United Kingdom Mathematics Trust

Junior Kangaroo Past Paper

2015 – 2019 Collection

Last updated: August 18, 2020

Instructions

1. Do not open the paper until the invigilator tells you to do so.
2. Time allowed: **60 minutes**.
   No answers, or personal details, may be entered after the allowed time is over.
3. The use of blank or lined paper for rough working is allowed; **squared paper**, **calculators and measuring instruments are forbidden**.
4. **Use a B or an HB non-propelling pencil.** Mark at most one of the options A, B, C, D, E on the Answer Sheet for each question. Do not mark more than one option.
5. **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.
6. **Scoring rules:**
   5 marks are awarded for each correct answer to Questions 1-15;
   6 marks are awarded for each correct answer to Questions 16-25;
   In this paper you will not lose marks for getting answers wrong.
7. Your Answer Sheet will be read by a machine. **Do not write or doodle on the sheet except to mark your chosen options.** The machine will read all black pencil markings even if they are in the wrong places. If you mark the sheet in the wrong place, or leave bits of eraser stuck to the page, the machine will interpret the mark in its own way.
8. **The questions on this paper 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.

Comments and suggestions to 89272376@QQ.com .

Contents

Answers:

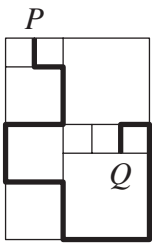
	15	16	17	18	19	20	21	22	23	24	25	
1	C	D	D	A	C							1
2	A	B	C	E	C							2
3	E	E	B	C	D							3
4	C	A	B	C	D							4
5	B	B	E	E	E							5
6	C	E	C	D	B							6
7	C	C	E	A	E							7
8	A	E	E	B	C							8
9	B	E	A	D	B							9
10	D	D	A	B	D							10
11	B	B	D	E	A							11
12	C	C	A	D	C							12
13	A	B	D	B	C							13
14	D	B	C	E	A							14
15	C	C	E	C	D							15
16	C	D	D	D	D							16
17	B	A	B	A	A							17
18	E	D	E	B	E							18
19	D	C	A	C	C							19
20	B	D	C	B	B							20
21	E	C	B	C	D							21
22	D	C	C	B	A							22
23	E	E	E	A	A							23
24	E	A	A	B	E							24
25	A	C	E	D	E							25

Comments and suggestions to 89272376@QQ.com .

1. Riana has been asked to erase digits from the number 12 323 314 to obtain a number which reads the same from left to right as it does from right to left. What is the smallest number of digits Riana needs to erase?

A 1 B 2 C 3 D 4 E 5

2. The diagram shows squares of three different sizes arranged into a rectangle. The length of each side of the smallest squares is 20 cm. Adam Ant walks along the path marked from P to Q. How far does Adam walk?



A 380 cm B 400 cm C 420 cm D 440 cm E 460 cm

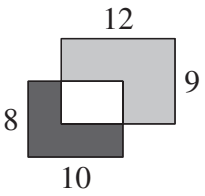
3. A bridge is built across a river. One quarter of the bridge is over the left bank of the river and one third of the bridge is over the right bank. The river is 120 m wide. How long is the bridge?

A 150 m B 190 m C 240 m D 288 m E 324 m

4. In four years' time Evie will be three times older than she was two years ago. How old will Evie be in one year's time?

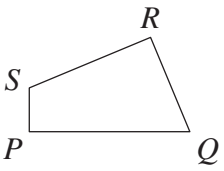
A 2 B 3 C 4 D 6 E 7

5. Two rectangles of dimensions 8 cm by 10 cm and 9 cm by 12 cm overlap as shown in the diagram. The area of the black region is 37 cm^2. What is the area of the grey region?



A 60 cm^2 B 62 cm^2 C 62.5 cm^2 D 64 cm^2 E 65 cm^2

6. In the quadrilateral $PQRS$, the length of PQ is 11 cm, the length of QR is 7 cm, the length of RS is 9 cm and the length of SP is 3 cm. Both $\angle QRS$ and $\angle SPQ$ are 90°. What is the area of the quadrilateral $PQRS$?



A 30 cm^2 B 48 cm^2 C 50 cm^2 D 52 cm^2 E 60 cm^2

7. There are 30 pupils in my class. 20 pupils like Maths and 18 pupils like English. Twice as many pupils like both subjects as like neither of them. How many pupils like only Maths?

A 20 B 16 C 12 D 8 E 4

8. The mean of five numbers is 25. Abbie adds 5 to the first number, 10 to the second number, 15 to the third number, 20 to the fourth number and 25 to the fifth number to obtain a new set of five numbers. What is the mean of the numbers in the new set?

A 100 B 50 C 40 D 30 E 25

9. What is the smallest possible sum of two positive integers whose product is 240?

A 30 B 31 C 32 D 34 E 38

10. There are 39 boys and 23 girls in a dance group. Every week, 6 boys and 8 girls join the group and no one leaves the group. What is the total number of people in the dance group in the week when the number of boys is equal to the number of girls?

A 144 B 154 C 164 D 174 E 184

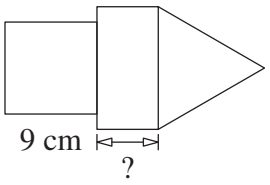
11. Two of the following four facts about a positive integer N are true and two are false.

N is divisible by 5
N is divisible by 11
N is divisible by 55
N is less than 10

What is the value of N?

A 5 B 10 C 11 D 55 E 110

12. The shape in the diagram is made up of a rectangle, a square and an equilateral triangle, all of which have the same perimeter. The length of the side of the square is 9 cm. What is the length of the shorter sides of the rectangle?



