

Edexcel GCSE Mathematics (1387)

Intermediate Tier Summer 2003

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.

Brian Daugherty

Statements in italics are for information rather than a part of the answer

Paper 3 (Non-Calculator), 4 June 2003

Question 1

(a) (i)

$$3g + 5g = 8g$$

(ii)

$$2r \times 5p = 10pr$$

(b)

$$5(2y - 3) = 10y - 15$$

(c)

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

$$6x + 8 - 12x + 15$$

$$-6x + 23$$

Question 2

Sequence is

$$6, 12, 18, \dots$$

Constant first difference of 6 \Rightarrow formula is given by

$$m = 6n + k$$

where k is a constant. Here $k = 0$, so formula is

$$m = 6n$$

Question 3

(i)

$$0.067, 0.56, 0.6, 0.605, 0.65$$

(ii)

$$-10, -6, -4, 2, 5$$

(iii)

$$\frac{2}{5}, \frac{1}{2}, \frac{2}{3}, \frac{3}{4}$$

Question 4

	Tea Bags	Packet Tea	Instant Tea	Total
50g	2	0	5	7
100g	35	20	5	60
200g	15	5	13	33
Total	52	25	23	100

Question 5

If you were to use the grids, the Left-Hand grid could represent $\frac{3}{5}$ by shading in 3 rows, and the Right-Hand grid could represent $\frac{2}{3}$ by shading in 2 columns. The result is that the Left-Hand grid would have 9 shaded squares and the Right-Hand grid would have 10 shaded squares. Thus $\frac{2}{3}$ is the largest.

Note : you could also convert original fractions to be fractions with the same denominator, and thus compare them directly

Question 6

Number of drawing pins	Frequency	
29	2	58
30	5	150
31	2	62
32	1	32

Mean

$$= \frac{58 + 150 + 62 + 32}{10} = 30.2$$

Question 7

(a) B has vertices

$$(-2, -2), (-2, -4), (-3, -2)$$

(b) Vertices will transform as follows

$$(2, 2) \Rightarrow (1, 1)$$

$$(2, 4) \Rightarrow (1, 2)$$

$$3, 2) \Rightarrow \left(\frac{3}{2}, 1\right)$$

Question 8

(a)

$$12x$$

(b)

$$12x + 10y$$

Question 9

$$1 - \frac{1}{3} - \frac{1}{4}$$

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

$$= \frac{5}{12}$$

Question 10

(a)

$$180 - 126 = 54^\circ$$

(b) (i)

$$180 - 2(54) = 72^\circ$$

(ii) Since we have an isosceles triangle, angle at Q also equals x°

Question 11

(a) Bryani is right - the value of $4x^2 = 36$

The index of 2 only relates to the x - not the whole expression

(b)

$$4(x + 1)^2 = 4(4)^2 = 4(16) = 64$$

Question 12

(a) Side elevation will be a rectangle of height 4 units and width 3 units (lined up properly with other elevations given)

(b) Could copy down front elevation and then extend that into a 3-D view.

Question 13

(a)

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{20}{30} \text{ km/min}$$

$$= \frac{20}{30} \times 60 \text{ km/h}$$

$$= 40 \text{ km/h}$$

(b) At 60km/h, it will take 20 mins to travel 20 km, so line starts at 45 mins and hits the horizontal axis at 65 mins.

Question 14

(i)

$$119.31$$

(ii)

$$119\ 310$$

(iii)

$$1.23$$

Question 15

$$10\% \text{ of } 12000 = 1200$$

Therefore value of car after 1 year

$$= 12000 - 1200 = 10800$$

Now

$$10\% \text{ of } 10800 = 1080$$

Therefore value of car after 2 years

$$= 10800 - 1080 = \text{£}9720$$

Question 16

(a)

$$7p + 2 = 5p + 8$$

$$2p = 6$$

$$p = 3$$

(b)

$$7r + 2 = 5(r - 4)$$

$$7r + 2 = 5r - 20$$

$$2r = -22$$

$$r = -11$$

Question 17

Constant first difference of 5 \Rightarrow the required expression is of the form

$$5n + k$$

where k is a constant

On inspection $k = 1$. So expression is

$$5n + 1$$

Question 18

- (a) $-1, 0, 1$

- (b) Insert lines corresponding to
 $x = -2$
 $x = 1$
 $y = -2$
 $y = x + 1$

giving the required points, as follows

$$(1, 1), (1, 0), (1, -1), (0, 0), (0, -1), (-1, -1)$$

Question 19

- (a) D has vertices

$$(0, 0), (3, 0), (0, -2)$$

- (b) rotation by 180° (anti-clockwise or clockwise) about $(0,1)$

Question 20

Draw bisector of BC through A

Draw an arc of 5cm from A (using compasses)

Shaded area will be 'above' bisector and to the 'left' of arc.

