Activity 29
Brown Academy

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Summer Urban Institute, Urban IMPACT Project

Description of Module

In designing this module, several areas of Brown Academy will be visited. The participant will solve mathematics problems based on data collected in the cafeteria, in the gymnasium, in the library, in the hallway, on the staircases, in the parking lot, and on the exterior of the building. Location: 718 E. 8th St., Chattanooga, TN 37403

Standards

Number and Operations, grades 6-12
Geometry, grades 6-12
Data Analysis and Probability, grades 6-12
Algebra, grades 6-12
Measurement, grades 6-12
Connections, grades 6-12

Standards Documents

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Retrieved July 17, 2003, from http://standards.nctm.org

National Council of Teachers of Mathematics. (2003). *Illuminations*. Retrieved July 17, 2003, from http://illuminations.nctm.org/

Tennessee Department of Education. (2002). *Mathematics curriculum standards*. Retrieved July 17, 2003, from http://www.state.tn.us/education/ci/cistandards2001/math/cimath.htm

Hamilton County Department of Education. (2002). *HCDE standards & benchmarks*. Retrieved July 17, 2003, from http://www.hcde.org/standards/stindex.html

Problems

Part 1: Library

1. The bookshelf that holds Encyclopedia Britannica is 35 inches wide. Each volume of the encyclopedia is 1 ½ inches wide (across the binding). The bottom shelf contains 22 volumes. Is there space for additional volumes? If so, how many?

2. The fiction books range in height from 7 inches to 11 inches. The bookcase that contains fiction is 54 inches tall. There are 39 shelving holes with 1 ¼-inch spacing between them. The shelf is ¾-inch thick. Design an arrangement for the shelving.

3. The width (across the binding) of fiction books ranges from ½ inch to 1 inch. The bookshelf is 35 inches wide. What is the minimum number of books that will fill the shelf? What is the maximum number of books that will fill the shelf?

4. The magazine rack tilts to display the cover of the latest issue of each magazine. What is the slope of the tilted surface if the depth of the case is 1 foot and the height of the case is 10 inches?

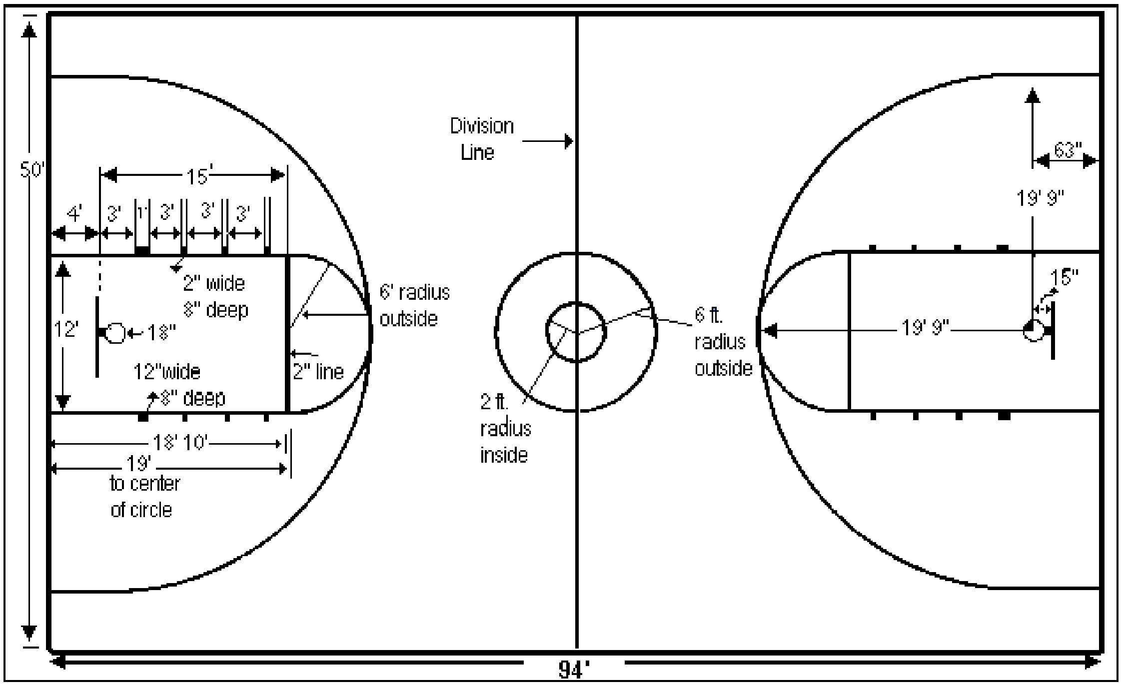
5. The library contains square tables and round tables. Each square table has sides of length 42 inches. Each round table has a diameter of 41 inches. Find the surface area of each type of table.

