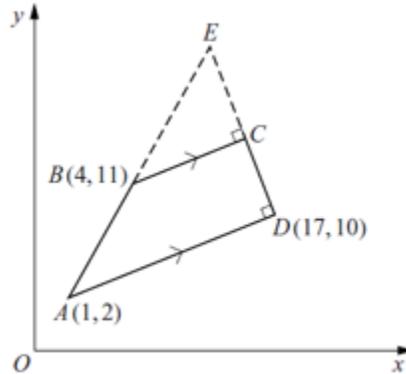


SECTION A

QUESTION 1:

The diagram, which is not drawn to scale, shows a trapezium $ABCD$ in which BC is parallel to AD . The side $BC \perp DC$. Point $A(1; 2)$, $B(4; 11)$ and $D(17; 10)$.



Calculate:

- a) The gradient of line BC (2)
- b) The equation of line EC (3)
- c) The coordinates of C (4)
- d) The angle $E\hat{A}D$ (4)

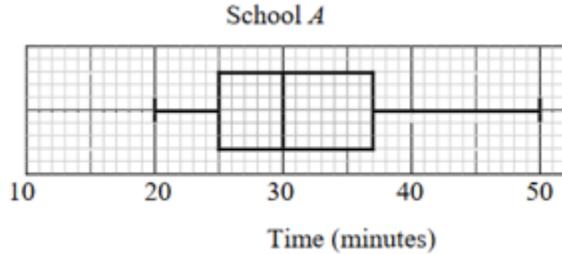
The lines AB and DC are extended to meet at E . Find

- e) The coordinates of E . (4)
- f) The ratio of the area of triangle EBC to the area of trapezium $ABCD$. (4)

[21]

QUESTION 2:

- a) Children from school A took part in a fun run for charity. The times, to the nearest minute, taken by the children from school A are summarised in the diagram below.



- 1) Write down the time by which 75% of the children in school A had completed the run. (1)
 - 2) State the name given to this value. (1)
 - 3) Briefly comment on the box and whisker plot. (2)
- b) Sunita and Shelley talk to each other once a week on the telephone. Over many weeks they recorded, to the nearest minute, the number of minutes spent in conversation on each occasion. The following table summarises their results.

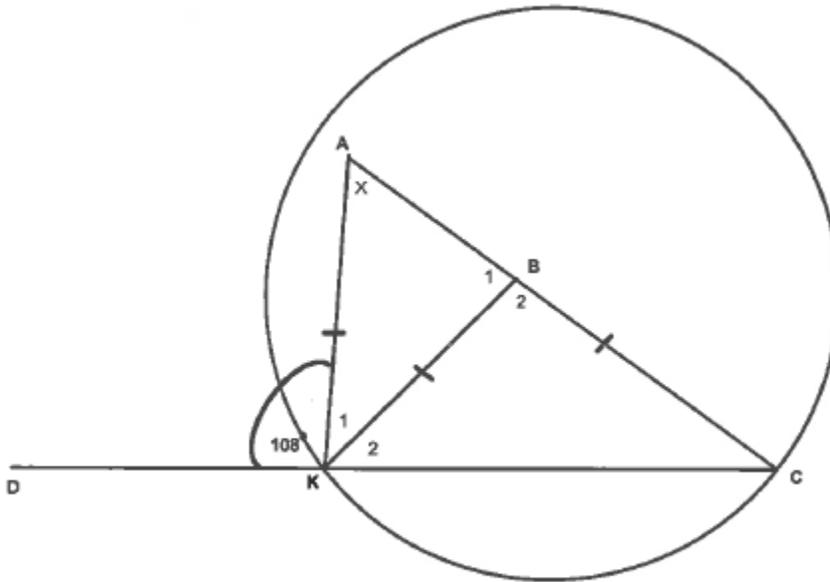
Time (to the nearest minute)	Number of conversations
5-9	2
10-14	9
15-19	20
20-24	13
25-29	8
30-34	3

- 1) Two of the conversations were chosen at random. Find the probability that both of them were longer than 24.5 minutes. (2)
 - 2) Calculate an estimate of the mean time spent on their conversations. (2)
- During the following 25 weeks, they monitored their weekly conversation and found that at the end of the 80 weeks their overall mean length of conversation was 21 minutes.
- 3) Find the mean time spent in conversation during these 25 weeks (4)
 - 4) Comment on these two mean values. (2)

