SOLUTIONS

Practice Exam 1A

Relax. You have done problems like these before. Even if these problems look a bit different, just do what you can. If you're not sure of something, please ask! You may use your calculator. Please show all of your work and write down as many steps as you can. Don't spend too much time on any one problem. Do well. And remember, ask me if you're not sure about something.

As you work, make a "don't forget" list of any information you need to look up or ask about.

---

1. Arva and Ellie began hiking at an elevation of 1,500 feet and climbed at the steady rate of 600 vertical feet per hour.

   (a) Make a table showing their elevation after 1 hour, 2 hours, and 5 hours.

H	1	2	5
E	2,100	2,700	4,500

1500 + 2×600 =

1500 + 600 =

   (b) Name the variables, including units.

H = time Arva and Ellie have been hiking (hours) ~ indep

E = their elevation (feet) ~ dep

   (c) Explain the dependence using a sentence of the form "E is a function of H."

   (d) Is the function increasing or decreasing?

because they're climbing up.

   (e) How long does it take them to reach 5,300 feet up? Try to figure out the answer in hours and minutes (H:MM format).

5300 end
− 1500 start
3800 ft

$3800\,\text{ft} \times \frac{1\text{ hour}}{600\,\text{ft}} = 3800 \div 600 = 6.33\ldots \text{ hours}$

= 6 hours, — minutes

$.33\ldots \text{ hour} * \frac{60\text{ min}}{1\text{ hour}} = .33\ldots \times 60 = 20\text{ min}$

6:20

2. The table shows Henry's weight as a baby.

Age (weeks)	0	12	15
Weight (pounds)	8	14	16

Wanted pounds/week so rate of change

(a) How much weight did Henry gain, on average, each week during his first 12 weeks?

$$\text{roc} = \frac{14-8 \text{ pounds}}{12-0 \text{ weeks}} = (14-8) \div (12-0) = .5 = \frac{1}{2} \text{ pound/week}$$

Henry gained $\frac{1}{2}$ pound/week

(b) During which time interval was Henry gaining weight faster? *Explain.*

$$\text{roc} = \frac{16-14 \text{ pounds}}{15-12 \text{ weeks}} = (16-14) \div (15-12) = .666\ldots = \frac{2}{3} \text{ pound/week}$$

Henry gained $\frac{2}{3}$ pound/week

$\Rightarrow$ Henry gained weight faster during 2nd interval.

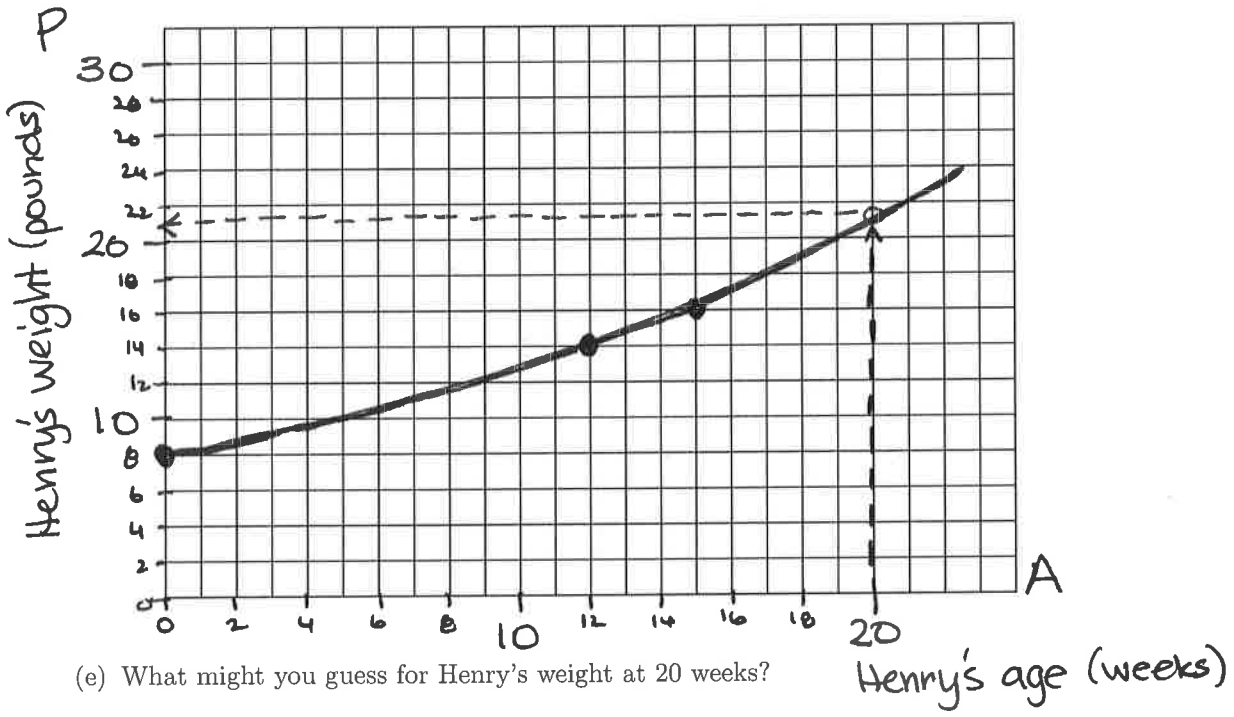
we avoided using W for Weeks or Weight!

