Candidate surname	Other names

DB Solutions
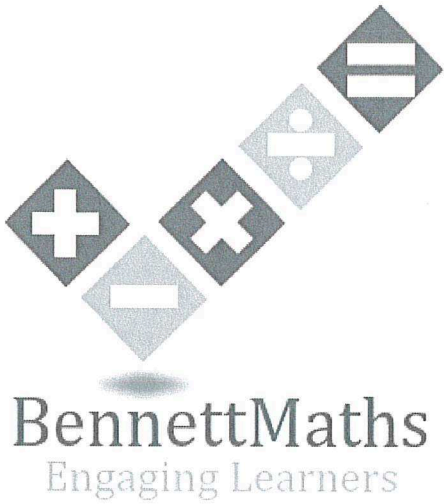
BennettMaths
Engaging Learners

Best Guess Paper – 3H
Calculator

Within this booklet you will find my best guess at what might be on the next edexcel gcse maths paper.

There may be other topics that appear on paper 3, so please ensure that you continue to revise all topics.

The paper consists of 23 questions totalling 80 marks.

1(a)   Expand and simplify
$$3(2x + 4) - 2(x - 1)$$

$6x + 12 - 2x + 1$

$4x + 13$

(2)

1(b)   Factorise fully
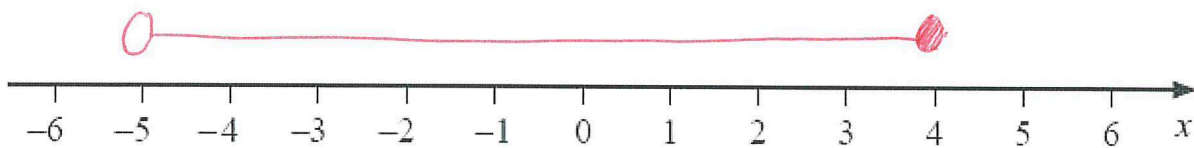$$4x^2y^3 + 6x^3y$$

$2x^2y(2y^2 + 3x)$

1(c)   Express on the number line
$$-4 < x + 1 \leq 5$$

$\begin{matrix} -1 & -1 & -1 \end{matrix}$

$-5 < x \leq 4$
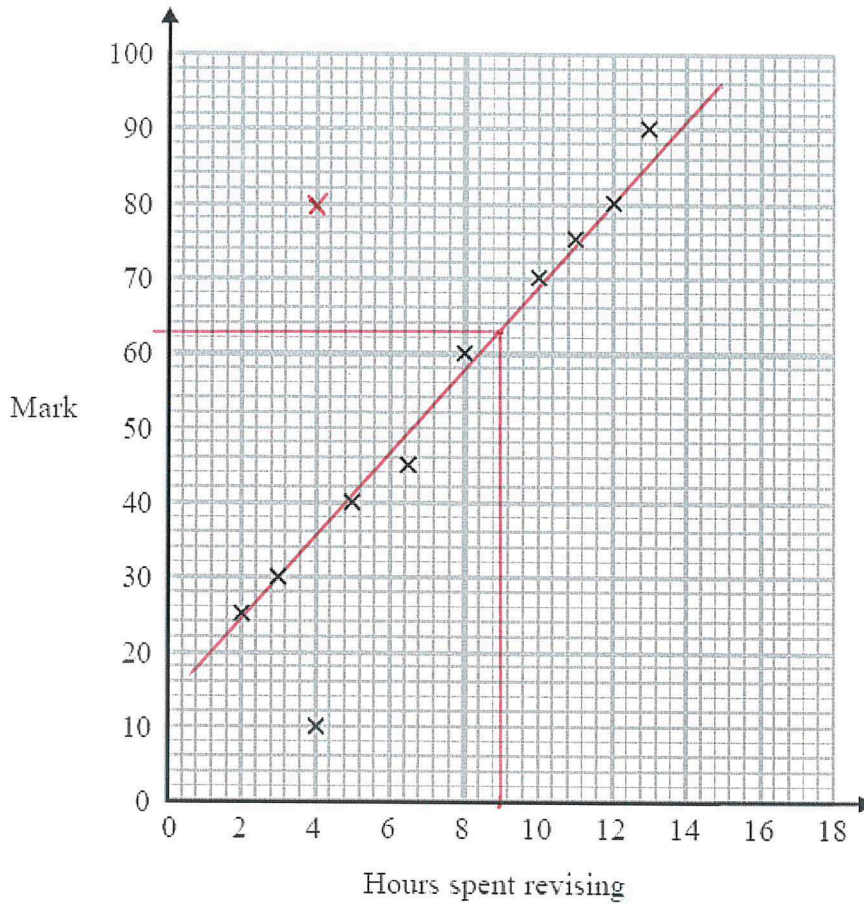

(2)