A 4 cm B 5 cm C 6 cm D 7 cm E 8 cm

13. What is the minimum number of cubes of the same size required to fill a box with dimensions 30 cm by 40 cm by 50 cm?

A 20 B 40 C 60 D 80 E 120

14. Henry starts to read a 290-page book on a Sunday. He reads four pages every day except on Sundays when he reads 25 pages. How many days does it take him to finish the book?

A 41 B 40 C 35 D 12 E 6

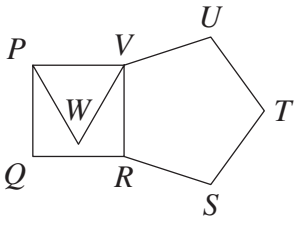
15. Amy, Bob, Cat and Dee occupy the top four positions in a chess tournament. The sum of Amy's position, Bob's position and Dee's position is 6. The sum of Bob's position and Cat's position is 6. Bob finished ahead of Amy. Who came first in the tournament?

A Amy B Bob C Cat D Dee
E You can't be certain

16. Eight cards are numbered from 1 to 8. The cards are placed in two boxes P and Q so that the sum of the numbers on the three cards in box P is equal to the sum of the numbers on the five cards in box Q. Which of the following statements must be true?

A The card numbered 1 is not in box Q
B Four cards in box Q have even numbers on
C The card numbered 5 is in box Q
D The card numbered 2 is in box Q
E Exactly three cards in box Q have odd numbers on.

17. The diagram shows a square, an equilateral triangle and a regular pentagon. What is the size of $\angle WUV$?



A 21° B 23° C 25° D 27° E 29°

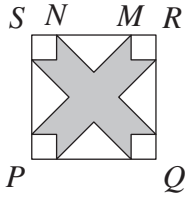
18. In the diagram, ♠, ♦ and ♣ each represent a positive integer. The sums of the numbers in each row and in each column are as shown.

♠	♦	♠	53
♦	♠	♣	47
♦	♣	♠	47
52	47	48	

What is the value of ♠ + ♦ − ♣?

A 12 B 17 C 18 D 22 E 23

19. In the diagram, $PQRS$ is a square of side 10 cm. The distance MN is 6 cm. The square is divided into four congruent isosceles triangles, four congruent squares and the shaded region.



What is the area of the shaded region?

A $42\,\text{cm}^2$ B $46\,\text{cm}^2$ C $48\,\text{cm}^2$ D $52\,\text{cm}^2$ E $58\,\text{cm}^2$

20. The diagram shows a 2×4 table in which the numbers in each column except the first column are the sum and the difference of the numbers in the previous column.

10	13	20	26
3	7	6	14

Carl completes a 2×7 table in the same way and obtains the numbers 96 and 64 in the final column. What is the sum of the numbers in the first column of Carl's table?

A 24 B 20 C 12 D 10 E 8

21. Ellis's Eel Emporium contains a large tank holding three different types of eel: electric eels, moray eels and freshwater eels. A notice on the tank reads as follows:

> All the eels are electric eels except 12
> All the eels are moray eels except 14
> All the eels are freshwater eels except 16

How many eels are in the tank?

A 42 B 33 C 24 D 21 E 20

22. Geraint always cycles to work, leaving at 8am every morning. When he averages 15 km/h, he arrives 10 minutes late. However, when he averages 30 km/h, he arrives 10 minutes early. What speed should he average to arrive on time?

A 20 km/h B 21 km/h C 22.5 km/h D 24 km/h E 25 km/h

23. Sid is colouring the cells in the grid using the four colours red, blue, yellow and green in such a way that any two cells that share a vertex are coloured differently. He has already coloured some of the cells as shown.

R	B		Y	G
				X

What colour will he use for the cell marked X?

A Red B Blue C Yellow D Green
E You can't be certain

24. There are two ponds at the bottom of Gabrielle's garden, each containing frogs and toads. In one pond the ratio of frogs to toads is 3 : 4. In the other pond the ratio of frogs to toads is 5 : 6. Suppose there are 36 frogs in total. What then would be the largest possible total number of toads in the ponds?

A 48 B 46 C 44 D 42 E 40

25. The room numbers of a hotel are all three-digit numbers. The first digit represents the floor and the last two digits represent the room number. The hotel has rooms on five floors, numbered 1 to 5. It has 35 rooms on each floor, numbered n01 to n35 where n is the number of the floor. In numbering all the rooms, how many times will the digit 2 be used?

A 60 B 65 C 95 D 100 E 105

1. Which calculation gives the largest result?

A $2 + 0 + 1 + 8$ B $2 \times 0 + 1 + 8$ C $2 + 0 \times 1 + 8$
D $2 + 0 + 1 \times 8$ E $2 \times 0 + 1 \times 8$

2. Which of the following expressions, when it replaces the symbol Ω, makes the equation $\Omega \times \Omega = 2 \times 2 \times 2 \times 2 \times 3 \times 3$ correct?

A 2 B 3 C 2×3 D $2 \times 3 \times 3$ E $2 \times 2 \times 3$

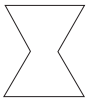
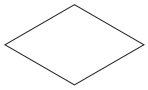
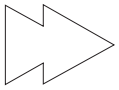
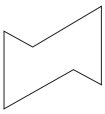
3. Each of the designs shown is initially divided into squares. For how many of the designs is the total area of the shaded region equal to three-fifths of the area of the whole design?

A 0 B 1 C 2 D 3 E 4

4. Milly likes to multiply by 3, Abby likes to add 2 and Sam likes to subtract 1. In what order should they perform their favourite actions to start with 3 and end with 14?

A MAS B MSA C AMS D ASM E SMA

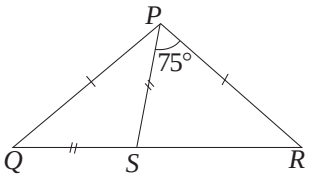
5. Emily has two identical cards in the shape of equilateral triangles. She places them both onto a sheet of paper so that they touch or overlap and draws around the shape she creates. Which one of the following is it impossible for her to draw?

