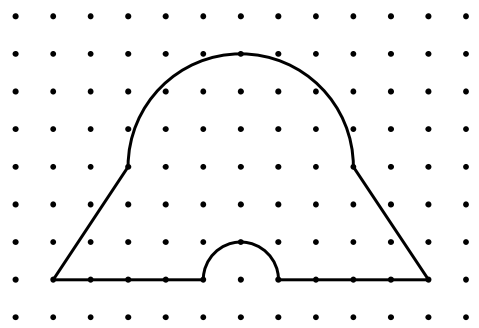
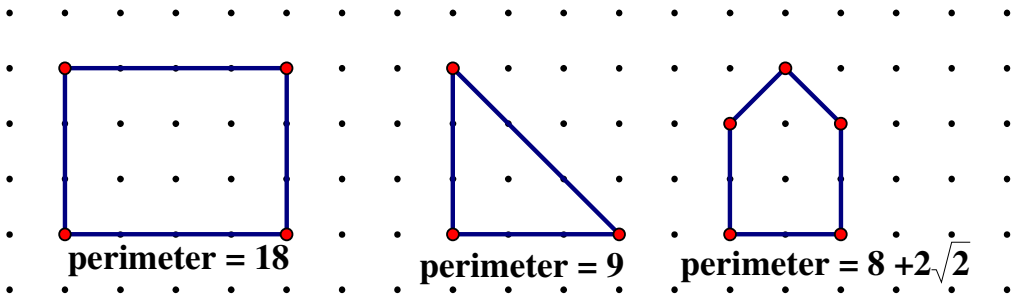
Math 247 Final exam topics and practice, Spring 2017

1. Find the perimeter. Show your work clearly. Leave answers in exact (square root and π form)



Full credit notes: Label and show your steps for each part (diagonal, horizontal, arc).
Know how to combine two of the same square roots
Know how to add, multiply and simplify fractions with π
Make sure you are using the right formulas (circumference vs area)
Don't try to combine lengths by grouping and subtracting: add the pieces together.
Final Answer: $8+2\sqrt{13}+5\pi$

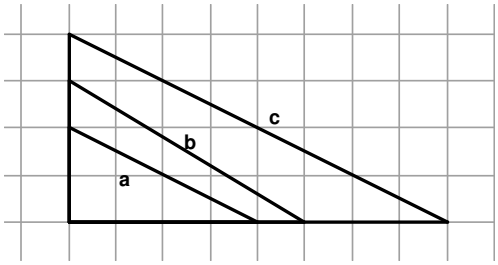
2. What common misconceptions might lead to these wrong answers when finding the perimeter of these shapes:



a. The most common error would be to count the dots for each side length instead of counting the spaces between the dots: 5+4+5+4=18
b. The most common error would be to count the spaces between the dots on the diagonal as if they were the same unit length as the length between dots horizontally and vertically.
c. The most common error would be to find the perimeter of the square (4+4+4+4) and then add the two diagonal sides (the top side of the square is not part of the perimeter and shouldn't be counted).

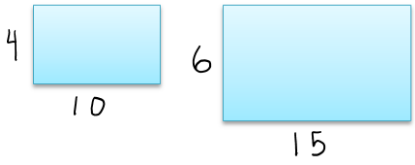
3. Are these shapes similar?

a. Which pair(s) of these triangles are similar?



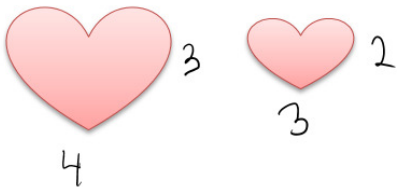
a and c are similar because the side lengths in c are double the side lengths in a.
Alternately, because the side ratios are equal:
$\frac{2}{4}=\frac{4}{8}$
b is not similar to either a or c.

Are these similar?



$\frac{6}{4}=\frac{3}{2}$; $\frac{15}{10}=\frac{3}{2}$ Yes, proportional

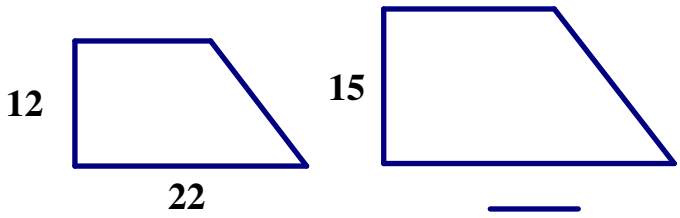
Are these similar?



