



# Answers

Non-Calculator  
KS4  
Mastery:  
Foundation  
Booklet

# 1

# Non-Calculator

# KS4 Mastery: Foundation

# Booklet 1 **Answers**

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## Week 1

1. Work out  $3 \times 2 + 4$

$$\mathbf{6 + 4 = 10}$$

2. Simplify  $7y + 8y + 2y$

$$\mathbf{17y}$$

3. Simplify  $\frac{9}{15}$

$$\mathbf{\frac{3}{5}}$$

4. Evaluate  $3x + 2y$  if  $x = 4$  and  $y = 1$

$$\mathbf{3 \times 4 + 2 \times 1 = 14}$$

5. Expand and simplify  $2(x + 5)$

$$\mathbf{2x + 10}$$

6. Write 40 as a product of its prime factors.

$$\mathbf{2 \times 2 \times 2 \times 5 \text{ or } 2^3 \times 5}$$

7. Share £20 in the ratio 1:4

$$\mathbf{£20 \div 5 = £4}$$

$$\mathbf{£4:£16}$$

8. Write down the gradient of the line whose equation is  $y = 5x + 3$

**5**

9. Simplify  $x^4 \times x^7$

**$x^{11}$**

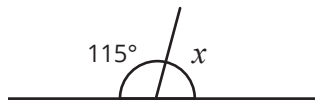
10.  $y = 2x + 1$ ; what is the value of  $y$  when  $x = 2$ ?

**$y = 2 \times 2 + 1 = 5$**

11. Find the area of a rectangle whose width is 8cm and whose height is 4cm.

**$8 \times 4 = 32\text{cm}^2$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$x = 180 - 115 = 65^\circ$ , angles on a straight line add to  $180^\circ$ .**

## Week 1

13. Solve  $3x = 21$

$$x = 7$$

14. Find the median of the following set of numbers:

4, 5, 7, 7, 8, 9, 10

**7**

15. A regular polygon has an exterior angle of  $30^\circ$ .  
Work out the number of sides this polygon has.

$$360 \div 30 = 12 \text{ sides}$$

16. Write down the value of  $\sin(0^\circ)$ .

**0**

17. 1 cup of tea and 3 slices of cake cost £4.50.

1 cup of tea of 1 slice of cake cost £1.90.

Work out the cost of 1 slice of cake.

**2 slices of cake cost £2.60 so 1 slice costs £1.30.**

18. A fair, six-sided dice is thrown. Write down the probability that the dice lands on a number greater than 4. Give your answer as a fraction in its simplest form.

$$\frac{2}{6} = \frac{1}{3}$$

19. A school must provide teachers to pupils in the ratio 1:7 for a school trip. If 8 teachers attend the trip, how many pupils can go?

$$8 \times 7 = 56 \text{ pupils}$$

20.  $x$  and  $y$  are integers.

$$x > 20$$

$$y \leq 40$$

Work out the largest possible value of  $y - x$ .

$$40 - 21 = 19$$

## Week 2

1. Work out  $11 - 2 \times 4$

$$11 - 8 = 3$$

2. Simplify  $4a + 8a - 2a$

$$10a$$

3. Simplify  $\frac{18}{27}$

$$\frac{2}{3}$$

4. Evaluate  $3x + 2y$  if  $x = 3$  and  $y = -1$

$$3 \times 3 + 2 \times -1 = 7$$

5. Expand and simplify  $3(x - 4)$

$$3x - 12$$

6. Write 120 as a product of its prime factors. Give your answer in index form.

$$2^3 \times 3 \times 5$$

7. Share £80 in the ratio 3:5

$$£80 \div 8 = £10$$

$$£30:£50$$



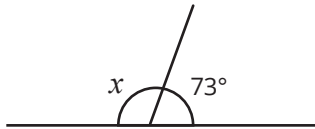
8. Write down the gradient of the line whose equation is  $y = 4 - 3x$   
**-3**

9. Simplify  $x^8 \times x^{-3}$   
 **$x^5$**

10.  $y = 4x - 3$ ; what is the value of  $y$  when  $x = -5$ ?  
 **$y = 4 \times (-5) - 3 = -23$**

11. Find the perimeter of a rectangle whose width is 8cm and whose height is 4cm.  
 **$2 \times (8 + 4) = 24\text{cm}$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$x = 180 - 73 = 107^\circ$ , angles on a straight line add to  $180^\circ$ .**

## Week 2

13. Solve  $a - 2 = 10$

**$a = 12$**

14. Find the median of the following set of numbers:

5, 9, 1, 2, 10, 3, 11

**5**

15. A regular polygon has an exterior angle of  $60^\circ$ . Work out the number of sides this polygon has.

**$360 \div 60 = 6$  sides**

16. Write down the value of  $\cos(0^\circ)$ .

**1**

17. 1 cup of tea and 3 slices of cake cost £3.80.

