Appalachian State Math Walk

Introduction

Math walks, or math trails, can be found all over the world. Math walks provide you with the opportunity to enjoy being outdoors and to exercise your brain as well as your body as you walk around.

Here at Appalachian State University, our math walk contains questions for all age levels from K-12 to adult. You will want to have the following items for your math walk:

- pencil & paper
- measuring tool such as a ruler
- a calculator (phone app)

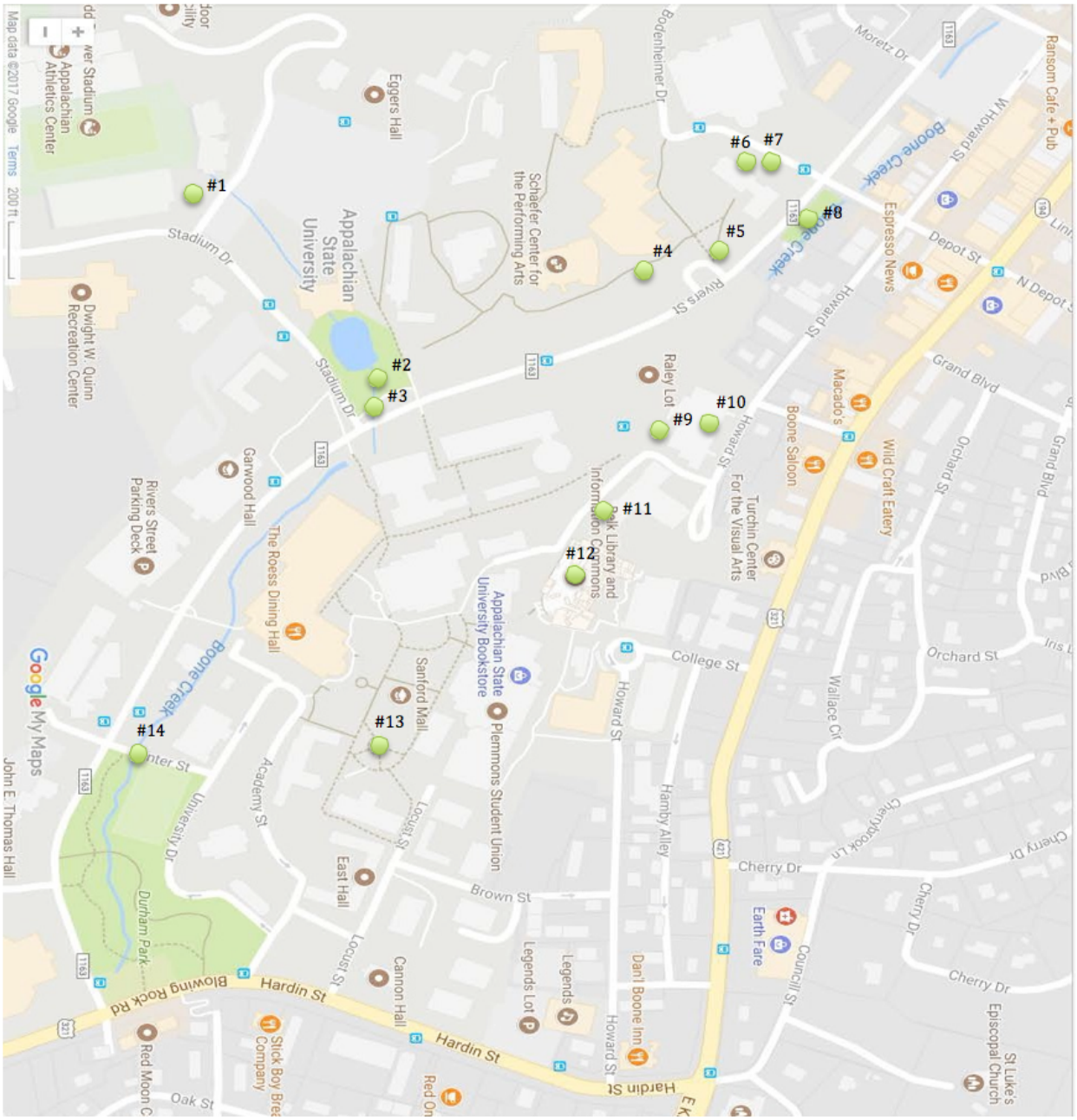
The map on the next page has the locations marked for a variety of activities that can be included on a walk around campus. There are 16 different activities scattered around the main part of campus and one activity related to the wind turbine at the top of the hill on Bodenheimer Drive. Starting on page 22 are some activities that can be completed indoors in the Schaefer Center.

Feel free to pick and choose which stops you visit and which questions you do based on the interests, ability levels, and the time you and/or your group wish to spend.

We hope you enjoy your visit!

