Key

Math 1
2-7 Homework

Name _____

Date _____

1. We've all heard the expression that a 5 year old dog is said to be about "35 years old in human years." How do they figure that out? Similarly, cats age in the same way. The data table below shows the ages of cats as related to the ages of humans, as observed by French veterinarian Dr. A. LeBeau.

X

Cat Age (years)	0.5	1	2	4	6	8	10	14	18
Y Equivalent Human Age (years)	10	15	25	32	40	48	56	72	91

a. Is this data linear? Explain.

Not exactly at first, but then it is pretty linear after 4 human yrs for each cat year.

b. What is the linear regression equation in function notation?

$f(x) = 12.341 + 4.377x$

c. Correlation value: $r = 0.996$ Meaning:

There is a strong, positive association between cat & human age.

d. According to your equation how many 'human years' does a cat gain for each year?

4.377 years → This is the slope

e. According to the equation, how old would a newborn cat be in human years? Does that answer make sense?

12.341 years old. It makes sense because a cat ages faster than a human.

f. According to the equation, how old 'in human years' would a cat be at age 7?

$f(7) = 12.341 + 4.377(7) =$ **42.98 human years**

g. According to the equation, how old 'in human years' would a cat be at age 20?

$f(20) =$ **99.88 human years**

h. According to the equation, if a cat is said to be 75 in human years, what is their actual age?

$75 = 12.341 + 4.377x$

$-12.341 \quad -12.341$

$\frac{62.659}{4.377} = \frac{4.377x}{4.377}$

→ **$x \approx 14.32$ cat years**

2. Sometimes, data in real life can be linear. It can be then useful to find the equation that best fits the data, even if it is not perfectly linear.

The following table shows the average weight of a girl compared to her age.

a
w

Age	0.5	1	2	3	4	6	8	10
Weight (in lbs.)	15.9	20.1	24.9	30.0	33.1	45.0	56.0	69.0

Graph this data on your calculator.

a. Does it seem to be linear?

It is pretty close.

b. What is the equation of best fit?

$w(a) = 13.439 + 5.405a$

c. What is your correlation coefficient?

$r \approx 0.998 \longrightarrow$ strong, positive association

d. If the equation is true, what would you expect a girl to weigh at age 18?

$w(18) = 13.439 + 5.405(18) \approx$ 110.729 pounds

e. Will this data continue to be linear in the future?

No! We tend to stop growing eventually...

3. Correlation Coefficient: the number **r** on the calculator when you do regression.
A number from -1 to 1. r indicates the direction of the relation between he variables. If r is positive, the slope of the line is positive and the correlation is positive (the variables agree). If r is negative, he slope of the line is negative and the correlation is negative (the variables disagree).

- The closer r is to 1, the more positive the relationship (very strong accuracy).
- The closer r is to -1, the more negative the relationship (very strong negative accuracy.)
- The closer r is to 0, the less of a relationship there is (very weak accuracy).

After reading what it says above, describe what the following correlation coefficients would mean.

a. r = .99928 — Strong, positive relationship → Both variables increase or both decrease

b. r = 0 — No relationship

c. r = -.97546 — Strong, negative relationship → one goes up, other goes down

d. r = .67823 — Moderate, positive relationship

e. r = -.21236 — Very weak, negative relationship

4. Examine the following studies and decide if they are an example of correlation or causation. If there is a lurking variable, identify it.

a.

Five Weird Ways to College Success

Don't smoke.

[Alexander] Astin and [Leticia] Oseguera [of UCLA] examined the graduation rates of 56,818 students at 262 colleges, a huge sample, and reported that smoking had one of the largest negative associations with degree completion.

Source: Jay Mathews, *The Washington Post*, June 13, 2006, www.washingtonpost.com/wp-dyn/content/article/2006/06/13/AR2006061300628.html

Correlation. Lurking variable: bad upbringing/parenting.

b.

Tall Men Display Greater Risk of Skin Disease

A poll conducted by University of Washington researchers in Seattle found that men taller than 6 feet, 1 inch had almost $2\frac{1}{2}$ times the risk of developing melanoma, an often fatal form of skin cancer, as those who were shorter than 5-foot-8.

Source: *Los Angeles Times*, January 14, 2002, page S2.

Causation. Taller = more skin surface area.

c.

Mind Games May Keep the Brain Sharp

An absorbing book or a challenging crossword puzzle may keep your mind more than busy. It may keep it healthy, too, according to a 21-year study of mental breakdown in old age. ...

In the Einstein College study of 469 elderly people, those in the top third in mental activity had a 63 percent lower risk of dementia than the bottom third. Taking part in a single activity one day a week reduced the risk by 7 percent.

The use-it-or-lose-it notion is not a new idea. Other researchers have discovered evidence that mental activity may guard against dementia. But it is hard to prove since early dementia without obvious symptoms may cause people to slack off their hobbies. If this is so, dementia affects hobbies—and maybe not the reverse.

The researchers tried to minimize that possibility by considering only those who were dementia-free for seven years after joining the study. They also tried to eliminate the potential role of education and intelligence in guarding against dementia.

The study also took physical exercise into account. Nearly all physical activities, including stair climbing and group exercises, appeared to offer no protection against dementia. The only exception was frequent dancing, perhaps because dance music engages the dancer's mind, suggested lead researcher Joe Verghese, a neurologist at Einstein College.

Source: www.cnn.com/2003/HEALTH/conditions/06/19/avoiding.dementia.ap/index.html

Possibly correlation. Lurking variable: Genetics – People who like to challenge their mind might be less likely to get dementia genetically.