[14]

QUESTION 3:

B is the centre of the circle. $AK = KB = BC$. $\widehat{AKD} = 108^\circ$. $\hat{A} = x$



- a) Express \hat{B}_1 in terms of x . (2)
 - b) Show that $\hat{C} = \frac{x}{2}$ (3)
 - c) Solve for x . (3)
 - d) Hence, calculate the value of \hat{K}_1 (2)
- [10]**

QUESTION 4:

- a) If $f(x) = -\cos(40^\circ - 2x)$ and $g(x) = \tan(-x)$.
 - 1) Write down the period of $g(x)$ (1)
 - 2) Write down the amplitude of $f(x)$ (1)
 - 3) Write down the period of $f\left(\frac{2x}{3}\right)$ (2)
 - 4) Write down the equation of $h(x)$ if $h(x) = -f(x - 10)$ (3)

b) If $\cos 22^\circ = m$, express the following in terms of m .

1) $\sin 22^\circ$ (2)

2) $\sin 44^\circ$ (3)

3) $\tan 44^\circ$ (4)

c) Simplify as far as possible without the use of a calculator.

1) $\frac{\tan 200^\circ \cdot \sin 300^\circ \cdot \cos 110^\circ}{\cos 135^\circ \cdot \sin 225^\circ \cdot \sin 160^\circ}$ (6)

2) $\frac{\sin(180-x) \cdot \tan(180+x) \cdot \cos(-x) \cdot \sin(90-x)}{\cos(x-360) \cdot \cos(90+x) \cdot \tan(-x)}$ (6)

[28]

SECTION B

QUESTION 5:

- a) Three airport management trainees, Ryan, Sunil and Tim, were each instructed to select a random sample of 12 suitcases from those waiting to be loaded onto aircraft.

Each trainee also had to measure the volume, x , and the weight, y , of each of the 12 suitcases in his sample, and then calculate the value of the correlation coefficient, r , between x and y .

- ◆ Ryan obtained a value of -0.843
- ◆ Sunil obtained a value of 0.007

Explain why neither of these two values is likely to be correct (2)

- b) Joe, a manager, recorded the volumes, v , and the weights, w , of a random sample of 8 suitcases as follows.

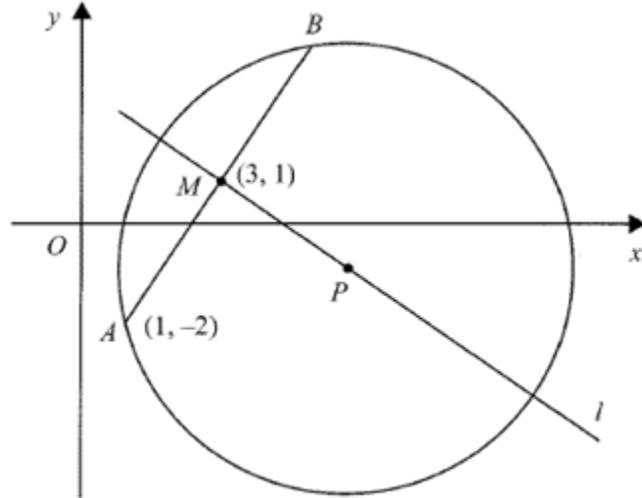
v	28.1	19.7	46.4	23.6	31.1	17.5	35.8	13.8
w	14.9	12.1	21.1	18.0	19.8	19.2	16.2	14.7

- 1) Calculate the correlation coefficient r , between v and w for this data to 4 decimal places. (2)
- 2) Interpret your value in the context of this question. (2)
- 3) Determine the equation of the least squares regression line of w on v to 4 decimal places. (3)

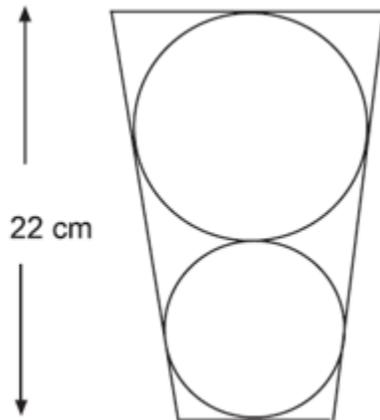
[9]

QUESTION 6:

- a) The points $A(1; -2)$ and B lie on a circle with centre P , as shown in the diagram below. The midpoint M of AB has coordinates $(3; 1)$. The line l passes through the points M and P .