$\frac{2}{3}$ and $\frac{3}{4}$. Not equal scale factors. Not proportional.

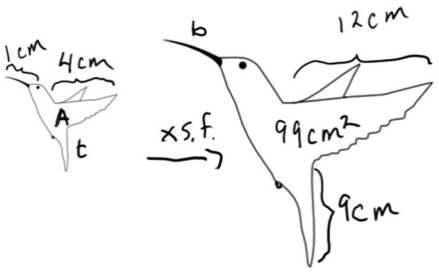
Find lengths, areas and volumes using scale factors:

4. These shapes are similar. Find the length of the missing side



The missing side has length $27\frac{1}{2}$

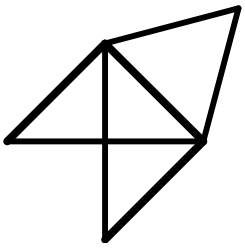
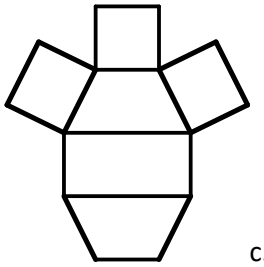
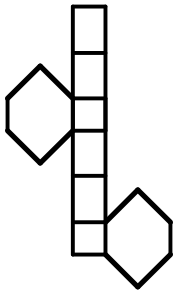
5.
a. what is the length of the beak of the larger bird? 3 cm
b. what is the length of the tail of the smaller bird? 3 cm
c. what is the area of the smaller bird? 11 cm^2



6. Tara makes stuffed dragons. She wants to make a larger, proportional (similar), dragon to display in the shop window. Her regular dragons are 1 1/2 ft. long. She plans to make a display dragon that is 6 ft long.
a. Regular dragons are 8 inches high. How tall will the larger dragon be? 32 inches
b. It takes 12 ft^2 to make a regular dragon. How much square feet of fabric should she buy to make the larger dragon? 192 ft^2
c. The fabric she buys is 1-yard (3 ft) wide, how many feet long should the 1-yard wide fabric be to get the correct amount of fabric? 64 ft long
d. It takes 2 lbs. of stuffing to fill the regular dragons. How much stuffing should she buy for the large dragon? 128 lbs.

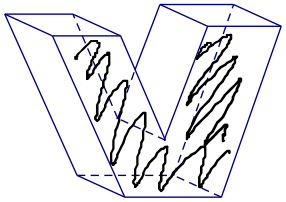
6'. I took a picture of a heart that was 6 cm^2 and stretched it so it was 3 times as wide and 1 1/2 times as high. What is the area of this new heart?
27 cm^2

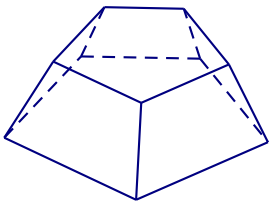
7. Describe/name the polyhedron that would be constructed from this net

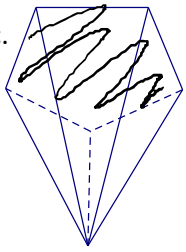
a. 
b. 
c. 

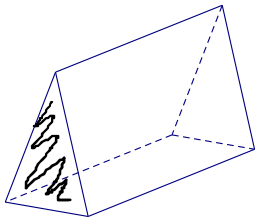
a. triangular pyramid b. trapezoidal prism c. hexagonal prism

