Updated 1/24/2022

Daily Class Slides

Geometry Spring 2022
Chandru Narayan

Introductions!

Chandru Narayan

Role at Bush: CS and Math teacher

What you were like in High School: Outgoing

Your first day of school tradition/superstition: Bowtie!

Who inspires you: Friendly People

Your interests outside of Bush: Bicycling, Astronomy

Something you are doing: Bicyling 110 miles to raise money for the Child Abuse Prevention dept at Mary Bridge Children's Hospital - My 15th year

A song you know all the words to: Katrinile Varum Geetham - A Tamil song about music in a light breeze

A talent I cherish: South Indian Cooking

Thursday, Jan 6th

What's happening today?

Check-in
- Welcome new Students!
- Reflections upon Fall Term
- Class Logistics
  - Ready to have fun! Be courteous, Participate, do lots of problems in class!
  - All Assignments in Portal and linked to Google Classroom. Do not be late in submitting them!
  - Bring fully charged laptop, geo instruments, notebook, toolbox & calculator
  - Dress Warmly Windows to be Open , Masks ON, No eating or drinks inside
  - Can you Access the textbook online?

Today
- Review Perimeter
- Introduce Area & Volume - New Chapter 8 (Page 422 in book)!
- 5-minute Break
- Area & Volume Investigation - Area of Rect, Parallelogram and any Triangle

Reminder
- Complete Investigation - Due today
- Complete Homework - Due Jan 10th

Introduce new Students!

Welcome Luc, Charlotte, Cophine!

State you name clearly pronouncing first and last names

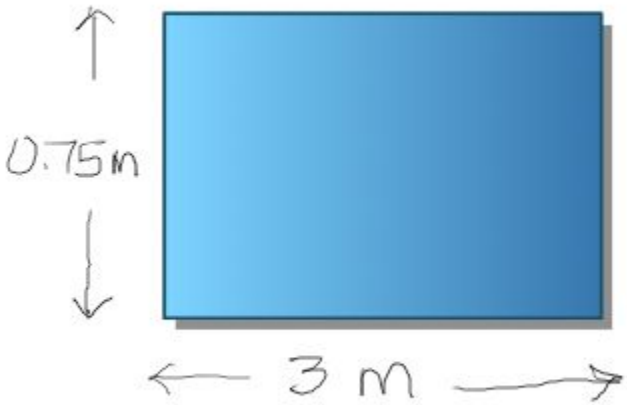
How would you like to be addressed?

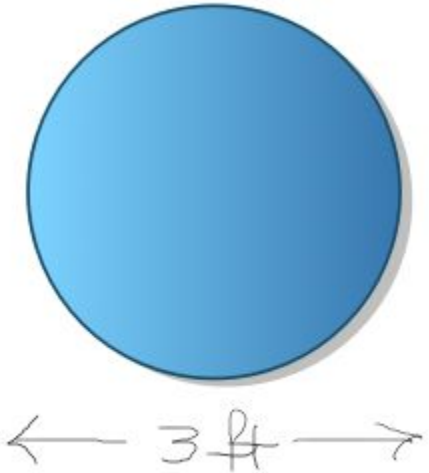
Your personal pronouns

Something interesting or special/peculiar about you?

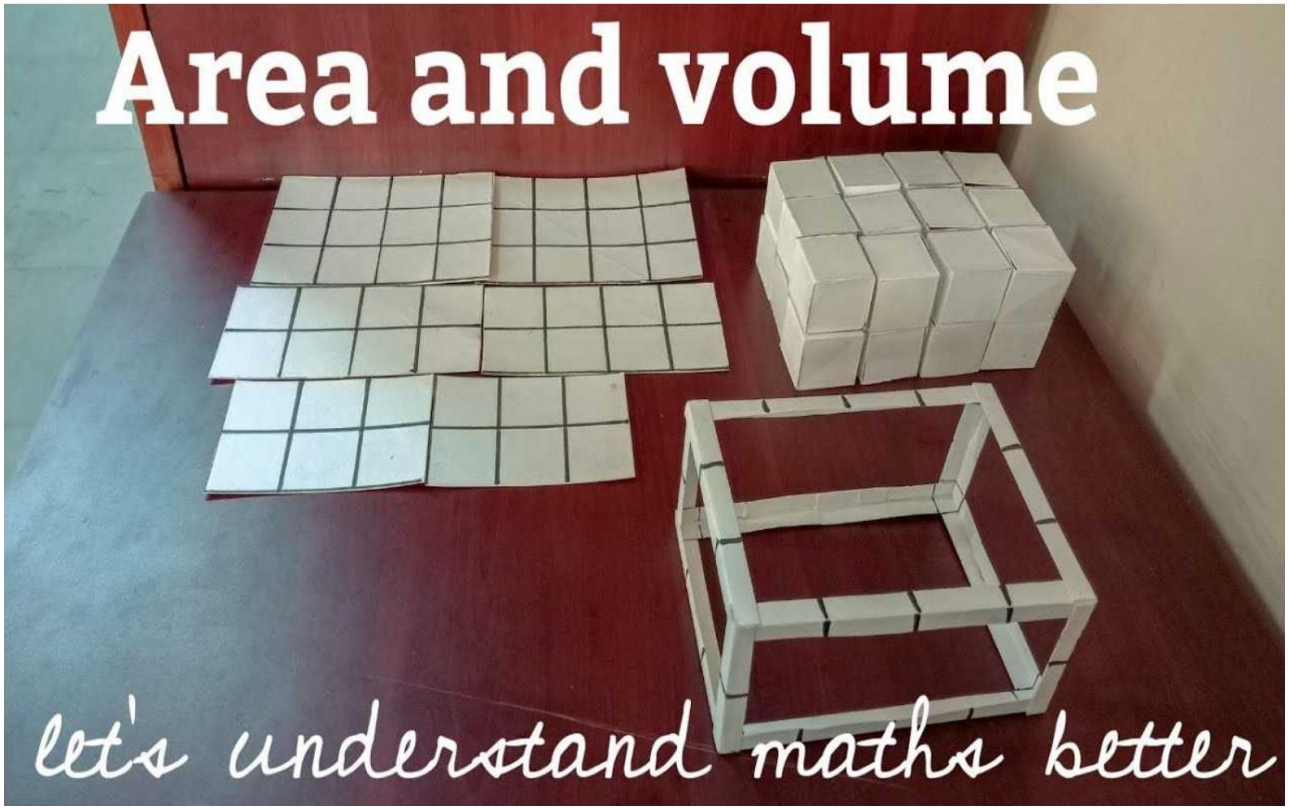
What are your expectations from this class?

What is the Perimeter of these Shapes ? Units ?





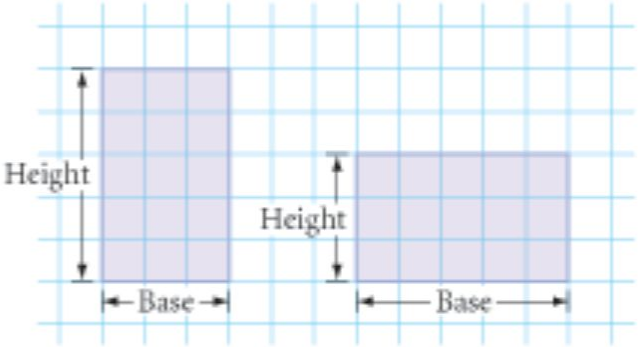
Area & Volume - What are these? Units?



