

# Paper 1 Nov 22

1)  $-4 \times \frac{-7}{9} = \frac{28}{9}$

2)  $(\sqrt{6})^4 = 6^{\frac{1}{2} \times 4} = 6^2 = 36$

3)  $0.203 = \frac{1}{5} + x$   
 $x = 0.203 - 0.2$   
 $= 0.003$   
 $= \frac{3}{1000}$

4)  $3x \equiv x + 2x$   
 $\equiv$  is an identity  
 always true.  
 Often we're lazy and write  
 $=$  when it's really  $\equiv$

5)  $3 : 7 = 10 \rightarrow 6.2$   
 $\times 6.2 \downarrow$   
 $18.6 : 43.4 = 62$

6) 1st. statement: definitely true  
 2nd statement: cannot be true  
 3rd statement: might be true.

7) a)  $\vec{b} = \begin{bmatrix} 4 \\ -1 \end{bmatrix}$

b)  $\vec{a} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

$4\vec{a} = \begin{bmatrix} 12 \\ 8 \end{bmatrix}$

we do not "simplify".  
 The vector really is  
 $\begin{bmatrix} 12 \\ 8 \end{bmatrix}$

9)  $\begin{bmatrix} 3 \\ 2 \end{bmatrix} + \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \end{bmatrix}$   
 $\begin{bmatrix} c_1 \\ c_2 \end{bmatrix} = \begin{bmatrix} 0 \\ -2 \end{bmatrix}$

8)  $(\frac{7}{10} - \frac{4}{15}) \div \frac{2}{3}$   
 $= (\frac{21}{30} - \frac{8}{30}) \times \frac{3}{2}$   
 $= \frac{13}{30} \times \frac{3}{2}$   
 $= \frac{6\frac{1}{2}}{10} = \frac{13}{20}$

9)  $12 \leq 4x < 25$   
 $3 \leq x < 6\frac{1}{4}$   
 $x \rightarrow 3 \quad 4 \quad 5 \quad 6$

10)   
 $\frac{3}{4}(120) = 90$   
 $(19 - x) + x + (14 - x) = 30$   
 $27 + x = 30$

$x = 3$

values are 16, 3 and 11

11)  $(3^6 \times 3^5) : 3^7$   
 $\Rightarrow n : 1$   
 $3'' : 3^7$   
 $\div 3^7$   
 $\Rightarrow 81 : 1$



12) a is 10% more than b

$$a = 1.1b$$

$$10a = 11b$$

$$a : b$$

$$11 : 10$$

The ratio is the reverse of the equation.

$$\begin{array}{r} 13) \quad 0.4777 \\ \quad 0.312 \\ \hline 0.1657 \\ \quad 0.38977 \end{array}$$

$$\Rightarrow 0.7897$$

14) criticism

Not drawn -3 to +3

Ratio is 1:2 NOT 2:1

NB The x-values are called the domain and the y values the range.

$$\begin{aligned} 15) \quad (3x+4)(2x-5) \\ -11x(x-2) \\ +5(x^2-3x-1) \end{aligned}$$

$$\begin{aligned} = \quad & 6x^2 + 8x \\ & -15x - 20 \\ & -11x^2 + 22x \\ & +5x^2 - 15x - 5 \\ \hline & 0x^2 + 0x - 25 \end{aligned}$$

$$16) \quad y = x^2 + px + r$$

(0,4) (1,3) (8,w)

$$\textcircled{1} \quad 4 = r$$

$$\textcircled{2} \quad 3 = 1 + p + r$$

$$\textcircled{3} \quad w = 64 + 8p + r$$

$$\textcircled{1} \quad r = 4 \quad \textcircled{2} \quad 3 = 1 + p + r$$

$$\begin{aligned} p &= -2 \\ \text{so } w &= 64 + 8(-2) + 4 \\ &= 52 \end{aligned}$$

$$\begin{array}{ll} 17) \quad h \leq 150 & 0 \\ h \leq 160 & 4 \\ h \leq 170 & 16 \\ h \leq 180 & 51 \\ h \leq 190 & 58 \\ h \leq 200 & 60 \end{array}$$

b) lower quartile  $160 < h \leq 170$   
(i.e. 15/16 athlete)

c) As drawn.  
Strictly at GCSE it should be drawn as a polygon - straight lines.

