

Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						1	3	8	0	/	3	H	Signature	

Paper Reference(s)

1380/3H

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 3 (Non-Calculator)

Higher Tier

Monday 7 June 2010 – Afternoon

Time: 1 hour 45 minutes



Examiner's use only

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Team Leader's use only

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Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.

Check that you have the correct question paper.

Answer ALL the questions. Write your answers in the spaces provided in this question paper.

You must NOT write on the formulae page.

Anything you write on the formulae page will gain NO credit.

If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 27 questions in this question paper. The total mark for this paper is 100.

There are 24 pages in this question paper. Any blank pages are indicated.

Calculators must not be used.

Advice to Candidates

Show all stages in any calculations.

Work steadily through the paper. Do not spend too long on one question.

If you cannot answer a question, leave it and attempt the next one.

Return at the end to those you have left out.

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Turn over

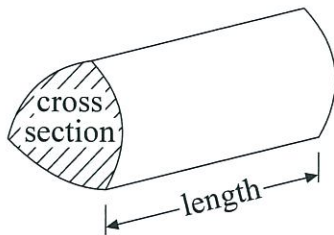
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GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

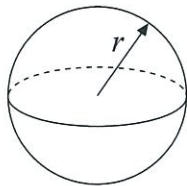
You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section \times length



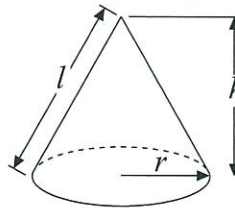
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

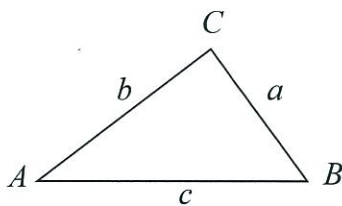


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$



Answer ALL TWENTY SEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1. Simplify

$$6x + 9y + 2x - 3y$$

$$\underline{8x + 6y}$$

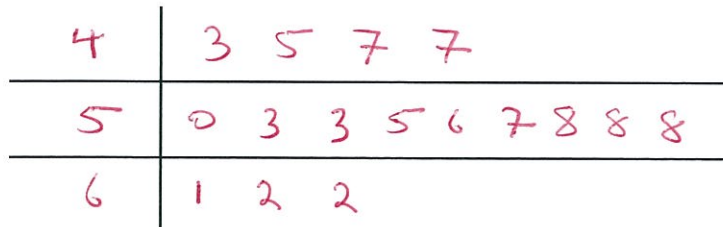
Q1

(Total 2 marks)

2. Here are the weights, in grams, of 16 eggs.

47	45	50	53	43	61	53	62
58	56	57	47	55	62	58	58

Draw an ordered stem and leaf diagram to show this information.
You must include a key.



Key: $4|3 = 43$

Q2

(Total 3 marks)



3.

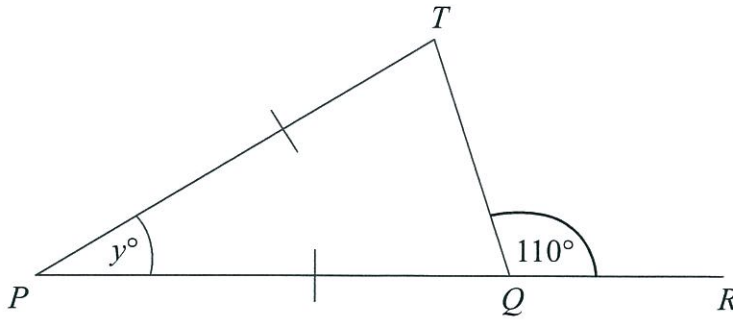


Diagram NOT accurately drawn

PQR is a straight line.
 $PT = PQ$.

(i) Work out the value of y .

$$\begin{aligned}
 y &= 180 - 2(180 - 110) \\
 &= 180 - 2(70) \\
 &= 180 - 140 \\
 &= 40^\circ
 \end{aligned}$$

40°

(ii) Give reasons for your answer.

Angles across a straight line add to 180° (i.e. are supplementary)
 Base angles of an isosceles triangle are equal
 Angles of a triangle add to 180°