(Total for Question 1 is 6 marks)

2   The scatter shows the maths scores attained by some students in Year 11.

Mark (y-axis) vs Hours spent revising (x-axis)

2(a)   Daisy scored 80 marks after revising for 4 hours.
Plot this information on the scatter graph

(1)

2(b)   Sadie revised for 9 hours. Work out an estimate for the mark she would achieve

63

(2)

2(c)   Daphne says that using the graph to estimate the mark achieved for somebody
spending 18 hours revising would not be appropriate. Explain why?
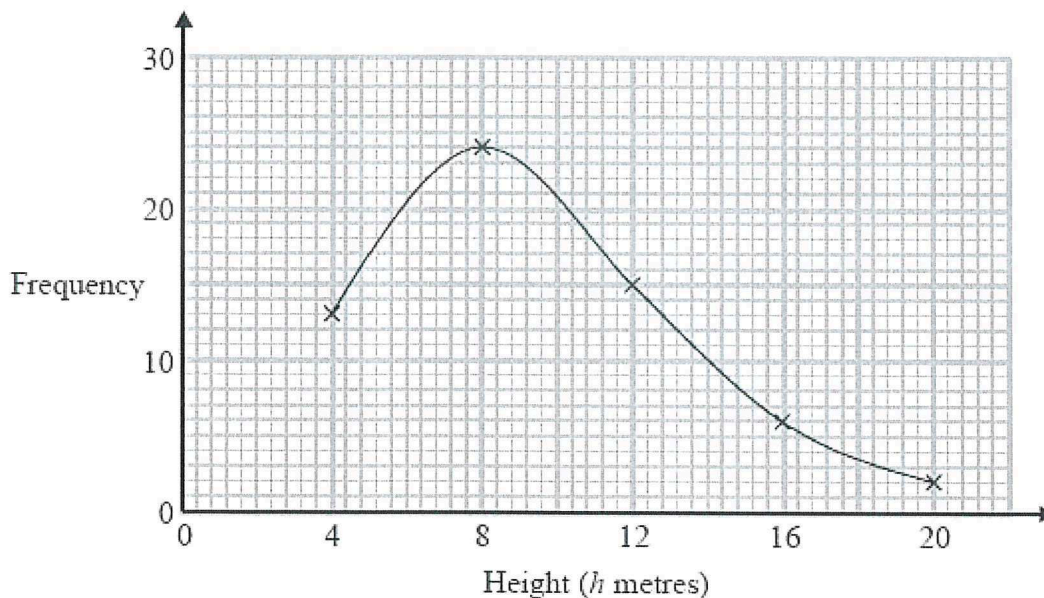
This is outside of the data set.

(1)

(Total for Question 2 is 4 marks)

3   The table shows the heights of 60 trees

Height (h metres)	Frequency
$0 < h \leqslant 4$	13
$4 < h \leqslant 8$	24
$8 < h \leqslant 12$	15
$12 < h \leqslant 16$	6
$16 < h \leqslant 20$	2

Freddie plots the frequency polygon below

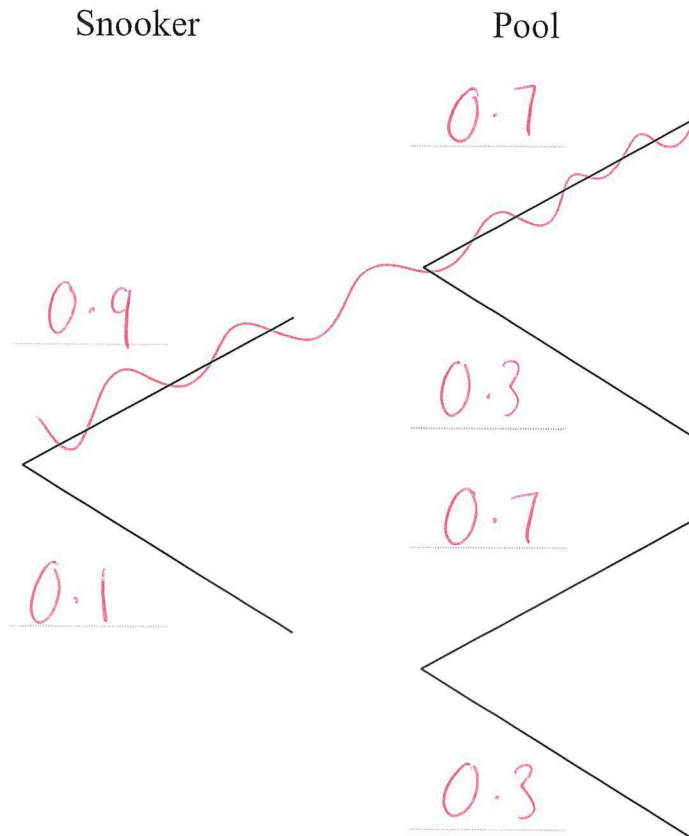
Write down 2 things that are wrong with this graph