(c) Identify the variables, including units and dependence.

A = Henry's age (weeks) ~ indep

P = Henry's weight (pounds) ~ dep

(d) Draw a graph illustrating the dependence. Choose a scale that shows up to 20 weeks and 20 pounds.



(e) What might you guess for Henry's weight at 20 weeks?

guess Henry will weigh $\approx$ 21 pounds at 20 weeks

answer will vary with graph!!

3. Pramesh's new car used 20.5 gallons of gas for a 715 mile trip.

   (a) How many miles per gallon (mpg) does his car get?

$$\frac{715 \text{ miles}}{20.5 \text{ gal}} = 715 \div 20.5 = 34.87\ldots \approx 34.9 \text{ mpg}$$

Pramesh's car gets $\approx$ 34.9mpg.

   (b) At that rate, how many gallons of gas would Pramesh use on his 3,200 mile cross-country trip?

$$3200 \text{ miles} * \frac{20.5 \text{ gal}}{715 \text{ miles}} = 3200 \times 20.5 \div 715 = 91.748\ldots \approx 92 \text{ gal}$$

Pramesh will use about 92 gallons of gas on his trip.

-OR-

$3200 \text{ miles} * \frac{1 \text{ gal}}{34.9 \text{ mi}}$

$= 3200 \div 34.9$

$= 91.69\ldots \approx 92 \text{ gal}$

   (c) If gas costs \$3.799/gallon, how much will gas for that trip cost?

$$92 \text{ gal} * \frac{\$3.799}{\text{gal}} = 92 \times 3.799 = 349.508\ldots \approx \$350$$

Gas for his trip will cost $\approx$ \$350.

4. Ndwiga is reading an article in the paper about atoms. From his physics textbook he discovered that the size of an atom is .142 nanometers. (That's 0.142 nanometers.)

   (a) Write the size of an atom in meters. Use 1 meter = 1,000,000,000 nanometers. Write your answer in usual decimal notation and in scientific notation.

$$.142\ \text{nm} * \frac{1\ \text{meter}}{1{,}000{,}000{,}000\ \text{nm}} = .142 \div 1{,}000{,}000{,}000$$

$$= \boxed{1.42 \times 10^{-10}\ \text{meters}} = \boxed{.000\ 000\ 000\ 142\ \text{meters}}$$

10 places

   (b) Ndwiga would like to know how many atoms across this sheet of paper which is 8.5 inches wide. Use that 1 inch $\approx$ 2.54 cm and 1 meter = 100 cm. Express your final answer in billions of atoms.

don't forget parentheses

$$8.5\ \text{in} * \frac{2.54\ \text{cm}}{1\ \text{in}} * \frac{1\ \text{m}}{100\ \text{cm}} * \frac{1\ \text{atom}}{1.42 \times 10^{-10}\ \text{m}}$$

$$= 8.5 \times 2.54 \div 100 \div (1.42 \times 10 \wedge (-) 10) =$$

$$= 1{,}520{,}422{,}535\ \text{atoms} * \frac{1\ \text{billion}}{1{,}000{,}000{,}000}$$

$$= 1{,}520{,}422{,}535 \div 1{,}000{,}000{,}000$$

$$= 1.52\ldots \approx \boxed{1.5\ \text{billion atoms}}$$

There are about 1.5 billion atoms here!