OCR
Oxford Cambridge and RSA

.CG Maths.
Worked Solutions

Wednesday 7 June 2023 – Morning

GCSE (9–1) Mathematics

J560/05 Paper 5 (Higher Tier)

Time allowed: 1 hour 30 minutes

You must have:
- the Formulae Sheet for Higher Tier (inside this document)

You can use:
- geometrical instruments
- tracing paper

Do not use:
- a calculator

H

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) ____________________

Last name ____________________

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **20** pages.

ADVICE
- Read each question carefully before you start your answer.

Please note that these worked solutions have neither been provided nor approved by OCR and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

.CG Maths.

1 Work out.

$$\frac{33}{35} \div 1\frac{4}{7}$$

Give your answer as a fraction in its simplest form.

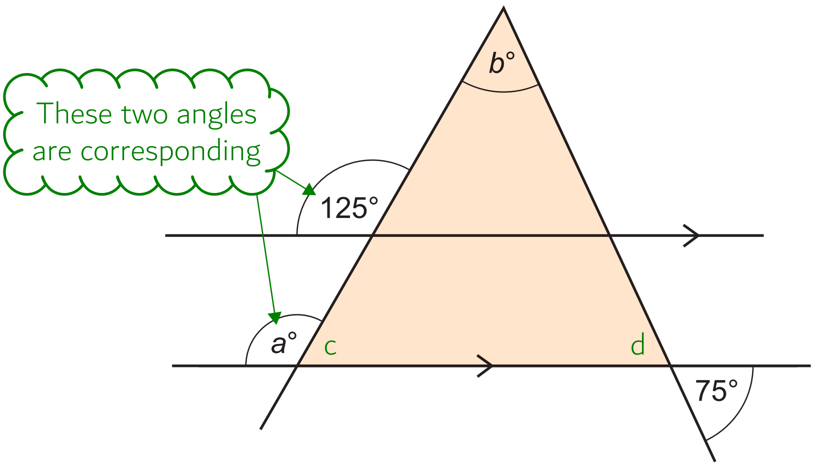
$\frac{33}{35} \div \frac{11}{7}$ Converting the mixed number into an improper fraction by multiplying the whole number by the denominator then adding the result to the numerator. 1 x 7 = 7 then 4 + 7 = 11

$\frac{33}{35} \times \frac{7}{11}$ To divide fractions: keep the first fraction, change the division to a multiplication, flip the second fraction

The 33 and the 11 can both be divided by 11 so it becomes 3/35 x 7/1. Then the 35 and the 7 can both be divided by 7 so it becomes 3/5 x 1/1, which equals 3/5

$\frac{3}{5}$ **[3]**

2 The diagram shows two straight lines crossing a pair of parallel lines.



Not to scale

(a) Write down the value of *a*.
Give a reason for your answer.

$a =$ 125 because corresponding angles are equal

[2]

(b) Work out the value of *b*.

$$\begin{array}{r} 180 \\ -125 \\ \hline 55 \end{array}$$

There are 180° around a point on a straight line. So subtracting angle a (which is 125°) from 180° works out that angle c is 55°

$$\begin{array}{r} 55 \\ +75 \\ \hline 130 \end{array}$$

Angle d is 75° as it is vertically opposite to the 75°. Adding angles c and d works out that there are 130° so far in the orange triangle

$$\begin{array}{r} 180 \\ -130 \\ \hline 50 \end{array}$$

There are 180° in total in a triangle so subtracting the 130° leaves angle b

(b) $b =$ 50 **[3]**

3 Work out.

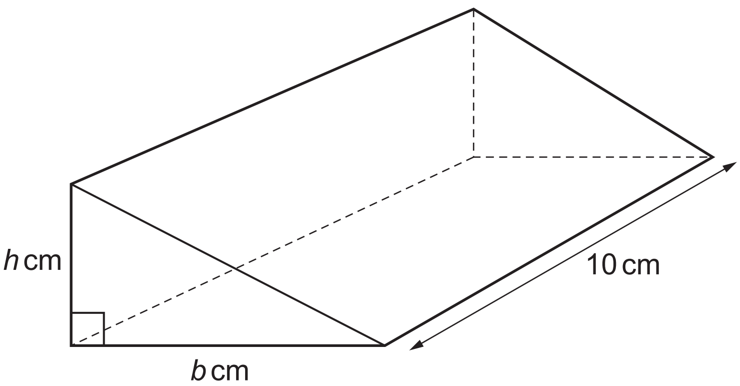
3.8 ÷ 0.02

$$2\overline{)380}$$
190

Multiplying both 3.8 and 0.02 by 100 gives an equivalent division and gets rid of the decimals

.................................190................................. **[2]**

4 The diagram shows a prism of length 10 cm.



The cross-section of the prism is a right-angled triangle.
The base, b cm, is 2 cm longer than the height, h cm.
The volume of the prism is 240 cm^3.

