

Maine Department of Education
 Career and Technical Education
 CTE Intersections with College and Career Readiness Standards-Mathematics
 with
 Auto Body; CIP: 47.0603
 Painting and Refinishing (NATEF)

<p style="text-align: center;">Painting and Refinishing Framework, Duties, and Tasks</p>	<p style="text-align: center;">Standards for Mathematical Content; Standards for Mathematical Practice (CCSS)</p>	<p style="text-align: center;">Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)</p>	<p style="text-align: center;">Maine Learning Results – Guiding Principles And Career and Education Development (optional)</p>
<p>1. Safety Precautions</p>			
<p>a. Identify and take necessary precautions with hazardous operations and materials according to federal, state, and local regulations.</p> <p>b. Identify safety and personal health hazards according to OSHA guidelines and the “Right to Know Law”.</p> <p>c. Inspect spray environment and equipment to ensure compliance with federal, state and local regulations, and for safety and cleanliness hazards.</p> <p>d. Select and use a NIOSH approved air-purifying respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.</p> <p>e. Select and use a NIOSH approved supplied air (Fresh Air Make-up) respirator system. Perform proper</p>			<p style="text-align: center;"><i>Guiding Principles</i></p> <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <p>C. A creative and practical problem solver who:</p>

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<p>maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation.</p> <p>f. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects, and detailing (gloves, suits, hoods, eye and ear protection, etc.).</p>			<ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <p>D. A responsible and involved citizen who:</p> <ol style="list-style-type: none"> 2. Accepts responsibility for personal decisions and actions 3. Demonstrates ethical behavior and the moral courage to sustain it 6. Demonstrates awareness of personal and community health and wellness <p style="text-align: center;"><i>CED</i></p> <p>A1 Self-Knowledge and Self-Concept</p> <p>Students reflect on and/or analyze interests, skills, habits of mind, and experiences to maintain a positive self-concept and</p>

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			<p>to aid them in making career and life decisions.</p> <p>A3 Interpersonal Skills Students demonstrate behaviors that reflect positive interpersonal skills and evaluate successful strategies that improve positive interpersonal skills in ways that lead to success in a variety of school, work, and community settings.</p> <p>B2 Skills for Individual/ Personal Success in the 21st Century Students evaluate strategies to improve skills that lead to lifelong learning and success in the classroom, and the achievement of schoolwork, work and career, and personal life goals.</p> <p>c. Critical thinking skills e. Interpersonal skills</p> <p>C1 The Planning Process Students use the planning process to make school-to-</p>

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			school and school-to-work decisions. a. Self-knowledge c. Decision-making skills
2. Surface Preparation			
<p>a. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.</p> <p>b. Soap and water wash entire vehicle; use appropriate cleaner to remove contaminants.</p> <p>c. Inspect and identify substrate, type of finish, surface condition, and film thickness; develop and document a plan for refinishing using a total product system.</p> <p>d. Strip paint to bare substrate (paint removal).</p> <p>e. Dry or wet sand areas to be refinished.</p> <p>f. Featheredge damaged areas to be refinished.</p> <p>g. Apply suitable metal treatment or primer in accordance with total product systems.</p> <p>h. Mask and protect other areas that will not be refinished.</p> <p>i. Mix primer, primer-surfacer or</p>	<p>Math.N-Q.A 1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.</p> <p>Math.N-Q.A 2: Define appropriate quantities for the purpose of descriptive modeling.</p> <p>Math.MP2: Reason abstractly and quantitatively.</p>	<p>Mils – understanding what this measurement is and means.</p> <p>i.e solving the problem of knowing how much product is needed to cover a given substrate. How much paint to cover a panel or how much primer to cover in 3 coats.</p>	<p><i>Guiding Principles</i></p> <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with individuals from

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<p>primer-sealer.</p> <p>j. Apply primer onto surface of repaired area.</p> <p>k. Apply two-component finishing filler to minor surface imperfections.</p> <p>l. Dry or wet sand area to which primer-surfacer has been applied.</p> <p>m. Dry sand area to which two-component finishing filler has been applied.</p> <p>n. Remove dust from area to be refinished, including cracks or moldings of adjacent areas.</p> <p>o. Clean area to be refinished using a final cleaning solution.</p> <p>p. Remove, with a tack rag, any dust or lint particles from the area to be refinished.</p> <p>q. Apply suitable sealer to the area being refinished.</p> <p>r. Scuff sand to remove nibs or imperfections from a sealer.</p> <p>s. Apply stone chip resistant coating.</p> <p>t. Restore corrosion-resistant coatings, caulking, and seam sealers to repaired areas.</p> <p>u. Prepare adjacent panels for blending.</p>			<p>diverse backgrounds</p> <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 2. Frames questions, makes predictions and designs data/information collection and analysis strategies 3. Identifies patterns, trends and relationships that apply to solutions 4. Generates a variety of solutions, builds a case for a best response and critically evaluates the effectiveness of the response 5. Sees opportunities, finds resources and seeks results 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <p>E. An integrative and</p>

