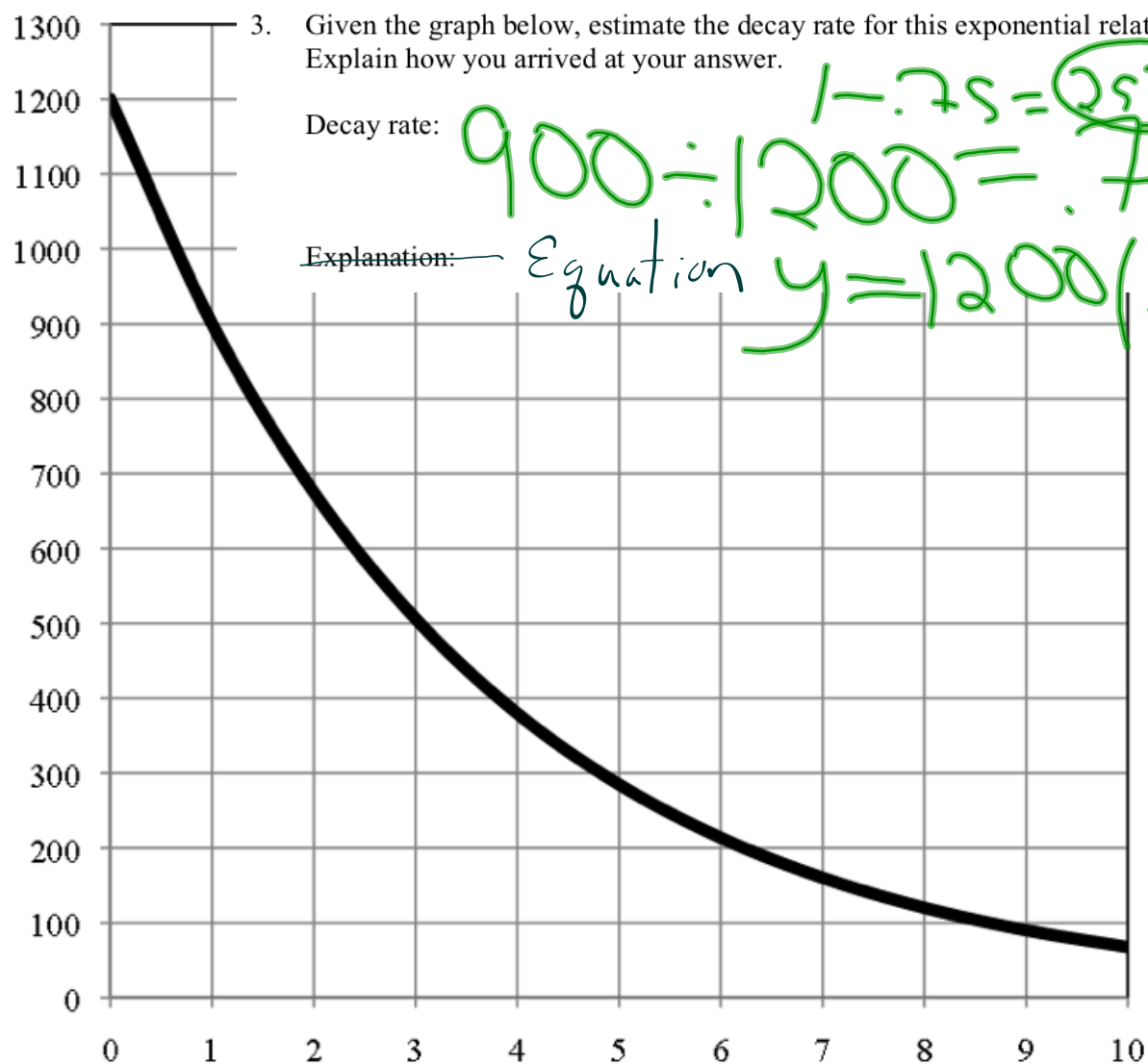
by table result

# of yr	
0	1000
1	1080
2	1166.4
3	1259.71
4	1360.48
5	1469.32
6	1586.87
7	1713.82
8	

It took about 6 years

- 2d. Suppose that, due to inflation, the price of the bike rises by \$50 each year. How many years will it take Kai to buy the bike now? (Hint: Making a (number of years, bike cost) table may be helpful.)

years	\$	cost
0	1000	1500
1	1080	1550



3. Belinda has a plan for distributing prize money for a trivia contest. For the first correct response, the contestant will receive \$500. For the second correct response, the contestant will receive an additional \$100, for a total of \$600. For the third correct response, the contestant will receive \$100 more, for a total of \$700. Belinda's plan continues in this pattern.

- 3a. Make a table showing a contestant's earnings for answering Questions 1 through 6 correctly.

Number of Correct Responses	1	2	3	4	5	6
Total Earnings	\$500	\$600	\$700			

- 3b. Write an equation for the relationship between the number of correct responses c and the amount of money the contestant will receive m .
- 3c. Monty has a different plan for distributing prize money for the trivia contest. The contestant will receive \$5 for the first correct response. For the second correct response, the total winnings will increase to \$25, for the third correct response, the total winnings will increase to \$125, and so on.

- 3c. Monty has a different plan for distributing prize money for the trivia contest. The contestant will receive \$5 for the first correct response. For the second correct response, the total winnings will increase to \$25, for the third correct response, the total winnings will increase to \$125, and so on.

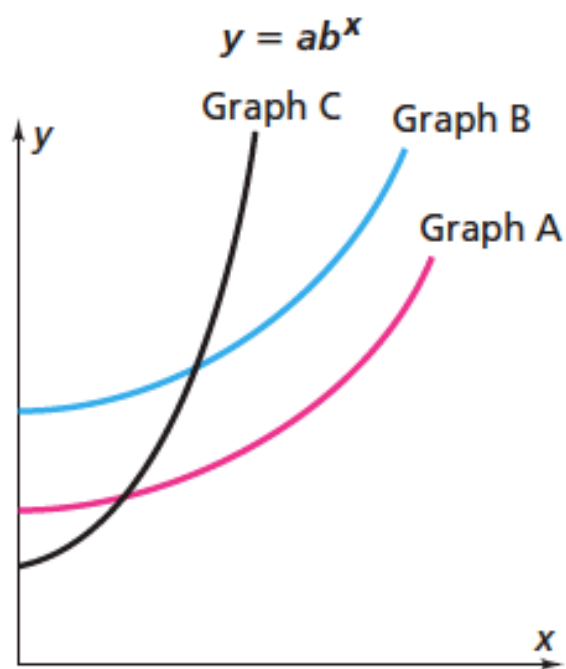
Make a table showing a contestant's earnings for answering Questions 1 through 6 correctly.

Number of Correct Responses	1	2	3	4	5	6
Total Earnings	\$5	\$25	\$125			

- 3d. Write an equation for the relationship between the number of correct responses c and the amount of money the contestant will receive m .
- 3e. How are the patterns of change in Belinda's and Monty's plans alike?

43. Each graph below represents an exponential equation of the form $y = ab^x$.

- a.** For which of the three functions is the value of a greatest?
- b.** For which of the three functions is the value of b greatest?



$$y_1 = 4(0.5)^x$$

$$y_2 = 2(3)^x$$

$$y_3 = 5(1.2)^x$$

$$y_4 = 10\left(\frac{2}{3}\right)^x$$

- 1.) Type of relationship (linear?, inverse, exponential)
- 2.) sketch graph
- 3.) rate, factor, slope...

Inquire

Reflect

IMAGINE

GROW



Question