

GCSE Mathematics

Delta Paper 3:

Paper 3F (Calculator)

Time: 1 hour 30 minutes

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

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.**
- 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.

Answer ALL questions.
Write your answers in the spaces provided.
You must write down all the stages in your working.

1.

(a) Write the following numbers in order.

~~8~~ ~~2~~ ~~7~~ ~~5~~ ~~3~~ ~~0~~
-8, -5, -3, 0, 3, 7

(1)

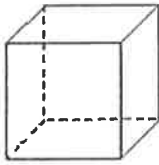
(b) Write the following numbers in order.

0.59 0.50 ~~0.09~~ 0.95 ~~0.95~~
0.05, 0.09, 0.50, 0.59, 0.95

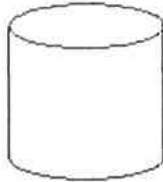
(1)

(Total 2 marks)

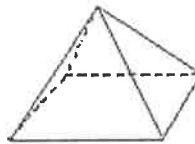
2.



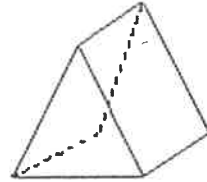
A



B



C



D

Diagram NOT accurately drawn

The diagram shows four 3-D solid shapes.

(a) Write down the number of vertices of shape A.

8.....(1)

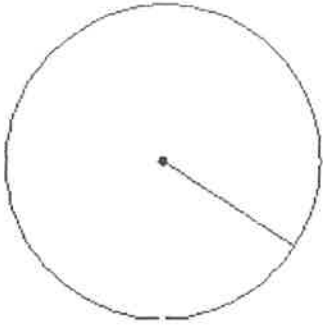
(b) Write down the number of faces of shape C

5.....(1)

(c) Write down the name of shape B

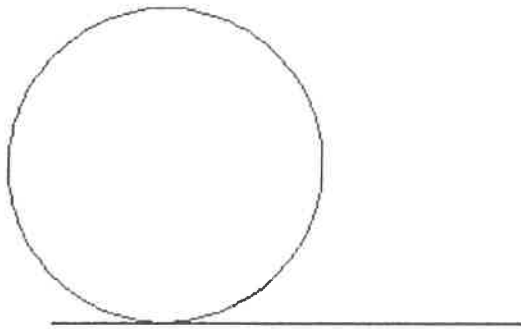
Cylinder.....(1)
 (Total 3 marks)

3. (a) Write down the mathematical name of the straight line shown in this diagram.



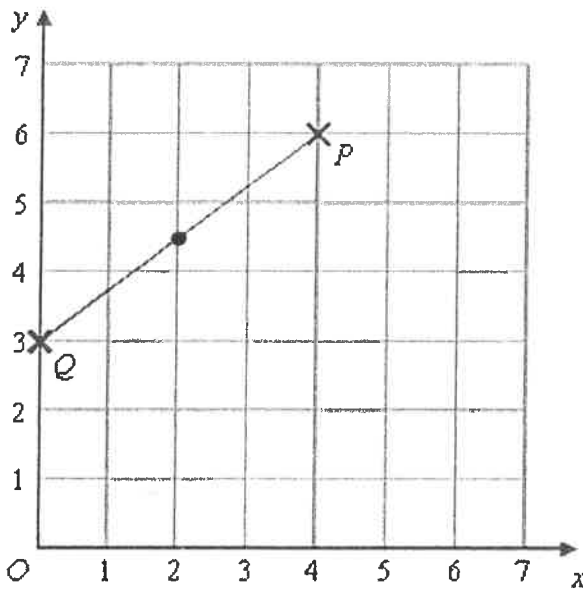
radius.....(1)

- (b) Write down the mathematical name of the straight line shown in the diagram.



tangent.....(1)
(Total 2 marks)

4.



- (a) Write down the coordinates of the point P .

(4, 6) (1)

M is the midpoint of the line from Q to P .

- (b) Find the coordinates of M .

