

PiXL Independence:

Mathematics – Answer Booklet

KS4 FOUNDATION

Topic 3 – Expressions, Equations and Inequalities

Contents:

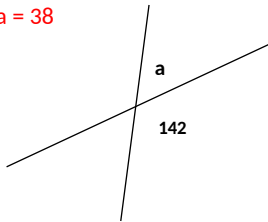
Answers

I. Basic Skills Check

Answer the following questions. In order to improve your basic arithmetic you should attempt these without a calculator.

Skills Check 1

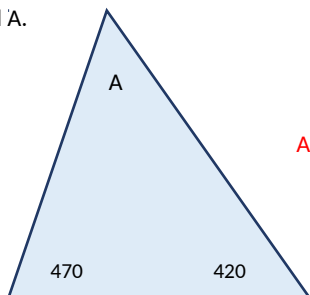
- What is the product of 20 and 21?
420
- The price of a 6 pack of loo roll is reduced by 4%, the original price was £1.50. What is the new price?
£1.44
- Write down any three factors of 30.
Any three of 1, 2, 3, 5, 6, 10, 15, 30
- Which of these numbers are square numbers?
1,2,3,4,5,6,7,8,9
Squares = 1, 4, 9
- Simplify $8j + 3k - 7k + 4j$.
 $12j - 4k$
- Solve: $2x + 6 = 12$.
 $x = 3$
- Find a.
 $a = 38$



- In a year group of 120 students $\frac{1}{6}$ th of the class are left handed. How many are left handed?
20
- Expand the bracket $7(2a-8)$
 $14a-56$
- In a quadrilateral the angles are 122° , 32° , 120° and A. Find the value of A.
 86°

Skills Check 2

- An electricity bill is £96 plus VAT at 20%. Calculate the VAT charged.
£19.20
- A bunch of flowers priced at £15 is reduced by a quarter. What is the new price?
£11.25
- Write down all the factors of 50.
1, 2, 5, 10, 25, 50
- Round 0.002550 to one significant figure.
0.003
- Simplify $7x + 3y + 2x - 8y$.
 $9x - 5y$
- Solve: $4x - 7 = -3$.
 $x = 1$
- Find A.

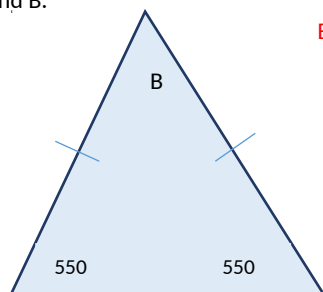


$$A = 180 - (47 + 42) = 91^\circ$$

8. Estimate the answer to 3.45×16.9 .
 $3 \times 20 = 60$
9. Expand and simplify $3(2a+8) + 3(a-4)$.
 $6a+24+3a-12 = 9a+12$
10. Find the next two terms in the sequence; 20, 10, 5, 2.5,
 $1.25, 0.265$

Skills Check 3

1. A sofa costs £165, delivery costs a further 5%. What is the delivery charge?
 $£8.25$
2. A train ticket that costs £156 is reduced by a $\frac{1}{3}$. What is the new cost?
 $£104$
3. Find the highest common factor (HCF) of 9 and 33.
 $HCF = 3$
4. Round 9.9999 to two significant figures.
 10.0
5. Expand $2(7x - 1)$.
 $14x-2$
6. Solve: $3x - 18 = -6$.
 $x=4$
7. Find B.



$$B = 180 - 110 = 70^\circ$$

8. In a packet of 30 sweets 4 are red. You take a sweet without looking; what is the probability of choosing a red sweet?
 $\frac{4}{30} = \frac{2}{15}$
9. Calculate $\frac{1}{6} + \frac{2}{5}$
 $= \frac{17}{30}$
10. Find the next two terms in the sequence; 9, 13, 17, 21,.....
 $25, 29$

