BUMPER
"BETWEEN PAPERS"
PRACTICE

SUITABLE FOR HIGHER TIER ONLY

Thanks to: Dawn Denye, Emma Weston, Kieran McCausland, Donald Walker, Janet Annetts, James Wood. + probably people I've missed out .. ... you're all my heroes for sending me your solutions Melx.

SUMMER 2019

~~QUESTIONS~~

SOLUTIONS

NOT A "BEST" GUESS PAPER.

NEITHER IS IT A "PREDICTION" ... ONLY THE EXAMINERS KNOW WHAT IS GOING TO COME UP! FACT!
YOU ALSO NEED TO REMEMBER THAT JUST BECAUSE A TOPIC CAME UP ON PAPER 1 IT MAY STILL COME UP ON PAPERS 2 OR 3 ...

WE KNOW HOW IMPORTANT IT IS TO PRACTICE, PRACTICE, PRACTICE .... SO WE'VE COLLATED A LOAD OF QUESTIONS THAT WEREN'T EXAMINED IN THE AQA 9-1 GCSE MATHS PAPER 1 BUT WE CANNOT GUARANTEE HOW A TOPIC WILL BE EXAMINED IN THE NEXT PAPERS ...

ENJOY!
MEL & SEAGER

1. A menu has a choice of 3 starters, 5 main courses and 4 desserts.

How many different choices of a 3-course meal are possible?

$3 \times 5 \times 4 = 60$

Circle your answer.

12 23 60 972

[1]

2. Use the quadratic formula to solve $5x^2 + 11x - 2 = 0$

Give your solutions to 2 decimal places.

$a = 5$
$b = 11$
$c = -2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-11 \pm \sqrt{(11^2) - 4 \times 5 \times -2}}{10}$

$x = \frac{-11 + \sqrt{161}}{10}$ $x = \frac{-11 - \sqrt{161}}{10}$

$x = 0.17$ $x = -2.37$

[3]

3. y is directly proportional to x and k is a constant.

Circle the correct equation.

$y = x + k$ $y = kx$ $y = \frac{k}{x}$ inverse propotion $y = x - k$

[1]

4. Written as the product of its prime factors

$672 = 2^5 \times 3 \times 7$

(a) Write 252 as the product of its prime factors.

2, 126, 2, 63, 3, 21, 3, 7

$2^2 \times 3^2 \times 7$

[2]

(b) Work out the value of the highest common factor of 672 and 252

$2^5 \times 3 \times 7$
$2^2 \times 3^2 \times 7$

$HCF = 2^2 \times 3 \times 7 = 4 \times 3 \times 7 = \underline{84}$

[1]

5. Show that $\frac{2x+1}{3} + \frac{5x-2}{2}$ simplifies to $\frac{19x-4}{6}$

$\frac{2(2x+1)}{6} + \frac{3(5x-2)}{6} = \frac{4x+2}{6} + \frac{15x-6}{6}$

$= \frac{4x+15x+2-6}{6} = \frac{19x-4}{6}$

[2]

6. Expand and simplify $(2x + 5)(2x - 5)(3x + 7)$

expand 2 brackets to start with

$4x^2 \cancel{+10x} \cancel{-10x} - 25$

$(4x^2 - 25)(3x + 7) = 12x^3 + 28x^2 - 75x - 175$

[3]

rationalise the denominators first

7. Write $\frac{26}{\sqrt{2}} - \frac{12}{\sqrt{18}} + 2\sqrt{50}$ in the form $a\sqrt{2}$ where a is an integer

$\frac{26\sqrt{2}}{2} - \frac{12\sqrt{18}}{18} + 2\sqrt{50}$

$13\sqrt{2} - 2\sqrt{2} + 10\sqrt{2}$

$= 21\sqrt{2}$

$\frac{12\sqrt{18}}{18} = \frac{12\sqrt{2}\sqrt{\cancel{9}}^{3}}{18} = 2\sqrt{2}$

$2\sqrt{50} = 2\sqrt{2}\sqrt{\cancel{25}}^{5} = 10\sqrt{2}$

[4]

8. Prove that the sum of four consecutive whole numbers is always even.

$n + n+1 + n+2 + n+3 = 4n+6$

$= 2(2n+3)$

multiplying anything by 2 will always result in an even number.

