Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9 - 1)

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics

Paper 2 (Calculator)

Higher Tier

Specimen Papers Set 1
Time: 1 hour 30 minutes

Paper Reference
1MA1/2H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out**.



Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Make t the subject of the formula $w = 3t + 11$ ← isolate t

$w = 3t + 11$

-11

$w - 11 = 3t$

$\div 3$

$\frac{w-11}{3} = t$

$t = \frac{w-11}{3}$

(Total for Question 1 is 2 marks)

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2 Three companies sell the same type of furniture.

The price of the furniture from Pooles of London is £1480
The price of the furniture from Jardins of Paris is €1980
The price of the furniture from Outways of New York is $2250

The exchange rates are

£1 = €1.34

£1 = $1.52

Which company sells this furniture at the lowest price?
You must show how you get your answer.

London : £1480

Paris : 1 : €1·34

€1980 ÷ 1·34 = £1477·61

New York : 1 : $1·52

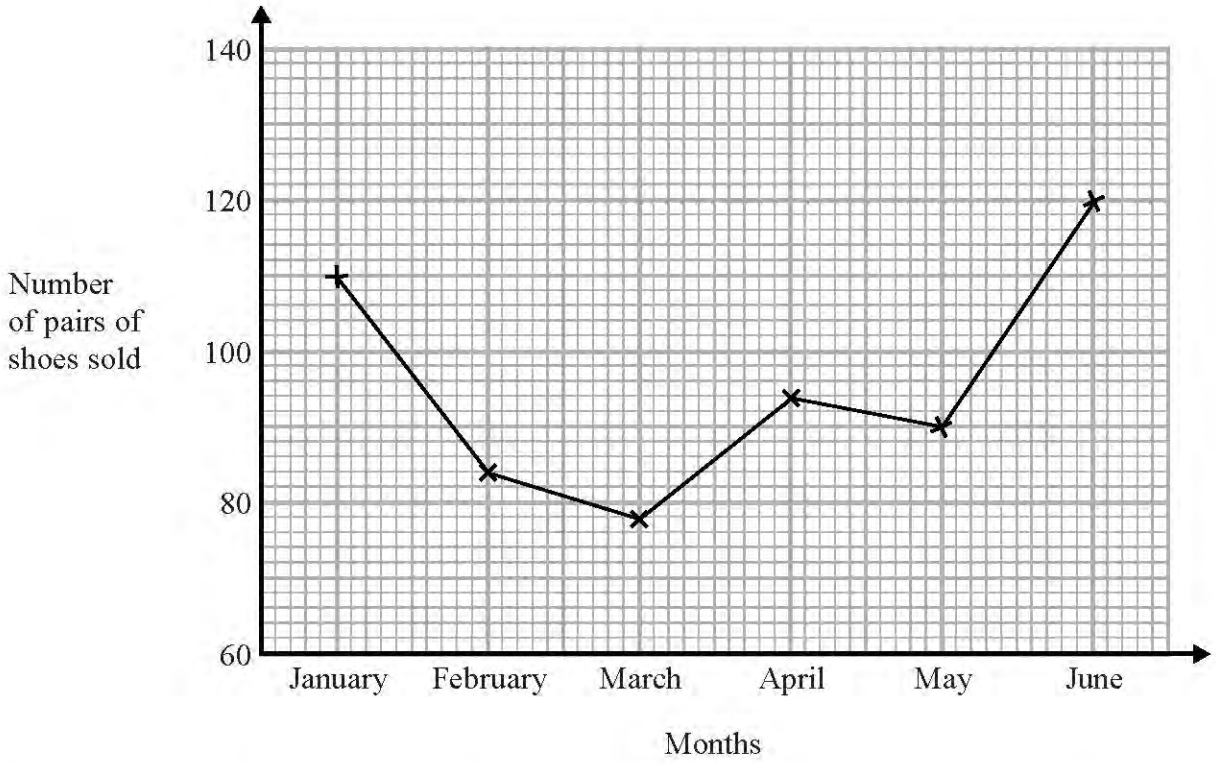
$2250 ÷ 1·52 = £1480·26

£1477·61 is the lowest

∴ Jardins of Paris is the cheapest

(Total for Question 2 is 3 marks)

3 The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

Did the shoe shop meet this sales target?
You must show how you get your answer.

$$\text{Mean} = \frac{\text{Total}}{\text{Freq}} = \frac{110+84+78+94+90+120}{6}$$

$$= \frac{576}{6} = 96$$

$96 = 96$

Yes, the target was met

(Total for Question 3 is 3 marks)

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4 The grouped frequency table gives information about the heights of 30 students.

