

"BETWEEN PAPERS" PRACTICE

(HIGHER TIER ONLY)

thanks to
Don Walker 

SUMMER 2018

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**

Q1. 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?

Circle your answer.

12

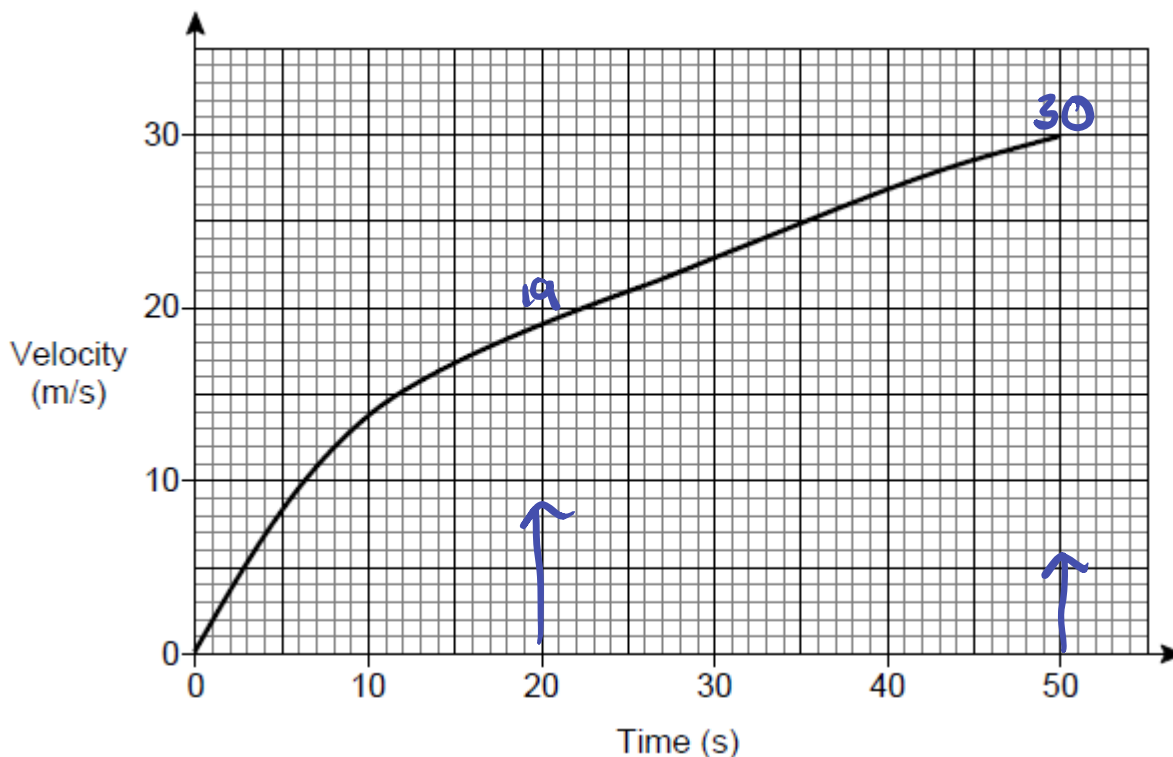
23

60

972

[1]

Q2. Here is the velocity-time graph of a car for 50 seconds.



(a) Work out the average acceleration during the 50 seconds.

Give the units of your answer.

$$\frac{30 \text{ m/s}}{50}$$

$$0.6 \text{ m/s}^2$$

[2]

(b) Estimate the distance travelled the last 30 seconds.

$$\text{Area under} = \frac{1}{2} (19 + 30) \times 30 = 735 \text{ m}$$

[2]

Q3. Convert 0.172 to a fraction in its lowest terms.

$$x = 0.172727272$$

$$100x = 17.272727272$$

$$99x = 17.1$$

$$x = \frac{17.1}{99} = \frac{171}{990} = \frac{19}{110}$$

[3]

Q4. Expand and simplify $(2x + 5)(2x - 5)(3x + 7)$

$$4x^2 - 10x + 10x - 25$$

$$(4x^2 - 25)(3x + 7)$$

$$12x^3 + 28x^2 - 75x - 175$$

$$12x^3 + 28x^2 - 75x - 175$$

[3]

Q5. Use the quadratic formula to solve $5x^2 + 11x - 2 = 0$. Give your solutions to 2 decimal places.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-11 \pm \sqrt{11^2 - 4 \times 5 \times -2}}{2 \times 5} = \frac{-11 \pm \sqrt{161}}{10}$$

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

$$x = \frac{-11 + \sqrt{161}}{10} = 0.17 \text{ OR } x = \frac{-11 - \sqrt{161}}{10} = -2.37$$

[3]

Not a predicted paper ... I'm a practice paper! collated from AQA sample/spec etc questions

Q6. Which expression gives the area, in cm^2 , of this triangle?