[3]

9. Volume of a sphere = $\frac{4}{3}\pi r^3$ where r is the radius.

a) Work out the volume of a sphere of radius 8 cm

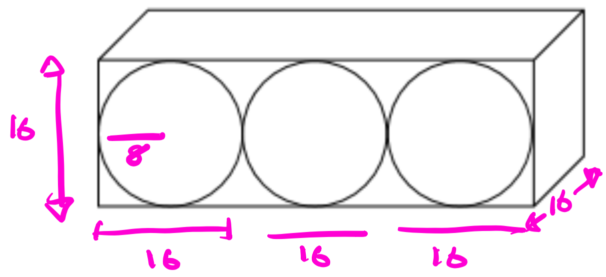
$V = \frac{4}{3} \times \pi \times 8^3 = 2144.7 \text{ cm}^3$ (1dp)

[2]

b) Three spheres of radius 8 cm are packed tightly into a cuboid as shown.

Work out the volume of the cuboid.

$16 \times 48 \times 16 = 12{,}288 \text{ cm}^3$



[4]

10. To complete a task in 15 days a company needs

4 people each working for 8 hours per day.

The company decides to have

5 people each working for 6 hours per day.

Assume that each person works at the same rate.

(a) How many days will the task take to complete?

You must show your working.

Total hours = $15 \times 4 \times 8 = 480$ hours

$5 \times 6 = 30$ hours.

$480 \div 30 = 16$ days

[3]

(b) Comment on how the assumption affects your answer to part (a).

if some people work faster, my answer is too high
if some people work slower, my answer is too low

[1]

11. The region R satisfies the three inequalities

$x > -3$ dotted line

$x + y \leqslant 2$ solid

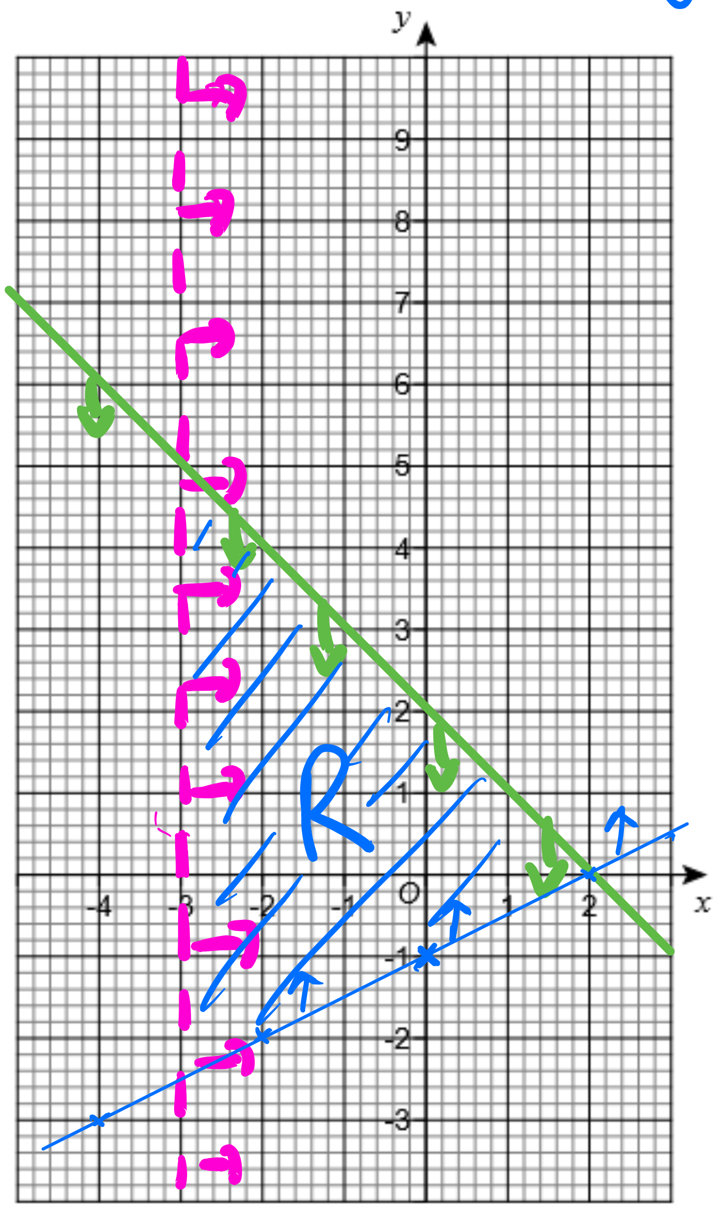
$y \geqslant \frac{x}{2} - 1$ solid.