Sherry Nikbahkt
Warren Colavito
Stephanie K. Moore
& Kory Illenye

Map of Outdoor Activities



#1) "The Rock"

Kidd Brewer Stadium's nickname is ***The Rock,*** but now there actually is a rock where students meet their friends for football games!

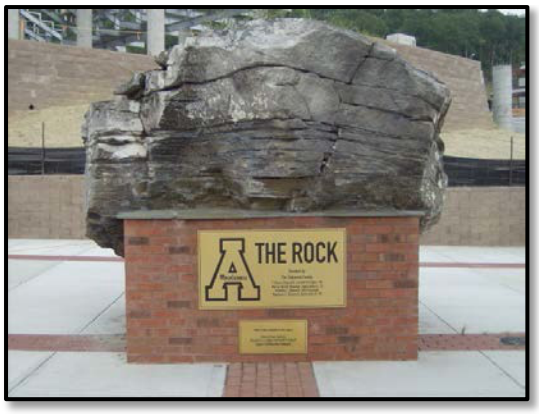


Figure 1. The Rock at the Kidd Brewer Stadium

While "The Rock" is impossible to measure very accurately with a tape measure, approximations for its dimensions are given in Figure 2. It is roughly 84" x 106" on top and has a front height of approximately 48" and a back height of approximately 64". We may consider shape of The Rock as a rectangular solid with a triangular wedge under it. It is made of granite, which has a density of approximately 2.70 g/cm3.

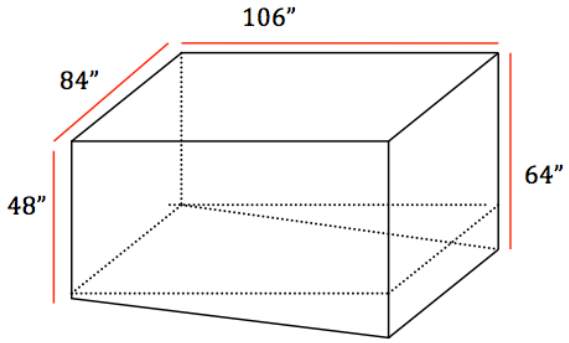


Figure 2. A rough diagram of The Rock's dimensions

Tasks:

Grade 6 – 8:

What is the volume of "The Rock" in cubic inches?

Grades 9 – 12:

Using the above information, what would you estimate "The Rock" to weigh in pounds? In kilograms? (Note: *454 g = .454 kg = 1 lb. 2.54 cm = 1inch, which means 1 cubic inches equals approximately to 16.387 cubic cm)*

#2A) It's "Stairing" You in the Face … Or is it?

Figure 3. The stairs by the Duck Ponds

The stairs on the trellis by the Duck Pond are only a small portion of the entire structure, but they take quite a bit of lumber (let's assume it's pressure treated). It is a nice place to sit, relax and have lunch. Let us look at a small piece of these structure and do some math with it. In Fig 3, you notice some steps with a highlighted circle around them. Those 4 steps and their handrails are facing the River street. Here are some measurements about that part of the trellis:

Handrails: composed of 2x4's, 2 short ones (each 13" long) and 2 long ones (each 42.5" long).

Steps: composed of 8 planks - 2x6x48.

Posts: four made up of 8 planks of 2x4s (each 30.5" long).

Tasks:

Grades K – 12:

a) Suppose you had to buy 2x4s and 2x6's in 8' lengths. How many of each would you have to buy to build those stairs?
b) Suppose the 2x4's cost $3.07 for each 8' length and the 2x6's cost $5.27 for each 8' length. How much would it cost to build the stairs?

Did You Know?

Wood commonly comes in 2"x4", 4"x4", 2"x6" and 2"x8" sizes (plus some other ones) thus the common terms 2 by 4's, 4 by 4's etc. However, the actual sizes of those dimensions are approximately ½" smaller making the 2 x 4, for example, actually 1.5" x 3.5".

#2B) The Duck Pond

Figure 4: The Duck Pond

Every student who desires to earn a chemistry degree from Appalachian State University must complete a course in quantitative analysis. While in this course these students complete many experiments that deal with "Duck Pond and Boone Creek" most of the students do not realize that the duck pond has a purpose other than aesthetics. It is actual a sediment retention pond that filters out debris and other harmful contaminants. One of the contaminants that is tested each semester is paraben level. Parabens are found in many products such as soaps, lotions and cosmetic products. The levels are checked in both the Duck Pond and Boone Creek to determine the effectiveness of the retention pond. So, let us do some math. The quantitative analysis class here at Appalachian State University conducted an experiment during the Spring of 2017 semester and found that there was 1 ppm of methylparaben in the duck pond and 0.3 ppm in the Boone Creek. This shows that the Duck Pond is doing its job.

