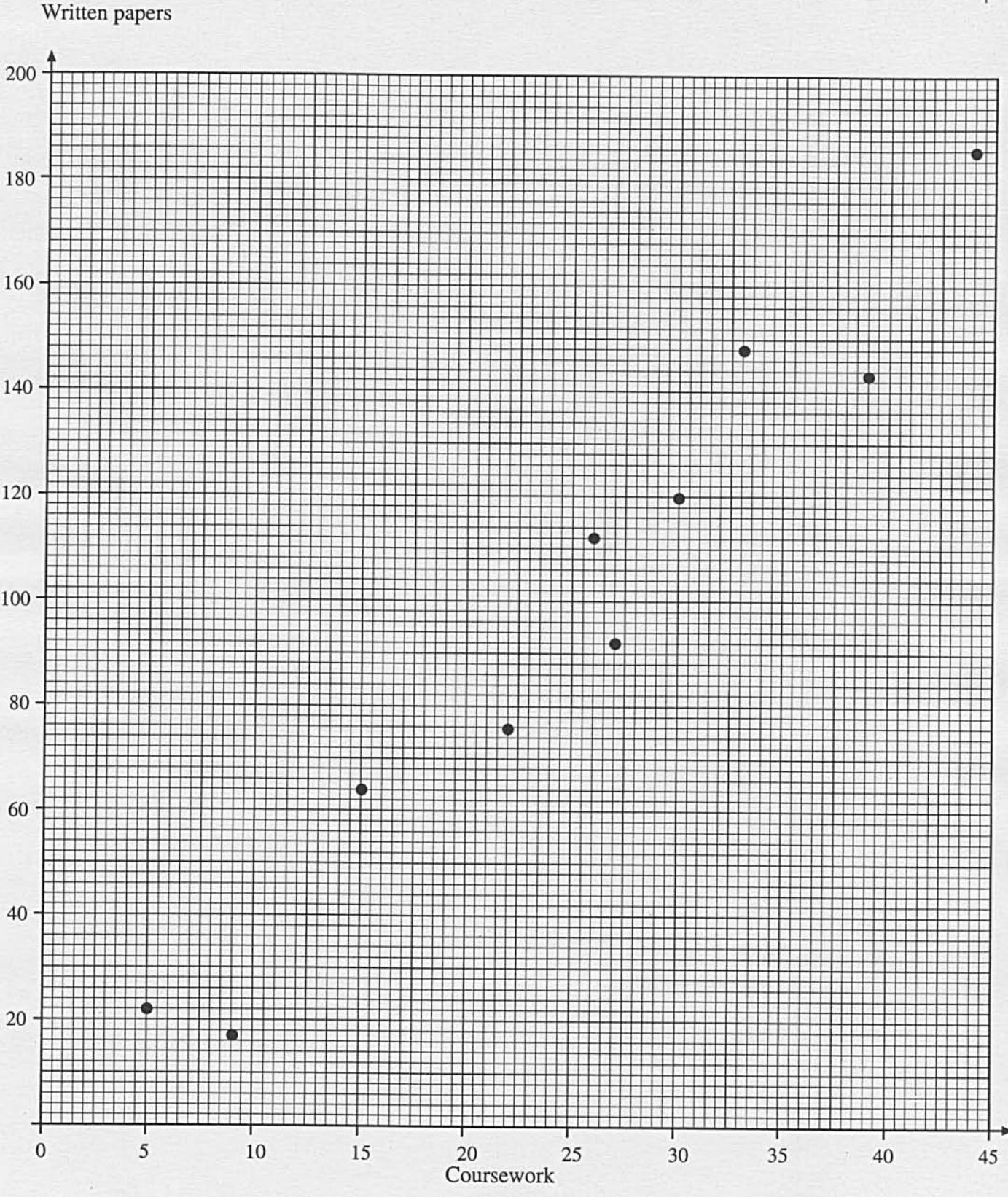
1. The assessment for a mathematics examination consists of two parts, namely, coursework marked out of 50, and written papers, marked out of 200. The marks for ten pupils are given in the table.