- 1) Find an equation for MP (3)
 - 2) Given that the x -coordinate of P is 6, calculate the y -coordinate. (1)
 - 3) Find an equation for the circle. (4)
- b) A new company sign has a logo in the shape of two circles, one sitting on top of the other as shown and 22 cm high.



- 1) The equation of the smaller circle is $x^2 + y^2 - 12x - 26y + 189 = 0$ and the line of centres is parallel to the y -axis. Find the equation of the larger circle. (6)
- 2) Calculate the equation of the common tangent to the two circles parallel to x -axis. (2)

[16]

QUESTION 7:

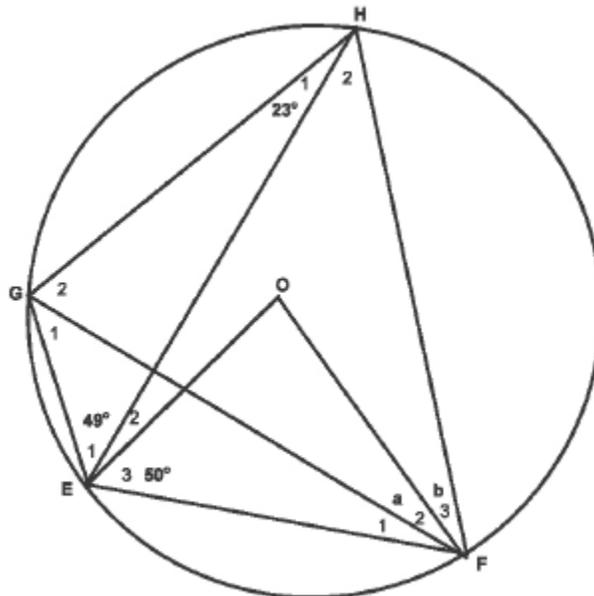
a) Given that $\frac{\sin x}{1+\cos x} + \frac{1}{\tan x} = \frac{1}{\tan x \cdot \cos x}$

- 1) Prove the above identity (5)
 - 2) For which value(s) of x , in the interval $0^\circ \leq x \leq 180^\circ$, is the identity undefined (2)
- b) Solve for x if $\sin 2x - \cos 2x = -1$ (6)

[13]

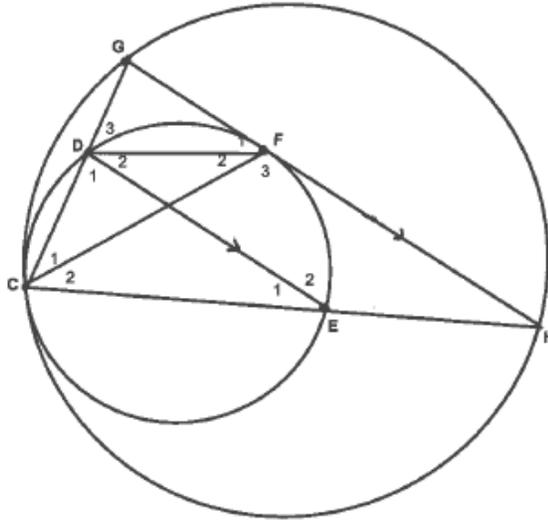
QUESTION 8:

- a) In the diagram below, E, F, H and G are points on the circle with centre O.



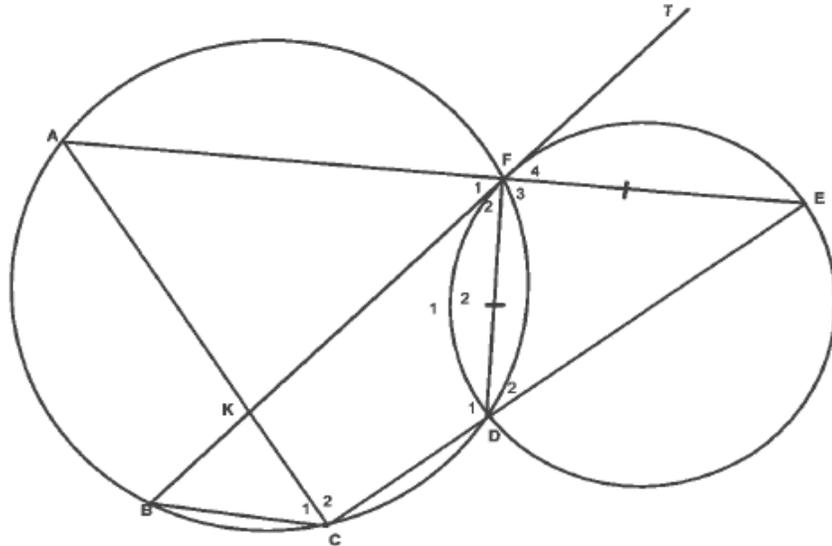
Calculate the sizes of a and b , give reasons. (5)

b) In the diagram below, $GH \parallel DE$ and GH is a tangent to the smaller circle.



