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To the Teacher

Your students will gain a whole new perspective on science instruction when they encounter the activities in *Science Mind Stretchers*. These puzzles are fun alternatives to traditional worksheets, and they are sure to challenge even your brightest budding scientists. While your students are solving these unique puzzlers, they will also be learning and reviewing important science content.

This book is designed to simplify your preparation and instructional time. Each section begins with a teacher resource page. This is a valuable tool which should not be overlooked! The resource pages include tips on what reference material your students will need for the section and what basic knowledge they need before proceeding with the work. Also included are warm-up activities which are often brainstorm/discussion topics that will get students thinking in the 'right direction.' There are hints for making certain mind stretchers simpler for younger students, and often there are suggestions for extension activities as well. In general, pages are arranged from simplest to most difficult within sections. Fortunately, there is a clear and complete answer key in the back of the book.

A unique feature of this book is that each section ends with two or more pages of open-ended exercises which allow students to think creatively and critically about science topics. Many of the mind stretchers in this book extend beyond the science curriculum into English, society & environment and maths.

The section 'Inventions and Inventors' looks at the history of many important devices and discoveries. 'Computers' helps students' understanding of how computers work and what they can do. 'Space and Space Exploration' deals not only with important facts about our solar system, but also with the interesting history of space travel. The section 'Weather and Climate' teaches about conditions that affect weather, and weather-related vocabulary and symbols. 'Animals and Plants' exposes students to unfamiliar living organisms and emphasises categorisation. The book ends with 'The Human Body,' a look at major organs and systems and the marvellous way in which they work.

The next time your students groan when they hear there is a science assignment, surprise them with a fun and challenging page from *Science Mind Stretchers*. You will not be disappointed, and they will not be bored!

1 Inventors and Inventions

The study of inventions and inventors is an appealing and valuable topic for students. They can learn a lot about science, history and research; they can also begin to develop 'inventive' ideas of their own. Be certain you have a good selection of appropriate reference books available to students before assigning any of the following puzzlers. Almanacs, encyclopedias, biographical dictionaries and library books specifically about inventions will also be helpful.

The author would especially like to acknowledge one book which provided much of the information included in this section: *Inventions, Innovations and Discoveries*, by Kevin Desmond, published by Constable and Co. Ltd., London, 1986.

It should be noted that sometimes sources do not agree on exact dates and/or descriptions of early inventions. Facts here have been verified in at least two sources whenever possible.

Warm-up activities:

1. How many famous inventors can your students list on the board in a ten-minute brainstorming session? Copy their list and have each student select one on which to write a one- to two-page report.
2. Write the names of the inventions listed below on the board. Ask students to name the country in which they think each originated. Next, ask them to place them in chronological order, numbering them from earliest to latest. (Answers in parentheses.)

gunpowder (China) (2; 221 BC)
boxing gloves (England) (7; 1747)
CD-ROM (Japan) (10; 1985)
windmill (Persia) (3; 644)
bathtub (Babylonia) (1; 1800 BC)
armoured ship (Korea) (5; 1592)
satellite (USSR) (9; 1957)
printing press (Germany) (4; 1451)
telephone (USA) (8; 1876)
classified advertisement (France) (6; 1631)

Suggestions for Specific Puzzlers

Chinese Confusion

This is a fun and informative activity in which disaster could result if instructions are not followed! Advise students to read and proceed carefully.

Criss-Crossed Inventors

Have reference books available for this activity. Inventors named here can be added to the list begun in the warm-up section to be assigned as report topics.

Sequential Sets

This activity could be assigned to small groups. Ask each group to first agree on the earliest invention, using students' own knowledge and guesswork. Then, allow the group to divide up the research, working cooperatively to find as many dates as possible. Note that some dates may vary from book to book.

International Inventiveness

If students have difficulty, you may wish to supply the first letter of some of the answer words. Or, if students have solved one word in a set, you may choose to allow them to look up its country and fill in the circled letters before unscrambling the other items.

Enterprising Edison

See how many questions students can answer on their own before allowing the use of biographies, encyclopedias, etc. Or, use this in small groups so that, without reference books, students have to pool their knowledge (and/or guesswork) to settle on their best answers. Be certain, of course, to cover the correct answers in the end.

Scientific Match-Up

This straightforward activity will no doubt require the use of reference books.

'Like'-ly Inventions

Here again, students will need reference material. For some sets, answers may not be apparent until all three items are researched.

Preposterous Publicity

This activity can be used in the following ways: (1) Read paragraphs orally and have students jot down their best guess. (2) Assign the page to individuals so that they have to research answers. (3) Assign to small groups so that each group either divides up the research or has to agree on their 'best guess' for the answer.

True Tales

Using only the context (and perhaps some lucky guesswork), students should be able to complete most answers. Use reference books only as a last resort.

Before, What Is It? and It's Your turn

These are all open-ended activities designed to let your students indulge in their own creative thinking. Allow students to share outcomes, as desired, with their classmates. Feel free to extend these in any appropriate manner.

