Measurement of 2D and 3D

Overall Expectations

Students will:

- solve problems involving the measurements of two-dimensional shapes and the volumes of three-dimensional figures (MGV.02)
- simplify numerical and polynomial expressions in one variable, and solve simple first-degree equations (NAV.02)

Specific Expectations

Students will:

- relate the geometric representation of the Pythagorean theorem to the algebraic representation $a^2 + b^2 = c^2$ (MG2.01)
- solve problems using the Pythagorean theorem, as required in applications (MG2.02)
- solve problems involving the areas and perimeters of composite two-dimensional shapes (i.e., combinations of rectangles, triangles, parallelograms, trapezoids, and circles) (MG2.03)
- develop, through investigation (e.g., using concrete materials), the formulas for the volume of a pyramid, a cone, and a sphere (MG2.04)
- solve problems involving the volumes of prisms, pyramids, cylinders, cones, and spheres (MG2.05)
- simplify numerical expressions involving integers and rational numbers, with and without the use of technology (NA2.01)
- relate their understanding of inverse operations to squaring and taking the square root, and apply inverse operations to simplify expressions and solve equations (NA2.02)
- describe the relationship between the algebraic and geometric representations of a single-variable term up to degree three [i.e., length, which is one dimensional, can be represented by x; area, which is two dimensional, can be represented by (x)(x) or x^2] (NA2.03)
- substitute into and evaluate algebraic expressions involving exponents (i.e., evaluate expressions involving natural –number exponents with rational-number bases (NA2.04)

Lessons:

- Volume of Pyramids and Cones
- Volume of Spheres
- Perimeter and Area of Composite Shapes
- Pythagorean Theorem

Volume of Pyramids and Cones

Specific Expectations: MG2.04, MG2.05, NA2.01, NA2.04

Learning Focus	Blended Learning	Other Resources
• Relate the volume of a pyramid to the volume of a prism with the same base area and same height • Relate the volume of a cone to the volume of a cylinder with the same base area and same height • Calculate the volumes of pyramids and cones by making connections to a prism with the same dimensions	Unit 1 Activity 1: Volume of Pyramids and Cones • OERB Resource ID: ELO1465680 Explore • 3D Shapes Prisms Practice • Math is Fun Prisms • Math is Fun Cylinders • Math is Fun Cones Videos • Volume of Cylinders • Volume of Three Square Pyramids Fitting into a Cube • Volume of a Cone	**TIPS4RM** • Unit 1 Day 1: Fill it up **Homework Help** • Volume Calculation (Part 2 Pages 3 and 4) **Gizmos** • Pyramids & Cones **Geogebra** • Prism Volume vs. Pyramid Volume **Gap Closing I/S** • Module 9 Measurement- Volume: Facilitator's Guide o Diagnostic questions 1-6 • Module 9 Measurement- Volume: Student Book o Pages 6-18

Volume of Spheres

Specific Expectations: MG2.04, MG2.05, NA2.01, NA2.04

Learning Focus	Blended Learning	Other Resources
• Relate the volume of a sphere to the volume of a cylinder with a height the same as the sphere's diameter and the radius of the cylinder's base the same as the sphere's radius • Relate the volume of a sphere to the volume of a cone with a height the same as the sphere's diameter and the radius of the cone's base the same as the sphere's radius • Calculate the volume of a sphere by making connections to an appropriate cylinder or cone	Unit 1 Activity 2: Spheres o OERB Resource ID: ELO1465690 Note: this activity does not develop the formula for volume of a sphere. This occurs in Unit 7 Solving Equations Activity 5. Videos • Volume of Cylinder and Sphere • Relationships between Cones, Spheres and Cylinders	**TIPS4RM** • Unit 1 Day 2: A Sweet Problem o VolumeSphere.ppt **Homework Help** • Volume of a Sphere

