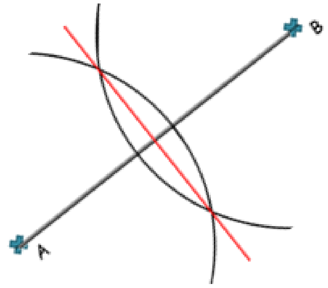
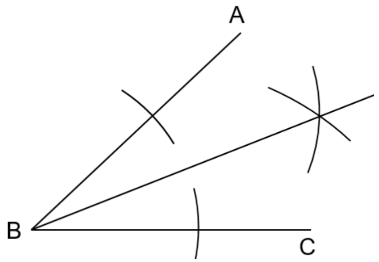
Year 9
CONSTRUCTIONS AND LOCI

Key Concepts

Line bisector



Angle bisector



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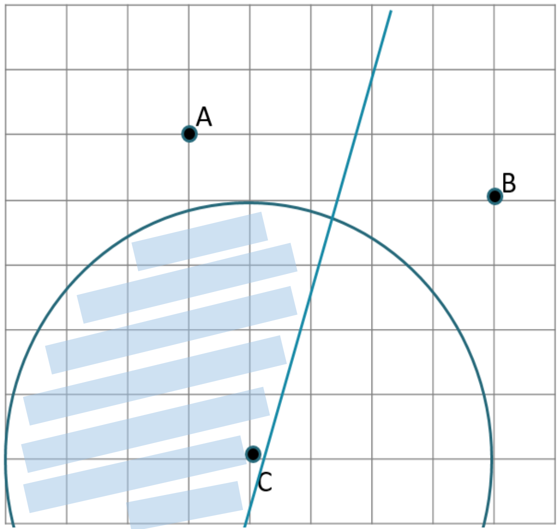
683,
660-665,
674-679

Examples



Shade the region that is:

- closer to A than B
- less than 4 cm from C

Line bisector of A and B

Circle with radius 4cm

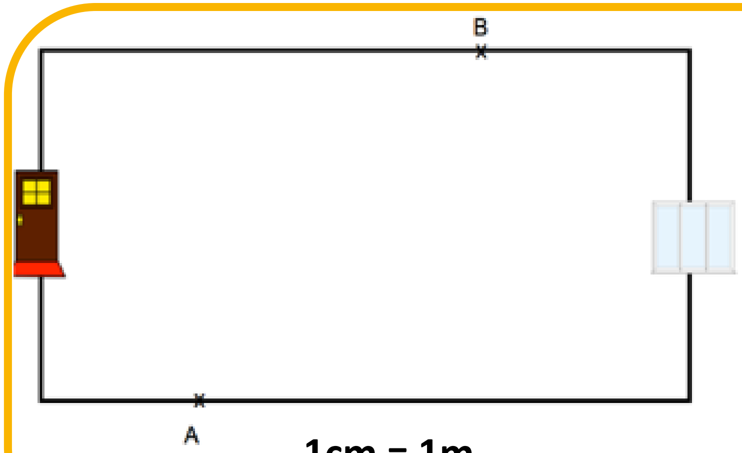
Key Words

Bisect

Radius

Region

Shade



1cm = 1m

There are two burglar alarm sensors, one at A and one at B.

The range of each sensor is 4m.

The alarm is switched on.

Is it possible to walk from the front door to the patio door without setting off the alarm?

Year 9
SEQUENCES

Key Concepts

Arithmetic sequences increase or decrease by a common amount each time.

Quadratic sequences have a common 2nd difference.

Fibonacci sequences
Add the two previous terms to get the next term

Geometric series has a common multiple between each term

Examples

Linear sequences:

4 , 7, 10, 13, 16…..

a) State the nth term

$3n + 1$

Difference

The 0th term

b) What is the 100th term in the sequence?

$3n + 1$

$3 \times 100 + 1 = 301$

c) Is 100 in this sequence?

$3n + 1 = 100$

$3n = 99$

$n = 33$

Yes as 33 is an integer.

Quadratic sequences:

$a + b + c$	3	9	19	33	51	
$3a + b$	6	10	14	18		First difference
$2a$	4	4	4			Second difference

$2a = 4$
$a = 2$

$3a + b = 6$
$3 \times 2 + b = 6$
$b = 0$

$a + b + c = 3$
$2 + 0 + c = 3$
$c = 1$

$2n^2 + 0n + 1 \rightarrow 2n^2 + 1$

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198,
247-250,
264

Key Words

Linear
Quadratic
Arithmetic
Geometric
Sequence
Nth term

A) 1, 8, 15, 22, ….

1) Find the nth term b) Calculate the 50th term c) Is 120 in the sequence?

