1. Match each expression to its definition.

a^2 2 more than a

2 - a   a multiplied by a

2a   2 less than a

a + 2   a divided by 2

$\dfrac{a}{2}$ a multiplied by 2

a - 2   a less than 2

2. Write down an algebraic expression for each of the following.

(a) 4 more than y

....

(b) 3 less than p

....

(c) 3 multiplied by y

....

(d) 2 divided by a

....

(e) c divided by a

....

(f) c taken away from m

3.   Explain the meaning of each of these expressions.

(a)   4y

....

(b)   y²

....

(c)   7 - s

....

(d)   xy

....

(e)   b - a

....

4.   In a furniture shop, a table comes with six chairs.

Which of the formulae below connects the number of tables, T, and the number of chairs, C?

Formula 1:

$C = T + 6$

Formula 2:

$C = 6T$

Formula 3:

$T = 6C$

Formula 4:

$T = C + 6$

5. Match each statement to the correct expression.

Multiply c by 2 then add 1

Square c then add 1

Add 1 to c then multiply by 2

Square c then subtract from 1

$c + 2$

$2c + 1$

$2(c + 1)$

$c^2 + 1$

$c^2 - 1$

$1 - c^2$

6. Write down the number that is 3 **less** than 2

7. Write down the number that is

    (a) 4 less than 1

    (b) 2 more than −8

8. Circle the number than is 5 less than −9

        14   4   −4   −14

9.   Write down the answer to

(c) $3 - 7$

(d) $-4 - 5$

10.   In February, the highest temperature in Ballycastle was 11°C

In February, the lowest temperature in Ballycastle was 20°C lower than the highest temperature.

Work out the lowest temperature in Ballycastle in February.

.... °C

11.   Write down the number that is

−2 multiplied by 7

−8 multiplied by −3

-10 divided by 5

-12 divided by −2

12.   Circle the answer to

-4 x 4

−16   −8   8   16

13.   Write down the answer to

- $7 - 9 - 2$
- $10 + 3 + 13$
- $21 \div -7$
- $-100 \div -4$

- $5 - 8 + 1$
- -2×-7

14. Circle the answer to $\qquad$ **12 + (−3)**

$$15 \qquad 9 \qquad -9 \qquad -15$$

15. Work out each of the following

- $7 - (-4)$
- $-2 + (-3)$
- $-6 - (-8)$
- $10 - (-2)$
- $(-12) + (-7)$
- $-48 \div -8$

16. Complete the following

$20 \div \boxed{} = -4$

$-7 - \boxed{} = -10$

$5 + \boxed{} = 0$

$-6 \times \boxed{} = 36$

17.   Emily has the following cards

-1 -4 2 -6 4 5

Emily is going to choose two cards and multiply the numbers on them.
What cards should Emily choose to make the largest possible answer?

$\square$ × $\square$

18.   Fill in the missing numbers

(a)

$\square$ + 2 = -1

(b)

8 + $\square$ = 0

(c)

-8 - $\square$ = 3

19. Fill in the missing numbers

$$2 \times \boxed{} = -16$$

$$-1 \times \boxed{} = 2$$

$$\boxed{} \times -7 = 42$$

$$\boxed{} \div 3 = -15$$

$(-3)^2$ ....

$(-2)^3$ ....

20.   Expand the brackets.

- $y(y^2 + 3)$

- $2w(3w^2 - 5)$

- $y^2(8 - 2y)$

- $2(h - 4)$

- $5(2w + 3)$

- $3(2y - 1)$

- $6(3 - 2x)$

- $2(3w - 5y)$

- $y(3y + 5)$

- $8x(2x - 5)$

- $-3(y + 2)$

- $9e(2f - 3)$

- $-2(y - 4)$

- $3(x + 5) + 2(x + 1)$

- $4(x - 1) + 3(2x + 5)$

- $2w(3w^2 - 5)$

- $y^2(8 - 2y)$

- $a(3a + 2ac)$

- $9w - (5 - 4w)$

- $2(7y - 3x) - 8(x - 4y)$

21. From the list of numbers

3   6   8   14   16   28   41   64

(a) write down the cube numbers

.... and ....