II. Short Exam Questions

Section 1- Solving Basic Equations

1. I think of a number, double my number and add 4. I now have 56. What number did I first think of?
 26
2. Solve each of the following equations:
a) $x + 7 = 21$ $x = 14$

$$\begin{array}{ll} \text{b)} & y - 13 = 23 & x = 36 \\ \text{c)} & 6z = 42 & z = 7 \\ \text{d)} & \frac{g}{5} = 10 & g = 50 \\ \text{e)} & 3h + 2 = 20 & h = 6 \\ \text{f)} & 4f - 3 = 17 & f = 5 \\ \text{g)} & \frac{k}{4} + 5 = 8 & k = 12 \end{array}$$

3. Use the formula $v = u + at$ to find u when $v = 100, a = 5$ and $t = 10$.
 $U = 50$

4. Solve $4x + 7 = 43$.
 $X = 9$

5. Find the value of $3x + 5y$ when $x = -2$ and $y = 4$.
 $-6 + 20 = 14$

6. Find the value of $3a^2 + 5$ when $a = 4$.
 53

7. Solve the equation $\frac{20}{x} = 4$.
 $X = 5$

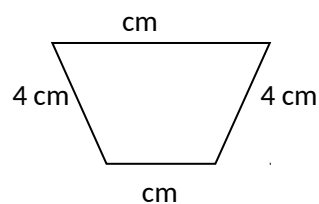
8. Solve the equation $\frac{y}{3} + 5 = 9$.
 $y = 12$

9. Make p the subject of the formula $t = 5p + 40$.
 $p = \frac{t - 40}{5}$

10. Solve the equation $7x - 3 = 9 + x$.
 $6 = 12$
 $x = 2$

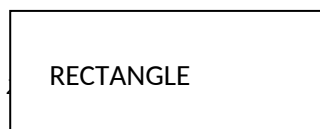
Section 2 - Forming Equations From Words

1. Find the length of the missing side of the shape below, given the perimeter is 23 cm.



$$\begin{array}{l} 8 + 3w = 23 \\ w = 5 \end{array}$$

2. a) If p is an odd number, what can you say about $2p$? even
 i. p and q are odd numbers. Is $p + q$ an odd number, an even number or could it be either?
 Write an explanation of how you know. Even, because even + even = even, and odd numbers are an even number +1 so you would have even + even +1+1 which is even +2.
3. Bag A contains x counters. Bag B contains 6 more counters than Bag A. Bag C contains 4 times as many counters as Bag B. $4(x+6)$
 Find the total number of counters in Bags A, B and C. Simplify your answer as far as possible.
 So $x + x + 6 + 4x + 24 = 6x + 30$
4. The perimeter of this rectangle is 32cm. Write down an equation in terms of x and use it to find the dimensions of the rectangle. $2(x+2) + 2(2x+5) = 32$



5. When Paul asked Simon for his house number, (h) , he replied
 "one subtracted from twice my house number is 47".
 Write an equation in terms of h for Simon's house number and then solve the equation.
 $2h - 1 = 47$
 $h = 24$
6. Natalie is 'a' years old. Write down expressions in terms of a for the following people's ages:
 a) Joyce, who is 10 years older than Natalie $a + 10$
 b) John, who is half Natalie's age. $a \div 2$
 c) Gavin, who is twice Joyce's age. $2(a + 10)$
 d) Steven, who is 4 years older than John. $\frac{a}{2} + 4$
7. The angles in a triangle are x , $3x$ and $5x$.
 Write an equation to find the value of x .
 Write down the size of each angle in the triangle.
 $180 = x + 3x + 5x$
 $180 = 9x$
 $x = 20$
 Sides of the triangle are 20° 60° 100°
8. Biscuits are sold in packets. Each packet contains 16 biscuits. Jason buys m packets of biscuits.
 a) Write down an expression, in terms of m , for the number of biscuits Jason buys.
 $16m$
 Jason eats six biscuits.
 b) Write down an expression, in terms of m , for the number of biscuits left.
 $16m - 6$
9. Rajiv is x years old.
 His sister Tanvi is 5 years younger than Rajiv.
 a) Write down an expression, in terms of x , for Tanvi's age. $x - 5$
 The total of Rajiv's age and Tanvi's age is 41 years.

b) Form an equation and solve it to find the value of x . $x + x - 5 = 41$

$$2x - 5 = 41$$

$$x = 23$$

c) Write down Tanvi's age. **18**

10. The four angles of a quadrilateral are 45° , 105° , $(4x - 15)^\circ$ and $5x^\circ$.

a) Form an equation, in terms of x , using this information.

$$360 = 45 + 105 + 4x - 15 + 5x$$

$$360 = 135 + 9x$$

b) Solve your equation and work out the size of the largest angle of the quadrilateral.

$$x = 25$$

11. Jo, Tara & Amy go to a party. They each take CDs to play and have 64 between them. Tara had 9 more than Amy & Amy had 14 more than Jo. How many CDs did Jo bring?