Question 21

$$x + y + z : \text{Length}$$

$$xyz : \text{Volume}$$

$$xy + yz + xz : \text{Area}$$

Question 22

- (a) A 'short' question could be on the lines : list, in order, your three favourite genres of food you like to eat in a restaurant? (any attempt to include all possibilities and not 'lead' the respondents on will be satisfactory.
- (b) 1. His family is not representative of the population as a whole
 2. The question is directing the respondents to a particular answer

Question 23

- (a) Distance travelled

$$\begin{aligned} &= 8 \times 10^4 \times 6 \times 10^2 \\ &= 48 \times 10^6 \\ &= 4.8 \times 10^7 \text{ km} \end{aligned}$$

- (b)

$$\begin{aligned} &(2 \times 10^5) + (3 \times 10^4) \\ &= (20 \times 10^4) + (3 \times 10^4) \\ &= 23 \times 10^4 \\ &= 230\,000 \text{ km} \end{aligned}$$

Question 24

- (i)

$$(2^2)^3 = 4^3 = 64$$

- (ii)

$$(\sqrt{3})^2 = 3$$

- (iii)

$$\begin{aligned} &\sqrt{2^4 \times 9} \\ &= \sqrt{2^4} \times \sqrt{9} \\ &= 2^2 \times 3 \\ &= 4 \times 3 = 12 \end{aligned}$$

Question 25

- (i) Angle $ACB = 27^\circ$, because FE is a tangent to the circle, and therefore angle $ACE = 90^\circ$.
- (ii) Angle $BAC = 63^\circ$, because the diameter AC subtends an angle of 90° at the circumference. From (i), we know that angle ACB is 27° .

Question 26

- (a) (i) lower quartile = 152
 (ii) upper quartile = 177
- (b) Box plot consisting of left hand side of box at 152 and right-hand side at 177. A line representing the median is drawn at 167. Lines are extended to display the range - to the left to 132 and to the right to 182.

Question 27

- (a)

$$\begin{aligned} &(x + y)^2 \\ &= (x + y)(x + y) \\ &= x^2 + 2xy + y^2 \end{aligned}$$

- (b) Expression can be stated as

$$\begin{aligned} &(3.47 + 1.53)^2 \\ &= 5^2 = 25 \end{aligned}$$

Paper 4 (Calculator), 15 June 2003

Question 1

(a)

$$17.9867$$

(b)

$$(1.6 + (3.8 \times 2.4)) \times 4.2$$

Question 2

(a) If d represents the no. of extra hours

$$56.80 + 42.50d = 269.30$$

$$42.5d = 212.5$$

$$d = 5$$

so the total no of hours worked

$$= 6h$$

(b)

$$95\% \text{ of } £269.30$$

$$= 0.95 \times 269.30 = £255.84$$

Question 3

(a)

$$60^\circ$$

(b) The interior angles of a hexagon

$$= (6 - 2) \times 180 = 720^\circ$$

Therefore each angle

$$= \frac{720}{6} = 120^\circ$$

(c)

$$6 \times 2 = 12\text{cm}^2$$

(d) Draw a horizontal line. Mark off a point (which I will call A). Place the compasses A and mark off 4cm along the line (at a point which I will call B), plus an arc above the line. Place the compasses B and draw an arc above the line such that it intersects the previous arc. Thus construct the required triangle by joining the intersection of arcs to both A and B.

Question 4

(a) (i) Total members' fees

$$= 240 \times 5 = £1200$$

Total Income

$$= 1200 + 50 = £1250$$

(ii)

$$\frac{50}{1250} = \frac{1}{25}$$

(b)

$$600 : 250$$

$$= 12 : 5$$

Question 5

(a)

$$x + 2$$

(b)

$$2(x + 2) + 2(x + 5)$$

$$= 2x + 4 + 2x + 10$$

$$= 4x + 14$$

(c)

$$4x + 14 = 20$$

$$4x = 6$$

$$x = 1.5m$$

Question 6

(a)

$$5p + 2q - 3p - 3q$$

$$= 2p - q$$

(b)

$$y = 5x - 3$$

$$4 = 5x - 3$$

$$5x = 7$$

$$x = \frac{7}{5}$$

Question 7

(a + b)	Row 1	1	= $\frac{1 \times 2}{2}$
	Row 2	1 + 2	= $\frac{2 \times 3}{2}$
	Row 3	1 + 2 + 3	= $\frac{3 \times 4}{2}$
	Row 4	1 + 2 + 3 + 4	= $\frac{4 \times 5}{2}$
	*	*	*
	Row 8	1 + 2 + 3 + 4 + 5 + 6 + 7 + 8	= $\frac{8 \times 9}{2}$