Perimeter and Area of Composite Shapes

Specific Expectations: MG2.03, NA2.01, NA2.03, NA2.04

Learning Focus	Blended Learning	Other Resources
• Relate the volume of a pyramid to the volume of a prism with the same base area and same height • Relate the volume of a cone to the volume of a cylinder with the same base area and same height • Calculate the volumes of pyramids and cones by making connections to a prism with the same dimensions	Unit 1 Activity 3: Perimeter and Area of Composite Shapes o OERB Resource ID: ELO1465700 Explore • Patch Tool Investigation • Everything you wanted to know about Perimeter and Area Practice • Step Perimeter Problem • Cross Problem • Area of Composite Shapes Level 3 • Area of Composite Shapes Level 4	**TIPS4RM** • Unit 1 Day 3: Diagnostic to Activate Prior Knowledge on Composite Figures • Unit 1 Day 4: Wacky Shapes o Composite Figures PPT **Homework Help** • Calculating the Area of a Trapezoid • Circle Measurement **Gizmos** • Areas of Parallelograms **Gap Closing I/S** • Module 8 Two Dimensional Measurement: Facilitator's Guide o Diagnostic Questions 1- 4 and 8 - 11 • Module 8 Two Dimensional Measurement: Student Book o Pages 14 - 27

Pythagorean Theorem

Specific Expectations: MG2.01, MG2.02, NA2.01, NA2.02

Learning Focus	Blended Learning	Other Resources
• Identify the hypotenuse and the legs of a right angled triangle • Use the Pythagorean theorem to calculate the length of one side of a right angled triangle given the lengths of the other two sides	Unit 1 Activity 4: Pythagorean Theorem o OERB Resource ID: ELO1465710 Note: This activity focuses on determining the length of the hypotenuse. Determining the lengths of the others sides is revisited in Unit 7 Solving Equations Activity 5. Videos • How To Layout Right Angled Triangles • Pythagoras in 2 Minutes • Exploring the Pythagorean Theorem Explore • Pythagorean Triples Investigation • Pythagorean Theorem Practice • Pythagoras Basics Level 1 • Pythagoras Basics Level 2	**TIPS4RM** • Unit 1 Day 5: The Rope Stretchers o Pythagorean Theorem PPT • Unit 1 Day 6: Using the Pythagorean Theorem Homework Help • Pythagorean Theorem (Part 1 and 2) Gizmos • The Pythagorean Theorem Gap Closing I/S • Module 5 Powers and Roots: Facilitator's Guide o Diagnostic questions 1-4 • Module 5 Powers and Roots: Student Book o Pages 6 - 11, 17 - 21

Volume of Pyramids and Cones

Resource	URL
Blended Learning: Unit 1 Activity 4: Pythagorean Theorem	https://download.elearningontario.ca/repository/14/1465710000/MFM1PPU01A04/overview.html
3D Shapes Prism	http://www.learner.org/interactives/geometry/3d_prisms.html
Math is Fun Prisms	http://www.mathsisfun.com/geometry/prisms.html
Math is Fun Cylinders	http://www.mathsisfun.com/geometry/cylinder.html
Math is Fun Cones	http://www.mathsisfun.com/geometry/cone.html
Volume of Cylinders	https://www.youtube.com/watch?v=qs9NQG-jrzc
Volume of Three Square Pyramids Fitting into a Cube	https://www.youtube.com/watch?v=OUDjY6vJ8pw
Volume of a Cone	https://www.youtube.com/watch?v=0ZACAU4SGyM
TIPS4RM: Unit 1 Day 1: Fill it up	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_Measurement2d3d.pdf
Homework Help: Volume Calculation Part 2 Page 3 and 4	https://homeworkhelp.ilc.org/tutorials/L_Objects/lo_objects_loader.php?object_id=397
Gizmos: Pyramids & Cones	https://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=193
Geogebra: Prism Volume vs Pyramid Volume	https://tube.geogebra.org/material/simple/id/1198399
Gap Closing I/S: Module 9 Measurement – Volume: Facilitator's Guide	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/GapClosing/NumberSense_Int-Senior/9-3DMeasurement-Volume_FG_IS.pdf
Gap Closing I/S: Module 9 Measurement – Volume: Student Book	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/GapClosing/NumberSense_Int-Senior/9-3DMeasurement-Volume_SB_IS.pdf

Volume of Spheres

Resource	URL
Blended Learning: Unit 1 Activity 2: Spheres	https://download.elearningontario.ca/repository/14/1465700000/MFM1PPU01A03/overview.html
Volume of Cylinder and Sphere	https://www.youtube.com/watch?v=8jygxFuLoCk
Relationships between Cones, Spheres and Cylinders	https://www.youtube.com/watch?v=NAcTBJ1boD4
TIPS4RM: Unit 1 Day 2: A Sweet Problem	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_Measurement2d3d.pdf
VolumeSphere.ppt	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_VolumeSphere.ppt
Homework Help: Volume of a Sphere	https://homeworkhelp.ilc.org/chat/chat.php?config=playback&question_id=476630&type=bs