How many tiles Investigation

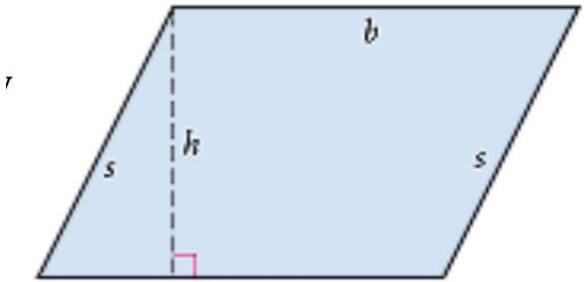
- Get handout from Chandru or print from GC
- Hint for #5:
  - poster: 2x3ft, postcard: 4x6”, queen bedsheet: 60x80”, stamp: 1x1.5”
- Hint for #8:
  - Think of cutting out 1 triangle from one side of parallelogram and rearranging

Area of Rectangle & Parallelogram Conjectures



Rectangle Area Conjecture C-74

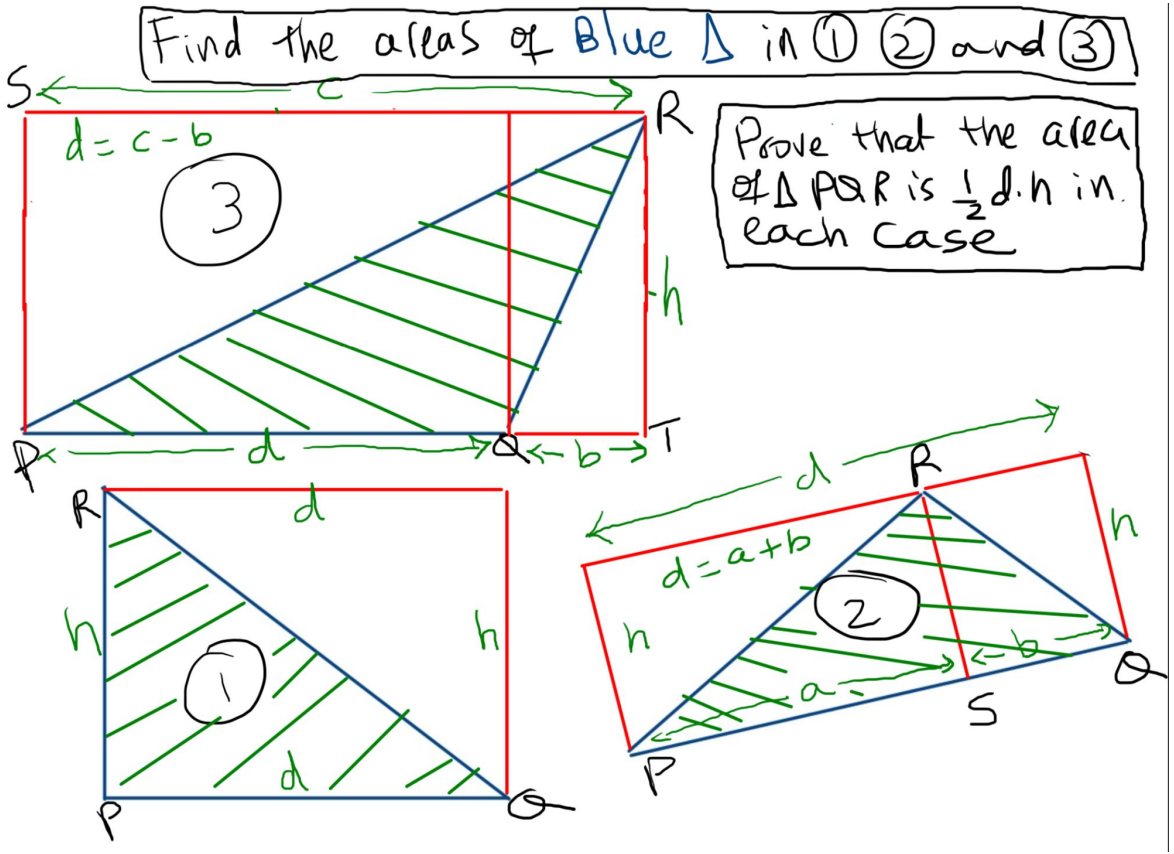
The area of a rectangle is given by the formula ?, where A is the area, b is the length of the base, and h is the height of the rectangle.



Parallelogram Area Conjecture C-75

The area of a parallelogram is given by the formula ?, where A is the area, b is the length of the base, and h is the height of the parallelogram.

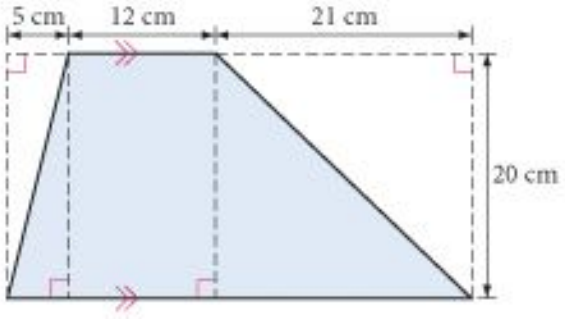
Derive Area of any Triangle based on Rect area Conjectures



Let’s do a few problems

5. $P = 40$ ft
$A = \underline{?}$

23. Find the area of the trapezoid at right.



Reminders!

Reminders

- Complete How many Tiles Investigation - Due today
- Complete Rect & Parallelogram Areas Homework - Due Jan 10th

Monday, Jan 10th

What's happening today?

Check-in

- How was your 1st week?
- Did you complete the Fall Course Review. Please click here to complete
- Form Random Teams!
- Review Syllabus

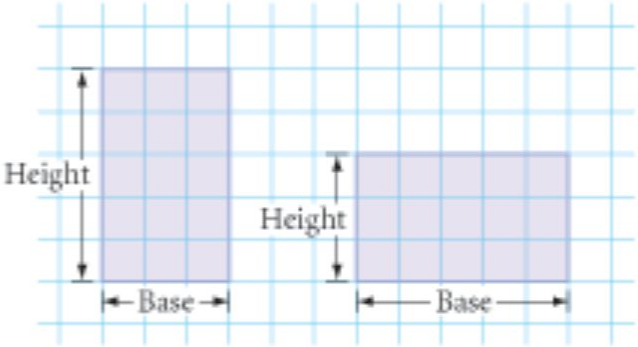
Today

- Review Rectangle & Parallelogram Area Conjectures
- Review formula for Area of any Triangle
- Review some Rect, Parallelogram Area Problems
- A Plethora of Area Formulas to be Discovered!

Reminder

- Investigation & 8.1 Homework Due today

Area of Rectangle & Parallelogram Conjectures



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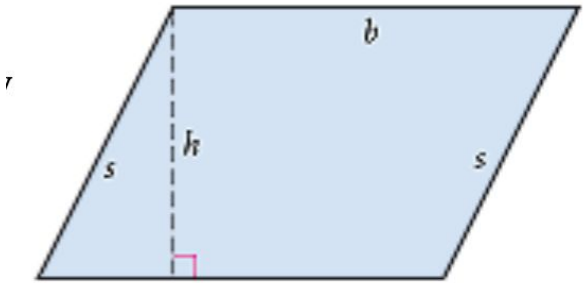