(2, 4.5) (2)
(Total 3 marks)

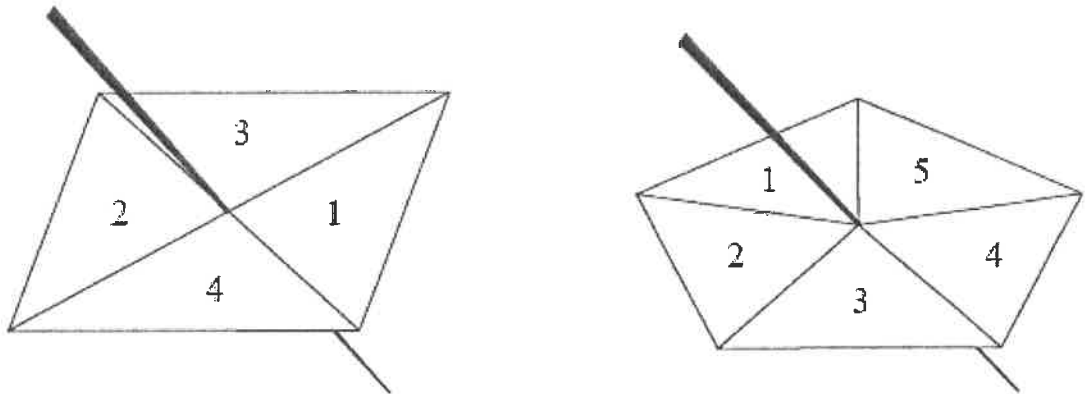
5. $a = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $b = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$

Calculate $2a - 3b$

$$2 \begin{pmatrix} 2 \\ 3 \end{pmatrix} - 3 \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix} - \begin{pmatrix} -9 \\ 3 \end{pmatrix} = \begin{pmatrix} 13 \\ 3 \end{pmatrix} \quad (\text{Total 2 marks})$$

6. Here are a 4-sided spinner and a 5-sided spinner.

The spinners are fair.



Jeff is going to spin each spinner once.
 Each spinner will land on a number.
 Jeff will get his score by adding these two numbers together.

5-sided spinner

4-sided spinner

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

(a) Complete the possibility space diagram for each possible score.

(1)

Jeff spins each spinner once.

(c) Find the probability that Jeff gets a score of 5 or more.

$$\frac{14}{20} = \frac{7}{10}$$

(1)

(Total 2 marks)

7. Here is a list of ingredients for making 8 cheese scones.

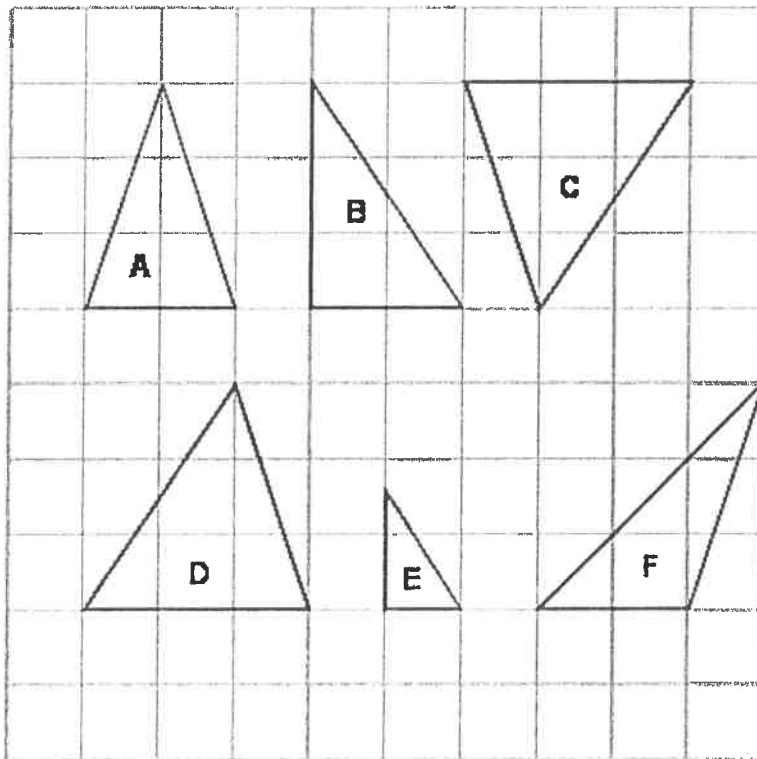
Ingredients for 8 cheese scones	
200 g self-raising flour	4 100g
60 g butter	30g
30 g cheese	15g
150 ml milk	75ml.