1 cup of tea of 1 slice of cake cost £1.60.

Work out the cost of 1 cup of tea.

**2 slices of cake cost £2.20 so 1 slice costs £1.10.**

**1 cup of tea costs £1.60 - £1.10 = 50p**

18. A fair, six-sided dice is thrown. Write down the probability that the dice does not land on a multiple of 3. Give your answer as a fraction in its simplest form.

$$\frac{4}{6} = \frac{2}{3}$$

19. A school must provide teachers to pupils in the ratio 1:7 for a school trip. If 35 students attend the trip, how many teachers must go?

$$35 \div 7 = 5$$

20.  $x$  and  $y$  are positive integers.

$$x > 20$$

$$y \leq 40$$

Work out the smallest possible value of  $y + x$ .

$$1 + 21 = 22$$

## Week 3

1. Work out  $7 + 2 \times 5 - 2$

$$7 + 10 - 2 = 15$$

2. Simplify  $3x - x + 4x - 2x$

$$4x$$

3. Simplify  $\frac{42}{56}$

$$\frac{3}{4}$$

4. Evaluate  $5xy$  if  $x = -2$  and  $y = -1$

$$5 \times -2 \times -1 = 10$$

5. Expand and simplify  $2(x - 9)$

$$2x - 18$$

6. Write 180 as a product of its prime factors. Give your answer in index form.

$$2^2 \times 3^2 \times 5$$

7. Share £45 in the ratio 2:7

$$£45 \div 9 = £5$$

$$£10:£35$$

8. Write down the gradient of the line whose equation is  $y = \frac{4x + 7}{2}$

**2**

9. Simplify  $x^{-4} \times x$

**$x^{-3}$**

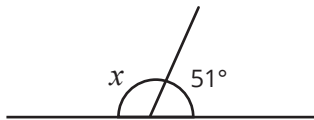
10.  $y = 2x - 9$ ; what is the value of  $y$  when  $x = -8$ ?

**$y = 2 \times (-8) - 9 = -25$**

11. Find the perimeter of a rectangle whose width is 3.5cm and whose height is 2cm.

**$2 \times (3.5 + 2) = 11\text{cm}$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$x = 180 - 51 = 129^\circ$ , angles on a straight line add to  $180^\circ$ .**

### Week 3

13. Solve  $x + 7 = 23$

**$a = 16$**

14. Find the median of the following set of numbers:

10, 2, -1, 7, 8, 15, 2

**7**

15. A regular polygon has an exterior angle of  $40^\circ$ . Work out the number of sides this polygon has.

**$360 \div 40 = 9$  sides**

16. Write down the value of  $\sin(90^\circ)$ .

**1**

17. 1 cup of tea and 4 slices of cake cost £9.00.

1 cup of tea and 1 slice of cake cost £2.70.

Work out the cost of 1 cup of tea.

**3 slices of cake cost £6.30 so 1 slice costs £2.10.**

**1 cup of tea costs £2.70 - £2.10 = 60p**

18. A fair, six-sided dice is thrown. Write down the probability that the dice lands on a prime number. Give your answer as a fraction in its simplest form.

$$\frac{3}{6} = \frac{1}{2}$$

19. A school must provide teachers to pupils in the ratio 1:9 for a school trip. If 54 students attend the trip, how many teachers must go?

$$54 \div 9 = 6 \text{ teachers}$$

20.  $x$  and  $y$  are integers.

$$x > 60$$

$$y > 35$$

Work out the smallest possible value of  $y + x$ .