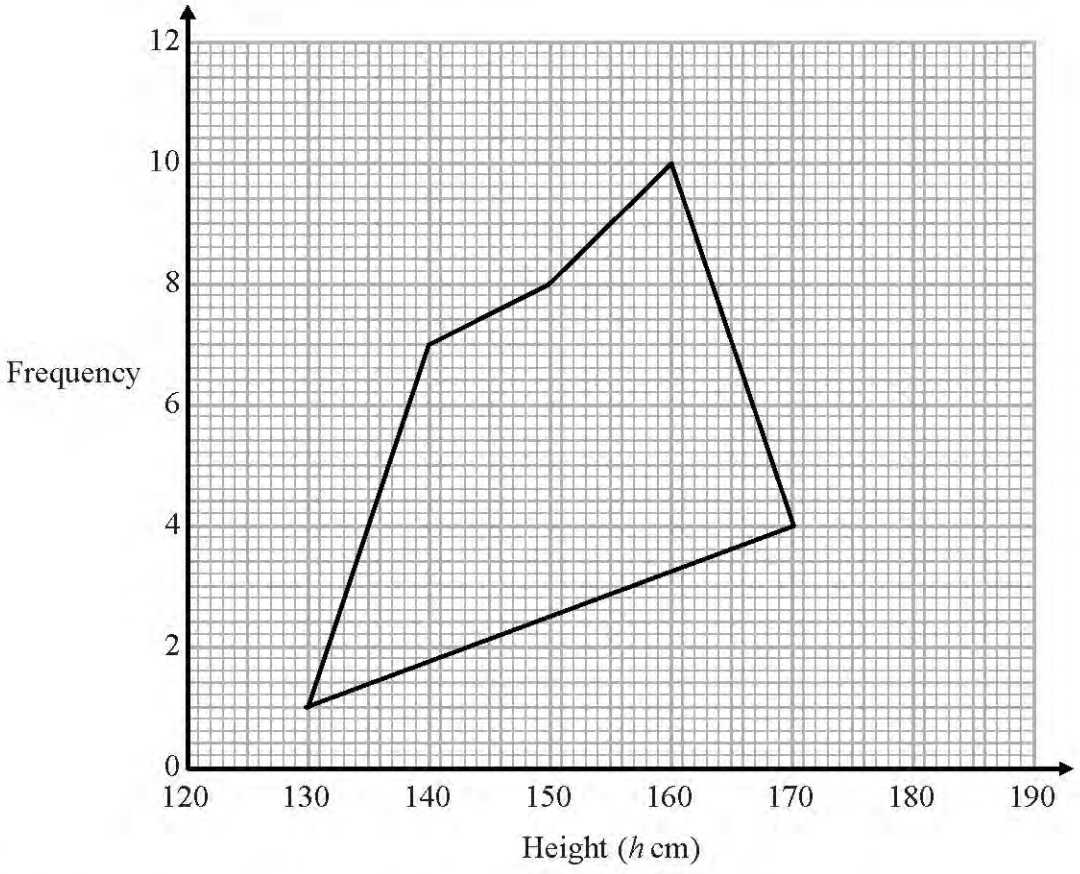
Height (h cm)	Frequency
$130 < h \leqslant 140$	1
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	8
$160 < h \leqslant 170$	10
$170 < h \leqslant 180$	4

(a) Write down the modal class interval.

10 is the highest $160 < h \leqslant 170$

(1)

This incorrect frequency polygon has been drawn for the information in the table.



(b) Write down two things wrong with this incorrect frequency polygon.

1 The points should be plotted at mid intervals

2 The 1st and last points shouldn't be joined

(2)

(Total for Question 4 is 3 marks)