Work out the amount of each ingredient needed to make 12 cheese scones.

- ...300..... g self-raising flour
- ...90..... g butter
- ...45..... g cheese
- ...225..... ml milk

(Total 3 marks)

8. These triangles have been drawn on a centimetre grid.



(a) Write down the letters of the **two** triangles that are congruent.

.....C..... andD.....

(1)

(b) Write down the letters of **two different** triangles that are similar.

..... **B** and **E**

(1)

(Total 2 marks)

9. Make w the subject of the formula $P = \frac{w-3}{2}$

$$2P = w - 3$$

$$2P + 3 = w$$

$$w = 2P + 3$$

(Total 2 marks)

10.

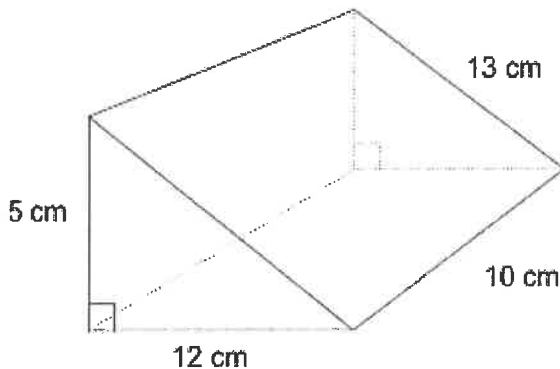


Diagram
NOT accurately
drawn

$$\triangle \frac{5 \times 12}{2} = 30$$

$$10 \times 13 = 130$$

$$10 \times 12 = 120$$

$$5 \times 13 = 65$$

$$2 \times 30 = \underline{60}$$

Work out the total surface area of this triangular prism.

$$375 \text{ cm}^2$$

(Total 3 marks)

11. You can use this rule to work out the total cost of hiring a car.

Total cost = £4 per hour plus £12

Arun hires a car for 5 hours.

(a) Work out the total cost.

$$T = 4 \times 5 + 12 = 32$$

(2)

Raj hires a car.

The total cost is £40

(b) Work out how many hours Raj hires the car for.

$$40 = 4 \times h + 12$$

7 hours

$$28 = 4 \times h \quad h = 7$$

(Total 4 marks)

12. Four friends each throw a biased coin a number of times.
The table shows the number of heads and the number of tails each friend got.

	Ben	Philip	Fred	Sharif
heads	34	66	80	120
tails	8	12	40	40

The coin is to be thrown one more time.

- (a) Which of the four friends' results will give the best estimate for the probability that the coin will land heads?
Justify your answer.

.....
Shariff - the more trials there are the more accurate the result.

(1)

Fred says,

“With this coin you are twice as likely to get heads as to get tails.”

- (b) Is Fred correct?
Justify your answer.

.....
Fred is correct for his trials but to be able to say it then you must have a bigger number of trials

(2)

The coin is to be thrown twice.

