DKC^3 2021 - Word Problems

(Each word problem is worth 5 points)

1. **Waterfowl Weights**

   Three ducks and two ducklings weigh 32 kg. Four ducks and three ducklings weigh 44kg. All ducks weigh the same and all ducklings weigh the same. What is the weight of two ducks and one duckling?

2. **Yards of Dirt**

   There is a hole 13' x 10' x 8' in size. How many cubic yards of dirt are in the hole? (Round to the nearest yard. Hint: 3' per yard.)

3. **The Knight's Calculator**

   I have a calculator that can display ten digits. How many different ten-digit numbers can I type using just the 0-9 keys once each, and moving from one keypress to the next using the knight's move in chess? (In Chess, the knight moves in an L shape: one square up and two across, two squares down and one across, two squares up and one across, and other like combinations.)

4. **Solve the Riddle**

   I add 8 to 7 and get 3. I add 4 to 10 and get 2. Both these answers are correct. What am I?

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5. Referencing Environments

For the following C code (starts in function main()), assume you are in F2 during execution of this program at the location shown as **STATEMENT**. Assuming dynamic scoping, what is the referencing environment for the **STATEMENT**?

```
int x;  // refer to as XG
int y;  // refer to as YG

void F1()
{
   int x;  // refer to as XF1
   F2();
}

void F2()
{
   int y;  // refer to as YF2
   int b;  // refer to as BF2
   **STATEMENT**
}
void main()
{
   int y;  // refer to as YM
   int k;  // refer to as KM
   F1();
}
```

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6. Pool Evaporation

Paul and Sarah have a circular pool with a diameter of 10 meters and a uniform depth of 2 meters. Every day they must replace the water that has evaporated over the previous 24 hours. The rate of evaporation is based on the surface area of the pool – specifically 0.025 liters per square meter per hour. Now, Paul fills pools with a hose that outputs a mere dribble of 1 liter of water per minute, while Sarah dumps a 3-liter bucket in every 2 minutes (she does not refill her bucket if there are 3 liters or less remaining to replace after she finishes dumping). Assuming they replace the missing water to the nearest liter, how long will it take Paul and Sarah to finish filling the pool?

7. Brick Houses

A Red House Is Made From Red Bricks. A Blue House Is Made From Blue Bricks. A Yellow House Is Made From Yellow Bricks. What Is A Green House Made From?

8. Delivery Truck Dilemma

The posted weight limit for a covered wooden bridge in Minnesota is 6000 pounds. A Digi-Key delivery truck that is carrying x identical boxes, each weighing 14 pounds, will pass over the bridge. If the combined weight of the empty delivery truck and its driver is 4500 pounds, what is the maximum possible value for x that will keep the combined weight of the truck, driver, and boxes below the bridge's posted weight limit?

9. Consecutive Numbers

The product of two negative consecutive numbers is 182. What is the lower of the two values?

10. Age is Just a Number

If you add the age of a woman to the age of her husband, the result is 91. She is now twice as old as he was when she was as old as he is now. How old is the woman and her husband?

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11. Pickle Ball Tournament

Sixteen players have entered a Pickle Ball tournament. Tournament rules provide that each player would play against one other player. The winners would advance to the second round of eight players and each would play against one of the remaining players. The third round would consist of the remaining four players. The two winners would advance to the finals and play against each other to determine the champion.

Randy beat Curt but lost to Kailee. Greg beat Victor but lost to Will, who beat Zach. Melissa beat Steve but lost to Jason, who beat Ted. Ivan lost to Will, as did Jason. Austin beat Keith but lost to Zach, who had beaten Lori and Kailee, who had beaten Faith.

Based on the previous information answer the following questions.

A. Who won the tournament?

B. Who played in the championship?

C. Who played in the semifinals?

D. Who played in the quarterfinals?

12. Treacherous Tunnel Travel

An adventurous family went on a hike and stumbled across a cave. They decided to take a peek inside. Unfortunately, as they did so, the cave entrance collapsed! Luckily, they were able to find a small tunnel leading to the surface. However, their single light source was dying out. If their light source dies out, they won't be able to navigate the tunnel! Given the information below, what is the minimum amount of time the light source needs to last so they can all escape through the tunnel?

The Dad can make it through the tunnel in one minute, the mom in two minutes, the son in four minutes, and the daughter in five minutes. No more than two people can go through the tunnel at once. Of the two people, they can only travel as fast as the slowest person. Whoever is traveling through the tunnel must have the light source with them.