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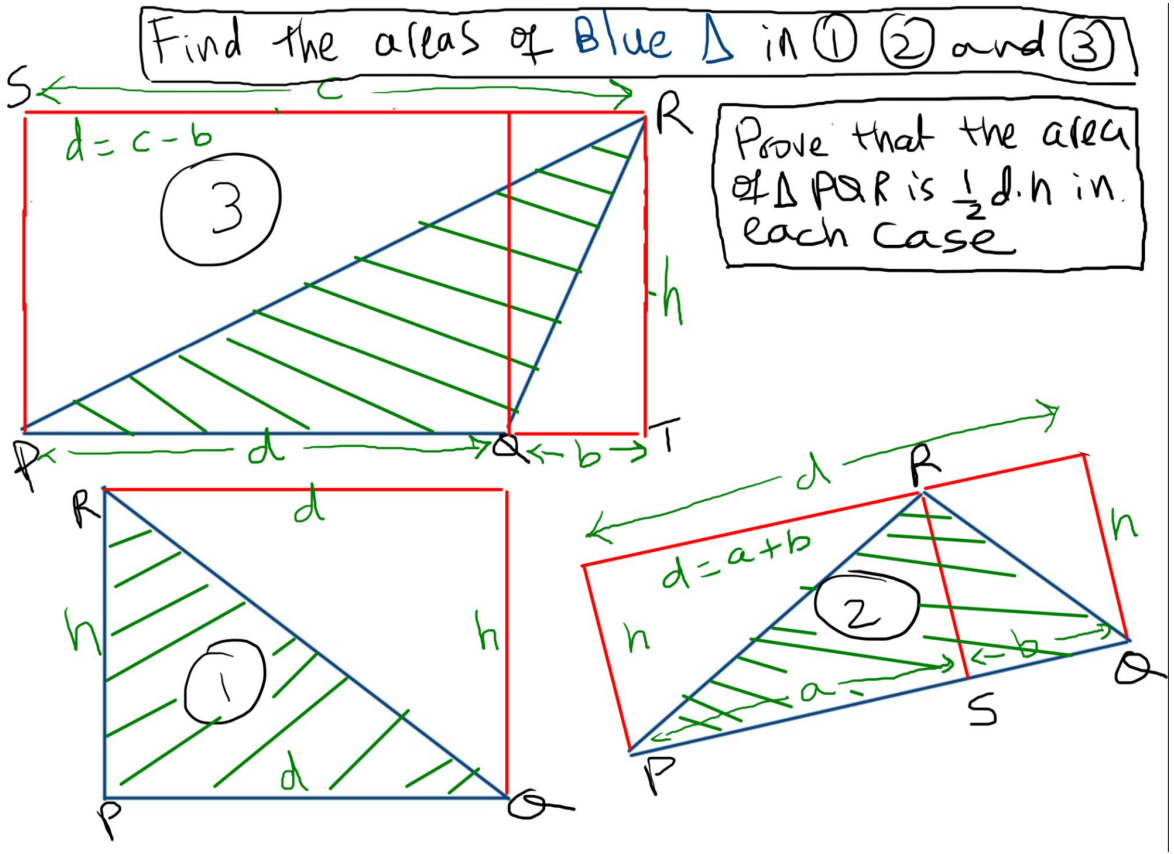
Derive Area of any Triangle based on Rect area Conjectures

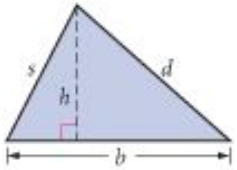


Area of Triangles Conjecture

Investigation 1
Area Formula for Triangles

You will need

- heavy paper or cardboard



Step 1 Cut out a triangle and label its parts as shown. Make and label a copy.

Step 2 Arrange the triangles to form a figure for which you already have an area formula. Calculate the area of the figure.

Step 3 What is the area of one of the triangles? Make a conjecture. Write a brief description in your notebook of how you arrived at the formula. Include an illustration.

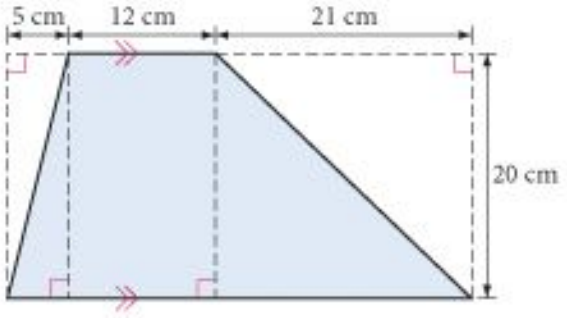
Triangle Area Conjecture C-76

The area of a triangle is given by the formula $\frac{?}{}$, where A is the area, b is the length of the base, and h is the height of the triangle.

Review Problems problems

5. $P = 40$ ft
$A = \underline{?}$

23. Find the area of the trapezoid at right.



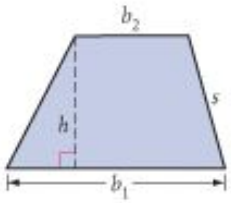
Let's derive the Area Formula for a Trapezoid

Area of Trapezoids Conjecture

Investigation 2
Area Formula for Trapezoids

You will need

- heavy paper or cardboard



Step 1 Construct any trapez… …ndicular to its bases. Label the trapezoid as sh…

Step 2 Cut out … a label a copy.

Step 3 Arrang… …s to form a figure for which you already have an area formula. …of polygon is this? What is its area? What is the area of one trapezoid? …e a conjecture.

Instead of following these steps, we are going to do these pure algebraic fashion!

Trapezoid Area Conjecture C-77

The area of a trapezoid is given by the formula $\frac{?}{}$, where A is the area, b_1 and b_2 are the lengths of the two bases, and h is the height of the trapezoid.

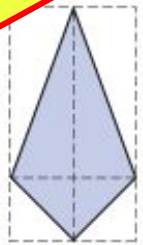
Area of Kites Conjecture

Investigation 3

Area Formula for Kites

Can you rearrange a kite into sha
already have the area formu
properties of a kite?

Create and carry out
formula for the area o
your group. State a conj



Instead of following these steps, we are going to do these pure algebraic fashion!

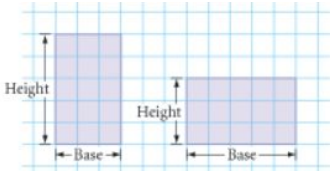
Kite Area Conjecture C-78

The area of a kite is given by the formula ?.

Complete & Add Conjectures to Toolbox

Rectangle Area Conjecture C-74

The area of a rectangle is given by the formula ?, where A is the area, b is the length of the base, and h is the height of the rectangle.



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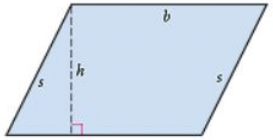
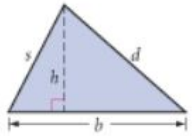


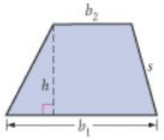
Triangle Area Conjecture C-76

The area of a triangle is given by the formula ?, where A is the area, b is the length of the base, and h is the height of the triangle.



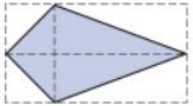
Trapezoid Area Conjecture C-77

The area of a trapezoid is given by the formula ?, where A is the area, b_1 and b_2 are the lengths of the two bases, and h is the height of the trapezoid.



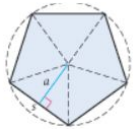
Kite Area Conjecture C-78

The area of a kite is given by the formula ?.



Regular Polygon Area Conjecture C-79

The area of a regular polygon is given by the formula ? or ?, where A is the area, P is the perimeter, a is the apothem, s is the length of each side, and n is the number of sides.



Wednesday, Jan 12th

What's happening today?

Check-in

- Form Random Teams!
- Did you add conjectures to your toolbox?
- Review Area formulas and how they work
- Announce Areas Quiz 8.1-8.4 Wednesday Jan 19th

Today

- Do Area & Real-world problems from chapters 8.1-8.3
- Cover Chapter 8.4 Areas of Regular Polygons
- Do Polygon Area Problems

Reminder

- Complete Homework due by Friday to prepare for Quiz
- AK will be posted regularly for review and prep
- Update your Google Classroom Notification Settings
- Check your emails - Comments will be made on Google classroom
- Upload your work as a SINGLE PDF files (jpg not allowed)
  - Use CamScanner or similar app

Real-world Area Problems!

1. ***Application*** Tammy is estimating how much she should charge for painting 148 rooms in a new motel with one coat of base paint and one coat of finishing paint. The four walls and the ceiling of each room must be painted. Each room measures 14 ft by 16 ft by 10 ft high.
   - **a.** Calculate the total area of all the surfaces to be painted with each coat. Ignore doors and windows.
   - **b.** One gallon of base paint covers 500 square feet. One gallon of finishing paint covers 250 square feet. How many gallons of each will Tammy need for the job?