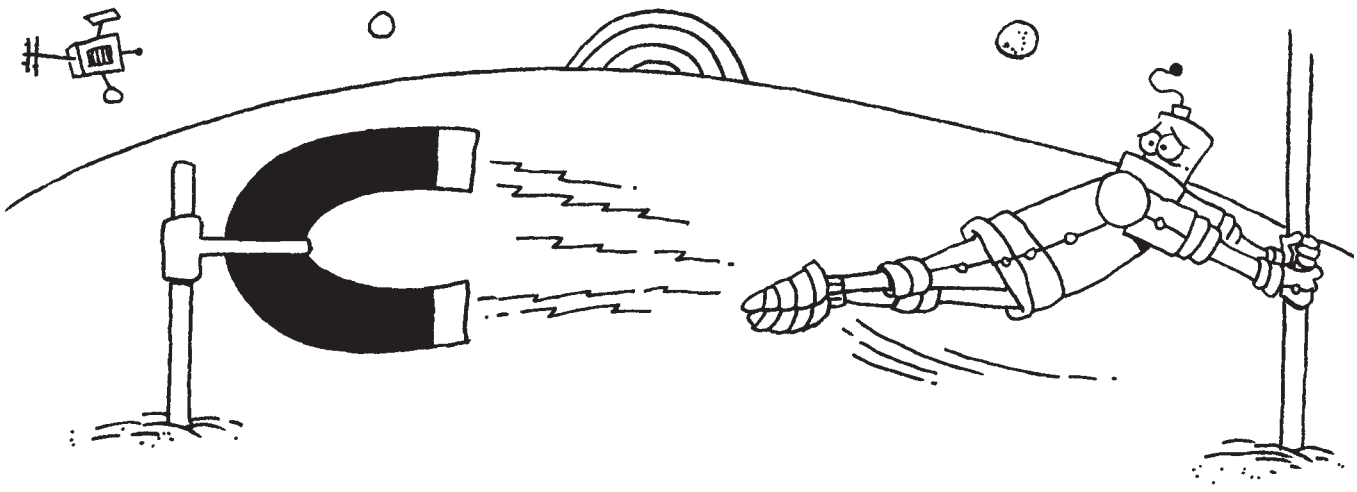
Name _____

Scientific Match-Up

Match the originator and year with the correct scientific discovery by writing a letter in each blank. Complete as much as you can without any aids; then refer to research material to find the remaining answers.

____ 1. China, A.D. 80
____ 2. Kepler, 1611
____ 3. Boyle, 1662
____ 4. Newton, 1684
____ 5. Romer, 1690
____ 6. Fahrenheit, 1715; Celsius, 1742
____ 7. Black, 1756
____ 8. Herschel, 1781
____ 9. Klaproth, 1789
____ 10. Dalton, 1803
____ 11. Oersted, 1819
____ 12. Wohler, 1827
____ 13. Ross, 1831
____ 14. Einstein, 1905
____ 15. Tombaugh, 1930
____ 16. NASA, 1960
____ 17. Rand Corp. and IBM, 1962
____ 18. IBM, 1970
____ 19. Boyd, 1972
____ 20. NASA, 1977

A. Theory of gravity
B. Temperature scale
C. Space shuttle
D. Black holes
E. Theory of relativity
F. Rainbow theory
G. Uranus
H. Atomic theory
I. Carbon dioxide
J. Magnetism
K. Robotics
L. Magnetic north pole
M. Gas pressure laws
N. Pluto
O. Magnetic field
P. Speed of light
Q. Weather satellite
R. Computer floppy disk
S. Uranium
T. Aluminium



Name _____

True Tales

Below are ten brief but true tales about some interesting inventions. Your job is to simply fill in the blank with the correct invention or a characteristic of an invention. Some answers will be obvious. Others will require deeper thinking and even speculation.

1. In 1826, a French inventor named Joseph Niépce coated a metal plate in light-sensitive chemicals and left it in a box by his window for eight hours. The view from Niépce's window was to become the world's first _____.
2. In 1927, the Rolex Company of Switzerland invented a watch called the 'oyster.' It was unique because it was _____.
3. John Spilsbury of London invented the _____ _____ in 1763 to assist in the teaching of geography.
4. Air pressure outside and suction from indoor elevators made doors difficult to open in new skyscrapers. So, in 1888, Theophilus van Konnel from the United States invented the _____ _____.
5. In Holland in 1683, Anton van Leeuwenhoek observed little animals which he called 'animolcules.' He used a high-powered lens to find these in saliva, teeth scrapings, cow excrement, etc. Unknowingly, he had discovered _____.
6. Lt. Walter Wilson and William Tritton of the United Kingdom made a prototype of a tracked, armoured vehicle in 1916. It was so successful that 100 vehicles were ordered. For security reasons, these were called 'water carriers.' Today they are commonly referred to as _____.
7. The Emperor Nero in A.D. 60 used the large transparent gemstone on one of his rings as the first miniature _____ _____.
8. In 1734, M. Fuchs of Germany filled glass balls with water and threw them into a fire, thus inventing the first _____ _____.
9. Frenchman Dinis Papin designed a container in 1680 with a tightly fitting lid which increased the pressure inside and raised the boiling point of water. Papin claimed his 'bone-digester' would make hard pieces of beef tender and savoury. Today his invention is known as a _____ _____.
10. In 1905, the Automatic Hook and Eye Co. of New Jersey, USA, began machine-producing a type of closure under the trade name of 'C-Curity'. It is better known today as a _____.