$$36 + 61 = 97$$

## Week 4

1. Work out  $2 \times 3^2$

$$2 \times 9 = 18$$

2. Simplify  $3x^2 + 2x - x^2 + 4x$

$$2x^2 + 6x$$

3. Simplify  $\frac{28x}{35x}$

$$\frac{4}{5}$$

4. Evaluate  $4x^2$  if  $x = -2$

$$4 \times (-2)^2 = 16$$

5. Expand and simplify  $3x(2x + 1)$

$$6x^2 + 3x$$

6. Write 175 as a product of its prime factors. Give your answer in index form.

$$5^2 \times 7$$

7. Share £68 in the ratio 1:10:6

$$£68 \div 17 = £4$$

$$£4:£40:£24$$



8. Write down the gradient of the line whose equation is  $y = 2(4x + 1)$

**8**

9. Simplify  $2x^7 \times 3x^4$

**$6x^{11}$**

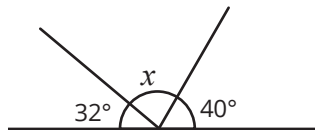
10.  $y = 3x + 15$ ; what is the value of  $y$  when  $x = 0.5$ ?

**$y = 3 \times 0.5 + 15 = 16.5$**

11. Find the area of a triangle whose width is 6cm and whose perpendicular height is 10cm.

**$6 \times 10 \div 2 = 30\text{cm}^2$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$180 - (32 + 40) = 108^\circ$ , angles on a straight line add to  $180^\circ$ .**

## Week 4

13. Solve  $3b + 5 = 17$

$$3b = 12$$

$$b = 4$$

14. Find the median of the following set of numbers:

4, 6, 10, 2, 13, 5

**5.5**

15. A regular polygon has an interior angle of  $60^\circ$ . Work out the number of sides this polygon has.

$$180 - 60 = 120^\circ$$

$$360 \div 120 = 3 \text{ sides}$$

16. Write down the value of  $\tan(0^\circ)$ .

**0**

17. 1 cup of tea and 3 slices of cake cost £3.80.

1 cup of tea of 1 slice of cake cost £1.60.

Work out the cost of 3 slices of cake.

**2 slices of cake cost £2.20 so 1 slice costs £1.10.**

**3 slices of cake cost £3.30.**

18. A bag contains 5 red counters and 3 blue counters. A counter is chosen at random. What is the probability of choosing a blue counter? Give your answer as a fraction in its simplest form.

$$\frac{3}{8}$$

19. A school must provide teachers to pupils in the ratio 1:7 for a school trip. If 50 students attend the trip, what is the minimum number of teachers that must go?

$$50 \div 7 = 7 \text{ remainder } 1$$

**8 teachers must go.**

20.  $x$  and  $y$  are positive integers.

$$x > 20$$

$$y \leq 40$$

Work out the smallest positive value of  $xy$ .

$$21 \times 1 = 21$$

## Week 5

1. Work out  $1 + (2 + 5) \times 3$

$$1 + 7 \times 3 = 1 + 21 = 22$$

2. Simplify  $x^2 + 2x - 3y - x^2 - 4y - 2x$

$$-7y$$

3. Simplify  $\frac{15x}{20x}$

$$\frac{3}{4}$$

4. Evaluate  $xy^2$  if  $x = -1$  and  $y = -3$

$$-1 \times (-3)^2 = -9$$

5. Expand and simplify  $5x(x - y)$

$$5x^2 - 5xy$$

6. Write 900 as a product of its prime factors. Give your answer in index form.

$$2^2 \times 3^2 \times 5^2 \text{ or } (2 \times 3 \times 5)^2$$

7. Share £55 in the ratio 1:3:7

$$£55 \div 11 = £5$$

$$£5:£15:£35$$

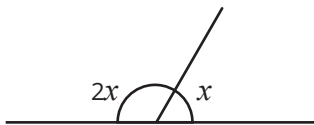
8. Write down the gradient of the line whose equation is  $2y = 4x + 1$   
**2**

9. Simplify  $9xy \times 5x$   
 **$45x^2y$**

10.  $y = 2x^2 + x$ ; what is the value of  $y$  when  $x = -4$ ?  
 **$y = 2 \times (-4)^2 + (-4) = 28$**

