

Unit 1: Area and Surface Area

Content Area: **Mathematics**
Course(s): **Math - Grade 6**
Time Period: **September**
Length: **21-22 Days**
Status: **Published**

Unit Overview

In this unit, students examine how the relative sizes of numerator and denominator affect the size of their quotient when numerator or denominator (or both) is a fraction. They acquire the understanding that dividing by a/b has the same outcome as multiplying by b , then by $1/a$. They compute quotients of fractions.

Transfer

Students will be able to independently use their learning to solve real-world situations including:

- using formulas to find area, surface area.
-

Meaning

Understandings

Students will understand:

- they can build upon their knowledge of 2D shapes to help find surface and volume of 3D shapes.
- they can use triangles to help find the area of quadrilaterals and other polygons.
- the vocabulary associated with the unit.
- how to use formulas for area, surface area, and volume.

Essential Questions

How can you use different measurements to solve real-life problems?

How is shape important when measuring a figure?

Application of Knowledge and Skill

Students will know...

- the vocabulary that goes along with the geometry unit.
- when to use the appropriate formula in a given situation.

Students will be skilled at...

- finding area, surface area, and volume.
- using nets to find surface area.

Learning Goal

Solve real-world and mathematical problems involving area, surface area, and volume.

MA.K-12.1

Make sense of problems and persevere in solving them.

MA.K-12.2

Reason abstractly and quantitatively.

MA.K-12.3

Construct viable arguments and critique the reasoning of others.

MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Vocabulary

area, region, rearrange, compose/decompose, parallelogram, base/height of a parallelogram, opposite vertex, base/height of a triangle, quadrilateral, vertex (vertices), edge, side, polygon, surface area, face, net, polyhedron (polyhedra), prism, pyramid, square of a number/squaring a number, cube of a number/cubing a number, exponent

Daily Target- Lesson 1

- Compare (orally) areas of the shapes that make up a geometric pattern.
- Comprehend that the word “area” (orally and in writing) refers to how much of the plane a shape covers.

Desmos 6.1.1 Tiling the Plane <https://teacher.desmos.com/activitybuilder/custom/59a784dea820882ea236abf5>

MA.6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
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Daily Target- Lesson 2

- Calculate the area of a region by decomposing it and rearranging the pieces, and explain (orally and in writing) the solution method.
- Recognize and explain (orally) that if two figures can be placed one on top one other so that they match up exactly, they must have the same area.
- Show that area is additive by composing polygons with a given area

Desmos 6.1.2 Finding Area by Decomposing and Rearranging <https://teacher.desmos.com/activitybuilder/custom/59b760fa2756fd05ad452170>

Desmos 6.1.2 with practice problems <https://teacher.desmos.com/activitybuilder/custom/5f64c4e8328b1f0c5ed2913d>

MA.6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
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Daily Target- Lesson 3

- Compare and contrast (orally) different strategies for calculating the area of a polygon.
- Find the area of a polygon by decomposing, rearranging, subtracting or enclosing shapes, and explain (orally and in writing) the solution method.
- Include appropriate units (in spoken and written language) when stating the area of a polygon.

Desmos Reasoning to find

Area <https://teacher.desmos.com/activitybuilder/custom/5b8935d090ec4d30a8ed41ed>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 4

- Compare and contrast (orally) different strategies for determining the area of a parallelogram.
- Describe (orally and in writing) observations about the opposite sides and opposite angles of parallelograms.
- Explain (orally and in writing) how to find the area of a parallelogram by rearranging or enclosing it in a rectangle.

Desmos Parallelograms on the Coordinate Plane - Missing Points, Perimeter and

Areas <https://teacher.desmos.com/activitybuilder/custom/568d066ac5cc641d06c8ec93>

Desmos Properties of

Parallelograms <https://teacher.desmos.com/activitybuilder/custom/5c827f062c3faa0c0ff1c5bb>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 5

- Comprehend the terms “base” and “height” to refer to one side of a parallelogram and the perpendicular distance between that side and the opposite side.
- Generalize (orally) a process for finding the area of a parallelogram, using the length of a base and the corresponding height.
- Identify a base and the corresponding height for a parallelogram, and understand that there are two different base-height pairs for any parallelogram.

Desmos Bases & Heights of

Parallelograms <https://teacher.desmos.com/activitybuilder/custom/59b6e6f7539dc20ce8206861>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

MA.6.EE.A.2a

Write expressions that record operations with numbers and with letters standing for numbers.

MA.6.EE.A.2c

Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

Daily Target- Lesson 6

- Apply the formula for area of a parallelogram to find the area, the length of the base, or the height, and explain (orally and in writing) the solution method.
- Choose which measurements to use for calculating the area of a parallelogram when more than one base or height measurement is given, and explain (orally and in writing) the choice.

Desmos Introduce Students to Using Geoboards - Exploring Length With Geoboards <https://teacher.desmos.com/activitybuilder/custom/58efa58b999d890619a5663e>

Desmos Exploring Quadrilateral Area with Geoboards <https://teacher.desmos.com/activitybuilder/custom/575986ef5e8730000ce6c2c3>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

MA.6.EE.A.2c

Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

Daily Target- Lesson 7

- Describe (orally and in writing) ways in which two identical triangles can be composed, i.e., into a parallelogram or into a rectangle.
- Show how any parallelogram can be decomposed into two identical triangles by drawing a diagonal, and generalize (in writing) that this property applies to all parallelograms, but not all quadrilaterals.

Desmos Area of Quadrilaterals & Triangles <https://teacher.desmos.com/activitybuilder/custom/5a74b29e5491352c6beb38a6>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 8

- Draw a diagram to show that the area of a triangle is half the area of an associated parallelogram.
- Explain (orally and in writing) strategies for using the base and height of an associated parallelogram to determine the area of a triangle

Desmos Exploring Area with Geoboards:

Triangles <https://teacher.desmos.com/activitybuilder/custom/575851499f161519064fed44>

Desmos Area of Triangles: <https://teacher.desmos.com/activitybuilder/custom/57131c61e0634f3e18b90332>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 9

- Compare, contrast, and critique (orally) different strategies for determining the area of a triangle.
- Generalize a process for finding the area of a triangle, and justify (orally and in writing) why this can be abstracted as $\frac{1}{2}(b)(h)$.
- Recognize that any side of a triangle can be considered its base, choose a side to use as the base when calculating the area of a triangle, and identify the corresponding height.

Desmos Explore Different Ways to Find Area of

Triangle <https://teacher.desmos.com/activitybuilder/custom/5f03d6aef8d33d0ef1bf915e>

MA.6.EE.A.2

Write, read, and evaluate expressions in which letters stand for numbers.

MA.6.EE.A.2a

Write expressions that record operations with numbers and with letters standing for numbers.

MA.6.EE.A.2c

Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

Daily Target- Lesson 10

- Draw and label the height that corresponds to a given base of a triangle, making sure it is perpendicular to the base and the correct length.
- Evaluate (orally) the usefulness of different base-height pairs for finding the area of a given triangle.

Desmos

Formula for the Area of a Triangle (Explore Base and Height of

Triangles) <https://teacher.desmos.com/activitybuilder/custom/5f03d3d16e43b81a22baa5f3>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

MA.6.G.A.3

Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 11

- Compare and contrast (orally) different strategies for finding the area of a polygon.
- Describe (orally and in writing) the defining characteristics of polygons.
- Find the area of a polygon, by decomposing it into rectangles and triangles, and present the solution method (using words and other representations).

Desmos Triangle Vocabulary and Characteristics

Practice <https://teacher.desmos.com/polygraph/custom/59062ae2b7470a7f2226cd3e>

Desmos Triangle (another practice for triangle

vocab) <https://teacher.desmos.com/polygraph/custom/560c53f7441172070b262215>

Desmos Area of Polygons <https://teacher.desmos.com/activitybuilder/custom/580145f025f19eb80e45c46a>

MA.6.G.A.1

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 12

- Calculate the surface area of a rectangular prism and explain (orally and in writing) the solution method.
- Comprehend that the term “surface area” (in written and spoken language) refers to how many square units it takes to cover all the faces of a three-dimensional object.

Desmos Surface Area of Regular

Prism <https://teacher.desmos.com/activitybuilder/custom/5716defc9853079d0dcc40cd>

Desmos Surface Area <https://teacher.desmos.com/activitybuilder/custom/5e8a6599f468fb0ce8ae307d>

Desmos Explore Nets and Surface

Area <https://teacher.desmos.com/activitybuilder/custom/570489a3493fc8d5195f5c6f>

MA.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 13

- Compare and contrast (orally and in writing) features of prisms and pyramids.
- Comprehend and use the words “face”, “edge”, “vertex”, and “base” to describe polyhedra (in spoken and written language).
- Understand that the word “net” refers to a two-dimensional figure that can be assembled into a polyhedron, and create a net for a given polyhedron.

Desmos Prisms and Surface

Area <https://teacher.desmos.com/activitybuilder/custom/5ea73d7b2d4d54701416d5bb>

MA.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the

context of solving real-world and mathematical problems.

Daily Target- Lesson 14

- Match polyhedra with their nets and justify (orally) that they match.
- Use a net with gridlines to calculate the surface area of a prism or pyramid and explain (in writing) the solution method.
- Visualize and identify the polyhedron that can be assembled from a given net.

Desmos Nets <https://teacher.desmos.com/activitybuilder/custom/5e937fe8347f1d0c59c24d2a>

Desmos Match the Net with the 3D

figure <https://teacher.desmos.com/activitybuilder/custom/5aabf7ebe9d5950a50866e73>

MA.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 15

- Draw and assemble a net for the prism or pyramid shown in a given drawing.
- Interpret (using words and other representations) two-dimensional representations of prisms and pyramids.
- Use a net without gridlines to calculate the surface area of a prism or pyramid and explain (in writing) the solution method.

Geogebra Nets Explore <https://www.geogebra.org/m/M5dZnUeH>

MA.6.G.A.2

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

MA.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 16

- Comprehend that surface area and volume are two different attributes of three-dimensional objects and are measured in different units.
- Describe (orally and in writing) shapes built out of cubes, including observations about their surface area and volume.
- Determine the surface area and volume of shapes made out of cubes.

Desmos Volume or Surface

Area? <https://teacher.desmos.com/activitybuilder/custom/588942a0ba3d1ee10662d349>

Desmos Surface Area and Volume Word

Problems <https://teacher.desmos.com/activitybuilder/custom/5e8ddf8186c94e6c003bc48f>

MA.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Daily Target- Lesson 17

- Generalize a process for finding the volume of a cube, and justify (orally) why this can be abstracted as .
- Include appropriate units (orally and in writing) when reporting lengths, areas, and volumes, e.g. cm, , .
- Interpret and write expressions with exponents and to represent the area of a square or the volume of a cube.

Desmos 6.1.17 Squares and

Cubes <https://teacher.desmos.com/activitybuilder/custom/59e583df3035c70b6748c360>

MA.6.EE.A

Apply and extend previous understandings of arithmetic to algebraic expressions.

MA.6.EE.A.4

Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

Daily Target- Lesson 18

- Generalize a process for finding the surface area of a cube, and justify (orally) why this can be abstracted as .
- Interpret (orally) expressions that include repeated addition, multiplication, repeated multiplication, or exponents.
- Write expressions, with or without exponents, to represent the surface area of a given cube.

Desmos Surface Area and Volume of a

Cube https://teacher.desmos.com/activitybuilder/custom/5e94ff308af3d00751018f88?fbclid=IwAR3RkbC_X44eK3kC78ULSQQ-noDj7Zs0FzhhXqhwGH-o7ZZI-dAUveeZokg

MA.6.G.A.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

MA.6.EE.A.1

Write and evaluate numerical expressions involving whole-number exponents.

MA.6.EE.A.2a

Write expressions that record operations with numbers and with letters standing for numbers.

Daily Target- Lesson 19

- Apply understanding of surface area to estimate the amount of fabric in a tent, and explain (orally and in writing) the estimation strategy.
- Compare and contrast (orally) different tent designs.
- Interpret information (presented in writing and through other representations) about tents and sleeping

bags.