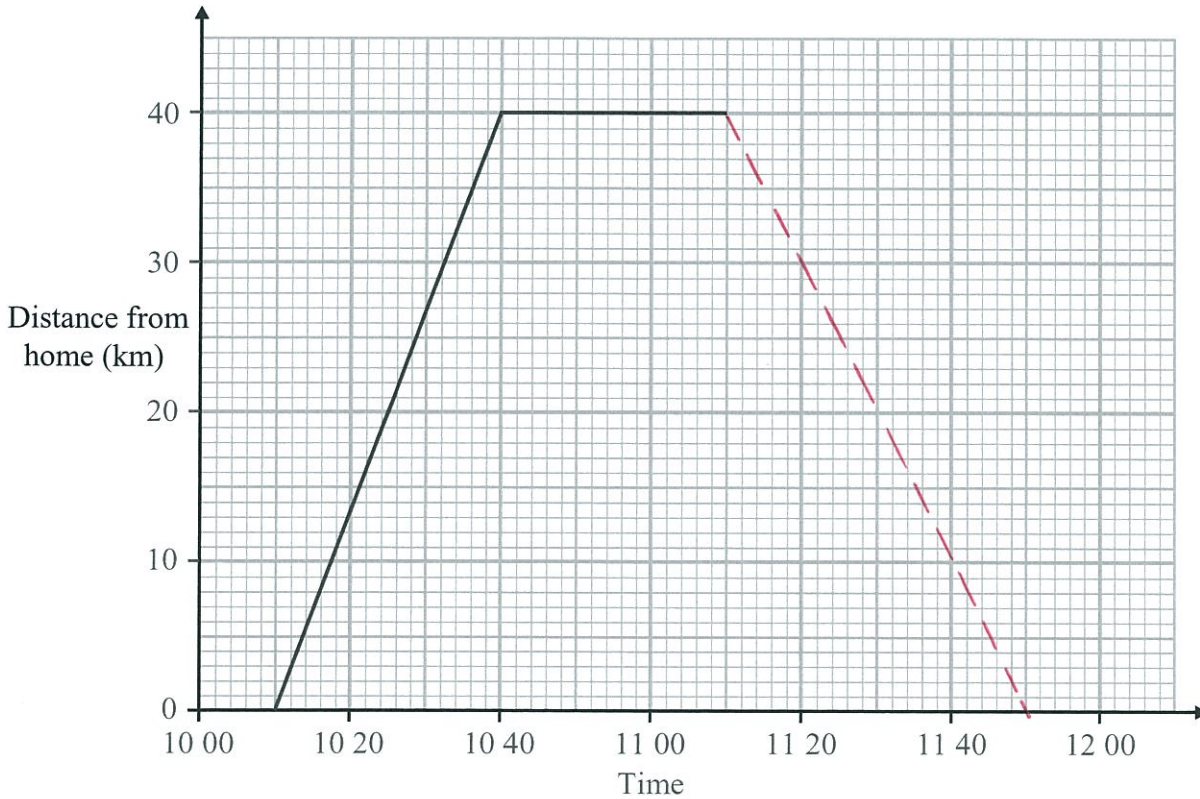
Q3

(Total 4 marks)



4. Nigel travelled from his home to his friend's house 40 km away. He stayed at his friend's house for 30 minutes. Nigel then travelled home.

Here is part of the distance-time graph for Nigel's journey.



- (a) At what time did Nigel leave home?

10:10

(1)

- (b) How far was Nigel from home at 10:20?

I think an estimate is called for!!

Badly constructed question. Technically, Nigel's distance from home is given by speed (km/min) \times time (mins) km
 $= \frac{40 \text{ km}}{30 \text{ mins}} \times 10 \text{ mins} = 13\frac{1}{3} \text{ km}$. However, from inspection of the graph, 13 km will serve as an estimate.

(1)

- (c) Complete the distance-time graph.

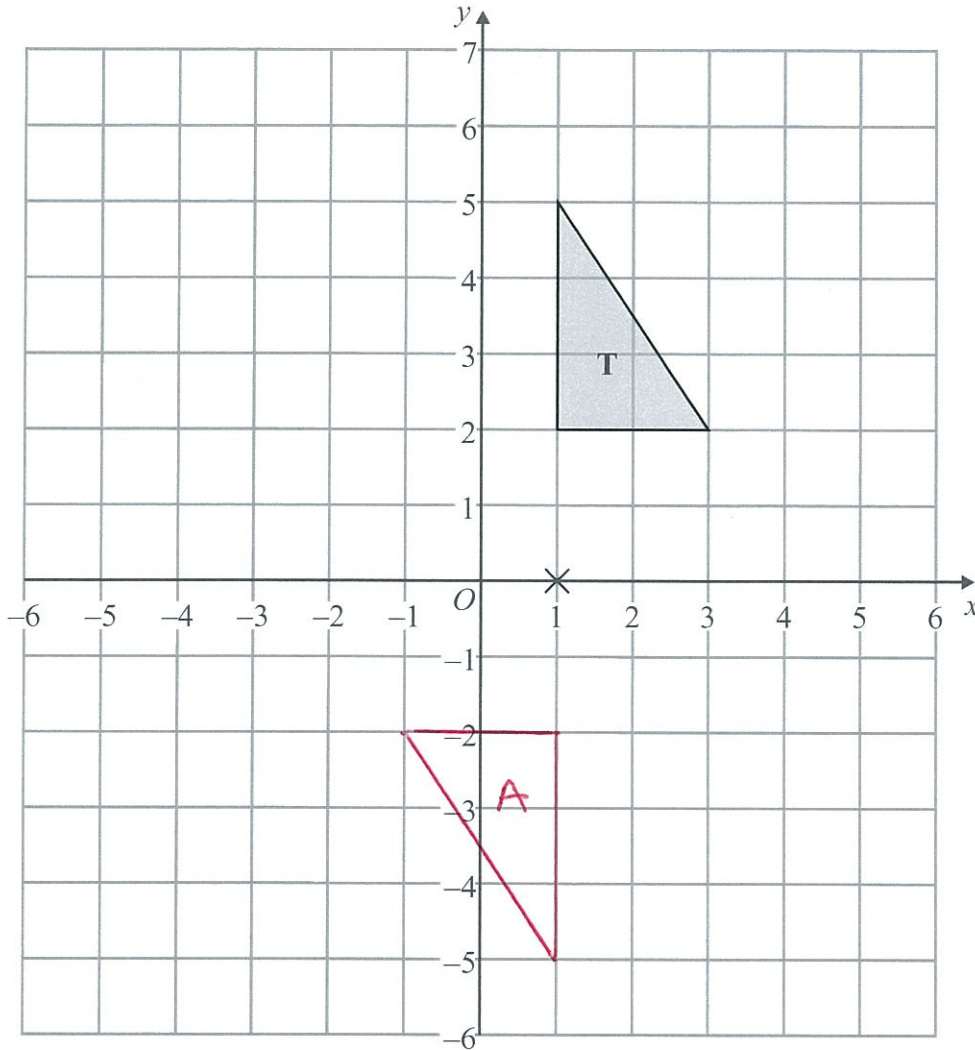
(1)

Q4

(Total 3 marks)



5.



Triangle **T** has been drawn on the grid.

