VIC SKEPTICS

Logic and Maths Puzzles 78 January 2019

1. Mr Evans, Charlie, and two other men, who have never met in person, communicate with each other on Facebook

One of the four started the group in July; Allan from Perth joined in August; the third member of the group joined in September and the fourth in October.

Mr Hawkins, who isn't from Perth joined before the man who lives in Brisbane.

Mr Guest, who isn't Doug, joined before Bill.

Doug joined one month before the man from Sydney.

Mr Flynn hasn't been to Brisbane.

Answer the following questions:
a. What is the full name of the Man who lives in Sydney?
b. What is the full name of the man who started the group?

	Allan	Bill	Charlie	Doug	Melbourne	Sydney	Brisbane	Perth	July	August	September	October
Evans												
Flynn												
Guest												
Hawkins												
July												
August												
September												
October												
Melbourne												
Sydney												
Brisbane												
Perth												

2. The Smith Family, the Jones family, the Brown family and the White family go on a picnic together, with their sons and daughters.

Mr and Mrs Smith have one daughter.
Mr and Mrs Jones have two daughters.
Mr and Mrs Brown have three daughters.
Mr and Mrs White have four daughters.
Each of the daughters has a brother.

How many people were at the picnic?

3. There are 4 keys and 4 locks. What is the maximum number of times you need to try the locks so as to match all 4 keys to their locks?

4. Grace and Jim are blindfolded. Their teacher asks Grace to pick a card from a deck of five cards numbered one through five.

She then returns Grace's card to the deck, shuffles and asks Jim to draw one card.

The teacher says "I'm going to whisper the sum of the two cards to Grace" and proceeds to do so.

The teacher then says "I'm going to whisper the product of the two cards to Jim" and proceeds to do so.

Grace and Jim are then asked to guess the two numbers, taking it in turns.

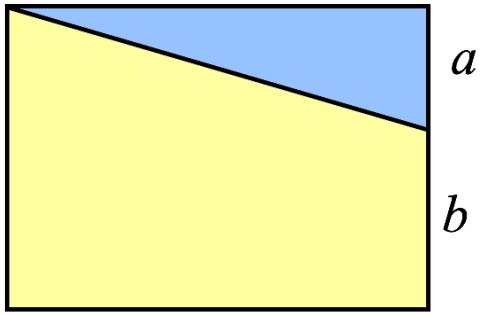
Grace: I do not know the two numbers. I don't have enough information.

Jim: I do not know the two numbers. I don't have enough information.

Grace: Now I know the two numbers. By the way, the number whispered to me is larger than the number whispered to Jim.

What are the two numbers?

5. In the diagram (not drawn to scale), the sloping line divides the rectangle so that the yellow region has six times the area of the blue region. What is the ratio of length *a* to length *b*?



6. There are three boxes: one yellow, one blue and one red. Inside one of the boxes is a $100 note. The following statements are written on each box.

YELLOW BOX: "*The $100 is in this box*".

BLUE BOX: "*The $100 is not in this box*"

RED BOX: "*The $100 is not in the yellow box*"

If you are then told that **AT MOST** one of those three statements is correct, which box contains the $100 note?

7. This question has the same set-up as question 6, but the clues have changed.

The following statements are written on each box.

YELLOW BOX: "*The $100 is not in the blue box*".

BLUE BOX: "*The $100 is not in this box*"

RED BOX: "*The $100 is in this box*"

