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BODMAS 5



Section A

Choose the correct answer for the following calculations.

$$(3 + 2) \times (3 - 5) =$$

7

- 10

- 2

10

$$(-6 + 2) \times -2 =$$

- 16

- 8

- 10

8

$$(-8)^2 =$$

- 64

- 16

64

16

$$4(-4 + 7) =$$

12

- 44

7

- 12

$$(8 - -3) - 9 =$$

- 14

- 99

14

2

$$(14 - 8 \times 2) - 1 =$$

3

11

4

- 3

$$5(75 - 81)^2 =$$

170

180

360

30

$$(4^2 - -7^2) \times 10 =$$

40

40

4

650

Section B

Insert brackets to make these calculations true.

Some questions need two pairs of brackets!

1) $10 - 2 \div 3 - 7 = -4$

6) $2 - 14^2 = 144$

2) $-8 - 1 \times 4 \times 5 = -60$

7) $7 + -1^2 = 8$

3) $-2 \times 6 - -12 = -36$

8) $2 + 2^3 + -2^2 = 14$

4) $-54 \div 4 - 13 + 3 = 9$

9) $11 - -6 + 1^2 - 2 = 12$

5) $23 - 38 \times -8 = 120$

10) $3^2 - -3^3 \div -8 + 5^2 = 12$

BODMAS 6



First, work out the following calculations without the calculator.

Second, work out the answer on a calculator.

Third, check if you are correct.

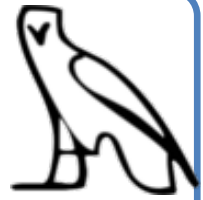
Remember, the calculator always does calculations using BIDMAS.

Calculation	Your answer	Calculator's answer	Were you correct?
$7 + 2 \times 3$			
$8 + 18 \div 2$			
$6 - 4 \times 5$			
$10 - 2 + 5 \times 11$			
$7 \times 4 + 3 \times 10$			
$36 \div 2^2$			
$25 + (12 - 4 \times 2)$			
$-7 + 5 \times 6$			
$2 - 32 \div 8$			
$0.5 + 0.1 \times 4$			
4×5^2			
$(3^2 - 1)^2$			
$50 - (10 + 10 \div 5)$			
$(12 - 48 \div 12)^2$			
$100 - 2(14 + 26)$			

Extension

- Work out 3×3
- Work out -3×-3
- Use your calculator to work out -3^2
- Is the calculator wrong?
Explain your answer.

Completing The Square 2



Section A: Express in the form $(x + a)^2 + b$.

1) $x^2 + 2x$

5) $x^2 + 2x - 6$

9) $x^2 + 3x$

2) $x^2 + 6x$

6) $x^2 + 8x - 1$

10) $x^2 - 7x$

3) $x^2 - 4x$

7) $x^2 - 4x + 5$

11) $x^2 + x + 4$

4) $x^2 - 10x$

8) $x^2 - 10x - 7$

12) $x^2 - 3x + 1$

Section B: Express in the form $a(x + b)^2 + c$.

1) $2x^2 + 8x + 10$

5) $4x^2 + 8x - 5$

9) $2x^2 + 3x - 5$

2) $3x^2 - 12x + 2$

6) $3x^2 - 12x + 7$

10) $3x^2 - 2x + 1$

3) $4x^2 + 24x - 8$

7) $2x^2 - 16x + 13$

11) $4x^2 - 2x - 9$

4) $5x^2 - 20x - 15$

8) $5x^2 + 20x - 6$

12) $12x^2 + 3x + 10$

Section C: Solve the equations by completing the square, leaving your answers as surds where appropriate.

1) $y = x^2 + 2x - 3$

4) $y = 2x^2 + 4x + 1$

7) $y = 2x^2 + x - 4$

2) $y = x^2 - 4x - 9$

5) $y = 4x^2 - 16x - 9$

8) $y = 4x^2 - 4x - 11$

3) $y = x^2 - 6x - 10$

6) $y = 3x^2 - 9x - 8$

9) $y = -x^2 + x + \frac{1}{2}$

Extension

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

- Write down the minimum point of the curve.
- Write down the coordinates of the point where the curve crosses the x-axis.
- Write down the coordinates of the point where the curve crosses the y-axis.
- What is the line of symmetry of the curve?
- Sketch the curve showing the exact coordinates of its turning point and where it crosses the x and y axes.

