Year 9 Numeracy 01 Worksheet

This worksheet contains 25 questions covering the full range of numeracy at a Year 9 level, including questions on area and volume, measurement, geometry, mathematical operations and general number sense.

Remember you can connect to one of our awesome Maths tutors and they'll help you understand where you're going wrong.
They're online 3pm-midnight AET, 6 days a week.

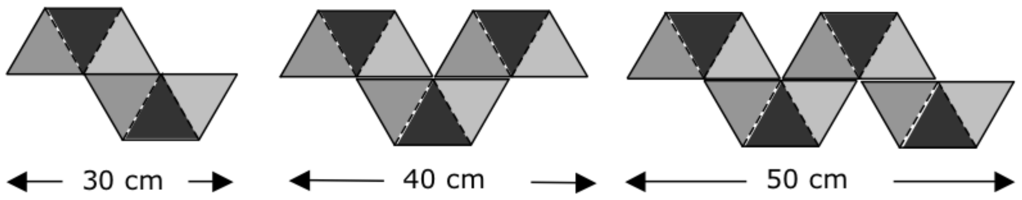
Homework help in a click: yourtutor.com.au

yourtutor

Questions

1. Trapeziums are divided into three equilateral triangles.

The trapeziums are lined up to make chain patterns.



There are 4 trapeziums in a chain 50 cm long.

How many trapeziums will there be in a chain 1 metre long?

a) 24
b) 8
c) 27
d) 9

Answer: ______________________

2. Rewrite the below algebraic fraction in the simplest form.

$$\frac{24a^3b^2c^4}{2(ac)^3}$$

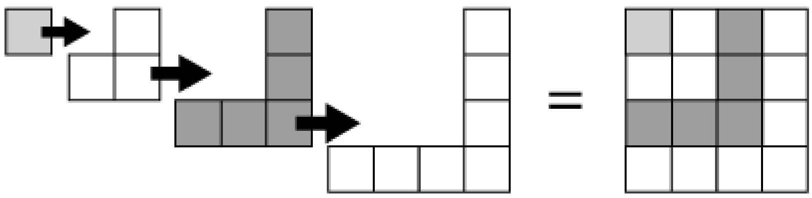
Answer: ______________________

3. Which term is like x^2?

a) $5x^2y^2$
b) $5x^3 \div x$
c) $3xy^2$
d) $3x^2y$

Answer: ______________________

4. Megan counts the boxes in the L-shaped regions and puts them together to make a larger square.



1 + 3 + 5 + 7 = 16

What conclusion should Megan come to?

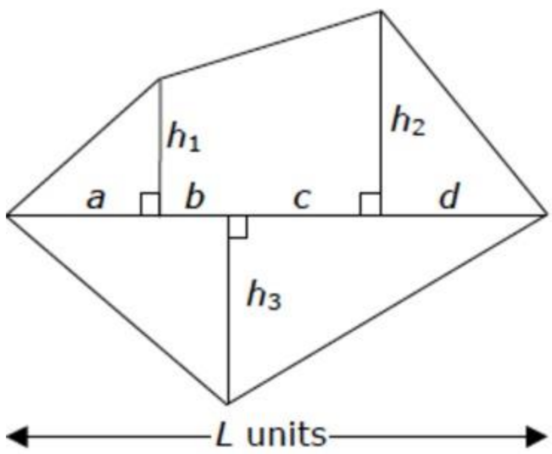
a) $1 + 3 + 5 + \ldots + 20 = 10^2$
b) $1 + 3 + 5 + 7 + 9 + 11 + 13 = 7^2$
c) $1 + 3 + 5 + \ldots + 39 = 38^2$
d) $1 + 3 + 5 + 7 + 9 + 13 = 6^2$

Answer: ____________________

5. An irregular pentagon has been broken up into four triangles and a trapezium.

The area of the pentagon, A sq. units, is the sum of these five areas.

The length of the diagonal is *L* units.



