

# AMERICAN ACADEMY LARNACA

## PLACEMENT EXAM

### Year 4

#### Sample 1

Time: 2 hours

**Materials required for examination**

Nil

**Items included with question papers**

Nil

**Calculators may be used in this examination.**

### **Information for Candidates**

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Full marks may be obtained for answers to ALL questions.

This paper has 24 questions.

### **Advice to Candidates**

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You must ensure that your answers to parts of questions are clearly labelled.

You must show sufficient working to make your methods clear to the examiner.

Answers without working may gain no credit.

### Question 1

(a) Write 240 as the product of its prime factors.

(a) ..... [2]

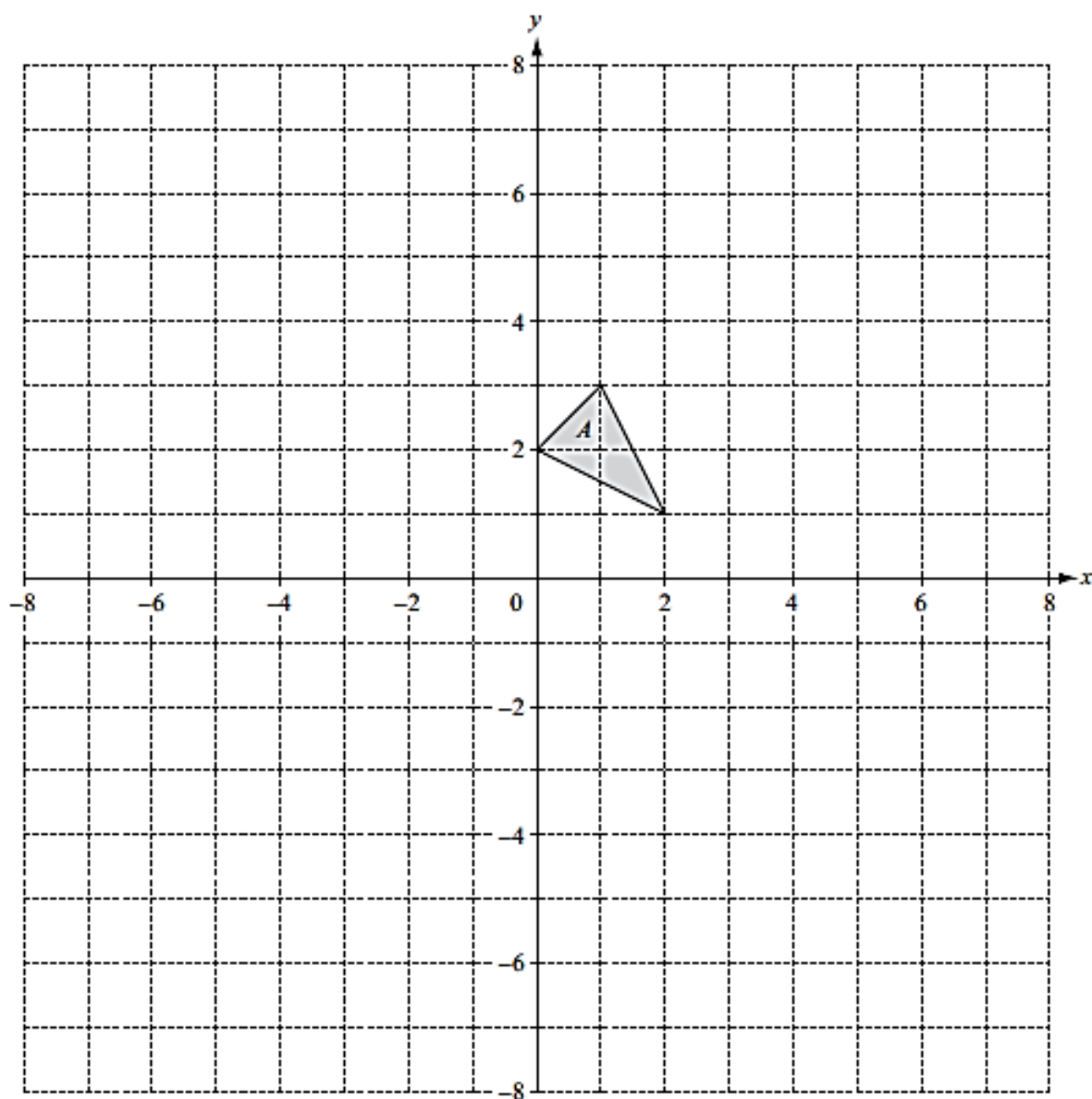
- (b) Buses to Acton leave a bus station every 24 minutes.  
Buses to Barton leave the same bus station every 20 minutes.