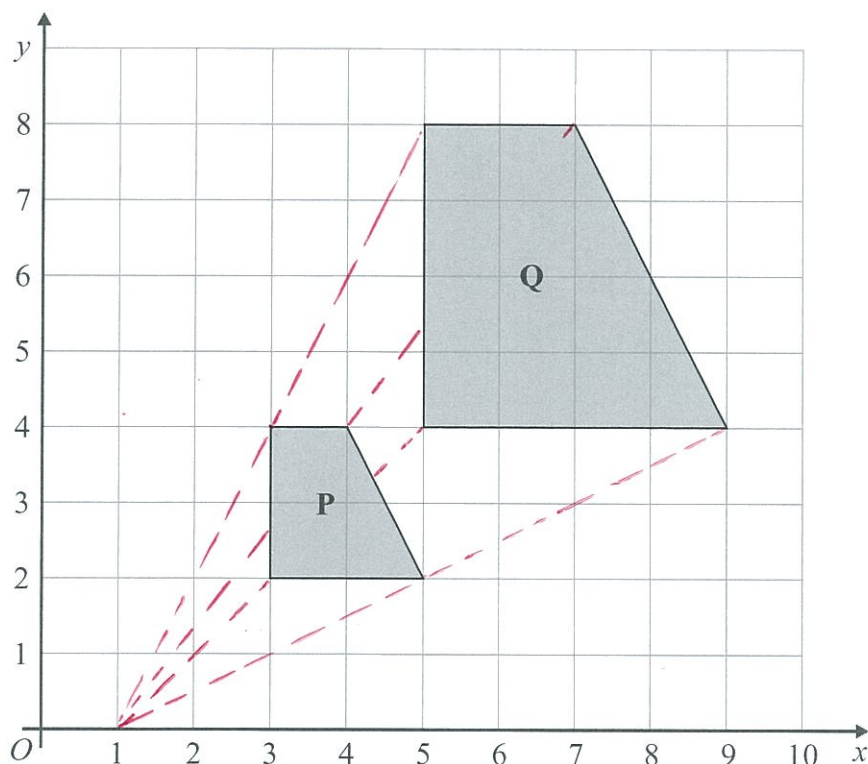
Rotate triangle **T** 180° about the point $(1, 0)$.
Label the new triangle **A**.

(Total 2 marks)

Q5



6.



Describe fully the single transformation which maps shape P onto shape Q.

An enlargement by scale factor 2 centred on (1, 0)

Q6

(Total 3 marks)

7. Anna and Bill share £40 in the ratio 2 : 3

Work out how much each person gets.

$$\frac{2}{2+3} \times 40 = \frac{2}{5} \times 40 = 8 \times 2 = \pounds 16$$

$$\frac{3}{2+3} \times 40 = \frac{3}{5} \times 40 = 8 \times 3 = \pounds 24$$

Alternatively, size of each of the 2+3 portions is given by

$$\frac{40}{2+3} = \frac{40}{5} = \pounds 8.$$

Anna gets 2 lots of £8 and
Bill gets 3 lots of £8.

Anna £ 16

Bill £ 24

Q7

(Total 3 marks)



8. Sasha carried out a survey of 60 students. She asked them how many CDs they each have.

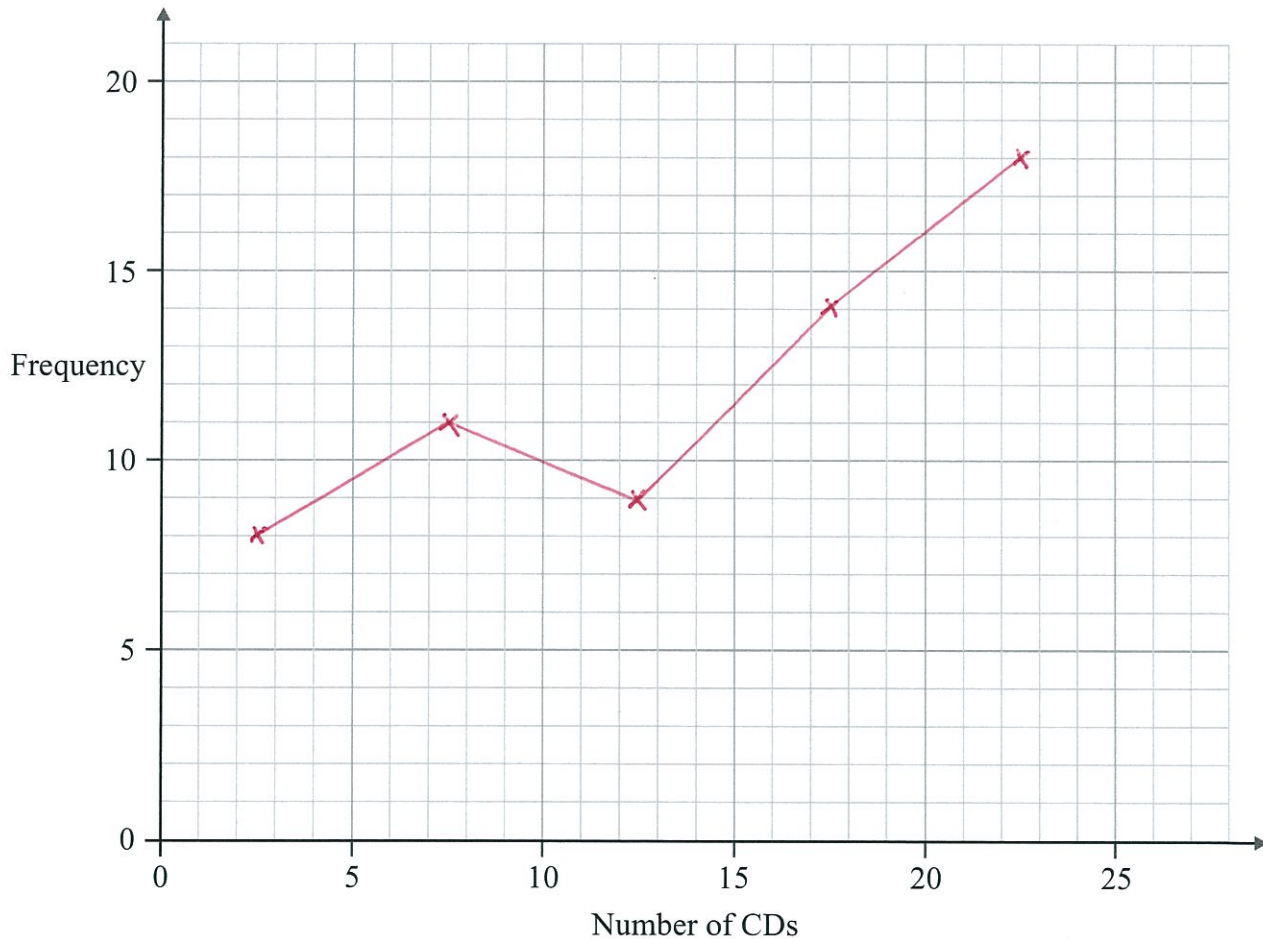
This table shows information about the numbers of CDs these students have.

Number of CDs	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24
Frequency	8	11	9	14	18

(a) Write down the class interval containing the median.

15 – 19
(1)

(b) On the grid, draw a frequency polygon to show the information given in the table.



(2)

(Total 3 marks)

Q8



9.

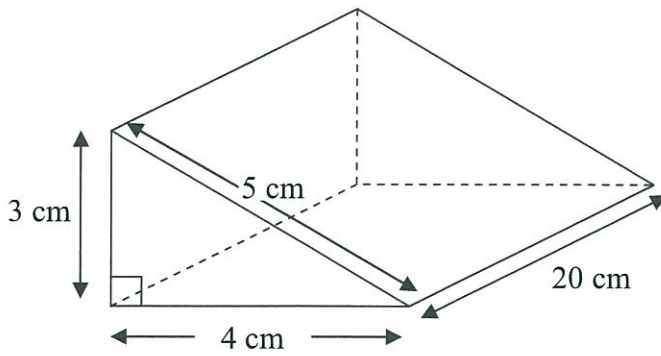


Diagram NOT accurately drawn

Work out the volume of the triangular prism.

$$\begin{aligned}
 \text{Volume of prism} &= \text{Cross-sectional surface area} \times \text{length} \\
 &= \frac{3(4)}{2} \times 20 \\
 &= 6 \times 20 = 120 \text{ cm}^3
 \end{aligned}$$

..... 120 cm³

(Total 2 marks)

Q9

10. Work out 4.52×36

$$\begin{array}{r}
 4.52 \\
 \times 36 \\
 \hline
 2712 \\
 + 13560 \\
 \hline
 162.72
 \end{array}$$

..... 162.72

(Total 3 marks)

Q10



11. There are 300 people in the cinema.

$\frac{1}{6}$ of the 300 people are boys.

$\frac{3}{10}$ of the 300 people are girls.

The rest of the people are adults.

Work out how many people are adults.

Fraction which represents adults is given by:

$$1 - \left(\frac{1}{6} + \frac{3}{10} \right)$$

$$= 1 - \frac{5 + 9}{30} = 1 - \frac{14}{30}$$

$$= \frac{16}{30} = \frac{8}{15}$$

$$\therefore \text{No. of adults} = \frac{8}{15} \times 300 = 20 \times 8 = 160.$$

ALTERNATIVELY:

$$\frac{1}{6} \times 300 = 50 \text{ — BOYS}$$

$$\frac{3}{10} \times 300 = 90 \text{ — GIRLS}$$

$$\Rightarrow \text{Adults} \rightarrow 300 - (90 + 50)$$

$$= 300 - 140 = 160$$

160

(Total 4 marks)

Q11

12.

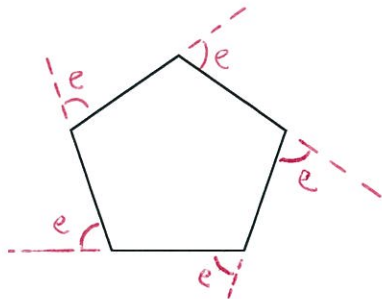


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

Exterior angle of any n -sided regular polygon is given by $\frac{360}{n}$.

\Rightarrow Exterior angle for a 5-sided regular polygon (i.e. a regular pentagon) is given by $\frac{360}{5} = 72^\circ$

72

(Total 2 marks)

Q12



13. Anil wants to find out how many DVDs people buy.

He uses this question on a questionnaire.

How many DVDs do you buy?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1 – 5	5 – 10	10 – 15	15 – 20

Write down **two** different things wrong with this question.

- 1 *His question is vague and lacks rigour as he has not specified a period of time.*
- 2 *He has overlapping class intervals and has not included options for extremes or outliers in answers such as 'None' or 'More than 20'.*

Q13

(Total 2 marks)



