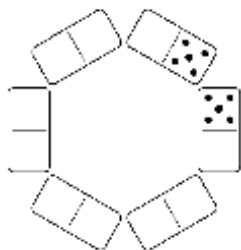


JMC Spatial Reasoning

1.



[JMC 2012 Q21] Dominic wants to place the six dominoes above in a hexagonal ring so that, for every pair of adjacent dominoes, the numbers of pips match. The ring below indicates how one adjacent pair match. In a completed ring, how many of the other five dominoes can he definitely *not* place adjacent to ?



2. [JMC 2011 Q24] Two adults and two children wish to cross a river. They make a raft but it will carry only the weight of one adult or two children. What is the minimum number of times the raft must cross the river to get all four people to the other side? (N.B. The raft may not cross the river without at least one person on board.)

A 3 B 5 C 7 D 9 E 11

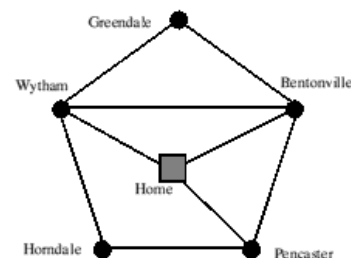
3. [JMC 2011 Q25] The diagram shows a trapezium made from three equilateral triangles. Three copies of the trapezium are placed together, without gaps or overlaps and so that only complete edges coincide, to form a polygon with N sides.



How many different values of N are possible?

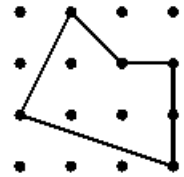
A 4 B 5 C 6 D 7 E 8

4. [JMC 2010 Q19] Pat needs to travel down every one of the roads shown at least once, starting and finishing at home. What is the smallest number of the five villages that Pat will have to visit more than once?



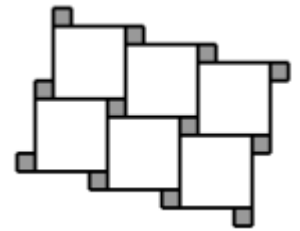
A 1 B 2 C 3 D 4 E 5

5. [JMC 2010 Q23] A single polygon is made by joining dots in the 4×4 grid with straight lines, which meet only at dots at their end points. No dot is at more than one corner. The diagram shows a five-sided polygon formed in this way. What is the greatest possible number of sides of a polygon formed by joining the dots using these same rules?



A 12 B 13 C 14 D 15 E 16

6. [JMC 2009 Q17] The tiling pattern shown uses two sizes of square, with sides of length 1 and 4. A very large number of these squares is used to tile an enormous floor in this pattern. Which of the following is closest to the ratio of the number of grey tiles on the floor to the number of white tiles?



A 1:1 B 4:3 C 3:2 D 2:1 E 4:1

7. [JMC 2009 Q21] A rectangular sheet of paper is divided into two pieces by a single straight cut. One of the pieces is then further divided into two, also by a single straight cut. Which of the following could *not* be the total number of edges of the resulting three pieces?

A 9 B 10 C 11 D 12 E 13

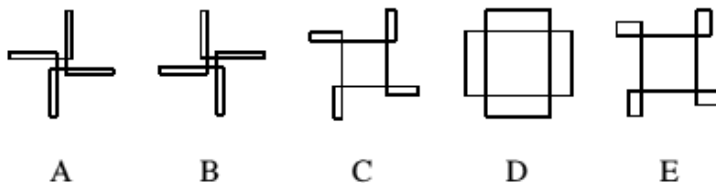
8. [JMC 2009 Q22] Starting with the square containing the 2, you are allowed to move from one square to the next either across a common edge, or diagonally through a common corner. How many different routes are there passing through exactly two squares containing a 0 and ending in one of the squares containing a 9?

2	0	0	9
0	0	0	9
0	0	0	9
9	9	9	9

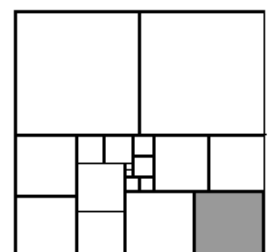
A 7 B 13 C 15 D 25 E 32

9. [JMC 2008 Q16] The figures below are all drawn to scale. Which figure would result from repeatedly following the instructions in the box on the right?