Desmos The Dynamic Tent (explore surface area and different designs of a tent) <https://teacher.desmos.com/activitybuilder/custom/5b58e70f82e28e59fd47115d>

Desmos Tent Building 101 <https://teacher.desmos.com/activitybuilder/custom/58dc4edfb1b3256c44b3d533>

MA.6.G.A.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
MA.6.G.A.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Formative Assessment and Performance Opportunities

- Academic Game
- BrainPop
- Centers
- Class Discussions
- Clickers
- Desmos
- Do Now
- Exit Ticket
- Graphic Organizer
- LinkIT
- Project
- Quiz
- Self-Assessment
- Student Teacher
- Teacher Interview
- Teacher Observation
- Think, Pair, Share

Summative Assessment

Group Presentation

End of Unit Assessment (located in shared google drive)

Desmos Area Review Part 2 <https://teacher.desmos.com/activitybuilder/custom/5e94e973141da70c7ecf27e3>

21st Century Life and Careers

Standard 9 (needed for 2021-2022 school year): [Career Readiness, Life Literacies, and Key Skills](https://nj.gov/education/cccs/2020/2020%20NJSLS-CLKS.pdf): <https://nj.gov/education/cccs/2020/2020%20NJSLS-CLKS.pdf>

Grade 6: The following standards may be addressed with conversations in class about marketing and packaging of products in Unit 1. • 9.1.8.FP.6: Compare and contrast advertising messages to understand what they are trying to accomplish. • 9.1.8.FP.7: Identify the techniques and effects of deceptive advertising.

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the

	actions of others.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.6	Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.8.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.8.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.

Accommodations and Modifications

- *Social-Emotional Functioning: Peer Tutors.* Pair students with their previously identified peer tutors.
 - *Conceptual Processing: Processing Time.* Provide the image to students who benefit from extra processing time to review prior to implementation of this activity.
 - *Executive Functioning:*
 - - *Graphic Organizers.* Provide a t-chart for students to record what they notice and wonder prior to being expected to share these ideas with others.
 - *Visual Aids.* Add parallelogram to the classroom vocabulary anchor chart.
 - *Fine Motor Skills: Eliminate Barriers.* Provide an enlarged version of the visual.
 - *Conceptual Processing: Processing Time.* Begin with a physical demonstration of how Elena decomposed the parallelogram, which will provide access for students who benefit from concrete contexts.
 - *Conceptual Processing: Processing Time.* Check in with individual students, as needed, to assess for comprehension during each step of the activity.
 - Teacher provides notes for student(s)
 - Teacher will modify test for student(s)
 - A word bank can be provided
 - Leveled centers can be used
 - Small group instruction can be utilized
 - Calculators may be used
 - Extra Practice Board can be utilized to review pre-requisite skills
 - Interactive games/websites may be used to practice skills
 - Teacher can conference with student(s) to "check-in"
 - Utilize items in the room to demonstrate skills as they relate to their life (book to wrap for SA, etc.)
 - Use coordinate plane to count spaces for area and surface area
 - Use blocks to help visualize volume of 3D shapes
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- Calculators
 - Conceptual Processing: Manipulatives. For students who benefit from hands-on activities, provide pattern tiles (or pre-cut an extra copy of each pattern) for students to compare the shapes.
 - Extra Practice Board
 - Interactive Games/Websites

- Leveled Centers
- Manipulatives
- Modify Assessments
- Provide Notes
- Teacher Conferences
- Word Bank

Unit Resources

Mr. Morgan's Math Help <https://sites.google.com/view/mrmorgansmathhelp/illustrative-mathematics/math-6/unit-1-area-and-surface-area>

More Desmos Activities Resources https://docs.google.com/spreadsheets/d/1ttDW7Dz50jXwXjXA_oi7G3q0348z3-W-9_QTOFEVYd4/edit#gid=1612865377

More Desmos Activities Resources https://docs.google.com/spreadsheets/d/1NUxX-yD89gbCGmC_qb5rzugD9ebXL5nX65cR-1s5nRA/edit#gid=0

Unit 1 Shared Google drive <https://drive.google.com/drive/folders/1Y2GyN-xCU-NTUGwnhckmqU5LPFsQ-0eG?usp=sharing>

Pattern Shapes https://apps.mathlearningcenter.org/pattern-shapes/?fbclid=IwAR1-njR2-D2-9oDVkx_WZRIU-ywpuQr22vwobE_mX2pRkPjAvHjaNJ9Kd_U

Illustrative Math YouTube Channel <https://www.youtube.com/c/ChannelGRated/videos>

Interdisciplinary Connections

Unit 1 Lesson 19 Design a Tent:

Language Arts/ Science - Discuss camping and tent size needed to fit up to 4 persons

Business - Cost/Materials needed for tent