Circle your answer.

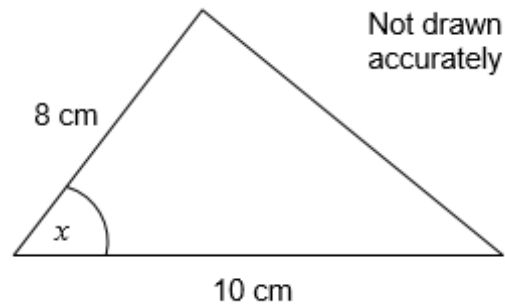
$$\frac{1}{2} ab \sin C$$

$$= \frac{1}{2} 8 \times 10 \times \sin C$$

[1]

80 $\sin x$ 40 $\sin x$

80 $\cos x$ 40 $\cos x$



Q.7 A sequence of numbers is formed by the iterative process $a_{n+1} = (a_n)^2 - a_n$

a) Describe the sequence of numbers when $a_1 = 1$

$$a_2 = 1^2 - 1 = 0 \quad a_3 = 0 \quad a_4 = 0$$

Show working to justify your answer.

A '1' then a series of zeros.

[1]

b) Describe the sequence of numbers when $a_1 = -1$

$$a_2 = (-1)^2 - (-1) = 2$$

$$a_3 = 2^2 - 2 = 2$$

$$a_4 = 2^2 - 2 = 2$$

Show working to justify your answer.

A '1' then a series of '2's

[2]

c) Work out the value of a_2 when $a_1 = 1 - \sqrt{2}$

$$a_2 = (1 - \sqrt{2})^2 - (1 - \sqrt{2})$$

$$= 1 - \sqrt{2} - \sqrt{2} + 2 - 1 + \sqrt{2}$$

$$= 2 - \sqrt{2}$$

[2]

Q8. The diagram shows the circle

$$x^2 + y^2 = 10 \quad \text{radius} = \sqrt{10}$$

P lies on the circle and has x-coordinate 1

The tangent at P intersects the x-axis at Q.

Work out the coordinates of Q.

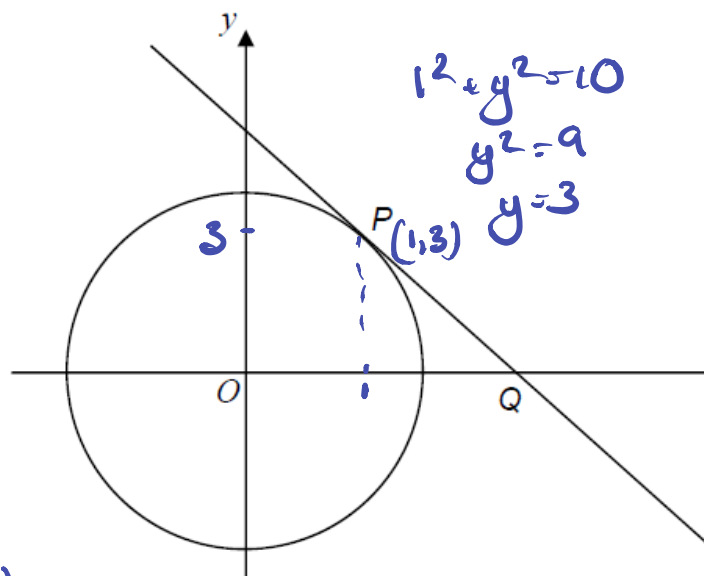
$$\text{gradient of } OP = \frac{3-0}{1-0} = 3$$

$$\text{gradient of } PQ = -\frac{1}{3}$$

$$\text{line PQ passes through } (1, 3) \quad y = -\frac{1}{3}x + c$$

$$3 = -\frac{1}{3} \times 1 + c$$

$$c = 3\frac{1}{3} \therefore \text{line} \Rightarrow y = -\frac{1}{3}x + 3\frac{1}{3}$$



