Appendix F

Item Descriptions Developed During the TIMSS 2007 Benchmarking

Fourth Grade – Mathematics

Items at Low International Benchmark (400)

Number

M08_01	Subtracts a three-digit number from another three-digit number.
M09_01	Adds a four-digit and a three-digit whole number.
M10_01	Identifies the number sentence that models a word problem involving subtraction.
M11_04	Finds the missing number in a number sentence involving multiplication.
M13_05	Solves a word problem involving addition of three-digit whole numbers.
M14_01	Identifies a four-digit number given in words.

Geometric Shapes and Measures

M01_09	Identifies two triangles with the same size and shape in a complex figure.
M07_09	Recognizes the inverse relationship between the size of a unit shown in a figure and the number of units required to cover an area.
M08_07	Identifies a pair of parallel lines.
M10_07A	Given the position, gives the informal coordinates of the position.
M10_07B	Given the informal coordinates, determines the position.

Data Display

M08_12	Completes a table from given information by counting.
M09_12	Completes a bar graph that represents a table of data.
M14_12	Identifies the largest increase shown in a bar graph.

Items at Intermediate International Benchmark (475)

Number

M01_08	Solves a measurement word problem involving subtraction of two-digit numbers.
M02_01	Identifies a set of two-digit numbers ordered from largest to smallest.
M02_05	Subtracts a number with one decimal place from another with one decimal place.
M04_01	Identifies a three-digit number described in units, 10s, and 100s.
M05_01	Identifies the appropriate operation to solve a word problem involving multiplication.
M05_04A	Extends entries in two tables according to numerical rules described in a situation.
M06_01	Identifies the value of a digit in a four-digit number.
M09_05	Selects the expression that represents a situation involving addition.
M10_06A	Extends a given geometrical pattern to determine a specified term.
M11_03	Generalizes from the first several terms of a numeric sequence to select another number that is also in the sequence.
M11_06	Extends a numeric sequence based on a geometric pattern.
M12_01	Identifies the rectangular model for a unit fraction.
M13_01A	Selects appropriate information and uses it to solve a simple proportion problem.
M14_02	Solves a word problem involving multiplication of one-digit numbers.
M14_03	Identifies multiples of a given number.

Geometric Shapes and Measures

M04_06	Identifies an object with its line of symmetry shown.
M04_07	Draws a rectangle given two adjacent sides.
M06_08	Writes the names of three familiar geometrical shapes.
M07_06	Recognizes that area does not change when the parts of a figure are rearranged.
M07_10	Recognizes the triangles in a set of polygons.
M09_10	Orders four angles by size.
M09_11	Identifies a pattern generated by quarter turns clockwise.
M10_08	Draws the line of symmetry on a symmetrical polygon.
M11_10	Locates a point on an informal coordinate grid and identifies the moves to get there.
M13_06	Identifies a three-dimensional object given the pictorial representation of its faces.
M14_06A	Identifies the shape made by connecting specified dots on a circle.
M14_06B	Draws a specified geometrical shape by connecting dots on a circle.
M14_06C	Draws a specified geometrical shape by connecting dots on a circle.

Data Display

M01_11	Identifies the pie chart that matches the information shown in a table.
M03_10	Completes a two-by-two table to summarize information.
M04_11	Completes a bar graph from information given in a table.
M05_09	Uses information to identify the number of symbols needed to complete a pictograph when the symbol represents more than one.
M06_13	Identifies the bar graph that shows a given piece of information.
M06_14	Identifies the bar chart that matches the information shown in a pie chart.
M07_12	Identifies the pie chart that matches a given bar graph.
M10_11	Identifies information from a pie chart.
M10_12	Identifies the bar chart that matches the information shown in a table.
M12_11	Interprets a bar chart to solve a problem.
M14_11	Interprets information in a table to solve a problem.

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Items at High International Benchmark (550)

Number

M01_01	Solves a word problem involving division of a three-digit number by a one-digit number.
M01_02	Determines the missing digit to give a specified difference in a three-digit subtraction problem.
M01_05	Solves a multistep word problem involving time and temperature.
M01_06	Solves a multistep word problem involving duration of time.
M01_07	Solves a word problem involving conversion of metric units of capacity.
M02_02	Identifies the operation needed to solve a problem involving division.
M02_03	Multiplies 2 two-digit numbers.
M03_06	Identifies a number that satisfies a number sentence involving division.
M04_04	Solves a word problem involving addition of two fractions with the same denominator.
M04_05	Identifies the operation needed to solve a problem involving division.
M05_02	Solves a word problem involving division of a three-digit number by a one-digit number.
M05_07	Solves a multistep word problem involving addition and multiplication of whole numbers.
M06_03	Shades half of a geometrical figure divided into four equal parts.
M06_04	Given five different digits, determines the smallest possible three-digit number.
M06_05	Writes a number between two consecutive whole numbers.
M07_01	Identifies the difference between two fractions with the same denominator.
M07_03	Selects the two-place decimal closest to a given whole number.
M07_04	Identifies the next term in a sequence of whole numbers formed by doubling.

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M07_05	Identifies a number sentence that represents a situation involving division.
M07_07	Identifies the value of an unlabelled mark on a circular scale.
M08_02	Identifies the whole number closest to a given multiple of a hundred.
M09_06	Identifies the two-step rule for a linear relationship between the first and second numbers in a set of ordered pairs of numbers.
M09_07	Identifies the value of an unlabelled mark on a circular scale.
M09_09	Identifies the appropriate operation to solve a word problem involving division.
M10_02	Identifies the number that is a hundred more than a given four-digit number.
M10_04	Identifies appropriately rounded numbers in a multiplication situation.
M10_05	Identifies equivalent familiar fractions in a context.
M10_06B	Extends a given geometrical pattern to find the value of a specified term.
M11_02	Solves a multistep word problem involving halving, doubling, and adding.
M11_08	Solves a word problem involving addition of time and conversion between hours and minutes.
M12_02	Uses knowledge of place value to solve a problem involving a five-digit number.
M12_04	Writes a fraction that represents a subset of a set of objects.
M12_05	Identifies the largest of a set of unit fractions.
M13_08	Solves a word problem involving measures and proportional reasoning.
M14_04	Adds 2 two-place decimals.
M14_05	Follows a rule to complete a table.

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Geometric Shapes and Measures

M02_07	Determines the perimeter of a rectangle given its dimensions.
M02_08A	Uses two specified geometric tiles to make a four-sided figure.
M02_08B	Uses two specified geometric tiles to make a six-sided figure.
M02_08C	Uses two specified geometric tiles to make a different six-sided figure from one made previously.
M03_07	Determines the number of nonstandard units of area needed to cover a figure.
M03_08B	On a map drawn to scale, positions a building within a range of distance from a specified point.
M03_09	Given a figure and the line of symmetry on a grid, draws the reflection.
M04_09A	States a property that two shapes have in common.
M04_09B	States a property that two shapes do not have in common.
M06_07	Given a set of angles, identifies the right angle.
M06_09	Determines the number of cubes in a stack with some hidden.
M06_10	Given the line of reflection, draws the reflection of a given figure.
M06_11	Identifies the distance around a square given the length of one side.
M08_10	Identifies a net of a cube.
M08_11	Identifies the area of a right triangle drawn on a grid.
M11_09	Draws an angle greater than 90°.
M11_11	Identifies the figure in which a line of symmetry is shown.
M12_07	Identifies a pair of shapes which are not mirror images of each other.
M14_07	Identifies the number of edges of a solid shown in a picture.
M14_08	Determines the perimeter of a figure made of squares.

