VIC SKEPTICS

Logic and Maths Puzzles 103 February 2021

1.

	Ann	Bo	Cass	Dave	1st	2nd	3rd	4th	PPS	MSGA	SSD	OS
Eade												
Foy												
Gee												
Ho												
PPS												
MSGA												
SSD												
OS												
1st												
2nd												
3rd												
4th												

There's an election looming in Sludgeville. Four politicians are standing, each representing a different party. (One party is the Progressive Party of Sludgeville or PPS).

Each has a gala campaign launch planned. From the clues provided, ascertain the full name of each candidate, their party and the order in which each campaign will be launched.

(i) The candidates are Cass, Foy, the Make Sludgeville Great Again (MSGA) candidate and the third to launch.

(ii) Ho will launch earlier than the Sludgeville Social Democrat (SSD), who will go before Dave.

(iii) Ann (not the PPS candidate) launches just before Gee, who launches just before the far-right One Sludgeville (OS) person.

(iv) Bo (who isn't Eade) plans to heckle at Gee's campaign launch.

2. **Pencils in Cups**

I have some pencils and some cups.

If I put 11 pencils into each cup, I will have 7 pencils left over.

If I put 14 pencils into each cup, I will have 1 cup left over

How many pencils and how many cups do I have?

3. **The Fencing Team**

Andy, Bruce and Charlie are painters. Together they have been hired to paint a fence which is 20 metres long.

If Andy worked at his normal speed, it would take him four hours to paint the fence on his own. Bruce would take five hours.

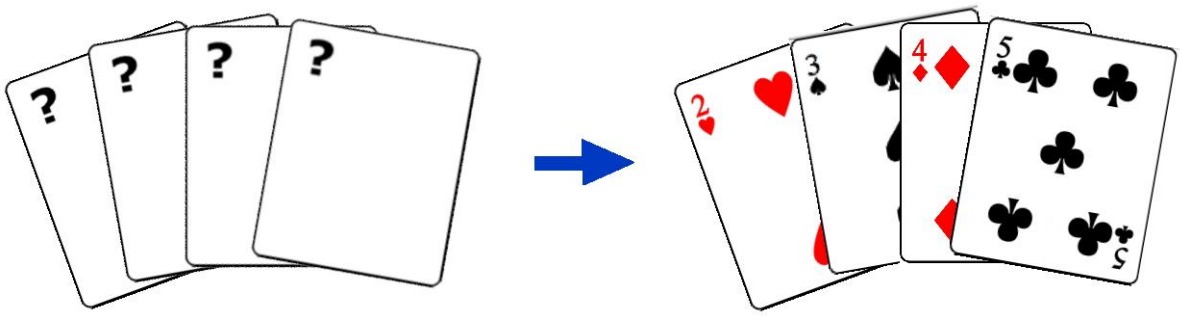
Charlie, on the other hand is the "gun" painter of the team. He works as fast as Andy and Bruce put together.

How long should it take all three of them working together to paint the fence?

4. **It's in the Cards .....**

(a) A man has four cards in his hand facing him.

He wants them placed in ascending order 2 to 5 from his left to his right (or, first to last). To do this, he takes the leftmost card and puts it last. He then takes the third card from the right and puts it in last place.

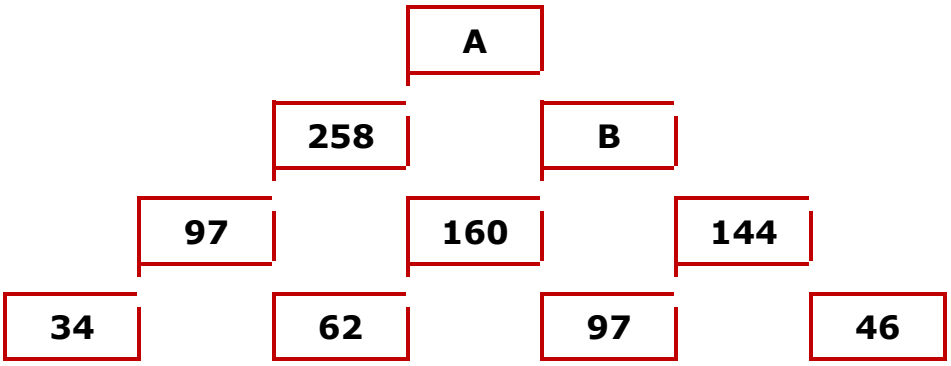


What was the previous order of the cards, left to right?