$$\text{when } y = 0$$

$$\frac{1}{3}x = 3\frac{1}{3}$$

$$\times 3$$

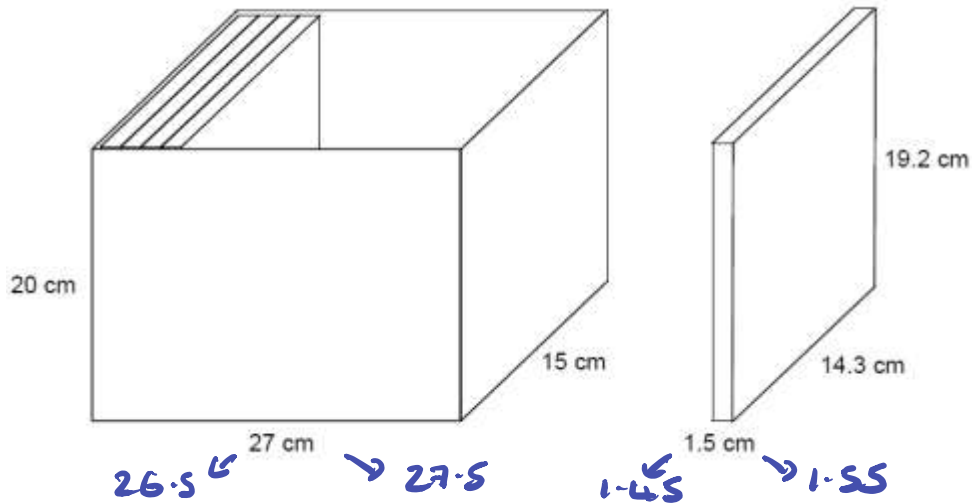
$$x = 10$$

$$\therefore Q = (10, 0)$$

[5]

Q9. A box is a cuboid with dimensions 27 cm by 15 cm by 20 cm
These dimensions are to the nearest centimetre.

DVD cases are cuboids with dimensions 1.5 cm by 14.3 cm by 19.2 cm
These dimensions are to the nearest millimetre.



Show that 17 DVD cases, stacked as shown, will definitely fit in the box.

$$26.5 \div 1.55 = 17.097$$

so 17 will definitely fit

[4]

Q10. Rationalise the denominator and simplify $\frac{10}{3\sqrt{5}}$

$$\frac{10 \times \sqrt{5}}{3\sqrt{5} \times \sqrt{5}} = \frac{10\sqrt{5}}{3 \times 5} = \frac{10\sqrt{5}}{15} = \frac{2\sqrt{5}}{3}$$

[2]

Q11. Tony and Ian are each buying a new car.

There are three upgrades that they can select:

- m** • metallic paint (10 different choices) 10
- a** • alloy wheels (5 different choices) x 5
- mu** • music system (3 different choices). x 3

a) Tony selects all 3 upgrades.

Show that there are 150 different possible combinations.

$$10 \times 5 \times 3 = 150$$

[1]

b) Ian selects 2 of these upgrades.

Show that there are 95 different possible combinations.

$$\begin{aligned} m \times a &+ m \times mu &+ a \times mu \\ 10 \times 5 &+ 10 \times 3 &+ 5 \times 3 \\ 50 &+ 30 + 15 &= \underline{\underline{95}} \end{aligned}$$

[3]

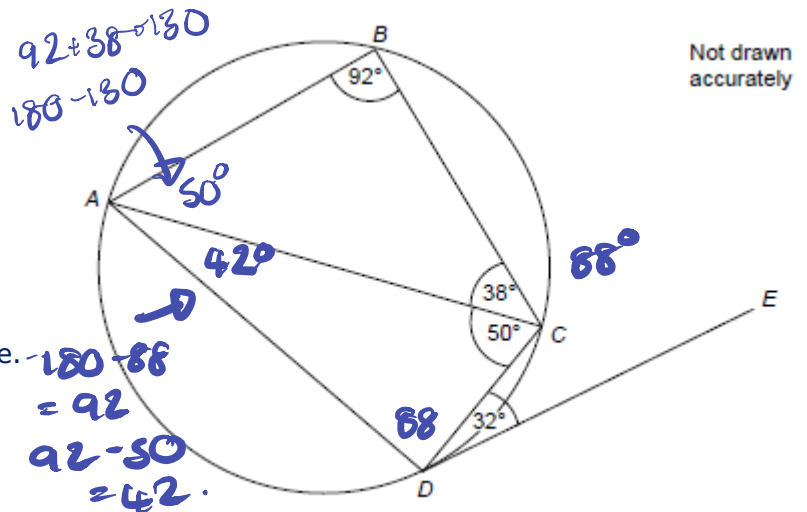
Q12. B, C and D are points on a circle.