Coursework mark	5	30	15	44	9	22	39	26	33	27
Written papers mark	22	120	64	186	17	76	143	112	148	92

The scatter diagram below displays these results.



(a) The mean coursework mark for the pupils is 25 and the mean mark of the written papers is 98.
Draw a line of best fit on your scatter diagram. [2]

(b) Another pupil completed the coursework and was given a mark of 19, but was absent from the written papers examination. Use your line of best fit to estimate the mark on the written papers for this pupil.

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[1]

2. The speeds of 120 cars on a stretch of motorway were measured and the following results were obtained.

Speed, s (m.p.h.)	Number of cars
$30 \leqslant s < 40$	6
$40 \leqslant s < 50$	24
$50 \leqslant s < 60$	30
$60 \leqslant s < 70$	45
$70 \leqslant s < 80$	12
$80 \leqslant s < 90$	3

Find an estimate for the mean speed of the cars.

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[4]

3. On April 1st Marcus owed £250 on his credit card account.
The credit card company requires Marcus to pay at least 10% of the balance on the 20th of each month.
The company charges interest at 2% on what the balance is on the 28th of every month.
Marcus pays the minimum payment on time every month.
Write down full details of his account up to May 31st.

April 1st £250.00

April 20th

[3]

4. *(a)* Expand $2x(x^2 + 3)$.

[2]

(b) Expand and simplify $4(3x - 1) + 3(x - 5)$.

[2]

5. Use your calculator to find the value of $\dfrac{\sqrt{845 \cdot 6}}{253 \cdot 9 - 46 \cdot 74}$ correct to 2 decimal places.

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[2]

6. *(a)* The following numbers have been written in standard form. Write **each** in decimal form.

(i) $(3 \cdot 7 \times 10^{6})$

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[1]

(ii) $(8 \cdot 2 \times 10^{-4})$

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[1]

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

(i) $(4 \cdot 2 \times 10^{8}) \times (9 \cdot 1 \times 10^{4})$

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[1]

(ii) $(6 \cdot 2 \times 10^{-9}) \div (8 \cdot 3 \times 10^{6})$

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[1]

7.

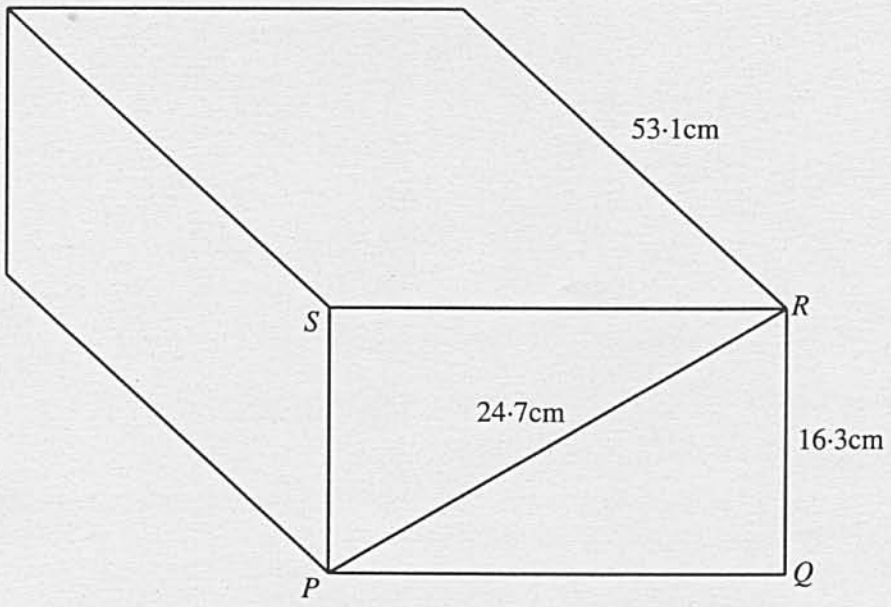


Diagram not drawn to scale.

The diagram shows a cuboid of length 53·1 cm. The cross-section, $PQRS$, is such that $PR = 24{\cdot}7$ cm and $QR = 16{\cdot}3$ cm.

(a) Calculate the length of PQ.

