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	Paper Reference
Time: 1 hour 30 minutes	**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)

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
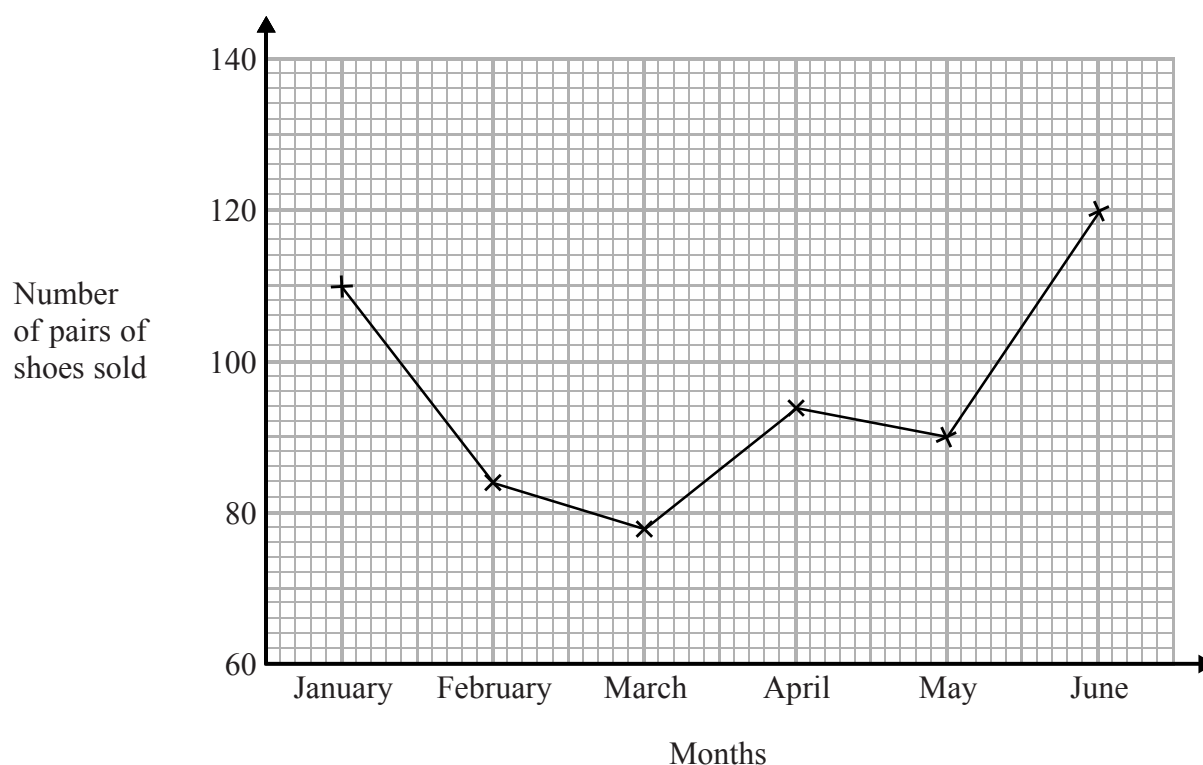$2250 ÷ 1·52 = £1480·26

£1477·61 is the lowest
∴ Jardins of Paris is the cheapest

<div align="right">

(Total for Question 2 is 3 marks)

</div>

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)

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.