Angle $ABC = 92^\circ$

Angle $ACB = 38^\circ$

Angle $ACD = 50^\circ$

Angle $CDE = 32^\circ$



Tick whether each statement is true or false.

Give a reason for each answer.

Statement

True

False

AC is a diameter

☐
☒

Reason

angle ABC is not 90° and if AC was a diameter it would be 90° (angles in a semicircle = 90°)

Statement

True

False

Angle $ADC = 88^\circ$

☐
☒

Reason

opposite angles in a cyclic quadrilateral add up to 180°

Statement

True

False

ABCD is a trapezium

☒
☐

Reason

AB and DC are parallel.

Statement

True

False

DE is a tangent to the circle

☐
☒

Reason


$\angle DAC = 42^\circ$. If it were a tangent it would be 32° (Alternate segment Theorem)

[4]

$$\sqrt{8} = \sqrt{2\sqrt{4}} = 2\sqrt{2}$$

Q13. The area of a right-angled, isosceles triangle is 4 cm^2

Work out the perimeter of the triangle in centimetres. Give your answer in the form $a + b\sqrt{c}$, where a, b and c are integers.

x  $\frac{1}{2}x^2 = 4$
 $x^2 = 8$
 $x = \sqrt{8}$
 $y^2 = x^2 + x^2$
 $= 8 + 8$
 $= 16$
 $y = 4$
 Perimeter $= \sqrt{8} + \sqrt{8} + 4$
 $= 4 + 2\sqrt{8}$
 $= 4 + 2 \times 2\sqrt{2}$
 $= 4 + 4\sqrt{2}$ [4]

Q14. Show that $\frac{2w+4}{w^2-25} \times \frac{w+5}{w^2+3w+2} \times (3w^2-16w+5)$ is.

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

$\frac{2(w+2)}{(w+5)(w-5)} \times \frac{w+5}{(w+1)(w+2)} \times \frac{3w^2-16w+5}{1}$
 $\frac{3w^2-16w+5}{3w(w-5)-1(w-5)}$
 $\frac{3w^2-16w+5}{(3w-1)(w-5)}$

$\Rightarrow \frac{2(3w-1)}{w+1} = \frac{6w-2}{w+1}$

$a = 6 \quad b = -2$
 $c = 1 \quad d = 1$

Q15. Solve

$5x - y = 5$

$y = 5x - 5$

$2y = 10x - 10$

$2y - x^2 = 11$

You must show your working.

Do not use trial and improvement.

$10x - 10 - x^2 = 11$
 $x^2 - 10x + 21 = 0$
 $(x-3)(x-7) = 0$

$x = 3 \quad x = 7$
 $y = 10 \quad y = 30$

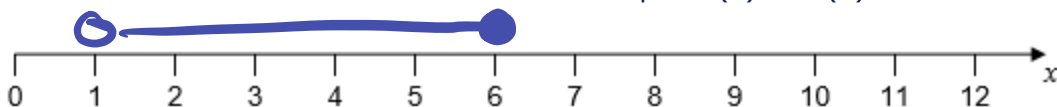
Q16. a) Solve the inequality $\frac{3x}{2} \leq 9$

$3x \leq 18$
 $x \leq 6$

b) Solve the inequality $4(x+2) > 12$

$x+2 > 3$
 $x > 1$

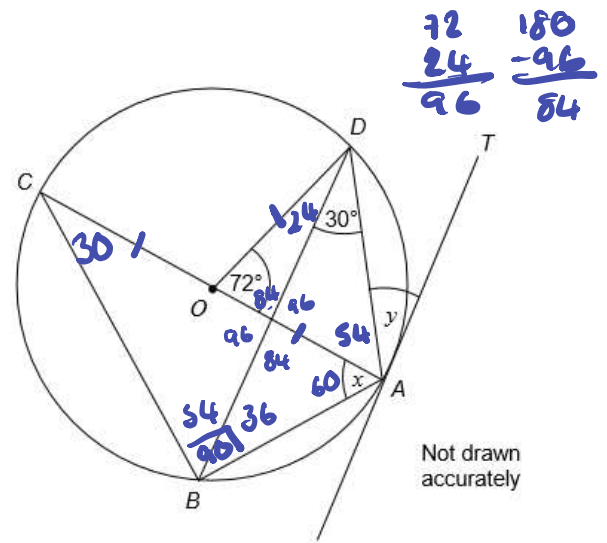
c) Represent the solution set that satisfies both answers to parts (a) and (b) on the number line.



Q17. A, B, C and D are points on a circle, centre O.

AC is a diameter of the circle.

AT is a tangent to the circle.



Work out the size of angle x and the size of angle y.

$$\triangle OAD \quad 180 - 72 = 108$$

$$108 \div 2 = 54$$

$$x = 60$$

$$y = 36 \quad \text{Alternate segment theorem}^{[4]}$$

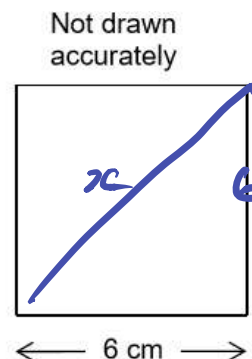
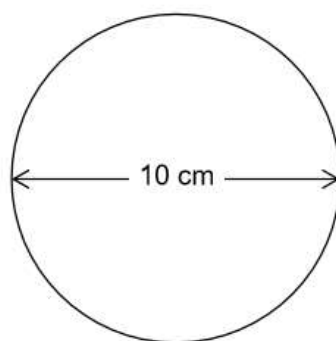
Q18. Write $\sqrt{12} + \frac{15}{\sqrt{3}}$ in the form $a\sqrt{b}$ where a and b are prime numbers

$$\sqrt{4}\sqrt{3} + \frac{15\sqrt{3}}{\sqrt{3}\sqrt{3}}$$

$$2\sqrt{3} + \frac{15\sqrt{3}}{3} = 2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3}$$

[3]

Q19. A circle has diameter 10 cm A square has side length 6 cm



$$6^2 + 6^2 = 72$$

$$x^2 = 72$$

$$x = \sqrt{72}$$

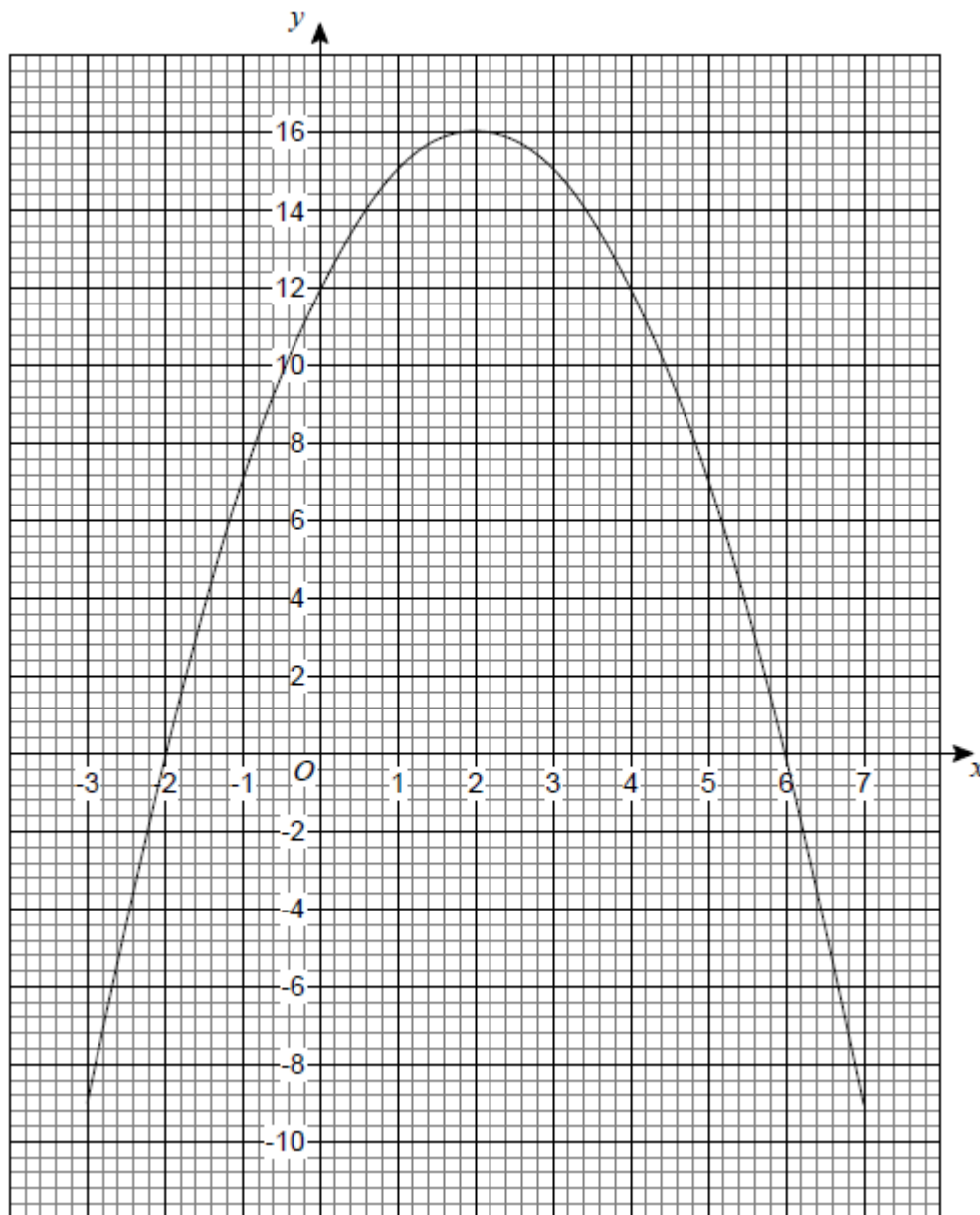
Use Pythagoras' theorem to show that the square will fit inside the circle without touching the edge of the circle.

