WJEC CBAC

GCSE

185/05

MATHEMATICS (2 Tier)
HIGHER TIER
PAPER 2

P.M. MONDAY, 2 June 2008

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution especially when a calculator is used.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

Formula List

Volume of prism = area of cross-section × length
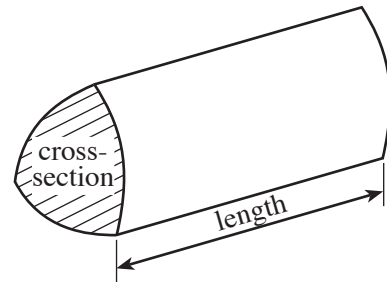
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$
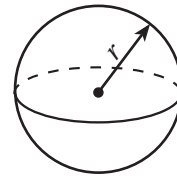
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl
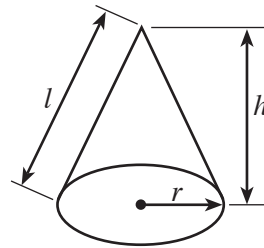
In any triangle *ABC*

Sine rule $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

Area of triangle = $\frac{1}{2}ab\sin C$
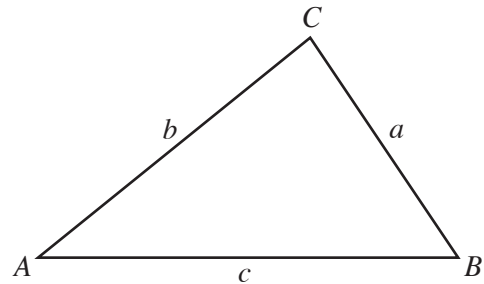
The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Standard Deviation

Standard deviation for a set of numbers

$x_1, x_2, \ldots, x_n$, having a mean of $\overline{x}$ is given by

$$s = \sqrt{\frac{\sum (x - \overline{x})^2}{n}} \quad \text{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

1.

N

Blackpool

N

N

Holyhead

Llandudno

p
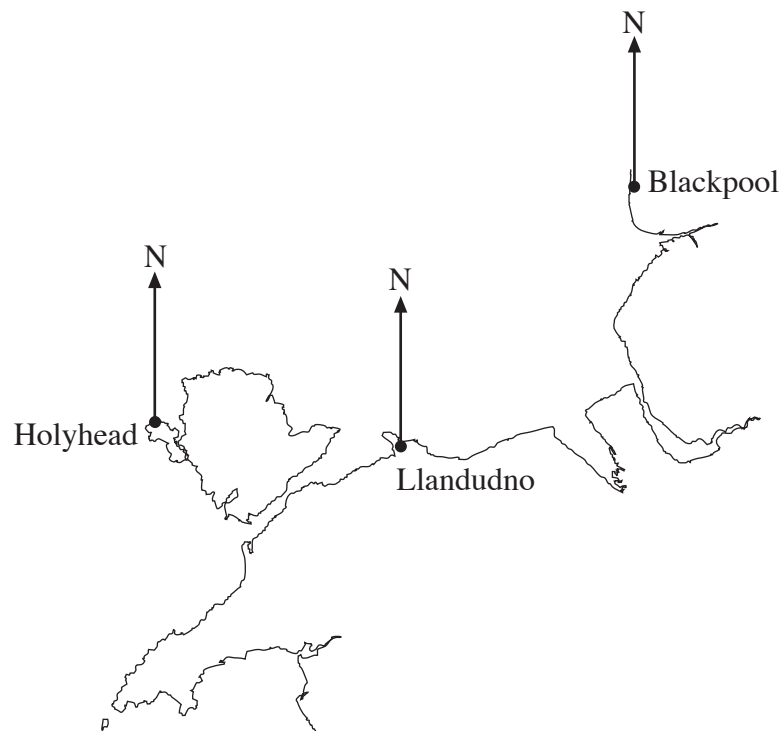
A fishing boat F is anchored in the bay.
The bearing of F from Llandudno is 345°.
The bearing of F from Blackpool is 280°.
By drawing suitable lines mark the position of F on the above diagram.

[3]

Turn over.

2. While on holiday in America, Katherine bought a camera for $470.
Colin, while on holiday in Spain, bought the same model camera for 324 euros.

The rates of exchange at the times the cameras were purchased were £1 = $1.88 and £1 = 1.44 euros.

Showing all your working, find out who purchased the camera for the lower price and write down the difference in the prices.

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.... paid the lower price

The difference in the prices was ....

[5]

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Turn over.

