

Factorising/Expanding/Solving Polynomials (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

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Total Marks:	

1. Factorise the following expressions.

a)
$$6x^2 + 8x$$

$$2x(3x+4)$$

b)
$$x^2 - 100$$

$$(x+10)(x-10)$$

2. Express $x^2 + 12x + 14$ in the form $(x + a)^2 + b$, where a and b are whole numbers to be found. $(x + b)^2 - 3b + 14$

$$(x+6)^2-36+19$$

$$a = 6 b = -22$$
 [2]

3. Expand and simplify (m + 7)(m + 3)

$$M^2 + 7m + 3m + 21 = m^2 + 10m + 21$$

4. Factorise fully $20x^2 - 5$

$$5(4x^2-1) = 5(2x+1)(2x-1)$$

5. Circle the equation with roots 4 and -8

$$4x(x-8) = 0$$
 $(x-4)(x+8) = 0$
 $x^2 - 32 = 0$ $(x+4)(x-8) = 0$

[1]

[2]

[2]

[1]

6. Factorise $y^2 + 7y + 6$

$$(y + 6)(y + 1)$$

[2]

- 7. $2x^2 6x + 5$ can be written in the form $a(x b)^2 + c$ where a, b and c are positive numbers.
- (a) Work out the values of a, b and c.

$$2(x^{2}-3x)+5$$

$$=2(x-\frac{3}{2})^{2}-\frac{9}{4}+5$$

$$=2(x-\frac{3}{2})^{2}-\frac{9}{2}+5=2(x-\frac{3}{2})^{2}+\frac{1}{2}$$

OJUSTMOTHS

Check $2(x-\frac{3}{2})^2 + \frac{1}{2}$ $= 2/x^2 - 3x + \frac{9}{4} + \frac{1}{2}$ $= 2x^2 - 6x + \frac{9}{4} + \frac{1}{2}$ $= 2x^2 - 6x + 5$ $= \frac{2}{5}$ $= \frac{3}{2}$ $= \frac{3}{2}$ $= \frac{3}{2}$

[3]

(b) Using your answer to part (a), or otherwise, solve $2x^2 - 6x + 5 = 8.5$

$$2(x-\frac{3}{2})^{2} + \frac{1}{2} = 8.5$$

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

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

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

$$x = +2 + \frac{3}{2} = 3.5$$
or $x = -2 + \frac{3}{2} = -0.5$

8. (a) Find the interval for which $x^2 - 7x + 10 \le 0$

(a)
$$2 \le x \le 5$$
 [3]

(b) The point (-3, -4) is the turning point of the graph of $y = x^2 + ax + b$, where a and b are integers.

Find the values of a and b.

$$y = (x+3)^{2} - 4$$

$$= x^{2} + 6x + 9 - 4$$

$$= x^{2} + 6x + 5$$

6. $y = 6x^4 + 7x^2$ and $x = \sqrt{w+1}$.

Find the value of w when y = 10.

Show your working.

$$|O = 6 (|WH)^{4} + 7 (|W+1|)^{2}$$

$$|O = 6 (|WH|)^{2} + 7 (|W+1|)$$

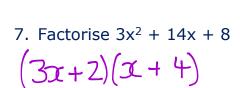
$$|O = 6 (|W+1|)^{2} + 7 (|W+1|)$$

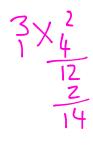
$$|O = 6 (|W+1|)^{2} + 7 (|W+1|)^{2}$$

$$|O = 6 (|W+1|)^{4} + 7 (|W+1|)^{4}$$

$$|O = 6 (|W+1|)^{4} +$$

$$W = -\frac{1}{6}$$
 or $W = -3$ [6]







[2]

11. a) Write $x^2 + 10x + 29$ in the form $(x + a)^2 + b$.

$$(x+5)^2 - 25+29 = (x+5)^2+4$$

a)
$$(x+5)^2 + 4$$
 [3]

b) Write down the coordinates of the turning point of the graph of $y = x^2 + 10x + 29$.

12. a) Expand and simplify.

$$(x + 7)(x + 2)$$

$$(x + 7)(x + 2)$$

a)
$$\chi^2 + 9\chi + 14$$
 [2]

b) Factorise completely.

$$2x^{2} - 6xy$$

b)
$$2x\left(x-3y\right)$$
 [2]

c) Solve.

$$x^{2} + 5x = 24$$

 $x^{2} + 5x - 24 = 0$
 $(x + 8)(x - 3) = 0$

$$\chi = -8 \text{ or } 3$$

13. Factorise $x^2 + 3x - 4$

$$(x+4)(x-1)$$

[2]

14. Factorise $y^2 + 27y$

$$y(y+27)$$



15. Expand and simplify (y + 5)(y - 4)

$$y^2 + 5x - 4y - 20 = y^2 + y - 20$$

16. $x(x + 4) \equiv x^2 + 4x$

For how many values of x is x(x + 4) equal to $x^2 + 4x$? Circle your answer.

0 1 2 all

17. Factorise fully 9a² - 6a

$$3a(3a-2)$$

18. Write $x^2 + 2x - 8$ in the form $(x + m)^2 + n$

where m and n are integers.

$$(\chi + 1)^2 - 1 - 8 = (\chi + 1)^2 - 9$$
 [2]

19. a) Write $2x^2 + 16x + 35$ in the form $a(x + b)^2 + c$ where a, b, and c are integers.

$$2(x^{2} + 8x) + 35 = 2(x + 4)^{2} - 16 + 35$$

$$= 2(x + 4)^{2} - 32 + 35$$

$$= 2(x + 4)^{2} + 3$$
[3]

b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 2x^2 + 16x + 35$

$$(-4,3)$$

20. Solve $x^2 - 6x - 8 = 0$

Write your answer in the form $\underline{a} \pm \sqrt{b}$ where a and b are integers.

$$3 \pm \frac{6 \pm \sqrt{36 + 32}}{2}$$
 quadratic formula
$$= \frac{6 \pm \sqrt{68}}{2} = \frac{168 \pm \sqrt{17}}{2} = \frac{3 \pm \sqrt{17}}{2} = \frac{3 \pm \sqrt{17}}{2}$$
[3]



21. Show that

$$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of x.

$$(3x^{2}-x+15x-5)(4x-3) = (3x^{2}+14x-5)(4x-3)$$

$$= 12x^{3}-9x^{2}+56x^{2}-42x-20x+15$$

$$= 12x^{3}+47x^{2}-62x+15$$

[3]

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

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

[3]

23. Expand and simplify (2x + 5y)(3x - 8y)

$$bx^2 - 1bxy + 15xy - 40y^2$$

= $bx^2 - 3xy - 40y^2$

[3]

24.
$$2x^2 - 20x + c \equiv a(x - b)^2 + 3b$$

Work out the value of c.

$$2(x^2-10x)+c=2(2c-5)^2-25+c$$

Therefore b=5 and c-25=15
c=40

[3]

25.
$$(3x + 1)(x - 2) + ax + b \equiv 3x^2 + 8x - 5$$

Work out the values of a and b.

$$3x^{2}+x-6x-2+ax+b$$

= $3x^{2}+(a-5)x+b-2$
 $a-5=8$ $b-2=-5$
 $a=13$ $b=-3$

[4]

26. Write $x^2 - 10x + 29$ in the form $(x - a)^2 + b$

$$(x-5)^2 - 25 + 29$$
$$= (x-5)^2 + 4$$

[2]

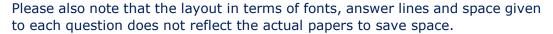


CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	WJEC Eduqas	12	OCR	23	AQA
2	WJEC Eduqas	13	Pearson Edexcel	24	AQA
3	Pearson Edexcel	14	Pearson Edexcel	25	AQA
4	Pearson Edexcel	15	AQA	26	AQA
5	AQA	16	AQA		
6	Pearson Edexcel	17	AQA		
7	AQA	18	Pearson Edexcel		
8	OCR	19	Pearson Edexcel		
9	OCR	20	Pearson Edexcel		
10	OCR	21	Pearson Edexcel		
11	OCR	22	AQA		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board's (similarly any errors I have corrected from the originals are also my corrections and not theirs!).



These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.



Links:

AQA http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300

OCR http://ocr.org.uk/gcsemaths

Pearson Edexcel http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

WJEC Eduqas http://www.eduqas.co.uk/qualifications/mathematics/gcse/

Contents:

This version contains questions from:

AQA - Sample Assessment Material, Practice set 1 and Practice set 2

OCR - Sample Assessment Material and Practice set 1

Pearson Edexcel - Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Edugas – Sample Assessment Material