(b) write down the cube root of 27.

....

22. Write down the value of

(a) 1^3

(a) $\sqrt[3]{64}$

(b) ten cubed

(b) $\sqrt[3]{8}$

(c) 5^3

(c) $\sqrt[3]{0}$

(d) 6 cubed

(d) $\sqrt[3]{1000}$

(e) 8^3

23. Arrange these in order, starting with the smallest.

2^2 $\sqrt[3]{27}$ 1^3 $\sqrt{25}$

....

24.   729 is both a square number and a cube number.

Find two other numbers that are both square numbers and cube numbers.

.... and ....

25.   Don says

"the difference between two consecutive cube numbers is always odd."

Is Don correct?
You must show your workings.

26.   Make x the subject of

$$y = 3x$$

$$y = 3x - a$$

27.   Make w the subject of the formula

$$s = \frac{w}{a}$$

Make d the subject of

$$e = d + 5$$

Rearrange this formula to make c the subject

$$a = c - w$$

Rearrange $t = \dfrac{w}{2}$ to make w the subject.

Rearrange $2x - y + 1 = 0$ to make x the subject

Given that $x + y = 1$

What does y equal?

$v = u + 10t$

(a) Work out the value of v when u = 4 and t = 3

(b) Make *u* the subject of the formula

$$v = u + 10t$$

(c) Make *t* the subject of the formula

$$v = u + 10t$$

28. Isaac is rearranging $m = 3t - 8$ to make t the subject.

$$m = 3t - 8$$
$$-8 \qquad -8$$
$$m - 8 = 3t$$
$$\div 3 \qquad \div 3$$
$$\frac{m - 8}{3} = t$$

Explain what mistake Isaac has made.

....

Make *m* the subject of the formula

$$s = \frac{hm}{4}$$

Express *v* in terms of *t*

$$t = \frac{v}{4} + 1$$

Make *d* the subject of the formula $c = 4d + 5$

Make *g* the subject of the formula:

$$a = \sqrt{g}$$

29. Here is a rectangle

$2x + 1$

P is the perimeter of the rectangle.

(a) Show that $P = 6x + 2$

X
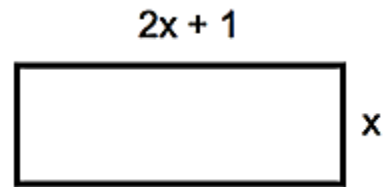
(b) Express x in terms of P

30. $C = 4x + 5y$

(a) Find the value of C when x = 9 and y = −2

(b) Make x the subject of the formula

(c) Find the value of x when C = 51 and y = 3

31.   Simplify

- $7y + 10 + 3y - 9$
- $y + y + y - y$
- $8x - 2x + 4x$
- $4c - 6c$
- $6y - 5 + 2y$
- $8c + 2p - 2c + 4p$
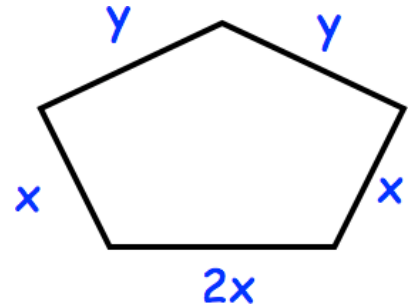- $3x + 4 - x + 7$
- $6a + 5w - 2a + w$
- $5c - 3s + 3c + 7s$

32.   Troy is simplifying $x^3 + x^3$

He says the answer is $2x^6$

Explain why Troy is wrong.

……………………………………………………………………………………………………
…

33.   Shown is a pentagon.

Find an expression, in terms of x and y, for the perimeter of the pentagon.

