FAIRFIELD METHODIST SECONDARY SCHOOL
SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC
PRELIMINARY EXAMINATION 2006

MATHEMATICS
PAPER 1

4017 / 01
2 hours

11th September 2006 (Monday)

Additional materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST.

Write your name, class and index number in the spaces provided at the top of the page.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question, it must be shown in the space below that question.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is 80.

NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.

For Examiner's Use	Marks
PAPER 1 (80 marks)	
PAPER 2 (100 marks)	
TOTAL (100%)	

This paper consists of 17 printed pages.

1   Evaluate the following and give your answers in standard form.

(a) $2.4 \times 10^5 \div 4.8 \times 10^{-3}$

(b) $3.7 \times 10^{-4} - 1.6 \times 10^{-5}$

Answer (a) _____ [1]

(b) _____ [1]

2   Express

(a)   67.4962 correct to two decimal places.

(b)   0.0013628 correct to four significant figures.

(c)   150 centimetres as a percentage of 4 metres.

Answer (a) _____ [1]

(b) _____ [1]

(c) _____ % [1]

3   (a)   Evaluate $2\frac{1}{3} - \frac{1}{2} \div 5\frac{1}{4}$.

    (b)   The reciprocal of x^{-2} is $\frac{1}{9}$. Find the possible values of x.

    (c)   Estimate the value of $\dfrac{702 \times \sqrt{80.89}}{308}$ giving your answer correct to one significant figure.

Answer   (a) _____ [1]

         (b) $x =$ _____ or _____ [1]

         (c) _____ [1]

4   Given that 26.4 x 165 = 4 356, find the exact value of

    (a)   2 640 x 1.65

    (b)   43.56 ÷ 1 650

Answer   (a) _____ [1]

         (b) _____ [1]

5   Tom and Dick took part in a marathon. Tom completed the marathon in 3 hours and

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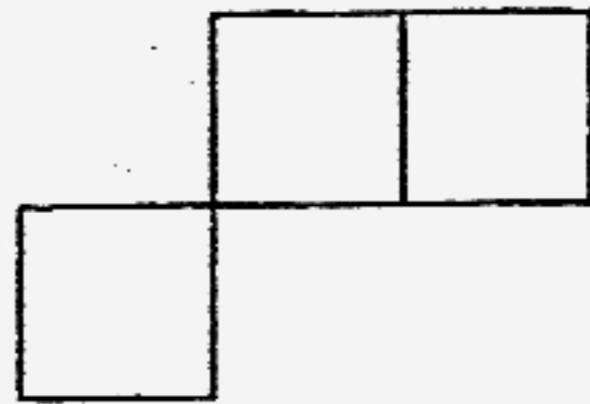52 minutes. Dick took $\frac{1}{3}$ hour longer than Tom.

(a)   How long did Dick take to complete the marathon?

(b)   Tom completed the marathon at 10 07. At what time did the marathon start?

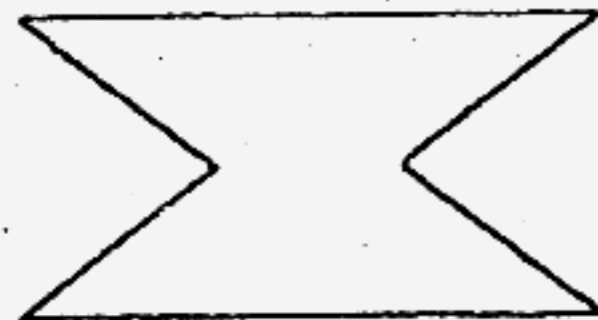Answer (a) _____ h _____ min [1]

(b) _____ [1]

6   (a)   The diagram shows 3 identical squares. Add onto the diagram, one more square such that the resulting diagram has a rotational symmetry of order 2.

Answer   (a)

[1]

(b)   How many lines of symmetry does the figure below have?

Answer (b) _____ [1]

7   It is given that $y = 3x^{p^2 - 5p + 7}$

(a)　Find the value of x when $p = 1$ and $y = 81$.

(b)　If y varies directly as x, find the possible values of p.

Answer　(a) $x =$ _____ [1]

(b) $p =$ _____ or _____ [1]

8　Given that $\dfrac{m}{n} = \dfrac{5}{7}$ where $m \neq 5$ and $n \neq 7$, evaluate

(a)　$\dfrac{m+n}{m}$

(b)　$\dfrac{5n+m}{5m+n}$

Answer　(a) _____ [1]

(b) _____ [1]

9　Jack is p years old and Jill is q years old. Eight years ago, the sum of Jack's and Jill's ages was 48. In four years' time, Jill will be twice as old as Jack. Find the present ages of Jack and Jill.

Answer   Jack is _____ years old [2]

Jill is _____ years old [2]

10   (a)   Factorise completely

   (i) $n^4 - 9n^2$

   (ii) $3p^2 - 18p + 15$

   (b)   (i)   Express in index notation, 168 as a product of its prime factors.

   (ii)   Hence, find the smallest integer k such that $\sqrt{168k}$ is an integer.
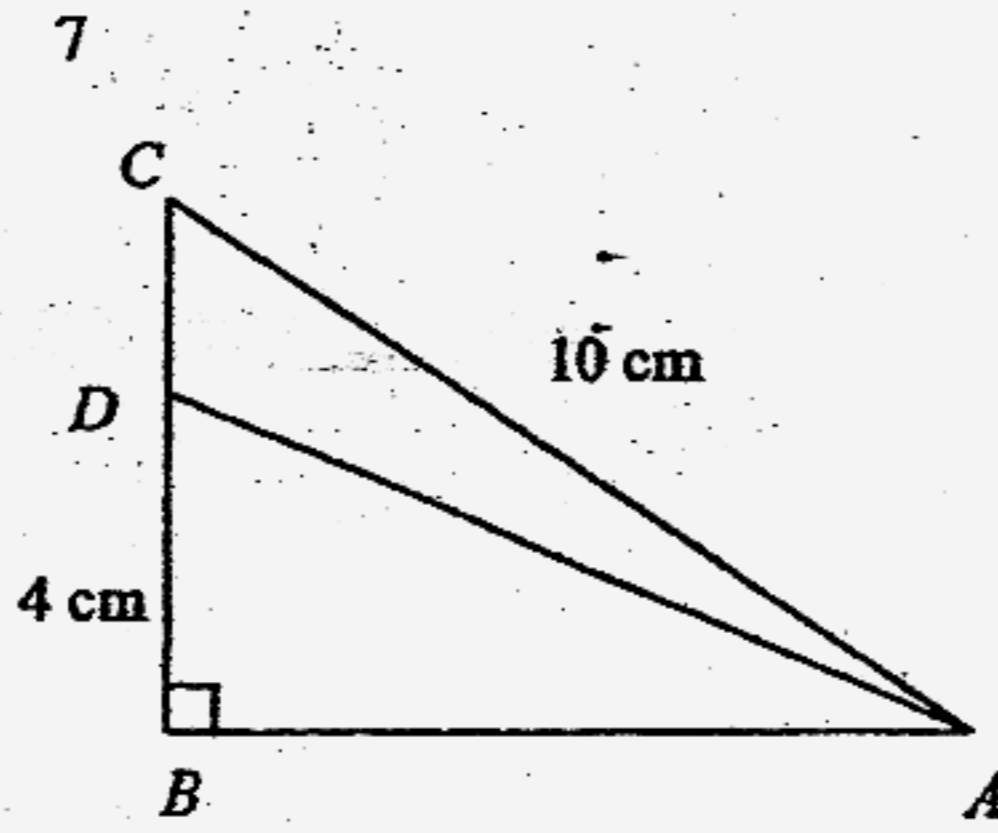
Answer   (a) (i) _____ [1]

(ii) _____ [1]

(b) (i) _____ [1]

(ii) $k =$ _____ [1]

11   In the diagram, CB is perpendicular to BA, $AC = 10$ cm and $\cos \angle ACB = \dfrac{3}{5}$. D is a point on BC such that $BD = 4$ cm. Find

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7

ADC

Answer (a) *CD* = _____ cm [1]

(b) *AB* = _____ cm [1]

(c) tan ∠*ADC* = _____ [1]

EADC is a parallelogram and *AC = AB*. Given that ∠*ECA* = 40° and
°, find the value of *x* and of *y*.

14   Given that

(a)   the sr

(b)   the la

(c)   the sr

Answer   *x* = _____ , *y* = _____ [2]
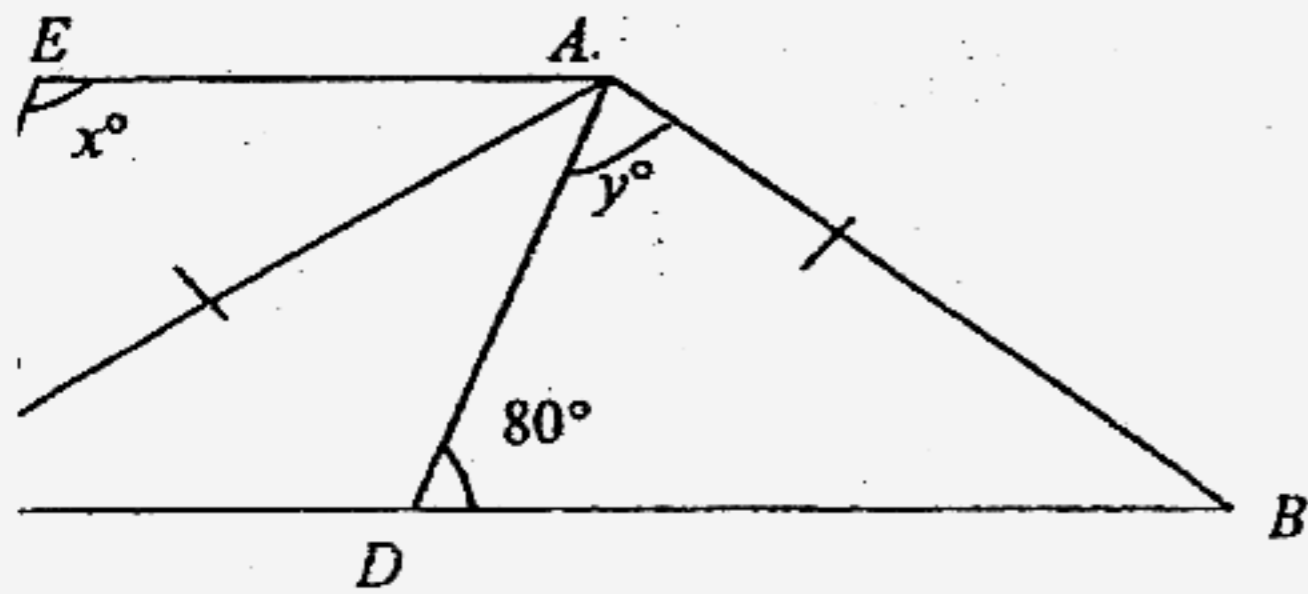
rior angle of a regular polygon is 9°. Find the number of sides of the

rior angle of a regular polygon of 2*n* sides is 30° greater than each interior

15   In a game

of losing i

ary Exam 2006

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angle of a regular polygon of n sides. Find the value of n.

