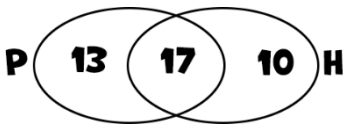
PMC 2024 ANSWERS AND NOTES

Question	Answer	Code	Notes
P1	555	C	
P2	21	C	There are 6 faces on a dice with 1, 2, 3, 4, 5 and 6 spots on each face respectively. Therefore, the number of spots altogether is 1 + 2 + 3 + 4 + 5 + 6 = 21.
1	6.30 am	B	Two hours into the sailing, the time is 12.30 am. Therefore, after another 6 hours, the time is 6.30 am.
2	2 years	C	With 52 weeks in a year, 104 weeks is 2 years.
3	-3	C	Increasing the temperature by 2 degrees means it rises from -5 to -3.
4	West	A	The distances are irrelevant but may help if students want to draw a diagram. Sultana is facing North-East initially. Turning 90° anticlockwise means she is then facing North-West. Turning a further 45° anticlockwise means she is then facing West.
5	15	C	The cube has a volume of 3 x 3 x 3 = 27cm^3. Each piece cut from it has a volume of 1 x 1 x 3 = 3cm^3. Four such pieces are cut from the cube so 4 x 3 = 12cm^3 is removed. The remaining volume is 27 – 12 = 15cm^3.
6	12	E	In essence this question is about selecting the relevant data. Only the legs matter. Tripodders have 3 legs each, so 3 Tripodders have 3 x 3 = 9 legs between them; Hoppers have 1 leg each, so 3 Hoppers have 3 x 1 = 3 legs between them. Thus 3 Tripodders and 3 Hoppers have 9 + 3 = 12 legs between them.
7	16	A	Five vertical lines equally spaced means that there are 4 spaces between them. Similarly, five horizontal lines means than there are 4 spaces between them. Thus, there are 4 x 4 = 16 squares. Alternatively, draw the diagram and count the squares.
8	1	A	Most students would try a number to see what happens. So, if we begin with 5, we get the following sequence of numbers 5, 6 (by adding 1), 12 (by multiplying 6 by 2), 2 (by subtracting 5 x 2), 1 (by subtracting 1). Some students might reason that adding 1 and then doubling that this is 2 times the first number plus 2, so taking away twice the first number leaves us with 2 and then subtracting a further 1 gets us back to 1 and that this is always the case. Algebraically, if the starter number is N then we have N → (N + 1) → 2(N + 1) = 2N + 2 → 2 → 1.
9	23	C	Having a remainder of 12 means that 265 was too big by 12 to be divided exactly by our mystery number. So, take 12 away from it to give 253. Now 253 must be 11 multiplied by our mystery number. So divide 253 by 11 to give 23, our mystery number.
10	15	E	Each King Penguin is 100cm tall i.e. it is a metre tall, so we need 5 rows of penguins to get to the height of Greta the giraffe, 5m. 5 rows of penguins implies 5 + 4 + 3 + 2 + 1 = 15. So 15 penguins are needed.
11	6	C	One way to do this is to write out all the different codes that begin with 2. A second way is to realise that the number of different codes that begin with 2 is simply the number of different orders that the other numbers, 3, 5 and 7 can be written out in. These are (3, 5, 7), (3, 7, 5), (5, 3, 7), (5, 7, 3), (7, 5, 3) and (7, 3, 5) i.e. 6 in all. The third way is to reason that, given we need to order the remaining three digits, there are 3 ways to choose the first, 2 ways to choose the second and 1 way to choose the third, giving 3 x 2 x 1 = 6 ways altogether.

12	12	B	The 6 runners in the club have won 6 x 5 = 30 races between them. When they become 7 runners, they have won 7 x 6 = 42 races between them. So, the numbers of wins have increased by 12, all down to the new runner who joined the club.
13	40 sec	C	The carrot is disappearing at a rate of 2 + 3 = 5 mm per sec and the carrot is 20 cm = 200 mm long. So, the carrot will last 200/5 = 40 seconds.
14	5/12	B	The area of the rectangle is 18 squares. The area of the triangle can be found by counting squares and parts of squares, but this is time consuming and may not be done accurately. A better way is to observe that the line AB divides the rectangle in half. Thus, in area, the triangle is equal to half the rectangle less half the end column of 3 squares that are shaved off the rectangle by the line BC. Therefore, the area of the triangle is 9 squares – 1.5 squares = 7.5 squares. And the fraction shaded is 7.5/18 = 15/36 = 5/12. Alternatively, the area of a triangle is ½ x base x height = ½ x 5 x 3 = 7.5 for the triangle ABC. So the fraction shaded is again 5/12.
15	6 min	D	Time taken is distance divided by speed so we have 2/20 = 1/10 of an hour i.e. 6 minutes. Beth Schriever is worth looking up. She has an MBE and was a gold medallist BMX rider at the 2020 Olympics. How fast can she really cycle?
16	50 cm^2	B	If we cut 5 cm off each of the longer sides then we have a square whose perimeter is 20 cm and so the sides must each be 5 cm. This means that the rectangle we began with has sides 10 cm and 5 cm long. Thus the area is 5 x 10 = 50 cm^2. Algebraically, if we let one of the shorter sides be x, one of the longer sides is x + 5. Therefore, given that the perimeter is 30 cm, x + (x + 5) + x + (x + 5) = 30 leading to 4x + 10 = 30, and so 4x = 20, giving x = 5 and an area of 5 x 10 = 50cm^2.
17	Dipesh	E	Working through each of the candidates: Jamie scores 50% of 48 = 24, Mimi scores ¾ of 48 = 36, Vlad scores all but 6 = 48 – 6 = 42, Sam scores 11/12 of 48 = 44, Dipesh scores 45. So, Dipesh scores highest
18	16	D	It has to be noticed that if Henry Hedgehog eats 4 slugs for every 3 snails, then when he does eat multiples of 4 slugs, his diet of slugs and snails is in multiples of 7, and 28 is 4 x 7. Hence Henry has eaten 4 x 4 = 16 slugs and 4 x 3 = 12 snails.
19	13	B	 In the diagram, H is the set of all the people who bought a hot chocolate, 27 in total and P is the set of all the people who bought a panini, 30 in total. But because 30 + 27 = 57 and 57 is greater than 40, we know that some people bought both. In adding the two numbers together we have counted these people who bought both twice, once with hot chocolate and once with panini. Thus by however much our total exceeds 40, that is the excess i.e. the number who bought both. In this case 17. Hence those who bought a panini but not a hot chocolate are 30 – 17 = 13.
20	21	D	He needs one 1 digit to cover all the one-digit numbers, one 1 digit to cover the 20s, one for the 30s, one for the 40s, etc and one for 100. So that is ten 1 digits so far.

