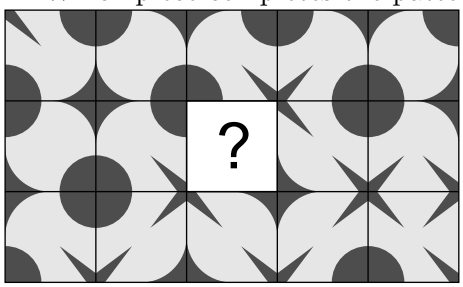
3 points

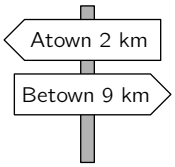
 # 1. Which piece completes the pattern?



(**A**)  (**B**)  (**C**)  (**D**)  (**E**) 

Solution:

 # 2. As Amira is walking from Atown to Betown she passes the five signposts shown. One of them is incorrect. Which one?

(**A**) 

(**B**) 

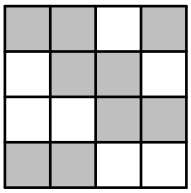
(**C**) 

(**D**) 

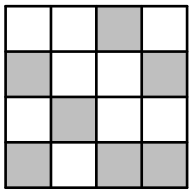
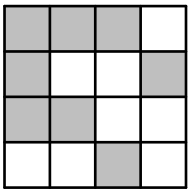
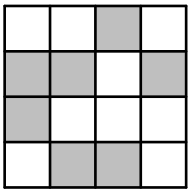
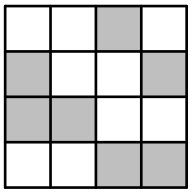
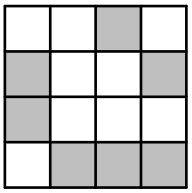
(**E**) 

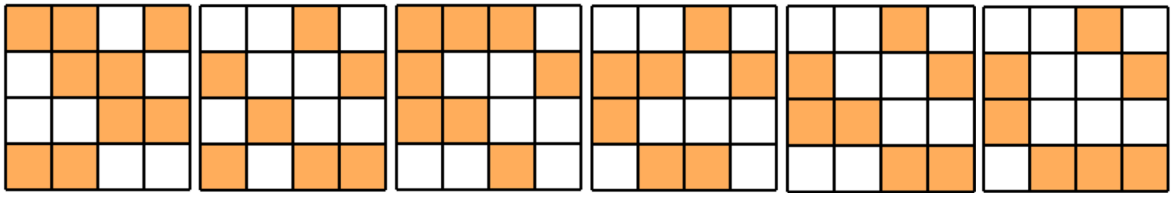
Solution:

 # 3. A large square is made up of smaller white and grey squares.



What does the large square look like if the colours of the white and grey squares are interchanged?

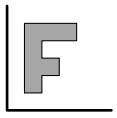
(**A**)  (**B**)  (**C**)  (**D**)  (**E**) 

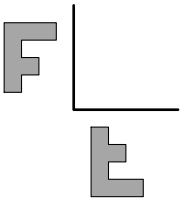
Solution: 

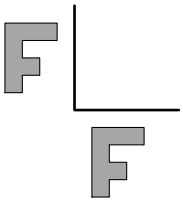
 # 4. Mikas wants to bake 24 muffins for his birthday party. To bake six muffins two eggs are needed. Eggs are sold in boxes of six. How many boxes does Mikas need to buy?

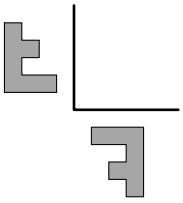
(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 8

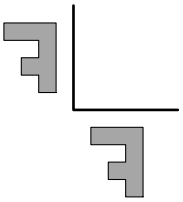
Solution:

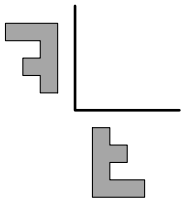
 # 5. Flora reflects the letter F in the two lines shown.  What will the reflections look like?

(**A**) 

(**B**) 

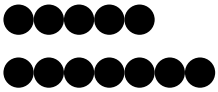
(**C**) 

(**D**) 

(**E**) 

Solution:

 # 6. Kim has several chains of length 5 and of length 7.



By joining chains one after the other, Kim can create different lengths.
Which of these lengths is impossible to make?

