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0607/42

May/June 2015

2 hours 15 minutes

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

The total number of marks for this paper is 120.

This document consists of **20** printed pages.

Formula List

For the equation $ax^2 + bx + c = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area, A , of cylinder of radius r , height h . $A = 2\pi rh$

Curved surface area, A , of cone of radius r , sloping edge l . $A = \pi rl$

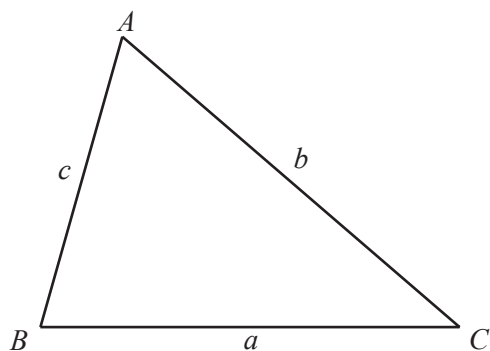
Curved surface area, A , of sphere of radius r . $A = 4\pi r^2$

Volume, V , of pyramid, base area A , height h . $V = \frac{1}{3}Ah$

Volume, V , of cylinder of radius r , height h . $V = \pi r^2 h$

Volume, V , of cone of radius r , height h . $V = \frac{1}{3}\pi r^2 h$

Volume, V , of sphere of radius r . $V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

Answer **all** the questions.

- 1** An art gallery values its paintings every five years.
The value of one painting increased by 90% every five years from 1990.
The value in 1995 was \$76 000.

(a) Calculate the exact value of the painting in

(i) 1990,

Answer(a)(i) \$ [3]

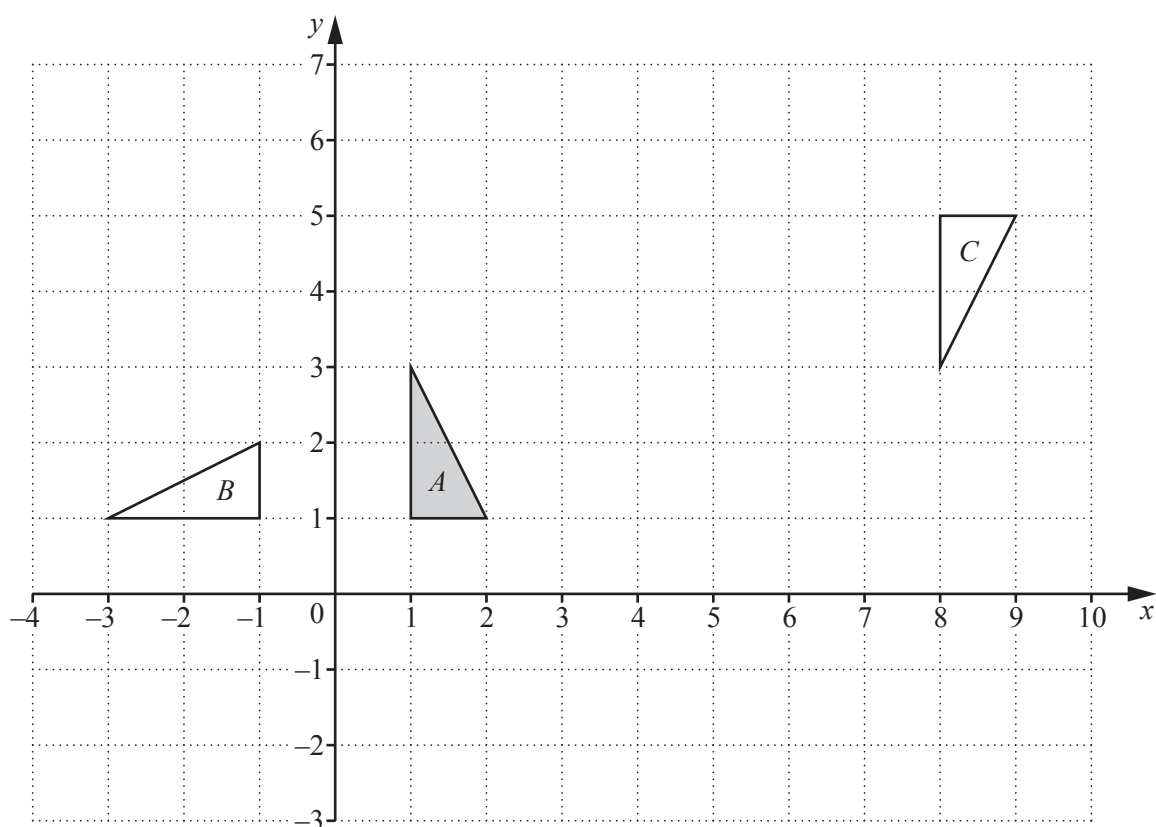
(ii) 2010.

