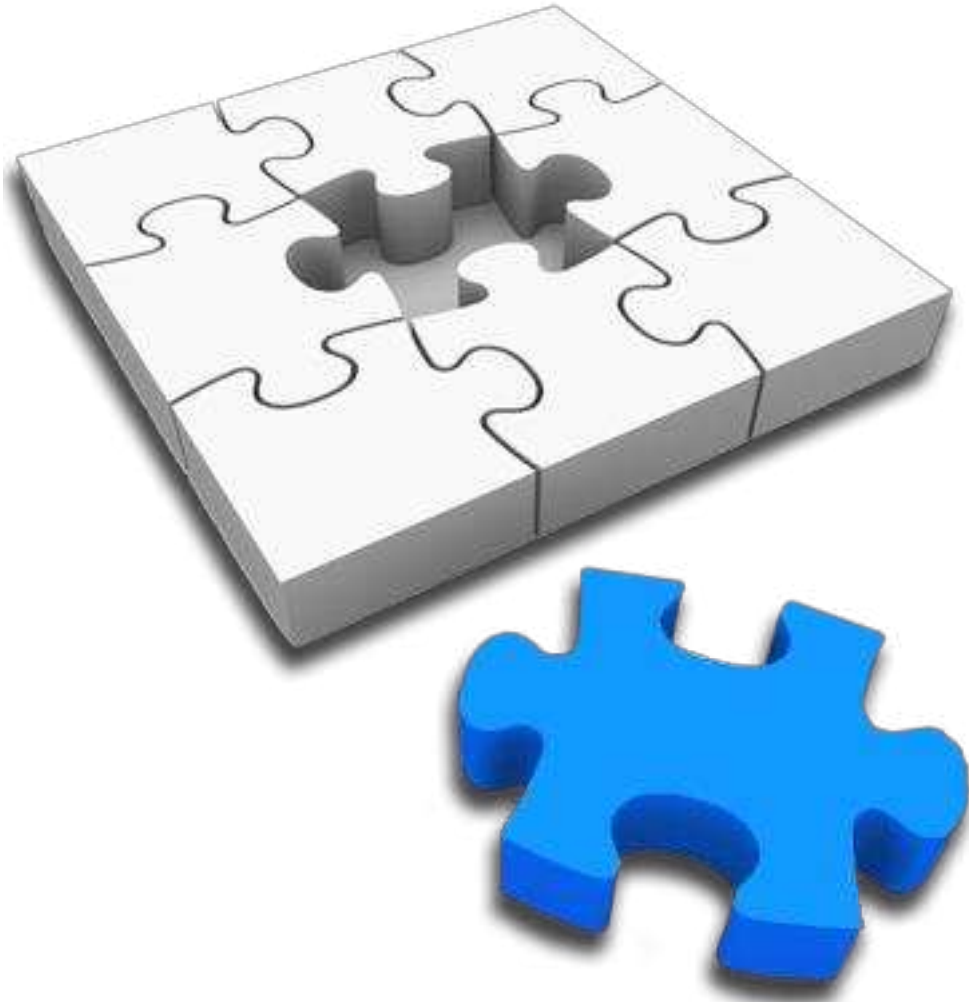


# Focus on Problem Solving

## Project Maths Workshop 3

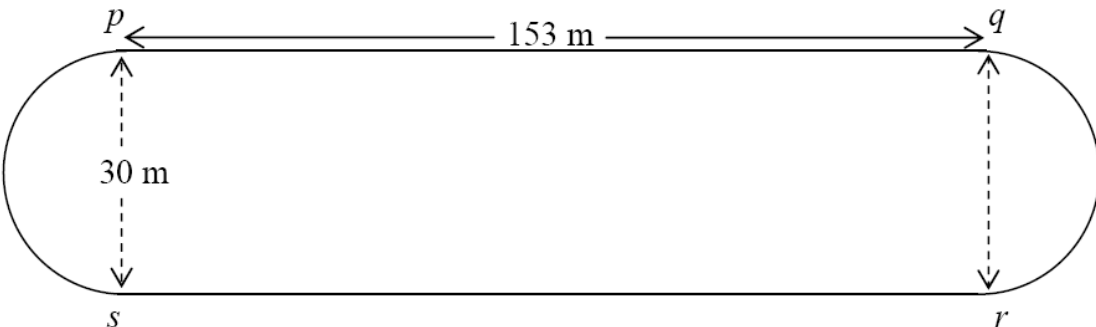


Name: \_\_\_\_\_

School: \_\_\_\_\_

### WS3.1 - Problem Solving

Read through the past papers provided and tick in the boxes below whether, in your opinion, certain questions are procedural or problem solving.

