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4024/01

May/June 2007

2 hours

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Omission of essential working will result in loss of marks.

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

The total of the marks for this paper is 80.

For Examiner's Use

This document consists of **15** printed pages and **1** blank page.

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

- 1** **(a)** Evaluate $3 + 25 \div 2$.
- (b)** Express $17\frac{1}{2}\%$ as a decimal.

Answer (a) [1]

(b)[1]

- 2** Evaluate

(a) $\frac{1}{4} + \frac{1}{7}$,

(b) $1\frac{7}{8} \div \frac{3}{16}$.

Answer (a)[1]

(b)[1]

- 3** It is given that $\frac{2}{3}$, $\frac{8}{d}$ and $\frac{n}{39}$ are equivalent fractions.

Find the value of d and the value of n .

Answer $d =$ [1]

$n =$ [1]

- 4 (a) A car decelerates uniformly from 20 m/s to 5 m/s in 25 seconds.
Calculate the retardation.
- (b) Express 20 metres per second in kilometres per hour.

Answer (a) m/s² [1]

(b) km/h [1]

- 5 (a) Write the following in order of size, starting with the smallest.

$$\frac{66}{100} \quad 0.\dot{6} \quad 0.67 \quad \frac{666}{1000}$$

Answer (a) , , , [1]
smallest

- (b) The distance of Saturn from the Sun is 1507 million kilometres.
Express 1507 million in standard form.

Answer (b)[1]

- 6 (a) Express 154 as the product of its prime factors.
- (b) Find the lowest common multiple of 154 and 49.

Answer (a)[1]

(b)[1]

7 In the quadrilateral $ABCD$, $\hat{A} = x^\circ$, $\hat{B} = 2x^\circ$, $\hat{C} = 3x^\circ$ and $\hat{D} = 4x^\circ$.

(a) Find x .

(b) Explain why AB is parallel to DC .

Answer (a) $x = \dots\dots\dots[1]$

(b) $\dots\dots\dots[1]$

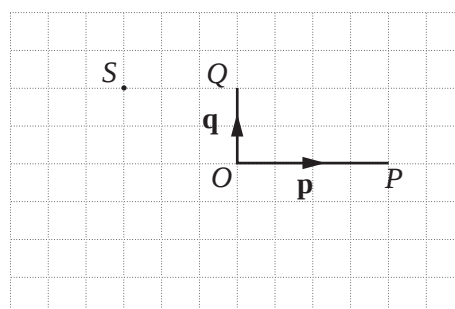
8 On the grid in the answer space, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

(a) Given that $\overrightarrow{OR} = \mathbf{p} - \mathbf{q}$, mark the point R clearly on the grid.

(b) The point S is shown on the grid.

Given that $\overrightarrow{OS} = \mathbf{q} + h\mathbf{p}$, find h .

Answer (a)

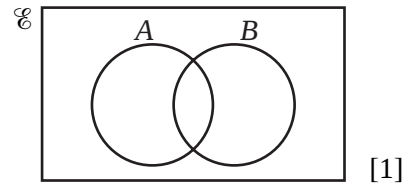


[1]

(b) $h = \dots\dots\dots[1]$

- 9 (a) The sets A and B are shown on the Venn Diagram in the answer space.
The element y is such that $y \in A$ and $y \notin B$.
On the diagram, write y in the correct region.

Answer (a)