3. *(a)* Using the graph paper on the following page, draw the graph of the straight line $y = 2x - 3$ for values of x from –2 to +3.

[3]

(b) On the same graph paper draw the line $y = -2$.
Write down the coordinates of the point at which the straight line $y = 2x - 3$ cuts the line $y = -2$.

Coordinates are (..............., ...)

[2]

Turn over.
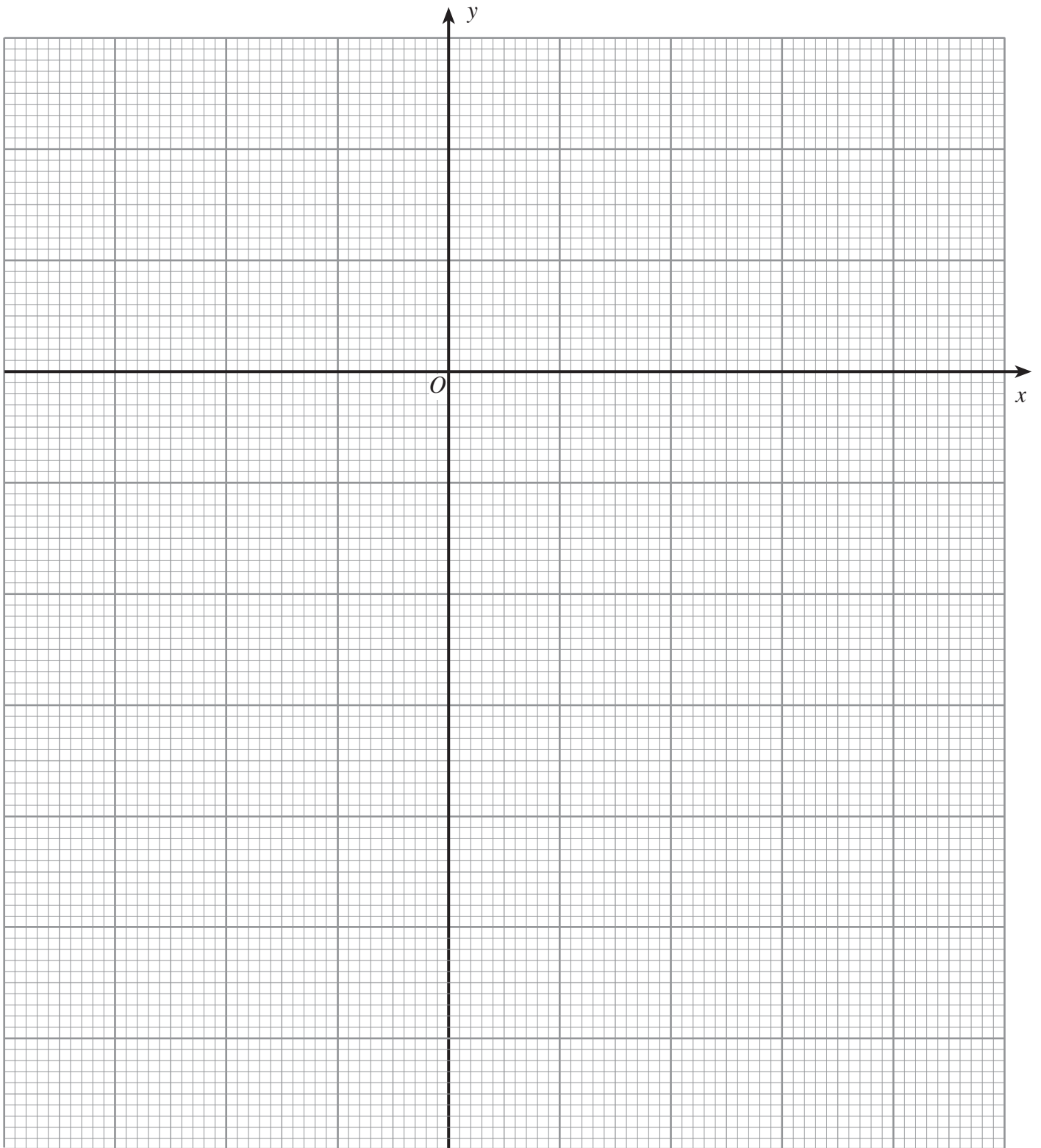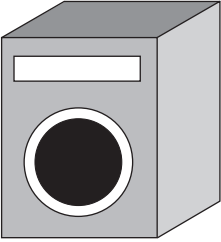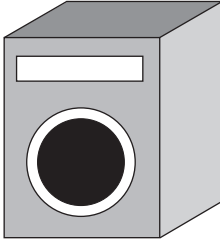
4.