Answer(a)(ii) \$ [3]

(b) The value of the painting continues to increase by 90% every five years.

In which year's valuation will the value of the painting first be over \$10 million?

Answer(b) [2]



- (a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

Answer(a)
 [3]

- (b) Complete the statement.

Triangle *A* can be mapped onto triangle *C* by a translation with vector $\begin{pmatrix} \\ \end{pmatrix}$ followed by
 a reflection in the line [2]

- (c) Stretch triangle *A* with the *x*-axis invariant and stretch factor 2. [2]

- 3 Jean-Paul goes on holiday and drives 780 km.
He leaves at 06 45 and arrives at 16 10.

(a) Find the average speed for the whole journey.

Answer(a) km/h [3]

- (b) He travels partly on autoroutes and partly on other roads.
He travels for 520 km on autoroutes at an average speed of 105 km/h.

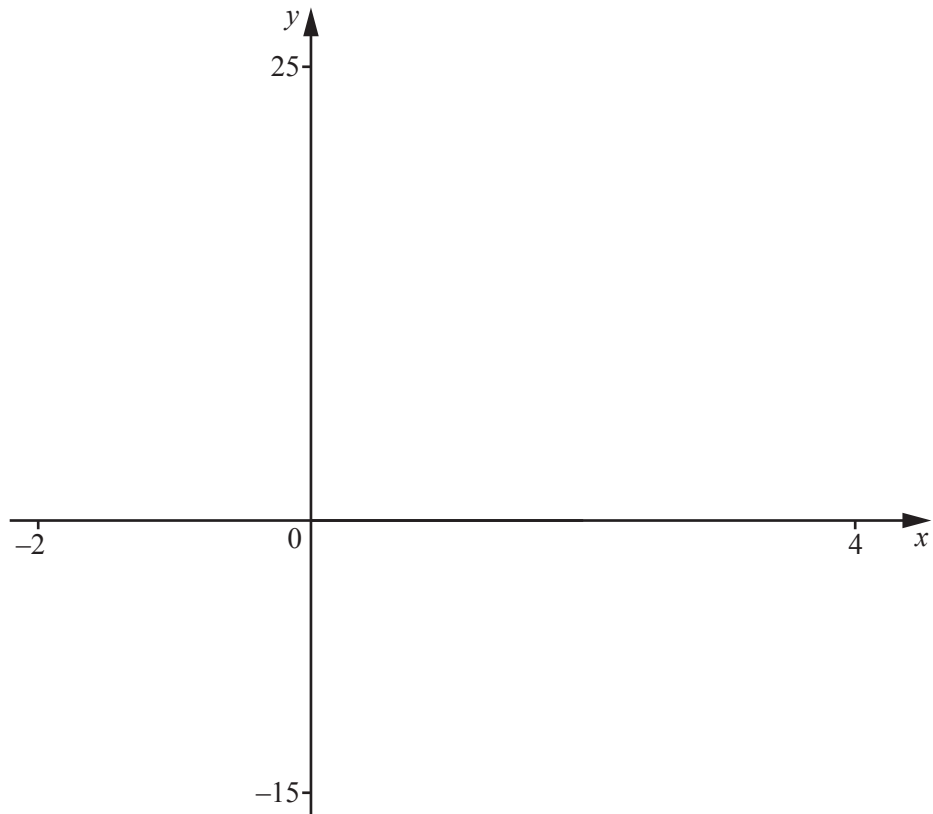
Find the average speed for the part of the journey on other roads.

Answer(b) km/h [3]

- (c) For every 100 km travelled on autoroutes, Jean-Paul's car uses 6 litres of fuel.
For every 100 km travelled on other roads, it uses 8 litres of fuel.
Fuel costs 1.63 euros per litre.
The total autoroute toll charges are 15.20 euros.

Find the total cost of the journey.

