Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 1 *Equivalent Ratios*

Activity ***Notes***

1

Revising fractions

T: It's a long time since we looked at fractions..

Can you see any equivalent fractions here? (T writes on BB):

$$\boxed{\frac{1}{2},\ \frac{4}{3},\ \frac{2}{4},\ \frac{6}{10},\ \frac{12}{9},\ \frac{5}{10},\ \frac{9}{15},\ \frac{8}{6}}$$

$$\left(\frac{1}{2}=\frac{2}{4}=\frac{5}{10}\right)$$

T: How do we know they have the same value? What is the rule? *(The value of a fraction stays the same if we multiply or divide both its numerator and its denominator by the same non-zero number)*

T: Which of the three equivalent fractions is in the simplest form?

$$\left(\frac{1}{2}\right)$$

T: Are there any other sets of equivalent fractions here?

$\left(\frac{4}{3}=\frac{8}{6}=\frac{12}{9}\right.$, *with* $\frac{4}{3}$ *being the simplest form)*

T: We still have two fractions left ... are they in their simplest form?

(No)

T: Let's simplify them. $\left(\frac{6}{10}=\frac{3}{5},\ \frac{9}{15}=\frac{3}{5},\ \text{so}\ \frac{6}{10}=\frac{9}{15}\right)$

Notes: Mental work as a warm-up activity and revision.

T asks, Ps answer, T agrees, praises and writes equivalent fractions on BB.

5 mins

2

Introducing equivalent ratios

T: Anti-freeze has to be mixed with water before being put into a car engine. The ratio of anti-freeze to water depends on the lowest air temperature that will be experienced. What can you say about the table of mixes below?

Amount of Anti-freeze (litres)	*Amount of Water* (litres)
1	1.5
2	3
0.5	0.75
4	6

Ps: This table must be for the same expected temperature.

T: Why do you say that?

P: Mixing 1 litre of anti-freeze with 1.5 litres of water gives the same concentration as mixing 2 litres of anti-freeze with 3 litres of water.

T: That's right. We say that the ratios 2 : 3 and 1 : 1.5, and the other two ratios in the table, are equivalent ratios (writes on BB):

1 : 1.5 = 2 : 3 = 4 : 6 = 0.5 : 0.75

What do you notice?

P: We can find ratios equivalent to other ratios by multiplying/ dividing both sides by the same number.

T: Have you met this before?

Ps: With equivalent fractions!

Notes: Whole class activity, introducing equivalent ratios with questions and answers, interactively.

Table appears on OHP.

Praising wherever possible.

11 mins

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 1 *Equivalent Ratios*

Activity ***Notes***

3

Equivalent ratios and simplest forms of ratios

T: You can see some ratios on BB. Find equivalent ones.

2 : 7	10 : 4	4 : 14	1 : 3	20 : 8
10 : 30	1 : 3.5	4 : 12	7 : 2	

P_1 (writes): 2 : 7 = 4 : 14

if we multiply both sides by 2, and

(writes) : = 1 : 3.5

if we divide both sides by 2.

T: And what about 7 : 2 ?

P_1: That is not the same.

T: Why?

P_1:?

T: Do you get the same drink if you mix 2 units of orange squash with 7 units of water as if you mix 7 units of squash with 2 units of water? Which would you prefer to drink? The order the numbers are written in is crucial when working with ratios, so you must be very careful.

P_2: 1 : 3 = 10 : 30 = 4 : 12 (with explanation)

T: Which of these ratios is the simplest one?

Ps 1 : 3

T: And which is the simplest from the previous set?

Ps: 1 : 3.5 or 2 : 7

P_3: 20 : 8 = 10 : 4 (with explanation)

T: Is 10 : 4 the simplest form of this ratio?

Ps: No!

T: What divisor would you suggest we use to get the simplest form of the ratio 20 : 8 ?

Ps: The number 4 $\Rightarrow$ 5 : 2.

T: What is the 4 in relation to the numbers 20 and 8 ?

Ps: It is their highest common factor.

T: So what can we say now?

Ps: The process of finding the simplest form of a ratio is the same as the process of finding the simplest form of a fraction.

Whole class activity.

T writes ratios on BB, then asks Ps to come to BB to write equivalent ratios and give reasons for their choices.

Discussion, agreement, praising, Ps write in Ex.Bs.

T introduces the concept of the simplest form of a ratio.

Debate among Ps, then agreement that the simplest form of a ratio is when it is written with the lowest possible pair of whole numbers.

Praising.