Part 2: Gymnasium

6. The gymnasium floor contains markings for a basketball court. Describe the lines, angles, and symmetry that can be seen.

7. Given the full court (NBA/NCAA) diagram (Handymanwire, 2003), find the following:
   a. The ratio of the length of the court (94 ft) to the width of the court (50 ft).
   b. The area of the backboard (72 inches in width by 42 inches in height).
   c. The area of the key (12 ft wide, 15 ft from free throw line to backboard, 4 ft from backboard to baseline). Don't forget the semicircle at the top of the key!
   d. The area of the rim (18 inches in diameter).
   e. The circumference of the rim (18 inches in diameter).
   f. The circumference of an NBA basketball is 29.5 inches. How many inches clearance does the basketball have as it passes through the rim?
   g. The volume of an NBA basketball.

h. The length of the hypotenuse of the right triangle formed by the distance from the free throw line to the backboard (15 ft) and the distance from the floor to the rim of the basket (10 ft).



Part 3: Cafeteria

8. The wall is composed of 8-inch blocks. Find the height of the wall.

9. Each cafeteria table has a length of 95 ½ inches, a table width of 14 ½ inches, and a bench width of 11 ½ inches. Find the surface area of the table and the bench (top surface only).

10. Estimate the following:
    a. The number of adults that can sit side-by-side on the bench.
    b. The number of students that can sit side-by-side on the bench.
    c. If there are 45 tables, how many students can be seated at the same time?

11. Count the number of 1-foot tiles along the length and width of the floor. Calculate the area of the floor in square feet and in square yards. Consider only full tiles.

12. Count the number of 4-foot by 2-foot panels along the length and width of the ceiling. Calculate the area of the ceiling in square feet and in square yards. Consider only full panels.

13. Compare the results obtained in problems 11 and 12 by calculating the percent error between the two measurements. Both values are based on observations, but the length as counted in floor tiles will be more accurate since this is a smaller unit. Use the area calculated with floor tiles as the accepted value and the area calculated with ceiling panels as the observed value.

14. Using the data collected in problems 8 and 11, calculate the volume of the room. Count the number of 2-foot diffusers and the number of 2-foot by 1-foot uptake vents in the ceiling. What volume of air is changed per diffuser and per uptake vent? Assume two room changes of air per hour. Express your answers in cubic feet per minute (cfm).

15. Count the number of 4-foot by 2-foot light panels in the ceiling. Calculate the percentage of the ceiling that has light panels.

16. Count the number of sprinkler heads in the ceiling. Calculate the percentage of the ceiling panels that contain a sprinkler head.

17. Draw a scale of the room. Construct the minimum size of the sprinkler head spray radius to obtain complete coverage of the floor.

18. Locate a nine-pane window. How many different sizes of panes are present? What is the ratio of the smallest pane to the largest pane?

Part 4: Connections

19. Look for patterns in the hallway and/or room floor tiles, on the walls, etc. Where can you find examples of odd numbers, even numbers, and/or prime numbers?

20. Look at the murals in the hallway, across from the school office. List the following:
    a. Geometric shapes that you see.
    b. Repeated patterns that you see.
    c. Types of symmetry that you see.
    d. List the time periods and locations that you see.

