GCSE MATHEMATICS

S21-C300

With Calculator Assessment Resource A

Foundation Tier

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. The table below shows the prices of items in a shop.

Price List	
Eraser	58p
Revision guide	£3.45
Calculator	£7.25
Pen	35p
Geometry set	£0.95

(a) Write the prices in order, starting with the cheapest. [2]

Change pence to pound for easy comparison

pen = 0.35   Eraser = 0.58

Pen   eraser   Geometry Set   Revision Guide   calculator

Cheapest

(b) What is the cost of 1100 erasers? [1]

$1100 \times £0.58 = £638$

(c) Fred buys some pens.
He pays a total of £4.90.
How many pens does Fred buy? [2]

$£4.90 \div £0.35 = 14 \text{ pens}$

(d) Salma buys a pen, a geometry set and a
calculator. She pays with a £10 note.
How much change should she get? [2]

total cost $= £7.25 + £0.95 + £0.35 = £8.55$

Change $= £10.00 - £8.55 = £1.45$

2. The chart below shows distances between some cities in England, using the best routes. All distances are in miles.

London				
121	Birmingham			
204	89	Manchester		
216	101	34	Liverpool	
211	133	71	102	York

Answer the following questions. Use the information in the chart above.

(a) Write down the distance between Birmingham and Liverpool. [1]

101 miles

(b) Name the two cities that are 71 miles apart. [1]

York and Manchester

(c) One day Dev drives from London to Manchester and then from Manchester to Liverpool.

How much further is this journey than driving directly from London to Liverpool? [2]

London → manchester = 204 miles

Manchester → Liverpool = 34 miles

Total miles = 34 + 204 = 238 miles

Direct London → Liverpool = 216 miles

238 − 216 = 22 miles further

3. *(a)* Shay has b books.

  (i) Wilma has 5 fewer books than Shay.
  Write an expression to show the number of books that Wilma has. [1]

  $Shay = b$ $wilma = b - 5$

  (ii) Ellie has 3 times as many books as Wilma.
  Write an expression to show the number of books that Ellie has. [1]

  $Ellie \rightarrow 3(b-5)$

(b) Shay has written this statement in his maths homework.

$5x + 3y = 8xy$

Is Shay correct?

  Yes ☐   No ☑

Explain how you decide. [1]

$5x + 3y$ cant be simplified further.
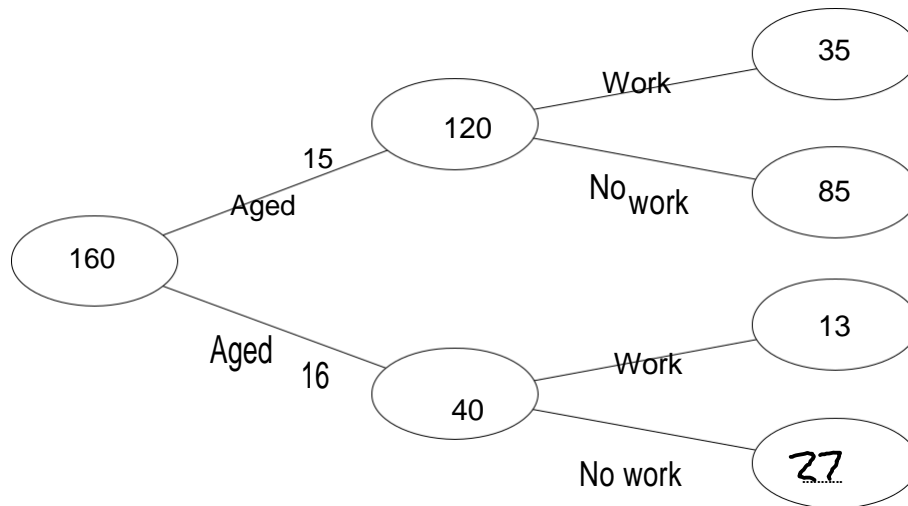E.g take $x=2$ and $y=3$ and substitute.
$19 \neq 48$

(c) Find the value of $15x$ when $x = -23$. [1]

$15(-23) = -345$

4. In November 2018, a survey was completed by all the students in Year 11 at *Thomas Bees Academy*. Students were asked their age and whether they had any part-time work. Some of this information is shown in the frequency tree below.

