Solving Problems Using Linear Equations

Worked Example 6:

Mira is twice Sanjin's age. How old are Mira and Sanjin now if in 10 years the sum of their ages will be 89. Use *s* to represent Sanjin's age.
Sanjin's Age: s Mira's present age: 2s
In 10 years:
Sanjin = s + 10 Mira's age = 2s + 10
(s+10) + (2s+10) = 89
3s + 20 = 89
3s = 69
s = 23
2s = 2 x 23 = 46
Sanjin is 23 years old and Mira is 46 years old.
In 10 years they will be 33 and 56 old respectively; 33 + 56= 89

Distance and Midpoint

Distance Formula	Midpoint Formula
The distance, *d*, between any two Cartesian coordinates (x1, y1) and (x2, y2) is:	The midpoint M(x,y) between 2 points (x1, y1) and (x2, y2) is given by:
d =	M(x,y) =

Gradient

The gradient of a line can be found by the ratio of the vertical **rise** to the horizontal **run** between any two points on the line.
Gradient AB = (vertical rise)/(horizontal run)
The letter *m* is used to represent the gradient.
y=mx+b
m = (rise)/(run)
= (change in *y*-value)/(change in *x*-value)
= (y2-y1)/(x2-x1)

Linear Graphs: Gradient and Y-Intercept

The **gradient-intercept form:**
y=mx+b, where *m* is the gradient and *b* is the y-intercept.
The **general form:**
ax+by+c=0, where *a*, *b* and *c* are constants and $a \neq 0$, $b \neq 0$.
In this equation, the gradient *m* = (-a)/(b) and the y-intercept = (-c)/(b)can be found by rearranging the equation to make *y* the subject.

Linear Graphs: Gradient and Y-Intercept (cont)

Worked Example 15

(a) y = -3x+2
gradient = -3
y-intercept: (0,2)
(b) y = x-1
= 1x+(-1)
gradient = 1
y-intercept: (0,-1)
(c) 2y = 5x - 4
y = (5)/(2)x - 2
gradient = (5)/(2)
y-intercept: (0,-2)
(d) y+2x =6
y = 6-2x
y = -2x+6
gradient: -2
y-intercept: (0,6)

Sketching Linear Graphs

Graphing using the y-intercept and gradient

There is no need to plot a number of points to graph linear relationships. Because only 2 points are needed to define a line, use the y-intercept as one point on the graph and the gradient, *m* to locate the second point. Once 2 points are known, a straight line can be drawn through them.

Sketching other Linear Graphs, y=mx+b, b ≠ 0

If the y-intercept is not the origin, then first identify the y-intercept from the equation before using the gradient to find the second point.
Using the equation *y=mx+b* and substituting x = 0, you get y = b.
x = 0 is the x=coordinate of a point on the y-axis, so *b* is the y-value at the point at the point at which the graph crosses the y-axis. This is the y-intercept

Worked Example 17

Use the y-intercept and the gradient to sketch the graph of y = 2x+1
y-intercept: (0,1)
Gradient = 2
= (2)/(1) = (rise)/(run)

Parallel and Perpendicular Lines

Worked Example 19

Find the gradient of the line parallel to each of the following
(a) y = 2x-5
m = 2
Any parallel line will have a gradient of 2.
(b) 2x + 3y = 6
2x-2x+3y = 6 - 2x
(3y)/(3) = - (2)/(3)x + (6)/(3)
y = - (2)/(3)x + 2
m1 = - (2)/(3)
Any parallel line will have a gradient of - (2)/(3).

Worked Example 20

Find the gradient of a line perpendicular to each of the following
(a) y = 4x + 3
m1 = 4
m2 = - (1)/(m1)
= - (1)/(4)
(b) 3x-5y = 10
3x-3x-5y = 10-3x
-5y = -3x + 10
(-5y)/(-5) = (-3x)/(-5) + (10)/(-5)
y = (3)/(5)x - 2 m1= (3)/(5)
m2 = - (1)/(m1) = -(5)/(3)

By **kira**
cheatography.com/kira/

Published 12th November, 2017.
Last updated 12th November, 2017.