(b) If you take a deck of 52 playing cards; Shuffle them; Deal them to yourself one at a time;
What is the least number of cards that must be dealt in order to be certain of getting at least one four-of-a-kind?

(c) If you then take **two** decks of 52 playing cards each; Combine them; Shuffle them; Deal them to yourself one at a time;
What is the least number of cards that must be dealt in order to be certain of getting at least one four-of-a-kind?

5. **PYRAMID POSER**



Based on the number pattern within the above pyramid, what are the values of A and B?

6. **Figure It Out**

At a business meeting each person shook hands with every other person exactly once. There were twenty-eight handshakes.

(a) How many people attended the meeting?
(b) How many handshakes would one hundred people share?

7. **Figure It Out**

If two bananas plus three mandarins plus an apple costs $3.30

Three bananas plus a mandarin plus two apples costs $3.40

One banana plus two mandarin plus three apples costs $2.90

What is the cost of one banana plus one mandarin plus one apple?

8. Four men and four women working in the same office discover they have a mutual love of competitive motor racing, so they join a car club.
Four different events are run, each requiring a driver and a navigator or co-driver.
Events are staged once per week, each Saturday, weeks 1, 2, 3 and 4. (If there is a fifth Saturday in any month, no event takes place).
It was decided that each of the four men would partner one of the four women when competing, and that each of the eight would compete in two events per month.
From the clues below, ascertain what kind of event is run on each week of the month, and which four of the eight friends are competitors at each event.

(i) None of the women partners the same man twice in any month.
(ii) Barbara, Sandra, Ted and Warren are the only four who compete in consecutive weeks; none of them in Week 1.
(iii) May partners Jay two weeks before she partners Roy; None of the three competes in Motocross.
(iv) Del competes in the One-Hour Race earlier in the month than she competes in the Time Trial.
(v) Warren's co-driver in the Four-Hour Race is not Sandra
(vi) Del and Sandra never compete with each other; Del and Jay never partner each other.
(vii) No two women compete in the same two events.

The following table was found to be useful in solving this puzzle:

Week	1	2	3	4
Event				
Competitors				

9. **Figure It Out**

There is a jar containing one hundred toffees that can be either orange flavoured or strawberry flavoured. You're told that there is at least one orange flavoured toffee in that jar, and that in any random selection of two toffees, at least one will be strawberry flavoured.
Can you tell how many strawberry toffees are in that jar?

10. # PRIME MINISTER PROBLEM

If this code represents "**HAWKE**"

©∞●ΣΔ

Which other Prime Ministers are represented by each of the following?

(a) **©!√X**

(b) **+@∞®Δ@**

(c) **©!●∞@$**

(d) **∞??!X X**

(e) **∞@$Δ@#**

(f) **X€@#?€√√**

(g) **ΣΔ∞X&#%**

(h) **%&√√∞@$**

(i) **●©&X√∞£**

(j) **£Δ#/&Δ®**

(k) **X©∞X≠©Δ@**

(l) **@€$$**

10.  Figure It Out

There is a jar containing one hundred toffees that can be either orange flavoured or strawberry flavoured. You're told that there is at least one orange flavoured toffee in that jar, and that in any random selection of two toffees, at least one will be strawberry flavoured.
Can you tell how many strawberry toffees are in that jar?

(answers next page)

Answers:

(worked solutions begin on the next page.)

