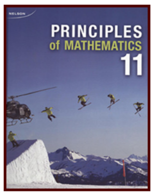
Strengthening and Conditioning



Lesson 3.1: Inductive Reasoning

Refer to *Principles of Mathematics 11* pages 6 – 11 and 18 – 21 for more examples.

- Page 12, #5, 7, 8a and c, 10, 12, 14, and 22.
- Page 22, #1, 3, 4, 6, 10, 16, and 19.

Question 5, page 12

You may need to measure the angles of the quadrilaterals before making a conjecture. Conjectures will vary, but one possibility is that the sum of the four angles is 360°.

Question 7, page 13

A table may help you to see the pattern clearly.

Odd Square	$1^2 = 1$	$3^2 = 9$	$5^2 = 25$	$7^2 = 49$
Odd Square divided by 4	$\frac{1}{4} = 0.25$	$\frac{9}{4} = 2.25$	$\frac{25}{4} = 6.25$	$\frac{49}{4} = 12.25$

Conjectures will vary, but one possibility is the decimal representation will always be a whole number followed by .25.

Question 8, page 13

a. Conjectures will vary, but should be based on the data in the table. Some possibilities include:
   - the sum of the digits will be 3, 6, or 9.
   - every third sum of the digits is 3.
   - the sum of the digits is divisible by 3.

c. You can test one of the conjectures by checking that it works for other multiples of 3.

Multiples of 3	36	72	852
Sum of digits	$3 + 6 = 9$	$7 + 2 = 9$	$8 + 5 + 2 = 15$

This table shows the first conjecture is not always true. This table does not confirm the second conjecture as true or false, though it appears likely that it is not always true. The third conjecture is true for the examples shown.

Question 10, page 13

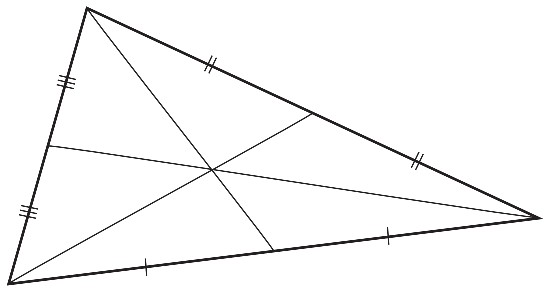
Conjectures will vary, but one possibility is that in any given year, temperatures will range between –12°C and 6°C on November 1 in Hay River. There are no values outside this range in the table and thus the data supports this conjecture.

Question 12, page 13

Conjectures will vary, but one possibility is that each rectangle will have exactly two diagonals. The fact that each rectangle shown has two diagonals supports this conjecture.

Question 14, page 14

Conjectures will vary, but one possibility is that all three medians meet at a single point. Additional evidence can be provided by showing the relationship works for other triangles as well, such as the following.



Question 22, page 15

Conjectures will vary. Typically general conjectures are more likely to come true than more restrictive ones. For example, a general conjecture like “the team’s winning percentage will increase over the next month” is more likely to be true than a more specific one such as “Mike D. will score the most points in game 1 and 2, but then get injured in game 3 and be out for the rest of the month”.

In general, sports are difficult to predict because the system is very complex and many things need to be accounted for when making predictions.

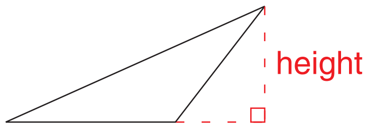
Question 1, page 22

Counterexamples will vary. A sample for each is shown.

a. 0 is neither positive nor negative.

b. 2 is a prime number that is even.

c. Anthony "Spud" Webb was 1.7 m tall (5'7") yet played in the NBA for over a decade. He even won the NBA Slam Dunk Contest in 1986.

d. 

e. T-O maps from medieval Europe conventionally placed east at the top of the map.

f. $\sqrt{0.04} = 0.2$

g. $-4 + 3 = -1$

h. The climate in Chile is warmer in the north than in the south.

Question 3, page 22

Disagree. A counterexample is $0 \times 5 = 0$.

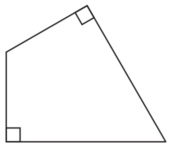
Question 4, page 22

Disagree. A counterexample is $15 + 24 = 39$.

15 is a multiple of 3 and 24 is a multiple of 6 (and also 3). The sum is a multiple of 3, but not 6.

Question 6, page 23

Disagree. A counterexample is the quadrilateral below.



Question 10, page 23

Patrice's conjecture is reasonable. The square of an even number will always be even and the square of an odd number will always be odd. This means you will either be adding two even numbers or two odd numbers. Both cases result in an even number.

Question 16, page 24

a. Examples will vary.

   $18 = 11 + 7$

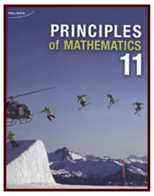
   $48 = 7 + 41$

   $220 = 197 + 23$

b. A counterexample would need to be an even number greater than two that is not the sum of any pair of prime numbers.

Question 19, page 25

Disagree. $8^2 - 3 = 61$



Lesson 3.2: Deductive Reasoning

Refer to *Principles of Mathematics 11* pages 27 – 30 for more examples.

- Page 31, #2, 5, 7, 8, 10, 11, 17, and 19.

Question 2, page 31

You can deduce that Austin got a good haircut.

Question 5, page 31

Let $2j$ represent an even integer and let $2k+1$ represent an odd integer.

The product of an even integer and an odd integer can then be represented as $2j(2k+1)$. This can be rearranged as follows:

$$
\begin{aligned}
&2j(2k+1) \\
&= 2j(2k) + 2j(1) \\
&= 4jk + 2j \\
&= 2(2jk + j)
\end{aligned}
$$

2 is a factor of the product so the product is even.