A student is explaining how they worked out the value of b.

They say

b is 6 because that means h is 4 and 6 × 4 × 10 = 240.

Describe the student's error and find the correct value of b.

The error is the formula for the volume of a cuboid was used

Volume of cuboid = length x width x height

b = ...8................................. **[3]**

The method is on the next page

$\frac{1}{2}bh \times 10 = 240$

Volume of prism = area of cross section x length. The cross section is a triangle. Area of triangle = 1/2 x base x height. The length of the prism is 10 cm. Expressing the volume of the prism in terms of the base and height and setting this equal to the actual volume of 240 cm^3

$\frac{1}{2}bh = 24$

Dividing both sides by 10

$bh = 48$

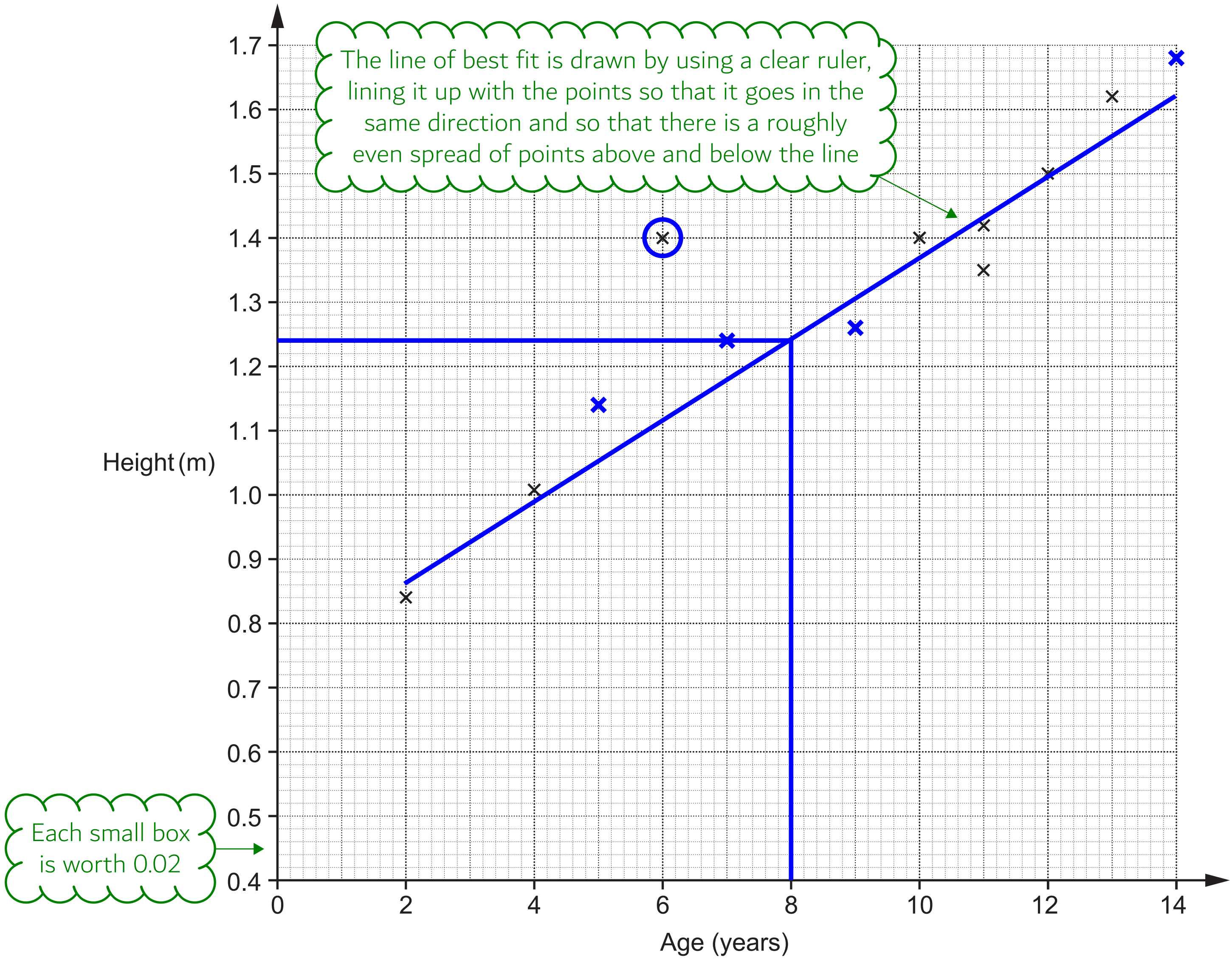
Multiplying both sides by 2 eliminates the 1/2 on the left

The base must be 8 cm and the height must be 6 cm in order for them to multiply to 48 and the base be 2 cm more than the height

5 The table shows the ages and heights of 12 children.

Age (years)	2	4	12	6	10	11	13	11	5	7	9	14
Height (m)	0.84	1.01	1.5	1.4	1.4	1.35	1.62	1.42	1.14	1.24	1.26	1.68

The points for the first eight children (shaded in the table above) are plotted on the scatter diagram.