Height > 176cm. estimated 23



$$\begin{array}{ll} D : E & E : F \\ 3 : 5 & 7 : 4 \\ \times 7 \downarrow & \downarrow \times 5 \\ 21 : 35 & 35 : 20 \end{array}$$

$$\text{length} = 76$$

$$\text{ratio is } 21/76$$

$$\begin{aligned} 19) \quad \left(\frac{5}{4}\right)^{-2} &= \left(\frac{4}{5}\right)^2 \\ &= \frac{16}{25} \end{aligned}$$

$$\begin{aligned} b) \quad \left(\frac{9}{100}\right)^{3/2} &= \left(\frac{3}{10}\right)^3 \\ &= \frac{27}{1000} \end{aligned}$$

20)  $x^2 + bx + c$  has one solution at  $x = -15$

$$(x+15)(x+15) = 0$$

$$x^2 + 30x + 225 = 0$$

$$b = 30 \quad c = 225$$



$$21) \begin{aligned} 0.6111... &= a \\ 6.1111... &= 10a \end{aligned}$$

$$\text{so } 9a = 5.5$$

$$a = \frac{5.5}{9}$$

$$a = \frac{55}{90}$$

$$22) \text{ Radius is } \perp \text{ to tangent}$$

$$\text{Gradient is } \frac{8}{4} = 2$$

$$\text{so gradient tangent} = -\frac{1}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y - 8 = -\frac{1}{2}(x - 4)$$

$$y - 8 = -\frac{1}{2}x + 2$$

$$y = -\frac{1}{2}x + 10$$

$$\text{at } x \text{ intersect } y = 0$$

$$+\frac{1}{2}x = 10$$

$$x = 20$$

$$23) 4 \times \sin 30^\circ \times \tan 30^\circ \times \csc 30^\circ = \sin y^\circ$$

$$4 \times \sin 30^\circ \times \frac{\sin 30^\circ}{\csc 30^\circ} \times \csc 30^\circ$$

$$= 4 \times \sin^2 30^\circ = \sin y$$

$$\sin y = 4 \times \left(\frac{1}{2}\right)^2 = 1$$

$$y = 90^\circ$$

$$24) \text{ The invariant point is}$$

$$B \text{ at } (-4, 1)$$

check your solution agrees.

$$25) x^2 - 5x - 6 < 0$$

$$\text{let } x^2 - 5x - 6 = 0$$

$$(x - 6)(x + 1) = 0$$

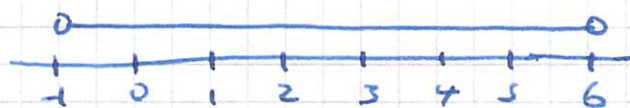
$$\text{so key values at } x = 6 \\ x = -1$$

$$\text{check } x = 4$$

$$f(4) = 4^2 - 5 \times 4 - 6 = -10 \text{ negative}$$

so the inequality is satisfied.

by values between -1 and 6



$$26) \angle RQP = 2x \\ (\text{alternate segment theorem})$$

$$2x + 2y = 180^\circ$$

(isosceles triangle)

$$y^\circ = 90^\circ - x^\circ$$

$$27) \sqrt{2 \frac{12}{16}} - \frac{2}{\sqrt{5}}$$

$$\Rightarrow \sqrt{4 \frac{3}{4}} - \frac{2}{\sqrt{5}}$$

$$\Rightarrow \frac{3\sqrt{5}}{4} - \frac{2\sqrt{5}}{5}$$

$$\Rightarrow \frac{15\sqrt{5} - 8\sqrt{5}}{20}$$

$$\Rightarrow \frac{7\sqrt{5}}{20}$$