OCR-H Nov'17 P4

Answer **all** the questions.

1 Donald swims 3 lengths of a swimming pool in 93 seconds.

(a) Use this information to show that he could swim 100 lengths in under 55 minutes. **[4]**

$93 \div 3 = 31s$ ✓

$31 \times 100 = 3100s$ ✓

$3100 \div 60 = 51.6$ mins ✓

< 55 mins ✓

(b) What assumption did you make in part **(a)**?

He can maintain the same speed for a longer distance ✓OE [1]

(c) Donald tries to swim the 100 lengths in under 55 minutes.

Suggest one reason why he might not achieve this.

He may tire ✓OE

[1]

2 **(a)** Simplify.

(i) $a^6 \div a^2$

$6 - 2$

(a)(i) a^4 ✓ [1]

(ii) $(b^5)^3$

5×3

(ii) b^{15} ✓ [1]

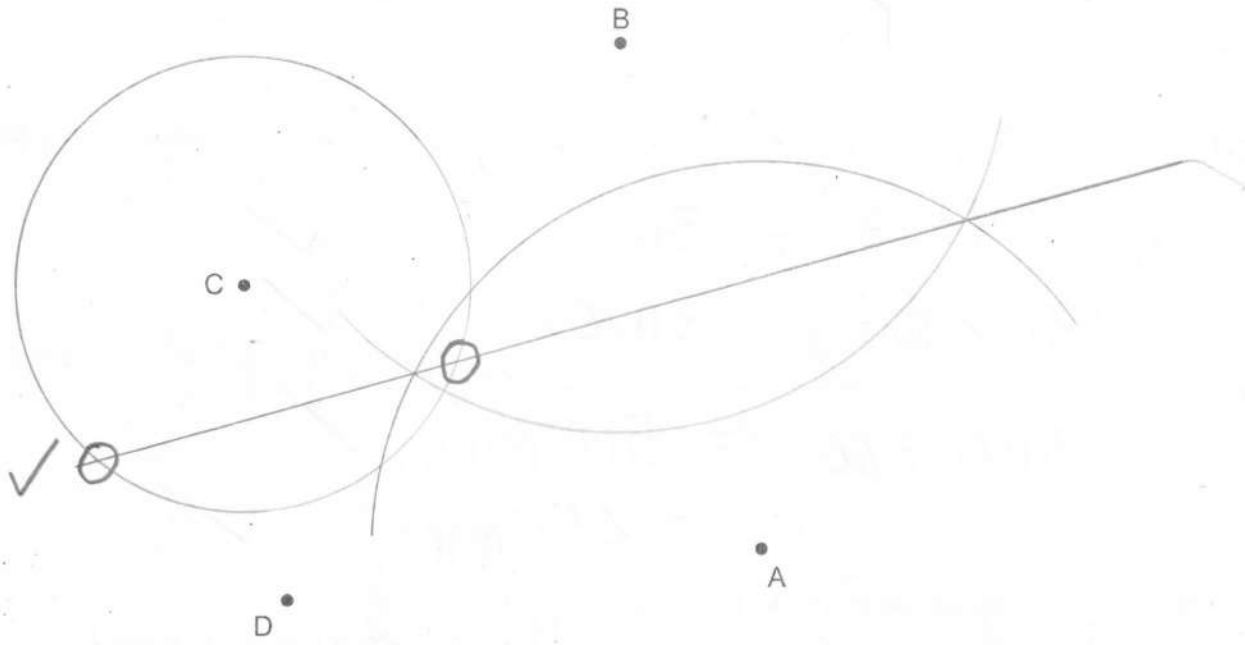
(b) Factorise.

$6x - x^2$

(b) $x(6 - x)$ ✓ [1]

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3 Four points A, B, C and D are shown on the scale diagram below.



Scale: 1 cm represents 5 m

(a) On the diagram, construct and mark the two points that are

- the same distance from A and B ✓✓

and

- 15 m from C. = 3cm ✓✓

Show all your construction lines. **[5]**

(b) The points A, B, C and D represent the four corners of Monty's garden.
His garden is bounded by four straight fences A to B, B to C, C to D and D to A.

Monty wants to plant a tree in his garden at a place that satisfies the two conditions in part **(a)**.