(a) Plot the points for the remaining four children. **[2]**

(b) Describe the type of correlation shown in the completed scatter diagram.

Positive

As one variable increases, the other also increases

.... **[1]**

(c) One of these children is taller than expected for their age.

On the scatter diagram, circle the point representing this child. **[1]**

The circled point is an outlier as it does not follow the trend of the other points

(d) **(i)** Kai is 8 years old.
By drawing a line of best fit, estimate Kai's height.

Drawing up from 8 years old to the line of best fit then across to the height

(d)(i) ....1.24............ m **[2]**

(ii) Describe an assumption you have made in giving your answer to part **(d)(i)**.

Kai has average height

This is an assumption as Kas's height might not follow the trend and might be taller or shorter than average

.... **[1]**

(e) Explain why using this data to estimate the height of a child that is 17 years old may be unreliable.

Outside the range of data

The trend may not continue

.... **[1]**

6 Taylor has a full bottle of medicine.
The bottle holds 20 doses of medicine.

Each day Taylor takes one dose of medicine out of the bottle.
After 8 days, there are 180 millilitres of medicine left in the bottle.

Work out how many millilitres of medicine the bottle holds when full.

$20-8$ ← 8 doses are used in 8 days. Subtracting these 8 doses from the 20 total doses leaves 12 doses left in the bottle

$12 \overline{)1^{1}8^{6}0}$ = 015 ← Dividing the 180 millilitres by the 12 doses works out that 1 dose is 15 millilitres

$15 \times 20 = 300$ ← Multiplying the 15 millilitres (which is 1 dose) by 20 works out that the total 20 doses is 300 millilitres

........................300........................ ml **[4]**

7 A volunteer packs boxes for a charity.
They can pack 5 boxes in 45 seconds.

(a) Use this information to show that they can pack 55 boxes in less than 9 minutes. **[4]**

$45 \div 5$

Dividing the 45 seconds by the 5 boxes works out that it should take 9 seconds to pack 1 box

$55 \times 9 < 60 \times 9$

Multiplying the 55 boxes by the 9 seconds it takes to pack 1 box expresses the number of seconds it should take to pack 55 boxes. There are 60 seconds in a minute so multiplying 60 by the 9 minutes converts it to seconds. 55 x 9 must be less than 60 x 9 so they should be able to pack 55 boxes in less than 9 minutes

(b) What assumption did you make in part **(a)**?

Every box is packed in 9 seconds

This was taken as a fact but might not be true. For example they might get tired and pack them as a slower rate

[1]

8 A block made of iron is in the shape of a cuboid.
The block is 3.1 cm by 4.9 cm by 2.2 cm.
The density of iron is 7.87 g / cm^3.
Sam thinks that the mass of the block is about 2.4 kg.

Use estimation to decide if Sam's answer is reasonable.
Show how you decide.

$3 \times 5 \times 2$

Volume of cuboid = length x width x height. The length is about 3 cm, the width is about 5 cm and the height is about 2 cm. This works out that the volume is about 30 cm^3

$d\,{}^{m}\,v$

Writing the formula triangle for density, mass, volume

8×30

From the formula triangle, mass = density x volume. The density is about 8 g/cm^3. This works out that the mass is about 240 g (as the unit of density involved g)

$240 \div 1000$

There are 1000 g in 1 kg, so dividing the 240 g by 1000 converts it into 0.24 kg

Sam's answer is not reasonable because it is about 0.24 kg

2.4 kg is not close to 0.24 kg

[5]

9 A zoo counts its animals.
The ratio of antelope to zebra is 3 : 2.
The ratio of meerkats to zebra is 7 : 3.

(a) Write the number of antelope as a percentage of the number of zebra.

$2\overline{)1^10\,0}$ 050×3

The number of antelope as a fraction of the number of zebra is 3/2. Multiplying this by 100 converts it to percentage. To multiply by a fraction, divide by the denominator then multiply the result by the numerator

(a) ......150...... % **[2]**

(b) There are 15 more meerkats than antelope.

Work out the number of zebra in the zoo.