(**A**) 10 (**B**) 12 (**C**) 13 (**D**) 14 (**E**) 15

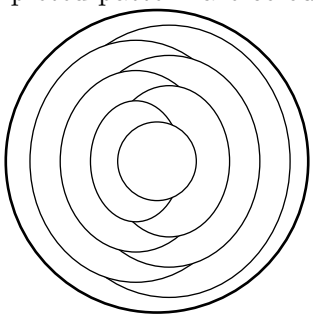
Solution:

 # 7. Maria has 10 sheets of paper. She cuts some of the sheets into five parts each. After that Maria has 22 pieces in total. How many sheets did she cut?

(**A**) 3 (**B**) 2 (**C**) 6 (**D**) 7 (**E**) 8

Solution:

 # 8. Cindy colours each region of the pattern below either red, blue or yellow. She colours regions that touch each other different colours. She colours the outer region blue. How many regions of the completed pattern are coloured blue?



(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

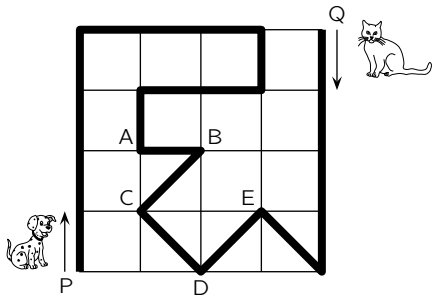
Solution:

 # 9. Four baskets contain 1, 4, 6 and 9 apples respectively. How many apples should be moved between the baskets to have the same number of apples in each basket?

(**A**) 3 (**B**) 4 (**C**) 5 (**D**) 6 (**E**) 7

SOLUTION: Total apples are 1+4+6+9=20 so each basket must have 20:4=5 apples. So must remove 1 apple from the basket with 6 and also 4 apples from the basket with 9. Total 1+4=5. You can distribute these to the other baskets and we are done.

 # 10. A dog and a cat walk in the park along the path marked by the thick black line. The dog starts from P at the same time as the cat starts from Q. The dogs walks three times as fast as the cat. At which point do they meet.

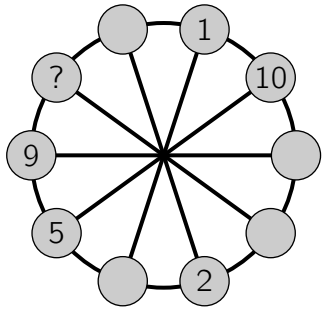


(**A**) at A (**B**) at B (**C**) at C (**D**) at D (**E**) at E

SOLUTION:

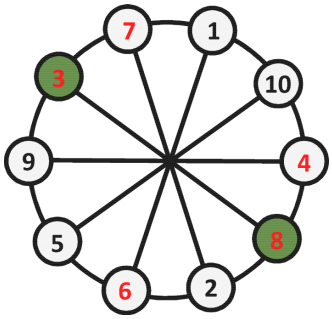
4 points

 # 11. The numbers from 1 to 10 have to be placed in the small circles, one in each circle. Numbers in any two neighbouring circles must have the same sum as the numbers in the two diametrically opposite circles. Some of the numbers are already placed. What number should be placed in the circle with the question mark?



(**A**) 3 (**B**) 4 (**C**) 6 (**D**) 7 (**E**) 8

SOLUTION: We fill in the numbers in the following order: $6 \to 7 \to 4$. Now only the numbers 3 and 8 remain for the two remaining (green) circles. By inspection we see how to place them (3 on the left and 8 on the right, rather than the other way round).



 # 12. When Elise the bat leaves her cave, a digital clock shows 20:20
When she returns and is hanging upside down, she sees 20:20 on the clock again.

How long has she been away from her cave?

(**A**) 3 hours and 28 minutes (**B**) 3 hours and 40 minutes (**C**) 3 hours and 42 minutes
(**D**) 4 hoursand and 18 minutes (**E**) 5 hours and 42 minutes

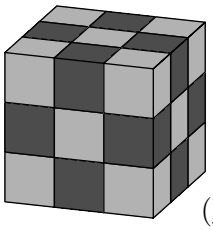
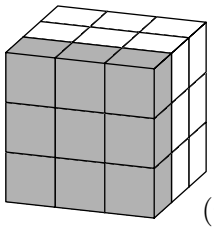
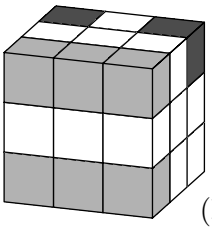
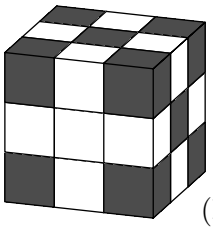
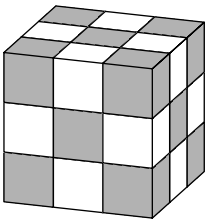
Solution:

 # 13. An elf and a troll meet. The troll always lies, while the elf always tells the truth. They both say exactly one of the following sentences: which one?

(**A**) I am telling the truth (**B**) You are telling the truth (**C**) We both are telling the truth
(**D**) I always lie (**E**) One and only one of us is telling the truth

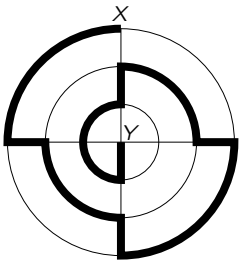
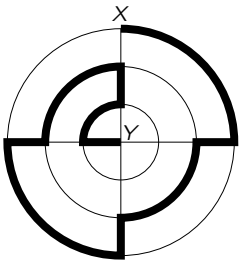
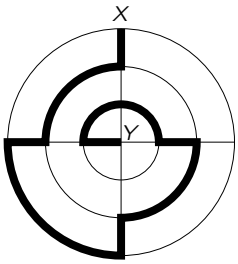
Solution:

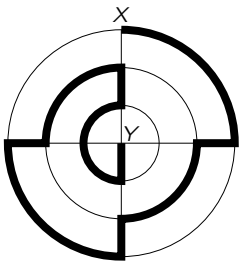
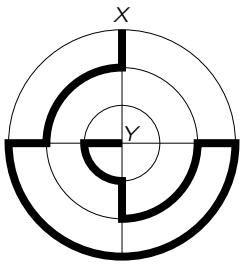
 # 14. Mary has exactly 10 white cubes, 9 light grey cubes and 8 dark grey cubes, all of the same size. She glues all these cubes together to build a big cube. One of the cubes below is the one she builds. Which one is it?

(**A**)  (**B**)  (**C**)  (**D**)  (**E**) 

Solution:

 # 15. The diagrams show five paths from X to Y marked with a thick line. Which path is the shortest?

(**A**)  (**B**)  (**C**) 

(**D**)  (**E**) 

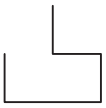
Solution: The idea is to compare and not measure the length of the various paths. The straight sections are of the same length in all cases. Also the circular part of the paths in the middle circle is the same in all cases. So we can ignore these. We can also ignore one quarter circle of the outer circle and one quarter of a circle in the small inside circle from each path. In the end we have left over with a) a small quarter circle and a large quarter circle in path A and also in D, b) a large quarter circle in path B and also in E, c) a small quarter circle in path A. So clearly C ¡ B = E ¡ A = D. So path C is the shortest.

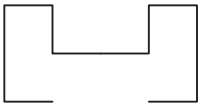
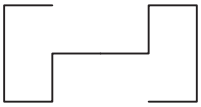
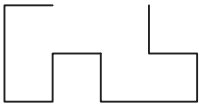
 # 16. A father kangaroo lives with his three children. They decide on all matters by vote, and each member of the family gets as many votes as its age. The father is aged 36 and the children are 13,

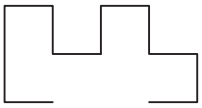
6 and 4 years old, so the father always wins. How many years will it take for the children to win all votes, if they all agree?

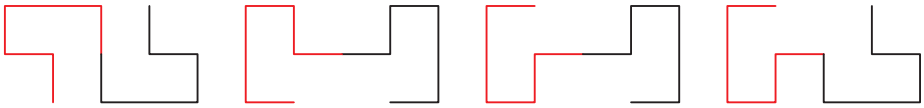
(**A**) 5 (**B**) 6 (**C**) 7 (**D**) 13 (**E**) 14

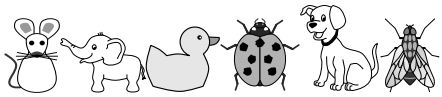
SOLUTION:

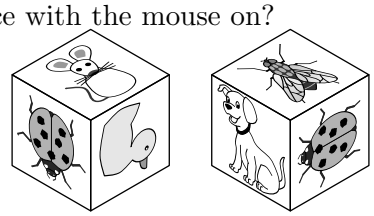
 # 17. Giorgio has two equal pieces of wire of shape  . Which of the following shapes cannot be obtained putting together these two pieces?

(**A**)  (**B**)  (**C**)  (**D**) 

(**E**) 

SOLUTION: This is shape E, see 

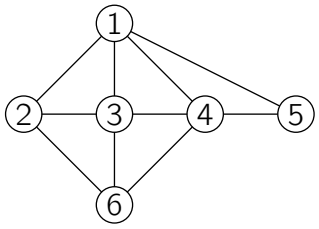
 # 18. Amy glues the six stickers shown onto the faces of a cube:  The pictures below show the cube in two different positions. Which sticker is on the face opposite the face with the mouse on?



(**A**)  (**B**)  (**C**)  (**D**)  (**E**) 

SOLUTION:

 # 19. The picture below shows the friendships of the six girls Ann, Beatrice, Chloe, Diana, Elisabeth and Fiona. Each number represents one of the girls and each line joining two numbers represents a friendship between those two girls. Chloe, Diana and Fiona each have four friends. Beatrice is friends with only Chloe and Diana. Which number represents Fiona?

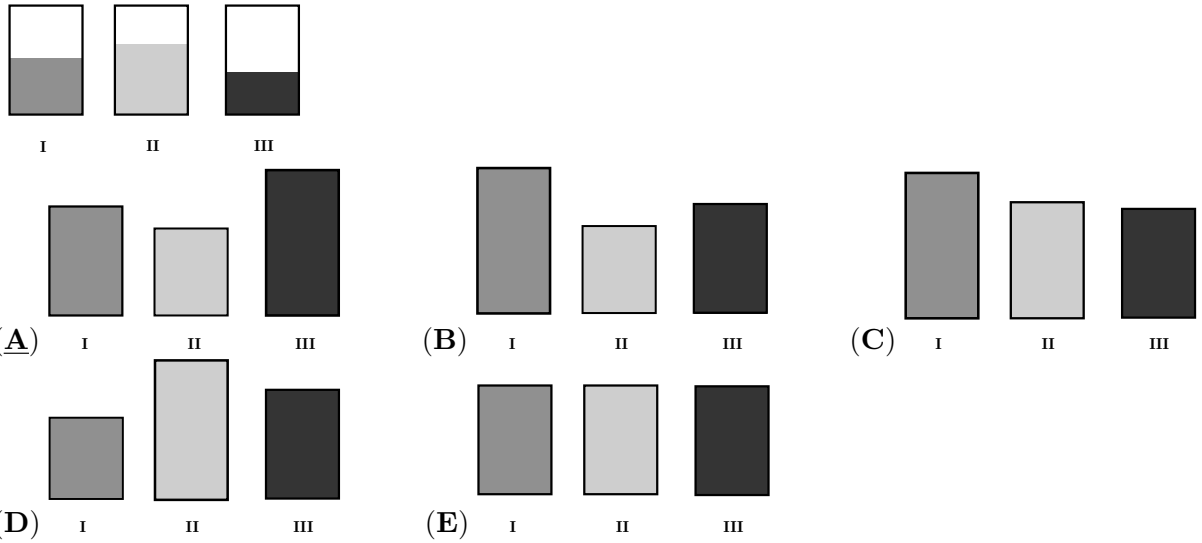


(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

SOLUTION:

 # 20. Mary put the same amount of liquid in three rectangular vessels. Viewed from the front, they

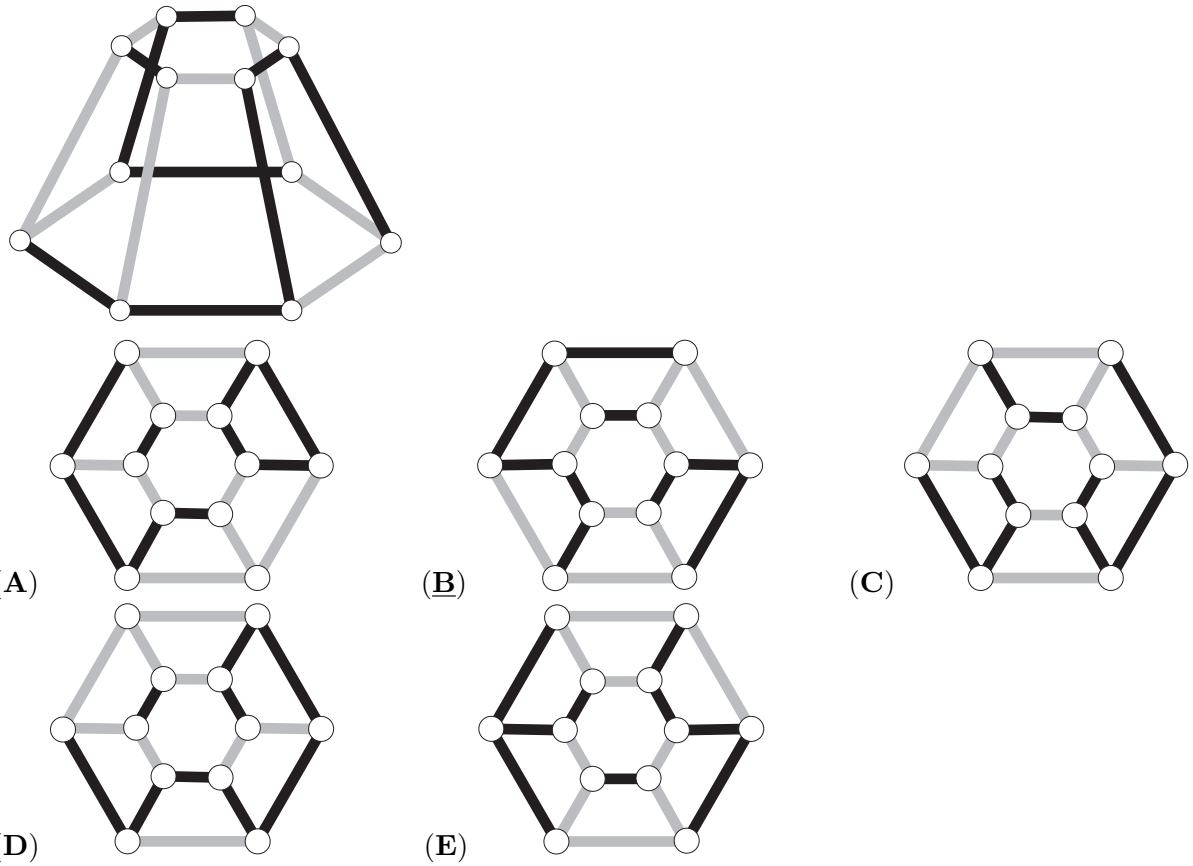
seem to have the same size, but the liquid has risen to different levels in the three vessels. Which of the following images represents the three vessels when viewed from above?



Solution:

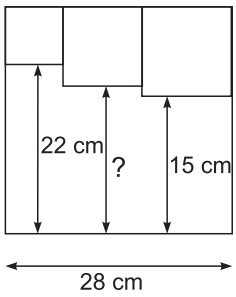
5 points

 # 21. What does the object in the picture look like when viewed from above?



Solution:

 # 22. Three small squares are drawn inside a larger square as shown. What is the length of the line

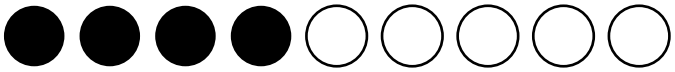


marked with a question mark?

(**A**) 17 cm (**B**) 17.5 cm (**C**) 18 cm (**D**) 18.5 cm (**E**) 19 cm

Solution:

 # 23. Nine tokens are black on one side and white on the other. Initially, four tokens have the black side upwards.

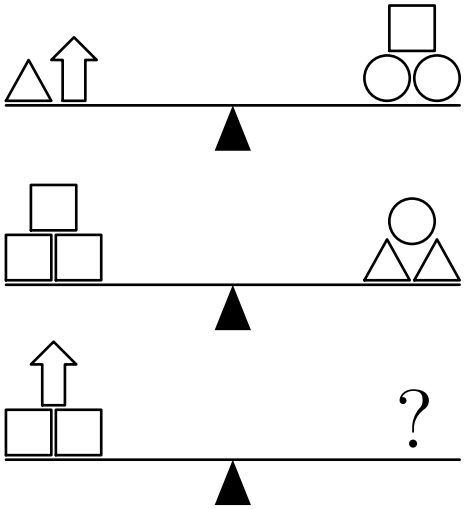


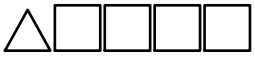
In each turn you have to flip three tokens. What is the least number of turns you need to have all tokens showing the same colour?

(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 5

Solution:

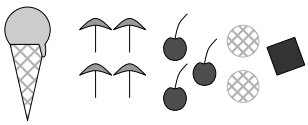
 # 24. Which of the following options will definitely balance the third scale?



(**A**) 
(**B**) 
(**C**) 
(**D**) 
(**E**) 

Solution:

 # 25. Ten people each order one scoop of ice cream. They order 4 scoops of vanilla, 3 scoops of chocolate, 2 scoops of lemon and 1 scoop of mango. They top the ice creams with 4 umbrellas, 3 cherries, 2 wafers and 1 chocolate chip. They use one topping on each scoop, such that no two ice creams are alike. Which of the following combinations is NOT possible.



(**A**) chocolate with a cherry (**B**) mango with an umbrella (**C**) vanilla with an umbrella
(**D**) lemon with a wafer (**E**) vanilla with a chocolate chip

Solution:

 # 26. We call a 3-digit number *nice* if its middle digit is greater than the sum of its first and last digits. What is the largest possible number of consecutive *nice* 3-digit numbers?

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

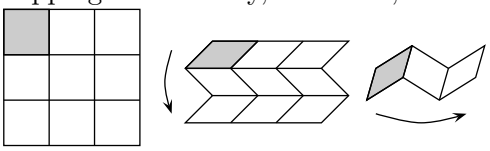
Solution:

 # 27. Magnus has to play 15 games in a chess tournament. At some point during the tournament he has won half of the games he has played, he has lost one third of the games he has played and two have ended in a draw. How many games has Magnus still to play?

(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

Solution:

 # 28. Vadim has a square piece of paper divided into nine cells. He folds the paper as shown - overlapping horizontally, and then, vertically so that the grey square ends on top.

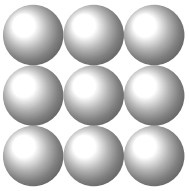
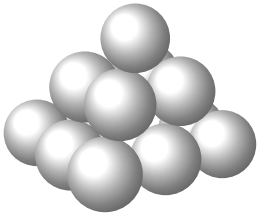


Vadim wants to write the numbers from 1 to 9 into the cells so that, once the paper is folded, the numbers would be in increasing order with number 1 on the top layer. What numbers should he write instead of a, b and c?

1	a	
		c
	b	

(**A**) $a = 6$, $b = 4$, $c = 8$ (**B**) $a = 4$, $b = 6$, $c = 8$ (**C**) $a = 5$, $b = 7$, $c = 9$
(**D**) $a = 4$, $b = 5$, $c = 7$ (**E**) $a = 6$, $b = 4$, $c = 7$

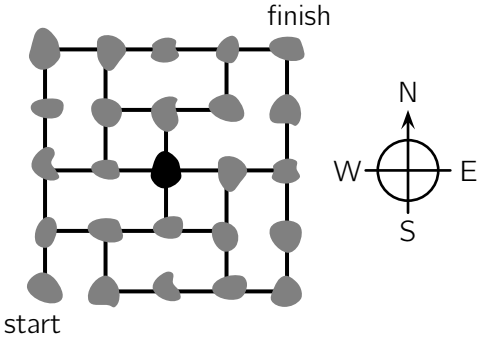
Solution:

 # 29. Don builds a pyramid with balls. The square base consists of 3×3 balls:  The middle layer has 2×2 balls, and there is one ball at the top.  There is glue at each contact point between two balls. How many glue points are there?

(**A**) 20 (**B**) 24 (**C**) 28 (**D**) 32 (**E**) 36

Solution:

 # 30. The figure shows a map of some islands and how they are connected by bridges. A postman has to visit each island exactly once. He starts on the island marked "start" and would like to finish on the island marked "finish". He has just reached the black island in the centre of the map. In which direction should he move to be able to complete his route?



(**A**) by going North (**B**) by going East (**C**) by going South

(**D**) by going West (**E**) there is no such path as the postman wishes to follow

SOLUTION: Solution: One does not attempt to draw the whole path in one go, by trial and error. The idea is to discover gradually parts of the path. For example there are some islands that are connected by exactly two others. So, ignoring the islands "start" and "finish", the path through those islands is uniquely determined (it comes from one of the two neighbours through the island and on to the other neighbour). On the map we have marked green such island and the path that necessarily goes through them. Now it is easy to complete the path. It has a unique solution, as shown in red on the right. So from the island in the middle the postman must move East.