

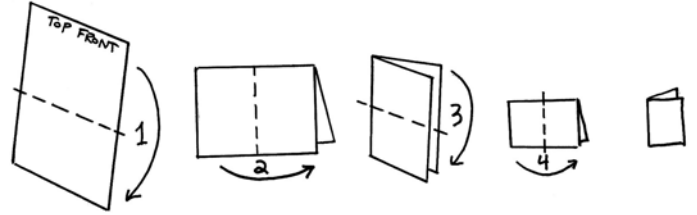
Algebra 1 CC
Assignment #55
Exponential Growth and Decay
*** Optional**

1. A piece of paper is 0.01 centimeters (cm) thick. When you fold it once, it becomes 0.02 centimeters thick. If you fold it again, it doubles again to 0.04 centimeters thick. Each fold doubles the thickness of the paper.

(a) How thick is the paper after:

4 Folds:

5 Folds:



(b) For each of the following number of folds, f , show how you can calculate the thickness, T , based on repeatedly multiplying by 2.

$$f = 0 \quad T = 0.01$$

$$f = 1 \quad T = 0.01(2)^1 = 0.02$$

$$f = 2 \quad T = 0.01(2) = 0.01(2)(2) = 0.01(2)^2$$

$$f = 3 \quad T =$$

$$f = 4 \quad T =$$

(c) Determine a formula, based on (b), for the thickness, T , based on the number of folds, f .

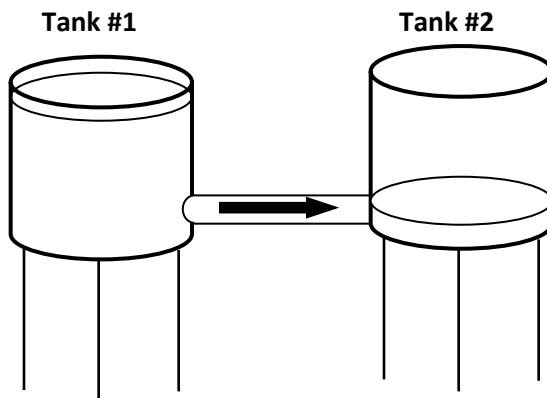
(d) How thick would the paper be if $f = 10$? Use proper units

(e) If there are 100 centimeters in a meter, how many *meters* thick is the paper after 20 folds? Show the work that leads to your answer.

(f) If there are 1000 meters in a kilometer and the Moon is 384,000 kilometers away from the Earth, will the paper reach the Moon after 40 folds? Show the calculations that lead to your answer.

R1. Lilly and Rosie are sisters. The sum of their ages is 19 and the positive difference of their ages is 9. Set up a system of equations involving Lilly's age, L , and Rosie's age, R , assuming that Lilly is the older child. Solve the system to find their ages.

*R2. Water is flowing from Tank #1 to Tank #2 as shown in the picture. Originally, Tank #1 had 1,540 gallons in it and Tank #2 had 236 gallons in it. Water is draining out of Tank #1 at a rate of 6 gallons per minute and, thus, filling Tank #2 up at a rate of 6 gallons per minute.



(a) Write an equation for each tank that models the volume of water, v in gallons, as a function of the number of minutes, m , that the water has been flowing.

(b) Find out how long it takes, to the nearest minute, for the two tanks to have the same number of gallons. Will it take longer or shorter than 2 hours? Justify.

1. (a) 4 Folds: 0.16 cm
5 Folds: 0.32 cm

(b)

$$f = 3 \quad T = 0.01(2)^3$$

$$f = 4 \quad T = 0.01(2)^4$$

(c) $T(f) = 0.01(2)^f$

(d) 10.24 cm

(e) 104.8576 m

(f) No. A paper folded 40 times would have a thickness of approximately 109,951 km.

R1. Lilly is 14
Rosie is 5

R2. (a) Tank #1 $V = 1540 - 6m$
Tank #2 $V = 236 + 6m$

(b) $108.\bar{6}$ minutes

Less than 2 hours

2 hours = 120 minutes

$108.\bar{6} < 120$