A bus to Acton and a bus to Barton both leave the bus station at 9 00am.

When will a bus to Acton and a bus to Barton next leave the bus station at the same time?

.....[2]

**Question 2:**



Draw the images of the following transformations on the grid above.

- (i) Translation of triangle *A* by the vector  $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$ . Label the image *B*. [2]
- (ii) Reflection of triangle *A* in the line  $x = 3$ . Label the image *C*. [2]
- (iii) Rotation of triangle *A* through  $90^\circ$  anticlockwise around the point  $(0, 0)$ . Label the image *D*. [2]

### Question 3:

Jason is playing a game.

He has two sets of cards.

One set has three red cards, numbered 1, 2 and 3.

The other set has four green cards, numbered 4, 5, 6 and 8.

Jason chooses a red card and a green card at random.

He works out the score by multiplying the numbers on the two cards together.

(a) Complete the table to show all the possible scores.

	3	.....	.....	.....	.....
Red card	2	.....	.....	.....	16
	1	4	.....	.....	.....
		4	5	6	8
		Green card			

[2]

(b) Work out the probability that Jason gets

(i) an odd score,

(b)(i) ..... [1]

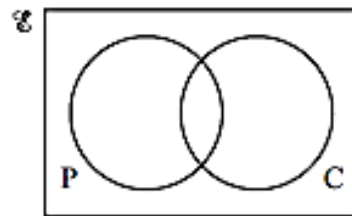
(ii) a score of 10 or less

(ii) ..... [1]

**Question 4:**

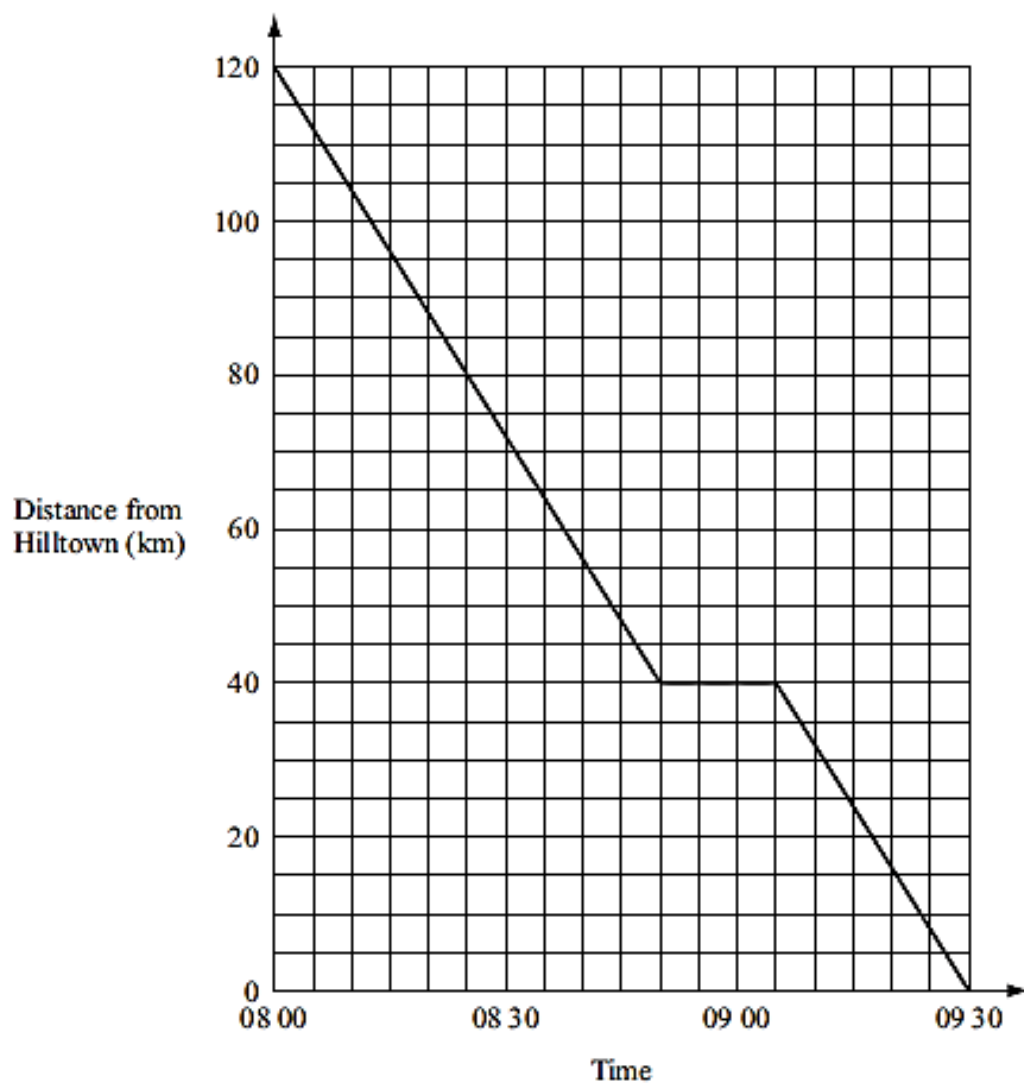
There are 30 students in a class.

