

A4 Ratio and Proportion

Activities

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A4.1 Price Ratios

A4.2 Paper Sizes

A4.3 How Far Away?

Notes and Solutions (1 page)

ACTIVITY A4.1*Price Ratios*

You can buy many products (particularly food) in a range of sizes. We usually assume that the larger the size, the better the value.

1. Why do you expect to get better value with larger sizes?

How can you find out which size is the best value?

In supermarkets, you will often find that the price per unit (e.g. per gram or per ml) is given (often in small print) on the shelf price label.

For example, a mixed fruit drink is sold in a range of sizes. The data in the table opposite was obtained from a supermarket.

<i>Volume</i>	<i>Price</i>
200 ml	34 p
500 ml	65 p
1500 ml	£1.50
3000 ml	£2.70

2. For each size, work out (to the nearest pence) the price per 1 ml, and then per 100 ml.

3. (a) Using the price for the 200 ml size drink, calculate how much you would pay for each of the other sizes if the prices were in the same ratio.

- (b) Similarly, using the price for the 3000 ml size drink, calculate how much you would pay for each of the other sizes, if the prices were in the same ratio.

Extension

Go to your local supermarket and undertake a similar analysis of other products which can be bought in different sizes (e.g. washing powder, cola, baked beans, coffee, etc.).

Can you find any products where it is *not* more economic to buy the largest size?

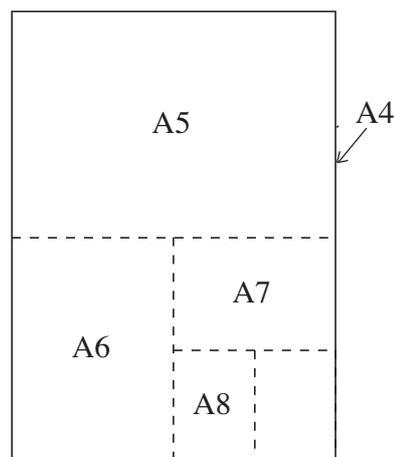
ACTIVITY A4.2*Paper Sizes*

In Europe, paper is usually produced and sold in the sizes

A0, A1, A2, . . . , A10

The A4 size is the usual size of photocopier paper in Europe; A5 is half the size of A4; A6 half the size of A5, etc: the sketch below illustrates these facts.

1. Cut out an A4-size sheet of paper, to the nearest millimetre.
2. From your A4 sheet of paper, accurately cut out
A5, A6, A7, A8, A9 and A10
sizes of paper. For each size, measure the width and length to the nearest millimetre.
3. Calculate the ratio of length : width for each size.
What do you notice?
4. What is the relationship between the length of A4 and width of A5, length of A5 and width of A6, etc ?

**Extension**

Deduce the dimensions of an A0-size sheet of paper.

For information

American paper sizes differ from those used in Europe. The 'letter' paper size is the most commonly used; 215.9 mm × 279.4 mm.

ACTIVITY A4.3

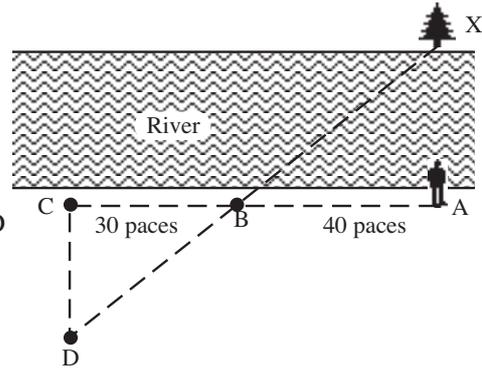
How Far Away?

Pace Length Before you attempt the tasks below you must first find the length of your pace. To do this, it is best to walk 10 paces, measure the distance, and divide by 10.

Distance

It is useful to be able to judge distances, and it is often not as difficult as you might think. Suppose, for example, you want to estimate the distance across a river. You can follow the procedure below:

- Find a landmark, say X, on the opposite bank from you, at A.
- Walk along your side of the river for, say, 40 paces and mark the point with a stick, B.
- Walk on 30 paces to C, and walk inland to a point D so that DBX are in a straight line.
- Count the number of paces taken between C and D.



Problem 1 What can you say about triangles DCB and XAB?

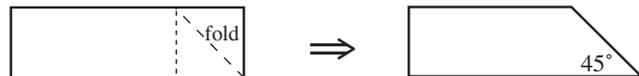
Problem 2 What is the ratio $\frac{XA}{CD}$? This can now be used to find XA.

Height

There is a similar method of estimating the height of a building. You follow the procedure below, but first you need to make a *sight gauge*.

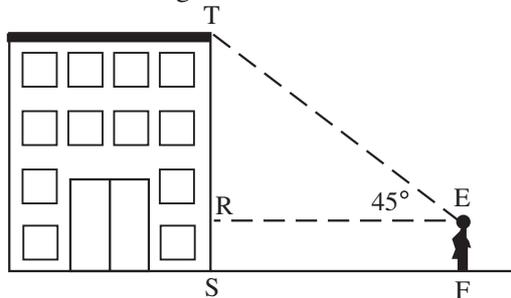
To Make a Sight Gauge

Fold a strip of card as shown opposite.



This gives a 45° angle.

- Starting at the foot of the building, count the number of paces as you walk away.
- Stop walking when, looking along your sight gauge, you can see the top of the building.



(Make sure that you keep the gauge level.)

Problem 3 Why is $TR = RE$?

Problem 4 Explain why the height of the building = $RE +$ your height.

Task

Try out both these methods, and judge their accuracy.

Extension

Discuss other ways of estimating distances.

ACTIVITIES A4.1 – A4.3

Notes and Solutions

Notes and solutions given only where appropriate.

- A4.1** 2. 1.7 p (2 p, to nearest p) and 17 p
 1.3 p (1 p, to nearest p) and 13 p
 0.1 p and 10 p
 0.09 p and 9 p

3. (a) 85 p, £2.55, £5.10
 (b) 18 p, 45 p, £1.35

A4.2 1. and 2. Approximate sizes are:

A	Length (mm)	Width (mm)
4	297	210
5	210	148
6	148	105
7	105	74
8	74	52
9	52	37
10	37	26

3. Constant ratio of about 1 : 1.4 (in fact, 1 : $\sqrt{2}$).
 4. Length of A4 : width of A5 = 2 : 1
 Length of A5 : width of A6 = 2 : 1

Extension

Using $\sqrt{2}$ as the ratio, the dimensions are 1188 mm and 840 mm.

- A4.3** 1. The triangles are similar.
 2. $\frac{XA}{CD} = \frac{BA}{BC} = \frac{40}{30}$, so $XA = \frac{4}{3} \times CD$
 3. $TR = RE$ since TRE is an isosceles triangle (angle RTE = angle RET = 45°)
 4. The height of the building = $TR + RS = RE +$ height of observer .

Extension Sight can be used to estimate distances but it is probably not a very accurate method.

Sound can sometimes be used, since sound travels at a speed of 333 m s⁻¹. So if there is some way to *see* an activity and to time how long it takes to *hear* the activity, we can use the formula

$$\text{distance (m)} = \text{time (s)} \times 330.$$

(For example, a lightening flash can be seen almost instantaneously but there is often some time before the thunderclap is heard. Every 5 second interval equates to about 1 mile distance.)