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Map: **Earth Science** Grade Level: **9**

District: **Island Trees**

Created: **03/15/2007** Last Updated: **03/15/2007**

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	Essential Questions	Content	Skills		Standards/PIs
Unit 1	**Introduction to Earth Science**? How is Earth Science divided into smaller branches? Why is it necessary to make precise observations to study earth science? Why is the metric system more convenient to use than the standard U.S. system for measurement? What are the skills required to make an accurate graph? How do graphs help us predict change and interpret data? How do we simplify our data, when working with very large or small numbers? How is density	**Tools of Earth Science** Observation & Inference Measurements & Units Exponential Notation Percent Deviation Types of Graphs Measuring & Calculating Density **Vocabulary:** *astronomy, coordinate system, density, earth science, ecology, geology, inference, meteorology, observation, oceanography, percent deviation, science, interpolate, extrapolate*	Define 4 branches of Earth Science Identify and distinguish observations from inferences Measure mass, volume, and time Calculate density, rate of change, and percent deviation Distinguish between Metric and U.S. standards of measurement Construct and interpret various types of graphs Interpolate and extrapolate graphical data Express extreme values using scientific notation		**MST1-K1-1A** **MST6-K2-2A** **MST6-K3-3B**

	measured and how do we calculate it? What are past, current, and future human effects on Earth Systems?				
Unit 2	**Describing Planet Earth** What evidence allow us to infer the shape and size of the earth? How do the earth's layers differ from one another? How does a coordinate system allow us to locate positions on earth? How does the Earth's motions provide us with reference lines for latitude and a system for telling time?	**Measuring Planet Earth** Shape of the Earth Diameter/Circumference Structure of the Earth- Layers **Mapping Planet Earth** Earth's Coordinate System- Latitude/Longitude Earth's magnetic field Solar Time and Clock Time Altitude of Polaris Fields-isolines Topographic Maps Contour Interval, Gradient, Profile **Vocabulary**	Describe the shape, size, and smoothness of the Earth Compare and contrast the different layers of the Earth and its atmosphere. Use a coordinate system to locate positions on Earth. Describe the importance of the equator, prime meridian, international date line, and Polaris in determining locations on earth. Construct field map from gathered data. Interpret map symbols and various isolines Calculate gradients and construct topographic profiles		**MST4-K1-1A**

		atmosphere, axis, equator, Greenwich Mean Time, horizon, hydrosphere, latitude, lithosphere, longitude, mesophere, oblate, Polaris, prime meridian, stratosphere, thermosphere, troposphere, zenith, altitude, azimuth, contour line, elevation, field, gradient, hachure, isoline, isotherm, model, profile, scale, topographic map				
Unit 3	**Earth Materials: Rocks & Minerals** How can a mineral be identified using physical and chemical properties? How does the internal relation of atoms give the mineral its properties? How are different minerals used by humans? How are minerals formed? How are origin, mineral content, and texture used to classify rocks? What processes are involved with the rock cycle?	**Rocks & Minerals** Characteristics of Minerals Properties of Minerals Formation & Classification of Rocks (Igneous, Sedimentary, Metamorphic) Rock Cycle Mineral Resources and Fossil Fuels **Volume** *compound, cleavage, crystal, element, fracture, hardness, luster, metallic, mineral, Moh's scale, ore, silicate, streak, tetrahedron, banding, bioclastic, clastic, contact metamorphism, crystalline, extrusive, felsic, foliated, igneous, intrusive, lava, mafic, magma, metamorphic, plutonic, precipitation, regional metamorphism, sedimentary rock, texture, vesicular, volcanic*	**Explain the properties of minerals in terms of the arrangement and properties of the atoms that compose them.** Use physical and chemical properties to identify different minerals Use texture and mineral composition to classify rocks Identify the processes and relationships making up the rock cycle.		**MST4-K2-2A** **MST4-K3-3A**	
	The Dynamic Crust	**Continental Drift & Plate Tectonics**	**Use the concepts of density and**		**MST4-K2-2A**	