Answer (a) _____ sides [1]

(b) $n =$ _____ [2]

14 Given that $-4 \le x \le 1$ and $2 \le y \le 5$, find

(a) the smallest value of $\dfrac{x^2}{y}$,

(b) the largest value of $y - x$,

(c) the smallest value of xy.

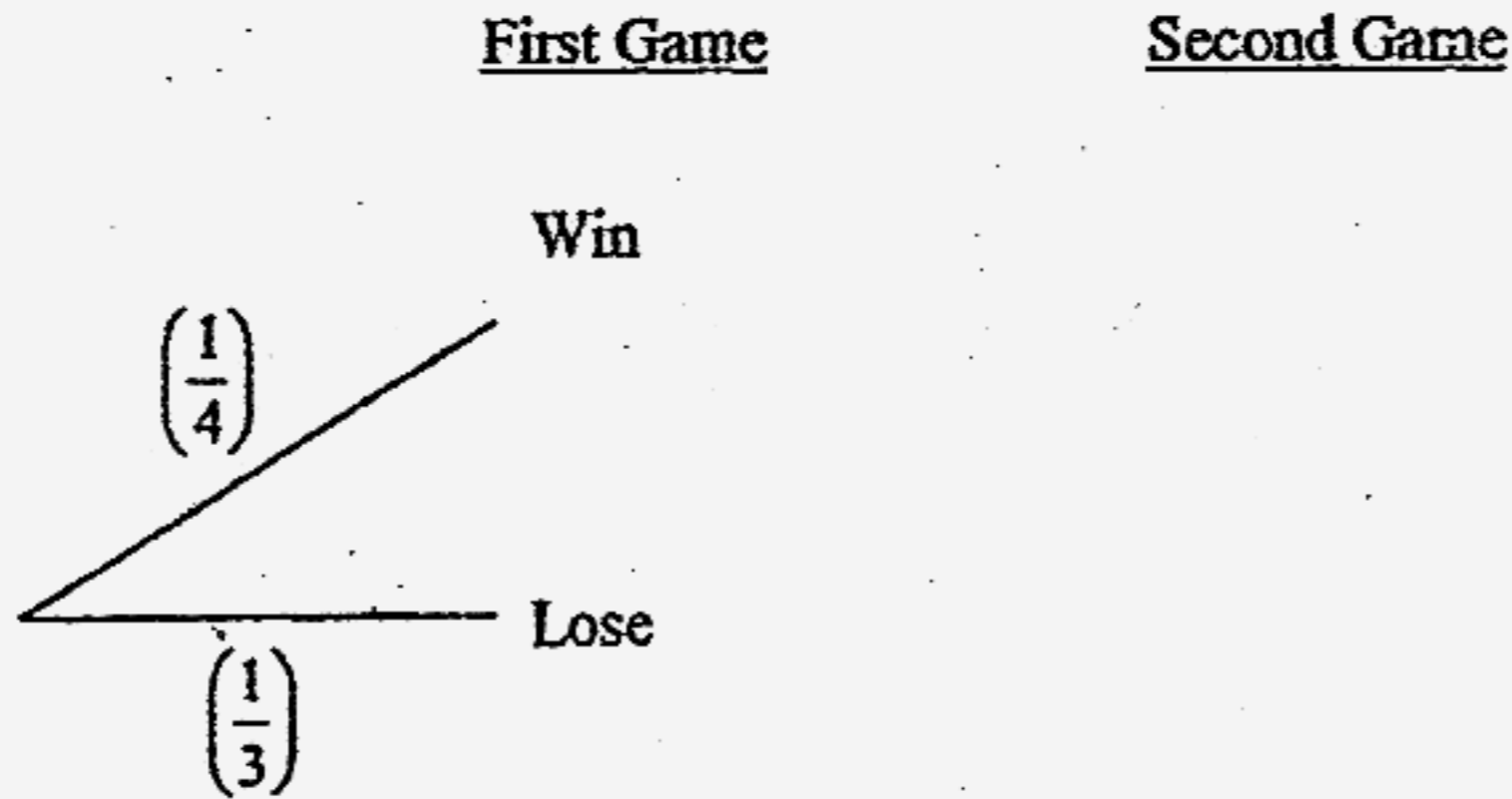Answer (a) _____ [1]

(b) _____ [1]

(c) _____ [1]

15 In a game of chess against the computer, the probability of winning is $\dfrac{1}{4}$ and the probability of losing is $\dfrac{1}{3}$. The player continues to play another game if he draws but not otherwise.

(a)   Alan plays a total of two games. Complete the probability tree diagram below
to show all the possible outcomes.

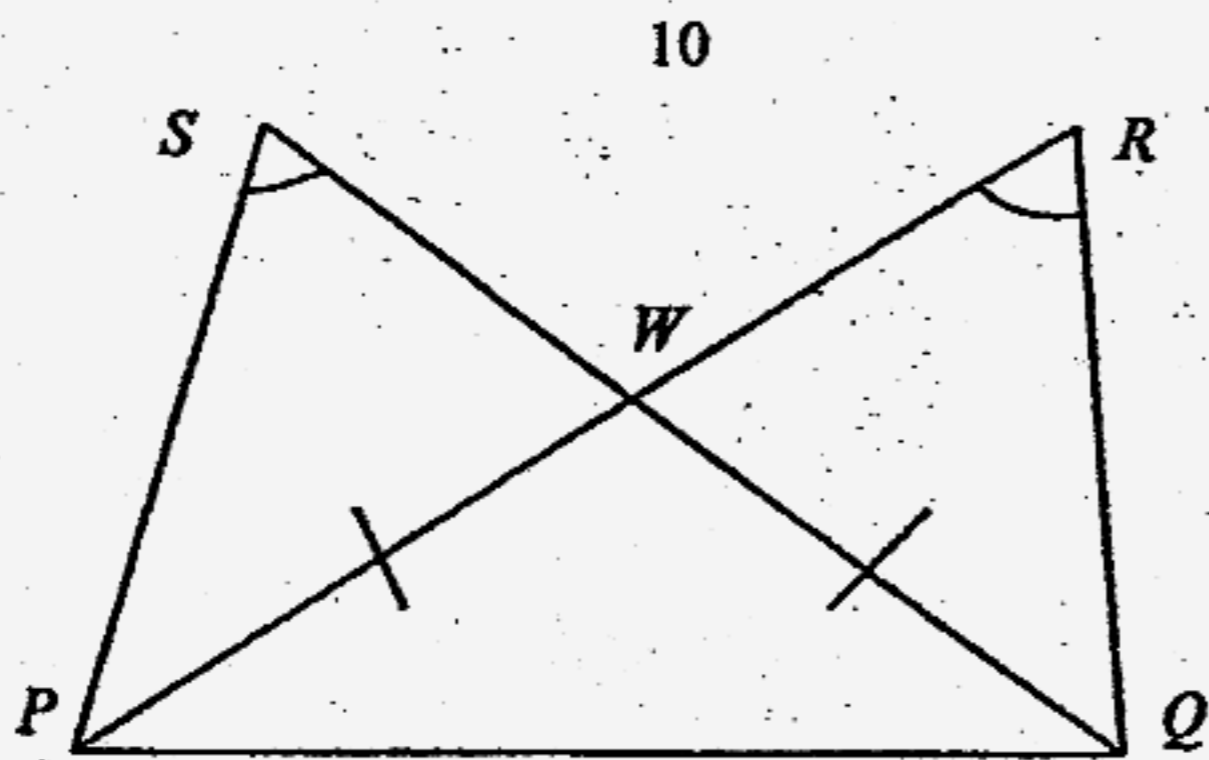Answer (a)   [2]

First Game   Second Game

Win

$\left(\dfrac{1}{4}\right)$

Lose

$\left(\dfrac{1}{3}\right)$

(b)   Calculate the probability that Alan

(i)   wins both games,

(ii)   wins after exactly two games,

(iii)   can continue to play after two games.
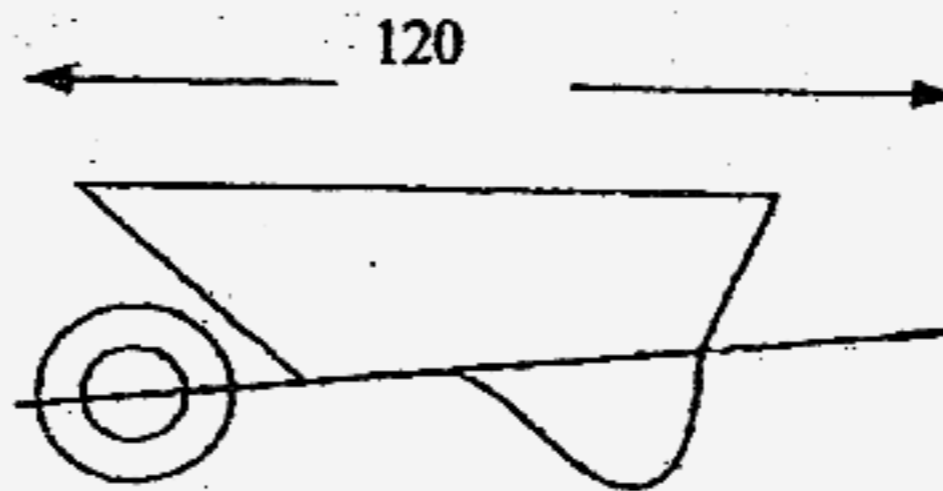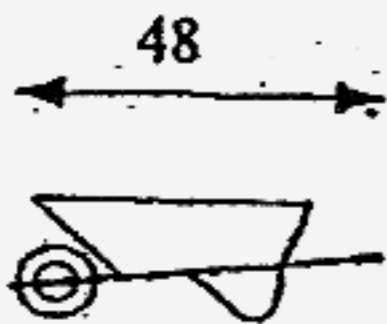
Answer (b) (i) _____ [1]

(ii) _____ [1]

(iii) _____ [1]

16   In the diagram, $\angle PSQ = \angle QRP$, $PW = QW$. Show that $\triangle PRQ$ is congruent to $\triangle QSP$.

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Answer _____

_____

_____

_____ [2]

17   A child's wheelbarrow is a scale model of an adult's wheelbarrow. The lengths of the
        two barrows are 48 cm and 120 cm.

