

KSF 2017 - Problems Cadet (Class 7 & 8)

Time Allowed: 180 minutes

SECTION ONE - (3 points problems)

1. What is the time 17 hours after 17:00?

- (A) 8:00 (B) 10:00 (C) 11:00
(D) 12:00 (E) 13:00

2. A group of girls stands in a circle. Xena is the fourth on the left from Yana and the seventh on the right from Yana. How many girls are there in the group?

- (A) 9 (B) 10 (C) 11
(D) 12 (E) 13

3. What number must be subtracted from -17 to obtain -33 ?

- (A) -50 (B) -16 (C) 16
(D) 40 (E) 50

4. The diagram shows a stripy isosceles triangle and its height. Each stripe has the same height. What fraction of the area of the triangle is white?

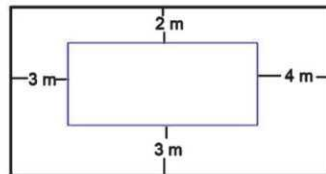


- (A) $1/2$ (B) $1/3$ (C) $2/3$
(D) $3/4$ (E) $2/5$

5. Which of the following equalities is correct?

- (A) $\frac{4}{1} = 1.4$ (B) $\frac{5}{2} = 2.5$ (C) $\frac{6}{3} = 3.6$
(D) $\frac{7}{4} = 4.7$ (E) $\frac{8}{5} = 5.8$

6. The diagram shows two rectangles whose sides are parallel. What is the difference in the lengths of the perimeters of the two rectangles?

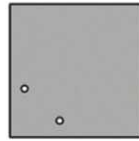


- (A) 12 m (B) 16 m (C) 20 m
(D) 21 m (E) 24 m

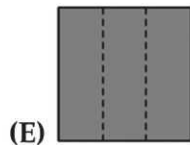
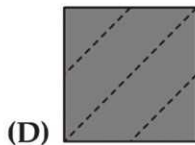
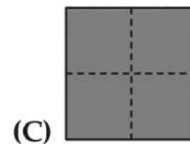
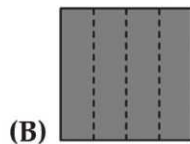
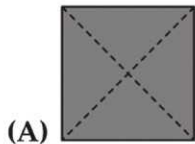
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7. Bob folded a piece of paper twice and then punched one hole in the folded piece of paper. When he unfolded the paper, he saw the arrangement shown in the diagram.



How had Bob folded his piece of paper?



8. The sum of three different positive integers is 7. What is the product of these three integers?

(A) 12

(B) 10

(C) 9

(D) 8

(E) 5

9. The diagram shows four overlapping hearts. The areas of the hearts are 1 cm^2 , 4 cm^2 , 9 cm^2 and 16 cm^2 . What is the shaded area?



(A) 9 cm^2

(B) 10 cm^2

(C) 11 cm^2

(D) 12 cm^2

(E) 13 cm^2

10. Yvonne has 20 euros. Each of her four sisters has 10 euros. How many euros does Yvonne have to give to each of her sisters so that each of the five girls has the same amount of money?

(A) 2

(B) 4

(C) 5

(D) 8

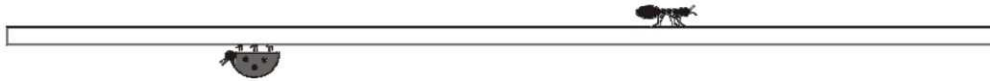
(E) 10

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SECTION TWO - (4 points problems)

11. Annie the Ant started at the left end of a pole and crawled $\frac{2}{3}$ of its length. Bob the Beetle started at the right end of the same pole and crawled $\frac{3}{4}$ of its length. What fraction of the length of the pole are Annie and Bob now apart?

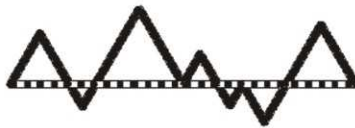


- (A) $\frac{3}{8}$ (B) $\frac{1}{12}$ (C) $\frac{5}{7}$
(D) $\frac{1}{2}$ (E) $\frac{5}{12}$

12. One sixth of the audience in a children's theatre were adults. Two fifths of children were boys. What fraction of the audience were girls?

- (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$
(D) $\frac{1}{5}$ (E) $\frac{2}{5}$

13. In the diagram, the dashed line and the black path form seven equilateral triangles. The length of the dashed line is 20. What is the length of the black path?



- (A) 25 (B) 30 (C) 35
(D) 40 (E) 45

14. Four cousins Ema, Iva, Rita and Zina are 3, 8, 12 and 14 years old, although not necessarily in that order. Ema is younger than Rita. The sum of the ages of Zina and Ema is divisible by 5. The sum of the ages of Zina and Rita is also divisible by 5. How old is Iva?

- (A) 14 (B) 12 (C) 8
(D) 5 (E) 3

15. This year there were more than 800 runners participating in the Kangaroo Hop. Exactly 35% of the runners were women and there were 252 more men than women. How many runners were there in total?

- (A) 802 (B) 810 (C) 822
(D) 824 (E) 840

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16. Ria wants to write a number in each box of the diagram shown. She has already written two of the numbers. She wants the sum of all the numbers to equal 35, the sum of the numbers in first three boxes to equal 22, and the sum of the numbers in the last three boxes to equal 25. What is the product of the numbers she writes in the grey boxes?