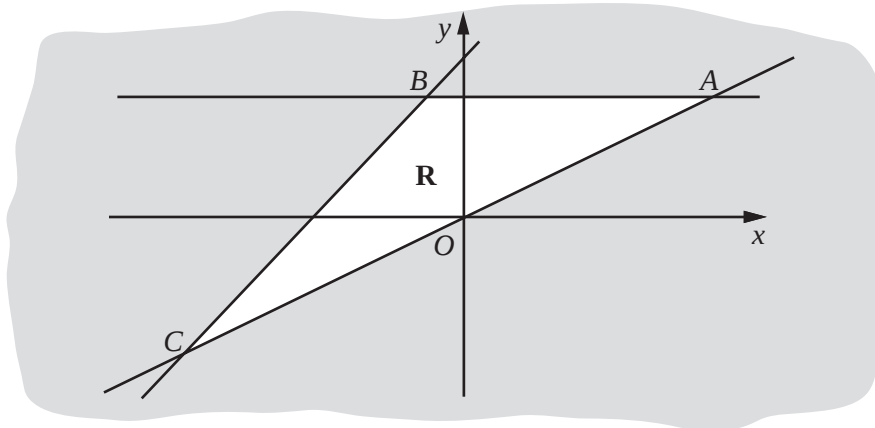
- (b) $\mathcal{E} = \{x : x \text{ is an integer and } 1 \leq x \leq 8\}$.
 $P = \{x : x > 5\}$.
 $Q = \{x : x \leq 3\}$.

- (i) Find the value of $n(P \cup Q)$.
(ii) List the elements of $P' \cap Q'$.

Answer (b)(i)[1]

(ii) { } [1]

10



In the diagram, A is the point $(6, 3)$ and C is the point $(-8, -4)$.
The equation of AB is $y = 3$ and the equation of CB is $y = x + 4$.

- (a) Find the coordinates of B .
(b) The unshaded region R inside triangle ABC is defined by three inequalities.
One of these is $y < x + 4$.

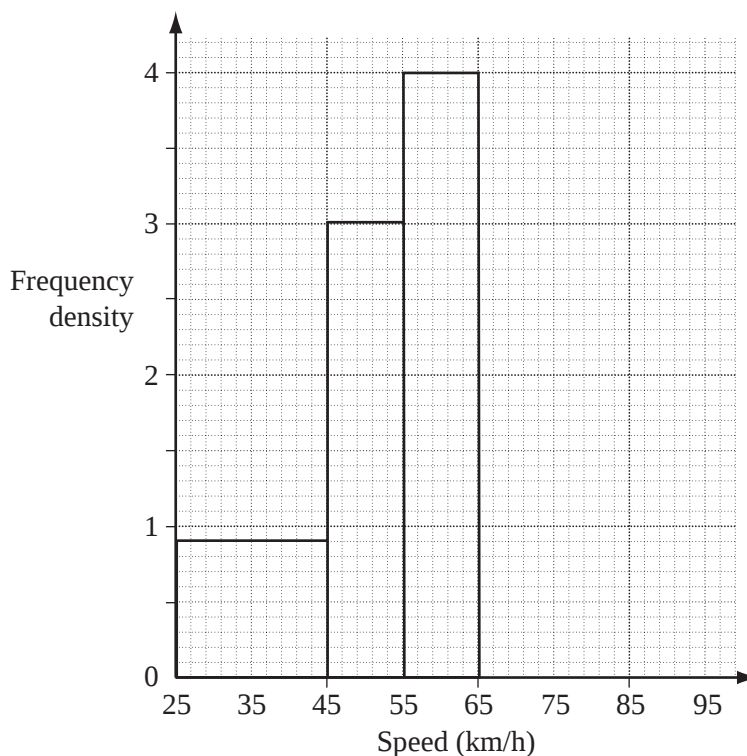
Write down the other two inequalities.

Answer (a) (.....,) [1]

(b)
.....[2]

- 11** On a certain stretch of road, the speeds of some cars were recorded. The results are summarised in the table. Part of the corresponding histogram is shown alongside.

Speed (x km/h)	Frequency
$25 < x \leq 45$	q
$45 < x \leq 55$	30
$55 < x \leq 65$	p
$65 < x \leq 95$	12



(a) Find the value of

- (i)** p ,
(ii) q .

Answer (a)(i) $p = \dots\dots\dots$ [1]

(ii) $q = \dots\dots\dots$ [1]

(b) Complete the histogram.

[1]

12 Evaluate

- (a)** 17^0 ,
(b) $4^{\frac{5}{2}}$,
(c) $(0.2)^{-2}$.

