7th Grade Assignment – Week #27

Note for Parents:

I have decided to do each of the remaining units in the workbook – as much as time allows. These units are:

1. *Rates*
2. *Geometry*
3. *The Square Root Algorithm*

Now that we have finished our work with ratios, I believe that the above three topics can be best done somewhat simultaneously as we approach the end of the year. The *Rates* and *Geometry* units should be fairly straightforward. In contrast, the *Square Root Algorithm* unit is quite a challenge, so I am trying to work with this unit over a longer period of time than I typically do, hoping that this will make it more manageable for the students.

Group Assignments:

For Tuesday:

- Do **Square Root Algorithm – Sheet #2**: problems #1, 2, 5
- (If you have extra time) *Domino Puzzle!* A single domino has two parts, each of which contains between zero and six "dice dots". Two possible dominos are shown here.

  1) How many possible different dominoes are there in a complete set?
  2) If you toss out all doubles and dominos with a blank, how many different dominos are there?
  3) Without using any doubles or blanks, we will now consider each domino as a fraction. The domino 6-5 can then be used as the fraction $^5/_6$ or $^6/_5$. Your task is to select five dominos that can be added together for a sum of 2½. See how many different solutions you can discover!
  4) As with #3, we will use the dominos to add fractions. This time, divide the 15 dominos into three groups of five such that each group of five dominos add together (as fractions) to 10.

For Thursday:

- Do **Geometry – Sheet #1**: problems #1-6, 19
- (If you have extra time) *The Locker Puzzle!* Lockers in a row are numbered 1 through 300. To begin with, all of the lockers are closed, until someone comes by and opens each one. Then someone else closes every other locker, starting with locker #2. Another person then walks by and "changes the state" (i.e., closes a locker if it is open or opens a locker if it is closed) of every third locker, starting with locker #3. Then another person changes the state of every fourth locker, starting with #4, etc. This process continues until a final person changes the state of only locker #300. The question is: which lockers are left open at the end of the whole process? You should also give an explanation for your result.

Individual Work

- Do as much as you can with **Rates – Sheet #1**.
- Finish any of the group assignment problems (above) that you didn't get to in your group meeting.

Rates – Sheet #1

1) A train travels 300 miles in 6 hours. What is its average speed?

2) Bill takes 5 hours to drive 230 miles. What is his average speed?

3) Jean takes 3 hours and 45 minutes to drive 225 miles. What is her average speed?

4) How much money does Kevin earn in two weeks, if he works 36 hours per week at $12.50/hr?

5) How long does it take Mary to cycle 48 miles at 12 mph?

6) How long does it take a plane to fly 1800 miles at 540 mph?

7) What is Kate's hourly wage if she earns $345.60 for 32 hours of work?

8) Sophia works 4 hours per day, 6 days per week. If she earns $204 dollars per week, then what is her hourly wage?

9) How much does Morgan earn if he baby-sits from 6:15pm to 9:45pm and charges $3.50/hr?

10) Comparing speed.

a) Ken is traveling at 50mph. What does this mean?

b) Henry is traveling at 60km/h. What does this mean?

c) Wilbur is traveling at 30 m/s. What does this mean?

d) Making a good guess, and without doing any calculations, rank Ken, Henry, and Wilbur from fastest to slowest.

Mental Math

11) Cross multiply.

a) 85
x 61

b) 73
x 43

12) $15 \cdot 41 =$

13) $35 \cdot 45 =$

14) $2345 \div 9999 =$

15) $105 \cdot 106 =$

16) $180 \div 4 =$

17) $813 - 297 =$

Review

18) 42 in = _____ft

19) 0.82 g = _____mg

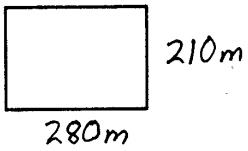
20) 12 qt = _____gal

21) 45 mm = _____cm

22) 8 gal = _____pt

23) 3.9 ℓ = _____mℓ

24) Write the four ways to express the ratio of this rectangle's dimensions.



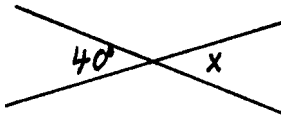
25) 240 up to 300 is what percentage increase?

26) 300 down to 240 is what percentage decrease?

27) Calculate $\sqrt{3844}$
(Hint: The answer is a whole number.)

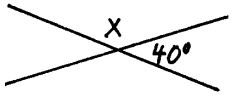
Geometry – Sheet #1

1) a) Find X.



b) The two labeled angles above are _____ angles.

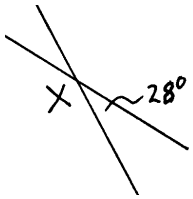
2) a) Find X.



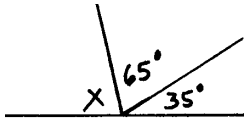
b) The two labeled angles above are _____ angles.

3) Find X.

a)

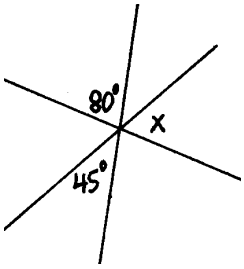


b)

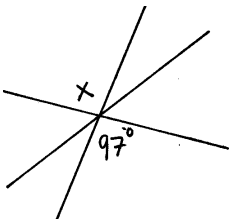


4) Find X.