Sam's Electrical Shop	**Discount Electrics**
Turbo washing machine	Turbo washing machine
£330 + VAT at 17·5%	£408 including VAT

Ann decides to buy a new Turbo washing machine.
She notes the prices shown above, at **Sam's Electrical Shop** and at **Discount Electrics.**
Ann buys the machine in the shop offering the lower price.
In which shop does Ann buy the washing machine and how much cheaper is it in this shop than in the other shop?

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[4]

5. The diagram shows three points *A*, *B* and *C*, which are on level ground.
The point *B* is 55m due East of *A*.
The point *C* is due North of *A* and 95m from *B*.
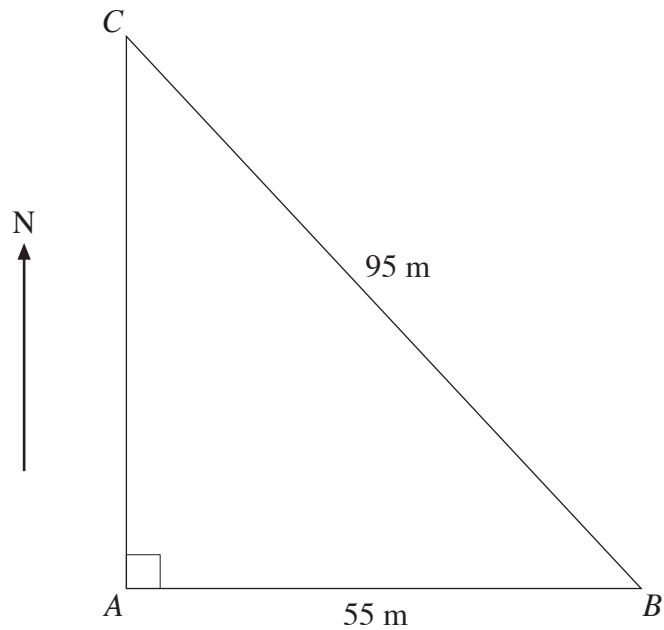
Diagram not drawn to scale.

Calculate the distance *AC*, giving your answer to an appropriate degree of accuracy.

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[4]

Turn over.

6. The heights of 110 Christmas trees were measured to the nearest centimetre. The table below shows a grouped frequency distribution of the heights.

Height (h centimetres)	Number of Christmas trees
$191 \leqslant h \leqslant 197$	24
$198 \leqslant h \leqslant 204$	35
$205 \leqslant h \leqslant 211$	28
$212 \leqslant h \leqslant 218$	23

Find an estimate for the mean height of the Christmas trees.

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[4]

7. A solution of the equation $x^3 + 2x - 5 = 0$ lies between $x = 1$ and $x = 2$. Find this solution giving your answer correct to one decimal place.

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[4]

Turn over.

8. *(a)* Find the value of $\dfrac{9\cdot2 \times 23\cdot4}{8\cdot5 - 2\cdot6}$ correct to 2 decimal places.

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[2]

(b) What percentage of 350 is 84?

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[2]

(c) Linda's dog eats $\dfrac{2}{3}$ of a tin of food each day. What is the least number of tins needed to feed the dog for 7 days?

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[3]

9. Manon wants to carry out a survey in order to find out how often people visit a dentist.

(a) She wrote the following question.

> *How often do you visit a dentist?*
>
> ☐ Not often   ☐ Often   ☐ Very often

What do you see wrong with this question and how would you improve it?

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[2]

(b) Another of the questions in her questionnaire was

> *Which age group are you in?*
>
> ☐ 30 – 40   ☐ 40 – 50   ☐ 50 and above

Write down **two** criticisms of this question.

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(ii) ....

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Turn over.

10. Theo invests £800 for 3 years at 5% per annum compound interest. How much money is in the account after 3 years?

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11. *(a)* A cylinder has a uniform circular cross section of radius of 4·7cm and a height of 23·5cm. Calculate the volume of the cylinder, stating the units of your answer.