Note: concentrations of chemicals in water are typically measured in units of the mass(milligrams) per volume of water (liter). For water, 1 ppm = approximately 1 mg/L, or 1g/m^3, of contaminant in water.

Task:

Grades 9 – 12:

If the duck pond has 35,000 gallons of water how many grams of methylparaben are in the duck pond?

Some equivalencies you may need:

1 ppm = 1 g/m^3
1 mL = 1 cm^3
1 gallon = 3.79 L
1 m = 100 cm

#3) Measure Yosef!

Tasks:

a) Go to the Yosef statue and see how you measure up. How many times do you think Yosef is taller than you? Write down your guess on the line below before you continue.

I think Yosef is _____ times taller than me.

Yosef is so tall we couldn't figure out a way to measure his whole height without a ladder! Instead, we measured the length of his leg to his belt (the yellow line on Fig 5). If you measure from the ground to where a person's hip bends, that is approximately 50-55% of the average person's height. Of course, some people are "all leg" and some are "all body" while others are about half and half. Do you know where most of your height is?

b) measure your ground-to-hip height and figure out what percentage that is of your height. To figure out how many times taller Yosef is than you are, you can either compare his ground-to-hip height to yours or, if your legs are not 50-55% of your total body height, you can compare Yosef's total height (using 55% as the percent his legs are of his total height) to your total height.

$$\frac{Yosef's\ ground-to-hip\ height}{Your\ ground-to-hip\ height}\ OR\ \frac{Yosef's\ total\ height}{Your\ total\ height} = How\ many\ times\ taller\ Yosef\ is$$

Fig 5: Yosef's statue

According to http://trackstarusa.com/long-stride-length/ the optimum stride length for someone running as fast as they can is 2.3-2.5 times their leg length for females and 2.5-2.7 times their leg length for males.

c) What would your optimum stride length be? What would Yosef's be?

#4) A New Slant on Stairs

Stand facing The Hayes School of Music building. There are 3 flights of steps leading up to the entrance. For this problem, feel free to make use of these measurements:

	Tread depth	*Height of step*	*#of Steps*
Bottom & Middle flights:	*12.5 in.*	*5.0 in.*	*10*
Top flight:	*11.5 in.*	*6.0 in.*	*11*

Fig 6. Flights of steps leading up to the entrance of Hayes School of Music

Tasks:

Grades K-1:

a) How many steps are in the 1st staircase? Count them.
b) How many steps are in the 2nd staircase? Count them.
c) How many steps do you think will be in the 3rd staircase? Count them.

Grades 6 – 8:

d) What is the slope for the bottom staircase?
e) For the highest staircase?
f) Is the slope the same for all 3 staircases?
g) If you are standing at the top of the 2nd set of stairs, how much higher are you than someone standing at the bottom of the first flight of stairs?

Grades 9-12:

h) What angle does the slope of the bottom staircase make with the ground (in degrees)? The top one?

#5) Wooden You Know, Another Post Problem!

When you face The Hayes School of Music from the sidewalk and look to your right, you'll see the flowerbed shown below. It has 10 posts and 10 chain sections.

Fig 7: flowerbed close to the Hayes School of Music

These posts are made up of a piece of lumber known as a 4x4 which is meant to describe the square end as being 4" by 4". The actual measurement is 3.5" x 3.5" because the piece you buy has been kiln dried and sanded smooth. On average, the height of these posts (above the ground) are approximately 40".

Tasks:

Grades 6 – 12:

a) What is the surface area of the rectangular portion of one post (minus the pyramid shaped top)?

Grades K – 5:

b) What shape is the top of each post?

#6) The Volume of Art:

The Rosen Sculpture Competition and Exhibition is an annual national juried competition presented by An Appalachian Summer Festival and the Turchin Center for the Visual Arts. Since its establishment by Martin and Doris Rosen in 1987, the Rosen competition continues a tradition of showcasing contemporary American sculpture in outdoor settings across the campus of Appalachian State University. Cash prizes are awarded to three artists whose work is chosen by the juror and will be announced at the annual sculpture walk - a highlight of every summer festival season. (http://www.rosensculpture.org/)

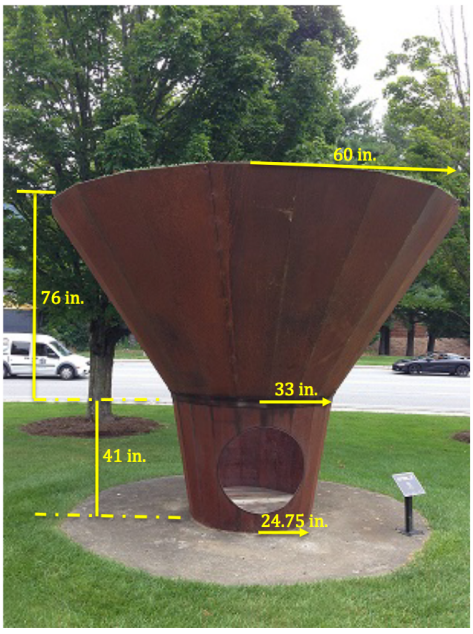
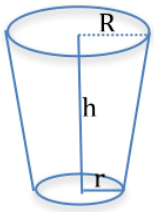


