7ᵗʰ Grade Assignment – Week #30

<u>Group Assignments</u>:

For Tuesday:

- Work together on **Rates – Sheet #5**, problem #10. This is a great challenge problem!
- If you have extra time, then do problems #7 and #8 from **Rates – Sheet #5**

For Thursday:

- Do **Square Root Algorithm – Sheet #4** – see how many problems you can do from #2 (at the bottom of the page).

<u>Individual Work</u>

- Do as much as you can with **Rates – Sheet #4**, problems #1-6.
- Do **Geometry – Sheet #4**, problems #1 and #2.
- If you have extra time, and would like an extra challenge, then do some of the problems #7-13 on **Rates Sheet #4.**

Rates – Sheet #4

1) How long does it take to cycle 68 miles at 12 mph?

2) At 28 mph, how far does someone travel…

  a) In 10 hours?

  b) In 5½ hours?

  c) In 2 hours and 24 minutes?

3) Doris leaves her house at 8:25am to cycle to Tina's house, which is 27 miles away. At what time does she arrive if she cycles at a rate of 12 mph?

4) Bill traveled 16 miles to Jeff's house at 4 mph and then did the return trip at 16 mph. What was the average speed for the trip?

5) Pete's car has a 12-gallon gas tank and gets 34 mpg.

  a) How much gas does Pete need to drive 400 miles?

  b) Pete is going to drive from New York City to San Francisco, which is about 2900 miles. What is the least number of times that he will need to stop and refill his gas tank during the trip? (Assume that he starts with a full tank.)

6) Matt went 36 miles in the first hour, 47 miles in the second hour, and 45 miles in the third hour. What was his average speed for the trip?

7) *Challenge!* Janet leaves home at 10:15am, jogging at 8 mph. At what time, and how far from home, will Sue catch her, if she leaves the same house at 10:35am biking at 18 mph?

8) Sally jogged at 4 mph for 4 hours, and then biked at an average rate of 16 mph for an hour. What was the average speed for the five hours?

9) The previous problem is the same as what other problem on this sheet?

10) Alice biked up a gradual 20-mile uphill road at 5 mph, and then came down at 15 mph. What was her average speed for the whole trip?

11) Kelly is training for a running race. She is trying to improve how far she can run in one hour. (Circle the correct answers.)
   a) If she increases her average speed, then the distance that she runs in one hour will
   increase
   decrease?

   b) Therefore, we can say that speed and distance are
   directly proportional
   inversely proportional?

   c) If she ran $^7/_8$ as fast today as she did yesterday, then in one hour today she went
   $^7/_8$ *as far,*
   $^8/_7$ *as far,*
   as yesterday?

12) Jake is biking to Pete's house. (Circle the correct answers.)
   a) If Jake increases his speed, then his time for the trip *increases decreases*?

   b) Therefore, we can say that speed and time are
   directly proportional
   inversely proportional?

   c) If he biked $^7/_8$ as fast today as he did yesterday, then the time it takes Jake to get to Pete's house today is
   $^7/_8$ *as long,*
   $^8/_7$ *as long,*
   as yesterday?

13) Frank is traveling on a train that is going a steady speed. (Circle the correct answers.)
   a) If he increases the amount of time that he stays on the train, then the distance he will travel
   increases
   decreases?

   b) Therefore, we can say that distance and time are
   directly proportional
   inversely proportional?

   c) If Frank sat on the train today for $^7/_8$ as long as yesterday, then today he went
   $^7/_8$ *as far,*
   $^8/_7$ *as far,*
   as yesterday?

Mental Math
14) Cross multiply.
$$\begin{array}{r} 46 \\ \times\ 35 \\ \hline \end{array}$$

15) $8 \cdot 59 =$

16) $25 \cdot 31 =$

17) $260 \cdot 15 =$

18) $240 \div 25 =$

19) $12 \cdot 39 =$

20) $140 \div 5 =$

21) 15% of $46 =$

Review
22) What is 83⅓% of 420?

23) What is 160% of 55?