$x = 0 \quad y = -1$

$y = 0 \quad x = 2$

Show the region R on the grid.

[4]



12. w is directly proportional to y

w is inversely proportional to x^2

$w = ky$

$w = \frac{k}{x^2}$

a) When y = 4, w = 14

Work out the value of w when y = 9

$w = ky$ $\quad 14 = k \times 4$ $\quad k = 3.5$ $\quad w = 3.5 \times 9$ $\quad w = 31.5$

[2]

b) When x = 2, w = 5

Work out the value of w when x = 10

$w = \frac{k}{x^2}$ $\quad 5 = \frac{k}{2^2}$ $\quad k = 5 \times 4 = 20$

$w = \frac{20}{10^2} = \frac{2\cancel{0}}{10\cancel{0}} = 0.2$

[3]

13. Show that $\frac{2w+4}{w^2-25} \times \frac{w+5}{w^2+3w+2} \times (3w^2 - 16w + 5)$

factorise first.

Simplifies to $\frac{aw+b}{cw+d}$ where a, b, c and d are integers.

$\frac{2(w+2)}{(w+5)(w-5)} \times \frac{w+5}{(w+1)(w+2)} \times (3w-1)(w-5)$

$\frac{2\cancel{(w+2)} \times \cancel{(w+5)} \times (3w-1)\cancel{(w-5)}}{\cancel{(w+5)}\cancel{(w-5)}(w+1)\cancel{(w+2)}} = \frac{2(3w-1)}{w+1} = \frac{6w-2}{w+1}$

cancel common factors

[5]

14. An approximate solution to an equation is found using this iterative process.

$$x_{n+1} = \frac{(x_n)^3 - 3}{8} \text{ and } x_1 = -1$$

a) Work out the values of x_2 and x_3

$x_2 = \frac{(-1)^3 - 3}{8} = -\frac{4}{8} = -\frac{1}{2}$

$x_3 = \frac{(-\frac{1}{2})^3 - 3}{8} = -0.390625$

x_2 = $-\frac{1}{2}$

x_3 = -0.390625 [2]

b) Work out the solution to 6 decimal places.

Use $\boxed{\text{ANS}}$ button $\rightarrow \frac{(\text{ANS})^3 - 3}{8} \Rightarrow x = -0.381966$ (6dp)

[1]

15. Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25 \quad (1)$$
$$y - 3x = 13 \quad (2)$$