2. ***Application*** Rashad wants to wallpaper the four walls of his bedroom. The room is rectangular and measures 11 feet by 13 feet. The ceiling is 10 feet high. A roll of wallpaper at the store is 2.5 feet wide and 50 feet long. How many rolls should he buy? (Wallpaper is hung from ceiling to floor. Ignore doors and windows.)

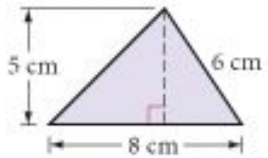
3. ***Application*** It takes 65,000 solar cells, each 1.25 in. by 2.75 in., to power the Helios Prototype, shown below. How much surface area, in square feet, must be covered with the cells? The cells on Helios are 18% efficient. Suppose they were only 12% efficient, like solar cells used in homes. How much more surface area would need to be covered to deliver the same amount of power?

Area Problems!

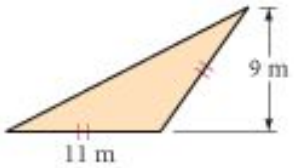
EXERCISES

In Exercises 1–12, use your new area conjectures to solve for the unknown measures.

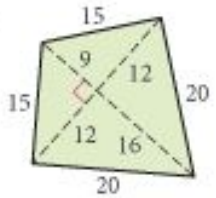
1. $A = \underline{?}$



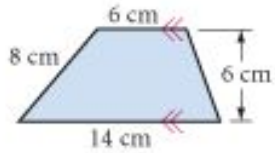
2. $A = \underline{?}$



3. $A = \underline{?}$

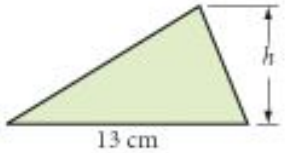


4. $A = \underline{?}$



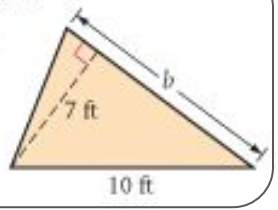
5. $A = 39\ \text{cm}^2$

$h = \underline{?}$



6. $A = 31.5\ \text{ft}^2$

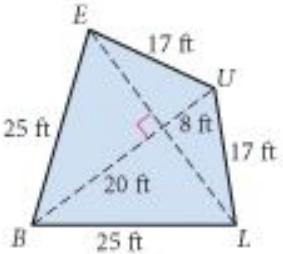
$b = \underline{?}$



s’more Area Problems!

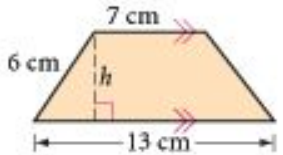
7. $A = 420\ \text{ft}^2$

$LE = \underline{?}$



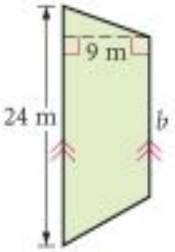
8. $A = 50\ \text{cm}^2$ (h)

$h = \underline{?}$



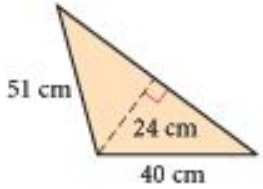
9. $A = 180\ \text{m}^2$

$b = \underline{?}$



10. $A = 924\ \text{cm}^2$

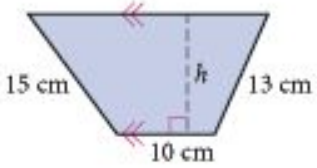
$P = \underline{?}$



11. $A = 204\ \text{cm}^2$

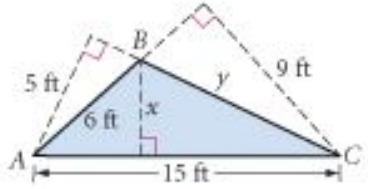
$P = 62\ \text{cm}$

$h = \underline{?}$

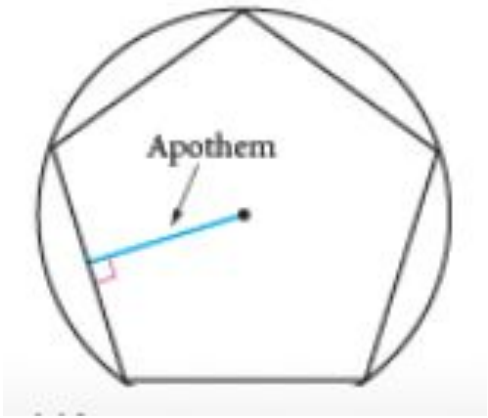


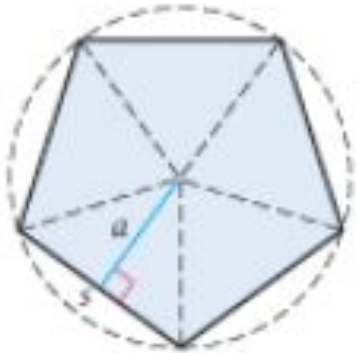
12. $x = \underline{?}$ (h)

$y = \underline{?}$



Chapter 8.4: Areas of Regular Polygons





Regular pentagon

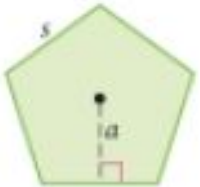
Regular Polygon Area Conjecture C-79

The area of a regular polygon is given by the formula $\frac{?}{}$ or $\frac{?}{}$, where A is the area, P is the perimeter, a is the apothem, s is the length of each side, and n is the number of sides.

Regular Polygon Area Problems!

1. $A \approx \underline{?}$
$s = 24$ cm
$a \approx 24.9$ cm

2. $a \approx \underline{?}$
$s = 107.5$ cm
$A \approx 19{,}887.5$ cm^2



8. Find the approximate length of each side of a regular n-gon if $a = 80$ feet, $n = 20$, and $A \approx 20{,}000$ square feet.

9. ***Construction*** Draw a segment 4 cm long. Use a compass and straightedge to construct a regular hexagon with sides congruent to this segment. Use the Regular Polygon Area Conjecture and a centimeter ruler to approximate the hexagon's area. (h)

Reminders

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Friday, Jan 14th

What's happening today?

Check-in

Complete 8.2-8.3 Area HW problems?

Today

Work on Area Problems - regular polygons, real-world

Algebra techniques - Linear Equations

Reminders

Areas Quiz 8.1-8.4 Wednesday - Jan 19th

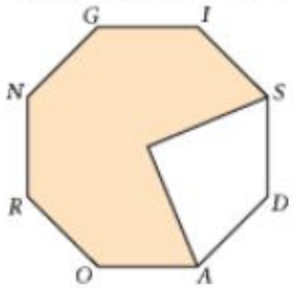
Complete All Homework on-time to prepare for Quiz

AK will be posted regularly for review and prep

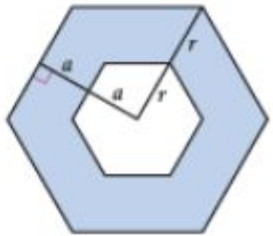
Regular Polygon Area Problems!

11. A square is also a regular polygon. How is the apothem of a square related to the side length? Show that the Regular Polygon Area Conjecture simplifies to s^2 for the area of a square.

13. Find the approximate area of the shaded region of the regular octagon *ROADSIGN*. The apothem measures 20 cm. Segment *GI* measures about 16.6 cm.



14. Find the approximate area of the shaded regular hexagonal donut. The apothem and sides of the smaller hexagon are half as long as the apothem and sides of the large hexagon. $a \approx 6.9$ cm and $r \approx 8$ cm



Real-world Area Problems!

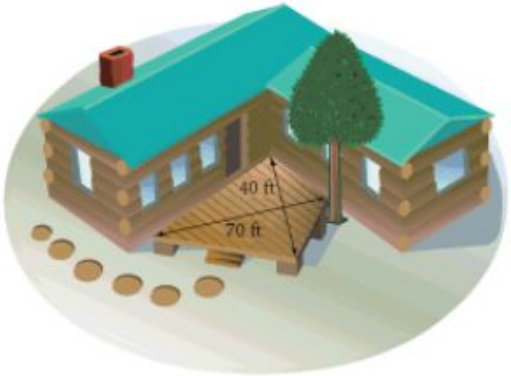
1. ***Application*** Tammy is estimating how much she should charge for painting 148 rooms in a new motel with one coat of base paint and one coat of finishing paint. The four walls and the ceiling of each room must be painted. Each room measures 14 ft by 16 ft by 10 ft high.

a. Calculate the total area of all the surfaces to be painted with each coat. Ignore doors and windows.