Which is the **correct** expression for A?

a) A = (1 + 2 + 3)Lh/2
b) $A = \frac{1}{2}\{ah_1 + (b + c)(h_1 + h_2) + dh_2 + (a + b + c + d)h_3\}$
c) $A = L(h_1 + h_2 + h_3)$
d) $A = L(h_1 + h_2 + h_3)/2$

Answer: ____________________

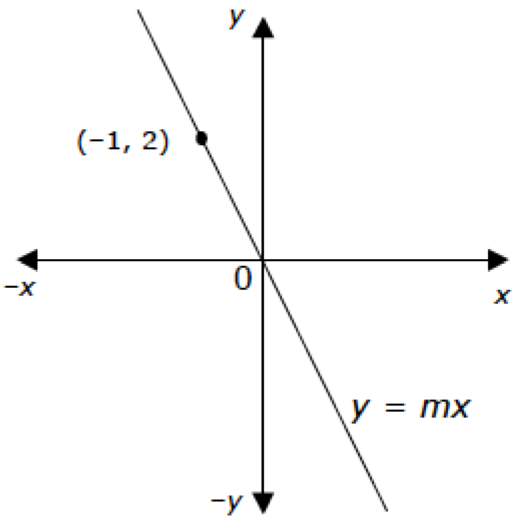
6. Find the value of x when:

$$\frac{2x+3}{5} + \frac{2-4x}{3} = \frac{1}{3}$$

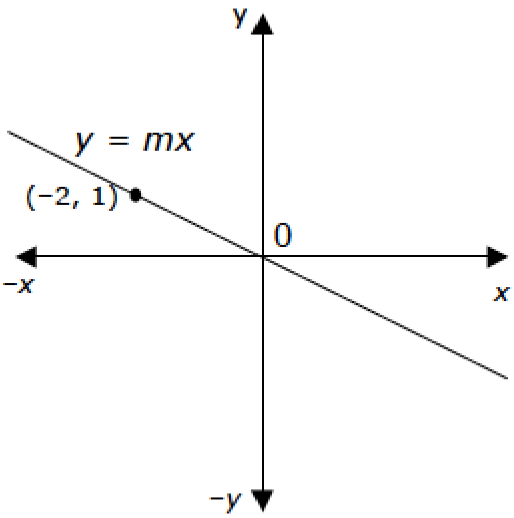
Answer: ______________________

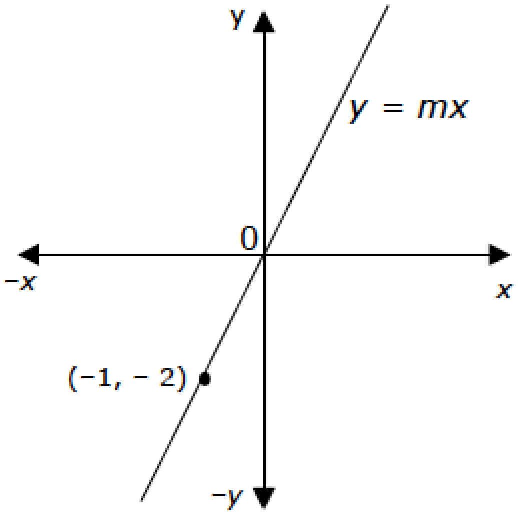
7. On which graph does the straight line y = mx have a slope of –2?

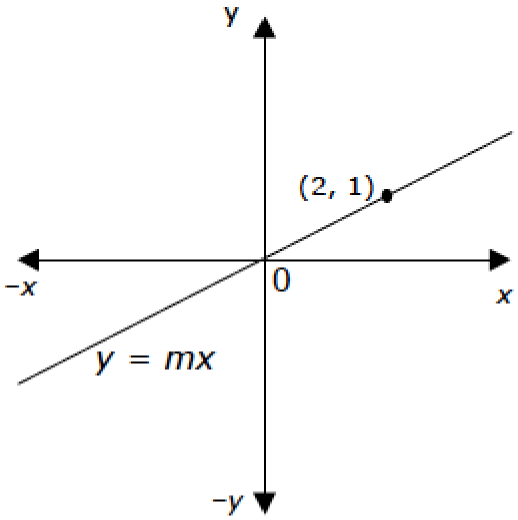
a)



b)



c) 

d) 