A  B  C  D  E 

6. Lucy has lots of identical lolly sticks. She arranges the lolly sticks end to end to make different triangles. Which number of lolly sticks could she not use to make a triangle?

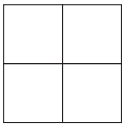
A 7 B 6 C 5 D 4 E 3

7. In the triangle PQR, the lengths of sides PQ and PR are the same. The point S lies on QR so that $QS = PS$ and $\angle RPS = 75°$. What is the size of $\angle QRP$?



A 35° B 30° C 25° D 20° E 15°

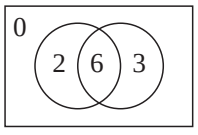
8. William has four cards with different integers written on them. Three of these integers are 2, 3 and 4. He puts one card in each cell of the 2×2 grid shown.



The sum of the two integers in the second row is 6. The sum of the two integers in the second column is 10. Which number is on the card he places in the **top left** cell?

A 2 B 3 C 4 D 6 E Can't be sure

9. Tom throws two darts at the target shown in the diagram. Both his darts hit the target. For each dart, he scores the number of points shown in the region he hits. How many different totals could he score?



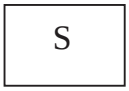
A 6 B 7 C 8 D 9 E 10

10. The diagram below shows five rectangles, each containing some of the letters P, R, I, S and M.

1 

2 

3 

4 

5 

Harry wants to cross out letters so that each rectangle contains only one letter and each rectangle contains a different letter. Which letter does he not cross out in rectangle 2?

A P B R C I D S E M

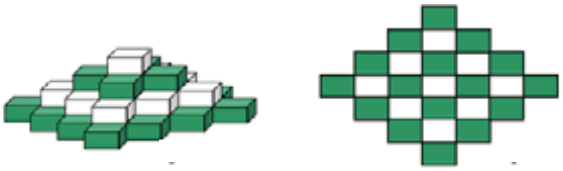
11. The five symbols @, *, #, & and ^ used in the equations below represent different digits.

@ + @ + @ = * # + # + # = ^ * + ^ = &

What is the value of &?

A 0 B 2 C 3 D 6 E 9

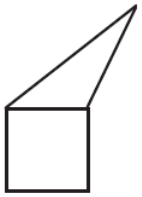
12. The two diagrams show a side view and a plan view of a tower made with light and dark coloured blocks. In the tower, only dark coloured blocks are placed on top of dark coloured blocks and only light coloured blocks are placed on top of light coloured blocks. How many blocks in the tower are light coloured?



A 9 B 13 C 18 D 20 E 24

13. The diagram shows a triangle joined to a square to form an irregular pentagon. The triangle has the same perimeter as the square.

What is the ratio of the perimeter of the pentagon to the perimeter of the square?



A 2: 1 B 3: 2 C 4: 3 D 5: 4 E 6: 5

14. A box contains seven cards, each with a different integer from 1 to 7 written on it. Avani takes three cards from the box and then Niamh takes two cards, leaving two cards in the box. Avani looks at her cards and then tells Niamh "I know the sum of the numbers on your cards is even." What is the sum of the numbers on Avani's cards?

A 6 B 9 C 10 D 11 E 12

15. Today Rachel realised the following facts were true: in two years' time her brother Tim will be twice as old as he was two years ago and in three years' time her sister Tina will be three times as old as she was three years ago.

Which of the following statements is also true?

A Tim is two years older than Tina
B Tim is one year older than Tina
C Tim is the same age as Tina
D Tim is one year younger than Tina
E Tim is two years younger than Tina

16. Ali is arranging the books on his bookshelves. He puts half his books on the bottom shelf and two-thirds of what remains on the second shelf. Finally he splits the rest of his books over the other two shelves so that the third shelf contains four more books than the top shelf. There are three books on the top shelf. How many books are on the bottom shelf?

A 60 B 50 C 40 D 30 E 20

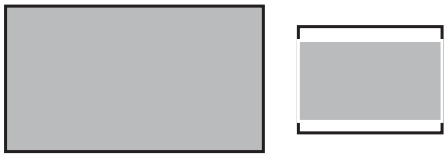
17. A large circular table has 60 chairs around it. What is the largest number of people who can sit around the table so that each person is only sitting next to exactly one other person?

A 40 B 36 C 30 D 25 E 20

18. The points *P*, *Q*, *R* and *S* are marked on a straight line in some order. The lengths of the line segments *PQ*, *QR*, *RS* and *SP* are 13 cm, 11 cm, 14 cm and 12 cm respectively. What is the distance between the two points that are furthest apart?

A 14 cm B 25 cm C 27 cm D 38 cm E 50 cm

19. My TV screen has sides in the ratio 16 : 9. My mother's TV screen has sides in the ratio 4 : 3. A picture which exactly fills the screen of my TV only fills the width of the screen of my mother's TV.



Ratio 16:9 Ratio 4:3

What fraction of the screen on my mother's TV is not covered?

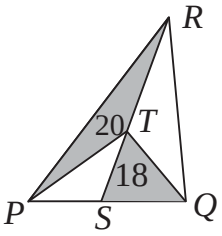
A $\frac{1}{6}$ B $\frac{1}{5}$ C $\frac{1}{4}$ D $\frac{1}{3}$ E It depends on the size of the screen.

20. Steven subtracts the units digit from the tens digit for each two-digit number. He then finds the sum of all his answers.

What is the value of Steven's sum?

A 30 B 45 C 55 D 90 E 100

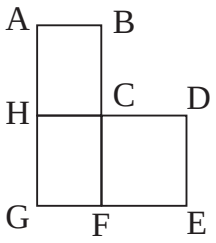
21. In triangle PQR, the point S is on PQ so that the ratio of the length of PS to the length of SQ is 2: 3. The point T lies on SR so that the area of triangle PTR is 20 and the area of triangle SQT is 18, as shown in the diagram.