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[3]

(b)
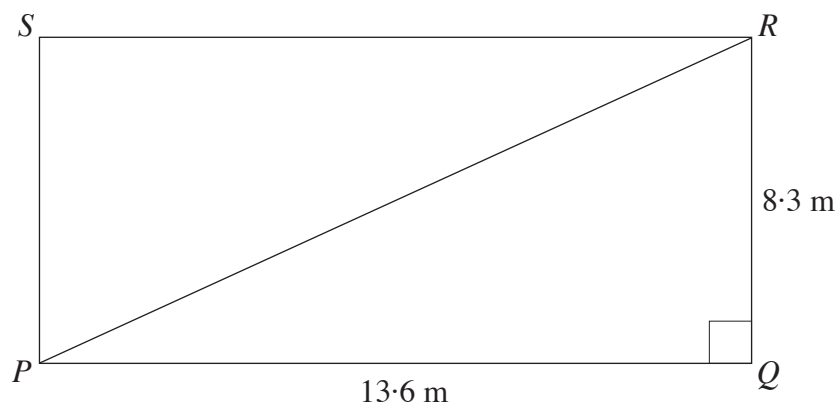
Diagram not drawn to scale.

PQRS is a rectangle in which *PQ* = 13·6 metres and *QR* = 8·3 metres. Calculate the length of the diagonal *PR*.

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12. *(a)* Write **each** of the following numbers in standard form.

(i)   53 000 000 000

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(ii)   0·00000002

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[1]

(b) Find, in standard form, the value of:

$$(6·8 \times 10^{-5}) \times (7·3 \times 10^{-4})$$

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[2]

13. *(a)* Expand the following expression, simplifying your answer as far as possible.

$$(x + 2)(x - 6)$$

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(b) Make m the subject of the formula

$$3(2m - t) = 2t + 7 \ .$$

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[3]

(c) Factorise $4x^2 - 4$.

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14. Solve the following equation.

$$\frac{3x - 7}{4} - \frac{4x + 5}{2} = \frac{3}{4}$$

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[4]

15. *(a)* A vertical post *AB* is 15 m from a point *C* on horizontal ground. The angle of elevation of the top of the post from the point *C* is 67°. Calculate the height of the post.
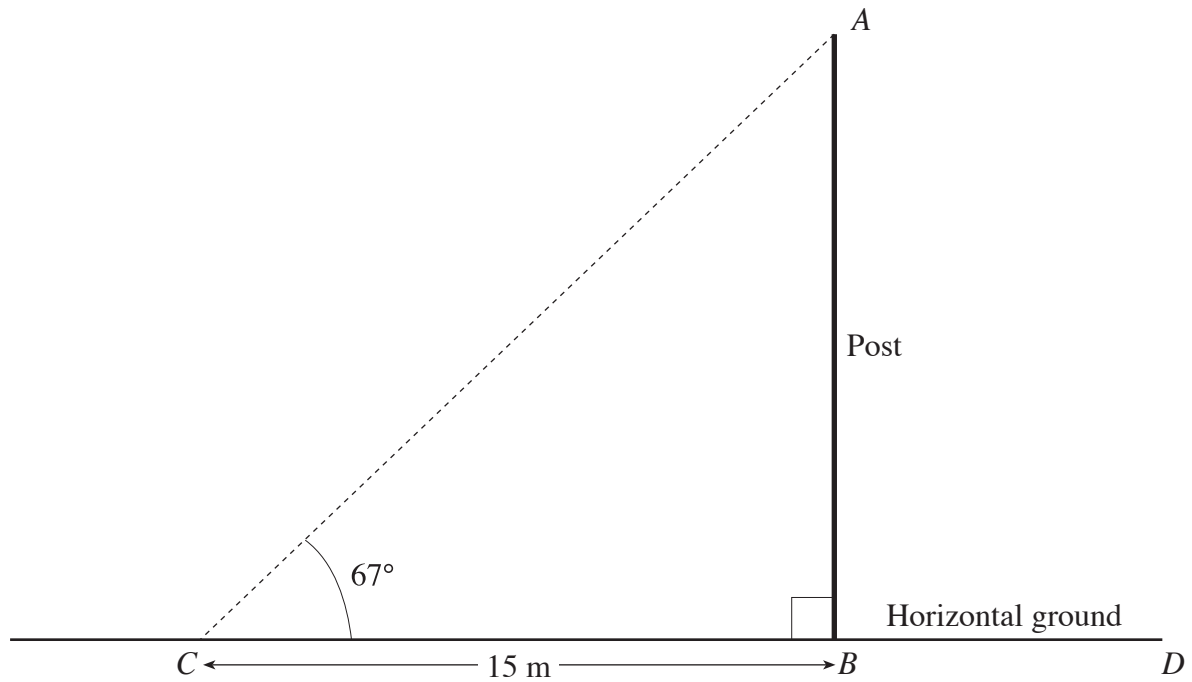
Diagram not drawn to scale.

