Test 2A - MTH 2010

Dr. Graham-Squire, Spring 2017

Name: Key

I pledge that I have neither given nor received any unauthorized assistance on this exam.

_____

(*signature*)

DIRECTIONS

1. Don't panic.
2. Show all of your work and use correct notation, even on multiple choice questions! A correct answer with insufficient work or incorrect notation will lose points.
3. Clearly indicate your answer by putting a box around it.
4. Calculators, cell phones and computers are not allowed on this test.
5. Make sure you sign the pledge.
6. Number of questions = 14. Total Points = 70.

1. (5 points)

(a) Is the following statement true or false? Explain why or why not. "A person who has two credit cards paid 50% of the first credit-card bill of \$648 and 45% of the second credit-card bill of \$352. The person paid 95% of the total \$1000 owed."

False! They would be paid overall less than 50% of 1000

b/c 50% of 648 = 324

+ 45% of 352 = 160 ← less than

= 484

↑ less than 500!

100% = 352

50% = 176

5% = 17.6

45% = less than 160

(b) A student calculates $4\frac{5}{7} \times 2\frac{1}{3} = (4 \times 2) + (\frac{5}{7} \times \frac{1}{3}) = 8\frac{5}{21}$. Is their answer correct? If not, what did the student do wrong?

Answer is wrong! They forgot middle terms of FOIL.

should be

$$4\tfrac{5}{7} \times 2\tfrac{1}{3} = \left(4 + \tfrac{5}{7}\right)\left(2 + \tfrac{1}{3}\right) = 4 \times 2 + 4 \times \tfrac{1}{3} + \tfrac{5}{7}(2) + \tfrac{5}{7} \cdot \tfrac{1}{3}$$

↑ They are missing these parts.

2. (5 points) To calculate $306 - 69$, a student writes the following equations:

$$69 + 1 = 70 + 30 = 100 + 200 = 300 + 6 = 306$$

$$1 + 30 = 31 + 200 = 231 + 6 = 237$$

and then says "so the answer is 237."

Which of the following statements is the most accurate regarding the student's work on this problem?

(A) The student got the wrong answer.

(B) The student got the correct answer, but their method was wrong and would not work for other subtraction problems.

(C) The student got the correct answer, and their method is correct, but their work includes incorrect equations.

(D) Everything the student did was correct.

2 9 16
306
- 69
237 ✓✓
Correct!

↳ "Adding up" method DOES work ✓✓✓

↳ 69+1 = ... = ... = 306 ← Not a true equation!

-1 if no such explanation.

3. (5 points) The HPU bookstore is having a 15% off sale on all items in the store, but you only get the sale price if you are dressed in purple. Bob dresses up in his finest purple suit and picks out 3 items that he wants at the bookstore, and when he purchases his items he notices that when the cashier rings up the purchases, she takes 15% off the total (before tax) rather than 15% off each item.

   (a) Will Bob get the same discount either way? Explain.

   (b) What property of mathematics is related to this situation? You can either name the property or use mathematical equations to show how the property fits this situation.

(a) Yes! ✓

$$15\%\,(A+B+C) = 15\%\,A + 15\%\,B + 15\%\,C$$

✓ ✓ ✓

15% off the total

15% off each item

(b) They are the same by the distributive property! ✓

+2 if they get (b) but say No on (a).

4. (5 points) A group of 15 friends is going trick or treating, each of them wearing a different costume. They realize that there is one house that has the best candy, though, so they decide to just go to that one house repeatedly. So that the owner of the house does not get wise to their trick, they decide to go in groups of two, each time changing the group of two. How many different groups of two costumed individuals can they get out of the 15 friends? Note that the group (Batman, Pirate) is the same as the group (Pirate, Batman), but is different from the group (Batman, Mermaid).

First costume has 15 possibilities

2nd costume has 14 (can't use same costume twice)

15×14

$= 210$

But need to divide by 2 b/c (B, P) = (P, B)

$\frac{210}{2} = \boxed{105}$

5. (5 points) (a) Use the fact that $10^A \times 10^B = 10^{A+B}$ for *all* numbers A and B to explain why the value of 10^0 is what it is. If you can't explain it that way, you can try to explain it another way, but you risk losing points if your explanation is not mathematically valid.