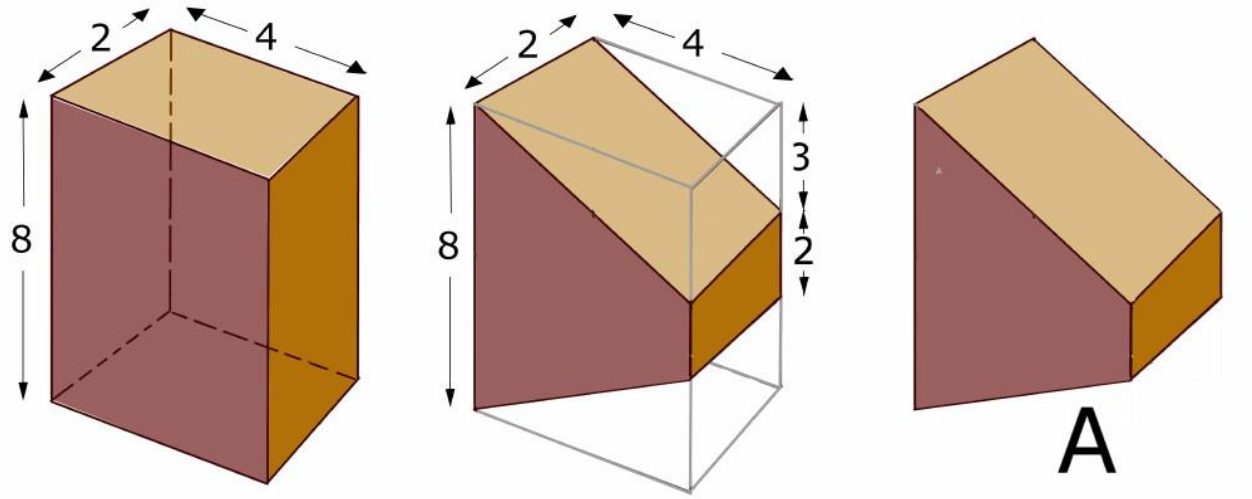
And this time you know that at least one of the above three statements is true and at least one is false.

Which box contains the $100?

8. Write the 3 prime numbers between 50 and 100 which have a "3" as one digit.

9. Start with a rectangular prism whose dimensions are 4 units X 2 units X 8 units.

Two identical triangular prisms are cut from the top and the bottom. Shape A remains.



a. Is the **volume** of shape A (in cubic units): **28**, **32**, **36**, **38**, **40**, **44** or **64** ?

b. Is the **total surface area** of shape A (in square units) **56**, **60**, **72**, **80**, **84**, **96** or **112** ?

10. It is often claimed that the AFL fixture is badly compromised, because:

*There are 18 teams competing
*There are usually about 23 rounds of home-and-away competition in any year.

Therefore each team plays each other team at least once, but only a relatively small number of matches in each year are actually re-matches.

If each of the 18 AFL teams were to play once per week and to play each other team TWICE in a year's home-and-away fixture:

a. How many games would that be in total? (For comparison, in 2017 207 home-and-away games were scheduled)

b. How many weeks would that take, assuming no byes or split rounds and not counting finals?

Answers:

1. a. Bill Flynn b. Charlie Hawkins

2. 22
Four sets of parents
10 daughters in total
If each daughter has one brother, there must only be one son in each family
(4 X 2) + 10 + (4 X 1) = 22

3. six tries

If you try 3 keys on the 1st lock, you will know that the 4th key is a match. So, you only need a maximum of 3 tries. Similarly, the 2nd lock needs a maximum of 2 tries and the 3rd lock needs only 1 try. Thus, 3 + 2 + 1 = 6 tries are needed.

4. 1 and 4

If Grace can't guess the two numbers with her first guess, it's because the sum she was given must be able to be made up more than one way. Possible sums are 2, 3, 4, 5, 6, 7, 8, 9 and 10

2 = 1 + 1
3 = 1 + 2
4 = either 1 + 3 or 2 + 2
5 = either 1 + 4 or 2 + 3
6 = either 1 + 5, 2 + 4 or 3 + 3
7 = either 2 + 5 or 3 + 4
8 = either 3 + 5 or 4 + 4
9 = 4 + 5
10 = 5 + 5

So at this stage, Grace only knows that the sum of her cards is 4, 5, 6, 7 or 8.

If Jim can't guess the two numbers with his first guess, it's because the product he was given must be able to be made up more than one way. That is only true if the product is 4.

4 = 1 X 4 or 2 X 2

Grace now knows the answer. It's either 2 and 2, if Grace was given a sum of 4. Or it's 1 and 4 if Grace was given a sum of 5.