Answer: ______________________

8. Which of these points is halfway between the points (1, 4) and (5, 6)?

    a) (3, 5)

    b) (2, 1)

    c) (1, 2)

    d) (5, 3)

Answer: ______________________

9. Write, in Roman numerals, the sum of MCXCLIX and DCCCLI.

Answer: ______________________

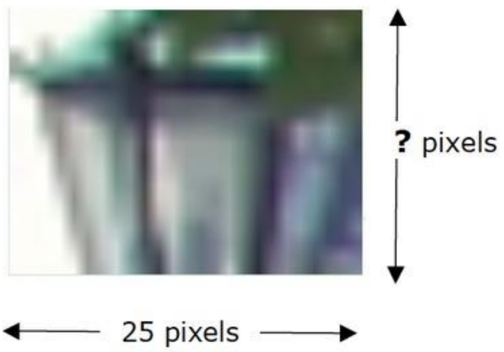
10. Which expression is equivalent to $6p + 24 + 3p - 9$?

a) $9(p + 5)$
b) $3p + 5$
c) $3(3p + 5)$
d) $3(2p - 3)$

Answer: ______________________

11. A ***pixel*** is a very small square.

This computer graphic contains 500 pixels.



How many pixels high is the graphic?

Answer: ____________________

12.Choose the expression equal to:

$7h^2 + 2h - 10h - 3h^2$

a) $-4h^2$

b) $h(4h + 8)$

c) $4h(h - 2)$

d) $h(4h - 2)$

Answer: ____________________

13. Which digits are wrong in this written division?

$$\begin{array}{r|l} & 1\quad 3\quad 8\quad r\quad 0 \\ \hline 7 & 9\quad {}^{2}5\quad {}^{4}6 \end{array}$$

a) 3 and 4

b) 2 and 4

c) 2 and 3

d) 8 and 0

Answer: ____________________

14. Jeff correctly solved an equation.

He wrote:

$3k + 9 = 4$

$3k = -5$

What was his next step?

a) $k = -15$
b) $k = -5 \div 3$
c) $3k + 5 = 0$
d) $k = -5 + 3$

Answer: ____________________

15. In the January Sale a shop advertises that all goods are to be discounted by 35% off the marked price.
Tabitha pays the discounted price of $57.85 for a pair of shoes.

What was the marked price before the discount?

Answer: ____________________

16. Ellie worked out the temperature of the day by counting 31 cricket chirps in 15 seconds.

Ellie used a formula for the Temperature:

$$\frac{5 \times (\text{number of chirps in 15 seconds}) + 25}{9} \ {}^\circ\mathrm{C}$$

What was the temperature?

a) 15°C

b) 11°C

c) 20°C

d) 30°C

Answer: ____________________

17. What is the largest number that is a factor of both 30 and 42?

    a) 6

    b) 5

    c) 3

    d) 2

Answer: ____________________

18. There are three integers which are equal to their own cubes.

    Write any one of them in your answer below.

Answer: ____________________

19. In the expression:

$\mathbf{2a^2b^2 + (5ab)^2 - abab + (3a)^2b}$ which is the **unlike** term?

a) $(3a)^2b$

b) abab

c) $2a^2b^2$

d) $(5ab)^2$

Answer: ____________________

20. What is the smallest square number that has 0 in the units place and the sum of its digits divisible by 9?

a) 8100

b) 900

c) 180

d) 360

Answer: ____________________

21. Which is the largest?

a) A half of a quarter
b) A quarter of a half
c) An eighth of 4
d) A twelfth of 3

Answer: ____________________

22. Which number is missing from this true number sentence?

59 × 32 + 59 × **?** = 5900

Answer: ____________________

23.Complete the following sum:

$$\begin{array}{r} 9\ 8\ 7\ 6\ 5\ 4\ 3\ 2\ 1 \\ +\ \ 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9 \\ \hline \end{array}$$

How is the answer written in words?

a) one hundred and eleven million, one hundred and eleven thousand, one hundred and eleven