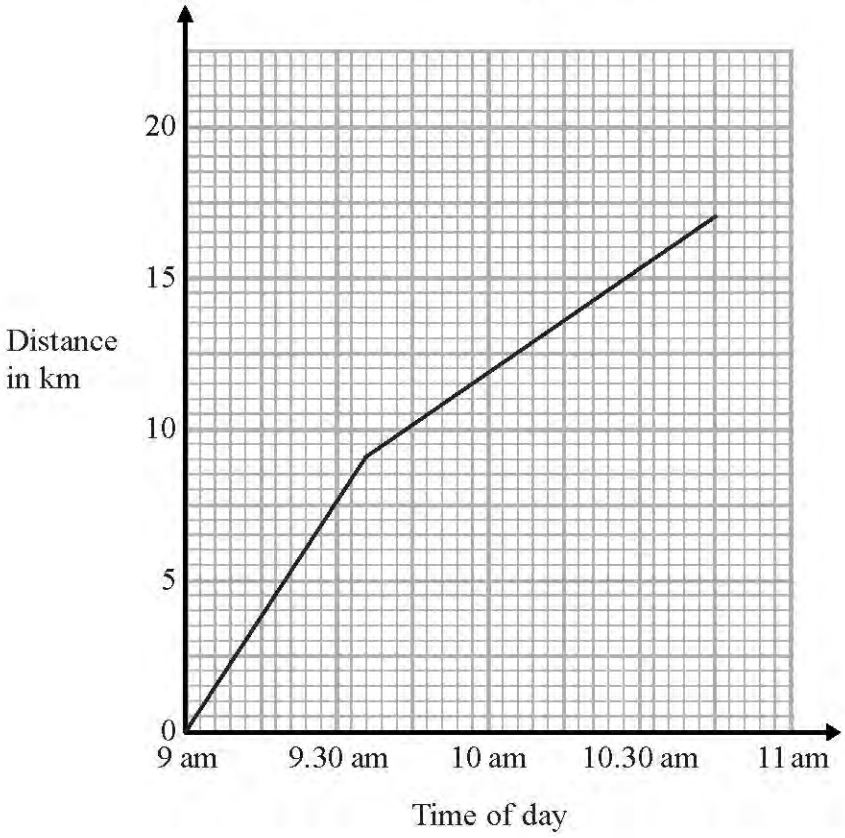
speed = dist / time

dist = speed × time = 15 × 0.6 = 9

5 At 9 am, Bradley began a journey on his bicycle.

From 9 am to 9.36 am, he cycled at an average speed of 15 km/h. (36min = 0.6h)
From 9.36 am to 10.45 am, he cycled a further 8 km.

(a) Draw a travel graph to show Bradley's journey. 9 + 8 = 17 km



(3)

From 10.45 am to 11 am, Bradley cycled at an average speed of 18 km/h.

(b) Work out the distance Bradley cycled from 10.45 am to 11 am. — 15min = $\frac{1}{4}$ h

Dist = speed × time

$= 18 \times \frac{1}{4} = 4.5$ km

4.5 km

(2)

(Total for Question 5 is 5 marks)

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6 Toby invested £7500 for 2 years in a savings account.
He was paid 4% per annum compound interest.

How much money did Toby have in his savings account at the end of 2 years?

100% + 4% = 104% = 1.04 multiplier

7500×1.04^2 ← 2 years $= 8112$

↓ Starting money

£ 8112

(Total for Question 6 is 2 marks)

7 Becky has some marbles.
Chris has two times as many marbles as Becky. 1
Dan has seven more marbles than Chris. 2

They have a total of 57 marbles. 3

Dan says,
"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.

① $\frac{c}{2} = b$

② $d = c + 7$

③ $b + c + d = 57$

$\frac{c}{2} + c + c + 7 = 57$

$\frac{5}{2}c + 7 = 57$

$\frac{5}{2}c = 50$

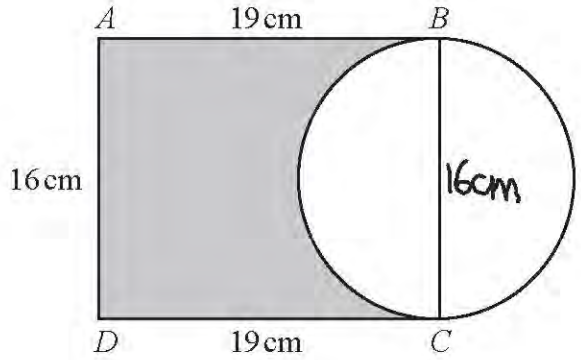
$c = 20$

Becky has $\frac{20}{2} = 10$ marbles
Chris has 20 marbles
Dan has $20 + 7 = 27$ marbles

As Chris has 20 marbles, 60 in total are required to share equally

(Total for Question 7 is 3 marks)

8 Here is a diagram showing a rectangle, $ABCD$, and a circle.



BC is a diameter of the circle. $r=8$

Calculate the percentage of the area of the rectangle that is shaded.
Give your answer correct to 1 decimal place.

Area of rect $= 16 \times 19 = 304 \text{cm}^2$

Area of shaded = Area of rect − $\frac{1}{2}$ Area of semi circle

$= 304 - \frac{1}{2} \times 8^2 \times \pi$

$= 304 - 32\pi$

Percentage $= \frac{304 - 32\pi}{304} \times 100$

$= 66.93\ldots$

3 > 5 round down

66.9 %

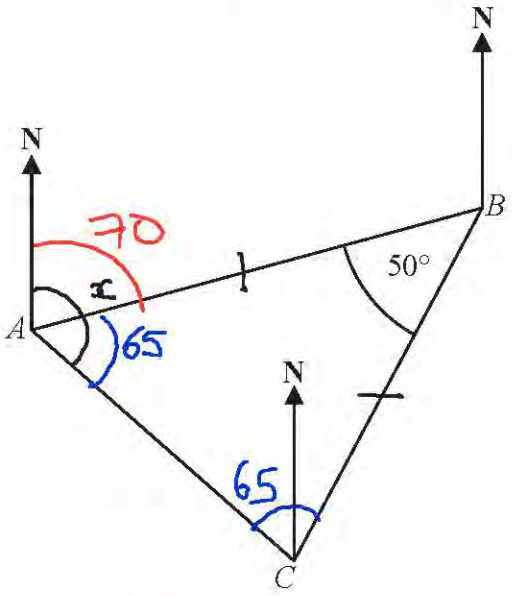
(Total for Question 8 is 4 marks)

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9 The diagram shows the positions of three points, A, B and C, on a map.