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[3]

(b) A ladder, 21 m long, is placed against a vertical wall. The foot of the ladder is 13 m from the wall on horizontal ground. Calculate the angle which the ladder makes with the horizontal.

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16. A European supermarket employs people from a number of countries.
The number of people employed by the company in each country is given in the following table.

Country	Number of employees
Germany	12 355
France	8340
Spain	6860
Italy	4100
United Kingdom	3045

The company is organising a conference and decides to invite a total of 45 employees to represent the views of the entire workforce.

Use a stratified sampling method to calculate how many people from each country should be invited to the conference.

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Turn over.

17. Given that y is inversely proportional to x^2, and that $y = 2$ when $x = 15$,

(a) find an expression for y in terms of x,

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(b) calculate y when $x = 10$.

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18. On the graph paper provided, draw the region which satisfies all of the following inequalities.

$$x + y \leqslant 8$$
$$y \geqslant 2x + 5$$
$$x \geqslant -3$$

Make sure that you clearly indicate the region that represents your answer.

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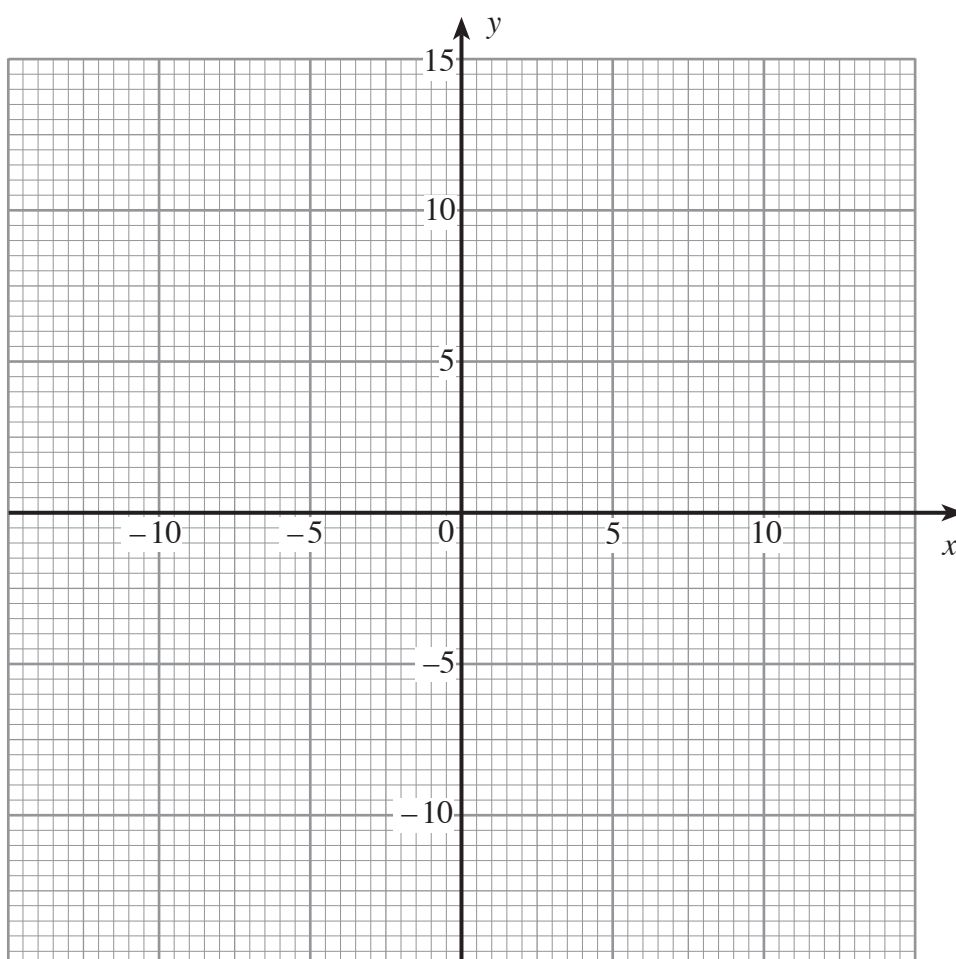
[3]

Turn over.

19. *(a)* Factorise the expression $8x^2 - 26x - 7$ and hence solve the equation $8x^2 - 26x - 7 = 0$.

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(b) Use the formula method to solve the equation $3x^2 + 6x - 11 = 0$, giving solutions correct to two decimal places.