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<p>v. Identify the types of rigid, semi-rigid or flexible plastic parts to be refinished; determine the materials, preparation, and refinishing procedures.</p> <p>w. Identify aluminum parts to be refinished; determine the materials, preparation, and refinishing procedures.</p>			<p>informed thinker who:</p> <p>4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes</p> <p align="center"><i>CED</i></p> <p>A1 Self-Knowledge and Self-Concept Students reflect on and/or analyze interests, skills, habits of mind, and experiences to maintain a positive self-concept and to aid them in making career and life decisions.</p> <p>A3 Interpersonal Skills Students demonstrate behaviors that reflect positive interpersonal skills and evaluate successful strategies that improve positive interpersonal skills in ways that lead to success in a variety of school, work, and community settings.</p> <p>e. Accepting/giving/using</p>

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			constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior i. Demonstrating safe behavior A4 Career and Life Roles Students demonstrate and evaluate successful strategies for accomplishing tasks, balancing career and life roles, and reducing stress in a variety of school, work, and community settings. C1 The Planning Process Students use the planning process to make school-to-school and school-to-work decisions. a. Self-knowledge c. Decision-making skills
3. Spray Gun and Related Equipment Operation			
a. Inspect, clean, and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source, and spray environment).			<i>Guiding Principles</i> B. A self-directed and lifelong learner who: 1. Recognizes the need for information and locates

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<p>b. Check and adjust spray gun operation for HVLP (high volume, low pressure) or compliant spray guns.</p> <p>c. Set-up (fluid needle, nozzle, and cap), test, and adjust spray gun using fluid, air, and pattern control valves.</p> <p>d. Demonstrate an understanding of the operation of pressure spray equipment.</p>			<p>and evaluates resources</p> <ol style="list-style-type: none"> 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 2. Frames questions, makes predictions and designs data/information collection and analysis strategies 3. Identifies patterns, trends and relationships that

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			<p>apply to solutions</p> <p>4. Generates a variety of solutions, builds a case for a best response and critically evaluates the effectiveness of the response</p> <p>5. Sees opportunities, finds resources and seeks results</p> <p>6. Uses information and technology to solve problems</p> <p>7. Perseveres in challenging situations</p> <p>E. An integrative and informed thinker who:</p> <p>4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes</p> <p align="center"><i>CED</i></p> <p>A1 Self-Knowledge and Self-Concept</p> <p>Students reflect on and/or analyze interests, skills, habits of mind, and</p>

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			<p>experiences to maintain a positive self-concept and to aid them in making career and life decisions.</p> <p>A3 Interpersonal Skills Students demonstrate behaviors that reflect positive interpersonal skills and evaluate successful strategies that improve positive interpersonal skills in ways that lead to success in a variety of school, work, and community settings.</p> <p>i. Demonstrating safe behavior</p> <p>C1 The Planning Process Students use the planning process to make school-to-school and school-to-work decisions.</p> <p>a. Self-knowledge c. Decision-making skills</p>
4. Paint Mixing, Matching, and Applying			
<p>a. Identify type and color code by manufacturer’s vehicle information label. b. Shake, stir, reduce,</p>	<p>Math.N-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.</p>	<p>By using panel size students determine how much product to mix to minimize waste of a given product. i.e primers, paints ect.</p>	<p><i>Guiding Principles</i> B. A self-directed and lifelong learner who: 1. Recognizes the need for</p>