20 study Physics, 15 study Chemistry and 3 study neither Physics nor Chemistry.



- (i) **Copy and complete** the Venn diagram to show this information. [2]
- (ii) Find the number of students who study both Physics **and** Chemistry. [1]
- (iii) A student is chosen at random. Find the probability that the student studies Physics but not Chemistry. [2]

**Question 5:**



The graph shows the distance, in kilometres, of a train from Hilltown.

Find the speed of the train in kilometres per hour at

(a) 08 30,

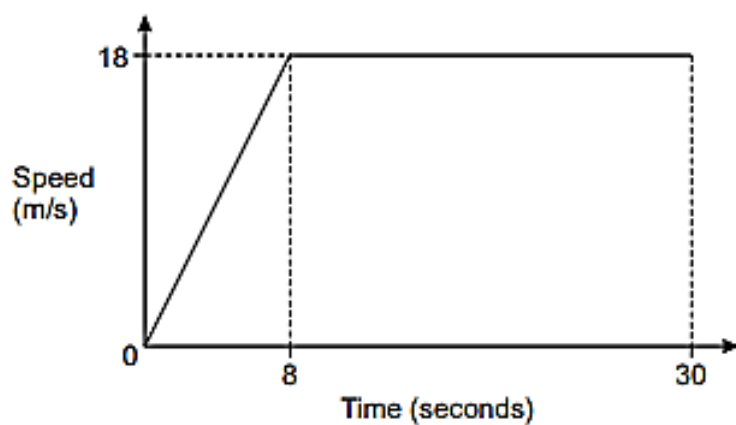
Answer(a) ..... km/h [2]

(b) 09 00.

Answer(b) ..... km/h [1]

**Question 6:**

(a) The graph shows the speed of a car during the first 30 seconds of its journey.



(i) State the acceleration of the car after 20 seconds.

(a)(i) .....  $\text{m/s}^2$  [1]

(ii) Find the total distance travelled by the car in the 30 seconds.

(ii) ..... m [2]

**Question 7:**

The force of attraction ( $F$ ) between two objects is inversely proportional to the square of the distance ( $d$ ) between them.

When  $d = 4$ ,  $F = 30$ .

- a) Find a formula for  $F$  in terms of  $d$ .

$$F = \dots\dots\dots$$

**(3)**

- b) Calculate  $d$  when  $F = 7.5$ .

$$d = \dots\dots\dots$$

**(2)**

**Question 8:**

- (a) Write 356 000 in standard form,

$$\dots\dots\dots$$

**(1)**

- (b) Work out the value of  $(2.5 \times 10^5) \div (5 \times 10^8)$   
Give your answer in standard form.

$$\dots\dots\dots$$

**(2)**



**Question 9:**

Hertford Juniors is a basketball team.