1. Ann Ho launches first for MGSA
   Cass Gee launches second for SSD
   Dave Eade launches third for OS
   Bo Foy launches fourth for PPS

2. 7 cups, 84 pencils.

3. approximately 1 hour 7 minutes

4. a. (In order) 4,2,3,5 b. 40 cards c. 40 cards (Note that the answer 40 would be correct for any number of decks.)

5. A = 564 B = 305

6. (a) 8 people (b) 4,950 handshakes

7. $1.60

8.

Week	1	2	3	4
Event	1-HR RACE	MOTO CROSS	4-HR RACE	TIME TRIAL
Pairs	DEL & ROY MAY & JAY	SANDRA & WARREN	SANDRA & TED BARBARA & WARREN MAY & ROY	DEL & TED BARBARA & JAY

9. 99 strawberry toffees

10. (a) Holt (b) Fraser (c) Howard (d) Abbott (e) Ardern (f) Turnbull (g) Keating (h) Gillard (i) Whitlam (j) Menzies (k) Thatcher (l) Rudd

SOLUTIONS:

1. The straight-forward information from the clues can be recorded in the grid using the blue **X**s, which mean "this" (horizontal) is not "that" (vertical). Because Ho was first or second to launch, and OS was third or fourth, we can conclude that Ho did not represent OS. Let's show that with a **X**.

	Ann	Bo	Cass	Dave	1st	2nd	3rd	4th	PPS	MSG	SSD	OS
Eade		X										
Foy			X				X			X		
Gee	X	X			X			X				X
Ho				X			X	X			X	X
PPS	X											
MSGA			X				X					
SSD				X	X			X				
OS	X				X	X						
1st				X								
2nd				X								
3rd	X		X									
4th	X											

From Clue (iii), Ann, Gee and the OS candidate launch consecutively.
Either Ann is first, Gee is second and OS is third
Or, Ann is second, Gee is 3rd and OS is fourth.

Try Ann first ✓

	Ann	Bo	Cass	Dave	1st	2nd	3rd	4th	PPS	MSG	SSD	OS
Eade		X				X						
Foy			X			X	X			X		
Gee	X	X			X	✓	X	X				X
Ho				X		X	X	X			X	X
PPS	X						X					
MSGA			X				X					
SSD				X	X		X	X				
OS	X				X	X	✓	X				
1st	✓	X	X	X								
2nd	X			X								
3rd	X		X									
4th	X											

Try Ann second ✓

	Ann	Bo	Cass	Dave	1st	2nd	3rd	4th	PPS	MSGA	SSD	OS
Eade		X					X					
Foy			X				X			X		
Gee	X	X			X	X	✓	X				X
Ho				X			X	X			X	X
PPS	X							X				
MSGA			X				X	X				
SSD				X	X			X				
OS	X				X	X	X	✓				
1st	X			X								
2nd	✓	X	X	X								
3rd	X		X									
4th	X											

Adding to the two possible grids: (✓ and **X**)

If Ann is first

	Ann	Bo	Cass	Dave	1st	2nd	3rd	4th	PPS	MSGA	SSD	OS
Eade	X	X	X	✓	X	X	✓	X	X	X	X	✓
Foy	X	✓	X	X	X	X	X	✓	✓	X	X	X
Gee	X	X	✓	X	X	✓	X	X	X	X	✓	X
Ho	✓	X	X	X	✓	X	X	X	X	✓	X	X
PPS	X	✓	X	X	X	X	X	✓				
MSGA	✓	X	X	X	✓	X	X	X				
SSD	X	X	✓	X	X	✓	X	X				
OS	X	X	X	✓	X	X	✓	X				
1st	✓	X	X	X								
2nd	X	X	✓	X								
3rd	X	X	X	✓								
4th	X	✓	X	X								