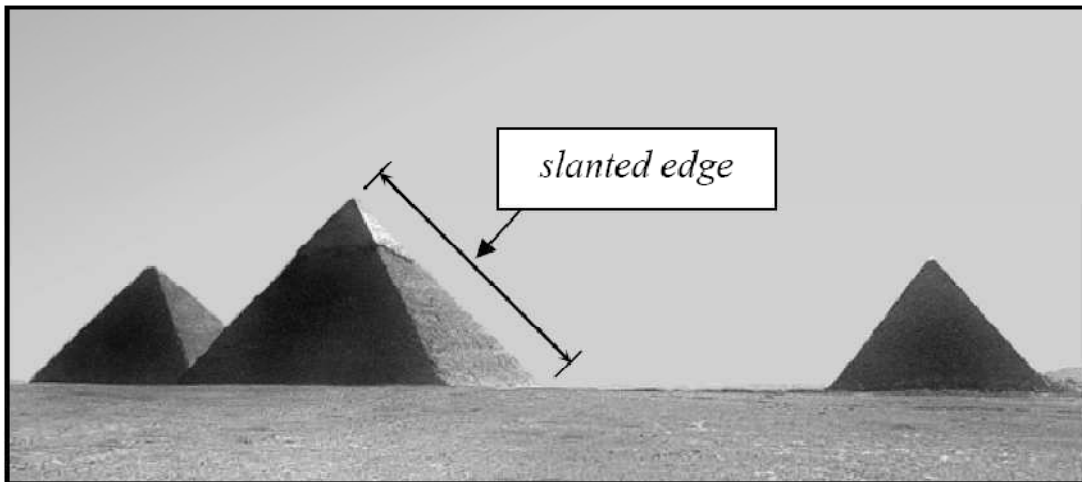
JCOL 2008 Q1 (c) (i)	Procedural	
	Problem Solving	
<p>An athletics track has two equal parallel sides [pq] and [sr] and two equal semi-circular ends with diameters [ps] and [qr]. <math> pq  =  sr  = 153</math> metres, and <math> ps  =  qr  = 30</math> metres.</p>  <p>Taking <math>\pi</math> as 3.14, calculate the length of one of the semi-circular ends, correct to the nearest metre.</p>		
JCOL 2008 Q1 (c) (ii)	Procedural	
	Problem Solving	
<p>Calculate the total length of one lap of the track, correct to the nearest metre.</p>		
JCOL 2008 Q1 (c) (iii)	Procedural	
	Problem Solving	
<p>Noirín ran a 5000 metre race on the above track in 15 minutes. Calculate, in seconds, the average time it took Noirín to complete one lap of the track during that race.</p>		

LCOL 1997 Q2 (c) (i)	Procedural	
	Problem Solving	
<p>The length and breadth of a rectangle are in the ratio 9:5, respectively. The length of the rectangle is 22.5 cm. Find its breadth.</p>		
LCOL 1997 Q2 (c) (ii)	Procedural	
	Problem Solving	
<p>Tea served in a canteen is made from a mixture of two different types of tea, type A and type B. Type A costs £4.05 per kg. Type B costs £4.30 per kg. The mixture costs £4.20 per kg.</p> <p>If the mixture contains 7kg of type A, how many kilograms of type B does it contain?</p>		

LCHL 2006 Q5 (c) (i)

Procedural	
Problem Solving	

The great pyramid at Giza in Egypt has a square base and four triangular faces. The base of the pyramid is of side 230 metres and the pyramid is 146 metres high. The top of the pyramid is directly above the centre of the base.



Calculate the length of one of the slanted edges, correct to the nearest metre.