Data Display

M02_10	Completes the scale so that a bar graph shows information given in a table.
M02_11	Completes a bar graph to show a specified comparison.
M04_12	Reads a part symbol on a pictograph when the symbol represents more than one.
M05_04B	Reads and interprets data from two tables to answer a question.
M05_04C	Draws conclusions from data in two tables.
M08_13	Completes a bar graph from information given in a tally chart.
M11_12	Interprets data from a bar graph to solve a problem.
M12_12	Recognizes the bar graph labeled appropriately to show given information.
M12_13A	Finds totals and decides which one is the least.

Items at Advanced International Benchmark (625)

Number

M01_03	Selects the appropriate information and uses it to solve a multistep word problem involving whole numbers.
M01_04	Writes two-step rule for a linear relationship between pairs of numbers.
M02_04	Identifies the fraction that is equivalent to the shaded fraction of a rectangle.
M02_06	Solves a two-step word problem involving two-place decimals.
M03_01	Solves a multistep word problem involving divisibility.
M03_02	Solves a problem involving proportional reasoning.
M03_03	Solves a multistep measurement problem involving multiplication and subtraction.
M03_04	Writes a rule for a multiplicative relationship between the first and second numbers in a set of ordered pairs of numbers.
M03_05	Identifies the two-step rule used to describe the relationship between adjacent terms in a sequence of numbers.
M04_02	Given a unit fraction, shows that fraction of a given set of objects.

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M04_03	Identifies a fraction equal to a given fraction.
M06_02	Solves a word problem involving division and rounding up the remainder.
M06_06	Adds two familiar unit fractions to solve a word problem.
M07_08	Solves a multistep problem involving conversion between hours and minutes.
M08_03	Identifies the smallest number from a set of one- and two-place decimals.
M08_04A	Identifies the circular representation of a nonunit fraction.
M08_04B	Explains why a chosen circular representation shows a given nonunit fraction.
M08_05	Identifies the missing first number in a number sentence involving subtraction.
M08_06	Identifies the two-step rule that relates the numbers in two columns of a table.
M09_02	Identifies all the numbers in a given interval ending in a given string of digits.
M09_03	Halves the amounts in a recipe involving whole numbers and fractions.
M10_03	Finds all the factors of a multifactor number less than 20.
M11_01	Given a unit fraction, identifies a larger fraction with a different denominator.
M11_05	Identifies the number that satisfies a number sentence involving addition of two terms on each side.
M11_06C	Generalizes from the first several terms of a numeric sequence to find the tenth term.
M12_03	Estimates the quotient of a four-digit number divided by a two-digit number.
M12_06	Solves a word problem involving proportional reasoning.
M13_01B	Selects appropriate information and uses it to solve a proportion problem.
M13_01C	Selects appropriate information and uses it to solve a multistep problem involving proportions.
M13_02	Selects appropriate information and uses it to solve a proportion problem.

Geometric Shapes and Measures

M02_08D	Uses three specified geometric tiles to make a seven-sided figure.
M02_09	Identifies a shape rotated by a 90° turn.
M03_08A	On a map drawn to scale, positions a park at a given distance from a specified point.
M03_08C	On a map drawn to scale, positions a building halfway between two specified points.
M04_08	Calculates the area of a rectangle.
M05_06	Recognizes that the area does not change when a figure is cut into parts and rearranged.
M05_08	Uses properties of rectangles and triangles to solve a problem.
M07_11	Recognizes the net of a triangular prism.
M08_08	Uses knowledge about properties of rectangles to classify statements as true or false.
M08_09	Solves a multistep word problem involving perimeter.
M09_08	Determines the area of a figure made up of squares and half squares on a grid.
M10_09	Uses knowledge of two common solids to classify statements about them as true or false.
M10_10	Matches a solid to its net.
M12_08	Determines the number of cubes in a given rectangular box.
M12_09	Identifies the area of an isosceles triangle drawn on a grid.
M12_10	Draws a line through a given point perpendicular to a given line.
M13_07	Identifies the position of a shape after a half-turn rotation.
M14_09	Estimates the length of a curved line in nonstandard units.

Data Display

M01_10	Organizes data and completes a tally chart to represent it.
M04_13	Uses data from two different graph types to solve a problem.
M12_13B	Draws and justifies a conclusion from data given in a table.

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Items Above the Advanced International Benchmark (625)

Number

M05_03	Identifies the number that satisfies a number sentence involving division of two terms on each side.
M05_05	Solves a multistep problem to find one of the two unknown values.
M07_02	Subtracts a one-place decimal from a two-place decimal presented horizontally.
M13_03	Selects the appropriate information and uses it to solve a multistep problem involving two proportions.

Geometric Shapes and Measures

M04_10	Estimates a height using a nonstandard unit.
M06_12	Classifies polygons according to two given properties they either have or do not have.
M11_07	Estimates the length of a curved line next to the middle of a ruler.
M14_10	Draws all four lines of symmetry in a nonstandard shape.

Fourth Grade – Science

Items at Low International Benchmark (400)

Life Science

S13_03	Recognizes that wings are common to bird, bats, and butterflies.
S11_07	Recognizes that birds sit on their eggs to keep the eggs warm.
S13_01	Recognizes wolf as a predator.
S14_11	States one effect the sun can have on unprotected skin.
S07_04	Recognizes from diagrams of animals which animal is most likely to live in a desert.
S12_01	Completes a table by matching diagrams of animals to their ecosystems.
S02_05	Recognizes that the lung is the body organ most harmed by smoking.

Physical Science

S04_06   Recognizes that an iron object is most likely to be heavier than a wood or styrofoam object of the same shape and size.

S10_01   From a diagram, recognizes which thermometer reading shows the hottest water.

S14_09   Recognizes that the vibrations that produce sound in a guitar start with the strings.

S06_01   Identifies wind as the cause of movement in a sail boat.

S12_06   Identifies ice as the solid form of water.

S07_06   Recognizes that iron nails rust.

S14_07   From a diagram, identifies the direction of the force of Earth's gravity.

Earth Science

S03_09A   States the names of two seasons.

Items at Intermediate International Benchmark (475)

Life Science

S05_01   Recognizes that snakes shed their outer covering as they grow larger.

S04_05   In the context of an investigation of plant growth, describes a treatment that can cause one plant to grow better than another.

S12_02   Describes one way people can protect their teeth from decay, in addition to brushing.

S02_01   From a diagram, distinguishes non-living things from living things.

S08_01   Recognizes the stomach as an organ where digestion takes place.

S14_01   Recognizes that the function of seeds is to produce new plants.

S11_03   From pictures of animals, pairs each animal with its distinguishing biological characteristics (skeleton, milk production, number of legs).

S09_05   Recognizes that tadpoles hatch from frogs' eggs.

S01_05   Recognizes that a person's hair type can be predicted by his/her parents' hair type.

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S05_03	Recognizes from diagram of birds which bird is most likely to eat mammals.
S09_02	Recognizes which foot structure belongs to a bird that lives in a pond.
S13_02	Recognizes that fat layers help keep a walrus warm.
S14_02	Recognizes that the body needs more oxygen during exercise.
S07_01	Recognizes that trees make their own food using sunlight.
S01_06	Interprets from a food chain that snakes eat voles.
S04_03	Recognizes that fruits and vegetables are the best source of vitamins and minerals.
S06_08	Describes how influenza can be passed from person to person.

