

**BUMPER
"BETWEEN PAPERS"
PRACTICE
SUITABLE FOR HIGHER TIER ONLY**

**SUMMER 2019
QUESTIONS**

NOT A "BEST" GUESS PAPER.

**NEITHER IS IT A "PREDICTION" ... ONLY THE EXAMINERS KNOW WHAT IS GOING TO COME UP! FACT!
YOU ALSO NEED TO REMEMBER THAT JUST BECAUSE A TOPIC CAME UP ON PAPER 1 IT MAY STILL COME
UP ON PAPERS 2 OR 3 ...**

**WE KNOW HOW IMPORTANT IT IS TO PRACTICE, PRACTICE, PRACTICE SO WE'VE COLLATED A LOAD OF
QUESTIONS THAT WEREN'T EXAMINED IN THE PEARSON/EDEXCEL 9-1 GCSE MATHS PAPER 1 BUT WE
CANNOT GUARANTEE HOW A TOPIC WILL BE EXAMINED IN THE NEXT PAPERS ...**

**ENJOY!
MEL & SEAGER**

Q1. The diagram shows the triangle PQR .

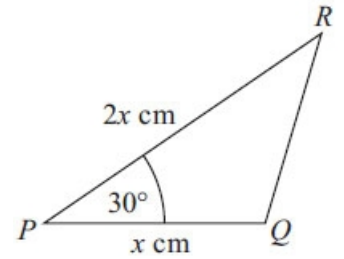
$$PQ = x \text{ cm}$$

$$PR = 2x \text{ cm}$$

$$\text{Angle } QPR = 30^\circ$$

The area of triangle $PQR = A \text{ cm}^2$

Show that $x = \sqrt{2A}$



(3)

Q2. Solve $5x^2 + 6x - 2 = 0$

Give your solutions correct to 2 decimal places.

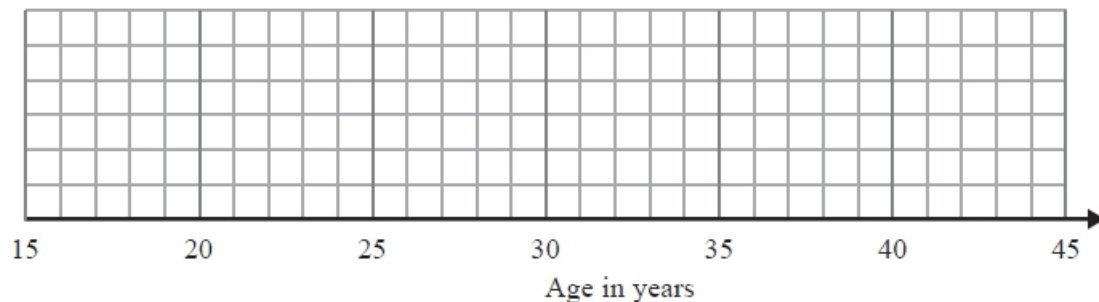
(3)

Q3. The stem and leaf diagram shows the ages, in years, of 25 people.

1	7 7 8 9
2	1 2 4 4 5 5 6 7 8 9 9
3	0 1 2 2 3 4 5 6
4	0 1

Key: 1|7 represents 17 years

(a) (i) On the grid, draw a box plot for this information.



(3)

One of these people is chosen at random.

(ii) What is the probability that this person is 30 years of age or older?

(2)

The grouped frequency table gives information about the ages of a different group of people.

Age (a years)	Frequency
$0 < a \leq 20$	7
$20 < a \leq 30$	12
$30 < a \leq 40$	5
$40 < a \leq 50$	1

Anne drew this cumulative frequency table for this information.

Age (a years)	Cumulative frequency
$0 < a \leq 20$	7
$20 < a \leq 30$	19
$30 < a \leq 40$	24
$40 < a \leq 50$	25

The cumulative frequency table is not correct.

(b) Write down one thing that is wrong with the table.

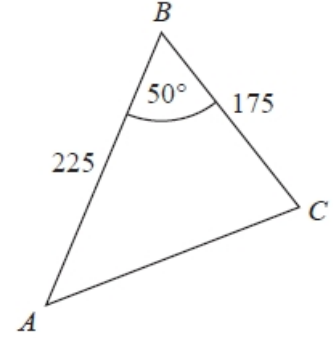
(1)

Q4. Jerry wants to cover a triangular field, ABC , with fertiliser.