Fig 8: The art piece in front of Walker building

Many types of art have math that is involved in them, merely from design or form perspective. One such piece of art gives us the opportunity to refine some of our skills as mathematicians to understand volume. Figure 8 is a picture of an art display located on the east side of the Walker Hall. This piece was displayed for a whole year starting from June 2017. When looking at this piece of art we can see it is made up of multiple circular cones. The following formula is used to find the volume of a circular cone as pictured in fig 9.



$$V = \frac{\pi}{3}h(R^2 + Rr + r^2)$$

Fig 9: The volume of a right circular cone

Task:

Grades 6 – 12:

a) Calculate the volume of this art piece in cubic inches, using the measurements given to you in Figure 8.
b) What is the volume of this shape in cubic feet?

Grades K – 5:

c) How many circular shapes do you spy in figure 8?

d) **#7A) What Do a Bike Rack and Trig Have in Common?**

There is a bike rack On the Bodenheimer Street side of the Walker Hall.

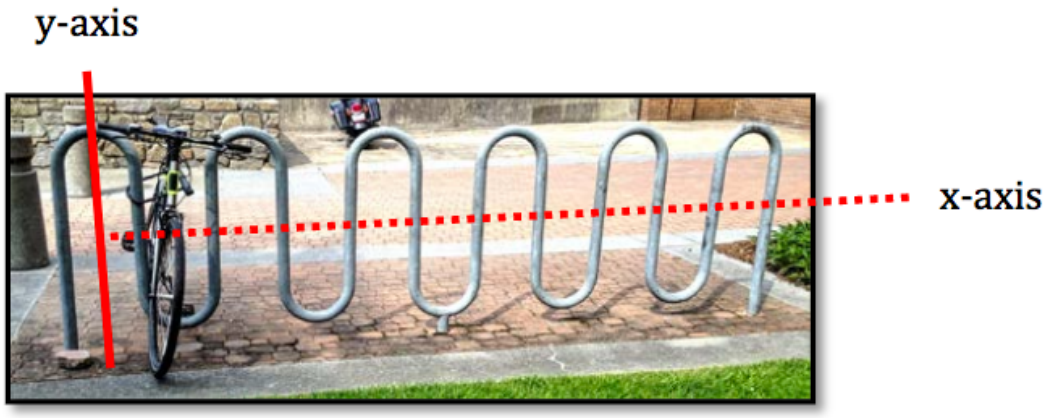


Fig 10: bike Rack on the Bodenheimer street side of the Walker hall

In the world we often see advanced math without ever noticing it. For example, this bike rack. Do you see a trigonometric function here? Assume the y-axis starts at the center of the first post and the x-axis is centered down the rack as drawn above.

Tasks:
Grades 6-12:

a) Which trig function does the bike rack look like?

Grades K – 5:

b) How many bikes could you currently fit in this rack, assuming 1 bike per slot?
c) If you add another loop how many bikes would you be able to fit?

#7B) Posts and Chains

Outside Walker Hall on the Bodenheimer Street side is an area with posts and chains:

Fig 11: posts outside of the Walker hall

The height of those posts are approximately 34 inches. The diameter of each post is about 10inches. The diameter of the skinny part is approximately 8 inches and the height of the skinny part is approximately 4 inches.

Tasks:

Grades 6 – 12:

a) What is the volume of each post in cubic inches (you can do it all as one cylinder or you can be more accurate and subtract what is "missing" from the skinnier part?

[In case you forgot: the volume of a cylinder is $V = \pi r^2 \times h$*]*

b) Convert the ***volume*** of a post to cubic meters using the fact the 1 in. = 2.54 cm (exact).

c) If concrete weighs approximately 5297.2 lb. per cubic meter, how many pounds (to the nearest whole pound) does one post weigh (the part that is showing above ground)?

Grades K-6:

d) If the average first grade student weighs 40 lb. and the post weighs 222 lb., how many first-grade students would you need to outweigh the post?

Did You Know?

A ***catenary*** is the shape a free-hanging cable takes when hung by the ends. It can be graphed as a hyperbolic cosine curve. Sometimes it is also called a *"funicular."* The catenary shape is important in architecture and engineering bridges and arches so that adding force doesn't result in the structure bending.