(a)   The radius of the wheel of the adult's wheelbarrow is 12.5 cm. Find the radius
        of the wheel of the child's wheelbarrow.

(b)   The adult's wheelbarrow can hold 50 kg of sand. Find the mass of sand that the
        child's wheelbarrow can hold.

Answer   (a) _____ cm [1]

(b) _____ kg [1]

18   Six hundred candidates took a Mathematics examination which consisted of two papers.
        Each paper was marked out of 100. The diagram shows the cumulative frequency curves
        for Paper 1 and Paper 2.

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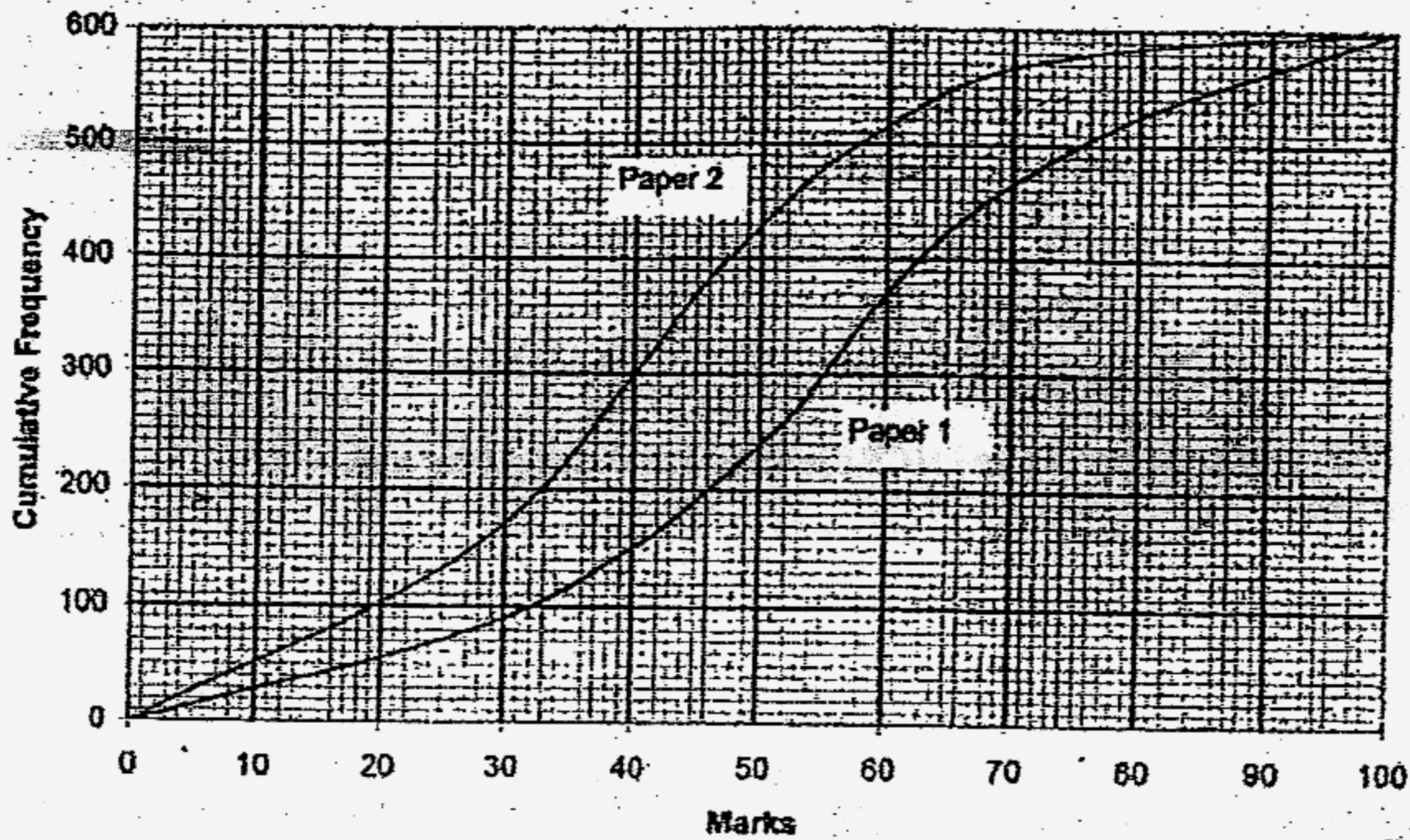
(a) Use the graph for Paper 1 to estimate
  (i) the median,
  (ii) the interquartile range,
  (iii) the number of candidates who scored more than 45 marks.

(b) A candidate scored 60 marks in Paper 1. Use the two graphs to estimate this candidate's mark on Paper 2.

(c) State, with a reason, which paper was more difficult.

Answer (a) (i) _____ [1]

(ii) _____ [1]

(iii) _____ [1]

(b) _____ [1]

(c) _____

_____ [1]

19
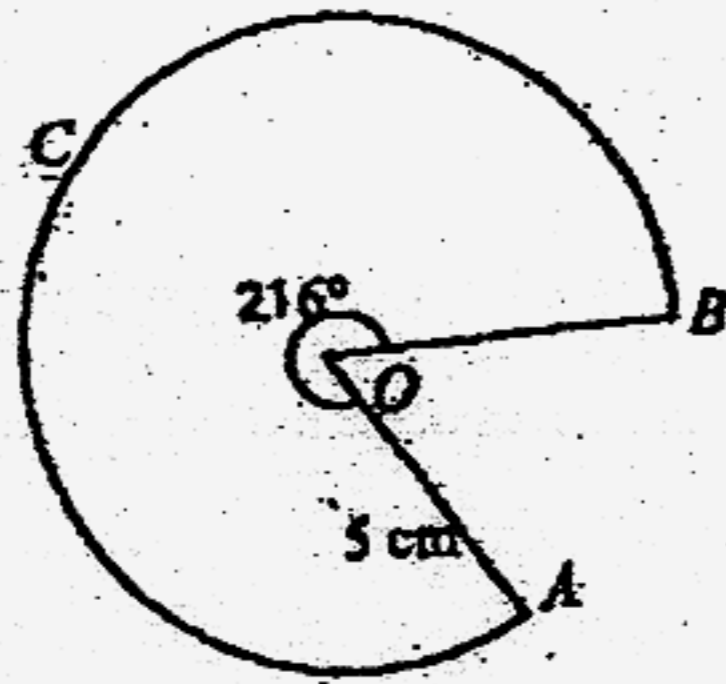
(a) Find the perimeter of the figure *OACB* shown above, leaving your answer in terms of π.

Answer   (a) _____ cm [2]

(b) The edges *OA* and *OB* are then joined together to form the cone shown below.
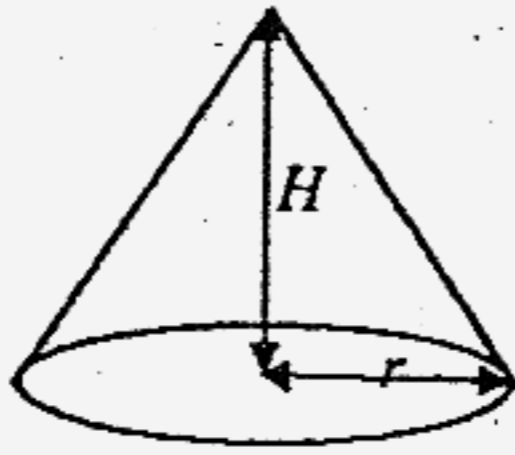
Find   (i)   *r*, the radius of the cone.
        (ii)   *H*, the height of the cone.

Answer   (b) (i) *r* = _____ cm [1]

(ii) *H* = _____ cm[1]

20   On the grid given, $\overrightarrow{OA} = 4a$ and $\overrightarrow{OB} = 4b$.

(a)   If $BP = 2a - b$, mark the point P clearly on the grid.

(b) Q is the point of intersection of OA and BP produced. Mark the point Q clearly on the grid. Hence state the value of n given that $\overrightarrow{OQ} = n\overrightarrow{OA}$.

(c)   If $\overrightarrow{CA} = \dfrac{1}{2}\overrightarrow{OB}$, mark the point C clearly on the grid.
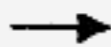
(d)   If $\overrightarrow{OA} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$, express $\overrightarrow{BC}$ as a column vector.