Here are the measurements Jerry makes

- angle $ABC = 50^\circ$ correct to the nearest degree,
- $BA = 225$ m correct to the nearest 5 m,
- $BC = 175$ m correct to the nearest 5 m.

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

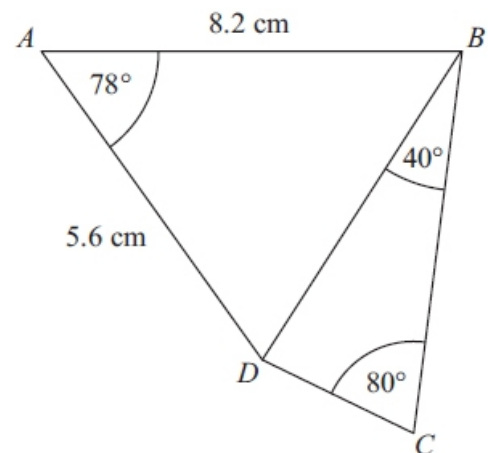


(3)

Q5. Simplify fully $\frac{4}{2-x} - \frac{3}{x}$

Q6. $ABCD$ is a quadrilateral.

Work out the length of DC .
Give your answer correct to 3 significant figures.



(3)

(6)

Q7. Write $0.\overline{624}$ as a fraction in its simplest form.

(3)

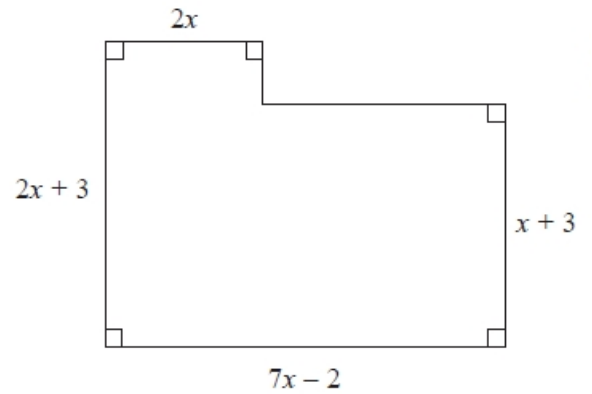
Q8.

All the measurements in the diagram are in centimetres.

The area of the shape is $A \text{ cm}^2$.

Find a formula for A in terms of x .

You must write your formula as simply as possible.



(4)

Q9. Vicky makes 8 purses and 9 key rings to sell for charity.

The price of a purse will be twice as much as the price of a key ring.

Vicky wants to get a total of exactly £40 when she sells all the purses and all the key rings.

Work out the price Vicky needs to charge for each purse and for each key ring.

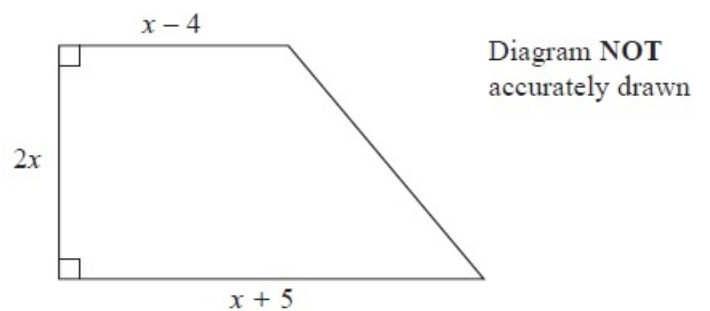
(4)

Q10. The diagram shows a trapezium.

All the measurements are in centimetres.

The area of the trapezium is 351 cm^2 .

(a) Show that $2x^2 + x - 351 = 0$



(2)

(b) Work out the value of x .

Q11. The functions f and g are such that (3)

$$f(x) = 3(x - 4) \quad \text{and} \quad g(x) = \frac{x}{5} + 1$$

(a) Find the value of $f(10)$

(1)

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

(2)

(c) Show that $fg(x) = 9x - 48$

Q12. y is inversely proportional to the square of x . When $x = 5$, $y = 15$ (2)
Write a formula for y in terms of x .