What is the area of triangle PQR?

A 100 B 90 C 80 D 70 E 60

22. The diagram shows a plan of a town with various bus stops.



There are four bus routes in the town.

Route 1 goes C − D − E − F − G − H − C and is 17 km long.

Route 2 goes A − B − C − F − G − H − A and is 12 km long.

Route 3 goes A − B − C − D − E − F − G − H − A and is 20 km long.

Route 4 goes C − F − G − H − C.

How long is route 4?

A 10 km B 9 km C 8 km D 7 km E 6 km

23. Three friends, Ms Raja, Ms Omar and Ms Beatty all live in the same street. They are a doctor, an engineer and a musician in some order. The youngest one, the doctor, does not have a brother. Ms Beatty is older than the engineer and is married to Ms Omar's brother.

What are the names, in order, of the doctor and the engineer?

A Raja and Omar B Omar and Beatty C Beatty and Omar
D Raja and Beatty E Omar and Raja

24. In the sum $\begin{array}{r} KAN \\ +\,GA \\ \hline ROO \end{array}$ each letter stands for a different digit.

What is the answer to the subtraction $\begin{array}{r} RN \\ -\,KG \\ \hline \end{array}$?

A 10 B 11 C 12 D 21 E 22

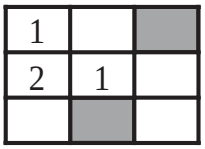
25. What is the largest number of digits that can be erased from the 1000-digit number 201820182018....2018 so that the sum of the remaining digits is 2018?

A 343 B 582 C 671 D 741 E 746

1. Kieran the Kangaroo takes 6 seconds to make 4 jumps. How long does it take him to make 30 jumps?

   A 30 seconds B 36 seconds C 42 seconds D 45 seconds E 48 seconds

2. Sophie wants to complete the grid shown so that each row and each column of the grid contains the digits 1, 2 and 3 exactly once. What is the sum of the digits she will write in the shaded cells?

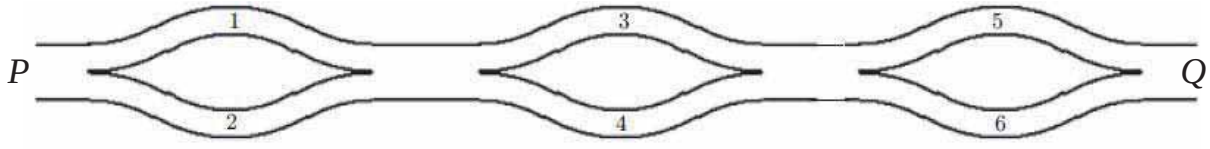


   A 2 B 3 C 4 D 5 E 6

3. Ben has exactly the right number of cubes, each of side 5 cm, to make a solid cube of side 1 m. He places the smaller cubes side by side to form a single row. How long is this row?

   A 5 km B 400 m C 300 m D 20 m E 1 m

4. Beattie wants to walk from *P* to *Q* along the paths shown, always moving in the direction from *P* to *Q*.



   She will add the numbers on the paths she walks along. How many different totals could she obtain?

   A 3 B 4 C 5 D 6 E 8

5. Anna is 13 years old. Her mother Annie is three times as old as Anna. How old will Annie be when Anna is three times as old as she is now?

   A 13 B 26 C 39 D 52 E 65

6. Hasan writes down a two-digit number. He then writes the same two-digit number next to his original number to form a four-digit number. What is the ratio of his four-digit number to his two-digit number ?

   A 2 : 1 B 100 : 1 C 101 : 1 D 1001 : 1 E It depends on his number

7. A square piece of card has perimeter 20 cm. Charlie cuts the card into two rectangles. The perimeter of one of the rectangles is 16 cm. What is the perimeter of the other rectangle?

   A 4 cm B 8 cm C 10 cm D 12 cm E 14 cm

8. Niko counted a total of 60 birds perching in three trees. Five minutes later, 6 birds had flown away from the first tree, 8 birds had flown away from the second tree and 4 birds had flown away from the third tree. He noticed that there was now the same number of birds in each tree. How many birds were originally perched in the second tree?

   A 14 B 18 C 20 D 21 E 22

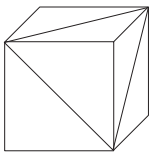
9. Alex colours all the small squares that lie on the two longest diagonals of a square grid. She colours 2017 small squares. What is the size of the square grid?

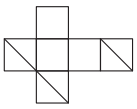
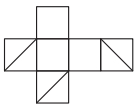
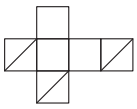
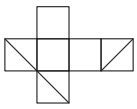
   A 1009×1009 B 1008×1008 C 2017×2017 D 2016×2016 E 2015×2015

10. In the sequence of letters KANGAROOKANGAROOKANG... the word KANGAROO is repeated indefinitely. What is the 2017th letter in this sequence?

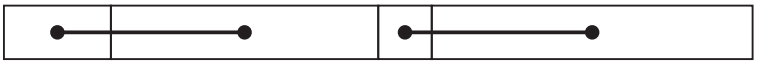
    A K B N C G D R E O

11. A cube has diagonals drawn on three adjacent faces as shown in the diagram. Which of the following nets could Usman use to make the cube shown?



A  B  C  D  E none of those shown

12. Maddie has a paper ribbon of length 36 cm. She divides it into four rectangles of different lengths. She draws two lines joining the centres of two adjacent rectangles as shown.

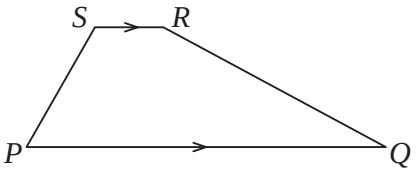


What is the sum of the lengths of the lines that she draws?