24) 8 is what percent of 40?

25) 32 is what percent of 40?

26) 9 is 6% of what number?

27) 12 is 66⅔% of what number?

Rates − Sheet #5

1) How far do you walk in 4 hours and 15 minutes at a rate of 2½ mph?

2) Denise works an average of 7 hours per day and 22 days per month at an hourly wage of $24/hr.
   a) How much does she earn in a month?

   b) How long does it take her to earn $200?

   c) How long does it take her to earn $10,000?

3) Jake works 40 hours per week and 40 weeks per year, and has a salary of $38,000/year. What does he earn per hour?

4) Crystal bikes 20 miles to Kate's house in just one hour. On the way back home it takes her 2½ hours. What is her average speed…
   a) Getting to Kate's house?

   b) Returning home?

   c) For the whole trip?

5) **Average Speed.** For each problem, don't calculate a value; simply indicate whether the average speed is *less than*, *equal to*, or *greater than* 8mph.
   a) Bob ran 10 miles in the first hour, and then 6 miles in the second hour.

   b) Benny ran from home to the river at 10mph and then ran back at 6mph.

6) What does it mean to say that…
   a) Speed and time are *inversely proportional*?

   b) Speed and distance are *directly proportional*?

7) Sam drove 300 miles in 5 hours yesterday, which is an average of 60 mph.
   a) If he drives the same speed today, then how far will he travel if he drives for $^5/_6$ as much time?

   b) If he drives the same speed today, then how far will he travel if he drives for $^6/_5$ as much time?

   c) If he drives $^5/_6$ as fast today, then how long will it take him to travel 300 miles?

   d) If he drives $^6/_5$ as fast today, then how long will it take him to travel 300 miles?

8) Bill measured that he went 280 miles on the highway in 4 hours and 15 minutes, and used 6.2 gallons of gas. Round each answer to three significant digits.

a) What was his average speed?

b) If he had gone the same distance at ¾ the speed, then how long would it have taken him?

c) If he had driven at the same speed (as found in part a), but for ¾ the amount of time, then how far would he have gone?

d) What was the fuel efficiency (in mpg) of his car for his original trip?

e) Around town, his car gets ⅔ the fuel efficiency as on the highway. How much gas would be needed to drive the same distance (280 miles) in town?

9) Jill went from her house to Mary's house (45 miles away) at 30 mph, and then returned at twice that speed. What was her average speed for going round trip?

10) *Challenge!* A train leaves Bigtown at 70 mph toward Smallville (545 miles away) at 1:20pm. At 1:50pm, another train leaves Smallville, heading for Bigtown, at 50 mph. At what time, and how far from Bigtown, do they pass one another?

Mental Math

11) $70 \cdot 890 =$

12) $81^2 =$

13) $135 \div 45 =$

14) $12 \cdot 999 =$

15) $3200 \div 2400 =$

16) $107^2 =$

17) $220 \cdot 45 =$

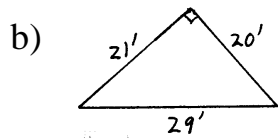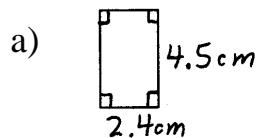18) $2027 - 1989 =$

Review

19) 128 fl.oz. = _____ qt

20) 4¼ mi = _____ ft

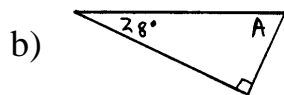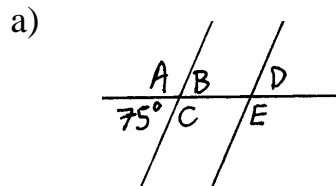21) How much do you have to pay for a jacket marked at $280 if there is a 4.3% tax rate?

22) Lenny paid $319.50 for a bike marked at $300.00. What was the percentage tax rate?

Geometry – Sheet #4

1) Find the area and perimeter.

a)

4.5 cm

2.4 cm

b)

21'   20'

29'

2) Find each variable.

a)

A / B   / D

75° / C   / E

b)

28°   A

3) **Using Pythagoras's formula to find Pythagorean triples.**

A Pythagorean triple is a special right triangle where all three sides (X, Y, and Z) have lengths that are whole numbers. Pythagoras's formula is:

$$X = 2n + 1$$
$$Y = 2n^2 + 2n$$
$$Z = 2n^2 + 2n + 1$$

The table below shows different Pythagorean triples by choosing different values for n. Fill in the table by using the formulas given above.

n	X	Y	Z
1			
2			
3			
4			
5			
6			

4) Using the Arabian formula to find Pythagorean triples.

The Arabian formula is
(where $u > v$):

$$X = u^2 - v^2$$
$$Y = 2uv$$
$$Z = u^2 + v^2$$

The table below shows different Pythagorean triples by choosing different values for u and v. Fill in the table by using the formulas given above.

u	v	X	Y	Z
2	1			
4	1			
6	1			
8	1			
3	2			
5	2			
7	2			
9	2			
4	3			
8	3			
5	4			
7	4			
9	4			
6	5			
8	5			
7	6			

1) Calculate each square root using the *Long Algebraic Method*, using the method shown on the previous worksheet. (All answers work out exactly.)

  a) $\sqrt{2025}$ b) $\sqrt{361}$ c) $\sqrt{7056}$ d) $\sqrt{4356}$

The Long Algebraic Method (for larger answers)

- For square roots that have answers with more than two digits, we need to do the same procedure as above, but repeat the process a number of times.
- Keep in mind that the a values are the digits that we are certain of at a given point, and the b values are the digits that we are trying to figure out.
- **Notation:** a_1 means the value of a (with one correct digit) for the first time through the process.
  a_2 means the value of a (with two correct digits) for the second time through the process.
  a_3 means the value of a (with three correct digit) for the third time through the process.
  The values of b are similarly given as b_1 , b_2 , b_3 , etc.

Example: Calculate $\sqrt{7203856}$.

Step #1 We know the answer has 4 digits, and the first digit is 2 (because $\sqrt{7}$ is between 2 and 3), so $a_1 = 2000$, and we use the identity $n-a_1^2 = b_1(2a_1 + b_1)$, where $2a_1 = 4000$.

  n   7203856
  a_1^2 $- 4000000$ (because $2000^2 = 4000000$)
  $n-a_1^2$ 3203856 $= b_1(4000 + b_1)$, where b_1 is the 100's place (e.g. 300, 400, etc.)

  $\underline{b_1 = 600}$ because 700 is too big,
  which means $b_1(2a_1 + b_1) = 2760000$

Step #2 We now know that the first two digits are 2 and 6, so $a_2 = 2600$, and we use the identity $n-a_2^2 = b_2(2a_2 + b_2)$, where $2a_2 = 5200$.

  n   7203856
  a_2^2 $- 6760000$ (because $2600^2 = 6760000$)
  $n-a_2^2$ 443856 $= b_2(5200 + b_2)$, where b_2 is the tens' place (e.g. 30, 40, etc.)

  $\underline{b_2 = 80}$ because 90 is too big,
  which means $b_2(2a_2 + b_2) = 422400$

Step #3 We now know that the first three digits are 2, 6, and 8, so $a_3 = 2680$, and we use the identity $n-a_3^2 = b_3(2a_3 + b_3)$, where $2a_3 = 5360$.

  n   7203856
  a_3^2 $- 7182400$ (because $2680^2 = 7182400$)
  $n-a_3^2$ 21456 $= b_3(5360 + b_3)$, where b_3 is the ones' place (e.g. 3, 4, etc.)

  $\underline{b_3 = 4}$, which means $b_3(2a_3 + b_3) = 21456$,

  which means that our final answer is *exactly* **2684**.

2) Calculate each square root using the Long Algebraic Method. It is important that you do the problem and organize your work exactly like the example given above. (All answers work out exactly.)

  a) $\sqrt{285156}$ b) $\sqrt{71289}$ c) $\sqrt{524176}$ d) $\sqrt{767376}$