Physical Science

S02_06	In the context of an investigation, recognizes that a floating body is lighter than bodies of the same shape and size that sink.
S03_07	From a diagram showing a person blowing into water using a straw, explains why bubbles rise to the top.
S09_08	From a list of common materials, indicates which of them will burn.
S01_02B	Given a diagram showing that the color of a white shirt appears to be different under different colored light bulbs, infers its color under blue light.
S11_08	Recognizes that an iron nail can complete an electrical circuit and allow a bulb to glow.
S10_07	Identifies electricity as the energy source for three household objects shown in a diagram.
S13_07	States two things that electricity can be used for in daily life.
S03_05A	States one way water in ice form is used by humans.
S03_05B	States one way water in liquid form is used by humans.

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Earth Science

S05_07	Explains why people should not drink water directly from oceans and seas.
S07_11	States two different things human use wood for.
S01_08	Orders diagrams showing ribbons on poles by decreasing wind strength.
S03_09B	States one difference between two previously named seasons.
S05_08	States one difference between the sun and the moon.
S08_11	States two planets other than Earth that orbit the sun.

Items at High International Benchmark (550)

Life Science

S11_02	Recognizes that if the only remaining Siberian tigers are female, they will not be able to reproduce, and will die out.
S02_03	Complete a diagram showing the life cycle of a moth.
S04_02	Describes one way that seeds from a plant are dispersed.
S10_04	From a diagram of a food chain, identifies a predator-prey relationship.
S04_08	From information shown in a table, completes a food chain.
S06_06	Explains why traveling by bicycle is better for the environment than traveling by motorbike.
S14_06	From a list of human activities, identifies which have positive and which have negative effects on the environment.
S09_04	Recognizes that differences in light brightness cause eyes in one picture to look different from the eyes in a second picture.
S10_02	Recognizes that plants make food using energy from the sun.
S01_04	Recognizes that the teeth of monkeys are most like the teeth of humans.
S07_05	Recognizes from a picture types of seed that are scattered by wind.
S08_02	Recognizes from a diagram the part of a flowering plant that produces seeds.

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S06_03	From a picture of a pond ecosystem, identifies three living and three nonliving things.
S05_04A	States one physical feature or behavior of fish that distinguishes them from sea mammals.
S03_03	Using knowledge of teeth, identifies and explains which of two skulls shows an animal that ate plants and an animal that ate meat.

Physical Science

S02_08	Identifies a method of separating a mixture of iron filings and sand.
S05_05	Recognizes that the hotter the water the more sugar will dissolve.
S08_09B	In the context of an investigation, states that candy dissolves faster in hot water than in cold.
S04_12	Completes a table by identifying examples of matter that exist as solid, liquid, or gas at room temperature.
S02_10	Explains why water disappears from a dish of water left in the sun.
S05_06A	Describes how a liquid can be turned into a gas.
S05_06B	Describes how a liquid can be turned into a solid.
S03_06	From a diagram showing a metal ruler heated at one end, recognizes the direction of heat transfer.
S11_05	Recognizes that metal conducts heat better than wood.
S06_10	From a table of properties of two materials, determine the identity of each.
S10_09	Given a diagram of three objects of different materials ordered by volume, justifies that objects with more volume do not necessarily weigh more.
S13_05	From a table showing the results of an experiment, identifies what was being studied in the experiment.
S08_09A	In the context of an investigation, explains that candy dissolves faster when it is crushed into small pieces.
S11_04	Recognizes that fine salt dissolves faster in water than coarse salt and explains why.
S13_08	Recognizes that heat needs to be supplied for melting and boiling but not for freezing.

S01_01C	From an investigation of the effect of different colored light on the apparent color of a shirt, infers the color of an unknown light bulb.
S10_11	From a diagram, recognizes the direction of a shadow.
S12_04	Recognizes what causes a shadow to be formed.
S01_02A	Describes the results of an investigation involving white shirt seen under different colored light bulbs.
S02_07	From a diagram of an electric circuit, states why an unbroken bulb does not light up.
S09_10	From a diagram showing two magnets on carts with the magnet poles marked, describes what happens to the carts when they are moved close together and let go.
S12_11	Completes the labeling of the poles on magnets shown in a diagram.
S04_07	Recognizes an example of an object moving because of the force of gravity.
S07_07	From a diagram showing three powders, recognizes those likely to be mixtures.
S09_07	Recognizes that salt water is a mixture.
S02_09	Identifies an object that runs only on electricity.
S07_08	Given a set of diagrams, recognizes that ice melts most slowly in a closed container.
S11_09	Recognizes that gravity causes an object to fall to the ground.

Earth Science

S02_12	Recognizes that most of Earth's surface is covered by water.
S10_13	Identifies that water that has had its salt removed so that it can be used as drinking water is most likely to come from the sea.
S07_09	Explains that early morning moisture can be due to condensation.
S06_13A	Describes one advantage of farming near a river.
S12_14	From a table showing temperature and cloud cover, identifies the place where it is most likely to snow.
S14_08	Recognizes that parts of animals that have hardened into rock are the best evidence that there were many kinds of animals on Earth that no longer exist today.

S04_10	Recognizes that a mountain side rock layer containing shellfish fossils was once part of a sea floor.
S10_10	States one form of energy Earth receives from the sun.
S13_10	Identifies the Earth, moon, and sun from a diagram.
S02_13A	From a table showing planetary distance from the sun, identifies the planet closest to the sun.
S02_13B	From a table showing planetary distance from the sun, identifies the planet most likely to have the lowest average surface temperature.

Items at Advanced International Benchmark (625)

Life Science

S05_04	States one physical feature or behavior of sea mammals that distinguishes them from fish.
S14_03	Recognizes examples of animals that take care of their young.
S07_02	Explains that the last surviving member of a species of a turtle cannot reproduce and gives a reason.
S06_09	Describes how migration increases the survival of birds.
S14_04	Recognizes an advantage to monarch butterflies of being poisonous to birds.
S10_03	States one thing a person can do to avoid catching flu from an infected person.
S12_09	Describes one physical change that can take place in a mammal as the weather gets cold.
S03_04	Recognizes that the energy needed to heal a cut comes from food.
S13_11	Describes two human activities that can lead to the extinction of animals.
S13_04	States one thing can cause the temperature of the human body to be higher than normal.
S02_02	Recognizes which animal has six legs.
S03_01	Recognizes a group of animals that are all mammals.
S04_01	From a diagram, recognizes an animal that has a skeleton on the outside of its body.
S08_06	Recognizes an animal that is classified as a mammal.
S08_03	Identifies the body covering that protects a reptile.

S10_06A   From a diagram of a tiger skull, identifies a function of the canines.

S11_01   Recognizes from a list of animals that humans have a young form that looks most like the adult form.

S09_01   Recognizes from a list of foods that cheese is the best source of calcium.

S01_07   Evaluates and supports argument for the need for a balanced diet.

S12_07   Explains why people should drink a lot of liquid every day.

Physical Science

S02_11   Recognizes that, regardless of their size, ice cubes float in water.

S04_11   Given a jar containing balls of the same volume but made of different metals, names one property that can be used to separate the balls into different groups.

S14_12   Names a source of energy other than coal, oil, or natural gas that is used to produce electricity.

S01_01A   Describes the results of an investigation involving a red shirt seen under different colored light bulbs.

S01_01B   From an investigation of the effect of different colored light on the apparent color of a shirt, concludes that the shirt looks different under different lights.

S11_06   Names one thing that shows that sunlight is made up of different colors.

S12_03   Using information in a table about physical properties of familiar items, identifies another item whose physical properties match those of one of the items in the table.

S13_06   Recognizes the diagram that best shows how ice floats in water.

S14_05   Labels the freezing point of water on a diagram of a thermometer.

S08_09C   In the context of an investigation, recognizes that more water in a solution makes a drink less sweet.

S14_13   Recognizes that burning results in new substances.

S08_10   From a list of familiar materials, recognizes the best conductor of heat.

