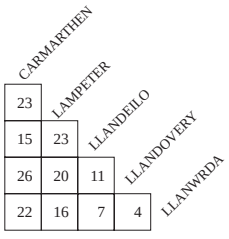
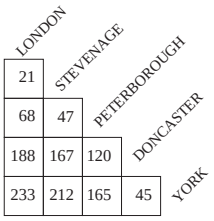
Y8 UNIT 1 *Mathematical Diagrams* Lesson Plan 1

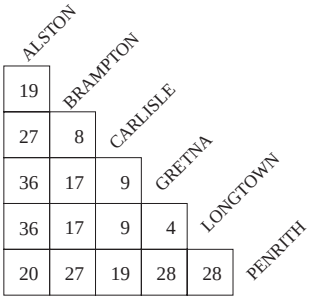
Mileage Charts

Activity		*Notes*
1A	**Introduction** T: Let's see if you remember how to work with whole numbers. T (for example): $4 + 5$ $\quad 7 + 14$ $\quad 12 + 18$ $\quad 23 + 19$ $30 + 50$ $\quad 400 + 300$ $\quad 122 + 301$ $6 - 5$ $\quad 5 - 6$ $\quad 13 - 8$ $\quad 8 - 13$ $27 - 13$ $\quad 60 - 40$ $\quad 432 - 210^{*}$ 5×7 $\quad 50 \times 7$ $\quad 50 \times 70$ $\quad 32 \times 100$ $63 \div 7$ $\quad 630 \div 7$ $\quad 630 \div 70^{**}$ $\quad 80\,000 \div 100$	After introducing the Y8 course and Practice Book Y8A, T uses mental work as a warm-up activity. T asks the questions around the class, starting at speed with the more straightforward ones. T should check that Ps are familiar with the words 'subtrahend' (number being subtracted, * 210 in this calculation) and 'dividend' (number being divided, ** 630 in this calculation).
1B	T: Now you can use your Ex.Bs. See if you can find a quick method for these calculations: $67 + 89 + 11 =$ *($(89 + 11) + 67 = 167$)* $238 + 77 + 62 =$ *($(238 + 62) + 77 = 377$)* $372 - 286 =$ *($72 + (300 - 286) = 86$)* $53 - 87 + 76 - 39 =$ *($(53 + 76) - (87 + 39) = 3$)* $5 \times 13 \times 20 =$ *($(5 \times 20) \times 13 = 1300$)* $4 \times 83 \times 0 \times 25 =$ *($A \times 0 = 0$)* $(530 \div 2) \times (4 \div 0) =$ *(It is meaningless!)*	Whole class activity. T writes the tasks on BB; volunteer Ps come to work and explain methods at BB. (T encourages slower Ps.) Agreement. Praising.
	10 mins	
2	**OS 1.1 Using mileage charts** T: What do you think this chart shows us? It's called a 'mileage chart' ... T: And how do you think we use it? T: For example, how far is it from Exeter to Taunton?	Whole class activity. OS 1.1 appears on OHP. At first, the questions are covered and T encourages Ps to work out the purpose of the chart and how to use it. Questions 1 (a) and (b) can be answered by volunteer Ps, explaining and showing at BB as in solution on p1 of PB. Other Ps can be asked to answer (c) and (d) at BB.
	T: Now look at question 2. How do you find the answer? Ps: We have to read all three of the distances from the chart and then add them up to get the total distance. T: Who would like to do it at the BB? P: $55 + 44 + 67 = 166$	Volunteer P reads out distances from OHP and writes solution on BB. Agreement. Praising.
	T: Now open your PB at p1 and look at the chart in Example 1. One day a delivery driver travelled from Penzance to Taunton, then from Taunton to Plymouth and finally from Plymouth to Bristol. (writes on BB): Penzance → Taunton → Plymouth → Bristol How far did he travel altogether? Use a quick method to count up the distances.	Individual work.
(continued)		

Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 1	*Mileage Charts*
Activity		***Notes***
2 *(continued)*	P (at BB): $144 + 75 + 125 = 144 + (75 + 125)$ $= 344$ (miles)	Agreement, feedback, discussion if needed. Self-correction. Praising.
	18 mins	
3	**PB 1.1, Q1 and Q2** *1.* *(a)* 72 miles *(b)* 38 miles *(c)* 44 miles *(d)* 36 miles *(e)* 71 miles *2.* 44 + 39 + 36 = 119 miles	Individual work. T monitors Ps' work, concentrating on those Ps who found the previous question difficult. After some minutes, T stops Ps working, and verbal checking follows. Agreement, feedback, self-correction. Praising.
	25 mins	
4	**Network diagrams and mileage charts** T: Now you are going to draw up a mileage chart using the distances, in miles, between some towns. **OS 1.2** T: Look at the network diagram and find the shortest distances on the routes marked between each pair of towns. Which ones do you suggest should be done first? Ps: The distances between neighbouring towns because they are marked on the diagram. T: Right. Who would like to write these on the OHP? T: And what about, for example, Devizes and Amesbury? Ps: There is no direct route between them, but we can travel from one to the other either via Upavon or via Shrewton. T: Which is the shorter distance? ... Complete the distance in the chart ... *(19 miles via Upavon)* T: Would you expect that a direct route between two towns would be shorter than another route which is via a third town? Let's see if this is the case in this example.	Whole class activity. OS 1.2 appears on OHP. First a volunteer and then other Ps are called to complete the first 6 gaps in the mileage chart. Agreement. Praising. The final three distances are shown on the network and completed in the chart by different Ps. Agreement. Praising.
	33 mins	
5	**PB 1.1, Q8 Individual practice** 	Individual work, monitored, helped. Checking at BB: T sketches a mileage chart on BB, Ps dictate distances, T writes them on chart, after agreement. Feedback, self-correction. Praising.
	41 mins	
6 *(continued)*	**PB 1.1, Q10 Further practice**	Individual work. It is likely that only the stronger Ps will solve this. T monitors Ps work. Ps need to realise that

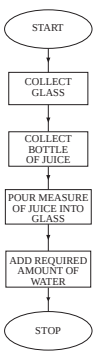
Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 1	*Mileage Charts*
Activity **6** *(continued)*	 (a) London → York = 21 + 47 + 120 + 45 = 233 miles Stevenage → York = 47 + 120 + 45 = 212 miles Peterborough → York = 120 + 45 = 165 miles (b) 233 + 233 = 466 miles *45 mins*	***Notes*** there is a 'simple' network: the stations are all on one line. That is why London → Peterborough = London → Stevenage + Stevenage → Peterborough, etc. T sketches the incomplete chart on BB, stops the work after 3 minutes and calls a volunteer P to BB to explain how to complete the chart. Agreement, feedback, self-correction. Praising.
	Set homework **PB 1.1, Q4** **PB 1.1, Q5** **PB 1.1, Q6** **PB 1.1, Q9**	

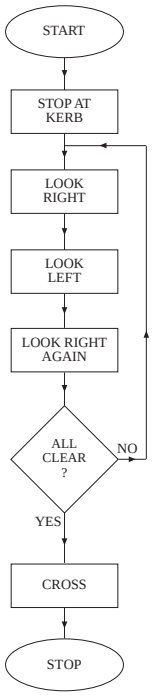
Y8 UNIT 1 *Mathematical Diagrams* Lesson Plan 2 — *Using Flow Charts*

Activity		*Notes*
1	**Checking homework** **PB 1.1, Q4** (a) 220 km (b) 270 km (c) 215 km (d) 146 km (e) 199 km **PB 1.1, Q5** 293 + 293 = 586 km **PB 1.1, Q6** P (at BB): 293 220 146 + 140 799 **PB 1.1, Q9**  	Verbal checking of Q4 and Q5. T asks Q4, (a) - (e) and Q5 and points to Ps to answer. T agrees or not ($\rightarrow$ correction). Feedback, self-correction. Praising. For Q6, a volunteer P comes to BB to show working. Agreement, feedback, self-correction. Praising. For Q9, T has prepared an OS showing the completed table. Ps correct their own work, asking if they don't understand. Praising.
	7 mins	
2A	**Mental revision of work with decimals** T: Before starting on a new topic, let's see if you can remember how to work with decimals.	Mental work. Review and warming up, with all Ps contributing. T asks, Ps volunteer, answer. Agreement. Praising.

T:		Ps:	
	0.3 + 0.4 =		*0.7*
	0.8 + 2 =		*2.8*
	1.7 + 3.5 =		*5.2*
	0.5 − 0.2 =		*0.3*
	3 − 0.6 =		*2.4*
	4.1 − 2.7 =		*1.4*
	0.35 + 1.8 =		*2.15*
	300.2 − 4.1 =		*296.1*
	0.2 × 3 =		*0.6*
	6 × 0.7 =		*4.2*
	0.2 × 0.4 =		*0.08*
	0.9 ÷ 3 =		*0.3*
	1.6 ÷ 4 =		*0.4*
	0.8 ÷ 0.2 =		*4*
	etc.		

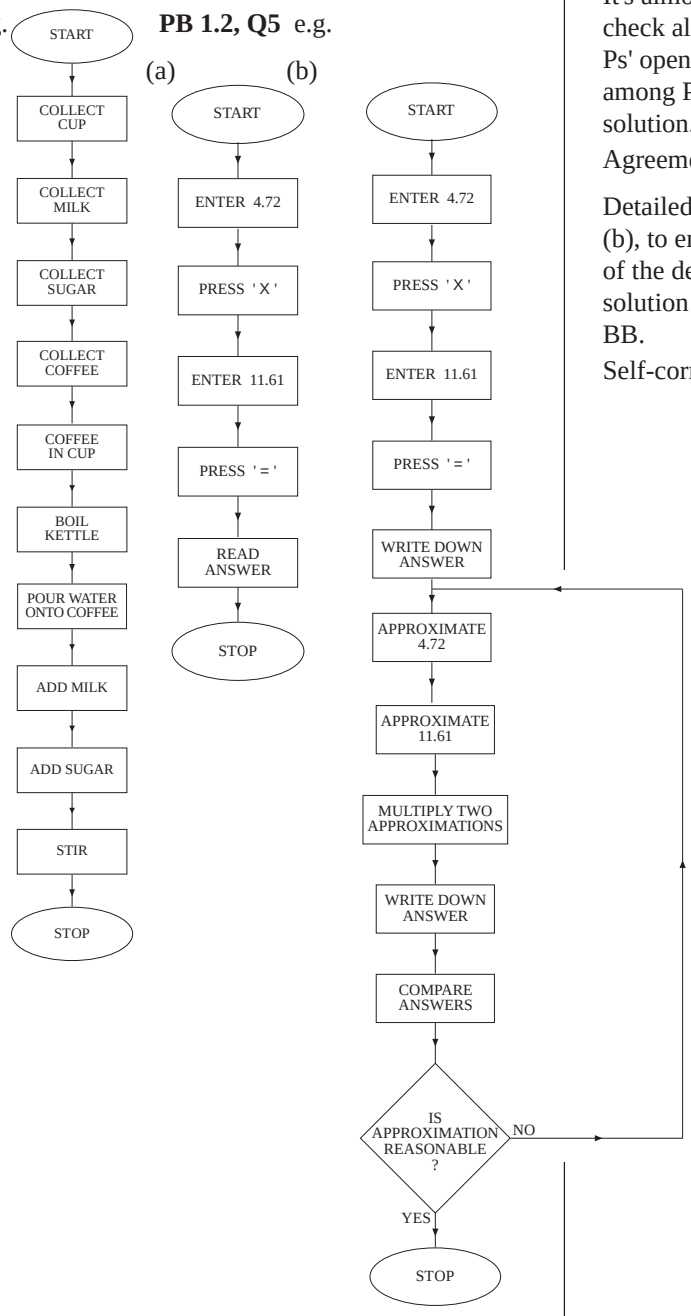
(continued)

Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 2	*Using Flow Charts*
Activity		***Notes***
2B *(continued)*	**Written revision of work with decimals** T: You can write in your Ex.Bs to work out the solutions to these calculations: T: 5.37 + 3.8 = — Ps: *(9.17)* 4.61 + 18.7 = — *(23.31)* 5.4 − 3.82 = — *(1.58)* 13.21 − 7.56 = — *(5.65)* 3.74 × 4 = — *(14.96)* 5.5 × 3.64 = — *(20.02)* 14.6 ÷ 4 = — *(3.65)* 7.32 ÷ 1.2 = — *(6.1)* *20 mins*	T asks a question, calls a P (encouraging slower ones) to BB to show the solution. Other Ps work in Ex.Bs. T asks Ps to explain their answers and to state the rules (such as lining up decimal points) they have learnt. Agreement. Praising.
3	**Introducing flowcharts, using a 'robot'** T (to the last P at BB in the previous activity): If you had a robot, would you have sent it to the BB to do the calculation instead of coming to the front yourself? T: Who'd like to play the part of the robot, and who would like to give the commands? The task is (writes on BB): 4.53 − 2.7 T: Connect with the robot by saying 'start' and disconnect by saying 'stop' or 'end'. P (e.g.): Start; Stand up; Go to BB; Pick up the board pen; Write the first number; Write the subtrahend under it, lining up the decimal points; Subtract; Put down pen; Return to seat; Sit down; Stop *26 mins*	T introduces the concept of flowcharts in a light-hearted way, with Ps contributing. P_1 gives commands/instructions, T writes them on BB as a flow chart (concisely); P_2 -the robot- acts as instructed. Praising at the end. Then T introduces flow charts and the different shapes used for start/end and instructions.
4	**Practice with flow charts** **PB 1.2, Q1** *Various possible solutions, including:*  *32 mins*	Individual work. T monitors Ps' work to check that they use the different boxes correctly. When almost all Ps have finished, T asks one or two of them to read out their instructions. Praising.

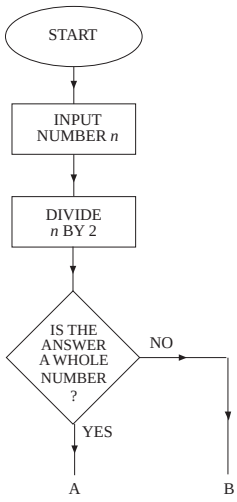
Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 2	*Using Flow Charts*
Activity		***Notes***
5	**Flow charts - the decision box** T: Let's use our first flow chart to make another subtraction. Who'd like to be the robot this time? The task is (writes on BB): 2.63 – 7.4 P (at BB): 2.63 – 7.4 ? T: What do we have to do? Ps: The smaller number has to be subtracted from the other number, and the result is given a minus sign. T: Would we always do this? Ps: No, only when the subtrahend is greater than the other number. T: So what do we have to do, and when? Ps: Before the fourth command we have to decide if the subtrahend is greater than the other number.	Previous flow chart for subtraction remains on BB. Now T introduces Ps to 'decision' box on chart. A P reads out commands. When robot P arrives at subtraction, Ps have to state that the flow chart cannot work using these instructions. This continues until the flow chart is completed. Praising.
	38 mins	
6	**Individual practice** **PB 1.2, Q3** *A possible solution:*  	Individual work, monitored, helped. Detailed discussion follows after the question has been completed. A volunteer P writes solution on BB; T and Ps analyse the chart, particularly the positioning of decision box(es) and how it works. Praising.
	45 mins	
	Set homework **PB 1.2, Q2 (a)** **PB 1.2, Q5**	

Y8 UNIT 1 *Mathematical Diagrams* Lesson Plan 3

Flow Charts for Classification 1

Activity		*Notes*
1	**Checking homework** **PB 1.2, Q2** (a) e.g. **PB 1.2, Q5** e.g. (a) (b)  *6 mins*	It's almost impossible for T to check all solutions. T looks at Ps' open Ex.Bs while walking among Ps, while a P reads out solution. Agreement. Praising. Detailed discussion is needed for (b), to emphasise the importance of the decision box. A good solution should be written on BB. Self-correction. Praising.
2	**Using a flow chart to generate numbers** **OS 1.3** T (after checking the results): What does the first decision box do? Ps: Separates the 1 and the other whole numbers. T: What does the second decision box do? Ps: Separates the 'other' numbers according to whether they are odd or even. T: So we can say that the numbers are 'classified' as odd or even numbers. *This leads on to the next Activity ...* *15 mins*	Ps work in pairs, monitored, helped. Each pair of Ps has a copy of OS 1.3. Pairs of Ps work together, discussing the problems. Checking follows. The role of decision boxes should be fully explained and understood.

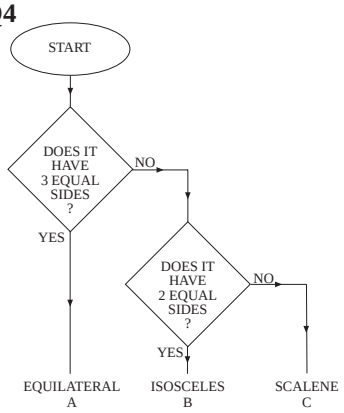
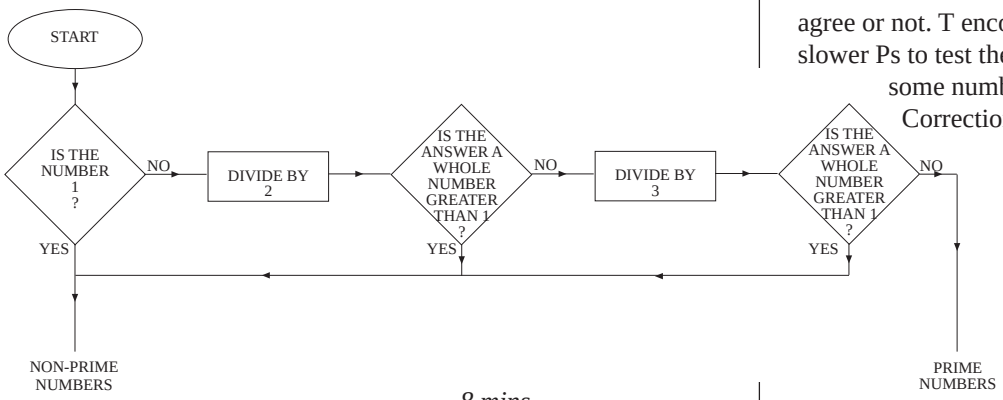
Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 3	*Flow Charts for Classification 1*
Activity		***Notes***
3	*... following on from previous Activity* **Classifying numbers** T: We met classifying last year, several times. Can you remember, for example, how to classify angles between 0° and 360°? **OS 1.5**	Whole class activity. Ps start to recall their knowledge about angles, and T puts OS 1.5 onto OHP (with flow chart covered up) to help them. When Ps have named the types of angles on OS, T shows the flow chart. Ps then decide where each of the angles comes out of the flow chart.
	23 mins	
4	**Classifying angles on a flow chart - individual work** **PB 1.3, Q1**	Individual work, monitored, helped. Verbal checking (looking at the flow chart). Agreement, feedback, self-correction. Praising.
	28 mins	
5A	**Classifying polygons on a flow chart - whole class activity** T: As well as angles, we can classify polygons on a flow chart. Can you remember the different classifications for triangles? *(Equilateral, isosceles or scalene)* T: Which triangles are equilateral? *(Those with sides of equal length)* T: Which are scalene? *(Those with all their sides of different lengths)* T: And what about quadrilaterals? What types can you name? P_1 (e.g.): Square T (sketches on BB and asks): List all its properties. P_2: It has four right angles. P_3: Its sides are all of the same length. P_4: It has two pairs of parallel sides. T: Right, Let's look at another quadrilateral. etc.	Whole class activity. Before proceeding, T makes Ps recall types of triangles and quadrilaterals. Ps volunteer and list quadrilaterals. T sketches them on BB and asks their properties. If Ps omit one (see OS 1.6), T sketches it on BB and ask Ps to give its name.
5B	**Classifying quadrilaterals on a flow chart** **OS 1.6**	Whole class activity. Task appears on OHP. For each quadrilateral, two volunteer Ps are used. P_1 acts as teacher, reading out instructions - class responds. P_2 shows the progress on the flow chart. T praises.
	38 mins	
6	**Individual practice with flow charts** **PB 1.3, Q2**	Individual work. Checking at OHP by following each quadrilateral through the chart. Agreement, feedback, self-correction. Praising.
	45 mins	
	Set homework **PB 1.3, Q6**	

Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 4	*Flow Charts for Classification 2*
Activity		***Notes***
1	**Checking homework** **PB 1.3, Q6** *(a)* *Monkey D, Bird C, Giraffe B* *Horse B, Centipede F, Elephant B* *Zebra A, Pig B, Kangaroo B* *Fish E, Dolphin E, Cat B* *(b) For example:* *A Chipmunk, D Ape* *B Lion, E Shark* *C Man, F Spider* Note that the instruction 'Does it have 4 legs?' should be interpreted as 'Does it have *exactly* 4 legs?' *6 mins*	Verbal checking. Flow chart on OHP. Looking at the flow chart, Ps have to say (T asks) what kind of animals can come out of it at each of the end points. After agreement, Ps can write the properties of the animals coming out under the letters A - E on OS. For example, after point D 'a four-legged animal covered in fur' can be written. Then Ps answer questions (a) and (b). For each answer the class checks that the animal does have those properties.
2	**Sorting numbers with a flow chart** **PB 1.3, Q7** T: What does the first decision box do? Which numbers came out of the flow chart at the end points A and B, and which ones came out at C, D or E? *(A, B: even numbers* *C, D, E: odd numbers)* T: Why? *(Because when a whole number is divided by 2 the answer will be a whole number if the dividend is an even number)* T: So what does this decision box do? *(Classifies numbers as odd or even)* etc. *18 mins*	Whole class activity. Flow chart appears on OHP. Volunteer Ps come to OHP to show and explain how the numbers are classified. Other Ps agree or not. T praises. Then T and Ps discuss the role of the decision boxes.
3	**Drawing a flow chart - individual work** **PB 1.3, Q8** P (at BB): draws flow chart, e.g.  *25 mins*	Individual work, monitored, helped. T asks Ps to think about what they have discussed before starting Q8. When Ps have finished their flow charts, a volunteer P draws solution on BB. Agreement, discussing other possible solutions. Feedback, self-correction. Praising.

Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 4	*Flow Charts for Classification 2*
Activity		***Notes***
4	**Drawing a flow chart - whole class activity** **PB 1.3, Q5** P_1: We can separate out the 'Polygons with more than 8 sides' with a 'Does it have more than 8 sides?' decision box after the 'No' output of the previous decision box. T: Right. What's next? Ps: Let's separate out the octagons. T: How shall we do that? P_2: We can put in a 'Does it have more than 7 sides?' decision box. T: Right. Who'd like to draw on BB what we've decided? T: Who'd like to continue on BB? T (to the volunteer P): Don't say anything, just draw. We'll see if we all agree with you. T (after drawing and agreement): Now try to complete the flow chart on your own.	Whole class activity. T and Ps discuss that the only difference between the categories is the number of sides. Then T lets Ps suggest how to separate the polygons. A volunteer P comes to BB to draw, with T helping P to position the first two boxes (and the START box) on BB so that there will be room for the whole flow chart. T lets Ps work individually, but monitors them, helping slower ones. After Ps have finished, one of them completes the chart on BB. After agreement, Ps and T can discuss other ways of constructing a chart to classify these polygons.
	35 mins	
5A	**Classifying sports events - individual work** **Activity 1.3 (without Extension)** *(a) A (b) A (c) D (d) B* *(e) D (f) C (g) C (h) C*	Individual work, monitored, helped. Each P has a copy of Activity 1.3 and works on Q1 and Q2 until T stops them. Then discussion, self-correction. Praising.
5B	**Activity 1.3 Extension (changed)** Draw a flow chart that will sort plants with woody stems into the following categories: Deciduous trees (shedding their leaves during winter) Evergreen trees Deciduous bushes Evergreen bushes	Individual work. Task appears on BB. Extension contains a similar type of classification as Q1 of Activity 1.3. If Ps realise this, they will only have to draw a similar flow chart and change the labels. Checking on BB. Agreement, feedback, self-correction. Praising.
	45 mins	
	Set homework **PB 1.3, Q4** **PB 1.3, Q9 (for stronger Ps only)**	

Y8 UNIT 1 *Mathematical Diagrams* Lesson Plan 5

Networks

Activity		*Notes*
1	**Checking homework** **PB 1.3, Q4**  	Checking at BB. A volunteer P comes to BB, draws and explains solution. Other Ps decide if this flow chart sorts triangles as required. Then T asks who has other similar solutions, and who has completely different solutions. Any different charts should be drawn on BB and discussed. Agreement (correction). Praising.
1B	**PB 1.3, Q9**  	This task was for stronger Ps only. Now one of them can describe the problem to the other Ps and then draw the solution on BB. Ps agree or not. T encourages slower Ps to test the chart with some numbers at BB. Correction if needed. Praising.
	8 mins	
2	**Introducing networks** **Worked Example 2 (PB Y8A, page 16)** T (after placing OS onto OHP): What can you see on this figure? *(Lines, sections, ...)* T: What do you think it might represent? *(Roads, connections, ...)* T: Where have you seen something similar to this? *(Map of London Underground, ...)* T: What do you think the numbers represent? *(Distances, e.g. in miles)* T: Do you think that the route from S to C is shorter via A than the direct route? Do you think that the shortest distance between two points is *not* the straight section?	Figure appears on OHP. T introduces networks with some questions.
(continued)	T: Start from S and find the shortest routes to its neighbouring points. Which points are these? *(A, C and D)*	Finally T and Ps agree that triangles in a network are not triangles, so the inequality between the sides of a triangle is not true here (SA + AC can be less than SC). Then they come to the question.

Y8	**UNIT 1** ***Mathematical Diagrams*** Lesson Plan 5	*Networks*
Activity		***Notes***
2 *(continued)*	T: Which points can represent the last station before the end point T? *(B, C and E)* T: Which are the shortest routes from S to B and from S to E? *(SAB = 4, SDCE = 4)* T: Find the shortest route from S to T. *(SDCET = SACET = 6)*	Ps say the shortest route, T agrees and writes the 'distances' in the figure close to the 'points', A, C and D. T writes distances on OS. Praising.
	16 mins	
3	**Practice with networks** **PB 1.3, Q2** P: The shortest journey times from S to A, B and C are: SA = 2 hours SAB = 3 hours SC = 3 hours. The shortest journey time from S to T is: SABT = 4 hours.	Individual work, monitored, helped. Before Ps have finished working, T sketches the network on BB. A volunteer P comes and shows solution at BB. Agreement, feedback, self-correction. Praising.
	22 mins	
4A **4B**	**More difficult networks** **OS 1.7 (A)** **OS 1.7 (B)**	Whole class activity. Task appears on OHP and each pair of Ps has a copy. Volunteer Ps come to OHP to tackle the problems in steps: (1) from S to A, B and C (2) from S to E and D (3) from S to F (4) from S to T. Agreement. Praising. Ps work in pairs, monitored. Then one of volunteer Ps shows solution and explains it. Agreement, feedback, self-correction. Praising.
	34 mins	
5	**Revising mathematical diagrams** **(1) M 1.2, Q1-7** **(2) RT 1.1, Q1 (a), (b)** **(3) M 1.2, Q8-10**	Mental work. T makes Ps revise previous topic of mathematical diagrams with M 1.2 and RT 1.1. Data sheet for Mental Tests and RT 1.1 appear on OHP: Mileage Chart, Flow Chart and Network Diagram, one after the other. T asks questions from M 1.2 and RT 1.1 Q1, points to P, P answers, T agrees/waits for correction and praises, question by question.
	45 mins	
	Set homework **PB 1.3, Q1** **PB 1.3, Q3** **OS 1.4** (each P has a copy)	