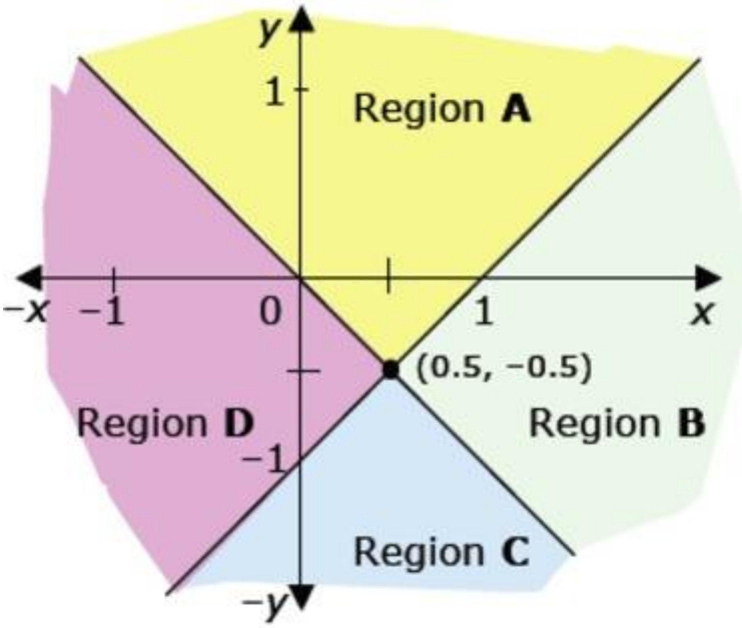
b) one hundred and eleven million, one hundred and eleven thousand, one hundred and ten

c) one billion, one hundred and eleven million, one hundred and eleven thousand, one hundred and eleven

d) one billion, one hundred and eleven million, one hundred and eleven thousand, one hundred and ten

Answer: ____________________

24. In which region is $x + y > 0$ and $x - y < 1$?



a) Region D
b) Region B
c) Region A
d) Region C

Answer: ____________________

25. Which numeral is missing from this true number sentence?

$4 \times 3210 \times ? = 3\ 210\ 000$

Answer: ____________________

The Answers.

Hey! No peeking until you've finished…

Answers

Question 1.

Answer: D) 9

We can make a table of values relating the length of the chain (L) to the number of trapezia (T):

T:	1	2	3	4
L:	20	30	40	50

Notice that as the number of trapezia increases by 1, the length increases by 10 (cm).

So, L is increasing at 10 times the rate of T. This means that part of the rule will be:

L = 10T ...

However, this is not quite correct. 1 x 10 is 10, not 20, and 2 x 10 is 20, not 30.

In each case, we need to ADD 10 to get the correct value of L, so our rule is:

L = 10T + 10

Check that this is correct by applying it to T = 3 and T = 4.

Now, we want to know how many trapezia will make a chain of 100cm. To work that out, we substitute in 100 for L and solve the equation for T:

10T + 10 = 100

10T = 90

T = 90/10

T = 9

So in a chain of 100cm, there will be 9 trapezia (or trapeziums).

Question 2.

Answer: $12b^2c$

To simplify this expression, we need to identify factors shared by the numerator and the denominator.

First, though, it might be helpful to expand the $(ac)^3$ in the denominator:
$(ac)^3 = a^3c^3$

Now we can methodically simplify by finding common factors.

The 24 in the numerator and the 2 in the denominator have a common factor of 2, so that will leave 12 in the numerator (and 1 in the denominator) for the actual numbers.

The a^3 in the numerator cancels the a^3 in the denominator.
The b^2 in the numerator will remain the same as there are no factors of b in the denominator.
In the numerator, we have c^4 and in the denominator we have c^3 . This will leave one factor of c in the numerator:

$$\frac{\overset{12}{\cancel{24}}\cancel{a^3}\, b^2\, c^{\cancel{4}}}{\cancel{2}\cancel{a^3}\,\cancel{c^3}}$$

$$= 12\, b^2 c$$

Question 3.

Answer: B) $5x^3 \div x$

"Like" terms are amounts of the same "thing". We can add like terms together, whereas we cannot add unlike terms.

For example, we can add 3y + 4y, and get 7y. We cannot add 3y and $4y^2$: these are unlike terms.
None of the possible choices appear to be terms in x^2However, we can simplify this one:
$5x^3 \div x$
$= {}^{5x3}/ {}_{x}$
$= 5x^2$
So, this IS a term in x^2 and hence is "like" x^2 .