A	Z	M
3	2	
	3	7
9	6	14

Writing the ratio of the antelope to zebra and the ratio of the meerkats to zebra above each other with zebra in the middle as this is shared by both ratios. Combining them by multiplying both sides of the first ratio by 3 and both sides of the second ratio by 2 to get 6 as a common number of parts for the zebra

14−9

Subtracting the number of parts for antelope from the number of parts for meerkats works out that there are 5 more parts for meerkats than antelope

5p = 15

These 5 parts represent 15 animals

p = 3

Dividing both sides by 5 finds that 1 part of the ratio represents 3 animals

3×6

Multiplying the value of 1 part of the ratio by the 6 parts for zebra works out that there are 18 zebra

(b) ......18...... **[4]**

10 A student draws two different regular polygons.
The exterior angle of one polygon is p°.
The exterior angle of the other polygon is q°.

The sum of p and q is 112°.
The difference between p and q is 32°.

Find the **number of sides** of each polygon.
You must show your working.

$p+q=112$ The sum means to add. This forms the first equation

$p-q=32$ The difference means to subtract. This forms the second equation

$2p=144$ Solving the two equations as simultaneous equations. Adding the first and second equation eliminates the q term and gets an equation just in term of p. p + p = 2p. q + -q = 0. 112 + 32 = 144

$144 \div 2 = 072$ Dividing both sides of the equation by 2 to get p on its own. So p = 72

$72+q=112$ Substituting 72 for p in the first equation

$112 - 72 = 40$ Subtracting 72 from both sides gets q on its own. So q = 40

$360 \div 72 = 005$

72, 114, 216, 288, 360

All exterior angles add up to 360 for any polygon. So dividing 360 by 72 works out how many lots of the exterior angle p are in the polygon and therefore how many sides it has. Listing out the 72 times table helps with the division

$\frac{360}{40} = \frac{36}{4}$ All exterior angles add up to 360 for any polygon. So dividing 360 by 40 works out how many lots of the exterior angle q are in the polygon and therefore how many sides it has. Dividing both the numerator and denominator of 360/40 by 10 gives 36/4

........5........ sides and ....9........ sides **[6]**

11 y is directly proportional to the square of x.

Find the percentage decrease in y when x is decreased by 30%.

$100 - 30$ This works out that x is reduced to 70%

$\frac{7}{10} \times \frac{7}{10}$ Multiplying x by 7/10 finds 70% of x. As x is squared, the 7/10 it is multiplied should be squared to find the effect on y

$\frac{49}{100}$ The numerators are multiplied and the denominators are multiplied. Percentage is out of 100 so y must be reduced to 49%

$$\begin{array}{r} 100 \\ -49 \\ \hline 51 \end{array}$$

Working out that the difference between the 49% y has reduced to and the original 100% is 51%, so this is what percentage y reduces by

......................51...................... % **[4]**

12 Here are the first four terms of a sequence.

$$\frac{2}{5} \quad \frac{5}{10} \quad \frac{8}{17} \quad \frac{11}{26}$$

Numerators: +3, +3, +3, +3

Denominators: +5, +7, +9, +11

(a) Find the next term.

The numerator keeps increasing by 3 between each term. The denominator increases by 2 more between each term

(a) ....$\frac{14}{37}$...................... **[1]**

(b) Find the nth term.

The method is shown on the next page

Adding the sequences of n^2 and $2n + 2$ gives the original sequence for the denominators. Writing the nth term of the numerators as a fraction of the nth term of the denominators

(b) ....$\frac{3n-1}{n^2+2n+2}$...................... **[3]**

$3n-1$

Writing down the nth term of the numerators. It goes up 3 between each term so must involve 3n. Going backward in the sequence finds that the 0th term (the one before the 1st term) is -1. So it must be 3n - 1

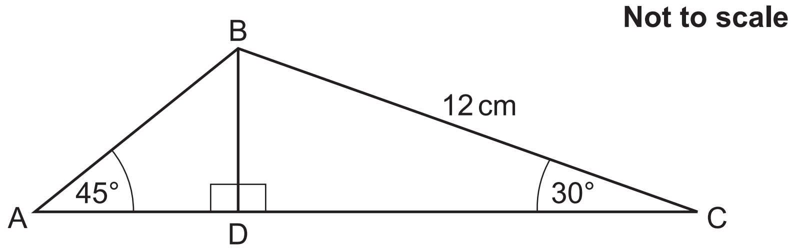
$n^2: 1, 4$

The second difference of the denominators is 2 as this is how much the difference between each term increased by. It must be a quadratic sequence as the second difference is constant. Halving this finds that the coefficient of the n^2 is 1. Listing the first two terms of $1n^2$

$4, 6: 2n+2$

Writing down what needs to be added to each term of $1n^2$ to get the original sequence. This is a linear sequence. It goes up 2 between each term so must involve 2n. Going backward in the sequence finds that the 0th term (the one before the 1st term) is 2. So it must be 2n + 2

13 The diagram shows a triangle, ABC, with perpendicular height BD.



BC = 12 cm, angle BCD = 30° and angle BAD = 45°.