8. For each of these, tell if it is a pyramid, a prism or neither. If it is a pyramid or prism, shade a/the base.

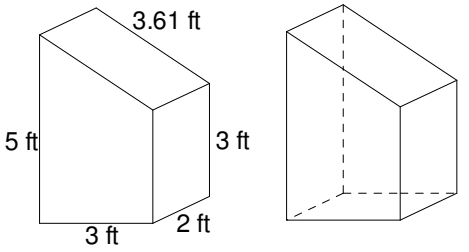
a. 
Prism

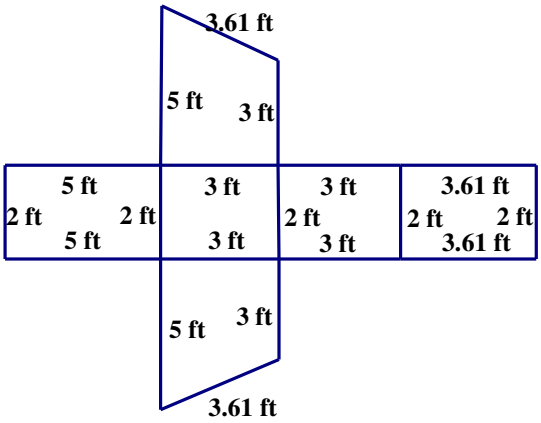
b. 
neither

c. 
pyramid

d. 
prism

9. a. Sketch a net for the bin (label the lengths on your sketch)





b. Sarah wrote the following as her work for finding the surface area of the bin. Tell whether she is correct or not, and if she is incorrect, make corrections to her work.

Sarah: the front of the bin is a square and a triangle so the area is $3\times3+\frac{1}{2}(3\times2)$

the top is a rectangle: 3.61×2 and the side is a rectangle: 2×3.

Multiply by 2 for the hidden sides, so the surface area is $2\times25.22=50.44$

This is not correct because the hidden sides are not all the same as the visible sides.

Correct answer is

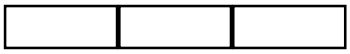
$$2(3\times3+\frac{1}{2}(3\times2))+3.61\times2+2\times3+2\times3+2\times5=53.22\,\text{ft}^2$$

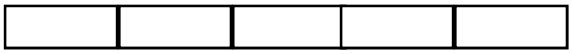
....

Ratios:

13. Starting from the ratio information, the ratio of hardback to paperback books on my bookshelf is 3:5, express this same relationship in several ways:

a.

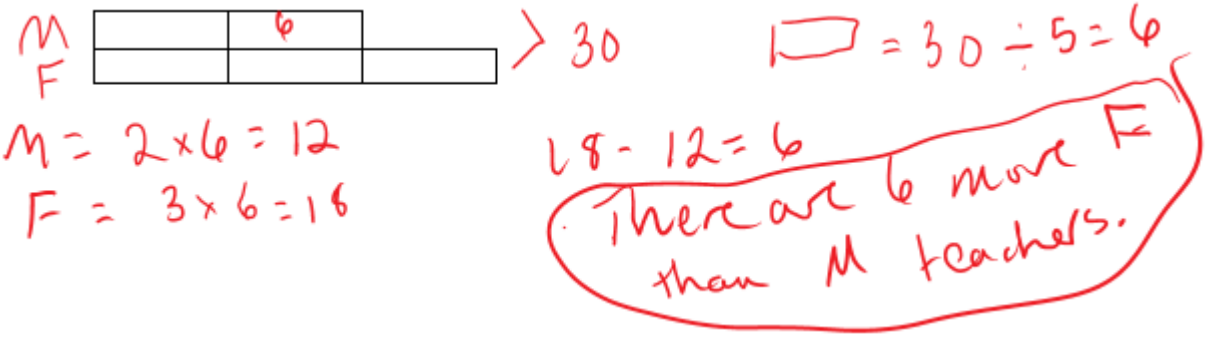
HB 

PB 

b. There are 3/5 as many hard back as paperback books

c. 3/8 of the books are hardback.

14. There are 2/3 as many male teachers as female teachers in a school. If there are 30 teachers altogether, how many more female teachers than male teachers are there?



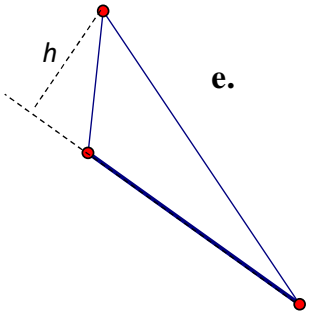
15. At the pet store the ratio of mongrels to pure-breds is two to seven. Two more pure-bred dogs and two more mongrels are brought in. If there are 8 mongrels after the new dogs arrive, how many dogs are there now?