At the end of 10 games, their mean score is 35 points per game.

At the end of 11 games, their mean score has gone down to 33 points per game.

How many points did the team score in the 11th game?

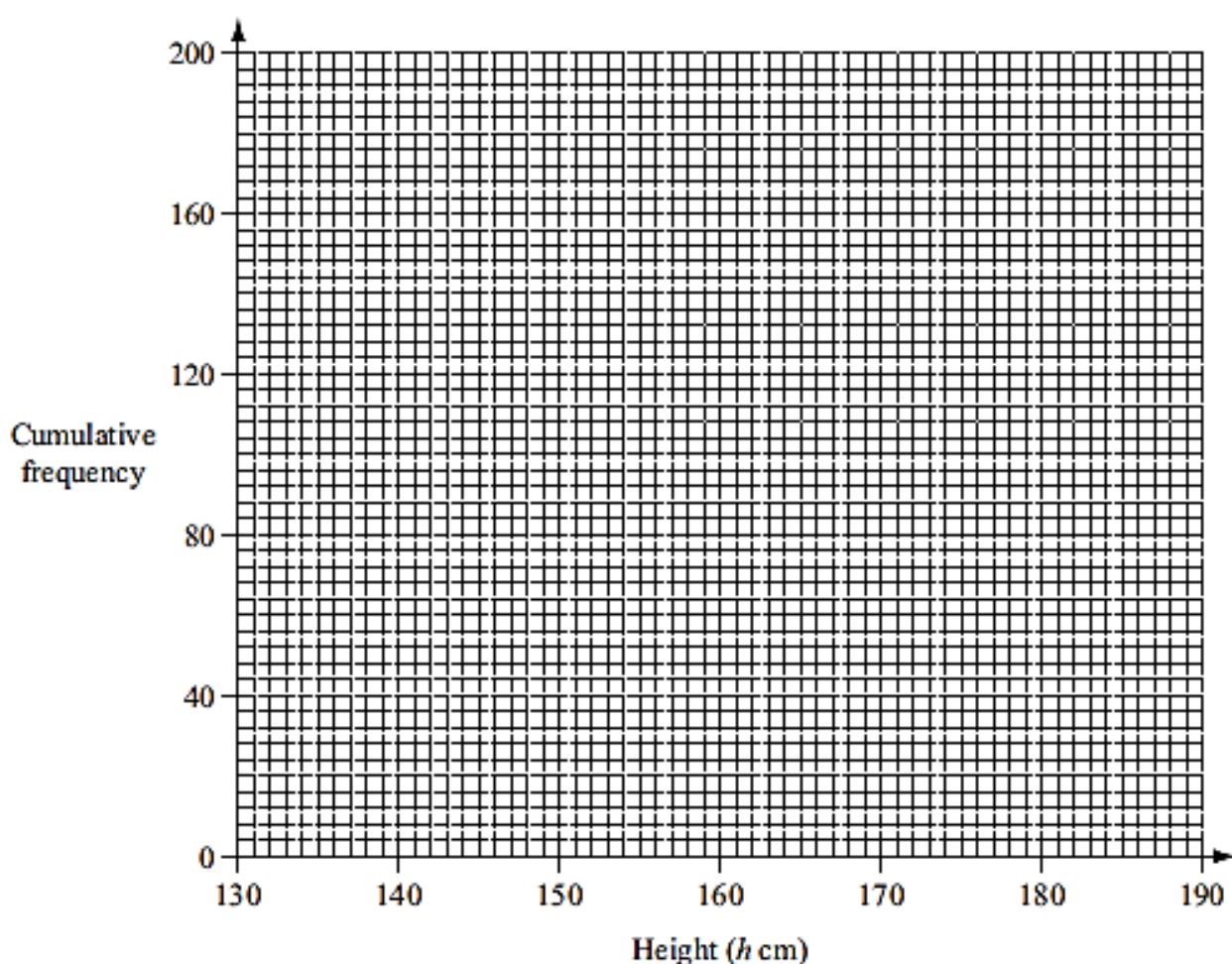
.....  
(3)

**Question 10:**

The cumulative frequency table shows the distribution of heights,  $h$  centimetres, of 200 students.