21. Look at the left or right side of the roof of the Tennessee Aquarium model. Measure the three sides of the large and small triangles. Show that they are similar.

22. Measure the height of the knight sculpture. What percentage of your height is the knight?

23. There is a vending machine located outside the hallway door to the back of the building. Determine the price per soda or water, and the number of flavors. What coin or bill combinations may be used to purchase one, two, three, or four cans of soda?

Part 5: Outside

24. At the flagpole on the front of the school, measure the length and height of an exterior wall brick. Measure from the beginning of one brick to the beginning of the next brick. Count the number of bricks from the ground to the metal flashing. Estimate the height of the building.

25. Repeat the process given in problem 24 while standing by the G24 Storage marker, near the Children's Center play area. Estimate the average height per story of the school.

26. Locate the concentric concrete circles near the Children's Center play area. Measure the diameter of the inner circle and the width of the annulus. Find the area of the outer circle, the inner circle, and one section of the annulus.

27. There is a circular parking lot at the south end of the school, outside of the Children's Center. Find the following:
    a. Estimate the number of degrees of a circle through which there are painted parking spots.
    b. Count the number of parking spots. Count the half-sized handicapped access spot (blue-striped) as one-half of a spot.
    c. Calculate the number of degrees per parking spot.

28. In the circular parking lot, use the following measurements: radius of the grassy circle, 17 ½ feet; 34 feet from the curb to the back end of the parking stripe; and length of the parking stripe, 17 ½ feet. Calculate the largest and smallest widths of a parking spot. Compare these to actual measurements.

29. In the circular parking lot, consider a parking spot to be a trapezoid. Find the area of the parking spot. (Use approximate values.)

30. Locate the outside staircase on the west side of the school (facing UTC Place). Measure the rise and run of a step. Calculate the slope of the staircase. Repeat for another step. Repeat for an inside staircase in the main hallway. Which staircase has more uniform steps? State a reason for your selection.

31. In either school parking lot, count the following: total number of cars, cars with a Tennessee license plate, cars with an out-of-state license plate, cars with a specialty license plate (for example, Animal Friendly), and cars with a personalized license plate. Find the following:
    a. The ratio of Tennessee to out-of-state license plates (all types).
    b. The ratio of specialty to traditional license plates (all states).
    c. The percentage of Tennessee license plates (all types).
    d. The percentage of out-of-state license plates (all types).
    e. The percentage of personalized license plates.
    f. The number of possible license plate combinations for a traditional Tennessee license plate.
    g. The number of possible license plate combinations for a specialty Tennessee license plate (if present).
    h. The number of possible license plate combinations for a traditional out-of-state license plate (if present). List the name of the state.
    i. In what way or ways are traditional and specialty license plates similar?
    j. In what way or ways are traditional and specialty license plates different?
    k. The number of possible license plate combinations for a personalized Tennessee license plate (minimum of three numbers and/or letters, maximum of seven numbers and/or letters).
    l. Design a personalized Tennessee license plate for yourself.

Solutions

Part 1: Library

1. The bookshelf that holds Encyclopedia Britannica is 35 inches wide. Each volume of the encyclopedia is 1 ½ inches wide (across the binding). The bottom shelf contains 22 volumes. Is there space for additional volumes? If so, how many?

   22 volumes x 1.5 in./volume = 33 in.
   35 in. – 33 in. = 2 in.
   2 in. ÷ 1.5 in./volume = 1.33 volumes
   There is space for 1 additional volume.

2. The fiction books range in height from 7 inches to 11 inches. The bookcase that contains fiction is 54 inches tall. There are 39 shelving holes with 1 ¼-inch spacing between them. The shelf is ¾-inch thick. Design an arrangement for the shelving.