1. The end point has been used rather than the midpoint

2. The lines should be straight not curved

(Total for Question 3 is 2 marks)

4(a)   Margot is going to play one game of snooker and one game of pool.
        The probability that Margot wins a game of snooker is 0.9.
        The probability that Margot does not win a game of pool is 0.3.

                Snooker   Pool

                                        0.7

                0.9

                                        0.3

                                        0.7

                0.1

                                        0.3

                                                                        (2)

4(b)   Work out the probability that Margot wins at both snooker and pool.

                0.9 × 0.7 = 0.63

                                                                        (2)

                                            (Total for Question 4 is 4 marks)

5 Work out
$$\frac{(3.1 \times 10^3) + (2.4 \times 10^{-2})}{(4.2 \times 10^2)}$$

Giving your answer in standard form, correct to 3 significant figures.

7.38100952

7.38×10^0

(Total for Question 5 is 2 marks)

6 Simplify fully
$$(4a^4bc^{-3})^5$$

$4^5 = 1024$

$(a^4)^5 = a^{20}$

$(b)^5 = b^5$

$(c^{-3})^5 = c^{-15}$

$1024a^{20}b^5c^{-15}$

(Total for Question 6 is 2 marks)

7   Martha invests £15200.
     She earns $x\%$ for the first year.
     At the end of the first year she has a total of £15656.

     For the next 2 years, Martha earns $2x\%$.
Work out the total of her investment at the end of the third year.
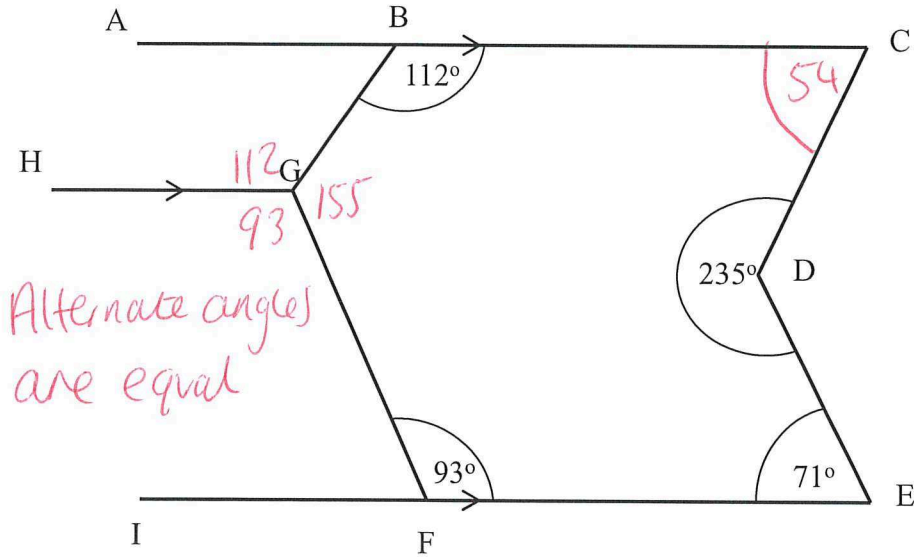
$$\frac{15656}{15200} = 1.03 = 3\% \text{ increase}$$

$$x = 3 \quad 2x = 6$$

$$15656 \times 1.06^2 = 17591.08$$

(Total for Question 7 is 3 marks)

8   Shape BCDEFG is an irregular hexagon.
     Lines AC, HG & IE are parallel.

A ——————————— B ————————————— C
                112°   54

H ——————→ 112 G 155
            93
                                235° D
Alternate angles
are equal
                93°   71°
                                      E
     I   F

Work out the size of angle BCD

$(n-2) \times 180$

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

$720 - 112 - 155 - 93 - 71 - 235 = 54$

(Total for Question 8 is 4 marks)

