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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S 4 9 8 1 8 A 0 1 2 4

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 $w = 3t + 11$

$\Rightarrow 3t = w - 11$

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

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

(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

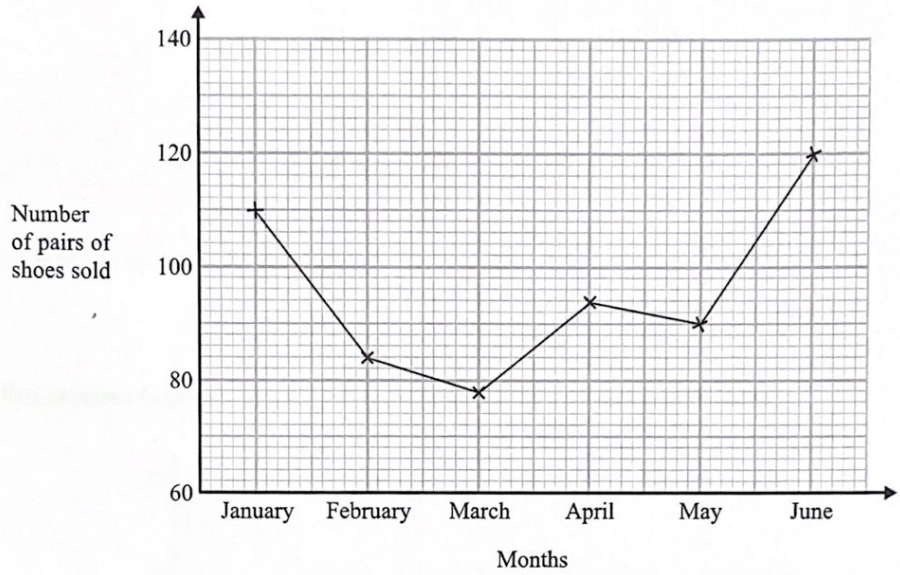
Paris $= \frac{1980}{1.34} =$ £1477.61

New York $= \frac{2250}{1.52} =$ £1480.26

Hence Paris is 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.

Mean sold = $\frac{110 + 84 + 78 + 94 + 90 + 120}{6}$

= 96

Therefore target was met.

(Total for Question 3 is 3 marks)

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

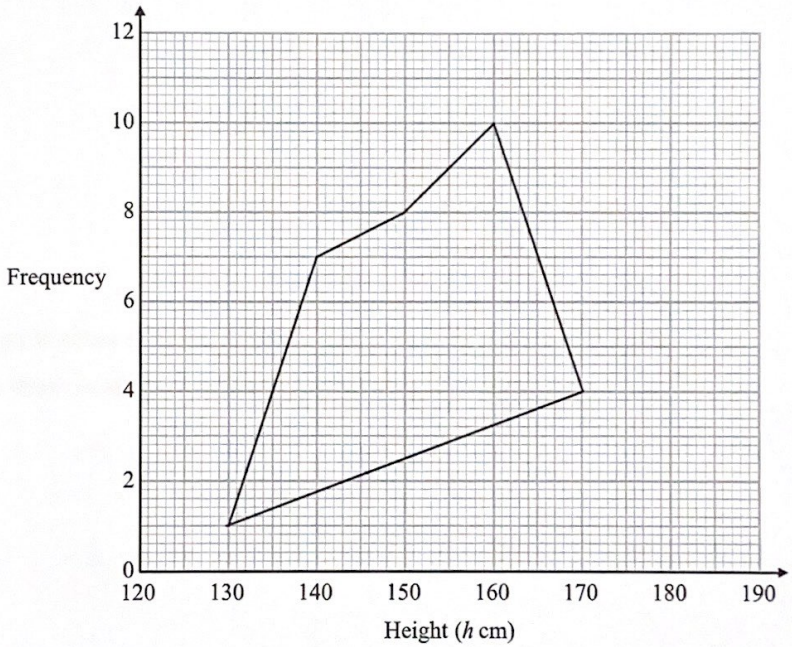
Height (h cm)	Frequency
$130 < h \leqslant 140$	1
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	8
$160 < h \leqslant 170$	10
$170 < h \leqslant 180$	4

(a) Write down the modal class interval.

$160 < h \leqslant 170$

(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-interval values.

