

תוכנית חדשה

## Mathematics

3 Points — 2nd Exam

## מתמטיקה

3 יחידות לימוד – שאלון שני

### Instructions

### הוראות

א. Duration of the exam: Two and a quarter hours.

א. משך הבחינה: שתיים ורבע.

ב. Exam structure and breakdown of points:

ב. מבנה השאלון ומפתח ההערכה:

This exam has six questions.

בשאלון זה שש שאלות.

Each question is worth 22 points.

לכל שאלה 22 נקודות.

You may answer as many questions as you like, completely or partially, but the maximum number of points you can earn is 100.

מותר לענות, באופן מלא או חלקי, על מספר שאלות כרצונכם, אך סך הנקודות שתוכלו לצבור לא יעלה על 100.

ג. Material that may be used during the exam:

ג. חומר עזר מותר בשימוש:

(1) A non-graphing calculator. You may not use the programming options of a programmable calculator. Use of a graphing calculator or programming options may lead to the disqualification of your exam.

(1) מחשבון לא גרפי.

אין להשתמש באפשרויות התכנות

במחשבון שיש בו אפשרות תכנות.

שימוש במחשבון גרפי או באפשרויות התכנות

במחשבון עלול לגרום לפסילת הבחינה.

(2) Formula sheets (attached).

(2) דפי נוסחאות (מצורפים).

(3) A Hebrew–foreign language / foreign language–Hebrew dictionary.

(3) מילון עברי–לועזי / לועזי–עברי.

ד. Special instructions:

ד. הוראות מיוחדות:

(1) Write all your calculations and answers in the Hebrew exam booklet.

(1) יש לכתוב את כל החישובים והתשובות

בנוסח העברי של השאלון.

Do not write in the margins.

אסור לכתוב על הפסים שבשוליים.

(2) Explain all of your work, including calculations, in detail and in a clear and organized fashion.

(2) יש להסביר את כל הפעולות, כולל חישובים,

Lack of detail may lower your score or lead to the disqualification of your exam.

בפירוט ובצורה ברורה ומסודרת. חוסר פירוט עלול

לגרום לפגיעה בציון או לפסילת הבחינה.

(3) Use the pages in the **Hebrew exam booklet** for draft work. If you use other paper for draft work, your exam may be disqualified.

(3) לטייטה יש להשתמש בדפים שבנוסח העברי

של השאלון. שימוש בטייטה אחרת עלול לגרום לפסילת הבחינה.

שימו לב: בסוף הבחינה בעברית מצורפים דפי טייטה. אין להוסיף דפים אחרים למחברת הבחינה.

Note: There is draft paper at the end of the Hebrew exam booklet. Do not add any other paper to the exam booklet.

Good Luck!

בהצלחה!

## Questions

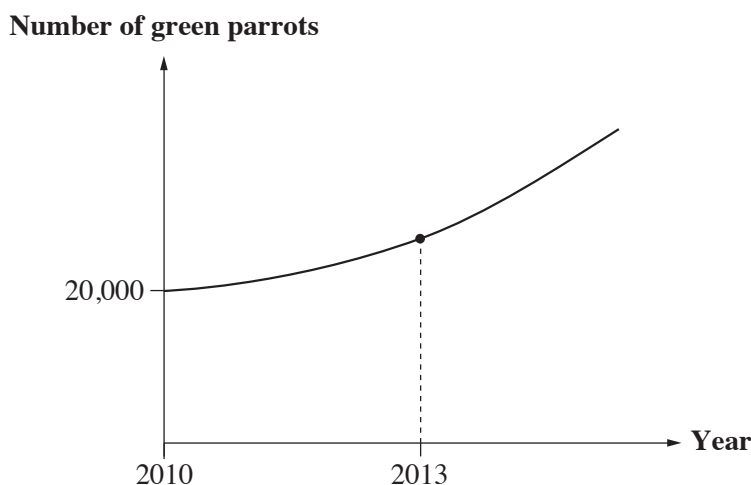
This exam consists of six questions. A complete answer is worth 22 points. You may answer as many questions as you like, completely or partially, but the maximum number of points that you can earn is 100.

**Write all your calculations and answers in the Hebrew exam booklet.**

### Society and Science

1. The number of green parrots on a certain tropical island grows by 8% every year.

The graph below shows the number of green parrots on the island by year, from the beginning of 2010 onwards.



- א. (1) How many green parrots were there on the island at the beginning of 2010 ?  
(2) How many green parrots were there on the island at the beginning of 2013 ?  
ב. At the beginning of which year were there 29,387 green parrots on the island?

There are also blue parrots on the island. The number of blue parrots on the island grows by a fixed percentage every year.

At the beginning of 2010 the number of blue parrots and the number of green parrots on the island was the same.

- ג. The table below (and in the Hebrew exam booklet) shows the number of blue parrots at the beginning of 2012 .

| Year                   | 2010 | 2011 | 2012   | 2013 |
|------------------------|------|------|--------|------|
| Number of blue parrots |      |      | 21,632 |      |

- (1) Find by what percentage the number of blue parrots on the island grows every year.  
(2) Fill in the missing values in the table in the **Hebrew exam booklet**.

2. The forecast of daily wave height in the Mediterranean Sea uses three terms to describe wave height: low, medium, or high.

Each day during a certain period, the probability of low waves is 0.6 and the probability of medium waves is 0.25 .

- א. What is the probability of high waves on each day during this period?

Hadar plans to go to the Mediterranean Sea on two specific days during this period.

- ב. (1) What is the probability that there will be low waves on both days?  
(2) What is the probability of wave height being the same on both days?

Hadar only surfs in the Mediterranean Sea when wave height is medium or high.

- ג. What is the probability that Hadar will surf on at least one of these two days?

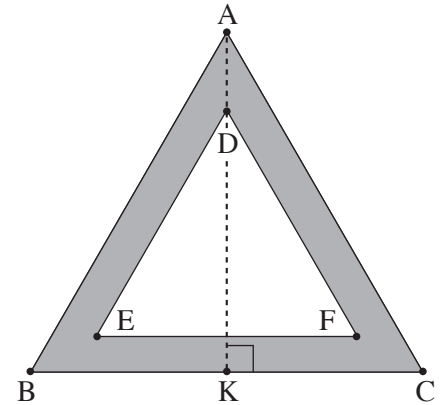
### Planar and Spatial Orientation

3. In a lesson on road safety, Amir drew a sign in the shape of an equilateral triangle [משולש שווה צלעות]  $ABC$ .

Amir drew an additional equilateral triangle  $DEF$  in the middle of the sign (Side  $EF$  is parallel to Side  $BC$ ).

He colored the area between the two triangles in grey, as shown in the figure.

- א. Explain why Triangles  $ABC$  and  $DEF$  are similar triangles [משולשים דומים].



We know that the side length of Triangle  $ABC$  is 72 cm .

$AK$  is the height to Side  $BC$  in Triangle  $ABC$  , as shown in the figure.

- ב. (1) Find the length of Height  $AK$  .  
(2) Calculate the entire area of the sign ( $\triangle ABC$ ).

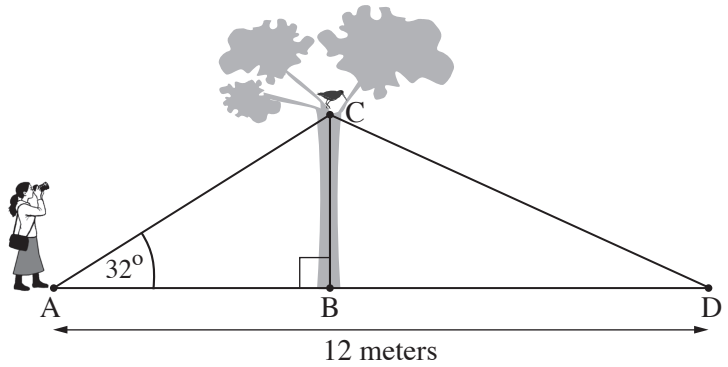
We know that the side length of Triangle  $DEF$  is 48 cm .

- ג. (1) Find the ratio of similarity [יחס הדמיון] between Triangles  $ABC$  and  $DEF$  .  
(2) Calculate the area of Triangle  $DEF$  .  
ד. Calculate the area that Amir colored in grey.

4. A tree is located at Point B in a city park whose ground is level.

Smadar is a bird photographer.

She stands at Point A and photographs a bird perched in the tree at Point C, as shown in the figure.



We know that BC is perpendicular to AB.