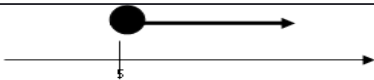
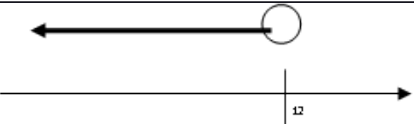
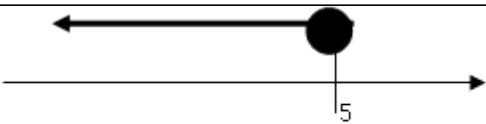
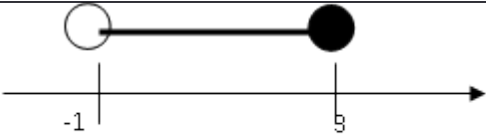
Let Jo = x so Amy $x + 14$ Tara $x + 14 + 9$

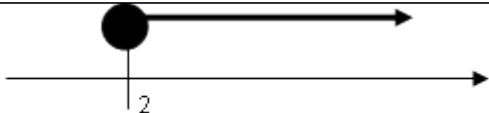
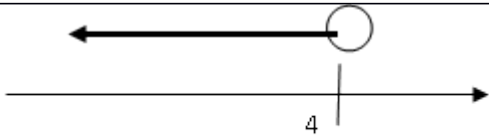
$$64 = x + x + 14 + x + 23$$

$$64 = 3x + 37$$

Section 3 - Solving Inequalities

1. For each of the inequalities solve them and then display them on a diagram.

	Solve	Diagram
$2x \geq 10$	$x \geq 5$	
$2x - 4 < 20$	$x < 12$	
$10 - x \leq 5$	$x \leq 5$	
$-2 \leq 2x \leq 6$	$-1 \leq x \leq 3$	

$2x + 3 \geq 7$	$x \geq 2$	
$5x + 3 < 23$	$x < 4$	

2. Solve the following inequalities:

a) $x + 7 \leq 21$ $x \leq 14$

b) $5x - 3 \geq 22$ $x \geq 5$

c) $4x + 9 < 21$ $x < 3$

d) $6x - 2 > -8$ $x > -1$

3. Given n is an integer, list the possible values of n when

$$3 \leq 3n < 12$$

1, 2, 3

4. Solve these inequalities and represent the solutions on a number line;

a) $3x < 24$ $x < 8$

b) $2x - 5 > 17$ $x > 11$

c) $2(x + 5) \leq 16$ $x \leq 3$ d) $7x - 5 \geq 3x + 3$ $x \geq 2$

e) $3x + 1 < x + 3$ $x < 1$

5. Make a list of numbers that satisfy these inequalities.

a) $2 < y < 8$ 3, 4, 5, 6, 7 c) $-5 \leq y < 5$ -5, -4, -3, -2, -1, 0, 1, 2, 3, 4

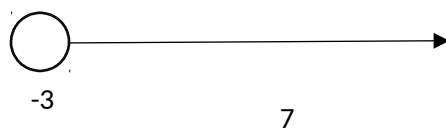
b) $2 < y \leq 8$ 3, 4, 5, 6, 7, 8 d) $-1 < y \leq 1$ 0, 1

6. Show the following inequalities on a number line:

a) $x \leq 5$



b) $x > -3$



c) $5 \leq x \leq 11$



Section 4 - Mixed Exam Style Questions

1. k is an even number.

Jo says that $\frac{1}{2}k + 1$ is always even.