Prove with reasons that, $\hat{C}_1 = \hat{C}_2$ (5)

c) The two circles shown intersect at points F and D . BFT is a tangent to the smaller circle at F . Straight line AFE is drawn such that $DF = EF$. CDE is a straight line and chord AC and BF cut at K .



Prove, with reasons:

1) $BT \parallel CE$. (4)

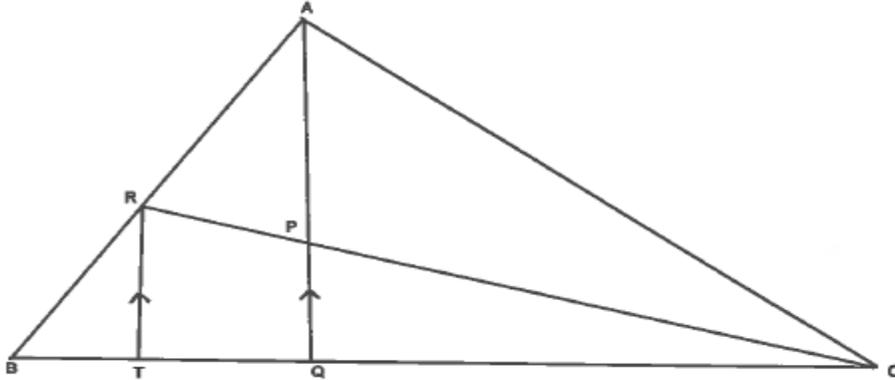
2) $BCEF$ is a parallelogram. (4)

3) $AC = BF$ (4)

[22]

QUESTION 9:

If $AQ \parallel RT$, $\frac{BQ}{QC} = \frac{3}{5}$ and $\frac{BR}{RA} = \frac{1}{3}$



a) If $BT = x$, calculate, TQ in terms of x (2)

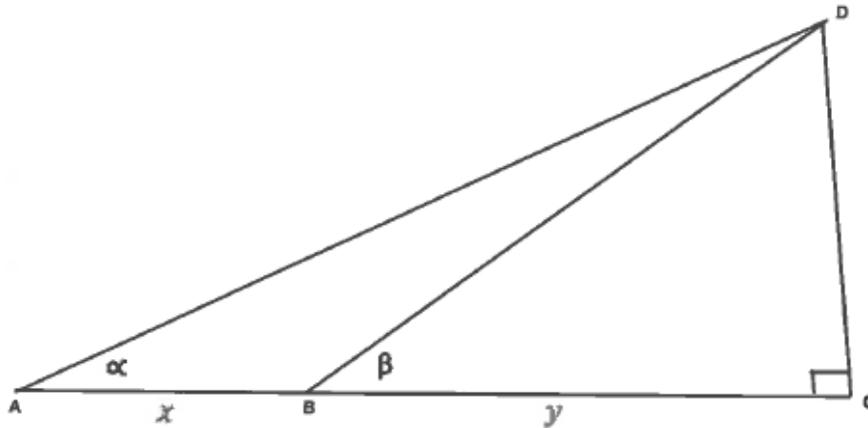
b) Calculate the numerical value of $\frac{CP}{PR}$ (3)

c) Calculate the numerical value of $\frac{\text{Area of } \triangle RCT}{\text{Area of } \triangle BRT}$ (4)

[9]

QUESTION 10:

In the diagram below $\hat{A} = \alpha$, $\hat{C}BD = \beta$, $\hat{C} = 90^\circ$ $AB = x$ and $BC = y$.



a) Prove that: $y = \frac{x \cdot \sin \alpha \cdot \cos \beta}{\sin(\beta - \alpha)}$ (5)

b) If $\alpha = 42^\circ$, $\beta = 68^\circ$ and $y = 4$. Calculate AC (3)

[8]