Q13. (a) Factorise $3(x - y)^2 - 2(x - y)$ (3)

(b) Show that $\frac{1}{2x^2 + x - 15} + \frac{1}{3x^2 + 9x}$ simplifies to $\frac{ax}{bx + c}$ where a , b and c are integers. (2)

(3)

Q14. Daniela works in a shop.

Daniela served 50 customers in the morning. She served 75 customers in the afternoon.

The mean time to serve 50 customers in the morning was 48.7 seconds.

The mean time to serve all 125 customers was 50.2 seconds.

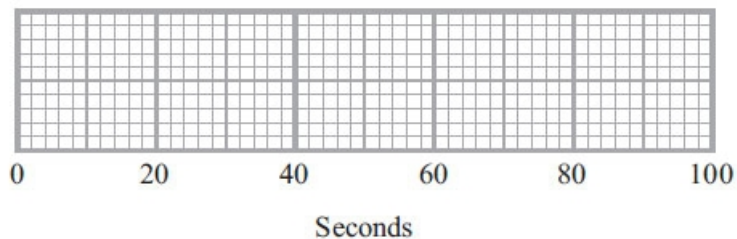
(a) Work out the mean time to serve the 75 customers in the afternoon.

(3)

For the 75 customers served in the afternoon

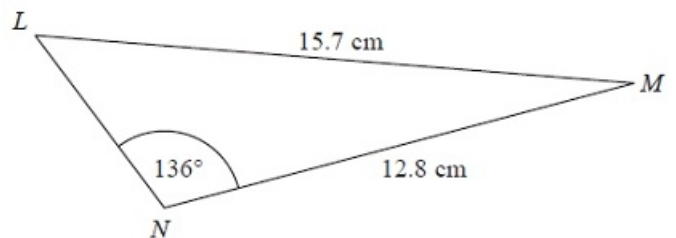
- the least time was 18 seconds
- the greatest time was 96 seconds
- the median time was 56 seconds
- the lower quartile was 32 seconds
- the upper quartile was 72 seconds

(b) On the grid, draw a box plot for this information.



(3)

Q15. The diagram shows triangle LMN .



Calculate the length of LN .

Give your answer correct to 3 significant figures.

(5)

Q16. The length of a rectangle is the same as the length of each side of a square.

The length of the rectangle is 4 cm more than 3 times the width of the rectangle.

The area of the square is 66 cm^2 more than the area of the rectangle.

Find the length and the width of the rectangle. You must show all your working.

(6)

Q17. Solve, by factorising, the equation $8x^2 - 30x - 27 = 0$

(3)

Q18. Solve $\frac{4 - 2x}{x + 1} = x$

(4)

Q19. At time $t = 0$ hours a tank is full of water. Water leaks from the tank.

At the end of every hour there is 2% less water in the tank than at the start of the hour.

The volume of water, in litres, in the tank at time t hours is V_t

Given that

$$V_0 = 2000$$

$$V_{t+1} = kV_t$$

write down the value of k .

(1)

Q20. (a) Show that the equation $x^3 + 4x = 1$ has a solution between $x = 0$ and $x = 1$

(2)

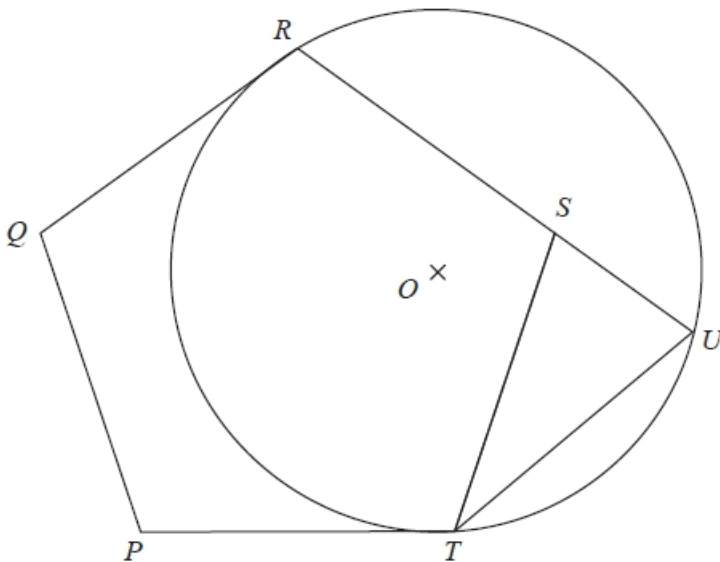
(b) Show that the equation $x^3 + 4x = 1$ can be arranged to give $x = \frac{1}{4} - \frac{x^3}{4}$