The bearing of B from A is 070° (1)

Angle ABC is 50°
$AB = CB$

Work out the bearing of C from A.

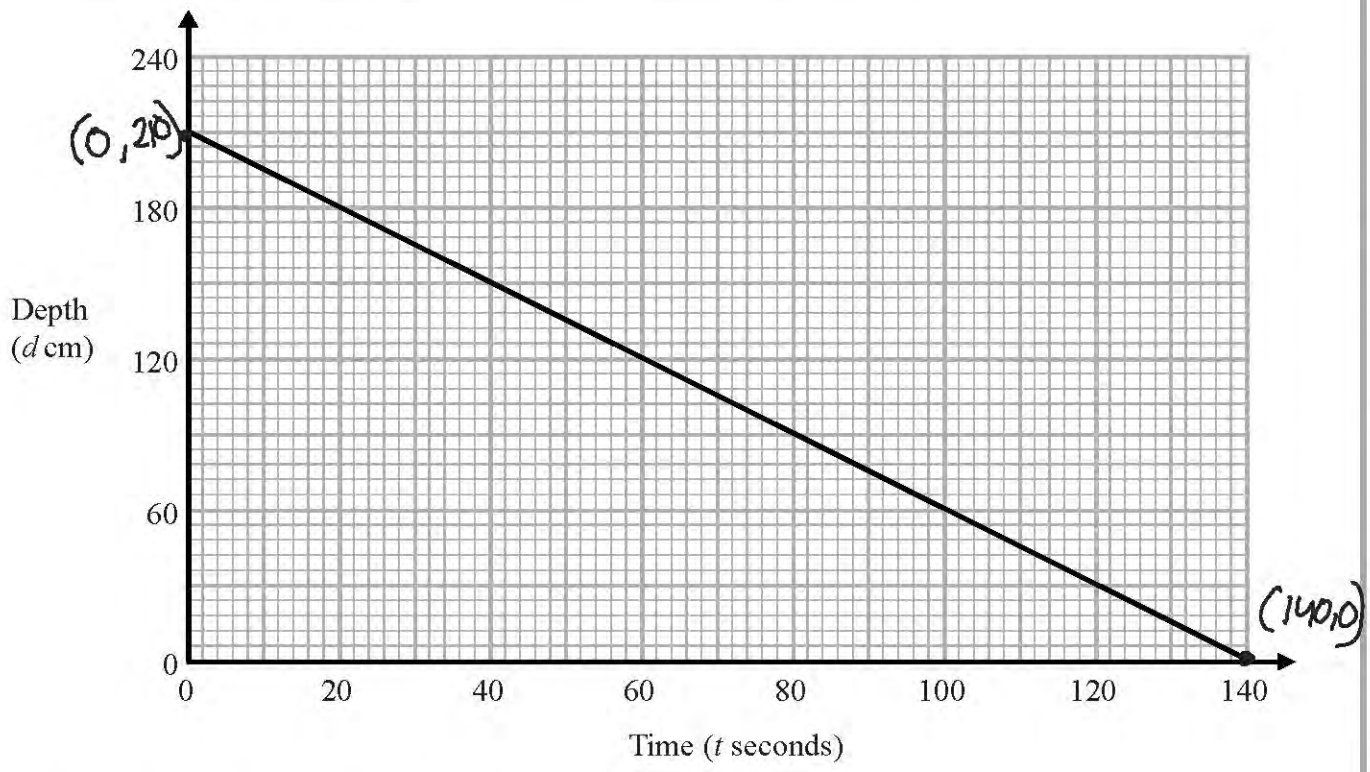
$\frac{180-50}{2} = 65°$ Isosceles Triangle

$70+65 = 135$

135 °

(Total for Question 9 is 3 marks)

10 The graph shows the depth, d cm, of water in a tank after t seconds.



(a) Find the gradient of this graph.

gradient $= \frac{y_1 - y_2}{x_1 - x_2} = \frac{210 - 0}{0 - 140}$

$= \frac{210}{-140} = -1.5$

(2)

(b) Explain what this gradient represents.

