

AQA GCSE Mathematics (3301)

Intermediate Tier

Model Answers

In general, the number of significant figures in an answer should not exceed the number of significant figures in the input data, or if this data has differing numbers of significant figures, the data with the lowest number of significant figures.

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Paper 1 - 3301/1I, 4 June 2003

Question 1

Cost of tickets

$$= 140 \times \text{£}0.80$$

$$= \text{£}112$$

Hint : 140 tickets at one pound would equal 140 pounds. If you realise that $140 \times 10p = \text{£}14$, and then double that, you can subtract $\text{£}28$ from $\text{£}140$ to get $\text{£}112$

Profit

$$= 112 - 70 = \text{£}42$$

Question 2

Required height

$$= 0.4 \times 100 = 40\text{cm}$$

Hint : multiplying by 100 just requires shifting the decimal point by 2 places

Question 3

Area

$$= 5 \times 4 = 20\text{cm}^2$$

Hint : The formula is just height \times base. You can imagine 'chopping off' the 'oblique bit' from the right hand side and inserting it to the left, converting it into a rectangle, thus justifying the formula

Question 4

(a) *The median is the middle term when all the data is placed in order. Since this has been done for us already, and since there are 15 items of data, we require the eighth item. We can work from either top or bottom to arrive at the middle term, i.e 42 years*

(b) The range

$$= 62 - 27 = 35\text{years}$$

Question 5

(a) When $x = 0$, $y = -1$
When $x=2$, $y = 3$

(b) Straight line on graph crossing y-axis at $y = -1$ (and (3,5), for example)

(c)

$$\left(-\frac{1}{2}, -2\right)$$

Question 6

(a) In total, the children have bought 4 tickets, so the probability that either of them will win is

$$\frac{4}{200} = \frac{1}{50}$$

(b) Number of tickets **not** bought by the family is 180, so the probability that **none** of the family will win

$$= \frac{180}{200} = \frac{9}{10}$$

Hint : In general, probabilities are best expressed in fractions. It's hard to come up with hard-and-fast rules, but resist the temptation to always convert probabilities to decimals using calculators (I know this is a non-calculator paper, but you get the idea

Question 7

(a)

$$12 \times 18 - 10 \times 18$$

$$= 18(12 - 10) = 36$$

*Hint : If you are not too happy with what I have done here, then you will have to do it long hand, but remember that all multiplications **must** be done before the subtraction.*

(b) Expression is approximately equal to

$$\frac{40 \times 200}{80}$$

$$= 100$$

Question 8

3 rows of (from top) 2 blocks, 2 blocks and 3 blocks, arranged appropriately

Question 9

- (a) (i) Volume
 $= 30 \times 12 \times 4 = 1440m^3$
- (ii) Area of 4 walls
 $= 2(30 \times 4) + 2(12 \times 4)$
 $= 240 + 96 = 336m^2$

- (b) 10 tins of paint will cover

$$10 \times 30 = 300m^2$$

The percentage of paint used will be

$$\frac{279}{300} \times 100 = \frac{279}{3} = 93\%$$

Hint: This question follows a standard technique - express the paint used as a fraction, and then convert to a percentage using the standard rule, i.e. multiply by 100

Beware of being lead astray by superfluous information - you do not need to know the volume of each paint tin to solve the question

Question 10

- (a)

$$3x + 4y$$

$$= 3(6) + 4(-3)$$

$$= 18 - 12 = 6$$

- (b) Cost of sweets

$$= 22x \text{ pence}$$

now

$$£5 = 500 \text{ pence}$$

So change, in pence

$$= 500 - 22x$$

Question 11

- (a)

$$a = 50^\circ$$

$$b = 110^\circ$$

- (b) C and D

Question 12

- (a)

$$0.8x = 80$$

$$x = \frac{80}{0.8} = 100$$

- (b) First stage

$$10 - 14 = -4$$

Second Stage

$$-4 \times -2 = 8$$

Question 13

Rotation of 180° about the origin

Hint: A rotation is a point rotation so, in addition to the angle of rotation, it is necessary to specify the point about which the rotation is taking place.

Question 14

Between 150 m and 250 m from B draw two arcs of 3cm and 5cm from B using compasses

nearer to A than C draw a wide arc from A and from C such that they cross each other twice, once either side of a line connecting AC. Connect the points where they cross and this will be the line equidistant between A and C.

more than 100m from the path Construct a line parallel to the path and 2 cms away.