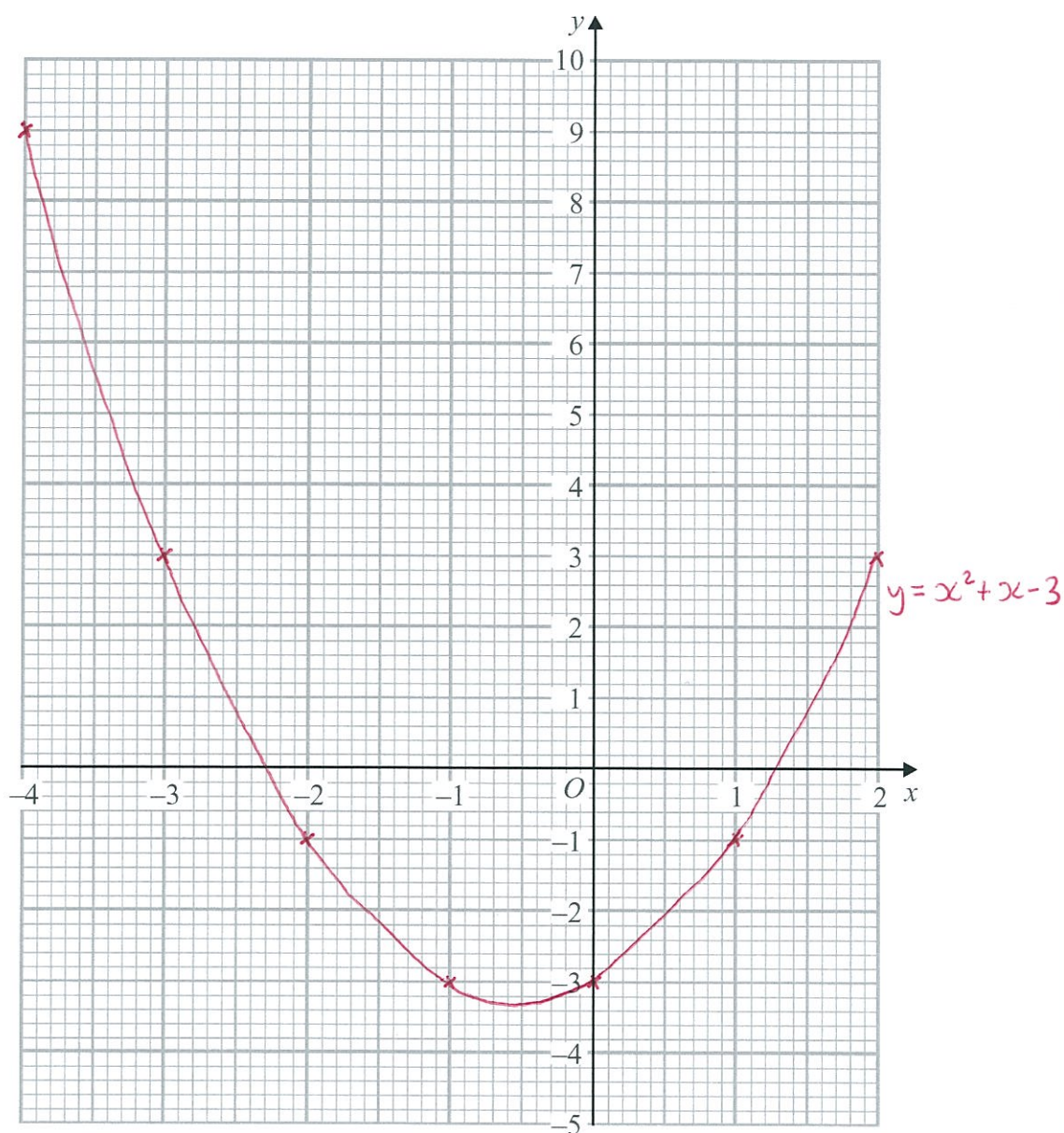
14. (a) Complete the table of values for $y = x^2 + x - 3$

x	-4	-3	-2	-1	0	1	2
y	9	3	-1	-3	-3	-1	3

(2)

(b) On the grid below, draw the graph of $y = x^2 + x - 3$ for values of x from -4 to 2

(2)



(c) Use your graph to find estimates for the solutions of $x^2 + x - 3 = 0$

$$x = 1.3$$

$$x = -2.3$$

(1)

Q14

(Total 5 marks)

15. Express 180 as a product of its prime factors.

$$\begin{aligned} 180 &= 2 \times 90 \\ &= 2 \times 2 \times 45 \\ &= 2 \times 2 \times 3 \times 15 \\ &= 2 \times 2 \times 3 \times 3 \times 5 \end{aligned}$$

$$2^2 \times 3^2 \times 5$$

(Total 3 marks)

Q15

16. Work out $3\frac{1}{4} \times 2\frac{2}{3}$

Give your answer in its simplest form.

Easiest to convert mixed numbers to improper fractions first.

$$3\frac{1}{4} = \frac{(3 \times 4) + 1}{4} = \frac{13}{4}$$

$$2\frac{2}{3} = \frac{(2 \times 3) + 2}{3} = \frac{8}{3}$$

$$\frac{13}{4} \times \frac{8}{3} = \frac{104}{12} = \frac{52}{6} = \frac{26}{3} = 8\frac{2}{3}$$

$$8\frac{2}{3}$$

(Total 3 marks)

Q16



17. (a) Factorise $3x + 12$

$$\frac{3(x+4)}{\dots\dots\dots} \quad (1)$$

(b) Solve $4(2x - 3) = 5x + 7$

$$8x - 12 = 5x + 7$$

$$3x - 12 = 7$$

$$\Rightarrow x = \frac{7+12}{3} = \frac{19}{3} = 6\frac{1}{3}$$

$$x = \frac{6\frac{1}{3}}{\dots\dots\dots} \quad (3)$$

(c) Expand and simplify $(y + 4)(y + 5)$

$$y^2 + 5y + 4y + 20 = y^2 + 9y + 20$$

$$\frac{y^2 + 9y + 20}{\dots\dots\dots} \quad (2)$$

(d) Factorise fully $8x^2 + 12xy$

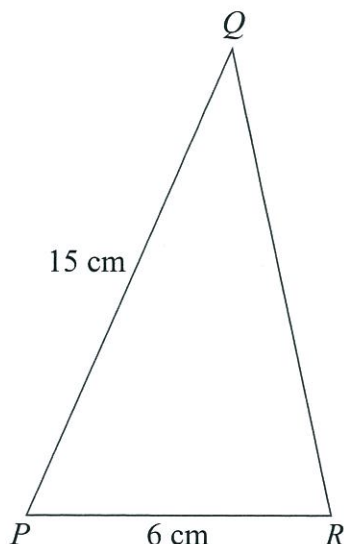
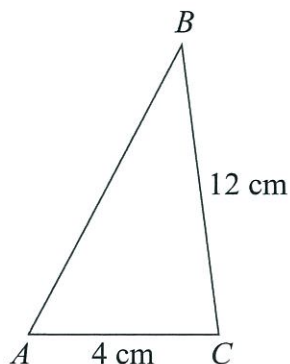
$$\frac{4x(2x + 3y)}{\dots\dots\dots} \quad (2)$$

(Total 8 marks)

Q17



18.



Diagrams NOT accurately drawn

Triangles ABC and PQR are mathematically similar.

Angle $A =$ angle P .

Angle $B =$ angle Q .

Angle $C =$ angle R .

$AC = 4$ cm.

$BC = 12$ cm.

$PR = 6$ cm.

$PQ = 15$ cm.

(a) Work out the length of QR .

$$\frac{QR}{12} = \frac{6}{4} = \frac{3}{2}$$

$$\Rightarrow QR = \frac{3}{2} \times 12 = 6 \times 3 = 18 \text{ cm}$$

18cm
(2)

(b) Work out the length of AB .

$$\frac{15}{AB} = \frac{3}{2}$$

$$\begin{aligned} \Rightarrow AB &= \frac{15}{(3/2)} = 15 \times \frac{2}{3} \\ &= 5 \times 2 = 10 \text{ cm} \end{aligned}$$

10cm
(2)

Q18

(Total 4 marks)



19. Arwen buys a car for £4000
The value of the car depreciates by 10% each year.

Work out the value of the car after two years.

$$4000 \times 0.9^2 = 4000 \times 0.81 = 4 \times 0.81 \times 1000$$

$$= 3.24 \times 1000$$

$$= \underline{\underline{£3,240.00}}$$

ALTERNATIVELY

$$4,000 - (10\% \text{ of } 4,000) = 4,000 - 400 = \underline{£3,600} \text{ — YR 1}$$

$$3,600 - (10\% \text{ of } 3,600) = 3,600 - 360 = \underline{\underline{£3,240}} \text{ — YR 2}$$

£ 3,240

Q19

(Total 3 marks)

20. (a) Here are some expressions.

a^3b	$a^2(c+b)$	$4abc$	$ab+c^3$	$4\pi c^2$
	✓	✓		

The letters a , b , and c represent lengths.
 π and 4 are numbers that have no dimension.

Two of the expressions could represent volumes.
Tick the boxes (✓) underneath these two expressions.

(2)

The volume of this cube is 8 m^3 .

(b) Change 8 m^3 into cm^3 .

$$1 \text{ m}^3 = 100^3 \text{ cm}^3 = 1,000,000 \text{ cm}^3$$

$$\Rightarrow 8 \text{ m}^3 = 8 \times 10^6 = 8,000,000 \text{ cm}^3$$

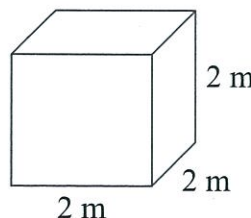


Diagram NOT accurately drawn

$$200 \text{ cm} \times 200 \text{ cm} \times 200 \text{ cm}$$

$$= 2^3 \times 10^6 \text{ cm}^3$$

$$= 8 \times 10^6 \text{ cm}^3$$

8,000,000 cm^3
(2)

Q20

(Total 4 marks)



21. Solve the simultaneous equations

$$3x + 2y = 8$$

$$2x + 5y = -2$$

—————> Equation ①

—————> Equation ②

From ①, $x = \frac{8 - 2y}{3}$

In ②: $2\left(\frac{8 - 2y}{3}\right) + 5y = -2$

$$\frac{16 - 4y}{3} + 5y = -2$$

$$\frac{16}{3} - \frac{4y}{3} + 5y = -2$$

$$\frac{11y}{3} = -\frac{22}{3}$$

$$\Rightarrow 11y = -22$$

$$\therefore y = \frac{-22}{11} = -2$$

$$x = \frac{4}{\dots\dots\dots}$$

$$y = \frac{-2}{\dots\dots\dots}$$

In ①: $3x + 2(-2) = 8$

(Total 4 marks)

Q21

$$\Rightarrow x = \frac{8 + 4}{3} = \frac{12}{3} = 4$$

ALTERNATIVELY, USE GAUSSIAN ELIMINATION.

2 x EQUATION 1: $6x + 4y = 16 \dots\dots$ ③

3 x EQUATION 2: $6x + 15y = -6 \dots\dots$ ④

} coefficients of x now same.

③ - ④: $-11y = 22$

$$\Rightarrow y = \frac{22}{-11} = -2, \text{ which we can substitute}$$

back into any equation we want to derive $x = 4$ as before.



22. The table gives some information about the delays, in minutes, of 80 flights.

Delay (n minutes)	Frequency
$0 < n \leq 20$	16
$20 < n \leq 30$	26
$30 < n \leq 40$	23
$40 < n \leq 50$	10
$50 < n \leq 60$	5

(a) Write down the modal class interval.

$20 < n \leq 30$
(1)

(b) Complete the cumulative frequency table.

Delay (n minutes)	Cumulative Frequency
$0 < n \leq 20$	16
$0 < n \leq 30$	42
$0 < n \leq 40$	65
$0 < n \leq 50$	75
$0 < n \leq 60$	80

(1)

(c) On the grid opposite, draw a cumulative frequency graph for your table.

