

# MATHEMATICS TEST

Year 9

Spring 2004

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## Part A – Oral Part

*Teacher Material – For Copying*  
Instructions for the Final Discussion –  
Framework and Implementation

*Student Material – For Copying*  
Information for Students  
Version I–III

**PRIM**  
gruppen

Stockholm Institute of Education

## ***Instructions for the final discussion – framework and implementation***

### **Version I and II**

The students' presentations of the various solutions should focus on the following questions:

- Do you think that this is a good way to solve the problem? Explain why!
- How do you think the student who solved the problem reasoned?

#### *Final discussion*

The students are given a few minutes to look at all the student solutions, even those that were not treated. The teacher instructs the students to compare solutions and to find other methods of solution (calculations, testing by trial, equations, figures).

- What similarities and differences are there between the various solutions? □
- What advantages and disadvantages are there with the different methods? □

For version II the following questions can also be discussed:

- What would happen if the increase was different e g 20 %, 10 % or 100 %? □
- What would happen if the price was decreased first? □

### **Version III**

Students' presentations of the various solutions should focus on the following questions:

- Do you think that the solution is satisfactory or incorrect? Explain why!
- What is good or bad about the solution?

#### *Final discussion*

- Compare student solutions 2, 4, 5, 8 and 9. What similarities and differences are there between the solutions? What differences in quality are there? □
- What happens if we instead have a 20 % increase and a 20 % decrease? □
- What happens if we have a 20 % increase and a 10 % decrease? □
- Is it possible to change the length and width by certain percentages so that the area will remain unchanged? □

### **Information for students**

This task is the oral part of the national test. This oral test is to be carried out in groups of 3–4 students sitting together with the teacher around a table.

- Each student receives a paper with information and a task that may be studied for a few minutes to get acquainted with the problem. Then you will receive a paper with a number of student solutions to the problem. Your teacher will tell you in what order you will make your presentations.
- Each student presents a student solution for the rest of the group. You should explain why you think that the solution is acceptable or incorrect. After each presentation your fellow students may ask questions, make comments and support or criticise the presentation.
- When everyone has made his or her presentation the group will be asked to discuss some questions posed by the teacher.
- Your performance during this oral test will be assessed on the basis of three aspects: *understanding, language and degree of participation*.

To what extent you have understood the question, the concepts involved and the quality of the different student solutions.

How clear your presentation is and how well you use mathematical language.

To what extent you participate in the discussion and can argue for your ideas and make responses to the explanations of others.

Remember that this is an occasion for you to show your abilities both in your own presentation, in the discussion after your classmates' presentations and in the concluding discussion. Your achievement on this oral part is summarised and gives a number of g- and vg points and you also have the opportunity to demonstrate MVG-qualities. The result of this oral part is then combined with the results of the other parts of the national test.

## Part A – Version I

Your oral test concerns this problem:

The price of a pair of skis is reduced by 40 %, so that they now cost 1 800 kr. What did the skis cost before the reduction in price?

Read through the problem. You do not need to solve the problem, only try to understand it.

You will receive a student solution to the problem.

- Do you think that this is a good way to solve the problem? Explain why!
- How do you think that the student who solved the problem reasoned?

When your classmates have presented their solutions you may also have opinions about the other solutions.

Part A – Version I

First time

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1.  $0.40 \cdot 1800 = 720$   
 $1800 + 720 = 2520$

Answer: The skis cost 2520 kr

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2.  $\frac{1800}{40} = 45$

$45 \cdot 100 = 4500$

Answer: The skis cost 4500 kr

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3.

Price	-40%
2000	1200
5000	3000
4000	2400
3000	1800

Answer: The skis cost 3000 kr

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4.  $0.40 \cdot 1800 = 720$   
 $1800 - 720 = 1080$

Answer: The skis cost 1080 kr

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5. 10% of 1800 kr is 180 kr  
40% of 1800 kr is  $4 \cdot 180 \text{ kr} = 720 \text{ kr}$   
 $1800 \text{ kr} + 720 \text{ kr} = 2520 \text{ kr}$

Answer: The skis cost 2520 kr

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6. You have to pay 60%

60% is 1800kr

1% is  $\frac{1800}{60}$  kr = 30 kr

100% is  $100 \cdot 30$  kr = 3000kr

Answer: The skis cost 3000kr

7.  $\frac{60 \cdot x}{100} = 1800$

$60 \cdot x = 180000$

$x = \frac{180000}{60}$

$x = 3000$  Answer: The skis cost 3000kr

8.  $40\% = 0.4$

$0.4 \cdot x = 1800$

$x = \frac{1800}{0.4}$

$x = 4500$  Answer: The skis cost 4500kr

9. The price is  $x$  kr

$x - 0.4x = 1800$

$0.6x = 1800$

$x = \frac{1800}{0.6}$

$x = 3000$  Answer: The skis cost 3000kr

10.