   Answers will vary. One possible arrangement: 12 1/2 inches of clearance from the bottom shelf, place pins at the 10^{th} set of holes (12 1/2 inches), ¾-inch shelf, 11 3/4 inches of clearance, place pins at the 20^{th} set of holes (25 inches), ¾-inch shelf, 9 1/4 inches of clearance, place pins at the 28^{th} set of holes (35 inches), ¾-inch shelf, 9 1/4 inches of clearance, place pins at the 36^{th} set of holes (45 inches), ¾-inch shelf, 8 1/4 inches of clearance.

3. The width (across the binding) of fiction books ranges from ½ inch to 1 inch. The bookshelf is 35 inches wide. What is the minimum number of books that will fill the shelf? What is the maximum number of books that will fill the shelf?

   Minimum: 35 in. ÷ 1 in./book = 35 books
   Maximum: 35 in. ÷ 0.5 in./book = 70 books

4. The magazine rack tilts to display the cover of the latest issue of each magazine. What is the slope of the tilted surface if the depth of the case is 1 foot and the height of the case is 10 inches?

   Slope = rise / run
   Slope = 10 in. / (1 ft x 12 in./ft) = 10/12 = 5/6

5. The library contains square tables and round tables. Each square table has sides of length 42 inches. Each round table has a diameter of 41 inches. Find the surface area of each type of table.

   Square: 42 in. x 42 in. = 1,764 $in.^2$
   1,764 $in.^2$ x 1 ft^2/144 $in.^2$ = 12.25 ft^2

   Circle: Πr^2 = 3.14 x $(41 \text{ in.}/2)^2$ = 1,320 $in.^2$
   1,320 $in.^2$ x 1 ft^2/144 $in.^2$ = 9.17 ft^2

Part 2: Gymnasium

6. The gymnasium floor contains markings for a basketball court. Describe the lines, angles, and symmetry that can be seen.

   Answers will vary. Answers should include sightings of right angles, parallel lines, perpendicular lines, mirror symmetry (reflection), rotational symmetry (through 180°), etc.

7. Given the full court (NBA/NCAA) diagram (Handymanwire, 2003), find the following:
   a. The ratio of the length of the court (94 ft) to the width of the court (50 ft).

      94 ft ÷ 50 ft = 1.88

   b. The area of the backboard (72 inches in width by 42 inches in height).

      Area = 72 in. x 42 in. = 3,024 $in.^2$
      3,024 $in.^2$ x 1 ft^2/144 $in.^2$ = 6 ft^2

   c. The area of the key (12 ft wide, 15 ft from free throw line to backboard, 4 ft from backboard to baseline). Don't forget the semicircle at the top of the key!

      Rectangle: Area = 12 ft x (15 ft + 4 ft) = 12 ft x 19 ft = 228 ft^2
      Semicircle: Area = $\Pi r^2/2$ = [3.14 x (6 ft) ^{2}] / 2 = 56.52 ft^2
      Total: 228 ft^2 + 56.52 ft^2 = 284.52 ft^2

   d. The area of the rim (18 inches in diameter).

      Area = Πr^2; r = d/2
      Area = 3.14 x $(9\ in.)^2$ = 254.35 $in.^2$

   e. The circumference of the rim (18 inches in diameter).

      Circumference = $2\Pi r = \Pi d$ = 3.14 x 18 in. = 56.52 $in.^2$

   f. The circumference of an NBA basketball is 29.5 inches. How many inches clearance does the basketball have as it passes through the rim?

      d = C/Π = 29.5 in. / 3.14 = 9.4 in.
      18 in. – 9.4 in. = 8.6 in. (about 4.3 in. around the inner edge)

   g. The volume of an NBA basketball.

      Volume = $(4/3)\Pi r^3$ = (4/3) x 3.14 x $(4.7\ in.)^3$ = 435 $in.^3$

h. The length of the hypotenuse of the right triangle formed by the distance from the free throw line to the backboard (15 ft) and the distance from the floor to the rim of the basket (10 ft).

$c^2 = a^2 + b^2$
$c^2 = (15\text{ ft})^2 + (10\text{ ft})^2 = 225\text{ ft}^2 + 100\text{ ft}^2 = 325\text{ ft}^2$
$c = 18\text{ ft}$

Part 3: Cafeteria

8. The wall is composed of 8-inch blocks. Find the height of the wall.

   8 in./block x 16 blocks = 128 in. = 10.67 ft.