Height ( $h$ cm)	$\leq 130$	$\leq 140$	$\leq 150$	$\leq 160$	$\leq 165$	$\leq 170$	$\leq 180$	$\leq 190$
Cumulative frequency	0	10	50	95	115	145	180	200

- (a) Draw a cumulative frequency diagram to show the information in the table.



[4]

Use the graph to find:

(i) the median,

..... min [1]

(ii) the upper quartile,

..... min [1]

(iii) the inter-quartile range,

..... min [2]

(iv) the number of students whose height was more than 170 cm

..... [2]

b) The frequency table shown below shows the heights of the 200 students.

Height ( $h$ cm)	Frequency	
$130 < h \leq 140$	10	
$140 < h \leq 150$	40	
$150 < h \leq 160$	45	
$160 < h \leq 165$	20	
$165 < h \leq 170$	30	
$170 < h \leq 180$	35	
$180 < h \leq 190$	20	

Calculate an estimate of the mean.

.....minutes [3]

**Question 11:**

Eddie and Caroline are going to the school play.

Eddie buys 6 adult tickets and 2 child tickets. He pays £39.

Caroline buys 5 adult tickets and 3 child tickets. She pays £36.50.

Work out the cost of an adult ticket and the cost of a child ticket.

Adult ticket £ .....

Child ticket £ ..... |

**(4)**

**Question 12:**

**(a) (i) Factorise**  $9x^2 - 25$

**(i)** ..... **[1]**

**(ii) Simplify**  $\frac{3x^2 + 4x - 5}{9x^2 - 25}$

**(ii)** ..... **[2]**

b) List the integer solutions of

$$6 - x < 4 - 2x \leq 28 + 2x$$

.....**(3)**

**Question 13:**

- (a) (i) Each year the value of a car decreases by 15% of its value at the beginning of that year.  
Alberto buys a car for \$18 000.

Calculate the value of Alberto's car after 3 years.

\$ ..... [2]

- (ii) Belinda bought a car one year ago.  
The value of this car has decreased by 15% to \$14025.

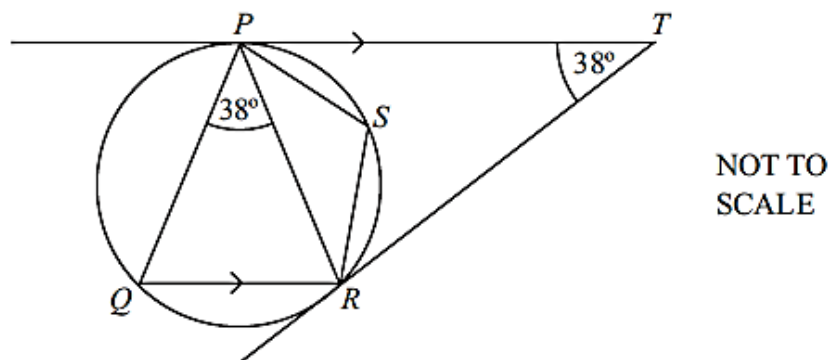
Calculate how much Belinda paid for the car.

\$ ..... [2]

- b) Nick invests €12 300 in the bank, at compound interest 4% p.a.  
After how many years will Chris have more than €17 000 in his account?  
Show all your working.

.....(2)

**Question 14:**



In the diagram  $PT$  and  $QR$  are parallel.  $TP$  and  $TR$  are tangents to the circle  $PQRS$ .  
Angle  $PTR = \text{angle } RPQ = 38^\circ$ .

- (a) What is the special name of triangle  $TPR$ . Give a reason for your answer.