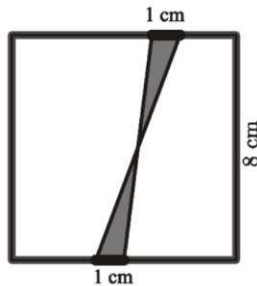


- (A) 63 (B) 108 (C) 0
(D) 48 (E) 39

17. Simon wants to cut a piece of thread into nine pieces of the same length and marks his cutting points. Barbara wants to cut the same piece of thread into only eight pieces of the same length and also marks her cutting points. Carl then cuts the thread at all the cutting points that are marked. How many pieces of thread does Carl obtain?

- (A) 15 (B) 16 (C) 17
(D) 18 (E) 19

18. Two segments, each 1 cm long, are marked on opposite sides of a square of side 8 cm. The ends of the segments are joined as shown in the diagram. What is the shaded area, in cm^2 ?



- (A) 2 (B) 4 (C) 6.4
(D) 8 (E) 10

19. Tycho wants to prepare a schedule for his jogging. He wants to jog exactly twice a week, and on the same days every week. He never wants to jog on two consecutive days. How many such schedules are possible?

- (A) 16 (B) 14 (C) 12
(D) 10 (E) 8

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20. Emily wants to write a number into each cell of a 3×3 table so that the sum of the numbers in any two cells that share an edge are the same. She has already written two numbers, as shown in the diagram. What is the sum of all the numbers in the table?

2		
		3

- (A) 18 (B) 20 (C) 21
(D) 22 (E) 23

SECTION THREE - (5 points problems)

21. The numbers of degrees in the angles in a triangle are three different integers. What is the minimum possible sum of its smallest and largest angles?

- (A) 61° (B) 90° (C) 91°
(D) 120° (E) 121°

22. Ten kangaroos stood in a line as shown in the diagram. At some point, two kangaroos standing side by side and facing each other exchanged places by jumping past each other. This was repeated until no further jumps were possible. How many exchanges were made?



- (A) 15 (B) 16 (C) 18
(D) 20 (E) 21

23. Diana has nine numbers: 1, 2, 3, 4, 5, 6, 7, 8 and 9. She adds 2 to some of them, and 5 to all the others. What is the smallest number of different results she can obtain?

- (A) 5 (B) 6 (C) 7
(D) 8 (E) 9

24. Buses leave the airport every 3 minutes to drive to the city centre. A car leaves the airport at the same time as one bus and drives to the city centre by the same route. It takes each bus 60 minutes and the car 35 minutes to drive from the airport to the city centre. How many buses does the car pass on its way to the centre, excluding the bus it left with?

- (A) 8 (B) 9 (C) 10
(D) 11 (E) 13

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25. Olesia's tablecloth has a regular pattern, as shown in the diagram. What percentage of the tablecloth is black?

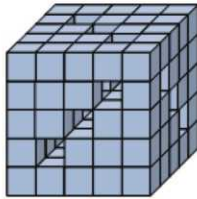


- (A) 16 (B) 24 (C) 25
(D) 32 (E) 36

26. Each digit in the sequence starting 2, 3, 6, 8, 8 is obtained in the following way: the first two digits are 2 and 3 and afterwards each digit is the last digit of the product of the two preceding digits in the sequence. What is the 2017th digit in the sequence?

- (A) 2 (B) 3 (C) 4
(D) 6 (E) 8

27. Mike had 125 small cubes. He glued some of them together to form a big cube with nine tunnels leading through the whole cube as shown in the diagram. How many of the small cubes did he not use?



- (A) 52 (B) 45 (C) 42
(D) 39 (E) 36

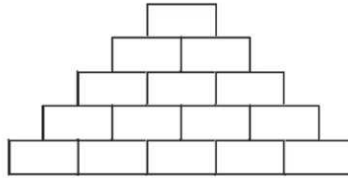
28. Two runners are training on a 720 metre circular track. They run in opposite directions, each at constant speed. The first runner takes four minutes to complete the full loop and the second runner takes five minutes. How many metres does the second one run between two consecutive meetings of the two runners?

- (A) 355 (B) 350 (C) 340
(D) 330 (E) 320

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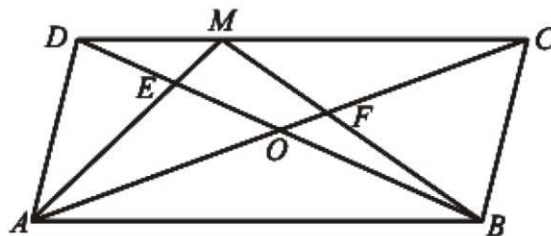
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29. Sarah wants to write a positive integer in each box in the diagram so that each number above the bottom row is the sum of the two numbers in the boxes immediately underneath. What is the largest number of odd numbers that Sarah can write?



- (A) 5 (B) 7 (C) 8
 (D) 10 (E) 11

30. The diagram shows parallelogram $ABCD$ with area S . The intersection point of the diagonals of the parallelogram is O . The point M is marked on DC . The intersection point of AM and BD is E and the intersection point of BM and AC is F . The sum of the areas of the triangles AED and BFC is $\frac{1}{3}S$. What is the area of the quadrilateral $EOFM$, in terms of S ?



- (A) $\frac{1}{6}S$ (B) $\frac{1}{8}S$ (C) $\frac{1}{10}S$
 (D) $\frac{1}{12}S$ (E) $\frac{1}{14}S$

