

MATH 313
EXAM 2

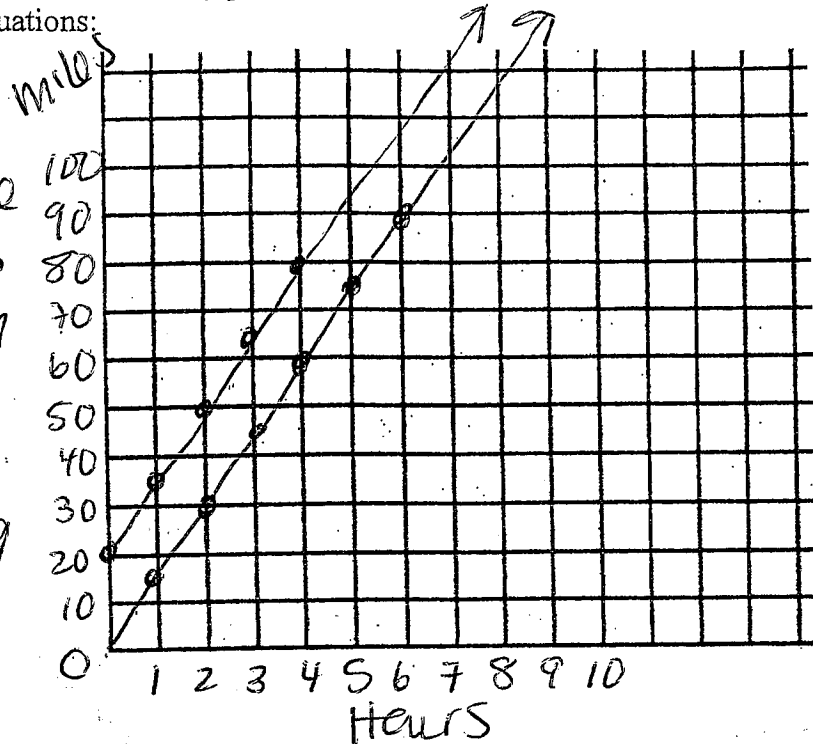
Name Key

Follow all directions. Use complete sentences for explanations. Point values are indicated.

1. (6 points) Graph the pair of equations and write a story problem of a situation that could be represented by the pair of equations:

$D = 15T$
 $D = 15T + 20$

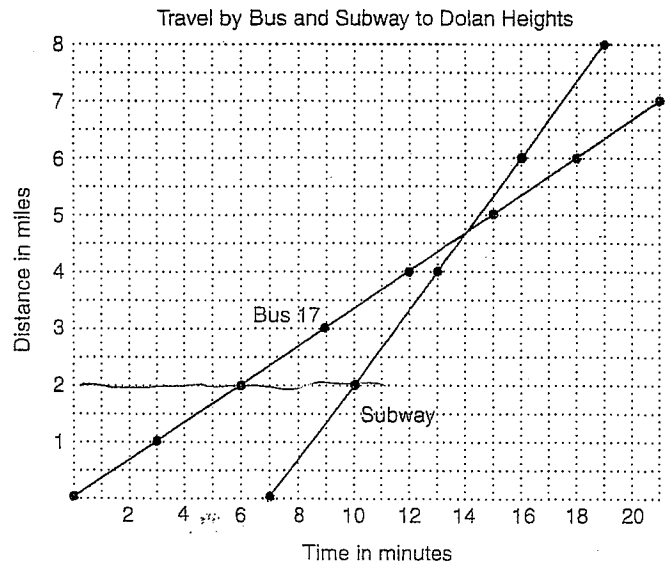
Tami & Tom both ride their bikes at 15 mph. Tom lives 20 miles from Tami. They leave their homes at the same time traveling the same direction



2. (6 points) Students at City High School who live in the direction of Dolan Heights can take either Bus 17 or the Subway to get home. The bus leaves when school is over and travels 1 mile every 3 minutes. The subway leaves 7 minutes later and every 3 minutes travels 2 miles. Use this information and the graph below to answer the questions.

- a. If a student lived 2 miles from school, which would be faster? **Bus**
- b. If a student lived 4 miles from school, which would be faster? **Bus**
- c. If a student lived 6 miles from school, which would be faster?

subway



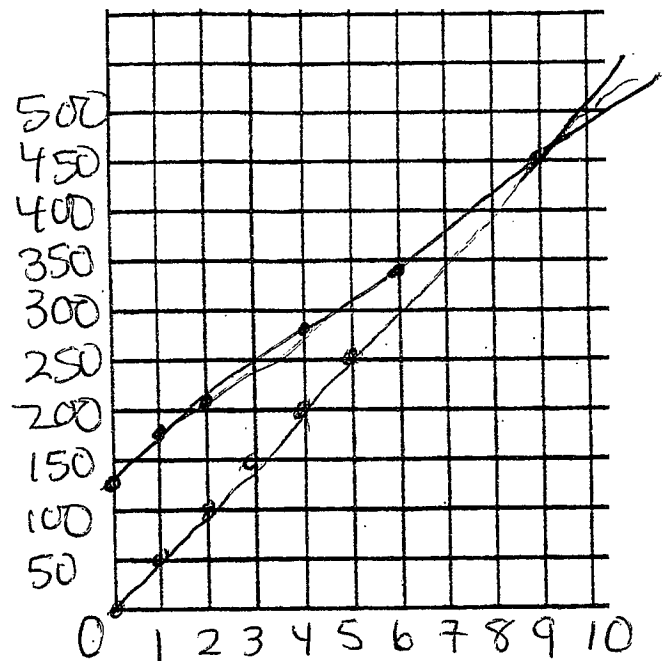
3. (14 points) Solve the following in **3 different** ways from the choices below.
 Two Girl Scout Troupes are competing in a cookie sale. Troupe A can sell an average of 50 boxes per day, and Troupe B can sell an average of 35 boxes per day. However Troupe B won a contest and gets to start selling early, in which they sell 135 boxes. If the sale lasts 2 weeks (14 days) from when Troupe A begins sales, who will win?

ANSWER: Troupe A WILL / WILL NOT catch up to Troupe B before the end of 2 weeks. If Troupe A will catch up, it takes 9 days after start of the sale, and there are 450 boxes sold. If Troupe A will not catch up, they are ~~X~~ boxes behind.

a) Create a table

# of days	Total boxes for Troupe A	Total boxes for Troupe B
0	0	135
1	50	170
2	100	205
4	200	275
6	300	345
8	400	415
9	450	450

b) Make a graph. Label everything.



c) Use algebra

Let B = # of boxes of cookies sold
 Let T = # of days (time)

$$A \Rightarrow B = 50T$$

$$B \Rightarrow B = 35T + 135$$

$$50T = 35T + 135$$

$$15T = 135$$

$$T = 9$$

$$B = 50(9) = 450$$

d) Quantitative reasoning

catch up by 15 boxes per day, need to catch up 135 boxes

$$135 \div 15 = 9 \text{ days}$$

4. (12 points) Dave and Brenda were Mountain Biking at Mammoth Mountain. Brenda is a faster biker than Dave, so Brenda always gives Dave a head start. It takes Dave 33 minutes to bike down the mountain and it takes Brenda 30 minutes to get down. Brenda gives Dave a $4\frac{1}{2}$ -minute head start. **State all fractions in SIMPLEST FORM.**

- a. Will Brenda catch up with Dave before he reaches the bottom of the hill? Circle the correct answer. Use any method to solve, but show all work and/or explain how you obtained your answer.

Brenda will will not catch Dave before the bottom of the hill.

Brenda takes 3 less minutes so if she gives a $4\frac{1}{2}$ min. head start, it is too much

- b. If Brenda catches Dave, state the exact time she catches him, if not, tell how much of the trip she has traveled when he finishes.

Brenda will catch Dave after _____ minutes OR

Brenda will finish $\frac{19}{20}$ (fraction) of the trip when Dave finishes.

$$28.5/30 = 57/60 = 19/20$$

- c. By how much is Brenda catching up each minute (what is the difference in their rates)?

Brenda's rate is $\frac{1}{30}$ (fraction) of the race finished each minute.

Dave's rate is $\frac{1}{33}$ (fraction) of the race finished each minute.

The difference in Brenda and Dave's rates is $\frac{1}{330}$.

$$\frac{33}{990} - \frac{30}{990} = \frac{3}{990} = \frac{1}{330}$$

- d. How much of a head start can Brenda give Dave so that they will reach the bottom at the same time?

Brenda can give Dave a 3 minute head start and they will reach the bottom at the same time.

5. (20 points) Wiley Coyote and Smiley Coyote are racing. Wiley Coyote can run at 16 mph and Smiley can run at 24 mph, so he gives Wiley a 12 mile head start.

a. Write an equation for Smiley's distance (D_s) in terms of time (t) since he started.

$$D_s = \underline{24T}$$

b. Write an equation for Wiley's distance (D_w) in terms of time (t) since Smiley started.

$$D_w = \underline{16T + 12}$$

c. How many hours will Smiley have run when he catches Wiley?

Smiley will have run 1 1/2 hours.

Show all work.

$$\begin{aligned} 16T + 12 &= 24T \\ 12 &= 8T \\ T &= 12/8 = 1\frac{1}{2} \end{aligned}$$

d. How many hours will Wiley have run when Smiley catches up to him?

Wiley will have run 3/4 hours.

$$\frac{12}{16} = \frac{3}{4} \text{ hour head start}$$

e. How far will each of them have run when Smiley catches Wiley?

They will each have run 36 miles when Smiley catches up.

6. (6 points) Wiley Coyote ran for 45 miles at 10 mph and then walked back at 3 mph. What was his average speed for the trip? Show all work. **Round answer to nearest tenth.**

Overall Average Speed = 4.6

$$\begin{array}{r} 45 \div 10 = 4.5 \\ 45 \div 3 = 15 \\ \hline 19.5 \end{array}$$

$$\begin{array}{r} \text{Distance} \\ 45 + 45 = 90 \end{array}$$

$$90 \div 19.5 = 4.6$$

joined.

7. (12 points) A chicken and a squirrel joined the turtle and rabbit in Over and Back. The run a total of 600 ft. Over and Back, with the known times and rates shown below.

Chicken		→ 3.5sec. for the first 100 ft. over, 6 sec. for the next 200 ft. over		300 ft.	$9.5 + 4 = 13.5$
		← 75 feet per second back			$300 \div 75$
Squirrel		→ 40 feet per second over		300 ft.	$7.5 + 5 = 12.5$
		← 5 seconds back			$300 \div 40$
Turtle		→ 50 feet per second over		300 ft.	$6 + 7\frac{1}{2} = 13.5$
		← 7 1/2 seconds back			$300 \div 50$
Rabbit		?		300 ft.	
		?			

- a. Going the same speed over and back, the rabbit tied for 1st place. What was rabbit's speed? Show all work.

Fastest 12.5 sec.

$$\frac{600}{12.5} = 48 \text{ ft/sec}$$

- b. Who came in second, third and fourth? Indicate ties if any. No further explanation needed.

First: tie Second: Squirrel Third: Chicken Fourth: Rabbit
tie tie

- c. Assuming the speed for Rabbit in part a above, at the halfway point of the race (300 ft.), what was the order of the animals? Indicate ties if any. No further explanation needed.

First: Turtle Second: Rabbit Third: Squirrel Fourth: Chicken

8. (6 points) Teresa worked the breakfast shift at a restaurant in the morning from 6 am to 1pm and earned \$9 per hour plus \$59 in tips. She also worked for a caterer in the evening from 5pm to 10pm and earned \$100. If she had worked the same number of hours at a job that paid a constant wage, what would she have earned per hour? Show all work.

Average wage = $\frac{\$1850}{12}$

$$\frac{\text{total money}}{\text{total hours}} = \frac{9(7) + 59 + 100}{12} = \frac{222}{12}$$

9. (4 points) Use numerical calculation (in expanded form) to inform the algebraic one. Give the answers for both.

$$\begin{array}{r} 457 \quad 4 \cdot 10^2 + 5 \cdot 10 + 7 \\ +98 \quad \quad 9 \cdot 10 + 8 \\ \hline 4 \cdot 10^2 + 14 \cdot 10 + 15 \end{array}$$

$$\begin{array}{r} 4x^2 + 5x + 7 \\ +9x + 8 \\ \hline 4x^2 + 14x + 15 \end{array}$$

10. (6 points) Calculate the **sum** and **product** of the following polynomials:

(1) $5x^2 - 2x + 9$

(2) $3x + 5$

a. (1) + (2) = $\frac{5x^2 + x + 14}{}$

b. (1) X (2) = $\frac{15x^3 + 19x^2 + 17x + 45}{}$

Show your work.

$$\begin{array}{r} 5x^2 - 2x + 9 \\ \times \quad 3x + 5 \\ \hline \end{array}$$

$$\begin{array}{r} 15x^3 \quad 25x^2 - 10x + 45 \\ - 6x^2 + 27x \\ \hline 15x^3 + 19x^2 + 17x + 45 \end{array}$$

11. (8 points) Identify the correct letter for the property that is illustrated below.

Example	Property
<u>A</u> $\frac{0}{14} + \frac{27}{28} = \frac{27}{28}$	A. additive identity
<u>G</u> $8(n + 8) = 8n + 64$	B. multiplicative identity
<u>E</u> $4 + 7 = 7 + 4$	C. associative property of addition
<u>D</u> $(42 \times 86) \times 14 = 42 \times (86 \times 14)$	D. associative property of multiplication
	E. commutative property of addition
	F. commutative property of multiplication
	G. distributive property