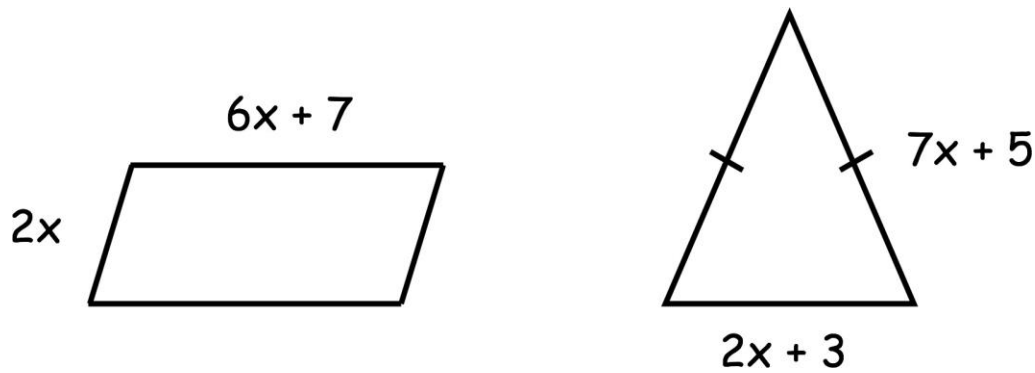…………………………………………………………………………………………………

34.   Simplify fully

$2x^2 + 3x - 1 - x^2 + 2x - 5$

$9(y - 2) + 4y + 3$

$5(x + 3y) + 2(2x - y)$

$3(4x + 8) - (7x - 2)$

$3(4x - 1) - 2(x + 4)$

35.   Below is a parallelogram and an isosceles triangle

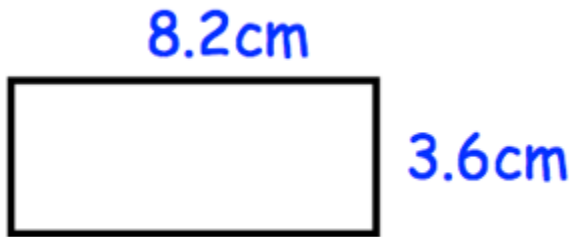$6x + 7$

$2x$

$7x + 5$

$2x + 3$

Which shape has the greatest perimeter? Show your working

36.   Work out

- $0.8 \times 1.2 =$

- $5.18 \div 7 =$

- $0.3 \times 0.2 =$

- $16.44 \div 0.3 =$

- $0.3 \times 0.3 =$

- $0.06 \times 0.4 =$

- $12.4 \times 0.7 =$

- $75.2 \times 0.23 =$

- $14.04 \div 6 =$

- $120 \div 0.3 =$

- $0.845 \div 5 =$

- $1.72 \div 0.8 =$

- $5 \div 0.04 =$

37. Shown below is a rectangle

8.2cm

3.6cm

Find the area of the
rectangle.Include units.

38.   State whether each answer is more than 20 or less than 20.
  Write "more than" or "less than" for each.

(a)   20 x 0.8

(b)   20 ÷ 0.8

(c)   0.2 x 200

(d)   0.2 ÷ 200

39.   You are given that

$$358 \times 26 = 9308$$

Use this information to find the answers to

(a)   3580 x 260

(b)   3.58 x 2.6

(c)   3580 x 0.26

(d)   93080 ÷ 2.6

40.   Factorize the following Expressions

(a) $4x + 6$ (b) $15x + 20$ (c) $9y - 12$ (d) $5x + 15$

(e) $6x - 3$ (f) $4x + 8$ (g) $5y - 25$ (h) $8w + 24$

(i) $8cdf + 10cde$ (j) $7w^2 + 6w + wy$ (k) $8ab^2 - 10ab$ (l) $4xy^2 + 6xy + 2x^2y$