$10^0 \times 10^2 = 10^{0+2} = 10^2$

$\Rightarrow 10^0 \times 10^2 = 10^2$. Thus multiplying by 10^0 does not change the other number, so

$10^0 = 1$,

b/c mult. by 1 does not change any thing.

(b) Use the fact that $10^A \times 10^B = 10^{A+B}$ for *all* numbers A and B to explain why 10^{-1} must equal $\frac{1}{10}$ (or, equivalently, why 10^{-1} must equal division by 10).

$10^2 \times 10^{-1} = 10^1$, so $100 \times 10^{-1} = 10$

Thus multiplying by 10^{-1} is like "chopping off a zero", which is the same as dividing by 10 (or multiplying by $\frac{1}{10}$)

6. (5 points) Given that 22 pounds is approximately equal to 10 kilograms, which of the following expressions models a way to find approximately how many pounds are equivalent to 330 kilograms?

(A) $330 \times \left(\frac{22}{10}\right)$

(B) $(22 - 10) \times 330$

(C) $330 \times \left(\frac{10}{22}\right)$

(D) $(330 - 22) \times 10$

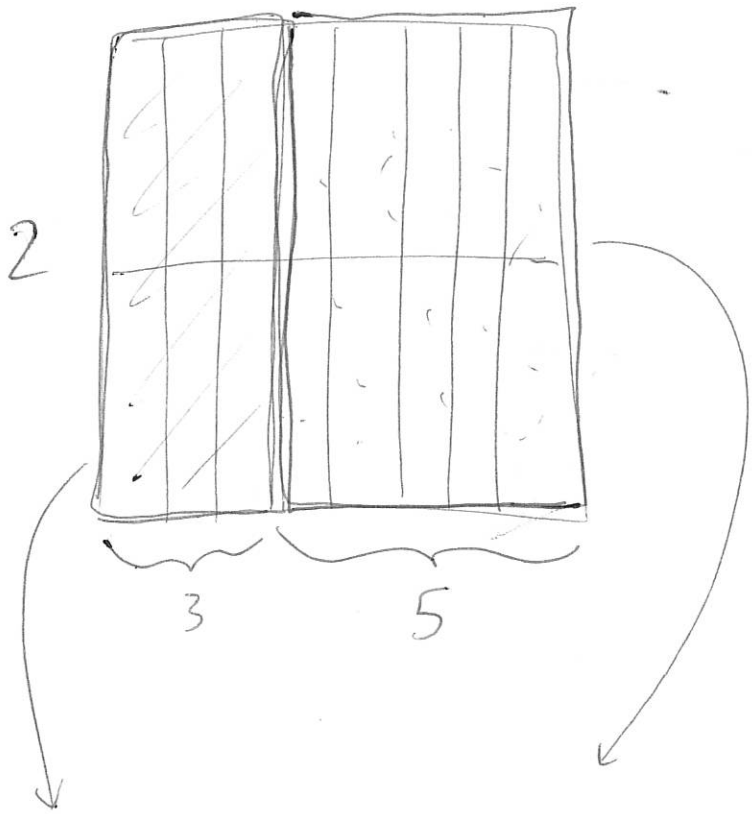
$\frac{330}{10} = 33$ groups of 10 kg

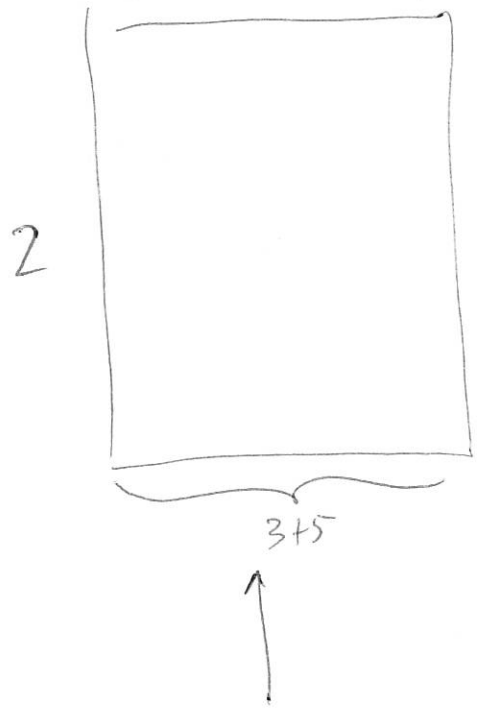
$\Rightarrow 33 \times 22 =$ total pounds.