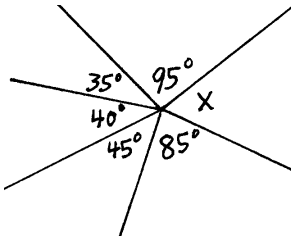
a)



b)

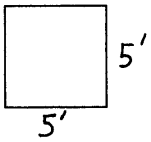


c)



5) Find the area of each square.

a)



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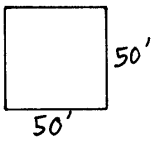

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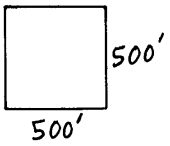
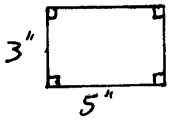
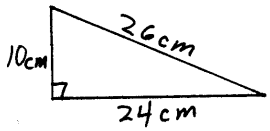


6) Find the area and perimeter.

a)



b)



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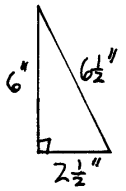


Mental Math

7) Cross multiply.

$$\begin{array}{r} 63 \\ \times\ 95 \\ \hline \end{array}$$

8) $36 \cdot 5 =$

9) $48000 \cdot 25 =$

10) $947 \div 999 =$

11) $51^2 =$

12) $35 \cdot 22 =$

13) $800 \div 25 =$

14) $21^2 =$

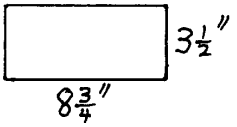
Review

15) 0.0003 kg = _____g

16) 60 in = _____yd

17) 0.562 m = _____cm

18) Write the four ways to express the ratio of this rectangle's dimensions.



19) The ratio in a circle.

a) Give each of the four ratios in a circle.

b) Find the circumference of a circle that has a diameter of 5m.

c) Find the circumference of a circle that has a diameter of 14ft.

d) Find the diameter of a circle that has a circumference of 14".

e) Find the diameter of a circle that has a circumference of 220ft.

20) The ratio in a square.

a) Give each of the four ratios in a square.

b) Find the length of the diagonal of a square that has a 45ft side.

c) Find the length of the diagonal of a square that has a 32ft side.

d) Find the length of the side of a square that has a 77ft diagonal.

e) Find the length of the side of a square that has a 32ft diagonal.

$\sqrt{\ }$ Algorithm – Sheet #2

1) Calculate.
   a) $\sqrt{16000000}$
   b) $\sqrt{90000}$
   c) $\sqrt{1210000}$
   d) 600^2
   e) 15000^2

2) *For each of the below problems*, state the number of digits that the answer will have (before the decimal point), and state what the first digit will be.

Do not calculate the square root exactly.

Example: $\sqrt{467856}$

Solution: $\sqrt{467856}$ has 3 digits and the first digit is 6.

Note: It turns out that $\sqrt{467856}$ is equal to 684 (which you don't have to calculate).

   a) $\sqrt{2601}$ has ___ digits; The first digit is ___.
   b) $\sqrt{537289}$ has ___ digits; The first digit is ___.
   c) $\sqrt{1369}$ has ___ digits; The first digit is ___.
   d) $\sqrt{79524}$ has ___ digits; The first digit is ___.
   e) $\sqrt{74390625}$ has ___digits; The first digit is ___.
   f) $\sqrt{88209}$ has ___ digits; The first digit is ___.

3) Using formulas.

Galileo's Law of Falling Bodies.

$$D = 16 \cdot T^2$$

This formula tells us something about dropping rocks off cliffs. Specifically, it calculates how many feet the rock will fall (D) after being in the air for T seconds. (Note: it assumes zero air resistance.)

   a) How far does a rock fall after being dropped from a cliff for 1 second?
   b) How far does a rock fall after being dropped from a cliff for 2 seconds?
   c) How far does a rock fall after being dropped from a cliff for 3 seconds?
   d) How far does a rock fall after being dropped from a cliff for 5 seconds?
   e) How far does a rock fall after being dropped from a cliff for 10 seconds?
   f) How high would a cliff need to be in order for a rock to be able to fall for a whole minute before hitting the ground?

4) Using formulas.

Heron's Formula for the Area of a Triangle.

Area = $\sqrt{s(s-a)(s-b)(s-c)}$
Where s is the semi-perimeter (half the perimeter).

Example: Find the area of the triangle with sides of length 5, 6, and 7 inches.

Solution: We set a,b,c equal to 5,6,7. The perimeter is 18, so s is set to 9, which gives us:

$$\text{Area} = \sqrt{9(2)(3)(4)}$$
$$= \sqrt{216} \approx \underline{14.7\text{in}^2}$$

   a) Find the area of the triangle with sides of length 6, 8, and 10 meters.
   b) Find the area of the triangle with sides of length 13, 14, and 15 feet.
   c) Find the area of the triangle with sides of length 3, 5, and 6 centimeters.

5) Using formulas.

The Squaring Formula.

$$(a+b)^2 = a^2 + b(2a+b)$$

This formula gives us a very different method for calculating the square of a number. It says that if I want to calculate the square of a number (call it N), then I can first break it down into two parts, a and b, such that $a + b = N$, and then put these values for a and b into the formula in order to get my final answer.

Example: Calculate 17^2 using the Squaring Formula.

Solution: We can choose any two numbers that add to 17, but 10 and 7 are the easiest. Putting these numbers into the formula gives us:

$$17^2 \rightarrow (10+7)^2 = 10^2 + 7(2\cdot 10 + 7)$$
$$= 100 + 7(27)$$
$$= 100 + 189$$
$$= 289$$

(which is equal to 17^2)

Note: There are many other possible squaring formulas. This particular one does not save us time for calculating the square of a number. It is, in fact, much easier to get an answer by simply multiplying the number times itself, as we would normally do. *The reason that we are using this formula is that it will be of great use for us when we learn a method for calculating square roots – something called the "Square Root Algorithm".*

a) Calculate 26^2 by using the Squaring Formula.

b) Calculate 83^2 by using the Squaring Formula.

c) Calculate 74^2 by using the Squaring Formula.

d) Calculate 39^2 by using the Squaring Formula.