(m) $6 - 4x$ (n) $9 + 12y$ (o) $45 + 60x$ (p) $16y - 32$

41. Find the mistake

Factorise completely

$24x^2 + 20x$

$4(6x^2 + 5x)$
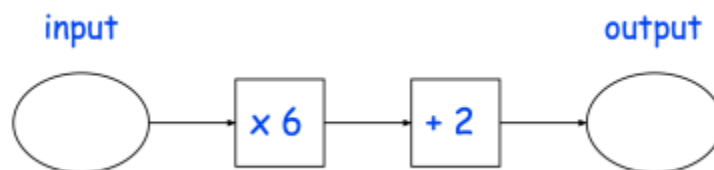
Factorise completely

$20a^2c + 30ac$

$5ac(4a^2 + 6)$

42.   Below is a number machine.

input ⟶ × 4 ⟶ − 9 ⟶ output

Work out the output when the input is 6

Work out the input when the output is 35

43.   Here is a number machine.

input   output
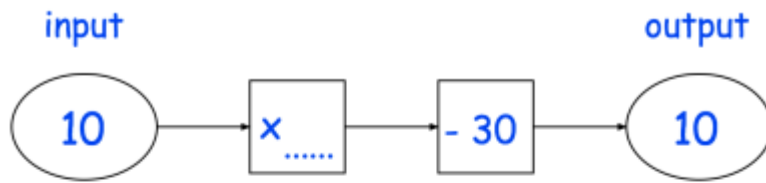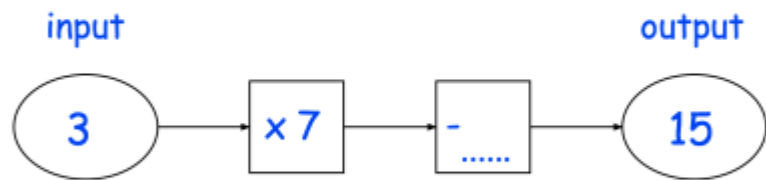
○ ⟶ × 6 ⟶ + 2 ⟶ ○

Work out the output when the input is 13

Work out the input when the output is 5
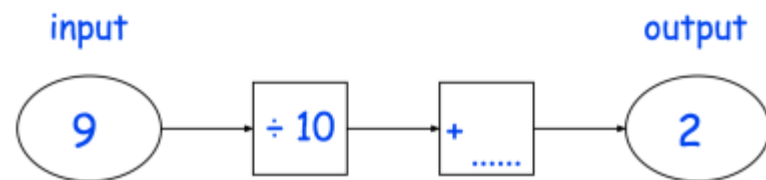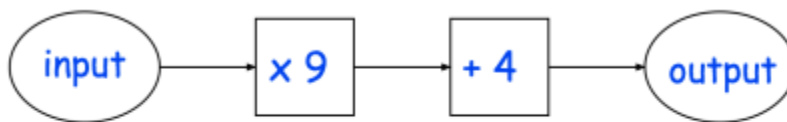
44. Complete the following number machines

(a)

input   output

$\boxed{10}$ → $\boxed{\times \underline{\quad}}$ → $\boxed{- 30}$ → $\boxed{10}$

(b)

input   output

$\boxed{3}$ → $\boxed{\times 7}$ → $\boxed{- \underline{\quad}}$ → $\boxed{15}$

(c)

input   output

$\boxed{9}$ → $\boxed{\div 10}$ → $\boxed{+ \underline{\quad}}$ → $\boxed{2}$

45.   Below is a number machine

$\boxed{input}$ → $\boxed{\times 9}$ → $\boxed{+ 4}$ → $\boxed{output}$

The input is the same as the output.

Work out the input

$\boxed{input}$ → $\boxed{+ 6}$ → $\boxed{\times 4}$ → $\boxed{output}$
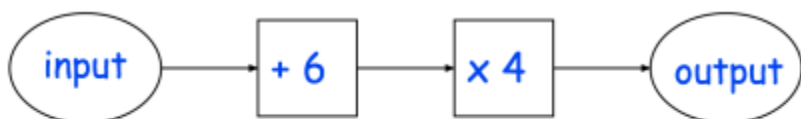
The output is twice the input.