20 mins

4

Practice simplifying ratios

T: I've talked too much in this lesson! Now it's your turn. Simplify these ratios, explaining your answers:

OS 7.1

(a) 4 : 8 = 1 : 2
(b) 5 : 20 = 1 : 4
(c) 9 : 45 = 1 : 5
(d) 25 : 40 = 5 : 8
(e) 8 : 36 = 2 : 9
(f) 6 : 21 = 2 : 7
(g) 11 : 44 = 1 : 4

Whole class activity. Task appears on OHP.

Ps volunteer (T encouraging slower ones) to come to front, write solution on BB and explain it. Others agree/correct and write solution in their Ex.Bs, after agreement.

T praises.

26 mins

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 1 *Equivalent Ratios*

Activity | *Notes*

5

Individual practice

PB 7.1, Q1 (a), (d), (e), (g), (j), (k)

T:	2 : 6	Ps: dividing both sides	by 2 →	1 : 3
	6 : 2		by 2 →	3 : 1
	24 : 4		by 4 →	6 : 1
	14 : 21		by 7 →	2 : 3
	80 : 100		by 20 →	4 : 5
	18 : 24		by 6 →	3 : 4

Individual work, monitored, helped.
Verbal checking: one P saying the divisor and the simplest form and the others agreeing or correcting.
Feedback, self-correction.
Praising.

33 mins

6

Introducing 1 : *n* and *n* : 1

T: We said earlier that either 1 : 3.5 or 2 : 7 could be given as the simplest form of the ratio 4 : 14. For some purposes it's best to reduce the numbers to the form 1 : *n* or *n* : 1 by dividing both numbers by either the left hand side or the right hand side number.

T: For example, what will be the divisor if we are to reach the form 1 : *n* for the ratio 4 : 5 ?

(The divisor will be 4 and the ratio will be 1 : 1.25)

T: And if we are to reach the form *n* : 1 for the same ratio?

(The divisor will be 5, and the ratio will be 0.8 : 1)

T: It is useful to be able to find both forms, as either one can be used as the unit in a problem.

Whole class activity.
Introducing the forms 1 : *n* and *n* : 1 of a ratio.

OS 7.2

(a) 2 : 10 = 1 : 5

T: Can you also give the *n* : 1 form of the ratio?

Ps: 0.2 : 1, by dividing both sides by 10.

(b) 5 : 70 = 1 : 14

T: What is the *n* : 1 form of this ratio?

Ps: $\frac{1}{14}$: 1

T: That doesn't seem very friendly, does it? ...

(c) 5 : 9 = 1 : 1.8

(d) 10 : 11 = 1 : 1.1

(e) 10 : 42 = 1 : 4.2

(f) 5 : 3 = 1 : 0.6

(g) 4 : 3 = 1 : 0.75

Task appears on OHP.
T points to a volunteer P to answer. T agrees/waits for correction, praises and writes ratio on OS, Ps write in Ex.Bs.
For questions (a) and (b), T can also ask for the *n* : 1 forms of the ratios.

40 mins

7

Practice with ratios

PB 7.1, Q2 (a), (c), (g)

PB 7.1, Q3 (a), (f)

Solutions: *Q2* *(a)* 2 : 5 = 1 : 2.5
(c) 10 : 35 = 1 : 3.5
(d) 6 : 9 = 1 : 1.5
Q3 *(a)* 24 : 3 = 8 : 1
(f) 6 : 5 = 1.2 : 1

Individual work, monitored, helped.

Checking: solutions appear on OHP or T writes them on BB; Ps check their work.
Feedback, self-correction.
Praising.
Discussion if necessary.

45 mins

Y8	**UNIT 7** ***Ratio and Proportion*** Lesson Plan 1	*Equivalent Ratios*
Activity	**Set homework** **PB 7.1, Q1 (b), (f), (h), (l)** **PB 7.1, Q2 (d), (h)** **PB 7.1, Q3 (c), (e)** **PB 7.1, Q4**	***Notes***

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 2 *Map Scales*

Activity | ***Notes***

1

Checking homework

1A

PB 7.1, Q1 **(b)** 4 : 20 = 1 : 5 **(f)** 30 : 25 = 6 : 5
(h) 15 : 60 = 1 : 4 **(l)** 22 : 77 = 2 : 7
PB 7.1, Q2 **(d)** 2 : 17 = 1 : 8.5 **(h)** 15 : 12 = 1 : 0.8
PB 7.1, Q3 **(c)** 7 : 10 = 0.7 : 1 **(e)** 18 : 5 = 3.6 : 1

For Q2 (h):

P_1 (writing division 12 ÷ 15 at BB):

$$12 \div 15 = 0.8$$

so 15 : 12 = 1 : 0.8

P_2 (giving an alternative method):

$$15 : 12 = 1 : \frac{12}{15} = 1 : \frac{4}{5} = 1 : 0.8$$

PB 7.1, Q4 600 ml : 900 ml = 2 : 3

6 mins

T has asked a P to write solutions to Q1-3 on BB as soon as P arrives.