9
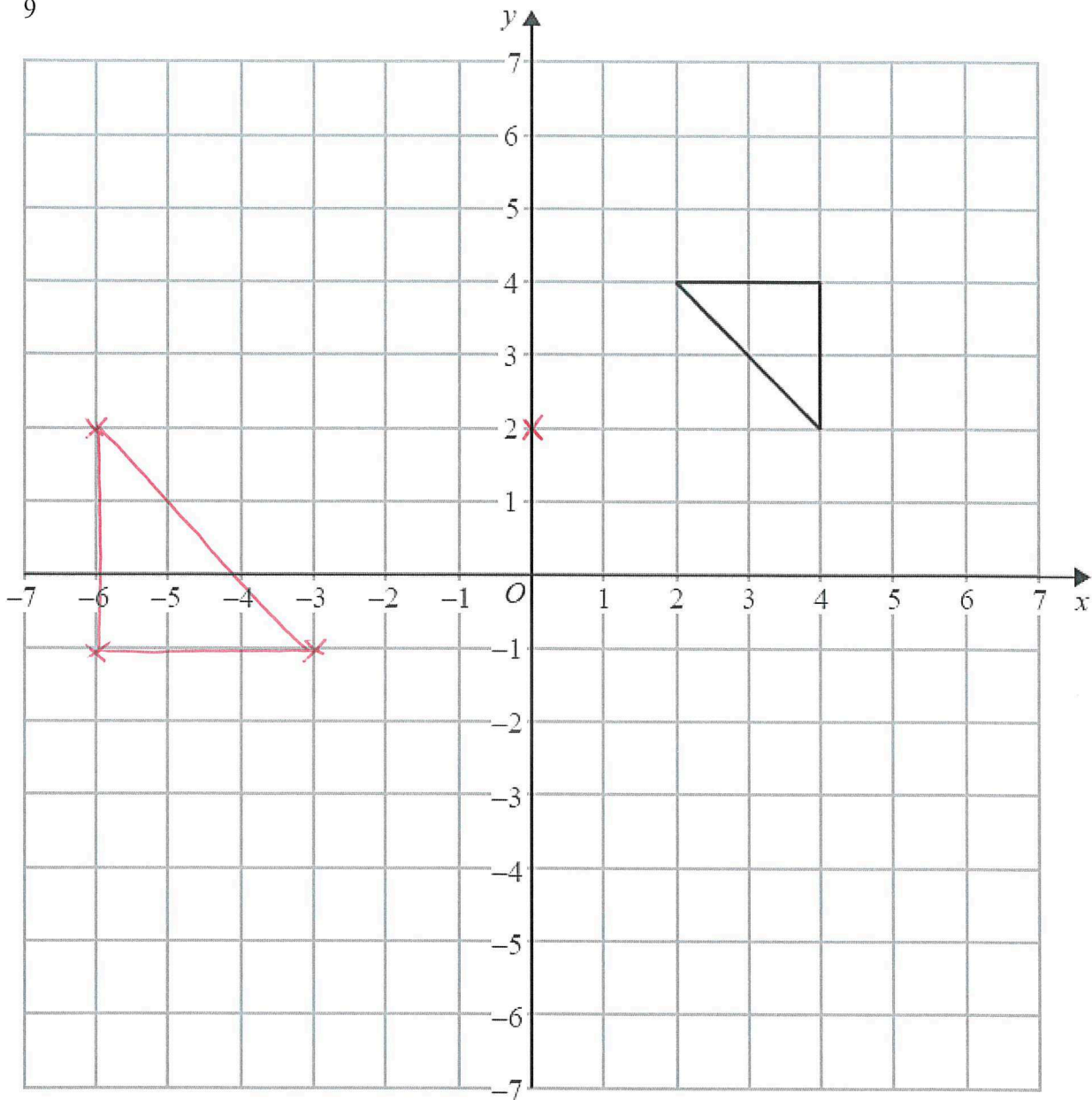
On the grid, enlarge the triangle by scale factor -1.5 with centre (0,2)

$$-1.5\begin{pmatrix} 4 \\ 0 \end{pmatrix} = \begin{pmatrix} -6 \\ 0 \end{pmatrix}$$

$$-1.5\begin{pmatrix} 2 \\ 2 \end{pmatrix} = \begin{pmatrix} -3 \\ -3 \end{pmatrix}$$

$$-1.5\begin{pmatrix} 4 \\ 2 \end{pmatrix} = \begin{pmatrix} -6 \\ -3 \end{pmatrix}$$