Answer   (a), (b), (c)   [3]
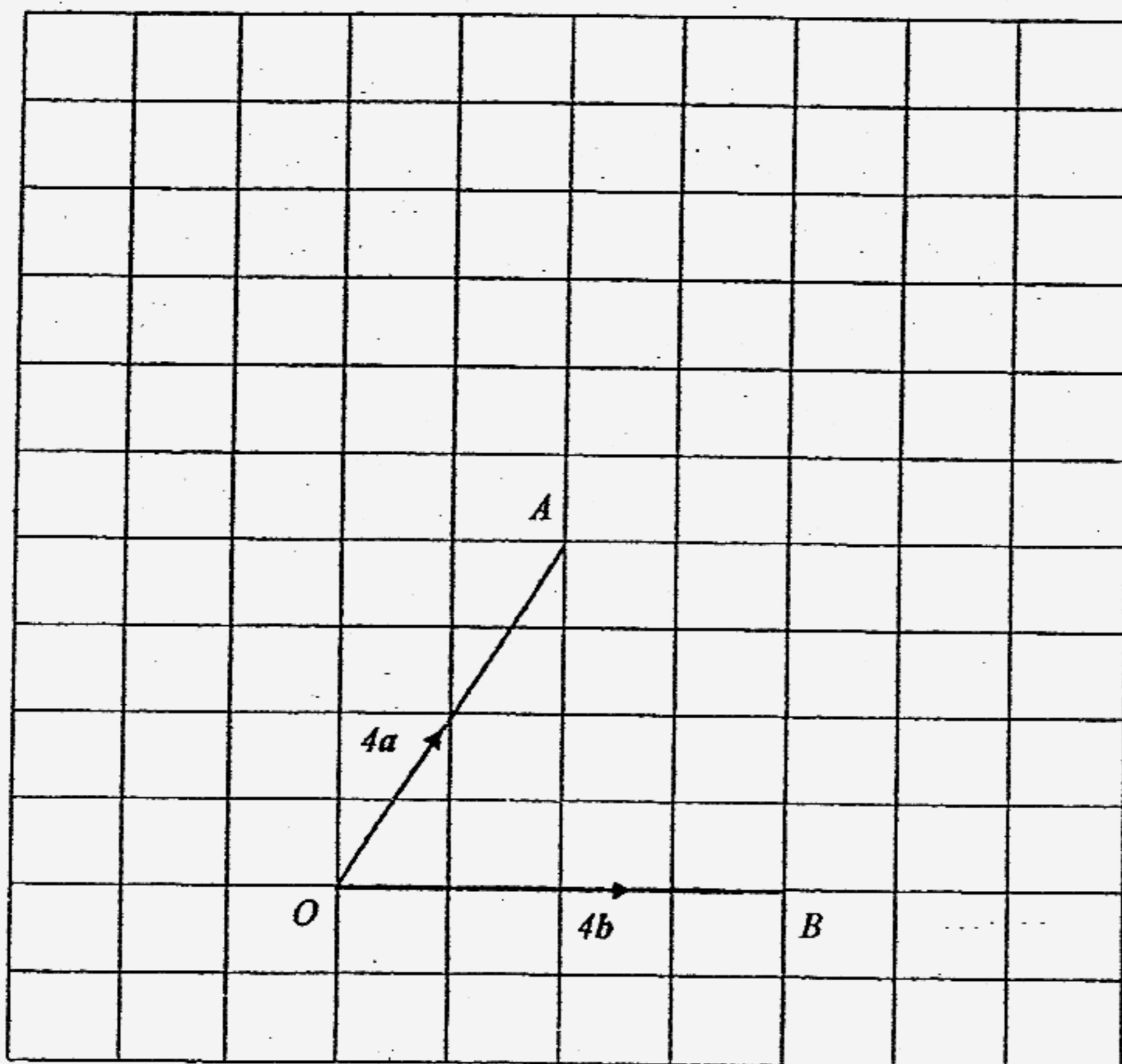
Answer   (b) $n =$ _____ [1]

(d) $\overrightarrow{BC} =$ _____ [1]

21   The diagram shows the distance-time graph of a bus.

Distance (metres)

[3]

Time (*t* seconds)
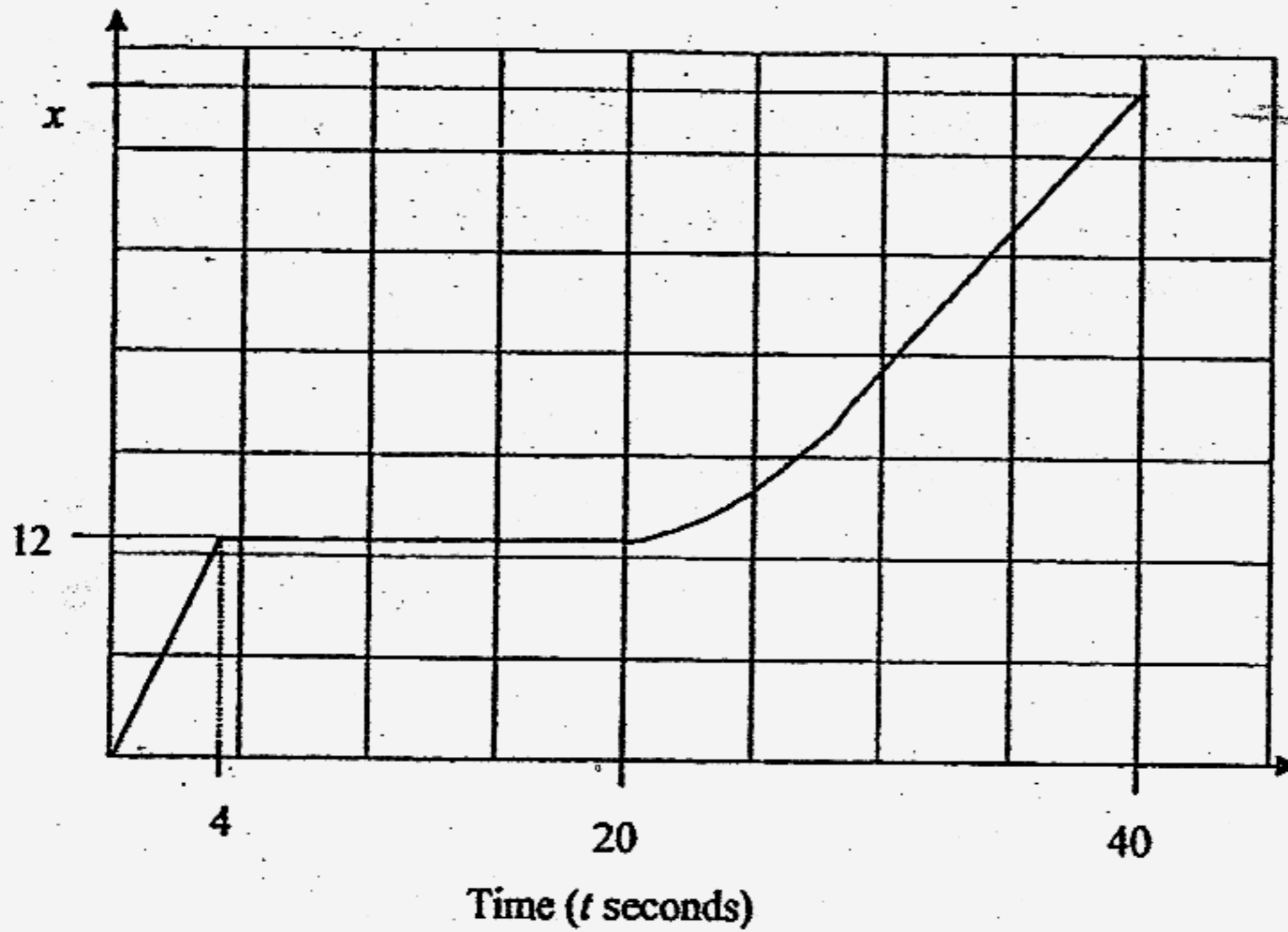
(a)   What is the distance travelled in the first 4 seconds?

(b)   Find the average speed of the bus during the first 20 seconds.

(c)   The speed-time graph of the bus for $0 \leq t \leq 4$ is a straight line. State the gradient of this line.

(d)   The distance travelled in the last 20 seconds is twice the distance travelled in the first 20 seconds. Find the value of *x*.

Answer   (a) _____ m [1]

(b) _____ m /s [1]

(c) _____ [1]

(d) *x* = _____ [1]

22   *A* is the point (– 4, 0) and *B* is the point (0, 3). The area of triangle *ABC* is 9 units².

y

B (0, 3)

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15

A (-4, 0)   C
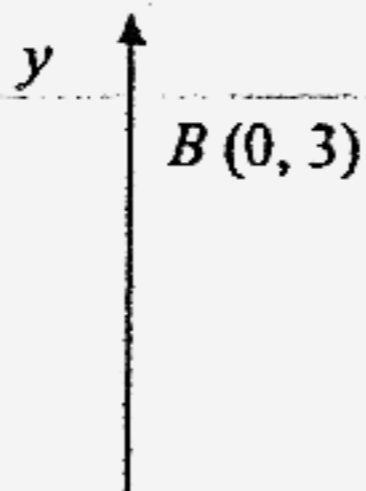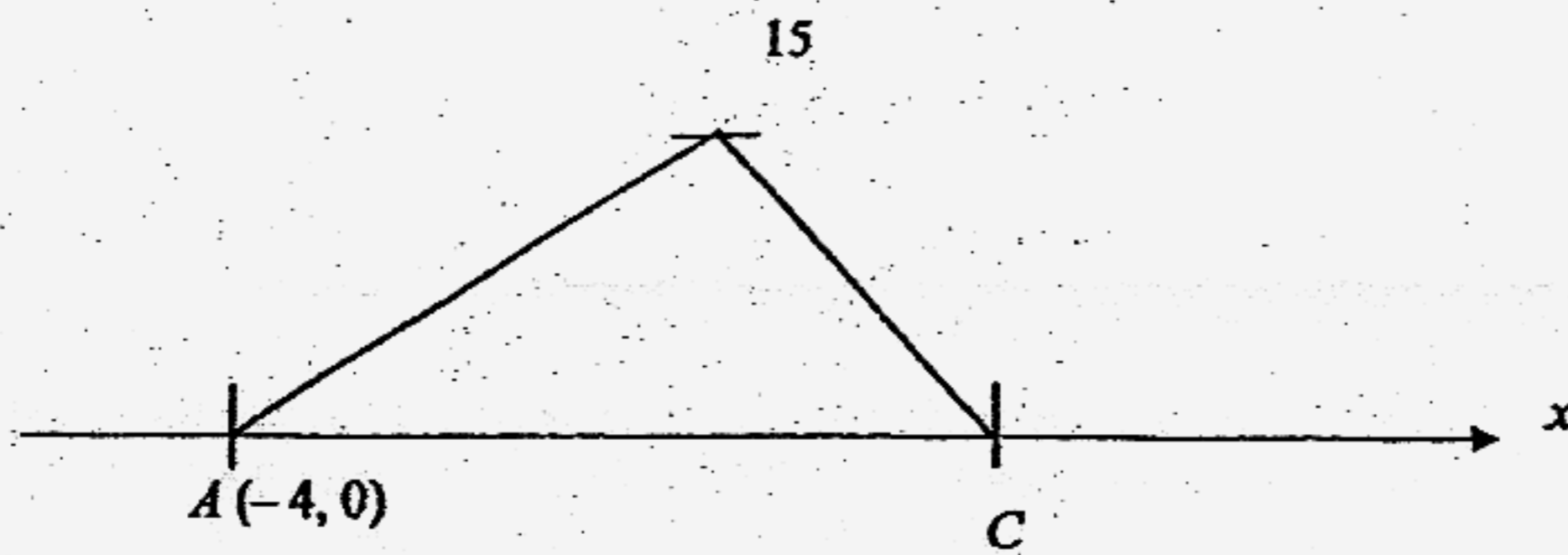
(a)   Find the coordinates of C.

(b)   The equation of BC is y = px + q. Find the value of p and of q.