Frequency (*y*-axis) vs Height (*h* cm) (*x*-axis)
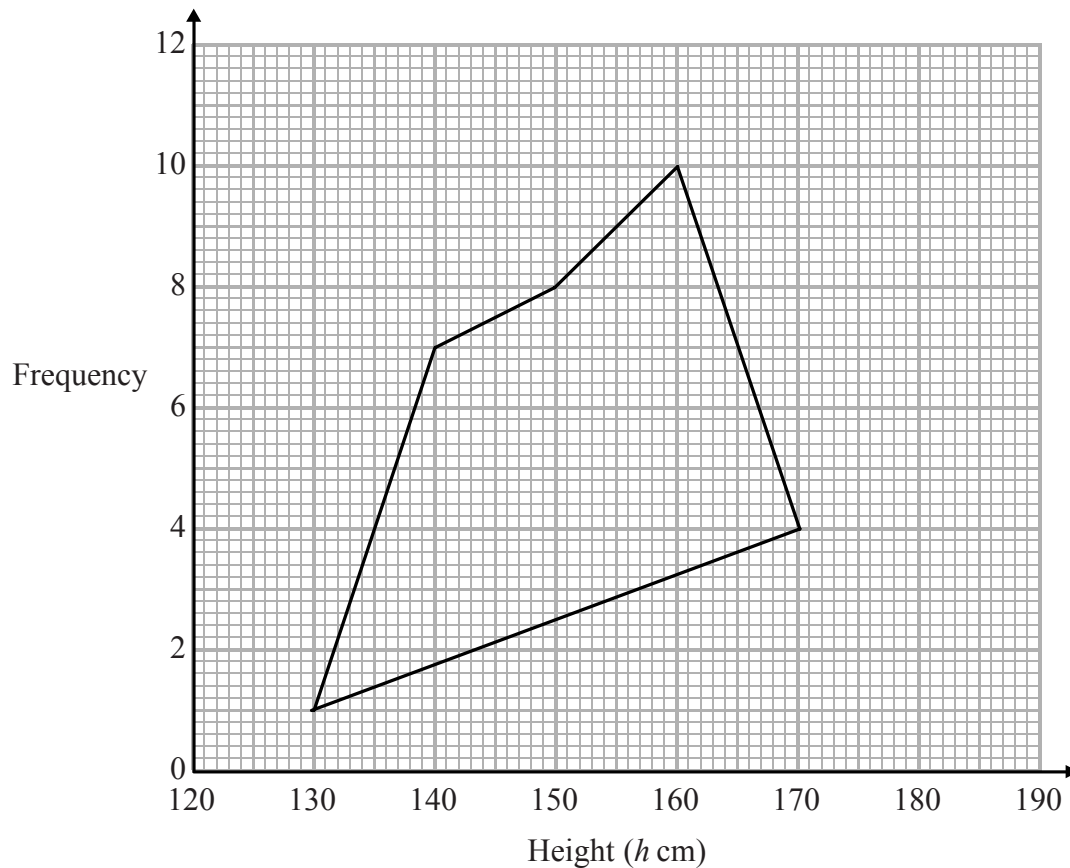
(b) Write down two things wrong with this incorrect frequency polygon.

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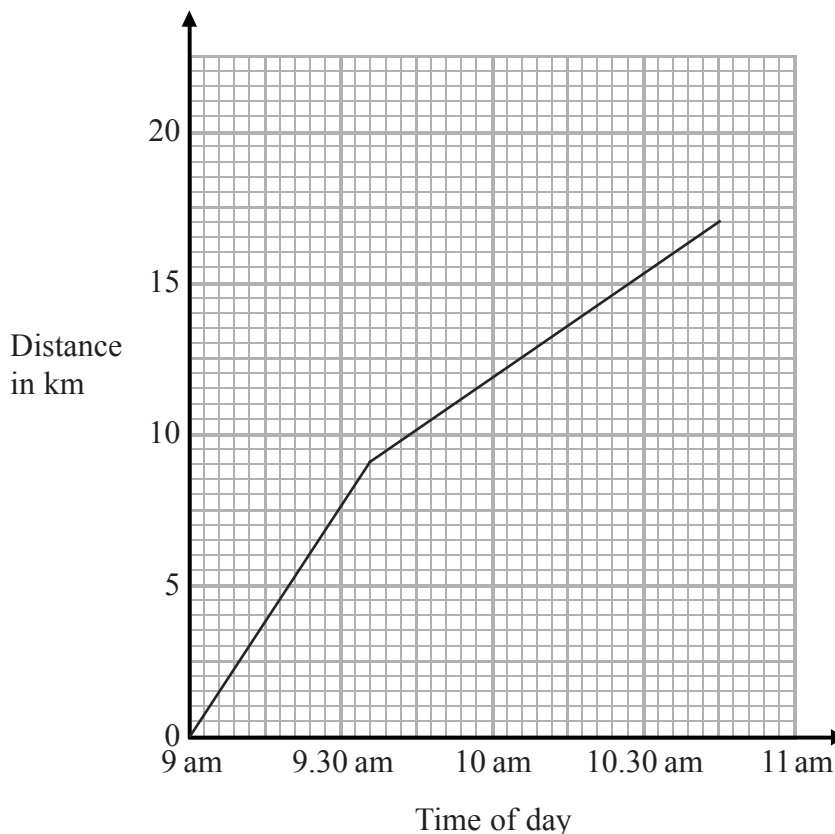
5 At 9 am, Bradley began a journey on his bicycle.