$y = 3x + 13$

subin (1) $x^2 + (3x+13)^2 = 25$

$x^2 + 9x^2 + 78x + 169 - 25 = 0$

$10x^2 + 78x + 144 = 0$

$\div 2$ $5x^2 + 39x + 72 = 0$

$(5x + 24)(x + 3) = 0$

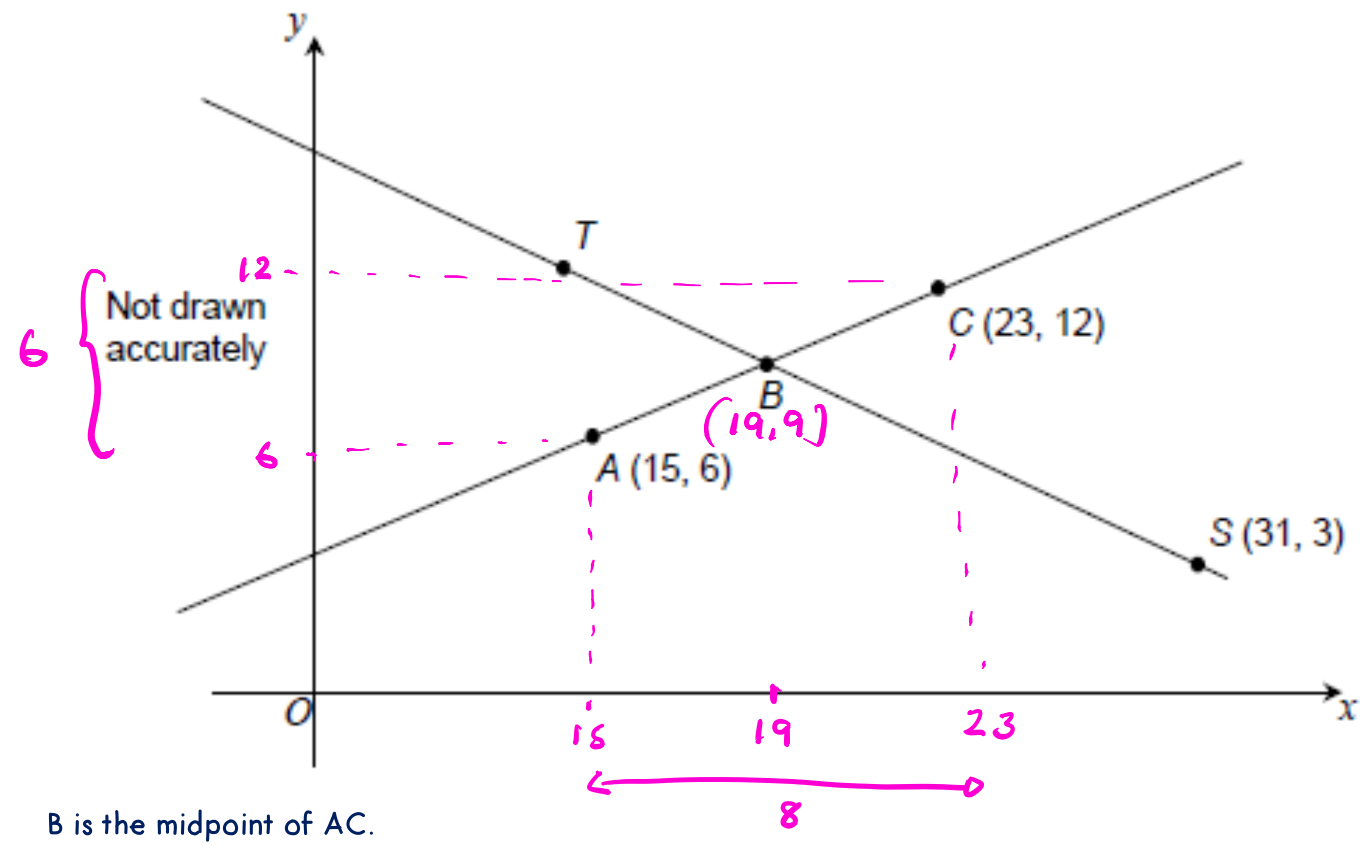
when $5x + 24 = 0$, $x = -24/5 = -4.8$, $y = -1.4$

$x + 3 = 0$, $x = -3$, $y = 4$

$x = -4.8$, $y = -1.4$
$x = -3$, $y = 4$

[5]

16. Two straight lines are shown.



B is the midpoint of AC.

TB : BS = 2 : 3

Work out the coordinates of T.

