1.2   Tables and graphs – Practice exercises

1. My grandfather had $200 in savings bonds that matured in 1962 when he gave them to me. The bonds continue to earn interest at a fixed rate so I have yet to cash them in. The table shows some values.   *Story also appears in 4.1 #3 and 5.3 #1*

year	1962	1970	1980	1990	2000	2010
Y	0	8	18	28	38	48
B	200.00	318.77	570.87	1,022.34	1,830.85	3,278.77

indep →
dep →

(a) What do Y and B stand for? Include the units and dependence.

Y = time (years since 1962) ~ indep
B = value of savings bonds ($) ~ dep

(b) What were the savings bonds worth in 1970?   **$318.77**

(c) When were the savings bonds worth $1,022.34?   **1990**

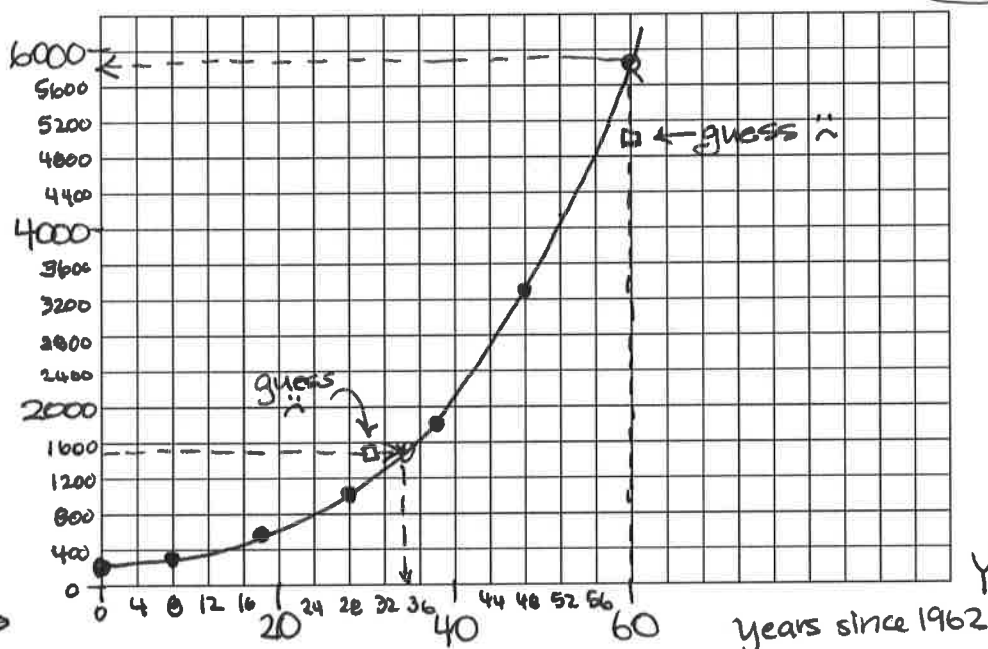*from the table it seems closer to 1990 value than to 2000 value*

(d) Approximately when were the savings bonds worth $1,500?

guess 1994?

(e) What do you expect the savings bonds will be worth in 2020?

guess $5000?

3278.77
−1830.85
‾‾‾‾‾‾‾
1447.92
+3278.77
‾‾‾‾‾‾‾
$4726.69
prob more

(f) Graph the function using the information given in the table.

B is the dep var so it goes here → B

Counted by 400s and 4s to make graph large enough and still fit.

Y is the indep var so it goes here

(g) Use the graph to check your answers to the questions.

35   1994
+1962 −1962
‾‾‾‾   ‾‾‾‾
1997   31

(d) graph seems to suggest they were worth $1,500 in 1997, a few years later than guessed.
(e) graph seems to suggest they will be worth ≈ $5,900 in 2020. That's a lot more than we guessed.