(2)

(Total for Question 9 is 2 marks)

10   L_1 has the equation of $y = 3x - 8$ ← gradient = 3
      L_2 has the equation of $4x + 12y = 96$

Sam says that the two lines are perpendicular.
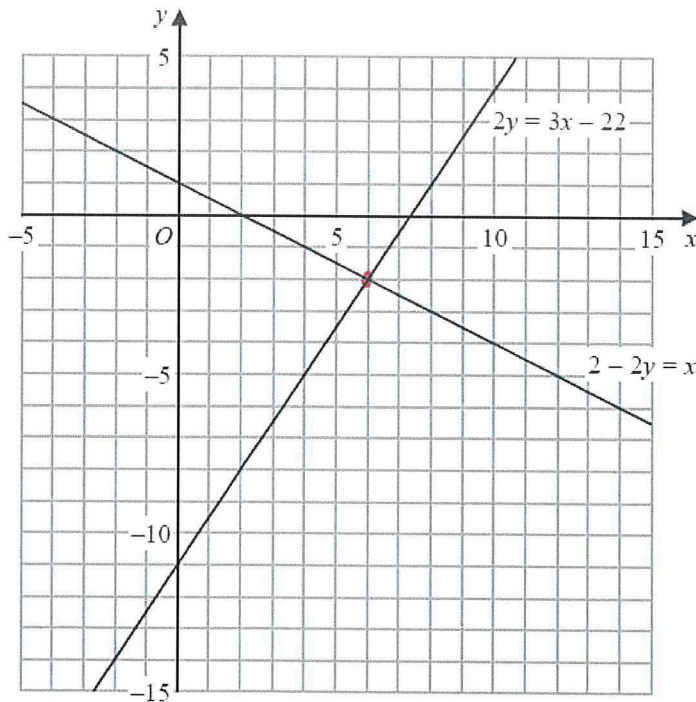Is she correct?

$$4x + 12y = 96$$

$$12y = -4x + 96$$

$$y = \frac{-4}{12}x + 8 \leftarrow \text{gradient} = -\frac{1}{3}$$

negative reciprocal

Yes

(Total for Question 10 is 3 marks)

11

$2y = 3x - 22$

$2 - 2y = x$
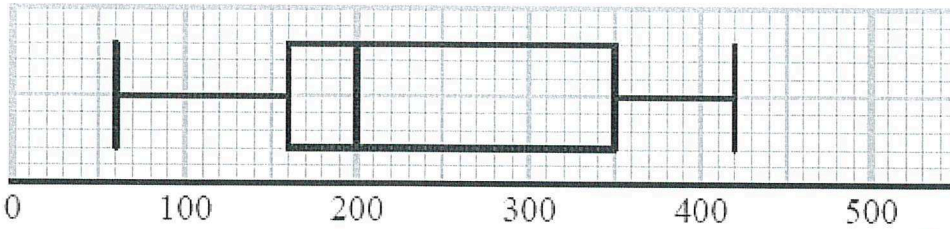
Use the graph to solve the simultaneous equations

$$2 - 2y = x$$
$$2y = 3x - 22$$

x = 6

y = -2

(Total for Question 11 is 1 mark)

12   The box plot shows information about the sales, in thousands of pounds, of Bennett's Bistro

Margot says,
'50% of the sales data is below £210,000 as the highest value is £420,000'
Margot is wrong.
(a) Explain why.

m = 200
IQR = 350 - 160
= 190
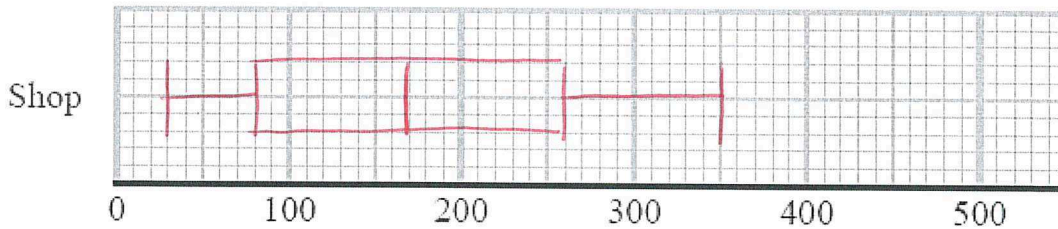
50% of data is below the median.
Which is 200,000

(1)