Answer(c) euros [4]



$$f(x) = x^3 - 3x^2 + 6$$

(a) On the diagram, sketch the graph of $y = f(x)$ for $-2 \leq x \leq 4$. [2]

(b) Find the co-ordinates of the local maximum point and the local minimum point.

Answer(b) Maximum (..... ,)

Minimum (..... ,) [2]

(c) Find the range of values of k for which the equation $f(x) = k$ has 3 different solutions.

Answer(c) [2]

- (d) Describe fully the symmetry of the graph of $y = f(x)$.

Answer(d)
 [3]

- (e) The graph of $y = g(x)$ is the translation of the graph of $y = f(x)$ with vector $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$.

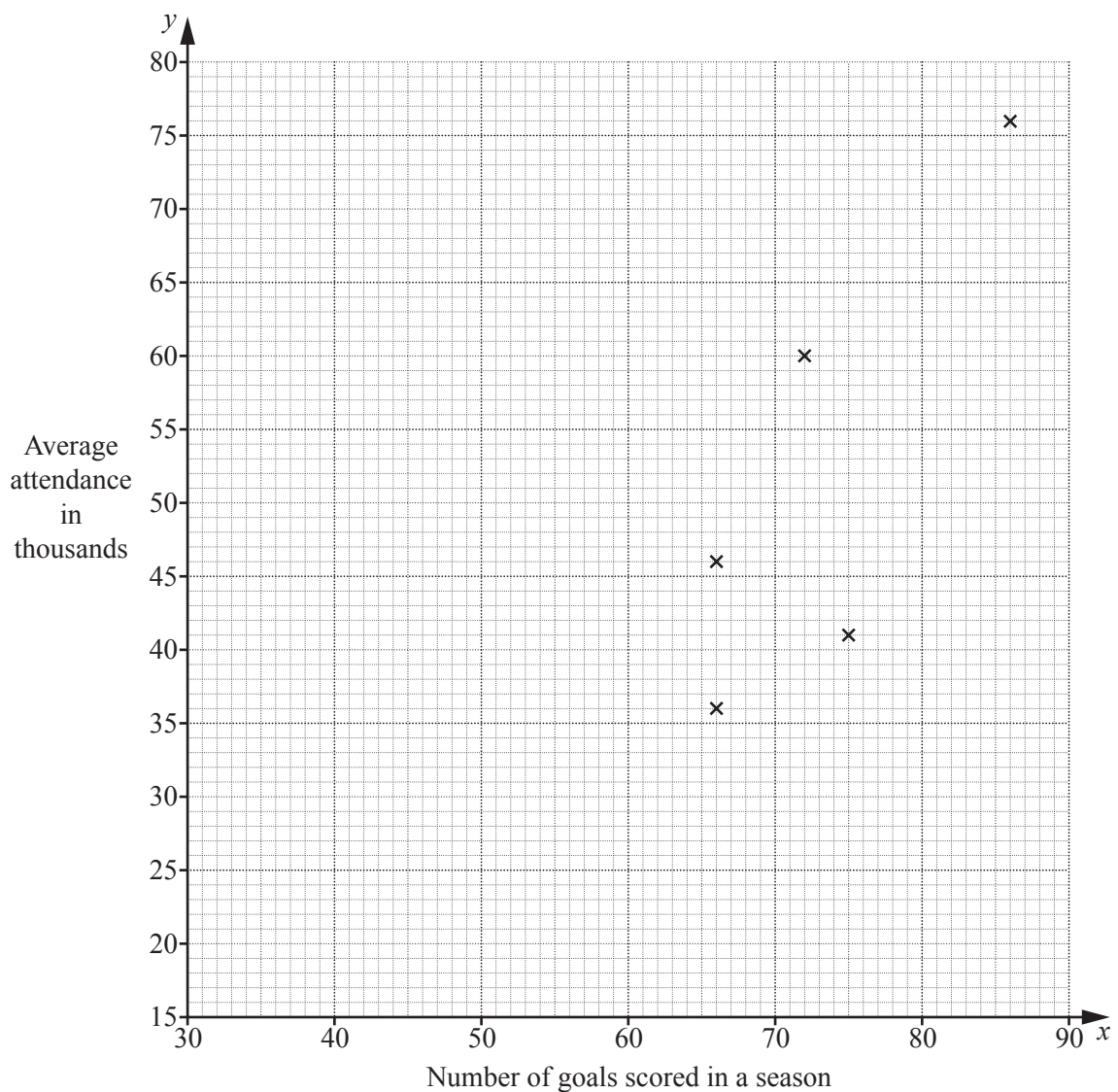
Write down and simplify $g(x)$.