(c)   The point D (0, y) is such that ABCD is a trapezium. Find the possible values of y.

Answer   (a) C = (_____ , _____) [1]

(b) p = _____ , q = _____ [2]

(c) y = _____ or _____ [2]

23   Mr and Mrs Tan want to enrol their 6-year old son in Wonder Secondary School which is
      2 kilometres west of a hospital H. They are aware that the chances of success would be very
      high if they live within 1 kilometre vicinity of the school.

(a)   In the space below, use a scale of 1 : 20 000 to mark the location of the school S and

draw a 1 kilometre boundary for the school.

(b) There is an MRT station 1 kilometre away on a bearing of 190° from the school. Mark the location of the MRT station with the letter M.

(d) A new condominium within the 1 kilometre vicinity of the school has just been built. Mr Tan intends to purchase a unit nearer to the MRT station than the school. By drawing a suitable locus, shade the region where Mr Tan's new condominium will be located.

(e) There is a community library located near the school. This library is equidistant from MS and HS. Draw a locus to represent the possible locations of this community library and label this locus L.

Answer [5]

N

×H
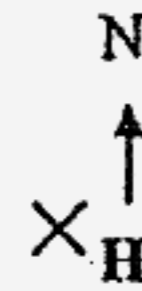
24 In the diagram below, triangle A is mapped onto triangle D by a transformation P.

(a) Describe fully the transformation P.

(b) If triangle B is the image of triangle A under a 180° rotation about the origin, draw and label B clearly on the axes.

(c) A translation, T, maps triangle *A* onto triangle *C*. Given that $T^2(A) = C$, write down the column vector T.

(d) An enlargement with centre $(-4, 0)$ and scale factor -2 maps triangle *A* to triangle *E*. Draw and label triangle *E*.

Answer (b), (d) [3]
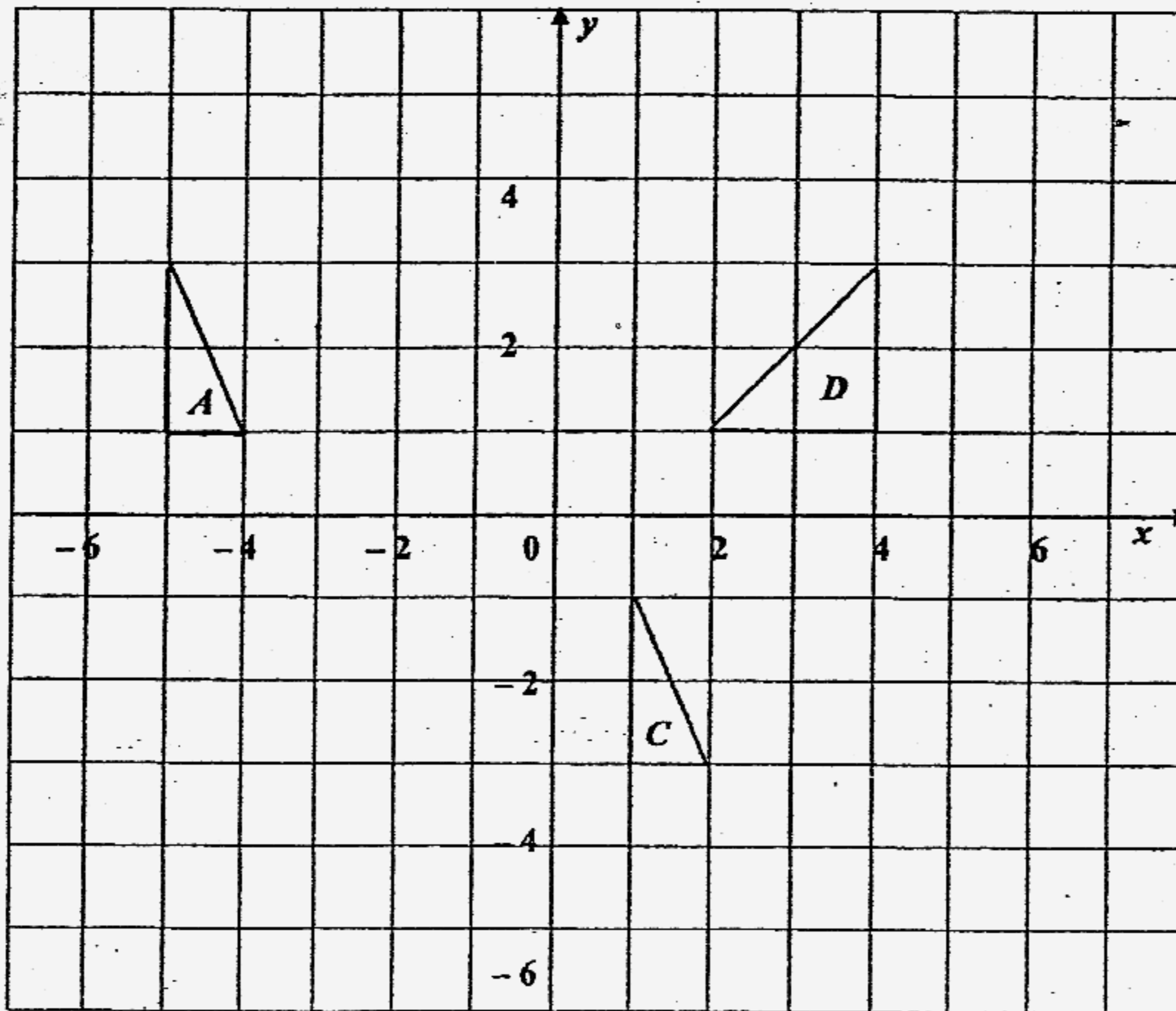
Answer (a) _____

_____ [2]

(c) T = _____ [1]

END OF PAPER

Name: _____ (   )   Class: _____

FAIRFIELD METHODIST SECONDARY SCHOOL
Prelim 2006 Math Exam Answers

PAPER 1

1 (a) 50   (b) 3.54×10^{-4}

2 (a) 67.50   (b) 0.001363   (c) 37.5%

3 (a) $2\frac{5}{21}$ (b) $x = \pm\frac{1}{3}$ (c) 20

4 (a) 4356   (b) 0.0264

5 (a) 4 h 12 minutes   (b) 0615 h or 6.15 am

6 (a)

 (b) 2 lines of symmetry

7 (a) $x = 3$ (b) $p = 2$ or 3

8 (a) $2\frac{2}{5}$ (b) $1\frac{1}{4}$

9 Jack is 20 years old
  Jill is 44 years old

10 (a) (i) $n^2(n-3)(n+3)$
    (ii) $3(p-5)(p-1)$

  (b) (i) $2^3 \times 3 \times 7$ (ii) 42

11 (a) 2 cm   (b) 8 cm   (c) -2

12 $x = 100$ and $y = 60$

13 (a) 40 sides   (b) $n = 6$

14 (a) 0   (b) 9   (c) -20

15 (a)

First Game   Second Game
Win / Lose / Draw ...
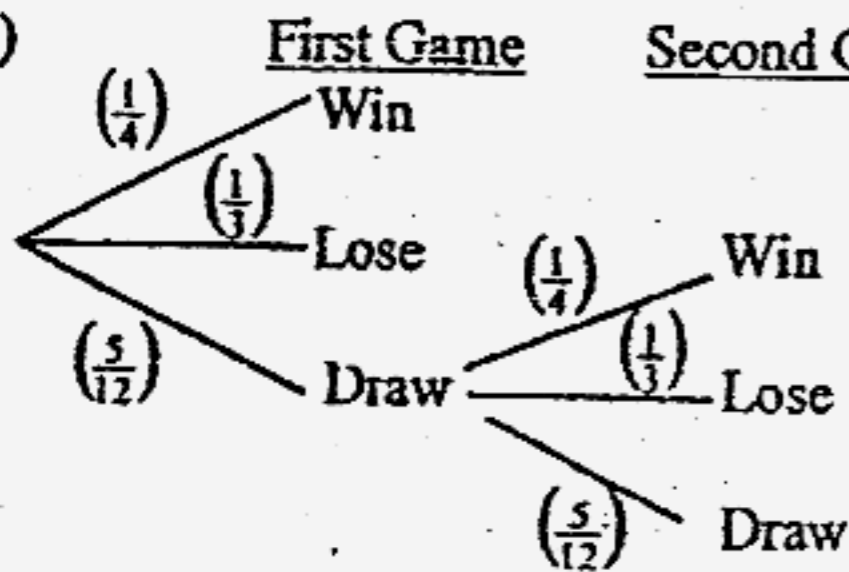
 (b) (i) 0   (ii) $\frac{5}{48}$ (iii) $\frac{25}{144}$

16 $\angle PRQ = \angle QSP$ (given)
  $\angle SQP = \angle RPQ$ (isos Δ)

17 (a) 5 cm   (b) 3.2 kg

18 (a) (i) 55 marks   (ii) 28 marks
   (iii) 410 candidates (b) 45 marks
 (c) Paper 2 was more difficult as the
   median is lower (40 only). Median for
   Paper 1 is 55 marks.