(a) Work out the length of BD.

S O H C A H T O A

Right-angled trigonometry can be used in triangle BDC. Writing SOH CAH TOA as formula triangles. Ticking H as we have the hypotenuse. Ticking O as we are looking for the opposite. There are two ticks on the SOH formula triangle so this one can be used

0 30 45 60 90
0 1 2 3 4

Finding sin30 by listing the angles of 0, 30, 45, 60, 90 and listing 0, 1, 2, 3, 4 under these. Square rooting the 1 and putting it over 2 finds that sin30 = 1/2

$\frac{1}{2} \times 12$

From the formula triangle: opposite = sin of the angle x hypotenuse

(a) ....6.......... cm **[3]**

(b) Work out the exact length of AB.
Give your answer in its simplest form.

S O H C A H T O A

Right-angled trigonometry can be used in triangle ABD. Writing SOH CAH TOA as formula triangles. Ticking O as we have the opposite. Ticking H as we are looking for the hypotenuse. There are two ticks on the SOH formula triangle so this one can be used

$6 \div \frac{\sqrt{2}}{2}$

From the formula triangle: hypotenuse = opposite/sin of the angle. Looking back at the 0, 30, 45, 60, 90 list in part (a), square rooting the 2 and putting it over 2 finds that sin45 = √2/2

$6 \times \frac{2}{\sqrt{2}}$

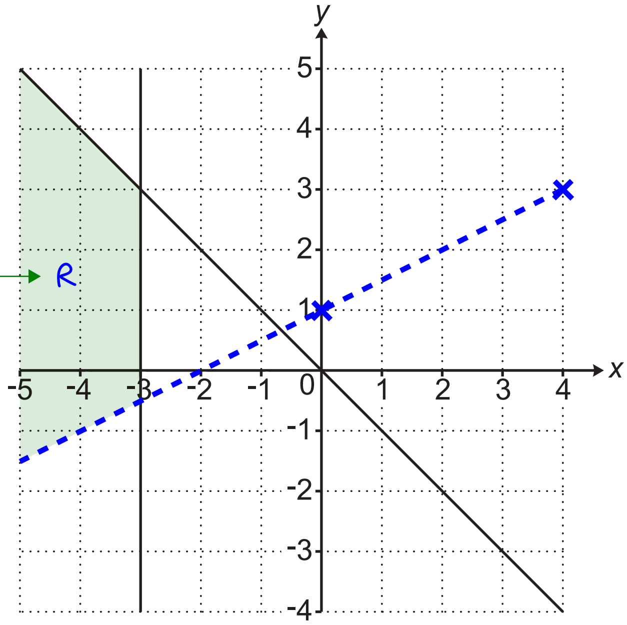
To divide by a fraction: keep the first part, change the divide to a multiply, flip the second fraction

Multiplying the numerator of the fraction by the 6

(b) .... $\frac{12}{\sqrt{2}}$ .... cm **[3]**

14 The graphs of $x = {}^{-}3$ and $y = {}^{-}x$ are drawn on the grid.

The region is shaded in green but it does not need to be shaded in the exam. It is to the left of the line x = -3 as x is less. It is below the line y = -x as y is less. It is above the line y = 1/2 x +1 as y is greater



The region **R** satisfies the following inequalities.

$x \leqslant {}^{-}3 \qquad y \leqslant {}^{-}x \qquad y - 1 > \frac{1}{2}x$

By drawing one more line, find and label the region **R**. **[5]**

$y > \frac{1}{2}x + 1$ Adding 1 to both sides of the third inequality to get y on its own. This makes it easier to draw

Drawing the graph of y = 1/2 x + 1 with a dashed line as it cannot be equal. When x = 0, y = 1/2 (0) + 1 = 1. So plotting the point (0 , 1). When x = 4, y = 1/2 (4) + 1 = 3. So plotting the point (4 , 3). Drawing a straight line (as it is in the form y = mx + c) through both of these points

15 **(a)** Factorise.

$9x^2 - 4$

Factorised using difference of two squares: $A^2 - B^2 = (A + B)(A - B)$. Square rooting the $9x^2$ gives $3x$, which must be A. Square rooting the 4 gives 2, which must be B

(a) $(3x+2)(3x-2)$ **[2]**

(b) Solve by factorisation.

$3x^2 - 2x - 8 = 0$

1,24
2,12
3,8
4,6

It is in the form $ax^2 + bx + c = 0$. Multiplying a by c gives -24. Listing out the factor pairs of 24 until a pair would add to b (which is -2) when one of the two factors are negative (as a positive multiplied by a negative gives a negative). 4 and -6 both multiply to the -24 and add to the -2

$3x^2 - 6x + 4x - 8$

Splitting the middle x term into -6x and 4x

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

Factorising the left two terms and the right two terms separately

$(3x+4)(x-2) = 0$

Bringing into the factorised form

(b) $x = -\frac{4}{3}$ or $x = 2$ **[3]**

One of the two brackets must equal to 0. Either $3x + 4 = 0$ so $x = -4/3$ or $x - 2 = 0$ so $x = 2$

(c) Solve.

$$\frac{2(x-5)}{1-3x} = 2$$

$2x - 10 = 2 - 6x$

Multiplying both sides by 1 - 3x to eliminate the denominator and expanding all brackets

$8x - 10 = 2$

Adding 6x to both sides to get all the x on the same side

$8x = 12$

Adding 10 to both sides to get the x term on its own

Dividing both sides by 8 gets x on its own. The answer can be left as an unsimplified fraction

(c) $x = \frac{12}{8}$ **[4]**

16 (a) Work out.

$64^{\frac{2}{3}}$

1, 8, 27

Dealing with the denominator of the power first. The over 3 means to cube root. Listing out the cube numbers to work out which number cubed gives 64. $1^3 = 1 \times 1 \times 1 = 1$. $2^3 = 2 \times 2 \times 2 = 8$. $3^3 = 3 \times 3 \times 3 = 27$

$16 \times 4 = 64$

Working out 4^3. $4 \times 4 = 16$. Then $16 \times 4 = 64$. So the cube root of 64 must be 4

Then dealing with the numerator of the power. The 2 means to square. $4^2 = 16$

(a) ....16........ **[2]**

(b) $\frac{p}{q} + 0.\dot{1}\dot{3} = \frac{5}{9}$

where $\frac{p}{q}$ is a fraction in its lowest terms.

Find the value of p and the value of q.

$x = 0.\dot{1}\dot{3}$

Let x be the recurring decimal

$100x = 13.\dot{1}\dot{3}$

There are two recurring digits so multiplying by ten twice so that the recurring digits are in the same decimal places

$99x = 13$

Subtracting x from 100x cancels out the recurring digits

$x = \frac{13}{99}$

Dividing both sides by 99 expresses x (the recurring decimal) as a fraction

$\frac{55}{99} - \frac{13}{99} = \frac{42}{99}$

Multiplying both the numerator and denominator of 5/9 by 11 makes it so that it has the same denominator as 13/99. Then subtracting the 13/99 from both sides of the original equation finds p/q

$42 \div 3 = 14$

$99 \div 3 = 33$

Dividing both the numerator and denominator of 42/99 by 3 simplifies it to 14/33. The fraction cannot go any simpler as 14 and 33 cannot be divided by the same amount to get smaller whole numbers

(b) p = ...14........

q = ...33........ **[4]**

17 A rhombus is drawn on a coordinate grid.

One diagonal of the rhombus has equation $y = \frac{1}{2}x + 3$.

The other diagonal passes through the point (1, 7).

Find the equation of the other diagonal of the rhombus.
Give your answer in the form $y = mx + c$.

$7 = -2 \times 1 + c$

The general equation of a straight line is y = mx + c, where m is the gradient and c is the y-intercept. The other diagonal is a straight line and is perpendicular to the one diagonal as the diagonals of a rhombus are perpendicular. The gradient of the one diagonal is 1/2 so the gradient of the other diagonal is -2, as perpendicular gradients are the negative reciprocal of each other. Substituting in the x and y-coordinates from the point (1 , 7) and the gradient of -2 as m

$c = 7 + 2$

-2 x 1 = -2. Adding 2 to both sides gets c on its own and finds that it is 9

The gradient is -2 and the y-intercept is 9

See next page for a possible diagram

$y =$ .... $-2x+9$ .... **[4]**

18 $\sqrt[5]{p^2} = (\sqrt[3]{m})^2$ and $p = m^x$, where $p > 0$, $m > 0$ and $p \neq m$.