<table>
<tr><td></td><td></td><td></td><td>Now the 10s, perhaps best written out and counted: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, eleven 1 digits. So that is twenty-one 1 digits altogether.</td></tr>
<tr><td>21</td><td>12,000 bees</td><td></td><td>In Errol's hive the highest number of bees that there could be is 45,499 and the lowest is 44,500. Similarly, in Lauren's hive, the highest is 56,499 and the lowest is 55,500. Therefore, the greatest possible difference if Lauren's highest minus Errol's lowest,
56,499 – 44,500 =11,999 which, to the nearest 1,000 is 12,000.</td></tr>
<tr><td>22</td><td>2</td><td></td><td><table><tr><td>1</td><td>5</td><td>7</td><td>35</td></tr><tr><td>3</td><td>x</td><td></td><td>48</td></tr><tr><td>9</td><td></td><td></td><td>216</td></tr><tr><td>27</td><td>40</td><td>336</td><td></td></tr></table>
Since the numbers in the end column and the bottom row are all obtained by multiplying numbers in the respective columns and rows together, we are looking at factors. 35 = 1 x 5 x 7. In the bottom row 40 is the only number divisible by 5, so we have the red 5. 27 in the bottom row does not divide by 7 and so we have the green 1 and hence the blue 7. Which means that 336 must divide by 7 to give 48. We are using only the digits 1 to 9 and so 48 = 6 x 8. Similarly, 27 in the bottom row is 1 x 3 x 9. Now 48 does not divide by 9, so we have the brown 9 and the black 3. 3 divides into 48 to give 16 = 2 x 8 and so x = 2</td></tr>
<tr><td>23</td><td>8 laps, with 24 laps acceptable*</td><td></td><td>The runners reach the start line together when the number of laps they have run is a multiple of 3 and of 4 and of 8. 24 is the smallest multiple of 3, 4, and 8. So they have completed 24 laps when they next are at the finish line together.
*We had thought we were setting a question that would use the idea of the lowest common multiple of the three numbers, 8, 4, and 3. And of course, the lowest common multiple is 24, the answer given in the notes.
However, once we read the question, the obvious answer is 8 because all three will have completed 8, 4 and 3 laps at the same time and arrive together at the start line. And so, Xanthe will have completed 8 laps when they are next together at the start line.
We would suggest that if you are marking the paper, you make a judgement on the answer, but we will accept both 8 or 24 as correct answers. We have seen both answers given so would not like to disadvantage pupils.</td></tr>
<tr><td>24</td><td>48%</td><td></td><td>We do not know the number of pupils in the school but this does not matter. Percentages are based on a hundred so let us assume that there are 100 pupils in the school. 80% voted and 80% of 100 is 80. 60% voted for the winner of the election, i.e. 80 x 60/100 = 48. So based on a population of 100 pupils, 48 voted for the winner, i.e. 48%.</td></tr>
<tr><td>25</td><td>£11</td><td></td><td>This question may be tackled by bar modelling.
Alice is the youngest so her share will be the smallest. So we take Alice's share as the unit of the model (not to scale):

Bethany is twice as old as Alice and so gets twice as much so we add a bar twice as long</td></tr>
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			Catherine is three years older than Bethany and so gets 3 units more than Bethany, i.e. twice as much as Alice plus 3 units. Let us add a bar to show this. We have a bar that is now 5 lots of Alice plus 3 in length, and this is equal to 58 in length. In other words, 5 lots of Alice is £55, so one lot of Alice is £11 Algebraically, if we denote Alice's share by x, then Bethany's share is 2x and Catherine's share is 2x + 3. Therefore, since the money to be shared is £58 we have x + 2x + 2x + 3 = 58, leading to 5x + 3 = 58. Which gives 5x = 55 and so x = 11. Thus Alice receives £11.