- (c) Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

$$\begin{array}{r}
 34 \\
 66 \\
 80 \\
 \hline
 120 \\
 \hline
 300
 \end{array}
 \qquad
 \begin{array}{r}
 8 \\
 12 \\
 40 \\
 40 \\
 \hline
 100
 \end{array}$$

total = 400.

$$\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$$

$$\frac{9}{16}$$

(2)

(Total 5 marks)

13. A rugby team played six games.
The mean score for the six games is 14.5

The rugby team played one more game.
The mean score for all seven games is 16

Work out the number of points the team scored in the seventh game.

$$14.5 \times 6 = 87$$

$$16 \times 7 = 112$$

$$112 - 87 = 25$$

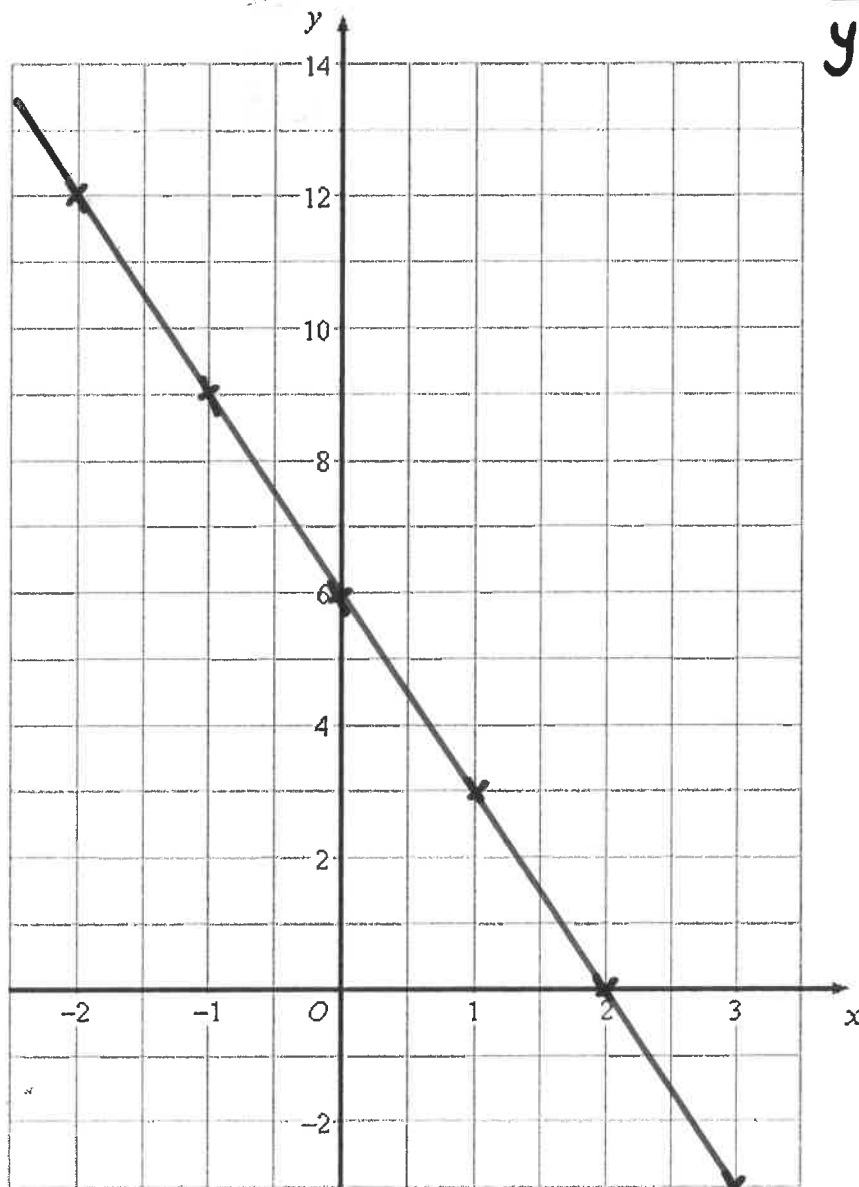
..... **25** points

(Total 2 marks)

14.

On the grid, draw the graph of $3x + y = 6$ for values of x from -2 to 3

x	-2	-1	0	1	2	3
y	12	9	6	3	0	-3



(Total 3 marks)

15. (a) Simplify $t^6 \times t^2$

t^8
.....