So must do $\frac{330}{10} \times 22$

or $330\left(\frac{22}{10}\right)$

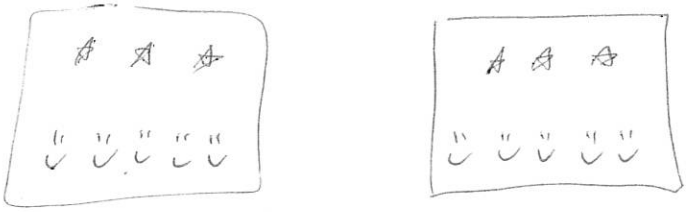
7. (5 points) Use an array or a diagram to explain why $2 \times (3+5) = 2 \times 3 + 2 \times 5$. Note that you *cannot* just say that it is true by the distributive property!





$2\times3 + 2\times5$ is same as $2\times(3+5)$ b/c same array.

or



is 2 boxes of 8 (=3+5) things is $2\times(3+5)$

or 2 groups of 3 stars and 2 groups of 5 ☺ same

$2\times3 + 2\times5$

8. (5 points) Dominic has a tub filled with $1\frac{3}{4}$ yd^3 of water. He removes one-third of the water in the tub to give to his friend Iris, and then he adds $\frac{1}{6}$ yd^3 of new water to the tub. How much water is in the tub now? Show your work! A diagram may help your explanation, but is not necessary.

(a) $1\frac{3}{4} - \frac{1}{3}\left(1\frac{3}{4}\right) + \frac{1}{6}$

Starts with; removes; $\frac{1}{3}$ of; water in tub; adds; cubic yard of water

$= \frac{7}{4} - \frac{1}{3}\left(\frac{7}{4}\right) + \frac{1}{6}$

$= \frac{7}{4} - \frac{7}{12} + \frac{1}{6}$ (3x, 3x, x2, x2)

$= \frac{21}{12} - \frac{7}{12} + \frac{2}{12} = \frac{16}{12} = \frac{4}{3}$ yd^3 of water

9. (5 points) A student has to multiply $3,257.2 \times 18.371$, and they come up with 598,380.212 as the answer. You can see from their work that they multiplied the numbers 32572 and 18371 correctly, but their overall answer is still wrong.

   (a) Use estimation to explain to the student why their answer could not be correct.

   (b) Explain to the student what the correct answer is, and how they should have gotten it.

(a) $3,257.2 \times 18.371 \approx 3000 \times 20 = 60,000$,

so there answer should be close to 60,000.

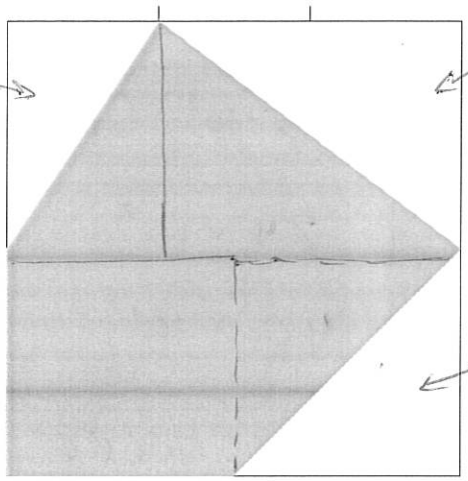
Correct is 59,838.0212

(b) should have added the decimal places in the orig. problem (4), then moved decimal 4 places at the end

598380.212

Correct is 59,838.0212

10. (5 points) Calculate what fraction of the square is shaded. You can assume that lengths that look the same are the same. Show/explain your work!