$3000$  Answer: The skis cost 3000kr

## Part A – Version II

Your oral test concerns this problem:

The price of a TV is increased by 25 %.  
By what percentage must the price  
thereafter be reduced in order that  
the final price be the same as the original  
price?

Read through the problem. You do not need to solve the problem, only try to understand it.

You will receive a student solution to the problem.

- Do you think that this is a good way to solve the problem? Explain why!
- How do you think that the student who solved the problem reasoned?

When your classmates have presented their solutions you may also have opinions about the other solutions.

Part A – Version II

First time

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1. The TV cost 5000 kr originally

$$\frac{5000}{2} = 2500 \quad \frac{2500}{2} = 1250$$

$$5000 + 1250 = 6250$$

$$6250 - 5000 = 1250$$

1250 is 25% of 5000

Answer: The price must be reduced by 25%

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2. It depends on what the TV costs,  
because 25% of 10000 kr is more than 25%  
of 2000 kr

Answer: It depends on what the TV costs

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3. Suppose the TV costs 1000 kr

25% of 1000 is 250

The TV then costs 1250 kr

25% of 1250 is 312.5 kr

20% of 1250 is 250

Answer: You have to reduce the price by 20%

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4. The TV cost 8000 kr  
The price increases by 2000 kr  
Then the price must be reduced by 2000kr  
$$\frac{2000}{8000} = 0,25 = 25\%$$

Answer: The price must be reduced by 25%

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5.  $100\% + 25\% = 125\%$   
 $125\% - 25\% = 100\% = \text{the original price}$   
Answer: It must be reduced by the same percentage as it was increased, that is, by 25%
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6. The price of the TV's 10 000 kr

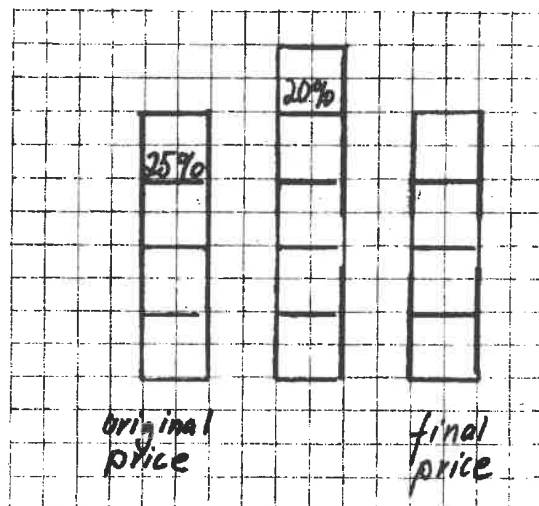
$$\frac{10\,000}{4} = 2\,500 \quad 10\,000 + 2\,500 = 12\,500$$

$$\frac{12\,500}{5} = 2\,500 \quad 12\,500 - 2\,500 = 10\,000$$

$$\frac{1}{5} = 20\%$$

Answer: The price must be reduced by 20%

7.



Answer: The price must be reduced by 20%

8. Assume that the TV cost 1000 kr, for simplicity,  
 $25\% = \frac{1}{4} \quad \frac{1000}{4} = 250 \text{ kr}$

$$1000 \text{ kr} + 250 \text{ kr} = 1250 \text{ kr} \quad 1250 \text{ kr} = 100\%$$

$$\frac{1250 \text{ kr}}{100\%} = 12.50 \text{ kr} = 1\% \quad \frac{1000 \text{ kr}}{12.5 \text{ kr}} = 20\%$$

Answer: The price must be reduced by 20%

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9. Let us say that the TV costs 10 000 kr

$$10\,000 \cdot 1.25 = 12\,500$$

$$12\,500 - 10\,000 = 2\,500$$

$$\frac{2\,500}{12\,500} = 0.2$$

Answer: The price must be reduced by 20%

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10. First the price was increased from 800 kr to 1000 kr.