9. Each cafeteria table has a length of 95 ½ inches, a table width of 14 ½ inches, and a bench width of 11 ½ inches. Find the surface area of the table and the bench (top surface only).

   Area of table = 95.5 in. x 14.5 in. = 1,384.75 in.^{2} = 9.6 ft^2
   Area of bench = 95.5 in. x 11.5 in. = 1,098.25 in.^{2} = 7.6 ft^2

10. Estimate the following:
    a. The number of adults that can sit side-by-side on the bench.

       95.5 in. ÷ 20 in./adult = 4.775 adults, or about 4 or 5 adults

    b. The number of students that can sit side-by-side on the bench.

       95.5 in. ÷ 15 in./child = 6.367 children, or about 6 or 7 children

    c. If there are 45 tables, how many students can be seated at the same time?

       45 tables x 6 children/table = 270 children
       45 tables x 7 children/table = 315 children
       A range of 270 to 300 children is a good estimate.

11. Count the number of 1-foot tiles along the length and width of the floor. Calculate the area of the floor in square feet and in square yards. Consider only full tiles.

    Floor is 48 ft by 78 ft (16 yards by 26 yards).
    Area = 48 ft x 78 ft = 3,744 ft^2
    Area = 16 yd x 26 yd = 416 yd^2

12. Count the number of 4-foot by 2-foot panels along the length and width of the ceiling. Calculate the area of the ceiling in square feet and in square yards. Consider only full panels.

    19 panels long (4 ft) by 24 panels across (2 ft).
    One panel is 8 ft^2, so (19 x 24) panels are 3,648 ft^2.
    3,648 ft^2 x 1 yd^2/9 ft^2 = 405.3 yd^2

13. Compare the results obtained in problems 11 and 12 by calculating the percent error between the two measurements. Both values are based on observations, but the length as counted in floor tiles will be more accurate since this is a smaller unit. Use the area calculated with floor tiles as the accepted value and the area calculated with ceiling panels as the observed value.

    Percent error = |[(observed – accepted) / accepted]| x 100%
    = |[(405.3 yd^2 – 416 yd^2) / 416 yd^2]| x 100%
    = |(-10.7 in. / 416 yd^2)| x 100%
    = 0.0257 x 100%
    = 2.57%

14. Using the data collected in problems 8 and 11, calculate the volume of the room. Count the number of 2-foot diffusers and the number of 2-foot by 1-foot uptake vents in the ceiling. What volume of air is changed per diffuser and per uptake vent? Assume two room changes of air per hour. Express your answers in cubic feet per minute (cfm).

    Volume = 10.67 ft x 3,744 ft^2 = 39,948 ft^3
    Diffusers: 8; Uptake vents: 4
    Diffuser: 39,948 ft^3 x 2/hr x 1 hr/60 min ÷ 8= 166 ft^3/min (cfm)
    Uptake vent: 39,948 ft^3 x 2/hr x 1 hr/60 min ÷ 4= 333 ft^3/min (cfm)

15. Count the number of 4-foot by 2-foot light panels in the ceiling. Calculate the percentage of the ceiling that has light panels.

    35 panels ÷ 456 panels = 0.077
    0.077 x 100% = 7.7%

16. Count the number of sprinkler heads in the ceiling. Calculate the percentage of the ceiling panels that contain a sprinkler head.

    28 panels ÷ 456 panels = 0.061
    0.061 x 100% = 6.1%

17. Draw a scale of the room. Construct the minimum size of the sprinkler head spray radius to obtain complete coverage of the floor.

    Answers will vary. Hint: Simulate with circles, or outlines of round objects, for example, drawing the outlines of the bottoms of four soda cans.

18. Locate a nine-pane window. How many different sizes of panes are present? What is the ratio of the smallest pane to the largest pane?