Unit 4	How do temperature and density differences within the earth drive plate motion? How does lithospheric plate movement create three different kinds of plate boundaries and how do these boundaries differ? How do the oceanic and continental crust differ from each other? How does the distribution of earthquakes, volcanoes, and mountain ranges relate to plate boundaries? Why is the rockcycle a consequence of plate dynamics? How do we prepare for and respond to geologic hazards such as earthquakes, volcanoes, and tsunamis? How are the forces associated with plate motion responsible for surface features such as ridges/trenches/island arcs/mountain ranges/hot spots? How are seismic waves used to infer the properties of the earth's interior? How are earthquakes located and measured	Plate Boundaries-Convergent, Divergent, Transform Evidence/ Mechanisms of Plate Tectonics Sea floor spreading Convection Currents Earth's Interior Earth's Layers: Crust, the Mantle, the Core, Seismology -Measuring Earthquakes-Mercalli and Richter Scales -Locating an Epicenter -Earthquake waves-P-S waves- earth shadow zones -The origin time of an earthquake Distribution and types of volcanoes Seismic & Volcanic Hazards **Vocabulary** *conduction, convection, earthquake, epicenter, faulth, focus, mercalli scale, Moho, primary wave, refraction, Richter*	**heat energy to explain movements of Earth's plates.** List direct/indirect evidence of crustal movement Explain how convection results in crustal plate motion. Describe three different plate boundaries Identify and describe features associated with plate boundaries. Explain how seismic waves allow us to infer properties of the inner earth. Use seismograph data to determine epicenter location and time of earthquake origin Compare and contrast the Mercalli Intensity scale and Richter scale in measuring earthquakes.		**MST4-K2-2A**

	using both the Richter and Mercalli scales?	*scale, secondary wave, seismic wave, seismogram, seismograph, Alfred Wegener, asthenosphere,, convergent, crater, divergent, hotspot, island arc, lithospheric plate, mid-ocean ridge, ocean trench, plastic, plate tectonics, polarity, subduction, transform boundary, tsunami, volcano*				
Unit 5	**Surface Processes & Resulting Landscapes** How do temperature and moisture affect both physical and chemical weathering? How do soils form? Why is gravity the driving force behind all natural agents of erosion? How does each agent of erosion affect the materials they are transporting and create characteristic surface features? How does the size, shape, and density of transporting materials result in different patterns of deposition? How do tectonic forces, climate variations, and bedrock structure interact to shape landscape features including mountains, plateaus, plains, valleys, ridges, and stream drainage patterns?	**Surface Processes & Landscapes** Physical Weathering Chemical Weathering Soil Horizons & Development Agents of Erosion Patterns of Deposion Glaciers & Glacial Features Three types of Landscape Regions Watersheds & Drainage Basins Ocean & Coastal Processes **Volcabulary**	Compare and contrast the conditions that lead to physical and chemical weathering. Explain how size and shape affect rate of weathering, deposion, and erosion. Describe how each agent of erosion affects the sediment being transported. Describe some common landforms and identify the processes that produced each. Relate drainage patterns to landforms to which they are associated. Determine the path a pollutant will follow through a watershed.		**MST4-K2-2A**	

		abrasion, bedrock, biological, chemical change, frost wedging, infiltration *mechanical (physical) weathering, risidual, sediment, soil, soil horizon* *weathering, agent of erosion, deposition, dune, erosion, flotation, glacier* *graded bedding, horizontal sorting, landslide, load, mass wasting, solution* *vertical sorting, delta, discharge, drainage divide, drainage pattern, floodplain, meander, run-off, tributary, watershed, continental glacier, drumlin, erratic, kettle, moraine, outwash, striations, terminal moraine, till* *valley (alpine) glacier, escarpment, landscape, mountain, plains, plateau*			
Unit 6	**Earth's History** How does fossil evidence show the evolution of organisms and past environmental conditions over time? What processes are responsible for the accumulation of oxygen in earth's atompshere? What principles are used to determine the relative ages of rocks and fossils? How is the fossil record used to divide Earth's history into time units?	**Earth's History** Geologic Sequencing Laws -Uniformitarinism -Superposition -Original Horizontality Igneous Intrusions, Extrusions, & Inclusions Folds & Faults Fossils Geological Time scale	Determine sequence of events using the laws of superposition & horizontality. Correlate and interpret geological & biological events from earth's origin to present day. Use the decay rate of selected isotopes to determine the absolute age of materials such as fossils and meteorites. Explain the patterns observed in the fossil record. Describe the		**MST4-K1-1B**