#8) Park it Here (Brainstorm and Concept Problem)

Across from Walker Hall on River St., there is a little park area called Jimmy Smith Park. It is just a couple of green areas with a sidewalk and benches near a little stream, which on sunny days it is really nice to sit outside and enjoy the sun while eating lunch. If your group brought a snack, this might be a good location to sit and relax while you are eating it!

Fig 12: Jimmy Smith Park

Look at the *further* patch of green grass. Can you think of a way to estimate its perimeter or area?

Since no measurements are marked on the concrete, is there something you have with you that you ***do*** know the length of that could help you estimate distances?

What kinds of shapes could you put together to help you estimate the area?
[Triangles, Circles, Rectangles]

Note: There are no calculations with this "problem" – only the chance to do a little bit of brainstorming and to creatively think of ways to solve a problem.

#9) Making Molehills into Mountains

The Mountain-Shaped Solar Panels (near Peacock Hall)

Photo credit: https://sustain.appstate.edu/initiatives/renewable/pv/
Fig 13: Solar panels near Peacock Hall

Appalachian State University is very interested in sustainability. The campus has several photovoltaic and solar thermal systems.

Photovoltaic (PV) devices (commonly known as solar cells or solar panels) convert sunlight into electrical energy. Photovoltaics can literally be translated as light-electricity. (U.S. Department of Energy).

Near Peacock Hall is a solar panel that combines sustainability with art. Its unique mountain design reflects the natural wonders of our area and is the most visible photovoltaic system on campus. The 37-panel grid-tied system's capacity is 4 kW. (https://sustain.appstate.edu/initiatives/renewable/pv/)

Tasks:
Grades 6 – 12:

a) This custom shaped solar panel is made to look like mountains. The cost of building this artistic solar panel is about $65,000.00 and is anticipated to produce about 5,782 kWh energy annually. Assuming, 1 kWh worth about $0.06, how long will it take to pay for this solar panel?

b) Assuming there are 1554 small square panels in that solar panel and each square has an area of 36 square inches, how much energy do you get from 1 square inch of panel in kWh annually?

#10) Peacock Hall's Glass Semi-Circle

The Walker College of Business is located within Kenneth E. Peacock Hall. Opened in 1990, the 130,000 square-foot, four-story building is in the middle of the Appalachian State University campus.
At the time of its completion, Peacock Hall received the 1990 Architectural Brick Award from the Brick Association of North Carolina. The building was cited for the use of different colors of brick, for a design that breaks up the mass of the building without dwarfing neighboring buildings, its curved glass block wall and its pedestrian access. (https://business.appstate.edu/about/facilities)

Fig 14: Peacock Hall

Tasks:
Grades 6 – 12:

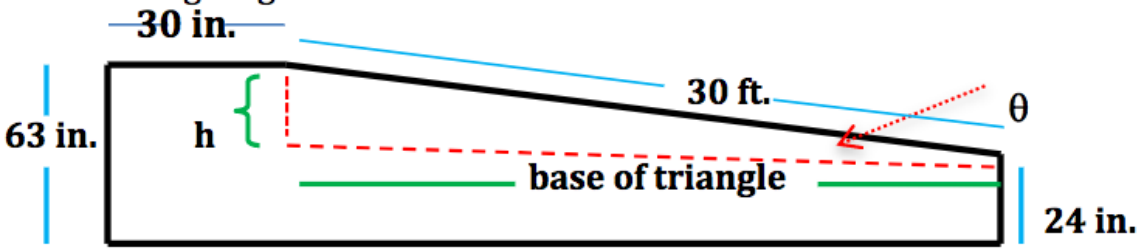
Given that Peacock hall has 10,384 glass blocks on its curvature and each glass block plus mortar has dimensions of 8 by 8 inches:

a) Estimate how much paint you would need to cover the glass blocks in Peacock Hall's semicircle to tint the blocks? The brand of the paint you are considering is a spray paint designed for glass which costs $6.25 per can. Each can will roughly cover 20 square feet.
b) How much would it cost to paint the whole semicircle glass blocks with that particular spray paint?

#11) Ramping Up: the handicap ramp by Chapell-Wilson Hall

Fig 15: the handicap ramp by Chapell-Wilson Hall

Given the following diagram:



Tasks:

Grades 9 – 12:

a) Find the angle of incline θ:
b) Find the slope of the incline.

> "For commercial use when somebody is sitting in the wheelchair or scooter while it climbs the ramp, ADA recommends a 1:12 slope, which means that every 1" of vertical rise requires at least 1' (12") of ramp length (5 degrees of incline)."
>
> http://www.discountramps.com/wheelchair-ramp-length/a/B20/

Grades 6 – 8:

c) Find the area of the triangle in the diagram:
d) Find the area of the entire Ramp: (Hint: break it up into multiple shapes)

Grades K – 5:

e) Convert 30 feet to inches.
f) Given that the area of the ramp is 17,456.4 in^2 and a brick covers 8.15 in^2. How many bricks would you need to complete the ramp? (Hint: remember always round up.)

