

SOUTH AFRICAN COMPUTER OLYMPIAD
First Round Question Paper
11 March 2011



Computer Society
of South Africa

- Please write your personal details and your answers on the answer sheet provided.
- Work through the explanations carefully to ensure that you understand the nature of the questions fully before attempting to answer the questions.
- You may answer the questions in any order. Leave the difficult questions for last.
- In each case provide the BEST answer.
- It is important to place the answers in the correct line on the answer sheet.
- There are 32 questions in this paper.
- You have one hour (**60 minutes**) to attempt as many questions as possible.
- The maximum number of marks is **100**.
- The mark allocation per question is given on the answer sheet.
- You may ask your teacher to translate a question, but in all other ways the conditions are the same as for a formal examination.

1. What is the smallest number made up of 1's and/or 0's that is a multiple of 5?

2. What is the smallest number made up of 1's and/or 0's that is a multiple of 3?

3. BMW produced R50/5 engines with serial numbers in the range 564005 to 565639 without skipping any numbers. How many R50/5 engines did BMW produce?

4. There are four dogs at four corners inside a square with sides 100 m. At the same instant all four dogs start running at 10 km/h towards the dog on their clockwise direction and will always run towards that same target. Where will they meet?

5. A man ate 100 bananas in five days, each day eating 6 more than the previous day. How many bananas did he eat on the first day?

6. How must you throw a ball as hard as you can and have it come back to you? Assume that it doesn't bounce off anything, there is nothing attached to it, and no one else catches the ball and throws it back to you.

7. A Petri dish hosts a healthy colony of bacteria. Once a minute every bacterium divides into two. The colony was founded by a single cell at noon. At exactly 12:43 (43 minutes later) the Petri dish was half full. At what time will the dish be full?

8. What is the next number in the series
2 5 10 17 26 37 50 ___?

9. 60 S in a M – stands for 60 Seconds in a Minute
What do the letters stand for in:
 - 9.1 7 D in a W
 - 9.2 100 Y in a C
 - 9.3 9 P in SA
 - 9.4 11 P in a ST
 - 9.5 90 D in a RA

10. Given the alphabet and a code where
A = 0, B = 2, C = 4, D = 6, E = 8, etc.
What does 46, 48, 50 stand for?

11. Which letter comes next in the series
B A C B D C E D F?

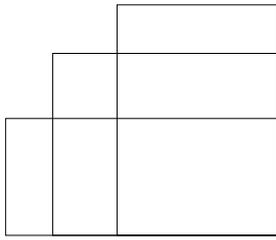
12. Which 2-digit number has 3 as a factor, but not 9; has 315 as one of its multiples and has 3 as the sum of its digits?

13. A clock was set right at 5 am and then loses 16 minutes every day. On the 4th day when it actually is 11 am, what time does the clock show?

14. Look at the drawing. The numbers alongside each column and below each row are the total of the values of the symbols within each column and row. What value should replace the question mark?

				28
				30
				20
				16
?	19	20	30	

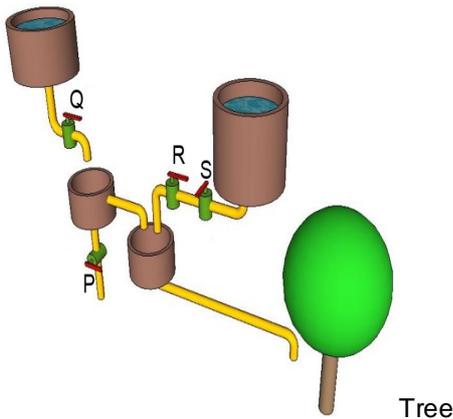
15. How many rectangles can you see in the figure?



16 What is the next number in the series
13 17 19 23 29 ___?

17 How many unique four letter combinations can you make with only the letters A, B, C and D? (Letters can be repeated) Example: AAAA, ABBB, ABCC, ABCD, DCBA, BCAD, BDAC, etc

18 Farmer Brown has built a system with which he can water his apple tree. The taps P, Q, R and S can be opened and closed. In which of the examples below will the tree get water?