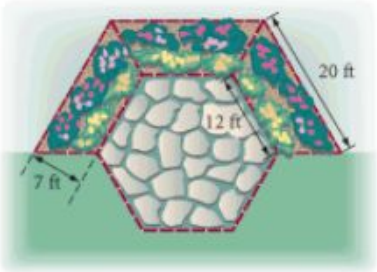
b. One gallon of base paint covers 500 square feet. One gallon of finishing paint covers 250 square feet. How many gallons of each will Tammy need for the job?

s’more Real-world Area Problems!

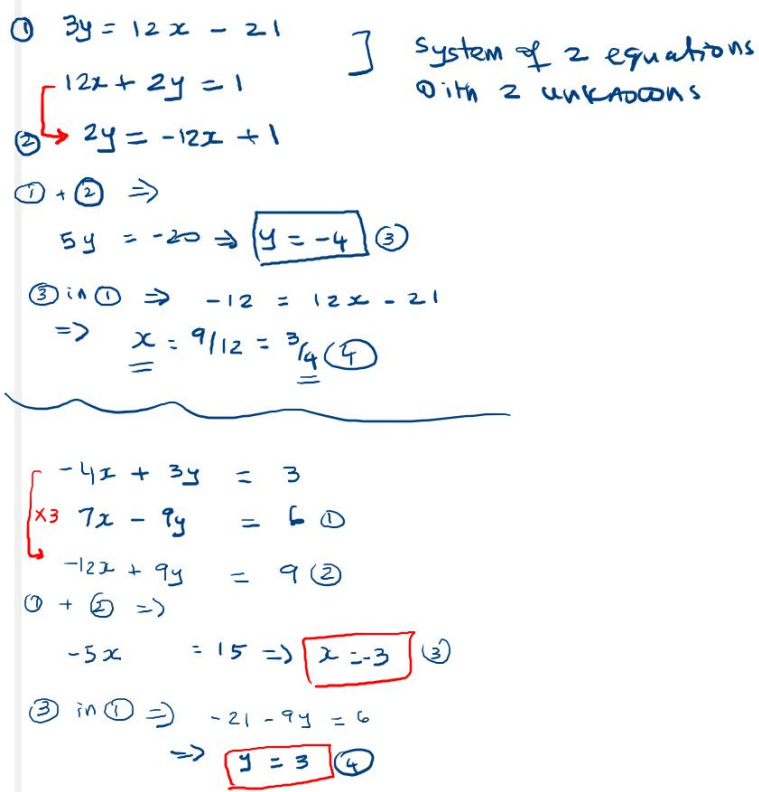
4. ***Application*** Harold works at a state park. He needs to seal the redwood deck at the information center to protect the wood. He measures the deck and finds that it is a kite with diagonals 40 feet and 70 feet. Each gallon of sealant covers 400 square feet, and the sealant needs to be applied every six months. How many gallon containers should he buy to protect the deck for the next three years?



5. ***Application*** A landscape architect is designing three trapezoidal flowerbeds to wrap around three sides of a hexagonal flagstone patio, as shown. What is the area of the entire flowerbed? The landscape architect’s fee is $100 plus $5 per square foot. What will the flowerbed cost?



Linear Equations - pts of concurrency Chapter 6.6



Plot these lines to show approximates slopes, Y-intercepts & pt of intersection

Reminders

1. Complete Homework due by Friday to prepare for Quiz
2. AK will be posted regularly for review and prep
3. Update your Google Classroom Notification Settings
4. Check your emails - Comments will be made on Google classroom
5. Upload your work as a SINGLE PDF files (jpg not allowed)
   - Use CamScanner or similar app

Wed, Jan 19th

What's happening today?

Check-in

- Completed Area HW problems?
- Have Calculator, Conjectures Toolbox, Geo instruments for Quiz?
- Starting next week - **Phones will not be allowed in class** - Bring your calculators!