Show that the value of x is $\frac{5}{3}$. **[3]**

$p^2 = ((m^{\frac{1}{3}})^2)^5$

Getting rid of the fifth root on the left by raising both sides to the power of 5. Writing the cube root as the power of 1/3

$p = ((m^{\frac{1}{3}})^2)^5)^{\frac{1}{2}}$

Getting rid of the square on the left by square rooting both sides. Writing the square as the power of 1/2

$x = \frac{1}{3} \times 2 \times 5 \times \frac{1}{2}$

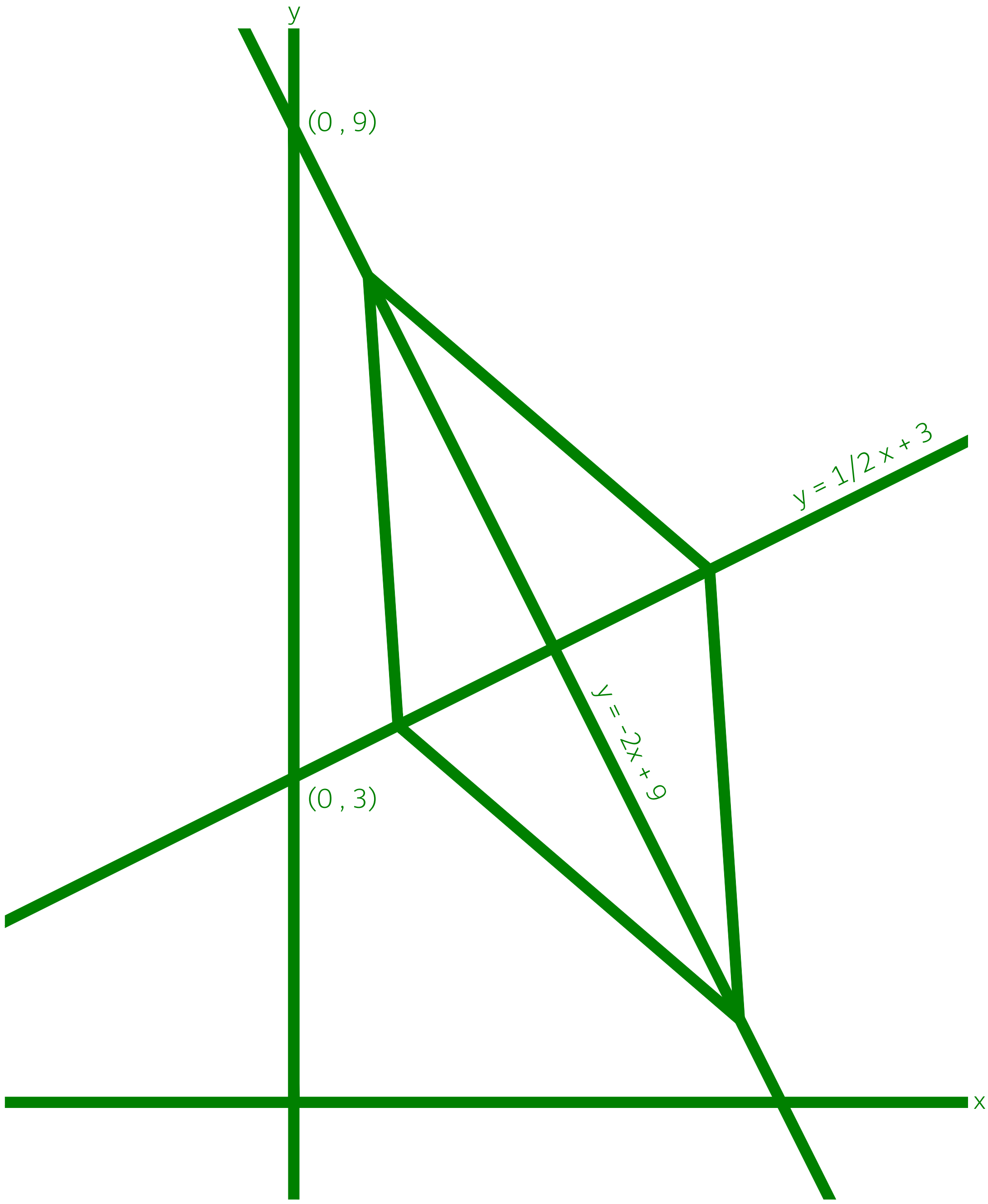
$(a^x)^y = a^{xy}$ so multiplying all of the powers gives x, which is the power m is raised to in $p = m^x$

$= \frac{10}{6}$

Multiplying all the numerators and denominators together. The 2 and 5 are numerators

$= \frac{5}{3}$

Simplifying the fraction by dividing both the numerator and denominator by 2



The rhombus could look like this. The diagonals
are extended beyond the corners of the shape

19 A box contains 25 discs.
The discs are either blue or yellow in the ratio 4 : 1.
Two discs are chosen at random from the box without replacement.

Find the probability that the two discs are different colours.
You must show your working.

$4+1$

There are 25 discs in total. Adding the 4 and 1 parts of the ratio works out that these 25 discs are represented by 5 parts of the ratio

$25 \div 5$

Dividing the 25 discs by the 5 parts which represent them works out that 1 part of the ratio is worth 5 discs

$5 \times 4 = 20$

Multiplying the value of 1 part of the ratio by the 4 parts representing blue works out that there are 20 blue discs

$5 \times 1 = 5$

Multiplying the value of 1 part of the ratio by the 1 part representing yellow works out that there are 5 yellow discs

$\frac{20}{25} \times \frac{5}{24} + \frac{5}{25} \times \frac{20}{24}$

Blue AND yellow OR yellow AND blue. AND means to multiply the probabilities. OR means to add the probabilities. 20 out of the 25 discs are blue. After the first disc is taken there is 1 fewer disc in total so then 5 out of the remaining 24 discs are yellow. For the other possibility, 5 out of the 25 discs are yellow. After the first disc is taken there is 1 fewer disc in total so then 20 out the the remaining 24 discs are blue

$\frac{4}{5} \times \frac{5}{24} + \frac{1}{5} \times \frac{20}{24}$

Simplifying the 20/25 by dividing both the numerator and denominator by 5. Simplifying the 5/25 by dividing both the numerator and denominator by 5

$$\begin{array}{r} 24 \\ \times\ 5 \\ \hline 1{}_{2}20 \end{array}$$

Multiplying the denominators of 5 and 24

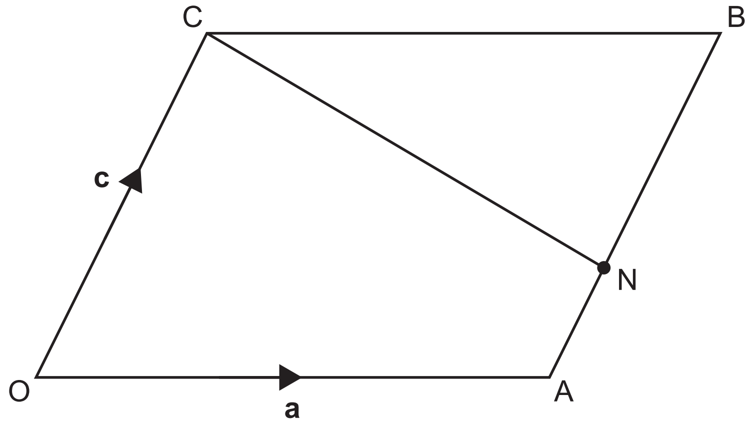
$\frac{20}{120} + \frac{20}{120}$

The result of multiplying the fractions by multiplying the numerators together and multiplying the denominators together

Adding the fractions by adding the numerators and the denominator stays the same

$\frac{40}{120}$ .... **[5]**

20 OABC is a parallelogram.



Not to scale

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.
The point N lies on line AB such that AN : NB = 3 : 5.

(a) Find the following vectors in terms of **a** and **c**.
Give your answers in their simplest form.

(i) $\overrightarrow{OB}$

$\overrightarrow{OB} = \overrightarrow{OA} + \overrightarrow{AB}$. $\overrightarrow{AB} = \overrightarrow{OC}$ as they are parallel and the same length

(a)(i) $\overrightarrow{OB} =$ .... $a+c$ .... **[1]**

(ii) $\overrightarrow{ON}$

$\overrightarrow{ON} = \overrightarrow{OA} + \overrightarrow{AN}$. $\overrightarrow{AN} = 3/8\ \overrightarrow{AB}$ as it is represented by 3 out of the total 8 parts in the ratio

(ii) $\overrightarrow{ON} =$ .... $a+\frac{3}{8}c$ .... **[2]**

(b) Line CN is extended to reach point P, such that $\overrightarrow{CP} = \frac{8}{5}\overrightarrow{CN}$.

Show, using vectors, that OAP is a straight line. **[4]**

$\overrightarrow{CN} = -c + a + \frac{3}{8}c$ ← $\overrightarrow{CN} = \overrightarrow{CO} + \overrightarrow{ON}$. $\overrightarrow{CO}$ = -c as it is in the opposite direction to $\overrightarrow{OC}$

$= a - \frac{5}{8}c$ ← Simplifying. 3/8 - 8/8 = -5/8 so this is the coefficient of c

$\overrightarrow{CP} = \frac{8}{5}\left(a - \frac{5}{8}c\right)$ ← $\overrightarrow{CP}$ = 8/5 $\overrightarrow{CN}$

$= \frac{8}{5}a - c$ ← Simplifying by expanding the bracket

$\overrightarrow{OP} = c + \frac{8}{5}a - c$ ← $\overrightarrow{OP} = \overrightarrow{OC} + \overrightarrow{CP}$

$= \frac{8}{5}a$ ← Simplifying

$\overrightarrow{OA}$ and $\overrightarrow{OP}$ are both multiples of a and both start from point O

Therefore OAP is a straight line as both vectors are going in the same direction and start from point O

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).