(2)

(d) Use your graph to find an estimate for

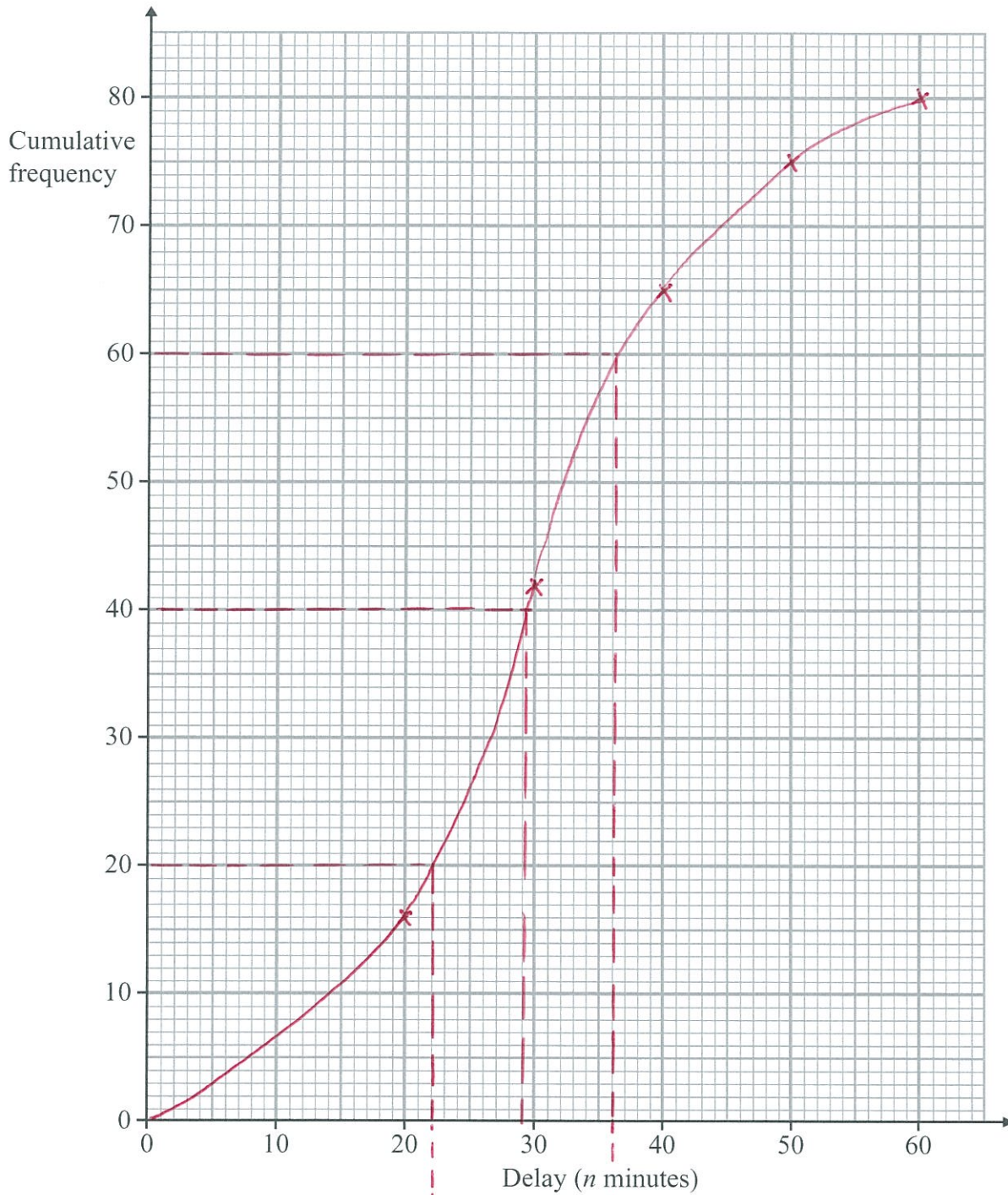
(i) the median delay,

.....29..... minutes

(ii) the interquartile range of the delays.

$36 - 22 = 14$ mins14..... minutes
(3)





Interquartile
range = 36 - 22 = 14 mins.

(Total 7 marks)

Q22



23. A straight line passes through (0, -2) and (3, 10).

Find the equation of the straight line.

$y = mx + c$ → y-intercept.
 ↓
 gradient

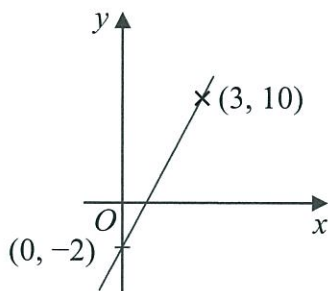


Diagram NOT accurately drawn

Gradient, $m = \frac{\Delta y}{\Delta x}$ or $\frac{\text{change in } y}{\text{change in } x}$ or $\frac{y_2 - y_1}{x_2 - x_1}$

$\Rightarrow m = \frac{10 - (-2)}{3 - 0} = \frac{12}{3} = 4.$

So $y = 4x + c$ passing through (0, -2)

Determine value for c by substituting $(x, y) = (0, -2)$

into $y = 4x + c$.

$y = 4x - 2$

$\Rightarrow -2 = 4(0) + c \therefore c = -2$

(this y-intercept is instantly

(Total 3 marks)

identifiable from inspection of graph in any case)

Q23

24. Find the value of

(i) 6^0

General rule: $a^0 = 1, a \neq 0.$

So $6^0 = 1$

1

(ii) $64^{\frac{1}{2}}$

$a^{\frac{1}{n}}$ means $\sqrt[n]{a}$ or n^{th} root of $a.$

So $64^{\frac{1}{2}} = \sqrt{64} = 8$

8

(iii) $\left(\frac{27}{8}\right)^{-\frac{2}{3}}$

$\left(\frac{a}{b}\right)^{-\frac{c}{d}} = \frac{1}{\left(\frac{a}{b}\right)^{c/d}} = \frac{1}{\left(\frac{a^{c/d}}{b^{c/d}}\right)} = \frac{1}{\frac{a^{c/d}}{b^{c/d}}}$

So $\left(\frac{27}{8}\right)^{-\frac{2}{3}} = \frac{1}{\left[\frac{(\sqrt[3]{27})^2}{(\sqrt[3]{8})^2}\right]} = \frac{1}{\left(\frac{3^2}{2^2}\right)} = \frac{4}{9}$

$\frac{4}{9}$

Q24

(Total 4 marks)



25.

