Mixed Exercise 7

1.

$w \blacktriangledown h$ is defined as $5w^2 - 8w + h^2 - 2h$

For example $1 \blacktriangledown 6 = 5 \times 1^2 - 8 \times 1 + 6^2 - 2 \times 6$
$= 5 - 8 + 36 - 12$
$= 21$

(a) Work out $2 \blacktriangledown 4$

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Answer…… *(2 marks)*

(b) Solve $x \blacktriangledown 3 = 0$

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Answer…… *(4 marks)*

2.

(a) n is a positive integer.

Write down the **next** odd number after $2n - 1$

Answer..... *(1 mark)*

(b) Prove that the product of two consecutive odd numbers is **always** one less than a multiple of 4 .

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(3 marks)

3.

Bag A contains $7x$ counters.

Bag B contains $2x$ counters.

Five counters are taken from bag A and put in bag B.

(a) Write an expression, in terms of x, for the number of counters now in bag B.

Answer..... *(1 mark)*

(b) The ratio of counters in bag *A* to bag *B* is now 8 : 3

Use algebra to work out the **total** number of counters in the bags.

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Answer..... *(4 marks)*

4.

Solve the simultaneous equations

$$\frac{x-1}{y-2}=3 \qquad \frac{x+6}{y-1}=4$$

Do **not** use trial and improvement.
You **must** show your working.

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$x =$ ....., $y =$ ..... *(5 marks)*

5.

Simplify fully $\dfrac{4x^2 + 19x - 5}{9x^2 - 16} \div \dfrac{x + 5}{3x - 4}$

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Answer..... *(5 marks)*

6.

(a) Expand $(x+m)(x+n)$

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Answer ..... *(1 mark)*

(b) $x^2+qx+r \equiv (x+m)(x+n)$

Use your answer to part (a) to write q and r in terms of m and n.

$q =$ .....

$r =$ ..... *(2 marks)*

(c) r is an odd integer.

Use your answer to part (b) to explain why q is an even integer.

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(2 marks)

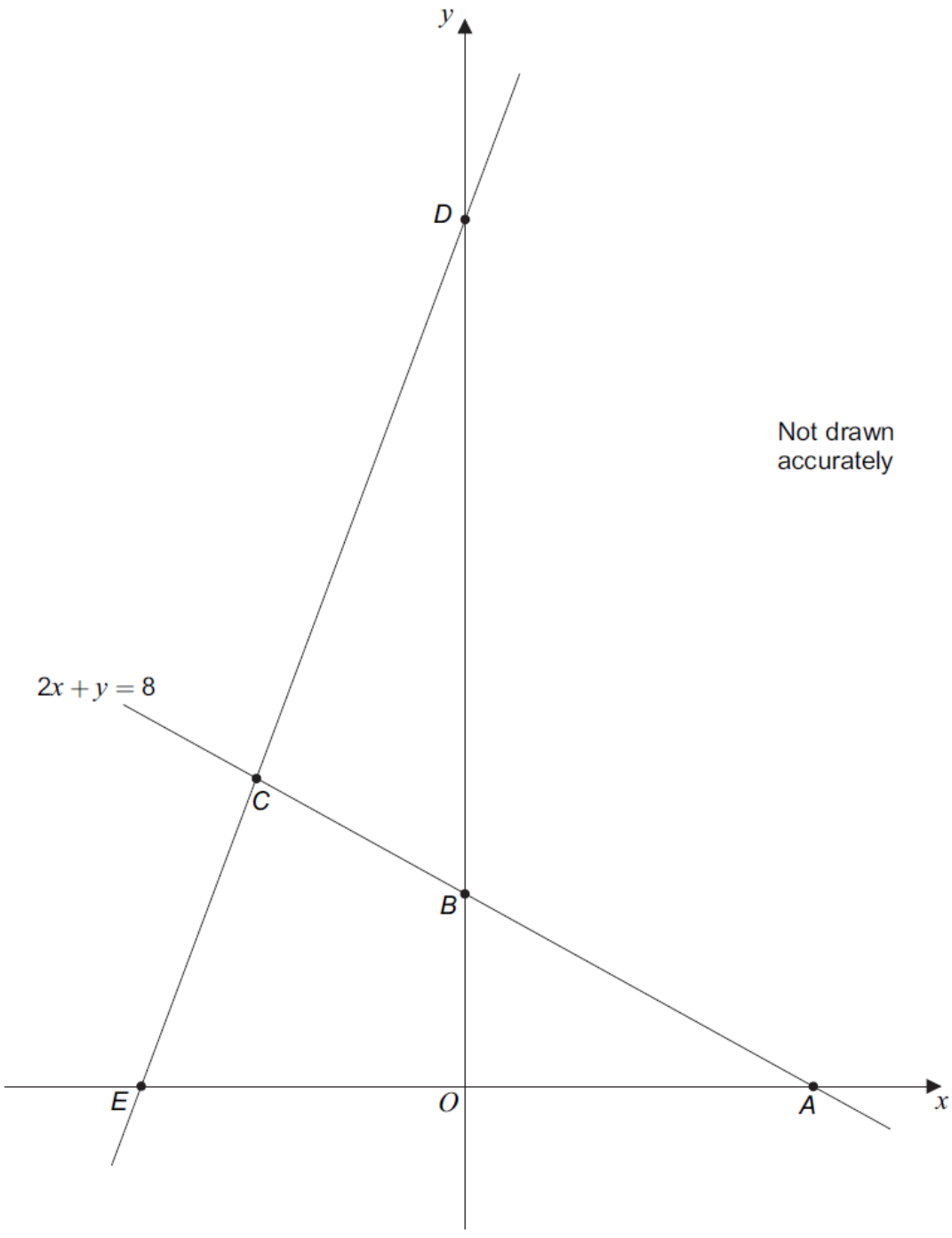
7.

A, B and C are points on the line $2x + y = 8$

DCE is a straight line.

$AB : BC = 2 : 1$

$EC : CD = 1 : 2$



Work out the ratio Area of triangle *AEC* : Area of triangle *BCD*

Give your answer in its simplest form.

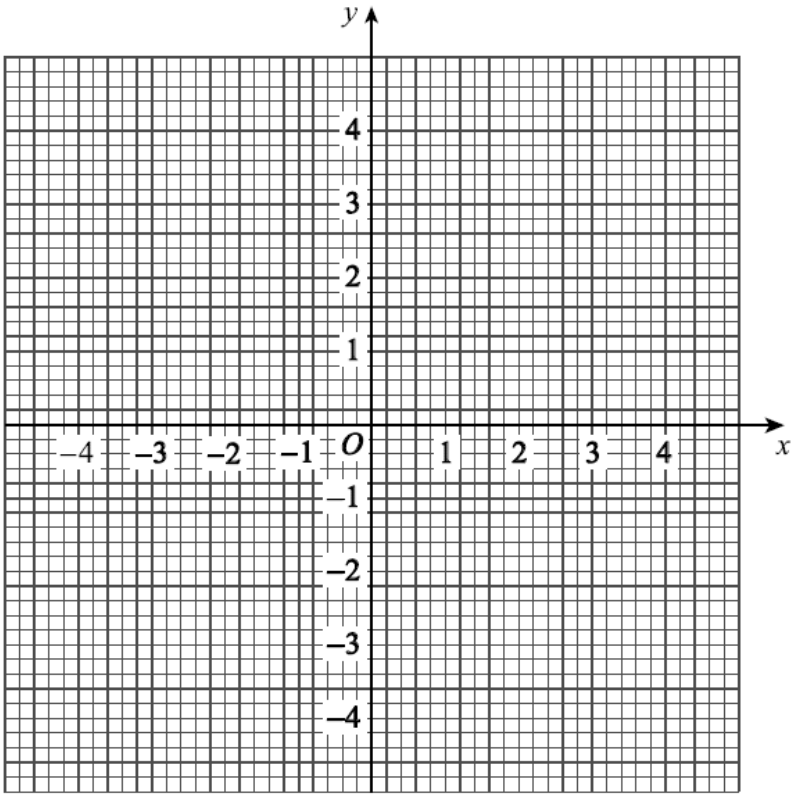
Answer ..... : ..... *(6 marks)*

8.

A function $f(x)$ is defined as

$$\begin{aligned} f(x) &= 4 && x < -2 \\ &= x^2 && -2 \leqslant x \leqslant 2 \\ &= 12 - 4x && x > 2 \end{aligned}$$

(a) Draw the graph of $y = f(x)$ for $-4 \leqslant x \leqslant 4$



(3 marks)

(b) Use your graph to write down **how many** solutions there are to $f(x) = 3$

Answer ..... *(1 mark)*

(c) Solve $f(x) = -10$

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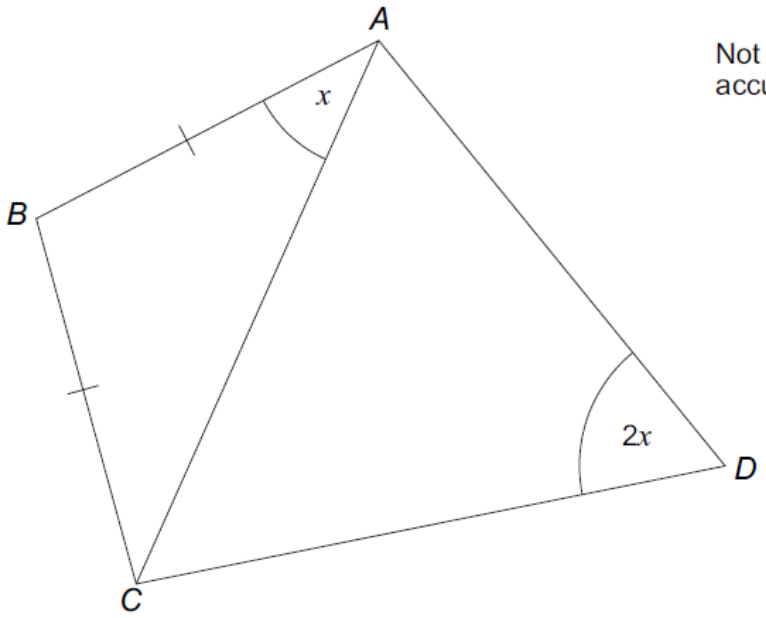
$x =$ ..... *(2 marks)*

9.

In the diagram, $AB = BC$



Not drawn accurately

Prove that $ABCD$ is a cyclic quadrilateral.
Give reasons for any statements you make.

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(3 marks)

10.

$f(x) = \sin x \qquad 180° \leqslant x \leqslant 360°$

$g(x) = \cos x \qquad 0° \leqslant x \leqslant \theta$

(a) Calculate the value of f(210°).

Answer ..... *(1 mark)*

(b) Complete this inequality for the range of $f(x)$.

Answer ..... $\leqslant f(x) \leqslant$ ..... *(2 marks)*

(c) You are given that $0 \leqslant g(x) \leqslant 1$

Work out the value of θ.

$\theta =$ ..... degrees *(1 mark)*