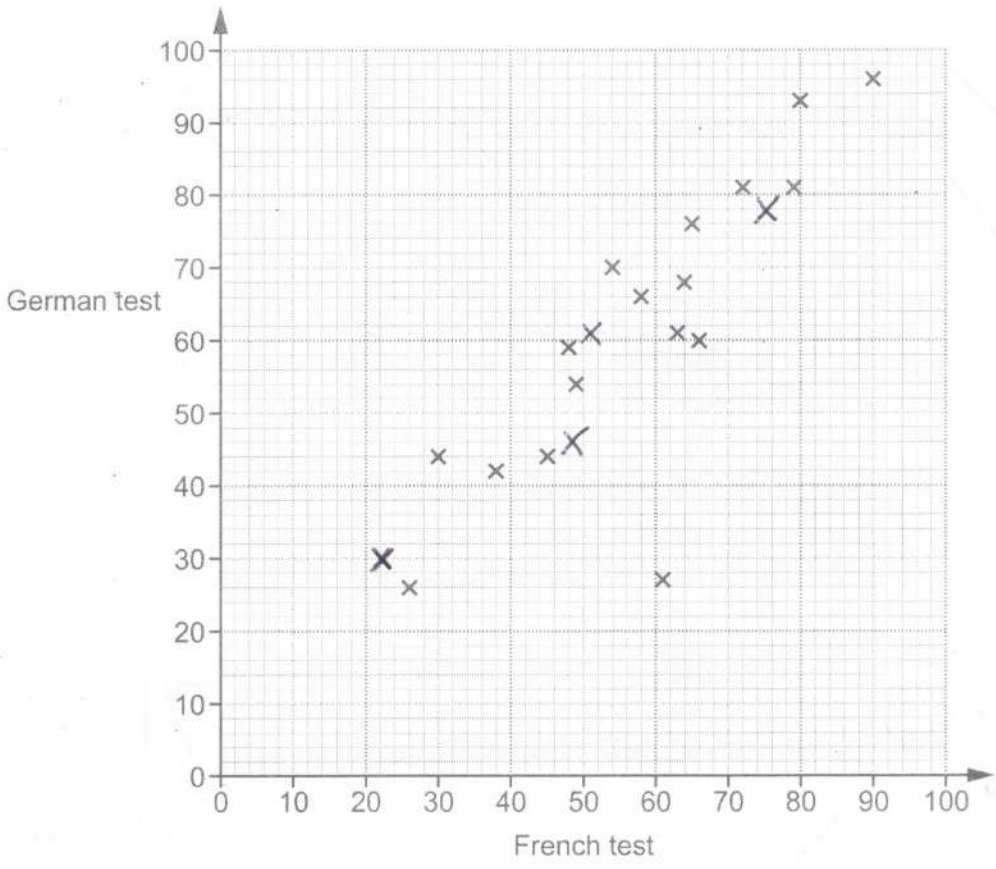
Explain why there is only one position where Monty can plant his tree.

One point is outside of Monty's garden ✓etc

..... **[1]**

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4 The scatter diagram shows the results of 17 students in their French test and their German test. Both tests are out of 100.



✓all
✓2

(a) Here are the results of another 4 students.

French	21	75	48	53
German	30	78	46	61

x
y

Plot these results on the scatter diagram. **[2]**

(b) Describe the type and strength of the correlation shown in this diagram.

(b) strong positive ..... **[2]**

✓ ✓

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(c) Work out the percentage of the students whose German result was **higher** than their French result.