	Sales (£000s)
least value	30
lower quartile	80
median	170
upper quartile	260
greatest value	350

m = 170
IQR = 260 - 80 = 180

12(b) On the grid below, draw a box plot for the information given above about the sales from Buckley's Cafe

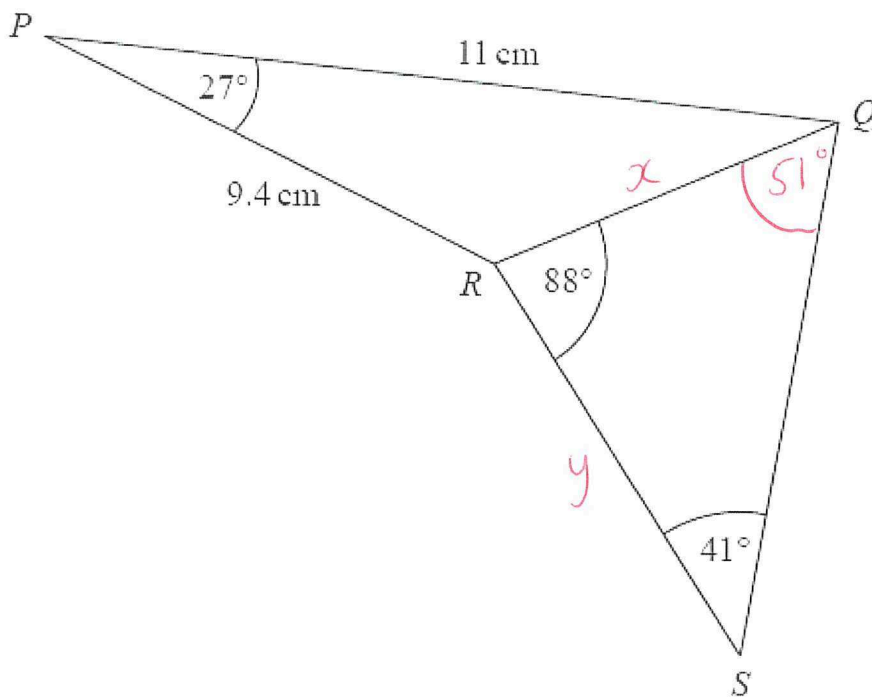Sales (£000s)   (2)

12(c) Compare the distributions of the sales of both eateries.

On average, Bennett's Bistro had ~~better~~ higher sales as
they have a larger median. The sales are more
consistent at Buckley's cafe as they have a smaller
IQR

(2)

(Total for Question 12 is 5 marks)

13   PQR and QRS are triangles

P
27°
11 cm
9.4 cm
Q
x
51°
R   88°
y
41°
S

Calculate the length of RS.
Give your answer correct to 3 significant figures.
You must show all of your working

$$x = \sqrt{11^2 + 9.4^2 - 2 \times 11 \times 9.4 \times \cos(27)}$$

$$x = 5.01$$

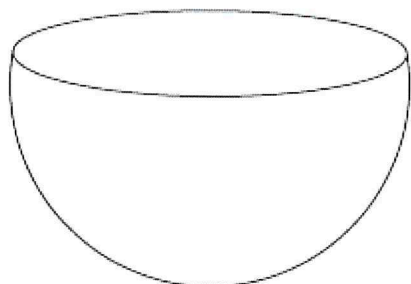$$\frac{y}{\sin(51)} = \frac{5.01}{\sin(41)}$$

$$y = \frac{5.01}{\sin(41)} \times \sin(51) = 5.93$$

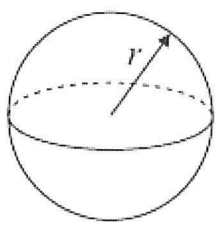   cm

(Total for Question 13 is 4 marks)

14   The diagram shows a solid hemisphere

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

Surface area of sphere $= 4\pi r^2$

(a)   The diameter of the sphere is 12.3cm. $r = 6.15$
       Work out the volume of the hemisphere.

$$\frac{1}{2} \times \frac{4}{3} \times \pi \times 6.15^3 = 487.17 \, cm^3$$

(2)

(b)   Maggie says that 300cm² is the same value as 3000mm².
       Is Maggie correct. Give a reason for your answer.

No, $cm^2 \rightarrow mm^2 = \underline{\times 10^2}$

$300 \times 10^2 = 30000mm^2$ not $3000mm^2$

(1)

(Total for Question 14 is 3 marks)

15   Katie has a pond containing some fish.
On Monday, she catches 45 fish and places a tag on them.
On Tuesday, she catches 240 fish, 18 of the fish have a tag on them.

