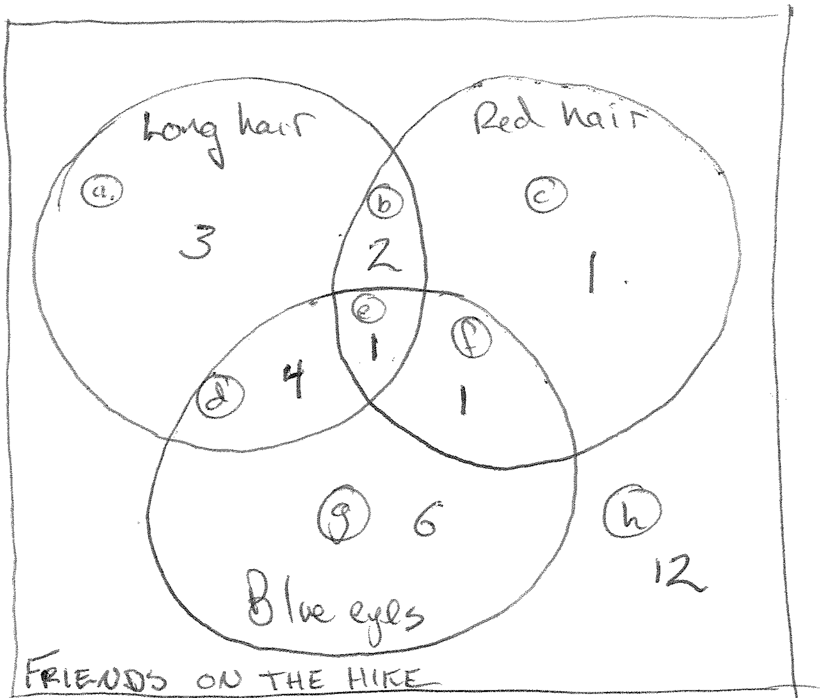
FINAL EXAM REVIEW

1. a.

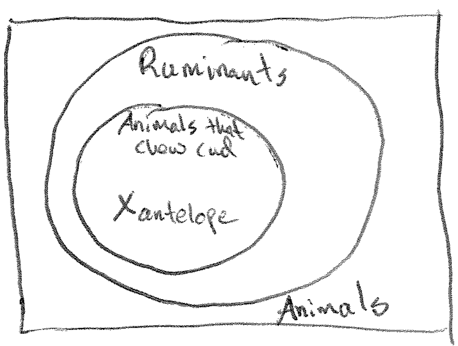


b. Regions b, c, e, f, d, & g.

$b + c + e + f + d + g =$ **15 people**

c. Region h. **12 people**

2. a.



b. Yes - the antelope x mark is in the Ruminant circle.

3a. $70 \text{ minutes} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{40 \text{ miles}}{1 \text{ hour}} = \boxed{46.67 \text{ miles}}$

b. $46.67 \text{ miles} \cdot \frac{1 \text{ gallon}}{25 \text{ miles}} = 1.8667 \text{ gallons each way}$

$2 \cdot 1.8667 \text{ gallons} = \boxed{3.733 \text{ gallons}}$

c. $3.733 \text{ gallons} \cdot \frac{\$2.00}{1 \text{ gallon}} = \$7.467$

$\frac{\$7.467}{4 \text{ people}} = \$1.867$ or about $\boxed{\$1.87 \text{ per person.}}$

4.a. New - Old = 15-20 = $\boxed{-5 \text{ hikers}}$ Note that your answer is wrong without the negative.

b. $\frac{\text{New} - \text{Old}}{\text{Old}} = \frac{15-20}{20} = \boxed{-25\%}$

5.a. $24 = (1+0.5)x$

$24 = 1.5x$

$16 = x$

$x = \boxed{16 \text{ omens}}$

b. Looking for a relative difference. Reference = this year; Compared = last year.

