

United Kingdom  
Mathematics Trust

## 25TH ANNIVERSARY CHALLENGE

Tuesday 25 January 2022

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supported by  

*England & Wales: Year 8 or below*

*Scotland: S2 or below*

*Northern Ireland: Year 9 or below*

### INSTRUCTIONS

1. Time allowed: **45 minutes**.
2. The use of blank or lined paper for rough working is allowed; **squared paper, calculators and measuring instruments are forbidden**.
3. **Do not expect to finish the whole paper in the time allowed.** The questions in this paper have been arranged in approximate order of difficulty with the harder questions towards the end. You are not expected to complete all the questions during the time. You should bear this in mind when deciding which questions to tackle.
4. **Scoring rules:**  
1 mark is awarded for each correct answer.  
0 marks are awarded for each incorrect or blank answer.  
In this paper you will not lose marks for getting questions wrong.
5. **The questions on this paper have been carefully selected from the last 25 years of UKMT Junior Mathematical Challenges. They are designed to challenge you to think, not to guess.** You will gain more marks, and more satisfaction, by doing one question carefully than by guessing lots of answers. This paper is about solving interesting problems, not about lucky guessing.

Enquiries about the 25th Anniversary Challenge should be sent to:

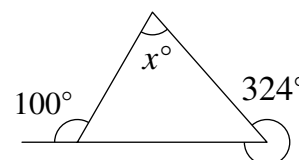
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1. What is  $(999 - 99 + 9) \div 9$ ? [2014]  
 A 91                      B 99                      C 100                      D 101                      E 109
2. Which of the following statements is false? [2002]  
 A  $3 + 5 \times 4 = 23$                       B  $20 - 5 \times 4 = 0$                       C  $12 - 5 \times 2 = 2$                       D  $3 + 6 \times 4 = 36$   
 E  $5 \times 3 - 2 = 13$
3. Which of the following could have a length of 2010 mm? [2010]  
 A a table                      B an oil tanker                      C a teaspoon                      D a school hall                      E a hen's egg
4. Kylie the clumsy koala is all fingers and thumbs. Like all koala bears, Kylie has two thumbs [1997] and three fingers on each front paw, and one thumb and four fingers on each rear paw. How many thumbs do Kylie and her nine brothers have between them?  
 A 10                      B 20                      C 30                      D 40                      E 60
5. Which of the following has only one factor other than 1 and itself? [2012]  
 A 6                      B 8                      C 13                      D 19                      E 25
6. In this diagram, what is the value of  $x$ ? [2008]  
 A 16                      B 36                      C 64                      D 100                      E 144

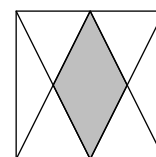


7. Amrita thinks of a number. She doubles it, adds 9, divides her answer by 3 and [2020] finally subtracts 1. She obtains the same number she originally thought of. What was Amrita's number?

A 1                      B 2                      C 3                      D 4                      E 6

8. The diagram shows a rhombus formed by joining each vertex of a [2021] square to the midpoint of a side of the square. What fraction of the area of the square has been shaded?

A  $\frac{1}{2}$                       B  $\frac{1}{3}$                       C  $\frac{1}{4}$                       D  $\frac{1}{6}$                       E  $\frac{1}{8}$



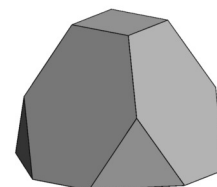
9. In William Shakespeare's play *As You Like It*, Rosalind speaks to Orlando about [2017] "He that will divide a minute into a thousand parts."

Which of the following is equal to the number of seconds in one thousandth of one minute?

A 0.24                      B 0.6                      C 0.024                      D 0.06                      E 0.006

10. A solid square-based pyramid has all of its corners cut off, as shown. [2004] How many edges does the resulting shape have?

A 8                      B 13                      C 15                      D 20                      E 24



11. Travelling by train from Edinburgh to London, I passed a sign saying “London 150 miles”. [2006]  
After 7 more miles, I passed another sign saying “Edinburgh 250 miles”.  
How far is it by train from Edinburgh to London?

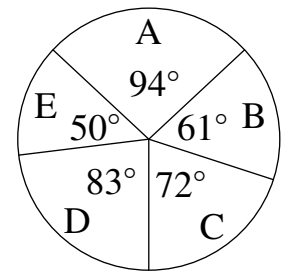
A 407 miles      B 393 miles      C 257 miles      D 243 miles      E 157 miles

12. A newspaper reported last year that marine experts at the Sea Life Centre in Brighton [2001]  
were teaching an octopus to open jam jars to get at food as a way of stopping it becoming bored.  
Assuming that it can open four jars simultaneously and that each jar takes 30 seconds to open, how  
many jars can the octopus open per hour?

