VIC SKEPTICS

Logic and Maths Puzzles 83 June 2019

1. Joe's hobby is building model World War II fighter aircraft. Last year he completed a Spitfire, a Hurricane, an FW 190, a Zero and a Mustang in no particular order

- Each model was finished in a different month; (January, February, March, April and June); and on a different day of the week (Monday, Tuesday, Wednesday, Thursday and Friday)
- The Hurricane (which was not completed on a Thursday) was finished a month before the one completed on a Monday, which was finished a month before the Zero.
- The Spitfire was completed a month before the one finished on a Thursday, which was finished a month before the FW190.
- Joe finished the Mustang on a Tuesday
- The plane completed on a Wednesday was not a model of a British designed fighter

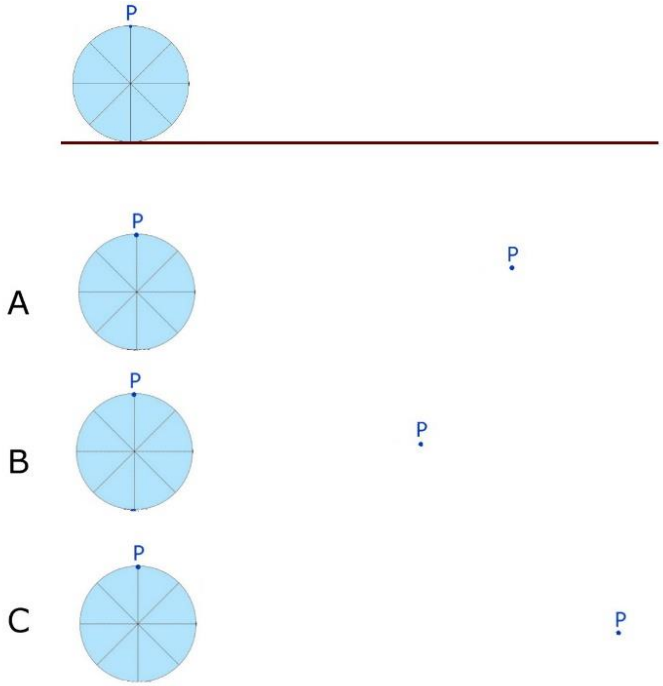
	Spitfire	Hurricane	FW190	Zero	Mustang	Jan	Feb	Mar	Apr	Jun
Mon										
Tue										
Wed										
Thu										
Fri										
Jan										
Feb										
Mar										
Apr										
Jun										

(a) In what month was the Mustang completed?

(b) The plane completed on a Thursday was completed in what month?

(c) What day of the week saw the completion of the Hurricane?

2.

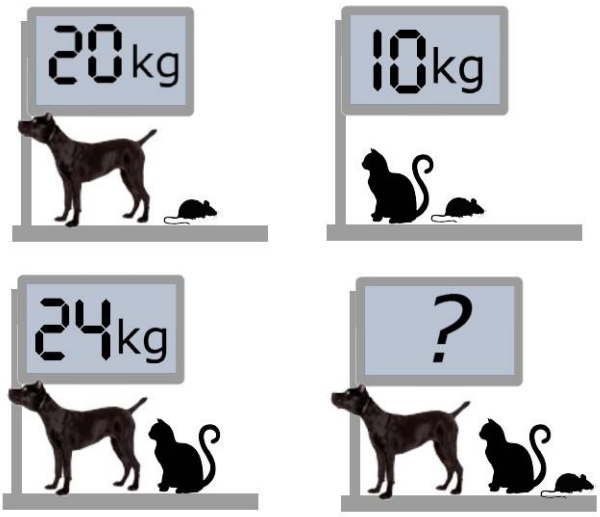


The diagram represents a wheel resting on a horizontal ramp. P is a point on the wheel.

Now imagine the ramp tilts slightly clockwise, so that the wheel starts to roll smoothly downhill (no bouncing or skidding).
(We've made the ramp invisible in each case)

Only one of the three diagrams A, B or C accurately shows a possible position for point P after one rotation of the wheel. Which one?

3.



What is the total weight of the dog, the cat and the mouse?

