THE BRITISH INTERNATIONAL SCHOOL ABU DHABI

A NORD ANGLIA EDUCATION SCHOOL

Year 9 Maths

Topic 1-2-3 Workbook

In the table below translate the key terms into your home language and write a short definition for each term [if needed visit www.mathsisfun.com/definitions/].

TOPIC 1 – ALGEBRAIC MANIPULATION		
TERM	**TRANSLATION**	**DEFINITION**
Algebra		
Factorise		
Expand		
Quadratic		
TOPIC 2 – PERCENTAGES		
Simple Interest		
Compound Interest		
Depreciation		
Reduce		
Percentage		
TOPIC 3 – LINEAR EQUATIONS		
Linear Equation		
Solve		
Fraction		
Rearrange		
Coefficient		

Factorising

1. Fill in the boxes to factorise the following expressions.

$14x + 2 = 2(\square + \square)$ $\qquad$ $24y + 30 = \square(\square + 5)$

2. Factorbot-3000 has crashed and isn't responding. You'll have to factorise these expressions yourself.

$18w + 3 =$ ..... $\qquad$ $21x - 7 =$ .....

$30y + 35 =$ ..... $\qquad$ $42z - 12 =$ .....

3. Draw lines to match the expressions on the left with those on the right.

$-36 + 15b$	$-3(12 + 5b)$
$-36 - 15b$	$3(12 - 5b)$
$36 + 15b$	$-3(12 - 5b)$
$36 - 15b$	$3(12 + 5b)$

4. For each expression, tick the box next to the correct factorisation.

a) $12x + xy$ $\qquad$ $12(x + y)$ ☐ $\qquad$ $x(12 + y)$ ☐ $\qquad$ $x(12 + xy)$ ☐

b) $15r + 12rs - 3rt$ $\qquad$ $3r(5 + 4s + t)$ ☐ $\qquad$ $-3r(5 + 4s + t)$ ☐ $\qquad$ $3r(5 + 4s - t)$ ☐

5. Fully factorise the following expressions.

a) $9pq + 12qr$

.....

b) $48x^2 - 60xyz + 20x$

.....

How did you do?

First I ask you to get rid of the brackets, then I ask you to put them back in — what's next, take them to watch a movie? Before you get on with that, check that you can:

☐ Factorise expressions using single brackets.

☹ ☐ 😐 ☐ 😊 ☐

Factorising

1. Fill in the boxes to fully factorise these expressions.

$6w + 3wx =$ ☐ (2 + ☐) $\quad 4y - 12yz =$ ☐ (1 − ☐)

To fully factorise, you need to take out all of the common factors.

2. Fully factorise these expressions.

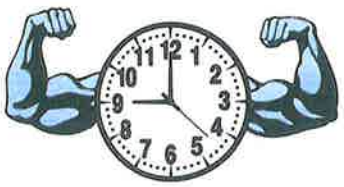
$14a + 7ab =$ ..... $\quad 15cd - 20c =$ .....

$-5e - 35ef =$ ..... $\quad 18g^2 - 2gh =$ .....

3. Chloe is having a tough time factorising.

Fill in the boxes to fully factorise this expression.

$27rs + 12rst + 15r^2 =$ ☐ (☐ + $4st$ + ☐)



4. Fully factorise these expressions.

$6x + 8xy + 10xz =$ ..... $\quad 5u + 25uv - 15u^2 =$ .....

5. Which numbers should replace the stars to give a correct factorisation?

Tick your answers ☑.

a) $x^2 + 4x + 3 = (x + 1)(x +$ ☆) ☐ 1 ☐ 2 ☐ 3

b) $x^2 + 6x + 5 = (x +$ ☆ $)(x + 1)$ ☐ 4 ☐ 5 ☐ 6

6. Factorise these expressions.

a) $x^2 + 3x + 2$ $\quad$ b) $y^2 + 8y + 12$

..... $\quad$ .....

How did you do?

Factorising is tricky, but with practice you'll get the hang of it. You can see if a factorisation is correct by expanding the brackets — you should get back to what you started with. Check you can:

☐ **Factorise expressions using single brackets.** ☐ **Factorise quadratics using double brackets.**

Factorising

1 Factorise fully $4a^2 - 24ab$. (C)

$4a^2 - 24ab = 4(\ldots\ldots - \ldots\ldots)$

$= 4\ldots\ldots(\ldots\ldots - \ldots\ldots)$

.....

[Total 2 marks]

2 Factorise the following expressions fully. (C)

a) $6x + 3$

.....

[1]

b) $7y - 21y^2$

.....

[2]

c) $2v^3w + 8v^2w^2$

.....

