# CONCEPTS OF MATHEMATICS & PHYSICS

## Parent Lesson Planner
### (PLP)

EXPLORING

THE WORLD OF MATHEMATICS

From Ancient Record Keeping to the Latest Advances in Comput

JOHN HUDSON TI

EXPLORING

THE WORLD OF PHYSICS

From Simple Machines To Nuclear Energy

JOHN HUDSON TINER
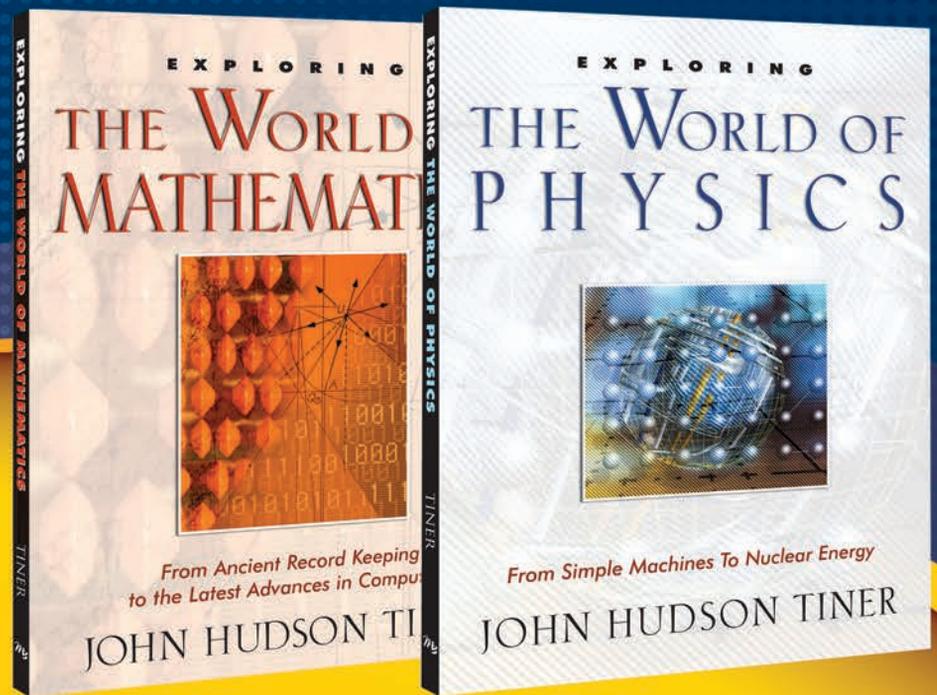
- Weekly Lesson Schedule
- Student Worksheets
- Quizzes & Test
- Answer Key

| 7th – 9th grade | |
| --- | --- |
| 1 Year Science | 1/2 Credit |

Unless otherwise noted, Scripture quotations are from the New King James Version of the Bible.

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*If the foundations are destroyed, what can the righteous do?*

Psalm 11:3; NKJV

As the largest publisher of creation science materials in the world, Master Books is honored to partner with our authors and educators, including:

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Whether a pre-school learner or a scholar seeking an advanced degree, we offer a wonderful selection of award-winning resources for all ages and educational levels.

*But sanctify the Lord God in your hearts, and always be ready*

*to give a defense to everyone who asks you a reason for the hope*

*that is in you, with meekness and fear.*

1 Peter 3:15; NKJV

## Permission to Copy

# Contents

# Lessons for a 36-week course!

**Overview:** This *Concepts of Mathematics and Physics PLP* contains materials for use with *Exploring the World of Mathematics* and *Exploring the World of Physics* in the Exploring series. Materials are organized by each book in the following sections:

| | |
|---|---|
| 📇 | Study Guide Worksheets |
| **Q** | Quizzes |
| **T** | Semester Test & Final Exams |
| 🔑 | Answer Keys |

> Suggested Optional Science Lab
> See page 13

**Features:** Each suggested weekly schedule has two easy-to-manage lessons that combine reading, worksheets, and vocabulary-building opportunities including an expanded glossary for each book. Designed to allow your student to be independent, materials in this resource are divided by section so you can remove quizzes, tests, and answer keys before beginning the coursework. As always, you are encouraged to adjust the schedule and materials needed to in order to best work within your educational program.

**Workflow:** Students will read the pages in their book and then complete each section of the PLP. They should be encouraged to complete as many of the activities and projects as possible as well. Tests are given at regular intervals with space to record each grade. If used with younger students, they may be given the option of only choosing activities or projects of interest to them and taking open book tests.

**Lesson Scheduling**: Space is given for assignment dates. There is flexibility in scheduling. For example, the parent may opt for a M–W schedule rather than a M, W, F schedule. Each week listed has five days but due to vacations the school work week may not be M–F. Adapt the days to your school schedule. As the student completes each assignment, he/she should put an "X" in the box.

| | |
|---|---|
| 🕐 | Approximately 30 to 45 minutes per lesson, two days a week |
| 🔑 | Includes answer keys for worksheets, quizzes, and semester exams |
| 📇 | Worksheet for each chapter. |
| 🔁 | Quizzes are included to help reinforce learning and provide assessment opportunities; optional semester exams included. |
| 📄 | Designed for grades 7 to 9 in a one-year course to earn 1/2 science credit |

Course includes books from creationist authors with solid, biblical worldviews:

**John Hudson Tiner** — *Exploring the World of Mathematics, Exploring the World of Physics*

John Hudson Tiner received five National Science Foundation teaching fellowships during his 12 years as a teacher of mathematics and science that allowed him to study graduate chemistry, astronomy, and mathematics. He also worked as a mathematician and cartographer for the Defense Mapping Agency, Aerospace Center in St. Louis, MO.

Tiner has received numerous honors for his writing, including the Missouri Writer's Guild award for best juvenile book for *Exploring the World of Chemistry*. He and his wife, Jeanene, live in Missouri.

# Concepts of Mathematics and Physics

## Course Description

This is the suggested course sequence that allows one core area of science to be studied per semester. You can change the sequence of the semesters per the needs or interests of your student; materials for each semester are independent of one another to allow flexibility.

## Semester 1: Mathematics

Numbers surround us. Just try to make it through a day without using any. It's impossible: telephone numbers, calendars, volume settings, shoe sizes, speed limits, weights, street numbers, microwave timers, TV channels, and the list goes on and on.