19 (a) $(6\pi + 10)$ cm
 (b) (i) 3 cm   (ii) 4 cm

20 (b) $n = 2$ (d) $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$

21 (a) 12 m   (b) 0.6 m/s
  (c) 0   (d) $x = 36$

22 (a) $C = (2, 0)$
 (b) $p = -1\frac{1}{2}$, $q = 3$
 (c) $y = -1\frac{1}{2}$ or $y = -6$

20

23

24
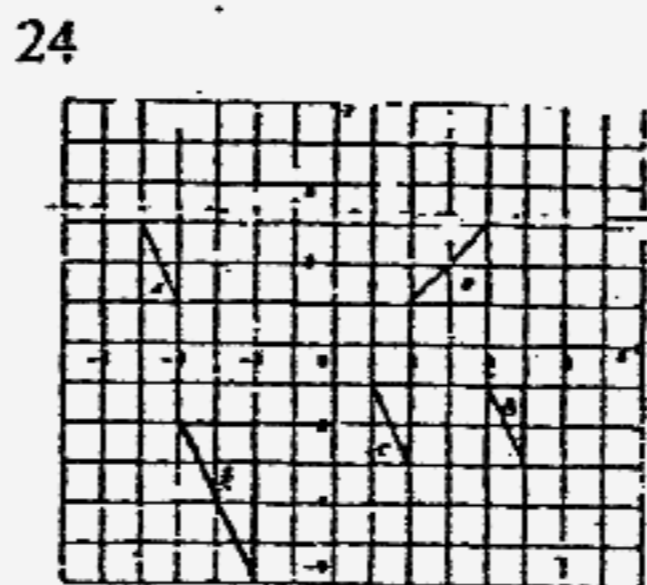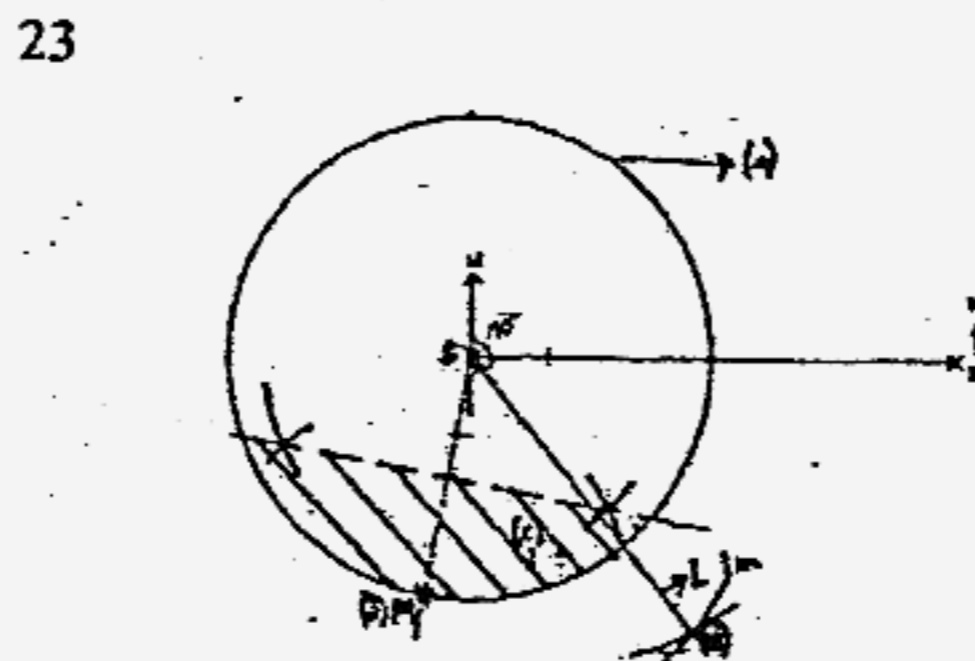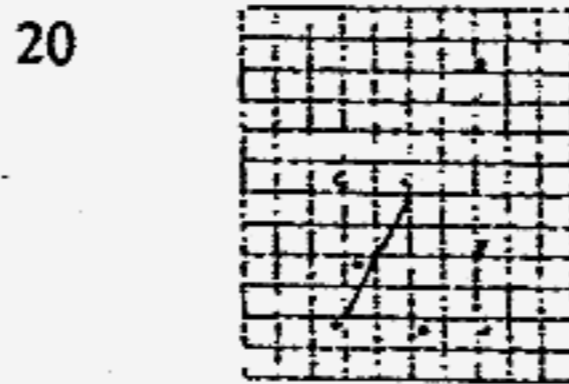
 (a) Stretch along x-axis with $x = -2$ as
   invariant line and stretch factor -2.

FAIRFIELD METHODIST SECONDARY SCHOOL

SECONDARY 4 Express/ 5 Normal
Preliminary Examination

MATHEMATICS
PAPER 2

4017/02

Tuesday

19 September 2006

2 hours 30 minutes

Additional materials: Answer Booklet/Paper
Electronic calculator
Geometrical instruments
Graph papers

READ THESE INSTRUCTIONS FIRST

Write your answers and working on the separate Answer Booklet/Paper provided.
Write your name, class and index number in the spaces provided on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer all questions.

Section B
Answer any **one** question.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

Show all your working on the same page as the rest of the answer.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is 100.
You are expected to use an electronic calculator to evaluate explicit numerical expressions. You
may use mathematical tables as well if necessary.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the
answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms
of π.

This question paper consists of **10** printed pages.

Section A [88 marks]

Answer all the questions in this section.

1   (a)   Solve the equation $1 + \dfrac{2}{x} = \dfrac{3}{2}$.   [2]

    (b)   Given that $a = \sqrt{\dfrac{b+2}{c}}$, express b in terms of a and c.   [2]

    (c)   Express the following as a single fraction, in its simplest form,

          (i) $\dfrac{k^2 - k}{k^2 - 1}$ [2]

          (ii) $\dfrac{1}{x-3} - \dfrac{2}{3-x}$.   [2]

---

2   [Please note that the diagram is not drawn to scale]

    The diagram shows a circle with centre O.
    ABC, CDE and BFD are tangents to the circle at A, E and F respectively as shown.
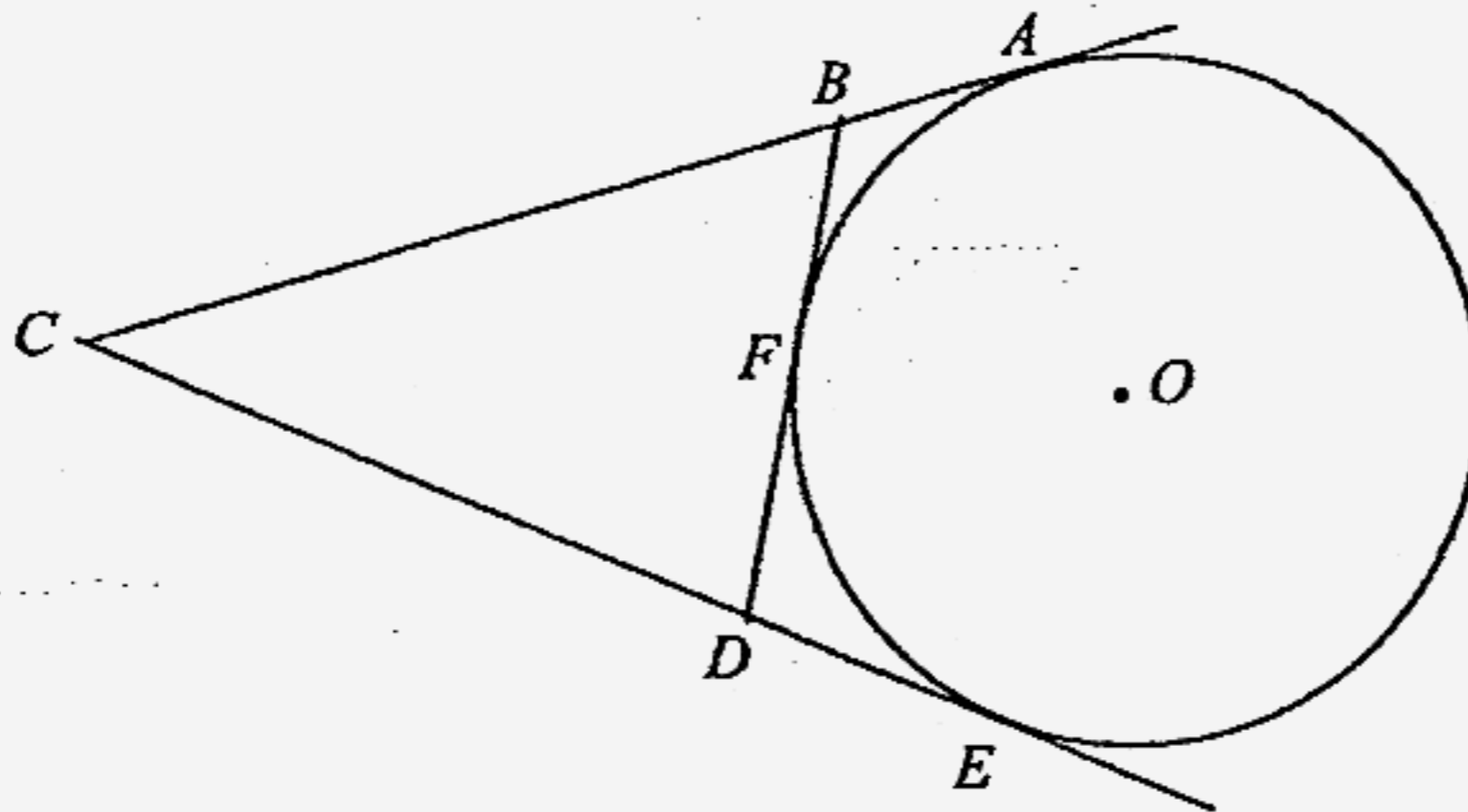
13   It is given that $CD = 6$ cm and $DF = 3$cm.
     Find the length of $FB + BC$, giving reasons for your working.   [3]

    (b)   If the radius of the circle is 4 cm, find the length of OC.   [3]

