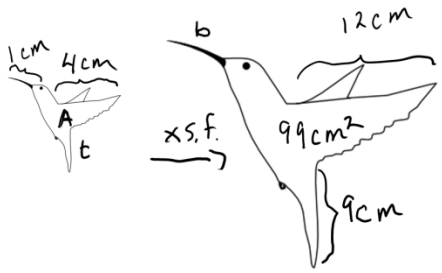
Final Exam Practice Problems Solutions

1.	original	scale factor	new
beak	1 cm		3 cm
wing	4 cm	x 3	12 cm
tail	3 cm		9 cm
Area	11 cm		99 cm^2

$99 \div 3^2$



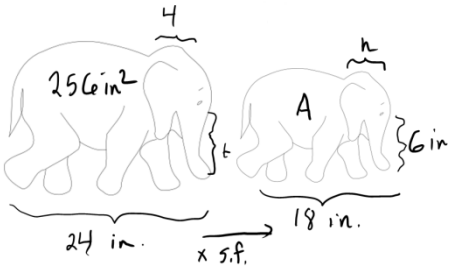
4/3

2.	original	scale factor	new
trunk	8 in.		6 in
length	24 in	x 3/4	18 in
head	4 in	x 3/4	3 in.
area	256 in^2		144 in^2

$t \cdot \frac{3}{4} = 6$

$t = 6 \cdot 4/3 = \frac{24}{3} = 8$

$256 \times \left(\frac{3}{4}\right)^2 = \frac{256 \times 9}{16} = 144$



$24 \times \square = 18$

$6 \times 4 \quad " \quad 6 \times 3$

$\square = 3/4$

3. I have two similar/proportional pictures of a bus. If the smaller bus has area 15 cm^2, and the area of the large bus is 60cm^2, what is the (length) scale factor that compares the large one to the small one? = 2

$15 \times \square = 60$

$cm^2 \quad 4 \quad cm^2$

2D

$15 \times 2^2 = 60$

$15 = 3 \times 5\,cm^2 \Rightarrow (3 \times 2) \times (5 \times 2) = 60\,cm^2$

4. Maya painted a tiger that was 12 inches high, and it used 1/2 oz of paint. If she wants to enlarge her picture (proportionately) to make a mural 6 feet high, how much paint will she need? (this one is extra tricky)

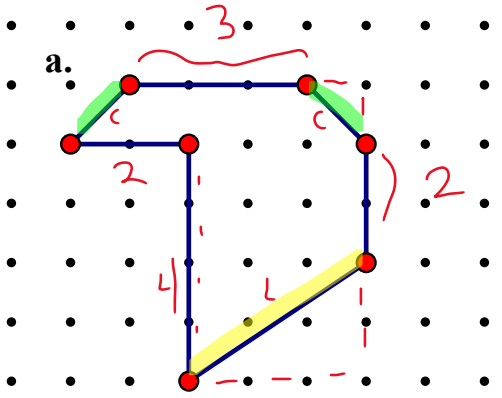
12 inches = 1 ft $\xrightarrow{\times 6}$ 6 ft

Amount of paint needed is proportional to area

$\frac{1}{2} \times 6^2 = 18$ oz

5. Figure out the side lengths and find each of these perimeters. Show your work in a neat, easy to follow way (assume a 1-cm grid size).

a.



$1^2 + 1^2 = c^2$

$2 = c^2$

$\sqrt{2} = c$

$2^2 + 3^2 = L^2$

$4 + 9 = L^2$

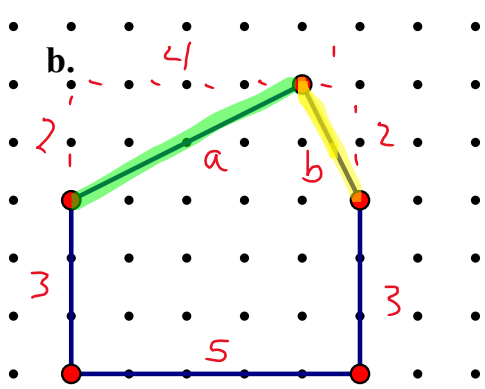
$13 = L^2$

$\sqrt{13} = L$

$P = 2 + 4 + \sqrt{13} + 2 + \sqrt{2} + 3 + \sqrt{2}$

$= 11 + \sqrt{13} + 2\sqrt{2}$ cm.

b.



