

# Home Base

*Problems in section 1.1, Home Base.*

**Problem 1** While visiting Mos Eisley spaceport, you stop by Chalmun's Cantina. After you sit down, you notice that one of the other aliens is holding a discussion on fractions. Much to your surprise, they explain that  $1/6$  of 36 is 7. You are unhappy with this, knowing that  $1/6$  of 36 is in fact 6, yet their audience seems to agree with it, not you. Next the alien challenges its audience by asking, "What is  $1/4$  of 10?" What is the correct answer to this question, and how many fingers do the aliens have? Explain your reasoning.

**Problem 2** When the first Venusian to visit Earth attended a sixth grade class, it watched the teacher show that

$$\frac{3}{12} = \frac{1}{4}.$$

"How strange," thought the Venusian. "On Venus,  $\frac{4}{12} = \frac{1}{4}$ ." What base do Venusians use? Explain your reasoning.

**Problem 3** When the first Martian to visit Earth attended a high school algebra class, it watched the teacher show that the only solution of the equation

$$5x^2 - 50x + 125 = 0$$

is  $x = 5$ .

"How strange," thought the Martian. "On Mars,  $x = 5$  is a solution of this equation, but there also is another solution." If Martians have more fingers than humans, how many fingers do Martians have on both hands? Explain your reasoning.

**Problem 4** In one of your many space-time adventures, you see the equation

$$\frac{3}{10} + \frac{4}{13} = \frac{21}{20}$$

Learning outcomes:

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written on a napkin. How many fingers did the beast who wrote this have? Explain your reasoning.

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**Problem 5** What is the smallest number of weights needed to produce every integer-valued mass from 0 grams to say  $n$  grams? Explain your reasoning.

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**Problem 6** Starting at zero, how high can you count using just your fingers?

- (a) Explain how to count to 10.
- (b) Explain how to count to 35.
- (c) Explain how to count to 1023.
- (d) Explain how to count to 59048.
- (e) Can you count even higher?

Explain your reasoning.

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