A 18 cm B 17 cm C 20 cm D 19 cm E It depends upon the sizes of the rectangles

13. In trapezium $PQRS$, $\angle RSP = 2 \times \angle SPQ$ and $\angle SPQ = 2 \times \angle PQR$. Also $\angle QRS = k \times \angle PQR$. What is the value of k?

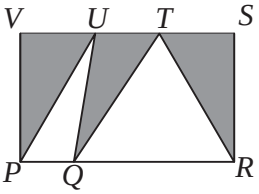
A 2 B 3 C 4 D 5 E 6



14. Taran thought of a whole number and then multiplied it by either 5 or 6. Krishna added 5 or 6 to Taran's answer. Finally Eshan subtracted either 5 or 6 from Krishna's answer. The final result was 73. What number did Taran choose?

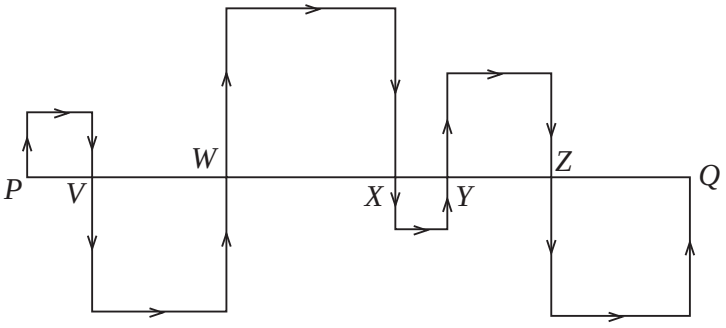
A 10 B 11 C 12 D 13 E 14

15. In the diagram, $PRSV$ is a rectangle with $PR = 20$ cm and $PV = 12$ cm. Jeffrey marks points U and T on VS and Q on PR as shown. What is the shaded area?



A More information needed B 60 cm^2
C 100 cm^2 D 110 cm^2 E 120 cm^2

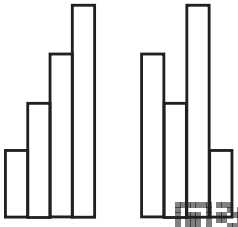
16. The line PQ is divided into six parts by the points V, W, X, Y and Z. Squares are drawn on PV, VW, WX, XY, YZ and ZQ as shown in the diagram. The length of line PQ is 24 cm. What is the length of the path from P to Q indicated by the arrows?



A 48 cm B 60 cm C 66 cm D 72 cm E 96 cm

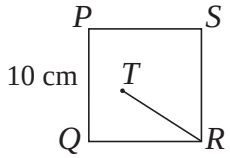
17. Henna has four hair ribbons of width 10 cm. When she measures them, she finds that each ribbon is 25 cm longer than the next smallest ribbon. She then arranges the ribbons to form two different shapes as shown in the diagram.

How much longer is the perimeter of the second shape than the perimeter of the first shape?



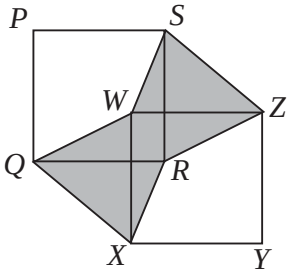
A 75 cm B 50 cm C 25 cm D 20 cm E 0 cm

18. In the diagram, $PQRS$ is a square of side 10 cm. T is a point inside the square so that $\angle SPT = 75°$ and $\angle TSP = 30°$. What is the length of TR?



A 8 cm B 8.5 cm C 9 cm D 9.5 cm E 10 cm

19. In the diagram, $PQRS$ and $WXYZ$ are congruent squares. The sides PS and WZ are parallel. The shaded area is equal to 1 cm^2.
What is the area of square $PQRS$?

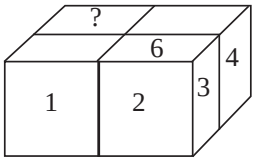


A 1 cm^2 B 2 cm^2 C $\frac{1}{2}$ cm^2 D $1\frac{1}{2}$ cm^2 E $\frac{3}{4}$ cm^2

20. The multiplication $abc \times de = 7632$ uses each of the digits 1 to 9 exactly once. What is the value of b?

A 1 B 4 C 5 D 8 E 9

21. Rory uses four identical standard dice to build the solid shown in the diagram.
Whenever two dice touch, the numbers on the touching faces are the same. The numbers on some of the faces of the solid are shown. What number is written on the face marked with question mark?
(On a standard die, the numbers on opposite faces add to 7.)

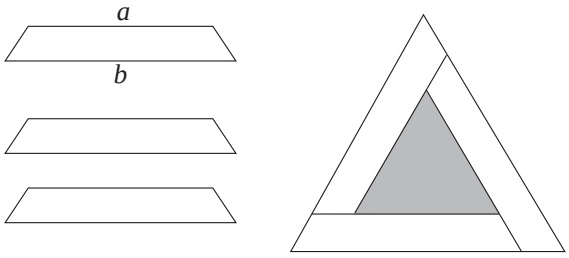


A 6 B 5 C 4 D 3 E 2

22. Harriet tells Topaz that she is thinking of three positive integers, not necessarily all different. She tells her that the product of her three integers is 36. She also tells her the sum of her three integers. However, Topaz still cannot work out what the three integers are.
What is the sum of Harriet's three integers?

A 10 B 11 C 13 D 14 E 16

23. Three congruent isosceles trapeziums are assembled to form an equilateral triangle with a hole in the middle, as shown in the diagram.



What is the perimeter of the hole?