Answer(a) name .....

reason ..... [1]

- (b) Calculate

- (i) angle  $PQR$ ,

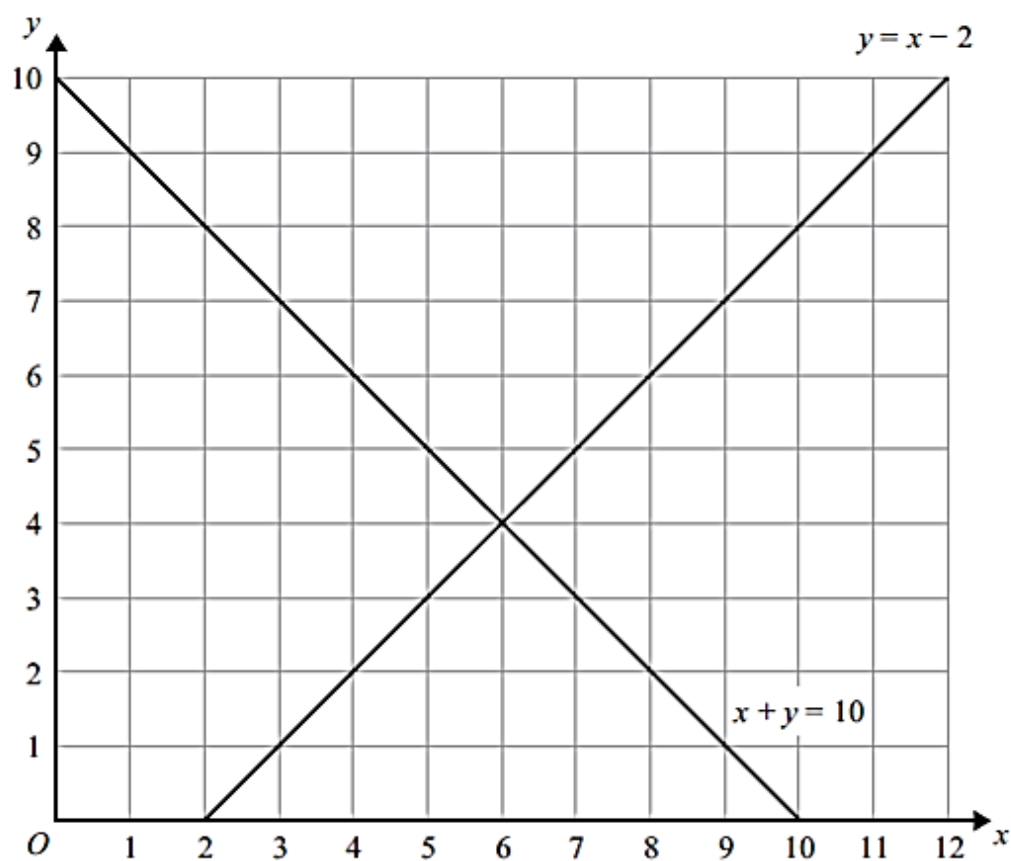
Answer(b)(i) Angle  $PQR = \dots\dots\dots$  [1]

- (ii) angle  $PSR$ .

Answer(b)(ii) Angle  $PSR = \dots\dots\dots$  [1]

**Question 15:**

The lines  $y = x - 2$  and  $x + y = 10$  are drawn on the grid.



On the grid, mark with a cross (×) each of the points with integer coordinates that are in the region defined by

$$y > x - 2$$

$$x + y < 10$$

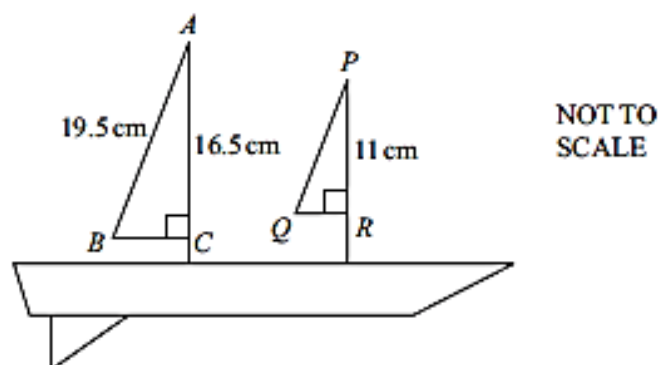
$$x > 3$$

(3)



**Question 16:**

(a)



The diagram shows a toy boat.

$AC = 16.5$  cm,  $AB = 19.5$  cm and  $PR = 11$  cm.

Triangles  $ABC$  and  $PQR$  are **similar**.

(i) Calculate  $PQ$ .

