

## Algebra

- 20 Rearrange the formula  $\frac{a}{b} = \frac{c}{d} + \frac{e}{f}$  to make  $f$  the subject.

A  $f = \frac{bce - ade}{ac}$

B  $f = \frac{bc + be - ad}{a}$

C  $f = \frac{bde}{ad - bc}$

D  $f = \frac{bcd}{ad - be}$

E  $f = \frac{bc + be}{ad}$

**2016**

- 12 Given that  $a = \frac{3}{5+X}$ ,  $b = \frac{3+X}{5}$  and  $c = \frac{3+X}{5+X}$ , where  $X$  is a whole number greater than zero, which one of the following is true?

- A  $a < b < c$  for all values of  $X$
- B  $a < c < b$  for all values of  $X$
- C  $b < a < c$  for all values of  $X$
- D  $b < c < a$  for all values of  $X$
- E  $c < a < b$  for all values of  $X$
- F  $c < b < a$  for all values of  $X$
- G The order of the fractions depends on the value of  $X$

**2015**

- 20 A class of  $n$  pupils takes a spelling test. Their mean score for the test is  $m$ . Another pupil takes the test and scores  $n$ . When this pupil's result is included with the other results it is found that the mean has decreased by 2.

Which equation below gives the correct expression for  $n$  in terms of  $m$ ?

A  $n = \frac{m}{m-1}$

B  $n = \frac{m}{m-3}$

C  $n = \frac{2}{m-3}$

D  $n = \frac{m-2}{3}$

E  $n = \frac{m+2}{m-1}$

F  $n = \frac{m}{3}$

G  $n = \frac{m+2}{3}$

**2015**



## Algebra

24 Simplify:

$$\frac{2x+3}{2x-3} + \frac{2x-3}{2x+3} - 2$$

A 0

B  $\frac{2(2x-1)}{(2x-3)(2x+3)}$

C  $\frac{18}{(2x-3)(2x+3)}$

D  $\frac{36}{(2x-3)(2x+3)}$

E  $\frac{8(x^2-2)}{(2x-3)(2x+3)}$

F  $\frac{12}{2x-3}$

2015

4 Simplify:

$$\frac{x^2-4x}{x^2-16}$$

A  $\frac{x}{4}$

B  $\frac{x}{x+4}$

C  $\frac{x}{x-4}$

D  $\frac{1}{4}$

E  $\frac{x-4}{x-16}$

2014

8 Given that  $4^p \times 8^q = 2^n$ , express  $n$  in terms of  $p$  and  $q$ .

A  $n = p + q$

B  $n = 2p + 3q$

C  $n = 2p + 4q$

D  $n = p + q + 5$

E  $n = 6pq$

2014



## Algebra

4 Given that  $x = 4.6 \times 10^7$  and  $y = 2 \times 10^6$ , what is the value of  $\frac{x+7y}{x-2y}$ ?

A  $\frac{10}{7}$

B  $1\frac{2}{3}$

C 3.1

D 7

E 10

F 31

2013

8 Simplify:

$$4 - \frac{x^2(1-16x^2)}{(4x-1)2x^3}$$

A  $2 - \frac{1}{2x}$

B  $2 + \frac{1}{2x}$

C  $4 - \frac{1}{2x}$

D  $4 + \frac{1}{2x}$

E  $6 - \frac{1}{2x}$

F  $6 + \frac{1}{2x}$

2013

## Algebra

16 Three variables  $x$ ,  $y$  and  $z$  are known to be related to each other in the following ways:

- $x$  is directly proportional to the square of  $z$
- $y$  is inversely proportional to the cube of  $z$ .

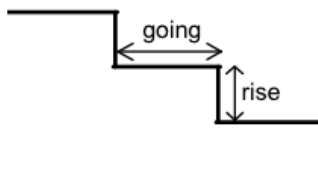
Which of the following correctly describes the relationship between  $x$  and  $y$ ?

- A The square of  $x$  is directly proportional to the cube of  $y$ .
- B The square of  $x$  is inversely proportional to the cube of  $y$ .
- C The cube of  $x$  is directly proportional to the square of  $y$ .
- D The cube of  $x$  is inversely proportional to the square of  $y$ .
- E  $x$  is directly proportional to  $y^6$ .

2013

8 A formula which connects the 'going',  $G$ , with the 'rise',  $R$ , of stairs in a staircase is below:

$$G = 5 + \sqrt{7(9 - R)^2 + 9}$$



Rearrange the formula to give  $R$  in terms of  $G$ .