A 30                      B 120                      C 240                      D 480                      E 960

13. Which one of the sectors in the pie chart represents the **mode**? [2005]

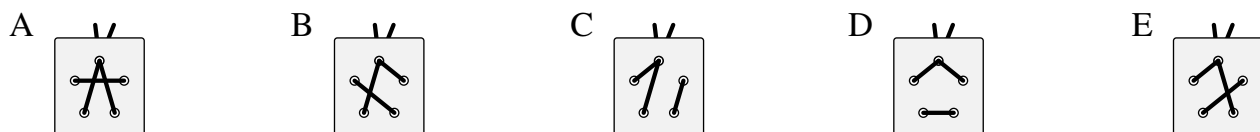
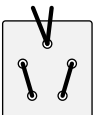
A                      B                      C                      D                      E



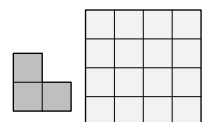
14. For £2, a stamp machine gives a mixture of 20p and 26p stamps worth a total of £2.02. [1999]  
How many 20p stamps are included?

A 1                      B 3                      C 5                      D 8                      E 10

15. A single piece of string is threaded through five holes in a piece of card. [2000]  
One side of the card is shown in the diagram on the right. Which of the diagrams below  
could *not* represent the pattern of the string on the reverse side?



16. Beatrix places copies of the L-shape shown on a  $4 \times 4$  board [2018]  
so that each L-shape covers exactly three cells of the board.  
She is allowed to turn around or turn over an L-shape.

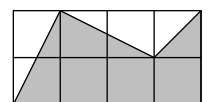


What is the largest number of L-shapes she can place on the board without overlaps?

A 2                      B 3                      C 4                      D 5                      E 6

17. What fraction of the rectangular grid is shaded? [1998]

A  $\frac{11}{16}$                       B  $\frac{9}{16}$                       C  $\frac{5}{8}$                       D  $\frac{3}{4}$                       E  $\frac{2}{3}$



18. Last year's match at Wimbledon between John Isner and Nicolas Mahut, which lasted 11 hours and 5 minutes, set a record for the longest match in tennis history. The fifth set of the match lasted 8 hours and 11 minutes. Approximately what fraction of the whole match was taken up by the fifth set? [2011]

A  $\frac{1}{5}$                       B  $\frac{2}{5}$                       C  $\frac{3}{5}$                       D  $\frac{3}{4}$                       E  $\frac{9}{10}$

19. Each row, each column and each of the bold 2 by 3 rectangles in the grid has to contain each of the numbers 1, 2, 3, 4, 5 and 6 (one number in each cell). [2019]

				$x$	5
				6	
		1	2		
		3	4		
		4		3	
2					1

What number should go in the cell marked  $x$ ?

A 1                      B 2                      C 3                      D 4                      E 6

20. The four knaves were asked who stole the tarts. [2015]

Knave of Hearts: "I stole the tarts."  
 Knave of Clubs: "The Knave of Hearts is lying."  
 Knave of Diamonds: "The Knave of Clubs is lying."  
 Knave of Spades: "The Knave of Diamonds is lying."

How many of the four Knaves were telling the truth?

A 1                      B 2                      C 3                      D 4  
 E more information needed

21. The sum of ten consecutive integers is 5. What is the largest of these integers? [2009]
- A 2                      B 3                      C 4                      D 5  
 E more information needed

22. The letters J, M, C represent three different non-zero digits. What is the value of  $J + M + C$ ? [2007]

A 19                      B 18                      C 17                      D 16                      E 15

$$\begin{array}{r} J J \\ MM \\ + CC \\ \hline JMC \end{array}$$

23. Weighing the baby at the clinic was a problem. The baby would not keep still and caused the scales to wobble. So I held the baby and stood on the scales while the nurse read off 78 kg. Then the nurse held the baby while I read off 69 kg. Finally I held the nurse while the baby read off 137 kg. What was the combined weight of all three? [2013]

A 142 kg                      B 147 kg                      C 206 kg                      D 215 kg                      E 284 kg

24. Three boxes under my stairs contain apples or pears or both. Each box contains the same number of pieces of fruit. The first box contains all twelve of the apples and one-ninth of the pears. How many pieces of fruit are there in each box? [2016]

A 14                      B 16                      C 18                      D 20                      E 36

25. Gill has recently moved to a new house, which has a three-digit number. The sum of this number and its three individual digits is 429. What is the *product* of the three digits which make up the house number? [2003]

A 20                      B 28                      C 30                      D 36                      E 48