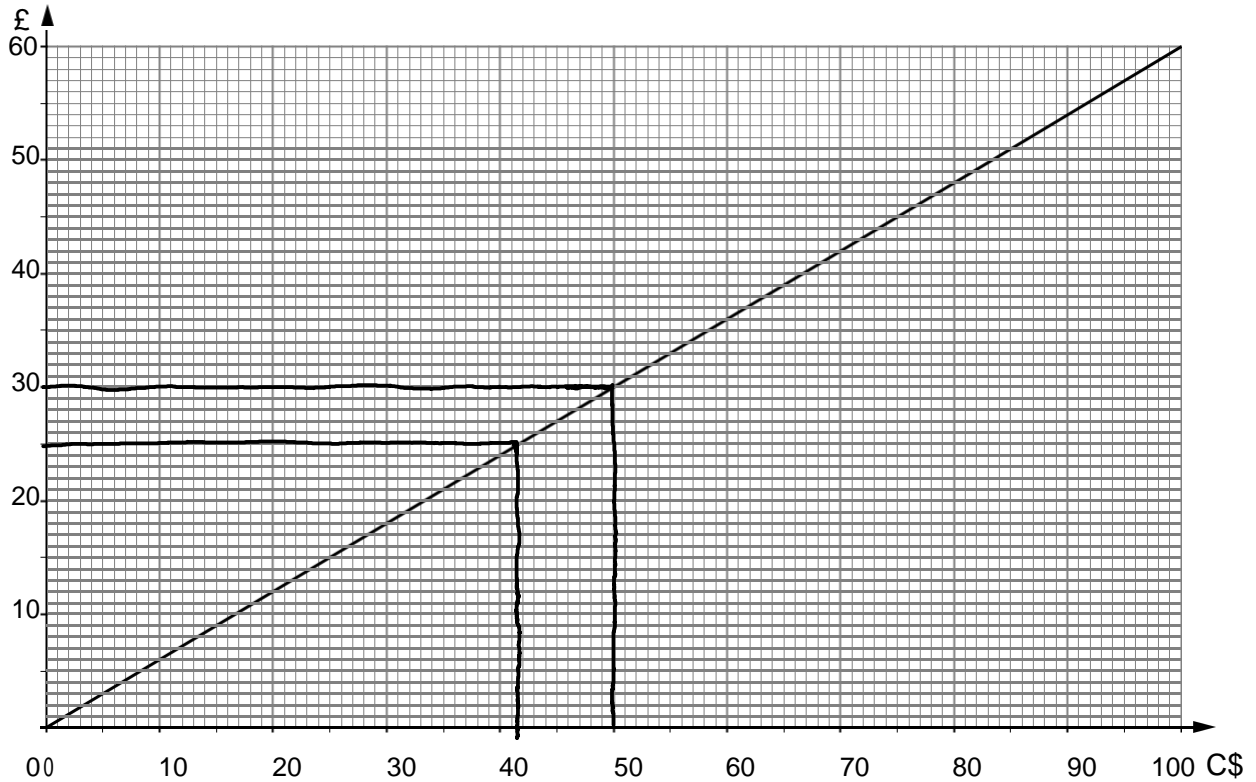*(a)* How many of the students were aged 15 in November 2018? [1]

120

(b) In total, how many of the students do not have any part-time work? [2]

27 + 85 = 112

(c) The same survey was repeated in April 2019. No students had joined or left Year 11.
The number of students aged 15 who had part-time work was only 23.
Explain why this change may have happened. [1]

The 15 year olds at November 2018 have now become 16 year olds now in April 2019. So number of 15 year olds with part time jobs decreased and number of 16 year olds with part time jobs increased.

5. *(a)* The graph below can be used to convert between Canadian dollars (C$) and pounds (£).
An exchange rate from 2018 has been used.

(i) Use the graph to convert C$ 50 into pounds (£).   £30   [1]

_____

(ii) Use the graph to convert £25 into Canadian dollars (C$). $41.5   [1]

_____

(iii) Convert C$ 160 into pounds (£).   [1]

$100 = £60   →   60+36=£96

$60 = £36

(b) In 1998 the exchange rate was £1 = C$ 2.44.

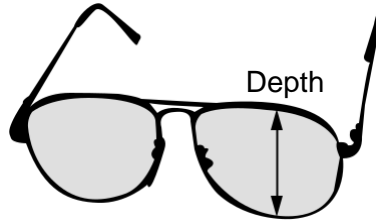How many **more** Canadian dollars would you have received for £25 in 1998 compared with 2018?   [2]

1998 → £25 = 25 × $2.44 = $61

2018 → worked out above = $41.5

$61 − $41.5 = $19.5

6. Marie works for an optician.
She records the depth of a lens in each of the 100 pairs of glasses on display.

Depth

Her results are summarised in the table.

midpoint — frequency × m

Depth of lens, x mm, to the nearest mm	Number of pairs of glasses	M	fm
$10 \leq x < 20$	5	15	75
$20 \leq x < 30$	20	25	500
$30 \leq x < 40$	23	35	805
$40 \leq x < 50$	52	45	2340

(a) Calculate an estimate for the mean depth of a lens. [4]

total fm ÷ total frequency = mean

$3720 \div 100 = 37.20$ mm

(b) In which group does the median lie? [1]

$40 \leq x < 50$

7. *(a)* Expand and simplify $(x + 6y)(3x + 5y)$. [3]

$$3x^2 + 5yx + 18xy + 30y^2$$

$$30y^2 + 3x^2 + 23xy$$

(b) Factorise $x^2 - 13x + 36$. [2]

Two numbers to multiply for 36 $-9 \times -4 = 36$

Same two numbers add to -13 $-9 + -6 = -13$

$$(x - 4)(x - 9)$$

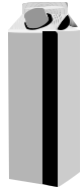$$x = 4 \quad x = 9$$

(c) Solve $w^2 + 7w - 18 = 0$. [3]

Two numbers to multiply to -18 $9 \times -2 = -18$

Same to add to 7 $9 + -2 = 7$

$$(x - 2)(x + 9) \qquad x = 2 \quad x = -9$$

8. 7 cartons of apple juice and 2 cartons of grapefruit juice cost £6.15 altogether.
5 cartons of apple juice and 8 cartons of grapefruit juice cost £9.19 altogether.

Use an algebraic method to calculate the **total** cost of 2 cartons of apple juice and
5 cartons of grapefruit juice.

apple juice = x   grapefruit = y   [5]

① $7x + 2y = 6.15$ ② $5x + 8y = 9.19$

①×4 $28x + 8y = 24.6$
② $5x + 8y = 9.19$
_____
       $23x + 0y = 15.41$
       $x = \dfrac{15.41}{23} = £0.67$

Plug x into ② $5(0.67) + 8y = 9.19$
                $3.35 + 8y = 9.19$
                $8y = 5.84$
                $y = \dfrac{5.84}{8} = £0.73$

2 cartons apple + 5 grapefruit cartons

   $2x + 5y \rightarrow 2(0.67) + 5(0.73) = £4.99$

Total cost of 2 cartons of apple juice and 5 cartons of grapefruit juice is £ ......4.99.....