Answer(a)(i)  $PQ =$  ..... cm [2]

(ii) Calculate  $BC$ .

Answer(a)(ii)  $BC =$  ..... cm [3]

(iii) Calculate angle  $ABC$ .

Answer(a)(iii) Angle  $ABC =$  ..... [2]

**Question 17:**

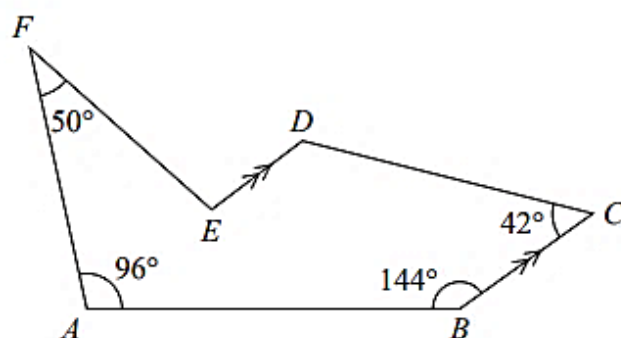


Diagram **NOT**  
accurately drawn

The diagram shows a hexagon  $ABCDEF$ .  
 $BC$  is parallel to  $ED$ .

Work out the size of the obtuse angle  $DEF$ .

.....  
(3)

**Question 18:**

The average fuel consumption ( $c$ ) of a car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where  $d$  is the distance travelled, in kilometres, and  $f$  is the fuel used, in litres.

$d = 160$  km, correct to the 3 significant figures

$f = 43.2$  litres, correct to 1 decimal place

Work out the minimum possible average consumption of a car.  
Show all your workings.

.....  
(3)

**Question 19:**

(a) Rearrange the formula to make ***d*** the subject of the formula.

$$c = \frac{d^3}{2} + 5 .$$

$$d = \dots\dots\dots(3)$$

(b) Rearrange the formula to make ***x*** the subject of the formula.

$$y = \frac{x(2y + b)}{3 - x}$$

$$x = \dots\dots\dots$$

**(3)**

**Question 20:**

(a) Evaluate the following WITHOUT using a calculator. Show ALL your workings.



(i)  $64^{\frac{1}{4}}$  .....

(ii)  $\left(\frac{16}{81}\right)^{\frac{3}{4}}$  .....

(iii)  $\left(-\frac{3}{5}\right)^{-2}$  .....

**(4)**

(b) Simplify fully

(i)  $24x^4y^2 \div 15x^{-3}y^3$  .....

(ii)  $(81a^6b^3)^{\frac{1}{2}}$  .....

**(3)**

c (i)  $\left(\frac{x^{27}}{27}\right)^{\frac{2}{3}},$

.....  
(2)

(ii)  $\left(\frac{x^{-2}}{4}\right)^{-\frac{1}{2}}.$

.....  
(2)

**Question 21:**

**(a)** Expand and simplify.

(i)  $(6 - 2x)(x + 7)$

..... **[2]**

(ii)  $(x + 3)(x - 5)^2$

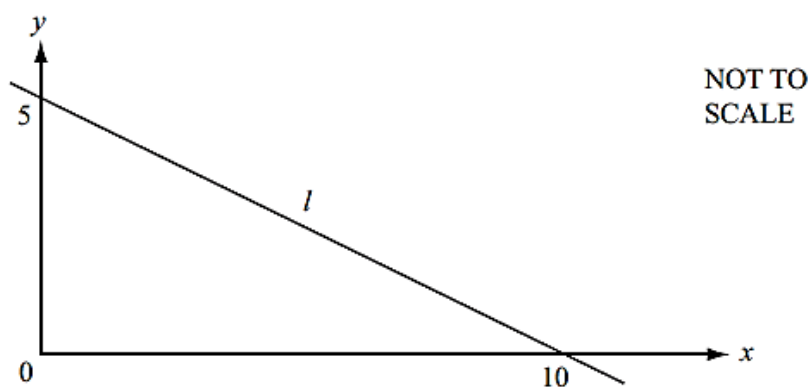
..... **[3]**

**(b)** Solve.

$$x^2 - 5x = 35 - 3x$$

**(b)** ..... **[2]**

**Question 22:**



- (a) Calculate the gradient of the line  $l$ .