36min = 0.6h

From 9 am to 9.36 am, he cycled at an average speed of 15 km/h.
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 = 17km

$speed = \dfrac{dist}{time}$

$dist = speed \times time$
$= 15 \times 0.6$
$= 9$

(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 = $\dfrac{1}{4}$h

$Dist = speed \times time$

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

4.5 .... km

(2)

(Total for Question 5 is 5 marks)

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?

$$100\% + 4\% = 104\% = 1.04 \text{ multiplier}$$

$$7500 \times 1.04^{2} = 8112$$

↙ 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 $b + c + d = 57$

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

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

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

$$c = 20$$

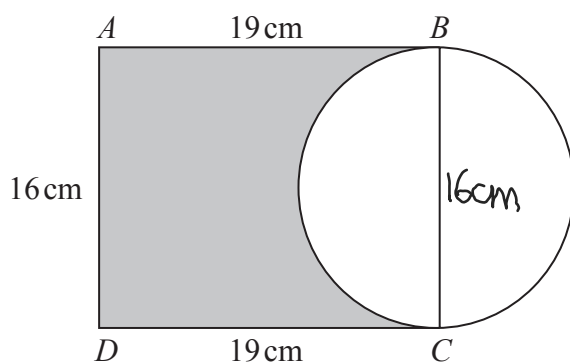Becky has $\frac{20}{2} = 10$ marbles
Chris has 20 marbles
Dan has $20 + 7 = 27$ marbles

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.

A 19 cm *B*

16 cm   16cm

D 19 cm *C*

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 $= 16 \times 19 = 304 \, cm^2$

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

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

$= 304 - 32\pi$

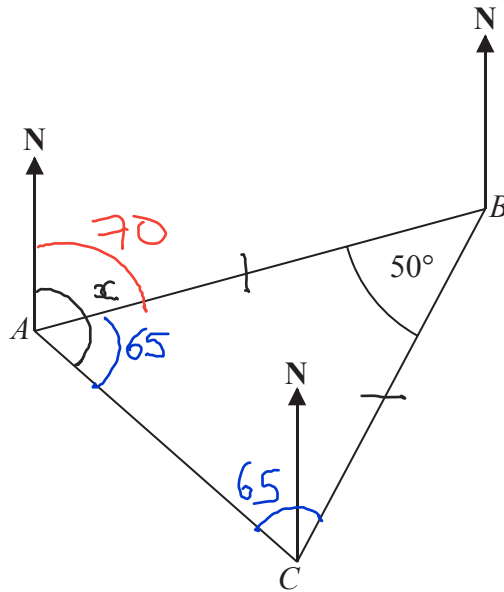Percentage $= \dfrac{304 - 32\pi}{304} \times 100$

$= 66.93\%$

3 > 5 round down

66.9 %

(Total for Question 8 is 4 marks)