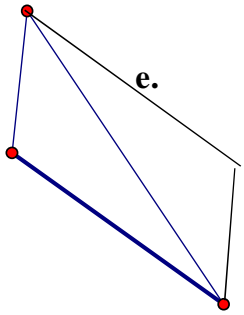
	mongrels	pure breds	ratio M:P
was		21	2:7
now	8	23	

There are 23 pure-bred dogs now.
So 23 + 8 = 31 dogs total now

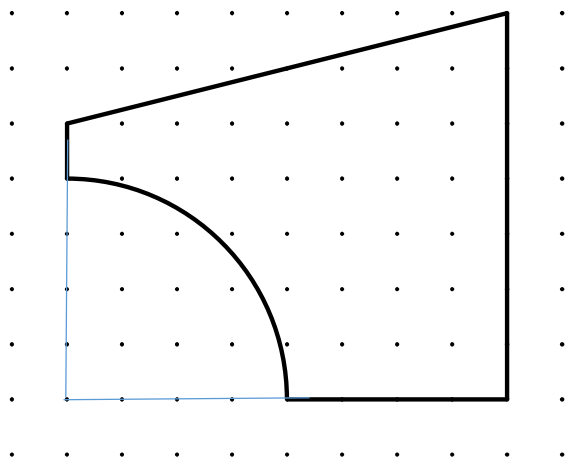
Area

16. For this triangle, draw in the height, using the bold side as the base, and draw in a parallelogram with twice the area that shares the bold side as a base:

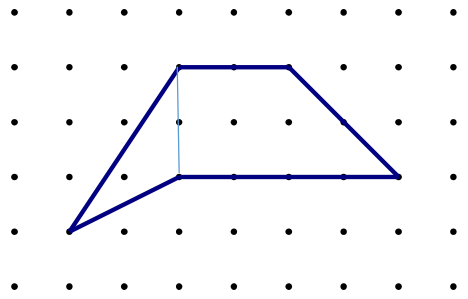




17. Find the area of:



Area large trapezoid: (5+7)×8/2=48
Area circle: $\pi \cdot 4^2 = 16\pi$
Area 1/4 circle: $16\pi / 4 = 4\pi$
Area total shape: $48 - 4\pi$

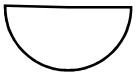


left triangle area: base is 2, height is 2 so $\frac{1}{2} \cdot 2 \cdot 2 = 2$

trapezoid area: $\frac{1}{2}(2+4) \cdot 2 = 6$

Total area: 6+2=8

Fraction representations, fraction comparison, fraction addition, subtraction, multiplication and division.

18. If  shows 1 whole, how much shows 2/3? 

19. Give good (complete) comparison answers using an appropriate choice of the strategies we have been studying (same denominator, same numerator, transitive or residual). You do not need to give the name of your strategy.

a. $\frac{3}{8}$ and $\frac{3}{10}$ Eighths are bigger than tenths (to make 10 parts from a whole, each part has to be smaller than if you only make 8 parts from the whole), and there are the same number of parts in each fraction, so 3 large parts (eighths) is larger than 3 small parts (tenths)

b $\frac{3}{8}$ and $\frac{5}{8}$ Both fractions are made out of the same size parts (eighths), so 5 parts is more than 3 of the same size parts: 5/8 > 3/8

20. How do we know that fifteenths are bigger than sixteenths?

If you need to split something into more parts (16 is more than 15), then you have to make each part smaller to get more parts, so sixteenths are smaller than fifteenths.

Problems from the second quiz topics that might be on the exam:

21. Explain how to add $\frac{2}{3}+\frac{3}{4}$ by making a visual model and multiplying

(for example: you could use fractions squares to show the fractions and visually find equivalent fractions with the same denominator by splitting; then use the fraction squares to explain how to find the numerical value of the equivalent fractions by multiplying)

22. Show how to solve $\frac{3}{4}\times\frac{5}{6}$ using a square area diagram. Explain how to get the multiplication steps $\frac{3\times5}{4\times6}$ from your diagram.

