

KINGDOM OF BAHRAIN

NATIONAL AUTHORITY for QUALIFICATIONS
and QUALITY ASSURANCE of EDUCATION
and TRAINING

Directorate of National Examinations

Grade 12 National Examinations

مملكة البحرين

الهيئة الوطنية للمؤهلات و ضمان جودة

التعليم و التدريب

إدارة الامتحانات الوطنية

الامتحانات الوطنية للصف الثاني عشر

March 2016

امتحان مارس 2016

PROBLEM SOLVING

حل المشكلات

Paper 2 Problem Analysis and Solution

الورقة 2 تحليل و حل المشكلات

Duration: 2 hours

مدة الامتحان: ساعتان

Write your answer on the answer booklet.

اكتب الإجابة في كراسة الإجابة.

Additional materials: ruler, pencil, eraser,
calculator, answer booklet.

الأدوات الإضافية: مسطرة، قلم رصاص، ممحاة،

آلة حاسبة، كراسة الإجابة.

Read these instructions first:

Use a blue pen only.

Follow the instructions on the answer booklet
provided.

Answer **all** questions.

The use of calculators is permitted.

The total number of marks for this paper is 50.

This document consists of **12** printed pages and **4** blank pages.

- 1 Study the information below and answer the questions that follow. You should show your working.

The entertainment park Majic Land has many rides. Some of the rides are for children only and some are for adults only. There are also family rides that anybody can ride on.

These three boards can be seen outside the entrance to Majic Land.

Majic Land

OPEN EVERY DAY
10 am – 10 pm
All rides every 15 minutes
First rides at 10:15 am
Last rides at 9:45 pm

Entrance:	10 am – 5 pm	After 5 pm
Adult:	500 Fils	300 Fils
Child:	300 Fils	200 Fils

All children must be accompanied by at least one adult

Majic Land

Adult Rides

Ride	Capacity (persons)	Price (fils)
Log Flume	30	1000
Flying Carousel	20	500
Bumper Cars	20	1000
Skills Gym	30	750
Roller Coaster	40	500
Amazon Adventure	30	500
Swing Ship	30	500
Rocket	30	750
Whirlpool Caesar	20	500
Dark Ride	30	500
Tornado	40	1000

Child Rides

Ride	Capacity (persons)	Price (fils)
Mini Carousel	20	300
Cloud Race	20	300
Mini Rocket	6	500
Mini Windmill	24	300
Mini Chain	20	300
Mini Disco	20	300
Mini Train	20	300
Magic Balloon	30	300

Majic Land

Family Rides

Ride	Capacity (persons)	Adult Price (fils)	Child Price (fils)
Cars	4	300	200
Paddle Boats	40	300	200
Bumper Carts	20	400	250
Monorail	20	1000	600
Dragon	30	500	300
Discovery	20	500	300
Rotating Star	40	300	200
Family Coaster	20	300	200
Windmill	36	300	200
Karting	20	500	300
Helicopter	20	500	300
The Chain	20	500	300
Rapid River	20	500	300
Simulator	40	300	200
Fun Cups	30	300	200
Trampoline	30	500	300
Rocking Tug	30	300	200
Road Train	30	500	300
Carousel	30	300	200

(a) Hassan often goes to Majic Land and likes to ride on the Flying Carousel. On a quiet day, when there is no waiting time, he rides on it again and again.

(a1) What is the maximum number of times that Hassan can ride on the Flying Carousel in one day? [2]

(a2) What is the maximum number of times that Hassan can ride on the Flying Carousel when he has only paid 300 fils entrance? [2]

(b) On a busy day, what is the maximum total number of people that can ride on the Rotating Star in one day? [2]

(c) Qasim has arrived at the entrance to Majic Land at 6:20 pm with his three children. They will have to leave at 8:30 pm.

What is the greatest amount that Qasim might have to spend in total to ride with his children without repeating any of the rides? [4]

(d) On a quiet day last week, Mohammed arrived at the entrance to Majic Land at 10:50 am with BD 4.500 in his pocket. He rode on the adult rides but he did not repeat any of the rides. He was able to go on the maximum possible number of rides that his money would allow.

(d1) How many rides did Mohammed go on? [1]

(d2) Explain whether he was able to go on his favourite ride, the Tornado, or not. [1]

- (e) Next week the management of Majic Land is going to introduce a ticket called the Majic Pass. The Majic Pass will allow entry to the park and unlimited rides for the rest of the day, without any further payment. It will cost BD 16 per adult and BD 10 per child. There will be a discount for buying two or more Majic Passes as shown in the following table:

2 adults	BD 28
1 adult + 1 child	BD 24
3 adults	BD 40
2 adults + 1 child	BD 34
1 adult + 2 children	BD 28
4 adults	BD 48
3 adults + 1 child	BD 42
2 adults + 2 children	BD 36
1 adult + 3 children	BD 30

Hassan has decided with his friends Salman and Osama to go together to Majic Land next Wednesday. They know that it will be quiet then and they can have every ride on the Flying Carousel until closing time. They intend to buy Majic Passes.

What is the latest time that they must get to the Flying Carousel by for the Majic Passes to be more economical than paying for each ride? [3]

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2 Study the information below and answer the questions that follow. You should show your working.