(1)

(b) Simplify $\frac{m^8}{m^3}$

m^5
.....

(1)

(c) Simplify $(2x)^3$

$8x^3$
.....

(2)

(d) Simplify $3a^2h \times 4a^5h^4$

$12a^7h^5$

$12a^7h^5$
.....

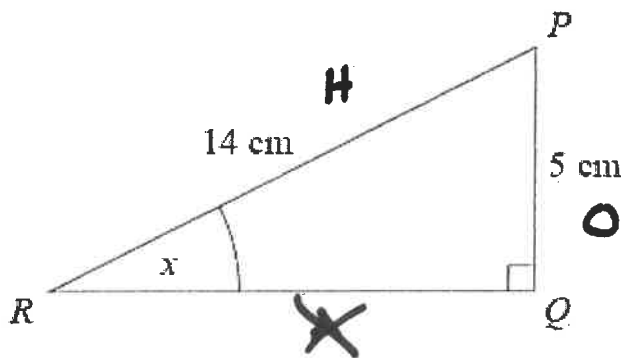
(2)

(Total 6 marks)

16.

PQR is a right-angled triangle.

SOH CAH TOA



Work out the size of the angle marked x .
Give your answer correct to 1 decimal place.

$\sin x = \frac{\text{Opp}}{\text{hyp}}$

$\sin x = \frac{5}{14}$

$x = \sin^{-1}\left(\frac{5}{14}\right) = 20.9$

20.9
..... $^{\circ}$

(Total 2 marks)

17. Solve the simultaneous equations

$$\begin{aligned} 2x - y &= 13 & \textcircled{1} \\ x - 2y &= 11 & \textcircled{2} \end{aligned}$$

when $y = -3$

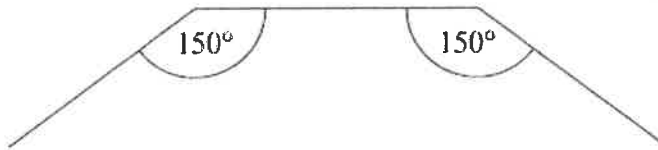
$$\begin{aligned} \textcircled{1} \quad 2x + 3 &= 13 \\ 2x &= 10 \\ x &= 5 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \times \textcircled{2} \quad 2x - 4y &= 22 & \textcircled{3} \\ \textcircled{1} - \textcircled{3} \quad 3y &= -9 \\ y &= -3 \end{aligned}$$

check. $5 - 2 \times -3 = 11$ ✓ (Total 3 marks)

18. The diagram shows 3 sides of a regular polygon.

Diagram NOT accurately drawn



Each interior angle of the regular polygon is 150° .

Work out the number of sides of the regular polygon.

$$\begin{aligned} \text{Exterior angle} &= 30^\circ \\ \frac{360^\circ}{30} &= 12 \end{aligned}$$

..... 12
(Total 2 marks)

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

1 1 2 3 5 8 13 21 34 55

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 10th term of this sequence.

..... 55
(1)

The first three terms of a different Fibonacci sequence are

m n $m + n$ $m + 2n$ $2m + 3n$

(b) Show that the 7th term of this sequence is $5m + 8n$

$3m + 5n$ $5m + 8n$.

(2)
(Total 3 marks)

20. 30 students ran in a cross-country race.
The table below shows information about the times recorded for each student.