13. Palindrome Pair

If x is a 3-digit palindrome, and 42 more than x is a 4-digit palindrome, what is the sum of the digits of x?

DKC^3 2021 - Word Problems

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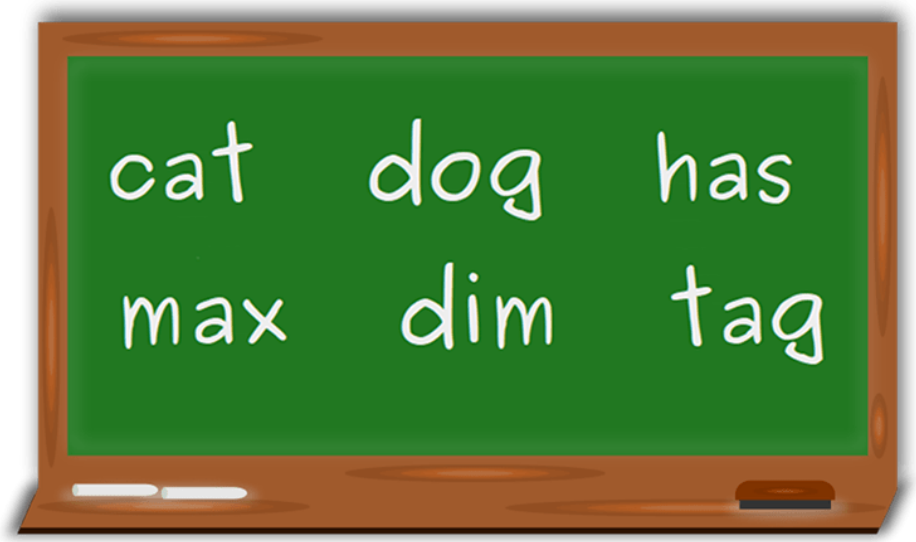
14. Guess the Word

A teacher has a puzzle for three students: Alicia, Brittany and Cheryl. The teacher puts the following words on the board: CAT, DOG, HAS, MAX, DIM, TAG.



The teacher then hands each student a slip of paper with a single letter written on it, explaining that the three letters together spell one of the words on the board. The teacher asks Alicia if she knows what the word is, and she answers Yes. Then the teacher asks Brittany if she knows what the word is, and she thinks for a moment and also answers Yes. Finally she asks Cheryl if she knows what the word is, and she also thinks for a moment and says Yes. What is the word?

15. Candy Bag

Seth has a bag with six blue candies and three white candies. While Seth is turned around debugging his code, Mary sneaks over and eats two of the candies at random. Assuming Seth does not know what color candies Mary ate, what is the probability that the next candy he draws from the bag is white?

16. Solve the Sequence

What is the next number in this sequence? 16 06 68 88

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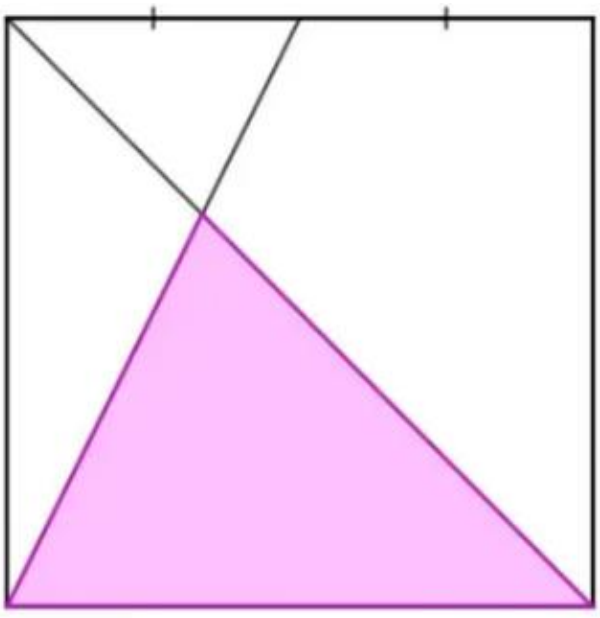
17. Lorena's Specialty Cakes

Situation: Lorena's Specialty Cakes has a number of different orders to fulfill this week. Each order consists of the person who placed the order, the delivery date, shape of the cake, and flavor. No individuals have the same delivery date, shape, or flavor. Using the clues below, determine: who ordered the turtle shaped cake, the delivery date, and flavor.

- The cake shaped like a turtle is either Mrs. Armstrong's cake or Mrs. Becker's order.
- Of the October 7th delivery and the order shaped like a sailboat, one will be key lime-flavored, and the other is for Mrs. Ingram.
- The cake shaped like an airplane will be delivered sometime before Mrs. Becker's order.
- Mrs. Ingram's order, the lemon cake, and the October 8th delivery are all different cakes.
- The order shaped like a sports car will be delivered 2 days after the coconut cake.
- The October 5th delivery will be in the shape of an airplane.
- Mrs. Harper's order will be in the shape of a sports car.
- The banana cake is not delivered on October 6th.

18. Square Fractions

What fraction of the square is shaded?



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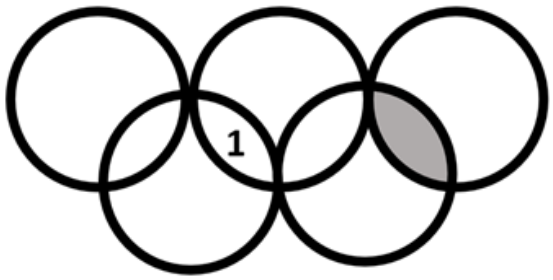
19. Olympic Sum

Place the digits from 1 to 9 in each closed area so that the sum of the digits in each complete circle is the same. 1 has already been placed. What number goes in the shaded area?



20. Coin Jar

William had a jar with fifty coins, totaling exactly $1.00. Unfortunately, while he was bringing the jar to the bank to be deposited, he dropped one coin. What is the probability that it was a penny?

21. Colored LEDs

There are three LED lights that are colored red, green, and blue. The red light turns on for 3 seconds and then off for 3 seconds. The green light turns on for 4 seconds and then off for 4 seconds. The blue light turns on for 5 seconds and off for 5 seconds. Assuming they are all at the start of their cycle (turning on at the same time), how many seconds will it take before all of them turn on at the same time again?

22. How Many Triangles?

If every vertex of a regular pentagon is connected to every other vertex, how many triangles are formed?

23. Picking Strawberries

When Jill and Lucy work together, they can pick a bucket of strawberries in 20 minutes, Jill and Vanessa in 15 minutes, Vanessa and Lucy in 12 minutes. How long does it take Jill to pick a bucket of strawberries?

DKC^3 2021 - Word Problems

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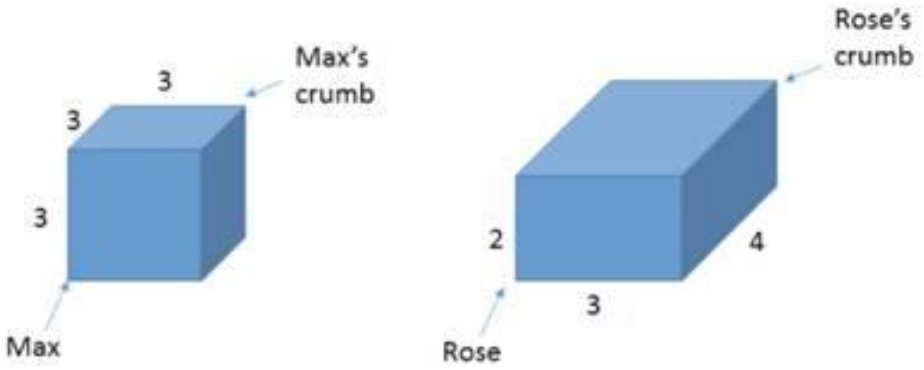
24. Ant Race

Max and Rose are ant siblings. They love to race each other, but always tie, since they crawl at the exact same speed. So, they decide to create a race where one of them (hopefully) will win.

For this race, each of them will start at the bottom corner of a cuboid, and then crawl as fast as they can to reach a crumb at the opposite corner. The measurements of their cuboids are as pictured:



If they both take the shortest possible route to reach their crumb, who will reach their crumb first? (Don't forget they're ants, so of course they can climb anywhere on the edges or surface of the cuboid.)

25. Strange Currency

In the country of Strangelandia, the local currency (strangeos) consists of coins in six unique denominations. Each denomination is worth either exactly five strangeos more than another denomination or exactly five strangeos less, but never both. The sum value of one coin from each denomination is 99 strangeos. If the lowest denomination coin is worth 6 strangeos, and Tim from Strangelandia has 15 strangeos in his pocket, what is the largest denomination coin worth?