Checklist and Assignment

Checklist:
- Linear Vs. Exponential Growth
- Properties of Exponential Growth
- Doubling

Assignment:
1. p 478 Quick Quiz
2. p 478 - 479 Exercises 1, 5-8, 9, 10, 12, 15, 16, 17, 21, 25

Key Words

- **Linear Growth** When a quantity grows by the same absolute amount during each unit of time.
- **Exponential Growth** When a quantity grows by the same relative amount (by the same percentage) during each unit of time.

Quantities that increase are called growing, and quantities that decrease are called decaying.

Sample Plot
Growth

**Linear growth or decay** (blue) occurs when a quantity grows or decays by the same *absolute* amount each unit of time.

E.g. ‘increased by 10 each year’

**Exponential growth or decay** (red) occurs when a quantity grows or decays by the same *relative*, or *percentage*, amount each unit of time.

E.g. ‘increased by 5% each year,’ ‘doubles every eight years.’

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**Exercises - Linear or Exponential?**

State whether the growth (or decay) is linear or exponential.

1. The number of students increased by 750 in each of the past six years.
2. The price of gasoline rises by 2% per year.

1. If the student population was 16,000 six years ago, what is it today?
2. If the price of gas was $3.19 per gallon last year, what is it this year?

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**Doubling - Parable 1**

"As a reward, place 1 grain of wheat on the first square of my chessboard. Then place 2 on the next square, then 4 on the next, 8 on the next, and so on."

How do the grains of wheat add up? Is this a humble or difficult request?
Doubling - Parable 2

An eccentric and wealthy employer gives you a choice: Get paid $10,000 per day for a month, or on the first day get paid $0.01, then $0.02 on the next, $0.04 on the next and so on.

What are the two options totalling after 1 month?

Doubling - Parable 3

A single cell bacterium is placed in a bottle at 11:00 AM. By 11:01 it divides into two cells. These each grow in divide by 11:02, and so on. When it is 12:00, the bottle is full (2^{60} cells!) and they are doomed to disaster by filling this bottle.

When was the bottle half-full?

Suppose at 11:56 the bacteria are alerted of the disaster. Is it believable?

Doubling - Lessons

With exponential growth
- ... there is repeated doubling.
- ...impossible proportions are reached, and growth cannot continue indefinitely.