    There are six sizes of window panes present, since the left and right columns contain the same sized panes.
    Smallest: 11.5 in. x 27.5 in. = 316.25 in.^{2}
    Largest: 36 in. x 30 in. = 1,080 in.^{2}
    Ratio: 316.25 in.^{2} ÷ 1,080 in.^{2} = 0.29 (or between ¼ and 1/3 as large)

Part 4: Connections

19. Look for patterns in the hallway and/or room floor tiles, on the walls, etc. Where can you find examples of odd numbers, even numbers, and/or prime numbers?

    Answers will vary. Number patterns present include groups of 5 and 13 in cafeteria floor tiles, 9 tiles per dark tile area, exterior brick work includes 11 groups of 3 vertical bricks as a unit, cafeteria exterior includes 5 groups of 3 vertical bricks as a unit, odd or even numbers can be see in the hallway floor tiles, etc.

20. Look at the murals in the hallway, across from the school office. List the following:
    a. Geometric shapes that you see.

       Answers will vary. Examples: square, circle, triangle, six-sided star, etc.

    b. Repeated patterns that you see.

       Answers will vary. Examples: feathers/leaves, rectangles, etc.

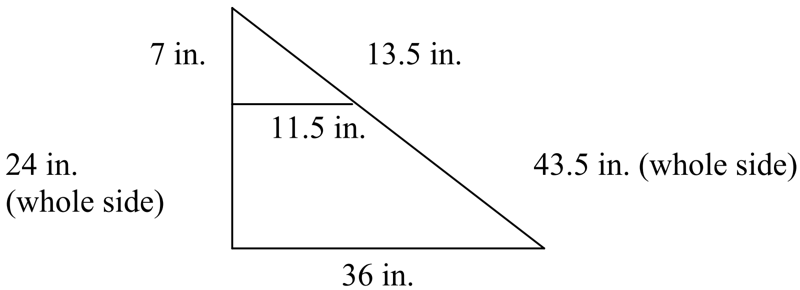
    c. Types of symmetry that you see.

       Answers will vary. Examples: reflection, rotation, translation.

    d. List the time periods and locations that you see.

       Answers will vary. Time periods: Ancient Egypt, Ancient Greece, Roman Empire, Medieval/Renaissance, Modern. Locations: Egypt, Greece, Rome, Genoa, Moors/Africa, Japan, Aztec/Central America, Native American/Southwest/Southeast/etc., Chattanooga.

21. Look at the left or right side of the roof of the Tennessee Aquarium model. Measure the three sides of the large and small triangles. Show that they are similar.



Show that the ratios of the sides are the same for the small and large triangles:
24 in. ÷ 7 in.= 3.43
36 in. ÷ 11.5 in. = 3.13
43.5 in. ÷ 13.5 in. = 3.22

22. Measure the height of the knight sculpture. What percentage of your height is the knight?

The knight is 43 in. tall. I am 60 in. tall.
43 in. ÷ 60 in. = 0.72
0.72 x 100% = 72%

23. There is a vending machine located outside the hallway door to the back of the building. Determine the price per soda or water, and the number of flavors. What coin or bill combinations may be used to purchase one, two, three, or four cans of soda?

Answers will vary. There are 7 flavors, and the cost is 60 cents per can. The vending machine accepts quarters, dimes, nickels, and dollar bills. Example: Four cans of soda could be purchased with two dollar bills, one quarter, one dime, and one nickel. (The machine may provide change in between purchases.)

Part 5: Outside

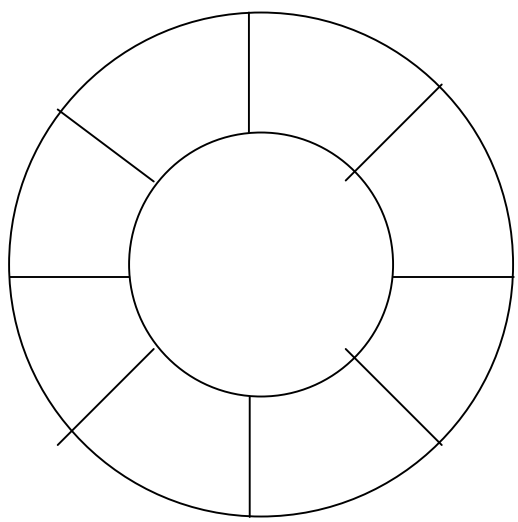
24. At the flagpole on the front of the school, measure the length and height of an exterior wall brick. Measure from the beginning of one brick to the beginning of the next brick. Count the number of bricks from the ground to the metal flashing. Estimate the height of the building.