The many advancements and branches of mathematics were developed through the centuries as people encountered problems and relied upon math to solve them. It's amazing how ten simple digits can be used in an endless number of ways to benefit man.

The development of these ten digits and their many uses is the fascinating story in *Exploring the World of Mathematics*.

## Semester 2: Physics

Physics is a branch of science that many people condsider to be too complicated to understand. John Hudson Tiner puts this myth to rest as he explains the fascinating world of physics in a way that students can comprehend.

Did you know that a feather and a lump of lead will fall at the same rate in a vacuum? Learn about the history of physics from Aristotle to Galileo to Isaac Newton to the latest advances. Discover how the laws of motion and gravity affect everything from the normal activities of everyday life to launching rockets into space. Learn about the effects of inertia firsthand during fun and informative experiments.

*Exploring the World of Physics* is a great tool for students who want to have a deeper understanding of the important and interesting ways that physics affects our lives.

## First Semester Suggested Daily Schedule

| Date | Day | Assignment | Due Date | ✓ | Grade |
|------|-----|-----------|----------|---|-------|
| | | **First Semester-First Quarter — Exploring the World of Mathematics** | | | |
| Week 1 | Day 1 | | | | |
| | Day 2 | Read pages 4–12 • *Exploring the World of Mathematics* • (EWM) | | | |
| | Day 3 | | | | |
| | Day 4 | Counting the Years - Questions<br>**Mathematics Ch 1: Worksheet 1** • Page 21 • Lesson Plan • (LP) | | | |
| | Day 5 | | | | |
| Week 2 | Day 6 | | | | |
| | Day 7 | Read Pages 14–22 • (EWM) | | | |
| | Day 8 | | | | |
| | Day 9 | Counting the Hours - Questions<br>**Mathematics Ch 2: Worksheet 1** • Page 23 • (LP) | | | |
| | Day 10 | | | | |
| Week 3 | Day 11 | | | | |
| | Day 12 | Read Pages 24–28 • (EWM) | | | |
| | Day 13 | | | | |
| | Day 14 | Read Pages 29–34 • (EWM) | | | |
| | Day 15 | | | | |
| Week 4 | Day 16 | | | | |
| | Day 17 | Muddled Measuring - Questions<br>**Mathematics Ch 3: Worksheet 1** • Page  25 • (LP) | | | |
| | Day 18 | | | | |
| | Day 19 | Read Pages 36–44 • (EWM) | | | |
| | Day 20 | | | | |
| Week 5 | Day 21 | | | | |
| | Day 22 | Measuring by Metric - Questions<br>**Mathematics Ch 4: Worksheet 1** • Page  27 • (LP) | | | |
| | Day 23 | | | | |
| | Day 24 | **Mathematics Chs 1–4: Quiz 1** • Page 93 • (LP) | | | |
| | Day 25 | | | | |
| Week 6 | Day 26 | | | | |
| | Day 27 | Read Pages 46–52 • (EWM) | | | |
| | Day 28 | | | | |
| | Day 29 | Practical Mathematics - Questions<br>**Mathematics Ch 5: Worksheet 1** • Page  29 • (LP) | | | |
| | Day 30 | | | | |
| Week 7 | Day 31 | | | | |
| | Day 32 | Practical Mathematics - Questions<br>**Mathematics Ch 5**: **Worksheet 2** • Page 31 • (LP) | | | |
| | Day 33 | | | | |
| | Day 34 | Read Pages 54–62 • (EWM) | | | |
| | Day 35 | | | | |

| Date | Day | Assignment | Due Date | ✓ | Grade |
|---|---|---|---|---|---|
| Week 8 | Day 36 | | | | |
| | Day 37 | The Greek Way with Math - Questions<br>**Mathematics Ch 6: Worksheet 1** • Page 33 • (LP) | | | |
| | Day 38 | | | | |
| | Day 39 | Read Pages 64–72 • (EWM) | | | |
| | Day 40 | | | | |
| Week 9 | Day 41 | | | | |
| | Day 42 | Names for Numbers - Questions<br>**Mathematics Ch 7: Worksheet 1** • Page 35 • (LP) | | | |
| | Day 43 | | | | |
| | Day 44 | Read Pages 74–82 • (EWM) | | | |
| | Day 45 | | | | |
| **First Semester-Second Quarter — Exploring the World of Mathematics** | | | | | |
| Week 1 | Day 46 | | | | |
| | Day 47 | Number Pattern - Questions<br>**Mathematics Ch 8: Worksheet 1** • Page 37 • (LP) | | | |
| | Day 48 | | | | |
| | Day 49 | **Chapters 5–8: Quiz 2** • Page 95 • (LP) | | | |
| | Day 50 | | | | |
| Week 2 | Day 51 | | | | |
| | Day 52 | Read Pages 84–94 • (EWM) | | | |
| | Day 53 | | | | |
| | Day 54 | Endless Numbers - Questions<br>**Mathematics Ch 9: Worksheet 1** • Page 39 • (LP) | | | |
| | Day 55 | | | | |
| Week 3 | Day 56 | | | | |
| | Day 57 | Endless Numbers - Questions<br>**Mathematics Ch 9: Worksheet 2** • Page 41 • (LP) | | | |
| | Day 58 | | | | |
| | Day 59 | Read Pages 96–106 • (EWM) | | | |
| | Day 60 | | | | |
| Week 4 | Day 61 | | | | |
| | Day 62 | Math for Scientists - Questions<br>**Mathematics Ch 10: Worksheet 1** • Page 43 • (LP) | | | |
| | Day 63 | | | | |
| | Day 64 | Read Pages 108–118 • (EWM) | | | |
| | Day 65 | | | | |

