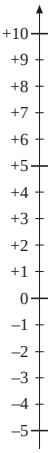
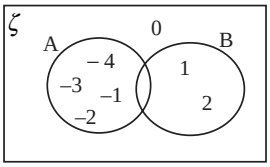
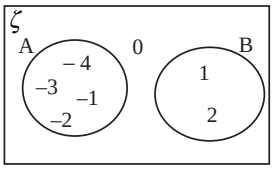
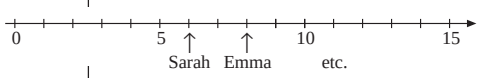
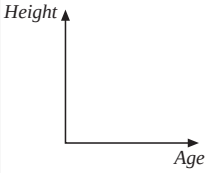
Y7	**UNIT 3 *Graphs*** Lesson Plan 1	*Negative Numbers*
Activity		***Notes***
1	**Place value table** T: What sleepy weather! I'd rather be lazing around at home. What about you! T: So we had better make a positive start with some brain work to wake us up.	Mental work with whole class. T chooses Ps with or without hands up. As many Ps as possible involved, at speed.
1A	T: 3 + 8, 21 + 7, 30 + 50, 9 – 4, 27 – 12, 60 – 20, 33 + 47, 28 + 19 + 72	1A prepares for 1B and 1B for 2C.
1B	T: What number is (a) 4 more than 8 (b) 13 more than 19 (c) 5 less than 22 (d) 11 less than 11 ? T: What is your favourite number?	Agreement. Praising. Relaxing question at end.
	5 mins	
2A	**Extending the number line** T: Can you remember how we illustrate numbers? *(Number line)* T: Who can draw a simple number line on the BB? T: I can only see whole numbers; what about decimals? Where are they? T: Who can show us where the number 3.2 is? T: Can you round it to the nearest unit? *(3)*	Whole class activity. Before introducing negative numbers, T gets Ps to review the illustration of whole numbers and decimals. Ps volunteer, T chooses one (slower one if possible) to come to BB and draw 0 1 2 3 4 5 6 7 8 9 10 T asks Ps to illustrate on BB. Ps point to approximate position on number line. T asks Ps to show 2 or 3 more decimals, and the number they round to, on the number line.
2B	T: What do you think is on the left hand side of 0 ? *(Negative numbers)* T: Who can extend my number line to the left? T: So, as on the RHS, the numbers –1, –2, ..., increase. *(No)* T: Don't tell me –2 is larger than –3 ? *(Yes)* T: OK; but by how much? *(1)* Why? *(–3 + 1 = –2)*	P comes to BB and marks –1, –2, etc. –8 –7 –6 –5 –4 –3 –2 –1 0 1 2 Ps should protest.. Ps agree that it *is* larger. Discussion. Praising. T asks Ps to draw extended number line in Ex.Bs.
(continued)		

Y7	**UNIT 3 *Graphs*** Lesson Plan 1	*Negative Numbers*
Activity *(continued)*		***Notes***
2C	**OS 3.6** T (to P): Read out the first question for us, please. T: What is the answer? etc. If mistake made: T: Who agrees? Who doesn't? T (to P with mistake): Come to the BB and move along the number line with your finger. How any steps? In what direction? etc. *17 mins*	Whole class activity; task appears on OHP. Every P listens to question and then uses number line in Ex.B to find answer. T points to P to answer. Agreement, feedback, praising, and on to next question.
3	**Temperature OS 3.5** T: Where do you meet negative numbers in real life? *(Answers might include temperature)* T: We'll look at negative numbers in the context of temperature. T gives out copies of OS 3.5 to each P. *17 mins*	Individual work. Ps work on copy of OS 3.5. T monitors, helps, suggests to slower Ps that they count along the thermometer. Checking: T asks, P answers, giving reasons. Agreement. Feedback. Self-correction. Praising.
4	**Number sequences** T: Consider the number sequence ?, -2, -5, -8, …, … (a) What are the next 3 numbers? *(–11, –14, –17)* (b) What is the rule? *(–3 to get next term)* (c) What number comes before –2? *(1)* (d) What is the tenth number? (–26) T: How did you find the answer to (d)? *(Counted on, term by term)* T: But we didn't need to find the 8th or 9th term! What happens if I ask you for the 100th term? *33 mins*	Whole class activity. T writes sequence on BB. Ps volunteer to answer; stronger Ps will find it easier, but give time for others to work out answers. Ask Ps the reasons for their answers, in particular for (d). Discussion to see if anyone has a quicker way. Tell them that we will find a quicker way when they reach Unit 7.

Y7	**UNIT 3 *Graphs*** Lesson Plan 1	*Negative Numbers*
Activity		***Notes***
5	**Water gauge** T: Do you know what a water gauge is? *(Suggestions)* T: Along rivers, at certain points, water gauges are placed to measure the water level. Has anyone seen one? T: The gauge has a zero point marked on it, and dividing points to measure the water level, in centimetres. It's like a vertical ruler, but with negative numbers on it. T on prepared OHS, (a) On Monday 3 October, early in the morning, the water level was –13 cm. It increased by 5 cm every day for a week. What was the water level at the end of this time? *(+22 cm)* (b) On the morning of 28 October, the water gauge showed +8 cm. The level decreased by 6 cm every day until the morning of 3 November. What was the water level now? *(–28 cm)*	This task connects the mathematics with a practical context. On BB:  Individual work, monitored, helped. Ps work in Ex.Bs. Review answers and methods. (Make sure that Ps know how many days there are in October.)
	40 mins	
6	**Illustrating with a Venn diagram** T reads out from OHP: ζ is { –4, – 3, – 2, – 1, 0, 1, 2 } A is { negative numbers } B is {positive numbers } (a) Draw Venn diagrams to illustrate the sets, and put in the numbers. (b) $A \cap B = ?$ *(Empty set)* (c) $A \cup B = ?$ { –4, –3, –2, –1, 1, 2 } (d) $(A \cup B)' = ?$ { 0 }	This task connects with Unit 1, and clarifies the definition of zero. Whole class activity. Task appears on OHP. Ps volunteer to put numbers in Venn diagrams and answer questions; T chooses.  or  Discussion of the correct place for zero (clarified in (d)).
	45 mins	
7	**Set homework** PB 3.3, Q2 Activity 3.2, Q1	

Y7	**UNIT 3 *Graphs*** Lesson Plan 2	*Scatter Graphs and Coordinates*
Activity		***Notes***
1	**Checking homework**	
1A	**PB 3.3, Q2**	T points to Ps to answer. Others agree or not. If there is a problem, T draws number line on BB and calls P to it, ensuring that they count step by step. Praising. Self-correction.
1B	**Activity 3.2, Q1** T asks extra questions to make Ps think, e.g. T: Can you say what were the actual results for the two matches played by (a) Derby County *(0 - 0 and 0 - 0)* (b) Newcastle United *(1 - 1 and 0 - 0)* (c) Manchester United *(Can't say)* (d) Leeds United *(1 - 0 and 0 - 0)* *8 mins*	Checking on OHP. T shows completed sheet of results, with good differences (ranging from +5 to –6). Feedback. Self correction. Praising. Discussion. Agreement. Praising.
2	**OS 3.1** T: How do we illustrate numbers? *(Number line)* T: Can you illustrate *any* data on a number line? T: For example, the data for the ages of these 5 children is to be shown on a number line: Sarah is 6 years old Emma is 8 years old Rebecca is 13 years old Xanthia is 6 years old Samantha is 13 years old T: OK, but I have some more data: Sarah is 150 cm tall Xanthia is 120 cm tall Emma is 150 cm tall Samantha is 140 cm tall Rebecca is 170 cm tall T: How can I illustrate this? *(Another number line)* T: But how can I show both sets of data together? *(Use two axes)* T: This is called a scatter graph. T shows OS 3.1 and checks that data is correct. *18 mins*	Whole class activity. Ps illustrate on number line.  T aims to get Ps to understand why it is better to use two coordinate axes, i.e. two number lines, at right angles to each other.  At pace, answers to questions on OS 3.1. Agreement. Praising.

Y7	**UNIT 3 *Graphs*** Lesson Plan 2	*Scatter Graphs and Coordinates*
Activity		***Notes***
3	**PB 3.1, Q2** T: Could Ben use the data to support his argument for more pocket money? How? T: What is the connection between the two factors on the graph? *(Increasing pocket money as you get older)* *26 mins*	Individual work; monitored, helped, with detailed checking on OHP or BB, giving reasoning. T calls Ps to OHP to say what information we have about each child and how we can read if from the graph. Reasoning needed for (i).
4 **4A**	**Coordinates** **Identifying pupils** T: I met the mother of someone in this class earlier today and she asked me to give her child these sweets. T: But I didn't know whose mother it was. We talked a bit and it came to light that her child has BROWN hair .... and BROWN eyes .... and that the numbers 3 and 4 belong to this child. *(?)* T: What do these numbers mean? T: Do you want a clue? *(Yes!!)* T: Location! T: Does the order matter? *(Yes)* T: Can you give *your* coordinates in this way?	Whole class activity. T leads Ps into using coordinates to identify their position in class. T chooses P, and notes hair colour and eye colour (and position). Many Ps still a possibility. Still some left. Discussion as to what they could mean. Eventually class realises that the numbers refer to the positions of their seats in the classroom, i.e. column 3 and row 4, so P is identified. T asks most Ps to give their coordinates.
4B	**OS 3.3** T gives one copy to each P. *40 mins*	Whole class activity. Task on OHP. Ps volunteer answers. T chooses and P says coordinates; class checks. For plotting points (H, L) T calls out Ps to OHP to plot points. Agreement. Praising.
5	**PB 3.2, Q2** *45 mins*	Individual work; monitored, helped. Checking with discussion, different Ps giving coordinates of each place. Agreement. Feedback. Self-correction. Praising.

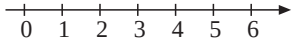
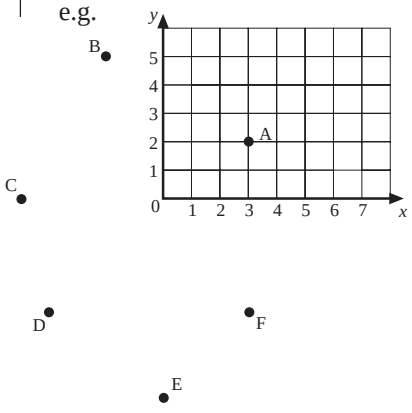
Y7	**UNIT 3 *Graphs*** Lesson Plan 2	*Scatter Graphs and Coordinates*
Activity		***Notes***
6	**Set homework** PB 3.1, Q4 (a) - (d), plus the question: "Is there any evidence from the graph to show that Ps good at maths are also good at science?" PB 3.2, Q1, but first, "Copy the grid and the triangle into your Ex.B."	Ps write extra question in their Ex.Bs, and copy grid and triangle as instructed.

18 mins

Y7	**UNIT 3 *Graphs*** Lesson Plan 3	*Plotting Points*
Activity		***Notes***
1	**Checking homework** PB 3.1, Q4 (a) - (d) PB 3.2, Q1 *5 mins*	Checking answers in words; T asks, Ps answer. Agreement. Feedback. Self-correction. Praising. (T revises how to read graphs in the checking.)
2	**PB 3.2, Q5** T: We did some plotting of points on the last lesson, but now we really concentrate on it. *15 mins*	Whole class activity. T puts prepared grid on OHP or BB. Ps copy grid into Ex.Bs. T asks Ps to plot points on OS. Each point plotted by different P, including slower ones. Ps watch. Agreement, and Ps plot the correct points in Ex.Bs.
3	**OS 3.4** Instructions Group A : Write a set of instructions for drawing the left eye. Group B : Write a set of instructions for drawing the right eye. Group C : Write a set of instructions for drawing the mouth. Group D : Write a set of instructions for drawing the outside of the head. T: Group E's instructions are to join the points in the order given, first by Group A, then Group B, etc. *30 mins*	Group activity, led, monitored and, if necessary, helped by T. T divides Ps into 5 groups (each of these should contain stronger and slower Ps). Groups A, B, C and D are given OS 3.4 and sheet (opposite) of instructions. Group E are given an OS showing a numbered grid (prepared previously by T). Groups are kept separate and cannot see the other groups' work. T keeps control, and ensures each group in turn gives instructions to group E. Group E work on OS, but it is not shown to class until all instructions have been carried out. When completed, Group E's grid is shown on OHP. Everyone checks; discussion. Praise.

Y7	**UNIT 3 *Graphs*** Lesson Plan 3	*Plotting Points*
Activity		***Notes***
4	**PB 3.1, Q4** (2nd part)	Whole class activity. T copies set of axes onto BB, and Ps into Ex.Bs. T chooses Ps to come to BB and plot points. T can ask questions like (a) - (f) again with new data.
	37 mins	
5	**PB 3.1, Q5** T: Is there any evidence that the two judges were well trained? *(Some)*	Individual work; monitored, helped. Slow Ps may have a problem, e.g. how to name and label the axes; T monitors and helps. After most Ps have finished, T stops Ps and put on OS showing solutions. Self-correction. Feedback. Praising.
	45 mins	
6	**Set homework** PB 3.2, Q6 PB 3.1, Q6	

Y7 UNIT 3 *Graphs* Lesson Plan 4 *Plotting Polygons*

Activity		*Notes*
1	**Checking homework** PB 3.2, Q6 PB 3.1, Q6	Both tasks can be checked on OHP with T using prepared slides, or T quickly checks Ps' graphs by walking round class. Self-correction. Feedback. Praising.
	4 mins	
2	**Negative numbers** (again)	Mental work with everyone contributing.
2A	T: Can you remember how to work with negative numbers? *(Yes)*	
	T: OK; here's a brain teaser for you. Sarah, (e.g.), choose two numbers between –10 and 10 and say if you want to add or subtract them; choose the next P to answer and then say whether the answer given is correct.	e.g. Sarah: "3 – 5.... , Peter!" Peter: " – 2" Sarah: "Correct."
	T: Now it's Peter's turn to choose two numbers between –10 and 10 and say if they are to be added or subtracted. Who will you choose to answer this, Peter? Is she correct?	e.g. Peter: "– 8 + 10.... , Lucy!" Lucy: " + 2 ", etc.
	Continue for several more turns, at a good pace.	T praises Ps.
2B	T: Can you still remember negative numbers? *(Yes!)*	Whole class activity.
	T: Where is the number – 5? – 2 ? etc.	T draws positive end of number line on BB.  T chooses P to extend number line on BB and Ps put on values.
2C	T: Can you still remember negative numbers? *(Yes!!)*	Whole class activity.
	T: So what can I do if I want to tell somebody the place of points A, B, C, D, E or F ? *(Need coordinates)*	T copies only positive quadrant of OS 3.7 onto top right quarter of BB before the lesson, with all points plotted, approximately.
	T: But they are not all on the grid! *(Extend the axes both ways)*	e.g.
	T shows complete version of OS 3.7 and gets Ps to read out coordinates and plot points G to L.	
	20 mins	

Y7	**UNIT 3 *Graphs*** Lesson Plan 4	*Plotting Polygons*
Activity		***Notes***
3	**PB 3.4, Q2** T: Who got all the points correct? Who had one mistake ? two ? three ? more? T: Is there anyone whose points were all correct, but who could not join them up to make the 8-pointed star?	Individual work, monitored, helped. For checking, T puts diagram and marked points (without joining) on OS on OHP. Self-correction. Feedback. T chooses successful P to join up points on OS.
	28 mins	
4 **4A**	**Plotting polygons** T: Have you ever studied the 8-pointed star? *(No)* T: It is a well-known polygon. What kind of polygon have we studied? T: What is a *regular* polygon? *(All sides equal)*	T gets Ps to remember triangle, square, rectangle, etc. and shows table on p47 of PB Y7A.
4B	**(a) OS 3.10** **(b) PB 3.5, Q3 (b)** **(c) PB 3.5, Q6**	T asks Ps to come to OHP to complete the square on OS 3.10. Agreement. Ps read out coordinates of the missing point. Praising. Ps do (b) and (c) in Ex.Bs. Monitoring, helping. T draws on BB if there is a problem. Discussion. Agreement. Praising.
	37 mins	
5	**PB 3.5, Q2 (a), Q4 (c), Q7**	Individual work, monitored, helped. For Q2 and Q4, Ps have to draw a grid in their Ex.Bs, so slower Ps may fall behind. For these, it is not necessary to finish Q7. When most of the Ps are ready, T can stop work and start checking. T asks Ps to give coordinates of missing points. Agreement. Feedback. If many Ps have a problem, then T will need to draw grid onto BB and call Ps to plot the points done first. If only one or two have problems, T can help individually. Self-correction. Praising.
	45 mins	

Y7	**UNIT 3 *Graphs*** Lesson Plan 4	*Plotting Polygons*
Activity		***Notes***
6	**Set homework** PB 3.4, Q5 PB 3.5, Q4 (b) PB 3.5, Q5 (a), (b)	

Y7	**UNIT 3 *Graphs*** Lesson Plan 5	*Conversion Graphs*
Activity		***Notes***
1	**Checking homework** PB 3.4, Q5	Ps open Ex.Bs at homework and T checks path of tennis ball by walking among them; if there is a problem, T stops and shows mistake. Praising.
	PB 3.5, Q4 (b)	Check coordinates; if agreement, no problems; otherwise, discussion needed, with grid drawn on BB.
	PB 3.5, Q5 (a), (b) T: Who got one square? Two? Three? Four or more *(joke)* ? *(More could be found by going outside the plane of the grid.)*	Self-correction. Praising. T sketches grid and asks Ps to give coordinates of extra points. Agreement. Feedback. Self-correction.
	6 mins	
2	**PB 3.6, Q1** e.g. T: How can you convert pounds sterling into French francs *without* using this graph? How are the currencies related? *(Multiply by 50)* T: So, do we need the graph? *(No, it's easier to multiply)* T: Maybe we will not have this problems much longer if we join the European monetary union.	Whole class activity. T reminds Ps of scatter graphs. T points to Ps to answer (mainly slower ones), using the graph in their PB. Agreement. Praising. Discussion. Discussion!
	12 mins	
3	**Speed conversion** OS 3.11 T: I hope that wider integration with Europe won't affect our cars. What do you think I mean by this? *(Steering wheel on RHS)* T: Yes; what else? (Speed in mph) T: In continental Europe, how do they measure speed? *(km/h)* T: How can we convert the speeds? T: Let's see if we can use this conversion graph. What does 30 mph correspond to? *(About 48 km/h)* How did you get your answer? T: Do we have to use this graph? *(No)* T: What is the multiplier? *(It will be a decimal)* T: OK; we will just use the graph and find approximate answers.	Whole class activity. Ps may answer in chorus. Task appears on OHP, and each P gets a copy of the sheet. P describes process using graph. At speed, Ps give answers. Checking. Praising.
	20 mins	

Y7	**UNIT 3 *Graphs*** Lesson Plan 5	*Conversion Graphs*
Activity		***Notes***
4	**PB 3.6, Q5 (a) - (c)** T: This is a bit more complicated, but you will be able to cope. We will find approximate answers, but take care to be as accurate as possible.	Individual work, monitored, helped. T (walking amongst Ps) checks that Ps have correctly copied grid and the two points. T checks answers: T asks P and others have to decide if they accept the answer. Self- correction. Praising.
	30 mins	
5	**Revision: M 3.1**	
5A	T: Let's check what we have learnt in this lesson.	M 3.1 appears on OHP; questions dealt with one-by-one. For Q1, Q6 and Q7, coordinate grid on OHP or BB needed. P points to one or comes out and reads coordinates.
5B	T: Extra question: "A, B and D are corners of a square. What are the coordinates of the fourth corner?"	(In Q2 and Q5, replace 'with' by 'say'.)
5C	**PB 3.1, Q3**	Ps read this task from PBs. T asks questions and Ps answer as above. T notes which topics need review and practice.
	45 mins	
6	**Set homework** M 3.2 (sheet for each P) PB 3.1, Q6	