A $3a + 6b$ B $3b - 6a$ C $6b - 3a$ D $6a + 3b$ E $6a - 3b$

24. Jacob and Zain take pencils from a box of 21 pencils without replacing them. On Monday Jacob takes $\frac{2}{3}$ of the number of pencils that Zain takes. On Tuesday Jacob takes $\frac{1}{2}$ of the number of pencils that Zain takes. On Wednesday morning the box is empty. How many pencils does Jacob take?

A 8 B 7 C 6 D 5 E 4

25. How many three-digit numbers are equal to 34 times the sum of their digits?

A 0 B 1 C 2 D 3 E 4

1. At which of these times is the angle between the minute hand and the hour hand of a clock equal to 150°?

   A 9 pm B 8 pm C 6 pm D 5 pm E 4 pm

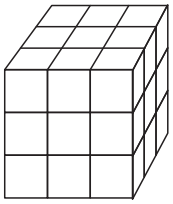
2. Twelve people, and no more, can sit evenly spaced around a large square table. Rohan arranges eight of these square tables in a row to make one long rectangular table. What is the maximum number of people that can sit evenly spaced around this long table?

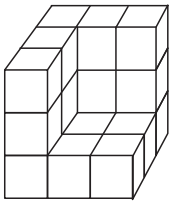
   A 48 B 54 C 60 D 80 E 96

3. A ball and a bat cost £90 in total. Three balls and two bats cost £210 in total. How much does a bat cost?

   A £20 B £30 C £40 D £50 E £60

4. It takes 9 litres of paint to cover the surface of the cube on the left.





   How much paint would it take to cover the surface of the shape on the right?

   A 9 litres B 8 litres C 6 litres D 4 litres E 2 litres

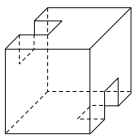
5. What is 10% of 30% of 50% of 7000?

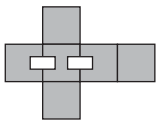
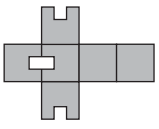
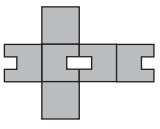
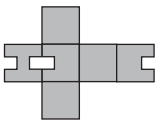
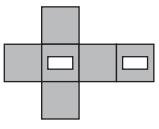
   A 15 B 105 C 150 D 501 E 510

6. Miss Spelling has enough sheets of paper to give each pupil in her class 3 sheets and have 31 sheets left over. Alternatively, she could give each pupil 4 sheets and have 8 sheets left over. How many sheets of paper does she have?

   A 31 B 34 C 43 D 91 E 100

7. Which of the following nets can be used to build the partial cube shown in the diagram?

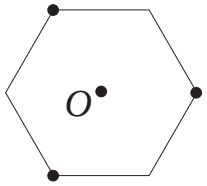


A 
B 
C 
D 
E 

8. One angle of an isosceles triangle is 30°. Which of the following could be the difference between the other two angles?

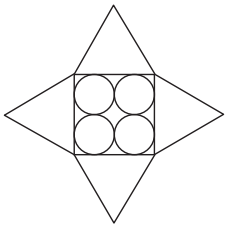
   A 30° B 60° C 70° D 80° E 90°

9. A piece of paper in the shape of a regular hexagon, as shown, is folded so that the three marked vertices meet at the centre O of the hexagon. What is the shape of the figure that is formed?



   A Six-pointed star B Dodecagon C Hexagon
   D Square E Equilateral Triangle

10. Four circles of radius 5 cm touch the sides of a square and each other, as shown in the diagram. On each side of the square, an equilateral triangle is drawn to form a four-pointed star.



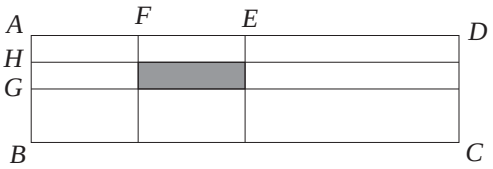
What is the perimeter of the star?

A 40 cm B 80 cm C 120 cm D 160 cm E 200 cm

11. Joey calculated the sum of the largest and smallest two-digit numbers that are multiples of three. Zoë calculated the sum of the largest and smallest two-digit numbers that are not multiples of three. What is the difference between their answers?

A 2 B 3 C 4 D 5 E 6

12. The diagram shows a rectangle $ABCD$ in which $AB = 1$ metre and $AD = 4$ metres. The points E and G are the midpoints of AD and AB and the points F and H are the midpoints of AE and AG.



What is the area of the shaded rectangle?

A $\frac{1}{16}$ m^2 B $\frac{1}{8}$ m^2 C $\frac{1}{4}$ m^2 D $\frac{1}{2}$ m^2 E 1 m^2

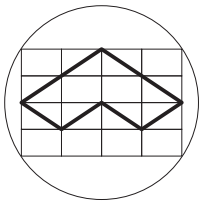
13. The tens digit of a two-digit number is three more than the units digit. When this two-digit number is divided by the sum of its digits, the answer is 7 remainder 3. What is the sum of the digits of the two-digit number?

A 5 B 7 C 9 D 11 E 13

14. How many different cubes are there with three faces coloured red and three faces coloured blue?

A 1 B 2 C 3 D 4 E 5

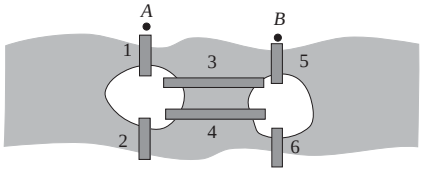
15. The diameter of the circle shown is 10 cm. The circle passes through the vertices of a large rectangle which is divided into 16 identical smaller rectangles.



What is the perimeter of the shape drawn with a dark line?