$\frac{1}{2}$ of $\frac{2}{6}$ = $\frac{1}{6}$

$\frac{1}{2}$ of $\frac{1}{6}$ = $\frac{1}{12}$

$\frac{1}{2}$ of $\frac{1}{4}$ = $\frac{1}{8}$

Shaded is $1 - \left(\frac{1}{12} + \frac{1}{6} + \frac{1}{8}\right)$

$= 1 - \left(\frac{2}{24} + \frac{4}{24} + \frac{3}{8}\right)$

$= 1 - \left(\frac{9}{24}\right)$

$= \frac{24}{24} - \frac{9}{24} = \boxed{\frac{15}{24}}$

11. (5 points) Consider the expression below. Choose the answer below that most closely approximates the value of the expression.

$$\frac{(3,134)(7.7 \times 10^5)}{(487)(8.162 \times 10^{-1})}$$

(A) 6,000

(B) 60,000

(C) 600,000

(D) 6,000,000

$$\approx \frac{(3 \times 10^3)(8 \times 10^5)}{(5 \times 10^2)(8 \times 10^{-1})}$$

$$= \frac{24 \times 10^8}{40 \times 10^1}$$

$$= \frac{24000000\cancel{0}}{400}$$

$$= 6,000,000$$

12. (5 points) Consider the following problem: "After driving 180 miles, a family had completed $\frac{5}{8}$ of their trip. How many *more* miles must they drive to complete their entire trip?"

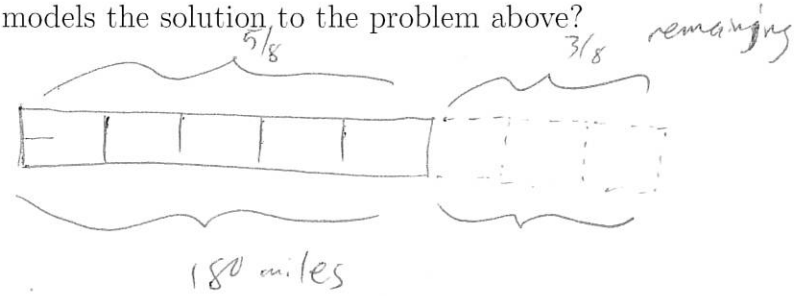
Which of the following expressions models the solution to the problem above?

