

Student's Name:

Teacher's Name:



Barker
College

ALY*, PJR, ARP, SJB, PDJ, PCB
JAI, JZT, LMD, BHC, ARM

Monday 7th March 2022
Period 1 or 2
Time Allowed: 55 minutes

**YEAR 9
MATHEMATICS**

5.3

ASSESSMENT 1

248 copies

**Algebra
Products and Factors**

INSTRUCTIONS TO STUDENTS

- * Write ALL answers in the space provided.
- * ALL NECESSARY working for each question must be shown to gain full marks.
- * Marks may not be awarded for careless or badly arranged working.
- * DIAGRAMS ARE NOT TO SCALE
- * Write in blue or black pen
- * Board-approved, non-programmable calculators may be used.

TOTAL: [70 marks]

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1. Simplify fully:

(a) $-6m + 3m - 5m$ 1

(b) $7ab - 2ab^2 - 5ba$ 1

(c) $4m \times (-3mn) \times 6n$ 2

(d) $\frac{7pq^2}{21pqr}$ 2

2. Expand and simplify if possible:

(a) $-5(7 - 2x)$ 1

(b) $(7a - 5)(2a + 2)$ 2

(c)	$(3 - m)(3 + m)$	2
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(d)	$(3h - 8)^2$	2
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(e)	$10 - 5(2x - 7)$	2
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3.	Fully factorise:	
(a)	$9a + 12$	1

(b)	$8y(y - 3) - 9(y - 3)$	2
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(c)	$56a^2b - 63ab^2$	2
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(d)	$2a^2 + 5a - 6ab - 15b$	2
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(e)	$x^2 - 1$	1
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(f)	$x^2 + 11x + 30$	2
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(f) $k^2 - 8k - 48$ 2

(g) $14x^2 - 19x - 3$ 3

(h) $3x^2 + 3x - 18$ 3

4. Explain why there is no factorisation for $x^2 + x + 23$ 1

5. Simplify:

(a) $\frac{5y}{8} - \frac{3y}{8}$ 2

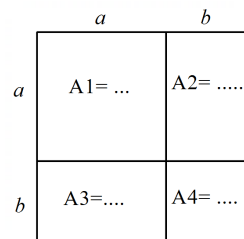
(b) $\frac{7n}{8} + \frac{3n}{4}$ 2

(c) $\frac{g}{5} \times \frac{15}{13g}$ 2

(d) $36xy \div \frac{6x^2}{y}$ 3

6. The recurring decimal $0.58\dot{3}$ is equivalent to $\frac{7}{12}$.
Show using algebra that this is true. 3

7. Consider the large **square** shown.



- i. Give an expression for the length of each side of the larger (outside) square? 1
- ii. Write an expression for the area of the larger square using your answer from i. **Do not expand your answer.** 1
- iii. On the diagram fill in the blanks with the areas of the smaller shapes labelled A1, A2, A3, A4. 1
- iv. Using information from parts i. – iii., **explain why** $(a + b)^2 = a^2 + 2ab + b^2$. Make sure you **use words and algebra** in your answer. 2

8. Expand and simplify: $y^2 \left(\frac{3}{y} + 5y \right)^2$ 3

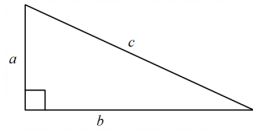
9. Fully factorise and simplify:

(a) $2v^3 - 8v$ 2

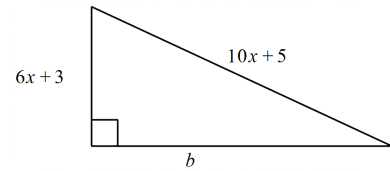
(b) $\frac{x^2-25}{4x-6} \div \frac{x^2-5x}{6x^2-7x-3}$ 4

(c) $\frac{7}{a^2+4a-5} - \frac{4}{a^2-8a+7}$ 4

10. In a right angled triangle, Pythagoras theorem allows us to find the length of the shorter side, using the formula $b^2 = c^2 - a^2$, where c is the hypotenuse.



- i. In the right angled triangle below, use $b^2 = c^2 - a^2$ to find a simplified, fully factorised expression for b^2 . 3



- ii. Find the simplest expression for b . 1

11. Fully factorise $-9x^2 + x^4 - 16 - 24x$ 2

Turn over page for the last question.

END OF PAPER

1a. $-6m+3m-5m$
 $= -8m$

b. $7ab-2ab^2-5ba$
 $= 2ab-2ab^2$

c. $4m \times (-3mn) \times 6n$
 $= -72m^2n^2$

d. $\frac{7pq^2}{21pqr} = \frac{q}{3r}$

2a. $-5(7-2x)$
 $= -35+10x$

b. $(7a-5)(2a+2)$
 $= 14a^2+14a-10a-10$
 $= 14a^2+4a-10$

c. $(3-m)(3+m)$
 $= 9-m^2$

d. $(3h-8)^2$
 $= (3h-8)(3h-8)$
 $= 9h^2-24h-24h+64$
 $= 9h^2-48h+64$

e. $10-5(2x-7)$
 $= 10-10x+35$
 $= 45-10x$

3a. $9a+12 = 3(3a+4)$

b. $8y(y-3)-9(y-3)$
 $= (8y-9)(y-3)$

c. $56a^2b-63ab^2$
 $= 7ab(8a-9b)$

d. $2a^2+5a-6ab-15b$
 $= a(2a+5)-3b(2a+5)$
 $= (2a+5)(a-3b)$

3e. $x^2-1 = (x-1)(x+1)$

f. $x^2+11x+30$
 $= (x+5)(x+6)$

f. $k^2-8k-48$
 $= (k-12)(k+4)$

g. $14x^2-19x-3$
 $= 14x^2-21x+2x-3$
 $= 7x(2x-3)+1(2x-3)$
 $= (2x-3)(7x+1)$

h. $3x^2+3x-18$
 $= 3(x^2+x-6)$
 $= 3(x+3)(x-2)$

4. There is no factorisation for x^2+x+23 because the only factors of 23 are 1 and 23 and these cannot be added to give 1.

5a. $\frac{5y}{8} - \frac{3y}{8} = \frac{2y}{8} = \frac{y}{4}$

b. $\frac{7n}{8} + \frac{3n}{4}$
 $= \frac{7n}{8} + \frac{6n}{8} = \frac{13n}{8}$

c. $\frac{9}{5} \times \frac{15}{139} = \frac{3}{13}$

d. $36xy \div \frac{6x^2}{y}$
 $= \frac{36xy}{1} \times \frac{y}{6x^2}$
 $= \frac{6y^2}{x}$

6. Let $x = 0.583333...$
 Let $100x = 58.3333...$
 Let $1000x = 583.3333...$
 $1000x - 100x = 583 - 58$
 $900x = 525$
 $x = \frac{525}{900} = \frac{7}{12}$
 as required.

7i) Length of each side
 $= a+b$

ii) Area $= (a+b)^2$

iii)

$A1 = a^2$	$A2 = ab$
$A3 = ab$	$A4 = b^2$

iv) Total area = sum of all 4 smaller areas
 $A = (a+b)^2 = A1 + A2 + A3 + A4$
 $= a^2 + ab + ab + b^2$
 $= a^2 + 2ab + b^2$
 $\therefore A = (a+b)^2 = a^2 + 2ab + b^2$

8. $y^2 \left(\frac{3}{y} + 5y \right)^2$
 $= y^2 \left(\frac{3}{y} + 5y \right) \left(\frac{3}{y} + 5y \right)$
 $= y^2 \left(\frac{9}{y^2} + \frac{15y}{y} + \frac{15y}{y} + 25y^2 \right)$
 $= y^2 \left(\frac{9}{y^2} + 15 + 15 + 25y^2 \right)$
 $= y^2 \left(\frac{9}{y^2} + 30 + 25y^2 \right)$
 $= 9 + 30y^2 + 25y^4$

9a. $2v^3 - 8v$
 $= 2v(v^2 - 4)$
 $= 2v(v-2)(v+2)$

9b. $\frac{x^2-25}{4x-6} \div \frac{x^2-5x}{6x^2-7x-3}$
 $= \frac{(x-5)(x+5)}{2(2x-3)} \times \frac{6x^2-7x-3}{x^2-5x}$
 $= \frac{(x-5)(x+5)}{2(2x-3)} \times \frac{(3x+1)(2x-3)}{x(x-5)}$
 $= \frac{(x+5)(3x+1)}{2x}$

c. $\frac{7}{a^2+4a-5} - \frac{4}{a^2-8a+7}$
 $= \frac{7}{(a+5)(a-1)} - \frac{4}{(a-7)(a-1)}$
 $= \frac{7(a-7)}{(a+5)(a-1)(a-7)} - \frac{4(a+5)}{(a+5)(a-1)(a-7)}$
 $= \frac{7a-49-4a-20}{(a+5)(a-1)(a-7)}$
 $= \frac{3a-69}{(a+5)(a-1)(a-7)}$

10. $b^2 = (10x+5)^2 - (6x+3)^2$
 (i) $= 100x^2 + 100x + 25 - (36x^2 + 36x + 9)$
 $= 100x^2 + 100x + 25 - 36x^2 - 36x - 9$
 $= 64x^2 + 64x + 16$
 $= 16(4x^2 + 4x + 1)$
 $= 16(2x+1)^2$
 (ii) $b = \sqrt{16(2x+1)^2}$
 $= 4(2x+1)$
 $= -9x^2 + x^4 - 16 - 24x$
 $= x^4 - (9x^2 + 24x + 16)$
 $= x^4 - (3x+4)^2$
 $= (x^2 - (3x+4))(x^2 + (3x+4))$
 $= (x^2 - 3x - 4)(x^2 + 3x + 4)$
 $= (x-4)(x+1)(x^2 + 3x + 4)$