| Date | Day | Assignment | Due Date | ✓ | Grade |
|---|---|---|---|---|---|
| Week 5 | Day 66 | | | | |
| | Day 67 | Pure and Applied Math - Questions<br>**Mathematics Ch 11: Worksheet 1** • Page 45 • (LP) | | | |
| | Day 68 | | | | |
| | Day 69 | **Mathematics Chs 9–11: Quiz 3** • Page 97 • (LP) | | | |
| | Day 70 | | | | |
| Week 6 | Day 71 | | | | |
| | Day 72 | Read Pages 120–130 • (EWM) | | | |
| | Day 73 | | | | |
| | Day 74 | Computing Machines - Questions<br>**Mathematics Ch 12: Worksheet 1** • Page 47 • (LP) | | | |
| | Day 75 | | | | |
| Week 7 | Day 76 | | | | |
| | Day 77 | Computing Machines - Questions<br>**Mathematics Ch 12: Worksheet 1** • Page 49 • (LP) | | | |
| | Day 78 | | | | |
| | Day 79 | Read Pages 132–140 • (EWM) | | | |
| | Day 80 | | | | |
| Week 8 | Day 81 | | | | |
| | Day 82 | Bits and Bytes - Questions<br>**Mathematics Ch 13: Worksheet 1** • Pages 51-52 • (LP) | | | |
| | Day 83 | | | | |
| | Day 84 | Read Pages 142–152 • (EWM) | | | |
| | Day 85 | | | | |
| Week 9 | Day 86 | | | | |
| | Day 87 | Math on Vacation - Questions<br>**Mathematics Ch 14: Worksheet 1** • Pages 53-54 • (LP) | | | |
| | Day 88 | | | | |
| | Day 89 | **Mathematics Chs 12–14: Quiz 4** • Page 101 • (LP) | | | |
| | Day 90 | | | | |
| | | **Chapters 1-14: Test** • Page 103 • (LP) | | | |
| | | **Mid-Term Grade** | | | |

**Second Semester Suggested Daily Schedule**

| Date | Day | Assignment | Due Date | ✓ | Grade |
|---|---|---|---|---|---|
| | | **Second Semester-Third Quarter — Exploring the World of Physics** | | | |
| Week 1 | Day 91 | | | | |
| | Day 92 | Read Pages 4–12 • *Exploring the World of Physics* • (EWP) | | | |
| | Day 93 | | | | |
| | Day 94 | Motion - Questions<br>**Physics Ch 1: Worksheet 1** • Page 57 • (LP) | | | |
| | Day 95 | | | | |
| Week 2 | Day 96 | | | | |
| | Day 97 | Read Pages 14–22 • (EWP) | | | |
| | Day 98 | | | | |
| | Day 99 | Laws of Motion - Questions<br>**Physics Ch 2: Worksheet 1** • Page 59 • (LP) | | | |
| | Day 100 | | | | |
| Week 3 | Day 101 | | | | |
| | Day 102 | Read Pages 24–32 • (EWP) | | | |
| | Day 103 | | | | |
| | Day 104 | Gravity - Questions<br>**Physics Ch 3: Worksheet 1** • Page 61 • (LP) | | | |
| | Day 105 | | | | |
| Week 4 | Day 106 | | | | |
| | Day 107 | Read Pages 34–40 • (EWP) | | | |
| | Day 108 | | | | |
| | Day 109 | Simple Machines - Questions<br>**Physics Ch 4: Worksheet 1** • Page 63 • (LP) | | | |
| | Day 110 | | | | |
| Week 5 | Day 111 | | | | |
| | Day 112 | **Physics Chs 1–4: Quiz 1** • Page 107 • (LP) | | | |
| | Day 113 | | | | |
| | Day 114 | Read Pages 42–52 • (EWP) | | | |
| | Day 115 | | | | |
| Week 6 | Day 116 | | | | |
| | Day 117 | Energy - Questions<br>**Physics Ch 5: Worksheet 1** • Page 65 • (LP) | | | |
| | Day 118 | | | | |
| | Day 119 | Read Pages 54–64 • (EWP) | | | |
| | Day 120 | | | | |

| Date | Day | Assignment | Due Date | ✓ | Grade |
|---|---|---|---|---|---|
| Week 7 | Day 121 | | | | |
| | Day 122 | Heat - Questions<br>**Physics Ch 6: Worksheet 1** • Page 67 • (LP) | | | |
| | Day 123 | | | | |
| | Day 124 | Heat - Questions<br>**Physics Ch 6: Worksheet 2** • Page 69 • (LP) | | | |
| | Day 125 | | | | |
| Week 8 | Day 126 | | | | |
| | Day 127 | Read Pages 66–76 • (EWP) | | | |
| | Day 128 | | | | |
| | Day 129 | State of Matter - Questions<br>**Physics Ch 7: Worksheet 1** • Page 71 • (LP) | | | |
| | Day 130 | | | | |
| Week 9 | Day 131 | | | | |
| | Day 132 | **Physics Chs 5–7: Quiz 2** • Page 109 • (LP) | | | |
| | Day 133 | | | | |
| | Day 134 | Read Pages 78–88 • (EWP) | | | |
| | Day 135 | | | | |
| | **Second Semester-Fourth Quarter — Exploring the World of Physics** | | | | |
| Week 1 | Day 136 | | | | |
| | Day 137 | Wave Motion - Questions<br>**Physics Ch 8: Worksheet 1** • Page 73 • (LP) | | | |
| | Day 138 | | | | |
| | Day 139 | Wave Motion - Questions<br>**Physics Ch 8: Worksheet 2** • Page 75 • (LP) | | | |
| | Day 140 | | | | |
| Week 2 | Day 141 | | | | |
| | Day 142 | Read Pages 90–100 • (EWP) | | | |
| | Day 143 | | | | |
| | Day 144 | Light - Questions<br>**Physics Ch 9: Worksheet 1** • Page 77 • (LP) | | | |
| | Day 145 | | | | |
| Week 3 | Day 146 | | | | |
| | Day 147 | Light - Questions<br>**Physics Ch 9: Worksheet 2** • Page 79 • (LP) | | | |
| | Day 148 | | | | |
| | Day 149 | Read Pages 102–110 • (EWP) | | | |
| | Day 150 | | | | |
| Week 4 | Day 151 | | | | |
| | Day 152 | Electricity - Questions<br>**Physics Ch 10: Worksheet 1** • Page 81 • (LP) | | | |
| | Day 153 | | | | |
| | Day 154 | Read Pages 112–122 • (EWP) | | | |
| | Day 155 | | | | |