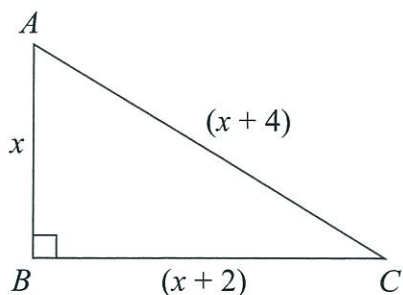


Diagram NOT accurately drawn

ABC is a right-angled triangle.
All the measurements are in centimetres.

$AB = x$
 $BC = (x + 2)$
 $AC = (x + 4)$

(a) Show that $x^2 - 4x - 12 = 0$

$x^2 + (x + 2)^2 = (x + 4)^2$ — Pythagoras' theorem.
 $x^2 + x^2 + 4x + 4 = x^2 + 8x + 16$
 $\Rightarrow x^2 - 4x - 12 = 0$

(3)

(b) (i) Solve $x^2 - 4x - 12 = 0$

N.B: $x^2 - 4x - 12 \equiv (x + 2)(x - 6)$

In general, to factorise $ax^2 + bx + c$ where $a = 1$, find factors, α and β , such that $\alpha\beta = c$ and $\alpha + \beta = b$ and rewrite as $(x + \alpha)(x + \beta)$. For $x^2 - 4x - 12$, 2 and -6 are the integer factors of -12 which add to -4 and so $x^2 - 4x - 12 \equiv (x + 2)(x - 6)$

$\Rightarrow (x + 2)(x - 6) = 0$ and so $x = -2$ or 6

(ii) Hence, write down the length of AC .

For geometric dimensions, x must be +ve. $AC = \dots 10 \dots$ cm

$\therefore x = 6. \Rightarrow AC = x + 4 = 6 + 4 = 10$ cm

(4)

Q25

(Total 7 marks)



26. There are 3 orange sweets, 2 red sweets and 5 yellow sweets in a bag.

Sarah takes a sweet at random.

She eats the sweet.

She then takes another sweet at random.

Work out the probability that both the sweets are the same colour.

$$\begin{aligned}
 P(\text{same colour}) &= P(\text{OO OR RR OR YY}) \\
 &= P(\text{OO}) + P(\text{RR}) + P(\text{YY}) \\
 &= \frac{3}{10} \left(\frac{2}{9} \right) + \frac{2}{10} \left(\frac{1}{9} \right) + \frac{5}{10} \left(\frac{4}{9} \right) \\
 &= \frac{1}{90} (6 + 2 + 20) \\
 &= \frac{28}{90} = \frac{14}{45}
 \end{aligned}$$

$$\frac{14}{45}$$

Q26

(Total 4 marks)



27.

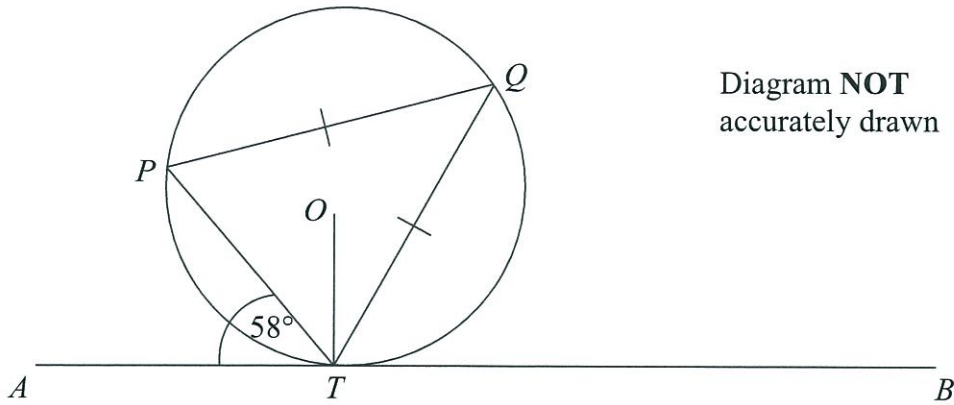


Diagram NOT accurately drawn

P, Q and T are points on the circumference of a circle, centre O .
The line ATB is the tangent at T to the circle.

$PQ = TQ$.
Angle $ATP = 58^\circ$.

Calculate the size of angle OTQ .
Give a reason for each stage in your working.

Angle $OT\hat{P} = 90 - 58 = 32^\circ$ (A radius and tangent of a circle form a right-angle through the point of contact).

Angle $PO\hat{T} = 180 - 2(32) = 116^\circ$ (Triangle POT is an isosceles triangle, albeit a bit of a sneaky one!)

* Angle $P\hat{Q}T = \frac{1}{2}(116) = 58^\circ$ (Double angle theorem.... Actually, come to think of it, the above 2 steps are wasteful as you could note straight away that $AT\hat{P} = P\hat{Q}T$ due to 'angles in opposite segment being equal').

$Q\hat{T}P = \frac{180 - 58}{2} = \frac{122}{2} = 61^\circ$ (PQT is an isosceles triangle) 29°

Q27

(Total 5 marks)

\therefore Angle $OTQ = 58 + 61 - 90 = 29^\circ$ TOTAL FOR PAPER: 100 MARKS

(a radius and tangent form a right-angle through the point of contact). **END**

N.B: The last 3 steps from * will suffice. The first 2 steps are superfluous.



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