Question 15

- (a) (i) When $n = 1$, $4n + 1 = 5$
 When $n = 2$, $4n + 1 = 9$
 When $n = 3$, $4n + 1 = 13$

- (ii) $4n + 1$ will always be an odd number, so 122 will not be a term in this sequence.

- (b) The sequence of numbers of pieces of wood is

$$4, 7, 10, \dots$$

The first differences will be a constant value of 3, so the general formula will contain a term

$$3n$$

The difference between $3n$ and the numbers in the sequence is a constant value, i.e. 1. So general formula will be

$$3n + 1$$

which is the required answer

Question 16

An odd number multiplied by an odd number will always be an odd number. So p^2 will always be odd - adding 1 to it will make it even.

Question 17

- (a)

$$5^7 \div 5^4 = 5^{7-4} = 5^3 = 125$$

- (b)

$$a = 2, b = 3$$

Hint: Since you know b is prime, work thru the primes from the bottom to find an appropriate value. $2^3 = 8$ and 8 does not divide into 54 so that is not the right answer. $3^3 = 27$ which does divide 54 by 2, and 2 is a prime number.

(c)
$$\begin{array}{cc} 54 & 135 \\ 2.27 & 3.45 \\ 2.3^3 & 3^2.15 \\ & 3^3.5 \end{array}$$

So H.C.F.

$$= 3^3 = 27$$

Question 18

(a) Something like : "How often do you read for pleasure ?

Various responses possible daily, weekly etc., or something similar

(b) The sample suggests that the fraction of pupils who read comics is

$$\frac{16}{50} = \frac{8}{25}$$

Therefore the estimate of pupils in the entire school who read comics is

$$\frac{8}{25} \times 1000 = 320$$

Question 19

Amount in account after 2 years

$$\begin{aligned} &700(1 + 0.10)^2 \\ &= 700(1.1)^2 \\ &= 700(1.21) \\ &= 847 \text{ pounds} \end{aligned}$$

Therefore, the interest

$$= 847 - 700 = \text{£}147$$

Question 20

(a)

$$7.2 \times 10^6 \text{ gm}$$

(b)

$$6 \times 10^{-4} \text{ gm}$$

(c) No of grains of sand

$$\begin{aligned} &= \frac{7.2 \times 10^6}{6 \times 10^{-4}} \\ &= \frac{7.2}{6} \times 10^{10} \\ &= 1.2 \times 10^{10} \end{aligned}$$

Question 21

(a) At A, $y=0$. So eqn. of line becomes

$$-x = 4 \Rightarrow x = -4$$

The required coordinates are

$$(-4, 0)$$

At B, $x=0$. So eqn. of line becomes

$$2y = 4 \Rightarrow y = 2$$

The required coordinates are

$$(0, 2)$$

(b) From the coordinates of B and A, the gradient would be

$$\frac{2 - 0}{0 - (-4)} = \frac{2}{4} = \frac{1}{2}$$

Alternatively, you could re-arrange the equation of the line to produce $y = \frac{1}{2}x + 2$, from which the gradient can be read off as the coefficient of x

Question 22

(a)

$$\begin{aligned} &7x + 14 \\ &= 7(x + 2) \end{aligned}$$

(b)

$$\begin{aligned} &4(m + 3) + 3(2m - 5) \\ &4m + 12 + 6m - 15 \\ &10m - 3 \end{aligned}$$

(c)

$$2x + 3y = 9 \tag{1}$$

$$3x + 2y = 1 \tag{2}$$

(1) times 3

$$6x + 9y = 27 \tag{3}$$

(2) times 2

$$6x + 4y = 2 \tag{4}$$

(3) - (4)

$$5y = 25$$

$$y = 5$$

Substituting this into (1)

$$2x + 3(5) = 9$$

$$2x = -6$$

$$x = -3$$

(d)

$$x^2 + 6x - 16$$

$$(x + 8)(x - 2)$$

Question 23

- (a) First Spin 0.7 needs to be added to bottom branch

Second Spin Likewise add 0.7 to the bottom branch of the top half. The bottom half needs 0.3 on the top branch and 0.7 on the bottom branch

- (b) Identify the relevant branches - there is only one branch, i.e. the 'top' one.

