Dingwall Academy Mathematics Department

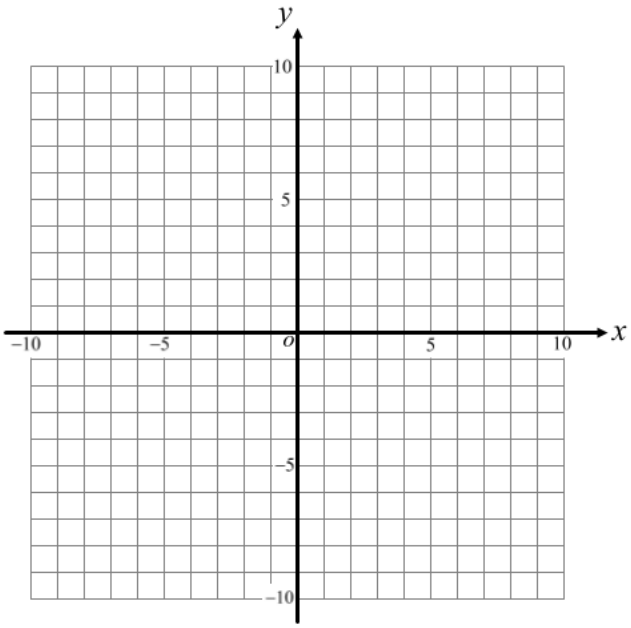
# Unit 2. Relationships.

# Preparation for Assessment

Q1i) Complete the table below for $y = 3x - 2$.

| x | -1 | 0 | 2 | 4 |
|---|---|---|---|---|
| y | | | | |

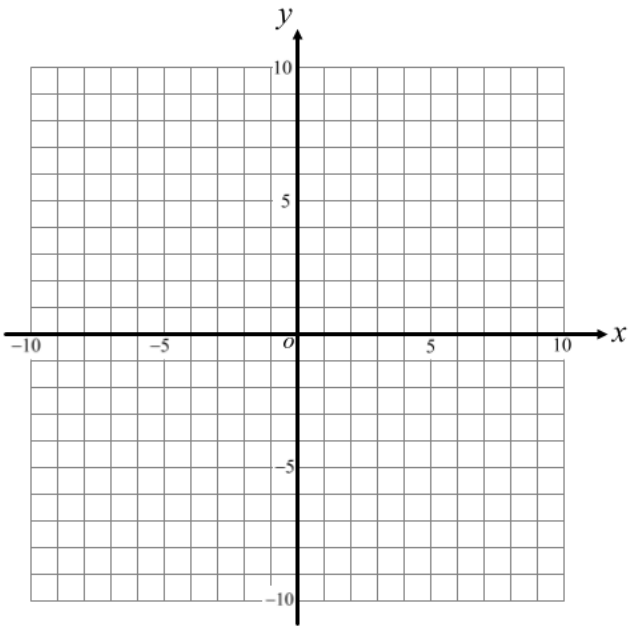
Draw the line $y = 3x - 2$.




ii) Complete the table below for $y = 2x + 4$.

| x | -1 | 0 | 2 | 4 |
|---|---|---|---|---|
| y | | | | |

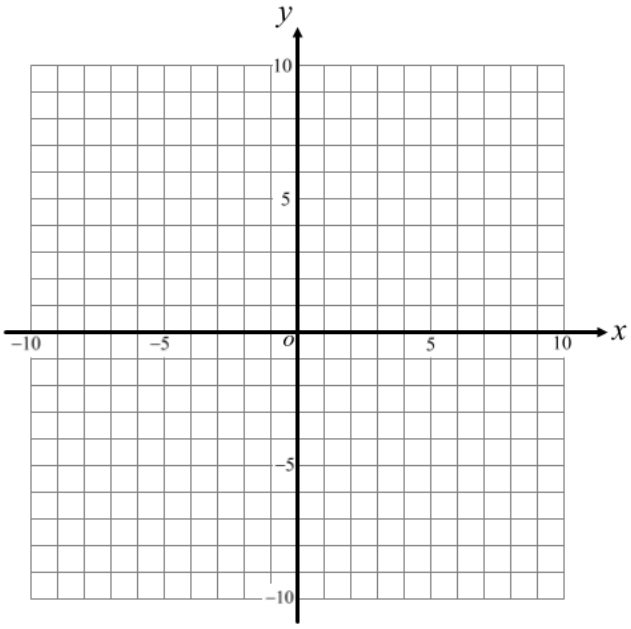
Draw the line $y = 2x + 4$.




iii) Complete the table below for $y = 2x - 3$.

| x | -1 | 0 | 2 | 4 |
|---|---|---|---|---|
| y | | | | |

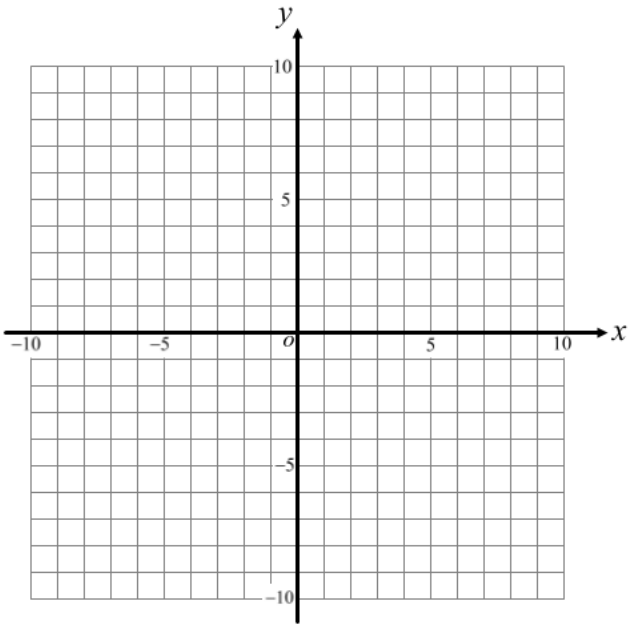
Draw the line $y = 2x - 3$.



iv) Complete the table below for $y = -x - 2$.

| x | -1 | 0 | 2 | 4 |
|---|---|---|---|---|
| y | | | | |

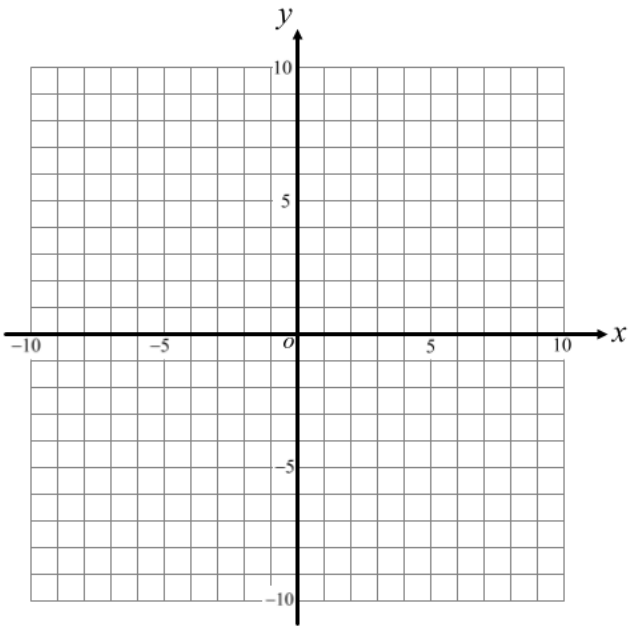
Draw the line $y = -x - 2$.




v) Complete the table below for $y = 4x - 3$.

| x | -1 | 0 | 2 | 4 |
|---|---|---|---|---|
| y | | | | |

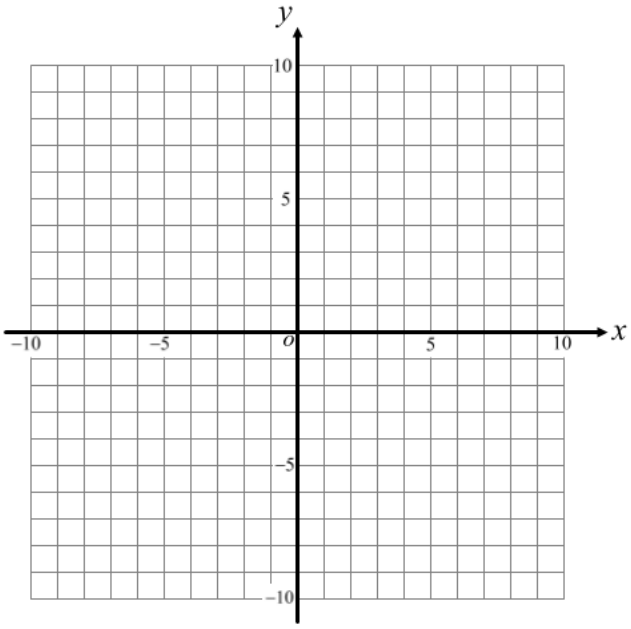
Draw the line $y = 4x - 3$.




vi) Complete the table below for $y = 3x + 4$.

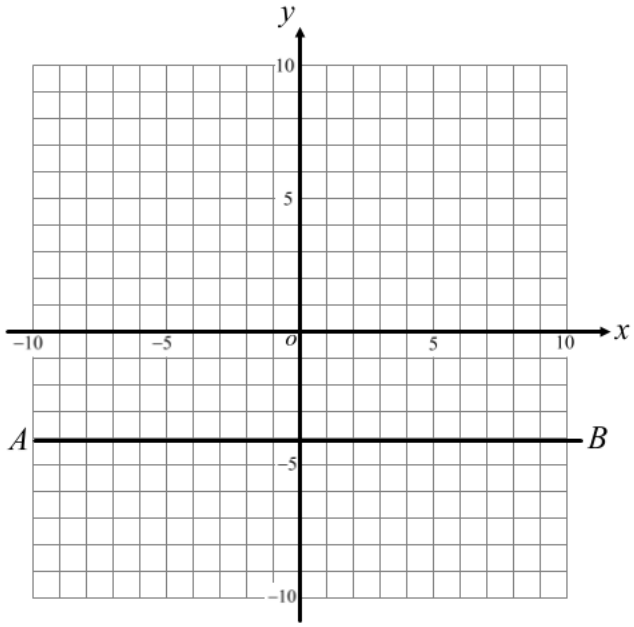
| x | -1 | 0 | 2 | 4 |
|---|---|---|---|---|
| y | | | | |

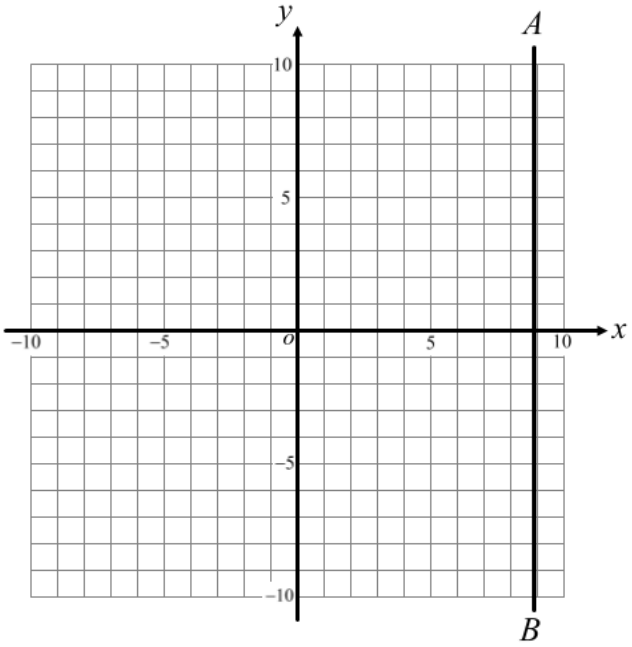
Draw the line $y = 3x + 4$.

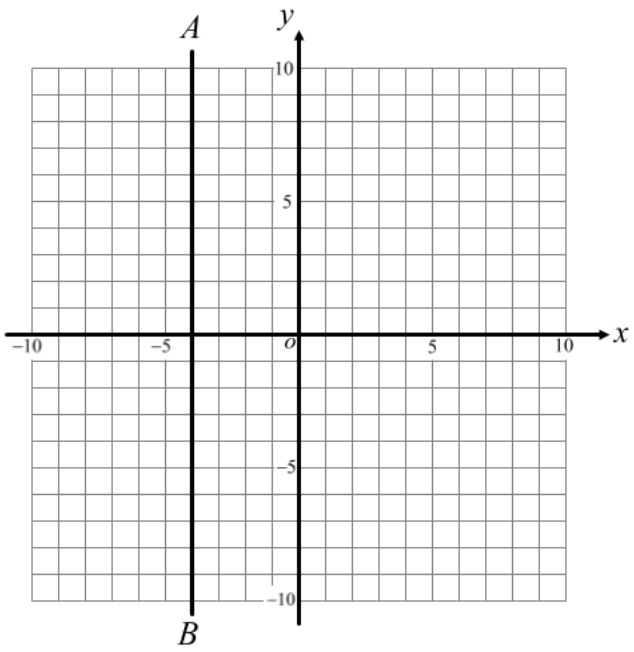


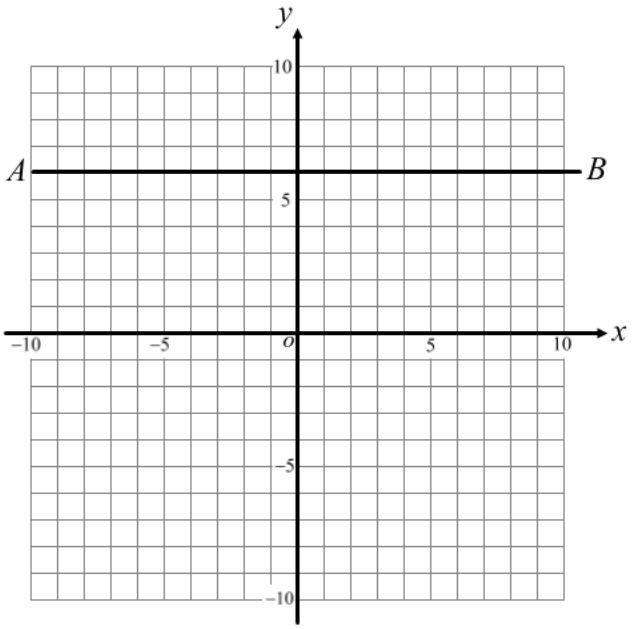
Q2 Line **AB** is shown on the grid below.

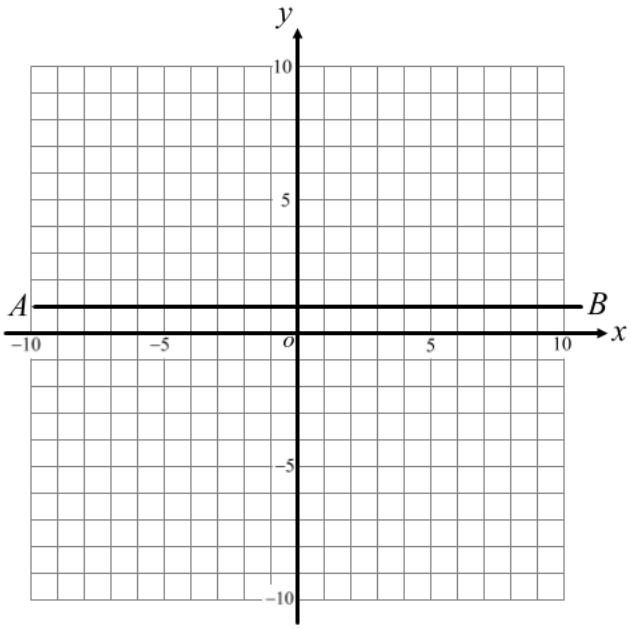
Write down the equation of **AB**

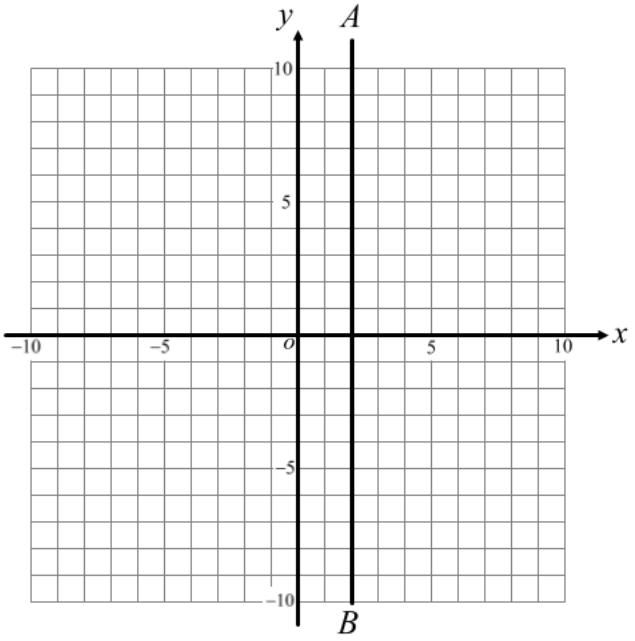


Q3 Solve the following Equations

***Set down your working carefully.***

| | | | |
|---|---|---|---|
| (a) | $2x + 2 = 8$ | (b) | $2x + 3 = 13$ |
| (c) | $3x + 4 = 10$ | (d) | $5x + 4 = 19$ |
| (e) | $2x - 1 = 9$ | (f) | $2x - 2 = 12$ |
| (g) | $4x - 3 = 25$ | (h) | $3x - 2 = 19$ |
| (i) | $6x - 3 = 45$ | (j) | $7x - 1 = 55$ |
| (k) | $8x + 7 = 31$ | (l) | $9x - 6 = 39$ |
| (m) | $3x - 7 = 2$ | (n) | $4x + 11 = 15$ |
| (o) | $5x + 40 = 40$ | (p) | $3x - 1 = 62$ |
| (q) | $7x - 7 = 0$ | (r) | $4x - 2 = 0$ |
| (s) | $6x - 2 = 13$ | (t) | $8x + 1 = 21$ |
| (u) | $20x - 10 = 0$ | (v) | $100x - 25 = 0.$ |

Q4 i) The formula for calculating speed is given in the form $s = \frac{d}{t}$

Change the subject of the formula to $d$

ii) Hooks Law is expressed as $F = kx$

Change the subject of the formula to $k$

iii) Newton's 2nd Law is expressed as $F = ma$

Change the subject of the formula to $a$

iv) The formula for gravitational potential energy is expressed as $E = mgh$

Change the subject of the formula to $g$

v) The equation to calculate work done is $W = Fd$

Change the subject of the formula to $d$

vi) An equation to calculate power used is expressed as $P = \frac{W}{t}$

Change the subject of the formula to $t$

vii) An equation to calculate the pressure inside a tube is given by $P = \frac{F}{A}$

Change the subject of the formula to $F$

Q5 i) Change the subject of the formula $y = 5x + 2$ to $x$

ii) Change the subject of the formula $g = 7q - 5$ to $q$

iii) Change the subject of the formula $m = 8d + 13$to $d$

iv) Change the subject of the formula $p = 2q - 7$ to $q$

v) Change the subject of the formula $y = 9n - 7$ to $n$

vi) Change the subject of the formula $z = 4x + 5$ to $x$

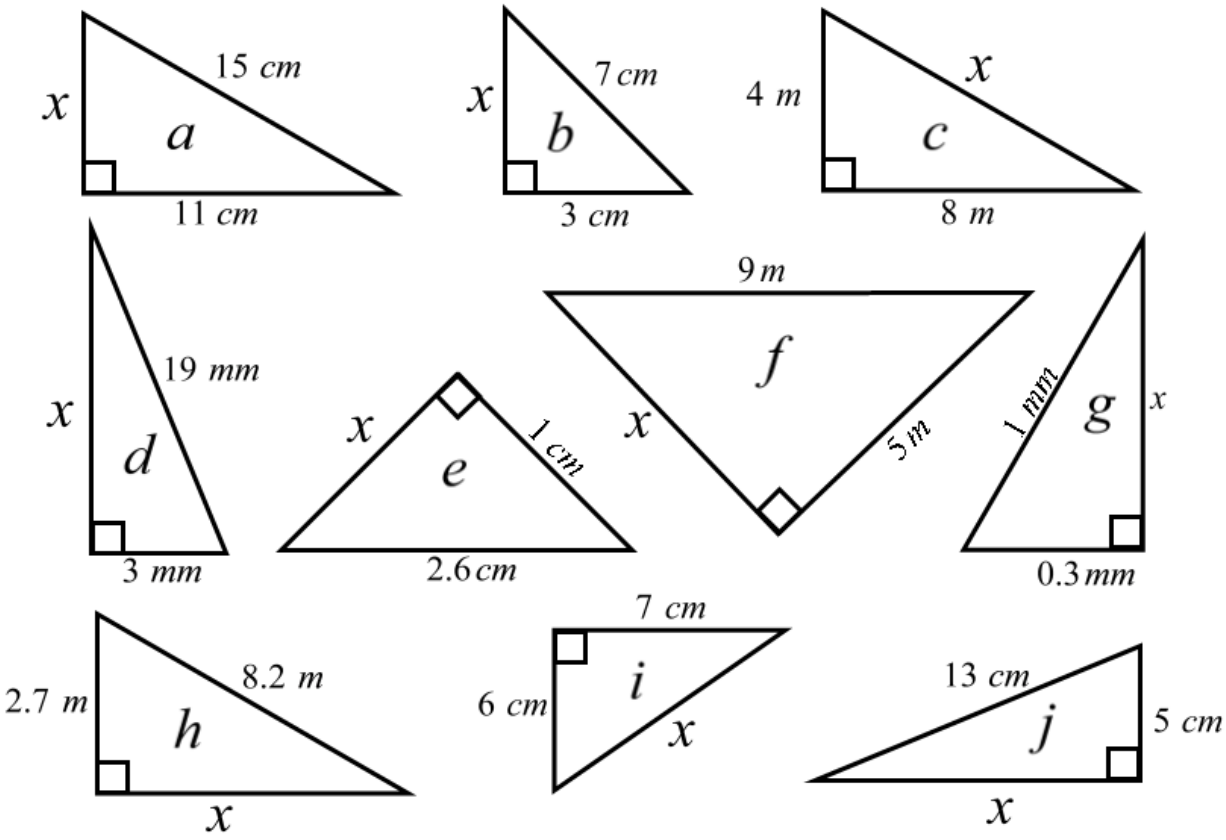
vii) Change the subject of the formula $h = 3 - 5g$ to $g$

viii) Change the subject of the formula $v = 13 + 3t$ to $t$

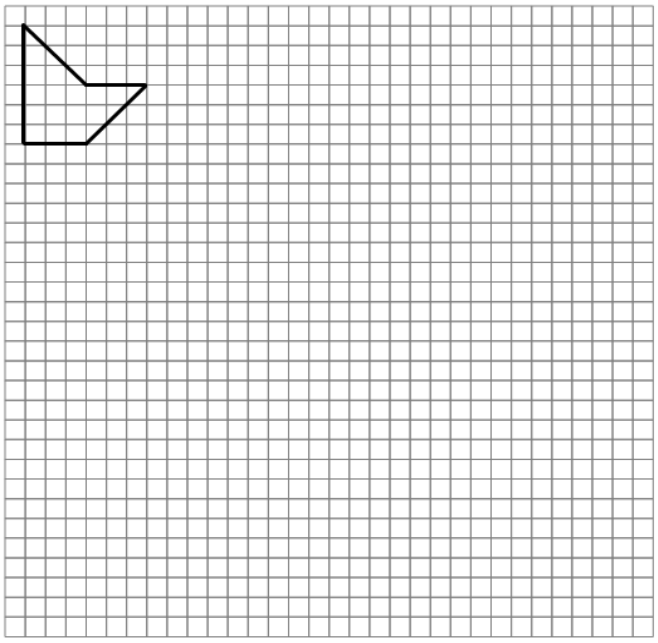
ix) Change the subject of the formula $a = -4 - 3b$ to $b$

x) Change the subject of the formula $y = \frac{1}{5}x + 4$ to $x$

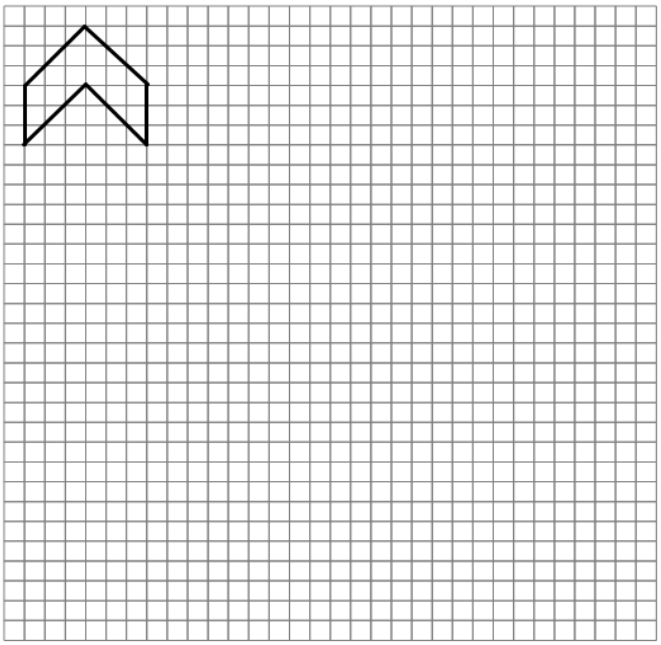
Q6 Calculate the length of side $x$ in each of the following right angled triangles.



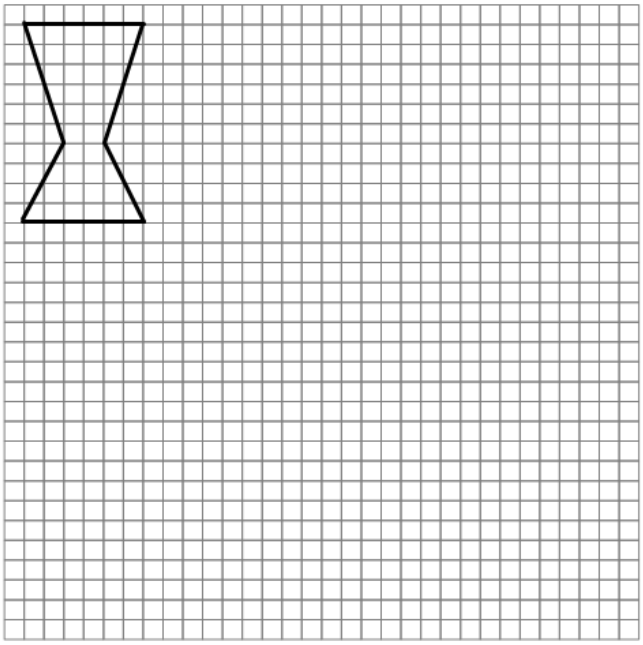
Q7 Enlarge the pictures below by the factor stated below each diagram.



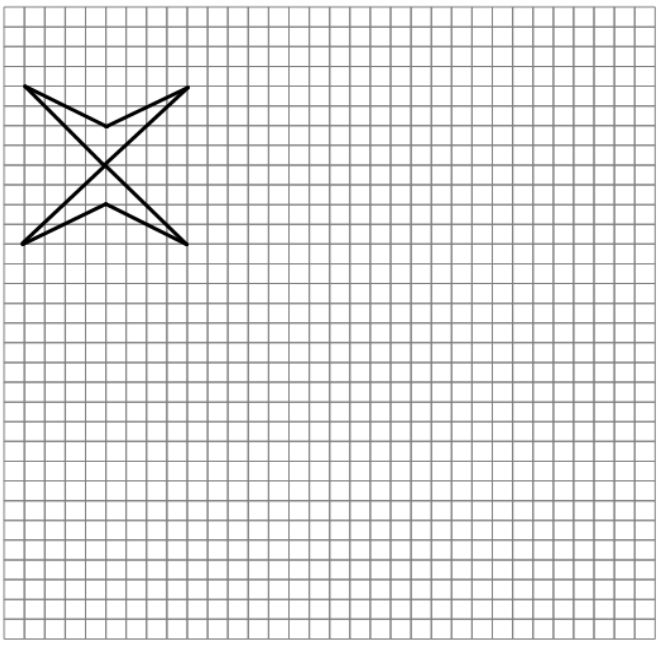
Enlarge by a factor of $\frac{5}{3}$



Enlarge by a factor of $\frac{4}{3}$

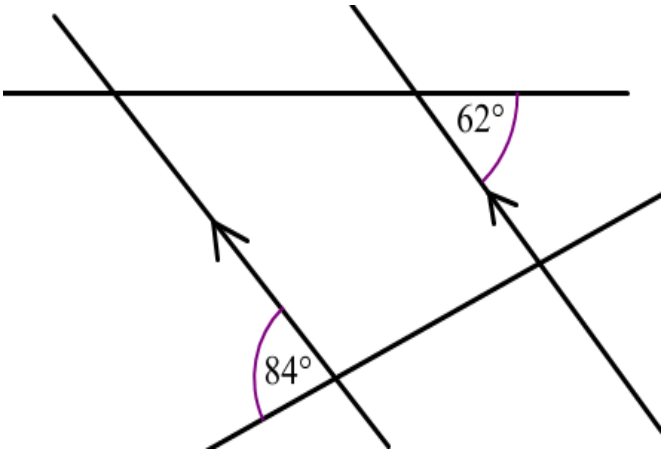


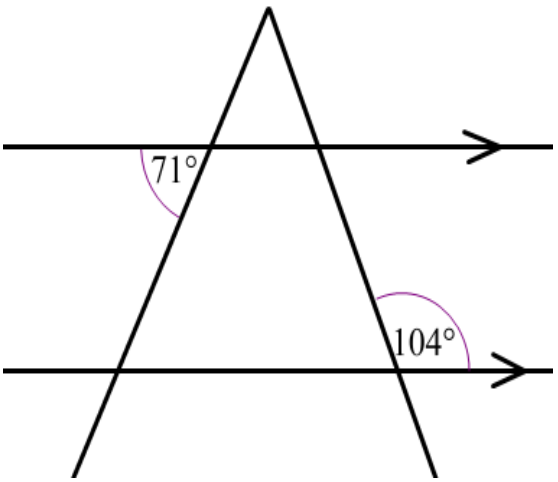
Enlarge by a factor of $\frac{3}{2}$



Enlarge by a factor of $\frac{5}{2}$

Q8 Fill in all of the missing angles in the diagrams below.

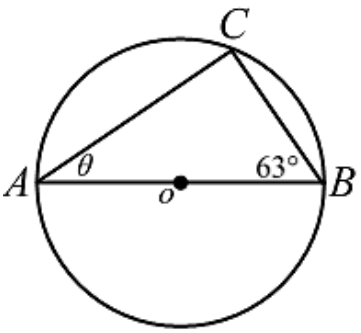


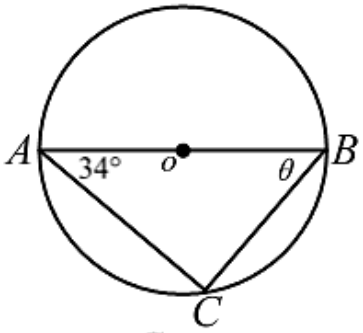



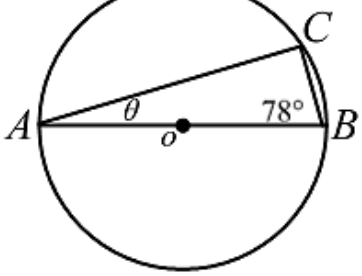

Q9 $AB$ is the diameter of a circle, centre $o$.

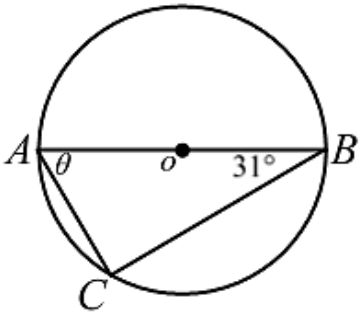
C is a point on the circumference of the circle.

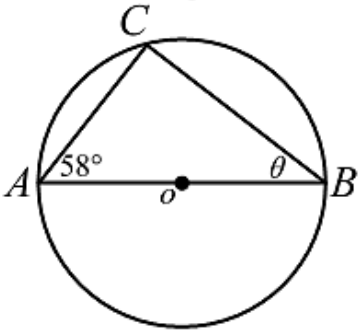
Calculate angle $\theta$ in each of these circles.

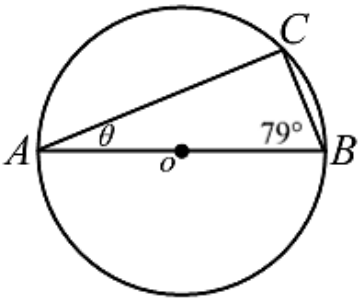


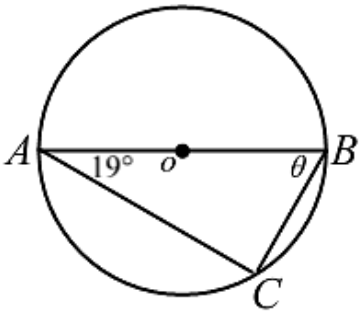



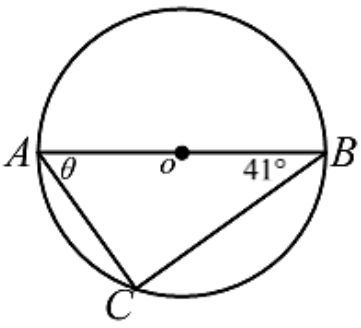



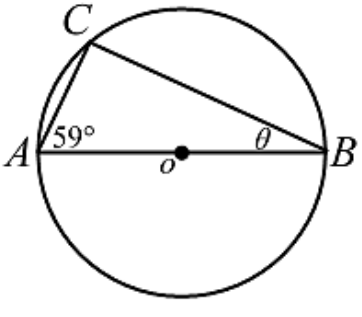



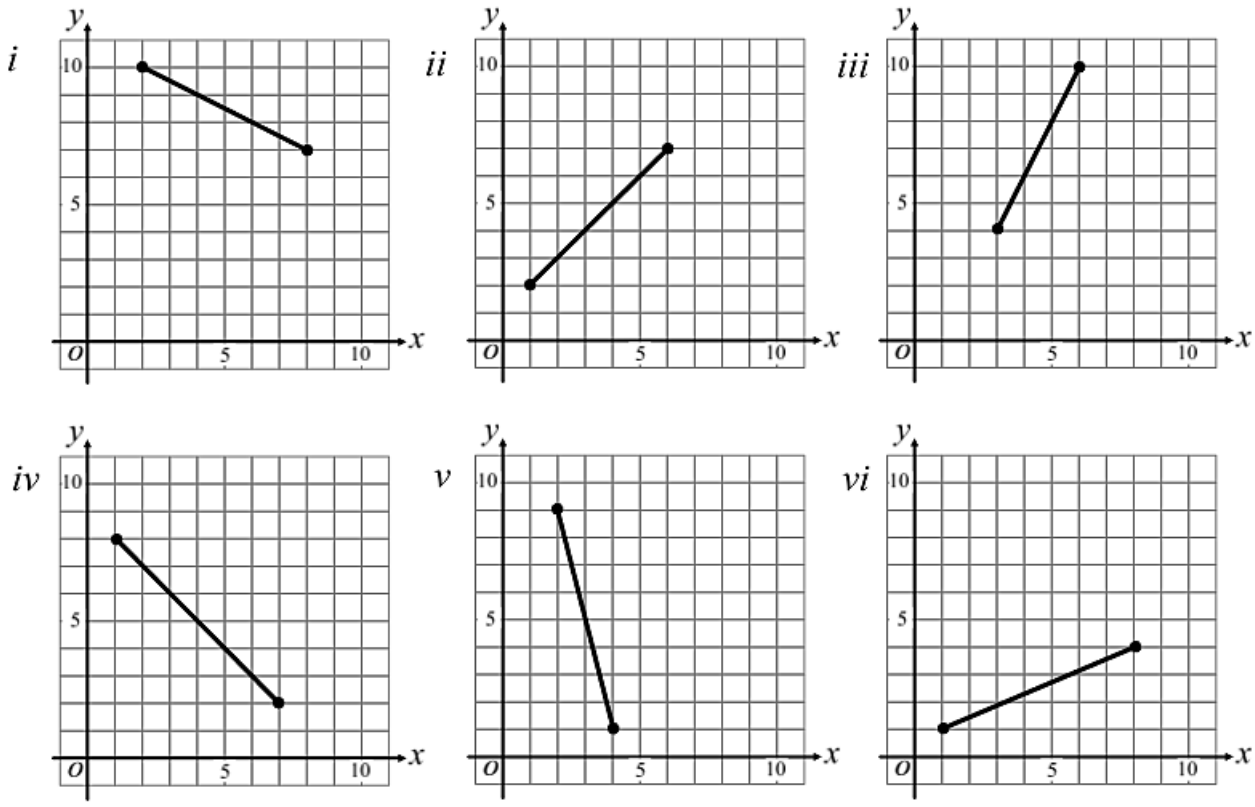



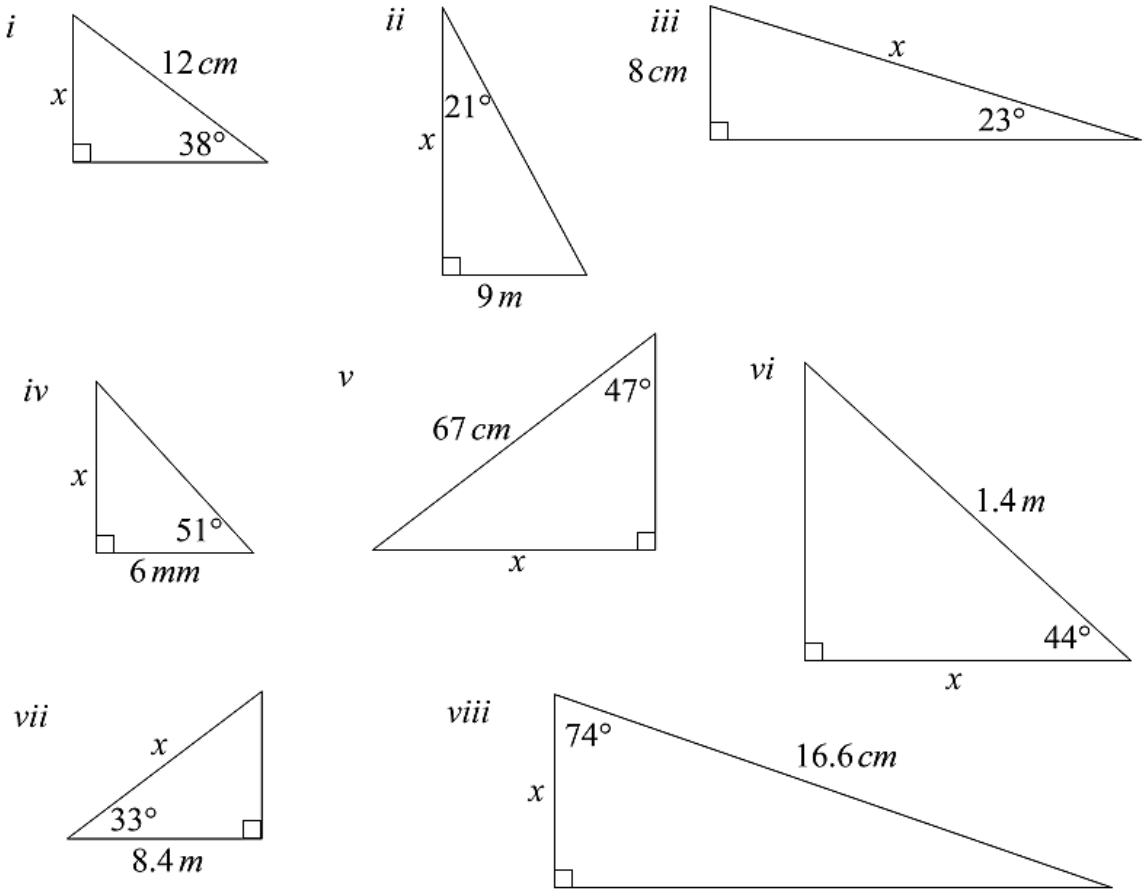



Q10 Calculate the lengths of the lines shown in the graphs below.

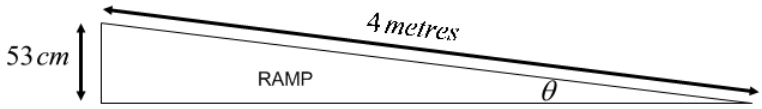



Q11 Calculate the length of side $x$ in the right angled triangles shown below.



Q12

i) A disabled man is having a new access ramp fitted in his house as shown in the diagram below.




For safety reasons, the maximum angle of inclination of the ramp cannot exceed 8°.

Is the ramp suitable? **(Justify your answer)**

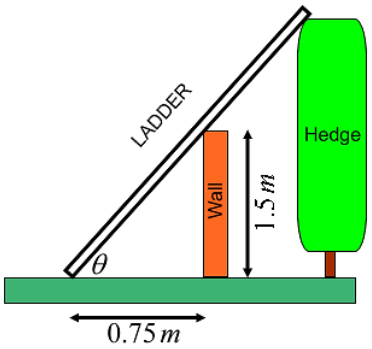
ii) Peter is a gardener.

He has been hired to trim some hedges but a garden wall is making it difficult for him to set his ladders properly.

The manufactures recommend that the minimum safe angle of inclination of the ladder is 50°.

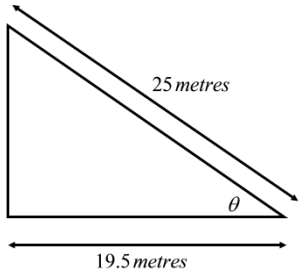
Using the diagram below, work out if the ladder will be safe.

**(Justify your answer)**




iii) Land Rover recommends that you do not exceed a gradient of 35° on a continuous climb.

Would Land Rover recommend that you should tackle the slope shown below? **(Justify your answer)**

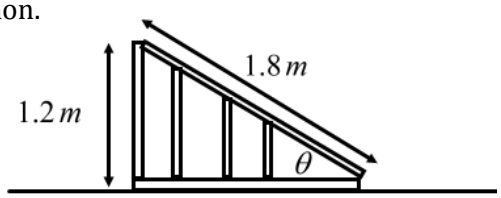



iv) Susan is building a Potato cannon for a science experiment.

Susan has worked out that a launch angle of between 42° *and* 48°, will give her the greatest distance.

Susan has asked a friend to build her a frame to hold her cannon.

Shown below is the plan of the frame.




Does the frame meet Susan's requirement for the launch angle? **(Justify your answer)**

Q13 a) A class of pupils sat two tests, one in English and one in History

The table below shows the pupils corresponding marks for both tests.

| History Mark | 40 | 38 | 35 | 75 | 60 | 85 | 87 | 95 | 54 |
|---|---|---|---|---|---|---|---|---|---|
| English Mark | 25 | 35 | 30 | 78 | 45 | 67 | 91 | 82 | 60 |

i) Draw a scattergraph of these marks on the grid provided.

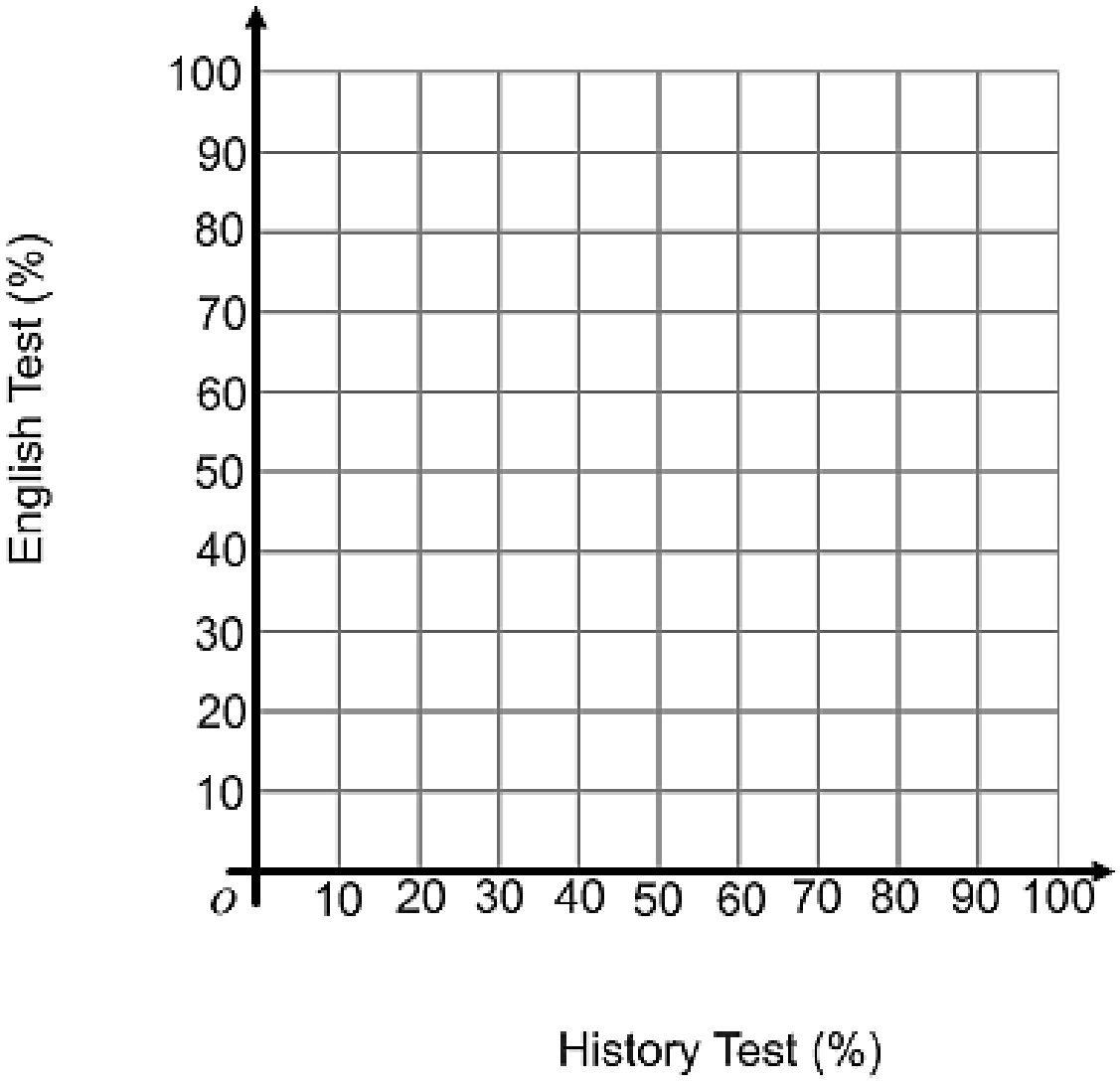
ii) Draw a best fitting straight line for this scattergraph.

iii) Another pupil scored 60% in her English test but was ill on the day of the History test.

Use your line to estimate her mark in the History Test

iv) Another pupil scored 72% in his History test. He was ill on the day of the English test. His English Teacher has estimated his mark as 65%.

Is this a reasonable estimate?



b) A coffee shop has been tracking its customer numbers and its daily takings.

The information is shown on the table below.

| Takings (£) | 120 | 112 | 115 | 85 | 70 | 72 | 150 | 105 | 113 |
|---|---|---|---|---|---|---|---|---|---|
| Number of Customers | 30 | 26 | 28 | 20 | 12 | 18 | 32 | 25 | 27 |

i) Draw a scattergraph of these marks on the grid provided.

ii) Draw a best fitting straight line for this scattergraph.

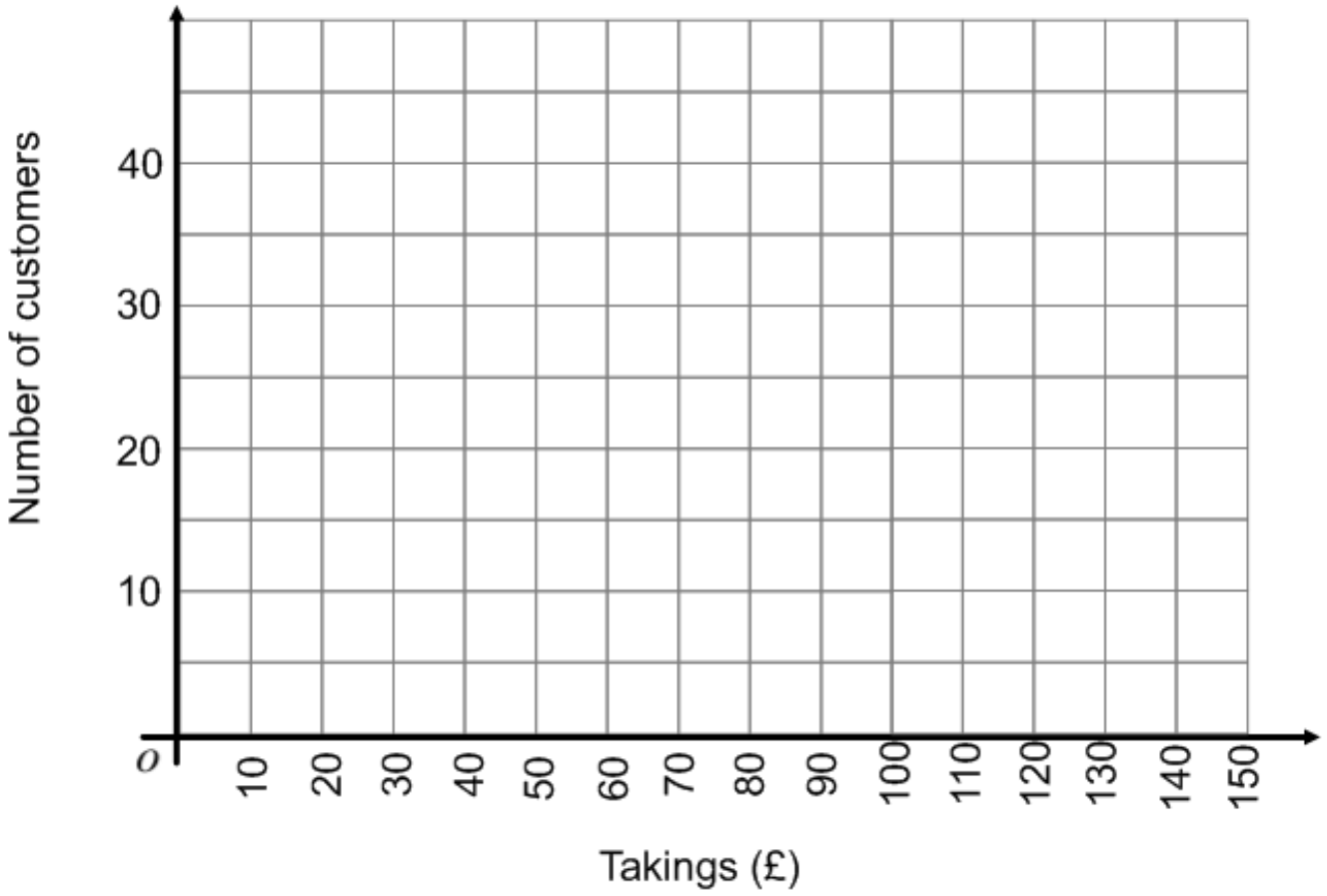
iii) On a Tuesday, the coffee shop served 29 customers.

Use your line to estimate the takings that day.

iv) On Thursday, the coffee shop's takings £95.

They estimated that they had served 25 people.

Is this a reasonable estimate?



c) During a 9 month period, a group of scientists monitored the average hours of sunshine against the average daily rainfall.

The results are shown in the table below.

| Rainfall (mm) | 1 | 3 | 2 | 10 | 10 | 2 | 5 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|
| Hours of Sunshine | 8 | 7 | 8 | 5 | 4 | 7 | 6 | 9 | 8 |

i) Draw a scattergraph of these marks on the grid provided.

ii) Draw a best fitting straight line for this scattergraph.

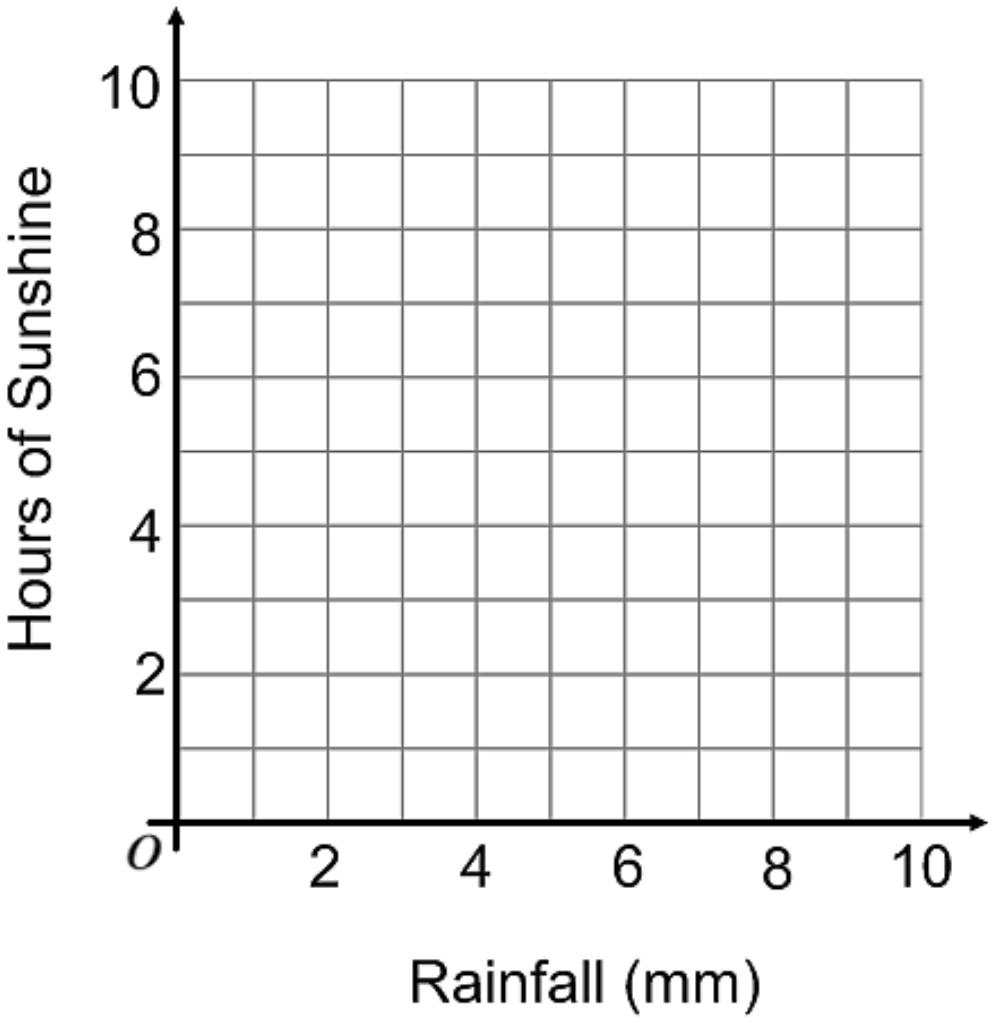
iii) In the tenth month, the scientists know that the average hours of sunshine per day will be 7.5 hours.

Use your line to estimate the average daily rainfall in that month.

iv) The twelfth month has an average daily rainfall of 4 mm.

One of the scientists estimates that there will be an average of 7.5 hours of sunshine per day in that month.

Is this a reasonable estimate?



d) A sports trainer is monitoring the resting heart rate of his clients and comparing it to the hours of exercise they get each week.

The results are shown in the table below.

| Hours of Exercise (per week) | 8 | 4 | 6 | 12 | 10 | 12 | 3 | 7 |
|---|---|---|---|---|---|---|---|---|
| Resting Heart Rate (bpm) | 70 | 90 | 82 | 61 | 60 | 55 | 87 | 75 |

i) Draw a scattergraph of these marks on the grid provided.

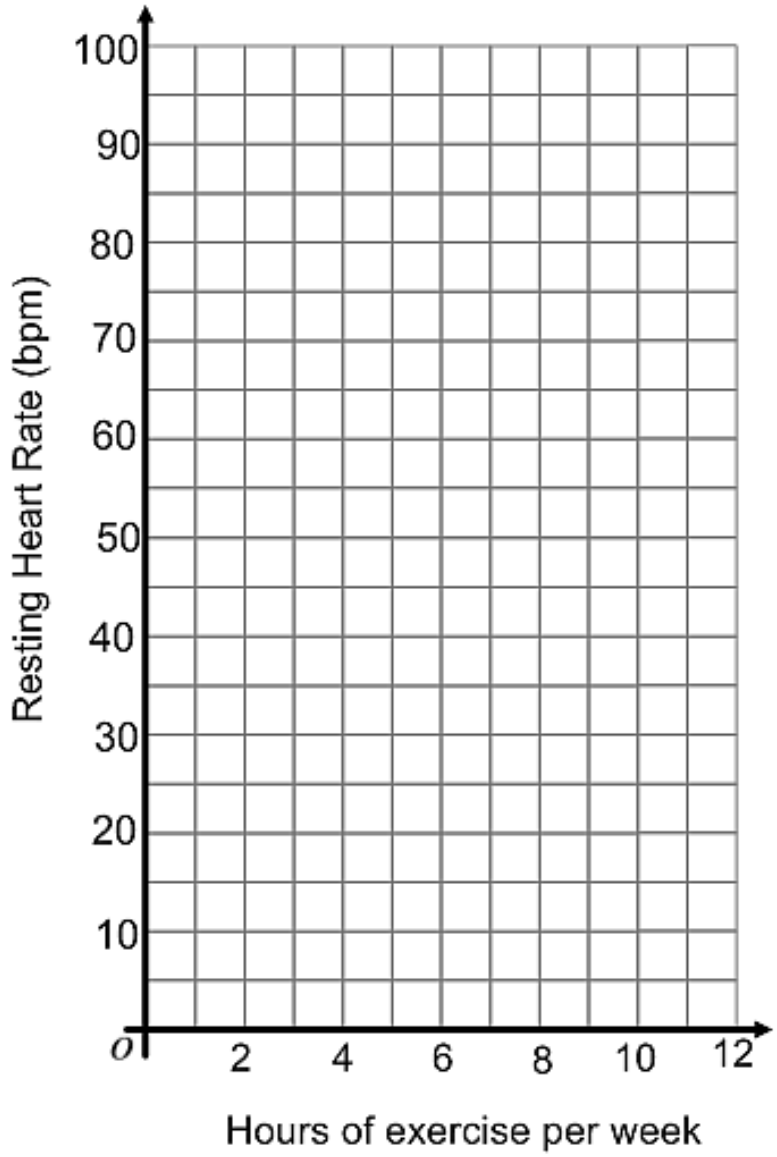
ii) Draw a best fitting straight line for this scattergraph.

iii) A new client joins the trainer. He has a resting heart rate of 78 beats per minute.

Use your line to estimate how many hours of exercise the new client does per week.

iv) Another new client joins the trainer. He tells the trainer that he does 9 hours of exercise per week. The new clients resting heart rate is 81 beats per minute.

Is the client being honest about the amount of exercise he is doing every week?



e) A financial advisor is monitoring the amount of savings his clients are putting away every month, compared to their annual salary.

The information is shown in the table below.

| Salary (£p.a) | **15,000** | **19,000** | **13,000** | **13,500** | **14,500** | **22,000** | **32,000** | **12,000** | **23,000** |
|---|---|---|---|---|---|---|---|---|---|
| Money saved per month (£) | **200** | **350** | **100** | **180** | **230** | **400** | **1,200** | **50** | **620** |

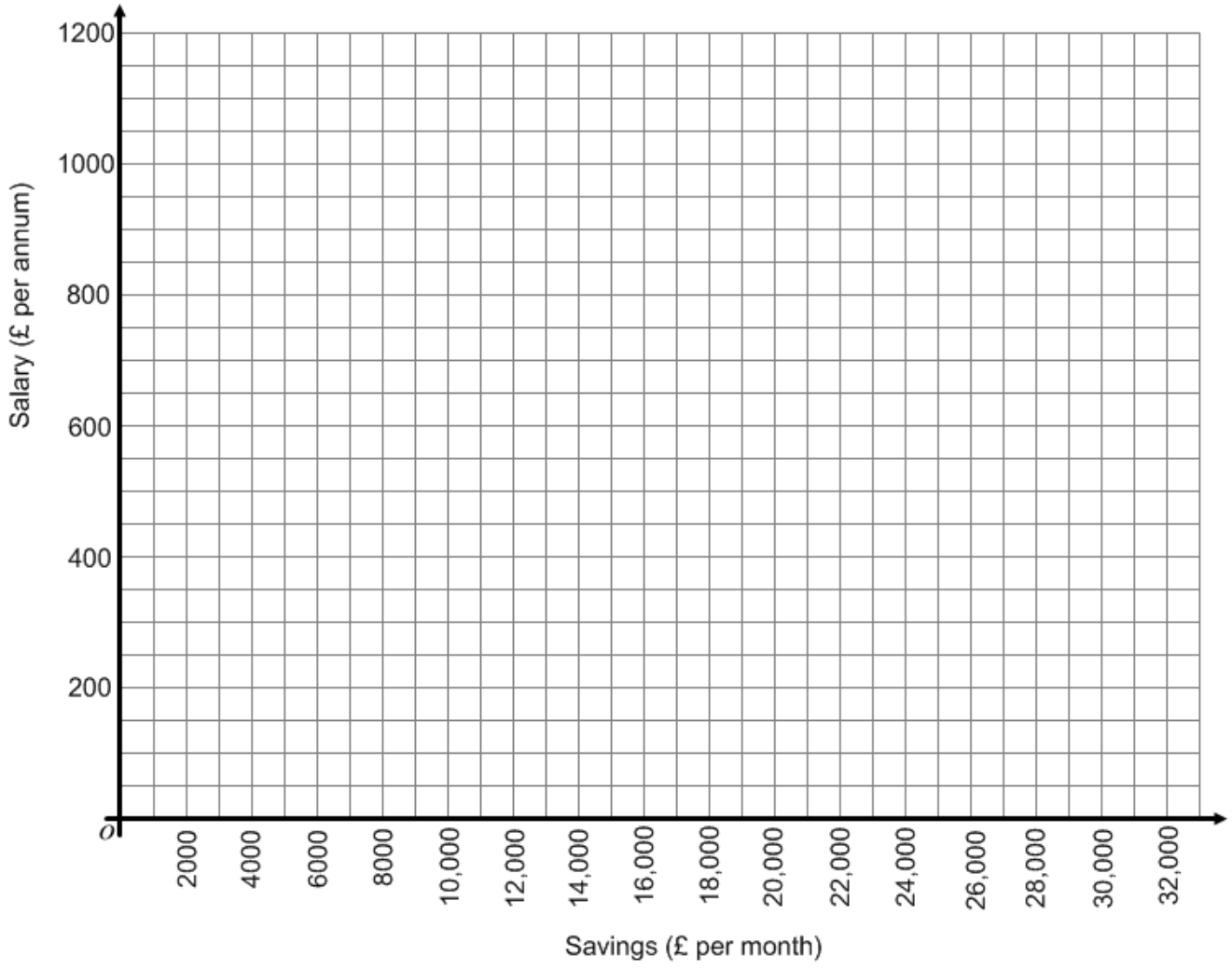
i) Draw a scattergraph of these marks on the grid provided.

ii) Draw a best fitting straight line for this scattergraph.

iii) A new client comes to the Financial Advisor and says that he can afford to save £300 per month.

Use your line to estimate the new clients annual salary.

iv) The Financial Advisor is approached by a new client who has an annual salary of £27,000.

The client thinks he will be able to save £1000 per month.

Is this a reasonable estimate?