$\frac{\text{compared} - \text{reference}}{\text{reference}} = \frac{16-24}{24} = \frac{-8}{24} = -33.33\%$

so $\boxed{33.33\% \text{ fewer}}$

c. Use $Q = Q_0 \cdot (1+r)^t$

$Q = 24 \cdot (1+0.5)^{20}$

$= 79{,}806.15$ or about $\boxed{79{,}806 \text{ dark omens}}$

5.a. $5 \cdot 10^9$ blades of grass

$2 \cdot 10^{-2}$ grams of grass per blade per day

b. $5 \cdot 10^9 \cdot 2 \cdot 10^{-2} = 5 \cdot 2 \cdot 10^9 \cdot 10^{-2} = 10 \cdot 10^{-7} = 10^{-7+1} = \boxed{10^{-6} \text{ grams per day}}$

7.a. Method 1: $\frac{\log(2)}{\log(1+r)} = \frac{\log(2)}{\log(1+0.04)} = \boxed{17.67 \text{ hours}}$

Method 2: $2 = 1 \cdot (1+0.04)^T$

$2 = (1+0.04)^T$

$\log(2) = \log\left[(1+0.04)^T\right]$

$\log(2) = T \log(1+0.04)$

$\frac{\log(2)}{\log(1+0.04)} = T$

$\boxed{T = 17.67 \text{ hours}}$

7b. $Q = 100 \cdot (1+0.04)^{2 \cdot 24} = 100 \cdot (1+0.04)^{48} = 657.05$ so **657 Zombies**

c. $3200 = 100 \cdot (1+0.04)^t$

$32 = (1+0.04)^t$

$\log(32) = \log[(1+0.04)^t]$

$\log(32) = t \log[1+0.04]$

$\frac{\log(32)}{\log(1+0.04)} = t$

$t =$ **88.365 hours**

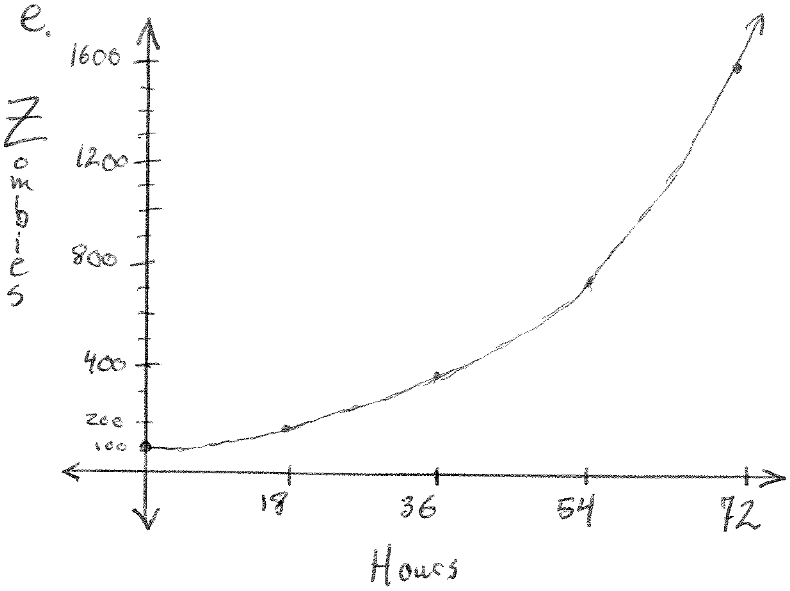
8a. Exponential growth, since it's increasing by a fixed percentage per hour.

b. Indepentent variable is time

c. Dependent variable is # of zombies.

d. The range is the possible # of zombies - between 0 & 2,000,000. So (0, 2,000,000].

e.



Hours Passed	Zombies
0	100
17.67	200
35.35	400
53.02	800
70.69	1600

9. a. Say we have \$100 in our account. Then after 1 year we'd have

$\$100 \cdot \left(1+\frac{0.03}{12}\right)^{12 \cdot 1} = \$103.0416$

Relative change after 1 year is

$\frac{\$103.0416 - \$100}{\$100} = 3.0416\%$ so about **3.04% APY**

b.

$\$30{,}000 = PMT \cdot \frac{\left[\left(1+\frac{0.03}{12}\right)^{12 \cdot 4} - 1\right]}{\left(\frac{0.03}{12}\right)}$

$PMT = \frac{30{,}000}{\left(\frac{\left[\left(1+\frac{0.03}{12}\right)^{4 \cdot 12} - 1\right]}{\left(\frac{0.03}{12}\right)}\right)} = \$589.029\ldots$ so **\$589.03**

10. $\$5{,}000 = \$2000 \cdot \left(1 + \frac{0.036}{12}\right)^{12Y}$

$$\frac{\$5{,}000}{\$2{,}000} = \left(1 + \frac{0.036}{12}\right)^{12 \cdot Y}$$

$$\log\left(\frac{\$5000}{\$2{,}000}\right) = \log\left[\left(1 + \frac{0.036}{12}\right)^{12Y}\right]$$

$$\log\left(\frac{\$5000}{\$2000}\right) = 12Y \log\left[1 + \frac{0.036}{12}\right]$$

$$\frac{\log\left(\frac{5000}{2000}\right)}{\log\left(1 + \frac{0.036}{12}\right)} = 12Y$$

$$\frac{\left(\frac{\log\left(\frac{5000}{2000}\right)}{\log\left(1 + \frac{0.036}{12}\right)}\right)}{12} = Y$$

$y = 25.49$ years. But only compound monthly.