[2]

[Total 5 marks]

3 Factorise the following expressions fully. (B)

a) $x^2 - 16$

$x^2 - 16 = x^2 - (\ldots\ldots)^2$

$= \ldots\ldots$

.....

[2]

b) $9n^2 - 4m^2$

.....

[2]

[Total 4 marks]

Score: ☐/11

☹☐ 😐☐ 😊☐

Percentage Change

1. Tom has a badge collection. He buys more so that his collection increases by 35%.

He originally had 20 badges. How many badges does he have now?

.....

2. Cecilia went for a run on both Saturday and Sunday.
On Sunday, she ran 60% further than she did on Saturday.

Cecilia ran 3900 m on Saturday. How far did she run on Sunday?

..... m

3. Tamara eats 90% of the chips on her plate. There are now four chips left.

How many chips did she have to start with?

.....

4. Jasper starts the day with a full bottle of water.

a) By lunchtime, he has drunk 30% of the water and now has 665 ml of water left.
How much water was in Jasper's bottle when it was full?

..... ml

b) In the afternoon, he drinks a further 20% of the original amount of water.
How many millilitres did he drink in the afternoon?

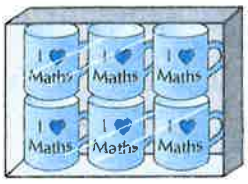
..... ml

5. A department store is having a sale. Match the offers with the percentage discount.

Was £60
Now £39

Was £65
Now £39

Was £44
Now £22



Was £30
Now £12

50% off

60% off

35% off

40% off

Percentage Change

6. One month, a charity receives £1250 in donations.
The next month, after a fundraiser, the charity receives £2200 in donations.

By what percentage did the donations increase from the first month to the next?

To find a percentage change, divide the difference in the amounts by the original amount, then multiply by 100.

..... %

7. Brighter Days Bank offers an account that pays 2% simple interest each year.

2% simple interest means 2% of the original amount of money in the account is added each year.

a) Oliver opens an account with £300.

(i) How much money will he have earned in interest after one year?

£ .....

(ii) How much money will he have earned in interest after three years?

£ .....

b) Emily opens an account with £500.

(i) How much money will she have earned in interest after one year?

£ .....

(ii) How much will be in her account after two years?

£ .....

8. Jamila invests £2500 in a savings account. After a year, she has earned £75 in simple interest.

a) What percentage interest does the account pay?

What percentage of £2500 is £75?

..... %

b) Jamila opens a different account with £1000. It pays 1.5% simple interest.
How much will be in the account two years from now?

£ .....

How did you do?

My brother is intrigued by percentages, but he doesn't like the complicated bits — it's only a simple interest... Once you've stopped laughing (or rolling your eyes), see if you can:

- ☐ **Find amounts before and after a percentage change.**
- ☐ **Work with simple interest rates.**
- ☐ **Find the percentage change when given the amounts before and after the change.**

Percentages

1 Ali has 40 micro pigs. 24 of them are female. (D)

What percentage of Ali's micro pigs are male?

..... %

[Total 3 marks]

2 Ben wants to buy a new laptop. His local shop sells two different laptops. VAT is added at a cost of 20% of the laptop's original price.

a) Laptop A costs £395 before VAT is added. What is the total price including VAT? (D)

£ .....

[3]

b) The VAT on laptop B is £99. What is the total price of the laptop including VAT? (C)

£ .....

[3]

[Total 6 marks]

3 After an 8% pay rise Mr Brown's salary was £15 714. (C)

What was his salary before the increase?

£ .....

[Total 3 marks]

4 Last year Amy weighed 30 kg. C

a) Amy weighs 36 kg now. Calculate her percentage increase in weight.

..... %
[3]

b) Amy is 12.5% taller than last year and she is now 135 cm tall.
How tall was she last year?

..... cm
[3]

[Total 6 marks]

5 Bill is looking at caravans. C

a) He sees one that cost £18 500 when it was new. It is now worth £12 600.
Calculate the percentage decrease in value to 1 d.p.

..... %
[3]

b) Another caravan has dropped 30% in value. It is now worth £11 549.
What was its original value to the nearest pound?

£ .....
[3]

[Total 6 marks]

6 Between 1974 and 1994 the prize money for a football tournament increased by 25%.
The prize money of the same tournament then increased by 16% between 1994 and 2014.
By what percentage did the prize money increase between 1974 and 2014? C

..... %
[Total 3 marks]

Exam Practice Tip

One of the trickiest things about percentage change questions can be figuring out which type of question you're dealing with. Think carefully about whether the question is on percentage increase or decrease and whether you are being asked to find the amount after a % change, the actual % change or the amount before a % change.