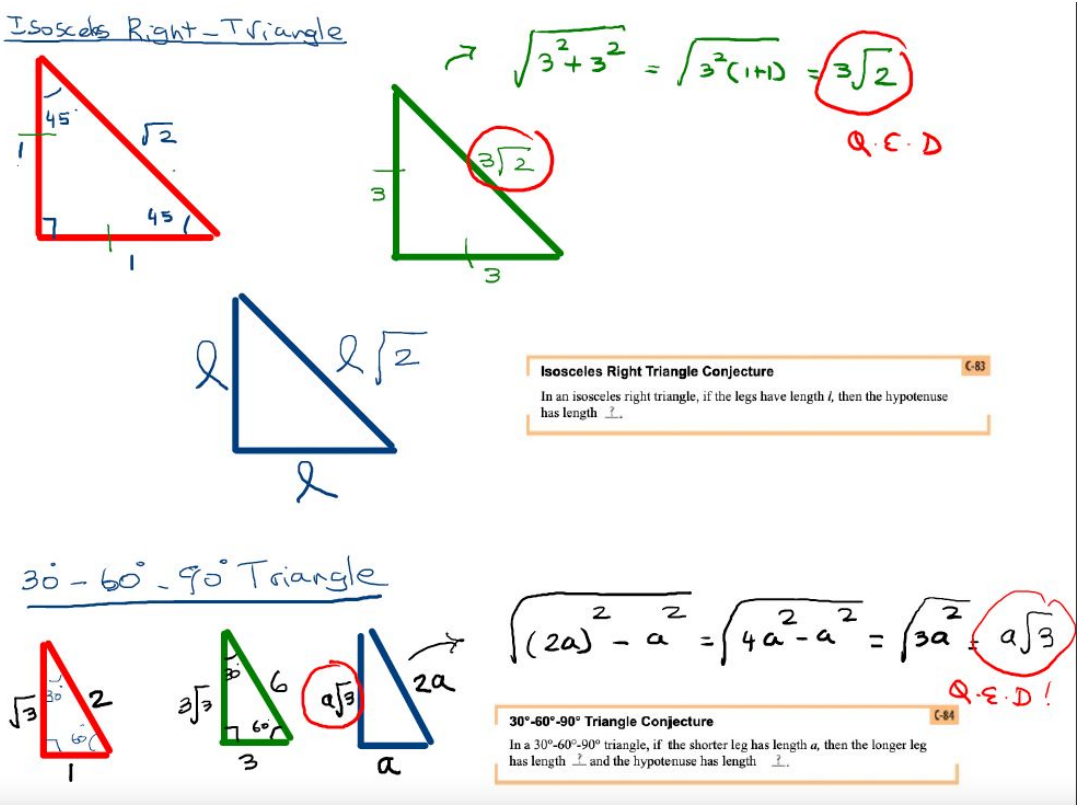
Today

- 30-60-90 triangles
- Radical Expressions
- Areas Quiz 8.1-8.4

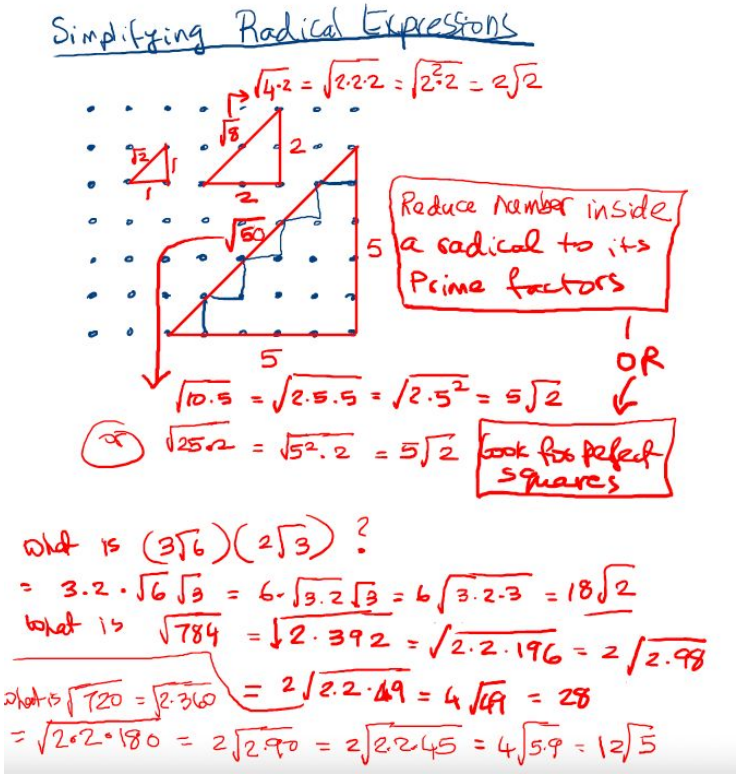
Reminders

- Project on Radical Expressions & Linear Equations due 1/25

Special Triangles Chapter 9.2



Radical Expressions



Fri Jan 21st

What's happening today?

Check-in

- Submit Quiz Corrections with explanations for 100% marks
- You need to explain your mistake and how you corrected it in your submission or verbally
- Project on Radical Expressions & Special right-triangle conjectures due today
- Homework assigned on 8.5 & 8.6

Today

- Questions on Project?

Reminders

Complete Investigation - Do Problems (Teams)

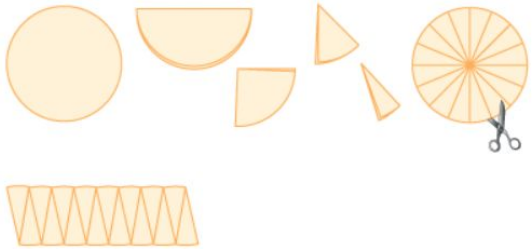
Investigation
Area Formula for Circles

Circles do not have straight sides like polygons do. However, the area of a circle can be rearranged. Let's investigate.

Step 1 Use your compass to make a large circle. Cut out the circular region.

Step 2 Fold the circular region in half. Fold it in half a second time, then a third time and a fourth time. Unfold your circle and cut it along the folds into 16 wedges.

Step 3 Arrange the wedges in a row, alternating the tips up and down to form a shape that resembles a parallelogram.



If you cut the circle into more wedges, you could rearrange these thinner wedges to look even more like a rectangle, with fewer bumps. You would not lose or gain any area in this change, so the area of this new "rectangle," skimming off the bumps as you measure its length, would be closer to the area of the original circle.

If you could cut infinitely many wedges, you'd actually have a rectangle with smooth sides. What would its base length be? What would its height be in terms of C, the circumference of the circle?

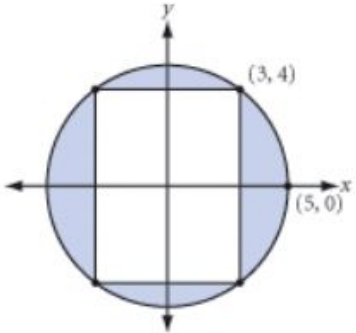
Step 4 The radius of the original circle is r and the circumference is $2\pi r$. Give the base and the height of a rectangle made of a circle cut into infinitely many wedges. Find its area in terms of r. State your next conjecture.

Circle Area Conjecture

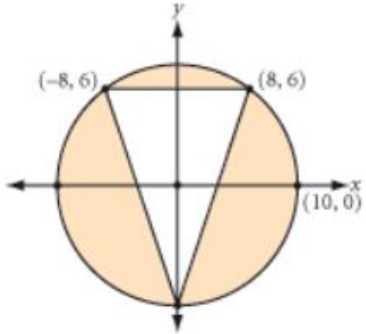
C-80

The area of a circle is given by the formula ?, where A is the area and r is the radius of the circle.

9. What is the area of the shaded region between the circle and the rectangle?

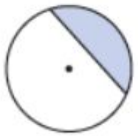


10. What is the area of the shaded region between the circle and the triangle?



Sectors - Segments - Annuli

Sector of a circle



Segment of a circle

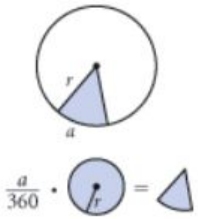
Annulus

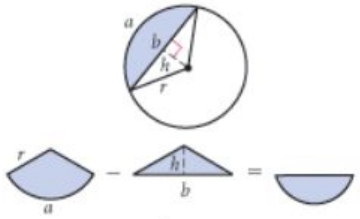
A **sector of a circle** is the region between two radii and an arc of the circle.

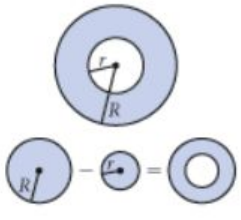
A **segment of a circle** is the region between a chord and an arc of the circle.

An **annulus** is the region between two concentric circles.

"Picture equations" are helpful when you try to visualize the areas of these regions. The picture equations below show you how to find the area of a sector of a circle, the area of a segment of a circle, and the area of an annulus.

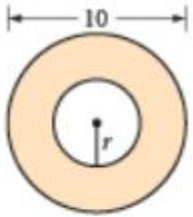




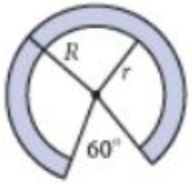


Do some Problems

7. $r = 2$ cm



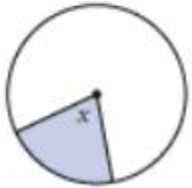
8. $R = 12$ cm
$r = 9$ cm



9. The shaded area is 12π cm^2. Find r.

10. The shaded area is 32π cm^2. Find r.

11. The shaded area is 120π cm^2, and the radius is 24 cm. Find x.



12. The shaded area is 10π cm^2. The radius of the large circle is 10 cm, and the radius of the small circle is 8 cm. Find x.

Tue Jan 25th

What's happening today?