$4^2 + 2^2 = a^2$

$16 + 4 = a^2$

$20 = a^2$

$a = \sqrt{20}$

$1^2 + 2^2 = b^2$

$1 + 4 = b^2$

$5 = b^2$

$b = \sqrt{5}$

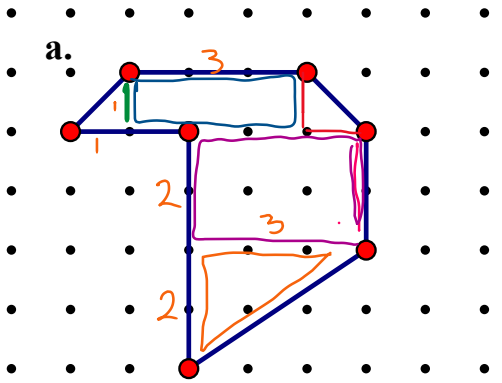
$P = 3 + 5 + 3 + \sqrt{5} + \sqrt{20}$

$= 11 + \sqrt{5} + \sqrt{20}$ cm ← OK final

$= 11 + \sqrt{5} + 2\sqrt{5} = 11 + 3\sqrt{5}$ cm

6. Find the areas of the shapes in #5

a.



△: $\frac{1}{2} \cdot 1 \cdot 1 = \frac{1}{2}$

△: $\frac{1}{2} \cdot 1 \cdot 1 = \frac{1}{2}$

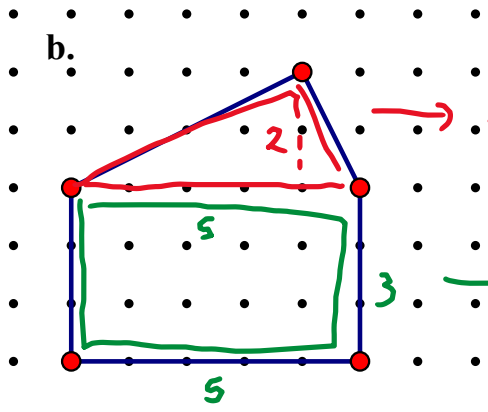
▭ = 3

▭: $2 \times 3 = 6$

◺: $\frac{1}{2} \cdot 2 \cdot 3 = 3$

$A = \frac{1}{2} + \frac{1}{2} + 3 + 6 + 3 = 13\text{cm}^2$

b.

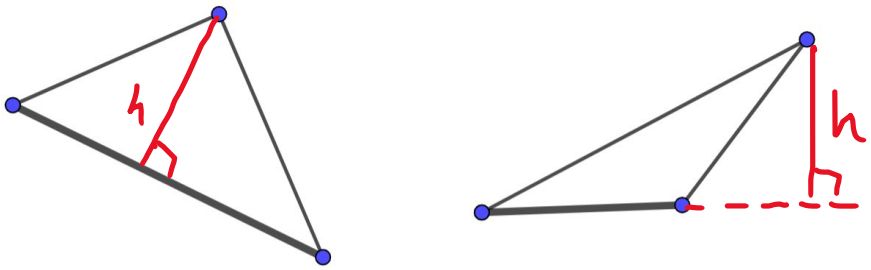


→ $\frac{1}{2} \cdot 5 \cdot 2 = 5$

→ $5 \times 5 = 15$

$A = 5 + 15 = 20\text{cm}^2$

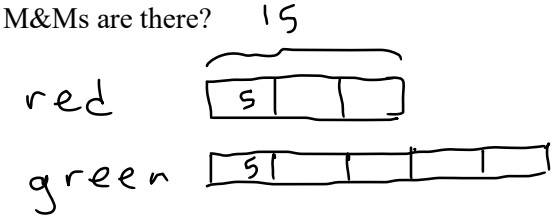
7. Draw the heights that correspond to the bold base in these triangles:



8. For the word problems below:

- Draw a bar diagram (or similar ~~bar~~ diagram)
- Solve the problem by multiplying and dividing by whole numbers
- Write a fraction multiplication expression for the solution

a. In a bag of M&Ms there are 3/5 as many red M&Ms as green M&Ms. There are 15 red M&Ms. How many green M&Ms are there?

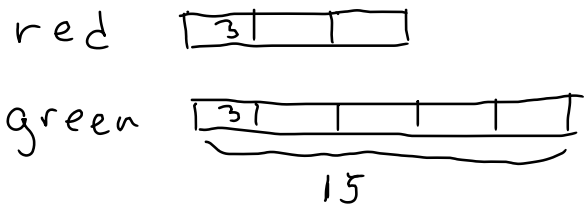


$15 \div 3 = 5$

$5 \times 5 = \boxed{25 \text{ green}}$

$15 \times \frac{1}{3} \times 5 = \boxed{15 \times \frac{5}{3}}$

b. In a bag of M&Ms there are 3/5 as many red M&Ms as green M&Ms. There are 15 green M&Ms. How many red M&Ms are there?