$$x = \sqrt{72} < 10 \text{ cm}$$

so will fit inside

[3]

Q20. The graph $y = a + bx - x^2$ is shown.



(a) Circle the coordinates of the turning point of the curve.

(-2, 0) (0, 12) (2, 16) (6, 0)

[1]

(b) Circle the value of a .

-2 12 16 6

[1]

(c) Circle the two roots of $a + bx - x^2 = 0$

-2 and 6 2 and -6 2 and 6 -2 and -6

[1]

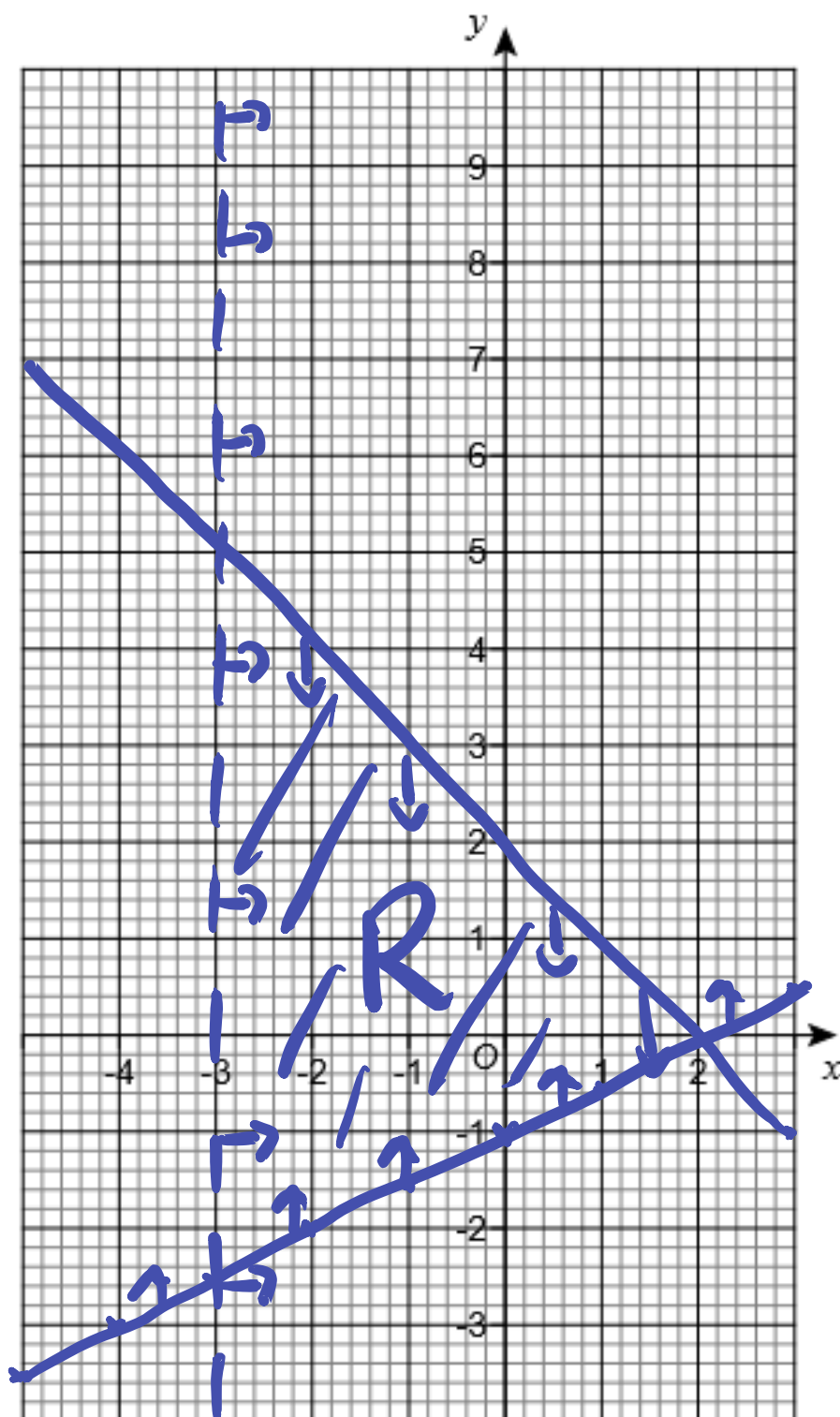
Q21. The region R satisfies the three inequalities

