Directions

Test time	240 minutes without a break.
Resources	Calculator and “Formulas to the National Test in Mathematics Course B”.
Test material	The test material should be handed in together with your solutions. Write your name and the name of your education programme / adult education on all the sheets of paper you hand in.
The test	The test consists of 20 problems. For some problems (1–10) it is enough to give short answers. For the rest of the problems short answers are not enough, but they require that you write down what you do, that you explain your train of thoughts, that you, where necessary, draw figures and that when you solve problems graphically/numerically show how you have used your resources. Problem no 20 is a larger problem that may take you up to one hour to solve completely. It is important that you try to solve this problem. Included in the problem is a description of what the teacher will consider when assessing your work. Try all of the problems. It can be relatively easy, even towards the end of the test, to receive some points for a partial solution or presentation
Score and mark levels	The maximum score is 52 points. The number of points you can receive for your solution is written 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 test-grade Pass: 14 points Pass with distinction: 29 points of which at least 6 “Pass with distinction”-points. Pass with special distinction: The requirements for Pass with distinction must be well satisfied. The teacher will also consider how well you solve the problems marked with the symbol ¤.

Name: _____ School: _____

Education programme/adult education: _____

In problems 1-10 you only have to write the answers on the corresponding lines.

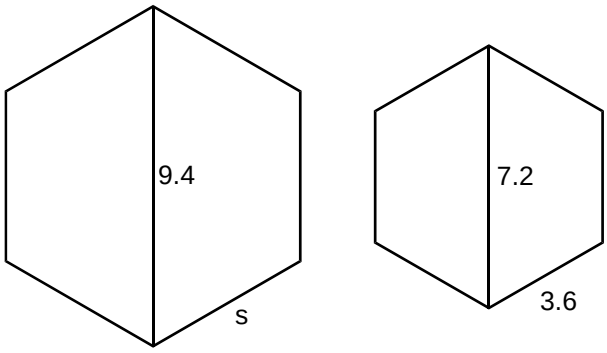
1. In a pot there are nothing but red and black balls. The probability of taking a red ball out of the pot is 75%.

Suggest how many red and black balls there might be in the pot.

Answer: _____ (1/0)

2. Give an example of a value of *x* such that $2x-1<3$ Answer:_____ (1/0)

3. The following two hexagons are similar. Calculate s. Answer:_____ (1/0)



4. Which of the following expressions is a simplification of $(x-2)(x+2)$?

A. x^2-4x+4

B. x^2+4x+4

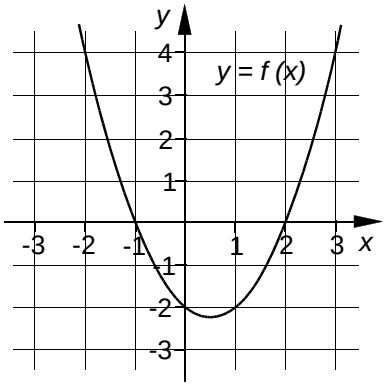
C. x^2+4

D. x^2-4

E. x^2+2x

F. x^2-2x Answer: _____ (1/0)

5. The figure to the right shows the graph of a function $y = f(x)$



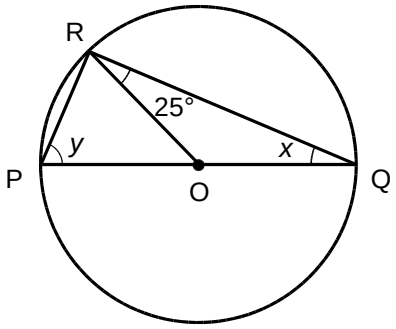
a) Find $f(0)$

Answer:_____ (1/0)

b) Find the solutions to the equation $f(x) = 0$

Answer: _____ (2/0)

6. The points P, Q and R are on a circle. O is the centre of the circle. PQ is the diameter of the circle.



a) Find the angle *x*. Answer:_____ (1/0)

b) Find the angle *y*. Answer:_____ (1/0)

7. Which *three* of the following expressions can be simplified to t ?

A. $\frac{t^2}{t}$

B. $\frac{t+t}{t}$

C. $2t - t$

D. $t^2 - t$

E. $\frac{t}{2} + \frac{t}{2}$ Answer:_____ (1/0)

8. Give an example of simultaneous equations with solutions $x = 1$ and $y = 3$.

Answer:_____ (0/1)

9. The point $(50, a)$ is on the line that has the equation $2x + y = 5$

Find *a*. Answer:_____ (0/1)

10. The sum of two numbers, *x* and *y*, is at least as large as their product.

How is this condition written in mathematical signs and symbols?

