



هيئة التعليم

EDUCATION INSTITUTE

# **Mathematics workshop 5**

## **for teachers of Grades 7 to 12**

**Trainer's notes**

**Developed for the Education Institute by CfBT**

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# Introduction

These materials are intended to help School Support Organisations (SSOs) and other trainers to plan and run the third set of workshops for subject leaders and teachers of mathematics in Qatar's Independent Schools. The complete pack of materials for this workshop consists of *Trainer's notes*, *Teacher's pack: Part 1*, *Teacher's pack: Part 2* and a CD-ROM with a set of PowerPoint presentations. Handout 7.2 is a separate file.

## Before the workshop starts

This workshop consists of 16 sessions over five taught days. On the first day, there are four sessions of 90 minutes. Other days have three sessions, usually of 80 minutes each. The last session on the final day is 70 minutes.

It is recommended that at least two teachers from each school attend each workshop and that the same teachers attend throughout.

You will need to prepare a programme for the workshop, making sure that enough time is allowed for prayers and refreshments.

**It is assumed that the sessions will be taught in a language that all the participants understand. If interpretation is required, you may need to reduce the material in each session or allow longer for each session.**

You will also need to prepare a letter of invitation to send with the programme to each teacher attending, giving details of the venue and the times of the sessions. This letter should be agreed in advance with the Education Institute. With your letter and the programme, you should send a copy of Part 1 of the *Teacher's pack*. Your letter should ask teachers to study this pack carefully before the workshop.

You should either provide at the workshop or ask teachers to bring with them on each day their copy of *Curriculum Standards for mathematics: Grades K to 12*. Other materials that they need to bring are indicated in Part 1 of the *Teacher's pack*.

## Aims of the workshop

The purpose of this workshop is to continue to introduce the curriculum standards for mathematics and to discuss the implications for planning the curriculum, teaching, learning and assessment.

The workshops as a whole aim to help subject leaders and teachers to:

- become more familiar with the new curriculum standards;
- consider the implications of the standards for planning, teaching and assessment;
- start or refine the planning of a mathematics scheme of work based on the standards, and related lesson plans;
- support colleagues as they implement the standards.

## Sample programme

### Day 1: Number and algebra

08:00	Registration	
Session 1 08:30–10:00	Number to algebra	90 minutes
Session 2 10:30–12:00	The distributive law	90 minutes
Session 3 13:00–14:30	Mathematical modelling	90 minutes
Session 4 15:00–16:30	Report from School 1	90 minutes

### Day 2: Geometry and ICT

10:45	Registration	
Session 5 11:10–12:30	Dynamic geometry 1	80 minutes
Session 6 13:30–14:50	Dynamic geometry 2	80 minutes
Session 7 15:10–16:30	Report from School 2	80 minutes

### Day 3: Data handling

10:45	Registration	
Session 8 11:10–12:30	Interpreting graphs and diagrams 1	80 minutes
Session 9 13:30–14:50	Interpreting graphs and diagrams 2	80 minutes
Session 10 15:10–16:30	Report from School 3	80 minutes

### Day 4: Problem solving

10:45	Registration	
Session 11 11:10–12:30	Themes through the grades	80 minutes
Session 12 13:30–14:50	The normal distribution	80 minutes
Session 13 15:10–16:30	Report from School 4	80 minutes

### Day 5: Applications and ICT

10:45	Registration	
Session 14 11:10–12:30	Applications of mathematics	80 minutes
Session 15 13:30–14:50	Using ICT	80 minutes
Session 16 15:10–16:20	Summing up	70 minutes

## Objectives of each session

### Day 1: Number and algebra

#### Session 1: Number to algebra

By the end of the session teachers will:

- know how algebra is developed through the mathematics standards;
- have considered how diagnostic and formative assessment can be used effectively to inform planning;
- have discussed ways of teaching algebra.

#### Session 2: The distributive law

By the end of the session teachers will:

- have looked at the links between number and algebra;
- have considered strategies for teaching algebra;
- have seen how topics in algebra develop through the grades.

#### Session 3: Mathematical modelling

By the end of the session teachers will:

- have looked at some exercises to help students turn word problems into mathematical statements;
- have considered some strategies for teaching sequences;
- have studied some investigations that lead to generalisations.

#### Session 4: Report from School 1

By the end of the session teachers will:

- have heard how other colleagues have implemented the standards;
- have discussed progress made by students;
- have considered how diagnostic and formative assessment can be used to inform planning.

### Day 2: Geometry and ICT

#### Sessions 5 and 6: Dynamic geometry 1 and 2

By the end of the sessions teachers will:

- have practised using dynamic geometry software;
- have considered some strategies for teaching transformation geometry, geometrical constructions and theorems;
- have planned some activities for use in the classroom.

#### Session 7: Report from School 2

By the end of the session teachers will:

- have heard how other colleagues have implemented the standards;
- have shared their own reflections with the other teachers;
- have used ICT to draw a wide range of graphs.

## Day 3: Data handling

### Sessions 8 and 9: Interpreting graphs and diagrams 1 and 2

By the end of the sessions teachers will:

- have considered some strategies for teaching students to interpret graphs and diagrams;
- have designed some questions to ask students;
- have looked at some exercises to help students interpret graphs.

### Session 10: Report from School 3

By the end of the session teachers will:

- have heard how other colleagues have implemented the standards;
- have revisited the data handling cycle in statistics and considered the implications for teaching and learning;
- have considered criteria for assessing statistical investigations.

## Day 4: Problem solving

### Session 11: Themes through the grades

By the end of the session teachers will:

- have identified some themes that can be explored at different levels through different grades;
- have engaged in some investigative work to develop an extended theme;
- have thought about other developmental strands within the standards and how they might be developed.

### Session 12: The normal distribution

By the end of the session teachers will:

- understand probability distributions
- be able to identify some common probability distributions;
- know the characteristics of the normal distribution;
- appreciate the importance of the normal distribution.

### Session 13: Report from School 4

By the end of the session teachers will:

- have heard how other colleagues have implemented the standards;
- have discussed progress made by students;
- have considered how diagnostic and formative assessment can be used to inform planning.

## **Day 5: Applications and ICT**

### **Session 14: Applied mathematics**

By the end of the session teachers will:

- have reviewed the standards relating to applications;
- have considered the significance of mathematical models;
- have looked at the mathematics of motion;
- have used software to do vector algebra.

### **Session 15: Investigating with ICT**

By the end of the session teachers will:

- have considered some strategies for teaching using ICT;
- have explored some mathematical problems using ICT;
- have practised using mathematical software.

### **Session 16: Summing up**

By the end of the session teachers will:

- have watched videos tailored to the local context;
- have reflected on the workshops.

# Preparing for the workshop

Before the workshop, you will need to check out practical matters such as:

- the venue, including car parking and arrangements for coffee, lunch and tea;
- workshop numbers and participating schools;
- resources needed every day, including an overhead projector, a computer equipped with Microsoft PowerPoint, a video recorder and projection facilities (full details of the resources needed are on the pages following this page);
- furniture arrangements (preferably workshop style with tables);
- any displays that you may wish to have;
- interpretation and translation facilities.

You will also need to prepare a workshop register, with names of schools and details of whether teachers are mathematics subject leaders or other teachers.

Other preparation consists mainly of making sure that you are familiar with the workshop materials and other publications.

## Teachers' pack: Parts 1 and 2

You will need to prepare one copy of the *Teacher's pack: Parts 1 and 2* for each teacher attending the workshop.

Part 1 should be sent to teachers in advance of the workshop, together with your letter of invitation and the workshop programme.

Part 2 should be given out at the start of the first day. This contains:

- handouts for particular sessions;
- reduced copies of all the slides used on the workshop.

Handout 7.2, the answers to the questions on Handout 7.1, is a separate file. This should be copied and kept separately for distribution during Session 7.

## Video clips

Video material recommended for the workshops is produced in the UK by the Department for Education and Skills (DfES), Sanctuary Buildings, Great Smith Street, London SW1P 3BT. Extracts from these videos may be reproduced for non-commercial or training purposes on condition that the source is acknowledged.

Teachers attending the workshop will need to understand English to gain the maximum benefit from the video clips. Alternatively, ask an interpreter to provide simultaneous translation.

The video extracts are not examples of 'perfect' teaching. They are recommended as good materials for teachers to discuss as part of their professional development.

