Computer Olympiad
South African Computer Olympiad: a project of the Computer Society of South Africa.

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TALENT SEARCH 2012

- 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 28 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. Which number is missing?
1, 4, 9, □, 25

2. A book is open in front of you. When you add the numbers of the two pages open in front of you, the sum is 17. Which pages are in front of you?

3. You need to cut a 19m pole into 9 equal bits. Each cut takes 2 minutes. How many minutes will it take to cut all 9 bits?

4. A phone alternates a ring with an equal period of silence. It takes exactly 10 seconds from the time it starts ringing till the time it starts the next ring. How many seconds to make it ring six times?

5. Mpho and Lerato are given a bag of Lego bricks. They share them out equally and are left with one remaining brick. How many bricks were in the bag 58, 79, 100 or 276?

6. Suzy's mother has three children; one named Peter, and one named Paul. What is the name of the third child?

7. Which is most like a bucket?
Water, Soap, Can, Mop

8. Which is most like a car?
Ship, Truck, Airplane, Bicycle

9. $20 \div 0.5 = ?$

10. Which fraction has the highest value?
$3/4,\ 7/8,\ 7/10,\ 13/20$

11. An employee earns R20 per hour, gets a wage increase of 5% plus R5 per hour. What is the new wage?

12. All Martians are psychic. Some psychics are immortal. All immortals are invincible. Given this information, which of the statements are definitely true and which are false?
a) All Martians are immortal
b) Some Martians are invincible
c) If a person is invincible, they are immortal
d) Some psychics are invincible

13. Long ago South Africa used Pounds (lb) and Ounces (oz) to measure weight. This system is still in use in some parts of the world. You need to know that 1lb is equal to 16oz. Given only mass pieces of 1lb, ½lb, ¼lb, 2oz and 1oz;
a) What is the largest mass you can measure (in oz)?
b) Which mass pieces would you use to make up 11oz?

14. Slob-Air uses a unique code to identify its flights.
Flight SLA 12 leaves at 06:15
Flight SLA 15 leaves at 08:25
Flight SLA 04 leaves at 12:10
Flight SLA 08 leaves at 15:20
What is the flight number for the flight leaving at 18:00?

15. With two positions and 10 digits you can make 100 unique combinations (from 00 to 99).
a) How many unique combinations can you make by using 21 capital letters and/or 10 digits in 2 positions? (from AA to 99)
b) There are 26 letters in the alphabet. Which 5 capital letters have been left out of the alphabet for the above because they can be confused with numbers?

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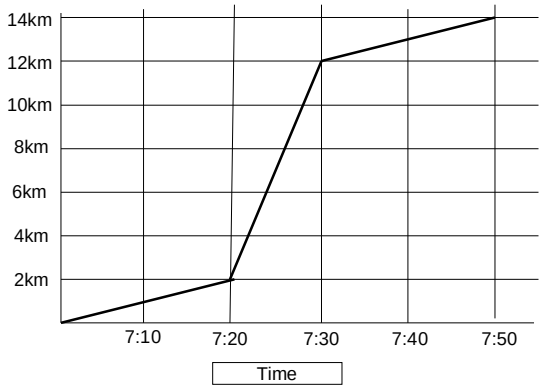
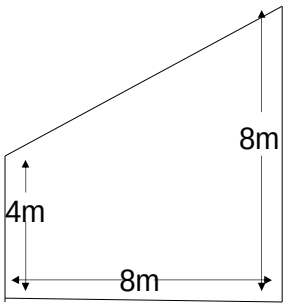
16. Jack walks to the station, then takes a train to the station near his school, and walks to school. His progress is recorded in the graph below:



a) How far does Jack walk? (kms)
b) How fast (in km/hr) does Jack walk?
c) What is the average speed (in km/hr) of the train?

17. What is the area of the wall (in $m^{2)}$?



18. A search team moves 3km South, 3km West and 3km North. How far are they from their starting point?

19. Supply the missing letters in each series:
a) a c e ☐ i
b) h g ☐ e d
c) c c d ☐ e f g g h
d) a z b ☐ c x

20. How many times do the hands of a clock catch up with each other in 24 hours?

21. Thandiwe and Jane play chess by post. It takes each participant one day to decide on a move and it takes 10 days for the letter with that move to reach the other player. By playing multiple games, each starting one day apart, they can play so that each one can make a move each day. How many games do they need to play at the same time to achieve one move each every day?

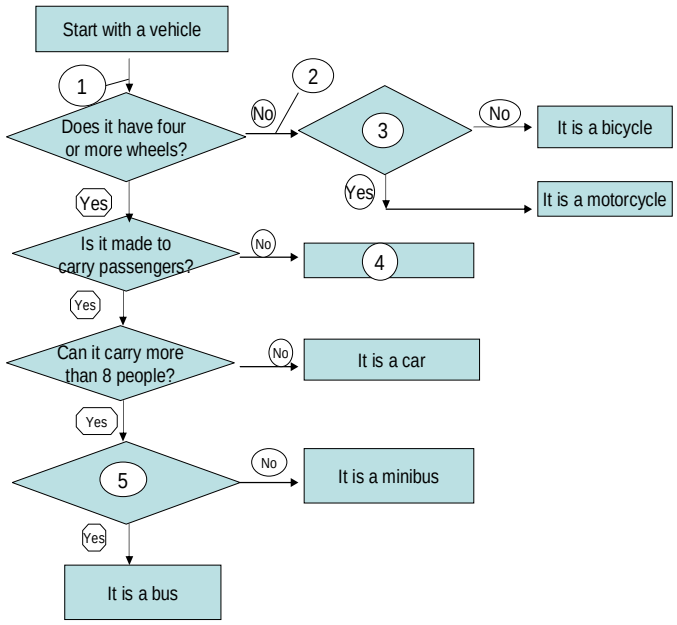
22. Use the mathematical symbols +, -, ÷, x once each to resolve the equation. Write the symbols in the correct order:
(8 ☐ 3 ☐ 4) ☐ 5 ☐ 1 = 5

23. When building a house, the following constraints must be followed:
The walls must be built before the roof
The foundations must be built before the walls
The foundations must be built before the doors
The list "foundations, roof, walls, doors" can be written in 24 different orders (for example, "foundations, roof, walls, doors"; or, "foundations, doors, roof, walls"). How many of them are valid orders for building a house?

24. How many degrees between the hands of the clock at 3:15?

25. If Tandi pays the following:
R2 for 1
R4 for 17
R6 for 126
What is she buying?

26. Computers need problems to be split up into easy steps. This is why we draw up flow diagrams that describe in detail the steps the computer must follow. Diamond-shaped boxes are used to represent questions to which the answer may only be "YES" or "NO".
In the language of the tribes of the Hoggar there is only one word for "vehicle" that is used for all vehicles. Complete the flow diagram for the program that will help the refugees to learn how to classify a vehicle as a car, minibus, truck, bus, bicycle or motorcycle.



At the numbered points: Which of the following statements are true?

At 1 a. It cannot be a bicycle
b. It can be any kind of vehicle
c. It can only be a bicycle
d. It can only be a bus

At 2 a. It can only be a bicycle
b. It can only be a bus
c. It can be any four-wheeled vehicle
d. It must be either a bicycle or a motorcycle

At 3 The Instruction should read

a. Does it have wheels?
b. Does it have a seat?
c. Does it have an engine?
d. Does it have tyres?

At 4 The Label should read

a. It is a bus
b. It is a car
c. It is a minibus
d. It is a truck

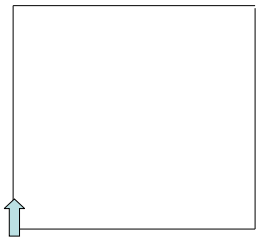
At 5 The Instruction should read

a. Can it carry more than 9 people?
b. Can it carry more than 20 people?
c. Can it carry more cargo than people?
d. Does it have an engine?

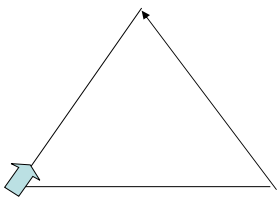
27. Rob is a robot that leaves a line wherever he moves. He only knows three instructions:
T for "Turn right", and
F for "Move forward" and
R for "Repeat".
The number after T indicates the degrees of the turn while the number after F indicates how many steps. The number after R will indicate how many times an instruction in brackets has to be repeated.

The arrow represents Rob's position and direction at the start of the journey. He must always end in that position and direction too. The shortest instruction set will be the one that contains the least number of instructions.

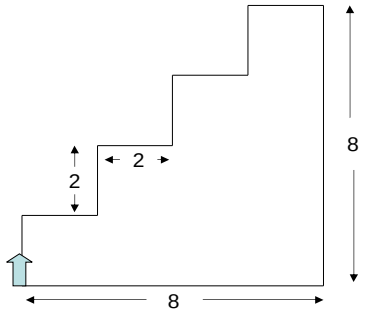
Thus a set of three instructions, R4(F4 T90), will result in



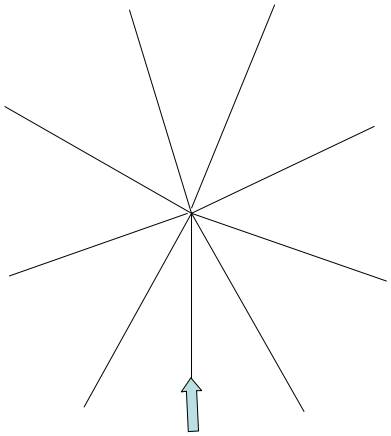
a) Now write down the shortest instruction set to make Rob draw the triangle with sides of 3 steps.



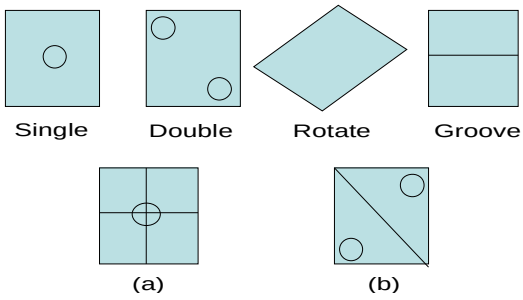
(b) Now write down the shortest instruction set to make Rob draw the podium with 4 levels of two steps high and two steps wide.(Remember Rob must end in the position in which he started.) [2]



c) Write down the shortest instructions to make Rob draw a nine-pointed star with each ray 8 steps long. . (Remember Rob must end in the position in which he started.) [2]



28. A factory robot manufactures widgets. To be able to do this, the robot knows only four commands. Single (Punches one circle); Double (Punches two circles); Groove (Cuts a horizontal groove); and Rotate (Rotates 45º clockwise) See the examples below.



a) and b) Write the least number of commands, in the correct order, that will create the widgets (a) and (b) from a blank. [2 each]

{50 x 2 = 100}