Repeat the steps above for the curve $y = 3x^2 + 6x - 5$

Expanding and Factorising Mixed Exercise



Section A: Simplify the expressions.

1) $a \times b$

2) $3s \times 8t$

3) $x \times x$

4) $2y \times 4y$

5) $9pq \times p$

6) $7cd \times 11d$

7) $f \times f \times f$

8) $-4a \times 2$

9) $12g \times -5g^2h$

10) $-7k^2 \times -3k$

Section B: Expand the brackets.

1) $2(3x + 4)$

2) $4(6y - 5)$

3) $8(6 + 2t)$

4) $5x(y + 4)$

5) $6a(3 - a)$

6) $7g(3g - 12)$

7) $8u(5 - uv)$

8) $3e(4ef - 6e)$

9) $-4(7h - k)$

10) $-3d(a + 2b - 9d)$

Section C: Expand and simplify the expressions.

1) $8(6 + 3p) + 5p$

2) $3(x + 3) - 11$

3) $5 + 6(2s + 5)$

4) $m + 7(6m - 4)$

5) $4b + 2(2 - 5b)$

6) $1 - 2(9w + 11)$

7) $2n - 10(2 - 6n) + 25n$

8) $5(9y + 8) + 2(3 - y)$

9) $4(2j + 4) - (12 - j)$

10) $8x(2 + 3x) - 2x(3 + x)$

Section D: Factorise the following expressions.

1) $3h - 9$

2) $15w + 25$

3) $16 - 22n$

4) $ab + a$

5) $9jk + 21k$

6) $12h - 16gh$

7) $2x^2 - x$

8) $24c^2d + 32c$

9) $12q + 8p - 24$

10) $6mn - 27m^2 + 9m$

Factorising Quadratic Expressions



Factorise the following quadratic expressions.