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

N

N

70

x

50°

B

A

65

N

65

C

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
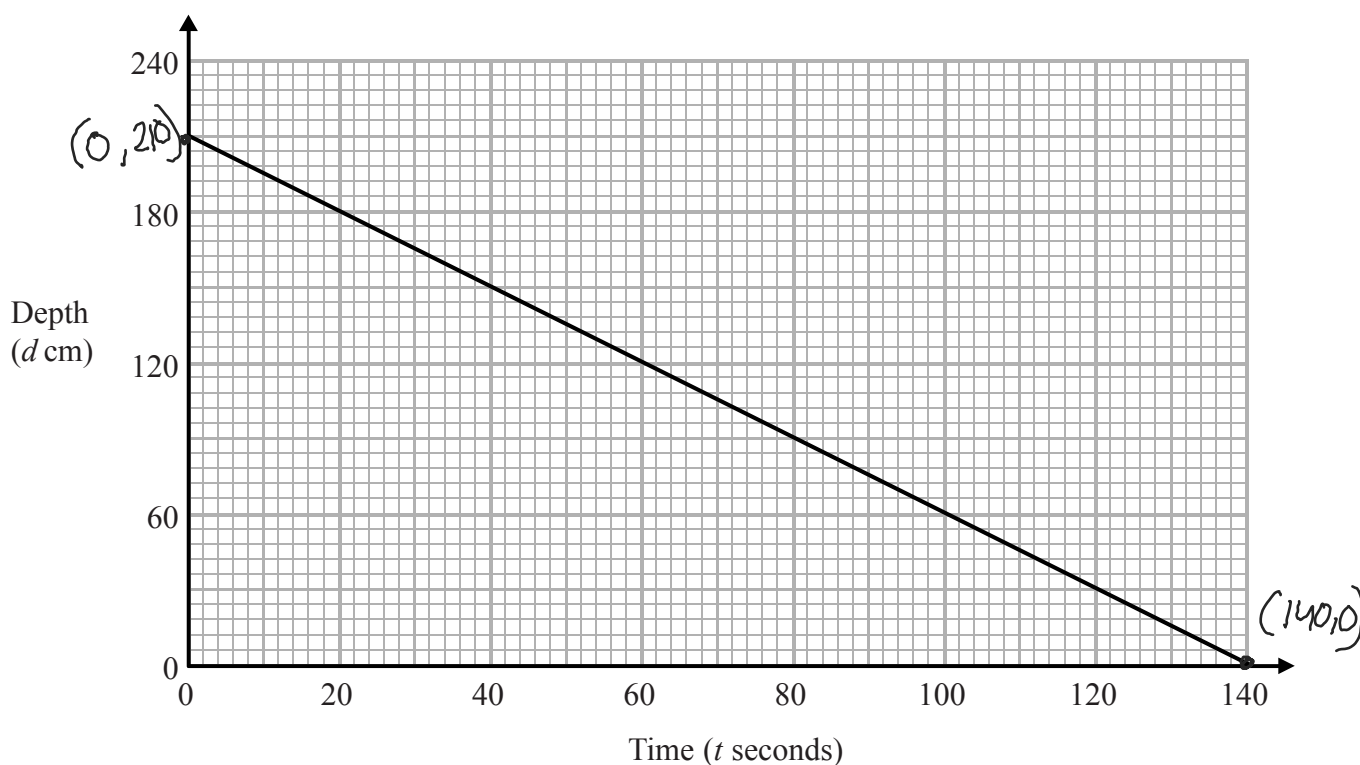
$$70+65 = 135$$

135   °

(Total for Question 9 is 3 marks)

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

(0, 210)

240

180

Depth
(*d* cm)   120

60

0

0   20   40   60   80   100   120   140

(140, 0)

Time (*t* seconds)

(a) Find the gradient of this graph.

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

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

(2)