Question 4.
Answer: B) $1 + 3 + 5 + 7 + 9 + 11 + 13 = 7^2$

Notice that we start with a square that is 1 x 1 (or 1 squared), using just the first odd number.

$1 = 1 \times 1 = 1^2$

When we slide that into the next shape, it combines the first two odd numbers (1 and 3), making 4, which is 2 x 2 or 2 squared.

$1 + 3 = 4 = 2 \times 2 = 2^2$

Then, with the first 3 odd numbers (1, 3 and 5) we have a total of 9 squares (1 + 3 + 5), which is 3 x 3 or 3 squared.

$1 + 3 + 5 = 9 = 3 \times 3 = 3^2$

The fourth term in the pattern uses the first 4 odd numbers (1, 3, 5 and 7), which add to 16, which is 4 x 4 or 4 squared.

$1 + 3 + 5 + 7 = 16 = 4 \times 4 = 4^2$

So, we can deduce that the total number of small squares that make up the large square is the number of consecutive odd numbers that we had added, squared.

Hence, 1 + 3 + 5 + 7 + 9 + 11 + 13 (which are the first 7 odd numbers) will be equal to 7^2 .

Question 5.

Answer: B) $\frac{1}{2}\{ah_1 + (b + c)(h_1 + h_2) + dh_2 + (a + b + c + d)h_3\}$

The area of the pentagon, A sq. units, is the sum of the five shapes that make up the composite. The area of a triangle is ½bh.

For triangle 1, the area is $\frac{1}{2}ah_1$. For triangle 2, the area is $\frac{1}{2}dh_2$. For triangle 3, the area is $\frac{1}{2}(a+b)h_3$. For triangle 4, the area is $\frac{1}{2}(c+d)h_3$.
For a trapezium, the formula for area is ½(a+b)h. In the case of our trapezium, this becomes $\frac{1}{2}(b+c)(h_1+h_2)$.
We can now add each of these areas. $\frac{1}{2}ah_1 + \frac{1}{2}dh_2 + \frac{1}{2}(a+b)h_3 + \frac{1}{2}(c+d)h_3 + \frac{1}{2}(b+c)(h_1+h_2)$.

The answer we have here is correct, but to simplify, we can factor out the common term, ½:

$\frac{1}{2}\{ah_1 + dh_2 + (a+b)h_3 + (c+d)h_3 + (b+c)(h_1+h_2)\}$
We can also factor the two bolded terms, because they both include h_3:
$\boldsymbol{\frac{1}{2}\{ah_1 + (b + c)(h_1 + h_2) + dh_2 + (a + b + c + d)h_3\}}$

Question 6.

Answer: X = 1

We can think about this in a couple of ways, but in the end, the process is generally the same.

When adding fractions, we need them to have the same denominator, so we create equivalent fractions. We'll do that for all 3 fractions in this equation.

The lowest common multiple of 3 and 5 is 15, so we'll change the fractions to 15ths.

5 into 15 goes 3, so we need to multiply the first fraction by 3, in both the numerator and the denominator. 3 into 15 goes 5, so we'll multiply the numerator and denominator of the second fraction on the left side and the fraction on the right side by 3:

$^{3(2x + 3)}/_{15} + {}^{5(2 - 4x)}/_{15} = {}^{5}/_{15}$

Therefore:

3(2x + 3) + 5(2 - 4x) = 5(equating the numerators or multiplying both sides by 15)

6x + 9 + 10 - 20x = 5 (expanding the brackets)

- 14x + 19 = 5 (collecting like terms and simplifying)