Answer(e) $g(x) =$ [1]

- 5 The table shows the number of goals scored in a season, x , and the average attendance at matches in thousands, y , for ten teams in a league.

Team	A	B	C	D	E	F	G	H	I	J
Number of goals scored in a season (x)	86	66	75	72	66	55	71	53	47	45
Average attendance in thousands (y)	76	46	41	60	36	36	45	25	20	35

- (a) Complete the scatter diagram.
The first five points have been plotted for you.



[2]

- (b) What type of correlation is shown by the scatter diagram?

Answer(b) [1]

- (c) Find the mean

- (i) number of goals scored,

Answer(c)(i) [1]

- (ii) average attendance.

Answer(c)(ii) thousand [1]

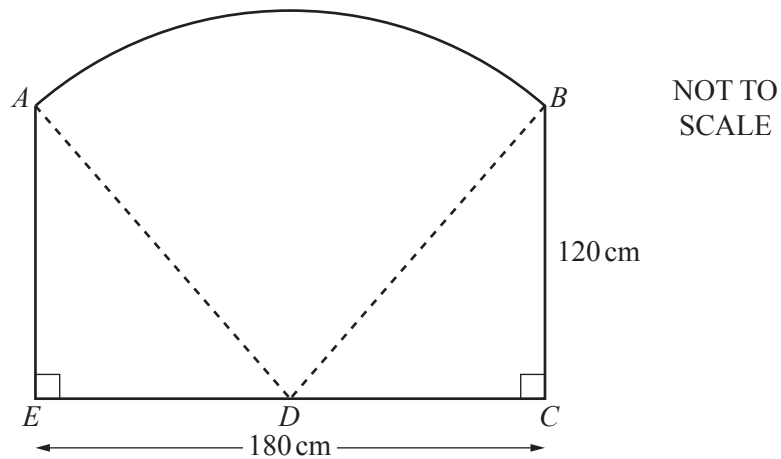
- (d) Find the equation of the line of regression in the form $y = mx + c$.

Answer(d) $y =$ [2]

- (e) Use your answer to **part (d)** to estimate the average attendance for a team that scored 80 goals in a season.

Answer(e) [1]

6



The diagram shows a fence panel $ABCDE$.

The vertical edges AE and BC are of length 120 cm and the horizontal base EC is of length 180 cm. D is the midpoint of EC .

- (a) Calculate AD .

Answer(a) cm [2]

- (b) Show that angle $ADB = 73.74^\circ$ correct to 2 decimal places.

[3]

- (c) AB is an arc of a circle centre D .
Find the area of the fence panel.

