Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number | Candidate Number

Mathematics A

Paper 3HR

Higher Tier

Monday 8 January 2018 – Morning
Time: 2 hours

Paper Reference
4MA0/3HR

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ▶

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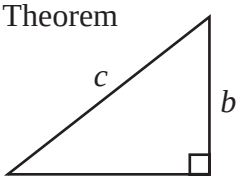
Pearson

International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER

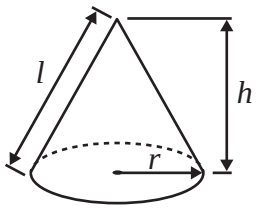
Pythagoras' Theorem



$a^2 + b^2 = c^2$

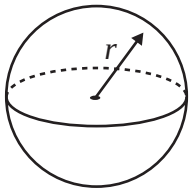
Volume of cone = $\frac{1}{3}\pi r^2 h$

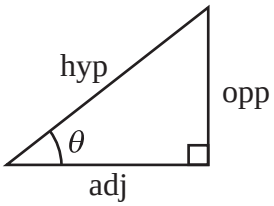
Curved surface area of cone = πrl



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

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





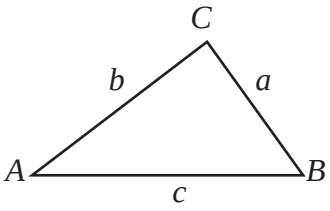
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

or $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

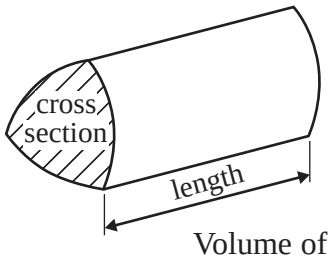
In any triangle ABC



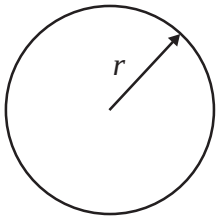
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



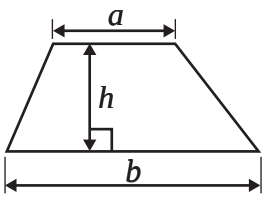
Volume of prism = area of cross section × length

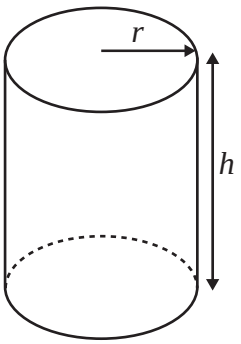


Circumference of circle = $2\pi r$

Area of circle = πr^2

Area of a trapezium = $\frac{1}{2}(a + b)h$





Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Expand and simplify

$$5(x + y) - 3x + 3y$$

.....

(2)

(b) Simplify $t^3 \times t^7$

.....

(1)

(c) Simplify $(m^4)^3$

.....

(1)

(Total for Question 1 is 4 marks)

2 *ABCD* is a parallelogram.

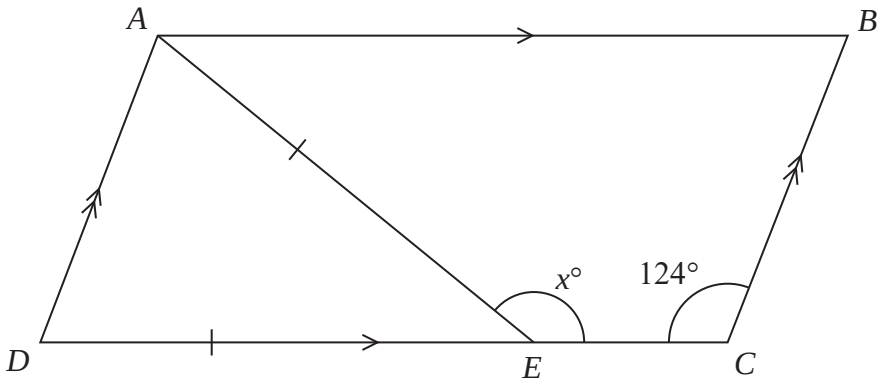


Diagram **NOT** accurately drawn

Angle *DCB* = 124°
E is the point on *DC* such that *AE* = *DE*.
Angle *AEC* = *x*°

Work out the value of *x*.

.....

(Total for Question 2 is 4 marks)

3 Faisal lives in the USA.
He wants to buy one cotton sheet.

In the USA one sheet costs 79 US dollars.

Faisal knows that the same type of sheet costs 210 Egyptian pounds when bought in Egypt.

He also knows these exchange rates.