4. **Crack this three-digit number combination using the following clues**

(It's a bit like Mastermind)

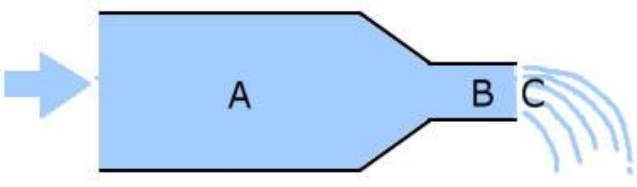
5 4 8	*One of these three numbers is correct and is in the right place*
5 3 0	*None of these three numbers is correct*
1 5 7	*Two of these numbers are correct but both are in the wrong place*
8 0 6	*One of these numbers is correct but it is in the wrong place*
6 4 7	*One of these numbers is correct but it is in the wrong place*

5. At a school fete, cupcakes were being sold at two for a dollar and toffees at three for a dollar. Some children (there were as many boys as girls) were given $7 to spend between them, and chose to spend it on cupcakes and toffees.

- They spent the $7 exactly.
- Two of the children were sisters
- Each child received at least one cupcake and at least one toffee.
- Each child received a whole number of cupcakes and a whole number of toffees.
- Each child received the same number of cupcakes and the same number of toffees as each other child.

(a) How many children were involved?
(b) How many cupcakes did each child receive?
(c) How many toffees did each child receive?

6. The diagram above shows water being forced left-to-right through a pipe which has a reduction in its diameter shortly before the water exits the pipe. At which point will the water be flowing fastest: A, B or C?



7. What day comes three days after the day which comes two days after the day which comes immediately after the day which comes two days after Monday?

8. Jessie is an aspiring actress. She spent much of her time working as an extra and attending auditions, usually at short notice.

To try to pay the bills, she also worked as a check-out girl at the local supermarket. However, her employer was on the point of sacking her because he was never sure when she would be unavailable for work, or be called from work at short notice for an audition.

Finally they agreed on the following: She would work a 3 hour shift each day for 30 days. For this she would receive 80 dollars a day.

However, if she was unexpectedly unavailable to work, she would forfeit pay at the rate of 100 dollars per day.

At the end of the 30 days neither owed the other anything.

Calculate how hours work she put in as a check-out girl and how many hours she missed, to the nearest hour.

9. In a consignment of eggs 552 were cracked, which was 12 percent of the total consignment. How many eggs were in the consignment?

10. At the end of 2015 Walter was half as old as his grandmother. The sum of the years in which they were born is 3880. How old was Walter at the end of 2018?

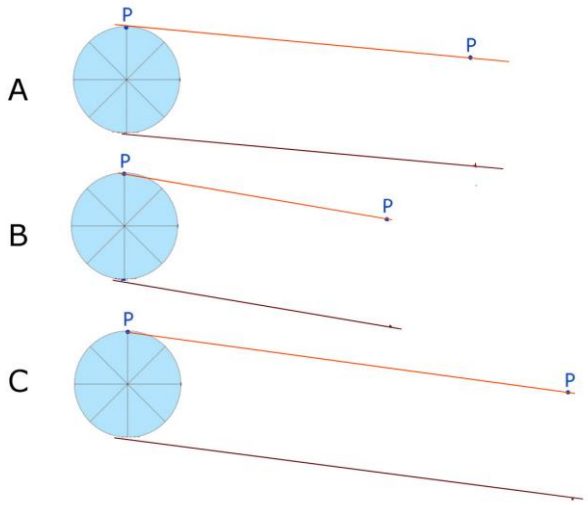
Answers:

1. a. June b. March c. Friday

2. A is correct.

If the wheel rolls through one rotation, the distance it moves down the ramp will be equal to the circumference of the wheel.

You can work out the approximate slope of the ramp in by connecting point P at beginning and end with a straight line.
The ramp will be approximately parallel to that line



The circumference of the wheel is ∏ times or slightly more than 3 times the diameter of the wheel. If you measure the diameter of the wheel and step it down the ramp, you'll find that A is about right whereas B is clearly too short and C is clearly too long.

3. 27 kg
One method is to use simultaneous equations; let the mass of the cat be C kilograms, let the mass of the dog be D kilograms and let the mass of the mouse be M kilograms
Then
D + M = 20 [equation 1]
C + M = 10 [equation 2]
C + D = 24 [equation 3]

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The mass of the mouse is therefore 10 – C
So
D + (10 – C) = 20
D + 10 – C = 20
D – C = 10 [equation 4]
C + D = 24 [equation 3]

Take equation 4 from equation 3
2C = 14
C = 7 - The cat has a mass of 7 kg.
The cat has a mass of 7 kg.
D + M = 20 [equation 1]
C + M = 10 [equation 2]
C + D = 24 [equation 3]

