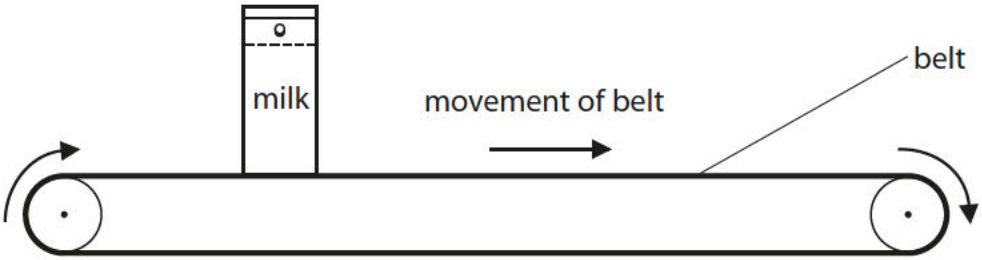
1 Supermarkets use conveyer belts to move shopping at the till.

The diagram shows a carton of milk being pulled along by a horizontal conveyer belt.



The horizontal force on the carton from the belt is 1.7 N.

The carton moves a distance of 0.46 m.

(a) (i) State the equation linking work done, force and distance.

(1)

(ii) Calculate the work done moving the carton.

(2)

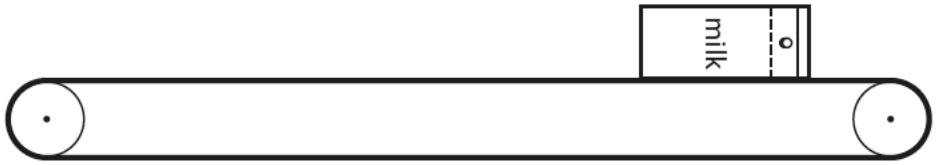
Work done = ... J

(iii) State how much energy is transferred to the carton.

(1)

Energy transferred = ... J

(b) The belt stops suddenly and the carton falls over.



(i) How does this affect the kinetic energy of the carton?

(1)

.....

.....

(ii) Why does falling over reduce the gravitational potential energy of the carton?

(1)

.....

.....

.....

(Total for Question 1 = 6 marks)

2 (a) Which of these is a vector quantity?

(1)

☒ **A** density

☒ **B** force

☒ **C** mass

☒ **D** speed

(b) Which of these is a scalar quantity?

(1)

☒ **A** acceleration

☒ **B** energy

☒ **C** momentum

☒ **D** velocity

(c) When a book from a low shelf is placed on a higher shelf, the book gains

(1)

☒ **A** gravitational potential energy

☒ **B** mass

☒ **C** weight

☒ **D** work

(d) When an object falls at terminal velocity

(1)

☒ **A** it accelerates at 10 m/s^2

☒ **B** it has no weight

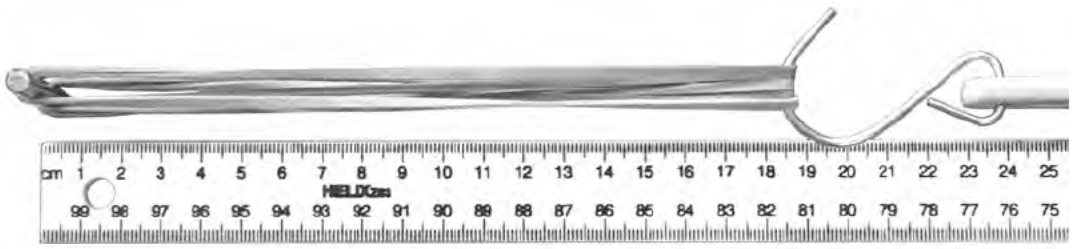
☒ **C** the resultant vertical force is downwards

☒ **D** the vertical forces on it are balanced

(Total for Question 2 = 4 marks)

3 A student investigates the stretching of rubber bands.

She stretches four rubber bands as shown in the photograph.



She applies a force of 5.0 N and measures the length of the rubber bands.

She repeats the experiment with different numbers of rubber bands, using a force of 5.0 N each time.

The table shows her results.

Number of rubber bands	Stretched length in cm
1	43.2
2	28.0
3	21.5
4	
5	17.6
6	17.0

(a) (i) Estimate the length of the four rubber bands shown in the photograph and use your value to complete the table.

(1)

(ii) Suggest two reasons why your estimate may not be accurate.

(2)

1 .....

.....

2 .....

.....

(b) Suggest how the student made this investigation a fair test.

(1)

.....

.....

(c) (i) The number of rubber bands is a series of whole numbers.

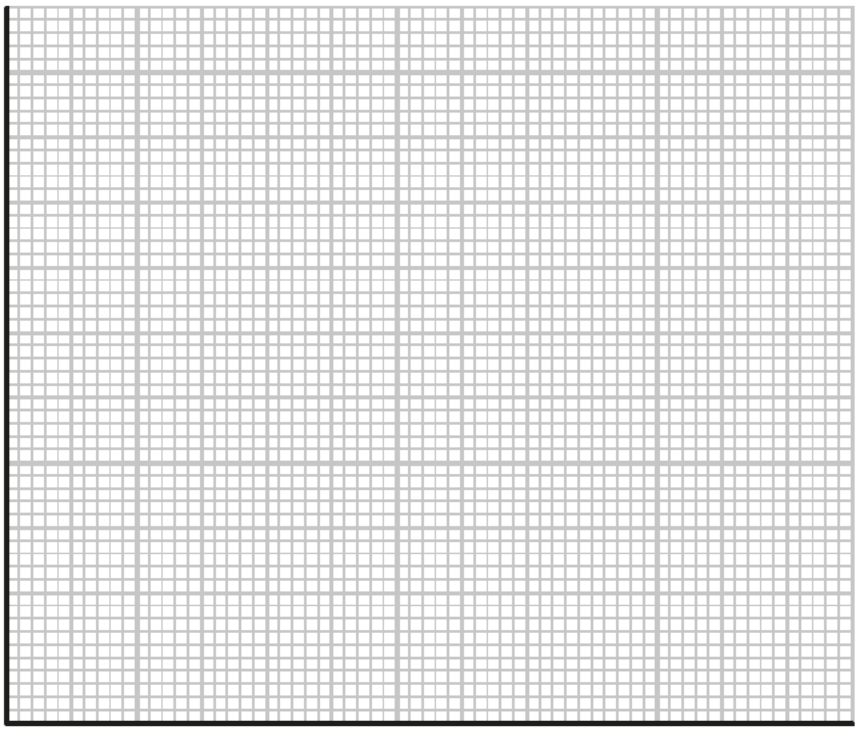
State the name of this type of variable.

(1)

.....

(ii) Display the results of the student's investigation on the grid.

(4)



(iii) Describe the relationship between the number of rubber bands and the stretched length.

(2)

.....

.....

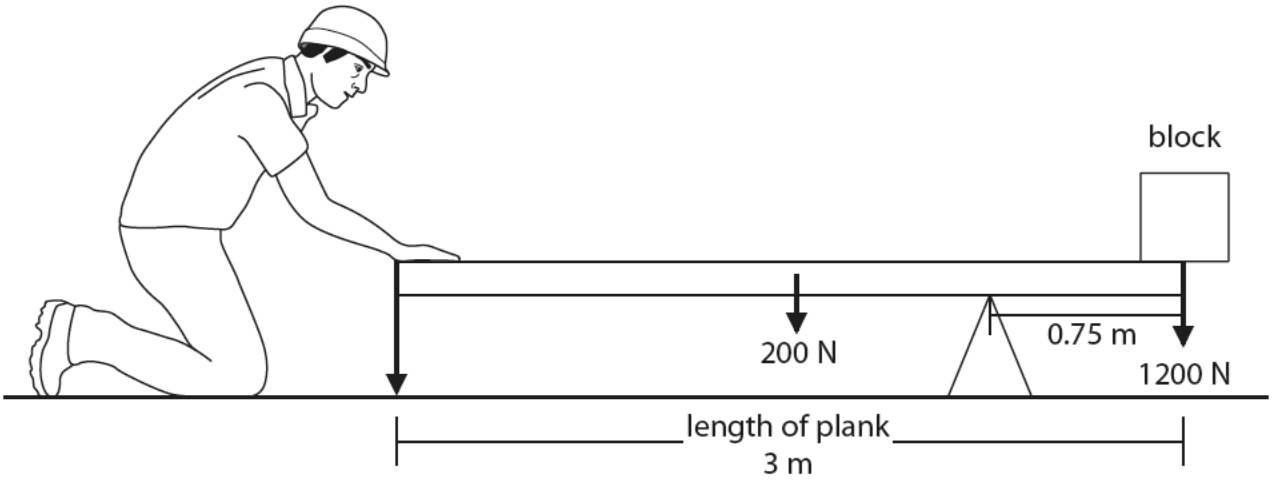
.....

.....

(Total for Question 3 = 11 marks)

4 A man uses a uniform plank to lift a block.

He holds the plank horizontal.



The arrows on the diagram represent three forces on the plank.

(a) Complete the table to identify the missing force.

(1)

Force	Name of force
F	force of man pushing down on the plank
1200 N	weight of block
200 N	

(b) (i) State the equation linking moment, force and perpendicular distance from the pivot.

(1)

(ii) Calculate the clockwise moment of the block about the pivot.

(2)

moment = ... Nm

(c) Calculate the force of the man pushing down on the plank.

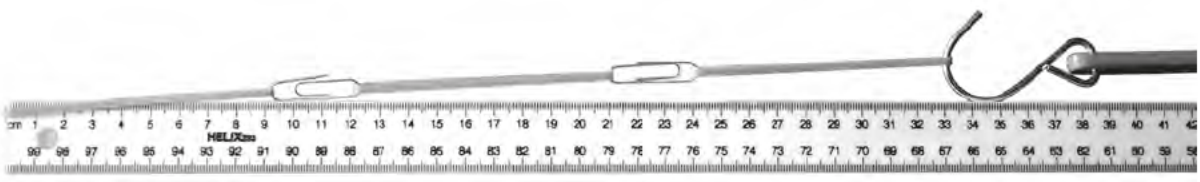
(4)

force = ... N

(Total for Question 4 = 8 marks)

5 A student makes chains of elastic bands by joining them together with paperclips.

He uses a newtonmeter to stretch each chain along a metre rule, as shown in photograph **A**.



Photograph A

For each chain, he records

- the number of elastic bands
- the length when the tension is 2 N
- the length when the tension is 1 N

Then he calculates the difference in length for each chain.

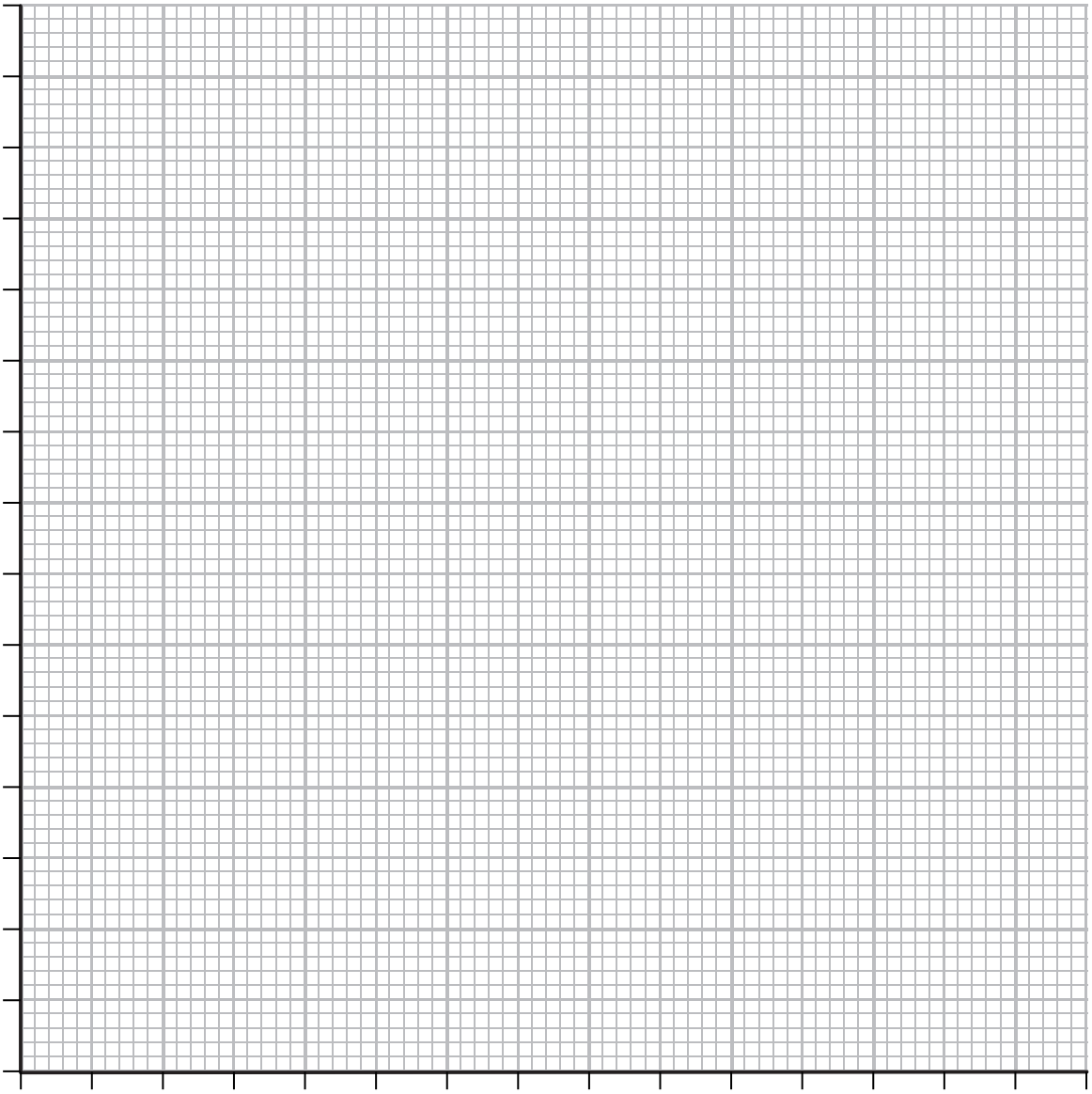
(a) (i) Complete the table by calculating the missing value.

(1)

Number of elastic bands	Length in cm		Difference in length in cm
	When tension 2 N	When tension 1 N	
1	8.1	7.5	0.6
2	20.2	18.2	2.0
3	31.7	29.3	2.4
4	43.7	40.3	3.4
5	56.3	51.6	4.7
6	67.6	62.5	

(ii) Use the grid to plot a graph to show the relationship between the number of elastic bands and the difference in length.

(5)



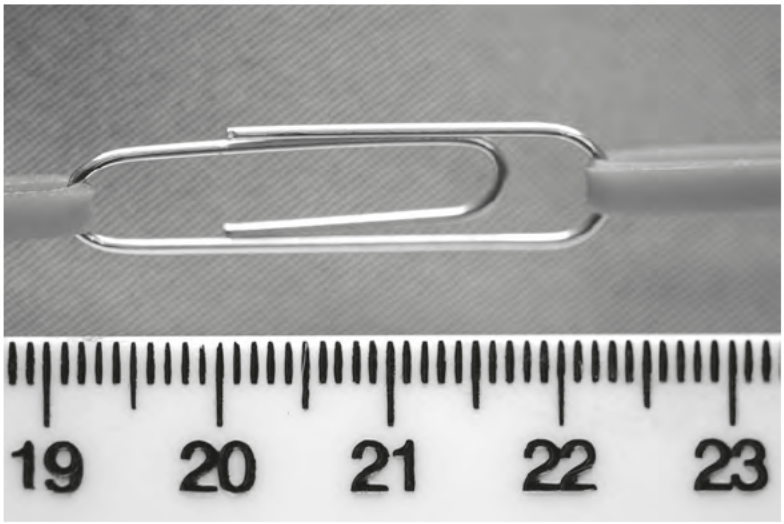
(iii) Describe your line of best fit.

(2)

.....

.....

(b) Photograph **B** shows a paperclip in one of the chains against the same metre rule.



Photograph B

Use photograph **B** to estimate the length of this paperclip.

(2)

Length ..... cm

(c) Look again at photograph **A**.

Suggest two ways that the student could improve his measuring technique.

(2)

1 .....

.....

2 .....

.....

(Total for Question 5 12 marks)