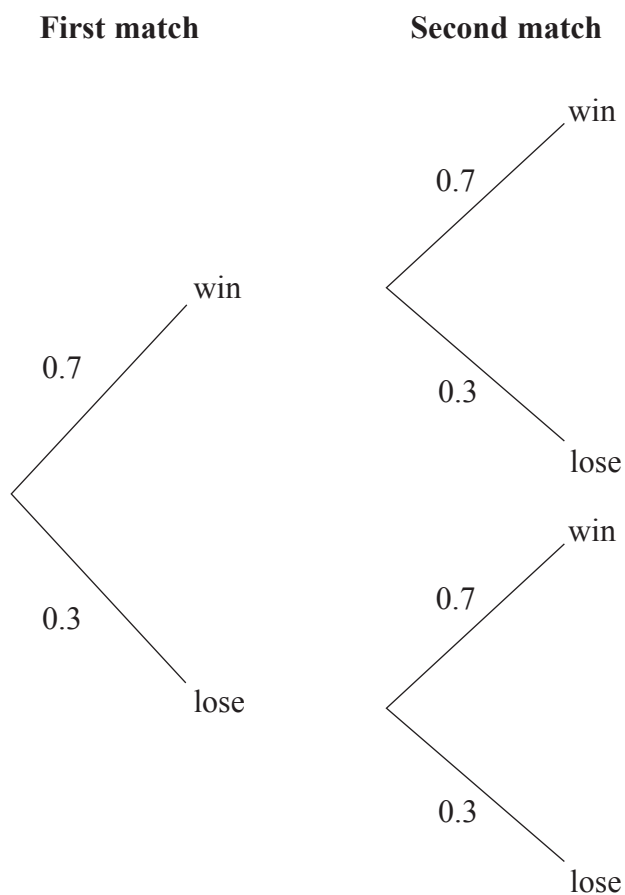(b) Explain what this gradient represents.

The rate at which water flows out of the bank

(1)

(Total for Question 10 is 3 marks)

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.

First match   **Second match**

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

win × win

$0.7 × 0.7 = 0.49$

.... 0.49 ....

(2)

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

$1 - P(\text{wins both})$

$1 - 0.49 = 0.51$

.... 0.51 ....

(2)

(Total for Question 11 is 4 marks)

12 (a) Find the reciprocal of 2.5 ← 1 over 2.5

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

$\dfrac{2}{5}$

(1)

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

Give your answer correct to 3 significant figures.

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

$$= 0.586 \quad (3sf)$$

0.586

(2)

(Total for Question 12 is 3 marks)

13 Show that

$$\overset{1 \quad 2 \quad 3}{(3x - 1)(x + 5)(4x - 3)} = 12x^3 + 47x^2 - 62x + 15$$

for all values of x.

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

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

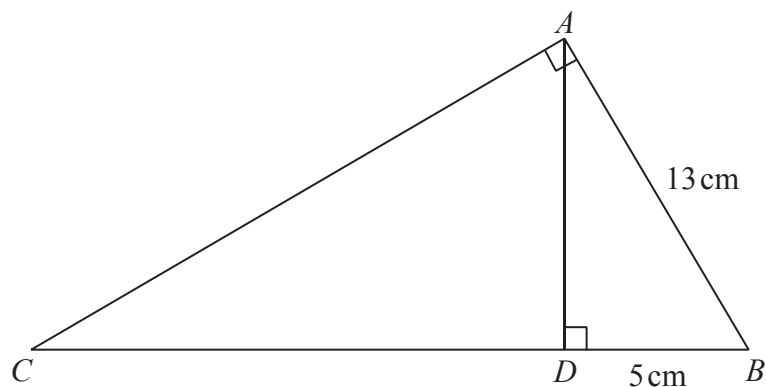$12x^2 - 9x^2 + 56x^2 - 42x - 20x + 15$

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

(Total of Question 13 is 3 marks)

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*.

$$\triangle ABC \text{ and } \triangle ADB \text{ are similar by RHS}$$

$$Sf: \qquad \frac{5}{13} = \frac{13}{CB}$$

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

_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%. $\longrightarrow \times 1.4$

Work out the percentage increase in the time period.

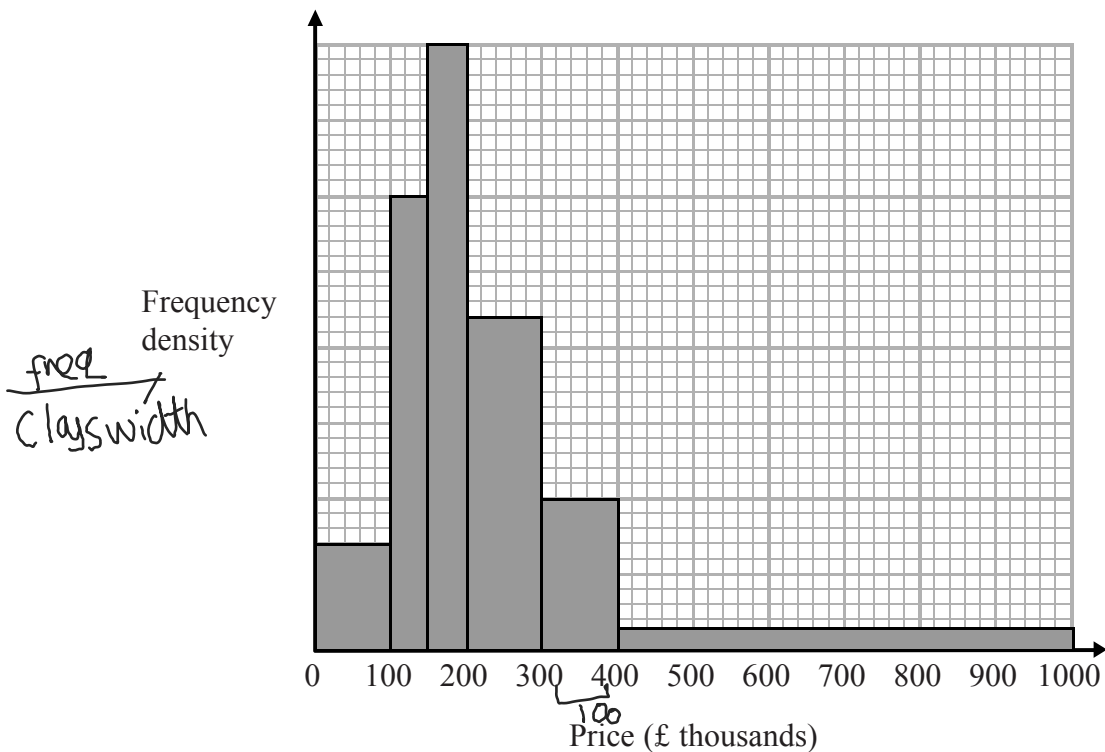$$T \propto \sqrt{L}$$
$$T = K\sqrt{L}$$

$$T_1 = K\sqrt{1.4L}$$

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

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

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

$= $ ....**18.3**............ %

(Total for Question 15 is 3 marks)

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

Frequency density

$$\frac{freq}{Classwidth}$$

Price (£ thousands)

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 × class width

20 = fd × 100

fd = 0.2

1 division = 0.2 ÷ 10 = 0.02

7 × 0.02 × 100 + 30 × 0.02 × 50 + 40 × 0.02 × 50

= 84

84

(Total for Question 16 is 3 marks)

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

$$1 \qquad 3 \qquad 7 \qquad 13 \qquad 21$$

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

$$1, 3, 7, 13, 21$$

$$+2 \quad +4 \quad +6 \quad +8$$

$$+2 \quad +2$$

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

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

$$0, -1, -2, -3$$

$$-1 \quad -1$$

$$-n+1$$

$$\underline{n^2 - n + 1}$$

(Total for Question 17 is 3 marks)

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

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

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

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

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

$$= 3x^2 + 10x$$

$$\underline{3x^2 + 10x}$$

(Total for Question 18 is 3 marks)

19 Here is a right-angled triangle.
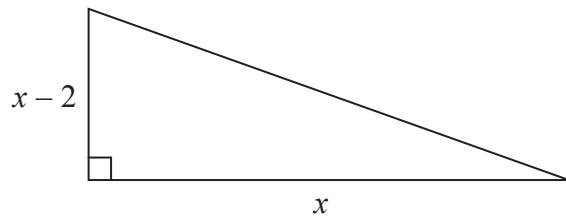
All measurements are in centimetres.
The area of the triangle is 2.5 cm².