Multiply along this branch

$$0.3 \times 0.3 = 0.09$$

which is the answer

Question 24

- (a) (i)

$$40^\circ$$

- (ii) Since opposite angles of a cyclic quadrilateral equal 180°

$$y = 180 - 40 = 140^\circ$$

- (b) Since AD and CD are tangents, then the angles at A and C are both right angles. The remaining angle in both triangles equals 50° , so angle ABC will equal $2 \times 50 = 100^\circ$

- (c) The area of a triangle is given by

$$\text{Area} = \frac{1}{2} \text{base} \times \text{height}$$

so for OPQ

$$24 = \frac{1}{2}(8) \times OP$$

$$OP = 6$$

OP is also the radius of the circle, so using this in

$$\text{Area} = \pi r^2$$

$$= \pi(6)^2$$

$$= 36\pi$$

Paper 2 - 3301/2I, 10 June 2003

Question 1

(a)

$$£400 = 400 \times 1.64 = 656 \text{ euros}$$

(b)

$$672 \text{ euros} = \frac{672}{1.05} = 640 \text{ dollars}$$

Question 2

$$C = \frac{F - 30}{2}$$
$$= \frac{22 - 30}{2} = \frac{-8}{2} = -4$$

Question 3

(a) The other two angles in \triangle sum to $180 - 48 = 132^\circ$
so each angle is 66°
Therefore

$$x = 180 - 66 = 114^\circ$$

(b) The internal angles of a triangle sum to 180 degrees. A quadrilateral can always be bisected into two triangles. Its interior angles therefore sum to $2 \times 180 = 360^\circ$.

Question 4

(a) To his son he gives

$$\frac{1}{4} \times 2200 = £550$$

To his daughter he gives

$$\frac{2}{5} \times 2200 = £880$$

So he keeps

$$2200 - (550 + 880) = £770$$

(b) There are 24 'shares' altogether

Laura will receive

$$\frac{7}{24} \times 12000 = £3500$$

Question 5

(a) He is not moving - possibly resting

(b) 16 miles

(c) Average Speed

$$= \frac{16}{2} = 8 \text{ m.p.h.}$$

(d) Straight line from top left (at 10.00 and 20 miles, down to 0 miles at 11.00)

Question 6

(a)

$$8z - 5 = 11$$

$$8z = 16$$

$$z = 2$$

(b)

$$3(w - 2) = 9$$

$$3w - 6 = 9$$

$$3w = 15$$

$$w = 5$$

Question 7

(a) Circumference

$$= 2\pi r$$

$$= 2\pi(2.2)$$

$$= 13.8m$$

(b) Area

$$= \pi r^2$$

$$= \pi(2.2)^2$$

$$= 15.2m^2$$

*Hint : Remember to insert the units **always** when they are omitted on the answer line*

Question 8

(a) Probability of male

$$= \frac{23}{40} = 0.575$$

(b) Probability person passed

$$= \frac{16}{40} = 0.4$$

(c) The probability from our sample is lower than 0.7. Forty people is quite a decent size such that it could be representative of people at Center A in general.

Question 9

(a) line of best fit

(b) positive correlation

Question 10

Standard : cost per sheet

$$= \frac{95}{150} = 0.633p$$

Regular : cost per sheet

$$\frac{320}{500} = 0.64p$$

So standard is the best value

Question 11

- (a) Disagree - all probabilities must be equal to or less than one
- (b) Agree - there are 13 soft centers from a total of 28 chocolates
- (c) Disagree - Each toss of a fair coin is an independent event, i.e. it is unaffected by previous tosses of the coin. So the probability of getting a head will always be $\frac{1}{2}$.

Question 12

(a) Miss Evans : Pay rise

$$= 240 \times \frac{3.5}{100} = \text{£}8.40$$

Mr Dale : Pay rise

$$= 220 \times \frac{4}{100} = \text{£}8.80$$

So Mr Dale has his pay increased by the greater amount

(b) If we consider the original figure to correspond to 100%, then the figure of $\text{£}78.03$ will correspond to 102%.

So the original figure

$$= 78.03 \times \frac{100}{102} = \text{£}76.50$$

Question 13

Using Pythagoras' Theorem

$$x^2 = 1.2^2 + 3^2$$

$$x^2 = 10.44$$

$$x = 3.2m$$

Question 14

x	$x^3 + 7x$	Comment
2	22	Too small
3	48	Too big
2.5	33.125	Too big
2.4	30.624	Too big
2.3	28.267	Too small
2.35	29.428	Too small

So answer is 2.4, to 1 decimal place

Hint : Remember to test down to the second decimal place. We had determined that the result lay between 2.3 and 2.4 but we needed to test 2.35 to decide whether it was to be rounded up or down when quoted to one decimal place.

Question 15

Taking the mid-values of each range, the times will total to

$$(3 \times 3) + (5 \times 6) + (7 \times 7) + (9 \times 8) + (11 \times 5) + (13 \times 1) = 228$$

So estimate of mean

$$= \frac{228}{30} = 7.6mins$$

Question 16

- (a) (i) Reflection about the line $x = -1$
- (ii) translation of each apex of the triangle as instructed
- (b) (i)

$$\frac{1}{2}$$

(ii) extrapolating back on the graph leads to

$$(-2, -1)$$

Question 17

(a)

$$6x$$

(b) (i)

$$x^5 \times x^{-2} = x^{5-2} = x^3$$

(ii)

$$y^5 \div y^{-2} = y^{5-(-2)} = y^7$$

(c)

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

$$4x^2 + 20x - 3x - 15$$

$$4x^2 + 17x - 15$$

Question 18

$$\sin 33 = \frac{125}{x}$$

$$x = \frac{125}{\sin 33}$$

$$x = 229.5m$$

$$x = 230m \text{ to 3 sig figs}$$

Hint : Insert figures in formula at beginning (could insert $\sin=O/H$ if you want), do algebraic manipulation and only reach for your calculator on the last line

Question 19

- (a) (i) 27.38306776
 (ii) 27.4

(b)

$$(3.18 \times 10^5) \times (4.25 \times 10^3)$$

$$13.515 \times 10^8$$

$$= 1.3515 \times 10^9$$

Hint : In standard form, there is only one number to the left of the decimal point

Question 20

Equating ratios

$$\frac{9}{6} = \frac{AB}{4}$$

$$AB = \frac{9}{6} \times 4$$

$$= 6$$

So

$$BD = 2cm$$

Question 21

Using $\pi r^2 h$, each glass has a volume of

$$\pi(3)^2 10$$

$$= 282.74cm^2$$

So no. of glasses filled

$$= \frac{4000}{282.74}$$

$$= 14.15$$

So 14 glasses can be filled

*Hint : Since we are dealing with discrete values, i.e. no. of glasses, there is **no** rounding up in a question of this type. This statement is not of immediate relevance here because 14.15 would not be rounded up anyway, but take note of this statement for general use.*

Question 22

$$w = x^2 + y$$

$$x^2 = w - y$$

$$x = \sqrt{w - y}$$

Question 23

Let x be the no. of packs of bread rolls and y be the no. of packs of sausages. We need

$$30x = 16y$$

$$\frac{x}{y} = \frac{16}{30} = \frac{8}{15}$$

So the answer would be 8 packs of bread rolls, and 15 packs of sausages

Question 24

(a)

$$\frac{23 - 2x}{5} = 3$$

$$23 - 2x = 15$$

$$2x = 8$$

$$x = 4$$

(b)

$$3x + 8 < 29$$

$$3x < 21$$

$$x < 7$$

Question 25

Upper Quartile = 19 mins
 Lower Quartile = 11 mins

So required limits are 11 mins and 19 mins

Paper 1 - 3301/1I, 11 November 2003

Question 1

$$64 - 36 = 28$$

Question 2

You could take first difference and second differences in order to work out a general formula and go from there, but here it might be easier just to get the answer by examination.

The answers go down by 2, 4, 6 which implies that the difference is increasing by 2 each time. So the first missing number would be **11**, the 1 in the sequence agrees with the implication, and so the last number would be **-11**.

Question 3

Maximum no. of videos per shelf

$$= \frac{900}{25} = 36$$

And on 5 shelves the number would be

$$180$$

Question 4

The implication is that the length and width are whole numbers of centimeters. It is then a case of considering the factors of 40, e.g. (4,10), (5,8) etc, to see which might also produce a perimeter of 26 cm. (5,8) will fit the bill because 2 sides of 5cm and two sides of 8cm will equal 26cm.

So length : 8cm, and width : 5cm

Question 5

- (a) $y = -4$ will be a horizontal line through $y = -4$. $y = 2x + 1$ will be a line crossing the y -axis at $y = 1$ with a gradient of 2.

(b)

$$\left(-\frac{5}{2}, -4\right)$$

Question 6

Percentage shaded

$$= \frac{25 - 9}{25} \times 100$$

Hint : Shaded area stated as a fraction and then multiplied by 100 to convert it to a percentage

$$= \frac{16}{25} \times 100$$

$$= 64\%$$

Question 7

- (a) (i) Range

$$= 75 - 35 = 40 \text{ pence}$$

- (ii) We have 15 items of data, already arranged in order, so the median will be the middle, i.e. 8th. item, which is **51 pence**.

- (iii) 48 pence

- (b) (i) various possibilities, e.g. Gender/Foods

- (ii) Fraction of boys eating healthily

$$= \frac{13}{30}$$

Fraction of girls eating healthily

$$= \frac{12}{20} = \frac{18}{30}$$

Based purely on this figure there is good evidence to support the hypothesis, although the confidence would be increased if 30 girls were tested as well.

Question 8

Mark off the bearings by measuring both angles clockwise from North

Question 9

$$a = 50^\circ \text{ similar triangles}$$

$$b = 70^\circ$$

Question 10

(a)

$$600 \times 0.3 = 180$$

(b)

$$600 \div 0.3 = 6000 \div 3 = 2000$$

(c) 4320

(d)

$$\frac{2987}{21 \times 49} \approx \frac{3000}{20 \times 50} = 3$$

Question 11

(a)

$$a^3 = 4^3 = 4 \times 4 \times 4 = 64$$

(b)

$$\begin{aligned} &5x + 3y \\ &= 5(-2) + 3(4) \\ &= -10 + 12 = 2 \end{aligned}$$

(c)

$$5p + 2q$$

Question 12

(a) $P + Q$ will be an odd number, so subtracting 1 will produce an even number always

(b) The expression could equal 2, which is a prime number

Question 13

Three rows of, from top, 3,1 and 2, arranged appropriately

Question 14

With compasses draw three arcs from each apex of the triangle and measure 90° along each arc to find the new position of each apex.

Final coordinates : $(2, -1), (5, -1), (2, -3)$

Question 15

(a) (i)

$$\frac{153}{300} = \frac{51}{100}$$

(ii) Yes - For a fair dice, the expected values from 300 throws would be - red 150, blue 100 and green 50. The outcomes are compatible with these expected values

(b) The number of throws is too small to make definite conclusions.

Question 16

(a) The number of sticks goes up by 4 each time, so Diagram 5 has **21 sticks**

(b)

$$4n + 1$$

(c)

$$4n + 1 = 201$$

$$4n = 200$$

$$n = 50$$

i.e. 50th. diagram

Question 17

(a)

$$2x^3 = 250$$

$$x^3 = 125$$

$$x = 5$$

(b)

$$75 = 3.25 = 3.5^2$$

Question 18

Mary's statement: According to her, the length is satisfied by

$$34.5 \leq \text{length} < 35.5$$

Habib's Statement :

$$25 \leq \text{length} < 35$$

so choose any length in the range

$$34.5 \leq \text{length} < 35$$

Question 19

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

$$x^2 + x - 3x - 3$$

$$x^2 - 2x - 3$$

Question 20

(a) Area of X-section

$$\begin{aligned} &= \frac{1}{2}(4 + 10) \times 4 \\ &= 7 \times 4 \\ &= 28cm^3 \end{aligned}$$

(b) Volume of the original bar

$$= 28 \times 15 = 420cm^3$$

Considering the cuboid

$$10 \times 10 \times h = 420$$

$$100h = 420$$

$$h = 4.2cm$$

Question 21

(a)

$$80 \times 1.75 = 140km$$

(b) The second stage will be 50 km
This will take 30 minutes

Average speed for second stage

$$= \frac{50}{0.5} = 100km/h$$

Question 22

(a) After two years, the account will contain

$$\begin{aligned} &2500(1 + 0.1)^2 \\ &= 2500(1.1)^2 \\ &= 2500(1.21) \\ &= \text{£}3025 \end{aligned}$$

Note : If you are uncertain about the above procedure, you can always calculate the final value differently, year by year

(b) (Hint:Easiest way would be)

$$1320 \times \frac{10}{11} = \text{£}1200$$

Question 23

Equating the formula for a volume to 320π

$$\pi r^2 h = 320\pi$$

$$\pi r^2 (3.2) = 320\pi$$

$$r^2 = \frac{320}{3.2} = 100$$

$$r = 10cm$$

Question 24

(a) Tom's Throw - insert 0.7 on the lower branch
Sam's Throw - insert 0.8 on lower branch of 'top half'.
Mirror this 'top half' on the 'bottom half', i.e. 0.2 on upper branch, 0.8 on lower branch.

(b) Identify the relevant branches - there is only one, i.e. the 'very top' one. Multiply along this branch

$$0.3 \times 0.2 = 0.06$$

Question 25

$$15\% \text{ of } 3 \times 10^7$$

$$= \frac{15}{100} \times 3 \times 10^7$$

$$45 \times 10^5$$

$$4.5 \times 10^6$$

Question 26

(a) (i)

$$x^2 - 7x - 8$$

$$(x - 8)(x + 1)$$

(ii) Equation becomes

$$(x - 8)(x + 1) = 0$$

so either

$$x - 8 = 0 \Rightarrow x = 8$$

or

$$x + 1 = 0 \Rightarrow x = -1$$

(b)

$$5x + 3y = 13 \tag{5}$$

$$3x + 5y = 3 \tag{6}$$

$$(5) \times 3$$

$$15x + 9y = 39 \tag{7}$$

$$(6) \times 5$$

$$15x + 25y = 15 \tag{8}$$

$$(8) - (7)$$

$$16y = -24$$

$$y = -1.5$$

Substituting this into (5)

$$5x - 4.5 = 13$$

$$5x = 17.5$$

$$x = 3.5$$

Question 27

(a)

$$100^\circ$$

Hint : The angle subtended at the center is twice that subtended at the circumference

(b)

$$180 - 50 = 130^\circ$$

Hint : opposite angles of a cyclic quadrilateral will sum to 180°

(c) Angle BAC = 90°

$$\text{So } z = 180 - (90 + 20) = 70^\circ$$

Paper 2 - 3301/2I, 14 November 2003

Question 1

$$(a) \quad (i) \quad \begin{array}{cccc} & 2 & 4 & 5 \\ 1 & 3 & 5 & 6 \\ 3 & 5 & 7 & 8 \\ 4 & 6 & 8 & 9 \end{array}$$

(ii)

$$\frac{4}{9}$$

(b)

$$\frac{2}{5}$$

Question 2

water contained in 3 liter bottle

$$\begin{aligned} & 55\% \text{ of } 3 \\ & = \frac{55}{100} \times 3 \\ & = 1.65 \text{ l} \end{aligned}$$

water contained in 2.5 liter bottle

$$\begin{aligned} & \frac{3}{4} \text{ times } 2.5 \\ & = \frac{7.5}{4} = 1.875 \text{ l} \end{aligned}$$

Therefore the 2.5 liter bottle contains the most water

Question 3

(a) If x is the cost of the apples

$$(1.4 \times 0.95) + 0.8x = 1.93$$

$$1.33 + 0.8x = 1.93$$

$$0.8x = 0.60$$

$$x = 0.75$$

i.e. apples were 75p per kg

(b) Percentage of bill on fruit

$$= \frac{4.50}{22.50} \times 100$$

$$= 20\%$$

Hint : Method is to express as a fraction and then convert to a percentage by multiplying by 100

Question 4

(a)

$$x = \frac{1}{2}(180 - 34)$$

$$x = 73^\circ$$

(b) Angle ADC = $180 - 73 = 107^\circ$

$$\text{So } y = 180 - 38 - 107 = 35^\circ$$

(c) No. If AD equalled DC, then we would have an isosceles triangle, requiring two of the angles to be equal

Question 5

(a)

$$\begin{aligned} & mp + t \\ & = \frac{3}{4} + 2 \\ & = 2\frac{3}{8} \end{aligned}$$

(b)

$$\begin{aligned} & \frac{m+p}{t} \\ & \frac{\frac{3}{4} + \frac{1}{2}}{\frac{2}{\frac{5}{4}}} \\ & \frac{5}{8} \end{aligned}$$

Question 6

The no. of tiles along one side of the wall will be

$$= \frac{2.55}{0.15} = 17$$

no. of tiles along the other side

$$= \frac{2.85}{0.15} = 19$$

so the total no. of tiles required

$$= 17 \times 19 = 323$$

The no. of boxes required

$$= \frac{323}{24} = 13.4$$

so 14 boxes are required

Question 7

- (a) line of best fit
- (b) negative correlation

Question 8

(a)

$$\frac{22}{7} = 3.143$$

$$\sqrt{10} = 3.162$$

$$\frac{256}{81} = 3.160$$

$$3\frac{1}{8} = 3.125$$

so required order is

$$3\frac{1}{8}, \frac{22}{7}, \frac{256}{81}, \sqrt{10}$$

(b)

$$\frac{22}{7}$$

Question 9

(a)

$$\begin{aligned} 2x + 3y + 5x - 2y - 4x \\ = 3x + y \end{aligned}$$

(b)

$$4c + 12$$

$$4(c + 3)$$

(c)

$$x^2 + 5x$$

$$x(x + 5)$$

Question 10

- (a) (i) A
- (ii) E
- (iii) B

(b) Reflection in the line $x=-2$

Question 11

(a)

$$6r + 2 = 8$$

$$6r = 6$$

$$r = 1$$

(b)

$$7s + 2 = 5s + 3$$

$$2s = 1$$

$$s = \frac{1}{2}$$

(c)

$$\frac{12 - y}{3} = 5$$

$$12 - y = 15$$

$$y = -3$$

Question 12

Largest angle

$$= \frac{7}{20} \times 360 = 126^\circ$$

Question 13

(a)

$$\pi r^2$$

$$= 64\pi = 201.06$$

(b) Perimeter

$$= \frac{2\pi r}{2} + 9 = \pi r + 9 = 3\pi + 9 = 14.1 + 9 = 23.1cm$$

Question 14

(a) Probability of vegetarian

$$= 0.28$$

(b) 320 constitutes a fifth of the total no. of pupils, so total no. of students

$$= 320 \times 5 = 1600$$

Question 15

Length becomes

$$25 + 2.5 = 27.5cm$$

Width becomes

$$10 + 2 = 12cm$$

So percentage increase

$$= \frac{(27.5 \times 12) - (25 \times 10)}{25 \times 10} \times 100 = 32\%$$

Question 16

- (a) D - the increase of height in both segments is a straight line, i.e. the height is proportional to time. The change from one 'segment' to the other is maybe smoother than expected but there is no other alternative offering two straight regions for the two separate segments of the bottle.
- (b) Cylinder

Question 17

- (a)
- $$5(2a - c) + 4(3a + 2c)$$
- $$10a - 5c + 12a + 8c$$
- $$22a + 3c$$
- (b)
- $$3x + 7 < 1$$
- $$3x < -6$$
- $$x < -2$$

Question 18

Using Pythagoras's Theorem

$$OA^2 = 6^2 + 2.5^2$$

$$OA^2 = 36 + 6.25 = 42.25$$

$$OA = 6.5$$

Therefore

$$AB = 6.5 - 2.5 = 4cm$$

Question 19

- (a)
- $$\sin 48 = \frac{x}{5.1}$$
- $$x = 5.1 \sin 48$$
- $$x = 3.79cm = 3.8cm \text{ to 2 sig figs}$$
- (b) Using the result from (a), the height of the parallelogram is 3.79cm.

Therefore the area of PQRS

$$= 6.8 \times 3.8 = 25.84cm^2$$

Question 20

Consider three consecutive numbers

$$a, a + 1, a + 2$$

These sum to

$$3a + 3$$

which will always be divisible by 3

Question 21

$$u = \frac{t}{3} + 5$$

$$3u = t + 15$$

$$t = 3u - 15$$

Question 22

- (a)
- $$7 \times 10^9$$
- (b)
- $$0.0045$$

Hint : the index of -3 implies you shift the decimal point by three places - you just have to decide in what direction

- (c)
- $$\frac{2.7 \times 10^3}{3.375 \times 10^5}$$
- $$= 0.8 \times 10^{-2}$$
- $$= 8 \times 10^{-3}$$

Question 23

- (a) (i) corresponding to 20 on the vertical scale, the median is
- $$100$$
- (ii) Corresponding to 10 on the vertical scale is
- $$93$$
- Corresponding to 30 on the vertical scale is
- $$106$$
- So the inter-quartile range is
- $$106 - 93 = 13$$
- (b) (i) George - who has a smaller Inter-Quartile Range
- (ii) Brian - who has the lowest median

Question 24

- (a)
- $$BC = 3.6 \times \frac{3}{2} = 5.4cm$$
- (b)
- $$45^\circ$$