Dimensions of the brick: 8.25 in. by 2.75 in.
By the flagpole: 12 red, 3 yellow, 17 red, 3 yellow, 3 red 51 yellow, yellow vertical, 3 red, 15 yellow. Total of 105 horizontal (2.75 in.) and 1 row vertical (8.25 in.)
(105 x 2.75 in.) + (1 x 8.25 in.) = 288.75 in. + 8.25 in. = 297 in.
297 in. x 1ft/12 in. = 24.75 ft

25. Repeat the process given in problem 24 while standing by the G24 Storage marker, near the Children's Center play area. Estimate the average height per story of the school.

Dimensions of the brick: 8.25 in. by 2.75 in.
By G24 storage: 29 red, 3 yellow, 36 red, 3 yellow, 20 red 3 yellow, 3 red, 49 yellow, yellow vertical, 18 yellow. Total of 164 horizontal (2.75 in.) and 1 row vertical (8.25 in.)
(164 x 2.75 in.) + (1 x 8.25 in.) = 451 in. + 8.25 in. = 459.25 in.
459.25 in. x 1ft/12 in. = 38.27 ft
38.27 ft ÷ 3 stories = 12.76 ft/story

26. Locate the concentric concrete circles near the Children's Center play area. Measure the diameter of the inner circle and the width of the annulus. Find the area of the outer circle, the inner circle, and one section of the annulus.



Diameter of inner circle: 117 in.
Spoke: 59 in.
Area of outer circle: Πr^2
$= 3.14 \times (117.5\text{ in.})^2$
$= 43{,}352\text{ in.}^2 = 301\text{ ft}^2$
Area of inner circle: Πr^2
$= 3.14 \times (58.5\text{ in.})^2$
$= 10{,}746\text{ in.}^2 = 75\text{ ft}^2$
Area of annulus section:
= (outer area – inner area) / 8
$=(301\text{ ft}^2 - 75\text{ ft}^2) / 8 = 28.25\text{ ft}^2$

27. There is a circular parking lot at the south end of the school, outside of the Children's Center. Find the following:
    a. Estimate the number of degrees of a circle through which there are painted parking spots.

       ¾ of a circle, or 270°

    b. Count the number of parking spots. Count the half-sized handicapped access spot (blue-striped) as one-half of a spot.

       There are 27 parking spots.

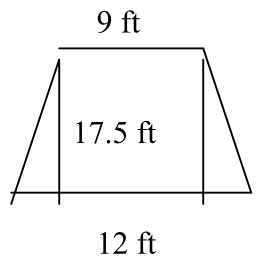
    c. Calculate the number of degrees per parking spot.

       270° ÷ 27 parking spots = 10° /parking spot

28. In the circular parking lot, use the following measurements: radius of the grassy circle, 17 ½ feet; 34 feet from the curb to the back end of the parking stripe; and length of the parking stripe, 17 ½ feet. Calculate the largest and smallest widths of a parking spot. Compare these to actual measurements.

Circumference of the large circle = $2\Pi r$ = 2 x 3.14 x 69 ft = 433 ft
Circumference of the circle at back end of stripe = $2\Pi r$ = 2 x 3.14 x 51.5 ft = 323 ft
Calculated: 433 ft ÷ 36 = 12.03 ft   Observed: 15.2 ft   Percent error: 26%
Calculated: 323 ft ÷ 36 = 8.97 ft   Observed: 11.5 ft   Percent error: 28%

29. In the circular parking lot, consider a parking spot to be a trapezoid. Find the area of the parking spot. (Use approximate values.)