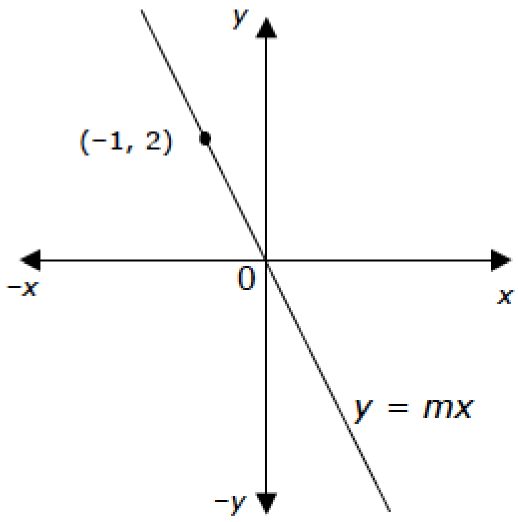
-14x = -14 (subtracting 19 from both sides)

x = $^{-14}/_{-14}$ (dividing both sides by -1)

x = 1

Question 7.

Answer: A)



To calculate the slope of a straight line, we need two points. From these, we can work out how much y changes compared to how much x changes. (Remember also that a negative gradient means that the line is falling from left to right, so this immediately rules out two of the options.

The formula for gradient of slope (designated m) using two points (x_1, y_1) and (x_2, y_2) is:
$m = (y_2 - y_1) \div (x_2 - x_1)$
All of the graphs in the possible answers pass through the origin (0, 0), so we can designate this as the point (x_1, y_1) for all of them.

The slope of the line passing through the origin and the point (−2, 1) will be:

$m = (1 - 0) \div (-2 - 0)$

$m = -1/2$, so this is the not correct answer.

The slope of the line passing through the origin and the point (−1, 2) will be:

$m = (2 - 0) \div (-1 - 0)$

$m = -2$, so this is the correct answer.

Question 8.

Answer: A) (3 , 5)

The mid-point is given by the average of the x values and the y values, so the formula is:

MP = ($^{(x1 + x2)}/_2$, $^{(y1 + y2)}/_2$)
= ($^{(1 + 5)}/_2$, $^{(4 + 6)}/_2$)

= (3 , 5)

Question 9.

Answer: 100 = MMC

We can convert these two numbers to our "normal" number system (Hindu-Arabic). It is useful to group the symbols that relate to the ones (units), tens, fifties, hundreds etc.

There are seven symbols used in Roman numerals:

I meaning 1
V meaning 5
X meaning 10
L meaning 50
C meaning100
D meaning 500
M meaning 1000

MCXCLIX can be broken up as follows:

MC XCL IX

MC stands for "100 after 1000", so that's 1 100

XCL stands for "10 before 150", so that's 140

IX stands for "1 before 10", so that's 9.

That makes the first of the two numbers:

1 100 + 140 + 9

= 1 249

DCCCLI can be broken up as:

DCCC L I

DCCC stands for "300 after 500", so that's 800

L is simply 50

I is simply 1.

So, this number is:

800 + 50 + 1

= 851.

Now we can do the addition:

1 249 + 851 = 2 100

Finally, we'll change that back to Roman numerals:

One thousand is M, so two thousand is MM, and one hundred is C, so:

2 100 = MMC

Question 10.

Answer: B) 3(3p + 5)

$6p + 24 + 3p - 9$

Collecting like terms (the terms in p, and the constants), we have:

$= 6p + 3p + 24 - 9$

$= 9p + 15$

We can then factorise that expression by taking out the common factor of 3 from both terms:

$= \mathbf{3(3\boldsymbol{p} + 5)}$

Question 11.

Answer: The graphic is 20 pixels high.

Identify the information you are given and what you need to find:

Area = 500 pixels

Length = 25 pixels

Height = ?

Find an equation that relates the above variables:

The equation for the area of a rectangle is Area = length x height

Substitute in the known values and solve:

500 = 25 x height

height = 500/25

height = 20.

The graphic is 20 pixels high.

Question 12.

Answer: C) 4h(h - 2)

This expression has "terms in h squared" and "terms in h".

We can rearrange the expression as follows:

$7h^2 - 3h^2 + 2h - 10h$
$= 4h^2 - 8h$

Now factorise. The highest common factor of these two terms is 4h, so we have:

= **4h (h - 2)**

Question 13.

Answer: D) The incorrect digits are the 8 and the 0 in the answer.

The person doing this division has started off correctly.

When sharing the 9 hundreds, they have correctly placed a 1 in the hundreds, and carried the 2 remaining hundreds into the tens place.