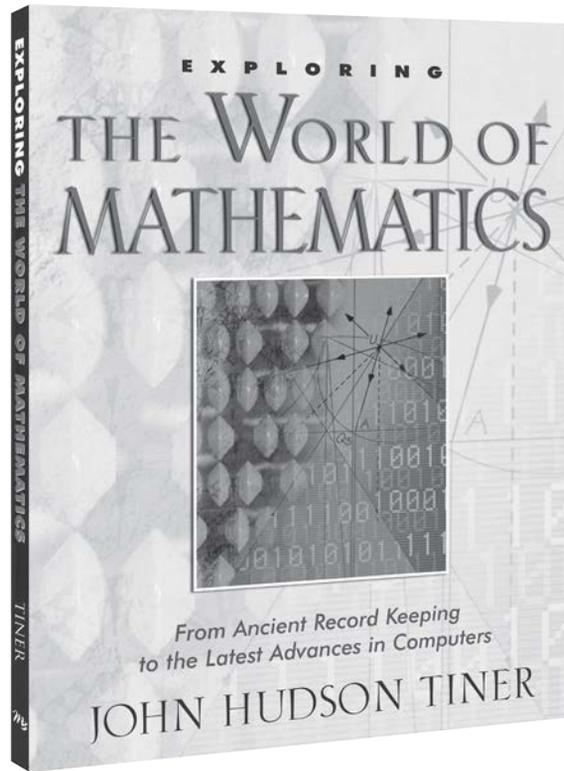| Date | Day | Assignment | Due Date | ✓ | Grade |
|---|---|---|---|---|---|
| Week 5 | Day 156 | | | | |
| | Day 157 | Magnetism - Questions<br>**Physics Ch 11: Worksheet 1** • Page 83 • (LP) | | | |
| | Day 158 | | | | |
| | Day 159 | **Physics Chs 8–10: Quiz 3** • Page 111 • (LP) | | | |
| | Day 160 | | | | |
| Week 6 | Day 161 | | | | |
| | Day 162 | Read Pages 124–134 • (EWP) | | | |
| | Day 163 | | | | |
| | Day 164 | Electromagnetism - Questions<br>**Physics Ch 12: Worksheet 1** • Page 85 • (LP) | | | |
| | Day 165 | | | | |
| Week 7 | Day 166 | | | | |
| | Day 167 | Read Pages 136–142 • (EWP) | | | |
| | Day 168 | | | | |
| | Day 169 | Nuclear Energy - Questions<br>**Physics Ch 13: Worksheet 1** • Page 87 • (LP) | | | |
| | Day 170 | | | | |
| Week 8 | Day 171 | | | | |
| | Day 172 | Read Pages 144–152 • (EWP) | | | |
| | Day 173 | | | | |
| | Day 174 | Future Physics - Questions<br>**Physics Ch 14: Worksheet 1** • Page 89 • (LP) | | | |
| | Day 175 | | | | |
| Week 9 | Day 176 | | | | |
| | Day 177 | **Physics Chs 11–14: Quiz 4** • Page 115 • (LP) | | | |
| | Day 178 | | | | |
| | Day 179 | **Physics Chs 1-14: Test** (Optional) • Page 117 • (LP) | | | |
| | Day 180 | | | | |
| | | **Final Grade** | | | |

**Suggested Optional Science Lab:**

There are a variety of companies that offer science labs that complement our courses. These items are only suggestions, not requirements, and they are not included in the daily schedule. We have tried to find materials that are free of evolutionary teaching, but please review any materials you may purchase. The following items are available from www.HomeTrainingTools.com.

*Concepts of Math & Physics*
*The World of Physics*
KT-PHSKIT Physics Workshop Kit

EXPLORING

THE WORLD OF
MATHEMATICS

*From Ancient Record Keeping
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JOHN HUDSON TINER

**Mathematics Worksheets**

**for Use with**

*Exploring the World of Mathematics*

*Answer T or F for true or false, fill in the blank, or
select the letter for the phrase that best completes the sentence.*

**T  F**  1. The extra day, or leap day, every four years was put in the calendar to honor Augustus Caesar.

**T  F**  2. The Gregorian calendar has 100 leap days every 400 years.

3. What is the main reason to have leap days?

**A B C D**  4. The first calendar with a leap day every four years was the one
A. authorized by Julius Caesar
B. used by the American colonies after 1752
C. used by the Babylonians
D. used by the Egyptians

**Matching**

5._____ day                          a. due to the tilt of the earth's axis, equal to three months

6._____ week                         b. earth revolves around the sun once

7._____ month                        c. earth rotates on its axis once

8._____ season                       d. moon revolves around the earth once

9._____ year                         e. seven days

**Try Your Math**

10. The Bible says that Methuselah died at age 969 years (Gen. 5:27). What would be that age in days? (Ignore leap years.)

11. Using the Babylonian calendar of 360 days in a year, how many days are in one-third of a year; one-fifth of a year; one-twentieth of a year; one-sixtieth of a year?

12. Find the population of your city and calculate how many people are likely to have a birthday on February 29.

*Answer T or F for true or false, or select the letter
for the phrase that best completes the sentence.*

**A B C D**  1. The shortest naturally occurring period of time that ancient people could observe was the (A. day, B. hour, C. week, D. year).

**T F**  2. The Egyptians divided daylight into 8 or 12 hours depending on whether it was winter or summer.

**A B C D**  3. The inventors of the hourglass were the (A. Babylonians, B. British Navy, C. Egyptians, D. Romans).

**A B**  4. A watch with a sweep second hand is known as (A. an analog, B. a digital) watch.

**T F**  5. Meridians are imaginary lines going around the earth parallel to the equator.

**A B C D**  6. Military time has hours numbered from 0000 to (A. 0400, B. 1200, C. 2400, D. 3600).

**A B C D**  7. Time zones were introduced when it became common to travel by (A. airplanes, B. ox carts, C. ships, D. trains).

**A B**  8. The International date line is in the (A. Atlantic, B. Pacific) ocean.

**A B**  9. Atomic clocks proved that the earth's rotation (A. is, B. is not) uniform.

**A B C**  10. The United States became an independent nation in 1776. In 1976, the country celebrated the fact that the United States was two (A. decades, B. centuries, C. millenniums) old.

**Try Your Math**

11. Assume that the first four-hour watch began at midnight. What time would it be at five bells on the second watch?

12. Feel your pulse at the wrist and count the number of beats in a minute. Calculate the number of times your heart beats in a day.

13. An office job is often described as working from 9 to 5. This means 9:00 a.m. to 5:00 p.m. How many hours is this?

14. At 4:00 p.m., a family on vacation drives from Mountain Standard Time into Central Standard Time. Should their watches be set one hour earlier to 3:00 p.m. or one hour later to 5:00 p.m.?

*Answer T or F for true or false, fill in the blank, or
select the letter for the phrase that best completes the sentence.*

**A B C D**   1. NASA's Climate Orbiter to Mars failed because (A. American and French engineers did not communicate with one another, B. engineers used two different measures of force, C. fuel had been measured improperly, D. the spacecraft weighed too much).

**A B**   2. A troy ounce was used to measure (A. small and expensive, B. large and inexpensive) items.

**A B C D**   3. A scruple was a standard of weight for measuring (A. barley, B. diamonds, C. drugs, D. potatoes).

**A B C D**   4. At first, the United States Customary system agreed with that of (A. Britain, B. France, C. Morocco, D. Spain).

**T F**   5. The American ton and the British tonne are identical in weight.

**A B C D**   6. Most early measures of distance were based on (A. animal strides, B. human body, C. parts of ships, D. Roman military terms).

  7. The length of a mile in feet is _____.

  8. "A pint is a _____ the world around."

**Choose the larger:**

**A B**   9. A. foot, B. yard

**A B**   10. A. fathom, B. yard

**A B**   11. A. nautical mile, B. statute mile

**A B**   12. A. cup, B. quart

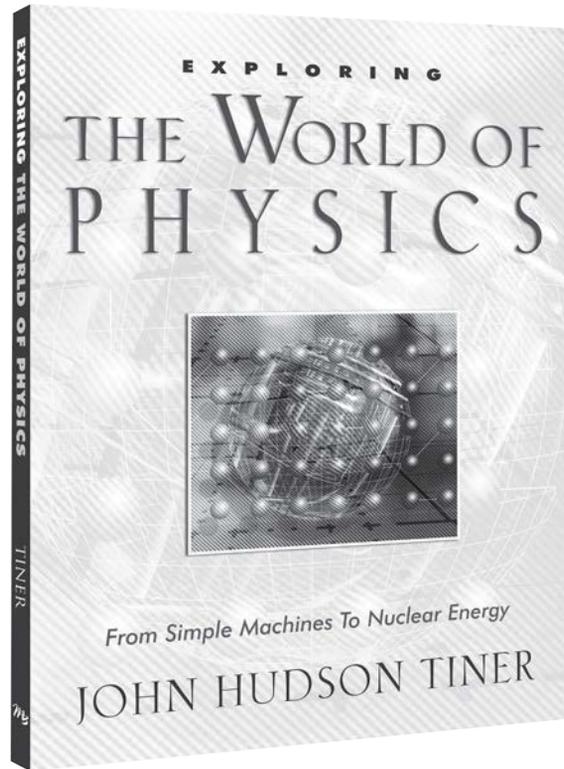**A B**   13. A. bushel, B. peck

**Try Your Math**

  14. Recall that a hand is four inches. How tall is a horse in inches that is 15 hands tall? How tall in feet?

  15. Change your weight from pounds to ounces.

  16. The tallest mountain on earth is Mt. Everest. Its summit is 29,035 feet above sea level. How high is the mountain in miles?

*Answer T or F for true or false, or
select the letter for the phrase that best completes the sentence.*

**A B**    1.  The metric system began in (A. Britain, B. France).

**A B C**    2.  The metric system is based on powers of (A. 2, B. 10, C. 12).

**T F**    3.  The metric system was designed specifically to meet the needs of merchants.

**A B C D**    4.  Currently, the meter is defined as (A. 1,640,763.73 wavelengths of krypton gas, B. $\frac{1}{10,000,000}$ of the distance from the equator to the North Pole, C. the distance between two scratch marks on a metal rod, D. the distance light travels in $\frac{1}{299,792,458}$ of a second).

**T F**    5.  Volume (capacity) is a derived unit because it is based on a container that is $\frac{1}{10}$ of a meter on each side.

**A B C**    6.  One meter is slightly longer than one (A. inch, B. yard, C. mile).

**A B C**    7.  One liter is slightly larger than one (A. pint, B. quart, C. gallon).

**A B C**    8.  One kilogram is about 2.2 times as much as (A. one ounce, B. one pound, C. one ton).

**A B**    9.  A standard kilogram is defined by (A. the mass of a platinum cylinder, B. the wavelength of krypton gas).

**A B C D**    10.  Daniel Fahrenheit set the boiling temperature of water on his thermometer at (A. 0, B. 32, C. 100, D. 212) degrees.

**A B C D**    11.  Most people liked Fahrenheit thermometers because (A. they were free, B. they were accurate, C. Fahrenheit was an Englishman, D. daytime temperatures stayed between 0 and 100 degrees).

**T F**    12.  The metric system is illegal to use in the United States.

**A B C**    13.  The (A. Celsius, B. Fahrenheit, C. Kelvin) temperature scale starts at absolute zero.

EXPLORING

# THE WORLD OF PHYSICS

*From Simple Machines To Nuclear Energy*

JOHN HUDSON TINER

**Physics Worksheets**

**for Use with**

*Exploring the World of Physics*

*Answer T or F for true or false, fill in the blank, or
select the letter for the phrase that best completes the sentence.*

**A B C D**   1. Physics is the science that explores how energy acts on (A. heat, B. light, C. matter, D. sound).

**T F**   2. The ancient Greeks were noted for their careful experiments.

**T F**   3. The regular back and forth motion of a pendulum was used to regulate the first accurate clocks.

**T F**   4. In Galileo's time, only length and time could be measured with any accuracy.

**A B C D**   5. A feather and lump of lead will fall at the same speed in (A. a high speed wind tunnel, B. the atmosphere, C. a vacuum, D. water).

   6. To calculate speed, divide distance by _____.

**A B C D**   7. To study the motion of falling objects, Galileo (A. beat them into cubes, B. dropped them from a high tower, C. pushed them from a cliff, D. rolled them down a ramp).