11. Find the area of a triangle whose width is 4cm and whose perpendicular height is 15cm.  
 **$4 \times 15 \div 2 = 30\text{cm}^2$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$3x = 180, 180 \div 3 = 60^\circ$ , angles on a straight line add up to  $180^\circ$**

## Week 5

13. Solve  $\frac{x}{5} = 15$   
 **$x = 75$**

14. Find the median of the following set of numbers:  
-3, -1, 0, -2  
**-1.5**

15. A regular polygon has an interior angle of  $140^\circ$ . Work out the number of sides this polygon has.  
 **$180 - 140 = 40^\circ$**   
 **$360 \div 40 = 9$  sides**

16. Write down the value of  $\cos(90^\circ)$ .  
**0**

17. 1 cup of tea and 3 slices of cake cost £4.90.  
1 cup of tea and 1 slice of cake cost £2.00.  
Work out the cost of 2 cups of tea.  
**2 slices of cake cost £2.90 so 1 slice costs £1.45.**  
**1 cup of tea costs £2.00 - £1.45 = 55p**  
**Therefore, 2 cups of tea cost  $55p \times 2 = £1.10$ .**

18. A bag contains 15 red counters and 20 blue counters. A counter is chosen at random. What is the probability of choosing a blue counter? Give your answer as a fraction in its simplest form.

$$\frac{20}{35} = \frac{4}{7}$$

19. A school must provide teachers to pupils in the ratio 2:5 for a school trip. If 8 teachers attend, how many students can go on the trip?

$$8 \div 2 = 4$$

$$4 \times 5 = 20 \text{ students.}$$

20.  $x$  and  $y$  are integers.

$$x > 20$$

$$y \leq 40$$

Work out the smallest possible value of  $\frac{x}{y}$ .

$$21 \div 40 = 0.525$$

## Week 6

1. Work out  $8 - 3 \times 2^2$

$$8 - 3 \times 4 = 8 - 12 = -4$$

2. Simplify  $3 \times 2x - 4 \times x$

$$2x$$

3. Simplify  $\frac{16x}{2}$

$$8x$$

4. Evaluate  $\frac{y^2}{4}$  if  $y = -8$

$$\frac{(-8)^2}{4} = 16$$

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

$$x^2 + 5x + 6$$

6. Write  $2 \times 90$  as a product of its prime factors. Give your answer in index form.

$$2^2 \times 3^2 \times 5$$

7. Share £25 in the ratio 1:3

$$£25 \div 4 = £6.25$$

$$£6.25:£18.75$$



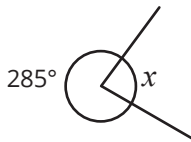
8. Write down the gradient of the line whose equation is  $2y = 5 - 8x$   
**-4**

9. Simplify  $3x^2y \times 8xy^2$   
 **$24x^3y^3$**

10.  $y = x^2 + 3x + 1$ ; what is the value of  $y$  when  $x = 2$ ?  
 **$y = 2^2 + 3 \times 2 + 1 = 11$**

11. Find the area of a rectangle whose width is  $x$ cm and whose height is  $(x + 5)$ cm. Give your answer in expanded form.  
 **$x(x + 5) = (x^2 + 5x)\text{cm}^2$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$360 - 285 = 75^\circ$ , angles around a point add to  $360^\circ$ .**

## Week 6

13. Solve  $2(x + 3) = 8$

$$2x + 6 = 8$$

$$2x = 2$$

$$x = 1$$

14. Find the range of the following set of numbers:

-3, -1, 0, -2, 7

$$7 - (-3) = 10$$

15. A regular polygon has an interior angle of  $135^\circ$ . Work out the number of sides this polygon has.

$$180 - 135 = 45^\circ$$

$$360 \div 45 = 8 \text{ sides}$$

16. Write down the value of  $\sin(180^\circ)$ .

**0**

17. 2 cups of tea and 3 slices of cake cost £5.30.

1 cup of tea and 1 slice of cake cost £1.90.