A. $x + y \leq xy$
B. $x + y \geq xy$
C. $x + y < xy$
D. $x + y > xy$
E. $x + y = xy$

Answer:_____ (0/1)

You have to present your solutions to problems 11-19 on separate test sheets.

11. Solve the equations

a) $x^2 - 4x - 45 = 0$ (2/0)

b) $18 - 3x = 3x^2$ (2/0)

12. Solve the simultaneous equations

$$\begin{cases} 3x - 6y = 2 \\ 2x - 2y = 1 \end{cases}$$ (2/0)

13. The TRISS lottery ticket is a popular one. At the back of the lottery ticket, there is the following prize plan:

Prize plan for 8 000 000 tickets.

If the number of lottery tickets is changed the prize plan is proportionally changed.

* ** Average sum in public TV - draws.

Number	Prize	Total
4 x	2 500 000 kr*	10 000 000 kr
16 x	250 000 kr**	4 000 000 kr
64 x	100 000 kr	6 400 000 kr
608 x	10 000 kr	6 080 000 kr
2 528 x	1 000 kr	2 528 000 kr
56 000 x	100 kr	5 600 000 kr
165 280 x	75 kr	12 396 000 kr
664 000 x	50 kr	33 200 000 kr
712 000 x	25 kr	17 800 000 kr
1 600 500		98 004 000 kr

* Lottery tickets with 3 CLOVES. If the winner chooses one single payment instead of monthly payments 500 000 kr is paid.

** Lottery tickets with 3 TV-SCREENS.

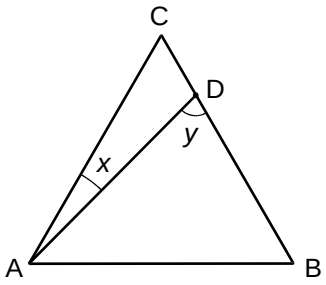
a) Calculate the probability that you win a prize if you buy a TRISS lottery ticket. (1/0)

b) Calculate the probability that you win a prize larger than 10 000 SEK if you buy a TRISS lottery ticket. (2/0)

c) If you buy one TRISS lottery ticket a week during one year, how many 25 SEK prizes can you expect to win during that year? (1/1)

14. A straight line passes through the points $(-1, 3)$ and $(1, 9)$.
Find the equation of the line expressed in the form $y = kx + m$ (2/0)

15.



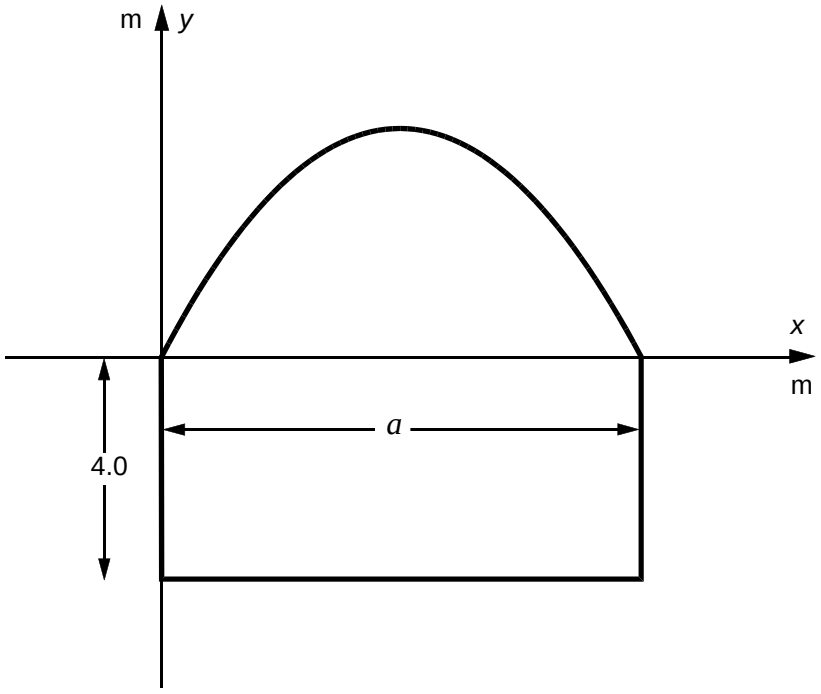
ABC is an equilateral triangle. Together with the sides of the triangle the distance AD forms the angles *x* and *y* as can be seen in the figure.