The fact that she tells Jim that her whispered sum is larger than his whispered product indicates the dice scores must be 1 and 4

5. 2:5
Draw a line as shown here in red to turn your diagram into an upper rectangle and a lower rectangle.
The upper rectangle has area 2 unit^2, the lower rectangle has area 6 – 1 = 5 unit^2. We know that the ratio of the area of the upper rectangle to the area of the lower rectangle is 2 : 5. Since both rectangles have the same width, then a and b must also in the ratio 2 : 5.

6. The blue box

At most, one of the three statements is true.

But YELLOW BOX: "*The $100 is in this box*" and RED BOX: "*The $100 is not in the yellow box*" directly contradict each other.
One of those two statements has to be true, and it can be the only statement of the three that is true.
So the statement on the BLUE BOX - "*The $100 is not in this box*" - is false. The $100 IS in the blue box.

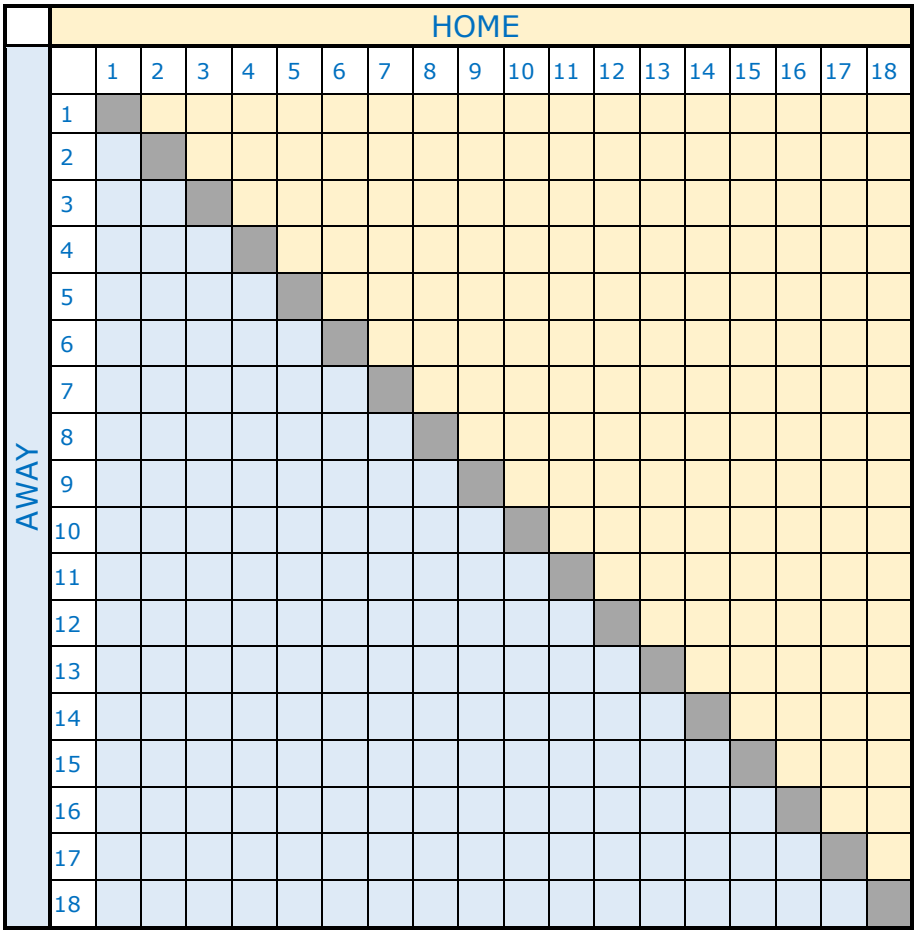
7. The yellow box

If the $100 is in the red box, then all three statements are true. Not possible.
If the $100 is the in blue box, then all statements are false. Not possible.
So the $100 must be in the yellow box, in which case two statements (the one on the yellow box and the one on the blue box) are true and one (the one on the red box) is false.

8. 53, 73, 83

9. A. 40 cubic units B. 80 square units

10. a. 306 games b. 34 weeks



a. Number of games = (18 X 18) -18 (teams do not play themselves)
= 306 games

b. It takes 17 weeks for each team to play each other team; therefore 2 X 17 = 34 weeks for each team to meet twice.