Then the price was reduced by  $x\%$

$$\frac{x \cdot 1000}{100} = 200$$

$$10x = 200$$

$$x = 20$$

Answer: The price must be reduced by 20%

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11. Initial price  $a$  kr

Increase 25% growth factor 1.25

New price  $1.25a$

Decrease change factor  $x$

Equation for initial price  $1.25a \cdot x = a$

$$x = \frac{1}{1.25} = 0.8$$

A decrease of  $1 - 0.8 = 0.2 = 20\%$

Answer: 20% reduction in price

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## Part A – Version III

Your oral test concerns this problem:

The length of a rectangle increases by 10 % and the width decreases by 10 %. Investigate how the area changes.

Read through the problem. You do not need to solve the problem, only try to understand it.

You will receive a student solution to the problem.

- Do you think that this solution is satisfactory or incorrect? Explain why!
- What is good or bad about this solution?

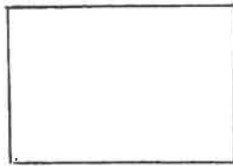
When your classmates have presented their solutions you may also have opinions about the other solutions.

### Part A – Version III

First time

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1.



4.5 cm

$$3.5 \text{ cm} \quad \text{Area: } 3.5 \cdot 4.5 = 15.75 \approx 16 \text{ cm}^2$$

$$\text{New length: } 4.5 + 0.45 = 4.95 \text{ cm}$$

$$\text{New width: } 3.5 - 0.35 = 3.15 \text{ cm}$$



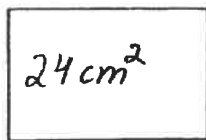
4.95 cm

$$3.15 \text{ cm} \quad \text{area: } 4.95 \cdot 3.15 = 15.5925 \approx 16 \text{ cm}^2$$

Answer: The area will be the same

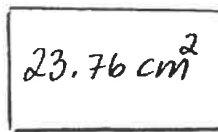
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2.



6 cm

4 cm



6.6 cm

3.6 cm

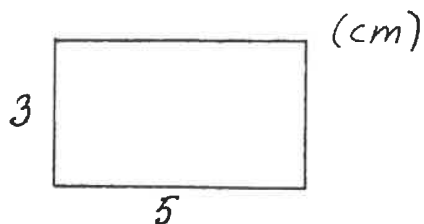
$$\text{Length: } 6 \cdot 0.1 = 0.6 \quad 6 + 0.6 = 6.6$$

$$\text{Width: } 4 \cdot 0.1 = 0.4 \quad 4 - 0.4 = 3.6$$

Answer: The area will be smaller

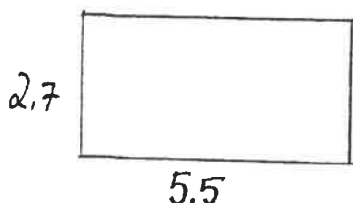
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3.



The area:  $3 \cdot 5 = 15$

Increased the length by 10%  
and reduced the width by 10%

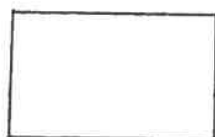


The area:  $2.7 \cdot 5.5 = 14.85$

Answer: Whether the area will  
become larger or smaller  
depends on the original lengths  
of the sides

4.

Ex1



5cm decreases by 10%

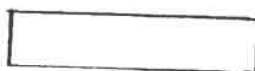
8cm increases by 10%

The area:  $8 \cdot 5 = 40 \text{ cm}^2$

After increase, decrease

The area:  $8.8 \cdot 4.5 = 39.6 \text{ cm}^2$

Ex2



2cm decreases by 10%

10cm increases by 10%

The area:  $10 \cdot 2 = 20 \text{ cm}^2$

After increase, decrease

The area:  $11 \cdot 1.8 = 19.8 \text{ cm}^2$

In ex 1 and 2 we see that both rectangles area  
have decreased.

In ex 1 from  $40 \text{ cm}^2$  to  $39.6 \text{ cm}^2$  and  
in ex 2 from  $20 \text{ cm}^2$  to  $19.8 \text{ cm}^2$

Answer: The area becomes smaller

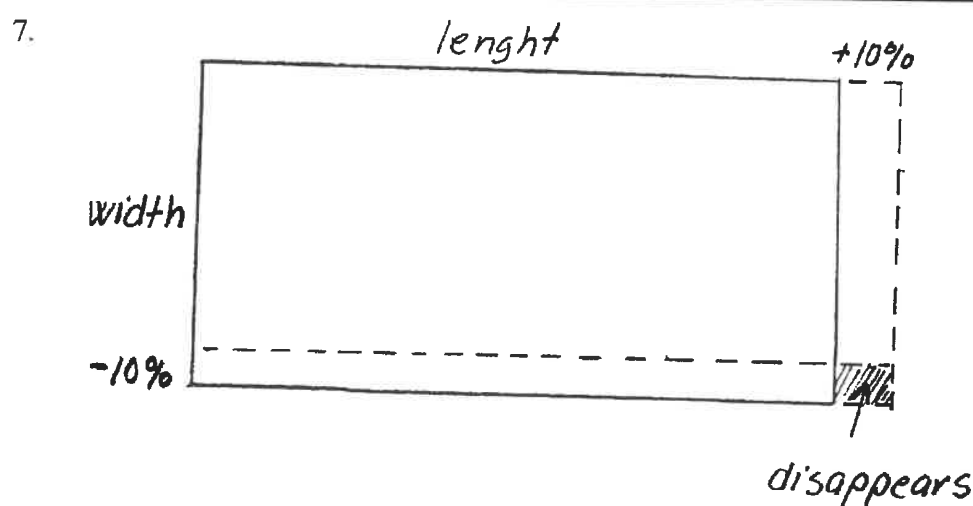
5. Rectangles with side lengths After decrease, increase

1. $2.5 \cdot 5$	$A = 12.5$	2. $2.25 \cdot 5.5$	$A = 12.375$
2. $3 \cdot 5$	$A = 15$	2.7 $\cdot 5.5$	$A = 14.85$
3. $4 \cdot 5$	$A = 20$	3.6 $\cdot 5.5$	$A = 19.8$
4. $5 \cdot 6$	$A = 30$	4.5 $\cdot 6.6$	$A = 29.7$
5. $6 \cdot 7$	$A = 42$	5.4 $\cdot 7.7$	$A = 41.58$

Answer: The area will always become smaller

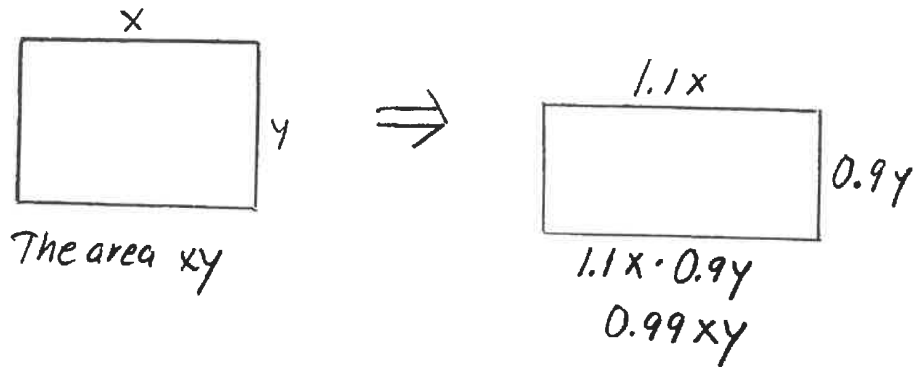
6. Since the length increases by 10% and the width decreases by 10% the area will of course be the same. Increase — decrease cancel out each other.

Answer: The area will be the same.



Answer: The area will be smaller

8.



Answer: The area will always be 1% smaller.

9.

Rectangle I

$$\begin{aligned} 4 \cdot 5 &= 20 \text{ cm}^2 \\ 3 \cdot 6 &= 18 \text{ cm}^2 \\ 5 \cdot 5 &= 25 \text{ cm}^2 \\ 1 \cdot 10 &= 10 \text{ cm}^2 \\ 6 \cdot 3 &= 18 \text{ cm}^2 \end{aligned}$$

New rectangle

$$\begin{aligned} 3.6 \cdot 5.5 &= 19.8 \text{ cm}^2 \\ 2.7 \cdot 6.6 &= 17.82 \text{ cm}^2 \\ 4.5 \cdot 5.5 &= 24.75 \text{ cm}^2 \\ 0.9 \cdot 11 &= 9.9 \text{ cm}^2 \\ 5.4 \cdot 3.3 &= 17.82 \text{ cm}^2 \end{aligned}$$

$$\frac{19.8}{20} = 0.99$$

$$\frac{17.82}{18} = 0.99$$

$$\frac{24.75}{25} = 0.99$$

$$\frac{9.9}{10} = 0.99$$

$$\frac{17.82}{18} = 0.99$$

Answer: The new rectangle will always be 1% smaller than the original one.