(1)

(c) Starting with $x^0 = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{x_n^3}{4}$ twice, to find an estimate for the solution of $x^3 + 4x = 1$

(3)

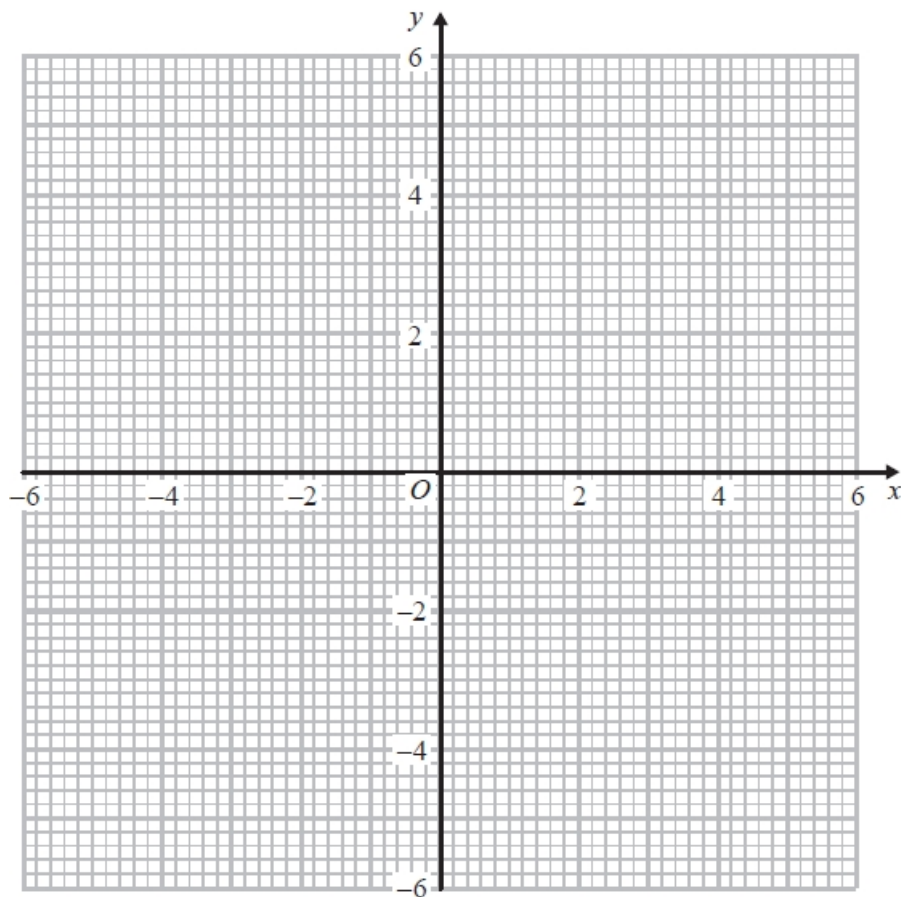
Q21. $PQRST$ is a regular pentagon. R , U and T are points on a circle, centre O .



QR and PT are tangents to the circle.
 RSU is a straight line.
Prove that $ST = UT$.

(5)

Q22. (a) On the grid, construct the graph of $x^2 + y^2 = 16$



(2)

(b) Find estimates for the solutions of the simultaneous equations

$$\begin{aligned}x^2 + y^2 &= 16 \\ y &= 2x + 1\end{aligned}$$

(3)

Q23. f and g are functions such that

$$f(x) = 3x^3 \quad \text{and} \quad g(x) = \frac{1}{x-2}$$

Find $gf(4)$.

Give your answer as a fraction.