Check-in

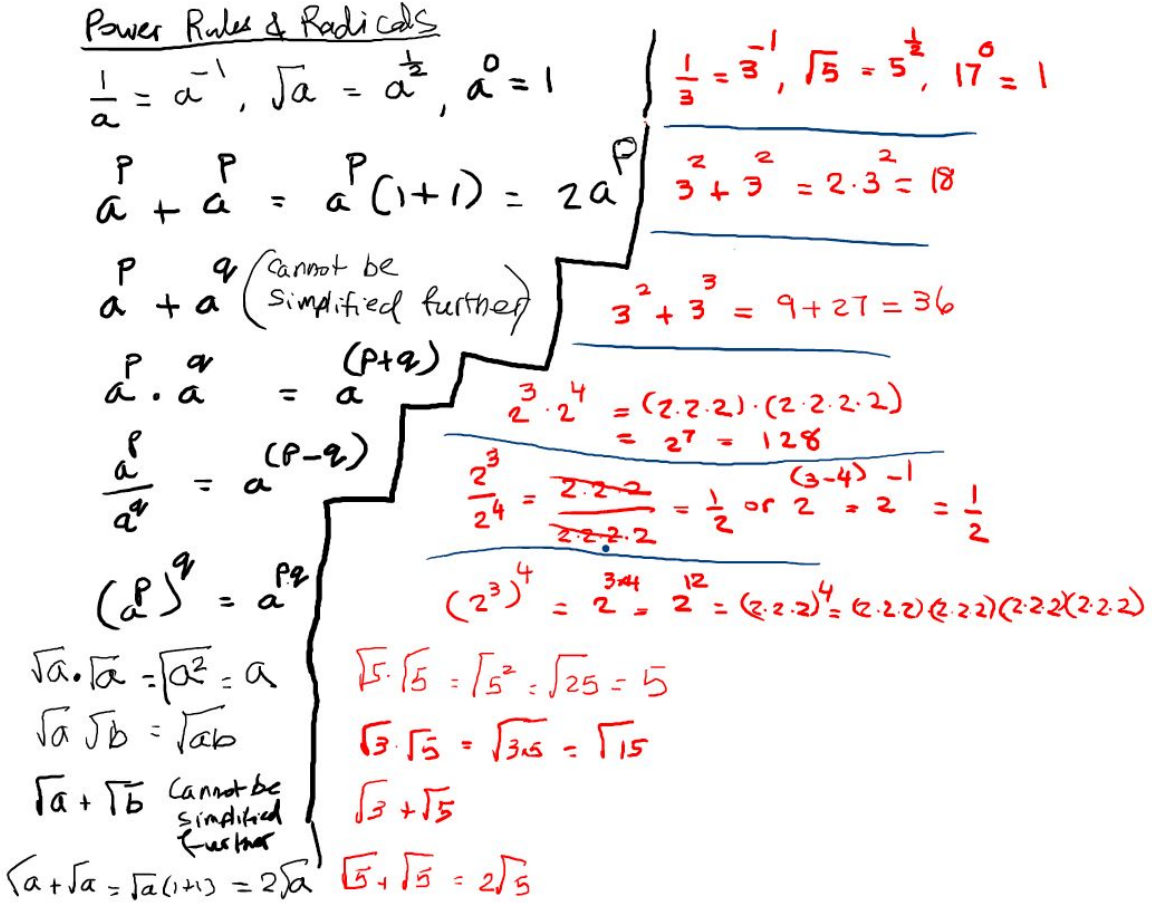
- Submit Quiz Corrections for 100% marks
- You need to explain your mistake and how you corrected it in your submission or verbally
- Project on Radical Expressions & Special right-triangles due today (this weekend)
- Homework assigned 8.5 & 8.6
- Conjectures Notebook Review and Reflection Assigned

Today

- Points of trouble - Power Rules, Simplifying Expressions, PEMDAS, Units, Bases & Heights
- Project Hints
- Going 3-D today - Surface Areas Chapter 8.7!

Reminders

Power Rules & Radicals



Simplifying Expressions

1. $7x^2 = a^2 - c^2$ Calculate x

$a=3,\ b=4,\ c=5$

$x = \sqrt{\frac{c^2 - a^2}{7}} = \sqrt{\frac{16}{7}}$

2. $\frac{b^2}{2} = c^2 - x^2$ Calculate x

$x = \sqrt{c^2 - \frac{b^2}{2}} = \sqrt{17}$

(Taking $\sqrt{}$ is same as taking to power $\frac{1}{2}$)

3. $\sqrt{a} + \sqrt{a}$, $\sqrt{a} + \sqrt{b}$, $\sqrt{a} \cdot \sqrt{b}$

$2\sqrt{a}$, $\sqrt{a}+\sqrt{b}$, $\sqrt{ab}$

Simplify ③ & ④

4. $(a^2)^3$, $(\sqrt{a}\ \sqrt{a})^2$, $c(a+b)^2$

a^6, a^2, $c(a^2+2ab+b^2)$

(Dividing by 2 is same as multiply by $\frac{1}{2}$)

5. $-4x + 3 = -2y$ what is slope & y-int

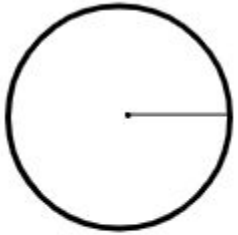
729, 9, 245

$y = 2x - \frac{3}{2}$ slope: 2, y-int: $-\frac{3}{2}$

How do Units work?

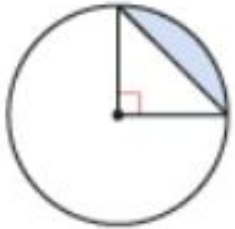
How do units work in these formulas?

The above fig is a Trapezoid of Area 500 sq-ft & height 8 meters. Calculate the length of the small base in meters if the large base is 10 meters in length.



Area of circle is 72 sq. ft What is the radius in meters?

4. $r = 2$ cm



Calculate the area of the shaded segment

Soln to Units problems

How do Units work?

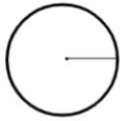
How do units work in these formulas?

The above fig is a Trapezoid of Area 500 sq-ft & height 8 meters. Calculate the length of the small base in meters if the large base is 10 meters in length.

$\text{Area} = 72\ ft^2 = \pi r^2$

$r = \sqrt{\frac{72}{\pi}\ ft^2} = 4.79\ ft$

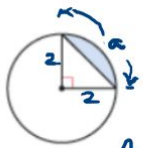
$= 4.79\ ft \times \frac{1}{3.28}\ \frac{m}{ft}$



Area of circle is 72 sq. ft
What is the radius in meters?

$= 1.46\ m$

4. $r = 2$ cm



$\text{Area} = \frac{a}{360} \times \pi r^2 - \frac{1}{2} b h$

$= \frac{90}{360} \times \pi \times 2^2 - \frac{1}{2} \times 2 \times 2$

Calculate the area of the shaded segment

$= \frac{1}{4} \pi \cdot 4 - 2$

$A = \pi - 2\ cm$

$500\ ft^2 \times \frac{m^2}{ft^2} = \frac{1}{2}(10 + b_2)\ m \times 8\ m$

there are 3.28 ft in a meter

$500 \times ft^2 \times \frac{m^2}{3.28^2\ ft^2} = \frac{1}{2}(10 + b_2) \times 8\ m^2$

$46.4 = 40 + 4 b_2$

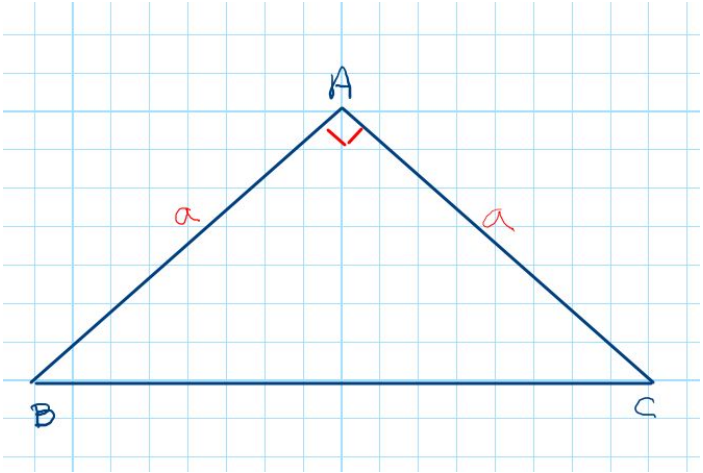
$b_2 = 6.4 / 4 = 1.61\ m$

Validate: $\text{Area} = \frac{1}{2}(10 + 1.61) \times 8 = 46.4\ m^2$

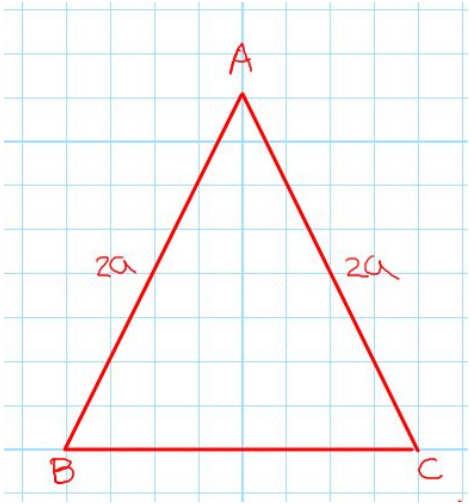
or $46.4 \times 3.28^2 = 499.6\ ft^2$

Project Hints

Find the hypotenuse of an Isosceles Right-Triangle of side ‘a’