$\frac{15}{21} \times 100$

$= 71.4...$

(c) 71 % **[4]**

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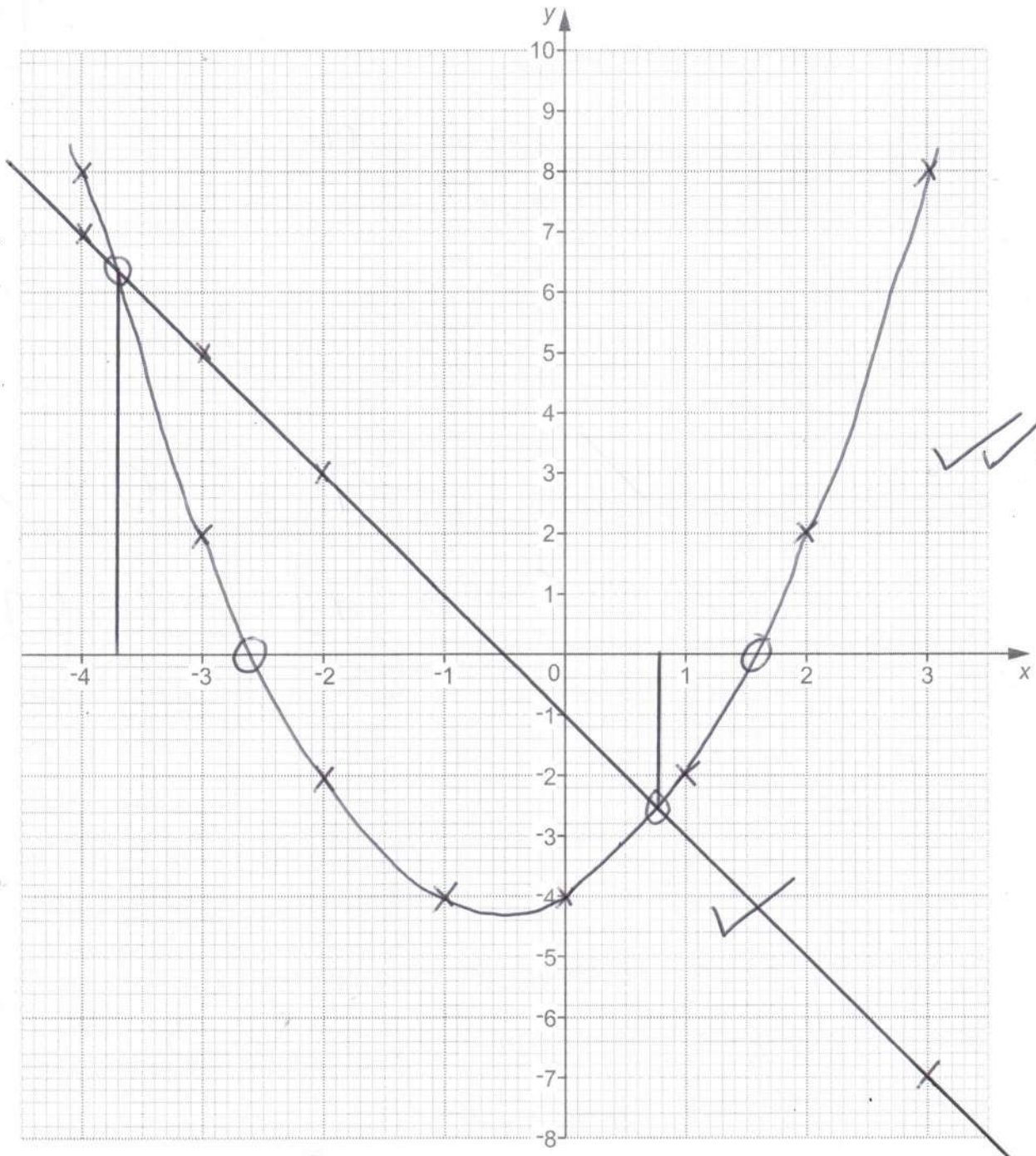
5 **(a)** Complete this table for $y = x^2 + x - 4$.

x	-4	-3	-2	-1	0	1	2	3
y	8	2	-2	-4	-4	-2	2	8

✓2
✓4

[2]

(b) Draw the graph of $y = x^2 + x - 4$ for $-4 \leqslant x \leqslant 3$.



✓✓6+

✓

c)

[3]

1 ✓ ✓ ✓

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(c) Use your graph to solve $x^2 + x - 4 = 0$.

✓ 1·6 -2·6 ✓

(c) $x =$ ..... or $x =$ ..... [2]

[±0·1]

(d) On the same grid, draw the graph of $y = -2x - 1$ for $-4 \leqslant x \leqslant 3$.
You may use the table if you wish.

x	-4	-3	-2
y	7	5	4

etc

[3]

(e) Use your graphs to solve the equation $x^2 + x - 4 = -2x - 1$.

✓ -3·7 0·8 ✓

(e) $x =$ ..... or $x =$ ..... [2]

[-3·9 → -3·7] [0·7 → 0·9]

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6 Maria mixes white paint and red paint in the ratio 2 : 3.
She makes a total of 15 litres of paint.

How much more red paint does she need to add to the mixture so that the ratio of white paint to red paint becomes 1 : 5?