Ahmed is buying a new car and he has been looking for the best deals for car insurance on the internet. His findings for comprehensive cover are shown in the following table:

Insurance company	Annual premium rate	Annual depreciation rate	Accident increment rate
Cooperation	3.0%	15%	30%
Hope	2.0%	16%	60%
Leadership	2.5%	14%	40%

The premium is an amount paid to insure the car and is based on a percentage of its value. For example:

- If Zayed's car is estimated by the Leadership company to be worth BD 7000, then an annual premium rate of 2.5% would result in a premium of BD 175.

The insurance company's estimate of the value of the car is depreciated (reduced) every year by the depreciation rate. In the previous example:

- If Zayed decided to renew his insurance with the Leadership company, the value of the car is depreciated (reduced) by the depreciation rate (14%) to BD 6020 after one year, then to BD 5177.200 after two years, and so on.

The accident increment rate is a percentage increase which is added to the premium, when a car has had an accident during the last year. In the previous example:

- If Zayed's car has had an accident during the last year, the accident increment rate of 40% will increase the premium when he renews his insurance from BD 150.500 to BD 210.700 with the Leadership company.

- (a) All three insurance companies have told Ahmed that the car he is going to buy will be worth BD 10000. He has decided to insure his car with the Hope insurance company, because it has the lowest annual premium rate.
- (a1) What is the premium that Ahmed will pay to insure his car with the Hope insurance company for the first year? [1]
- (a2) What premium will Ahmed pay when he renews the insurance with the Hope company after one year, providing he does not have an accident? [2]
- (b) In the event of Ahmed having an accident during the first year, would the Cooperation company have been a better option than the Hope company as his choice of insurance company? Explain your answer. [3]
- (c) During his search, Ahmed found a fourth insurance company. An error on the website meant that he was unable to read the figures for the annual depreciation rate and the accident increment rate. The only available information was the annual premium rate.

Insurance company	Annual premium rate	Annual depreciation rate	Accident increment rate
Integrity	2.4%	■■%	■■%

When he made further enquiries, he discovered that if he chose to insure his car with the Integrity company his renewal premium after the first year would be BD 11 less than if he chose the Leadership company, provided he did not have an accident. However, if he did have an accident during the first year, the renewal premium with the Integrity company would be BD 5 more than with the Leadership company.

- (c1) What is the Integrity company's annual depreciation rate? [4]
- (c2) What is the Integrity company's accident increment rate? [2]

- (d) Khalid will open his “Easy Rent Company” soon. He has contacted the Glory insurance company and got the following information for the annual insurance rate for comprehensive cover and the fixed annual amount for third party cover:

Car Type	Comprehensive cover annual rate	Third party cover annual amount
Small cars	3.0%	BD 40
Van cars	4.0%	BD 60
Mini trucks	5.0%	BD 80

Khalid has bought 3 small cars with a value of BD 6000 each and 4 mini trucks with a value of BD 8000 each. He has a maximum budget of BD 1750 for their insurance. He must insure all of them, but he wishes to insure as many vehicles as possible under comprehensive cover, with third party cover for the rest of them.

What is the greatest number of his vehicles that Khalid can insure under comprehensive cover? Justify your answer. [3]

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3 Study the information below and answer the questions that follow. You should show your working.

When weekend tickets for the 2015 Formula 1 – Bahrain Grand Prix first went on sale, 1000 “Early Bird” tickets were offered at the discount price shown in the table below.

Weekend ticket	Full price (\$)	Discount price (\$)	Number of “Early Bird” tickets
Main Grandstand	400	320	200
Batelco Grandstand	320	272	220
Turn1 Grandstand	267	227	250
University Grandstand	160	136	165
Victory Grandstand	160	136	165

There were 300 additional tickets available for students studying at the University of Bahrain and they were able to buy these tickets for the University Grandstand at half the “Early Bird” price.

- (a) A family of ten wanted tickets for the Grand Prix. Their three sons studying at the University of Bahrain were able to buy the students tickets. The rest of the family bought tickets for the Main Grandstand, but they got the last 5 “Early Bird” tickets.

How much in total did it cost the family to attend the Grand Prix?
[3]

- (b) All the “Early Bird” and student tickets were sold very quickly. How much potential income was lost from the sale of these tickets?
[4]

- (c) What was the percentage by which the student tickets were reduced from the full price?
[2]

- (d) A company spent \$6057 on tickets for 20 of its employees to attend the Grand Prix. The number of tickets it bought for the Batelco Grandstand was twice the number of tickets it bought for the Main Grandstand. The rest of the tickets it bought were for the Turn 1 Grandstand. There were no “Early Bird” tickets available for any of the grandstands.

How many tickets did it buy for the Batelco Grandstand? [2]

- (e) A company bought a number of “Early Bird” tickets for its employees for both the Main Grandstand and the Batelco Grandstand. The cost of the tickets was \$1456. They would have cost \$1760 at full price.

How many tickets for each grandstand did it buy? [3]

- (f) The number printed on the Main Grandstand tickets ran from 0001 to 5000. It was decided that tickets that satisfied all of the following conditions would be given away free:

- The first two digits make up a square number between 10 to 99.
- The last two digits make up a number that is a multiple of 11.
- The sum of the four digits is at least 20.

For example, ticket number 6477 would have been given away for free if the ticket number ran to 7000.

How many tickets were given away free? [3]

- (g) A family of six bought two tickets for each of three different grandstands. They spent a total of \$1838. Some of the tickets were “Early Bird” tickets.

Give the cost of each one of the six tickets. [3]

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PS12/02E

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الورقة 2 تحليل و حل المشكلات

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