



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate Examination 2014

Mathematics
(Project Maths – Phase 2)

Paper 2

Higher Level

Monday 9 June – Morning, 9:30 to 12:00

300 marks

Examination number

Centre stamp

Running total

For examiner

Question	Mark	Question	Mark
1			
2			
3			
4			
5			
6			
7			
8			
9			
10		Total	

Grade

Instructions

There are 10 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. There is space for extra work at the back of the booklet. You may also ask the superintendent for more paper. Label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

You will lose marks if all necessary work is not clearly shown.

Answers should include the appropriate units of measurement, where relevant.

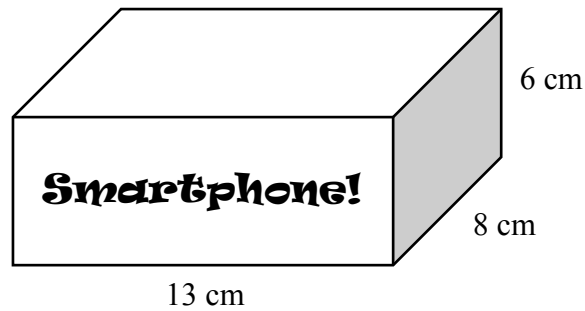
Answers should be given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

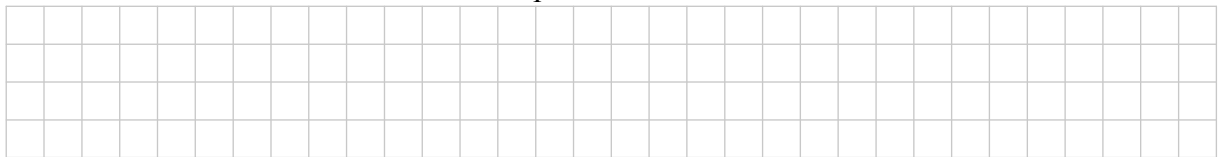
Question 2

(Suggested maximum time: 15 minutes)

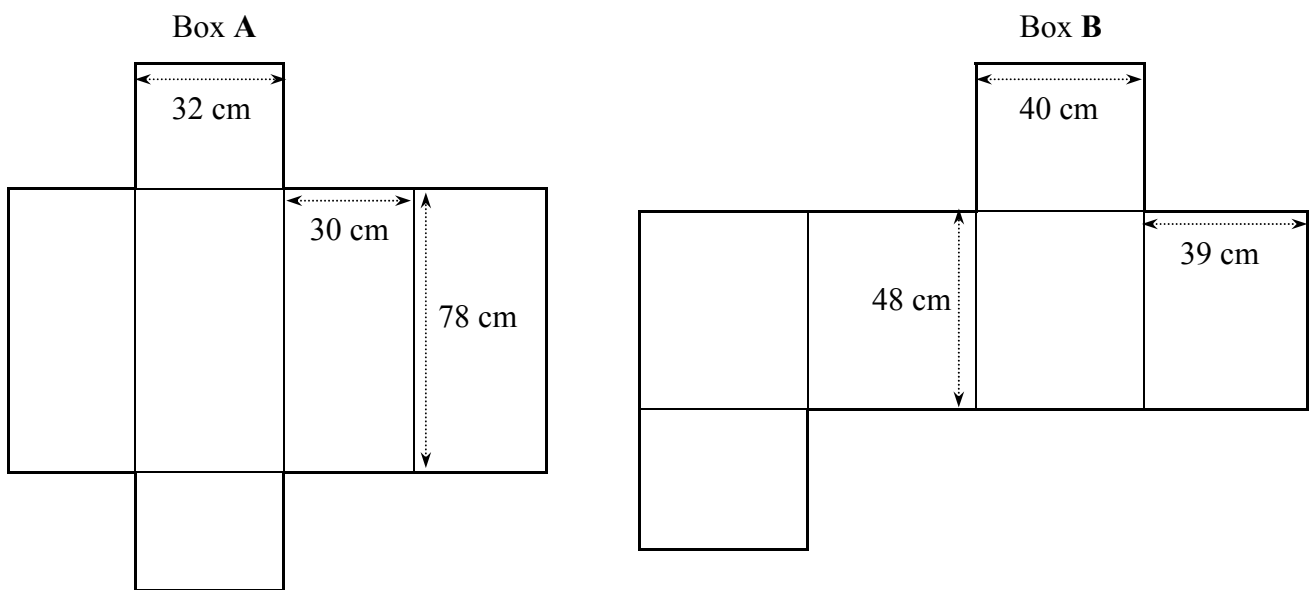
The box for an individual mobile phone is 13 cm long, 8 cm wide, and 6 cm high, as shown.



- (i)** Find the volume of an individual mobile phone box.



These individual mobile phone boxes will be shipped in a large rectangular box. Below are diagrams of the nets of two large boxes that could be used, Box **A** and Box **B**.



- (ii)** Show that Box **A** and Box **B** have the same volume.

Box A:	Box B:

Question 3**(Suggested maximum time: 15 minutes)**

All of the students in a class took *IQ Test 1* on the same day. A week later they all took *IQ Test 2*. Their scores on the two IQ tests are shown in the tables below.

<i>IQ Test 1</i>				
86	104	89	105	96
96	103	94	104	119
115	79	97	111	108

<i>IQ Test 2</i>				
83	120	105	111	114
99	111	108	106	97
97	102	94	108	117

- (i) Draw a back-to-back stem-and-leaf plot below to display the students' scores.

<i>IQ Test 1</i>		<i>IQ Test 2</i>
	7	
	8	
	9	
	10	
	11	
	12	
Key: _____		

- (ii) Find the range of scores for each IQ test.

<i>IQ Test 1:</i> _____	<i>IQ Test 2:</i> _____

Question 4

(Suggested maximum time: 20 minutes)

- (a) Prove that the angle at the centre of a circle standing on a given arc is twice the angle at any point of the circle standing on the same arc.

Diagram:

Given:

To Prove:

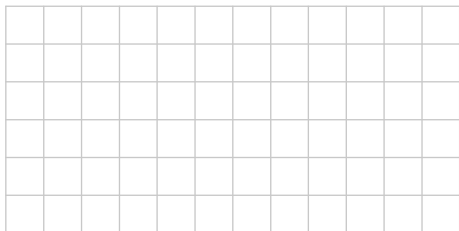
Construction:

Proof:

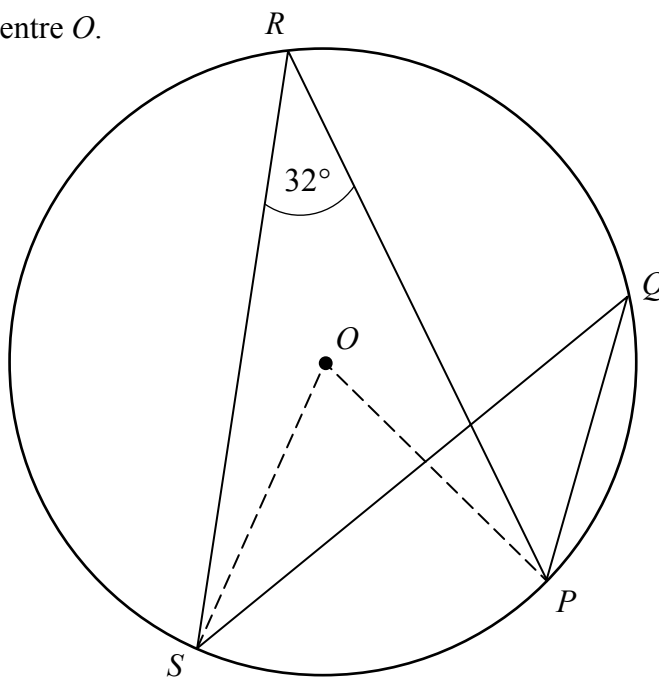
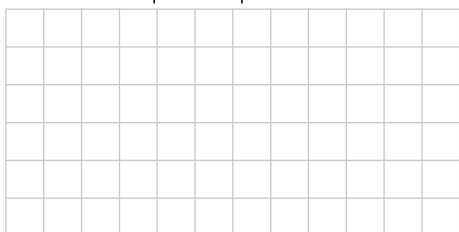
(b) $P, Q, R,$ and S are points on a circle with centre O .

$|\angle PRS| = 32^\circ,$ as shown.

(i) Find $|\angle SOP|.$



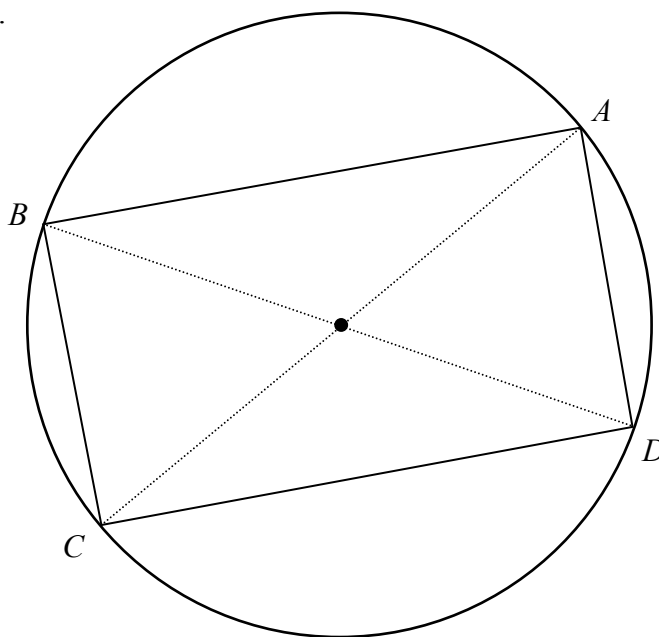
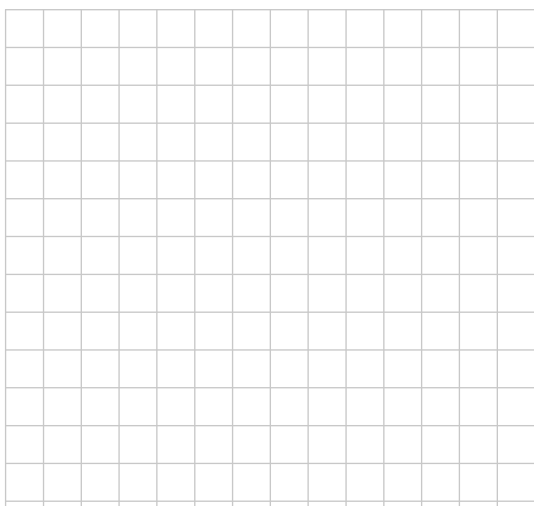
(ii) Find $|\angle SQP|.$



(c) $A, B, C,$ and D are points on a circle, as shown below.

$[AC]$ and $[BD]$ are diameters of the circle.

Prove that $ABCD$ is a rectangle.



Question 5

(Suggested maximum time: 20 minutes)

Students in a class are investigating spending in their local area. They each carry out a different survey, and display the results.

- (a) John is investigating whether people pay for their weekly shopping with Credit Card, Debit Card, Cash, or Cheque. When people tell him which one of these they usually use, he writes it in a table. His results are shown below.



Credit Card	Debit Card	Debit Card	Cash	Debit Card
Credit Card	Cash	Cash	Credit Card	Debit Card
Debit Card	Debit Card	Cheque	Cash	Cash
Cash	Cash	Debit Card	Cash	Credit Card

- (i) What type of data has John collected? Put a tick (✓) in the correct box below.

Numerical
Continuous

Numerical
Discrete

Categorical
Nominal

Categorical
Ordinal


- (ii) Fill in the frequency table below.

Method of Payment	Credit Card	Debit Card	Cash	Cheque
Frequency				

- (iii) What is the mode of John's data? Mode =


- (iv) John says that he cannot find the mean of his data. Explain why this is the case.

(v) Display John's data in a pie chart. Show all of your calculations clearly.

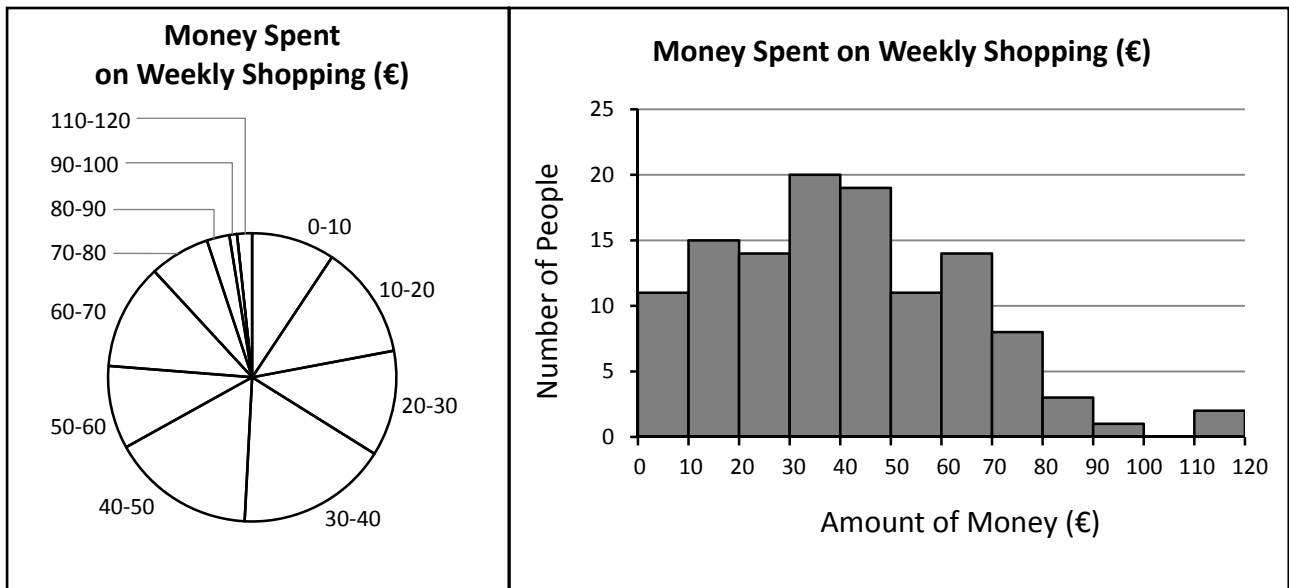


(b) Margaret wants to examine if people prefer to do their weekly shopping in *Tesco*, *Dunnes Stores*, *SuperValu*, or *Lidl*. She stands outside her local *Lidl* shop for one day, and asks everyone as they leave the shop where they prefer to do their weekly shopping.

Give one reason why Margaret's data may be biased.



- (c) Mary is interested in the amount of money people spend on their weekly shopping. She surveys people as they leave the local supermarket on a Saturday morning, and displays her results in the two graphs below.



- (i) Mary wants to show that about half of her sample spent less than €40 on their weekly shopping. Which graph do you think she should use? Give a reason for your answer.

Answer: _____

Reason: _____

- (ii) Mary wants to show that there were more people in the 30–40 group than in any other. Which graph do you think she should use? Give a reason for your answer.

Answer: _____

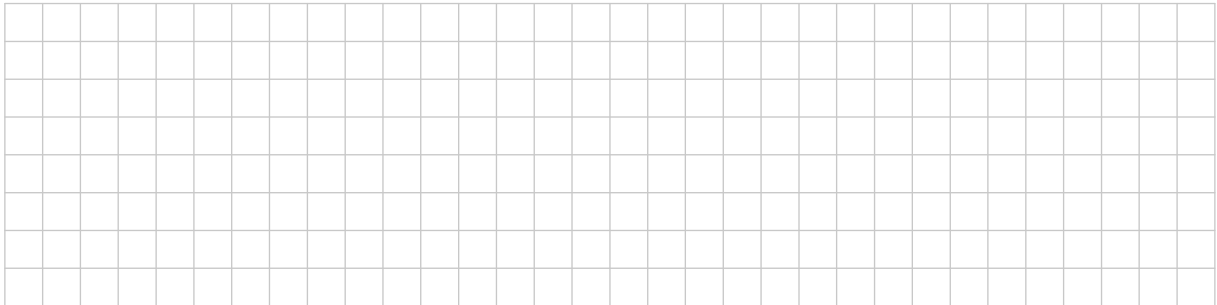
Reason: _____

Question 8

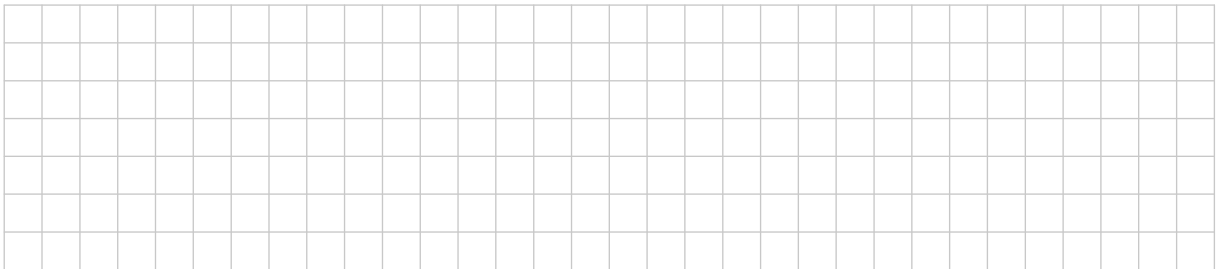
(Suggested maximum time: 10 minutes)

The equation of the line l is $x - 3y - 6 = 0$.

- (i) Find the slope of the line l .



- (ii) Show that the point $(1, -2)$ is **not** on the line l .



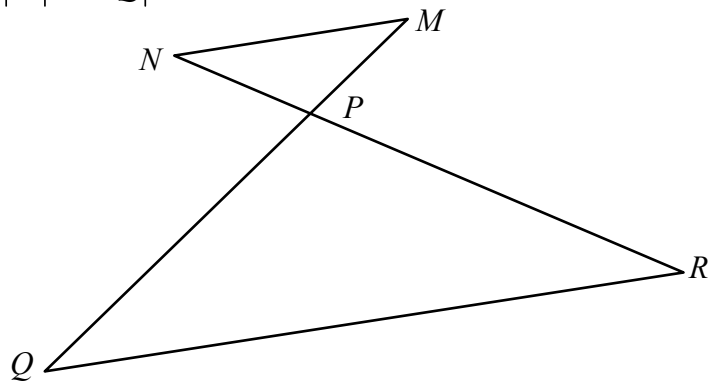
- (iii) The line k passes through $(1, -2)$ and is parallel to the line l .
Find the equation of the line k .



Question 9

(Suggested maximum time: 10 minutes)

In the diagram below, $|\angle MNP| = |\angle PRQ|$.



(i) Prove that $\triangle MNP$ and $\triangle QRP$ are similar.

(ii) Is NM parallel to QR ? Give a reason for your answer.

Given $|MN| = 6$, $|NP| = 4$, $|QP| = 9$, and $|PR| = 10$, find:

(iii) $|QR|$

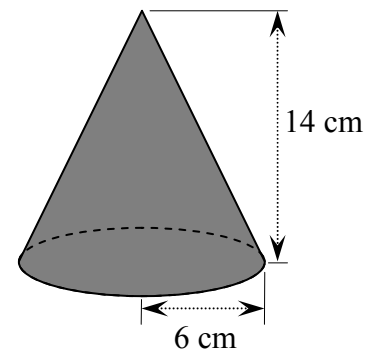
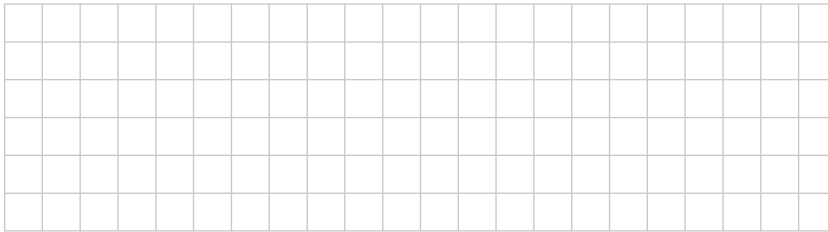
(iv) $|QM|$.

Question 10

(Suggested maximum time: 10 minutes)

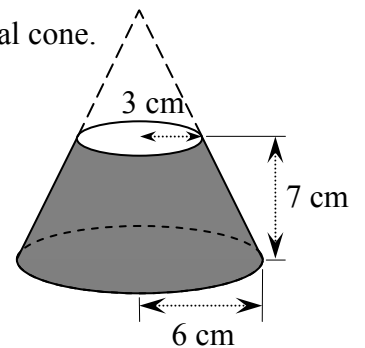
A solid cone has a radius of 6 cm and a height of 14 cm, as shown.

- (i) Find the volume of the cone. Give your answer in terms of π .

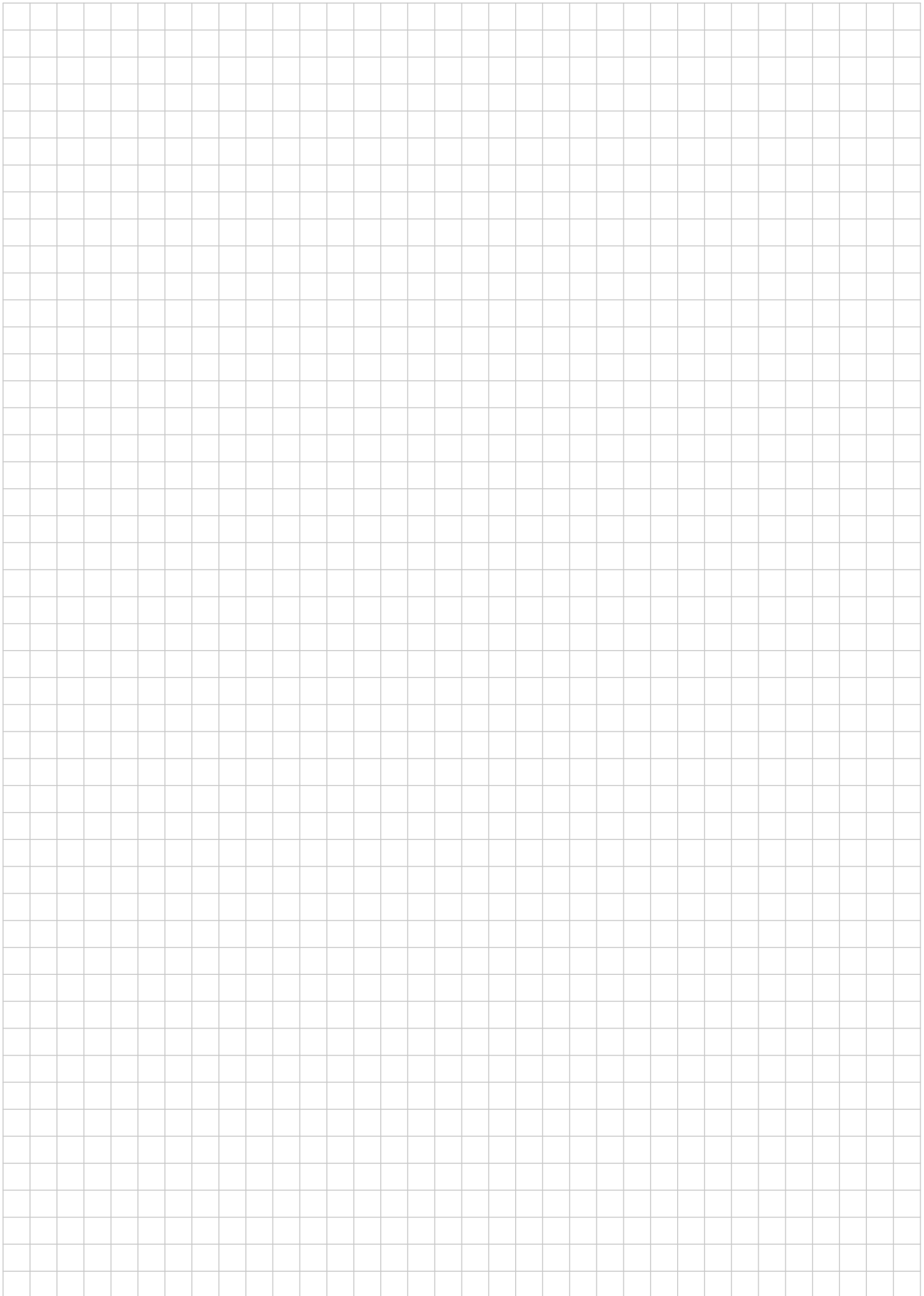


The shape shown below is a *frustum*. This is made by taking the cone above, cutting it horizontally at a height of 7 cm, and removing the upper portion. The radius of the circular top of the frustum is 3 cm, as shown in the diagram.

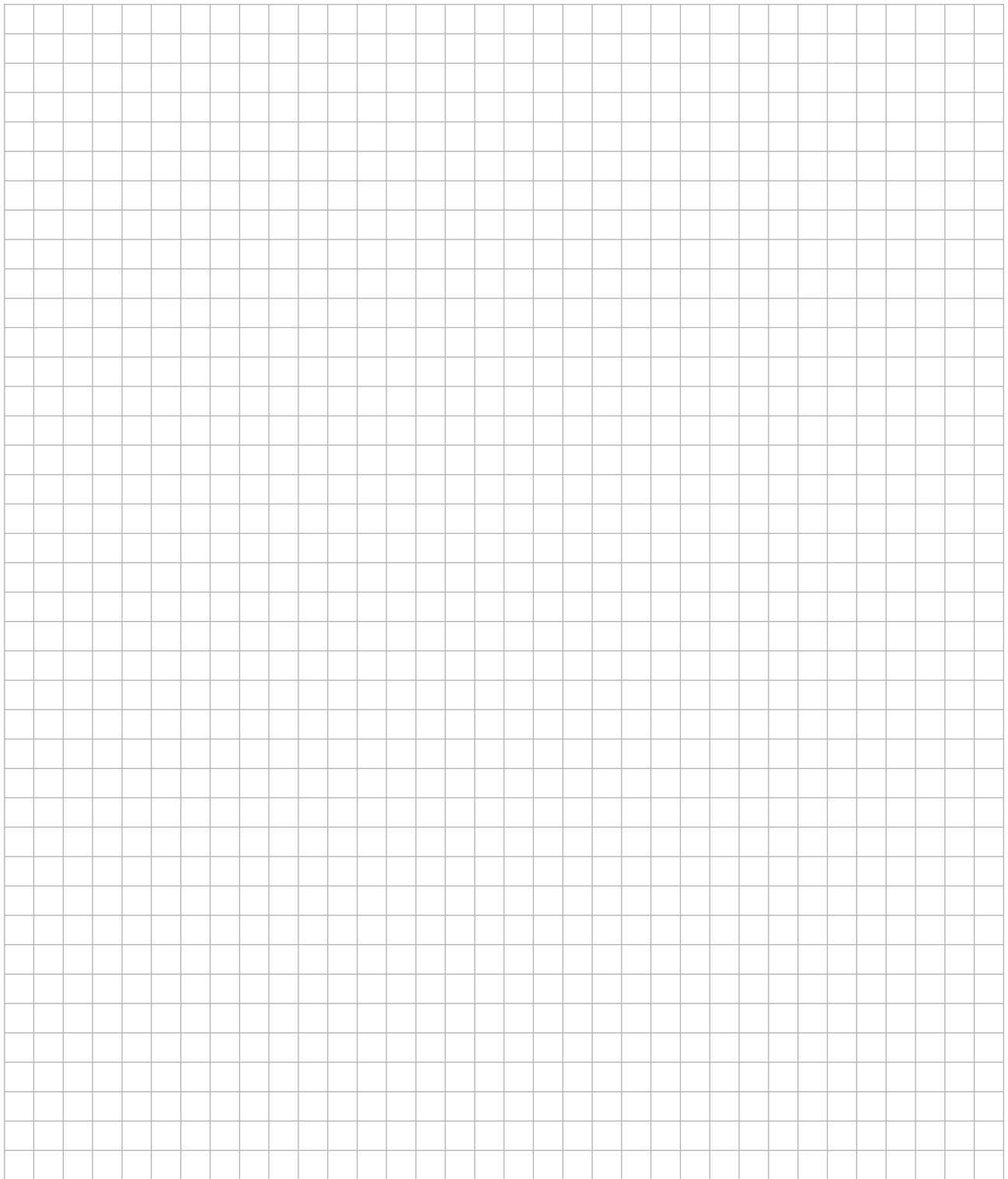
- (ii) Find the ratio of the volume of the frustum to the volume of the original cone.



You may use this page for extra work.



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