If Ann is second

	Ann	Bo	Cass	Dave	1st	2nd	3rd	4th	PPS	MSGA	SSD	OS
Eade	✓	X	X	X	✓	X	X	X	X	✓	X	X
Foy	X	✓	X	X	X	X	X	✓	X	X	X	✓
Gee	X	X	X	✓	X	X	✓	X	✓	X	X	X
Ho	X	X	✓	X	X	✓	X	X	X	✓	X	X
PPS	X	X	X	✓	X	X	✓	X				
MSGA	✓	X	X	X	✓	X	X	X				
SSD	X	X	✓	X	X	✓	X	X				
OS	X	✓	X	X	X	X	X	✓				
1st	X	X	✓	X								
2nd	✓	X	X	X								
3rd	X	X	X	✓								
4th	X	✓	X	X								

Ann Ho launches first for MGSA
Cass Gee launches second for SSD
Dave Eade launches third for OS
Bo Foy launches fourth for PPS
This alternative works.

Ann is Eade. But Ann Launches 2nd and Eade launches 1st.
Cass is Ho. But Cass launches 1st, and Ho launches 2nd
Inconsistent with the clues. This alternative does not work.

2. Let the number of pencils be p, and the number of cups c.

$p = 11c + 7$ [equation 1]

$c = p/14 + 1$ [equation 2]

substitute (p/14 + 1) for c in equation 1

$p = 11(p/14 + 1) + 7$

$p = 11p/14 + 11 + 7$

$p = 11p/14 + 18$

$p - 18 = 11p/14$

$14(p\text{-}18) = 11p$

$14p - 252 = 11p$

$3p = 252$

$p = 252/3 = 84$

substitute 84 for p in equation 2

$c = 84/14 + 1 = 6 + 1 = 7$

3. Andy's rate of fence painting is 20 metres in 4 hours or 5 metres per hour.
Bruce's rate of fence painting is 20 metres in five hours or 4 metres per hour.
Their combined rate is 9 metres per hour, which is Charlie's rate.
In one hour of working together they should be capable of painting (4 + 5 + 9) = 18 metres of fence.
20 metres of fence would therefore take them 20/18 or 1.111 hours or about 1 hour 7 minutes (to the nearest minute)

4. (a) If you reverse the moves one step at a time:

		Position left to right			
	sorted	2	3	4	5
	intermediate	Position unchanged	Position unchanged	4 and 5 swap places	
		2	3	5	4
	original	Moves to last position	Moves one to left	Moves one to left	Moves one to left
		4	2	3	5

(b&c) A very unlikely but possible outcome would be that you drew all 13 ranks, Ace, 2, 3, ….. Q, K three times in some order without drawing the fourth of any rank. That would involve 39 cards. However, if that were to happen, on the 40th draw you would

not be able to avoid drawing a fourth card of one rank. That would be true **regardless** of how many whole decks of cards shuffled together that you were using.

5. Each of the numbers in the second row from the bottom can be calculated as the sum of the two numbers below, plus 1.

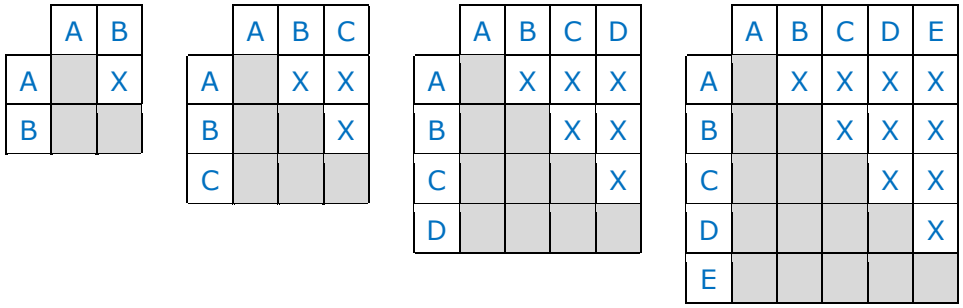
34 + 62 + 1 = 97 62 + 97 + 1 = 160 97 + 46 + 1 = 144

Each of the numbers in the third row from the bottom can be calculated as the sum of the two numbers below, plus 1.