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

$$\text{Area} = \frac{1}{2} \times b \times h$$
$$= \frac{x(x-2)}{2} = \frac{x^2 - 2x}{2}$$
$$\frac{x^2 - 2x}{2} = \frac{5}{2}$$
$$\frac{1}{a}x^2 - \underbrace{2}_{b}x - \underbrace{5}_{c} = 0$$

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

$$x = 1 \pm \sqrt{6} \qquad x = 1 + \sqrt{6} \quad \leftarrow \text{can't be negative}$$
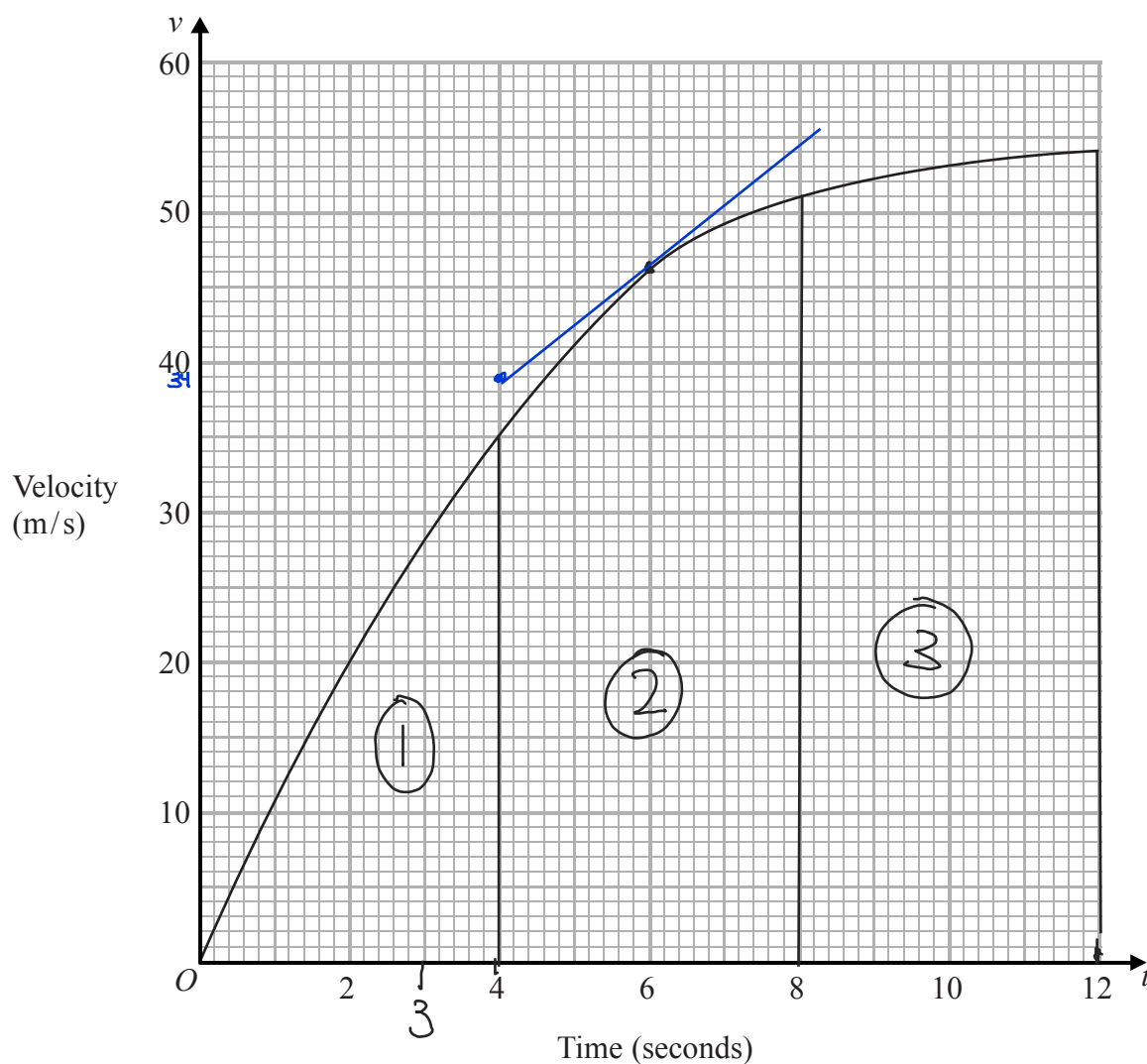
$$a^2 + b^2 = c^2$$
$$\text{hypotenuse} = \sqrt{x^2 + (x-2)^2} = \sqrt{(1+\sqrt{6})^2 + (\sqrt{6}-1)^2}$$
$$= \sqrt{14}$$

$$\text{Perimeter} = \sqrt{14} + 1 + \sqrt{6} + \sqrt{6} - 1$$
$$= \sqrt{14} + 2\sqrt{6} \qquad = \underline{8.64} \quad \text{cm}$$

(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 $t = 6$

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

Draw tangent at $t=6$

..........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. Split in trapezium + triangle
Use 3 strips of equal width.