(c)

$$\frac{100 \times 101}{2} = 5050$$

(d)

$$\frac{n(n+1)}{2}$$

Question 6

Area of outside of tank

$$= 2(2.8 \times 4.5) + 2(3.2 \times 4.5) + (3.2 \times 2.8)$$

$$= 62.96m^2$$

Liters required

$$= \frac{62.96}{2.5}$$

Cost

$$= \frac{62.96}{2.5} \times 2.99$$

$$= \text{£}75.30$$

Question 9

$$2.5m^2 = 2.5 \times 10^4 cm^2 = 25000cm^2$$

Question 10

(a) Sector for London will subtend an angle of

$$\frac{36}{90} \times 360 = 144^\circ$$

Southern England

$$\frac{8}{90} \times 360 = 32^\circ$$

Northern England

$$\frac{24}{90} \times 360 = 96^\circ$$

(b)

$$x = 1 - (0.15 + 0.27 + 0.38)$$

$$x = 1 - 0.8 = 0.2$$

Question 11

0	5788
1	000025556
2	00045
3	35

Question 12

(a) Volume of cylinder

$$= \pi r^2 h$$

$$= \pi(4^2)(10)$$

$$= 160\pi = 503cm^2$$

(b) Consider a right-angled triangle of sides 10 cm and 8 cm

$$\text{Hypotenuse}^2 = 10^2 + 8^2$$

$$= 100 + 64 = 164$$

$$\text{Hypotenuse} = 12.806...cm$$

So a pencil of 13cm cannot fit inside the cylinder

Question 13

(a) (i)

$$60 = 2 \times 30$$

$$= 2^2 \times 15$$

$$= 2^2 \times 3 \times 5$$

(ii)

$$96 = 2 \times 48$$

$$= 2^2 \times 24$$

$$= 2^3 \times 12$$

$$= 2^4 \times 6$$

$$= 2^5 \times 3$$

(b) HCF

$$= 2^2 \times 3 = 12$$

(c) LCM

$$= 2^5 \times 3 \times 5 = 480$$

Question 14

(a) Median = half the 20th and 21st items, which will fall in the class $150 < C \leq 200$

(b) One extra item at £1000 will raise the median to be the 21st item, which lies in the same class as before

(c)

$$5200 \times \frac{100}{80} = \text{£}6500$$

Question 15

(a) Volume of cuboid

$$= x \times x \times (x + 1) = x^3 + x^2$$

Therefore

$$x^3 + x^2 = 230$$

5	150	6	252
---	-----	---	-----

5.5	196.625
-----	---------

(b) 5.7	217.683
---------	---------

5.8	228.752
-----	---------

5.9	240.189
-----	---------

5.85	234.424125
------	------------

So answer to 1 d.p. is 5.9

Question 16

Area

$$= \frac{\pi r^2}{2} = \frac{\pi 7.5^2}{2} = 88.4cm^2$$

Question 17

(a)

$$5 = \frac{1}{2}x + 1$$

$$\frac{1}{2}x = 4$$

$$x = 8$$

(b)

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

for example (any constant on the end will suffice)

(c)

$$y = \frac{1}{2}x + 1$$

$$\frac{1}{2}x = y - 1$$

$$x = 2(y - 1)$$

Question 18

$$2x - 3y = 11$$

$$5x + 2y = 18$$

(1) $\times 2$

$$4x - 6y = 22$$

(2) $\times 3$

$$15x + 6y = 54$$

Add (3) and (4)

$$19x = 76$$

$$x = 4$$

therefore

$$2(4) - 3y = 11$$

$$3y = -3$$

$$y = -1$$

Question 19

(a)

$$\frac{CD}{4.8} = \frac{10}{6}$$

$$CD = \frac{48}{6} = 8cm$$

(b)

$$\frac{CA}{4.5} = \frac{10}{6}$$

$$CA = \frac{45}{6} = 7.5$$

Perimeter

$$= 8 + 4.8 + 4 + 3 = 19.8cm$$

Question 20

$$y^2 = \frac{(3 \times 10^8)(2 \times 10^7)}{(3 \times 10^8) + (2 \times 10^7)}$$

$$= \frac{6 \times 10^{15}}{32 \times 10^7}$$

$$= 0.1875 \times 10^{15}$$

$$= 1.875 \times 10^{14}$$

$$y = 1.4 \times 10^7$$

Question 21

$$\tan 38 = \frac{AB}{8.5}$$

$$AB = 8.5 \times \tan 38$$

$$AB = 6.64cm$$

Question 22

(1)

(2) (a) For a fair dice, we would expect 100 sixes. 200 sixes is too divergent a result, so dice is not fair.

(3)

(b) Left-hand side of tree requires a probability of 5/6 on the bottom branch. The right-hand side will have two branches from each node. Each set of branches will 'mirror' those on the left-hand side with a probability of 1/6 for a six and 5/6 for a 'not six'.

(4)