Score
27

Compound Interest and Depreciation

1 The population of fish in a lake is estimated to decrease by 8% every year. (C)

Approximately how many fish will be left after 15 years if the initial population is 2000?

population after 15 years $= 2000 \times (1 - \frac{\ldots\ldots}{100})^{\ldots}$

$= 2000 \times (\ldots\ldots)^{\ldots}$

TIP: think about which way you should round your answer.

$= \ldots\ldots$

..... fish

[Total 3 marks]

2 A new house cost £120 000, but increased in value by 15% each year. (C)

Work out its value after 5 years, to the nearest £1000.

£ .....

[Total 3 marks]

3 A car dealership is selling a used car for £3995.
The car is 6 years old and its value has decreased by 11% each year. (C)

Work out its original value to the nearest £100.

£ .....

[Total 3 marks]

4 Mrs Khan puts £2500 into a high interest savings account.
Interest is added to the account at the end of each year.
After 2 years Mrs Khan's account contains £2704. (B)

What is the interest rate on Mrs Khan's account?

..... %

[Total 3 marks]

Score: ☐ / **12**

☹☐ 😐☐ 😊☐

Solving Equations

1. Solve the following equations.

a) $w + 12 = 4$

$w =$ .....

b) $2x + 5 = -11$

$x =$ .....

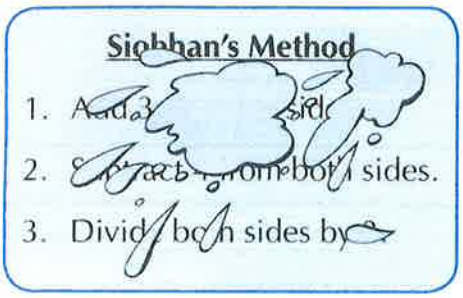
c) $-5y + 2 = 17$

$y =$ .....

d) $7 - 3z = -2$

$z =$ .....

2. Siobhan has left the following instructions on how to solve the equation $4 = 15 - 3x$.



Sadly though, I've gone and spilt my drink all over it... Fill in the blanks to recover Siobhan's method:

1. Add ..... to both sides.
2. ..... 4 ..... both sides.
3. Divide both sides by .....

3. Solve these equations. Give your answers as fractions where necessary.

a) $8w = 4$

$w =$ .....

b) $12x + 2 = 5$

$x =$ .....

c) $\frac{y}{3} + 1 = 5$

$y =$ .....

d) $\frac{2z}{5} + 7 = 11$

$z =$ .....

4. Solve these equations.

a) $2(m + 6) = 26$

$m =$ .....

b) $9(2n - 1) = 63$

$n =$ .....

5. Solve these equations. Give your answers as fractions or mixed numbers.

a) $7p + 13 = 3$

$p =$ .....

b) $20q - 13 = -21$

$q =$ .....

Solving Equations

1. Solve the following equations.

a) $13w + 9 = 6w + 30$

$w =$ .....

b) $21x + 1 = 4(9 + 4x)$

Expand any brackets first.

$x =$ .....

c) $2(3y - 2) = 6 + 7y$

$y =$ .....

d) $3(1 + 3z) = -2(5 - 4z)$

$z =$ .....

2. Solve these equations. Simplify your answers where possible.

a) $\frac{16}{3} = 2(u + 2)$

$u =$ .....

b) $5(1 - \frac{2}{5}v) = 7(2 - v)$

$v =$ .....

3. Mark was unable to solve the equations below on his computer. Show him how it's done and solve them by hand.

a) $3q - 1 = \frac{3q + 4}{2}$

Start by getting rid of the denominators.

$q =$ .....

b) $\frac{2(r + 1)}{5} = \frac{r + 3}{3}$

$r =$ .....

c) $t - 2 + \frac{t + 1}{4} = 12$

$t =$ .....

How did you do?

Solving equations isn't guesswork — there's always a sequence of steps that get you to the solution. If you've found all the solutions on this page (and well done for that) you should be able to solve:

- ☐ **Equations involving negatives.**
- ☐ **Equations involving brackets.**
- ☐ **Equations involving fractions.**
- ☐ **Equations with the unknown on both sides.**

Solving Equations

1 Solve the following equations.

a) $40 - 3x = 17x$ (D)

$x =$ .....

[2]

b) $2y - 5 = 3y - 12$ (D)

$y =$ .....

[3]

c) $2r - 6 = 3(3 - r)$ (C)

$r =$ .....

[3]

[Total 8 marks]

2 Solve the following equations. (C)

a) $9b - 7 = 2(3b + 1)$

$b =$ .....

[3]

b) $\frac{28 - z}{4} = 5$

$z =$ .....

[2]

[Total 5 marks]

3 Solve this equation. (B)

$\frac{8 - 2x}{3} + \frac{2x + 4}{9} = 12$

$x =$ .....

[Total 4 marks]