#12) The Library Atrium

Centrally located on campus in a beautifully-designed facility, Belk Library and Information Commons is a hub of activity, opening its doors to over a million visitors per year. The library shares its holdings with Western Carolina University and UNC Asheville and features a rich and unique collection, from rare artifacts of Appalachian history to state-of-the-art technology (https://library.appstate.edu).

Stand in the library's atrium (the circular area just inside the doors). As of July 2013, the library had 939,291 books.

Fig 16: The Library Atrium

Tasks:

Grades 6 – 12:

a) Estimate how many books it would take to fill the rotunda. The height of the atrium is 125 ft. with a diameter of approximately 32 ft. One of the librarians estimated that the average book is about 8" by 12" by 2". The formula for calculating volume of a cylinder is: $V = \pi r^2 h$.

b) Are there enough books in the library to fill the rotunda (ignoring the packing problem of fitting rectangular solids into a circular space)?

Grades K – 5:

c) If every student on campus (about roughly 18,000), were asked to move all the books (939,291) in the library how many books would each student have to carry?

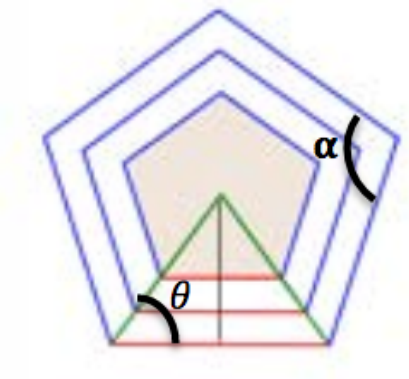
#13) The Outdoor Classroom

Sanford Mall is the name of a green area of campus that hosts all sorts of outdoor booths and information tables at certain times of the year. It is also where students meet to practice rope walking or to swing or just hang out. At one end is a group of statues that look like a teacher holding her class outdoors.

Fig 17: A group of statues in Sanford Mall

There are a series of dates and names which App State has been called throughout its history carved around each side of the platform which has a pentagon shape. Some examples of those dates and names are:
1899-1903 Watauga Academy
1903-1925 Appalachian Training School 1925-1929 Appalachian State Normal School
1929-1967 Appalachian State Teachers College 1967-present Appalachian State University

The base of the platform is made up of 2 layers of regular (or equiangular) pentagons. This means that angles are all equal, as well as all the sides.



The central angle goes from the center of the figure to two adjacent vertexes (a vertex is where 2 edges meet). To find the central angle you take 360° (the number of degrees in a circle) and divide it by the number of sides in your polygon (in this case 5). In a regular pentagon, therefore, each central angle is 72°. Since the sides forming the central angle are both radii, this makes each of the five triangles originating from the 5 central angles isosceles triangles. Therefore, the other 2 angles in each triangle must be equal to each other.

Tasks:
Grades 6 – 12:

a) What is the measure in degrees of the angle θ?
b) What is the measure in degrees of the angle α?

Grades K- 5:

c) Looking at fig.17, if 3 children can fit on each of the empty benches and 1 child can fit on each of the other benches with a statue on them, how many children can all the benches hold?

#14) Going with the Flow

Next to Jimmy Smith Park is a little creek that runs up and down the River Street which called Boone Creek.

One of the App State math professors had his modeling class come up with a way to estimate the flow of this creek. Different teams came up with different ways to attempt this. The only piece of information the class was given is that *stream flow is measured in cubic meters per second*. This group of students came up with some amazing ways to determine the flow. Why is this important?

Fig 18. The Boone Creek

In the past five decades or so evidence has been accumulating about an environmental factor, which appears to be influencing mortality, in particular, cardiovascular mortality, and this is the hardness of the drinking water. In addition, several epidemiological investigations have demonstrated the relation between risk for cardiovascular disease, growth retardation, reproductive failure, and other health problems and hardness of drinking water or its content of magnesium and calcium. In addition, the acidity of the water influences the reabsorption of calcium and magnesium in the renal tubule. Not only, calcium and magnesium, but other constituents also affect different health aspects. Thus, the present review attempts to explore the health effects of hard water and its constituents. (Abstract from [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3775162/)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3775162/).
Which means that being able to identify accumulation points based off sources of flow in and flow out can be used to control concentrations of harmful minerals in the water and where to best deal with them.

Tasks:
Grades 9-12:

a) Given that the river flows at 12 cubic meters per second, the concentration of calcium carbonate is 0.0001 grams per liter, and there are 1000 liters in a cubic meter. How many grams of calcium carbonate has the river moved in 30 minutes? (Note: 1 cm^3 = 1 mL)

Grades 6-8:

b) Given that you have 4 liters of water with a concentration of 0.0001 grams per liter of calcium carbonate, how many milligrams of calcium carbonate do you have?