B) Find the nth term for:

1) 5, 12, 23, 38, 57, … 2) 3, 11, 25, 45, 71, ….

ANSWERS: A1) 7n – 6 2) 344 3) 18 so yes as n is an integer B1) $2n^2$ + n + 2 2) $3n^2$ – n + 1

Year 9
INEQUALITIES

Key Concepts

Inequalities show the **range** of numbers that satisfy a rule.

$x < 2$ means x is less than 2
$x \leq 2$ means x is less than or equal to 2
$x > 2$ means x is greater than 2
$x \geq 2$ means x is greater than or equal to 2

On a **number line** we use circles to highlight the key values:

○ is used for less/greater than
● is used for less/greater than or equal to

Examples

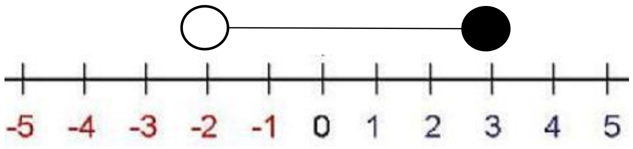
a) State the values of n that satisfy:

$$-2 < n \leq 3$$

Cannot be equal to 2 Can be equal to 3

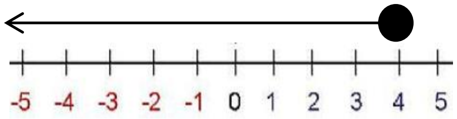
-1, 0, 1, 2, 3

b) Show this inequality on a number line:



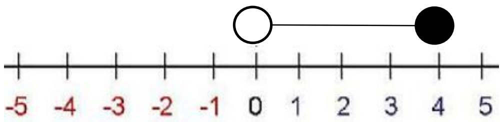
Solve this inequality and represent your answer on a **number line:**

$5x - 6 \leq 14$
+6 +6
$5x \leq 20$
÷5 ÷5
$x \leq 4$



Solve this inequality and represent your answer on a **number line:**

$4 < 3x + 1 \leq 13$
-1 -1
$3 < 3x \leq 12$
÷3 ÷3
$1 < x \leq 4$



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265-272

Key Words
Inequality
Greater than
Less than
Represent
Number line

1) State the values of n that satisfy: $-3 \leq n < 2$
2) Solve $4x - 2 \leq 6$ and represent your answer on a number line
3) Solve $5 < 2x + 3 \leq 9$ and represent your answer on a number line

ANSWERS: 1) -3, -2, -1, 0, 1 2) $x \leq 2$ 3) $1 < x \leq 3$

Year 9
REARRANGE AND SOLVE EQUATIONS

Key Concepts

Solving equations: Working with inverse operations to find the value of a variable.

Rearranging an equation: Working with inverse operations to isolate a highlighted variable.

In solving and rearranging we **undo the operations** starting from the last one.

For each step in solving an equation we must do the **inverse** operation

Solve:

$5(x-3) = 20$

Expand

$5x - 15 = 20$

+15 +15

$5x = 35$

÷5 ÷5

$x = 7$

Solve:

$12 = 3x - 18$

+18 +18

$30 = 3x$

÷3 ÷3

$x = 10$

Solve:

$7p - 5 = 3p + 3$

-3p -3p

$4p - 5 = 3$

+5 +5

$4p = 8$

÷ 2 ÷ 2

$p = 2$

Examples

Rearrange to make r the subject of the formulae :

$$Q = \frac{2r - 7}{3}$$

×3 × 3

$$3Q = 2r - 7$$

+7 +7

$$3Q + 7 = 2r$$

÷ 2 ÷ 2

$$\frac{3Q + 7}{2} = r$$

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177-186, 280-284, 287

Key Words

Solve

Rearrange

Term

Inverse operation

1) Solve $7(x + 2) = 35$

2) Solve $4x - 12 = 28$

3) Solve $4x - 12 = 2x + 20$

4) Rearrange to make x the subject:

$$y = \frac{3x + 4}{2}$$

ANSWERS: 1) $x = 3$ 2) $x = 10$ 3) $x = 16$ 4) $x = \frac{2y - 4}{3}$

Year 9

DIRECT AND INVERSE PROPORTION USING ALGEBRA

Key Concepts

Variables are **directly proportional** when the **ratio is constant** between the quantities.

Variables are **inversely proportional** when **one quantity increases in proportion to the other decreasing.**

α is the symbol we use to show that one variable is in proportion to another.