[4]

TB : BS
2 : 3

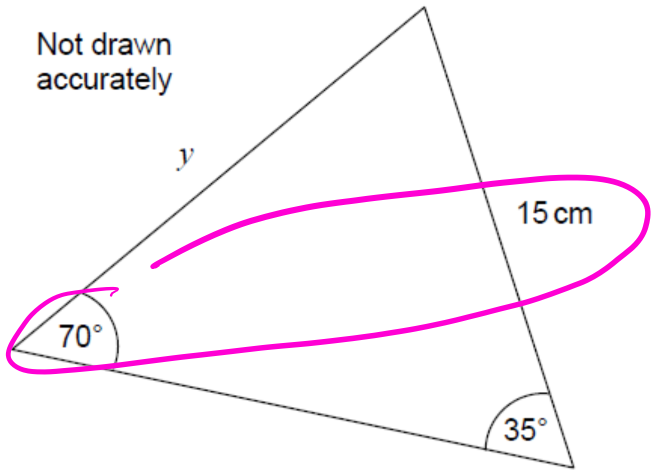
	T		B		S
x	11	$\xrightarrow{8}$	19	$\xrightarrow{12}$	31
y	13	$\xrightarrow{-4}$	9	$\xrightarrow{-6}$	3

$\overrightarrow{BS} = \begin{pmatrix} 12 \\ -6 \end{pmatrix}$

$\therefore \overrightarrow{TB} = \frac{2}{3} \times \begin{pmatrix} 12 \\ -6 \end{pmatrix} = \begin{pmatrix} 8 \\ -4 \end{pmatrix}$

$T = (11, 13)$

17. Work out the value of y. Sine Rule



$$\frac{y}{\sin 35} = \frac{15}{\sin 70}$$

$$y = \frac{15}{\sin 70} \times \sin 35$$

$$= 9.155809$$

$$= 9.16\text{cm } (3sf)$$

[2]

18. ACB is a straight line.

A is the point (0, 8), and B is the point (4, 0)

C is the midpoint of AB.

Line DCE is perpendicular to line ACB.

gradient AB $= \frac{-8}{4} = -2$

gradient DCE $= \frac{1}{2}$

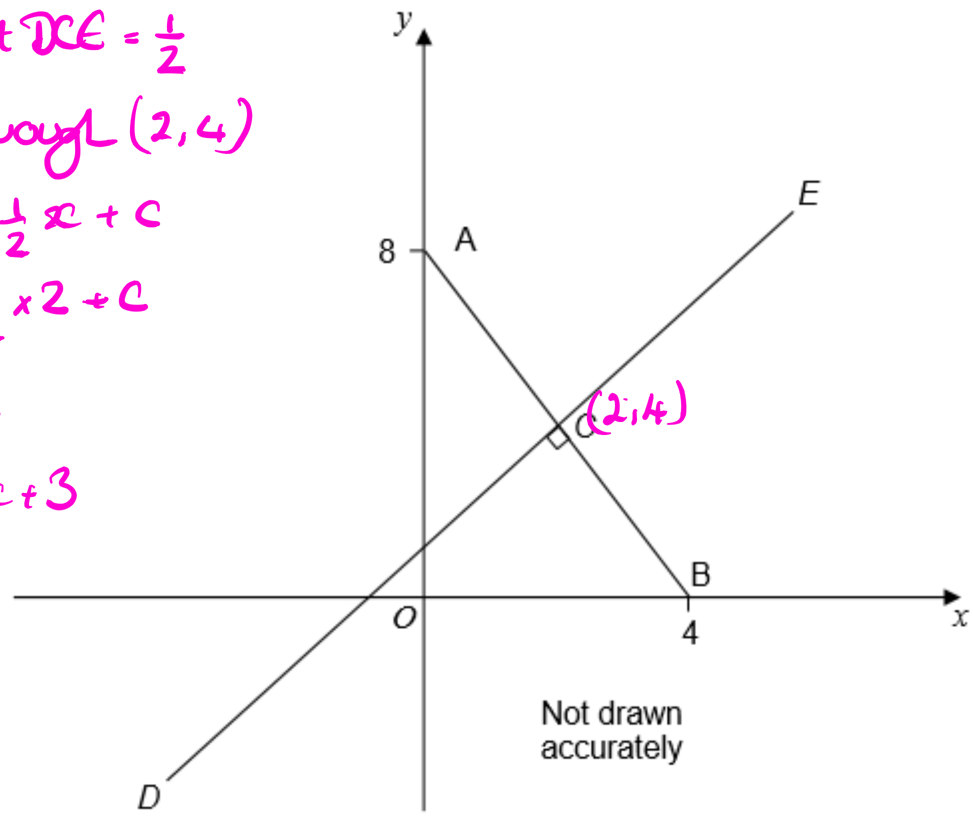
passes through $(2, 4)$

$$y = \frac{1}{2}x + c$$

$$4 = \frac{1}{2} \times 2 + c$$

$$c = 3$$

$$y = \frac{1}{2}x + 3$$



Work out the equation of line DCE.

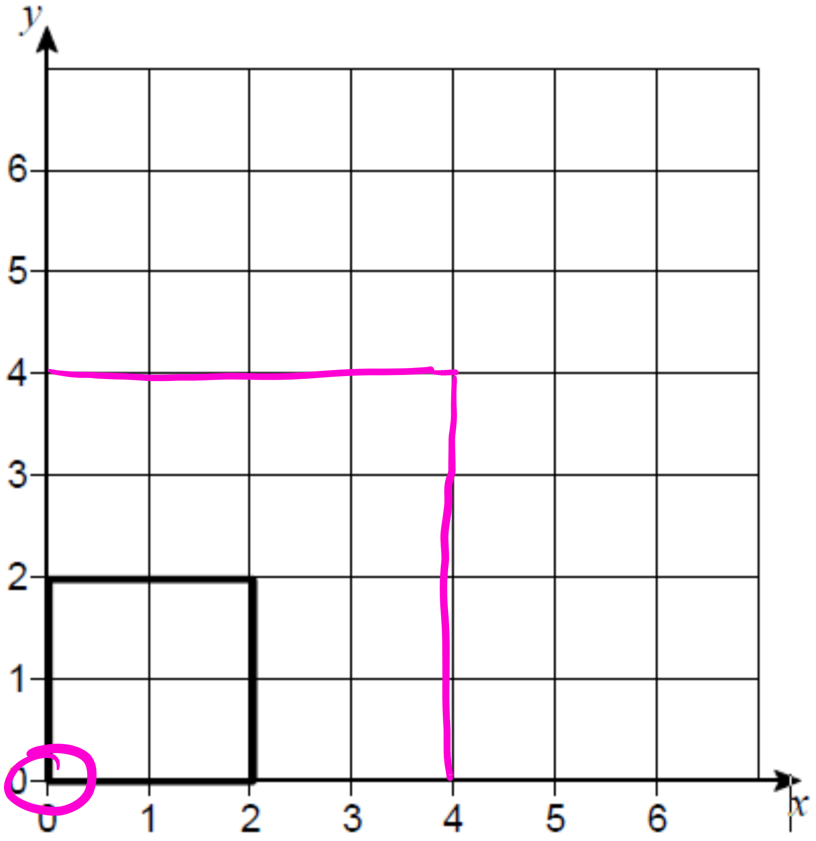
$$y = \frac{1}{2}x + 3$$

[5]

19. Square $OABC$ is drawn on a centimetre grid.

O is (0, 0) A is (2, 0) B is (2, 2) C is (0, 2)

invariant point (not changed)



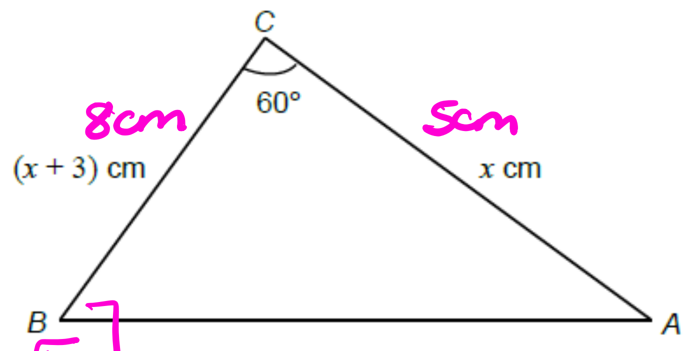
$OABC$ is enlarged, scale factor 2, centre (0, 0)

Circle the number of invariant points on the perimeter of the square.