	How is the rate of nuclear decay used to determine the absolute age of materials found in some rocks?	Fossil Record and Evolution of life Age Relationships -Relative Dating Absolute Dating and Decay of Radioactive Isotopes **Vocabulary** *absolute age, correlation, decay product, half-life, intrusion, horizontality, outcrop, radioactive, relative age, superposition, unconformity, uniformitarianism, evolution, extinction, index fossil, paleontology, species*	processes involved in the formation of fossils.			
Unit 7	**Properties of the Atmosphere** How did the earth's early atmosphere originate and evolve? How does energy from the sun drive and sustain our weather patterns? How does heat energy create density differences that result in air flow? How do we measure and interpret basic weather variables? Why is rising air responsible for cloud formation?	**Meteorology** Origin of Atmosphere Structure of Atmosphere Properties of the Atmosphere -Temperature -Pressure -Moisture Content Relative Humidity Local Winds	Collect and examine various weather data. Determine relative humidity, dew point, and cloud base altitude. Explain the relationship between different weather variables. Identify the steps in the formation of clouds and precipitaion. Describe how the sun's energy results in the movement of air.		**MST4-K1-1B** **MST4-K2-2A**	

		Global Winds Weather Variables and Relationships Formation of Clouds Precipitation **Vocabulary** *barometer, humidity, precipitation, radiation, relative humidity, saturated, scatter, transparency, weather, cloud base, condensation, condensation nuclei, dew point, evaporation, frost, hygrometer, lake-effect, latent heat, psychrometer, specific heat, transpiration, vaporization, convergence, Coriolis effect, divergence, isobar, jet streams, land breeze, monsoon, seabreeze*				
Unit 8	**Weather Systems** How do we predict future weather phenomena by observing changes in basic weather variables? How do we interpret synoptic weather maps? How do we prevent property damage and injury by observing	**Weather Systems & Severe Weather** Sun's Energy Air Masses Weather Fronts Highs, Lows, & Storm Tracks	**Classify** air masses based on temperature and moisture content. **Determine** the direction of an air mass or storm system will take. **Predict** how present weather will change with the arrival of new weather systems.		**MST4-K2-2A**	

	severe weather patterns? **Factors Affecting Earth's Climate** How does the sun heat the earth unevenly? How does intensity and duration of insolation by time and location? How is climate influenced by latitude, large bodies of water, ocean currents, prevailing winds, elevation, and mountain ranges? How have humans affected the earth's climate? How does the earth continually recycle water? How do slope of land, shape, size, and packing of sediments influence infiltration, runoff, and storage of water?	Synoptic Weather Maps Predicting Weather Severe Weather -Thunderstorms -Tornadoes -Hurricanes **Vocabulary** *anticyclone, arctic air mass, cold front, continental air mass, cyclone, maritime air mass, mid-latitude cyclone, occluded front, polar air mass, source region, stationary front, tropical air mass, warm front, blizzard, hurricane, lightning, sleet, thunder, tornado, El Nino* _____ **Earth's Climate** Angle & Duration of Insolation Absorption & Reflection of Insolation Factors that Affect Climate -Latitude, Altitude, Mountain Ranges, Oceans and Large Bodies of Water, Seasonal & Daily Temperature Patterns Greenhouse Effect	**Create** and **Interpret** synoptic weather maps. **Identify** the conditions needed to produce hurricanes and tornadoes. **Compare** the steps taken to safeguard against hurricane and tornado damage. **Explain** why the annual and daily time of greatest temperature occurs after the time of most intense insolation. **Describe** the role of water vapor and carbon dioxide in heating our atmosphere. I**llustrate** the various paths of the water cycle. **Explain** how ground water levels change with season and climate. **Explain how incoming solar radiation, ocean currents, and land masses affect weather and climate.** **Use the concepts of density and heat energy to explain observations of**			

		The Water Cycle Ground Water -Porosity, Permeablity, & Ground Water Zones **Vocabulary** *arid, biome, climate, climagraph, ocean current, orographic effect, temperate, tropics, aquifer, capillarity, evaporation, groundwater, infiltration* *permeabilty, poristy, spring, transpiration, water table, zone of aeration* *zone of saturation*	**weather patterns and seasonal changes.** ----------			
Unit 9	**Earth in Space** How are earth motions the basis for keeping time? How does the Foucault pendulum & Coriolis effect provide evidence of Earth's rotation? How is the motion of celestial objects affected by gravity and inertia? How are real motions of the earth responsible for the apparent motions of celestial objects? How does the tilt of the earth's axis result in seasonal variation?	**Astronomy** Celestial Sphere Earth Motions (Rotation/Revolution) Evidence for Rotation & Revolution Models of the Solar System (Geocentric vs. Heliocentric model) Seasons & Earth's Tilt Angle of Insolation/Latitude Vertical (direct) Ray of Sun	**Explain complex phenomena, such as tides, variations in day length, solar insolation, apparant motion, and annual traverse of the constellations.** **Describe** the evidence for earth's shape and motions. **Contrast** heliocentric vs. geocentric models of the solar system. **Explain** how the earth's tilt results in our seaons.		**MST4-K1-1B** **MST4-K2-2A** **MST4-K2-2B**	