W R
2 3
(x3)
6 + 9 = 15 ✓

Red must = 5 x white
so 5 x 6 = 30 ✓

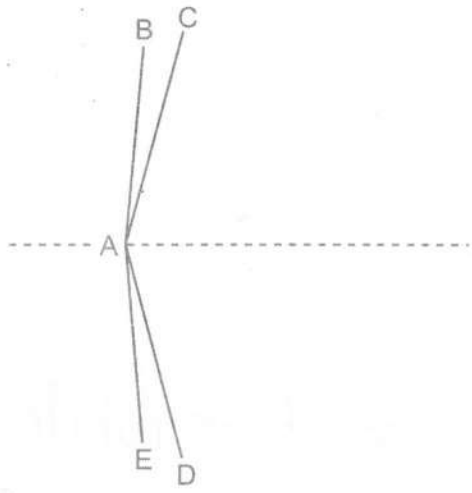
30 - 9 = 21 ✓

✓

..... litres [4]

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7 Angle BAE is part of a regular 18-sided polygon.
Angle CAD is part of a regular 10-sided polygon.
The dashed line through A is a line of symmetry of both polygons.



Not to scale

Work out angle BAC.

Internal CAD $= 180 - \frac{360}{18}$ ✓

$= 180 - 20 = 160$ ✓

Internal BAE $= 180 - \frac{360}{10}$

$= 180 - 36 = 144$ ✓

BAC $= \frac{160 - 144}{2} = 8$ ✓

✓

..... ° [5]

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8 Diners choose one starter and one main from the options given in the table below.
Vegetarian dishes are indicated with a (v).

Starter	Main
Cheese salad (v)	Steak and chips
Prawn cocktail	Fish and chips
Mozzarella sticks (v)	Tomato pizza (v)
	Pork chops
	Nut cutlet (v)

(a) Work out the fraction of all the meal combinations which have at least one vegetarian option.

All = 3 x 5 = 15 ✓

None = 1 x 3 = 3

At least 1 = 12 ✓

$\frac{12}{15}$ or $\frac{4}{5}$ ✓

(a) ..... **[3]**

(b) Diners also choose one of 6 dessert options.

How many different three-course meal combinations are available?

3 x 5 x 6 ✓ft

90 ✓

(b) ..... **[2]**

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9 Here are the results of a survey of 437 people in a town.

- 62 males speak Spanish.
- 153 females do not speak Spanish.
- 280 people do not speak Spanish.

Jeff says

40%

At least 2 out of every 5 females in the town can speak Spanish.

Is he correct?
Show clearly how you reached your decision.