Work out an estimate for the total number of fish in the pond.

$$\frac{45}{x} = \frac{18}{240} \quad \times 2.5$$

$\times 2.5$

600

(Total for Question 15 is 2 marks)

16   The population of grey squirrels in Garstang in 2024 is 12,000.
Population growth is given by the following iterative formula
$$P_{n+1} = 1.04P_n + 180$$

Work out an estimate for the number of grey squirrels in Garstang in
2025, 2026 and 2027

$$12,000 = ANS$$

$$= 1.04(ANS) + 180$$

2025   12 660

2026   13 346

2027   14 060

(Total for Question 16 is 3 marks)

17   Here are the first four terms of a quadratic sequence.

$$4, \qquad 13, \qquad 26, \qquad 43$$

Write down an expression, in terms of n, for the nth term of the sequence

$$4, \ 13, 26, \ 43$$

$$+9 \quad +13 \quad +17$$

$$+4 \qquad +4$$

$$2n^2 \quad \begin{cases} 2, \ 8, \ 18, \ 32 \\ 4, \ 13, \ 26, \ 43 \end{cases}$$

$$\overset{3}{+2}, \ \overset{6}{+5}, \ \overset{9}{+8}, \ \overset{12}{+11} \quad 2-1$$

$$+3 \quad +3 \quad +3$$

$$3n - 1$$

$$2n^2 + 3n - 1$$

(Total for Question 17 is 3 marks)

18   Solve

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

Give your answers correct to 3 significant figures

$$\rightarrow \frac{20x^2 - 4x}{20x^2 - 4x}$$

$$\frac{4x(2x+4) + (x+3)(5x-1)}{4x(5x-1)} = \frac{8x^2 + 16x + 5x^2 + 14x - 3}{20x^2 - 4x}$$

$$\frac{13x^2 + 30x - 3}{20x^2 - 4x} - \frac{20x^2 - 4x}{20x^2 - 4x} = \frac{-7x^2 + 34x - 3}{20x^2 - 4x}$$

$$\frac{-7x^2 + 34x - 3}{20x^2 - 4x} = 4$$

$$-7x^2 + 34x - 3 = 80x^2 - 16x$$

$$0 = 87x^2 - 50x + 3$$

$$a = 87 \quad b = -50 \quad c = 3$$

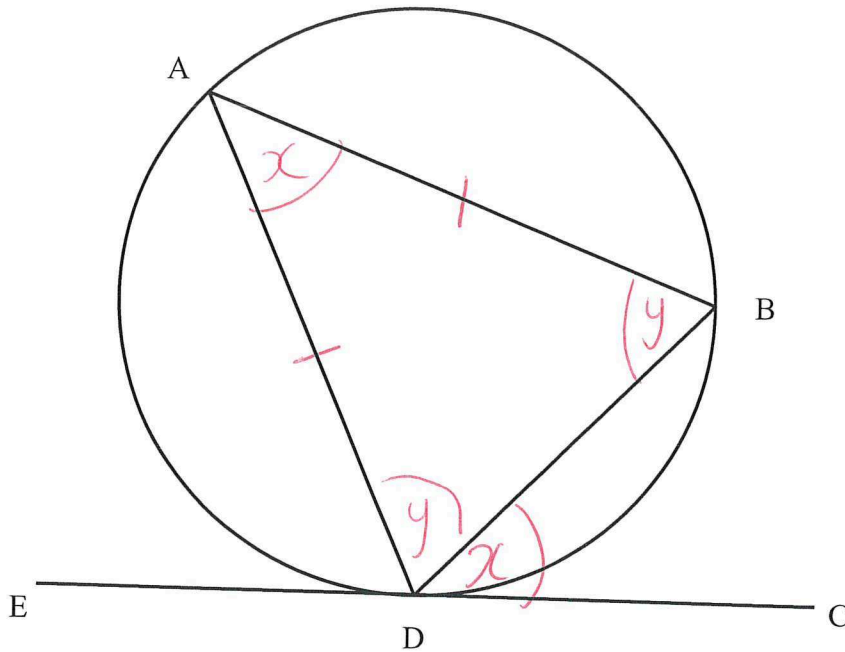$$\frac{50 \pm \sqrt{(-50)^2 - (4 \times 87 \times 3)}}{2 \times 87}$$

$$x = 0.0681$$

$$x = 0.507$$

(Total for Question 18 is 5 marks)

19

Points ABD are on a circle such that:
AB = AD
Angle ABD = $y°$
Angle BDC = $x°$

Show that $\frac{1}{2}x + y = 90$
Give reasons for your answer

$A\hat{D}B = A\hat{B}D$ base angles of an isosceles
triangle are equal.