Section A

1) $x^2 + 7x - 30$

2) $x^2 + 9x + 20$

3) $x^2 + 8x - 9$

4) $x^2 - 18x + 80$

5) $x^2 - 11x + 28$

6) $x^2 + 6x - 72$

7) $x^2 - 9x - 22$

8) $x^2 - x - 12$

9) $x^2 + 3x - 108$

10) $x^2 - 17x + 72$

11) $x^2 - x - 42$

12) $x^2 - 15x + 56$

Section B

1) $2x^2 + 3x + 1$

2) $2x^2 + 5x + 2$

3) $2x^2 + 7x + 3$

4) $2x^2 + 7x + 5$

5) $2x^2 + 9x + 7$

6) $2x^2 + 5x + 3$

7) $2x^2 + 8x + 6$

8) $2x^2 + 9x + 10$

9) $2x^2 + 16x + 14$

10) $2x^2 + 16x + 24$

11) $2x^2 + 12x + 18$

12) $2x^2 + 14x + 20$

13) $2x^2 + 22x + 36$

14) $2x^2 + 28x + 48$

15) $2x^2 + 26x + 72$

Section C

1) $2x^2 + x - 1$

2) $2x^2 + x - 3$

3) $2x^2 + 9x - 5$

4) $2x^2 - 3x - 2$

5) $2x^2 - 13x - 24$

6) $3x^2 - 14x - 5$

7) $3x^2 - 8x - 11$

8) $2x^2 - 14x + 12$

9) $3x^2 - 21x + 36$

10) $5x^2 - 41x + 8$

11) $3x^2 - 2x - 21$

12) $2x^2 + 2x - 12$

13) $2x^2 - 11x + 15$

14) $3x^2 - 34x - 24$

15) $5x^2 - 27x + 10$

Section D

1) $4x^2 + 12x + 8$

2) $6x^2 + 23x + 20$

3) $6x^2 + 24x + 18$

4) $4x^2 + 31x + 21$

5) $4x^2 + 22x + 18$

6) $8x^2 + 22x + 15$

7) $8x^2 + 36x + 16$

8) $6x^2 - 5x - 4$

9) $6x^2 - 16x + 15$

10) $8x^2 + 16x - 24$

11) $7x^2 + 52x - 32$

12) $6x^2 - 55x + 56$

13) $9x^2 + 36x + 35$

14) $12x^2 - 42x + 30$

15) $48x^2 + 72x + 24$

16) $18x^2 + 51x + 8$


17) $20x^2 + 27x + 9$

18) $30x^2 - 32x + 8$

19) $36x^2 + 42x - 8$

20) $24x^2 - 50x - 14$

21) $-2x^2 + x + 21$

Challenge! 

Index Notation 5



Section A: Simplify the following without a calculator.

1) $5^3 \times 5^3 =$

2) $8^9 \times 8^5 =$

3) $2^{11} \times 2^{-2} =$

4) $3^{-1} \times 3^{-8} =$

5) $5^3 \div 5^3 =$

6) $8^9 \div 8^5 =$

7) $2^{11} \div 2^{-2} =$

8) $3^{-1} \div 3^{-8} =$

Section B: Simplify the following without a calculator.

1) $\frac{7^{20} \times 7^4}{7^{15}} =$

2) $\frac{4^{13} \times 4^{-10}}{4^2} =$

4) $\frac{12^{-16} \times 12^{11}}{12^{-5}} =$

5) $\frac{4^{-1} \times 3^{12}}{3^{-5} \times 4} =$

Section C: Simplify the following.

1) $a^4 \times a^8 =$

3) $a^4 \div a^8 =$

2) $b^{-9} \times b^{-5} =$

4) $b^{-9} \div b^{-5} =$

Extension

Write a question that could give an answer of $\frac{a^3 b^{-3}}{c^3}$

Index Notation 6



Section A: Work out the unknown value.

1) $8^a \times 8^a = 8^{-12}$

a =

2) $2^b \times 10 = 5$

b =

3) $\frac{1}{3} \times 4^t = \frac{1}{48}$

t =

4) $(5^{-1})^x = 1$

x =

5) $\sqrt[4]{9} = 9^y$

y =

6) $\sqrt[3]{49} = 7^z$

z =

Section B: Evaluate the following without a calculator.

$144^{\frac{1}{2}}$	
$27^{\frac{1}{3}}$	
$(-1)^{\frac{1}{5}}$	
$\left(\frac{1}{8}\right)^{\frac{1}{3}}$	

$4^{\frac{5}{2}}$	
$64^{\frac{2}{3}}$	
$(-1000)^{\frac{4}{3}}$	
$\left(-\frac{8}{343}\right)^{\frac{2}{3}}$	

5^{-1}	
3^{-2}	
$(-2)^{-4}$	

$\left(\frac{3}{4}\right)^{-2}$	
0.2^{-3}	

Section C: Draw a line matching the correct answer for each question.

1) $16^{\frac{1}{2}} \times 216^{\frac{1}{3}}$

2) $8^{-\frac{1}{3}} \times 100^{-\frac{3}{2}}$

3) $0.04^{-\frac{3}{2}}$

4) $\left(5\frac{1}{16}\right)^{-\frac{3}{4}}$

A) 125

B) 24

C) 1/1000

D) 8/27

E) 0.0005

Extension

Express the following in the form 3^k

A) $\frac{1}{81}$

B) $\left(\frac{1}{27}\right)^{-5}$

Index Notation 7



Find the indices which multiply to make 1.

For example $a^2 \times a^{-2} = a^0 = 1$

Go horizontal, vertical or diagonal.

