1. You are to determine the density of the material used to make a A-4 size (30 cm × 21 cm) photocopy paper.

(a) You are provided with a spring balance, a triple-beam balance and a chemical balance which are available in a school laboratory. What is the most suitable measuring instrument that you would select to determine the mass (m) of the sheet of paper?

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(b) In order to determine the volume of the paper you have to take three measurements. Indicate below the most suitable and appropriate measuring instrument you would use to measure each of them.

Measurement	Instrument
(1) Length of the paper (say l)	.....
(2) Width of the paper (say w)	.....
(3) Thickness of the paper (say t)	.....

(c) Write down an expression for the density (d) of the material used to make the paper, in terms of m, l, w and t.

d = ...

(d) When measuring the thickness, it is more appropriate to take several readings at different places of the paper. What is the reason for this?

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(e) (i) Once the most appropriate measuring instruments are used by a student to measure l and t, the values he obtained are given below. Determine the fractional error of each of the measurements l and t. (It is **not** necessary to simplify your answers.)

	Fractional error
(1) l = 30.0 cm	.....
(2) t = 0.15 mm	.....

(ii) In order to achieve the fractional error of t same as that of l, a student suggested to measure the thickness of a bundle of papers. How many papers does he need to make the bundle?

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(f) In practice, a unit called gsm is used to measure the thickness of papers. gsm stands for grams per square metre, i.e. the mass of 1 m^2 area of a given paper.

Assuming that in (a) and (b) above, m was measured in grams and the l and w were measured in centimetres, write down an expression for the gsm value of the paper.

gsm value = ...