The rate at which water flows out of the bank

(1)

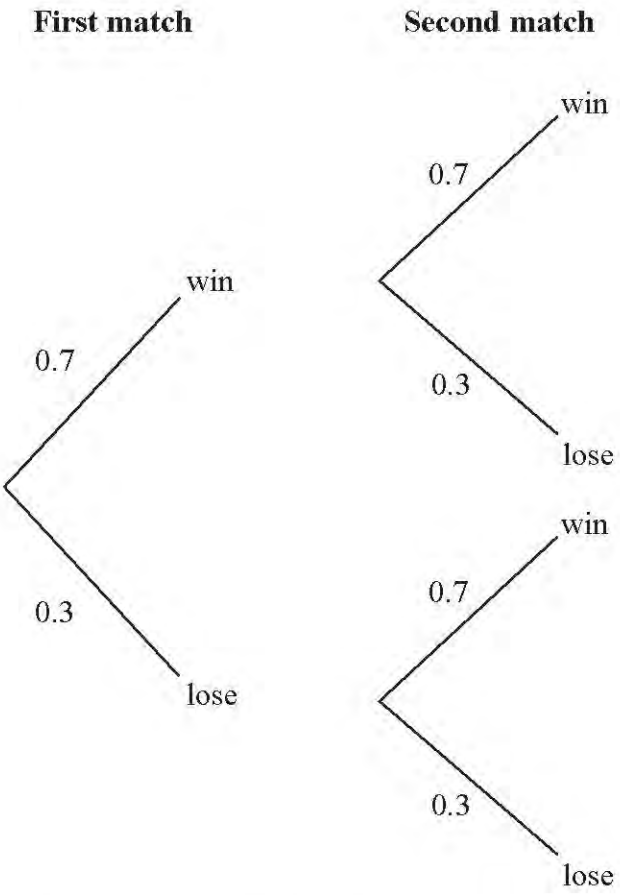
(Total for Question 10 is 3 marks)

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11 Finlay plays two tennis matches.

The probability that he will win a match and the probability that he will lose a match are shown in the probability tree diagram.



(a) Work out the probability that Finlay wins both matches.

win × win

$0.7 \times 0.7 = 0.49$

0.49

(2)

(b) Work out the probability that Finlay loses at least one match.

1 − P(wins both)

$1 - 0.49 = 0.51$

0.51

(2)

(Total for Question 11 is 4 marks)

12 (a) Find the reciprocal of 2.5

1 over 2.5

$\frac{1}{2.5} \overset{\times 2}{=} \frac{2}{5}$

$\frac{2}{5}$

(1)

(b) Work out $\sqrt[3]{\frac{4.3 \times \tan 39^\circ}{23.4 - 6.06}}$

Give your answer correct to 3 significant figures.

$\sqrt[3]{\frac{4.3 \times 0.8097540382}{23.4 - 6.06}}$

$= 0.586 \quad (3sf)$

0.586

(2)

(Total for Question 12 is 3 marks)

13 Show that

$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$

for all values of x.

1 2 3

$1 \times 2 = 3x^2 + 15x - x - 5$

$1 \times 2 \times 3 = (3x^2 + 14x - 5)(4x - 3)$

$12x^3 - 9x^2 + 56x^2 - 42x - 20x + 15$

$= 12x^3 + 47x^2 - 62x + 15$

(Total of Question 13 is 3 marks)

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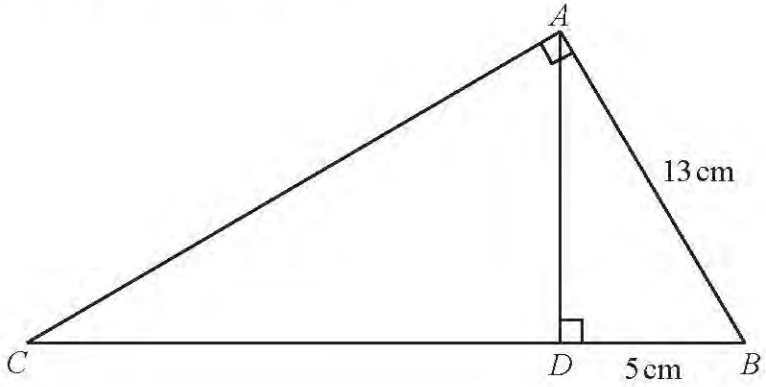
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14 *ABC* and *ABD* are two right-angled triangles.



Angle *BAC* = angle *ADB* = 90°

AB = 13 cm
DB = 5 cm

Work out the length of *CB*.

△ABC and △ADB are similar by RHS

sf : $\frac{5}{13} = \frac{13}{CB}$

$CB = \frac{13}{\frac{5}{13}} = \frac{169}{5} = 33.8\text{cm}$

33.8 cm

(Total for Question 14 is 3 marks)

15 A pendulum of length L cm has time period T seconds.
T is directly proportional to the square root of L.

The length of the pendulum is increased by 40%. — × 1.4

Work out the percentage increase in the time period.