There are 16 to find!

a^2	b^{-2}	b	$a^{-2}b$	ab	a	a^{-3}	b^4	$a^{-3}b$	a^{-1}
$\frac{1}{4}b^{-2}$	a^{-2}	a^{-3}	a	b	$3a^{-1}$	ab	$4a^{-1}$	a^2	$\frac{1}{4}a^2$
$4b$	b^{-2}	ab	a^3	$\frac{1}{3}a^4$	ab^3	b^{-3}	a^{-1}	b	$4b^{-2}$
b^2	$\frac{1}{4}$	a	b	a^{-1}	a^2b^{-2}	a^2b^2	$\frac{1}{2}a^4$	a	a
$2a$	a	$5b^{-5}$	ab^7	a^{-1}	b^{-3}	b^{-4}	$2b$	a	ab^{-5}
$\frac{1}{2}a^{-1}$	a^5b	b	b^{-4}	ab	b^6	a^4b^2	a	a	b
a^{-5}	b^4	a^{-4}	a	a^2b^4	$\frac{1}{2}b^4$	b^{-1}	a^3b	a^{-3}	a^{-8}
b^{-3}	a^{-4}	ab^{-1}	$2a$	$a^{-2}b^2$	a^6	a	b^{-1}	a	ab
a^2	b	a	$\frac{1}{2}a$	b^{-6}	b^2	ab^{-1}	a^{-3}	b	a^2b^2
a^{-1}	a^2	a^2	a^2	a^{-4}	a	$6a^{-1}$	$2b^2$	b^{-5}	b

Simplifying Expressions 14



Section A: Simplify the algebraic expressions.

1) $\frac{1}{3}a \times b =$

2) $\frac{2}{5}a \times bc =$

3) $4t \times \frac{7s}{2} =$

4) $\frac{3}{10}y \times \frac{5}{8}x =$

5) $\frac{2}{9}b \div a =$

6) $a \div \frac{3}{4}b =$

7) $\frac{5}{4}x \div \frac{2}{11}y =$

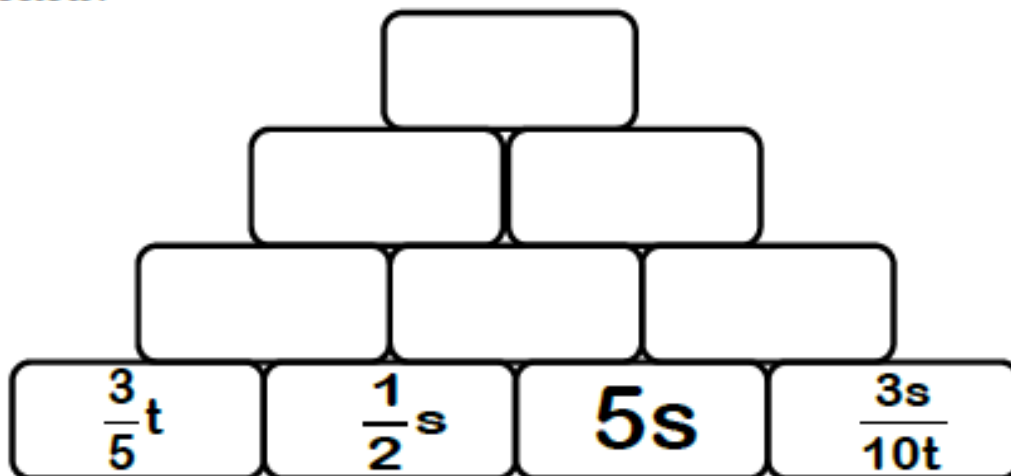
8) $\frac{st^2}{2} \div \frac{s}{12t} =$

Section B: Complete the grids.

\times	$\frac{x}{2}$	$\frac{3}{8}xy$	$\frac{9}{10x}$
$\frac{y}{3}$			
$\frac{4x}{7}$			
$\frac{5x^2}{2y}$			

\div	$\frac{1}{2}a$	$\frac{3}{11}c$	$\frac{2b}{5}$
$\frac{a}{6}$			
$\frac{2}{11}ab$			
$5b^2$			

Section C: Complete the algebraic multiplication pyramid by multiplying the two blocks below.



Linear Functions 4



Section A: Draw a line with the following gradients.