2 The polygon should not be closed.

(2)

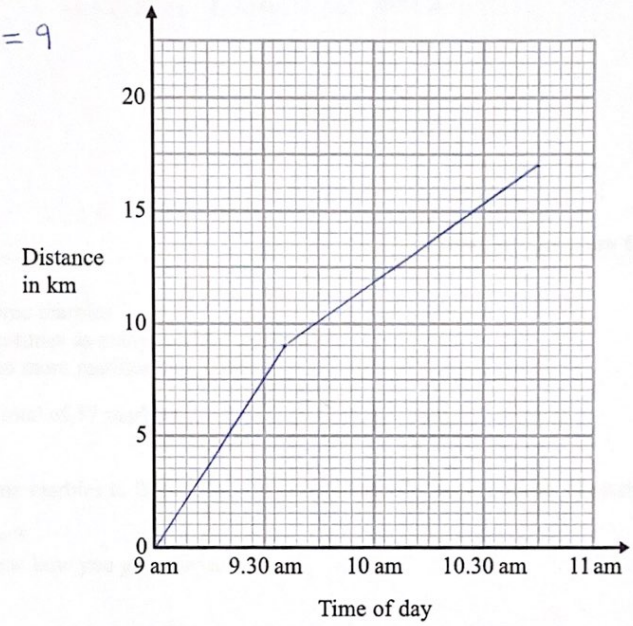
(Total for Question 4 is 3 marks)

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.
From 9.36 am to 10.45 am, he cycled a further 8 km.

(a) Draw a travel graph to show Bradley's journey.

$\frac{15 \times 36}{60} = 9$



(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.

$18 = \frac{\text{distance}}{0.25}$

$d = 4.5$ km

4.5 km

(2)

(Total for Question 5 is 5 marks)

DO NOT WRITE IN THIS AREA

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?

$7500 \times 1.04^2 = 8112$

£ 8112

(Total for Question 6 is 2 marks)

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

They have a total of 57 marbles.

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.

$57 \div 3 = 19$

$\frac{19}{2} = 9.5$, hence Chris cannot have 19 marbles as he has twice as many marbles as Becky, but Becky cannot have 9.5 marbles. So Dan is incorrect.

OR

let x = no. of marbles Becky has.

$x + 2x + (2x+7) = 57$

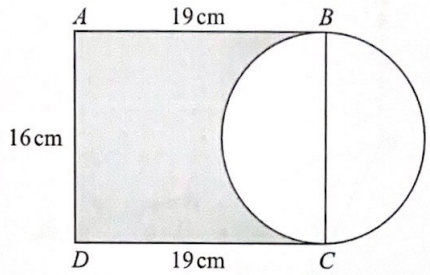
$\Rightarrow 5x = 50$

$\Rightarrow x = 10$

$\therefore$ Chris has 20 marbles (>19). So Dan is incorrect.

(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.

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

Area of ABCD = $19 \times 16 = 304 cm^2$

$\frac{1}{2}$ Area of circle $= \frac{1}{2} \times \pi \times 8^2 = 32\pi$

Shaded region $= 304 - 32\pi$

% of ABCD that is shaded $= \frac{304 - 32\pi}{304} \times 100$

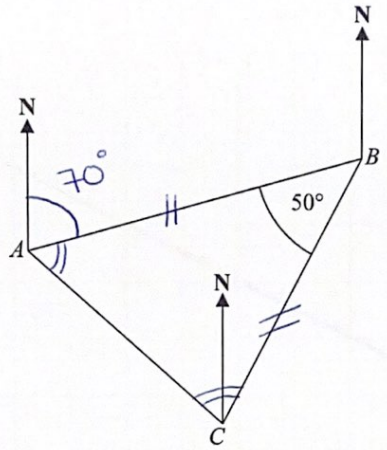
$= 66.9\%$

66.9 %

(Total for Question 8 is 4 marks)

S 4 9 8 1 8 A 0 8 2 4

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



The bearing of B from A is 070°

Angle ABC is 50°
$AB = CB$

Work out the bearing of C from A.