**A B C D**   8. Acceleration is found by dividing the (A. average velocity, B. distance, C. gravity, D. change in speed) by the change in time.

**A B**   9. On earth, the acceleration due to gravity is (A. 32 ft/sec$^2$,  B. 60 miles/hour).

**For More Study**

   10. Suppose a canoeist takes 70 days to paddle the entire length of the Mississippi River, a distance of 3,710 miles. The canoeist's average speed in miles per day is _____.

   11. An ordinary passenger car can accelerate to 60 miles per hour in about eight seconds. What is the car's acceleration?

   12. On the moon, the acceleration due to gravity is 5.3 ft/sec$^2$ rather than 32 ft/sec$^2$. If an object fell six seconds before hitting the ground, it strikes the ground with a speed of _____ ft/sec. (Hint: Use the final velocity equation.)

*Answer T or F for true or false, fill in the blank, or
select the letter for the phrase that best completes the sentence.*

**T F**      1. Velocity and speed mean the same.

**T F**      2. A force must act on an object to put the object in motion, give it greater speed, slow it, or change its direction.

**T F**      3. All objects come to a stop unless some force keeps them going.

**T F**      4. A ball rolling on a flat surface comes to a stop because of the force of (A. friction, B. gravity).

**A B C**      5. Isaac Newton's first law of motion was based on experiments done by (A. Aristotle, B. Galileo, C. Newton, himself).

**A B C D**      6. Inertia is a property of matter that resists changing its (A. electric charge, B. mass, C. momentum, D. velocity).

**T F**      7. Only very massive objects have inertia.

**T F**      8. Acceleration is any change of speed or direction.

          9. State the second law of motion.

         10. State the third law of motion.

         11. Momentum is the mass of an object times its _____.

**T F**      12. The law of conservation of momentum is one of the most firmly established laws of science.

**Matching**

13._____ first law of motion          a. $a = f/m$

14._____ second law of motion        b. $f = m \times a$

15._____ third law of motion         c. $f_{ab} = -f_{ba}$

16._____ force equation              d. $I = f \times t$

17._____ definition of impulse        e. If $f = 0$ then $a = 0$

18._____ definition of momentum    f. $p = m \times v$

*Answer T or F for true or false, fill in the blank, or*
*select the letter for the phrase that best completes the sentence.*

**T F**　　1. During Kepler's time, most people believed the laws governing motions in the heavens differed from those for motions on earth.

**A B C D**　2. Kepler proved that planets traveled in orbits that were (A. circular, B. elliptical, C. parabolic, D. straight-line).

**A B**　　3. A planet travels (A. faster, B. slower) when closer to the sun.

　　　　4. State the second law of planetary motion.

**T F**　　5. Kepler's third law of motion reveals that planets farther from the sun take longer to orbit the sun.

**A B**　　6. Isaac Newton built upon the discoveries of Galileo and (A. Aristotle, B. Kepler).

**T F**　　7. Isaac Newton came from a rich and powerful family.

**T F**　　8. The direction the force of gravity acts on the moon is toward the center of the earth.

**A B C D**　9. The moon is 60 times as far from the earth as an apple in a tree, so the force of earth's gravity on the moon is (A. 3,600 times weaker, B. 60 times stronger, C. 60 times weaker, D. the same).

**T F**　　10. The law of gravity applies only to the sun, moon, and planets.

**A B**　　11. If the moon were twice as far away, gravitational attraction between the earth and the moon would be (A. one-half  B. one-fourth) as great.

　　　　12. Force of gravitational attraction between two objects is directly proportional to the _____ of their masses and inversely proportional to the _____ of the distance separating them.

**T F**　　13. Scientists have proven that our sun is the only star that has planets orbiting it.

*Answer T or F for true or false, fill in the blank, or*
*select the letter for the phrase that best completes the sentence.*

1. A simple machine changes the amount of _____ needed to do a job or the direction the _____ is applied. (same word)

**A B C D** 2. The Greek who said, "Give me a place to stand and a long enough lever, and I can move the world" was (A. Archimedes, B. Aristotle, C. Eratosthenes, D. Ptolemy).

**A B** 3. Mechanical advantage is found by dividing load by (A. effort, B. gravity).

**A B C D** 4. The tab on a soft drink can is an example of (A. an inclined plane, B. a lever, C. a pulley, D. a wheel and axle).

**T F** 5. The pivot point (fulcrum) of a lever must be located in the middle.

**A B** 6. If a load is moved closer to the fulcrum than the effort, the effort required to move the load will be (A. increased, B. reduced).

7. The Grand Canyon is about one mile deep, and the most popular trail out of the canyon is nine miles long; the mechanical advantage of the trail is _____.

**A B C D** 8. A screwdriver is an example of (A. a pulley, B. a ramp, C. a wheel and axle, D. an inclined plane).

**T F** 9. A screw is an inclined plane wrapped around a cylinder.

**T F** 10. Because of friction, the work produced by a simple machine is greater than the work put into a simple machine.

**A B** 11. The one that is likely to be the least efficient is (A. a simple machine, B. an 18-wheeler truck).

**A B** 12. A machine with no friction or other hindrance to its movement would have an efficiency of (A. zero, B. 100) percent.

# Quizzes and Tests Section

*Exploring Mathematics*
Concepts & Comprehension | Quiz 1 | Scope: Chapters 1–4 | Total score: ____of 100 | Name:
Date:

## Matching (2 Points Each Question)

1. _____ day

2. _____ week

3. _____ month

4. _____ season

5. _____ year

a. due to the tilt of the earth's axis, equal to three months

b. earth revolves around the sun once

c. earth rotates on its axis once

d. moon revolves around the earth once

e. seven days

## Fill-in-the-Blank Questions (4 Points Each Question)

6. The length of a mile in feet is _____.

7. "A pint is a _____ the world around."