S08_08	Given two electric circuits diagrams showing different battery configurations, explain which circuit will allow a bulb to light.
S06_02	Distinguishes objects that produce their own light from those that do not.
S10_08	From diagrams providing partial information about the weights of four cubes, draws a conclusion about the relative weight of one of the cubes.

Earth Science

S11_11	Recognizes a soil change due to natural causes.
S13_09	Recognizes that soil rich in decaying plants and animals makes plants grow.
S12_13	States two things that make up Earth's crust.
S04_09	Recognizes the pie chart that shows the proportions of land and water on Earth.
S04_14	Recognizes a common characteristic of different types of desert.
S16_13B	Describes one disadvantage of farming near a river.
S04_13	Provides an example of a natural resource, other than water, and describes its use.
S14_10	In the context of an investigation, explains why water does not fill a glass inverted in water but does fill it when the glass is tilted.
S10_12	Recognizes that the direction a river flows depends on the slope of the land.
S03_08	Recognizes that the moon is visible because it reflects the light from the sun.
S12_12	Recognizes how long it takes for Earth to orbit the sun.
S06_11	Recognizes how long it takes for Earth to rotate on its axis.
S08_12	From a diagram showing a shadow at different times of the day, explains why the shadow changed.

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Items Above the Advanced International Benchmark (625)

Life Science

S04_04	States two characteristics that distinguish between living and nonliving things.
S12_05	States two characteristics that living things share, other than a need for water.
S06_05	Identifies a group of animals that contains only reptiles.
S05_02	States two reasons why humans need a skeleton.
S10_06B	From a diagram of a rat skull, identifies a function of the incisors.
S06_07	Identifies one function of fruit.
S06_04	From a diagram of a flowering plant, identifies numbered parts and states a function of each part.
S03_02	Predicts whether different types of plants can reproduce, and justifies the choice.
S07_03	Evaluates and explains the best experimental setup for investigating effect of salt on seaweed.
S02_04	Recognizes where plants get the energy to make food.
S08_04	Recognizes which living things make their own food.
S08_05	States one thing necessary to maintain good physical health and explains why.

Physical Science

S06_12	From a series of diagrams, identifies an unknown material as a gas based on its behavior in a closed container and justifies the answer.
S10_05	Recognizes a description of condensation.
S09_09	Determines changes in temperature when a hot object is put into cold water.
S01_03	Predicts and explains the color of a blue shirt under a blue light.
S12_08	Draws a conclusion about the relative weight of two objects made of different materials that both sink in water.

Earth Science

S11_10	Describes activities that require air.
S09_03	Describes two things people can do to avoid wasting water.
S07_10	Recognizes that fossils are evidence that land was once covered by the sea.
S09_11	Relates day and night on Earth to rotation on its axis.

Eighth Grade – Mathematics

Items at Low International Benchmark (400)

Number

M02_02	Multiplies a decimal by a power of ten.
M03_07	Multiplies a two-place decimal by a three-place decimal.
M03_11	Solves a word problem involving a proportion with unit ratio.
M04_01	Given a number in the millions in words recognizes the numeral.
M06_01	Given a three-place decimal recognizes the equivalent fraction.

Algebra

M10_05A	Finds the next term in a simple number pattern.

Data and Chance

M02_12	Given a table of values, selects the graph that could represent the given data.
M03_08	Given a table of values for two variables, selects the line graph that could represent the given data.
M14_13	Uses information in a table to complete a bar graph.

Items at Intermediate International Benchmark (475)

Number

M01_01	Identifies a circular model of a fraction that best approximates a given rectangular model of the same fraction.
M01_02	Solves a word problem by adding numbers with up to three decimal places.
M01_06	In a word problem selects the approximate quantity remaining after an amount is decreased by a given percent.
M02_01	Identifies a set of five-digit numbers ordered from largest to smallest.
M03_01	Reads the value indicated by an unlabeled tick mark on a circular scale.
M03_03	Selects the smallest fraction from a set of familiar fractions.
M03_12	Solves a word problem about distance and time by finding the missing term in a proportion.
M03_13	Identifies the integer that gives a specified result when divided by a given negative integer.
M04_05A	Completes a table by solving a simple word problem.
M08_01	Recognizes the power of 10 of the divisor in a division of decimals.
M10_01	In a word problem, given a unit fraction of a measure identifies the whole measure.
M12_01	Knows simple exponential notation.
M12_03	Uses knowledge of the whole being 100 percent to solve a simple word problem.
M12_04A	Completes a table of equivalent proportions.
M13_01	Rounds two-place decimals to whole numbers.
M14_01	Solves a word problem involving multiplication of a fraction and a decimal.
M14_04	Identifies equivalent ratios.

Algebra

M07_04	Selects the rule expressed in words that generates successive terms in a given number pattern.
M07_05	Solves a linear equation in one variable.

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M11_04	Knows the meaning of a simple algebraic expression involving multiplication and addition.
M11_05	Identifies the algebraic expression that represents a situation, involving addition and multiplication.
M13_03	Extends number patterns derived from a sequence of geometric shapes.
M14_03	Recognizes the distributive property in evaluating an algebraic expression.
M14_07	Identifies the ordered pair of numbers that satisfies a linear equation.

Geometry

M02_11	Given its coordinates, determines that a point is in the second quadrant of the Cartesian plane.
M03_14	Determines the measure of the missing angle in a right triangle.
M04_11	Draws a triangle on a grid with twice the area of a given rectangle.
M05_05	Solves a word problem by comparing distances on a map drawn to scale with a given distance.
M07_10	Uses properties of an isosceles triangle to identify the coordinates of a point on a grid.
M09_11	Given a net of a three-dimensional object, completes a two-dimensional drawing of it from a specific viewpoint.
M10_10A	Given instructions, locates points on polar grid.

Data and Chance

M02_13	Reads a bar graph to identify quantities which satisfy a given condition.
M03_02	Recognizes that the probability of an outcome of a single event is inversely related to the number of elements in the population of events.
M07_13A	Identifies the straight line graph modeling a situation described in words.
M07_13B	Interprets two straight line graphs and uses their intersection to solve a problem.
M08_15	Given a table of percentages, selects the pie chart that could represent the given data.

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M08_16	Interpolates from a line graph to provide an estimated value.
M10_11	Given a situation, judges the chance of an outcome as likely.
M11_13A	Selects the appropriate line on a graph and reads information from it.
M12_14	Given a situation, judges the chance of an outcome as unlikely.

Items at High International Benchmark (550)

Number

M01_09	Adds three fractions with different denominators which are less than 10.
M02_03	Uses knowledge of negative integers to produce the largest sum.
M02_05	Reduces an amount by a given percentage.
M04_02	Identifies the prime factorization of a number.
M04_05D	Combines the information from intermediate solutions to solve a problem involving time.
M05_01	Identifies equivalent ratios in a problem setting.
M06_02	Selects the numerator of a fraction to make two fractions equivalent when one denominator is not a multiple of the other.
M06_03	Continues a pattern of number sentences involving subtraction of negative integers.
M06_04	Given the part and the whole can express the part as a percentage and vice versa.
M07_01	Solves a word problem by determining a number between two given numbers that is divisible by only one of two other given numbers.
M08_02	Recognizes the fraction equivalent to a percentage.
M08_03	Approximates the sum of 5 three-digit numbers to the nearest 100.
M08_04	Identifies the larger of two fractions with different numerators and different denominators and explains why it is larger.
M08_05	Writes a rule for a multiplicative number pattern involving negative numbers.