Perimeter and Area of Composite Shapes

Resource	URL
Blended Learning: Unit 1 Activity 3: Perimeter and Area of Composite Shapes	https://download.elearningontario.ca/repository/14/1465700000/MFM1PPU01A03/overview.html
Patch Tool	http://illuminations.nctm.org/Activity.aspx?id=3577
Everything You Wanted to Know about Perimeter and Area	http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/perimeter_and_area/index.html
Step Perimeter Problem	http://www.transum.org/Software/SW/Starter_of_the_day/starter_June9.ASP
Cross Problem	http://www.transum.org/Software/SW/Starter_of_the_day/starter_February9.ASP
Areas of Composite Shapes Level 3	http://www.transum.org/software/SW/Starter_of_the_day/Students/Areas_of_Composite_Shapes.asp?Level=3
Areas of Composite Shapes Level 4	http://www.transum.org/software/SW/Starter_of_the_day/Students/Areas_of_Composite_Shapes.asp?Level=4
Areas of Composite Shapes Level 5	http://www.transum.org/software/SW/Starter_of_the_day/Students/Areas_of_Composite_Shapes.asp?Level=5
TIPS4RM: Unit 1 Day 3: Diagnostic to Activate Prior Knowledge on Composite Figures	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_Measurement2d3d.pdf
Composite Figures PPT	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_CompositeFigures.ppt
Homework Help: Calculating the Area of a Trapezoid	https://homeworkhelp.ilc.org/tools/listen_learn/details.php?t_id=221
Homework Help: Circle Measurement	https://homeworkhelp.ilc.org/tools/listen_learn/details.php?t_id=322
Gizmos: Areas of Parallelograms	https://www.explorelearning.com/index.cfm?method=cResource.dspView&resourceID=245
Gap Closing I/S: Module 8: Two Dimensional Measurement Facilitator's Guide	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/GapClosing/NumberSense_Int-Senior/8-2DMeasurement_FG_IS.pdf
Gap Closing I/S: Module 8: Two Dimensional Measurement Student Book	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/GapClosing/NumberSense_Int-Senior/8-2DMeasurement_FG_IS.pdf

Pythagorean Theorem

Resource	URL
Blended Learning: Unit 1 Activity 4: Pythagorean Theorem	https://download.elearningontario.ca/repository/14/1465710000/MFM1PPU01A04/overview.html
How to Layout Right Angled Triangles	http://www.todayshomeowner.com/video/how-to-layout-right-angles-accurately/
Pythagoras in 2 Minutes	https://www.youtube.com/watch?v=uaj0XcLtN5c
Exploring the Pythagorean Theorem	http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.PYTH&lesson=html/video_interactives/pythagoras/pythagorasSmall.html
Pythagorean Triples	http://www.mathsisfun.com/pythagorean_triples.html
Pythagorean Theorem	http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.PYTH&lesson=html/video_interactives/pythagoras/pythagorasInteractive.html;
Pythagoras Basics Level 1	http://www.transum.org/software/SW/Starter_of_the_day/Students/Pythagoras_Basics.asp?Level=1
Pythagoras Basics Level 2	http://www.transum.org/software/SW/Starter_of_the_day/Students/Pythagoras_Basics.asp?Level=2
TIPS4RM: Unit 1 Day 5: The Rope Stretchers	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_Measurement2d3d.pdf
Pythagorean Theorem PPT	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_PythagoreanTheorem.ppt
TIPS4RM Unit 1 Day 6: Using the Pythagorean Theorem	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/TIPS4RM/Grade9Applied/Unit1_Measurement2d3d.pdf
Homework Help: Pythagorean Theorem Part 1 and 2	https://homeworkhelp.ilc.org/tutorials/L_Objects/lo_objects_loader.php?object_id=217
Gizmos: The Pythagorean Theorem	https://www.explorelearning.com/index.cfm?method=cResource.dspView&ResourceID=200
Gap Closing I/S: Module 5: Powers and Roots: Facilitator's Guide	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/GapClosing/NumberSense_Int-Senior/5-PowersRoots_FG_IS.pdf
Gap Closing I/S: Module 5: Powers and Roots: Student Book	http://www.edugains.ca/resourcesMath/CE/LessonsSupports/GapClosing/NumberSense_Int-Senior/5-PowersRoots_SB_IS.pdf