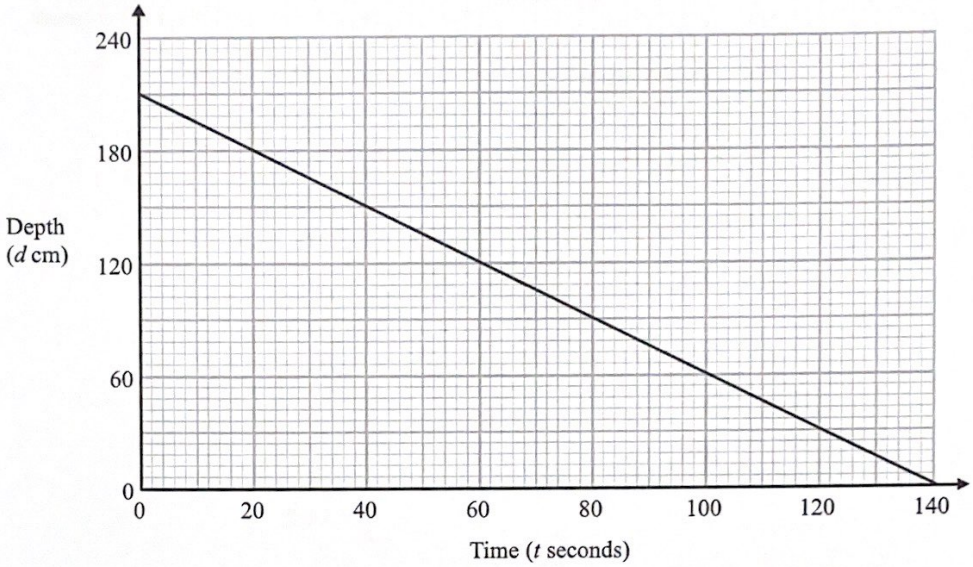
$\frac{180-50}{2} = 65° = \angle BAC = \angle BCA$

C from A = 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.

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

-1.5

(2)

(b) Explain what this gradient represents.

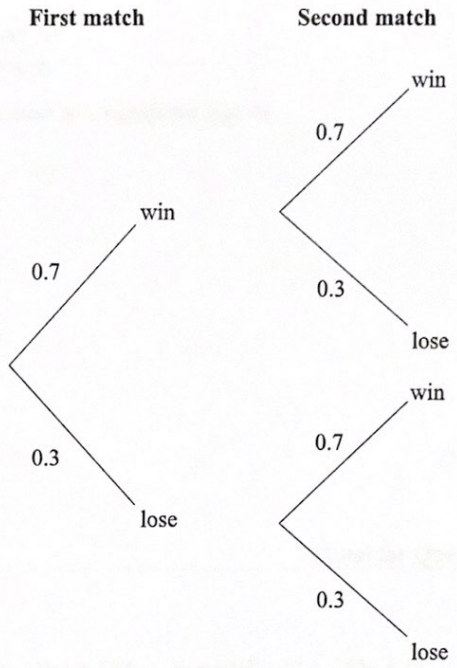
Rate of change of depth of water in tank.

(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.



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

$0.7 \times 0.7 = 0.49$

0.49

(2)

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

$W \times L + L \times W + L \times L$

$= (0.7 \times 0.3) + (0.3 \times 0.7) + 0.3^2$

$= 0.51$

0.51

(2)

(Total for Question 11 is 4 marks)

12 (a) Find the reciprocal of 2.5

$\frac{1}{2.5} = 0.4$

0.4

(1)

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

Give your answer correct to 3 significant figures.

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.

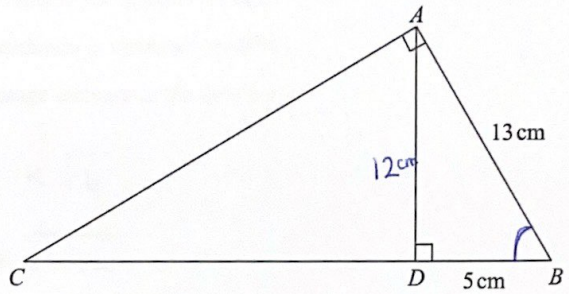
$(3x-1)(x+5)(4x-3) = (3x^2 + 15x - x - 5)(4x-3)$

$\Rightarrow (3x^2 + 14x - 5)(4x-3) = 12x^3 - 9x^2 + 56x^2 - 42x - 20x + 15$

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

(Total of Question 13 is 3 marks)

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*.

$\Rightarrow CB = CD + DB$
$= 28.8 + 5$
$= 33.8$

$13^2 = AD^2 - 5^2$

$AD = \sqrt{144} = 12$

~~ΔDBA~~

ΔADC and ΔADB are similar.

Hence sides have equal ratio.

12 : 5 is ratio of sides from ΔADC and ΔADB

$\frac{12}{5} = 2.4$

$2.4 \times 12 = 28.8 = CD$

33.8 cm

(Total for Question 14 is 3 marks)

Turn over

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DO NOT WRITE IN THIS AREA

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%.

Work out the percentage increase in the time period.