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<p>catalyze/activate, and strain refinish materials.</p> <p>c. Apply finish using appropriate spray techniques (gun arc, gun angle, gun distance, gun speed, and spray pattern overlap) for the finish being applied.</p> <p>d. Apply selected product on test and let-down panel; check for color match.</p> <p>e. Apply single stage topcoat.</p> <p>f. Apply basecoat/clearcoat for panel blending or panel refinishing.</p> <p>g. Apply basecoat/clearcoat for overall refinishing.</p> <p>h. Remove nibs or imperfections from basecoat.</p> <p>i. Refinish rigid or semi-rigid, and plastic parts.</p> <p>j. Refinish flexible plastic parts.</p> <p>k. Apply multi-stage coats for panel blending or overall refinishing.</p> <p>l. Identify and mix paint using a formula.</p> <p>m. Identify poor hiding colors; determine necessary action.</p> <p>n. Tint color using formula to achieve a blendable match.</p> <p>o. Identify alternative color formula</p>	<p>Quantities N-Q: Reason quantitatively and use units to solve problems.</p> <p>Geometry- Math.G-MG.A.1: Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.</p> <p>Geometry- Math.G-MG.A.2: Give an informal argument using Cavalieri’s principle for the formulas for the volume of a sphere and other solid figures.</p> <p>Geometry- Math.G-MG.A.3: Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.</p>	<p>Students can determine cost of a given refinish job, how much product to order.</p> <p>Students can also realize the cost of mistakes and waste, as this cannot be passed on to the customer, it is absorbed by the shop.</p> <p>Students will use surface area and grid method to determine amount of product needed.</p>	<p>information and locates and evaluates resources</p> <ol style="list-style-type: none"> 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 2. Frames questions, makes predictions and designs data/information

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<p>to achieve a blendable match.</p>			<p>collection and analysis strategies</p> <ol style="list-style-type: none"> 3. Identifies patterns, trends and relationships that apply to solutions 4. Generates a variety of solutions, builds a case for a best response and critically evaluates the effectiveness of the response 5. Sees opportunities, finds resources and seeks results 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <p>E. An integrative and informed thinker who:</p> <ol style="list-style-type: none"> 2. Evaluates and synthesizes information from multiple sources 4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes

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			<p align="center"><i>CED</i></p> <p>A1 Self-Knowledge and Self-Concept Students reflect on and/or analyze interests, skills, habits of mind, and experiences to maintain a positive self-concept and to aid them in making career and life decisions.</p> <p>A4 Career and Life Roles Students demonstrate and evaluate successful strategies for accomplishing tasks, balancing career and life roles, and reducing stress in a variety of school, work, and community settings.</p> <p>b. Goal-setting c. Resource management</p> <p>C1 The Planning Process Students use the planning process to make school-to-school and school-to-work decisions.</p> <p>a. Self-knowledge</p> <p>C2 Decision- Making</p>

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			Students determine and apply effective decision-making strategies for accomplishing short-term and long-term goals related to school-to-school and school-to-work decisions.
5. Paint Defects – Causes and Cures			
<p>a. Identify blistering (raising of the paint surface, air entrapment); determine the cause(s) and correct the condition.</p> <p>b. Identify blushing (milky or hazy formation); determine the cause(s) and correct the condition.</p> <p>c. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.</p> <p>d. Identify the presence of fish-eyes (crater-like openings) in the finish; determine the cause(s) and correct the condition.</p> <p>e. Identify lifting; determine the cause(s) and correct the condition.</p> <p>f. Identify clouding (mottling and streaking in metallic finishes); determine the cause(s) and correct the condition.</p> <p>g. Identify orange peel; determine</p>			<p><i>Guiding Principles</i></p> <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality

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<p>the cause(s) and correct the condition.</p> <p>h. Identify overspray; determine the cause(s) and correct the condition.</p> <p>i. Identify solvent popping in freshly painted surface; determine the cause(s) and correct the condition.</p> <p>j. Identify sags and runs in paint surface; determine the cause(s) and correct the condition.</p> <p>k. Identify sanding marks or sandscratch swelling; determine the cause(s) and correct the condition.</p> <p>l. Identify contour mapping/edge mapping while finish is drying; determine the cause(s) and correct the condition.</p> <p>m. Identify color difference (off-shade); determine the cause(s) and correct the condition.</p> <p>n. Identify tape tracking; determine the cause(s) and correct the condition.</p> <p>o. Identify low gloss condition; determine the cause(s) and correct the condition.</p> <p>p. Identify poor adhesion; determine the cause(s) and correct the condition.</p>			<p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 2. Frames questions, makes predictions and designs data/information collection and analysis strategies 3. Identifies patterns, trends and relationships that apply to solutions 4. Generates a variety of solutions, builds a case for a best response and critically evaluates the effectiveness of the response 5. Sees opportunities, finds resources and seeks results 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <p>E. An integrative and informed thinker who:</p>