$B\hat{D}C = D\hat{A}B$ alternate segment theorem

$x + 2y = 180$

$\frac{1}{2}x + y = 90$

(Total for Question 19 is 4 marks)

20    $f(x) = 3x^2 - 2$ $g(x) = 2x + 3$

(a)   Find fg(2)

$2(2) + 3 = 7$

$3(7)^2 - 2 = 145$

145

(2)

(b)   Find $f^{-1}(x)$

$y = 3x^2 - 2$

$x = 3y^2 - 2$

$\dfrac{x+2}{3} = y^2$

$\pm\sqrt{\dfrac{x+2}{3}}$

$f^{-1}(x) = \pm\sqrt{\dfrac{x+2}{3}}$

(2)

(c)   Solve $fg(x) = g^{-1}(21)$

$3(2x+3)^2 - 2 = \dfrac{21-3}{2}$

$3(4x^2 + 12x + 9) - 2 = 9$

$12x^2 + 36x + 27 - 2 = 9$

$12x^2 + 36x + 25 = 9$

$12x^2 + 36x + 16 = 0$

$a = 12 \quad b = 36 \quad c = 16$

$\dfrac{-36 \pm \sqrt{(36)^2 - (4 \times 12 \times 16)}}{2 \times 12}$

$y = 2x + 3$

$x = 2y + 3$

$\dfrac{x-3}{2} = g^{-1}(x)$

$x = -0.5425$

$x = -2.457$

(4)

(Total for Question 20 is 8 marks)

21   Prove algebraically that the sum of the cubes of two consecutive odd numbers is always even.

You must show all your workings.

$2n-1$

$2n+1$

$(2n-1)^3 + (2n+1)^3 = even$

$(2n-1)(2n-1)(2n-1) + (2n+1)(2n+1)(2n+1)$

$(4n^2-4n+1)(2n-1) + (4n^2+4n+1)(2n+1)$

$(8n^3-12n^2+6n-1) + (8n^3+12n^2+6n+1)$
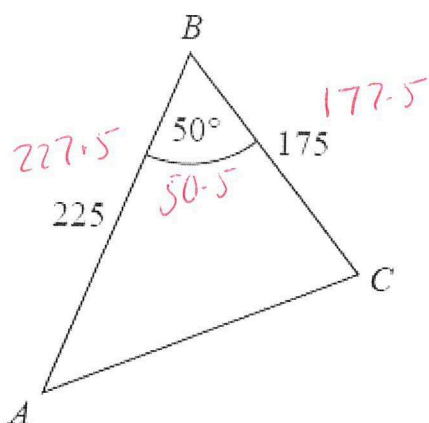
$16n^3+12n$

$2(8n^3+6n)$

↑

multiple of 2 ∴ even

(Total for Question 21 is 3 marks)

22   Anya measures a field.

The length AB measures 225m correct to the nearest 5m ± 2.5
The length BC measures ~~225~~ 175 m correct to the nearest 5m ± 2.5
Angle ABC measures 50° correct to the nearest degree. ± 0.5

Work out the upper bound for the area of the field.
You must show your working.

$$\frac{1}{2} \times a \times b \times Sin(C)$$

$$\frac{1}{2} \times 227.5 \times 177.5 \times Sin(50.5)$$

$$= 15579.58 \, m^2$$

(Total for Question 22 is 3 marks)

23   Solve algebraically the simultaneous equations

$$2x^2 - y^2 = 17$$
$$x = 1 - 2y$$

$$2(1-2y)(1-2y) - y^2 = 17$$

$$2(1 - 4y + 4y^2) - y^2 = 17$$

$$8y^2 - 8y + 2 - y^2 = 17$$

$$7y^2 - 8y - 15 = 0$$

$$a = 7 \quad b = -8 \quad c = -15$$

$$y = \frac{8 \pm \sqrt{(-8)^2 - (4 \times 7 \times -15)}}{2 \times 7}$$

$$y = 2.14 \left(\frac{30}{14}\right) \qquad x = 1 - 2\left(\frac{30}{14}\right) = \frac{-46}{14} \text{ or } -3.28$$

$$y = -1 \qquad x = 1 - 2(-1) = 3$$

(Total for Question 23 is 4 marks)

Total for this paper is 80 marks