So the mouse has a mass of 10 – 7 = 3 kg
The dog has a mass of 20 – 3 = 17 kg

C + D + M = 7 + 17 + 3

= 27 kg

4. 718

5. (a) 6 children (3 boys, 3 girls) (b) 1 cupcake each (c) 2 toffees each

(This is a trial-and-error solution)

If there are the same number of boys and girls, there must be 2, 4, 6, 8 _ , _) children.
Since two of the girls were sisters, there must be at least two girls and two boys.
Some multiple of 3 toffees must be involved in any solution otherwise an exact dollar total is not possible

TRY 2 BOYS AND 2 GIRLS

3 toffees ($1) + 12 cupcakes ($6) is not a solution because no child would get a whole number of toffees
6 toffees ($2) and 10 cupcakes ($5) is not a solution because no child would get a whole number of toffees
9 toffees ($3) and 8 cupcakes ($4) is not a solution because no child would get a whole number of toffees
12 toffees ($4) and 6 cupcakes ($3) is not a solution because no child would get a whole number of cupcakes
15 toffees ($5) and 4 cupcakes ($2) is not a solution because no child would get a whole number of toffees
18 toffees ($6) and 2 cupcakes ($1) is not a solution because no child would get a whole number of toffees OR cupcakes

TRY 3 BOYS AND 3 GIRLS

3 toffees ($1) + 12 cupcakes ($6) is not a solution because no child would get a whole number of toffees
6 toffees ($2) and 10 cupcakes ($5) is not a solution because no child would get a whole number of cupcakes
9 toffees ($3) and 8 cupcakes ($4) is not a solution because no child would get a whole number of toffees OR cupcakes

12 toffees ($4) and 6 cupcakes ($3) is a solution because each child would get two toffees and 1 cupcake

15 toffees ($5) and 4 cupcakes ($2) is not a solution because no child would get a whole number of toffees OR cupcakes
18 toffees ($6) and 2 cupcakes ($1) is not a solution because no child would get a whole number of cupcakes

TRY 4 BOYS AND 4 GIRLS

3 toffees ($1) + 12 cupcakes ($6) is not a solution because no child would get a whole number of toffees
6 toffees ($2) and 10 cupcakes ($5) is not a solution because no child would get a whole number of toffees OR cupcakes
9 toffees ($3) and 8 cupcakes ($4) is not a solution because no child would get a whole number of toffee
12 toffees ($4) and 6 cupcakes ($3) is not a solution because no child would get a whole number of cupcakes

15 toffees ($5) and 4 cupcakes ($2) is not a solution because no child would get a whole number of toffees OR cupcakes
18 toffees ($6) and 2 cupcakes ($1) is not a solution because no child would get a whole number of cupcakes OR cupcakes

***5 BOYS AND 5 GIRLS** have 70 cents each to spend. 1 cupcake + 1 toffee will cost 83.333 cents. 5 pairs of children and above are thereby eliminated; not enough money to go round.

6. **B**

The water will flow fastest when its path is restricted to the smallest cross-sectional area

7. Tuesday

8. Worked 50 hours, missed 40 hours

30 days of work is equivalent to 90 hours worked.
Let the time worked in hours = **t**
The time missed is therefore (90 – **t**)

Money earned in dollars = **t** X $\frac{80}{3}$

Money forfeited in dollars = (90 – **t**) X $\frac{100}{3}$

Money earned and money forfeited are equal

So **t** X $\frac{80}{3}$ = (90 – t) X $\frac{100}{3}$

Multiplying through by 3 gives

t X 80 = (90 – t) X 100

80**t** = 9000 - 100**t**

180**t** = 9000

t = 50, therefore (90 – **t**) = 40

9. 4600

(divide 552 by twelve to get 1% =46, then multiply by 100)

10. 53

Here's a trial-and-error solution.

Walter's age In 2015	Grandmother's age in 2015	Walter: Year born	Grandmother: Year born	Does that add up to 3880?	Walter's age in 2018
30	60	1985	1955	No	
40	80	1975	1935	No	
50	100	1965	1915	Yes	53

Solution by algebra:

Let Walter's age in 2015 = w years

Year of Walter's birth = (2015 – w)
Walter's grandmother's age in 2015 = 2w years
Year of Walter's grandmother's birth = (2015 – 2w)

(2015 – w) + (2015 – 2w) = 3880

4030 – 3w = 3880

3w = 4030 -3880 = 150

W = 50

Walter is 50 at end of 2015, therefore 50 + 3 = 53 at end of 2018