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<p>q. Identify paint cracking (shrinking, splitting, crowsfeet or line-checking, micro-checking, etc.); determine the cause(s) and correct the condition.</p> <p>r. Identify corrosion; determine the cause(s) and correct the condition.</p> <p>s. Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition.</p> <p>t. Identify water spotting; determine the cause(s) and correct the condition.</p> <p>u. Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.</p> <p>v. Identify finish damage caused by airborne contaminants (acids, soot, rail dust, and other industrial-related causes); correct the condition.</p> <p>w. Identify die-back conditions (dulling of the paint film showing haziness); determine the cause(s) and correct the condition.</p> <p>x. Identify chalking (oxidation); determine the cause(s) and correct the condition.</p> <p>y. Identify bleed-through (staining); determine the cause(s) and correct</p>			<ol style="list-style-type: none"> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources 3. Applies ideas across disciplines 4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes <p style="text-align: center;"><i>CED</i></p> <p>A1 Self-Knowledge and Self-Concept Students reflect on and/or analyze interests, skills, habits of mind, and experiences to maintain a positive self-concept and to aid them in making career and life decisions.</p> <p>A4 Career and Life Roles Students demonstrate and</p>

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<p>the condition. z. Identify pin-holing; determine the cause(s) and correct the condition. aa. Identify buffing-related imperfections (swirl marks, wheel burns); correct the condition. bb. Identify pigment flotation (color change through film build); determine the cause(s) and correct the condition.</p>			<p>evaluate successful strategies for accomplishing tasks, balancing career and life roles, and reducing stress in a variety of school, work, and community settings. b. Goal-setting c. Resource management C1 The Planning Process Students use the planning process to make school-to-school and school-to-work decisions. a. Self-knowledge C2 Decision- Making Students determine and apply effective decision-making strategies for accomplishing short-term and long-term goals related to school-to-school and school-to-work decisions.</p>
6. Final Detail			
<p>a. Apply decals, transfers, tapes, woodgrains, pinstripes (painted and taped), etc. b. Buff and polish finish to remove</p>	Math.N-Q.A 1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and	Mil thickness when buffing	<i>Guiding Principles –</i> B. A self-directed and lifelong learner who: 1. Recognizes the need for

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<p>defects as required. c. Clean interior, exterior, and glass. d. Clean body openings (door jambs and edges, etc.). e. Remove overspray. f. Perform pre-delivery detail and inspection.</p>	<p>interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.</p> <p>Math.N-Q.A 2: Define appropriate quantities for the purpose of descriptive modeling.</p> <p>Math.N-Q.A 3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p> <p>Math.G-MG.A.3: Apply geometric methods to solve design problems.</p>	<p>Symmetry and measurement when applying stripes and decals.</p>	<p>information and locates and evaluates resources</p> <ol style="list-style-type: none"> 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 2. Applies knowledge to set goals and make informed decisions 4. Demonstrates initiative and independence 6. Demonstrates reliability

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			<p>and concern for quality</p> <p>D. A responsible and involved citizen who:</p> <ol style="list-style-type: none"> 2. Accepts responsibility for personal decisions and actions 3. Demonstrates ethical behavior and the moral courage to sustain it 4. Understands and respects diversity <p style="text-align: center;"><i>CED</i></p> <p>A1 Self-Knowledge and Self-Concept Students reflect on and/or analyze interests, skills, habits of mind, and experiences to maintain a positive self-concept and to aid them in making career and life decisions.</p> <p>A3 Interpersonal Skills Students demonstrate behaviors that reflect positive interpersonal skills and evaluate successful strategies that improve positive</p>

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			<p>interpersonal skills in ways that lead to success in a variety of school, work, and community settings.</p> <p>A4 Career and Life Roles Students demonstrate and evaluate successful strategies for accomplishing tasks, balancing career and life roles, and reducing stress in a variety of school, work, and community settings.</p> <p>B2 Skills for Individual/ Personal Success in the 21st Century Students evaluate strategies to improve skills that lead to lifelong learning and success in the classroom, and the achievement of schoolwork, work and career, and personal life goals.</p> <p>c. Critical thinking skills</p> <p>C1 The Planning Process Students use the planning process to make school-to-school and school-to-work</p>

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			decisions. a. Self-knowledge C2 Decision- Making Students determine and apply effective decision-making strategies for accom- plishing short-term and long-term goals related to school-to-school and school-to-work decisions.