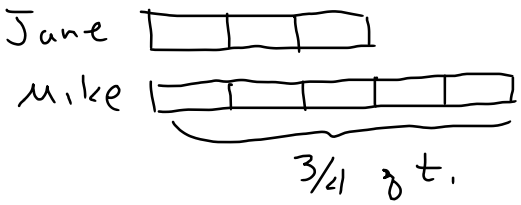


$15 \div 5 = 3$

$3 \times 3 = \boxed{9 \text{ reds}}$

$15 \times \frac{1}{5} \times 3 = \boxed{15 \times \frac{3}{5}}$

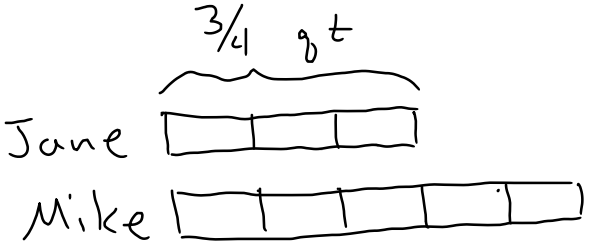
c. Mike has 3/4 of a quart of juice. Jane has 3/5 as much juice as Mike. How much juice does Jane have?



$\frac{3}{4} \div 5 = \frac{3}{4} \times \frac{1}{5} = \frac{3}{20}$

$\frac{3}{20} \times 3 = \boxed{\frac{9}{20} \text{ qt}} = \boxed{\frac{3}{4} \times \frac{3}{5}}$

d. Jane has 3/4 of a quart of juice. Jane has 3/5 as much juice as Mike. How much juice does Mike have?

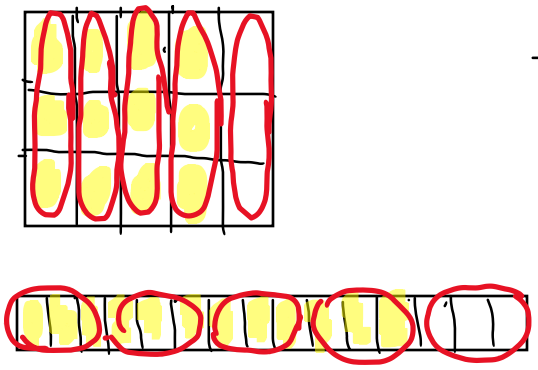


$\frac{3}{4} \div 3 = \frac{1}{4}$

$\frac{1}{4} \times 5 = \boxed{\frac{5}{4} \text{ qt}}$

$\frac{3}{4} \times \frac{1}{3} \times 5 = \boxed{\frac{3}{4} \times \frac{5}{3}}$

9. Explain (using a diagram) how to simplify 12/15



Groups shaded

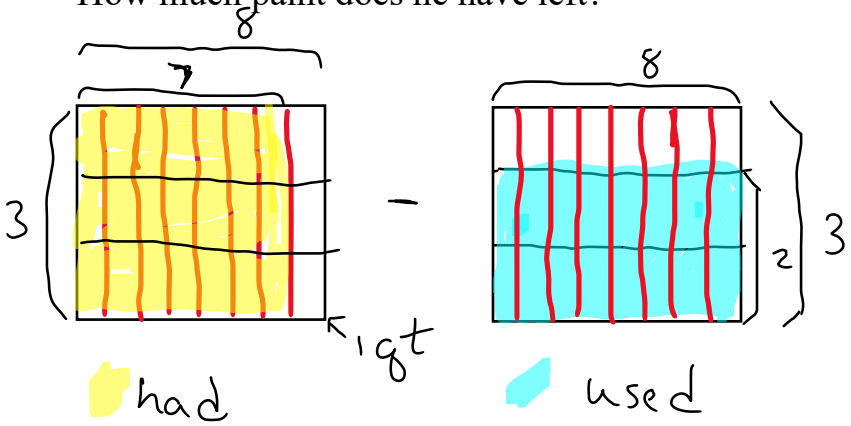
$\frac{12}{15} = \frac{12 \div 3}{15 \div 3} = \frac{4}{5}$ ← groups in 1 whole

divide both 12 and 15 by 3 to make groups of 3

10. For the problem: $\frac{7}{8} - \frac{2}{3}$

a. Write a word problem
b. Show how to solve it with a diagram
c. Show how to solve it with a numerical algorithm
d. Explain how the diagram work matches the number work.

a. Jack had 7/8 **of a quart of paint**. He used 2/3 **of a quart of paint** to paint his book shelf. How much paint does he have left?