Work out the input

46. Match each inequality to the correct description

$x > 4$ x is less than or equal to 4

$x \leq 4$ x is less than 4

$x < 4$ x is greater than 4

$x \geq 4$ x is greater than or equal to 4

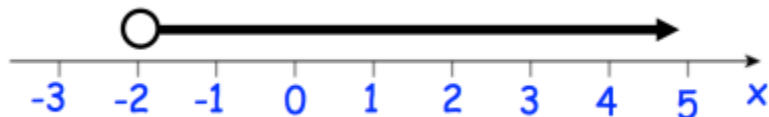47.   Represent the inequality $x > 2$ on this number line

48.   Represent the inequality $x \leq 4$ on this number line

49.   a) Solve the inequality $2x - 1 < 9$

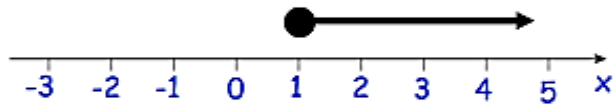b) Write down the inequality shown on the number below.

c) Write down all the integers that satisfy both inequalities shown in part (a) and (b).

50. (a) n is an integer

$$-2 < n \leq 3$$

List the possible values of n.

(b)

Write down the inequality shown in the diagram.

(c) Solve $3y - 4 > 17$

51. List the first six triangular numbers.

52. John is adding consecutive triangular numbers.
John says, "when I add consecutive triangular numbers, I get another kind of special number."

What kind of number does John get?

53. Work out

(a) 23×10^2

$4000 \div 10^2$

8×10

$70 \div 10$

(b) 7×10^3

$25000 \div 10^3$

6×100

$6000 \div 100$

(c) 2.5×10^3

$170 \div 10^2$

17×1000

$17 \div 10$

(d) 1.8×10^4

$9300 \div 10^4$

3.4×10

$93 \div 100$

(e) 0.2×10^2

$98 \div 10^2$

0.2×100

$28900 \div 1000$

54. Shown below are some questions and answers

$200 \div 10$ 0.2

$0.2 \div 10$ 20

0.2×10 2

$2 \div 10$ 0.02

$2 \div 1000$ 0.002

55. The heights of 7 children are shown below

132cm   1.2m   98cm   0.99m   116cm   1.4m   1.33m

(a) Change 132cm into metres.

(b) Change 98cm into metres.

(c) Order the heights, starting with the shortest.

56.   Five boys take part in a long jump competition. The distances jumped were

4.31m   4.08m   4.1m   4.093m   4.51m

(a) Write down the distance of the longest jump

(b) Put the jumps in order, starting with the shortest.

57.   Write these numbers in order of size.
Start with the smallest number.

4.2   0.42   0.024   0.93   0.039

58.   Calculate
- $16 - 5 \times 2$
- $5 \times (2 + 3)$
- $10 - 3^2$
- $40 \div 2 + 3$
- $8 \div 2 + 12 \div 4$
- $3 \times 10 \div 5 - 1$

59. Express as a product of its prime factors

36

56

100

42

60. $3x^2 = 75$

Find the value of x.

Express 75 as a product of its prime factors.

61.   Write to one significant figure.

236
74.86
6793
0.0683
9.99

62.   Write to two significant figures.
     17635
     0.1826
     0.0001921
     0.123456

63. Holly has worked out the answer to a calculation.

   Her teacher has told her to write all her answers to four significant figures.

   Round her answer to four significant figures

827.4715

64.   Ava thinks of a number.
 She multiplies it by 3.
 Then she adds 9.
 Her answer is 45

 What was the number Ava started with?

65.   Harry thinks of a number.
 He divides his number by 4.
 Harry then subtracts 1.
 He then multiplies his result by 6. His final answer is 72.