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20. In the diagram below $AD = 8 \cdot 7$ cm, $AB = 12 \cdot 1$ cm, $CD = 6 \cdot 3$ cm, $C\hat{D}B = 25°$ and $D\hat{A}B = 80°$.

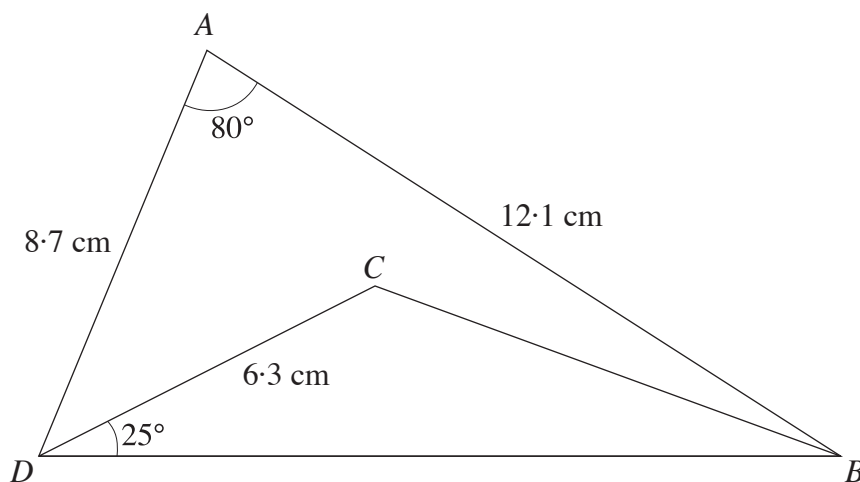*Diagram not drawn to scale.*

(a) Calculate the length of *BD*.

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(b) Calculate the area of the quadrilateral *ABCD*.

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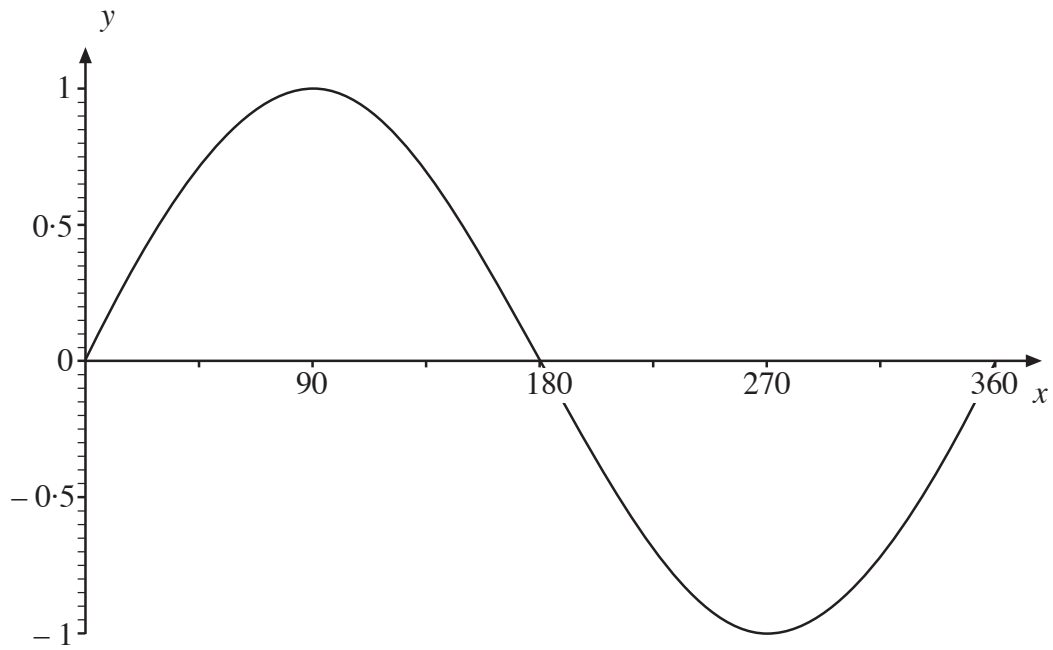
[3]

Turn over.

21. The diagram below shows the sketch of $y = \sin x$ for values of x from $0°$ to $360°$.

Find all solutions of the following equation in the range $0°$ to $360°$.

$$\sin x = -0{\cdot}454$$

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22. Solve the equation $\dfrac{n}{n+3} + \dfrac{7}{n+4} = 1$.

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