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M09_01	Identifies the decimal number that is equivalent to the sum of two fractions whose denominators are powers of ten.
M10_02	Identifies the decimal number represented by a point between two consecutive whole numbers on a number line with only the whole numbers labeled.
M10_03	Uses the law of exponents to express a product.
M12_02	Reads the value indicated by a minor unlabeled tick mark on a circular scale, when the previous major tick mark also is unlabeled.
M12_04B	Finds the unknown term in a proportion in a given situation.
M13_07	Identifies the prime factors of a given number.
M13_08	Uses percentages given in a pie chart to solve a problem.
M14_02	Uses knowledge of decimal place value to express a given sum as a decimal number.
M14_06A	Selects and combines information from two sources to solve a multistep word problem.
M14_06B	Selects and combines information from two sources to solve a multistep word problem.

Algebra

M02_06	Recognizes the simplification of an algebraic expression.
M02_07A	Continues a pattern involving the sum of interior angles of polygons based on triangles.
M04_04	Identifies the expression that represents a multiplicative situation.
M04_06	Solves a linear equation given in a word problem.
M05_02	Recognizes the product of two algebraic terms in one variable that involves exponents.
M05_10	Identifies the linear equation represented by a set of ordered pairs given in a table.
M06_05	Recognizes the collection of algebraic terms involving exponents.
M06_06	Evaluates an algebraic expression in two unknowns.
M06_08	Uses the value of a given algebraic expression to find the value of a related algebraic expression.
M07_06	Identifies an algebraic expression to model a situation.

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M08_06	Solves a simple linear equation in one variable with a mixed number solution.
M08_07	Finds a missing term in a nonarithmetic and nongeometric number sequence.
M08_08	Identifes the linear equation satisfied by two given values.
M08_09	Solves a proportion expressed algebraically.
M08_11A	Adds two algebraic expressions and simplifies.
M09_05	Identifies the algebraic expression that represents a situation involving the sum of a constant term and a product.
M09_06	Uses a formula to determine the value of one variable given the value of the other.
M10_05B	Finds a specific term in a simple number pattern.
M10_06	Uses the distributive law to identify an algebraic expression equivalent to a given one.
M10_07	Determines the solution to a pair of simultaneous equations.
M11_01	Solves a word problem by using patterns in a two-column table to determine the number in the second column that would correspond to a number midway between two entries in the first column.
M11_12	Identifies the quantity that satisfies two inequalities represented by balances in a problem situation.
M12_05	Identifies the equation of a line that passes through points shown on a graph.
M12_07	Finds the value of an algebraic expression involving parentheses and negative terms.
M12_08A	Finds a specific term in a pattern presented numerically and geometrically.
M13_09	Given an interval containing a number, determines the interval containing the sum of that number and a whole number.
M14_05	Identifies the algebraic expression that represents a fraction of a variable.
M14_08	Identifies the equation that models a situation given in a word problem.
M14_09	Identifies values of two variables each satisfying a simple inequality.

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Geometry

M01_03	Identifies a three-dimensional object after rotation.
M01_05	Finds the perimeter of a square, given its area is a square number.
M02_09	Identifies a net of a cube.
M03_06	Uses knowledge of a straight angle to find the measure of an angle.
M03_15	Uses properties of angles to draw and label a figure.
M04_09	Identifies how a three-dimensional object would look from a given viewpoint.
M05_04	Calculates the volume of a rectangular prism by using appropriate measure from its nets.
M05_09	Uses the properties of a triangle and regular hexagon to find the measure of an angle.
M06_11	Uses properties of triangles to draw a triangle of given dimensions on a grid.
M06_12	Given the volume and two dimensions of a rectangular solid, finds the other dimension.
M07_08	Calculates the area of an irregular figure formed by two rectangles.
M08_12	Identifies a true statement based on the properties of parallel and perpendicular lines.
M08_13	Uses the angle properties of triangles and rectangles to find a missing angle.
M09_09	Determines the number of cubes needed to fill a hole in a given shape.
M09_10	Identifies the justification that a triangle is a right triangle using the Pythagorean theorem.
M09_12	Identifies the transformations used to produce a sequence of figures.
M10_10B	Determines the measure of an angle drawn on a polar grid.
M11_08	Visualizes the unfolded shape of a figure shown on a folded piece of paper and uses properties of triangles to identify the shape.
M11_10	Applies properties of interior and exterior angles of a triangle to find an unknown angle in overlapping triangles.

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M12_09	Draws a symmetrical shape given half of it and one of its lines of symmetry.
M12_11	Identifies two shapes that make a square.
M14_11	Given a cube made of unit cubes, uses the properties of a cube to identify the number of remaining unit cubes.

Data and Chance

M01_07	In a word problem, when given the possible number of outcomes and the probability of successful outcomes, solves for the number of successful outcomes.
M02_14	Uses the information in a pie chart showing percentages to draw a bar chart.
M04_12A	Calculates and compares the means of two sets of numbers given their totals.
M04_13	Given a word problem, determines the most likely outcome.
M05_07C	Draws conclusions from data in a table to meet given conditions.
M05_08	Compares and integrates several sets of data to determine which meet given conditions.
M06_14	Determines which of a set of statements involving averages must be true.
M06_15	Determines the probability of two of three possible outcomes.
M06_16	Uses data given as percentages to predict the outcome of a future event.
M06_17	Constructs and labels a pie chart representing a given situation.
M07_11	Uses experimental data and an understanding of probability to draw the spinner that could have produced the given data.
M07_13C	Reads values from two straight line graphs to solve a problem.
M09_13	Constructs and labels a pie chart representing a given situation.
M09_14	Identifies the statement that best describes the relative likelihood of two events.
M10_12A	Calculates the mean of a set of numbers.

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M11_13C	Selects the appropriate line on a graph and determines the interval where the greatest change occurs.
M12_12	Reads values from two line graphs to solve a problem.
M12_13	Identifies a possible word representation for a part of a speed-time graph.
M14_14	Explains why a conclusion drawn from a given bar graph is incorrect.

Items at Advanced International Benchmark (625)

Number

M01_11B	Given the dimensions of two rectangles, expresses the ratio of their areas.
M02_04	Given the total number and the ratio of the two parts, identifies the value of one part.
M03_05	Given the total number and the ratio of the two parts, finds the value of one part.
M03_09	Selects appropriate data to solve a problem involving operations with fractions that have different denominators.
M03_10	Solves a word problem involving multiplication of a proper fraction and an improper fraction.
M04_05B	Given an average speed and distance, finds the duration and uses it to solve a problem.
M04_05C	Given an average speed and distance, finds the duration and uses it to solve a problem.
M07_02	Identifies a procedure for subtracting fractions with different denominators.
M07_03	Given the total number and the ratio of the two parts, identifies the value of one part.
M07_12	Given the original and reduced prices, finds the percentage of the reduction.
M09_02	Given two points on a number line representing unspecified fractions, identifies the point that represents their product.
M09_03	Solves a problem involving a fraction of a whole number of currency units.
M10_04	Arranges four given digits to obtain the greatest product of 2 two-digit numbers.
M11_02	Converts a mixed number to a decimal rounded to two places.