(A) $\frac{3}{8}(180)$

(B) $\frac{3}{5}(180)$

(C) $\frac{8}{3}(180)$

(D) $\frac{5}{3}(180)$

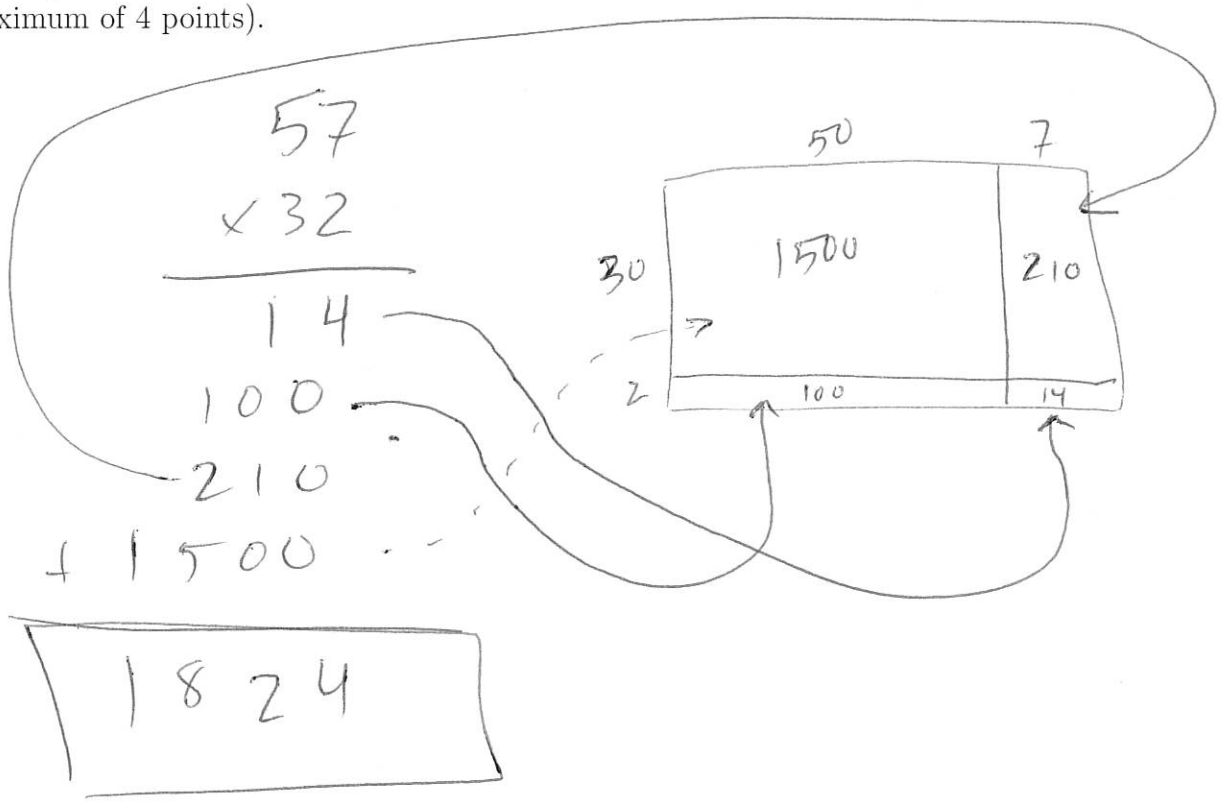


$\frac{180}{5} = 36$ ⇒ each box is 36 miles

have $3 \times 36 = 108$ miles left.

This is $\left(\frac{180}{5}\right)3 = 180\left(\frac{3}{5}\right)$

13. (5 points) Use the partial products algorithm to multiply 57×32. Show how the parts of the partial products method relate to either an array or to pieces that come from the distributive property. (If you can't figure it out using the partial products algorithm, you can do the same with the standard algorithm, but you will only receive a maximum of 4 points).



or $(50+7)(30+2)$

$= 50\times30 + 50\times2 + 7\times30 + 7\times2$

$= 1500 + 100 + 210 + 14$

14. (5 points) Adelaide and Evie want to be as tall as their dad, Alex, who is 6 foot 5 inches tall. Adding up their own individual heights to see if they will be tall enough if one of them stands on the other's head, they do the following calculation:

$$\begin{array}{rrrrr} & 1 & & 6 & \\ & 3 & \text{ft} & 9 & \text{in} \\ + & 2 & \text{ft} & 7 & \text{in} \\ \hline & 6 & \text{ft} & 6 & \text{in} \end{array}$$

and conclude that together they will be taller than their dad! Are they right? If so, explain why the calculation makes sense. If not, explain what the correct calculation should be, and whether or not they will actually end up taller than Alex.

They are so wrong. They thought they were in base 10, but there are 12 inches in a foot!

Should be 5 feet and 16 inches = 6 feet, 4 in

12 in 4 in

or

$$\begin{array}{rrrrr} & 1 & & 6 & \\ & 3 & & 9 & \\ & 2 & & 7 & \\ \hline & 6 & \text{ft} & 4 & \text{in} \end{array}$$

They are not taller than Alex.

Extra Credit(2 points) Quincy says that adding fractions is easy, because you just add the numerators together and the denominators together. For example, he says, "Yesterday I went to 2 of my three classes. Today I went to 4 of my 5 classes. Over the two days, then, I went to 6 out of 8 classes, and I would show how to add the fractions by doing:"

$$\frac{2}{3}+\frac{4}{5}=\frac{2+4}{3+5}=\frac{6}{8}$$

Is Quincy correct? If not, what is wrong with his calculations or his reasoning? You can answer on the back if you need more room.

Quincy has a correct calculation of $\frac{6}{8}$, but his work looks incorrect b/c writing fraction addition assumes the same whole (which is why you need common denominators), and his wholes are different (1 day vs. 2 days).