	How does the apparent positions of constellations provide evidence of Earth's revolution? How does the Sun's apparent path through the sky vary with latitude and season?	Tropic of Cancer/Capricorn Antarctic & Arctic Circles **Vocabulary** *altitude, Antarctic Circle, Arctic Circle, celestial object, equinox, revolution, rotation, solar noon, summer solstice, vertical (direct) ray, winter solstice, zenith, ellipse, focus, gravity, inertia, lunar phase, satellite, weight*				
Unit 10	**Beyond Planet Earth** How are we able to infer the age & size of the universe? How does a star develop and change over time? Why is gravity important in the formation of stars and planets? Why and how do terrestrial and jovian planets differ? How do asteroids, comets, & meteors differ and how have they contributed to earth's formation? How are the positions of earth-moon-sun responsible for cyclic changes such as tides	**The Solar System & Universe** Earth's Moon Phases of the Moon Eclipses & Tides Orbital Geometry Inner & Outer Planets Asteroids, Meteors, & Comets The Sun & Stars Life Cycle of a Star (H-R Diagram) Wavelengths of Light	**Describe current theories about the origin of the universe and solar system.** **Describe** the cause of the moon's phases and illustrate each phase. **Explain** how the motion of the earth affects the lunar month. **Use** Kepler's laws to explain the orbits of objects in our system. **Draw** an ellipse and **calculate** eccentricity. **Differentiate** between star systems, galaxies, and the universe. **Interpret** the		**MST4-K1-1B** **MST4-K2-2A** **MST4-K2-2B**	

	and phases of the moon? How did Kepler explain the geometry of orbits?	Doppler Effect (Red shift) Types of Galaxies Big Bang & Age of the Universe **Vocabulary** *asteroid, comet, Jovian , meteor, planet, terrestrial,* *big bang theory, cosmos, galaxy, light year, luminosity,* *nuclear fusion, redshift, star, magnitude, stellar, universe* _____ Review 100 Graphing Relationships to know for Regents Exam 117 Ways to pass the Earth Science Regents (Fill in the blank packet) At least five past Regents exams for practice	Hertzprung-Russell diagram. **Distinguish** between different forms of electromagnetic energy. **Explain** how the doppler effect results in the redshift of many stars. **Locate** any and all useful data in Earth Science Reference Tables.			

Key to Standards used in this Map

MST1-K1-1A [1 occurence] - MST Standard 1 - Key Idea 1 [Mathematical Analysis i] - Performance Indicator 1A - use algebraic and geometric representations to describe and cor

MST4-K1-1A [1 occurence] - MST Standard 4 - Key Idea 1 [Physical Setting i] - Performance Indicator 1A - explain complex phenomena, such as tides, variations in day length, s constellations. [Commencement]

MST4-K1-1B [4 occurences] - MST Standard 4 - Key Idea 1 [Physical Setting i] - Performance Indicator 1B - describe current theories about the origin of the universe and solar sy

MST4-K2-2A [8 occurences] - MST Standard 4 - Key Idea 2 [Physical Setting ii] - Performance Indicator 2A - use the concepts of density and heat energy to explain observations plates. [Commencement]

MST4-K2-2B [2 occurences] - MST Standard 4 - Key Idea 2 [Physical Setting ii] - Performance Indicator 2B - explain how incoming solar radiations, ocean currents, and land mas

MST4-K3-3A [1 occurence] - MST Standard 4 - Key Idea 3 [Physical Setting iii] - Performance Indicator 3A - explain the properties of materials in terms of the arrangement and p

MST6-K2-2A [1 occurence] - MST Standard 6 - Key Idea 2 [Models] - Performance Indicator 2A - revise a model to create a more complete or improved representation of the syst

MST6-K3-3B [1 occurence] - MST Standard 6 - Key Idea 3 [Magnitude and Scale] - Performance Indicator 3B - extend their use of powers of ten notation to understanding the ex [Commencement]