$$x > -3$$

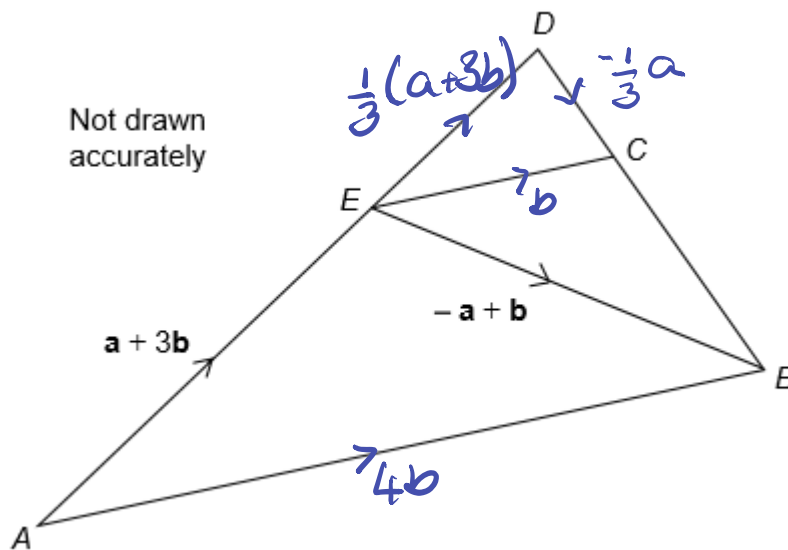
$$x + y \leq 2$$

$$y \geq \frac{x}{2} - 1$$

Show the region R on the grid.



Q22. AED is a straight line.



$$\overrightarrow{AE} = \mathbf{a} + 3\mathbf{b}$$

$$\overrightarrow{EB} = -\mathbf{a} + \mathbf{b}$$

a) Work out the vector \overrightarrow{AB} $\cancel{a} + 3b - \cancel{a} + b = 4b$

[1]

b) Also $\overrightarrow{ED} = \frac{1}{3} \overrightarrow{AE}$ and $\overrightarrow{DC} = -\frac{1}{3} \mathbf{a}$

Prove that EC is parallel to AB.

$$\begin{aligned} \overrightarrow{ED} &= \frac{1}{3}(\mathbf{a} + 3\mathbf{b}) - \frac{1}{3}\mathbf{a} \\ &= \cancel{\frac{1}{3}\mathbf{a}} + \mathbf{b} - \cancel{\frac{1}{3}\mathbf{a}} = \mathbf{b}. \end{aligned}$$

[3]

$\therefore \overrightarrow{AB} = 4\overrightarrow{EC}$ so AB and EC are parallel.