23. . Which equation matches each question (note, some equations may be used twice, and others not at all)

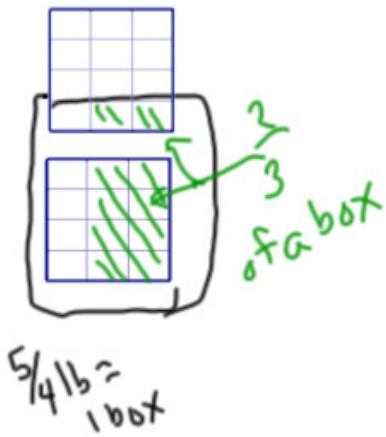
1a. iii. b. x. c. ii. d. vi e. vii f. v. g. ix h. i. i. ii. j. x.

a. A full box of crackers holds 5/4 lb of crackers. How many lbs of crackers is in 2/3 of a box of crackers? $\frac{5}{4}\times\frac{2}{3}=\frac{2}{3}\times\frac{5}{4}$	i. $\frac{5}{4}+\frac{2}{3}$
b. A full box of crackers holds 5/4 lb of crackers. If my friends eat 2/3 of the box, how many lbs of crackers be left? $\frac{5}{4}-\left(\frac{5}{4}\times\frac{2}{3}\right)$	ii. $\frac{5}{4}-\frac{2}{3}$ iii. $\frac{5}{4}\times\frac{2}{3}=\frac{2}{3}\times\frac{5}{4}$
c. A full box of crackers holds 5/4 lb of crackers. If my friends eat 2/3 lb of crackers, how many lbs of crackers will be left? $\frac{5}{4}-\frac{2}{3}$	iv. $\frac{5}{4}\div\frac{2}{3}$ v. $\frac{2}{3}\div\frac{5}{4}$
d. A full box of crackers holds 5/4 lb of crackers. How many lbs of crackers is in 4 boxes of crackers? $4\times\frac{5}{4}=\frac{5}{4}\times4$	vi. $4\times\frac{5}{4}=\frac{5}{4}\times4$
e. A full box of crackers holds 5/4 lb of crackers. If I have 4 lbs of crackers, how many boxes is that? $4\div\frac{5}{4}$	vii. $4\div\frac{5}{4}$ viii. $\frac{5}{4}\div4$

f. A full box of crackers holds 5/4 lb of crackers. If I have 2/3 lbs of crackers, how many boxes is that? $\frac{2}{3}\div\frac{5}{4}$ g. A full box of crackers holds 5/4 lb of crackers. If I have a box of crackers and another 2/3 of a box of crackers, how many lbs of crackers do I have? $\frac{5}{4}+\left(\frac{5}{4}\times\frac{2}{3}\right)$ h. A full box of crackers holds 5/4 lb of crackers. If I have a box of crackers and another 2/3 lbs of crackers, how many lbs of crackers do I have? $\frac{5}{4}+\frac{2}{3}$ i. A blue box of crackers holds 5/4 lb of crackers. A red box of crackers holds 2/3 lbs of crackers. How many more lbs of crackers are in a blue box than a red box. $\frac{5}{4}-\frac{2}{3}$ j. I have 2/3 of a box of crackers. My crackers weigh 5/4 lb. How much does a full box of crackers weigh? $\frac{5}{4}\div\frac{2}{3}$	ix. $\frac{5}{4}+\left(\frac{5}{4}\times\frac{2}{3}\right)$ x. $\frac{5}{4}-\left(\frac{5}{4}\times\frac{2}{3}\right)$

24. Diagrams

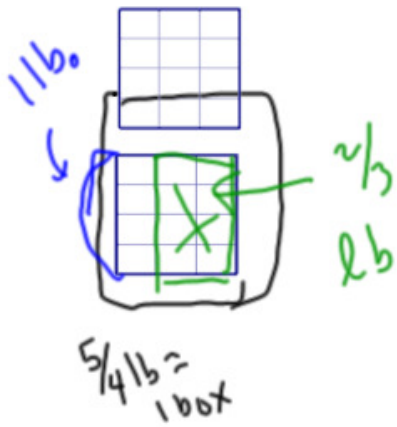
a. A full box of crackers holds 5/4 lb of crackers. How many lbs of crackers is in 2/3 of a box of crackers?