Algebra

M01_04	Solves a linear inequality involving a fraction.
M02_07B	Finds a specific term in a number pattern involving the sum of interior angles of polygons based on triangles.
M02_07C	Expresses the general term algebraically in a number pattern involving the sum of interior angles of polygons based on triangles.
M02_08	Solves a word problem that can be expressed as two linear equations with two variables.
M04_03	Evaluates an algebraic expression involving parentheses and negative terms.
M04_07	Simplifies an algebraic expression involving parentheses and negative terms.
M04_08	Given the equation of a straight line identifies a point on it.
M05_03	Extends a number pattern presented geometrically to solve a problem.
M06_09	Finds the missing term in a nonstandard number pattern.
M06_10	Identifies the linear equation that is satisfied by two ordered pairs.
M08_10A	Writes an equation to model a situation involving perimeter.
M08_10B	Solves a linear equation.
M08_11B	Subtracts one algebraic expression from another and simplifies.
M09_04	Identifies a diagram that models addition of two like algebraic terms.
M10_05C	Expresses the general term algebraically in a simple number pattern.
M10_08	Given the length of the sides of a rectangle in terms of a variable, identifies the algebraic expression for its area.
M11_03	Adds three simple algebraic rational expressions with different numerical denominators.
M11_09	Identifies the sum of three consecutive whole numbers given the middle number in general terms.
M12_06	Identifies the equation that models a situation involving distance, speed, and time.
M12_08B	Explains how to find a specific term in a pattern presented numerically and geometrically.

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M12_08C	Expresses the general term algebraically in a pattern presented numerically and geometrically.
M13_04A	Extends a number pattern presented geometrically and numerically to solve a problem.
M13_04B	Extends a number pattern presented geometrically and numerically to solve a problem.
M13_04C	Extends a number pattern presented geometrically and numerically to solve a problem.
M13_05	Expresses the general term algebraically for two related number patterns.
M14_10	Uses a given formula to solve a word problem.

Geometry

M01_08	Uses properties of congruent triangles and the sum of the angles of a triangle to find the measure of an angle.
M01_11A	Uses computation with fractions to find the length and width of a rectangle and draws and labels that rectangle on a grid.
M01_12	Finds the area of a triangle inscribed in a square with known dimensions.
M02_10	Uses properties of parallel lines and triangles to find the measure of an angle sum.
M03_04	Identifies the image of a triangle under a rotation about a point in the plane.
M04_10	Uses properties of isosceles and right triangles to find the measure of an angle.
M06_13	Identifies the image of a triangle under a rotation about a point in the plane.
M07_09	Solves a problem involving angle bisectors and angles at a point on a straight line.
M08_14	Uses properties of similar triangles to identify equal angles.
M09_07	Uses information about the lengths of segments on a line to determine the distance between their midpoints.
M09_08	Finds the perimeter of a square, given its area is a square number.
M10_09	Identifies the polygon that has a line of symmetry.

M11_06   Uses knowledge of time, clocks, and angles to solve a problem.

M11_07   Determines the area of a trapezoid inscribed in a rectangle.

M12_10   Uses the Pythagorean theorem in finding the perimeter of a trapezoid.

M13_06   Uses knowledge of interior angles of a triangle to determine the angle sum of a given polygon.

M14_12   Uses Pythagorean theorem in finding the area of a triangle.

Data and Chance

M04_12B   Determines the truth of statements made about data shown in a scattergraph.

M05_07A   Completes a table by interpreting several timetables to identify times that meet a given set of conditions.

M05_07B   Derives information from given timetables to complete a table for a specified journey and check that it meets given conditions.

M10_12B   Finds the median of a set of numbers.

M11_11   Given a spinner, identifies the expected frequency of a particular outcome.

M11_13B   Interprets information from a line graph to determine an average.

M13_02   Solves a problem involving extrapolation of the data shown in a double bar graph.

M14_15   Uses understanding of average to solve a problem.

Items Above the Advanced International Benchmark (625)

Number

M01_10   Estimates the total time in minutes for an event made up of a series of events, each given in minutes and seconds.

M05_06   Calculates total costs for each of two groups given different unit costs and discounts.

M14_06C   Compares information from two sources and explains the result.

Algebra

M06_07   Solves an inequality.

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Geometry

M07_07   Uses knowledge of the area of a circle and of average rate to solve a problem.

Data and Chance

M10_12C   Uses understanding of median and mean to solve a word problem.

Eighth Grade – Science

Items at Low International Benchmark (400)

Biology

S07_01   Identifies the circulatory system from a list of its components.

S04_01   Recognizes the cells that conduct messages.

Chemistry

S10_07   Recognizes the material that would complete an electric circuit.

S12_06   Recognizes the material that best conducts heat and electricity.

S10_01   Recognizes the chemical formula of carbon dioxide.

Physics

S07_06   Given the definition of work, identifies a diagram that shows that work is being done.

S08_06   Recognizes the form of energy in a compressed spring.

Items at Intermediate International Benchmark (475)

Biology

S08_05A   Based on data in a table, describes the changes in the population of two organisms over time.

S01_08   Based on a completed food web, predicts and explains what is most likely to happen to a predator population when its prey population is reduced.

S02_02   Explains why exposure to influenza does not necessarily lead to infection.

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S08_01	Recognizes how vaccination helps prevent illnesses.
S11_01	Recognizes which cells destroy bacteria that enter the body.
S11_04	States why exercise is important for good health.
S13_02	Explains that an acquired characteristic cannot be passed onto the next generation.
S05_09	Recognizes a characteristic that is found only in mammals.
S04_02	From a diagram, identifies an organ of the digestive system.
S12_01	Recognizes an organism that is a producer.
S04_05	Recognizes a disease caused by a virus.

Chemistry

S10_05	Recognizes from a description of indicator color changes that neutralization has occurred.
S10_11	Recognizes a chemical process involving energy absorption.
S07_05	Identifies vinegar as an acidic solution.
S12_04	In the context of an investigation, identifies the condition under which nails would rust most.

Physics

S03_05	Applies knowledge that sound requires a medium to travel through by contrasting a situation on Earth to a situation on the moon.
S14_10A	Given a diagram showing a ball being thrown upwards, states the force that causes the ball to fall.

Earth Science

S06_13	Recognizes where active volcanoes are most likely to be found.
S01_06	Predicts a long-term effect of cutting down trees on the environment.
S08_13	Matches each of four processes that take place in the water cycle with descriptions of the processes.
S11_10	Given a starting point, orders the processes involved in the water cycle.
S13_13	Identifies paper from a list of common materials as the one that breaks down fastest.
S12_14	Recognizes what is caused by Earth rotating in its axis.

Items at High International Benchmark (550)

Biology

S02_01	Recognizes digestion from a description of the process.
S09_04	States one function of the uterus.
S14_02	Classifies animals in a list into two groups on the basis of a physical or behavioral characteristic and states the characteristic used.
S11_03	Compares two diagrams showing a pair of eyes and recognizes that more light results in smaller pupils.
S03_10	Recognizes the hierarchy of organization in living organisms (cell, tissue, organ, and organism).
S07_02	States one structure that is found in plant cells but not in animal cells.
S07_03	Given that chlorophyll is needed for photosynthesis, states two other factors that are needed.
S10_06	Given a graphical representation of the results of an investigation into the effects of light intensity and carbon dioxide concentration on the rate of photosynthesis, describes the relationship between carbon dioxide concentration and rate of photosynthesis.
S05_10	Recognizes that comparing genes can determine whether two people are related.
S04_03	In the context of an investigation comparing the growth of plants from genetically identical seeds under different conditions, predicts which plants will grow tallest and justifies the answer.
S13_03	Explains that camouflage helps snails avoid predators.
S01_08	Completes the food web of an ocean ecosystem based on information given in a table that lists a number of species and how they obtain their energy.
S14_04A	Indicates in a table which gas is released into the air and which gas is removed from the air during animal respiration.