Find the connection between *x* and *y*. (0/2)

16. Explain with an example when it is suitable to use the median instead of the mean value. (0/2/¤)

17. A badminton centre has a vaulted roof. In the figure below you can see one of the gables of the centre placed in a system of co-ordinates. The vaulted roof then forms a curve in the system of co-ordinates. This curve can be described by

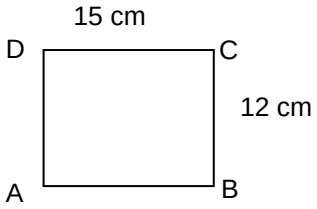
$y = 0.67x - 0.028x^2$

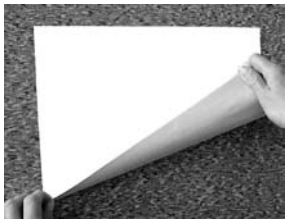


a) Calculate the width of the gable *a*. (0/2)

b) As you can see in the figure, the lowest ceiling height is 4.0 m.
How high is the highest ceiling height? (0/2)

18. ABCD is a white rectangular shaped sheet of paper where the back is grey (see left figure). The sheet is folded so that the folding line passes through corner A and so that corner B ends up on side CD (see right figure).





Calculate the area of the folded (grey) part of the sheet. (0/4/¤)
Calculations based on measurements are not accepted.

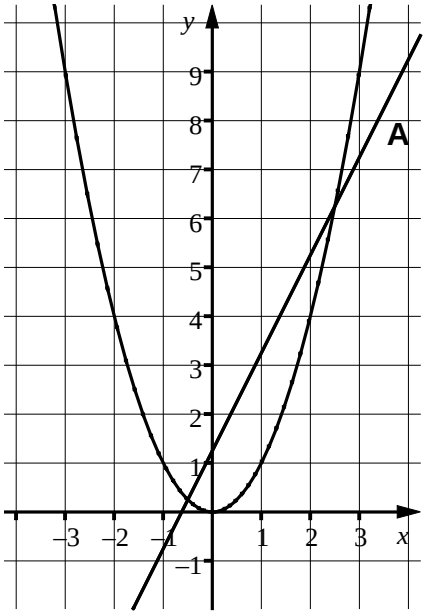
19. At the Olympics and other athletic games, blood tests are regularly taken to check if the participants are doped. It is rather expensive to test blood though. To reduce the number of blood tests taken and still be able to find traces of drugs, it is possible to do the following:

Parts of five different blood tests are mixed in one single test tube and then the mixture is tested. Only if there are illegal substances in the mixture do the five blood tests have to be examined separately.

What is the probability that the blood tests have to be examined separately? Assume that the probability that one single blood test contains traces of drugs is 0.015. (0/3)

Present your solution to problem 20 partly in this booklet (the table) and partly on separate test sheets.