[3]

(b) The density of the material from which the cuboid is made is $4{\cdot}3$ g/cm^3. Calculate the mass of the cuboid in kilograms.

[3]

8. A solution to the equation

$$x^3 - 6x - 3 = 0$$

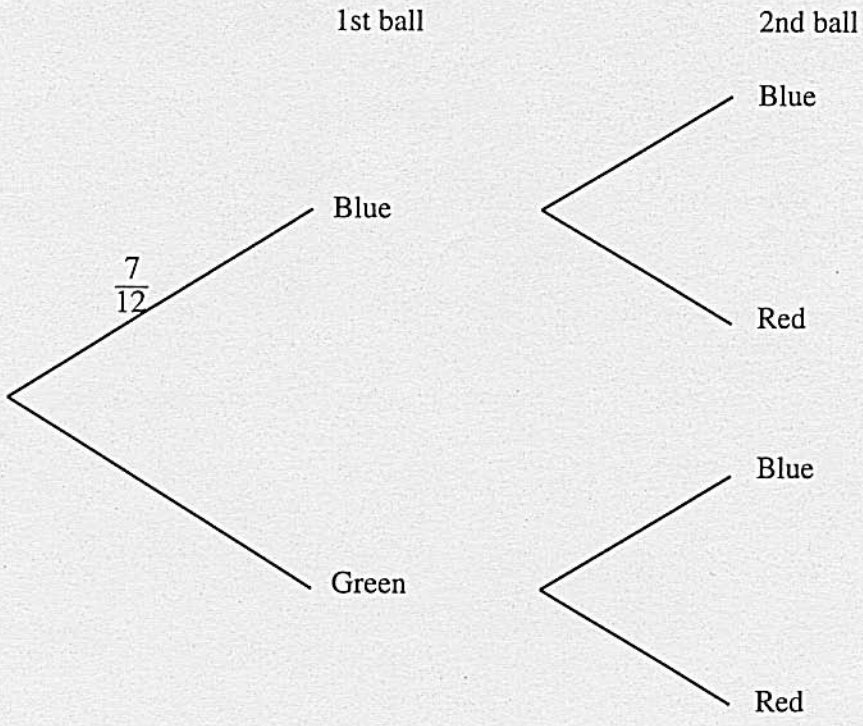
lies between 2·6 and 2·7.

Use the method of trial and improvement to find this solution correct to 2 decimal places.

[4]

9. A bag contains 7 blue balls and 5 green balls. Another bag contains 4 blue balls and 6 red balls. A ball is drawn at random from the first bag and its colour is noted. A ball is then drawn at random from the second bag and its colour is noted.

(a) Complete the following tree diagram.



[2]

(b) Calculate the probability that both balls are blue.

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[2]

(c) Calculate the probability that at least one ball is blue.

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[2]

10. *(a)* Simplify $(5x^3)^2$.

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(b) Expand the following expression, simplifying your answer as far as possible.

$$(x + 7)(x - 3)$$

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[2]

(c) Make d the subject of the following formula.

$$4(d - 2e) = 7 + 3e.$$

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[3]

11. In the diagram below, $A\hat{B}C = 90°$, $B\hat{E}D = 90°$, $AB = 17{\cdot}8$ m, $CD = 23{\cdot}6$ m, $BE = 21{\cdot}4$ m and $B\hat{A}C = 37°$.

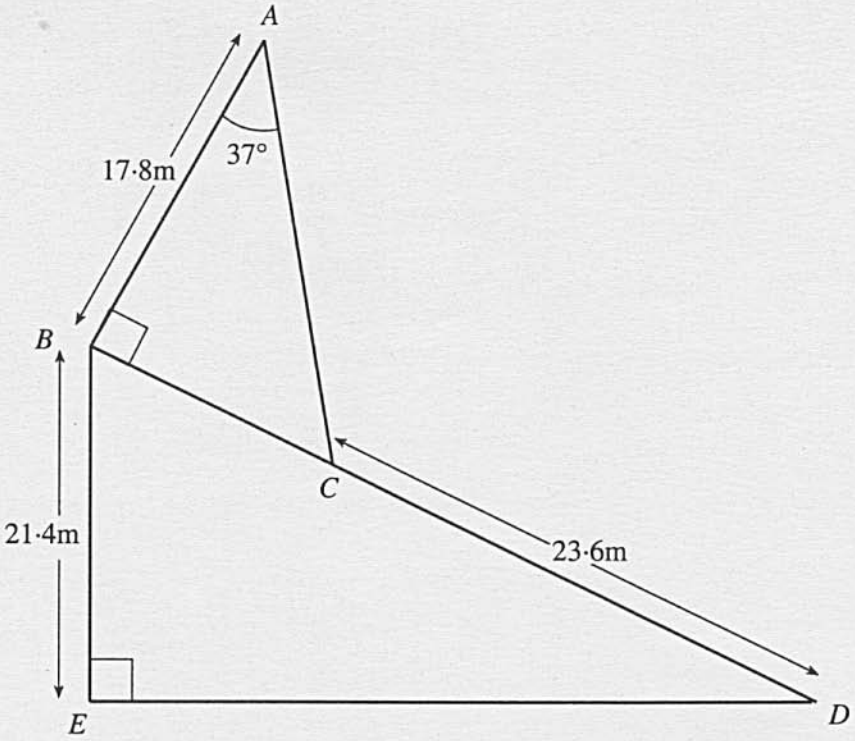

Diagram not drawn to scale.

Calculate the size of $B\hat{D}E$.

[5]

12. Solve the following equation.

$$\frac{3x+1}{4} - \frac{2x+1}{2} = \frac{3}{4}$$

[3]

13. *(a)* A pebble is dropped from rest and falls a distance d metres in t seconds. The distance d is proportional to the square of the time t. Given that the pebble falls $1\frac{1}{4}$ metres in the first $\frac{1}{2}$ second, find an expression for d in terms of t.

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[3]

(b) (i) Calculate the distance that the pebble falls in the first 3 seconds.

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[1]

(ii) Calculate the time taken in seconds for the pebble to fall 405 metres from rest.

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[2]

14. $ABCD$ is a square of side 10 cm. The points P, Q, R and S lie on the sides of the square $ABCD$.
$AS = BP = CQ = DR = x$ cm.

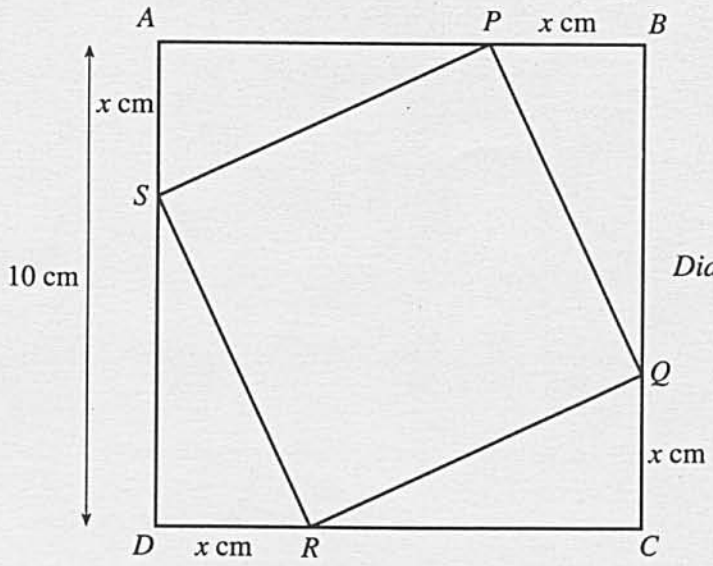

Diagram not drawn to scale.

The area of the square $PQRS$ is 75 cm^2.

(a) Show that x satisfies the equation $2x^2 - 20x + 25 = 0$.

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[3]

(b) Solve the equation $2x^2 - 20x + 25 = 0$.

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[4]

15. A solid metal cone has a height of 80 cm and radius of 30 cm. A smaller cone of height 20 cm is obtained by cutting off the top of the original cone.

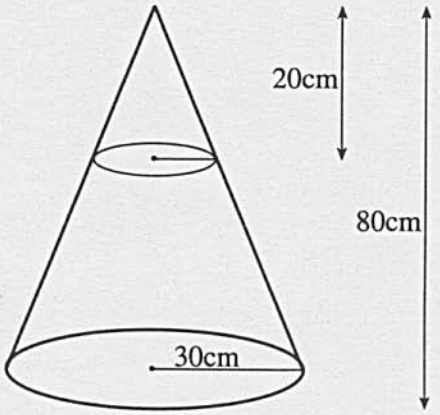

Diagram not drawn to scale.

(a) Calculate the volume of the smaller cone.

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[3]

(b) The smaller cone is melted down and recast as 20 identical cylinders. The length of each cylinder is 1·8 cm. Calculate the radius of each cylinder, giving your answer to an appropriate degree of accuracy.

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[4]

(a) Use the graph to solve the equation $x^3 - 5x^2 - 12x + 36 = 0$.

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[1]

(b) Using the graph, estimate the gradient of the curve $y = x^3 - 5x^2 - 12x + 36$ when $x = 5$.

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[3]

(c) By drawing an appropriate line on the graph, solve the equation $x^3 - 5x^2 - 7x + 10 = 0$.

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[3]

(d) Use the trapezium rule with 5 strips to estimate the area enclosed by the x–axis and the curve between $x = -3$ and $x = 2$.

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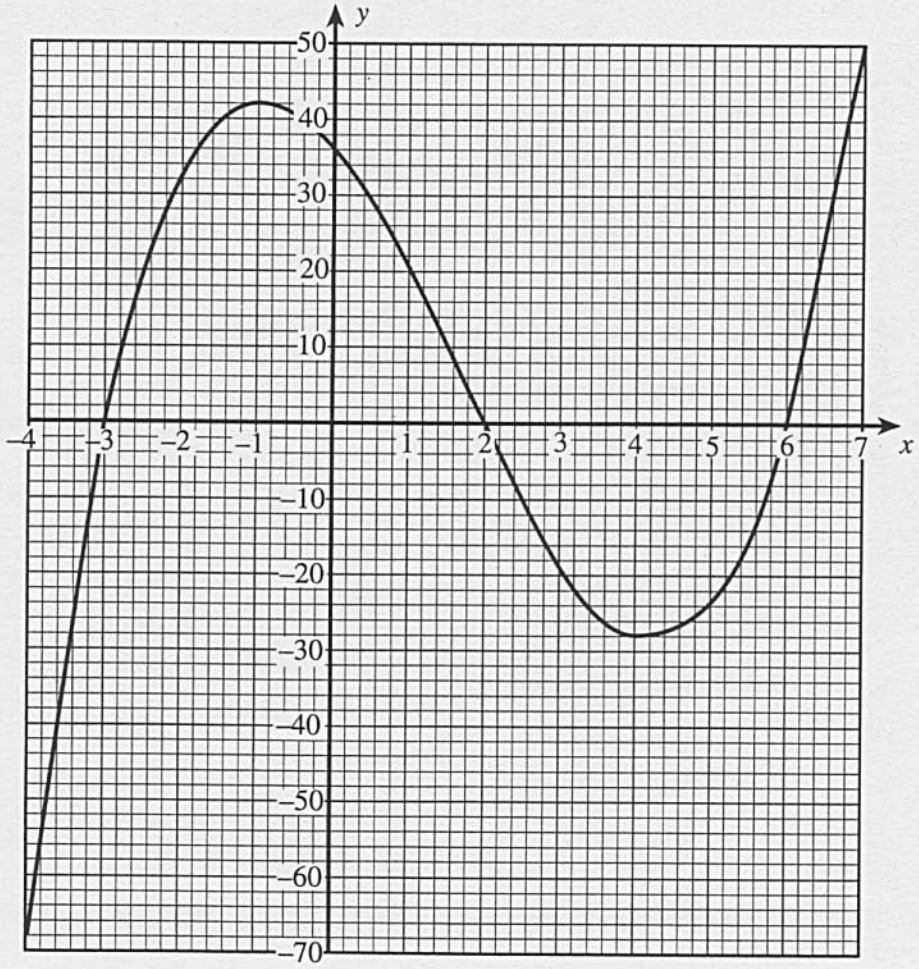
[4]

16. The graph of $y = x^3 - 5x^2 - 12x + 36$, for values of x between $x = -4$ and $x = 7$, has been drawn below.



17.

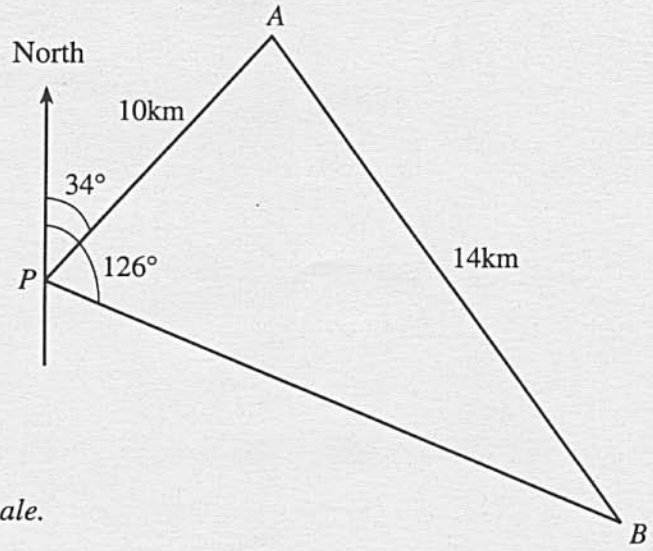


Diagram not drawn to scale.

Two ships A and B sail from port P.
Ship A sails out of the port on a bearing of 034° (N34°E) and ship B sails out of the port on a bearing of 126° (S54°E).
When ship A is 10 km from port P, ship B is 14 km from ship A.
Calculate the bearing of ship A **from** ship B at this time.

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18.

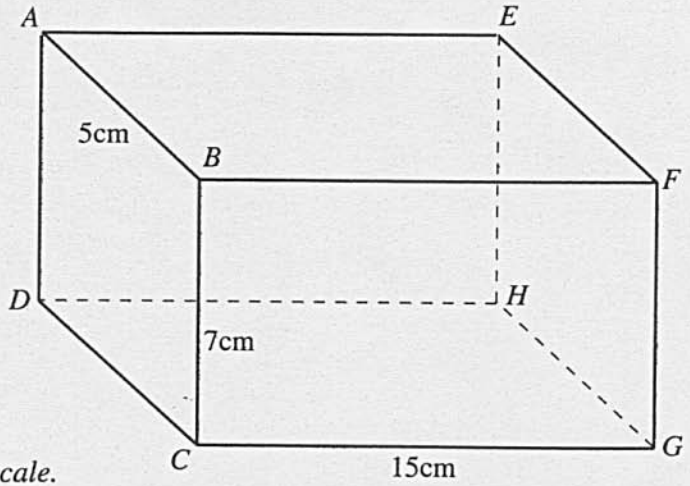

Diagram not drawn to scale.

The diagram shows a cuboid.

$AB = 5\,\text{cm}$, $BC = 7\,\text{cm}$ and $CG = 15\,\text{cm}$.

Calculate $A\hat{G}D$, giving your answer to an appropriate degree of accuracy.

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[4]

19. The table shows the age and gender distribution of members of a tennis club.

Gender	Age less than 30	Age 30 or over
Men	28	35
Women	10	18

A stratified random sample of 10 members is required. The sample is to be stratified with respect to age and gender.

(a) Calculate how many men under 30 should be in the sample.

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[2]

(b) Use the following extract from a table of random digits to select 2 men under 30 and 2 men aged 30 or over for the stratified random sample. Start from the first number and explain your method.

25 79 46 25 02 93 68 58 13 71 46 04

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[3]

20. A grouped frequency distribution of the marks scored by 90 girls in an English examination is given in the table below.

Mark	0 to 19	20 to 39	40 to 59	60 to 79	80 to 99
Frequency	9	12	20	32	17

An estimate for the mean marks scored by these girls is 57·5.

(a) Calculate an estimate for the standard deviation of the marks.

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[4]

(b) Each pupil had her mark for the examination increased by 3 marks for good spelling, punctuation and grammar. State estimates for the mean and standard deviation of the increased marks.

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