  What was the number Harry first thought of?

66.   Jonathan thinks of a number.
 He multiplies it by −7 and then subtracts 5 His answer is 51

  Was number is he thinking of?

67.   Hannah and Frankie think of the same number.
 Hannah divides her number by 7 and then adds 3.
 Her answer is 6. Frankie subtracts 9 and then squares.
 Her final answer is x.

 Find Frankie's final answer, x

68. Apples cost a pence each.

Bananas cost b pence each.

Write down an expression for the total cost, in pencil, of 3 apples and 5 bananas.

.............................pence

69. Martin is x years old.

Jennifer is 3 years younger than Martin.

Connor is twice as old as Martin.

(a) Write an expression for Jennifer's age.

(b) Write an expression for Conner's age.

(c) Write an expression for the sum of the three ages

70. The express bus from Dublin to Belfast takes x minutes.
The standard bus takes 29 minutes longer.

Write down an expression for the time the standard bus takes

....

71. Fred is 21 years old.
Hannah is y years younger than Fred.

Write an expression for Hannah's age

....

72. Evaluate

$$4^{-2} \qquad 36^{\frac{1}{2}} \qquad 25^{0} \qquad 5^{-3} \qquad 2^{4} \times 4^{-2}$$

73. w is greater than 1. Write in order from smallest to largest

$$w^{0} \qquad w^{3} \qquad \frac{w^{3}}{w^{4}} \qquad w^{-2}$$

74. Write the numbers below in the form 2^{n}

$$4 \qquad\qquad 8 \qquad\qquad 32$$

75. Calculate
- 9^{3}
- 2^{4}
- 10^{6}
- 1^{7}

76. A red light flashes every 6 seconds.
 A yellow light flashes every 4 seconds.
They both flash at the same time. After how many seconds will they next both flash at the same time?

...........................seconds

77. A blue light flashes every 8 minutes while a pink light flashes every 54 minutes. Both lights flash together at 2pm. When is the next time that both lights will flash together again?

....

78.   From the list of numbers

7   9   12   21   23   30   36   45

(a) write down the multiples of 7.

(b) write down the multiples of 5.

(c) write down the multiples of 12.

79.   Find the value of

- $5c + c$ when $c = 6$

- $4a - b$ $a = 9$ $b = 8$

- $12h + 9t$ when $h = 11$ and $t = 3$

- $3c + m$ when $m = 0.5$ and $c = 2.2$

- $\dfrac{ab + 24}{2c}$ $a = 4, b = 9$ and $c = -5$

80. Solve

$x^2 = 9$

x = ... or x = ...

$x^2 = 100$

$x^2 + 7 = 32$

$x^2 - 2 = 119$

81.   Matt says that the only answer to x squared = 4 is x = 2
Explain why Matt is wrong

82.   The area of a square is 169cm²
 Walter says that the length of each side is 13cm or −13cm
 Explain why Walter is incorrect

83.   Simplify

$m^5 \times m^3$

$m^8 \div m^2$

$\dfrac{m^9 \times m}{m^5}$

$(m^3)^2$

$w^3 \times w^{-5}$

$a^6 \div a^3$

$\dfrac{s^3 \times s^4}{s^2}$

84. Circle the rational numbers

$$\pi \qquad \sqrt{9}$$

$$0.1111...$$

$$4 \qquad \sqrt{2}$$

$$\frac{1}{3}$$

85.   Write down an irrational number.

86.   A rational number can be expressed in the form $\frac{a}{b}$ where a and b are integers. Explain why the following numbers are rational numbers.

0.82   -12   1.33333333… = 1.3

87.   Consider the following numbers.

$$-3 \quad 12 \quad 8.39 \quad -56.1 \quad 8 \quad 0 \quad 11\frac{1}{3}$$

a) Natural numbers

b) Integers

c) Rational numbers