$\frac{7}{8} - \frac{2}{3} =$

shaded $\frac{7 \times 3}{8 \times 3} - \frac{2 \times 8}{3 \times 8}$ ← shaded

whole ↗ ← whole

$= \frac{21}{24} - \frac{16}{24} = \frac{21-16}{24}$

$= \frac{5}{24}$

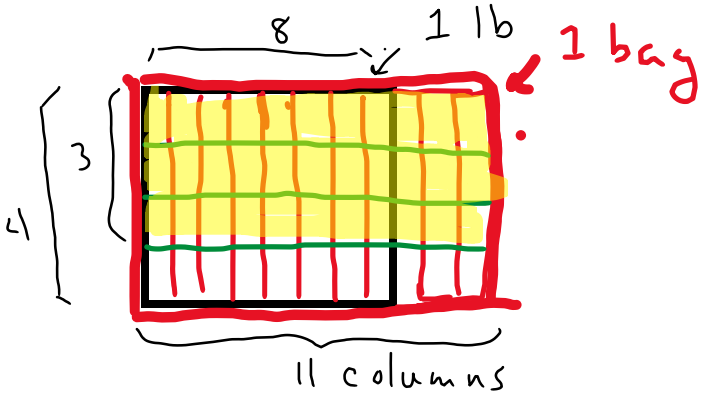
split each $\frac{1}{8}$ into 3 pieces

split each $\frac{1}{3}$ into 8 pieces

11. For the problem: $1\frac{3}{8}\times\frac{3}{4}$

a. Write a word problem
b. Show how to solve it with a diagram
c. Show how to solve it with a numerical algorithm
d. Explain how the diagram work matches the number work.

A **bag** of nuts has 1 3/8 **lbs** of nuts in it. How much is in 3/4 **of a bag**?



$1\frac{3}{8} = \frac{11}{8}$

$1\frac{3}{8}$ in a set (bag)

$\frac{3}{4}$ set(s)

= total (product

across x down

$1\frac{3}{8} \times \frac{3}{4} = \frac{11}{8} \times \frac{3}{4} = \frac{11\times 3}{8\times 4}$

draw in all eighths

Parts in 1 lb across x down

$= \boxed{\frac{33}{32} \text{ lbs}}$

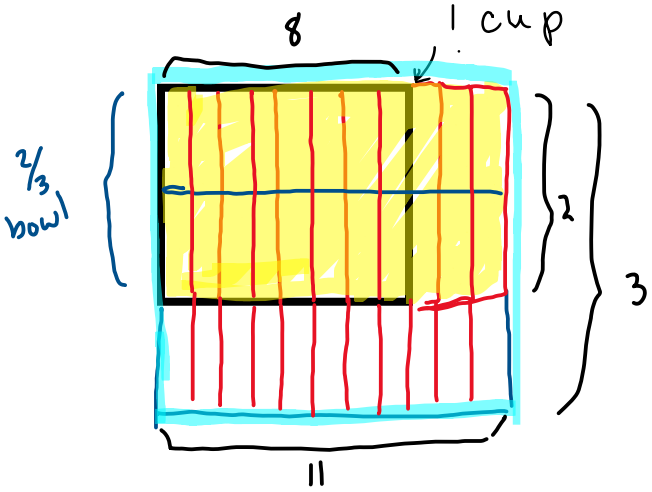
12. For the problem: $1\frac{3}{8} \div \frac{2}{3}$

a. Write a word problem
b. Show how to solve it with a diagram
c. Show how to solve it with a numerical algorithm
d. Explain how the diagram work matches the number work.

A partition division answer

I have 1 3/8 cups of ice cream. It fills my bowl 2/3 of the way full. How much ice cream can a full bowl hold?

1 3/8 is the amount I have. It fits evenly into 2/3 of a bowl (number of sets). How much is in 1 bowl (set)?



Amt total (distributed/shared)

1 (full) bowl

diagram solution: $\frac{11 \times 3}{8 \times 2}$ cups $= \frac{33}{16}$ cups

(amt in bowl; amt in cup)

numerical solution

$$1\frac{3}{8} \div \frac{2}{3} = \frac{11}{8} \div \frac{2}{3} = \frac{11}{8} \times \frac{3}{2} = \frac{11 \times 3}{8 \times 2} = \frac{33}{16}$$

(amt in bowl; amt in 1 cup)

show all of the $\frac{1}{8}$'s

The labels show how numbers and diagram match

12. For the problem: $1\frac{3}{8} \div \frac{2}{3}$

a. Write a word problem
b. Show how to solve it with a diagram
c. Show how to solve it with a numerical algorithm
d. Explain how the diagram work matches the number work.

A measurement division answer

I have 1 3/8 cups of sugar. I have sugar bowls that hold 2/3 cups of sugar. How many sugar bowls can I fill?

1 3/8 is the total amount I start with. I make groups of size 2/3. I want to know how many groups.