## Multiple Choice Questions (4 Points Each Question)

8. The first calendar with a leap day every four years was the one
    A. authorized by Julius Caesar      B. used by the American colonies after 1752
    C. used by the Babylonians      D. used by the Egyptians

9. The inventors of the hourglass were the
    A. Babylonians      B. British Navy
    C. Egyptians      D. Romans

10. Military time has hours numbered from 0000 to
    A. 0400      B. 1200
    C. 2400      D. 3600

11. Time zones were introduced when it became common to travel by
    A. airplanes      B. ox carts
    C. ships      D. trains

12. NASA's Climate Orbiter to Mars failed because
    A. American and French engineers did not communicate with one another
    B. engineers used two different measures of force
    C. fuel had been measured improperly
    D. the spacecraft weighed too much

13. A scruple was a standard of weight for measuring
    A. barley      B. diamonds
    C. drugs      D. potatoes

14. Most early measures of distance were based on
    A. animal strides      B. the human body
    C. parts of ships      D. Roman military terms

15. Currently, the meter is defined as
>    A. 1,640,763.73 wavelengths of krypton gas
>    B. 1/10,000,000 of the distance from the equator to the North Pole
>    C. the distance between two scratch marks on a metal rod
>    D. the distance light travels in 1/299,792,458 of a second

16. Daniel Fahrenheit set the boiling temperature of water on his thermometer at
>    A. 0 degrees           B. 32 degrees
>    C. 100 degrees         D. 212 degrees

## Multiple Answer Questions (3 Points Each Answer)

17. Using the Babylonian calendar of 360 days in a year, how many days are in one-third of a year; one-fifth of a year; one-twentieth of a year; one-sixtieth of a year?

>    a.              b.              c.              d.

18. A hand is four inches. How tall is a horse in inches that is 15 hands tall? How tall in feet?

>    a.              b.

## Short Answer Questions (4 Points Each Question)

19. What is the main reason to have leap days?


20. Assume that the first four-hour watch began at midnight. What time would it be at five bells on the second watch?

21. At 4:00 p.m., a family on vacation drives from Mountain Standard Time into Central Standard Time. Should their watches be set one hour earlier to 3:00 p.m. or one hour later to 5:00 p.m.?


22. The tallest mountain on earth is Mt. Everest. Its summit is 29,035 feet above sea level. How high is the mountain in miles?


## Applied Learning Activities (2 Points Each Answer)

23. Feel your pulse at the wrist and count the number of beats in a minute. Calculate the number of times your heart beats in a day.


Choose the larger:
24. A. foot              B. yard
25. A. fathom           B. yard
26. A. nautical mile    B. statute mile
27. A. cup              B. quart
28. A. bushel           B. peck

## Matching (2 Points Each)

1. _____ first law of motion          a. $a = f/m$

2. _____ second law of motion         b. $f = m \times a$

3. _____ third law of motion          c. $f_{ab} = -f_{ba}$

4. _____ force equation               d. $I = f \times t$

5. _____ definition of impulse        e. If $f = 0$ then $a = 0$

6. _____ definition of momentum       f. $p = m \times v$

## Fill-in-the-Blank Questions (4 Points Each Answer)

7. To calculate speed, divide distance by _____.

8. Suppose a canoeist takes 70 days to paddle the entire length of the Mississippi River, a distance of 3,710 miles. The canoeist's average speed in miles per day is _____.

9. On the moon, the acceleration due to gravity is 5.3 ft/sec$_2$ rather than 32 ft/sec$_2$. If an object fell six seconds before hitting the ground, it strikes the ground with a speed of _____ ft/sec. (Hint: Use the final velocity equation.)

10. Momentum is the mass of an object times its _____.

11. Force of gravitational attraction between two objects is directly proportional to the _____ of their masses and inversely proportional to the _____ of the distance separating them.

12. The Grand Canyon is about one mile deep, and the most popular trail out of the canyon is nine miles long; the mechanical advantage of the trail is _____.

## Multiple Choice Questions (4 Points Each)

13. Physics is the science that explores how energy acts on
    A. heat,  B. light,  C. matter,  D. sound.

14. A feather and lump of lead will fall at the same speed in
    A. a high speed wind tunnel, B. the atmosphere,  C. a vacuum,  D. water

15. To study the motion of falling objects, Galileo
    A. beat them into cubes          B. dropped them from a high tower
    C. pushed them from a cliff      D. rolled them down a ramp

16. Acceleration is found by dividing the
    A. average velocity          B. distance
    C. gravity                   D. change in speed by the change in time.

17. Inertia is a property of matter that resists changing its
    A. electric charge,  B. mass,  C. momentum,  D. velocity

18. Kepler proved that planets traveled in orbits that were
    A. circular,  B. elliptical,  C. parabolic,  D. straight-line

19. The Greek who said, "Give me a place to stand and a long enough lever, and I can move the world" was
    A. Archimedes,  B. Aristotle,  C. Eratosthenes,  D. Ptolemy

20. The tab on a soft drink can is an example of
    A. an inclined plane,  B. a lever,  C. a pulley,  D. a wheel and axle

## Short Answer Questions (4 Points Each Question)

21. An ordinary passenger car can accelerate to 60 miles per hour in about eight seconds. What is the car's acceleration?

22. State the second law of motion.

23. State the third law of motion.

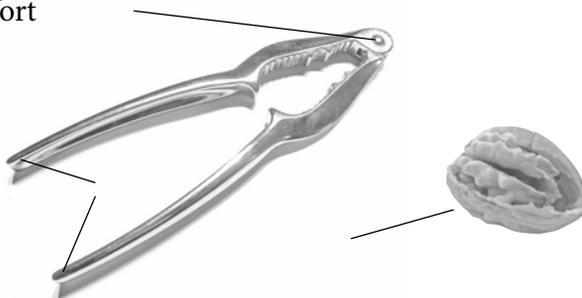## Applied Learning Activities (2 Points Each Answer)