$0.49 \text{ years} \cdot \frac{12 \text{ months}}{1 \text{ year}} = 5.888$ months

So really,

25 years and 6 months

11. a. $A = \$1000 \cdot e^{0.04 \cdot 4} = \boxed{\$1{,}173.51}$

b. $PMT = \frac{\$200{,}000 \cdot \left(\frac{0.05}{12}\right)}{\left[1 - \left(1 + \frac{0.05}{12}\right)^{-12 \cdot 30}\right]} = \boxed{\$909.29}$

12. First, find the scaling factor s.

$20\text{ft} = s \cdot 2\text{ft}$

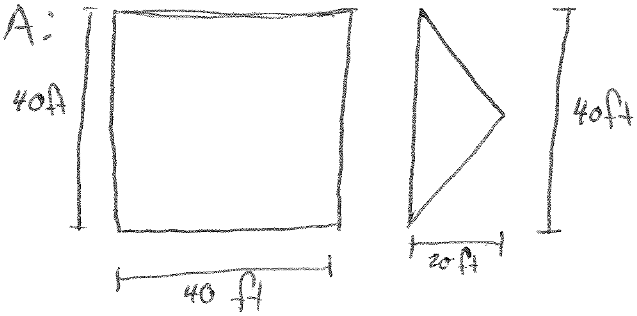
$\div 2\text{ft}$

$10 = s$

a. New area $= s^2 \cdot$ Old area $= 10^2 \cdot 80\text{ ft}^2 = \boxed{8000\text{ ft}^2}$

b. New volume $= s^3 \cdot$ old volume $= 10^3 \cdot 48\text{ft}^3 = \boxed{48{,}000\text{ ft}^3}$

13. PLAN A:

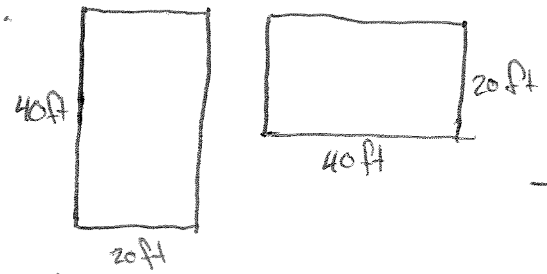


Area = $\ell \cdot w = 40ft \cdot 40ft$
$= 1600 ft^2$

Area = $\frac{1}{2} b \cdot h$
$= \frac{1}{2} \cdot 20ft \cdot 40ft$
$= 400 ft^2$

Total area: $1600 + 400 = 2000 ft^2$.

PLAN B:



← Area = $\ell \cdot w = 40ft \cdot 20ft = 800 ft^2$.

TOTAL = $800ft^2 + 800ft^2 = 1600ft^2$

↑ Area = $\ell \cdot w = 40ft \cdot 20ft = 800ft^2$

So PLAN A is larger.

NOTE: If you are clever, you can solve this without doing any computations at all!

14.a. Pick 2 points: (0, 120,000) & (30, 360,000)

slope is $\frac{rise}{run} = \frac{360{,}000 - 120{,}000}{30 - 0} = \frac{240{,}000}{30} = 8000 \frac{dollars}{year}$

b. $y = mx + b$

m is the slope, so...

$y = 8000x + b$

Now plug in (0, 120000)

$120{,}000 = 8000(0) + b$

$120{,}000 = b$

So $\boxed{y = 8000x + 120{,}000}$

15. a. Volume $= \pi r^2 h$; $r = 1.5$ m
$h = 3$ m.

$= \pi (1.5)^2 \cdot 3$

$= 21.21 \text{ m}^3$

Now convert to liters.

$21.21 \text{ m}^3 \cdot \left(\frac{100 \text{ cm}}{1 \text{ m}}\right)^3 \cdot \frac{1 \text{ L}}{1000 \text{ cm}^3} = \boxed{21{,}205.75 \text{ L.}}$

b. Area $= 2\pi r^2 + 2\pi r h$

$= 2\pi(1.5)^2 + 2\pi(1.5)(3)$

$= \boxed{42.41 \text{ m}^2}$