

Concerning test material in general, the Swedish Board of Education refers to the Official Secrets Act, the regulation about secrecy, 4th chapter 3rd paragraph. For this material, the secrecy is valid until the expiration of December 2011.

NATIONAL TEST IN MATHEMATICS COURSE B SPRING 2001

Directions

Test time 240 minutes without a break for Part I and Part II together. We recommend that you spend no more than 60 minutes on Part I.

Resources **Part I:** "Formulas for the National Test in Mathematics Course B"
Please note calculators are not allowed in this part.

Part II: Calculators, and "Formulas for the National Test in Mathematics Course B".

Test material The test material should be handed in together with your solutions.

Write your name, the name of your education programme / adult education on all sheets of paper you hand in.

Solutions to Part I should be handed in before you retrieve your calculator. You should therefore present your work on Part I on a separate sheet of paper. Please note that you may start your work on Part II without a calculator.

The test The test consists of a total of 19 problems. **Part I** consists of 10 problems and **Part II** consists of 9 problems.

To some problems (where it says *Only answer is required*) it is enough to give short answers.

For the other problems short answers are not enough. They require that you write down what you do, that you explain your train of thought, that you, when necessary, draw figures. When you solve problems graphically/numerically please indicate how you have used your resources.

Problem 19 is a larger problem which may take up to an hour to solve completely. It is important that you try to solve this problem. A description of what your teacher will consider when evaluating your work, is attached to the problem.

Try all of the problems. It can be relatively easy, even towards the end of the test, to receive some points for partial solutions. A positive evaluation can be given even for unfinished solutions.

Score and mark levels The maximum score is 46 points.

The maximum number of points you can receive for each solution is indicated after each problem. If a problem can give 2 "Pass"-points and 1 "Pass with distinction"-point this is written (2/1).

Lower limit for the mark on the test

Pass: 13 points

Pass with distinction: 26 points of which at least 6 "Pass with distinction points".

Pass with special distinction:

The requirements for Pass with distinction must be well satisfied. Your teacher will also consider how well you solve the α -problems.

Name: _____ School: _____

Education programme/adult education: _____

Part I

This part consists of 10 problems that should be solved without the aid of a calculator. Your solutions to the problems in this part should be presented on separate sheets of paper that must be handed in before you retrieve your calculator. Please note that you may begin working on Part II without the aid of a calculator.

1. Multiply and simplify $(x + 3)(x + 5)$ *Only answer is required* (1/0)

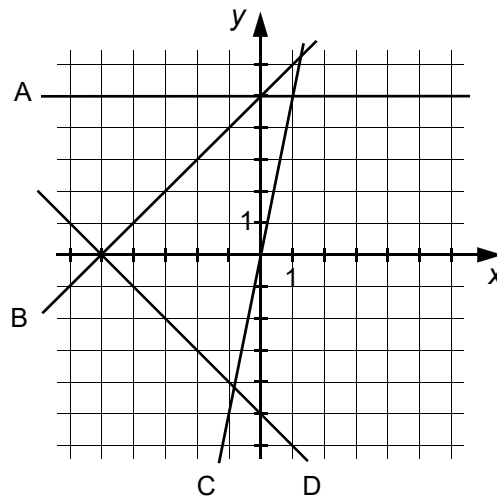
2. In the system of coordinates below, four lines are drawn. Pair the equations below with the corresponding lines A-D.

$$y = x + 5$$

$$y = 5x$$

$$y = 5$$

$$y = -5 - x$$



Only answer is required (2/0)

3. Solve the equation for x

$$x^2 - 6x + 5 = 0$$

(2/0)

4. Let $f(x) = (2x - 1)^2$

Evaluate $f(1.5)$

Only answer is required (1/0)

5. Anna is playing with an ordinary symmetrical six-sided dice, the sides numbered as 1, 2, 3, 4, 5 and 6. Her first twelve throws she recieved:
2 4 3 3 3 2 5 1 4 2 2 1

What is the probability that her thirteenth throw is a six?
Justify your answer.