Answer(a) ..... [2]

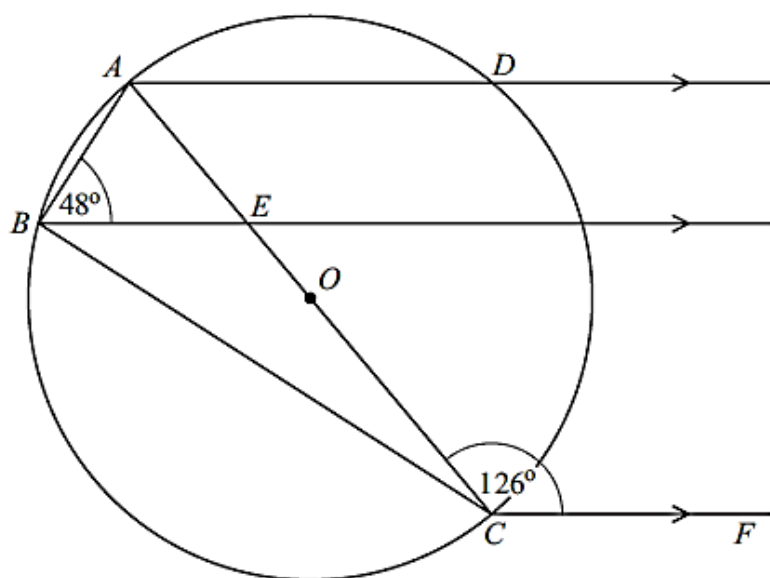
- (b) Write down the equation of the line  $l$ .

Answer(b) ..... [2]

- (c) Work out the equation of the line which is parallel to line  $l$ , and passes through the point (4, -3)

.....(3)

**Question 23:**



NOT TO  
SCALE

$A$ ,  $B$ ,  $C$  and  $D$  lie on a circle centre  $O$ .  $AC$  is a diameter of the circle.  
 $AD$ ,  $BE$  and  $CF$  are parallel lines. Angle  $ABE = 48^\circ$  and angle  $ACF = 126^\circ$ .  
 Find

(a) angle  $DAE$ ,

Answer(a) Angle  $DAE = \dots\dots\dots$  [1]

(b) angle  $EBC$ ,

Answer(b) Angle  $EBC = \dots\dots\dots$  [1]

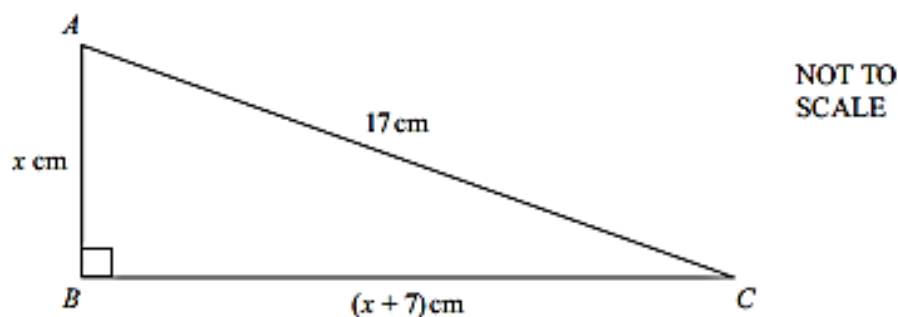
(c) angle  $BAE$ .

Answer(c) Angle  $BAE = \dots\dots\dots$  [1]



**Question 24:**

(a)



In the right-angled triangle  $ABC$ ,  $AB = x$  cm,  $BC = (x + 7)$  cm and  $AC = 17$  cm.

(i) Show that  $x^2 + 7x - 120 = 0$ .

*Answer(a)(i)*

[3]

(ii) Factorise  $x^2 + 7x - 120$ .

*Answer(a)(ii)* ..... [2]

(iii) Write down the solutions of  $x^2 + 7x - 120 = 0$ .

*Answer(a)(iii)*  $x =$  ..... or  $x =$  ..... [1]

(iv) Write down the length of  $BC$ .

*Answer(a)(iv)*  $BC =$  ..... cm [1]

**THE END!!**