20. Intersections between the curve $y = x^2$ and straight lines



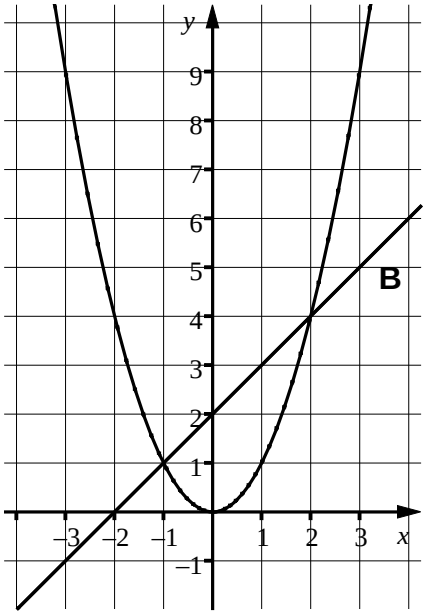
In the left figure, you can read the *x*-co-ordinates for the points where the curve and line A intersects:
The left intersection: $x_1 = -0.5$
and the right intersection: $x_2 = 2.5$

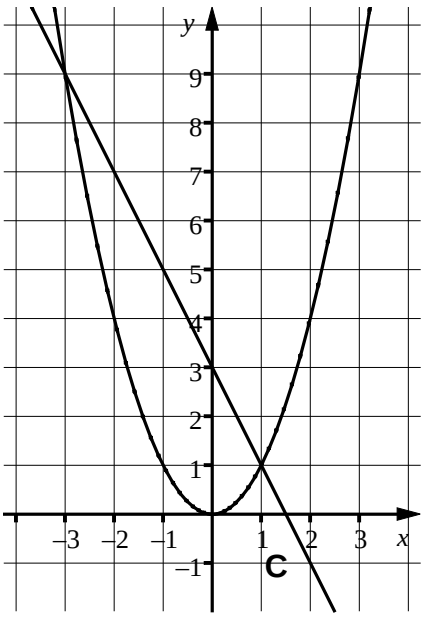
Then the sum $x_1 + x_2 = 2$
and the product $x_1 \cdot x_2 = -1.25$ are calculated.

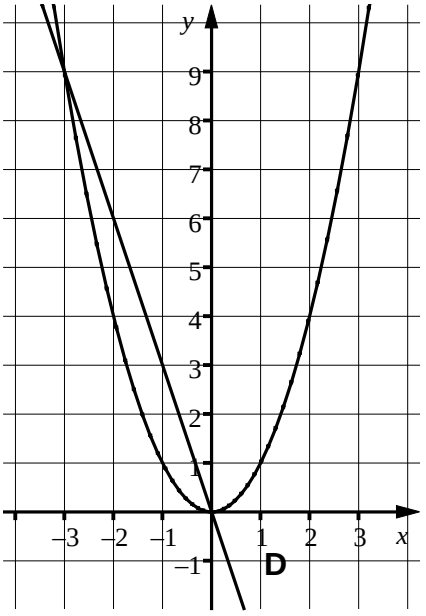
From the figure we can see that the *k*- and *m*-values are $k = 2$ and $m = 1.25$

All the values have been entered in the table on the next page.

- Do the corresponding readings in the figures below. Then fill out the table on the next page.







Line		A	B	C	D
x-co-ordinate for the left intersection with curve	x_1	-0.5			
x-co-ordinate for the right intersection with curve	x_2	2.5			
The sum of the *x*-co-ordinates	$x_1 + x_2$	2			
The product of the *x*-co-ordinates	$x_1 \cdot x_2$	-1.25			
The gradient of the line	k	2			
The *y*-co-ordinate for intersection with the *y*-axis.	m	1.25			
Equation of the line		$y = 2x + 1.25$			

- In words, write down what you can conclude from the table.

- In the table the *x*-co-ordinates for the intersection between the curve $y = x^2$ and the line $y = 2x + 1.25$ are given. These *x*-co-ordinates then form the solution to the quadratic equation $x^2 = 2x + 1.25$
  Solve the quadratic equation and show that the co-ordinates are correct in this particular case.

- Try to show that what you have concluded from the table is true for all lines that intersect with the curve $y = x^2$

(4/7/¤)

When assessing your work your teacher will consider the following:
- To what extent you solve the problem
- How well you formulate your conclusions
- How general is the method you use when you show your final conclusion
- How well you present your work