Other Ps check their work, self-correct or suggest correction on BB. Agreement.

Feedback with reasoning at BB if necessary (e.g. for Q2 (h)).

Praising.

Finally, verbal checking of Q4. Agreement, feedback, self-correction. Praising.

2

Repeating concept of simplest form and 1 : *n* and *n* : 1 forms

PB 7.1, Q5

T (writes on BB):

10 shovels of cement, 25 shovels of sand

P_1: To reach the simplest form we have to divide both sides by the HCF of the LHS and RHS, which in this example, is 5.

10 : 25 = 2 : 5

P_2: To reach the form 1 : *n* we have to divide both sides by the LHS, which is 10.

10 : 25 = 1 : 2.5

P_3: To reach the form *n* : 1 we have to divide both sides by the RHS, here 25.

$$10 : 25 = \frac{10}{25} : 1 = 0.4 : 1$$

11 mins

Mental work, repeating the concept of these forms of ratio. T reads out text, may write the amounts of cement and sand on BB, gives short time for thinking, then points to slower Ps to answer, with explanations. Stronger Ps may held with explanation. T writes solutions on BB and praises.

(Before they answer, T reminds Ps of the importance of the order; here, cement to sand.)

3

Further work with ratios

T: So far we've been simplifying ratios. Now let's do the opposite, by completing the following ratios:

T:	Ps:
1 : 3 = 4 : x	x = 12
1 : 5 = 5 : x	x = 25
1 : 4 = x : 20	x = 5
2 : 5 = 8 : x	x = 20
5 : 4 = x : 24	x = 30
4 : 6 = 6 : x	x = 9 (by multiplying both sides by 1.5)

T: Can you suggest another way of dealing with this last ratio?
(Simplifying 4 : 6 into 2 : 3, then multiplying both sides by 3)

T: 21 : 28 = 24 : x Ps: ?
T: Think about the previous one! *(*21 : 28 = 3 : 4 = 24 : 32*)*
T: 30 : 18 = x : 21 Ps: x = 35
T: Explain why. *(*30 : 18 = 5 : 3 = 35 : 21*)*

18 mins

Whole class activity.

Questions appear on OHP.

T asks, points to a volunteer P to answer and also explain, agrees/ waits for correction, then praises.

Ps write in Ex.Bs.

The final two questions might be best suited to stronger Ps.

Y8	**UNIT 7** ***Ratio and Proportion*** Lesson Plan 2	*Map Scales*
Activity		***Notes***
4	(1) Find the unknown side in each ratio. (a) $1 : 4 = 3 : x$ *($x = 12$)* (b) $2 : 3 = x : 9$ *($x = 6$)* (c) $1 : 7 = x : 21$ *($x = 3$)* (d) $2 : 3 = 5 : x$ *($x = 7.5$)* (e) $12 : 21 = 16 : x$ *($x = 28$)* (2) In a school, the ratio of teachers to pupils is 3 : 40. How many teachers are there in the school if there are 400 pupils? ($3 : 40 = 30 : 400 \Rightarrow 30$ *teachers)* *26 mins*	Individual work, monitored, helped. Task appears on OHP. Checking: answers for task (1) appear on OHP; task (2) is checked verbally with discussion. (If necessary, Q1 (d) and (e) can be worked through in detail at BB.) Self-correction, feedback. Praising.
5	**Using ratios with map scales** T: Can you remember where we met ratios earlier this year? *(Looking at maps and plans)* T: Give me some scales/ratios that we see on maps. *(*1 : 50 000, 1 : 100 000, ... *)* **OS 7.3** P_1: 1 : 20 000 means that 1 cm on the map represents an actual distance of 200 000 cm = 2000m = 2 km. P_2: Since 1 : 200 000 = 20 : 4 000 000, 20 cm represents 40 km. P_3: 1 cm : 2 km $= x$: 600 km, so x = 300 cm = 3 m. T: This would be quite a large map! *32 mins*	Whole class activity. Task appears on OHP. Discussion about how to use the scale as a ratio to find an unknown distance, either on the map or in reality. T guides Ps to solution and writes on OS, Ps write in Ex.Bs.
6	**Calculating distances on maps, using ratios** T: A map has a scale of 1 : 500 000. (a) Calculate the actual distances, in km, that are represented by the following lengths on the map: 3 cm *(15 km)* 1.2 cm *(6 km)* 14 cm *(70 km)* (b) What are the distances on the map, in cm, if the actual distances are: 50 km *(10 cm)* 42 km *(8.4 cm)* 90 km *(16 cm)* *38 mins*	Whole class activity. Task appears on OHP, or T reads it out and writes data on BB. Ps come to BB to give solutions and explanations. T encourages slower Ps, agrees, praises.
7	**Practice** **PB 7.1, Q8** *((a) 1 km (b) 4.5 km (c) 15 km)* **PB 7.1, Q9** *(1 cm on map = 2 km, 60 km = 30 cm on map)* *45 mins*	Individual work, monitored, helped. Checking at BB: volunteer Ps write solution, others agree or suggest correction. Self-correction, feedback. Praising.
	Set homework **Activity 7.1, omitting Extension**	Each P is given a copy of Activity 7.1.

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 3 *Direct Proportion*

Activity | *Notes*

1

Introducing 'direct proportion' and checking homework

T: If a can of cola costs 40p, what is the cost of:

T:	2 cans	Ps:	80p
	5 cans		£2.00
	10 cans		£4.00
	11 cans		£4.40

T: Good. We can see that, for example, double the number of cans costs double the price. We say that the total cost of the cans increases proportionally with their number.

T: Can you think of examples of proportionality in real life?

Ps: e.g. - litres of petrol and their price
- the number of maths PBs and their mass
- the number of km travelled and the time taken driving at a constant speed.

T: Did you find that the volume of drink was directly proportional to the price in your homework?

Ps: No!

T: Why?

Ps: Because selling food is about making a profit.

T: And what about the cost of petrol?

Ps: ?

T: The area of petrol sales is a huge and complicated business. Let's go back to the 'Sunny Delight' example in your homework. What is the price per 100 ml in each size?

P_1: For the 200 ml size, we have to divide the price by 2 to get the cost of 100 ml → 13p.

P_2: For the 500 ml size ... → 10p.

P_3: For the 1500 ml size ... → 8p.

P_4: For the 3000 ml size ... → 7p.

P_5: 500 ml size → 13p × 5 = 65p
1500 ml size → 13p × 15 = £1.95
300 ml size → 13p × 30 = £3.90

P_6: 200 ml size → 7p × 2 = 14p
500 ml size → 7p × 5 = 35p
1500 ml size → 7p × 15 = £1.05

Notes:

Whole class activity.

Introducing direct proportion and checking homework at the same time.

Questions/answers, sometimes in chorus, interactively.

Praising, wherever possible.

Verbal checking of Q2 of Activity 7.1 (homework) with Ps giving the ways to get the results.

Agreement, feedback, self-correction. Praising.

A volunteer P comes to BB to show what the calculations for prices of each size would be if they were in the ratio of the 200 ml size.

After agreement and feedback, T asks a slower P who did not manage the homework, to show the calculations using the price for the 3000 ml size drink.

Agreement, feedback, self-correction. Praising.

12 mins

2

Further examples of direct proportion - mental work

T: Let's look at some more examples of direct proportion.

T:	1 litre of petrol costs 83p. How much will you pay for:	
	2 litres	*(£1.66)*
	10 litres	*(£8.30)*
	20 litres	*(£16.60)*

Notes:

Mental work, using real-life examples, to check that Ps have understood the concept of direct proportion.

(continued)

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 3 *Direct Proportion*

Activity | ***Notes***

2 *(continued)*

T: The mass of a cube of 1 m side length, made from iron, is 8 kg.
Calculate the mass of a cube of side length:

2 m	*(16 kg)*
10 m	*(80 kg)*
1.5 m	*(12 kg)*

T: If baby Jemma has 6 teeth at the age of 1 year, how many teeth will she have at the age of:

2 years	*(12 or ?)*
3 years	*(18 or ?)*
10 years	*(?)*

T also gives examples of pairs of things (here, ages-teeth) which are not in direct proportion to each other. T waits for Ps to realise that this is *not* an example of direct proportion ...

T: I drop a pebble into a deep well. During the first minute, it falls 5 m. How far will it fall during the first two minutes?
(Direct proportion does not apply here because we have to take into account the acceleration caused by gravity)

This example is more serious, and can lead to interesting discussion.

18 mins

3

Practice with direct proportion

OS 7.4, Q2

P_2 (writes and explains): If 500 balls cost £60, 1 ball costs £60 ÷ 500 = 6000p ÷ 500 = 60p ÷ 5 = 12p

and 800 balls cost 12p × 800 = 9600p = £9.60.

n balls cost 12p × *n* = 12*n* pence

OS 7.4, Q1

P_1: 20 calculators → £170

1 calculator → £170 ÷ 20 = £8.50

7 calculators → £8.50 × 7 = £59.50

Whole class activity.

Task appears on OHP.
Volunteer P is given Q2 and shows the calculation.
Agreement, praising, Ps write in Ex.Bs.

Now a slower P is encouraged to show the calculation for Q1.
Agreement. Praising.

22 mins

4

Individual work with direct proportion

PB 7.2, Q1 (a)

PB 7.2, Q2 (a)

P_1: 5 tickets → £40

1 ticket → £40 ÷ 5 = £8

6 tickets → £8 × 6 = £48

So 6 tickets for a play cost £48.

P_2: 3 glasses → 600 ml water

1 glass → 600 ml ÷ 3 = 200 ml

5 glasses → 200 ml × 5 = 1000 ml = 1 litre

So to make 5 glasses of orange squash you need 1 litre of water.

T: In question 1, if we had to find the cost of 15 tickets, would we need to find the cost of one ticket, or is there a quicker method? *(Since 15 is 3 times 5, we would only have to multiply the price for 5 tickets by 3, to get £120)*

Individual work, monitored, helped.
Checking at BB with Ps writing down and explaining the solution.
Agreement, feedback, self-correction. Praising.

T asks Ps to convert the result to litres, and reminds the class to answer the question in context, with a whole sentence.

A mental question follows.
Answering, agreeing, praising.

33 mins

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 3 *Direct Proportion*

Activity

5

Practical work using proportion

Activity 7.2

Size	*Width* (mm)	*Length* (mm)	*Ratio of W : L*
A4	297	210	1 : 1.4
A5	210	148	1 : 1.4
A6	148	105	1 : 1.4
A7	105	74	1 : 1.4
A8	74	52	1 : 1.4
A9	52	37	1 : 1.4
A10	37	26	1 : 1.4

Notes

Whole class activity/individual work.

Each P is given two copies of Activity 7.2 on A4 paper, one to read and one to cut into parts as required in Q2.

First, T asks Ps to read as far as the end of Q2. Then Ps discuss together how to proceed.

Next, using rulers, Ps mark one of their sheets as shown on the figure. Then they make an 8×3 table, measure the width and length of the A4 - A10 sizes, to the nearest mm, and write them in pencil on their table. Ps work individually, T monitors their work, helping where necessary.

T also prepares a table on BB and, after Ps have finished their tables, T asks the widths and lengths. Because Ps'measurements will probably differ slightly, T asks them to agree on the lowest common values $\rightarrow$ Ps correct the data in their table.

Individual work follows, i.e. Q3. T asks Ps to complete their table with a fourth column and use their calculator to write the ratios of width : length in 1 : n form, correcting n to 1 d.p.

Verbal checking, agreement, self-correction. Praising.

45 mins

Set homework

(1) PB 7.2, Q1 (c)

PB 7.2, Q3 (c)

PB 7.2, Q4 (a)-(c)

(2) Activity 7.2, Q4

(3) For stronger Ps: Explain the connection between the ratios you gave in Q3 and Q4 of Activity 7.2.

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 4 *Proportional Division*

Activity		***Notes***
1	**Checking homework** **(1) PB 7.2, Q1 (c)** £40 × 4 = £160 **PB 7.2, Q3 (c)** £8.20 × 3 = £24.60 **PB 7.2, Q4** 1800 g ÷ 3 = 600 g **PB 7.2, Q4 (a)** 600 g × 2 = 1200 g = 1.2 kg **PB 7.2, Q4 (b)** 600 g × 17 = 4200 g = 4.2 kg **PB 7.2, Q4 (c)** 600 g × 24 = 14 400 g = 14.4 kg **(2) and (3) Activity 7.2, Q4 and extra question** *6 mins*	Verbal checking of homework, with explanations. T also asks which Ps have deduced the answers for Q1 (c) and Q3 (c) directly, without calculating the cost for one unit. Agreement, feedback, self-correction. Praising. Verbal checking of Q4 of Activity 7.4, then stronger Ps try to explain the connection. ($1.4^2 \approx 2$, maybe the actual ratios of Q3 are $1 : \sqrt{2}$?) If not, T leads them to the solution. Praising.
2	**Introduction to proportional division** (1) Tim is 3 years old and his brother, Tom, is 7. They both like mint sweets. The day before yesterday they shared a whole box of mints. Tim ate 3 and Tom ate 7. How many mints were in the full box? *(10 mints)* (2) Yesterday the brothers divided a cake into 10 equal slices and ate it all, again in the proportion of their ages. How many slices did they each eat? *(Tim ate 3 and Tom ate 7)* How many grams of cake did they each eat, if the whole cake weighed 1000 grams? *(One slice* → 1000 g ÷ 10 = 100 g *3 slices* → 100 g × 3 = 300 g *7 slices* → 100 g × 7 = 700 g*)* (3) Today they've decided to buy some sweets from the shop. Their mother has given them £4. How much can they each spend if they divide the money in the ratio of their ages? *(* 3 + 7 = 10 £4 ÷ 10 = 40p *Tim can spend* 40p × 3 = £1.20 *Tom can spend* 40p × 7 = £2.80*)* *15 mins*	Whole class activity/mental work. Questions are read out by T. T takes Ps through 3 steps (questions), introducing the idea of dividing something proportionally. T encourages slower Ps to answer. Agreement. Praising.
3 *(continued)*	**Practising and checking proportional division** **OS 7.5 (A)** P_1: 9 + 5 = 14 £70 ÷ 14 = £5 Joshua's share is £9 × 5 = £45. Mary's share is £5 × 5 = £25.	Whole class activity. Questions appear on OHP. Volunteer P comes to front to explain and show solution. Other Ps listen attentively, correcting if necessary, and write in Ex.Bs. Short discussion follows, about methods of checking.

Y8	**UNIT 7** ***Ratio and Proportion*** Lesson Plan 4	*Proportional Division*
Activity		***Notes***
3 *(continued)*	T: How can you check your answer? P_2: We have to see if £45 : £25 is in the same ratio as 9 : 5. T: Is it? P_3: Dividing both sides by 5, we can see that the ratios are the same. T: What else can we do to check? P_4: We can see if the shares add up to the total. T: Do they? P_5: £45 + £25 = £70, so 'Yes'. *21 mins*	Praising.
4	**Practice dividing by ratios** **PB 7.3, Q1 (a), (c)** **PB 7.3, Q3** e.g: Q1 (a) P_1: 2 + 3 = 5 £50 ÷ 5 = £10 So the shares are 2 × £10 = £20 and 3 × £10 = £30 P_2: The ratio 20 : 30, dividing its sides by 10, is the same as the ratio 2 : 3, and £20 + £30 = £50. *29 mins*	Individual work, monitored, helped. Verbal checking of Q1 (a) and (c), as in the previous questions; for Q3 a slower P is encouraged to write the solution in detail on BB. Agreement, feedback, self-correction. Praising.
5	**Ratios with more than two parts** T: Can you imagine a ratio with 3 or more parts? Ps: ? T: Tim, Tom and Tam are brothers. Tim has £10, Tom has £20 and Tam has £30. Write down the money they have as a ratio. (10 : 20 : 30) T: Can you simplify this? *(Dividing all parts by* 10 → 1 : 2 : 3*)* T: Three angles are $\alpha = 60^\circ$, $\beta = 80^\circ$, $\chi = 80^\circ$. Write them as a ratio, and them simplify the ratio. (60 : 80 : 80 =6 : 8 : 8) T: Can these be the angles of a triangle? *(No, since the angles of a triangle add up to* 180°*;* *these angles are* 60°+ 80°+ 80°= 220°*)* T: The lengths of the sides of a quadrilateral are 4 cm, 4 cm, 6 cm and 6 cm. Find their ratio and simplify it. (4 : 4 : 6 : 6 = 2 : 2 : 3 : 3) T: What type of quadrilateral can it be? *(Since it has two pairs of equal sides, it can be a rectangle or a kite)* T: If the sides were listed in order in the question, what type of quadrilateral must it be? *(For a rectangle, the opposite sides are equal, while a kite has two pairs of adjacent sides equal. This must be a kite)* *36 mins*	Whole class activity/mental work, to introduce ratios in three of more things (also revising parts of other topics). T asks volunteer P to write the solution on BB. Solution also appears on BB. The final two questions are perhaps for stronger Ps only. Agreement, praising (sketching quadrilaterals on BB if necessary.)

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 4 *Proportional Division*

Activity

Notes

6

Further practice with proportional division

OS 7.5 (B)

P_1: $2 + 7 + 9 = 18$

$90 \div 18 = 5$

Hannah's share is $2 \times 5 = 10$ sweets

Ben's share is $7 \times 5 = 35$ sweets

Emma's share is $9 \times 5 = 45$ sweets

P_2 (checking): $10 : 35 : 45 = 2 : 7 : 9$

and $10 + 35 + 45 = 90$

Whole class activity.

Task appears on OHP.

T points to a P to read out the text, another P (encouraged, helped) shows solution with help of OS, and third P checks solution.

All Ps listen attentively, T agrees, praises, Ps write in Ex.Bs.

40 mins

7

Further practice with ratios

PB 7.3, Q2 (a)

PB 7.3, Q6

Solutions: *Q2 (a)* $6 + 5 + 1 = 12$

$60 \div 12 = £5$

$6 \times £5 = £30$

$5 \times £5 = £25$

$1 \times £5 = £5$

Q6 $10 + 11 + 9 = 30$

$£300 \div 30 = £10$

Simon's share is $10 \times £10 = £100$

Sarah's share is $11 \times £10 = £110$

Matthew's share is $9 \times £10 = £90$

Individual work, monitored, helped.

After 4 minutes, solution appears on OHP.

Ps check and correct their work.

Feedback. Praising.

45 mins

Set homework

PB 7.3, Q1 (b)

PB 7.3, Q2 (b)

PB 7.3, Q4

PB 7.3, Q8 (a)

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 5 *Linear Conversion*

Activity

Notes

1

Checking homework

PB 7.3, Q1 (b)	*(* £20, £80*)*
PB 7.3, Q2 (b)	*(* £27, £36, £45*)*
PB 7.3, Q4	*(* 36 ml, 180 ml*)*
PB 7.3, Q8 (a)	

P (at BB): $1 + 1 + 2 = 4$

$200 \text{ ml} \div 4 = 50 \text{ ml}$

blue paint: $1 \times 50 \text{ ml} = 50 \text{ ml}$

red paint: $1 \times 50 \text{ ml} = 50 \text{ ml}$

yellow paint: $2 \times 50 \text{ ml} = 100 \text{ ml}$

4 mins

Verbal checking of the first 3 questions, then Q8 checked in detail at BB to review method of dividing to find ratios. The P chosen to do this should be one who made mistakes in the previous questions.

Feedback, self-correction. Praising.

2

Revision, and introduction to linear conversion

T: So far in this unit we've dealt with ratios. When does the ratio of two things remain the same?
(When the two things change proportionally to each other)

T: What is meant by 'changing proportionally'?
(For example, if one of the things is doubled, the other must be doubled as well)

T: We call it direct proportion, or we can say linear proportion, we'll find out more about that in a minute ...

T: Are conversions between different units (such as money, weight and distance) in direct proportion to each other? *(Yes)*

T: For example, taking one foot to be approximately 30 cm, convert to cm:

T:	Ps:
2 feet	60 cm
3 feet	90 cm
4 feet	120 cm
half a foot	15 cm
6 feet	180 cm

T: How have you calculated these?
(We multiplied data in feet by 30 to convert it to cm)

T: Let's look at it inversely (the other way round): My friend, Nancy, is 195 cm tall. Convert her height to feet.

P (at BB): $195 \div 30 = 195 \times \frac{1}{30} = \frac{195}{30}$

$$= 6\frac{15}{30}$$

$$= 6\frac{1}{2} \text{ (feet)}$$

Length in Feet	*Length in cm*
1	30
2	60
3	90
4	120
0.5	15
6	180
6.5	195

Whole class activity and mental work, reviewing the concept of direct proportion and introducing linear conversion with an example.

T writes data given by Ps into a table on BB. Now T asks Ps to copy this into their Ex.Bs.

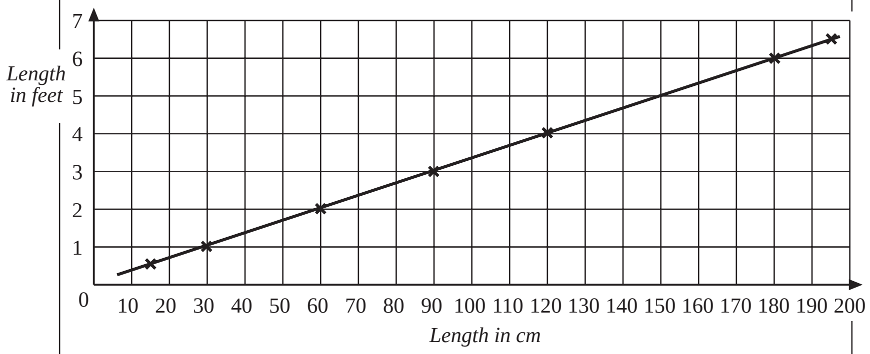
(continued)

Y8 UNIT 7 *Ratio and Proportion* Lesson Plan 5 *Linear Conversion*

Activity | ***Notes***

2 *(continued)*

T: Draw a grid and illustrate the data on it.
e.g.



Individual work. Before starting, Ps and T may discuss the units on the axes, etc.

T monitors and helps Ps work, then sketches solution on BB - it will be obvious why these conversions are called linear.

Feedback, self-correction. Praising.

15 mins

3

Currency conversion

T: What can you say about converting currencies? What type of conversion is this? *(Linear conversion)*

T: Now you need to convert some pounds pounds sterling into Hong Kong dollars, and then some dollars into sterling.

OS 7.6

P_1: (a) £10 = 10 × 12 HK\$ = 120 HK\$

P_2: (b) £18 = 18 × 12 HK\$ = 216 HK\$

P_3: (c) $240 \text{ HK\$} = £240 \times \frac{1}{12} = £\frac{240}{12} = £20$

P_4: (d) $114 \text{ HK\$} = £114 \times \frac{1}{12} = £\frac{114}{12} = £9.50$

Whole class activity.

Task appears on OHP; volunteer Ps come to front to show solutions.

Other Ps agree or correct.

T agrees, praises. Ps write in Ex.Bs.

21 mins

4

Practising currency conversions

PB 7.4, Q1

PB 7.4, Q5 (b), (c)

Solutions: *Q1* *(a)* £6 = 6 × 9 Ff = 54 Ff

(b) £100 = 100 × 9 Ff = 900 Ff

(c) $54 \text{ Ff} = £54 \times \frac{1}{9} = £\frac{54}{9} = £6$

(d) $28 \text{ Ff} = £28 \times \frac{1}{9} = £\frac{28}{9} = £3\frac{1}{9} \approx £3.11$

Q5 *(b)* 21 miles = 21 × 1.6 km = 33.6 km

(c) $80 \text{ km} = 80 \times \frac{1}{1.6} \text{ miles} = \frac{80}{1.6} \text{ miles}$

$$= \frac{800}{16} \text{ miles} = 50 \text{ miles}$$

T can remind Ps that many European currencies were replaced by the Euro in 2001. This question refers to the French franc, in use before that date.

Individual work, monitored, helped.

Checking: T has prepared an OS in advance with detailed solutions. After stopping the work, T puts OS on OHP, Ps check and correct their work.

Feedback. Praising.

30 mins

Y8	UNIT 7 *Ratio and Proportion* Lesson Plan 5	*Linear Conversion*
Activity		*Notes*
5	**Review of ratios** T: Let's look back at what we've covered in this unit. **M 7.2 with extra questions:** **2. (b) Also write the ratio in the form of 1 : *n*.** **9. A map uses a scale of 1 : 200 000.** **(a) Calculate the actual distance, in km, that is represented by 4 cm on the map.** **(b) What distance on the map represents an actual distance of 20 km?** *39 mins*	Mental work, summarising the topic of this unit. Task appears on OHP. T asks, gives time for Ps to think, points to a volunteer Ps to answer, agrees/waits for correction, then praises, question by question. (Slower Ps may be allowed to write in Ex.Bs.)
6	**An example of ratio in geometry** The angles of a triangle are in the ratio of the three least odd prime numbers. Find the angles. *Solution:* $\alpha : \beta : \chi = 3 : 5 : 7$ $\alpha + \beta + \chi = 180°$ $3 + 5 + 7 = 15$ $180 \div 15 = 12$ $\alpha = 3 \times 12° = 36°$ $\beta = 5 \times 12° = 60°$ $\chi = 7 \times 12° = 84°$ *45 mins*	Final task, applying Ps' knowledge about ratio to geometry. Individual work, monitored, helped. Task appears on OHP, followed by solution. Discussion, feedback, self-correction. Praising.
	Set homework **(1) PB 7.4, Q3** **PB 7.4, Q4** **(2) The side lengths of a triangle are in the ratio 2 : 3 : 4. Calculate the side lengths if the perimeter of the triangle is 13.5 cm.**	