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

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

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

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

$70 + 172 + 210$

$= 452$

..........452.......... m

(3)

(Total for Question 20 is 5 marks)

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?

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

$$P_{2017} = 9935.625$$

$$P_{2018} = 10169.90625$$
$$\nearrow$$
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 $= \dfrac{UB}{LB} = \dfrac{99.75}{66.5} = \dfrac{3}{2}$

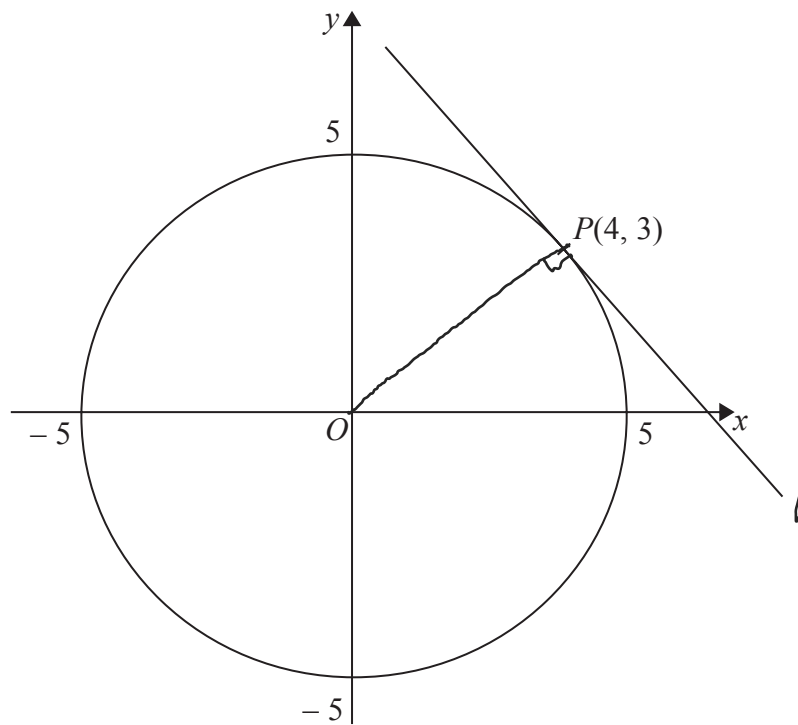.......................... 1.5 ....

(Total for Question 22 is 3 marks)

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 = $\dfrac{3-0}{4-0} = \dfrac{3}{4}$

tangent meets at 90°, so gradient of L is negative reciprocal of $\dfrac{3}{4} = \dfrac{-4}{3}$
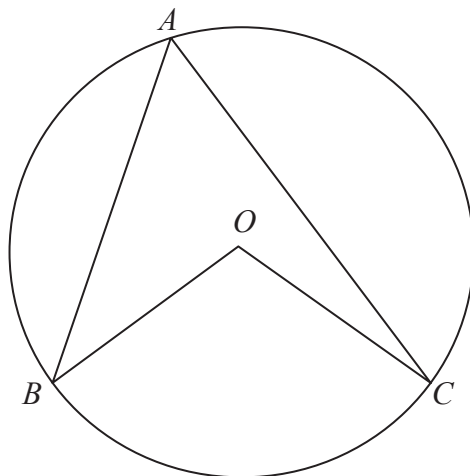
$y = \dfrac{-4}{3}x + c$

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

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

$\underset{\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots}{y = \dfrac{-4}{3} + \dfrac{25}{3}}$

(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