Time (t minutes)	Frequency
¹⁰ $5 < t \leq 15$	2
^{17.5} $15 < t \leq 20$	5
^{22.5} $20 < t \leq 25$	12
^{27.5} $25 < t \leq 30$	8
³⁵ $30 < t \leq 40$	3

fx

20

87.5

270

220

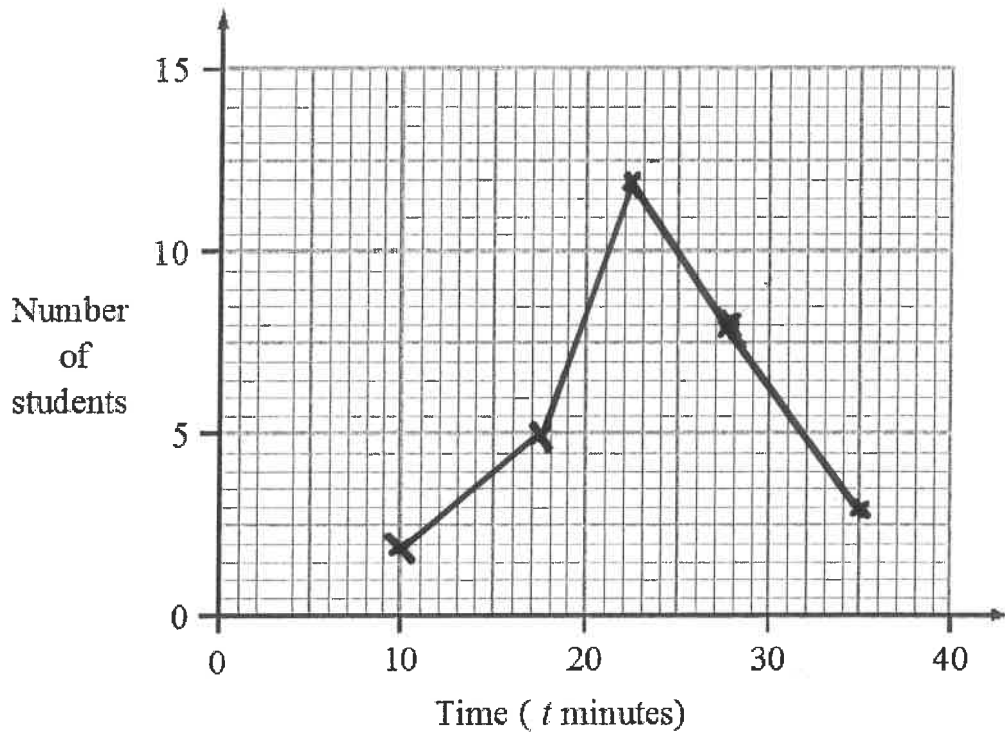
105

702.5

30

- a) On the grid, draw a frequency polygon to show this information

[2]



- b) Calculate an estimate for the mean time taken for a student to complete the race.

$$\frac{702.5}{30} = 23.41\dot{6}$$

[3]

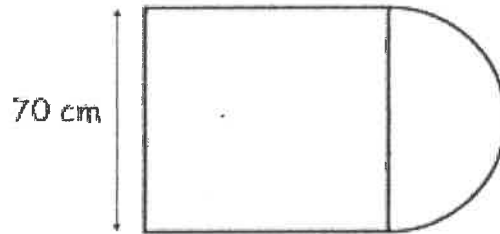
(Total 5 marks)

21.

A patio tile is made up of a square **and** a semi-circle.

The length of the side of the square is 70cm.

Calculate the area of the whole patio tile.