---

3   In the diagram, the points A, B, C, F and D are on the circle with centre O.
     CED is a straight line, ∠AEC = 100°, ∠ADC = 2y°, ∠ABC = x° and ∠DAE = 3y° − x°.
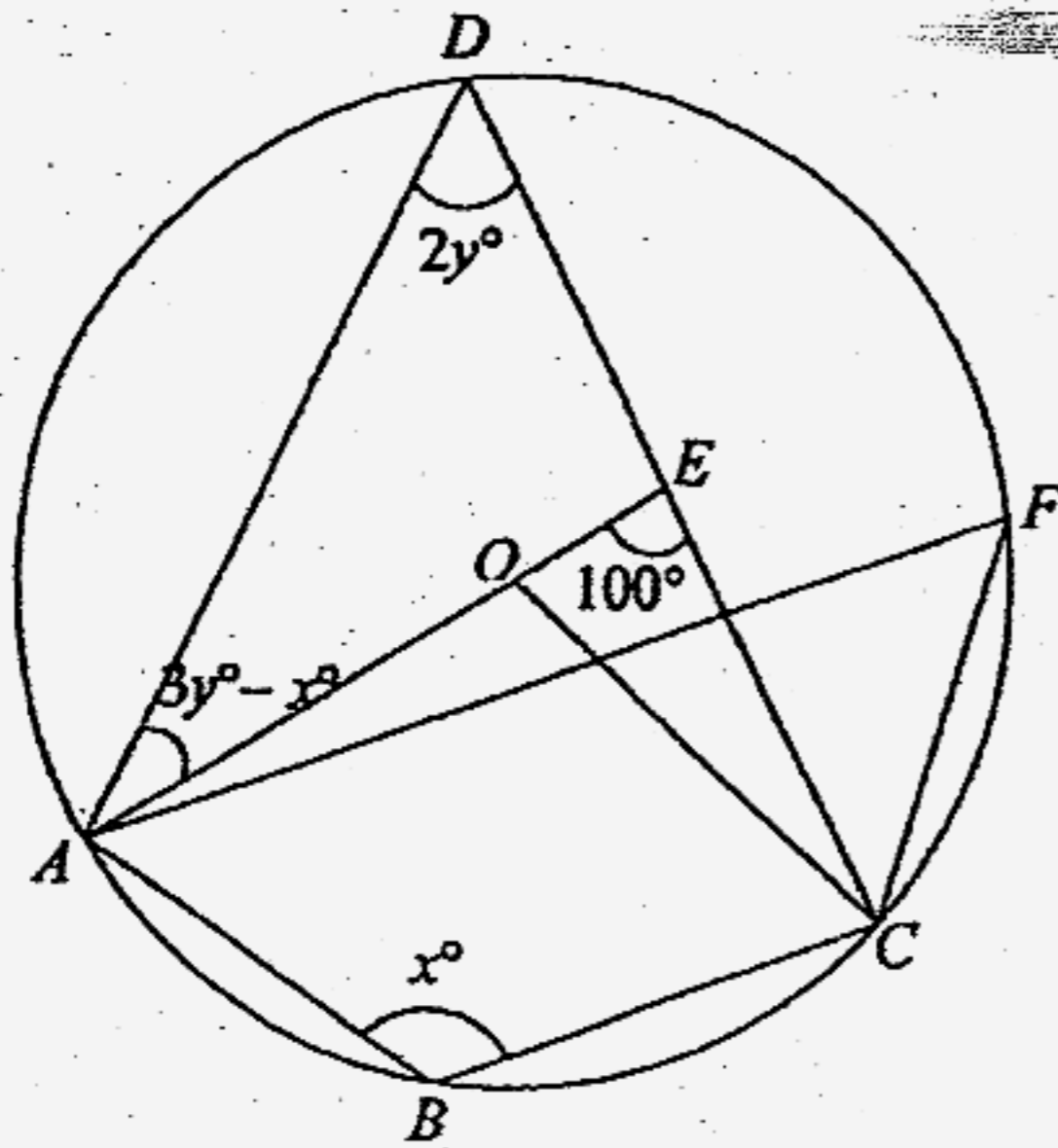
(a)   Give a reason why

a. $x + 2y = 180$,   [1]

b. $3y - x + 2y = 100$.   [1]

(b)   Find the value of x and of y.   [3]

(c)   Hence, calculate

       (i)   ∠AOC,   [1]

       (ii)   ∠AFC,   [1]

       (iii)   ∠ACD.   [3]

_____

4   **(a)**   An open container is made by joining a cylinder of radius 4 cm and a cone of height 6 cm as shown in diagram I.
The container is completely filled with water.
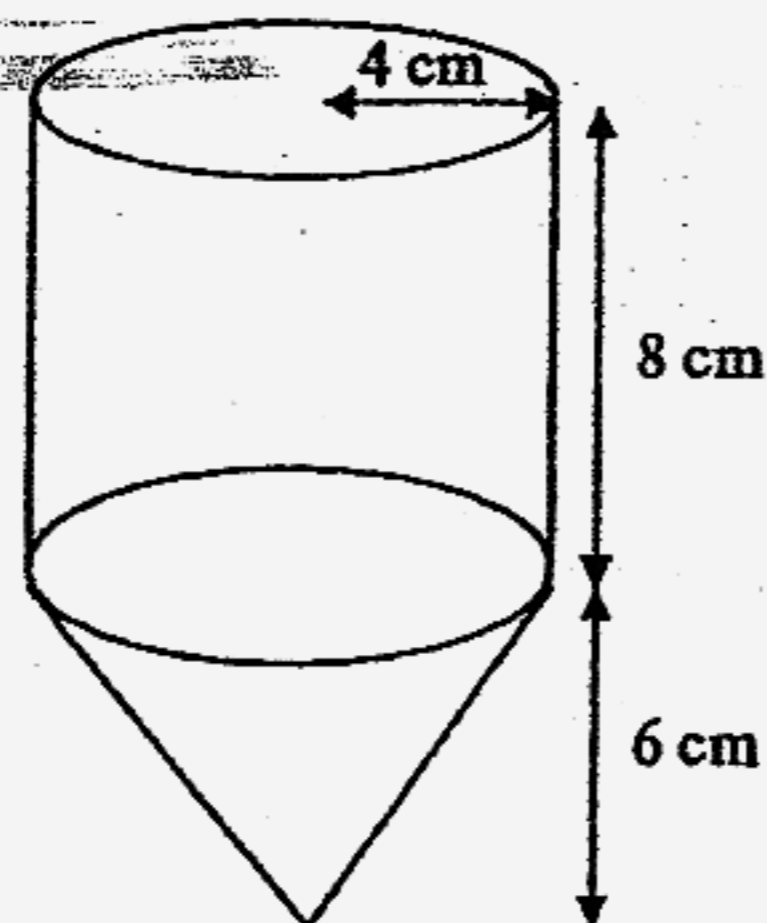
Diagram I

If the height of the cylinder is 8 cm, find

16   the volume of the water,   [3]

17   the total surface area of the container.   [4]

(b)   All the water from the container is poured into a spherical bowl, as shown in Diagram II, such that the height of water in the bowl is 10 cm and the radius of the top of the water surface is 3 cm. Find,

    (i)   the radius of the spherical bowl,   [3]

    (ii)   the percentage of the bowl that is filled with water.   [2]
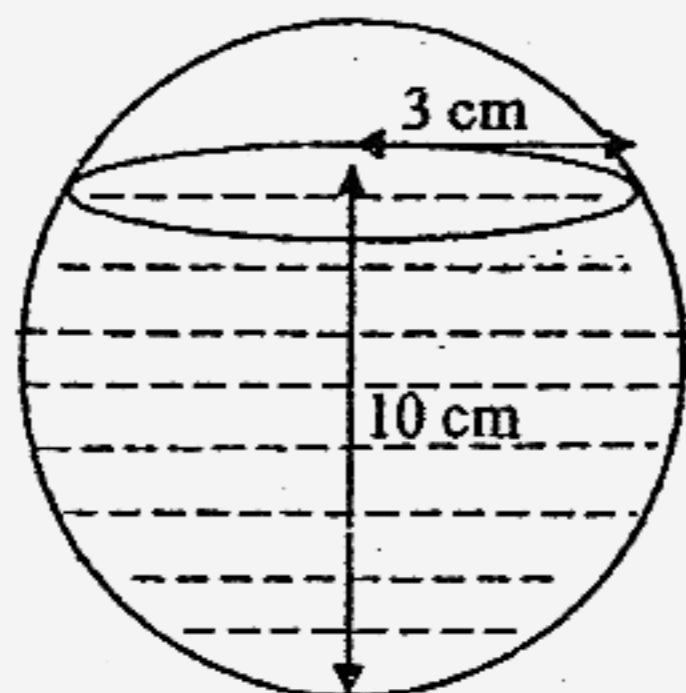
Diagram II

[Volume of the cone = $\frac{1}{3}\pi r^2 h$ and curved surface area of the cone = $\pi r l$, where radius of

the cone is r, height of the cone is h and the slant height of the cone is l.

Volume of the sphere = $\frac{4}{3}\pi r^3$ where radius of the sphere is r]

5   A 60 m race was held at Sports Carnival with S as the starting point for a particular runner and AB as the finishing line. A student helper was standing along the track at H, such that $\angle ABH = 90°$ and A is due north of B. The bearing of A from H is 023°, SH = 50 m and AH = 60 m.
It is also given that the bearing of H from S is 133°.

(a)   Calculate the distance AS.   [3]

(b)   Find the bearing of A from S.   [3]

(c)   The runner stopped at a point P which is equidistant from AH and SH and that $\angle HPS = 90°$.

    (i)   Find the distance PS.   [3]

    (ii)   Determine the shortest distance from P to the finishing line AB.   [3]

7   The followi

liagrams are formed by dots and toothpicks:
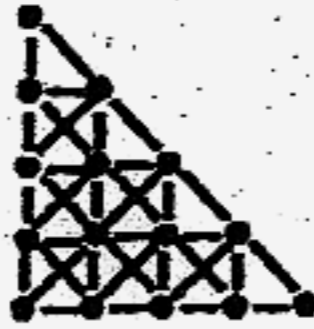
Fig 2   *Fig 3*   *Fig 4*   *Fig 5*

r of dots (D) and toothpicks (T) of each figure are shown in the table:

Fig	D	T
1	1	$0 \times 1 = 0$
2	3	$1 \times 3 = 3$
3	6	$2 \times 5 = 10$
4	10	$3 \times 7 = 21$
5	15	$a \times b = 36$
6	p	q
⋮	⋮	⋮

he diagrams and the patterns in the table, answer the following questions.

ilues of a and b.   [2]

the values of p and q.   [2]

form the 10th Figure, how many

; are needed?   [1]

hpicks are needed?   [1]

figure, express

ı terms of n.   [1]

 terms of n.   [1]

(a)   Copy ε

S
8
9
10

(b)   Draw ε

(c)   Find

(i)

(ii)

(iii)

2.   Two student:
        Find th

80
10
93

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7   The following data represents the marks scored by twenty students in a quiz.

80	84	93	83	83	95	87
100	95	99	89	89	83	91
93	94	98	83	88	83	

(a)   Copy and complete the stem and leaf diagram below.   [2]

```
S   | L
8   | 0  3  3
9   | 1
10  | 0
```

(b)   Draw a dot diagram to represent the data.   [2]

(c)   Find

        (i)   the modal mark

        (ii)   the median mark

        (iii)   the mean mark   [4]

2.   Two students are chosen at random.
      Find the probability that both students scored at least 87 marks.   [2]

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8   A tank can be filled completely with water by two pipes in 10 minutes. It is given that the larger pipe alone takes x minutes to fill the tank while the smaller pipe alone needs an additional 3 minutes to fill the same container.

(a) Write down an equation in x, and show that it simplifies to
$$x^2 - 17x - 30 = 0$$ [4]

(b) Solve the equation $x^2 - 17x - 30 = 0$, giving the solutions **correct to 3 decimal places.**
                                                                                                       [4]

(c) Find the percentage of tank that is being filled by the larger pipe alone after 9 minutes.   [2]

_____

9   In the latest 2006 IT-show, there were 60 000 visitors and 2400 exhibitors.

(a) (i)   Express the number of exhibitors as a percentage of the number of visitors.