Area = (1/2)(h)(b1 + b2)
= 0.5 x 17.5 ft x (9 ft + 12 ft)
= 183.75 ft^2

30. Locate the outside staircase on the west side of the school (facing UTC Place). Measure the rise and run of a step. Calculate the slope of the staircase. Repeat for another step. Repeat for an inside staircase in the main hallway. Which staircase has more uniform steps? State a reason for your selection.

Concrete: rise/run = 6.5 in. / 11 in. = 0.59 (not uniform)
Inside staircase: rise/run = 7 in. / 10.5 in. = 0.67 (uniform)
The inside staircase is made from uniform metal pieces; the concrete was poured for each individual step.

31. In either school parking lot, count the following: total number of cars, cars with a Tennessee license plate, cars with an out-of-state license plate, cars with a specialty license plate (for example, Animal Friendly), and cars with a personalized license plate. Find the following:
    a. The ratio of Tennessee to out-of-state license plates (all types).
    b. The ratio of specialty to traditional license plates (all states).
    c. The percentage of Tennessee license plates (all types).
    d. The percentage of out-of-state license plates (all types).
    e. The percentage of personalized license plates.

    Answers will vary for 31a – 31 e, depending on the parking lot selected and the cars parked in the given lot.

f. The number of possible license plate combinations for a traditional Tennessee license plate.

   Example: BEY 731 (3 letters, 3 numbers)
   26 x 26 x 26 x 10 x 10 x10 = 17,576,000

g. The number of possible license plate combinations for a specialty Tennessee license plate (if present).

   Example: AN 0000 (AN is the code for Animal Friendly)
   10 x 10 x 10 x 10 = 10,000 (for each type of specialty plate)

h. The number of possible license plate combinations for a traditional out-of-state license plate (if present). List the name of the state.

   Answers will vary. Example: Massachusetts license plates have 3 numbers followed by 3 letters. The number of combinations would be the same as for Tennessee.

i. In what way or ways are traditional and specialty license plates similar?

   Answers will vary. Example: They both contain numbers.

j. In what way or ways are traditional and specialty license plates different?

   Answers will vary. Example: Specialty plates contain only numbers.

k. The number of possible license plate combinations for a personalized Tennessee license plate (minimum of three numbers and/or letters, maximum of seven numbers and/or letters).

   Total letters and numbers: 26 + 10 = 36

   $36^3 = 46,656$ $36^4 = 1,679,616$ $36^5 = 60,466,176$
   $36^6 = 2,176,782,336$ (subtract traditional plates)
   2,176,782,336 - 17,576,000 = 2,159,206,336
   $36^7 = 78,364,164,096$
   Total = 80,585,562,880 (over 80 billion)

l. Design a personalized Tennessee license plate for yourself.

   DEBORAH SP2 TNTUX00

Reference

Handymanwire. (2003). *Basketball courts*. Retrieved July 19, 2003, from http://www.handymanwire.com/articles/basketballcourt.html. This diagram is also located at http://www.hoopinc.com/pages/dimensions/dimensions.html, http://www.basketballgoals.com/basketball_court_dimensions_new.html, and possibly other Web sites. (Ownership of the diagram is unclear.)

Web Sites for Further Exploration

Dr. Tommie F. Brown Academy for Classical Studies
http://www.hcde.org/schools/elementary/brown_academy/hcde_default.html

Math Forum Geometry Problem of the Week: Play Ball! (February 14, 2000)
http://mathforum.org/geopow/solutions/solution.ehtml?puzzle=66

Department of Safety – Specialty License Plates
http://www.tennessee.gov/safety/plates.html

U.S. License Plates 1969 – Present
http://www.15q.net/usindex.html

License Plates of American Indian Tribes
http://www.pl8s.com/tribals/indians.htm

HyperHistory Online
http://www.hyperhistory.com/online_n2/History_n2/a.html

Annulus – from MathWorld
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