## Resources needed

### Throughout the workshop

#### For the trainer

- *Trainer's notes*
- Copy of the *Teacher's pack: Part 1* and *Part 2*
- Computer and data projector, with Microsoft PowerPoint and *Autograph* (see [www.autograph-math.com](http://www.autograph-math.com))
- Overhead projector (OHP), blank acetate sheets and OHP pens
- Whiteboard or flipchart
- Video recorder linked to large screen, and the video clips needed for the sessions
- *Curriculum Standards for mathematics: Grades K to 12*

#### For each teacher

- *Teacher's pack: Part 2*

#### Either provide or ask teachers to bring each day

- *Curriculum Standards for mathematics: Grades K to 12*

## Day 1

#### For the trainer

- The PowerPoint slides for Day 1: Presentation 1.ppt, Presentation 2.ppt, Presentation 3.ppt, Presentation 4.ppt
- Copies of the evaluation form for Day 1 (see back of Trainer's notes)
- Number and algebra cards

## Day 2

#### For the trainer

- The PowerPoint slides for Day 2: Presentation 5.ppt, Presentation 6.ppt, Presentation 7.ppt
- Copies of the evaluation form for Day 2 (see back of Trainer's notes)
- Dynamic geometry software, e.g. *Geometer's Sketchpad*

#### For each school group

- Computer and dynamic geometry software, e.g. *Geometer's Sketchpad*, and *Autograph*

#### For each teacher

- Handout 7.2 (to be given out at the end of the session)

## Day 3

### For the trainer

- The PowerPoint slides for Day 3: Presentation 8.ppt, Presentation 9.ppt, Presentation 10.ppt
- Copies of the evaluation form for Day 3 (see back of Trainer's notes)
- Samples of statistics projects produced by students, and marking criteria

## Day 4

### For the trainer

- The PowerPoint slides for Day 4: Presentation 11.ppt, Presentation 12.ppt, Presentation 13.ppt
- Copies of the evaluation form for Day 4 (see back of Trainer's notes)
- TI-83 graphics calculator

### For each school group

- TI-83 graphics calculator
- Computer with *Autograph*

### For each teacher

- Graph paper
- Dotty paper with square and triangle grids

## Day 5

### For the trainer

- The PowerPoint slides for Day 5: Presentation 14.ppt, Presentation 15.ppt, Presentation 16.ppt
- Interactive whiteboard and a range of software
- Overhead projector calculator
- Calculators for teachers
- Video recorder linked to large screen
- Video clips:
  - A primary mathematics lesson (Arabic commentary)
  - A mathematics lesson in a Qatar Independent School
- Copies of both the evaluation forms for Day 5 (see back of Trainer's notes)

### For each school group

- Computer with *Autograph*

## Tips for new trainers

Some tips are provided here for trainers who are relatively new to the training role.

- If you are teaching the workshop with a colleague, you will need to agree how to manage your contributions. For example, you could allocate particular sessions to particular trainers, alternate contributions within a session, divide into separate groups for some or all sessions, and so on.
- If your workshop will involve interpreters, you will need to reduce the amount of material in each session, particularly if the translation is consecutive rather than simultaneous. If possible, try to brief the interpreters on key points of the training in advance. Discuss how you and the interpreter will work during presentations to the whole group and during group work.
- When you are giving a presentation, make sure that you are familiar with the notes and don't have to pause constantly in order to refer to them. Remember to leave time for any interpreter to translate. If you are sharing the teaching of a session, your partner can then check against the workshop notes while you are leading, and can mention any omitted points before they take their own turn.
- Don't read out PowerPoint slides to your audience. Instead, refer to the accompanying workshop notes to explain, elaborate or make supplementary points. It sometimes helps to annotate a photocopy of the slide to help to do this.
- If you are using video clips, make sure that you are familiar with the controls of the video recorder.
- If you are setting individual or small group tasks, make sure that you have a suitable arrangement of tables, make the task clear and set time limits. With longer tasks, warn the groups when there are only 5 minutes left.
- For tasks that involve study of the standards, it may help to put the numbers of the pages to be studied on a flipchart before the session begins.
- When you are taking feedback from group tasks, use the workshop notes to check that all the necessary points have been mentioned. If an opinion is expressed that you think may be an isolated or minority view, it may help to check whether other teachers share that view to create debate about it.
- Work flexibly to the indicative times for each session. Without making it obvious, keep a watchful eye on the clock.
- If time for questions runs out, or if you are asked a question to which you don't know the answer, make a note of the question on a flip chart, or on a wall poster put up for the purpose, so that you can deal with it later.
- Finally, you will be working from prepared notes because it is important that all teachers in the new schools are given the same information and a chance to consider the same range of issues. However, there are opportunities to draw on your own and local experience as well. This will help you to feel that it is your workshop and thus make it more effective for all teachers.
- If you are likely to repeat the workshop, the evaluation forms completed by the trainees should help you to make suitable adjustments.