LCHL 2006 Q5 (c) (ii)

Procedural	
Problem Solving	

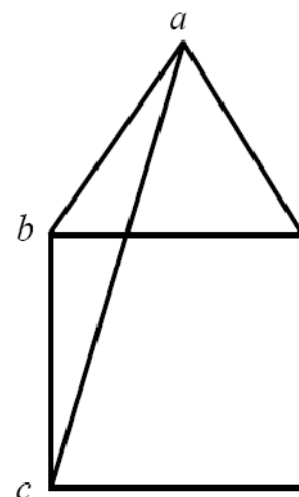
Calculate, correct to two significant figures, the total area of the four triangular faces of the pyramid (assuming they are smooth flat surfaces).

JCHL 2005 Q6 (c) (i)

Procedural	
Problem Solving	

The diagram shows an equilateral triangle and a square, each of side 6.  $a$  is joined to  $c$ .

Find  $|\angle abc|$  and  $|\angle bac|$ .



JCHL 2005 Q6 (c) (ii)

Procedural	
Problem Solving	

Find  $|ac|$ , correct to one decimal place.

**PMLCHL SAMPLE 2010 Q8 (a)**

Procedural

Problem Solving

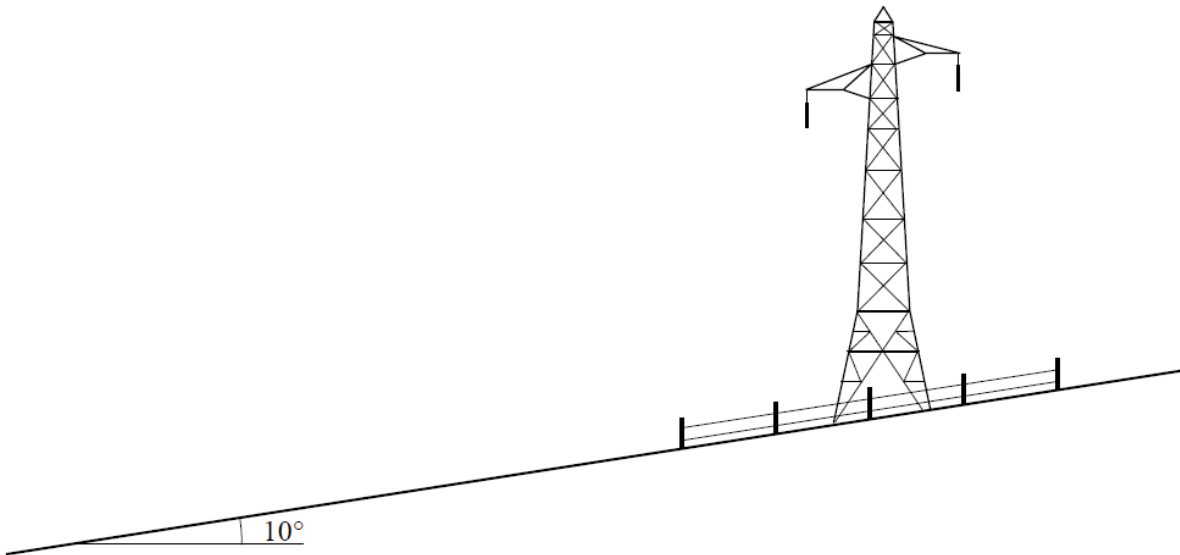
Two surveyors want to find the height of an electricity pylon. There is a fence around the pylon that they cannot cross for safety reasons. The ground is inclined at an angle. They have a clinometer (for measuring angles of elevation) and a 100 metre tape measure. They have already used the clinometer to determine that the ground is inclined at  $10^\circ$  to the horizontal.



Explain how they could find the height of the pylon. Your answer should be illustrated on the diagram below.

Show the points where you think they should take measurements, write down clearly what measurements they should take, and outline briefly how these can be used to find the height of the pylon.

*Diagram:*



Measurements to be taken:

Procedure used to find the height:

**PMLCHL SAMPLE 2010 Q8 (b)**

Procedural

Problem Solving

Write down possible values for the measurements taken, and use them to show how to find the height of the pylon. (That is, find the height of the pylon using your measurements, and showing your work.)

JCHL 2008 Q4 (c) (i)	Procedural	
	Problem Solving	
In a certain week, $x$ people shared equally in a club lotto prize of €2000. Write down an expression in $x$ for the amount that each person received.		
JCHL 2008 Q4 (c) (ii)	Procedural	
	Problem Solving	
The following week, $x + 1$ people shared equally in the prize of €2000. Write down an expression in $x$ for the amount that each person received that week.		
JCHL 2008 Q4 (c) (iii)	Procedural	
	Problem Solving	
In the second week, each winner received €100 less. Write down an equation in $x$ to represent the above information.		
JCHL 2008 Q4 (c) (iv)	Procedural	
	Problem Solving	
Solve this equation to find the value of $x$ .		

**WS3.2 - List 3 characteristics of questions that are problem solving questions**

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_
3. \_\_\_\_\_  
\_\_\_\_\_

## WS3.3 - Reflecting on my Practice

### WS3.3A - Teaching Strategies

Think about your own teaching. Which of the statements below are true? Do they fit into 'procedural' or 'problem solving' approaches? Is there a balance between procedural and problem solving approaches in your classroom?

During lessons:	Which of these statements are true?	Procedural	Problem Solving
I begin with easy questions and work up to harder questions			
I ask questions with only one possible answer			
I always teach the whole class together			
I know exactly what will be done in the lesson before beginning			
I allow students to learn through doing exercises			
I give students manipulative models for hands-on discovery			
I get students working in groups discussing a new topic. I listen to them			
I pose questions with more than one answer			
I ask thought provoking questions			
I explain everything very carefully to avoid students making mistakes			
I allow students to consult a classmate, from time to time, when they are working alone			
I teach each topic from the beginning, assuming the students know nothing			
I teach each topic separately			
I ask students to think about how what they already know could help			
I ensure students use only the methods that I suggest			
I draw links between topics and move back and forth between them			
I facilitate students in discussing their mistakes			
I encourage students to explain to the class how they got an answer			
I always follow the textbook or worksheets closely			
I give the formulae or algorithms at the beginning of the lesson			
I teach one method only for doing each question			

<b>During lessons:</b>	<b>Which of these statements are true?</b>	<b>Procedural</b>	<b>Problem Solving</b>
I arrange pairs/groups of students to facilitate collaborative learning			
I get students to reflect on what they have learned from the lesson/lessons			
I get students to produce questions to examine the topic			
I find out what prior knowledge students already have and I don't teach those parts of the syllabus			
I allow students to compare different methods for doing questions			
I allow students to discover formulae and algorithms			
I welcome being surprised by the ideas that come up in a lesson			
I encourage students to work more slowly			
I give students the freedom to decide which questions to tackle			
I encourage students to invent their own methods			

### **WS3.3B - Learning Strategies**

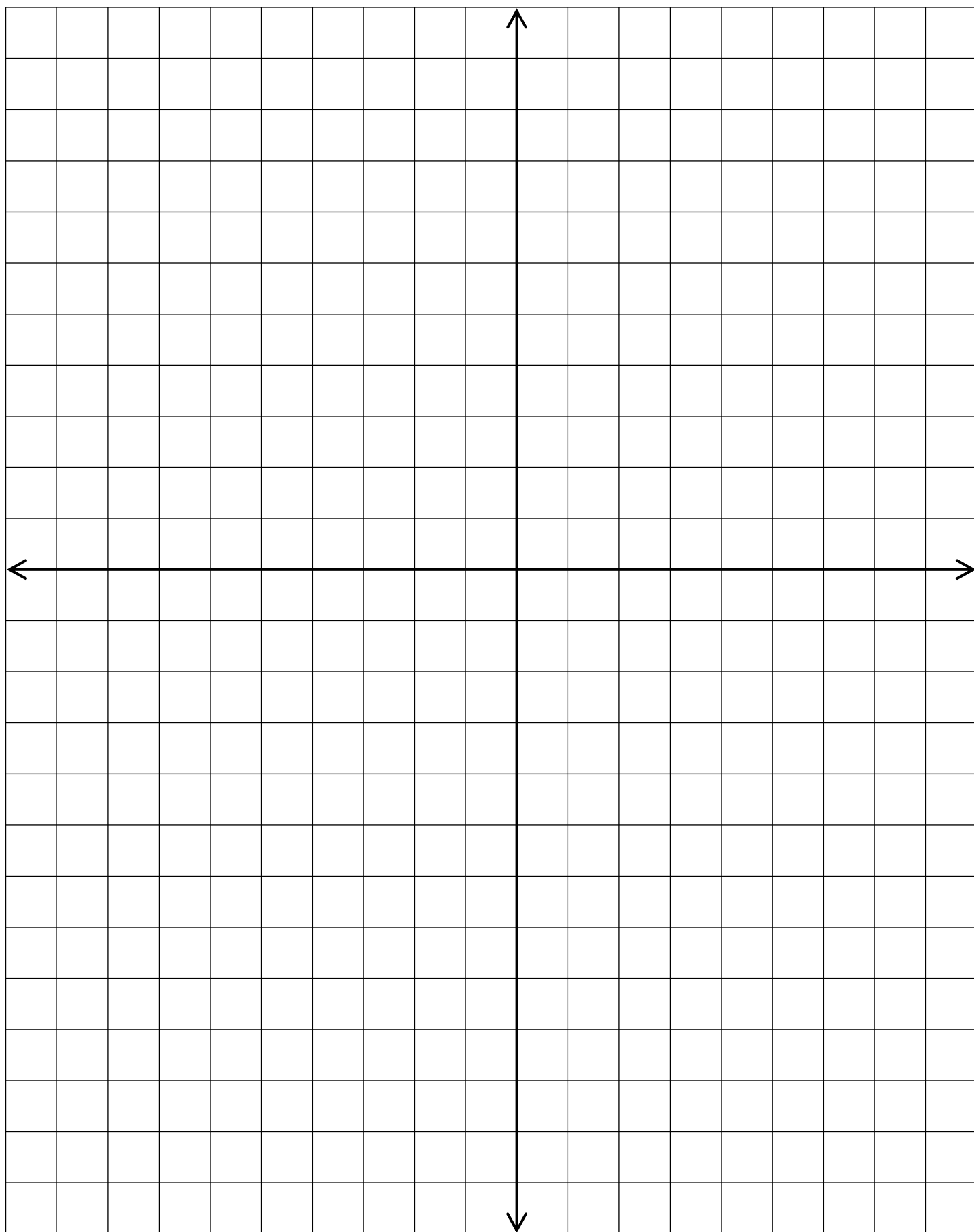
Now, think about what your students would say. Decide which of the following statements are true and into which column they fit.

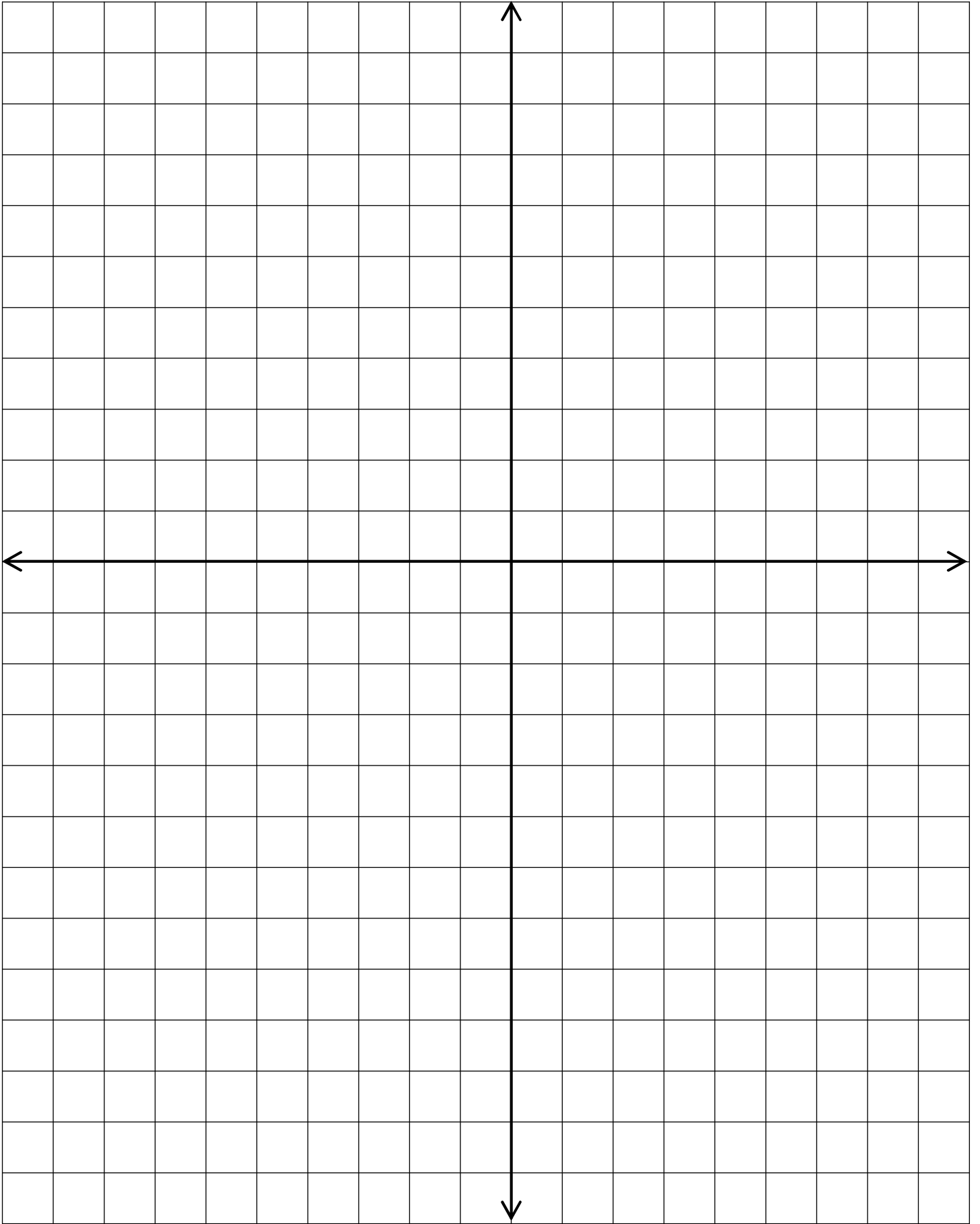
<b>During lessons:</b>	<b>Which of these statements are true?</b>	<b>Procedural</b>	<b>Problem Solving</b>
I listen while the teacher explains how to do the question			
I copy down the method from the board or textbook			
I only do questions given by the teacher			
I always work on my own			
I use things/props to help me answer questions			
I try to follow all the steps of a lesson			
I only use the method(s) shown by the teacher			
I do easy problems first to increase my confidence			
I write out the questions before doing them			
I practise the same method repeatedly on many questions			

During lessons:	Which of these statements are true?	Procedural	Problem Solving
I wait until the teacher shows the method for doing particular questions			
I ask the teacher questions			
I try to solve difficult problems in order to test my ability			
I use diagrams/pictures when trying to solve a problem			
I get the opportunity to share and compare answers with other students in the class			
I don't give up when work is hard			
I discuss ideas in a group or with a partner			
I try to connect new ideas with things I already know			
I stay silent when the teacher asks a question			
I memorise rules and properties			
I look for different ways of doing a question			
I explain something to a classmate			
I explain while the teacher and my classmates listen			
I choose which questions to do or which ideas to discuss			
I make up my own questions and methods			



### WS3.4 - Graph Paper



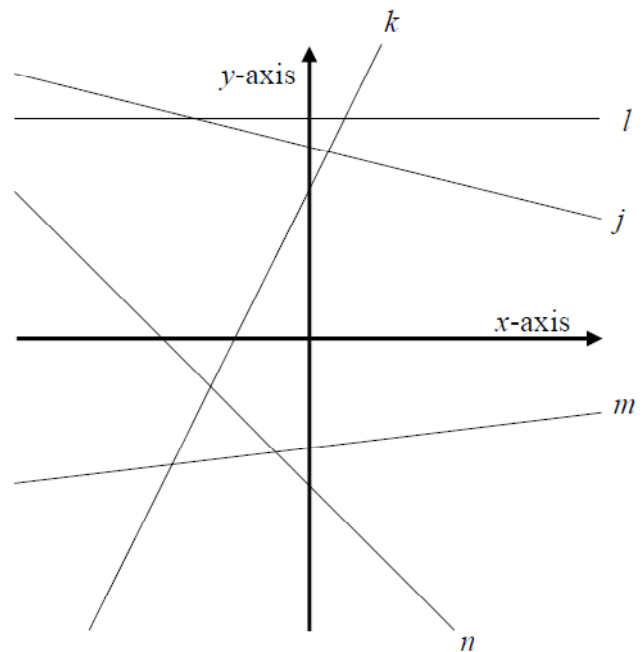


## WS3.5 - Assessment

### Question 6 (a) Ordinary Level

Five lines  $j$ ,  $k$ ,  $l$ ,  $m$ , and  $n$  in the co-ordinate plane are shown in the diagram. The slopes of the five lines are in the table below.

Slope	
2	
$\frac{1}{8}$	
0	
$-\frac{1}{4}$	
-1	



Notes:

## Question 7 (b) Ordinary Level and Question 7 Higher Level

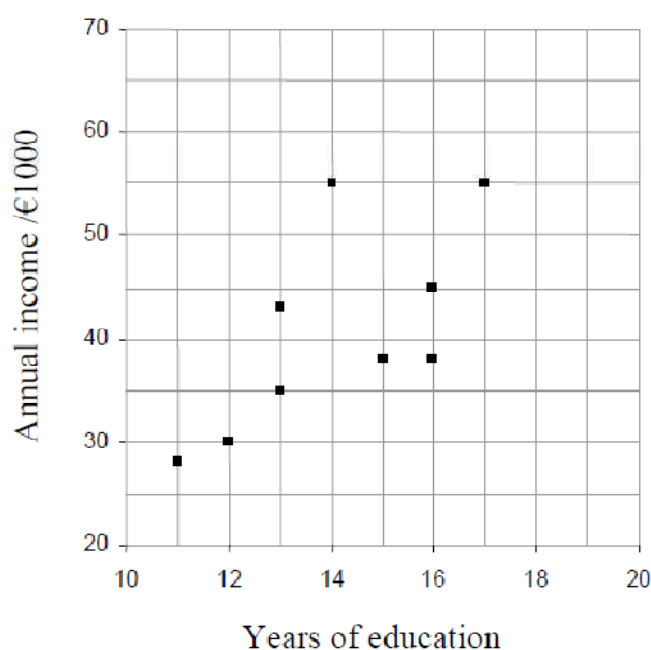
### Ordinary level:

An economics student wants to find out whether the length of time people spend in education affects how much they earn. The student carries out a small study. She asks twelve adults to state their annual income and the number of years they spent in full-time education. The data are given in the table below, and a partially completed scatter plot is given.

### Higher level:

An economics student is interested in finding out whether the length of time people spend in education affects the income they earn. The student carries out a small study. Twelve adults are asked to state their annual income and the number of years they spent in full-time education. The data are given in the table below, and a partially completed scatter plot is given.

Years of education	Income /€1,000
11	28
12	30
13	35
13	43
14	55
15	38
16	45
16	38
17	55
17	60
17	30
19	58



### Ordinary Level

- (i) The last three rows of data have not been included on the scatter plot. Insert them now.
- (ii) What can you conclude from the scatter plot?
- (iii) The student collected the data using a telephone survey. Numbers were randomly chosen from the Dublin area telephone directory. The calls were made in the evenings, between 7 and 9 pm. If there was no answer, or if the person who answered did not agree to participate, then another number was chosen at random.

Give **one** possible problem that might make the results of the investigation unreliable.

State clearly why the issue you mention could cause a problem.

### Higher Level

- (i) The last three rows of data have not been included on the scatter plot. Insert them now.
- (ii) Calculate the correlation coefficient.
- (iii) What can you conclude from the scatter plot and the correlation coefficient?
- (iv) Add the line of best fit to the completed plot above.
- (v) Use the line of best fit to estimate the annual income of somebody who has spent 14 years in education.
- (vi) By taking suitable readings from your diagram, or otherwise, calculate the slope of the line of best fit.
- (vii) Explain how to interpret this slope in this context?
- (viii) Same as first paragraph in (iii) ordinary level.  
List **three** possible problems regarding the sample and how it was collected that might make the results of the investigation unreliable. In each case, state clearly why the issue you mention could cause a problem.

### Notes

### Question 3 (b) Foundation Level

Seán's French teacher gives tests that are marked out of 10.  
Seán got the following results in five tests:

7, 5, 6, 10, 7

(i) \_\_\_\_\_  
\_\_\_\_\_

(ii) Áine got the following results in the same five tests. She was not in for the fourth test.

8, 5, 7, - , 7

\_\_\_\_\_  
\_\_\_\_\_

Notes