Here, they have correctly shared 25 tens, placing a 3 in the tens place of the answer and carrying the remaining 4 tens into the ones place.

The final step was to divide 46 by 7. Here they have made a mistake: 8 x 7 is 56, not 46, so the 8 is incorrect, as is the remainder of 0.

They should have written a 6 in the ones place of the answer (6 x 7 is 42). This would leave a remainder of 4.

Question 14.

Answer: B) k = - 5/3

Jeff has:

3k = -5

To get the k by itself, he nees to "un-do" the multiply by 3. The opposite of multiplying by 3 is dividing by 3.

To keep the equation balanced, he needs to do the same operation to both sides.

Dividing by 3 on both sides, his next line would read:

k = -5 ÷ 3

Question 15.

Answer: The original price was $89

We know that the discount was 35%, so we can subtract this from 100% to find the remaining percentage value of the shoes:

100% - 35% = 65%

We can convert 65% into a decimal by dividing it by 100.

65 ÷ 100 = 0.65

So $57.86 is 65%, or 0.65, of the original price. We can write this numerically as:

57.86 = 0.65 × P

(where P is the original price)

We can re-arrange this equation to find P.

P = 57.86 ÷ 0.65

P = $89.02

This would round down to **$89**.

Question 16.

Answer: C) 20°C

Substitute the number of cricket chirps into the equation:
(5 x 31 + 25)/9
Using the BOMDAS order of operations, we must do the multiplication first.

(155 + 25)/9

Because everything is divided by 9, we must simplify the numerator before dividing:

180/9

Temperature = 20°C

Question 17.

Answer: A) 6

We could either list the factors of the two numbers, or we could draw factor trees. For small numbers like 30 and 42, listing the factors is quite easy; however, with larger numbers, factor trees are more useful.

List the factors in pairs, being methodical to ensure you don't miss any:

30 = 1 x 30

= 2 x 15

= 3 x 10

= 5 x 6

42 = 1 x 42

= 2 x 21

= 3 x 14

= 6 x 7

Now compare the two lists to find the highest common factor. It is 6.

The factor tree method provides a list of prime factors that can then be "paired up" to find the highest common factor:

42 = 2 x 3 x 7

30 = 2 x 3 x 6

We can "pair" the 2s and the 3s, so once again we find that the highest common factor is 6.

Question 18.

Answer: **-1, 0, 1.**

A cube number has 3 identical factors; for example 8 = 2 x 2 x 2. We want numbers that give themselves as the answer when they are multiplied by themselves three times. In other words we want n such that:

n x n x n = n

The first number that comes to mind is 1:

$1 \times 1 \times 1 = 1$

Anything larger than 1 won't work; eg $2 \times 2 \times 2 = 8$.

However, 0 will work:

$0 \times 0 \times 0 = 0$

We need one more.

What happens when we try:

$-1 \times -1 \times -1$?

A negative multiplied by a negative gives a positive, so $-1 \times -1 = +1$

Then we multiply that by -1, remembering that a negative multiplied by a positive gives a negative:

$+1 \times -1 = -1$

So,

$-1 \times -1 \times -1 = -1$

Our three numbers, in order from smallest to largest are:

-1, 0, 1.

Question 19.

Answer: A) $(3a)^2b$

To make it easier to identify the like terms (and then find the unlike term), we can expand some brackets and consolidate some factors in the expression.

$2a^2b^2 + (5ab)^2 - abab + (3a)^2b$
$= 2a^2b^2 + 25a^2b^2 - a^2b^2 + 9a^2b$

Notice that the first three terms are all "terms in" a^2b^2 whereas the last term has a^2b, rather than a^2b^2 so this is the unlike term:

$(3a)^2b$

(You can check that this works by substituting "real" numbers for the a and the b. Say you let a = 4 and b = 5. You can see that 4 is not the same as 4^2, and 5 is not the same as 5^2.)

Question 20.

Answer: B) 900

Start by working out which of the choices are square numbers.