	S	S'	
M	62	127	189
F	95	153	248
	157	280	437

✓ ✓ ✓

$\frac{95}{248} \times 100 = 38.3...\%$, less than $\frac{2}{5}$ ✓

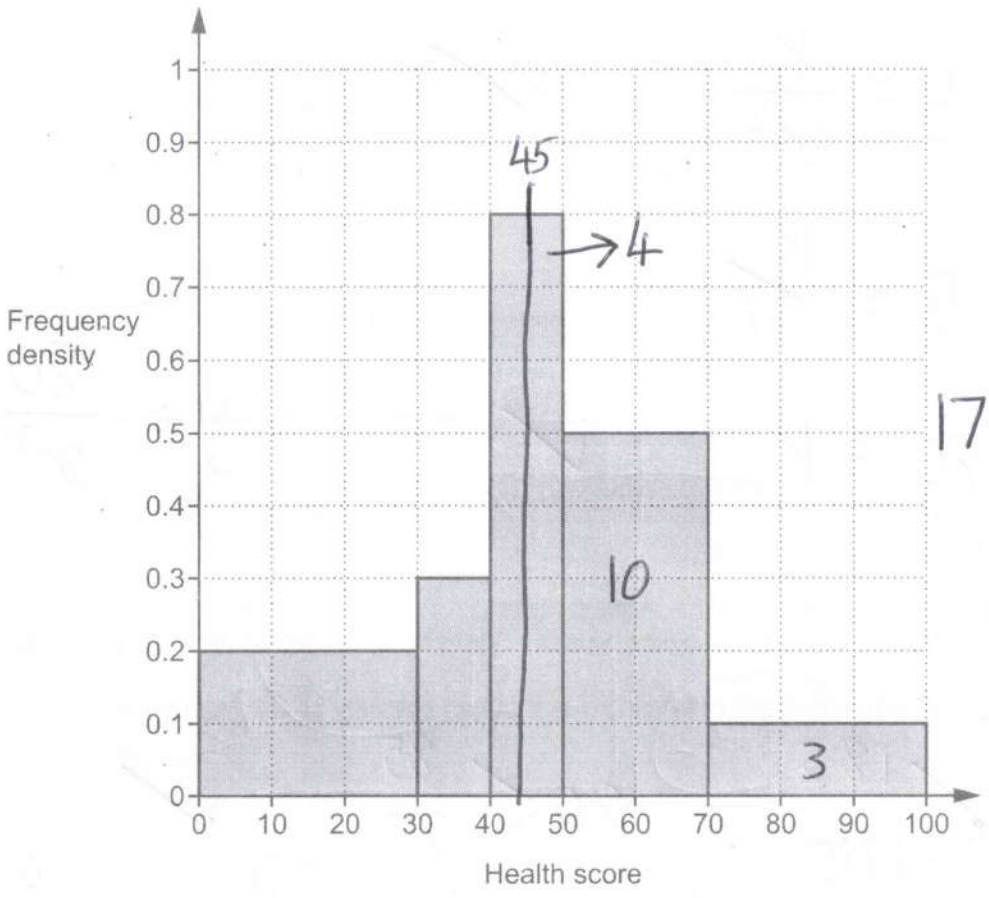
so No

✓✓

[6]

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10 The histogram summarises a health score for a group of people.



17 ✓

(a) Estimate the fraction of the group who had a score of 45 or more.

$30 \times 0.2 = 6$
$10 \times 0.3 = 3$
$10 \times 0.8 = 8$
$20 \times 0.5 = 10$
$30 \times 0.1 = 3$
} 30 ✓✓

$\frac{17}{30}$ ✓

(a) ..... **[4]**

(b) What assumption did you make in answering part **(a)**?

40→50 group is evenly spread ✓etc

..... **[1]**

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11 y is inversely proportional to x^2 and $y = 5$ when $x = 4$.

Find a formula linking x and y.

$y = \frac{K}{x^2}$ ✓

$5 = \frac{K}{16}$

$80 = K$ ✓

$y = \frac{80}{x^2}$ ✓

..... [3]

12 A log is 18 m long, correct to the nearest metre.
It is to be cut into fence posts which must be 80 cm long, correct to the nearest 10 centimetres.

What is the largest number of fence posts that can possibly be cut from this log?

✓ $18 < \begin{matrix} 18.5 \\ 17.5 \end{matrix}$ $80 < \begin{matrix} 85 \\ 75 \end{matrix}$ ✓

Max $= \frac{1850}{75} = 24.6...$ ✓

round down 24 ✓

..... [4]

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13 **(a)** Solve.

$x^2 - 6x + 15 = 3x - 5$

$x^2 - 9x + 20 = 0$ ✓

$(x-4)(x-5) = 0$ ✓✓

(a) $x =$ 4 or $x =$ 5 ✓ [4]

(b) Expand and simplify.

$(2x - 1)(x + 5)(3x - 2)$

$2x^2 + 10x - x - 5$ ✓

$2x^2 + 9x - 5$

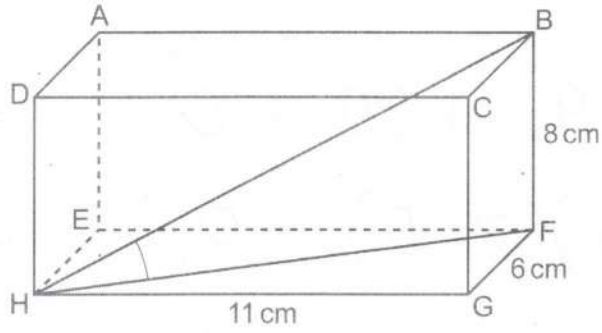
	$6x^3$	$27x^2$	$-15x$
$3x$			
-2	$-4x^2$	$-18x$	$+10$

✓✓

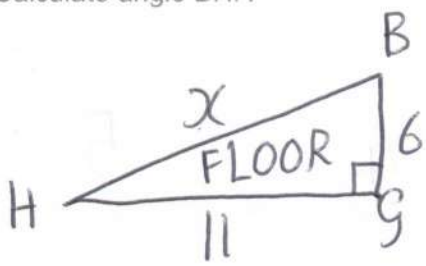
(b) $6x^3 + 23x^2 - 33x + 10$ ✓ [4]

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14 The diagram shows a cuboid ABCDEFGH.