Grades K-5:

c) If a fish can swim 1 meter every minute in stationary water and you are standing in water that is moving away from you at 2 meters per minute can the fish ever reach you if it starts 10 meters away?

#15) I Came, I Saw, I Conquered. Another art piece from the Rosen Sculpture Exhibition.

In figure 19, you will find another statue, form the Rosen Sculpture Competition and Exhibition which was displayed in the summer of 2016. The display was located just outside of the Walker Hall (between Walker and Hayes).

Fig 19. The sculpture which was displayed outside the Walker hall

Tasks:
Grades 6 – 8:

a) If you picture extending the pieces marked with the dotted lines all the way to the center of the blade, you can see that what is showing is not exactly half the blade. If it were, there would be 14 teeth and 14 does not divide evenly into the 360° in a circle. Assuming there are 16 teeth around the entire blade, what is the angle between any 2 teeth?

Grades 9 – 12:

b) This blade has approximately a 69" diameter. If the blade has a speed of 990 revolutions per minute, how many linear feet of wood would it cut in 1 minute?

Note: according to http://vermontamerican.com/article/circular-saw-blade-speed-chart/ - a 22" diameter blade has a max of 3000 rpm while a 6.5" blade has a max of 10000 rpm.

#16) Pyramid Sculptures (Near #3)

Fig 20. Pyramid Sculptures

On the back side of the Justice Hall, there are a set of Pyramids with blue and red lights at the top. Let's consider the following dimensions for the shortest pyramid which has a blue light on the top:
Square base of 36"x36" and the height of the pyramid is 93.5". *Please note this is the height of the pyramid not the line from the tip of the pyramid down the side to the middle of the base*

Tasks:

Grades 6-12:

a) What is the approximate total surface area of the 4 sides of the sculpture?
b) According to the CDC, from a study conducted from 2011 to 2014 the average male height in USA is 69.2 inches. How much taller in percentage is this statue than the average American male? https://www.cdc.gov/nchs/fastats/body-measurements.htm

#17) The Wind Turbine (At the top of Bodenheimer Drive)

You might have noticed the Broyhill Wind turbine as you entered the campus of the Appalachian state University today. This Wind Turbine is located on 755 Bodenheimer Drive which is the highest point on our campus. Wind is one of the forms of renewable energy employed at Appalachian State University. The uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth cause wind. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetative cover. This wind flow, or motion energy, when "harvested" by a wind turbine, is converted from kinetic energy to mechanical power. This mechanical power is then converted by a generator into useable, and in our case, grid-tied electricity.

Fig 21. The Broyhill Wind Turbine

The ASU wind turbine has become the iconic symbol of Appalachian's commitment to renewable energy. The 100-kW facility is the largest wind turbine in the state of North Carolina. It is situated on the highest point on campus and stands more than 152 feet tall. Funding for the turbine came predominately from the student-backed ASU Renewable Energy Initiative with generous support from New River Light & Power Company (https://sustain.appstate.edu/initiatives/renewable/wind/).
You can use the following link to get to the Real Time Output Data for the wind Turbine. (https://rei.appstate.edu/pagesmith/61). On average, the turbine produces 104,000 kWh yearly. This is enough energy to power about 8 North Carolinian homes each year.

You may use the following link for a map of the locations of wind turbines throughout the state of North Carolina. (https://wind.appstate.edu/turbine-map)

S1) The Schaefer Center – Balcony

The Schaefer Center for the Performing Arts is a 1,673-seat multi-use auditorium located on the campus of Appalachian State University in Boone, North Carolina. The Center features orchestra and balcony level seating and a proscenium stage. The Schaefer Center is also home to the Smith Gallery. http://theschaefercenter.org/about/

highcountryhost

Look up, and you will see a balcony/rotunda on the second floor above you. Above it on the ceiling, you will also see lights designed to look like sculptures.

Tasks:

Grades K-2:

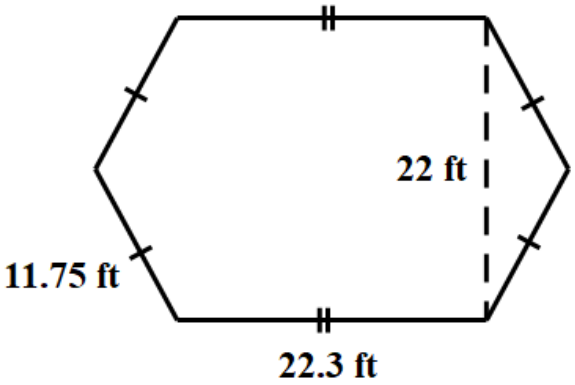
a) If you look past the balcony to the ceiling, you see a group of lights. How many are there?
b) What shape do the railings on the balcony form?