If you can't spot these straightaway, you can work them out by looking for factors of the numbers that are themselves square numbers:

8100 = 81 x 100

= 9 x 9 x 10 x 10

= 90^2

900 = 9 x 100

= 3 x 3 x 10 x 10

= 30^2

360 = 36 x 10

= 6 x 6 x 10, so 360 is NOT a square number

180 = 9 x 2 x 10, so 180 is NOT a square number.

Therefore, from the choices given, 900 is the smallest square number with a 0 in the ones (units) column and whose digits add up to 9 (meaning it is also divisible by 9).

Question 21.

Answer: C) An eighth of 4

An eighth of four:

$\frac{1}{8} \times 4 = \frac{4}{8} = \frac{1}{2}$

A half of a quarter:

$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

We can immediately see that a half of a quarter is less that an eighth of four, because the red term is less than the green term.

A twelfth of three:

$\frac{1}{12} \times 3 = \frac{3}{12} = \frac{1}{4}$

A quarter is logically greater than half of a quarter and smaller than a half (so it is smaller than an eighth of four). Thus a twelfth of three is the largest fraction.

A quarter of a half:

$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

Note: This is the same as a half of a quarter. We can immediately see that a quarter of a half is less that an eighth of four, because the red term is less than the green term.

Question 22.

Answer: ? = 68

You may begin by factorising the left hand side. This gives us a number we can divide by easily in our heads.

59 × 32 + 59 × ? = 5900

59(32 + ?) = 5900

32 + ? = 5900/59

32 + ? = 100

? = 100 – 32

? = **68**

If you didn't do it this way, don't worry! There are often several ways of solving a problem. Here is another method:

59 × 32 + 59 × ? = 5900

59 × ? = 5900 – 59 × 32 (59 × 32 are multiplied together, so we must move them together)

59 × ? = 5900 – 1888

59 × ? = 4012

? = 4012/59

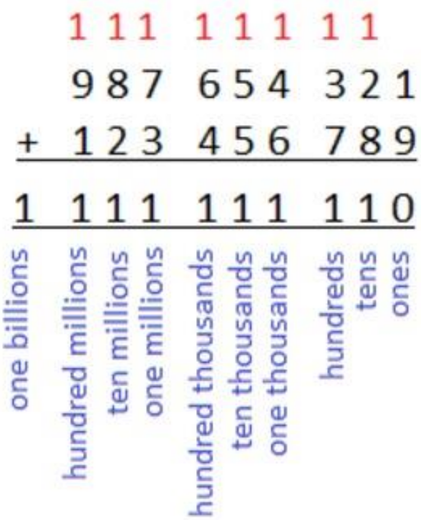
? = 68

This method is a bit harder to work out mentally, but not impossible!

Question 23.

Answer: D) One billion, one hundred and eleven million, one hundred and eleven thousand, one hundred and ten**.**

Write the question, being careful to line up the place value columns correctly.



In words, this is:

One billion, one hundred and eleven million, one hundred and eleven thousand, one hundred and ten**.**

Question 24.

Answer: C) Region A

Starting with Region A, we can use the point (0, 1) as we can see this lies in that region.

When $x = 0$ and $y = 1$,

$x + y = 0 + 1 = 1$, so the first inequality holds ($x + y > 0$)

When $x = 0$ and $y = 1$,

$x - y = 0 - 1 = -1$, so the second inequality also holds ($x - y < 0$).

So, the two inequalities are true in Region A.

We could check the other regions in the same manner.

For Region B, we could select the point (2, 0).

When $x = 2$ and $y = 0$,

$x + y = 2 + 0 = 2$, so the first inequality holds ($x + y > 0$)

When $x = 2$ and $y = 0$,

$x - y = 2 - 0 = 2$, so the second inequality does NOT hold in this region.

The other two regions can be checked in the same manner.

Question 25.

Answer: ? = 250

We can re-arrange this number sentence by performing the opposite operation on a number, to cancel it out on one side and introduce it into the other.

Start by dividing both sides by 3 210:

4 × 3210 × ? = 3 210 000

? × 4 × 3210 ÷ 3210 = 3 210 000 ÷ 3 210

? × 4 = 1000

? × 4 ÷ 4 = 1000 ÷ 4

? = 1 000 ÷ 4

? = 250