Move forward 2 units.
Turn right.
Move forward 15 units.
Turn right.
Move forward 20 units.
Turn right.



10. [JMC 2008 Q25] A large square is divided into adjacent pairs of smaller squares with integer sides, as shown in the diagram (which is not drawn to scale). Each size of smaller square occurs only twice. The shaded square has sides of length 10. What is the area of the large square?



A 1024 B 1089 C 1156 D 1296 E 1444

11. [JMC 2007 Q17] Just William's cousin, Sweet William, has a rectangular block of fudge measuring 2 inches by 3 inches by 6 inches. He wants to cut the block up into cubes whose side lengths are whole numbers of inches. What is the smallest number of cubes he can obtain?

- A 3 B 8 C 15 D 29 E 36

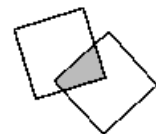
12. [JMC 2007 Q25] A piece of paper in the shape of a polygon is folded in half along a line of symmetry. The resulting shape is also folded in half, again along a line of symmetry. The final shape is a triangle. How many possibilities are there for the number of sides of the original polygon?

- A 3 B 4 C 5 D 6 E 7

13. [JMC 2006 Q17] In how many different ways can a row of five "on/off" switches be set so that no two adjacent switches are in the "off" position?

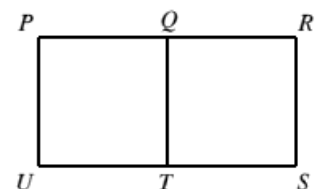
- A 5 B 10 C 11 D 13 E 15

14. [JMC 2006 Q21] Which one of the following shapes could not appear as the overlapping region of two identical squares?



- A equilateral triangle B square C kite
D heptagon E regular octagon

15. [JMC 2005 Q17] The figure shows rectangle $PRSU$ and line QT , which divides the rectangle into two squares. How many right-angled triangles can be drawn using any three of the points P, Q, R, S, T, U as corners?



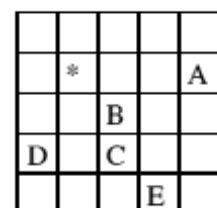
- A 8 B 9 C 10 D 12 E 14

16. [JMC 2005 Q20] How many of the statements in the box are true?

None of these statements is true.
Exactly one of these statements is true.
Exactly two of these statements are true.
All of these statements are true.

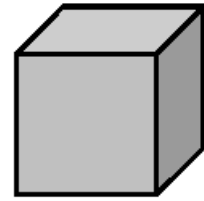
- A 0 B 1 C 2 D 3 E 4

17. [JMC 2005 Q21] If the square is completed with the letters A, B, C, D and E so that no row, column or either of the two main diagonal lines contains the same letter more than once, which letter should replace the asterisk?



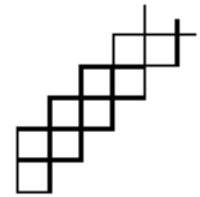
- A B C D E

18. [JMC 2005 Q25] The diagram shows a unit cube coloured blue. Additional blue unit cubes are glued face-to-face to each of its six faces to form a three-dimensional “cross”. If unit cubes coloured yellow are now glued face-to-face to all the spare faces of this cross, how many yellow unit cubes are required.



A 6 B 18 C 24 D 30 E 36

19. [JMC 2004 Q18] A shape consisting of 2004 small squares is made by continuing the pattern shown in the diagram. The small squares have sides of length 1cm. What is the length, in cm, of the perimeter of the whole shape?



A 4008 B 4010 C 6012 D 6016 E 8016

20. [JMC 2004 Q21] Four of these jigsaw pieces fit together to form a rectangle. Which one is not used?



Answers

1. B
2. D
3. C
4. C
5. E
6. A
7. E
8. D
9. A
10. D
11. C
12. B
13. D
14. A
15. E
16. B
17. D
18. B
19. B
20. E