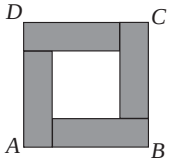
A 10 cm B 16 cm C 20 cm D 24 cm E 30 cm

16. The diagram shows part of a river which has two islands in it. There are six bridges linking the islands and the two banks as shown. Leonhard goes for a walk every day in which he walks over each bridge exactly once. He always starts at point A, goes first over bridge 1 and always finishes at point B. What is the maximum number of days that he can walk without repeating the order in which he crosses the bridges?



A 2 B 4 C 5 D 6 E More than 6

17. The square *ABCD* consists of four congruent rectangles arranged around a central square. The perimeter of each of the rectangles is 40 cm. What is the area of the square *ABCD*?



A 400 cm^2 B 200 cm^2 C 160 cm^2 D 120 cm^2 E 80 cm^2

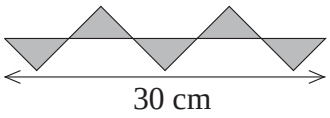
18. When Ellen went to the shop, she found she could spend all her money on 6 cans of cola and 7 croissants or on 8 cans of cola and 4 croissants. If she decided to buy only croissants, how many croissants could she buy?

A 12 B 13 C 15 D 16 E 25

19. Adam, Bill and Chris went swimming 15 times last summer. Adam paid for everyone eight times and Bill paid for everyone seven times. At the end of the summer, Chris calculated that he owed £30. How should he split this between Adam and Bill so that each has paid the same amount?

A £22 to Adam and £8 to Bill B £20 to Adam and £10 to Bill
C £18 to Adam and £12 to Bill D £16 to Adam and £14 to Bill
E £15 to Adam and £15 to Bill

20. The diagram shows five congruent right-angled isosceles triangles. What is the total area of the triangles?



A 25 cm^2 B 30 cm^2 C 35 cm^2 D 45 cm^2 E 60 cm^2

21. In Carl's pencil case there are nine pencils. At least one of the pencils is blue. In any group of four pencils, at least two have the same colour. In any group of five pencils, at most three have the same colour. How many pencils are blue?

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

22. Lewis drives from London to Brighton at an average speed of 60 mph. On the way back, he gets stuck in traffic and his average speed is only 40 mph. What is his average speed for the whole journey?

A 55 mph B 50 mph C 48 mph D 45 mph E Impossible to determine

23. In the addition sum below, a, b and c stand for different digits.

$$\begin{array}{r} a\,b\,c \\ +\ a\,c\,b \\ \hline c\,4\,a. \end{array}$$

What is the value of $a + b + c$?

A 20 B 19 C 18 D 17 E 16

24. The lengths of three adjacent sides of a quadrilateral are equal. The angle between the first and second of these sides is 60° and the angle between the second and third of these sides is 100°. What is the largest angle of the quadrilateral?

A 130° B 140° C 145° D 150° E 160°

25. The whole numbers from 1 to 2016 inclusive are written on a blackboard. Moritz underlines all the multiples of two in red, all the multiples of three in blue and all the multiples of four in green. How many numbers does Moritz underline exactly twice?

A 1008 B 1004 C 504 D 336 E 168

1. Ben lives in a large house with his father, mother, sister and brother as well as 2 dogs, 3 cats, 4 parrots and 5 goldfish. How many legs are there in the house?

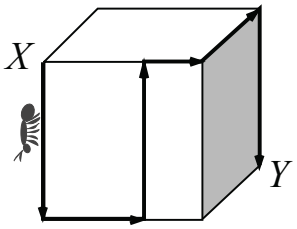
   A 18 B 36 C 38 D 46 E 66

2. The sum of five consecutive integers is 2015. What is the smallest of these integers?

   A 401 B 403 C 405 D 407 E 409

3. The diagram on the right shows a cube of side 18 cm. A giant ant walks across the cube's surface from X to Y along the route shown. How far does it walk?

   A 54 cm B 72 cm C 80 cm D 88 cm E 90 cm



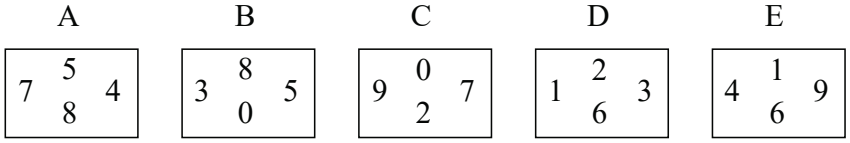
4. How many seconds are there in $\frac{1}{4}$ of $\frac{1}{6}$ of $\frac{1}{8}$ of a day?

   A 60 B 120 C 450 D 900 E 3600

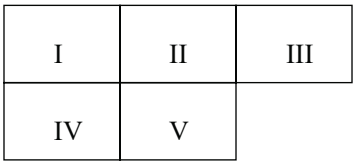
5. What is 203 515 ÷ 2015?

   A 11 B 101 C 1001 D 111 E 103

6. In the diagram, five rectangles of the same size are shown with each side labelled with a number.



   These rectangles are placed in the positions I to V as shown so that the numbers on the sides that touch each other are equal.



   Which of the rectangles should be placed in position I?

   A B C D E

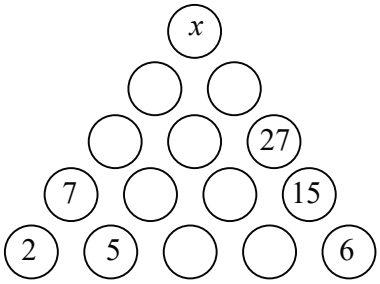
7. Selina takes a sheet of paper and cuts it into 10 pieces. She then takes one of these pieces and cuts it into 10 smaller pieces. She then takes another piece and cuts it into 10 smaller pieces and finally cuts one of the smaller pieces into 10 tiny pieces. How many pieces of paper has the original sheet been cut into?

   A 27 B 30 C 37 D 40 E 47

8. John takes 40 minutes to walk to school and then to run home. When he runs both ways, it takes him 24 minutes. He has one fixed speed whenever he walks, and another fixed speed whenever he runs. How long would it take him to walk both ways?