table: indep ‖ ... or indep | dep *graph:* dep ⌐ indep
dep ‖ ...   ⋮ | ⋮

don't forget

2. How cold is it? An air temperature of 10°F is cold but manageable. But add a 30 miles per hour wind and, brrr, it feels like it's -12°F (12 below zero). We say the **wind chill** of 10°F with a 30 mph wind is -12°F. The table lists the wind chill for various wind speeds at an air temperature of 10°F.   Source: National Weather Service

indep   *(a)*

Wind (mph)	0	5	10	15	20	25	30	35	40	45	50	55	60
Wind chill (°F)	10	1	-4	-7	-9	-11	-12	-14	-15	-16	-17	-18	-19

dep   *(b)*   *(c)*

don't forget the units

true for the entire story! just ignore

Story also appears in 4.1 #3

(a) At an air temperature of 10°F with a 20 mph wind, what's the wind chill? **-9°F**

(b) A **cold advisory** is issued whenever the wind chill falls below 0°F. How fast does the wind need to be at an air temperature of 10°F to issue a cold advisory?

Just above 5mph ⟹ **≈ 6mph**

(c) Between a wind chill of 0°F and -15°F, schools in our district are open but kids can't go outside for recess. What's the corresponding range of wind speeds at an air temperature of 10°F?

between 6 mph and 40 mph

(d) Draw a graph showing how wind chill depends on wind speed and use it to check your answers. Extend the vertical axis both above and below the horizontal axis so you can scale for the negative numbers.

dep goes here

axis goes here so can plot negative values

Wind chill (°F)
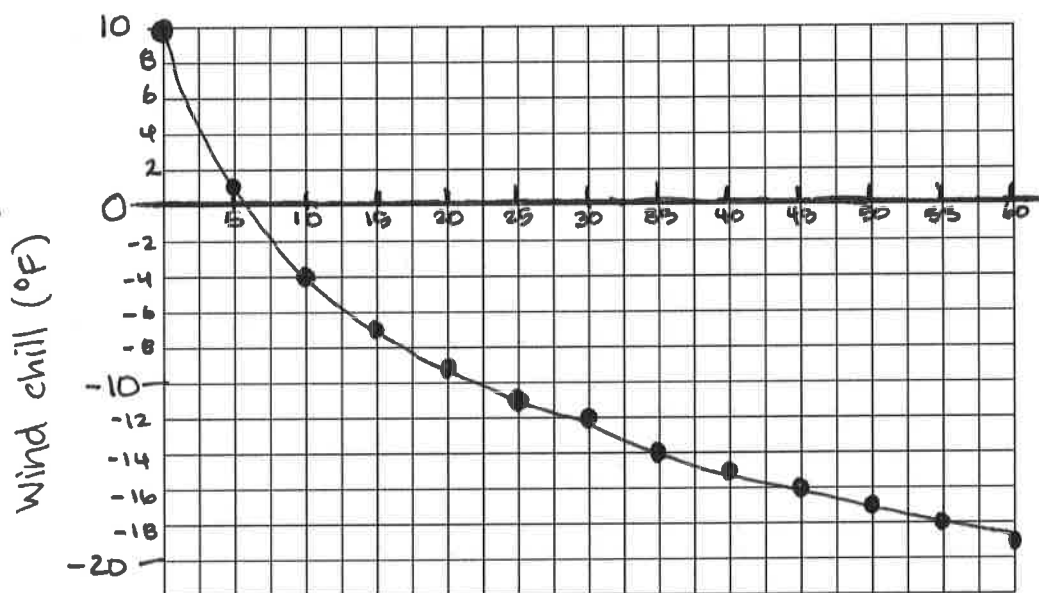
wind (mph)

indep goes here

3. Anthony and Christina are trying to decide where to hold their wedding reception. The Metropolitan Club costs $1,300 for the space and $92 per person.

Story also appears in 1.3 #2 and 3.2 #3

(a) Identify and name the variables, including units.

$$M = \text{total cost at Metro Club } (\$) \sim dep$$
$$G = \text{number of guests } (\$) \sim indep$$

(b) Explain the dependence using a sentence of the form " $\underline{M}$ is a function of $\underline{G}$ "

$$1300 + 150 \times 92 =$$

(c) Make a table of showing the cost for 20, 50, 75, 100, or 150 people.

indep →

G	20	50	75	100	150
M	3,140	5,900	8,200	10,500	15,100

dep →

(d) If Tony and Tina's budget is $8,000, how many people can they invite to their wedding reception? Give a rough estimate from your table.

≈ 70 guests?

(e) Graph the function.

dep → M

not want to write so much? could just list 5000, 10000, 15000

although 0 guests does not really make sense. Value should be $1300, I guess

These points fall on a line. Move on why in Section 1.3

indep

G

total cost ($)

number of guests
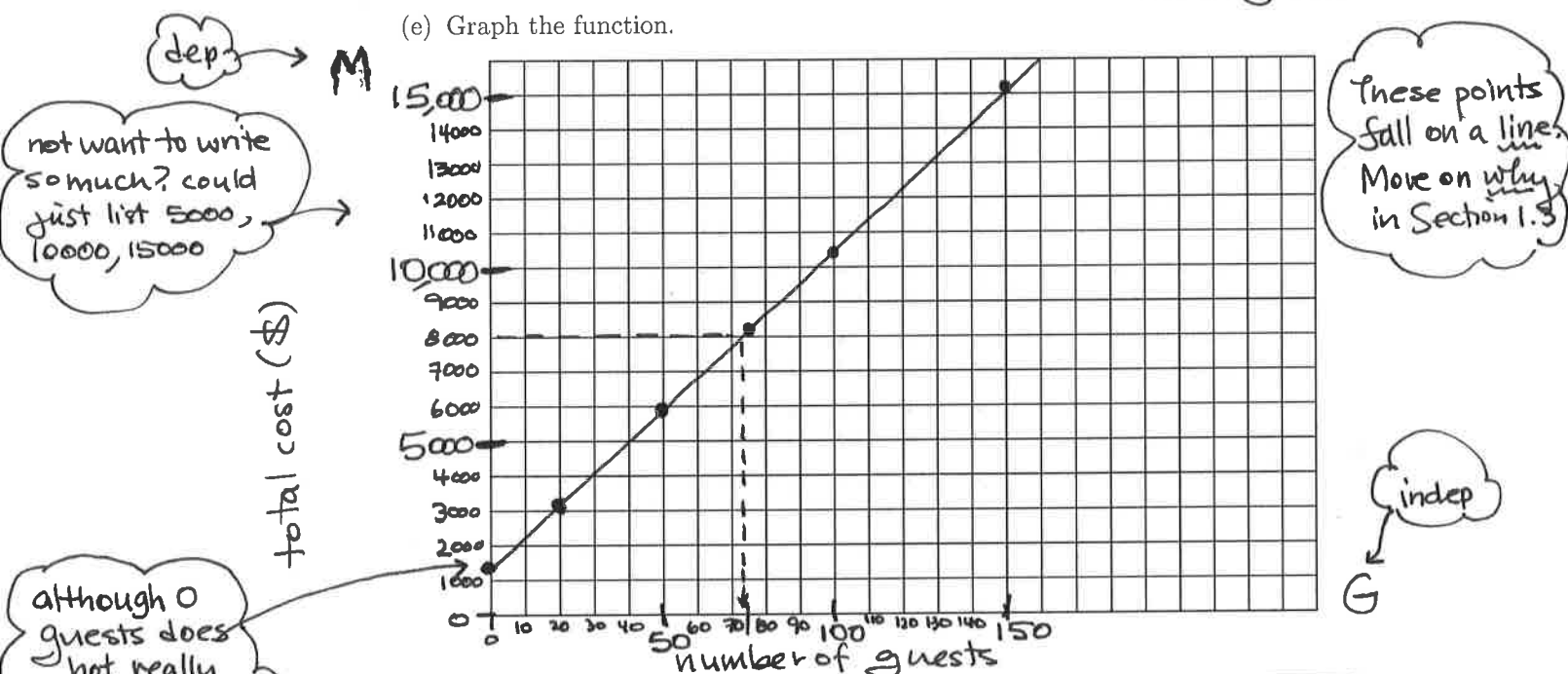
(f) Does your estimate agree with your graph? If not, revise.

≈ 73 guests?

(g) Can you figure out from the story exactly how many guests Tony and Tina can invite to their wedding reception and stay within their $8,000 budget?

$$\begin{array}{r} \$\,8,000 \text{ budget} \\ -\$\,1,300 \text{ space} \\ \hline \$\,6,700 \\ \hline \$92/\text{guest} \end{array}$$

$$= 6700 \div 92 = 72.82\ldots$$

⟹ They can afford up to 72 guests and stay within $8000 budget

means: assuming he buys 1 mug per day

4. A mug of coffee costs $3.45 at Juan's favorite cafe.

Story also appears in 2.1 #4 and 4.2 #2

(a) Juan buys coffee on the way to work every day. How much does Juan spend on coffee in a month? Let's say that's 22 workdays.

$$22 \text{ days} \times \$3.45/\text{day} = 22 \times 3.45 = \boxed{\$75.90}$$

(b) If Juan pays $10 for a discount card, then coffee costs $2.90/mug instead. How much (total) would Juan spend on coffee in a month if he buys the discount card first? Still use 22 workdays. Include the $10.

$$\$10 + 22 \text{ days} \times \$2.90/\text{day} = 10 + 22 \times 2.90 = \boxed{\$73.80}$$

(c) Does the card pay for itself within the month? That means, is the total with the card (including the $10 for the card) less than the total without the card?

$$\boxed{\text{Yes}}$$

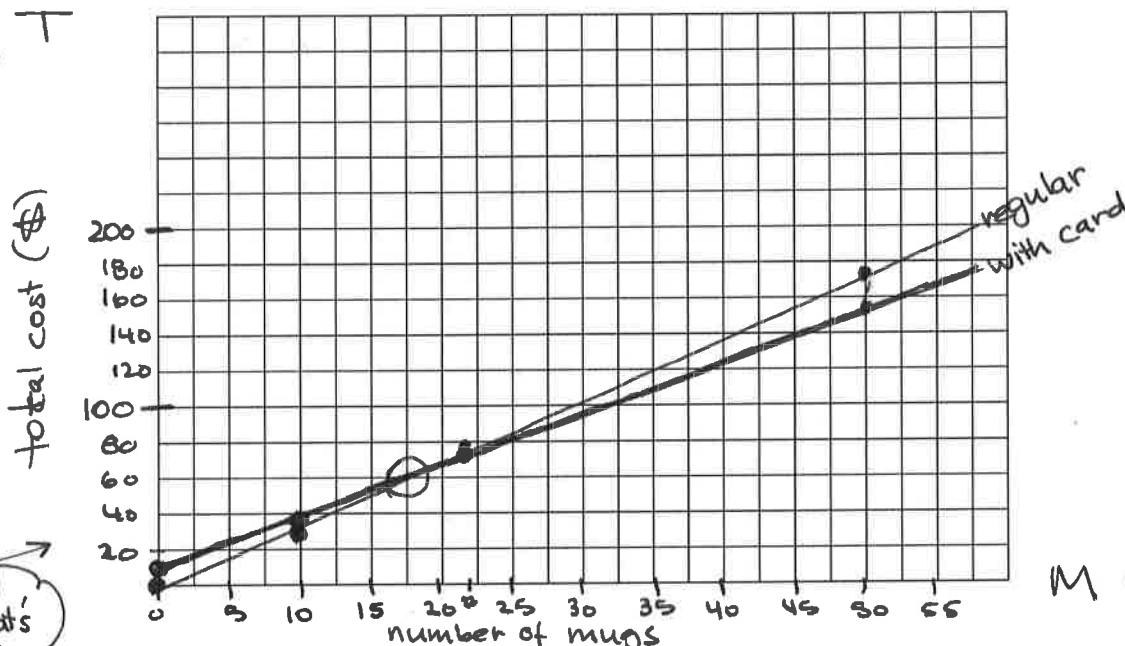(d) Complete the table, where M is the number of mugs of coffee Juan buys and T is the total cost, in dollars.

$10 \times 3.45 =$

M	0	10	22	50
T (regular)	0	34.50	75.90	172.50
T (with card)	10.00	39.00	73.80	155.00

because he buys the card

$10 + 10 \times 2.90 =$

(e) Draw a graph illustrating both functions.

T *dep*

total cost ($)

200, 180, 160, 140, 120, 100, 80, 60, 40, 20

regular
with card

number of mugs

0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55

M *indep*

could've counted by 15s to spread out — but that's an awkward choice of scale for guessing in between

(f) What does the point where the two lines cross mean in terms of the story?

The point of intersection of the two lines is where it changes from being cheaper just to pay $3.45/mug to where it's worth it to buy the discount card.