$T = k\sqrt{L}$

$T_2 = k\sqrt{1.4L}$

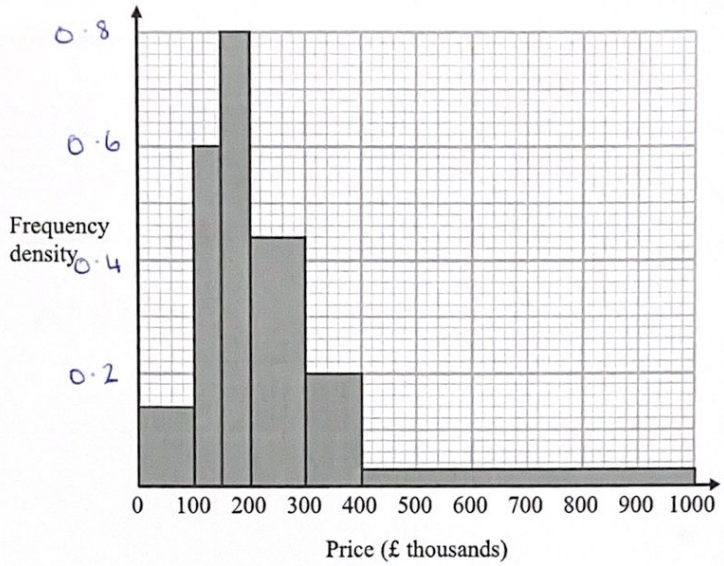
$\sqrt{1.4} = 1.183\ldots$

% increase $= (1.183 - 1) \times 100 = 18.3$

18.3 %

(Total for Question 15 is 3 marks)

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

20 ÷ 100 ~~120~~ = 0·2 f·d between 300 and 400

(50 × 0·8) + (50 × 0·6) + (100 × 0·14) = ~~84~~ 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 ①

2 4 6 8

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

2 4 6 8 $1^2, 2^2, 3^2, 4^2, 5^2$

+2 +2 +2 1, 4, 9, 16, 25 ②

Diff between ① and ② : 0, −1, −2, −3, −4 $= -n+1$

so : $n^2 - n + 1$

$n^2 - n + 1$

(Total for Question 17 is 3 marks)

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

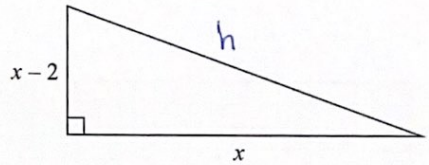
Express $f(x + 2)$ in the form $ax^2 + bx$

$$f(x+2) = 3(x+2)^2 - 2(x+2) - 8$$
$$= 3(x^2 + 4x + 4) - 2x - 4 - 8$$
$$= 3x^2 + 12x + 12 - 2x - 4 - 8$$
$$= 3x^2 + 10x$$

$3x^2 + 10x$

(Total for Question 18 is 3 marks)

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.