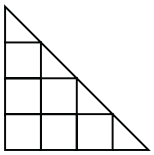
   A 56 minutes B 50 minutes C 44 minutes D 28 minutes E 24 minutes

9. In the diagram on the right, the number in each circle is the sum of the numbers in the two circles below it. What is the value of x?



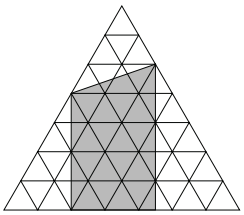
A 100 B 82 C 55 D 50 E 32

10. The diagram on the right shows a large triangle divided up into squares and triangles. S is the number of squares of any size in the diagram and T is the number of triangles of any size in the diagram. What is the value of $S \times T$?



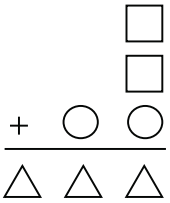
A 30 B 35 C 48 D 70 E 100

11. In the diagram, the small equilateral triangles have area 4 cm^2. What is the area of the shaded region?



A 80 cm^2 B 90 cm^2 C 100 cm^2 D 110 cm^2 E 120 cm^2

12. In the sum shown, different shapes represent different digits. What digit does the square represent?

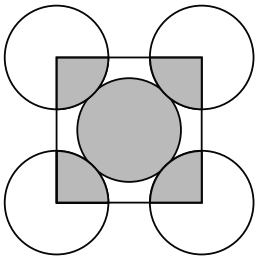


A 2 B 4 C 6 D 8 E 9

13. The sum of 10 distinct positive integers is 100. What is the largest possible value of any of the 10 integers?

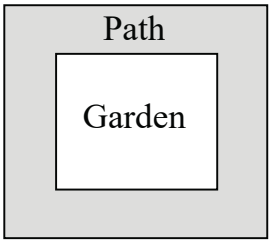
A 55 B 56 C 60 D 65 E 91

14. The diagram shows five circles of the same radius touching each other. A square is drawn so that its vertices are at the centres of the four outer circles.
What is the ratio of the area of the shaded parts of the circles to the area of the unshaded parts of the circles?



A 1:3 B 1:4 C 2:5 D 2:3 E 5:4

15. A rectangular garden is surrounded by a path of constant width. The perimeter of the garden is 24 m shorter than the distance along the outside edge of the path. What is the width of the path?



A 1 m B 2 m C 3 m D 4 m E 5 m

16. A caterpillar starts from its hole and moves across the ground, turning 90° either left or right after each hour. It moves 2 m in the first hour, followed by 3 m in the second hour and 4 m in the third hour and so on. What is the greatest distance it can be from its hole after seven hours?

A 35 m B 30 m C 25 m D 20 m E 15 m

17. In a pirate's trunk there are 5 chests. In each chest there are 4 boxes and in each box there are 10 gold coins. The trunk, the chests and the boxes are all locked. Blind Pew unlocks 9 locks and takes all the coins in all the boxes he unlocks. What is the smallest number of gold coins he could take?

A 20 B 30 C 40 D 50 E 70

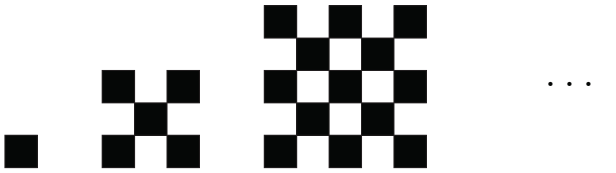
18. Brian chooses an integer, multiplies it by 4 then subtracts 30. He then multiplies his answer by 2 and finally subtracts 10. His answer is a two-digit number. What is the largest integer he could choose?

A 10 B 15 C 18 D 20 E 21

19. From noon till midnight, Clever Cat sleeps under the oak tree and from midnight till noon he is awake telling stories. A poster on the tree above him says "Two hours ago, Clever Cat was doing the same thing as he will be doing in one hour's time". For how many hours a day does the poster tell the truth?

A 3 B 6 C 12 D 18 E 21

20. The diagram below shows a sequence of shapes made up of black and white floor tiles where each shape after the first has two more rows and two more columns than the one before it.

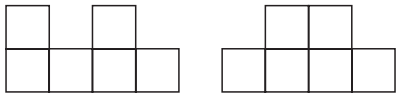


How many black tiles would be required to create the 15th shape in the sequence?

A 401 B 421 C 441 D 461 E 481

21. Peter has a lock with a three-digit code. He knows that all the digits of his code are different and that if he divides the second digit by the third and then squares his answer, he will get the first digit. What is the difference between the largest and smallest possible codes?

A 42 B 468 C 499 D 510 E 541

22. 

The diagram above shows the front and right-hand views of a solid made up of cubes of side 3 cm. The maximum volume that the solid could have is V cm^3. What is the value of V?

A 162 B 216 C 324 D 540 E 648

23. How many three-digit numbers have an odd number of factors?

A 5 B 10 C 20 D 21 E 22

24. Molly, Dolly, Sally, Elly and Kelly are sitting on a park bench. Molly is not sitting on the far right and Dolly is not sitting on the far left. Sally is not sitting at either end. Kelly is not sitting next to Sally and Sally is not sitting next to Dolly. Elly is sitting to the right of Dolly but not necessarily next to her. Who is sitting at the far right end?

A Molly B Dolly C Sally D Kelly E Elly

25. Anna, Bridgit and Carol run in a 100 m race. When Anna finishes, Bridgit is 16 m behind her and when Bridgit finishes, Carol is 25 m behind her. The girls run at constant speeds throughout the race. How far behind was Carol when Anna finished?

A 37 m B 41 m C 50 m D 55 m E 60 m

[This page is intentionally left blank.]