$T \propto \sqrt{L}$

$T = k\sqrt{L}$

$T_1 = k\sqrt{1.4L}$

$T_1 = \sqrt{1.4} \times k \times \sqrt{L}$

$T_1 = 1.183\ldots k\sqrt{L}$

percentage increase $= (1.183 - 1) \times 100$

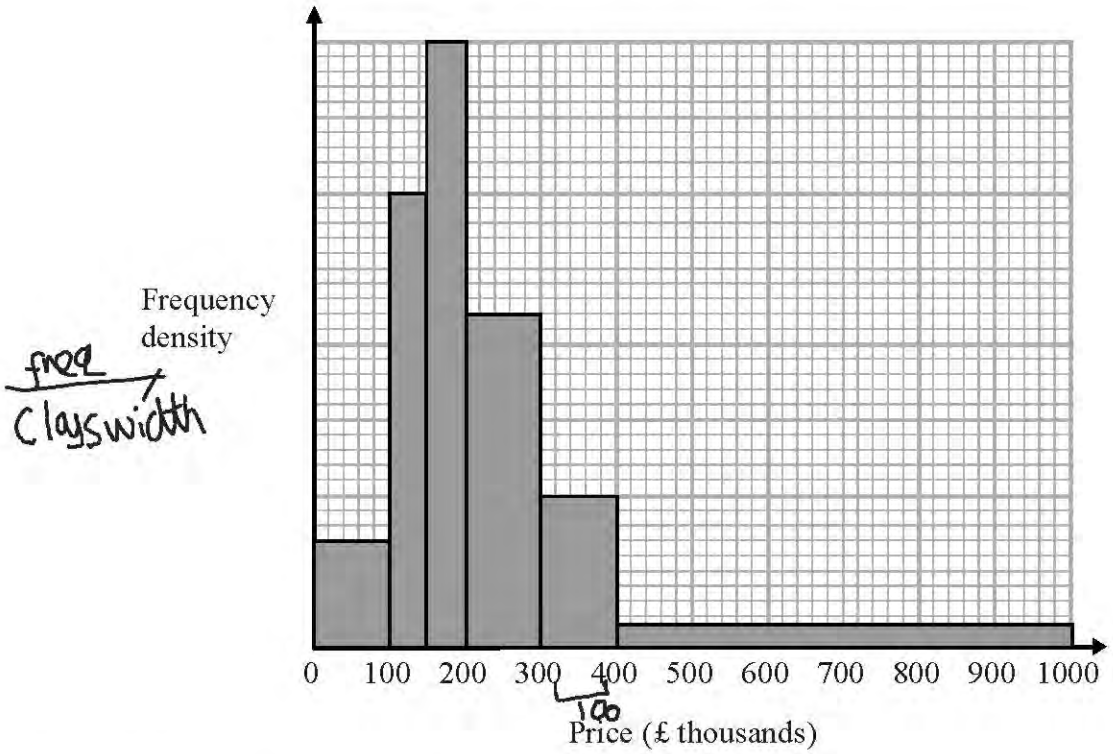
$= 18.3$ %

(Total for Question 15 is 3 marks)

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16 The histogram gives information about house prices in a village in 2015



20 houses in the village have a price between £300 000 and £400 000

Work out the number of houses in the village with a price under £200 000

freq = freq dens x class width

20 = fd x 100

fd = 0.2

1 division = 0.2 ÷ 10 = 0.02

7 x 0.02 x 100 + 30 x 0.02 x 50 + 40 x 0.02 x 50

= 84

84

(Total for Question 16 is 3 marks)

17 Here are the first 5 terms of a quadratic sequence.

1 3 7 13 21

Find an expression, in terms of n, for the nth term of this quadratic sequence.

1, 3, 7, 13, 21

+2 +4 +6 +8

+2 +2

$-2 \times \frac{1}{2} n^2 = n^2$

seq	1	3	7	13
$-n^2$	1	4	9	16
	0	−1	−2	−3

−1 −1

$-n+1$

$n^2 - n + 1$

(Total for Question 17 is 3 marks)

18 $f(x) = 3x^2 - 2x - 8$

Express $f(x + 2)$ in the form $ax^2 + bx$

$3(x+2)^2 - 2(x+2) - 8$

$= 3(x^2 + 4x + 4) - 2x - 4 - 8$

$= 3x^2 + 12x + 12 - 2x - 4 - 8$

$= 3x^2 + 10x$

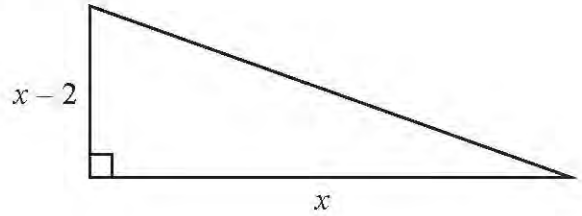
$3x^2 + 10x$

(Total for Question 18 is 3 marks)

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19 Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm².

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

Area = $\frac{1}{2} \times b \times h$

$= \frac{x(x-2)}{2} = \frac{x^2 - 2x}{2}$

$\frac{x^2 - 2x}{2} = \frac{5}{2}$

$\underbrace{1}_{a} x^2 \underbrace{- 2x}_{b} \underbrace{- 5}_{c} = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{+2 \pm \sqrt{4 + 20}}{2}$

$x = 1 \pm \sqrt{6}$ $\quad x = 1 + \sqrt{6}$ ← can't be negative

$a^2 + b^2 = c^2$

hypotenuse $= \sqrt{x^2 + (x-2)^2} = \sqrt{(1+\sqrt{6})^2 + (\sqrt{6}-1)^2}$

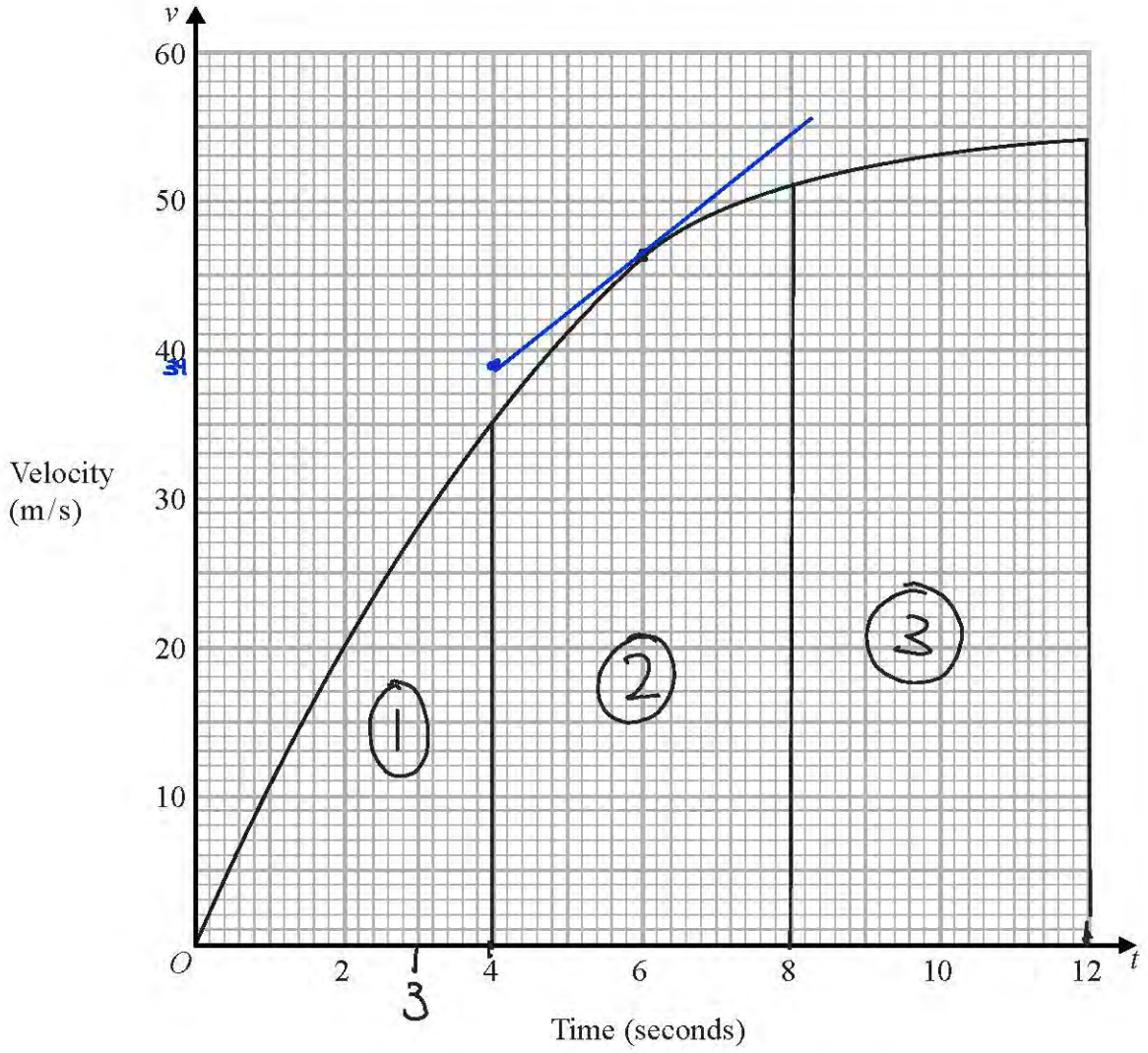
$= \sqrt{14}$

Perimeter $= \sqrt{14} + 1 + \sqrt{6} + \sqrt{6} - 1$

$= \sqrt{14} + 2\sqrt{6} = 8.64$ cm

(Total for Question 19 is 6 marks)

20 The graph shows information about the velocity, v m/s, of a parachutist t seconds after leaving a plane.



(a) Work out an estimate for the acceleration of the parachutist at $t = 6$

Draw tangent at t=6

$y_1 - y_2$ / $x_1 - x_2$ gradient $= \frac{46 - 39}{6 - 4} = \frac{7}{2} = 3.5$ 3.5 m/s²

(2)

(b) Work out an estimate for the distance fallen by the parachutist in the first 12 seconds after leaving the plane. Use 3 strips of equal width.

split in trapezium + triangle

$\frac{12}{3} = 4$ sec width

① $\frac{1}{2} \times 4 \times 35 = 70$

② $\frac{1}{2} \times 4 \times (35+51) = 172$

③ $\frac{1}{2} \times 4 \times (51+54) = 210$

$70 + 172 + 210$

$= 452$ m

(3)

(Total for Question 20 is 5 marks)

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21 The number of bees in a beehive at the start of year n is P_n.
The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$

At the start of 2015 there were 9500 bees in the beehive.

How many bees will there be in the beehive at the start of 2018?

$P_{2016} = 1.05(9500 - 250)$
$= 9712.5$

$P_{2017} = 9935.625$

$P_{2018} = 10169.90625$

nearest whole number 10170

(Total for Question 21 is 3 marks)

22 $D = \dfrac{x}{y}$

x = 99.7 correct to 1 decimal place.
y = 67 correct to 2 significant figures.

Work out an upper bound for D.

Bounds : $99.65 \leqslant x < 99.75$

$66.5 \leqslant y < 67.5$

UB for D = $\dfrac{UB}{LB} = \dfrac{99.75}{66.5} = \dfrac{3}{2}$

1.5

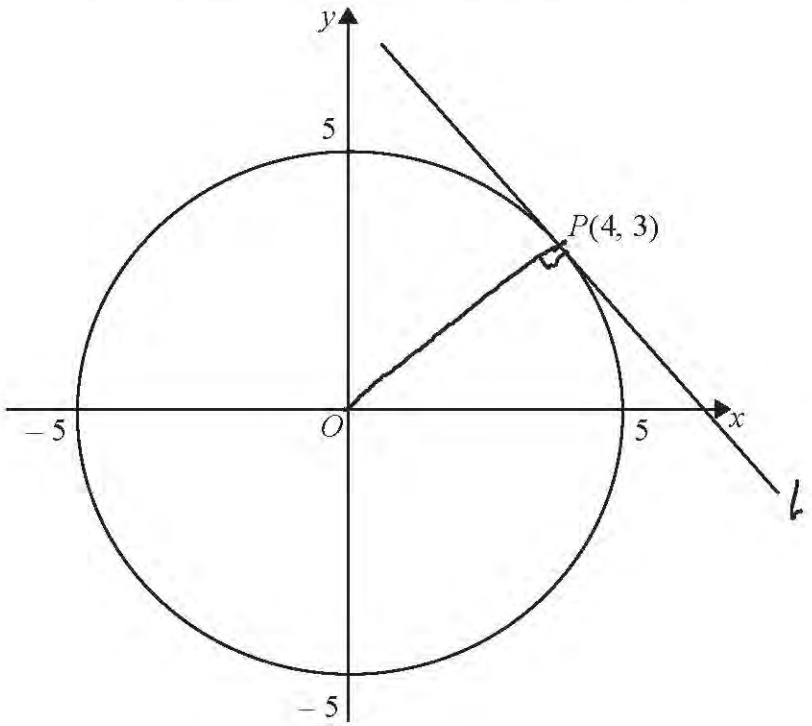
(Total for Question 22 is 3 marks)

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23 Here is a circle, centre O, and the tangent to the circle at the point $P(4, 3)$ on the circle.



Find an equation of the tangent at the point P.

gradient of OP $= \frac{3-0}{4-0} = \frac{3}{4}$

tangent meets at 90°, so gradient of l is negative reciprocal of $\frac{3}{4} = -\frac{4}{3}$

$y = -\frac{4}{3}x + c$

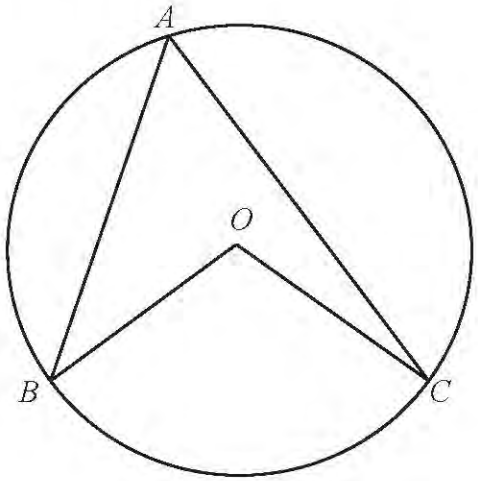
$3 = -\frac{4}{3} \times 4 + c$

$3 + \frac{16}{3} = c = \frac{25}{3}$

$y = -\frac{4}{3} + \frac{25}{3}$

(Total for Question 23 is 3 marks)

24 A, B and C are points on the circumference of a circle centre O.



Prove that angle BOC is twice the size of angle BAC.

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

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