97 + 160 + 1 = 258 160 + 144 + 1 = 305 (B = 305)

Continuing the pattern, the number in the top row (A) = 258 + 305 + 1 = 564

6. It may help to visualise grids which show each person shaking hands with each other person once.



Two people share one handshake; three people share three handshakes; four people share six handshakes; five people share ten handshakes. What's the pattern?
You can see that as the number of people (n) in the room increases, the number of handshakes increases exponentially – in other words, it's related to the number of people squared (n^2). However, no person shakes his own hand; that reduces the number of possible handshakes by n to ($n^2 - n$); and if A shaking hands with B is the same event as B shaking hands with A, then the total number of handshakes reduces further to $(n^2 - n)/2$

So for 6 people, the number of handshakes is $(6^2 - 6)/2 = 15$

For 7 people, it's $(7^2 - 7)/2 = 21$

And for 8 people it's $(8^2 - 8)/2 = 28$

For 100 people it's

$(100^2 - 100)/2$

= (10,000 – 100)/2

= 9,900/2

= 4,950

7. Let the price in cents for apples be a, bananas be b, and mandarins be c.

2b + 3m + a = 330 [equation 1]
3b + m + 2a = 340 [equation 2]
b + 2m + 3a = 290 [equation 3]

from equation 1, a = 330 – 2b – 3m

substituting for a in equation 2 gives

3b + m + 2(330 – 2b – 3m) = 340

Continued next page …..

3b + m + 660 – 4b – 6m =340

4b – 3b + 6m – m = 660 – 340

b + 5m = 320 [equation 4]

substituting for a in equation 3 gives

b + 2m + 3(330 – 2b – 3m) = 290

b + 2m + 990 – 6b – 9m = 290

5b +7m = 700 [equation 5]

From equation 4, b = 320 – 5m

Substituting for b in equation 5 gives

5(320 – 5m) + 7m = 700

1,600 – 25m + 7m = 700

18m = 900

m = 50 {mandarins cost 50 cents each}

substituting for m in equation 4 gives

b + 5 X 50 = 320

b + 250 = 320

b = 70 {bananas cost 70 cents each}

substituting for b and m in equation 1

a = 330 – 2b – 3m

a = 330 – 140 – 150

a = 330 – 290

a = 40 {apples cost 40 cents each}

One apple plus one banana plus one mandarin costs 40 + 70 + 50 cents = $1.60

8. One method of tackling this puzzle is to list all of the possibilities, and attempt to eliminate where possible:
NOTE: WHILE THERE MIGHT BE A TENDENCY TO ASSUME THAT THERE ARE TWO PAIRS COMPETING EACH WEEK, THE RULES DO NOT SAY THAT.

Week	1	2	3	4
Event	MOTO CROSS 1-HR RACE 4-HR RACE TIME TRIAL	MOTO CROSS 1-HR RACE 4-HR RACE TIME TRIAL	MOTO CROSS 1-HR RACE 4-HR RACE TIME TRIAL	MOTO CROSS 1-HR RACE 4-HR RACE TIME TRIAL
Competitors	Barbara, Del May, Sandra Jay, Roy, Ted Warren	Barbara, Del May, Sandra Jay, Roy, Ted Warren	Barbara, Del May, Sandra Jay, Roy, Ted Warren	Barbara, Del May, Sandra Jay, Roy, Ted Warren

From clue (iv): Del competes in the One-Hour Race earlier in the month than she competes in the Time Trial.

From clue (vi): Del and Sandra never compete with each other; Del and Jay never partner each other.
So Sandra competes in the Four-Hour Race and the Moto Cross.
Jay also competes in the Four-Hour Race and the Moto Cross.
From clue (ii): Barbara, Sandra, Ted and Warren are the only four who compete in consecutive weeks; none of them in Week 1.
Sandra's events are consecutive, Del's are not, and Del's events do not coincide with Sandra's events. Sandra's events are in Weeks 2 & 3, Del's are in Weeks 1 & 4.