0 1 2 4

[1]

20. The area of the triangle is $\sqrt{300}$ cm^2.



Calculate the length of AB.

$\frac{1}{2} x \times (x+3) \times \sin 60 = \sqrt{300}$

$(x^2+3x) \times \frac{\sqrt{3}}{2} = 2\sqrt{300}$

$\sqrt{3}(x^2+3x) = 4\sqrt{300}$

$x^2+3x = 4\sqrt{100}$

$x^2+3x-40=0$

$(x-5)(x+8)=0$

$x=5$ ✓ $x=-8$ ✗

$\left[\frac{\sqrt{300}}{\sqrt{3}} = \sqrt{100}\right]$

$AB^2 = 8^2+5^2-(2\times8\times5\times\cos 60)$

$= 49$

$AB = 7$cm

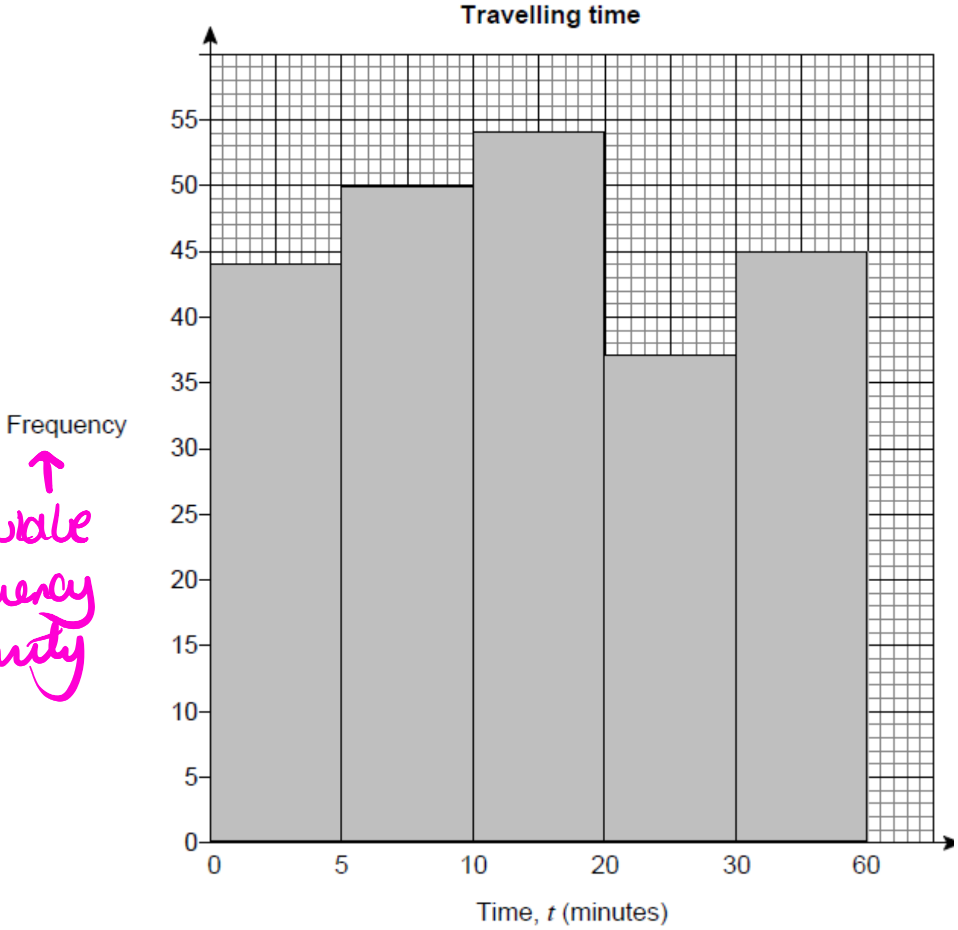
[8]

21. Joe asked 230 students how long it took them to travel to school.

The results are shown in the table.