Grades 3-5:

c) Notice that the balcony has 4 short sides and 2 long sides. Now, look at the glass panels on the railings. How many glass panels are on a short side? A long side? Use your answers to find how many panels were used to build the balcony.
d) If you look at the railings, you should see a group of metal circles. These are called rivets, and they hold the panel together to keep it from falling or breaking. How many rivets are on one panel? Use this amount and your answer from part c) to find how many rivets were used to build the balcony.
e) Given the diagram and measurements below, what is the perimeter of the balcony in feet?
f) If this design of railing cost $50 per foot, how much did the railing cost?

Grades 6-8:

g) Given the diagram and measurements below, determine the amount of 2nd floor area (in square feet) that had to be removed to create the balcony.
h) If the height from the 1st floor ceiling to the top of the railing is 97 inches, find the volume of the space surrounded by the balcony in cubic feet.



S2) Water Bottle Refill Stations

There are four water bottle refill stations in the Schaefer Center located next to the auditorium doors – two upstairs and two downstairs. These stations are called ezH2O Bottle Filling Stations which manufactured by the Elkay company. On the top of each station you will find the number of plastic water bottles as a result of people using the station for refills. This number resets whenever the filter is changed.

<u>Tasks:</u>

Grades K-2:

a) Imagine that the display showed that 426 plastic bottles had been saved as a result of people using the filter. Write this number in expanded form.
b) Decompose the number 426 in two other ways using hundreds, tens, and ones.

Grades 3-5:

c) Go to each of the four water fountains and write down the number of plastic bottles saved. How many bottles of water have Schaefer Center visitors saved in total?
(note: you may use the numbers on the fountains or use our sample values in the table below)
d) Create a bar graph for the amount of water saved at each of the four water fountains.

Grades 6-8:

e) Go to each of the four water fountains and write down the number of plastic bottles saved. What are the mean and median numbers of bottles saved for all four fountains? (note: you may use the numbers on the fountains or use our sample values in the table below)

Grades 9-12:

Assume the total number of refills for all of the four stations in the Schaefer Center for a month is 15,000. This means that we saved 15,000 plastic bottles from going to landfills.

f) If we line up all these bottles, could they reach a mile? You may use the following information for your calculations:
The height of an average bottle: 20 cm

1 ft = 30.48 cm and 1mile = 5280 ft.

g) To be able to answer the above question, what assumptions must be made?

Sample Values (recorded on 11/13/19)

Fountain	**Bottles Saved**
Downstairs Fountain 1	10,358
Downstairs Fountain 2	4,837
Upstairs Fountain 1	1,902
Upstairs Fountain 2	1,911

Yosef's origins explained

The history behind the Appalachian State accidental mascot

Elizabeth Storie
Associate Editor
1942 Rhododendron [Yearbook]

It was in the spring quarter of 1942; Appalachian was not yet using the semester system. World War II had started in December of 1941, and several of the male students had already volunteered for military service and were no longer on campus. Jim Storie, editor of the annual, the Rhododendron, had volunteered and left for the Navy in early March.

Deadlines for the annual were to be met, and members of the staff were working long hours in order to meet these deadlines. On one such late night, arranging pages, were Associate Editor Elizabeth South, freshman Editor Lloyd Isaacs and the Observer Printing House Company representative Bill Mitchell.

Realizing there was an imbalance of arrangement on the last page of freshman pictures, a solution was sought with various suggestions being made by the three.

For years, the appellation of Mountaineer had been used for the teams of Appalachian State Teaching College (ASTC, before the days of ASU), with the campus book store, managed by Twin Cottrell having decals with an appropriate profile.

The Mountaineer had already been selected to grace the cover of the annual, but with an original updated version being used. It was suggested that the space on the freshman page be filled with a likeness of the Mountaineer, and Bill Mitchell thought his publishing company artists could render an appropriate sketch to agree with the annual's cover.

It was thought by the three that the name of the student should be such to apply to all the Mountaineer students of ASTC. Bantering back and forth, it was felt that Daniel Boone was the prototype of a mountaineer.

To emphasize that all the freshman students should embrace the loyalty and feeling for the Mountaineers, some name should indicate that this student represented them all. D. Boone, You, Yourself was settled upon as the choice. The You was dropped for conservation of space. However, the printer at the publishing company misunderstood the apostrophe used to shorten the name to Yoself as well as misspelling the self to Seff, which evolved from Yourself to Yoseff. In later years, even this spelling was changed.

Yosef has become a symbol of the ASU teams: strong, independent and full of enthusiastic school spirit. Sometimes he is ridiculously, cartoonishly and exaggeratedly portrayed, and at other times, he is portrayed with more appropriate demeanor, as a tall, slender, strong Mountaineer, representing all students of ASU.