Answer (a) $\dots\dots\dots$ [1]

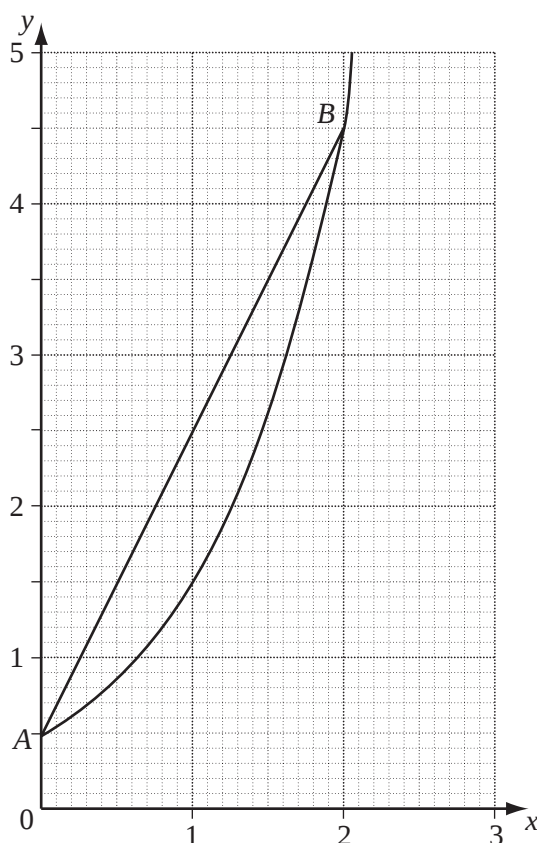
(b) $\dots\dots\dots$ [1]

(c) $\dots\dots\dots$ [1]

- 13 (a) Given that $2y = 3^x$, find x when $y = 40\frac{1}{2}$.

Answer (a) $x = \dots\dots\dots$ [1]

- (b) The points, $A(0, \frac{1}{2})$ and $B(2, 4\frac{1}{2})$, lie on the curve as shown in the diagram.



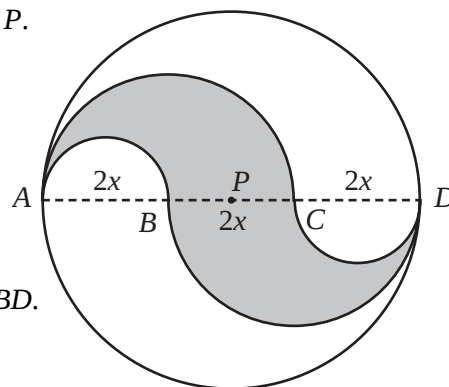
- (i) Calculate the gradient of the straight line AB .
- (ii) Using the diagram, estimate the value of x at which the gradient of the curve is equal to the gradient of the straight line AB .

Answer (b)(i) $\dots\dots\dots$ [1]

(ii) $x = \dots\dots\dots$ [1]

- 14** In the diagram, $ABCD$ is a diameter of the circle centre P .
 $AB = BC = CD = 2x$ centimetres.

- (a) Find an expression, in terms of x and π , for the circumference of this circle.
- (b) The perimeter of the shaded region consists of two semicircles whose diameters are AB and CD , and two semicircles whose diameters are AC and BD .



Find an expression, in terms of x and π , for the area of the shaded region.

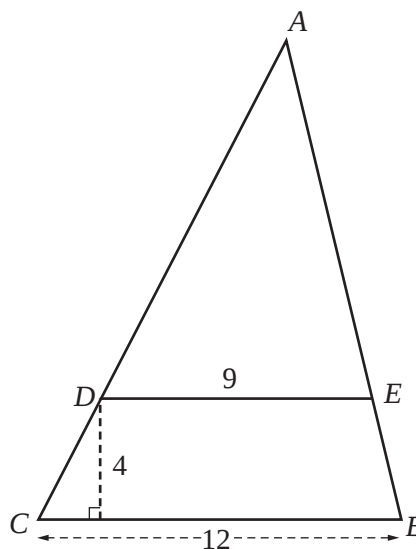
Answer (a)cm [1]

(b) cm² [2]

- 15** In the diagram, $BCDE$ is a trapezium, and the sides CD and BE are produced to meet at A .
 $CB = 12$ cm, $DE = 9$ cm and the perpendicular distance from D to CB is 4 cm.

Calculate

- (a) the area of $BCDE$,
- (b) the perpendicular distance from A to CB .



Answer (a) cm² [1]

(b)cm [2]

16 Given that $f(x) = \frac{5x-4}{3}$, find

(a) $f(1\frac{1}{5})$,

(b) $f^{-1}(x)$.

Answer (a)[1]

(b)[2]

17 In the diagram, the lines BA , DC and EF are parallel.

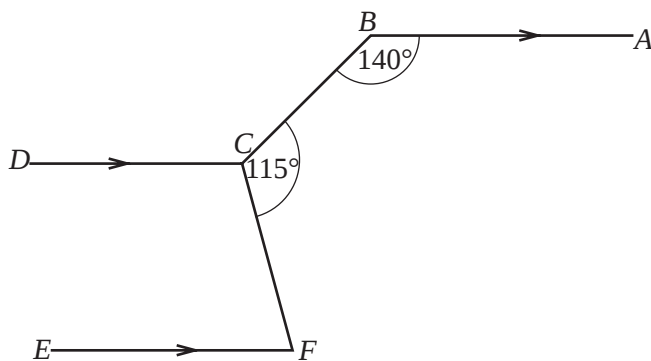
$\hat{A}BC = 140^\circ$ and $\hat{B}CF = 115^\circ$.

Find

(a) $\hat{D}CB$,

(b) $\hat{D}CF$,

(c) $\hat{E}FC$.



Answer (a) $\hat{D}CB =$ [1]

(b) $\hat{D}CF =$ [1]

(c) $\hat{E}FC =$ [1]

18 (a) Calculate 5% of \$280 000.

(b) A single carton of juice costs \$4.20.

A special offer pack of 3 cartons costs \$9.45.

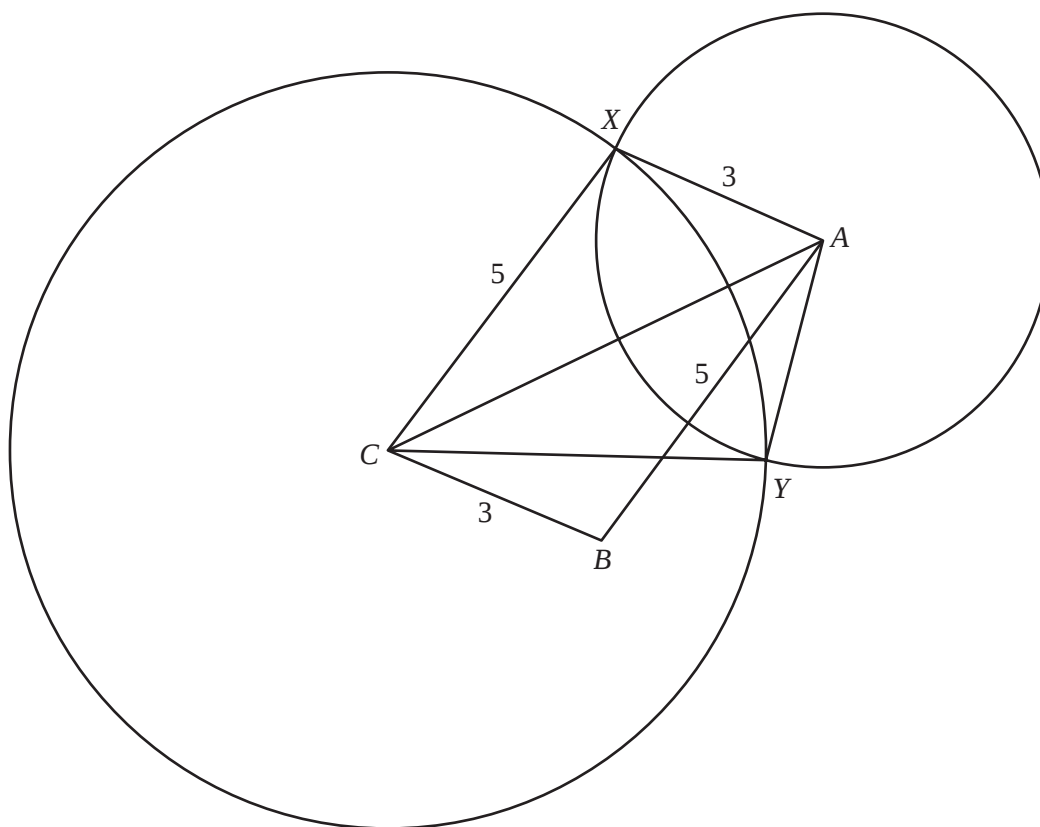
Ali bought a special offer pack instead of 3 single cartons.