    (ii) The number of visitors in 2006 was 25% higher than that in 2005.
          Find the number of visitors in 2005.   [3]

(b) The hottest item on sale in the 2006 IT-show was the 3G cellphone. The Nokia 6151 model cellphone was sold for 240 euros in the show.

    a. Find the price of the Nokia 6151 model cellphone in Singapore dollars if the exchange rate is 1 euro to S$2.025.

    b. If the Nokia 6151 model cellphone cost S$600 a year ago, find the price in euros. Give your answer to 2 decimal places.   [3]

(c) The total number of cellphones sold for Motorola, Samsung and Sony Ericsson was 45 664. The numbers of cellphones sold for these companies were in the ratio 3:5:8 respectively.

2. Find the number of cellphones sold by Samsung.

    (ii) If these data were shown on a pie chart, calculate the angle represented by the number of cellphones sold by Motorola.   [3]

(d) The number of 3G mobile service subscribers grew by a rate of n% every month. If the numbers of subscribers in January 2006 and April 2006 were 21 600 and 72 900 respectively, find the value of n.   [3]

_____

Section B (12 marks)

Answer one question in this section

10   *Answer the whole of this question on a sheet of graph paper*

The variables x and y are connected by the equation $y = 25 - 3x - \dfrac{18}{x}$. Some of the

corresponding values of x and y are given in the following table.

x	1	1.5	2	3	4	5	6	7	8
y	4	h	10	10	8.50	6.25	4	1.43	−1.25

(a)   Calculate the value of h.   [1]

(b)   Using a scale of 2 cm to represent 1 unit on the x-axis and 1 cm to represent 1 unit on the y-axis, draw the graph of

$$y = 25 - 3x - \frac{18}{x} \text{ for } 1 \le x \le 8.$$ [3]

(c)   From the graph, find the largest value of y and the value of x that corresponds to this largest value of y.   [2]

1. By drawing a tangent, find the gradient of the curve at the point $x = 1.5$.   [2]

(e)   By adding a suitable straight line to the graph drawn in part (b), solve the equation

$$11x + \frac{54}{x} = 69.$$ [2]

(f)   By adding a suitable straight line to the graph drawn in part (b), find the range of values of x for which $18(x - 1) \ge 3x^2$.   [2]

11
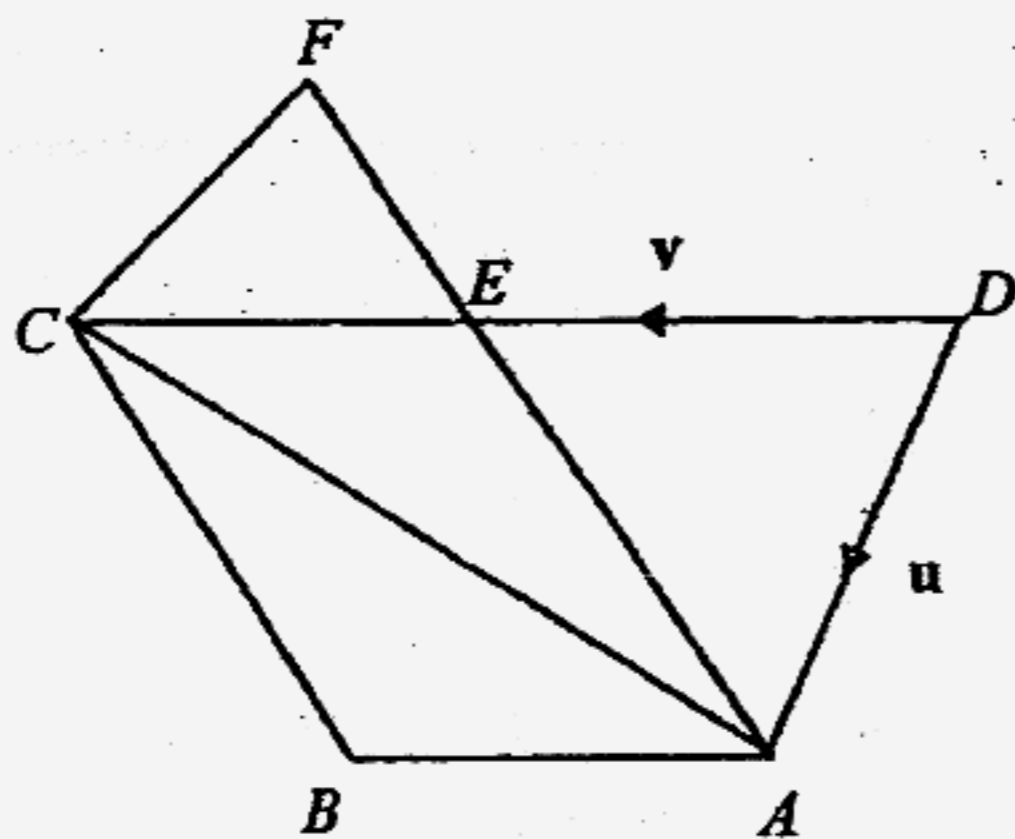
In the diagram, $ABCD$ is a trapezium and BC is parallel to AF, $\overrightarrow{DA} = u$ and $\overrightarrow{DE} = v$.
$DE = \frac{5}{4}EC$ and $AE : EF = 3 : n$.

(a) Express, as simply as possible, in terms of u and/or v,

    (i) $\overrightarrow{EC}$,   [1]

    (ii) $\overrightarrow{DB}$,   [1]

    (iii) $\overrightarrow{AE}$.   [1]

(b) Express $\overrightarrow{EF}$ in terms of u, v and n.   [1]

(c) **Given that FC and DB are parallel, find the value of n.**
    [3]

(d) Find the ratio of $\dfrac{Area\ of\ \triangle ADE}{Area\ of\ \triangle ACE}$.   [1]

(e) Given the area of triangle ADE is 90 units^2, find the area of triangle EFC.   [2]

(f) Given that the column vector $\overrightarrow{AB}$ is $\begin{pmatrix} 7 \\ 2 \end{pmatrix}$ and the position vector of B relative to the

    origin O is $\begin{pmatrix} 8 \\ 1 \end{pmatrix}$, find

    (i) the coordinates of the point A,   [1]

    (ii) the value of $|\overrightarrow{AB}|$.   [1]

PQ is the common side Δ PRQ is congruent to ΔQSP (AAS)	(c) T= $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

PAPER 2

1(a) $x = 4$

(b) $b = a^2c - 2$

(c) (i) $\dfrac{k}{k+1}$ (ii) $\dfrac{3}{x-3}$

2(b) $OC = 9.85$ cm

3(a) (i) Opposite angles of cyclic quadrilateral
    (ii) Exterior angle equals sum of interior angles

(b) $x = 100$ and $y = 40$

(c) (i) $160°$ (ii) $80°$ (iii) $70°$

4 (a) (i) 160π or 503 cm^3
    (ii) 292 cm^2

(b) (i) 5.45 cm   (ii) 74.1%

5 (a) 63.6 m

(b) $070.6°$

(c) (i) 28.7 m   (ii) 31.9 m
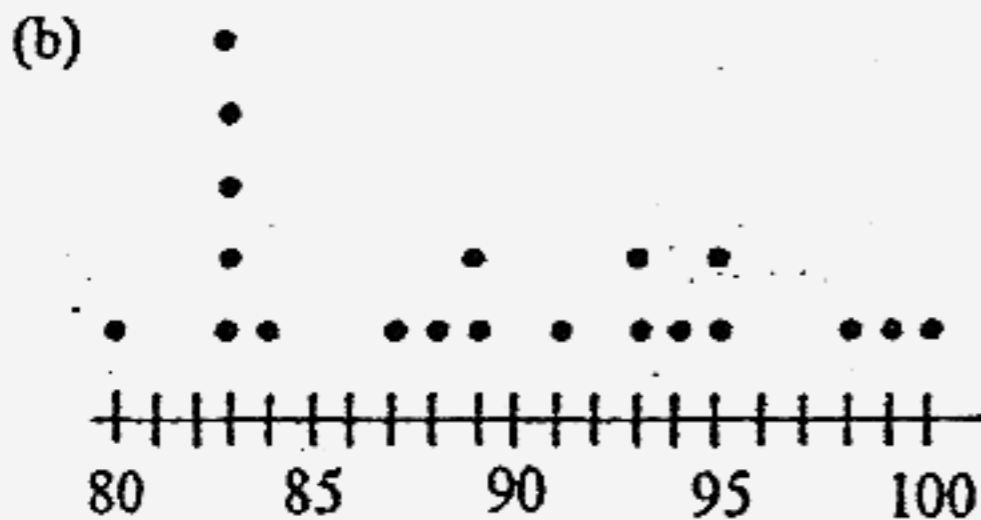
6 (a) $a = 4$ and $b = 9$

(b) $p = 21$ and $q = 55$

(c) (i) 55 (ii) 171

(d) (i) $D = \dfrac{n(n+1)}{2}$

    (ii) $T = (n-1)(2n-1)$

7 (a)

S	L
8	0 3 3 3 3 3 4 7 8 9 9
9	1 3 3 4 5 5 8 9
10	0

(b)


```
            •
            •
            •
        •       •   •
    •   ••    • • •   •   • • •    • • •
 ++|+|+|+|+|+|+|+|+|+|+|+|+|+|+|+|+|+|+|+|
  80      85      90      95     100
```

(c) (i) 83 (ii) 9 (iii) 89.5

(d) $\dfrac{39}{95}$

8 (b) $x = 18.612$ or $x = -1.612$

(c) 48.4%

9 (a) (i) 4% (ii) $48\,000$

(b) (i) S\$ 486   (ii) 296.30 euros

(c) (i) $14\,270$ (ii) $67.5°$

(d) $n = 50$

10 (a) $h = 8.5$

(c) Largest $y = 10.3$ when $x = 2.5$

(d) 5

(e) $x = 5.35$

(f) $0.3 \le x \le 4.7$

11 (a) (i) $\overrightarrow{EC} = \dfrac{4}{5}v$

    (ii) $\overrightarrow{DB} = u + \dfrac{4}{5}v$

    (iii) $\overrightarrow{AE} = v - u$

(b) $\overrightarrow{EF} = \dfrac{n}{3+n}(v - u)$

(c) $n = 2\frac{2}{5}$

(d) $\dfrac{5}{4}$

(e) 90 units^2

(f) (i) $A = (1, -1)$

    (ii) $\sqrt{2}$