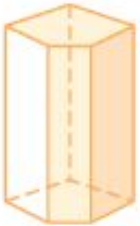
Find the Height of an Equilateral Triangle of side ‘2a’



Some 3-D Shapes and Vocabulary

3-Dimensional Shapes

Cylinder



Prism

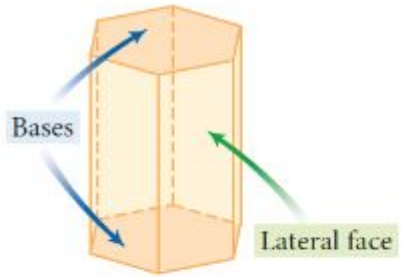
Sphere

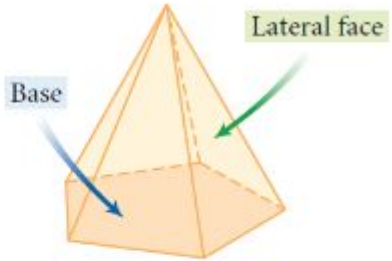
Cone

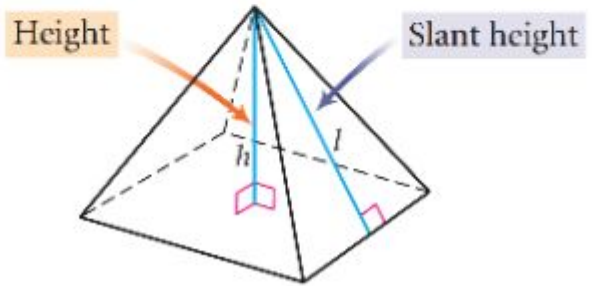
Pyramid

Hemisphere

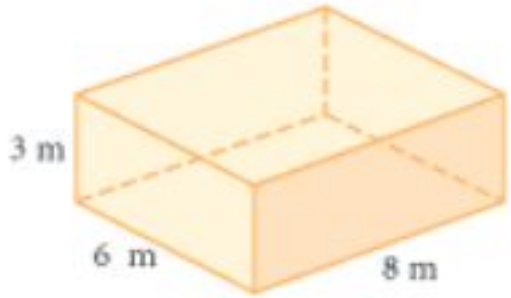
Some 3-D Shapes and Vocabulary

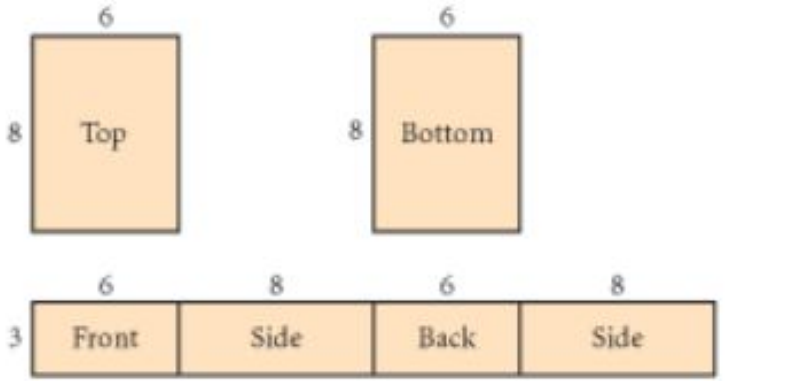






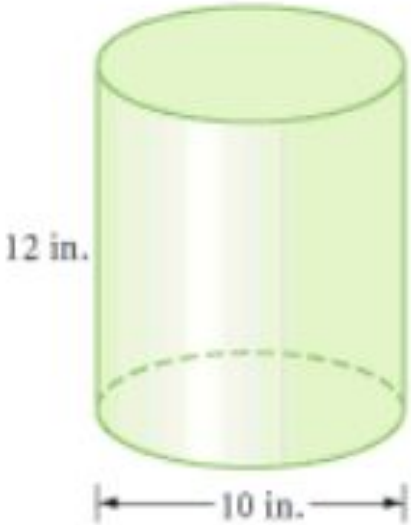
Surface Area of 3-D Shapes - Prism

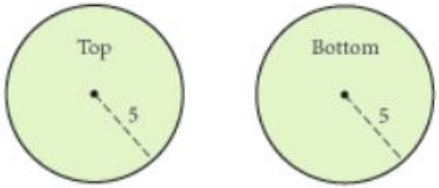




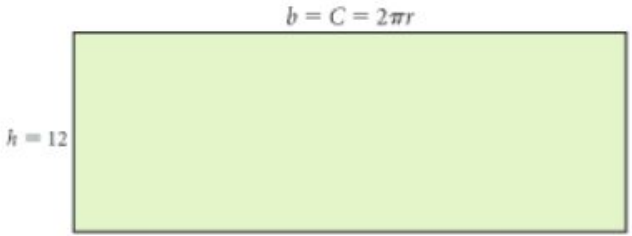
surface area = 2(base area) + (lateral surface area)

Surface Area of 3-D Shapes - Cylinder



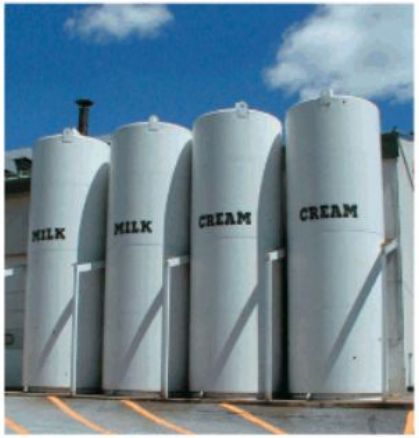


Bases



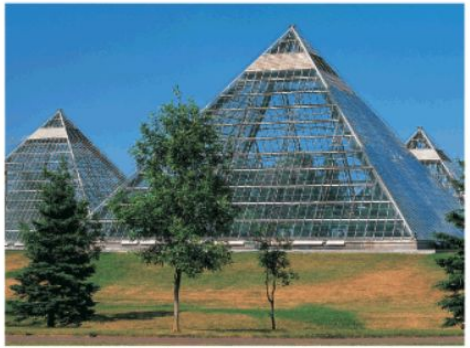
Lateral surface

$$\text{surface area} = 2(\pi r^2) + (2\pi r)h$$
$$= 2(\pi \cdot 5^2) + (2 \cdot \pi \cdot 5) \cdot 12$$

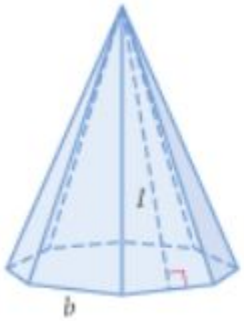


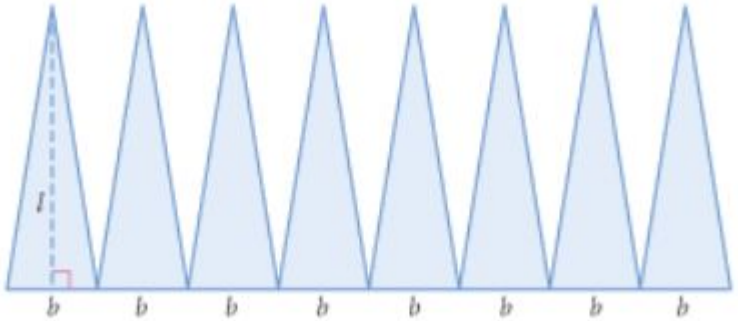
This ice cream plant in Burlington, Vermont, uses cylindrical containers for its milk and cream.

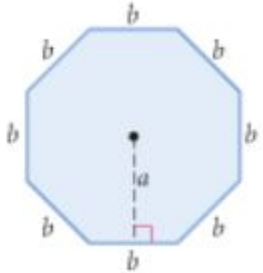
Surface Area of 3-D Shapes - Pyramid



These conservatories in Edmonton, Canada, are glass pyramids.







Surface Area of 3-D Shapes - Cone