- A  $R = 9 - \sqrt{\frac{(G-5)^2 + 9}{7}}$
- B  $R = 9 - \frac{G-8}{\sqrt{7}}$
- C  $R = 9 + \sqrt{\frac{(G-5)^2 - 9}{7}}$
- D  $R = 9 + \frac{G-8}{\sqrt{7}}$
- E  $R = 9 - \sqrt{\frac{(G-5)^2 - 9}{7}}$

2012

4 Simplify:

$$3x(3x^{-\frac{1}{3}})^3$$

- A  $\frac{1}{9}$
- B 1
- C 81
- D  $\frac{x^2}{9}$
- E  $x^2$
- F  $81x^2$



## Algebra

2011

- 12  $w, x, y$  and  $z$  are integers such that  $w < x^2$ ,  $x > y^2$ ,  $y^2 < z^2$  and  $x > z$ .

Which one of the following inequalities **must** be true?

- A  $w < x$
- B  $w > y$
- C  $w < z$
- D  $x > y$
- E  $y < z$

2011

- 4 I have two containers with different capacities. Initially, the larger one is full of water and the smaller one is empty. I pour water from the larger container into the smaller container until they contain the same volume of water. The volume of water in the large container is now  $p$  times its capacity and the volume of water in the small container is  $q$  times its capacity.

Which one of the following statements about  $p$  and  $q$  must be true?

- A  $p + q = 1$  (but  $p$  and  $q$  are not necessarily both 0.5)
- B  $p = 0.5$  and  $q = 0.5$
- C  $p = 0.5$  and  $q > 0.5$
- D  $p > 0.5$  and  $q = 0.5$
- E  $p > 0.5$  and  $q > 0.5$

2010

- 12 The mean time for running a race by a group of 20 people was 54 seconds. The times for a second group of people were added and the value of the mean went up to 56 seconds.

Which formula represents the relationship between the number of people in the second group,  $P$ , and the mean time of the second group,  $T$ ?

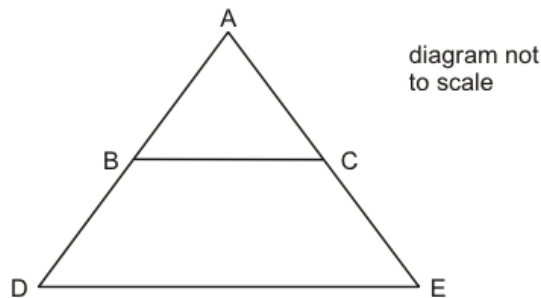
- A  $P = \frac{40}{T - 54}$
- B  $P = \frac{1080}{T - 54}$
- C  $P = \frac{40}{T - 56}$
- D  $P = \frac{1080}{T - 56}$
- E  $P = \frac{1120}{T} - 20$

2010

## Algebra

- 16 A shape is formed by drawing a triangle ABC inside the triangle ADE.  
BC is parallel to DE.

$$AB = 4\text{cm} \quad BC = x\text{cm} \quad DE = x + 3\text{cm} \quad DB = x - 4\text{cm}$$



Calculate the length of DE.

- A 5cm
- B 7cm
- C 9cm
- D  $4 + 2\sqrt{7}$  cm
- E  $7 + 2\sqrt{7}$  cm

2010

- 20 The total surface area of a cylinder is numerically the same as its volume.  
The radius of the cylinder is  $r$  cm, the height is  $h$  cm.

Express  $h$  in terms of  $r$ .

- A  $h = \frac{2r}{r-2}$
- B  $h = \frac{2r}{r+2}$
- C  $h = r+2$
- D  $h = r-2$
- E  $h = 2r(r-2)$

2010

- 12 The symbol  $\diamond$  defines a mathematical binary operation such that  $y \diamond x = \frac{y^x}{x}$  for all positive integers.

What is the value of  $(2 \diamond 3) \diamond 2$ ?

- A  $2 \times 3^3$
- B  $8/3$
- C  $32/9$
- D 4
- E  $2^5 \sqrt{2}/9$



2009

- 24 The equation gives  $y$  in terms of  $x$ .

$$y = 5\left(\frac{x}{2} - 3\right)^2 - 10$$

Rearrange the equation to give an expression for  $x$  in terms of  $y$ .

- A  $\pm 2\sqrt{\frac{y+10}{5}} + 6$
- B  $\pm 2\sqrt{\frac{y+10}{5}} - 6$
- C  $\pm 2\sqrt{\frac{y-10}{5}} + 6$
- D  $\pm 2\sqrt{\frac{y-10}{5}} - 6$
- E  $\pm 2\sqrt{\frac{y+50}{5}} + 6$
- F  $\pm 2\sqrt{\frac{y+10}{5}} + 3$

2009