Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 1	*The Multiplication Table, Multiplication and Division by Powers of 10*
Activity	**Multiplication**	***Notes***
1A	T: Can you still remember how to multiply numbers? Ps: Yes. No. T: We'll start with some simple ones. Can anyone calculate 4×5 ? Ps: 20 T: Why? Ps ? T: What does it mean: Do I have to take the number 4 five times? Describe it mathematically in another way. Ps: It means $4 + 4 + 4 + 4 + 4$, and that is 20. T: So what is 8×3, and why? P: $8 \times 3 = 24$ because $8 + 8 + 8 = 24$. T: Right, but we won't add all the time. It's important to know multiplications up to 100. Let's see how you are getting on.	Whole class activity. T introduces multiplication as repeated addition of the same number. Ps may be allowed to answer in chorus.
1B	**OS 6.1**	Whole class activity, question by question. T shows OS 6.1 on OHP, asks Ps and fills in numbers. All Ps involved; slower ones are asked several times. Agreement, disagreement. Praising.
	10 mins	
2	**PB 6.1, Q3**	Individual work. T monitors, helping slower Ps where necessary.
	T: Stop now. Let's review answers. Who would like to show and explain their solution? T (after P has answered): Why did you divide in part (b)? What type of relationship is there between the multiplication and the division? P (stronger): The process of division is multiplication in reverse. T: Give me an example of this ... P: $30 \div 5 = 6$ since $6 \times 5 = 30$.	T emphasises answering with whole sentence. Praising.
	15 mins	
3A	**Multiply by powers of 10** T: I know that you can multiply by even bigger numbers, but these are special numbers! Can you remember the place value table? Draw one in your Ex.Bs. Think about decimal numbers too. T: What is this table based on? Ps: The system is based on 10. T: What does it mean? P: It means that 10 units make 1 ten, 10 tens make 1 hundred, ... 10 tenths are 1 unit. T: What difference does it make if the digit 3 is tens or units? Ps: Its value is ten times more if it is a ten than if it is a unit. T: And what about if the 3 is a hundred? P: Its value is 100 times as much.	
(continued)		

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 1	*The Multiplication Table, Multiplication and Division by Powers of 10*
Activity		***Notes***
3A *(continued)*	T: Let's take 5! I mean, five units: - who can write it in my table? - multiply it by 10. Where will it be now? - multiply it by 100. Where now? - multiply it by 1000. Where now?	P comes to BB, writes, answers, gives reasons. Other Ps write in their Ex.Bs. Agree or not. Praising.
	T: Let's look at the number 32. Multiply it by 10, 100, 1000. How does each digit move?	Another P comes to BB; writes, explains. Praising.
	T: Who can state the rule for multiplying by powers of ten?	T helps Ps state the rule *(if we multiply by a number, 10, 100, 1000, each digit of the number takes a higher place in the place value table, and the missing digits are replaced with zeros)* and ensures that the process is described in precise mathematical language. Praising.
3B	T: Does this rule still hold if we multiply decimals? Let's see! T (reads from OHP): The thickness of one sheet of card is 0.46 mm. What is the thickness of 10, 100, 1000 sheets? Use the place value table for this.	Individual work, monitored, helped. Task appears on OHP, Ps work in Ex.Bs. Discussion at BB. P comes and uses previous table (still on BB) to write the 0.46, etc.. Reasoning. Others agree/disagree. Then T shows Ps that the previous rule holds true for decimals as well.
	25 mins	
4	Calculate: (a) 23×10 (b) 5×100 (c) 401×100 (d) 6.3×10 (e) 3.14×10 (f) 0.27×100 (g) 25.2×100 (h) 6.18×1000	Individual work, monitored, helped. Task appears on BB. T gives Ps exactly 4 minutes to write down answers. Ps then write answers on BB; class check each answer. Agreement, feedback, self-correction. Praising.
	31 mins	
5A	**Division** T: Now we'll look at division. Remember what we said just now, about the relation between multiplication and division?	
	P: Division is multiplication in reverse.	Slower P repeats this. Praising.
	T: OK. Now do these calculations and then explain what you did:	Whole class activity. Tasks appear on BB or OHP. Ps volunteer, T chooses P to explain and write on BB or OHP. Agreement. Praising.
(continued)	(a) $30 \div 10 =$ P: 3, since $3 \times 10 = 30$. (b) $400 \div 100 =$ P: 4, since $4 \times 100 = 400$. (c) $580 \div 10 =$ P: 58, since $58 \times 10 = 580$. (d) $8000 \div 100 =$ P: 80, since $80 \times 100 = 8000$ (e) $27\,000 \div 1000 =$ P: 27, since $27 \times 1000 = 27\,000$	

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 1	*The Multiplication Table, Multiplication and Division by Powers of 10*
Activity		***Notes***
5A *(continued)*	T: Who can state the rule for dividing by powers of ten?	Ps try to state the rule in words *(if we divide a number by 10, 100, 1000, each digit moves 1, 2, 3 steps to the right, to a lower place in the place value table).* Responses. Agreement. Praising.
	T: What do you think the numbers look like which are divisible by 10, 100, 1000 without a remainder? T: Any what about decimals? Does the same rule apply? Ps: Yes. T: For example, calculate: **(a)** 25.8 ÷ 10 = (2.58) (b) 6.2 ÷ 10 = (0.62) (c) 0.5 ÷ 10 = (0.62) (d) 332 ÷ 10 = (33.2) (e) 435.6 ÷ 100 = (0.05) (f) 628 ÷ 100 = (6.28) (g) 52 ÷ 1000 = (0.052)	Whole class activity. Task appears on BB or OHP. Ps volunteer and one of them explains; T writes result on BB or OHP. Agreement, feedback. Praising.
	39 mins	
6	**Revision** Now try these on your own: (a) 200 ÷ 10 (b) 380 ÷ 10 (c) 5600 ÷ 100 (d) 44 ÷ 10 (e) 440 ÷ 100 (f) 92 ÷ 100 (g) 3950 ÷ 1000	Individual work, monitored, helped. Tasks appear on OHP. Ps work in Ex.Bs. When most Ps have finished, T asks, Ps answer, T writes on OHP. Agreement, Feedback, self-correction. Praising.
	45 mins	
	Set homework **PB 6.1, Q7** **PB 6.3, Q2 (a), (b), (c), (d), (g)** **PB 8.2, Q1 (b), (d), (f), (i)** Find out something about John Napier – who he was, where he lived and why he is famous.	

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 2	*Methods of Multiplication*
Activity		***Notes***
1	**Checking homework** **PB 6.1, Q7** **PB 6.3, Q2 (a), (b), (c), (d), (g)** **PB 8.2, Q1 (b), (d), (f), (i)** T: Do you agree with the answers? Which on do you think is wrong? Who got them all right? Who had one, ... two, ... three mistakes? *5 mins*	T has already asked one of Ps to write answers on BB as soon as P arrives. Checking, discussion. Agreement, feedback, self-correction. Praising.
2	**Mental work** **T:** Right ... now you think you can do multiplication. Let's see if you're right. **M 6.1** plus Q11 3.2×10 Q12 5.4×100 Q13 0.49×10 Q14 $15 \div 100$ Q15 $6.7 \div 10$ Q16 20×30 *13 mins*	Mental work, aloud (recap and warming up). T asks questions, Ps answer at speed. Quick response from T; praising; next question. At Q5 ($3 \times 8 = 8 \times 3$) T can get Ps to state this property of multiplication (factors are interchangeable).
3	**John Napier** T: What have you found out about John Napier? T: As you've discovered, John Napier dealt with agricultural problems and mathematics was just a hobby. Despite this, he invented several things in maths. Since he had little time for calculations, he invented a mechanical method of multiplying large numbers. Before we look at this, we'll recap 'long multiplication'. *18 mins*	Individual Ps write facts on BB. All Ps write all facts in Ex.Bs. Discussion. Praising.
4	**Long multiplication** Calculate (a) 243×3 (b) 36×28 (c) 108×73 T: Now try these on your own. You have 2 minutes. (d) 35×19 (e) 137×27 *26 mins*	Whole class activity. T writes on BB, calls Ps out and they solve the task and explain how to multiply larger numbers. Other Ps listen, correcting if necessary, and write solutions in Ex.Bs. Praising. Individual work, monitored, helped. T puts solution, in full, on OHP so that Ps can correct their own work. T observes mistakes and draws attention to the correct method. Praising for successful Ps.

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 2	*Methods of Multiplication*
Activity		***Notes***
5	**Box method**	
5A	T: Let's look at the multiplication 35×19. Can anyone suggest a way to do it in your head? P_1: I would break it down (goes to BB, writes and says) $35 \times 10 + 35 \times 9$ T: Fine. P_2: It's almost 35×20, so I would ... (writes on BB) $35 \times 20 - 35 = 700 - 35 = 665$ T: Well done! That's much easier. But the first method is the easier if the multiplier is not close to one of the tens. Let's look at it again. Can we break it down further? P_3: (write on BB): $30 \times 10 + 5 \times 10 + 30 \times 9 + 5 \times 9$ T: Is everything here? To make sure we don't miss anything we can arrange it in boxes ...	Whole class activity. T lets Ps guess and give other solutions, encourages them to write their ideas on BB; praises. Finally leads them to 'invent' the Box Method.
	OS 6.3	
5B	T: Could we use the box method for larger numbers too? Look at 137×27. *34 mins*	T puts lower half of OS 6.3 onto OHP and asks Ps to copy it into Ex.Bs. They then fill in the boxes together (T at OHP, Ps in Ex.Bs) and add them up. Now T asks Ps what to do. T draws 3×2 table on BB, Ps in Ex.Bs, etc. Praising.
6	**Napier's method**	
6A	T: It's not too difficult to find 100×20, but John Napier dealt with even larger numbers. Since he found all the multiplications very tiring and calculators weren't available, he invented something to help him. His method is very simple ...	
	OS 6.3	T puts top half of OS 6.3 onto OHP, asks Ps to copy it into Ex.Bs and explains Napier's method.
	T: Now let's see how Napier multiplied larger numbers.	
6B	**Activity 6.5** *45 mins*	Then T gives each P a copy of Activity 6.5 Resource Sheet and, after Ps have cut out their 'bones', they all work through the example in Activity 6.5. If there is time, T can give Ps another multiplication to work out using Napier's method.
	Set homework **PB 6.2, Q1 (g), (k), (n)** by long multiplication **PB 6.2, Q3, (b), (c)** by box method **PB 6.2, Q3, (d), (f),** by Napier's method	

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 3	*Change of Order and Multiplication with Decimals*
Activity		***Notes***
1	**Checking homework.** **PB 6.2, Q1 (g), (k), (n)** by long multiplication **PB 6.2, Q3 (b), (c)** by box method **PB 6.2, Q3 (d), (f)** by Napier's method T: Who would like to explain at the BB how we multiply by box/ Napier's method? *6 mins*	T asks, Ps give answers. Agreement, feedback, self-correction. Praising. The two 'new' methods Ps met in the previous lesson can now be reinforced as homework is checked. P writes on BB and explains (using 'bones'). Class agrees or not. Self-correction. Praising.
2	**Mental work** **M 6.3,** with some changes: Q1 - Q6 remain the same, Q7 $32 \div \ldots\ldots = 0.32$ Q8 $0.4 \times \ldots\ldots = 4$ Q9 $5.9 \div \ldots\ldots = 0.59$ Q10 $7.1 \times \ldots\ldots = 710$ *10 mins*	Mental work, aloud, question by question, to warm up and prepare for the lesson's topic. Agreement/disagreement. Praising.
3 **3A**	**Changing order of questions** T: We're going to look at some properties of multiplication. First, find out if each of these statements is true or false. (a) $4 \times 7 = 7 \times 6$ (b) $4 \times 7 = 7 \times 4$ (c) $(2 \times 3) \times 4 = 2 + (3 \times 4)$ (d) $(2 \times 3) \times 4 = 2 \times (3 \times 4)$ (e) $(2 \times 3) \times 4 = (2 \times 4) \times 3$	Whole class activity. Statements appear on OHP. T points, P answers. Reasoning, agreement. Praising Then Ps state the rules in words, slower Ps can be chosen for this. T can help with the other rule *(order of multiplication with 2 factors does not change answer; for the product of 3 factors grouping does not change the answer).*
3B	T: Let's see if you can *use* what you know. Work out the following - try to find the quickest method. (a) $(2 \times 9) \times 5$ (b) $50 \times (2 \times 37)$ (c) $2.9 \times 4 \times 25$ (d) $5 \times 17.3 \times 20$ (e) $59 \times 27 \times 0 \times 38$ *18 mins*	Individual work, monitored, helped. T writes tasks on BB, Ps work in Ex.Bs. Checking at BB; P writes and explains the solution. (Task (e) develops divergent thinking.) Agreement, feedback, self-correction. Praising.
4	**OS 6.2** T: Can you recognise here some of the rules we have met? P_1. A and B are true because of change of order. P_2: E is true because of change of grouping. T: Fine. But there are four other statements that are true. Is this a coincidence, or can you find a pattern? *24 mins*	Task on OHP. Mental work aloud, at speed. Agreement. Praising. Focus on D, F, G and I. T helps Ps realise that *a product will not change if one of the factors is divided by any (non zero) number, while the other factor is multiplied by the same number.*

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 3	*Change of Order and Multiplication with Decimals*
Activity		***Notes***
5	**Practice** T: Now you're going so tackle some groups of tasks. Calculate the answers quickly, then compare the products with the first one in each group, look at their changes and write down what you notice. (a) $3 \times 2 =$ $9 \times 2 =$ $3 \times 6 =$ $9 \times 6 =$ $30 \times 20 =$ (b) $40 \times 20 =$ $40 \times 10 =$ $20 \times 20 =$ $20 \times 10 =$ $4 \times 2 =$ (c) $30 \times 2 =$ $10 \times 2 =$ $3 \times 200 =$ $3 \times 2000 =$ $300 \times 200 =$ (d) $40 \times 2 =$ $0.4 \times 2 =$ $4 \times 0.2 =$ $400 \times 200 =$ $0.4 \times 0.2 =$	Individual work, monitored, helped. Each P is given a sheet with the tasks on it, to work on. When most Ps have finished task (c) (some stronger Ps will have finished all tasks), T stops their work for a detailed discussion. First T shows OS with answers (previously prepared by T). After checking answers, T and Ps find out how the product changes if both factors are multiplied (task (a)), both factors are divided (task (b)), or one of them is multiplied and the other divided (task (c)). Then they come to task (d). T calls to BB a stronger P who successfully finished this task. P writes and explains solution. Class agrees or not; T can make Ps check, dividing them into two groups. Finally, T makes Ps repeat what they know about changes of product.
	36 mins	
6	**OS 6.4 A, C, E, H** T: Now let's see how we multiply decimals.	Whole class activity. T writes tasks on BB. Only tasks A, C, E and H are used now, as we are concentrating on multiplication of decimals. T asks, Ps answer and explain, deducing the changes of product from the changes of factors. Agreement. Praising. Then T steers Ps to state the rule *(there are as many decimal places in the product as there were in total in the factors).*
	40 mins	
7A	**PB 6.3, Q1 (j), (m)** **PB 6.3, Q3 (a)**	Whole class activity. Each multiplication is solved and reasoned by another P at BB. The others write in Ex.Bs; agree or not.

PB 5.2, Q1 (a), (d), (f)

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 3	*Change of Order and Multiplication with Decimals*
Activity		***Notes***
7B	T: Now, you have 2 minutes to work out the next two multiplications. **PB 6.3, Q1 (l)** **PB 6.3, Q3 (e)** *45 mins*	Individual work. Checking at BB. Agreement, feedback, self-correction. Praising.
	Set homework **PB 6.1, Q2** **PB 6.3, Q3 (e), (f), (h), (i), (j)** **PB 6.3, Q1 (a), (b)** **PB 6.3, Q3 (c), (f)**	

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 4	*Multiplication in Context*
Activity		***Notes***
1	**Checking homework** **PB 6.1, Q2** **PB 6.3, Q3 (e), (f), (h), (i), (j)** **PB 6.3, Q1 (a), (b)** **PB 6.3, Q3 (c), (f)**	Checking homework also acts to recap on the work covered so far in the unit. T has prepared OS to show solutions; Ps check and correct their work. T ensures that they go over: - properties of multiplication (changing order and grouping in PB 6.1, Q2 and PB 6.3, Q20); - changes of product (PB 6.1, Q2); - multiplying powers of ten (PB 6.3, Q2); - multiplying with decimals (PB 6.3, Q1 and Q3).
	8 mins	
2	**M 6.6**	Mental work, without writing, whenever possible. Tasks appear on OHP; T asks; Ps answer and explain. Slower Ps may write on BB if they find it necessary.
	16 mins	
3	**PB 6.4, Q4** **PB 6.4, Q7** **PB 6.4, Q8** **PB 6.4, Q12**	Individual work. These questions are not difficult. T should select from them according to the type of multiplication to be practised: - long multiplication - multiplication by powers of ten - multiplying with decimals and give them to Ps as individual work. T monitors Ps' work and helps slower ones if necessary. T should wait for all Ps to answer all four questions. Stronger Ps can be given copies of Activity 6.2 when they have finished. Checking: solutions shown at BB by slower Ps, reviewing how to multiply. Agreement, feedback, self-correction. Praising.
	28 mins	
4	**Activity 6.2: Egyptian multiplication**	A stronger P, at BB, shows (and maybe tries to explain) how the Egyptians multiplied. Praising.
	31 mins	

Y7	**UNIT 6** ***Multiplication of Decimals*** Lesson Plan 4	*Multiplication in Context*
Activity **5**	**Extra questions** 1. Nigel is facing north. He turns $28.5°$ clockwise 12 times. If he wants to be facing north again, what angle does he now have to turn through, (a) clockwise, $(18°)$ (b) anticlockwise? $(342°)$ 2. Copy and continue each sequence, giving the next three numbers. What is the rule? (a) 0.0047, 0.047, 0.47, ... (4.7, 47, 470, ...) (b) 1.3, 2.6, 5.2, ... (10.4, 20.8, 41.6, ...) 3. The formula below is used to convert temperatures from degrees Fahrenheit to degrees Celsius. $°\text{F} = °\text{C} \times 1.8 + 32$ The normal temperature of the human body is $36.6°\text{C}$. Convert this temperature to degrees Fahrenheit. $(97.88°\text{F})$ 4. I thought of a number and divided it by 100. I then added 1.275 to the quotient and got 2.6. What was the number I thought of? (132.5) *45 mins*	***Notes*** Team work. T divides class into four mixed-ability groups, each containing at least one of the stronger Ps who will help the others to understand. The questions are important because they involve the use of other topics learnt earlier. T gives Ps a copy of the extra questions (one copy between two Ps) and they work in their groups, writing answers in Ex.Bs. T monitors discussions and calculations. Ps work through all the questions. When T sees that all groups have finished question 1, T calls a slower P from one of the groups to write the answer on BB and explain. Before this, T has prepared a 4×4 scoring grid (for 4 groups and 4 questions) on an OS. Each question is worth two points, awarded if all the group's members have the correct answer in their Ex.Bs. Each questions is answered at BB by a P from a different group; the groups whose member explains the solution is awarded an extra point, so it is important for each group to ensure that *all* its members understand the solutions. Finally, T gives the competition results (maximum of 9 points per group), praises Ps and, maybe, rewards winning group.
	Set homework **PB 6.4, Q5** **PB 6.4, Q9** **PB 6.4, Q10** **PB 6.4, Q11** **PB 6.4, Q13**	