Give an example to show that Jo is wrong. Use 4, give 3 so shows she is wrong

2. The letters a and b represent prime numbers. Give an example to show that $a + b$ is **not** always an even number. Use $a = 2$ and $b = \text{any other prime}$

3. The sides of a rectangle are $2y + 1$, and $y - 3$.
The perimeter is 26cm - find the value of y and the length of each side.

$$2(2y + 1) + 2(y - 3) = 26$$

$$4y + 2 + 2y - 6 = 26$$

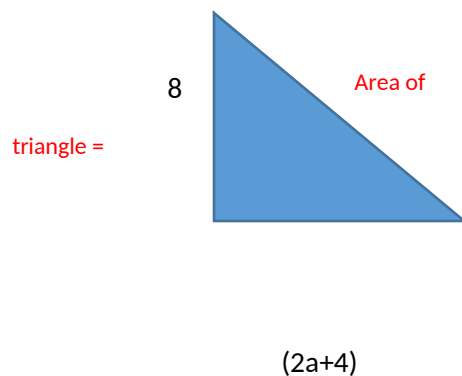
$$6y - 4 = 26$$

$$6y = 30$$

$$y = 5$$

Sides length 11, 11, 2, 2

4. Form an equation for the area of the triangle;



$$\frac{b \times h}{2}$$

$$\frac{8(2a+4)}{2} = 8a + 16$$

5. A shop sells two sizes of bags of cookies.
The large bag contains 6 cookies and the small bag contains 3 cookies.

- a) How many cookies are there in L large bags?

$$6L$$

- b) Write an expression for the total number of cookies in L and S small bags.

$$6L+3S$$

6. The dimensions of a rectangle are **length = $2x$** and **width = $4x-2$** . The perimeter of the rectangle is 32cm. Find the area in cm^2 .

$$2(2x) + 2(4x - 2) = 32$$

$$4x + 8x - 4 = 32$$

$$12x - 4 = 32$$

$$x = 3$$

So sides 6cm and 10 cm. Area = 60cm^2

7. The size of the largest angle in a quadrilateral, is 3 times that of the smallest angle. The other two angles are equal and are 30° less than the largest.

Work out in degrees the size of all four angles in the quadrilateral.

You must show your working.

$$\text{Smallest angle} = x$$

$$\text{Largest} = 3x$$

$$\text{Other two} = 3x - 30$$

$$\text{Total: } x + 3x + 3x - 30 + 3x - 30 = 360$$

$$10x - 60 = 360$$

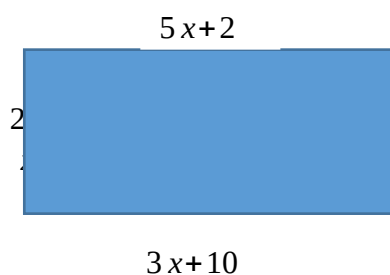
$$x = 42$$

Angles 126, 96, 96, 42

8. Given that the two lengths are equal, calculate the length of Sides.

$$5x + 2 = 3x + 10$$

$$\text{Sides} = 22$$



- 9.

A	B
$2p + 4$	$4p - 15$

Expression A is 10 more than twice expression B. Find p.

$$2p + 4 = 2(4p - 15) + 10$$

$$2p+4=8p-30+10$$

$$2p+4=8p-20$$

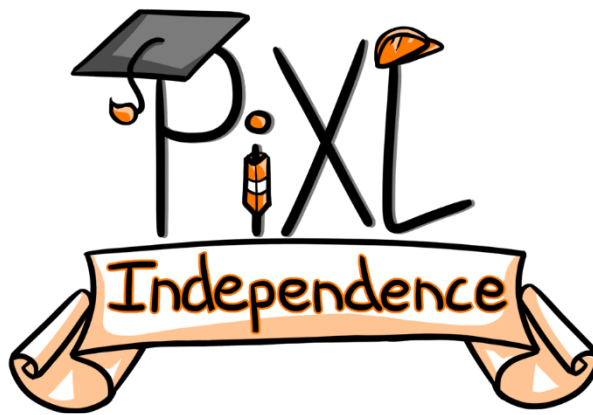
$$p=4$$

10. If I double my age, add 4, divide by 5, then take away 2 I get the age at which I first voted (18). How old am I now?

$$\frac{2x+4}{5}-2=18$$

$$2x+4=100$$

$$x=48$$



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