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S06_05A	From a graph showing the population changes over time of two organisms, identifies the time when the population of one of the organisms is at its highest.
S11_02	Interprets a graph showing a sudden drop in the size of a population of an organism and recognizes that loss of food supply is most likely to have caused this sudden drop.
S14_04C	Indicates in a table which gas is released into the air and which gas is removed from the air during photosynthesis.
S08_05B	Based on data in a table showing population changes over time, concludes that there is a population decline and gives an explanation for this decline.
S08_02	Applies knowledge of ecosystems to explain why birds of prey cannot survive in an environment without plants.
S06_03	Applies knowledge of competition to explain the importance of removing weeds from a field where crops are sown.
S13_12	States how a volcanic eruption impacts the environment.
S02_03	Recognizes the food that contains the highest percentage of protein.
S05_13	Recognizes the type of food that should be avoided by a person without a gall bladder.
S06_01	Interprets a graph showing changes in pulse rates before, during, and after exercise and recognizes what can be concluded from the graph.
S05_07	Recognizes the main function of chlorophyll.
S03_03	Applies knowledge of the processes of photosynthesis and respiration to identify gases used up and given off by plants and animals in a forest ecosystem pictured in a diagram.
S12_05C	Recognizes an advantage for a species of butterfly to resemble another species of butterfly that is toxic to birds.

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Chemistry

S08_08B	In the context of an investigation about the gold content of jewelry, selects information from a table of properties of gold alloys to complete a table relating the density of alloys to number of carats and percentage of gold in each piece of jewelry.
S08_08C	In the context of an investigation about the gold content of jewelry, uses previously selected information and follows an example to calculate the mass of gold in jewelry.
S07_04	Interprets data in a table of physical properties to identify iron, water, and oxygen.
S04_11A	In the context of an investigation of density, interprets a table summarizing the methods used for measuring mass by four groups and explains why their results differed.
S11_06	Identifies a property of metals and describes how this property can be used to determine whether an unknown substance is a metal or nonmetal.
S06_06	Given the chemical formula for sulfuric acid, completes a table to show the number of atoms of each element in a molecule of the acid.
S12_08	In the context of an investigation, identifies which of two solutions is more dilute and justifies the selection.
S04_10	Recognizes that oxygen is necessary for burning.
S13_05	Explains what causes a balloon to inflate when sodium bicarbonate in the balloon mixes with vinegar.
S13_04	Recognizes the graph that most likely shows the effect of temperature on the solubility of sugar in water.
S03_02	Given a report of an experiment, distinguishes an observation from a prediction, conclusion, theory, or hypothesis.

Physics

S03_06	Based on a diagram demonstrating an investigation of thermal conductivity, recognizes that metal conducts heat faster than glass, wood, or plastic.
S06_10	Recognizes that molecules of a liquid slow down as the liquid cools.

S13_14	Recognizes that gas molecules move faster when temperature increases.
S12_07	Given a table showing speed of sound through different media, identifies the state of each medium and uses this information to recognize a conclusion that can be drawn from the table.
S03_11	Interprets data presented in a nonlinear distance vs. time graph.
S12_09	Recognizes why a helium balloon rises into the air.
S08_12	States the forces acting on students sitting on a wall.
S12_12	Explains why lightning is seen before thunder is heard during an electrical storm.
S03_04	Completes a table showing the relation between voltage and current.
S09_08	Identifies conduction as the process by which heat is transferred along a metal rod.
S05_03	Recognizes why the height of an alcohol column in a thermometer changes with increasing and decreasing temperature.
S14_07	Recognizes the pathway of light for an object to be seen.
S02_08	Recognizes how sound waves with large amplitude differ in energy and loudness from sound waves with smaller amplitude.
S14_08	Recognizes the object most likely to be used as a lever.

Earth Science

S09_10	Interprets a contour map to recognize a topographical representation of a mountain top.
S02_13	Describes how soil is formed.
S10_17	Explains how water evaporated from the sea ends up as rain on land.
S02_14	From a diagram showing the relative location of different towns and information about weather conditions in these towns, recognizes a prediction about future weather conditions.
S12_13	Describes what causes earthquakes.
S04_13	Describes one way groundwater can become polluted.

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S04_14	Describes how trees can reduce soil erosion.
S05_11	Predicts one effect a new dam could have on wildlife.
S05_01	Recognizes the definition of an Earth year.
S05_06	Applies knowledge of the relative distances of the sun and the moon from Earth to explain why light from the moon reaches Earth in less time.
S04_15	Recognizes a nonrenewable resource.
S14_14	Recognizes a consequence of the gravitational pull of the moon on Earth.
S09_09	Recognizes the major cause of tides.
S08_09	Recognizes that carbon dioxide is increasing in Earth's atmosphere.
S03_07	Given a diagram of Earth's water cycle, recognizes the sun as the source of energy for the water cycle.
S11_11	Recognizes which soil change is due to a natural cause rather than human activity.
S13_10	Recognizes the main difference between planets and moons.

Items at Advanced International Benchmark (625)

Biology

S06_04	States a life function of a paramecium, other than taking in nutrients to produce energy.
S12_05B	In the context of an observation of butterflies and plants, identifies a developing stage in the life cycle of an organism and describes what takes place during that stage.
S14_05	Using the equipment and materials shown in a diagram, describes an investigation to find out how fertilizer affects the growth of plants.
S12_05A	In the context of an observation of butterflies and plants, identifies the growth stage in the life cycle of an organism and describes what takes place during that stage.
S02_05	Recognizes that a zygote is formed immediately after fertilization.
S01_09	From diagrams showing organisms that live in the intertidal zone, selects one organism, and explains how a physical feature or behavior helps the organism to survive low tide.

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S01_10	States two conditions that are found at the bottom of the ocean that make it difficult for most organisms to live there.
S04_06	Completes a diagram to show the direction of the energy flow in a food web.
S09_11	Based on demographic and other information about two countries, predicts how their population will change over time.
S09_11	Given a table showing demographic data and data on grain production and oil consumption for two countries, predicts how a change in population in each country will affect land use over the next 10 years.
S09_11	Given a table showing demographic data and data on grain production and oil consumption for two countries, predicts how a change in population in each country will affect pollution over the next 10 years.
S04_04	Describes two environmental problems likely to occur when a city doubles in population over a short time.
S07_12	States one reason why the human population increased rapidly over the last 200 years.
S06_05B	Interprets a graph showing the population changes over time of two organisms and describes how the changes in population sizes are related.
S13_06	Recognizes that vaccines provide the body with long-term immunity.
S10_02	Recognizes the function of a labeled part of a plant cell.
S13_01	Recognizes that the purpose of cellular respiration is to provide energy for cell activities.
S09_01	Identifies food source as a criterion for classifying animals into two groups.
S12_03	Recognizes an organism in which oxygen and carbon dioxide are exchanged between air and blood through the skin.
S10_03	Recognizes an organ in a frog that has a function similar to that of lungs.
S14_01	Recognizes a function shared by the lungs, skin, and kidneys.
S08_03	Recognizes a function of the cell membrane.

S06_02	Recognizes that the first organisms that appeared on Earth lived in water.
S09_02	Recognizes that organisms that are producers use energy from the sun to make food.
S11_13	Recognizes that the increase in algal growth in a lake is most likely due to fertilizer runoff.

Chemistry

S12_11	Applies knowledge of density to explain why oil floats on water.
S08_08A	In the context of an investigation about the gold content of jewelry, describes the measurements to be taken using a graduated cylinder and water to find the volume of the jewelry.
S01_02	Based on an incomplete table comparing pure water and salt water, explains that addition of salt increases the density.
S05_12	Recognizes electrical conductivity as the criterion used for classifying materials into two groups.
S06_08	Recognizes the definition of a compound.
S14_09	Applies knowledge of expansion of water during freezing to explain why a bottle full of water cracked when it was left in a freezer.
S02_12	Explains that a chemical change in milk caused litmus paper to turn from blue to pink.
S06_11	Describes two things that might be observed as a chemical reaction takes place.
S12_10	Applies knowledge of conservation of mass during a neutralization reaction to explain what happens to mass when new substances are formed.
S05_05	Recognizes an example of a physical change.
S02_10	Applies knowledge of conservation of mass during a chemical reaction to explain what happens to mass when a new substance is formed.
S03_01	From a list of gases, identifies oxygen as the gas that causes rust formation.
S02_11	Recognizes a model showing the configuration of subatomic particles in an atom.