Each big square (1 lb) is split into 4x3 parts, so each small part is 1/12 lb.

There are 2x5=10 small parts in the shaded 2/3 box, so that makes 10/12 lb.

c. A full box of crackers holds 5/4 lb of crackers. If my friends eat 2/3 lb of crackers, how many lbs of crackers will be left?



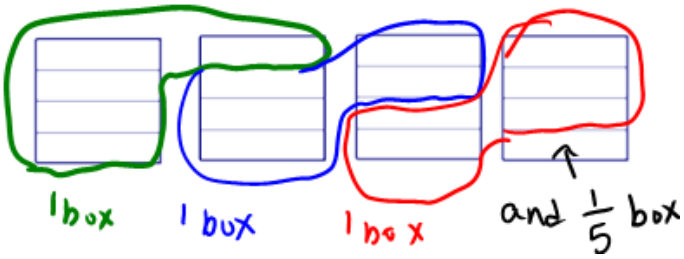
1 lb (large square) is split into 3x4=12 parts, so each small part is 1/12 lb.

In the full box of crackers there were 5x3=15 small parts

in 2/3 lb there are 2x4=8 small parts, so there are 15-8=7 parts left

There will be 7/12 lb of crackers left.

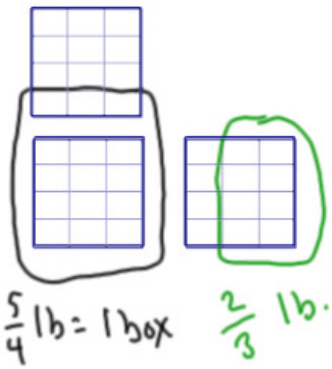
e. A full box of crackers holds 5/4 lb of crackers. If I have 4 lbs of crackers, how many boxes is that?



In 4 lbs there are 16/4 lbs of crackers, or 16 smaller parts. It takes 5/4 (5 parts) to fill a whole box.

3x(5/4) = 15/4 (15 parts) is 3 boxes. There is 1 part that can't make a whole box. It is 1 of 5 parts needed to make a full box, so it is 1/5 of a box. There are 3 1/5 boxes.

h. A full box of crackers holds 5/4 lb of crackers. If I have a box of crackers and another 2/3 lbs of crackers, how many lbs of crackers do I have?



A box is 5/4 lbs. (A big square shows 1 lb). The horizontal lines split the square into fourths.

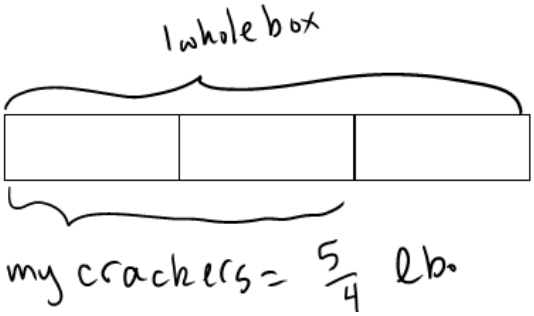
On the right, is 2/3 lb. The vertical lines split the square into thirds. If we split all of the squares both horizontally into fourths and vertically into thirds, that will split each square into 3x4=12 pieces, each of which shows 1/12 lb.

In the full box, there are 5x3=15 pieces (5 down and 3 across), so that is 15/12 lbs,

In the 2/3 lb group, there are 2x4=8 pieces (4 down and 2 across), so that is 8/12 lbs.

In total, there is 15/12 + 8/12 = 23/12 lb

j. I have 2/3 of a box of crackers. My crackers weigh 5/4 lb. How much does a full box of crackers weigh?



I have less than a box of crackers, so a full box weighs more than 5/4 lbs.

My picture shows a box split into 4 parts, and my crackers fill 2 of those parts.

That means half of my crackers fills each of those parts:

half of my crackers is $\frac{1}{2}\times\frac{5}{4}=\frac{5}{8}$ lbs of crackers.

There are 3 parts in a whole box, so there are $3\times\frac{5}{8}=\frac{15}{8}$ lbs of crackers in a whole box.

Alternately (if you like it better) you could draw this: