

Lesson 3

Coordinate Geometry : Year 9

3.1 Gradient

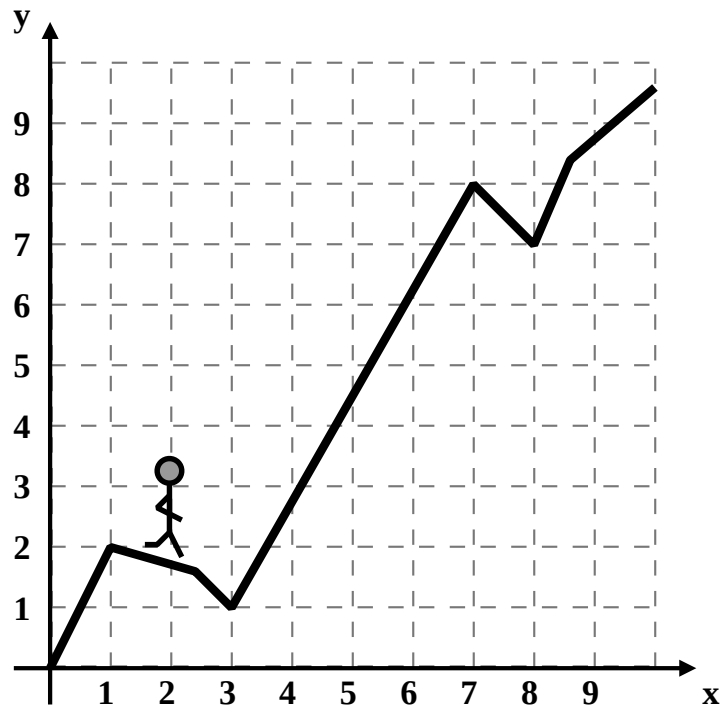
Calculator needed !

Example

On the grid below each square represents 1 metre by 1 metre.

It shows a man climbing a mountain.

We're interested in the climb from (3, 1) up to (7, 8).



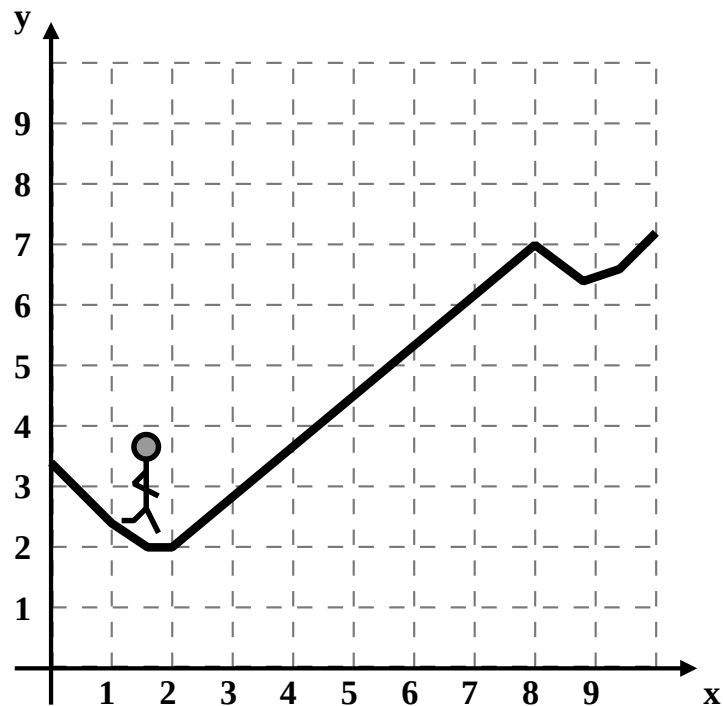
- (i) Plot the triangle (3, 1), (7, 1), (7, 8) on the grid.
- (ii) For your triangle, what is Δy ?
- (iii) For your triangle, what is Δx ?
- (iv) Find the gradient between (3, 1) and (7, 8) by use of the formula;
$$m = \frac{\Delta y}{\Delta x}$$

Give your answer to two decimal places.
- (v) Find the angle of the slope by use of the formula;
$$a = \arctan(m)$$

Give your answer to one decimal place.
- (vi) Mark this angle on your triangle on the grid.

3.2 Exercise

Question 1



- (i) Plot the triangle $(2, 2), (8, 2), (8, 7)$ on the grid.
- (ii) For your triangle, what is Δy ?
- (iii) For your triangle, what is Δx ?
- (iv) Find the gradient between $(2, 2)$ and $(8, 7)$ by use of the formula;
$$m = \frac{\Delta y}{\Delta x}$$

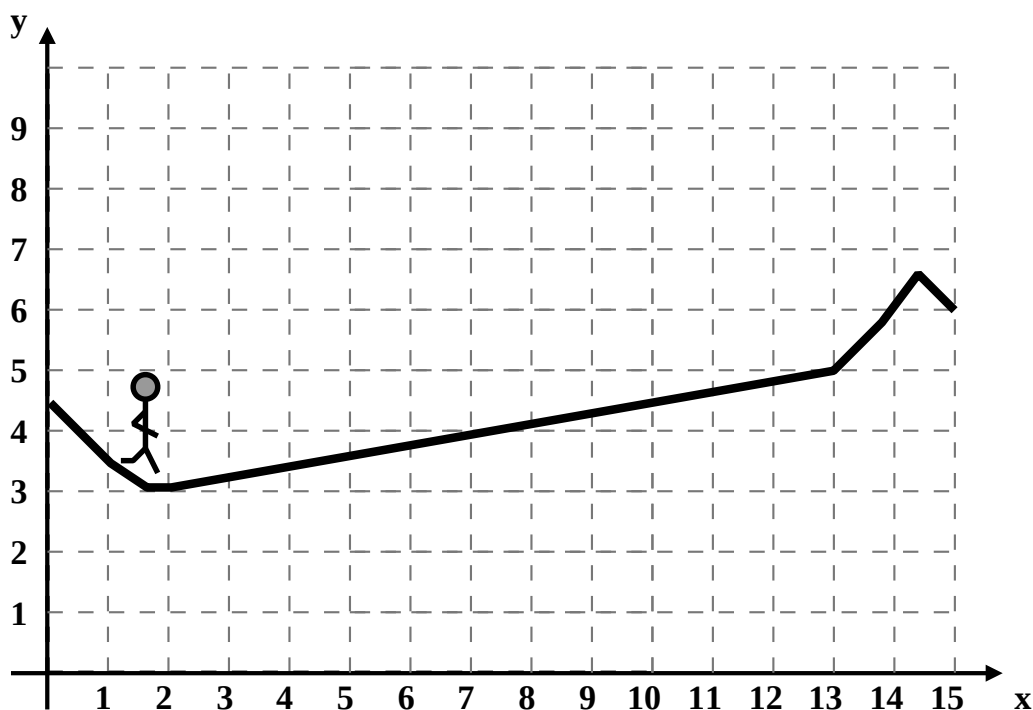
Give your answer to three decimal places.
- (v) Find the angle of the slope by use of the formula;
$$a = \arctan(m)$$

Give your answer to one decimal place.
- (vi) Mark this angle on your triangle on the grid.
- (vii) Use a *protractor* to check your answer.
Does your answer check out ?

- ☐ Yes, it's cool.
- ☐ No, I've gone wrong.
- ☐ What's a *protractor* ?

(Tick one box only)

Question 2



This question is about working out the gradient between (2, 3) and (13, 5).

- (i) Plot a suitable triangle on the grid.
- (ii) For your triangle, what is Δy ?
- (iii) For your triangle, what is Δx ?
- (iv) Find the gradient between the two points by use of the formula;

$$m = \frac{\Delta y}{\Delta x}$$

Give your answer to three decimal places.

- (v) Find the angle of the slope by use of the formula;

$$a = \arctan(m)$$

Give your answer to one decimal place.

- (vi) Mark this angle on your triangle on the grid.

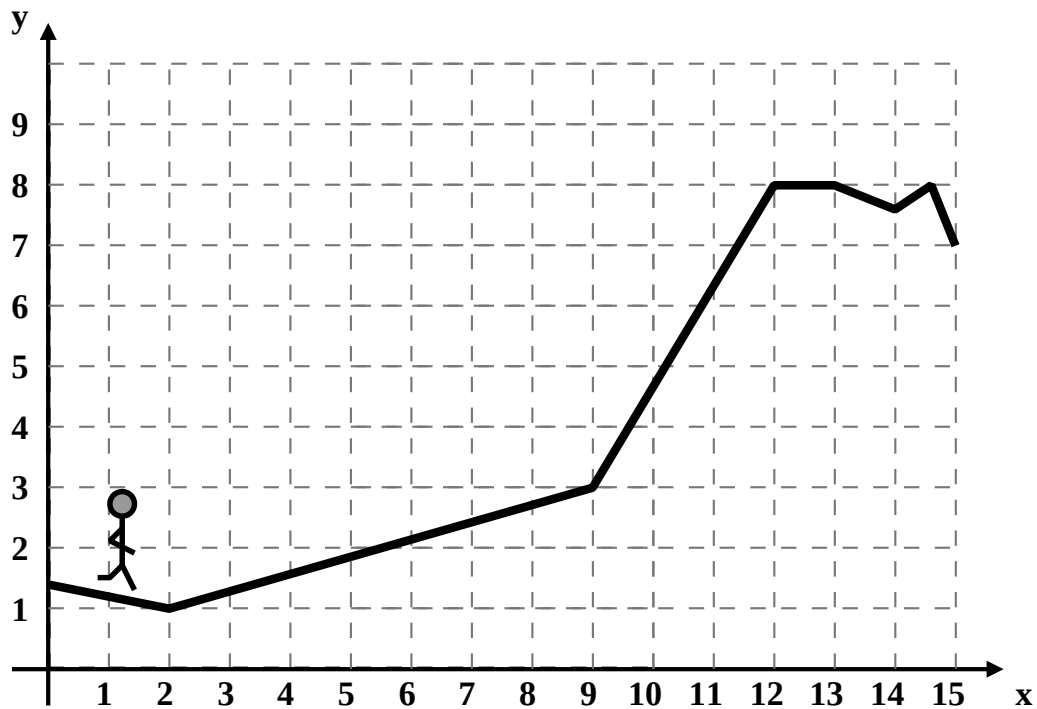
- (vii) Use a *protractor* to check your answer.

Does your answer check out ?

(Tick one box only)

- ☐ Yep, I've done good.
- ☐ Nope, I need to think more.
- ☐ Sorry, Lost my *protractor*.

Question 3



- (i) (a) Work out the gradient, m , between (2, 1) and (9, 3).

HINT :

$$m = \frac{\Delta y}{\Delta x}$$

- (b) Use $a = \arctan(m)$ to work out the angle of this slope.

- (ii) (a) Work out the gradient, m , between (9, 3) and (12, 8).

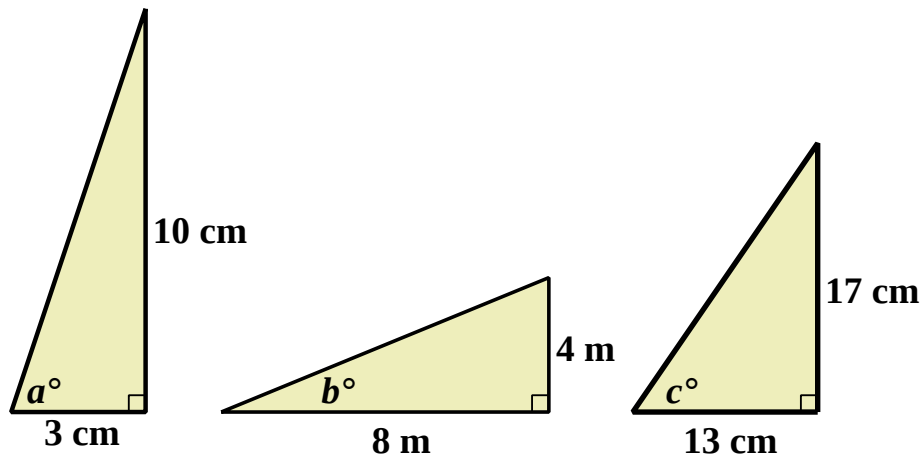
HINT :