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S11_05	Recognizes the concept map that best represents the particulate structure of matter going from molecules to atoms to subatomic particles (protons, neutrons, and electrons).
S09_05	Recognizes which diagram best represents the structure of water molecules.
S05_04	Recognizes that when sugar is dissolved in water, the sugar molecules continue to exist, but in solution.

Physics

S08_11	Describes how to distinguish between fresh water and salt water, using two hot plates but no thermometer.
S03_14	From a description of an experiment investigating the effect of dissolved salt on the freezing point of water, identifies the problem under investigation or states a conclusion based on prior knowledge.
S03_13	Applies knowledge of phase change and the boiling point of water to explain that the temperature of water does not exceed its boiling point despite the addition of heat.
S10_12	Identifies the characteristics or properties that change or remain the same as a liquid changes into a gas.
S05_08	Applies the principle of conservation of mass during phase change to explain why the mass of water remains unchanged after it is frozen.
S06_12B	In the context of an investigation into the relative efficiency of two heat sources, identifies a variable that was controlled.
S06_09	Given two metal bars, one of which is a magnet, describes how to use the magnet to determine if the other metal bar is a magnet.
S04_09	From a diagram showing three magnets, explain why two of them are touching and why the third remains separated.
S11_09	Recognizes that the force of gravity acts on a person regardless of position and movement.
S02_15A	In the context of an investigation about lifting blocks to build a pyramid, identifies the parts of an Egyptian lever, based on a model of the lever.

S05_02   Demonstrates an understanding that the surface of a liquid remains horizontal by drawing the level of the liquid on a frame-of-reference diagram depicting a tilted U-shaped container.

S10_14   On a diagram of a person looking through a periscope, draws the path and direction of a light ray through the periscope.

S07_08   Recognizes that plucking a guitar string harder causes the volume to increase but does not affect the pitch.

S13_09   Predicts the effect of removing air on the propagation of sound.

S13_07   Recognizes that when brought from a mountain top to a valley, a closed empty plastic bottle collapses because the air pressure in the valley is higher than on the mountain top.

S01_03   Recognizes that particles of a liquid move more slowly and are closer together than particles of a gas.

S07_07   Recognizes that mass is conserved during thermal expansion.

S06_12A   Recognizes where to place a thermometer in a liquid to take a reading while conducting an investigation.

S13_08   Recognizes that railway tracks are laid down with gaps between lengths to allow expansion on hot days.

S02_07   Recognizes that the color of an object is the same as the color of the light waves that are reflected by the object.

S12_15   Recognizes that a shadow is shortest when the sun is overhead.

S09_07   Interprets a circuit diagram to recognize that the current flowing through two bulbs is the same.

S10_08   From a description of an investigation about magnets, recognizes how the strength of a magnet is defined.

S04_12   From a diagram showing different liquids layered in a beaker, recognizes an accurate statement about relative densities.

Earth Science

S09_10   Draws on a contour map the path and direction of a river flowing from a mountain to a bay.

S11_12	Describes changes in atmospheric conditions that occur with increasing elevation.
S01_05	Identifies and explains a physical process that can cause weathering of rocks.
S12_16	Draws an arrow on a map to show the direction a river flows and explains why it flows in this direction.
S03_09	States that sulfur dioxide produced by burning coal combines with water vapor in the atmosphere to form acid rain.
S05_14	Describes how science and technology can be used to address global warming caused by increased levels of carbon dioxide in the atmosphere.
S02_16	Provides a reason why recycling household materials is important.
S07_11	Interprets data in a table to describe the effect of amount of fertilizer on the yield of rice.
S01_01	Recognizes the percentage of total water on Earth that is fresh water.
S13_11	Given a diagram showing weather conditions at different elevations on a mountain, identifies the most likely location of a jungle.
S07_09	Relates the tilt of Earth's axis as it orbits the sun to the seasons.
S08_14	Recognizes what causes the moon to appear to change shape.

Items Above the Advanced International Benchmark (625)

Biology

S02_06	Recognizes the likely classification of an animal with scales that uses only its lungs to exchange gases.
S02_04	Recognizes that the average body temperature of people living in hot climates is the same as those living in cold climates and provides a justification.
S03_12	Provides an explanation of why the heart beats faster during exercise.
S14_03	Recognizes which organelle produces energy for the cell.

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S10_04	Recognizes an equation that summarizes the process of respiration.
S09_03	States two conditions needed for germination of seeds.
S12_02	Recognizes and describes an example of asexual reproduction.
S10_09	Designs an investigation to test a hypothesis about whether red and green peppers are produced by the same type of pepper plant.
S08_04	Recognizes an explanation for a change over time in a physical characteristic of an organism.
S14_04B	Indicates in a table which gas is released into the air and which gas is removed from the air during plant respiration.
S01_07	Recognizes the graph showing increasing rate of human population growth over the last 200 years.

Chemistry

S04_11B	In the context of an investigation of density, explains why two approaches to measuring the volume of an empty can gave different results.
S04_11C	As part of an investigation of density of a metal can, interprets a table of mass, volume, and density to identify the method that determined the density of the metal of the can.
S14_12	Explains why ice will stay frozen in a wooden container longer than in a metal container.
S10_10	Classifies items as elements, compounds, or mixtures.
S14_06	Recognizes air as a mixture.
S02_09	Describes the steps used to separate salt from a mixture of salt, sand, and leaves, and provides a reason for each step.
S09_06	States one thing that could be observed that shows energy has been released during a chemical reaction.

Physics

S04_08	Recognizes a diagrammatic representation of the particles in a metal after heating.
S08_10	Recognizes that mass is conserved and volume increases as water freezes.

S11_07	Recognizes a sequence of energy conversions that takes place in a battery-operated flashlight.
S08_07	Interprets a diagram and describes the direction of heat flow in metals.
S10_13	Explains why an unwrapped block of ice will melt faster than a block of ice wrapped in newspaper.
S11_08	Interprets a diagram showing air and water in a sphere attached to a U-tube and explains that heating the air in the sphere can cause the water level in the open tube to rise.
S10_15	Recognizes that light travels fastest through a vacuum.
S04_07	Describes an advantage of using parallel rather than series electrical circuits in homes.
S14_11	Applies Ohm's law to calculate resistance from current and voltage.
S01_04	Recognizes that an iron nail becomes magnetized when current flows through a wire coiled around the nail.
S14_10B	Given a diagram showing a ball being thrown upwards, falling to the ground and bouncing, explains why the ball will not bounce to the height from which it fell.
S02_15B	As part of an investigation about lifting blocks to build a pyramid, uses information shown in a diagram of a lever and applies a given formula to calculate the force needed to lift a block.

Earth Science

S07_10	Recognizes that most fresh water on Earth is located in the polar ice caps.
S01_05	Identifies and explains a chemical process that can cause weathering of rocks.
S06_07	Applies knowledge of condensation to explain why a liquid appeared on the outside of a pitcher of cold water.
S05_14	Describes how science and technology can be used to address oil spills in the oceans.
S06_14	Recognizes a diagrammatic representation of the sun, moon, and Earth during an eclipse of the moon.

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