(1/1)

6. Which of the following alternatives is the complete solution for x in the inequality $2x \geq 8 - 2x$?

A $x \geq 2$

B $x = 2$

C $x \leq 2$

D $x > 2$

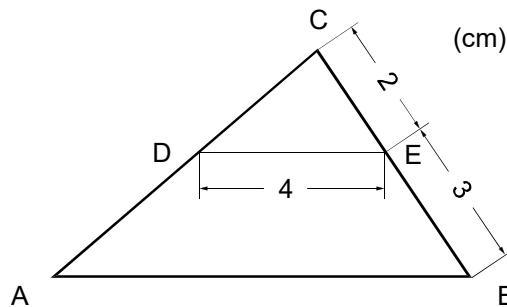
E $x < 2$

Only answer is required

(1/0)

7. In the triangle ABC the distance DE is parallel to the side AB.
Find the length of side AB.

(2/0)



The figure is not drawn to
scale

8. In a coordinate system, a line intersects the positive x -axis as well as the positive y -axis.

Give an example of an equation of such a line.

Only answer is required

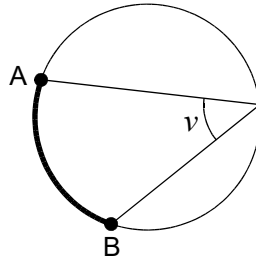
(0/1)

9. The arc of the circle AB pointed out in the figure below is one fourth of the circumference of the circle.

What is the value of the angle v ?

(0/2)

Calculations based on measurements will not be accepted.



10. $y = f(x)$ is a quadratic function. The graph to the function intersects the x -axis at the points $(1, 0)$ and $(4, 0)$ and the y -axis at the point $(0, 8)$.

a) Find $f(0)$ *Only answer is required* (0/1)

b) At what x -value does the function have its minimum value? *Only answer is required* (0/1)

c) Which of the following alternatives is true for $f(3)$?

A $f(3) = f(0)$

B $f(3) = 0$

C $f(3) < 0$

D $f(3) > 0$

Only answer is required (0/1)

Part II

This part consists of 9 problems and you may use a calculator when solving them. Please note that you may begin working on Part II without a calculator.

11. In a campground there are 23 cabins. Some of the cabins have three beds and some of the cabins have five. The total number of beds in the cabins is 83.

After having read the above text, one student wrote down the following system of simultaneous equations:

$$\begin{cases} x + y = 23 \\ 3x + 5y = 83 \end{cases}$$

- a) What do each of the respective variables x and y represent? (1/0)
- b) Solve the system of simultaneous equations. (2/0)

12. The area of a rectangle is 221 cm^2 . Its length is 4 cm longer than the width.

- a) Write down an equation that can be used to calculate the width of the rectangle by using the given information. *Only answer is required* (1/0)
- b) Calculate the width of the rectangle. (1/0)

13. You are going to buy a mobile phone. You then have to choose a subscription.

Price list:

Subscription	Pling	Ring
Monthly fee	SEK 100	SEK 150
Price per minute for national calls		
Weekdays 7-19	SEK 4.50	SEK 4
Other times	SEK 0.75	SEK 0.50

- a) Express the monthly cost y (SEK) as a function of the duration of the call x minutes for the subscription *Pling* if you only make phone calls during “other time”. (1/0)
- b) How many minutes per month would one be required to call if the subscription *Pling* were to be as expensive as the subscription *Ring*, given one only makes calls during the time slot “other time”? (2/0)

14. In a candy jar, there are five strawberry toffees and four lemon toffees. Marianne first picks one toffee at random, and then another one.

What is the probability that she picks two lemon toffees?

(2/0)

15. A straight line that passes through the points $(3, 1)$ and $(5, a)$ has a gradient of 7.

Determine the number a .