The distance between Smadar and the bird (AC) is 6 meters, and the size of Angle CAB is  $32^\circ$ .

- א. Find at what height from the ground the bird is perched (BC).
- ב. Find the distance between Smadar and the tree (AB).

In order to photograph the bird from another angle, Smadar walked to Point D, which is located on the extension of Segment AB, as shown in the figure.

We know that the length of Segment AD is 12 meters.

- ג. Find the size of Angle CDB.

## Finance and Economics

### 5. Hairdresser Beauty and Style offers four types of haircuts.

The table below shows data for haircut prices and the number of customers who had each type of haircut on a certain day.

| Haircut type               | Child | Short hair | Long hair | Special |
|----------------------------|-------|------------|-----------|---------|
| <b>Price</b><br>(shekels)  | 60    | 150        | 180       | 210     |
| <b>Number of customers</b> | 5     | 21         | 9         | 10      |

All earnings that day were from the individual customer payments for haircuts.

- א. (1) Find the number of customers who had a haircut that day.
- (2) Find the average earning of the hairdresser that day.

Right before the hairdresser closed for the day, three additional customers had a haircut. These customers are not included in the table.

- ב. Find the greatest possible average earning after including the three additional customers.

The three customers chose the same type of haircut. After they paid, the hairdresser's average earning that day decreased.

- ג. Below are three statements I–III .

For each statement, determine whether it is possible or impossible. Explain your answers.

- I. The three customers chose a short haircut.
- II. The three customers chose a long haircut, at a discount of 15 shekels per customer.
- III. The three customers chose a special haircut, at a discount of 35% per customer.

6. At the end of the summer vacation, Matan had 1,440 shekels, and Roi had 540 shekels.  
At the end of the summer vacation, Matan decided to spend his money on a basketball class that costs 120 shekels a month.  
Roi decided not to spend his money, and started work. He saved 60 shekels each month from the end of the summer vacation onward.
- א. (1) How much money did Matan have 4 months after he began participating in the basketball class?  
(2) How many months can Matan participate in the basketball class?

Let  $x$  denote the number of months that passed from the end of the summer vacation.

- א. Below are four expressions I–IV .

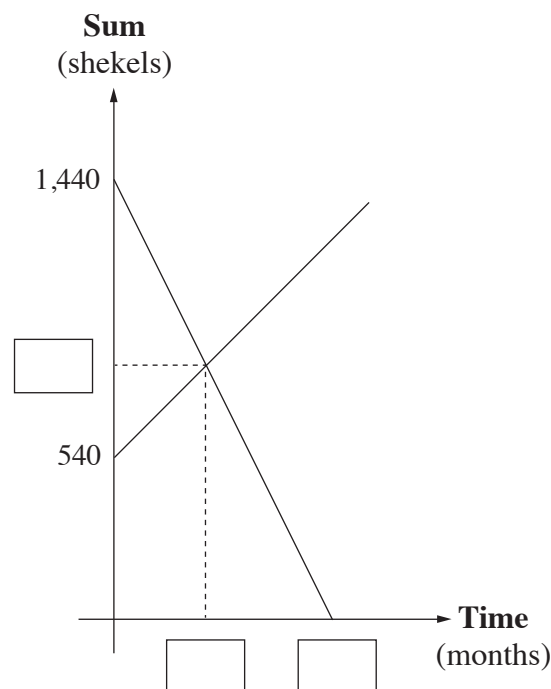
I.  $1,440 + 120x$

II.  $540x + 60$

III.  $540 + 60x$

IV.  $1,440 - 120x$

- (1) Determine which expression describes the sum of money Matan had after  $x$  months.  
(2) Determine which expression describes the sum of money Roi had after  $x$  months.
- א. How many months after the end of the summer vacation did Matan and Roi have the same sum of money?
- א. Below (and in the Hebrew exam booklet) are two graphs that describe the sum of money that Matan had and the sum of money that Roi had, by month, from the end of the summer vacation. Using the items above, fill in the correct values in the empty boxes in the figure in the **Hebrew exam booklet**.



**Good Luck!**

All rights reserved by the State of Israel.  
Copying or publication without the consent of the  
Ministry of Education is prohibited.

**בהצלחה!**

זכות היוצרים שמורה למדינת ישראל  
אין להעתיק או לפרסם אלא ברשות משרד החינוך