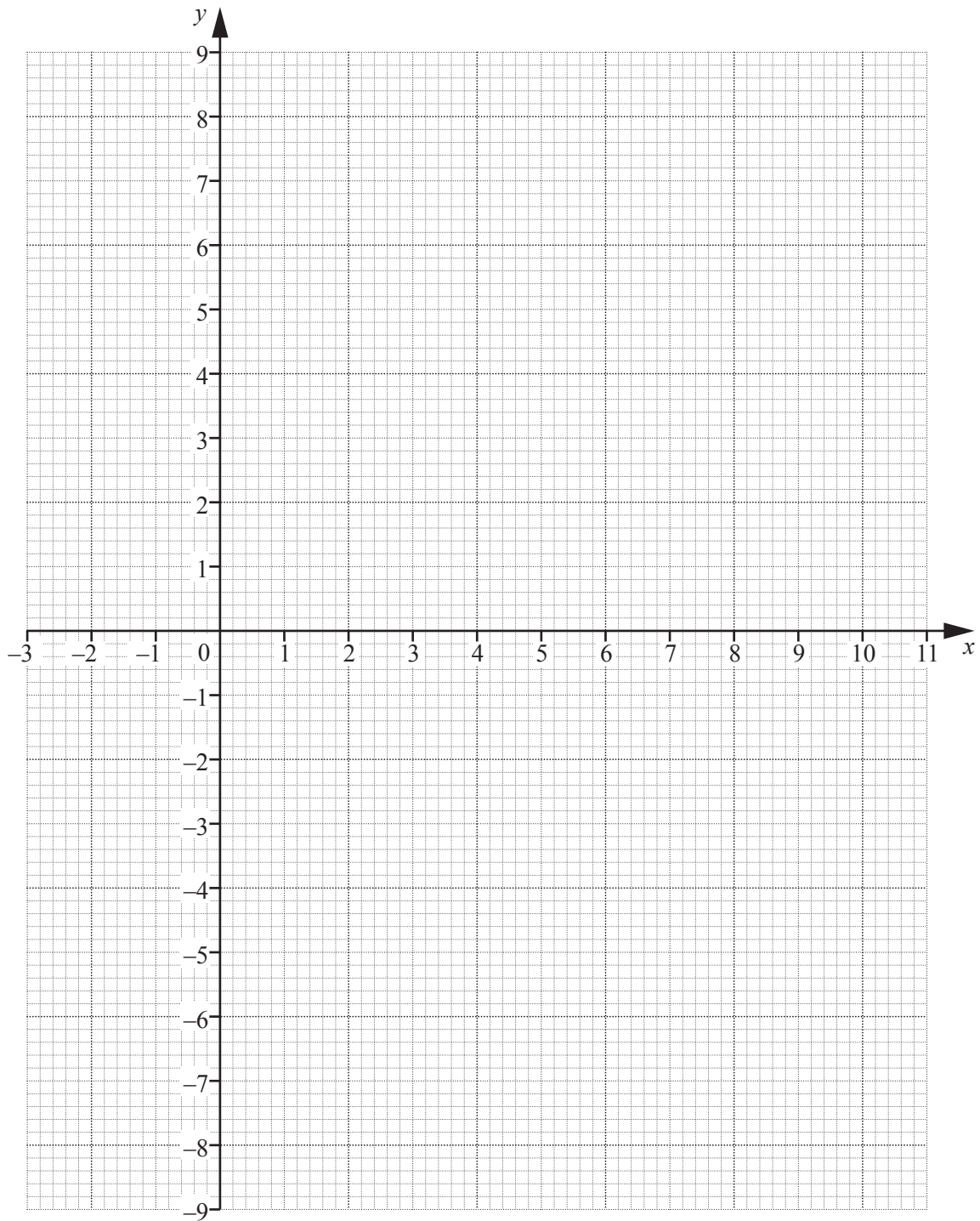
Answer(c) cm^2 [3]

- (d) Stefan's fence has 8 panels, each identical to $ABCDE$.
He wishes to paint both sides of all the panels.
Each litre of paint covers an area of 6 **square metres**.

Calculate the number of litres Stefan needs to paint **both** sides of the whole fence.

Answer(d) litres [3]

7



- (a) On the grid, show clearly the region defined by these inequalities.

$$x \geq -1 \quad y \geq 2 \quad y \geq 2x - 3 \quad 3x + 5y \leq 30 \quad [7]$$

- (b) Use your diagram to estimate

- (i) the greatest value of y in the region,

Answer(b)(i) [1]

- (ii) the greatest value of $x + y$ in the region.

Answer(b)(ii) [1]

8 (a) Give an example of

(i) discrete data,

Answer(a)(i) [1]

(ii) continuous data.

Answer(a)(ii) [1]

(b) The table shows the heights, h cm, of 30 students in a class.

Height (h cm)	$150 < h \leq 155$	$155 < h \leq 160$	$160 < h \leq 165$	$165 < h \leq 170$	$170 < h \leq 175$	$175 < h \leq 180$
Frequency	2	4	8	7	5	4

(i) Write down the modal interval.

Answer(b)(i) $< h \leq$ [1]

(ii) Write down the interval that contains the median.

Answer(b)(ii) $< h \leq$ [1]

(iii) Calculate an estimate of the mean.

Answer(b)(iii) cm [2]

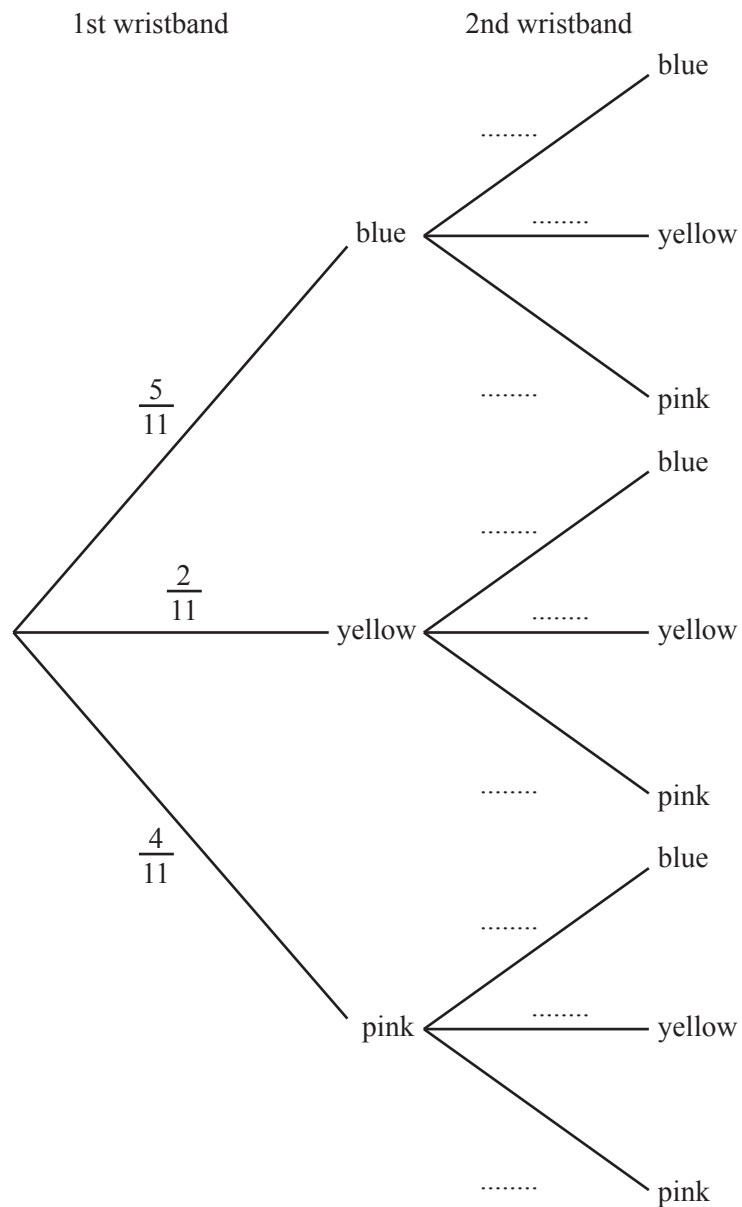
(iv) Explain why the answer to **part (b)(iii)** is an estimate and not an exact answer.

Answer(b)(iv)
 [1]

- 9 Gitte has a bag containing coloured wristbands.
There are 5 blue wristbands, 2 yellow wristbands and 4 pink wristbands.

Gitte takes a wristband at random from the bag.
If it is yellow, she puts it back in the bag.
If it is blue or pink she puts it on her wrist.
She then takes another wristband at random from the bag.

- (a) Complete the tree diagram.



[3]

- (b) If the second wristband is yellow, Gitte puts it back in the bag.
If it is blue or pink she puts it on her other wrist.

After choosing the second wristband, find the probability that she is wearing

- (i) no wristbands,

Answer(b)(i) [2]

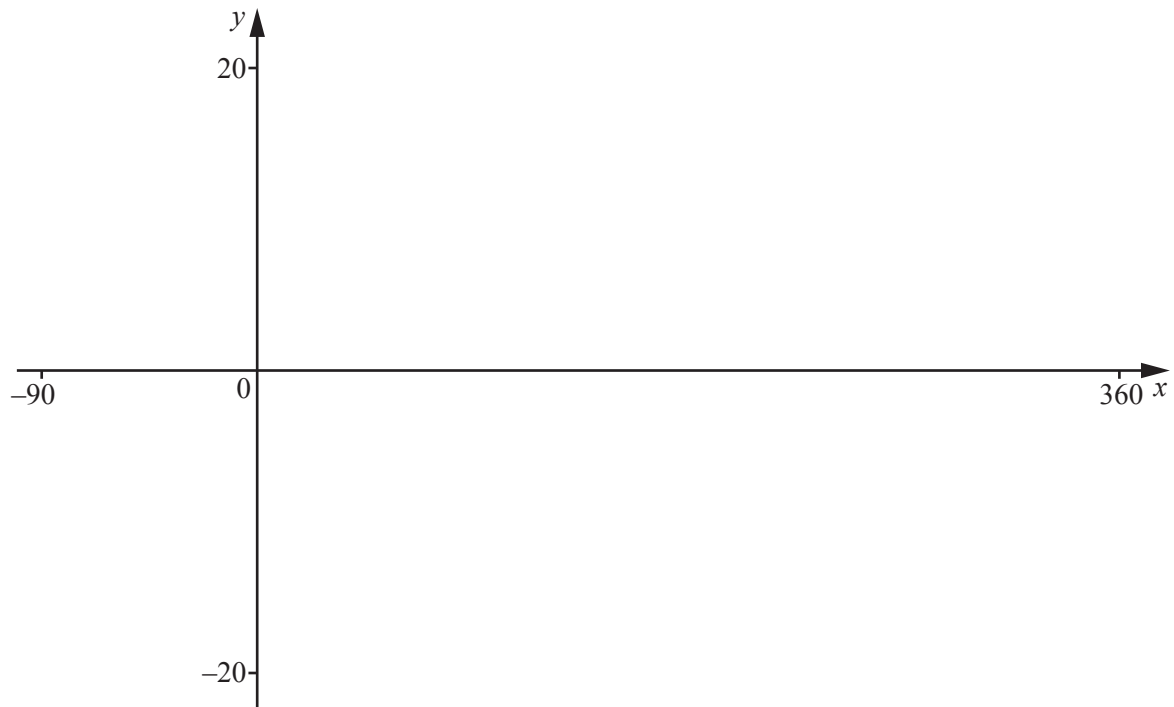
- (ii) a matching pair of wristbands,

Answer(b)(ii) [3]

- (iii) only one wristband.

Answer(b)(iii) [3]

10



$$f(x) = 2\tan(x + 30)^\circ$$

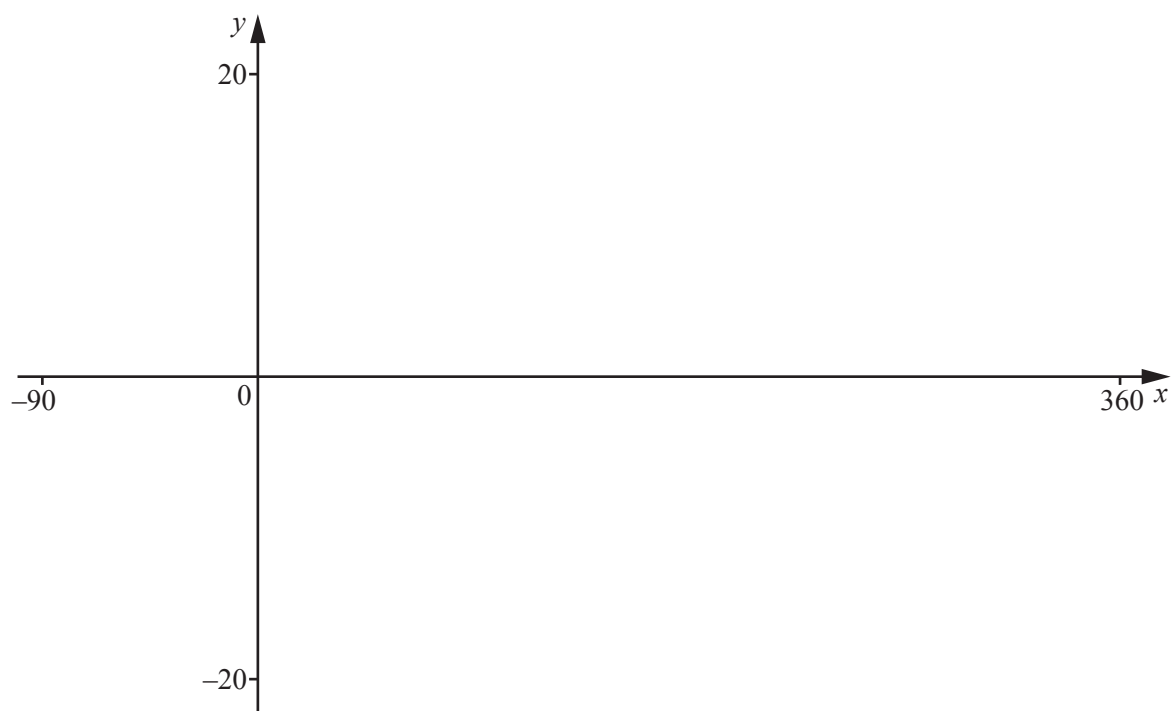
- (a) On the diagram, sketch the graph of $y = f(x)$ for values of x between -90 and 360 . [3]
- (b) Solve the equation $f(x) = 5$ for values of x between -90 and 360 .

Answer(b) $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

- (c) Write down the equations of the two asymptotes to this graph for values of x between -90 and 360 .

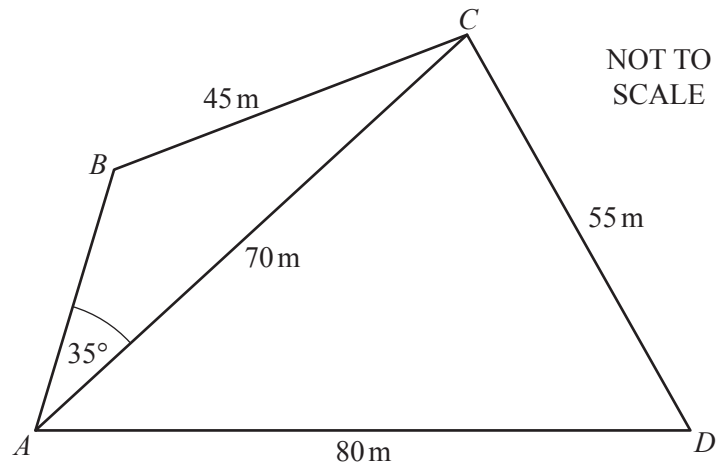
Answer(c) $\dots\dots\dots$
 $\dots\dots\dots$ [2]

- (d) On the diagram below, sketch the graph of $y = |2 \tan(x + 30)^\circ|$ for values of x between -90 and 360 .



[2]

11



The diagram shows the plan of a field $ABCD$ with a path from A to C .

(a) Calculate

(i) the obtuse angle ABC ,

Answer(a)(i) [4]

(ii) angle CAD .

Answer(a)(ii) [4]

(b) Waqar walks along the path AC .
Calculate his shortest distance from B .

Answer(b) m [2]

12 $f(x) = 5x - 2$ $g(x) = \frac{6}{4x+1}, x \neq -\frac{1}{4}$ $h(x) = 5x^2 + 3x - 2$

(a) Find $f(g(1))$.

Answer(a) [2]

(b) Find and simplify these expressions.

(i) $g(f(x))$

Answer(b)(i) [2]

(ii) $f^{-1}(x)$

Answer(b)(ii) [2]

(c) Simplify.

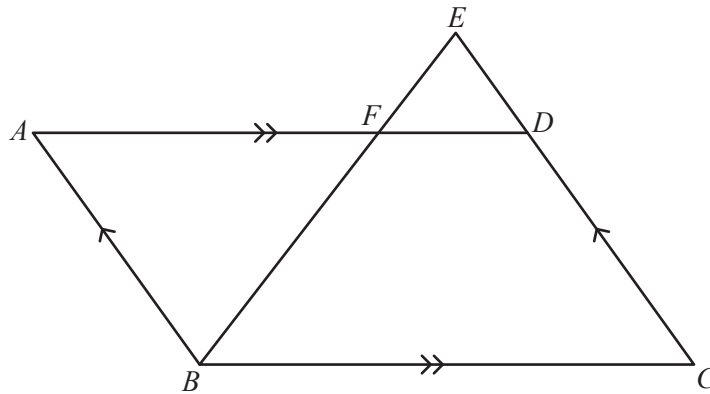
(i) $\frac{f(x)}{h(x)}$

Answer(c)(i) [3]

(ii) $g(x) - \frac{1}{f(x)}$

Answer(c)(ii) [3]

Question 13 is printed on the next page.



NOT TO
SCALE

$ABCD$ is a parallelogram.
 BFE and CDE are straight lines.

- (a) Explain why triangles AFB and DFE are similar.

Answer(a)
.....
..... [2]

- (b) $BC = 10$ cm, $FD = 4$ cm and $EC = 8$ cm.

- (i) Calculate the length of AB .

Answer(b)(i) cm [3]

- (ii) Find the value of $\frac{\text{Area of } DFE}{\text{Area of } AFB}$.

Answer(b)(ii) [1]

- (iii) Find the value of $\frac{\text{Area of } DFE}{\text{Area of } ABCD}$.

Answer(b)(iii) [2]

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