- (a) P is closed, Q is open, R is closed, S is closed
- (b) P is open, Q is open, R is closed, S is closed
- (c) P is open, Q is closed, R is closed, S is open
- (d) P is closed, Q is closed, R is closed, S is open

19. You have 8 identical looking bags. All but one, which is heavier, have exactly the same mass. How many times do you have to use a balance scale before you are sure you have the heavier bag?

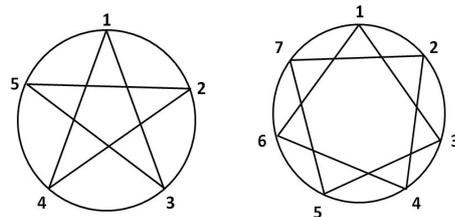
20 The object of the following problem is to insert +, -, /, *, or () between the given digits to arrive at a total of 28.
Given 7, 7, 7, 7, and the four standard arithmetic operations (+ - / *) and brackets () we can write $7 + 7 + 7 + 7 = 28$.

20.1 Given 7, 6, 2, 7 +, -, /, *, () create an expression that gives 28.

20.2 Given 7, 4, 5, 4, +, -, /, *, () create an expression that gives 28

20.3 Given 6, 8, 7, 5, +, -, /, *, () create an expression that gives 28.

21. By joining together points that are equally spaced around the circumference of a circle we can draw a star. For example:



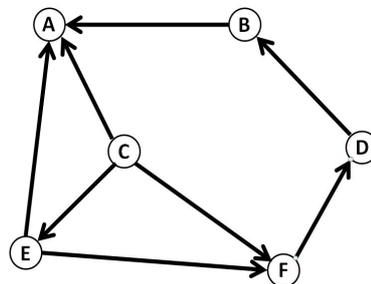
If we had 31 points:

21.1. How many lines would be required to draw the star?

21.2 What points would be connected to point 1?

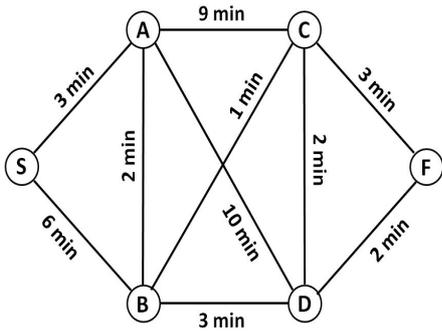
22. You have three kinds of bricks; 7, 11 and 13cm high. You can therefore build a wall of height 14cm ($7 + 7$), 18cm ($7 + 11$), 20cm ($7 + 13$), 21cm ($7 + 7 + 7$). Which walls between 20 and 33cm tall can you **NOT** build with the bricks you have?

23.



Six towns are connected by one-way roads. What is the minimum number of roads of which the direction must be reversed so that every town can be reached from every other town? Name the road(s) – eg: AB or EF

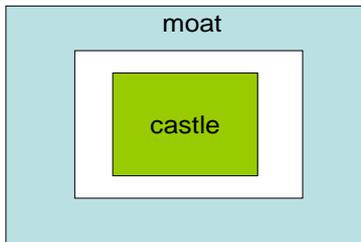
24.



Traffic jams mean that the shortest route is not always the quickest. Which route from S to F will take the shortest time?
e.g. S A C F

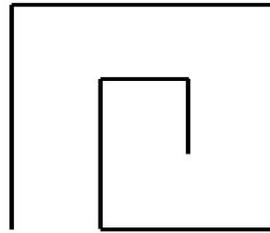
25. If two aunts can knit a pair of socks in two hours. How many aunts will you need to knit 9 pairs in 6 hours?

26. A square medieval castle on a square island is under siege. All around the castle there is a deep moat - a 10 meter wide ditch filled with water. Due to a regrettable miscalculation the raiders have brought footbridges that are only 9.5 meters long and cannot be lengthened. How can the invaders get to the castle walls? Show a sketch.



27. A maze has smooth, panelled walls. Each panel has 4 nail holes in a square pattern at random heights. There are 5 secret panels that can open. You have 9 nails. How will you mark each opening panel so that one can identify them by feel in the dark? The nail holes are too small to detect by feel.

28. The right angled spiral below was drawn with just two commands: "Forward 1 step" and "Left 90 degrees". What is the shortest possible length of the spiral?



29

If you were 2km further, it would only be half as far to your destination as it would be if you were 1km further. How far from your destination are you now?

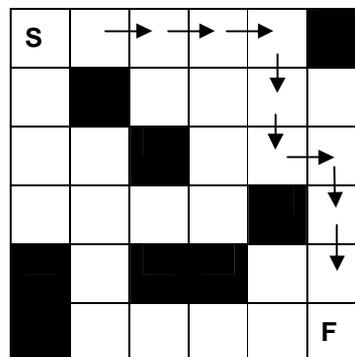
30



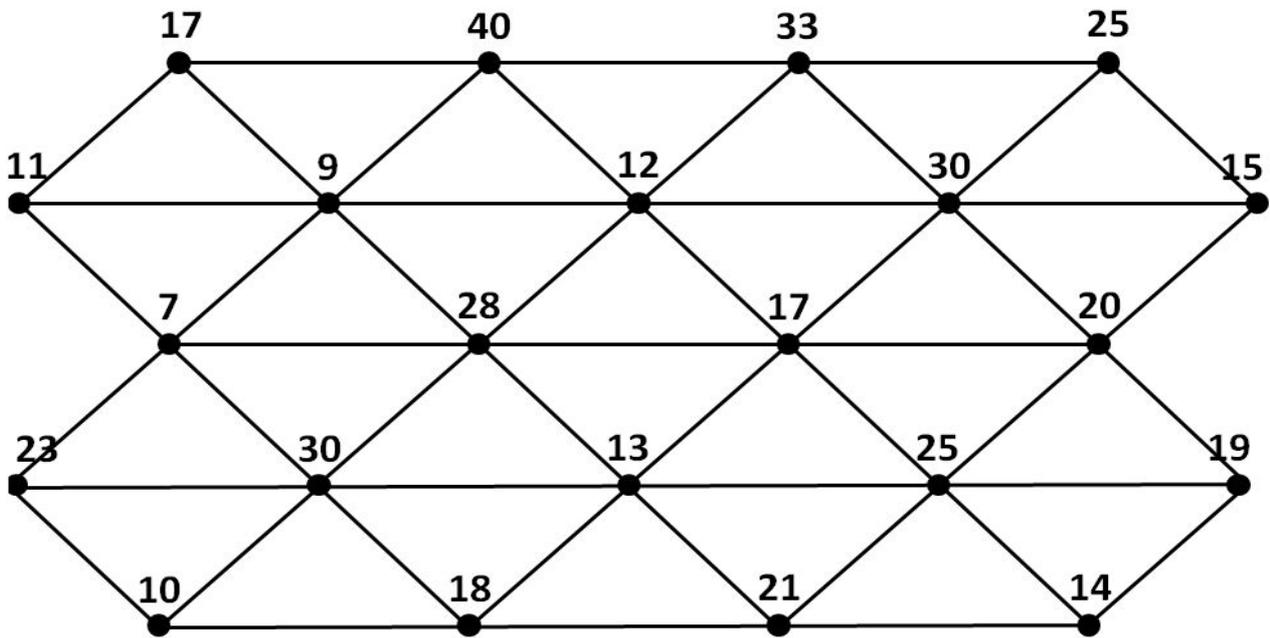
Write the numbers from 1 to 8 in the squares so that the squares containing consecutive numbers do not touch each other on a side or on a corner.

31. Maze

A computerised robot can only move to the right and down one block at a time. The black squares in the diagram below are barriers. The arrows in the diagram show one possible path that the robot can follow between the starting point (S) and the finishing point (F). Using just the given moves how many possible paths are available to the robot to get from S to F?



32. Fountains, Canals and Lakes



At each numbered point in the diagram above one finds a fountain. The number indicates the altitude above sea level. The lines between the numbered points are canals that connect the fountains. If water runs to a fountain and cannot run any further, a lake will form. At which numbered points will lakes form? Put your answer in numerical order.