Calculate his percentage saving.

Answer (a) \$[1]

(b) % [2]

19



The diagram shows a circle, centre C , of radius 5 cm, and a circle, centre A , of radius 3 cm. The circles intersect at X and Y .

B is a point such that $AB = 5$ cm and $BC = 3$ cm.

- (a) Show that triangles ABC and CYA are congruent.

Answer (a)

[2]

- (b) Show that the areas of the quadrilaterals $ABCX$ and $AYCX$ are equal.

Answer (b)

[1]

- (c) State the name of the special quadrilateral $AYCX$.

Answer (c) [1]

20 The plan of a field has a scale of 1 cm to 5 metres.

- (a) Express this scale in the form 1 : n .

Answer (a)[1]

- (b) The plan was made by measuring angles from two points, A and B , 50 m apart.
The line AB is drawn to scale in the answer space below.

- (i) A tree is at the point T in the field.
 $\hat{BAT} = 35^\circ$ and $\hat{ABT} = 70^\circ$.

Locate and label T on the plan.

- (ii) Given that A is due west of B , state the bearing of T from B .

- (iii) By making an appropriate measurement, find the actual distance, in metres, of the tree from B .

Answer (b)(i)



A

B

[1]

Answer (b)(ii) [1]

(iii) m [1]

21 Factorise

(a) $2x^2 - 7x - 15$,

(b) $2yt - 8ys - zt + 4zs$.

Answer (a)[2]

(b)[2]

22 (a) Solve

(i) $9 - k < 7$,

(ii) $\frac{5}{2t} = \frac{1}{12}$.

(b) Solve the simultaneous equations $x + y = 29$,
 $4x = 95 - 2y$.

Answer (a) (i)[1]

(ii) $t =$ [1]

(b) $x =$ $y =$ [3]

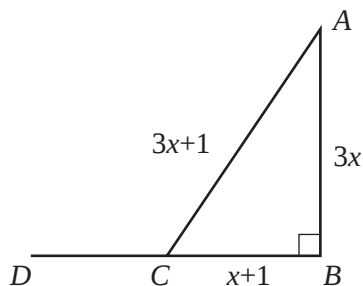
23 (a)

	sin	cos
30°	0.5	0.87
60°	0.87	0.5

Using as much information in the table as necessary, evaluate $2\sin 150^\circ$.

Answer (a).....[1]

(b)



In the triangle ABC , $\hat{ABC} = 90^\circ$, $AB = 3x$ cm, $BC = (x + 1)$ cm and $AC = (3x + 1)$ cm.

- (i) Form an equation in x and show that it reduces to $x^2 - 4x = 0$.

Answer (b)(i)

.....

[2]

- (ii) Find the value of x .

- (iii) Given that BCD is a straight line, state the numerical value of $\cos \hat{DCA}$.

Answer (b) (ii) $x =$ [1]

(iii)[1]

24 (a) Evaluate $\begin{pmatrix} 12 \\ 4 \\ 6 \end{pmatrix} - 3 \begin{pmatrix} 3 \\ -1 \\ 2 \end{pmatrix}$.

Answer (a)

$$\begin{pmatrix} \\ \\ \end{pmatrix}$$

[1]

- (b) A business makes toy buses and toy lorries.
The following table is used in calculating the cost of making each toy.

	Labour (hours)	Wood (blocks)	Paint (tins)
Bus	2	3	1
Lorry	1	w	2

Labour costs \$10 per hour, wood costs \$1 per block and paint costs \$ p per tin.

The information above can be summarised in the matrices **A** and **B**,

where $\mathbf{A} = \begin{pmatrix} 2 & 3 & 1 \\ 1 & w & 2 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 10 \\ 1 \\ p \end{pmatrix}$.

- (i) Given that $\mathbf{AB} = \begin{pmatrix} 28 \\ 24 \end{pmatrix}$, find

(a) p ,

(b) w .

- (ii) Evaluate $\begin{pmatrix} 100 & 200 \end{pmatrix} \begin{pmatrix} 28 \\ 24 \end{pmatrix}$.

- (iii) Explain what your answer to (ii) represents.

Answer (b)(i)(a) $p =$ [1]

(b) $w =$ [1]

(ii)[1]

(iii)[1]

- 25 The heights of 40 children were measured.
The results are summarised in the table below.

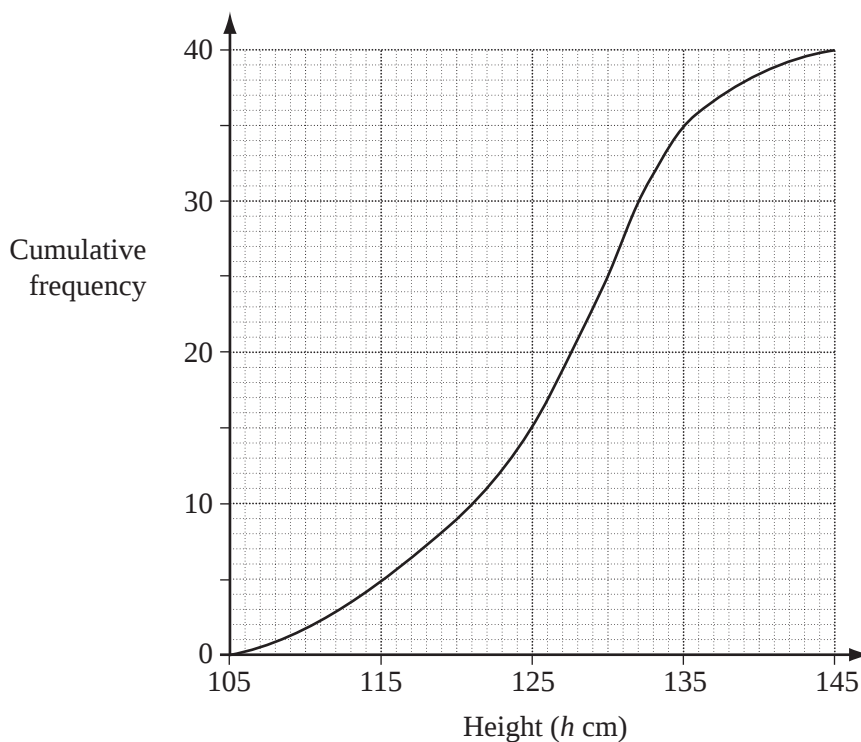
Height (h cm)	$105 < h \leq 115$	$115 < h \leq 125$	$125 < h \leq 135$	$135 < h \leq 145$
Frequency	5	10	20	5

- (a) (i) Identify the modal class.
(ii) Calculate an estimate of the mean height.

Answer (a)(i)[1]

(ii)cm [3]

- (b) The cumulative frequency curve representing this information is shown below.



Use the curve to find

- (i) the interquartile range,
(ii) the number of children whose heights are in the range 120 cm to 130 cm.

Answer (b)(i)cm [2]

(ii)[1]

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