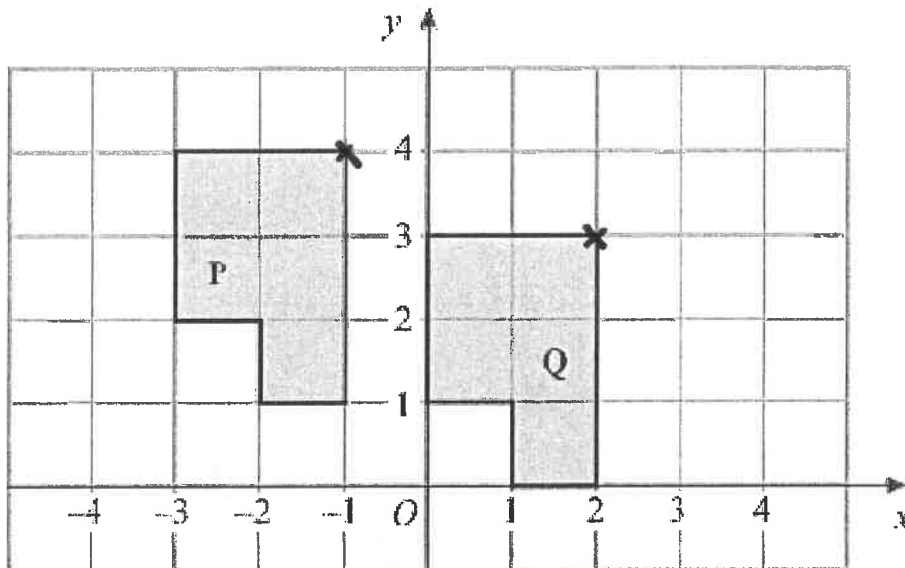
$$\frac{\pi r^2}{2} = \frac{\pi \times 35^2}{2}$$

$$70^2 + 1924.2255 = 6824.2255$$

$$= 6824.2 \text{ to } 1 \text{ dp} \\ \text{cm}^2$$

(Total 2 marks)

22.



Describe fully the single transformation that will map shape P onto shape Q

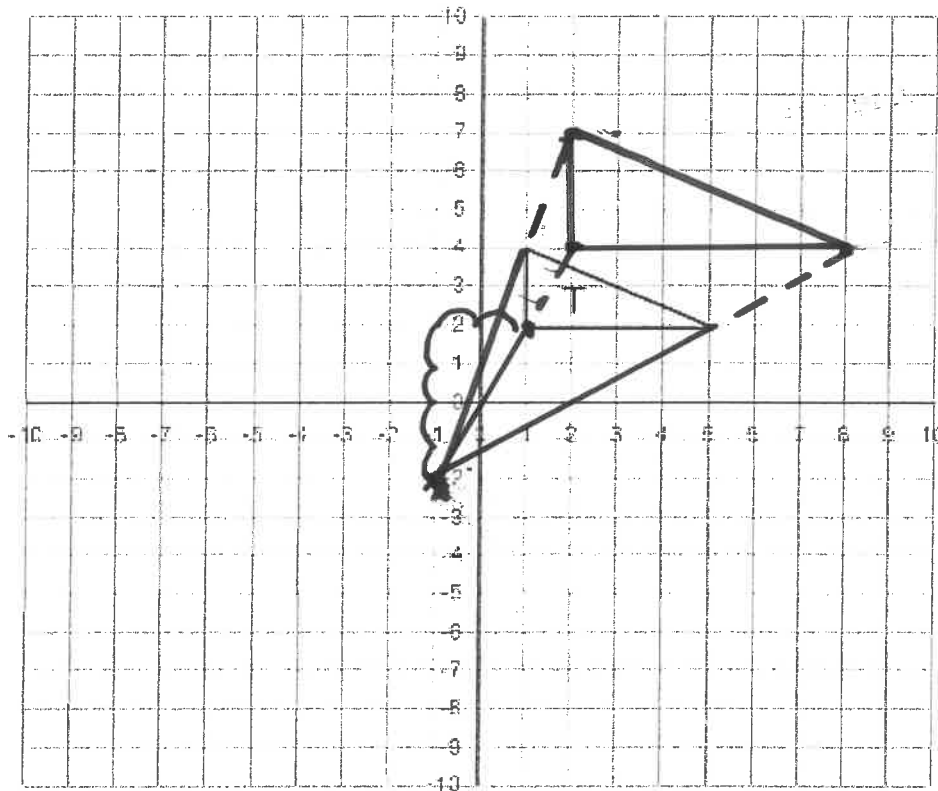
a translation of vector $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$

(Total 2 marks)

23.

The vertices of triangle T are (1, 2), (5, 2) and (1, 4).

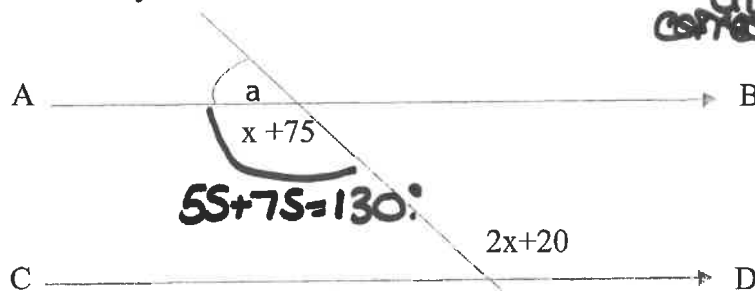
Enlarge triangle T by scale factor $\frac{3}{2}$, with (-1, -2) as the centre of enlargement.



$\begin{pmatrix} 6 \\ 2 \end{pmatrix} \begin{pmatrix} 9 \\ 3 \end{pmatrix}$

(Total 3 marks)

24. AB is parallel to CD.
Calculate the size of angle a.
Give reasons for your answer.



$2x + 20 = x + 75$
alternate angles
are equal

$$2x + 20 = 75$$

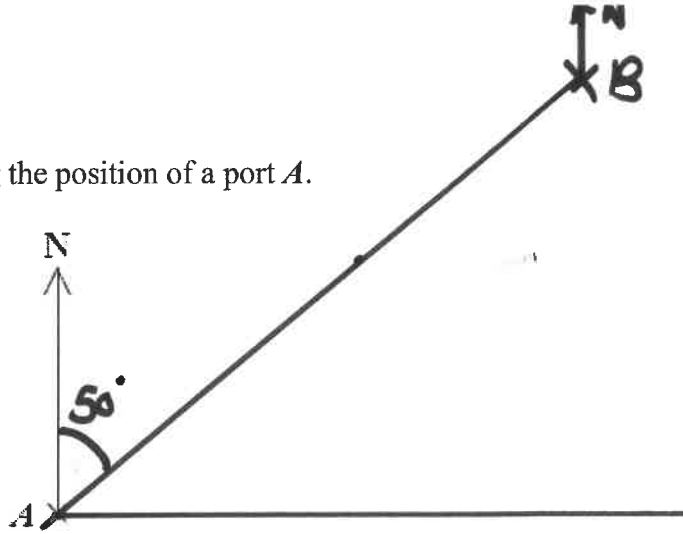
$$x = 55$$

$$55 + 75 = 130^\circ$$

$a = 180^\circ - 130^\circ = 50^\circ$
angles on a straight line add up to 180°

(Total 3 marks)

25. Here is part of a map showing the position of a port A .



B is a lighthouse 36 km from A on a bearing of 050°

(a) (i) On the diagram above using a scale of $1\text{ cm} = 4\text{ km}$, show the position of B .

(ii) Write down the bearing of A from B .

$$180 + 50 = 230^\circ$$

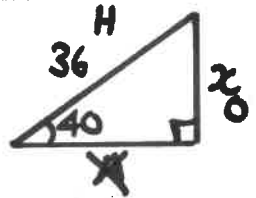
[3]

From the lighthouse at B , ships can be seen when they are within a range of 23 km of B .

A ship sails due East from A .

(b) Show, by calculation, that this ship will not be seen from the lighthouse at B .

You must not use a scale drawing.



[4]

(Total 7 marks)

$$\sin 40 = \frac{OP}{36} \Rightarrow OP = 23.14$$

The ship will not be seen from the lighthouse because the shortest distance it would be is 23.14 km.

26.

If $\varepsilon = \{3, 4, 5, 6, 7, 8, 9\}$ and
 $A = \{ \text{odd numbers} \}$
 $B = \{ \text{prime numbers} \}$

(a) Draw a Venn diagram to show this information



[2]

(b) Find the probability of $P(A \cup B)$.

$$\frac{4}{7}$$

[2]

(Total 4 marks)

TOTAL FOR PAPER IS 80 MARKS