Work out the cost of 1 cup of tea.

$$2 \text{ cups of tea and 2 slices of cake cost } £1.90 \times 2 = £3.80.$$

$$1 \text{ slice of cake costs } £5.30 - £3.80 = £1.50.$$

$$1 \text{ cup of tea costs } £1.90 - £1.50 = 40p.$$

18. A bag contains 5 red counters, 3 green counters and 2 blue counters. A counter is chosen at random. What is the probability of choosing a red or a green counter? Give your answer as a fraction in its simplest form.

$$\frac{8}{10} = \frac{4}{5}$$

19. A school must provide teachers to pupils in the ratio 2:5 for a school trip. If 20 students attend, how many teachers must go on the trip?

$$20 \div 5 = 4$$

$$4 \times 2 = 8 \text{ teachers.}$$

20.  $x$  and  $y$  are integers.

$$x > 4$$

$$y < 10$$

Work out the smallest negative value of  $x - y$ .

$$5 - 9 = -4$$

## Week 7

1. Work out  $8 \times 5 \div 2^2$

$$8 \times 5 \div 4 = 40 \div 4 = 10$$

2. Simplify  $8x \times 4x + 2 \times 5x + 3x \times 2x$

$$38x^2 + 10x$$

3. Simplify  $\frac{7x}{28}$

$$\frac{x}{4}$$

4. Evaluate  $\frac{2x^2}{y}$  if  $x = 5$  and  $y = 4$

$$\frac{2 \times 5^2}{4} = \frac{50}{4} = \frac{25}{2} \text{ or } 12.5$$

5. Expand and simplify  $(x + 5)(x + 1)$

$$x^2 + 6x + 5$$

6. Write  $3 \times 150$  as a product of its prime factors. Give your answer in index form.

$$2 \times 3^2 \times 5^2$$

7. Share £4 in the ratio 2:3:5

$$£4 \div 10 = £0.40$$

$$£0.80:£1.20:£2$$

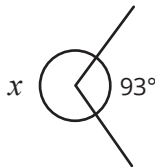
8. Write down the gradient of the line whose equation is  $3y = 5 - 15x$   
**-5**

9. Simplify  $2xy^2 \times 3x$   
 **$6x^2y^2$**

10.  $y = 2x^2 - x$ ; what is the value of  $y$  when  $x = -2$ ?  
 **$y = 2 \times (-2)^2 - (-2) = 10$**

11. Find the area of a rectangle whose width is  $y$ cm and whose height is  $(y - 2)$ cm. Give your answer in expanded form.  
 **$y(y - 2) = (y^2 - 2y)\text{cm}^2$**

12. Find the missing angle, marked  $x$ . Give a reason for your answer.



**$360 - 93 = 267^\circ$ , angles around a point add to  $360^\circ$ .**

## Week 7

13. Solve  $4x - 3 = x + 2$

Give your answer as a fraction.

$$3x - 3 = 2$$

$$3x = 5$$

$$x = \frac{5}{3}$$

14. Find the range of the following set of numbers:

-4, -10, -3, -8, -7

$$-3 - (-10) = 7$$

15. A regular polygon has an interior angle of  $144^\circ$ . Work out the number of sides this polygon has.

$$180 - 144 = 36^\circ$$

$$360 \div 36 = 10 \text{ sides}$$

16. Write down the value of  $\sin(30^\circ)$ .

$$\frac{1}{2}$$

17. 2 cups of tea and 3 slices of cake cost £3.80.

1 cup of tea and 2 slices of cake cost £2.30.

Work out the cost of 1 slice of cake and 1 cup of tea.

$$2 \text{ cups of tea and 4 slices of cake cost } £2.30 \times 2 = £4.60.$$

$$1 \text{ slice of cake costs } £4.60 - £3.80 = 80\text{p.}$$

$$1 \text{ cup of tea costs } £2.30 - (2 \times 80\text{p}) = 70\text{p.}$$

$$1 \text{ slice of cake and 1 cup of tea will cost } £1.50.$$

18. A bag contains 5 red counters, 3 green counters and 2 blue counters. A counter is chosen at random. What is the probability of choosing a yellow counter?

**0**

19. A school must provide teachers to pupils in the ratio 3:20 for a school trip. If 41 students attend, how many teachers must go on the trip?

$$41 \div 20 = 2 \text{ r } 1$$

$$2 \times 3 = 6$$

$$6 + 1 = 7$$

**7 teachers must go on the trip.**

20.  $x$  and  $y$  are integers.

$$x < -4$$

$$y > -10$$

Work out the largest negative value of  $x - y$ .

$$-5 - (-4) = -1$$

**B**YOND  
MATHS