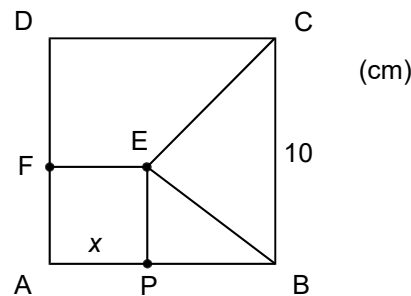
(0/2)

16. The simultaneous equations $\begin{cases} 2ax + by = 9 \\ bx - 3ay = 4 \end{cases}$ have the solution $x = 3$ and $y = -2$

Determine a and b .

(0/2)

17. ABCD is a square having sides with lengths 10 cm. In the lower left-hand corner of the square another smaller square APEF has been placed according to the figure. Straight lines are drawn from E to B and to C. Let y denote the total area (in cm^2) of the square APEF and the triangle EBC.



- a) Let x denote the length of one side of the square APEF (in cm).

Show that $y = x^2 - 5x + 50$

(0/2/□)

- b) What should the length of a side of the smaller square be if the total area should be as small as possible?

(0/2)

18. For a group of linear functions f , it holds that $f(x+1) < f(x)$ for all x , and $f(0) = 1$

- a) Give an example of *one* such linear function with these features.

Only answer is required

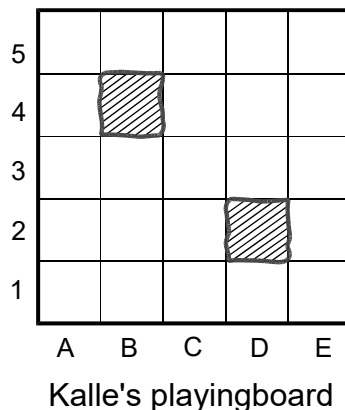
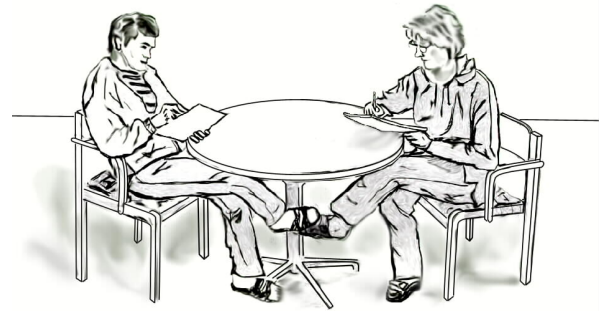
(0/1)

- b) What is the common characteristic for graphs of these functions? Justify your answer.

(0/3/□)

19. Sink the Ship

Sink the Ship is a game between two people where you place your ships on squares on your own playing board. The players are not allowed to see each other's playing boards. One can place ones ships on any squares on ones board, so long as the squares do not touch each other, not even corner to corner. The players then take turns trying to guess in which squares the opponent's ships are placed. The opponent then answers "*hit*" or "*miss*" according to whether a guess is correct or incorrect.



Lisa and Kalle are playing Sink the Ship. Kalle has placed two ships on his playing board (see figure).

In this problem, Lisa guesses *randomly* where Kalle has placed his ships, but she does not guess on impossible situations. If Lisa's guess is B4, Kalle answers *hit*. If Lisa's guess is A1, Kalle answers *miss*.

- What is the probability that Lisa's first guess is a hit?
- If Lisa's first guess is a hit (B4), what is the probability that her second guess is a hit?
- What is the probability that Lisa hits both of Kalle's ships in the first two guesses? The ships are placed according to the figure above.
- Investigate how Kalle's placement of his two ships affects the probability that Lisa hits his both ships in two guesses. What conclusions can you draw from your investigation?

3/4/□

When evaluating your work, your teacher will look at:

- What mathematical knowledge you present
- How well you carry out your calculations
- How methodical your investigation is
- How well you present and comment on your work
- How well you qualify your conclusions