$(x-2)^2 + x^2 = h^2$

$\Rightarrow x^2 - 4x + 4 + x^2 = h^2$

$\Rightarrow h^2 = 2x^2 - 4x + 4$

$\Rightarrow h^2 = (2x \quad)(x \quad)$

$h^2 = 2x^2 - 4x + 4$

$h^2 = 14$

$h = \sqrt{14}$

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

$= 8.64$

$2.5 = 0.5 \times (x-2)x$

$\Rightarrow x^2 - 2x = 5$

$\Rightarrow x^2 - 2x - 5 = 0$

$\Rightarrow (x-1)^2 - 6 = 0$

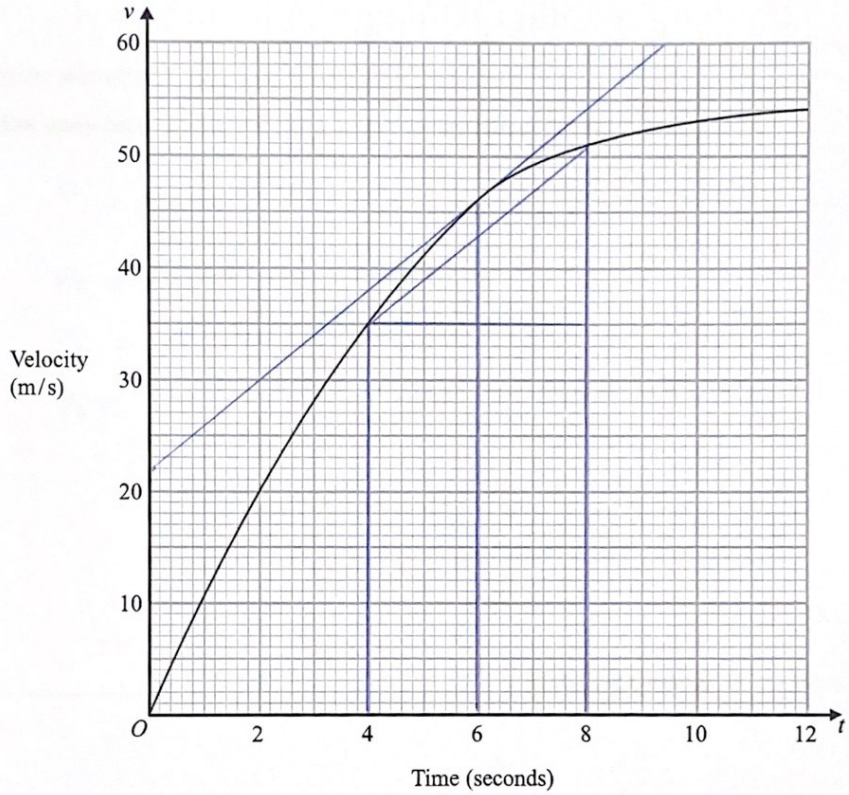
$\Rightarrow x = 1 \pm \sqrt{6}$

$\Rightarrow x = 3.449\ldots$

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 $t = 6$

$\frac{46 - 22}{6} = 4$

4 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.

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

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

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

Area = $70 + 172 + 210 = 452$

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?

$P_1 =$ ~~2015~~ 9500

$P_2 = 1.05(9500 - 250) = 9712.5$ (2016)

$P_3 = 1.05(9712.5 - 250) = 9935.625$ (2017)

$P_4 = 1.05(9935.625 - 250) = 10169.90625$

$= 10170$

10170

(Total for Question 21 is 3 marks)

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

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

Work out an upper bound for D.

Max of $x = 99.75$

Min of $y = 66.5$

$\frac{99.75}{66.5} = 1.5$

1.5

(Total for Question 22 is 3 marks)

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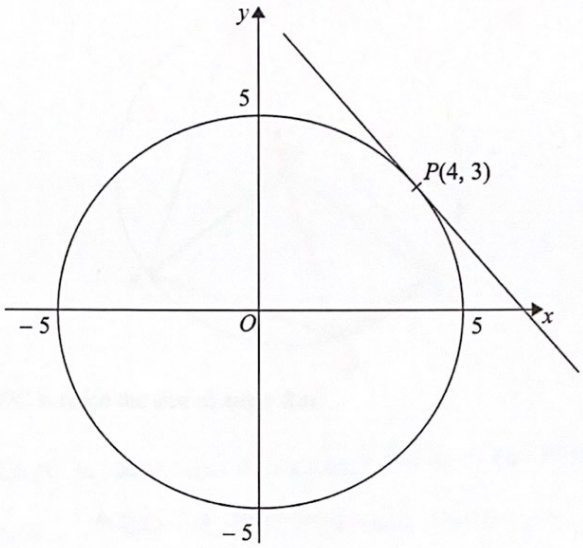
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

S 4 9 8 1 8 A 0 2 0 2 4

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 line through (0,0) and (4,3)

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

gradient of tangent at P(4,3) $= -1 \div \frac{3}{4} = -\frac{4}{3}$

$y - 3 = -\frac{4}{3}(x - 4)$

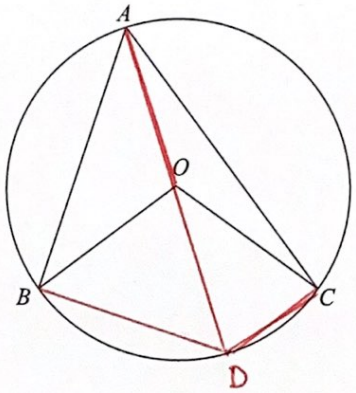
$\Rightarrow y = -\frac{4}{3}x + \frac{16}{3} + 3$

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

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

(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.

Let $\angle BAO = x$, and hence $\angle ABO = x$, because triangle ABO is an isosceles triangle and AO = AB because they are radii of the circle.

So $\angle BOA = 180 - 2x$

Let $\angle CAO = y$, and hence $\angle ACO = y$, ~~as~~ for the same reasons as above.

So $\angle COA = 180 - 2y$.

$\angle BAC = x + y$

$\angle BOC = 360 - (180 - 2x) - (180 - 2y) = 2x + 2y$

$\therefore \angle BOC = 2 \times \angle BAC$.

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS