1. *(a)* The population of a country increased from 56 000 000 to 59 500 000. What percentage increase is this?

[3]

(b) What will be the amount if £5000 is invested for 3 years at the rate of 4% compound interest per annum?

[3]

2. Solve the following equation.

$$\frac{15-4x}{7} = 3$$

[3]

3. A solution to the equation

$$x^3 + 5x - 30 = 0$$

lies between 2 and 3.

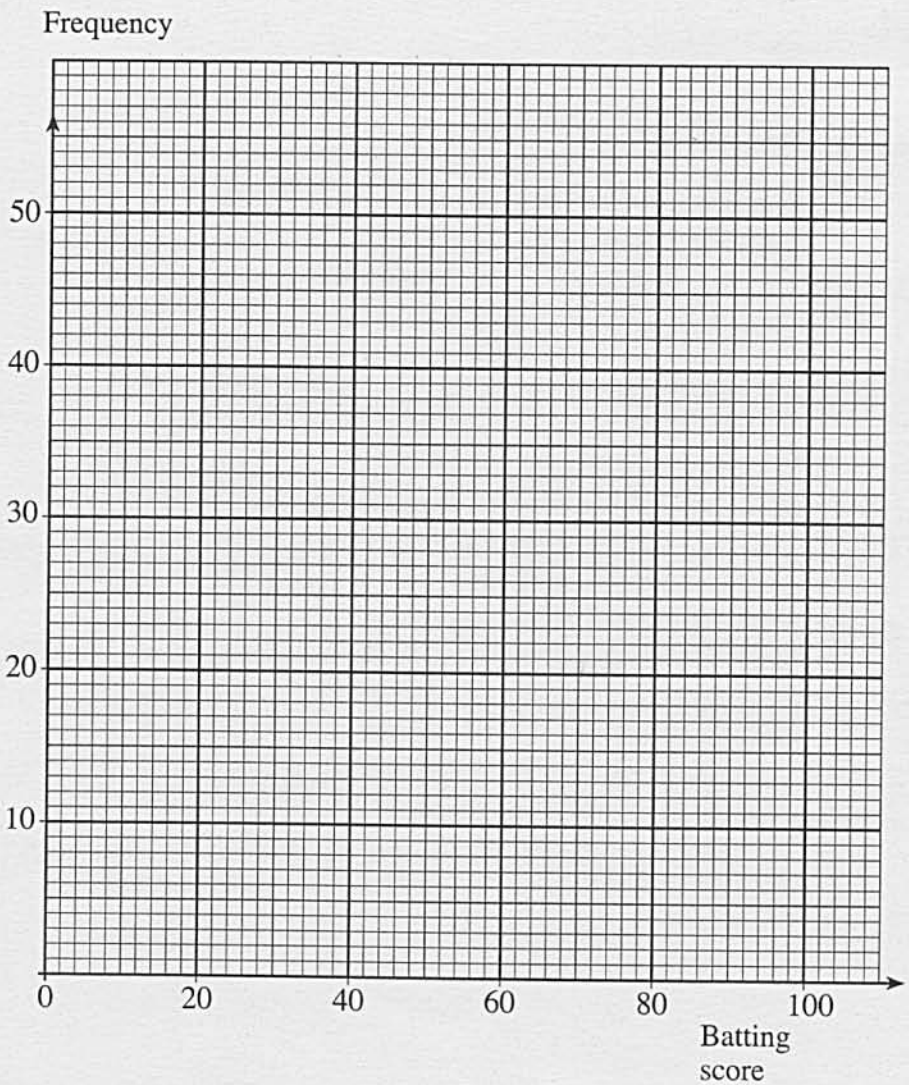
Use the method of trial and improvement to find this solution correct to one decimal place.

[4]

4. *(a)* The batting scores of 100 cricketers were recorded and the results are summarised in the following table.

Batting score	Frequency
0 - 19	20
20 - 39	45
40 - 59	24
60 - 79	9
80 - 99	2

On the graph paper, below draw a frequency polygon for the data. [2]



(b) Find an estimate for the mean of the batting scores.

[4]

5. The diameter of a circle, AB, is of length 8·7 cm, BC has length 5·4 cm and $\hat{ACB} = 90°$. Calculate the length of AC.

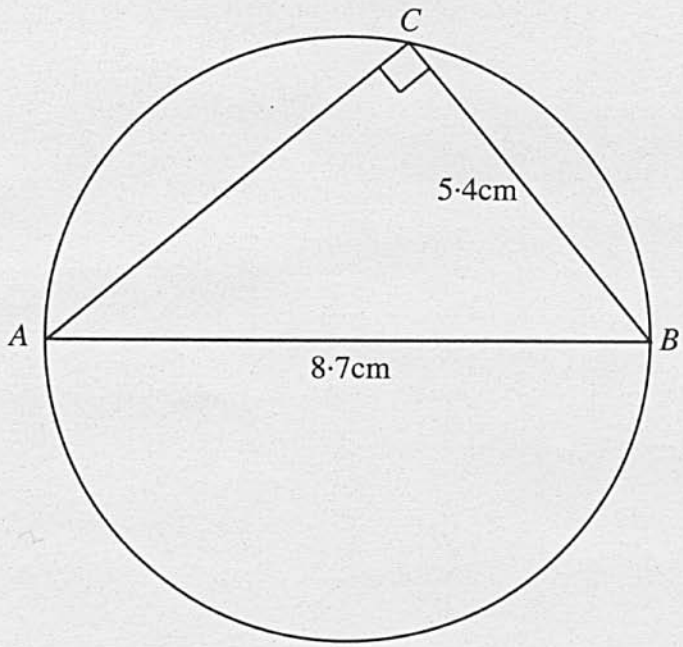
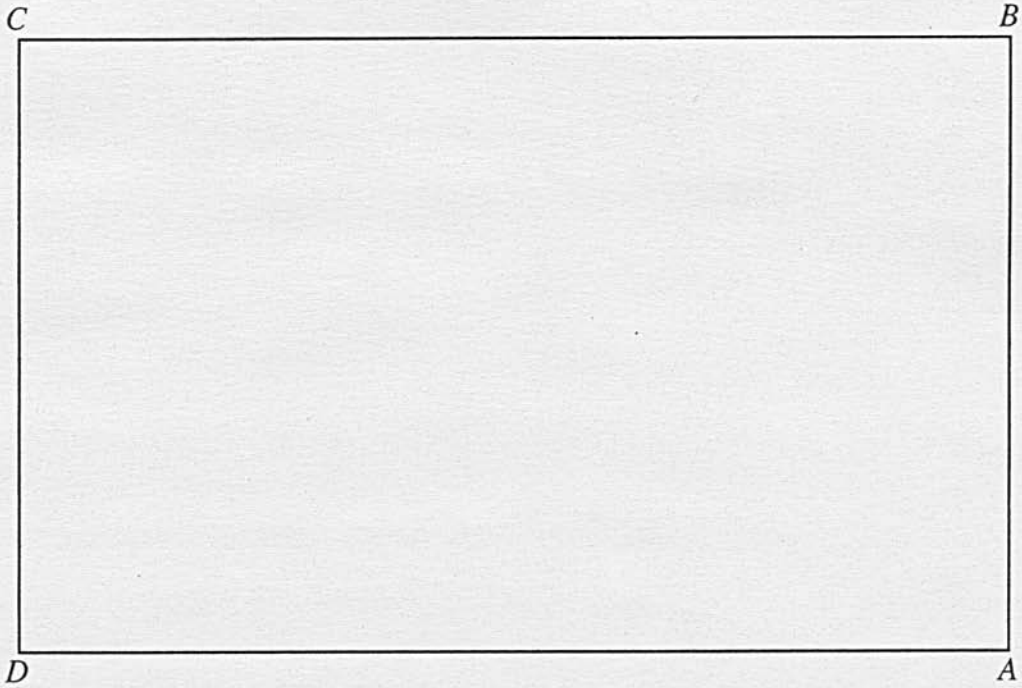


Diagram not drawn to scale.

[3]

6. *ABCD* is a rectangle.



(a) Draw the locus of all the points inside the rectangle whose distance from *AB* is the same as their distance from *AD*.

(b) Draw the locus of all the points inside the rectangle which are 6 cm from *DC*.

(c) Draw the locus of all the points inside the rectangle whose distance from *A* is the same as the length of *AB*.

[3]

7. Find, in standard form, the value of

(a) $(7{\cdot}4 \times 10^{-5}) \times (3{\cdot}9 \times 10^{-4})$,

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.....

[1]

(b) $\dfrac{59639}{0{\cdot}087}$.

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[2]

8. *(a)* Simplify the expression

$$(4x^3y^2) \times (2x^4y^5).$$

[2]

(b) Expand and simplify

$$(x + 5)(x - 6).$$

[2]

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

$$h = \sqrt{t - d}$$

[2]

9. Solve the following equation.

$$\frac{4x - 8}{3} - \frac{x}{6} = 2$$

[3]

10. A vertical flagpole, BDC, stands on horizontal ground ABE. It is supported by two ropes AC and DE. The length of AC is 13·5 m, and the distance CD is 4·7 m. The rope AC makes an angle of 62° with the ground and the rope DE is fixed to the ground at E such that BE is 8·4 m.

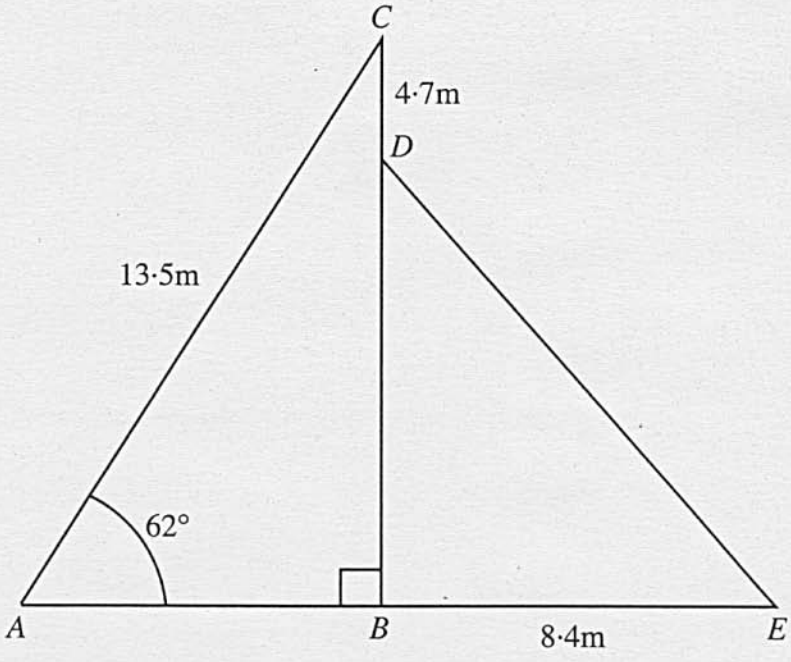


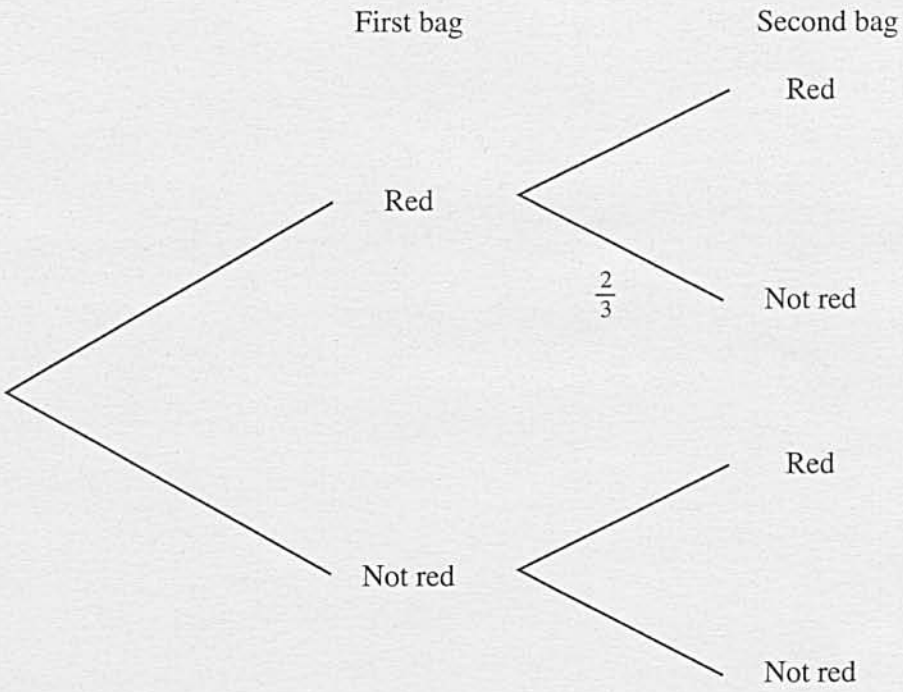
Diagram not drawn to scale.

Calculate the size of $\hat{BDE}$.

[6]

11. Two bags contain some coloured balls, which are identical except for their colour.
One ball is taken at random from each bag and their colours noted.
The probability of the selected ball from the first bag being red is $\frac{1}{4}$.
The probability of the selected ball from the second bag NOT being red is $\frac{2}{3}$.

(a) Complete the following tree diagram. [2]



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

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[2]

(c) Calculate the probability that only one ball is red.

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[3]

12. Spheres are made of a particular metal. The mass, m grams, of such a sphere is directly proportional to the cube of the radius, r centimetres.

(a) Given that the mass of a sphere with radius 2 cm is 80 g, find an expression for m in terms of r.

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[3]

(b) Calculate

(i) the mass of a sphere with radius 4 cm,

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[1]

(ii) the radius of a sphere of mass 270 g.

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[2]

13. The four points A, B, C and D lie on the circumference of a circle centre O.
The tangent PQ touches the circle at C.
The point X on the tangent PQ is such that OAX is a straight line.

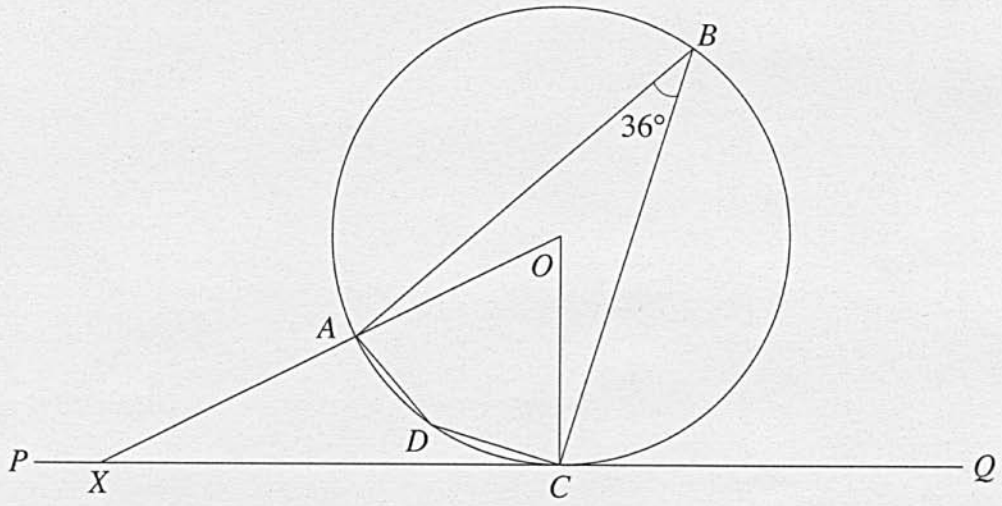

Diagram not drawn to scale.

Given that $A\hat{B}C = 36°$, find **each** of the following angles. Give reasons for your answers.

(a) $A\hat{O}C$

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(b) $O\hat{X}C$

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(c) $A\hat{D}C$

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.....

[4]

14. The Headteacher of a school wants to investigate opinions of pupils about meals sold in the canteen. She asks the first 20 pupils in the queue for dinner their opinion.

(a) Explain why this is not a satisfactory method of selecting a sample of pupils to ask about school meals.

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[1]

(b) Explain how the Headteacher could select a random sample of 20 pupils.

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[2]

15. *(a)* Factorise $x^2 - 16$.

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[1]

(b) Simplify $\dfrac{x^2-16}{2x^2+5x-12}$.

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[3]

16. The diagram shows a cuboid with dimensions 2·6 cm, 3·4 cm and 4·2 cm measured correct to the nearest mm.
Two vertices are labelled on the diagram, P and Q.

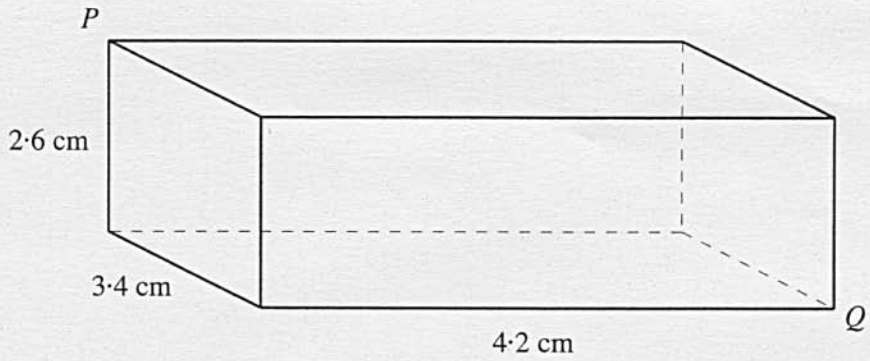

Diagram not drawn to scale.

Find the greatest length of diagonal PQ.

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[3]

17. The table shows the details of the departments in a computer company.

Department	Number of people employed
Management	36
Sales staff	182
Software technicians	62
Hardware engineers	48
Administration assistants	30

A stratified random sample of the people employed is to be selected to form a committee. Calculate the number of people from each department who should be selected to form a committee of size 20.

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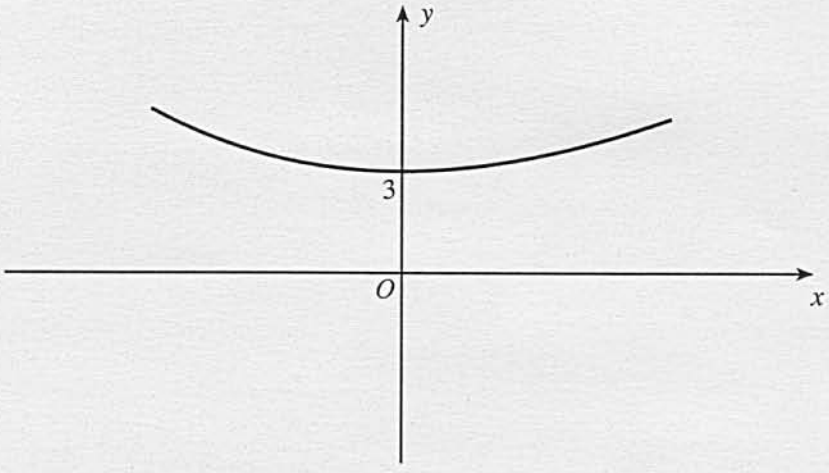
Complete the table below.

Department	Number of people on the committee
Management	
Sales staff	
Software technicians	
Hardware engineers	
Administration assistants	

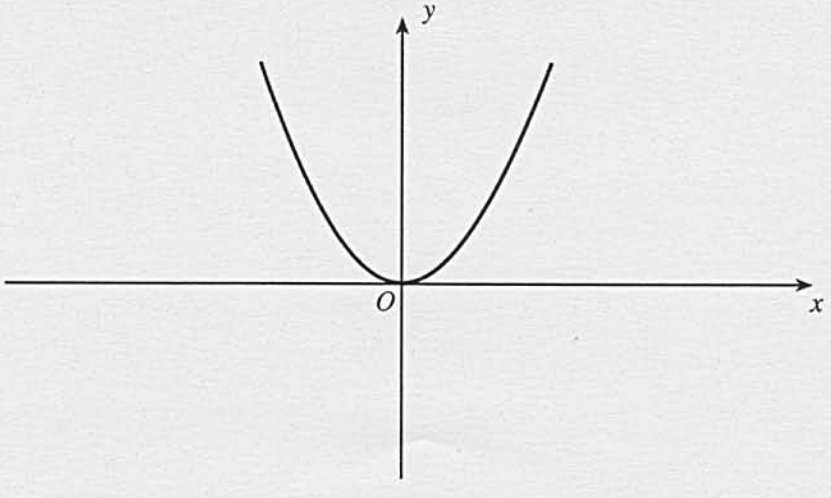
[4]

18. *(a)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x) - 4$.
Mark clearly the coordinates of the point where the curve crosses the y-axis.



[2]

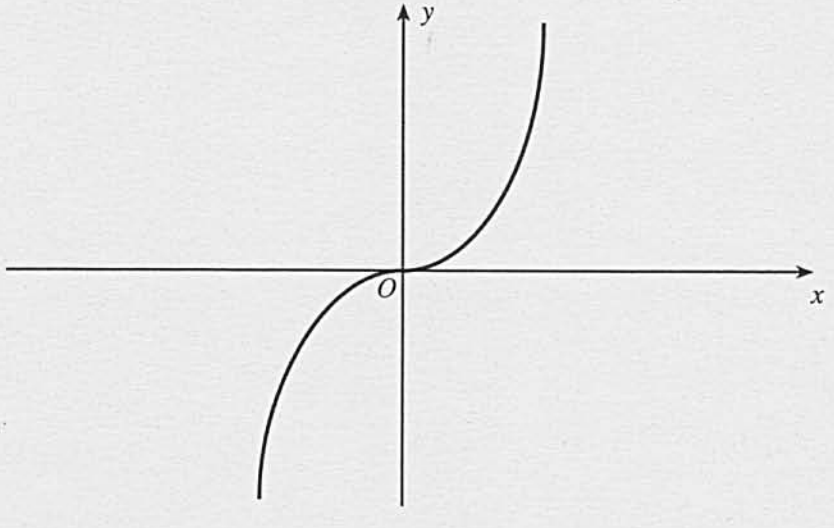
(b) The diagram shows a sketch of $y = g(x)$.
On the same diagram, sketch the curve $y = g(x + 4)$.
Mark clearly the coordinates of the points where the curve touches the x-axis.



[2]

(c) The diagram shows a sketch of $y = x^3$.
On the same diagram, sketch the curves

(i) $y = -x^3$,
(ii) $y = 3 - x^3$.



[2]

19. The diagram shows quadrilateral $PQRS$.

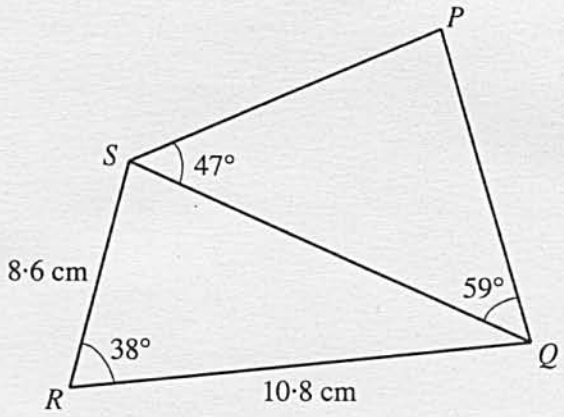


Diagram not drawn to scale.

Given that $S\hat{R}Q = 38°$, $P\hat{S}Q = 47°$, $P\hat{Q}S = 59°$, $SR = 8{\cdot}6$ cm and $QR = 10{\cdot}8$ cm, find the length of PQ.

[6]

20. Simplify $\frac{n+1}{n} - \frac{n}{n+1}$.

[4]

21. Calculate the mean and standard deviation of the following set of 12 numbers.

34, 23, 35, 64, 56, 52, 48, 32, 40, 57, 36, 45

[3]

22. The surface area of a cuboid with length x cm, width $(x - 1)$ cm and height 3 cm is 63 cm^2.

(a) Show that x satisfies the equation $2x^2 + 10x - 69 = 0$.

[3]

(b) (i) Solve the equation $2x^2 + 10x - 69 = 0$, giving solutions to two decimal places.

[3]

(ii) Hence write down the dimensions of the cuboid.

[1]