(2)

Q24. The function f is such that

$$f(x) = 4x - 1$$

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

(2)

The function g is such that

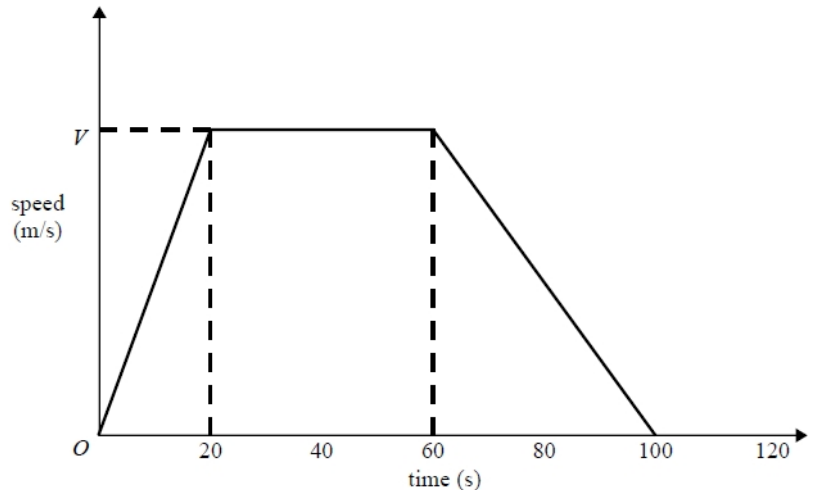
$$g(x) = kx^2 \quad \text{where } k \text{ is a constant.}$$

Given that $fg(2) = 12$

(b) work out the value of k

(2)

Q25. Here is a speed-time graph for a car journey. The journey took 100 seconds.



The car travelled 1.75km in the 100 seconds.

(a) Work out the value of V .

(3)

(b) Describe the acceleration of the car for each part of this journey.

(2)

Q26. Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is,

the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

(1)

The first three terms of a different Fibonacci sequence are

a b $a + b$

(b) Show that the 6th term of this sequence is $3a + 5b$

(2)

Given that the 3rd term is 7 and the 6th term is 29,

(c) find the value of a and the value of b .

(3)

Q27. In 2016 the population of the UK was 6.5×10^7

Laura wants to calculate an estimate for the population of the UK in 2020

She assumes that the population increases by 0.6% each year.

(a) Using Laura's assumption, calculate an estimate for the population of the UK in 2020

(2)

Kieran also assumes that the population of the UK increases by 0.6% each year.

He says that it will take over 80 years for the population to increase by 50% because $\frac{50}{0.6} = 83.\dot{3}$

Kieran's method is wrong.

(b) Explain what is wrong with his method.

(1)

Assuming that the population of the UK increases by 0.6% each year,

(c) show that the population of the UK each year forms a geometric progression.

(2)

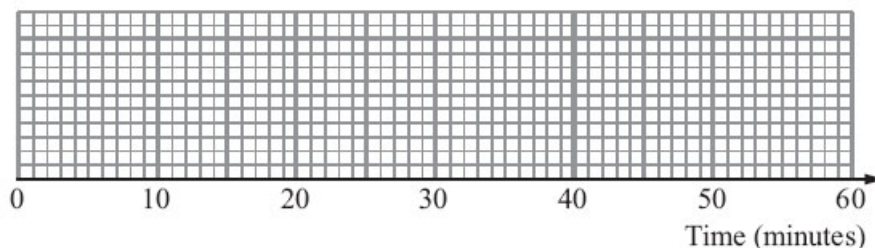
Q28. Kelly recorded the length of time 48 teachers took to travel to school on Monday. The table shows information about these travel times in minutes.

Least time	5
Greatest time	47
Median	28
Lower quartile	18
Upper quartile	35

(a) Work out the number of teachers with a travel time of 35 minutes or more.

(2)

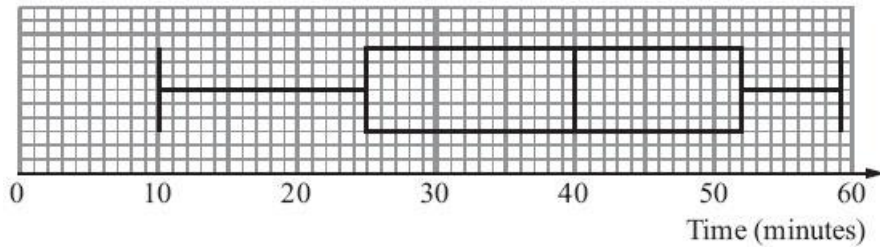
(b) On the grid, draw a box plot to show the information in the table.



(2)

Kelly then recorded the times the same 48 teachers took to travel to school on Tuesday.

The box plot shows some information about these times.



(c) Compare the travel times on Monday and on Tuesday.

(2)

Q29. $ABCD$ is a parallelogram.

$DC = 5 \text{ cm}$

Angle $ADB = 36^\circ$

Calculate the length of AD . Give your answer correct to 3 significant figures.

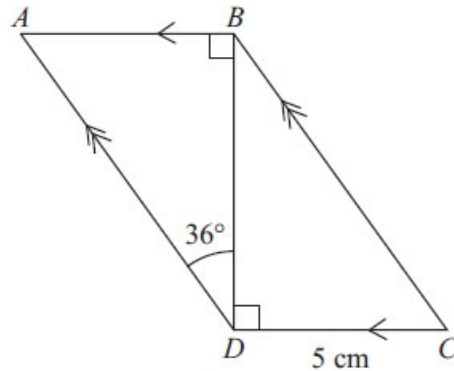
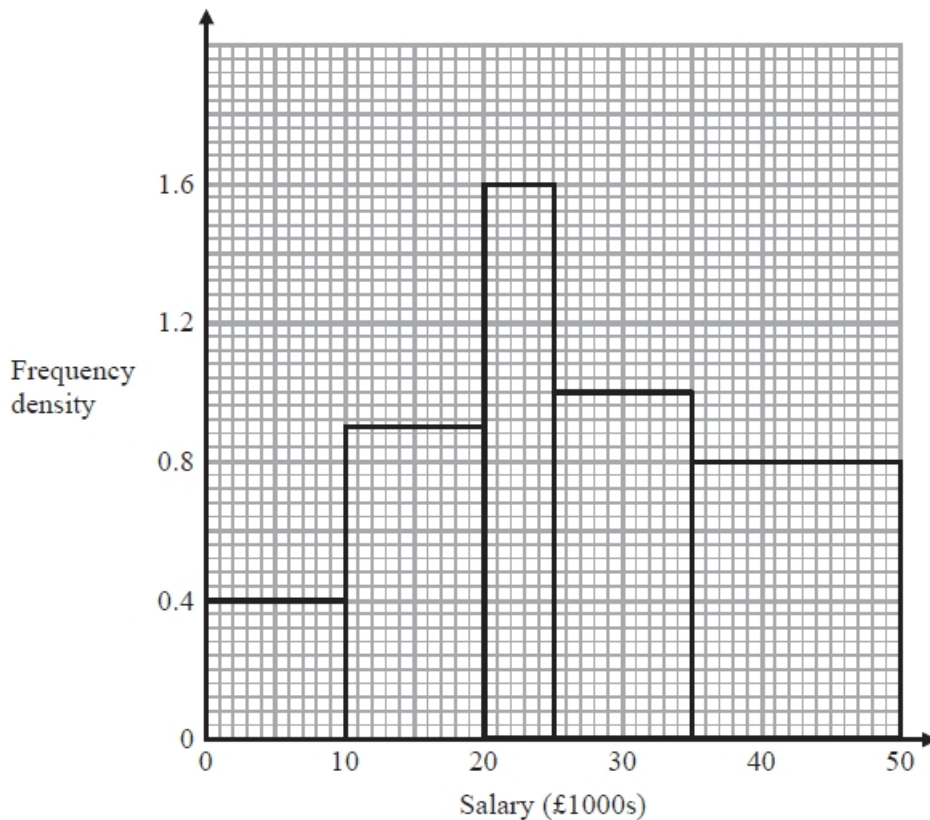


Diagram NOT accurately drawn

(4)

Q30. The histogram shows some information about the salaries of a sample of people.



(a) Use the histogram to complete the frequency table.

Salary (p) in £1000s	Frequency
$0 < p \leq 10$	4
$10 < p \leq 20$	
$20 < p \leq 25$	
$25 < p \leq 35$	
$35 < p \leq 50$	

(b) Work out the proportion of people in the sample who have a salary greater than £40000

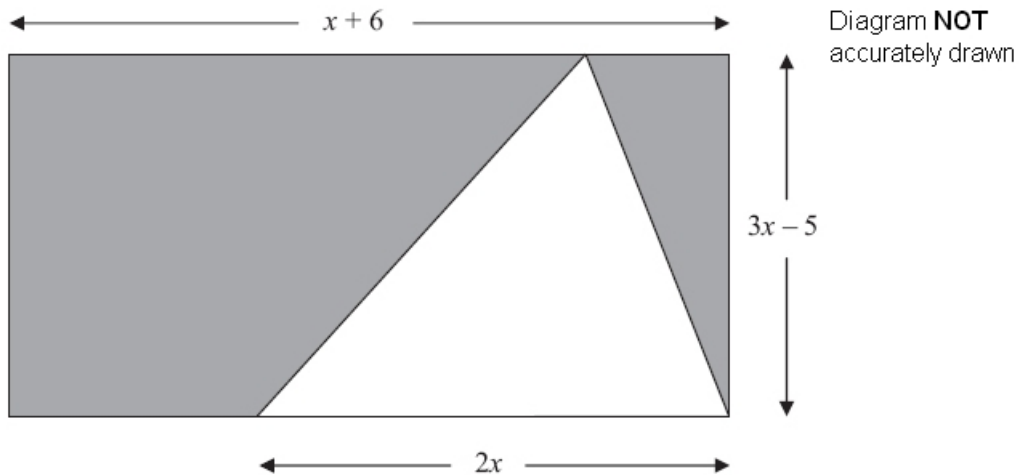
(2)

(c) Find an estimate for the median salary.

(2)

Q31. The diagram shows a triangle inside a rectangle.

(2)

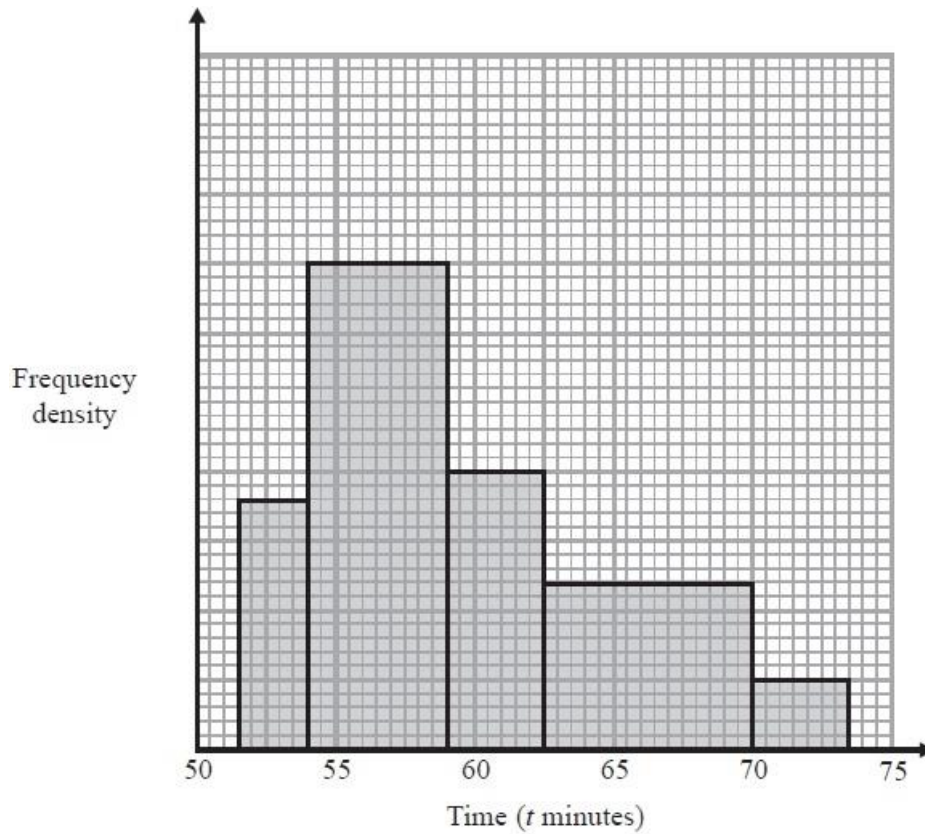


All measurements are given in centimetres.

Show that the total area, in cm^2 , of the shaded regions is $18x - 30$

(4)

Q32. Ulrika recorded the times some people took to run a race. The histogram gives information about these times.



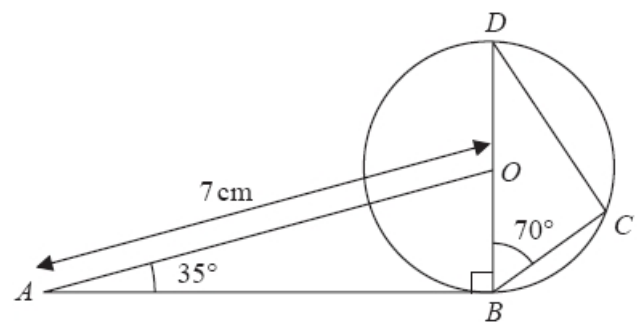
25% of the people took a time less than T minutes.

Work out an estimate for T .

(3)

Q33.

B , C and D are points on the circumference of a circle, centre O .
 BOD is a diameter of the circle.



$$AO = 7 \text{ cm} \quad \text{Angle } ABO = 90^\circ \quad \text{Angle } OAB = 35^\circ \quad \text{Angle } DBC = 70^\circ$$

*(a) Explain why angle BCD is 90°

(1)

(b) Calculate the length of BC .

Give your answer correct to 3 significant figures.

(4)

Q34. S and U are points on the circumference of a circle, centre O . ST and UT are tangents to the circle.

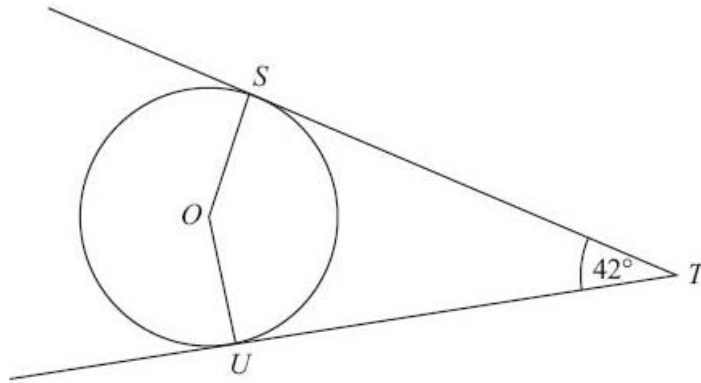


Diagram **NOT** accurately drawn

Angle $STU = 42^\circ$ Work out the size of angle SOU . Give reasons for your answer.

(3)

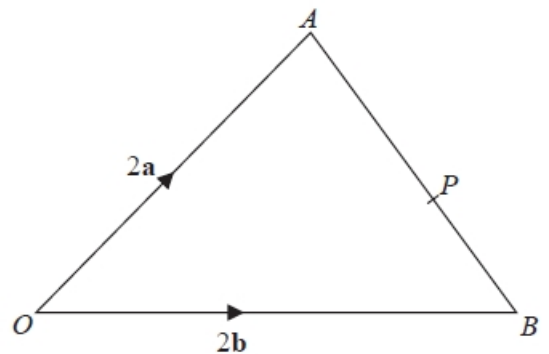
Q35. OAB is a triangle. P is the point on AB such that $AP : PB = 5 : 3$

$$\vec{OA} = 2\mathbf{a}$$

$$\vec{OB} = 2\mathbf{b}$$

$$\vec{OP} = k(3\mathbf{a} + 5\mathbf{b}) \text{ where } k \text{ is a scalar quantity.}$$

Find the value of k .



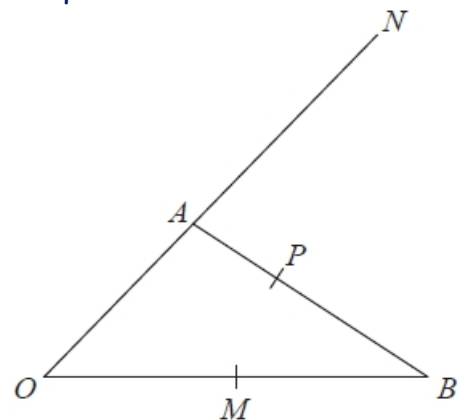
(4)

Q36. OAN , OMB and APB are straight lines. $AN = 2OA$. M is the midpoint of OB .

$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

$$\vec{AP} = k\vec{AB} \text{ where } k \text{ is a scalar quantity.}$$

Given that MPN is a straight line, find the value of k .



(5)

Q37. Given that:

$$2x - 1 : x - 4 = 16x + 1 : 2x - 1$$

find the possible values of x .

Q38. Solve $\frac{x+2}{3x} + \frac{x-2}{2x} = 3$

(5)

(3)