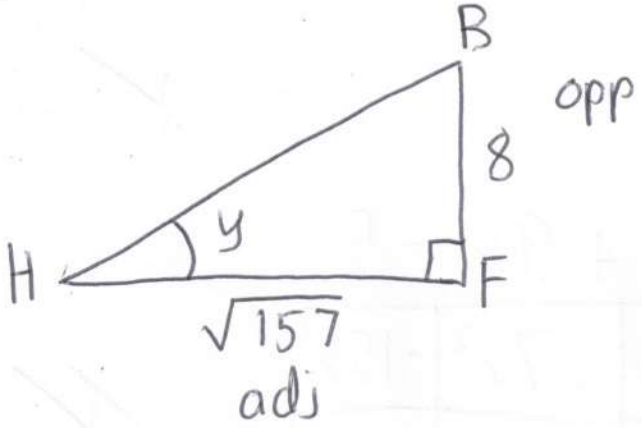


Calculate angle BHF.



$x = \sqrt{11^2 + 6^2}$ ✓

$= \sqrt{157}$ ✓



$y = \tan^{-1}\left(\frac{8}{\sqrt{157}}\right)$ ✓ ✓

$= 32.6$ ✓

..... ° **[5]**

(32.55699016)

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15 Show that $\frac{(4+2\sqrt{5})}{\sqrt{5}-1}$ can be simplified to $\frac{3\sqrt{5}+7}{2}$. **[4]**

1e ✓

$$\frac{4+2\sqrt{5}}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1} = \frac{4\sqrt{5}+4+2\sqrt{25}+2\sqrt{5}}{\sqrt{25}-1}$$

✓ ✓

$$= \frac{6\sqrt{5}+14}{4}$$

✓

$$= \frac{3\sqrt{5}+7}{2}$$

16 **(a)** Write $x^2 - 6x + 20$ in the form $(x-a)^2 + b$.

$(x-3)^2 - 9 + 20$ M✓

(a) $(x-3)^2 + 11$ ✓✓ **[3]**

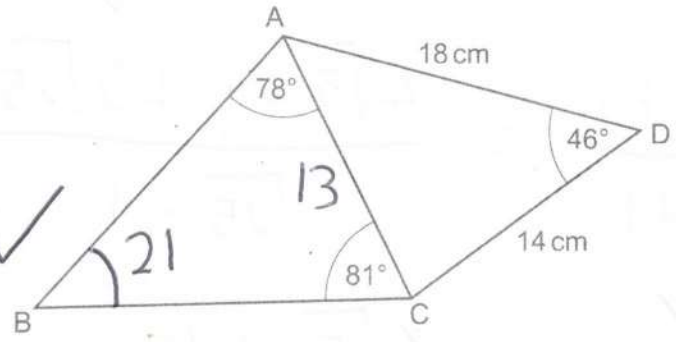
(b) Write down the turning point of the graph of $y = x^2 - 6x + 20$.

(b) (3 , 11) **[2]**

✓ ft ✓

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17 ABC and ACD are triangles.



Not to scale

(a) Show that AC = 13.0 cm, correct to 3 significant figures. **[4]**

Cosine rule ✓

$AC^2 = 18^2 + 14^2 - 2 \times 18 \times 14 \times \cos 46$ ✓

$= 520 - 350.1\ldots$

$AC = \sqrt{169.89\ldots}$ ✓

$= 13.03\ldots$ ✓

$= 13.0$ (3sf)

(b) Calculate BC.

$$\frac{BC}{\sin 78} = \frac{13}{\sin 21}$$ ✓

$$BC = \frac{13 \times \sin 78}{\sin 21} = 35.48\ldots$$

(b) 35.5 ✓ ..... cm **[3]**

[35.48 → 35.6]

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18 Solve this equation algebraically.
Give your solutions correct to 2 decimal places.

$3x^2 + 5x - 1 = 0$

$a = 3 \quad b = 5 \quad c = -1$

$$\frac{-5 \pm \sqrt{25 + 12}}{6}$$

1e 2e

0·1804... −1·847...

x = 0·18 or x = −1·85 [4]

END OF QUESTION PAPER

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1e 2e

0·1804... $\quad -1·847...$

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END OF QUESTION PAPER

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