

Notes on Discrete vs. Continuous Variables

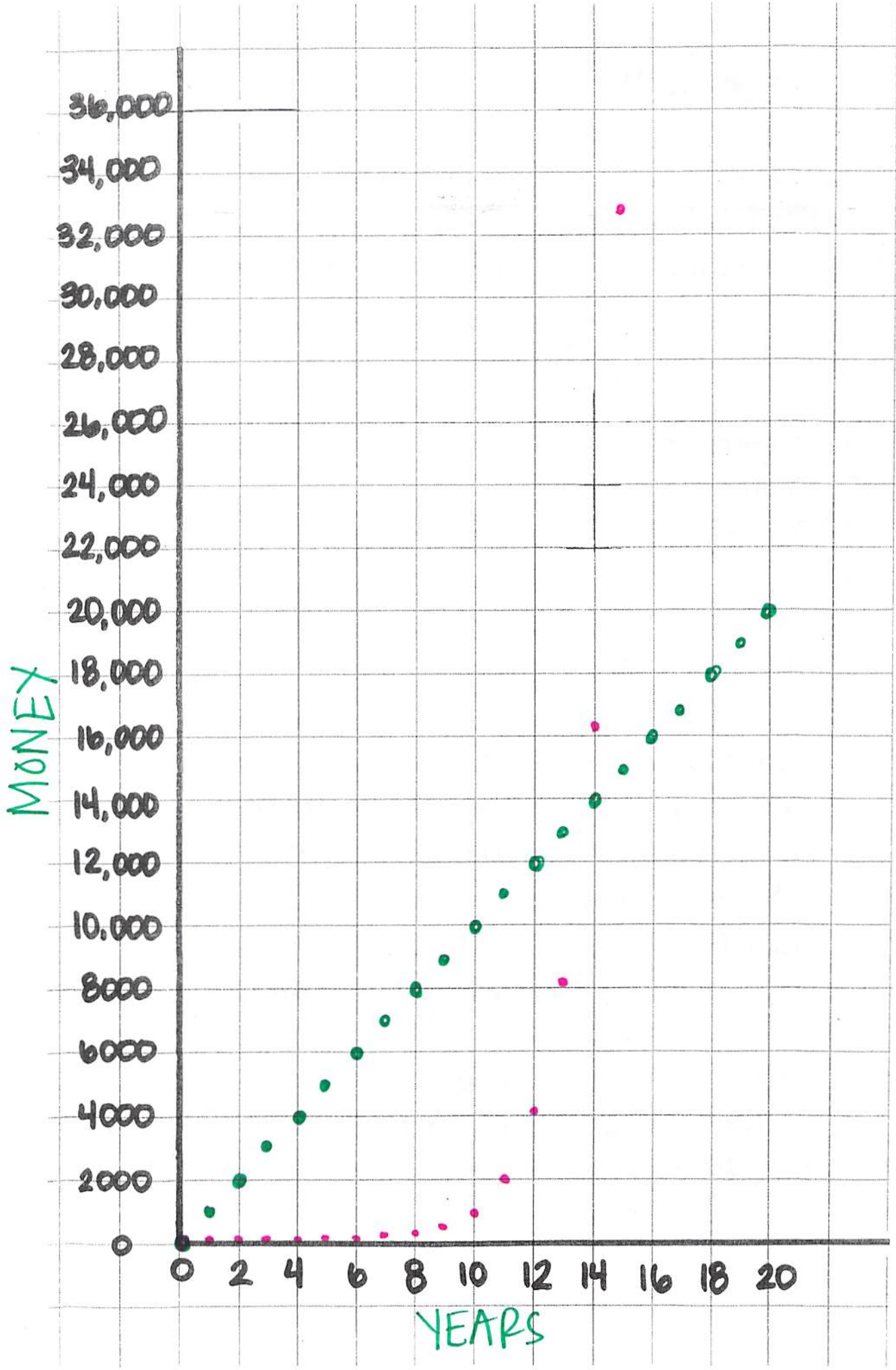
If a variable can take on any value between two specified values, it is called a continuous variable; otherwise, it is called a discrete variable.

Examples of a Continuous Variable:

1. A person's weight
2. A person's height
3. The number line
- 4.

Examples of a Discrete Variable:

1. Flip a coin and count the number of heads or tails (can only be a whole number)
2. In baseball, there are only four bases. If you get a hit it is either a one-base hit (single), a two-base hit (double), a three-base hit (triple) or a four-base hit (a home run). You cannot get a $2\frac{1}{2}$ base hit.
3. Money is discrete (you cannot sell something for \$1.005). If an item is two for \$0.99, you either pay 49 cents or 50 cents, not $49\frac{1}{2}$ cents.
- 4.



Linear vs. Exponential Functions Tasks
Money Task

Name _____ Class Period _____

Which option would you choose and why? _____

- **Option 1:** You can have \$1000 a year for twenty years
- **Option 2:** You can get \$1 the first year, \$2 the second year, \$4 the 3rd, doubling the amount each year for 20 years.

Use the chart below to figure out how much money you would gain at the end of 20 years for option 1 and Option 2.

Graph both options to see which will give you more money.

Year	Option 1	Option 2
1	\$1,000	\$1
2	\$2,000	$\$1 + \$2 = \$3$
3	\$3,000	$\$3 + \$4 = \$7$
4	4,000	$7 + 8 = 15$
5	5,000	$15 + 16 = 31$
6	6,000	$31 + 32 = 63$
7	7,000	$63 + 64 = 127$
8	8,000	$127 + 128 = 255$
9	9,000	$255 + 256 = 511$
10	10,000	$511 + 512 = 1023$
11	11,000	$1023 + 1024 = 2047$
12	12,000	$2047 + 2048 = 4095$
13	13,000	$4095 + 4096 = 8191$
14	14,000	$8191 + 8192 = 16,383$
15	15,000	$16383 + 16384 = 32,767$
16	16,000	$32,767 + 32,768 = 65,535$
17	17,000	$65,535 + 65,536 = 131,071$
18	18,000	$131,071 + 131,072 = 262,143$
19	19,000	$262,143 + 262,144 = 524,287$
20	20,000	$524,287 + 524,288 = 1,048,575$

Answer the following questions:

1. Should you connect the points in your graphs? Is the data discrete or continuous?

The data is discrete b/c you only get paid once a year so you should not connect the points.

2. Now that you have seen the results of both options, which option would you choose? Explain.

Choose option 2 b/c you make more money in the end.

3. If you only participate for 10 years, which option would you choose and why?

If you only participate for 10 years option 1 is better b/c you make \$10,000 vs \$1,023.

4. At what year does option 2 become better than option 1?

~~Between year 13 and 14~~
Option 2 is better at year 14.

5. Between what 2 years would the graphs intersect?

Between year 13 + 14.

6. Describe the difference in the way the two options grow?

- 1st option is linear growth
 - 2nd option is exponential growth.
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