Travelling time, t (minutes)	Number of students
$0 < t \leqslant 5$	44
$5 < t \leqslant 10$	50
$10 < t \leqslant 20$	54
$20 < t \leqslant 30$	37
$30 < t \leqslant 60$	45

This is Joe's attempt to draw a histogram to show the data.



should be frequency density

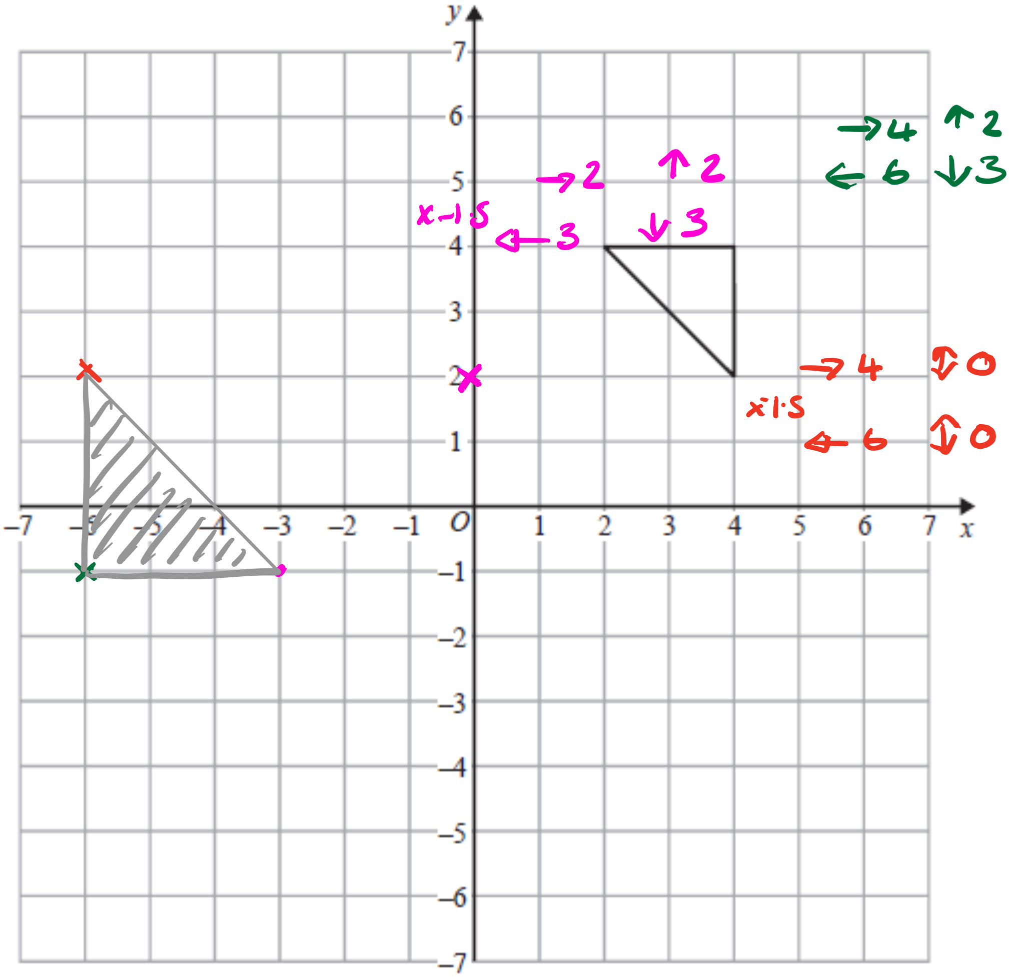
Make two criticisms of his histogram.

Criticism 1 used frequency instead of frequency density

Criticism 2 The bars should be different widths / a linear scale should have been used on the x-axis

[2]

22..



On the grid, enlarge the triangle by scale factor $-1\frac{1}{2}$, centre (0, 2)

[2]

Compiled by JustMaths – this is NOT a prediction paper and should not be used as such!