Week	1	2	3	4
Event	1-HR RACE	MOTO CROSS 4-HR RACE	MOTO CROSS 4-HR RACE	TIME TRIAL
Competitors	DEL May Jay, Roy,	SANDRA Barbara, May, Jay, Roy, Ted Warren	SANDRA Barbara, May, Jay, Roy, Ted Warren	DEL Barbara, May, Roy, Ted Warren

From clue (vii): No two women compete in the same two events. Barbara competes in consecutive weeks, but they can't be the same two weeks as Sandra. Barbara's weeks must be 3 & 4.

Week	1	2	3	4
Event	**1-HR RACE**	MOTO CROSS 4-HR RACE	MOTO CROSS 4-HR RACE	**TIME TRIAL**
Competitors	**DEL** May Jay, Roy,	**SANDRA** May, Jay, Roy, Ted Warren	**SANDRA, BARBARA** May, Jay, Roy, Ted Warren	**DEL, BARBARA** May, Roy, Ted Warren

From Clue (vi): Del and Sandra never compete with each other; Del and Jay never partner each other.
Del's partner in Week 1 must by elimination be Roy.

Week	1	2	3	4
Event	**1-HR RACE**	MOTO CROSS 4-HR RACE	MOTO CROSS 4-HR RACE	**TIME TRIAL**
Competitors	**DEL & ROY** May Jay	**SANDRA** May, Jay, Roy, Ted Warren	**SANDRA, BARBARA** May, Jay, Roy, Ted Warren	**DEL, BARBARA** May, Roy, Ted Warren

From clue (iii): May partners Jay two weeks before she partners Roy; None of the three competes in Motocross.
May never partners Warren
From clue (v) Warren's co-driver in the Four-Hour Race is not Sandra.
It's not Del either. It must be Barbara in Week 3
May must partner Jay in Week 1 and Roy in Week 3

Week	1	2	3	4
Event	**1-HR RACE**	**MOTO CROSS**	**4-HR RACE**	**TIME TRIAL**
Competitors	**DEL & ROY MAY & JAY**	**SANDRA** Ted Warren	**SANDRA, BARBARA & WARREN MAY & ROY** Jay, Ted	**DEL, BARBARA** Roy, Ted Warren

SANDRA is the only female competitor in week 2, partnering Ted or Warren. Ted is one of the three who have consecutive races in weeks 2, 3 or 4. In any case, he races in week 3, and so is Sandra's partner. That excludes him from being Sandra's partner also in Week 2, so her partner in that week is Warren.
Since Del and Jay never partner each other (Clue (vi), Del's partner in week 4 is Ted, and Barbara's partner is Jay.

Week	1	2	3	4
Event	**1-HR RACE**	**MOTO CROSS**	**4-HR RACE**	**TIME TRIAL**
Competitors	**DEL & ROY** **MAY & JAY**	**SANDRA & WARREN**	**SANDRA & TED** **BARBARA & WARREN** **MAY & ROY**	**DEL & TED** **BARBARA & JAY**

9. If one of the toffees is orange flavoured, the only way you can **guarantee** that one of the flavours in a random selection of two is for all the others to be strawberry flavoured.

10. Hint: Don't just attempt to solve in the order (a), (b), (c), etc: As you manage to complete each name, look for the next most similar name to substitute symbols for letters as you establish them. If you're stuck, it might help to Google "Australian Prime Ministers".
Here's a list of Australian post-war Prime Ministers. (Two other non-Australian but prominent Prime Ministers have been thrown into the puzzle to make it a bit harder 😊)
Note that there are only two four-letter surnames here. One starts with © = H, the other one doesn't.

CHIFLEY
MENZIES
HOLT
McEWEN
GORTON
McMAHON
WHITLAM
FRASER
HAWKE
KEATING
HOWARD
RUDD
GILLARD
ABBOTT
TURNBULL
MORRISON