Direct proportion: $y \propto x$

Inverse proportion: $y \propto \frac{1}{x}$

Examples

Direct proportion:

g is directly proportional to the square root of *h*
When *g* = 18, *h* = 16
Find the possible values of *h* when *g* = 2

$$g \propto \sqrt{h}$$
$$g = k\sqrt{h}$$
$$18 = k\sqrt{16}$$
$$18 = 4k$$
$$4.5 = k$$
$$g = 4.5\sqrt{h}$$

$$g = 4.5\sqrt{h}$$

When $g = 2$

$$2 = 4.5\sqrt{h}$$
$$\frac{2}{4.5} = \sqrt{h}$$
$$\left(\frac{4}{9}\right)^2 = h$$
$$\frac{16}{81} = h$$

Inverse proportion:

The time taken, t, for passengers to be checked-in is inversely proportional to the square of the number of staff, s, working.
It takes 30 minutes passengers to be checked-in when 10 staff are working. How many staff are needed for 120 minutes?

$$t \propto \frac{1}{s^2}$$
$$t = \frac{k}{s^2}$$
$$30 = \frac{k}{10^2}$$
$$3000 = k$$
$$t = \frac{3000}{s^2}$$

$$t = \frac{3000}{s^2}$$
$$120 = \frac{3000}{s^2}$$
$$s^2 = \frac{3000}{120}$$
$$s^2 = 25$$
$$s = \sqrt{25}$$
$$s = 5$$

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343-345,
346-348

Key Words

Direct
Inverse
Proportion
Divide
Multiply
Constant

1) *e* is directly proportional to *f*
When *e* = 3, *f* = 36
Find the value of *f* when *e* = 4

2) *x* is inversely proportional to the square root of *y*.
When *x* = 12, *y* = 9
Find the value of *x* when *y* = 81

ANSWERS 1) *f* = 48 2) *x* = 4

Year 9

DIRECT AND INVERSE PROPORTION ON GRAPHS

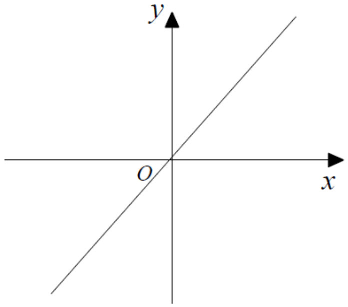
Key Concepts

Variables are **directly proportional** when the **ratio is constant** between the quantities.

Variables are **inversely proportional** when **one quantity increases in proportion to the other decreasing.**

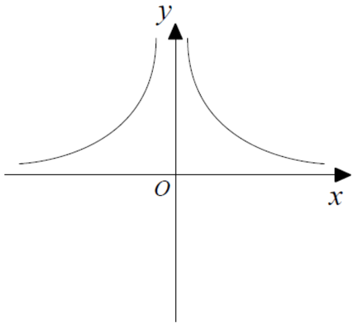
Direct and inverse proportion can also be represented on **graphs**.

Examples



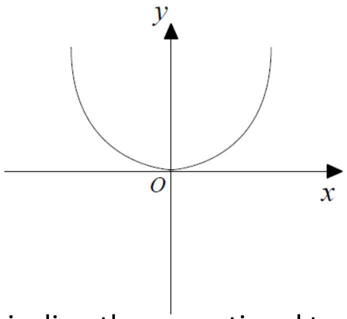
$y \propto x$

y is directly proportional to x



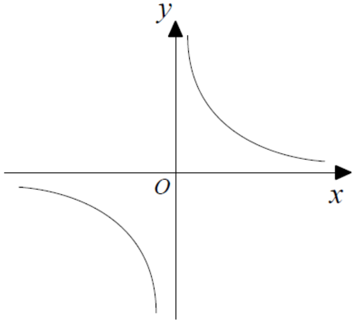
$y \propto \frac{1}{x}$

y is inversely proportional to x



$y \propto x^2$

y is directly proportional to x^2



$y \propto \frac{1}{x^2}$

y is inversely proportional to x^2

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340, 348

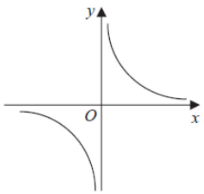
Key Words

Direct

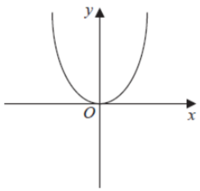
Inverse

Proportion

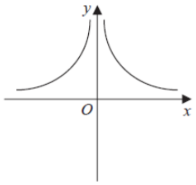
Graph



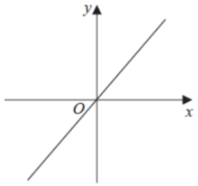
Graph A



Graph B



Graph C



Graph D

Match the correct graph to each statement:

Proportionality relationship	Graph letter
y is directly proportional to x	
y is inversely proportional to x	
y is proportional to the square of x	
y is inversely proportional to the square of x	

ANSWERS