$$m = \frac{\Delta y}{\Delta x}$$

- (b) Use $a = \arctan(m)$ to work out the angle of this slope.

Question 4

Work out the angle of the slope, a° , b° and c° in these triangles.

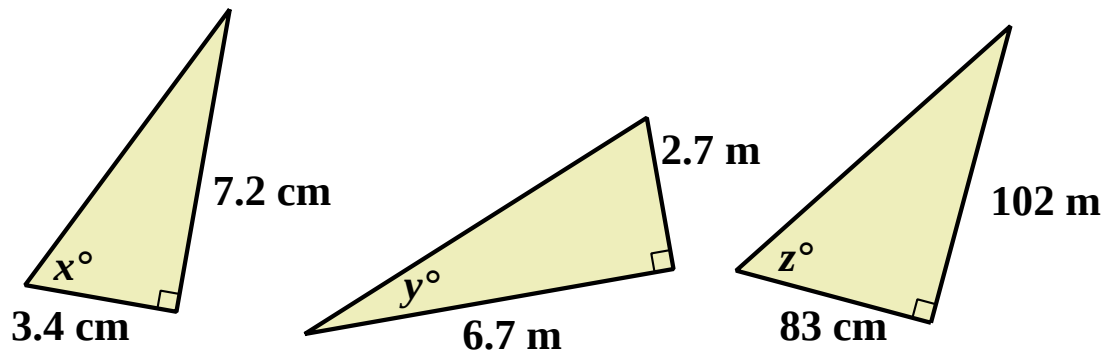


HINT : For the first triangle,

$$a^\circ = \arctan\left(\frac{10}{3}\right)$$

Question 5

Work out the angle of the slope, x° , y° and z° in these triangles.



HINT : Rotate your page.

(So that the triangle looks like )

3.3 Homework

Example

- Question :**
- (i) Find the gradient, m , between the points (4, 5) and (7, 14)
 - (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

- Solution :**
- (i)

$$m = \frac{\Delta y}{\Delta x} = \frac{14 - 5}{7 - 4} = \frac{9}{3} = 3$$

- (ii)

$$a = \arctan(m) = \arctan(3) = 71.6^\circ$$

Question 1

- (i) Find the gradient, m , between (3, 4) and (8, 14)
- (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

Question 2

- (i) Find the gradient between (13, 18) and (17, 38)
- (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

Question 3

- (i) Find the gradient between (156, 101) and (172, 197)
- (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

Question 4

- (i) Find the gradient between (- 5, 2) and (16, 9)
- (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

Question 5

- (i) Find the gradient between (7, 17) and (13, 5)
- (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

Question 6

- (i) Find the gradient between (17, 7) and (5, 13)
- (ii) Calculate the angle of the slope, a , using $a = \arctan(m)$

Example

Question : Find the distance, d , between the points (2, 5) and (8, 9)

Solution : Here is the formula that does this (from Pythagoras' theorem)

$$d = \sqrt{(\Delta y)^2 + (\Delta x)^2}$$

Where Δy and Δx are the same as in the gradient formula.

$$d = \sqrt{4^2 + 6^2}$$

$$= 7.21$$

Question 7

Find the distance, d , between the points (3, 2) and (8, 11)

Question 8

Find the distance, d , between the points (23, 21) and (56, 67)

Question 9

Find the distance, d , between the points $(13, 42)$ and $(34, 25)$

Question 10

Find the distance, d , between the points $(-3, 4)$ and $(3, -4)$