24. Label the four forces acting on an airplane in flight.
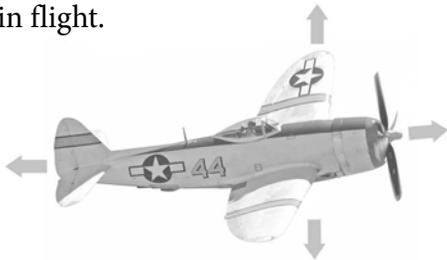


25. Label the fulcrum, load, and effort points on the seesaw.
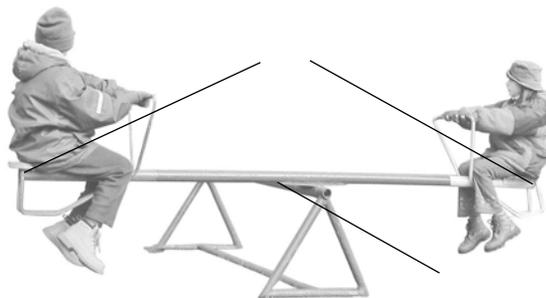


26. Label the fulcrum, load, and effort points on the nutcracker.

# Answer Keys

# *Exploring the World of Mathematics* ➝● Worksheet Answer Keys

**Chapter 1**

1. F, 2. F

3. So the calendar will match the seasons. Or, so the calendar year will be the same length as the solar year.

4. a, 5. c, 6. e, 7. d, 8. a, 9. b

10. 969 years x 365 days per year = 353,685 days

11. 120 days, 72 days, 18 days, 6 days (divide 360 by 3, 5, 20, and 60)

12. divide the population by 1,461

**Chapter 2**

1. A, 2. F, 3. D, 4. A, 5. F,

6. C, 7. D, 8. B, 9. B, 10. B

11. 6:30 a.m. The second watch began at 4:00 a.m. Each bell is ½ hour. Five bells are 2½ hours: 4:00 a.m. + 2 hr. 30 min. = 6:30 a.m.

12. Answer varies depending on actual heart rate. For 72 beats per min.: 72 beats per min. x 60 min per hr. x 24 hr. per day = 103,680 beats per day

13. 8 hours. One way to solve the problem is to change to military time and subtract — 9:00 a.m. is 0900 and 5:00 p.m. is 1700: 1700 – 0900 = 0800 or 8 hours.

14. one hour later, 4:00 p.m. MST is 5:00 p.m. CST

**Chapter 3**

1. B, 2. A, 3. C, 4. A, 5. F

6. B, 7. 5,280, 8. pound, 9. B

10. A, 11. A, 12. B, 13. A

14. 60 inches, 5 feet. Multiplying 15 hands by 4 inches per hand gives 60 inches. Sixty inches is equal to five feet: 60 in ÷ 12 in. per ft. = 5 ft.

15. Answer varies. Multiply weight in pounds by the conversion factor of 16 ounces per pound.

16. 5.499 miles or about 5.5 miles. Divide 29,035 feet by the conversion factor of 5,280 feet per mile.

**Chapter 4**

1. B, 2. B, 3. F, 4. D, 5. T

6. B, 7. B, 8. B, 9. A, 10. D

11. D, 12. F, 13. C

**Chapter 5**

1. B, 2. T, 3. F, 4. B, 5. D

6. F, 7. A, 8. D, 9. A, 10. A

11. e, 12. a, 13. d , 14. c, 15. b

16. d, 17. e, 18. f, 19. b, 20. a

21. c

22. 140 tiles. The area of the room is 140 square feet, A = L x W = 14 ft. x 10 ft. = 140 sq. ft., and each tile covers one square foot, so 140 tiles are needed.

**Chapter 6**

1. B

2. squares, square

3. A, 4. D, 5. A, 6. e, 7. d, 8. c

9. a, 10. b, 11. b, 12. d, 13. a

14. c

**Chapter 7**

1. T, 2. F, 3. T, 4. T, 5. F, 6. T

7. T, 8. F, 9. F, 10. F, 11. F

12. F, 13. F

**Chapter 8**

1. B, 2. C, 3. A, 4. A, 5. A

6. C, 7. B, 8. A, 9. B, 10. F

11. T, 12. B, 13. C

14. 233 = 89 + 144

15. F, 16. b, 17. c, 18. a, 19. d

20. e

**Chapter 9**

1. B, 2. B, 3. T, 4. T, 5. F, 6. T

7. D, 8. C, 9. B, 10. A, 11. A

12. F, 13. B, 14. D, 15. a, 16. g

and each tile covers one square foot, so 140 tiles are needed.

52. Sock Puzzle: One extra sock is enough. If the socks he is wearing match, he does not need the spare one. If his socks are not alike, then one will be the same color as the one he is carrying, giving him a matching pair.

53. Durer's Number Square: To get started, you should figure out the sum for each row, column, and diagonal. The numbers 1 through 9 sum to 45, and each row (and column and diagonal) must sum to 15 (45/3 = 15). One possible arrangement is:

| 8 | 1 | 6 |
|---|---|---|
| 3 | 5 | 7 |
| 4 | 9 | 2 |

The other seven solutions are merely rotations and mirror images of this solution.

## *Exploring the World of Physics* ➺ Quiz Answer Keys

### Unit One Quiz, chapters 1–4

1. e. If f = 0 then a = 0

2. a. a = f/m

3. c. fab = -fba

4. b. f = m x a

5. d. I = f x t

6. f. p = m x v

7. time

8. 53 miles per day. Average speed is the distance divided by the time: speed = distance/time = 3,710 miles/70 days = 53 mi/da.

9. 31.8 ft./sec. v1 = a x t = (5.3 ft./sec2) (6 sec.) = 31.8 ft/sec

10. Velocity

11. product, square

12. M.A. = 9

13. C. matter

14. C. a vacuum

15. D. rolled them down a ramp

16. D. change in speed by the change in time.

17. D. velocity

18. B. elliptical

19. A. Archimedes

20. B. a lever

21. 7.5 mi./hr. x sec. Acceleration = (change in speed)/(change in time) = (60 mi./hr.) (8 sec.) = 7.5 mi./hr. x sec.

22. The acceleration of an object is directly proportional to the force acting on it and inversely proportional to its mass.

23. To every action there is an equal and opposite reaction.

24. A. forward thrust of propeller

B. drag

C. upward lift of wings

E. downward pull of gravity

25. A. Fulcrum

B. Load

C. Effort Points

26. A. Fulcrum

B. Load

C. Effort Points

### Unit Two Quiz, chapters 5–7

1. b. The lifting force acting on a solid object immersed in water is equal to the weight of the water shoved aside by the object.

2. d. The volume of a gas is inversely proportional to the pressure.

3. a. Pressure times volume of any gas divided by the temperature is a constant.

4. c. The velocity of a fluid and its pressure are inversely related.

5. energy

6. heat