1)

	Gradient
	$+\frac{1}{2}$

2)

	Gradient
	$+\frac{1}{4}$

3)

	Gradient
	$+\frac{2}{3}$

4)

	Gradient
	$-\frac{1}{2}$

5)

	Gradient
	$-\frac{3}{4}$

6)

	Gradient
	-1.5

7)

	Gradient
	+2.5

8)

	Gradient
	-3.5

Section B

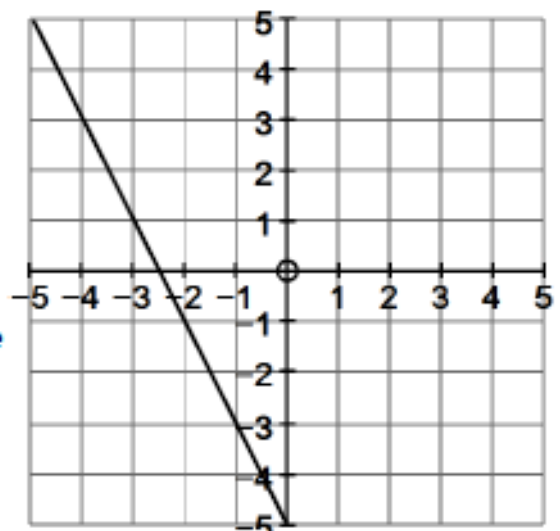
- 1) Find the gradient of the line drawn.
- 2) Draw a line perpendicular to the line drawn.
- 3) Find the gradient of the line you have drawn.

Extension

Draw two other lines that are perpendicular to the line in section B question 1.

Choose the gradient of one of the perpendicular lines and multiply it with the line in section B question 1.

What do you notice? Repeat if necessary.



Substituting into Expressions Worksheet 1



Section A: Substitute the value of a into the expressions. The first one has been done.

Expression	The value of a	Calculation	Answer
$2a$	$a = 3$	2×3	6
$10a$	$a = 5$		
$7a$	$a = 11$		
$18 + a$	$a = 4$		
$a + 14$	$a = 1$		
$a - 11$	$a = 16$		
$15 - a$	$a = 2$		
$\frac{a}{4}$	$a = 12$		
$\frac{a}{8}$	$a = 56$		

Section B: Substitute the value of b into the expressions. The first one has been started.

Expression	The value of b	Do first	Do second	Answer
$2b - 1$	$b = 15$	$2 \times 15 =$		
$20 - 4b$	$b = 1$			
$\frac{b}{2} + 7$	$b = 16$			
$100 - \frac{b}{5}$	$b = 25$			

Section C: Substitute the value of n into the expression.

Expression	The value of n	Answer
$9n + 11$	$n = 12$	
$\frac{n + 12}{8}$	$n = 84$	
$\frac{28 - 2n}{4}$	$n = 6$	
n^2	$n = 7$	

Substituting into Expressions Worksheet 2



Section A

Expression	The value of a	Do first	Do second	Answer
$8a - 9$	$a = 2$			
$4 + 2a$	$a = 6$			
$\frac{a}{5} + 20$	$a = 10$			
$11 - \frac{a}{3}$	$a = 12$			
$\frac{8a}{10}$	$a = 5$			

Section B

	The value of b	Do first	Do second	Do third	Answer
$\frac{14b+13}{9}$	$b = 1$				
$\frac{52-2b}{7}$	$b = 12$				
$10b - b^2$	$b = 2$				
	The value of a and b	Do first	Do second	Do third	Answer
$7a + ab$	$a = 2$ $b = 3$				
$9b - 6a$	$a = 5$ $b = 8$				
$a^2 + b^2$	$a = 11$ $b = 4$				
$1 + \frac{5a}{b}$	$a = 12$ $b = 6$				
$\frac{84-6a}{b}$	$a = 10$ $b = 3$				
$(a+b)^2 + 3$	$a = 2$ $b = 5$				

Section C

	The value of x and y	Answer
$\frac{33-3x}{2y}$	$x = 7$ $y = 3$	
$xy - y^2$	$x = 10$ $y = 6$	
$(xy - 3y)^2$	$x = 4$ $y = 8$	