1 euro = 1.10 US dollars
1 euro = 9.72 Egyptian pounds

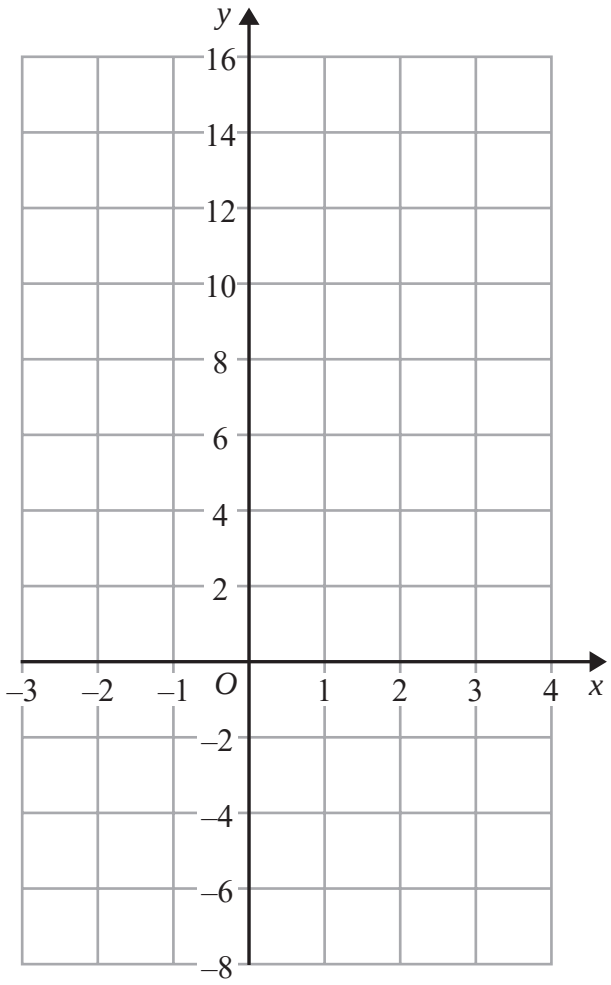
How much cheaper is the cost of one sheet when bought in Egypt than when bought in the USA?

Give your answer in US dollars correct to the nearest dollar.

.....US dollars

(Total for Question 3 is 4 marks)

4 (a) On the grid, draw the graph of $y = 4x + 2$ for values of x from −2 to 3



(3)

The point with coordinates $(p, 50)$ lies on the line with equation $y = 4x + 2$

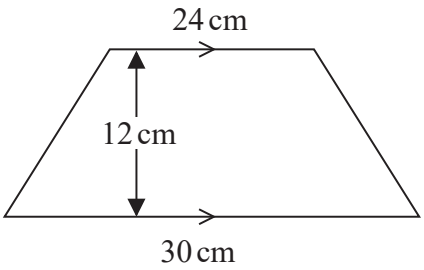
(b) Work out the value of p.

$p =$ .....

(2)

(Total for Question 4 is 5 marks)

5 Here is a trapezium and a square.



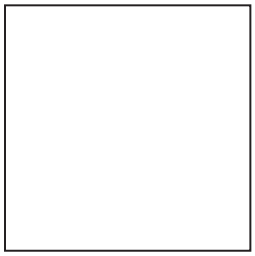


Diagram **NOT** accurately drawn

The lengths of the parallel sides of the trapezium are 24 cm and 30 cm.
The height of the trapezium is 12 cm.

The area of the square is equal to the area of the trapezium.

Work out the perimeter of the square.

.....cm

(Total for Question 5 is 4 marks)

6 Here is a field in the shape of a circle.

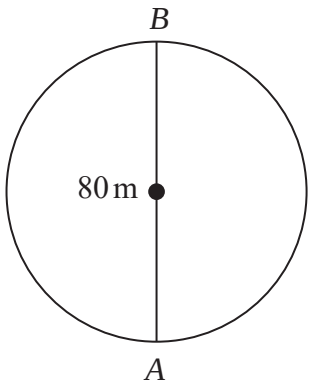


Diagram **NOT** accurately drawn

The field is crossed by a path *AB* where *AB* is a diameter of the circle.
AB = 80 metres.

Anil runs once around the circumference of the circle.
Sachin runs along the path from *A* to *B* and then runs back along the path to *A*.

Anil runs further than Sachin.

How much further?
Give your answer in metres, correct to 1 decimal place.

.....m

(Total for Question 6 is 3 marks)

7 Ahmed bought one box of lemons.
The box of lemons cost \$4
There were 24 lemons in the box.

Ahmed sold $\frac{3}{4}$ of all the lemons he bought for 30 cents each.

He then sold the rest of the lemons for 20 cents each.

Calculate the percentage profit that Ahmed made.

Use \$1 = 100 cents.

.....%

(Total for Question 7 is 4 marks)

8 The scale of a map is 1:50 000

The length of a road on the map is 30 cm.

Work out the length of the real road.
Give your answer in km.

.....km

(Total for Question 8 is 3 marks)

9 There are 320 students at a school.

$\frac{5}{8}$ of these students are girls.

$\frac{3}{4}$ of the girls have blue eyes.

$\frac{2}{3}$ of the boys have blue eyes.

What fraction of the students at the school have blue eyes?

.....

(Total for Question 9 is 4 marks)

10 $\mathscr{E} = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$

$A = \{2, 4, 6, 8, 10, 12\}$
$B = \{3, 6, 9, 12\}$

(a) List the members of the set $A \cup B$

.....

(1)

C is a set with 4 members.

$A \cap C = \varnothing$ and $B \cap C = \varnothing$

(b) List the members of set C

.....

(2)

(Total for Question 10 is 3 marks)

11 Here is a right-angled triangle *ABC*.

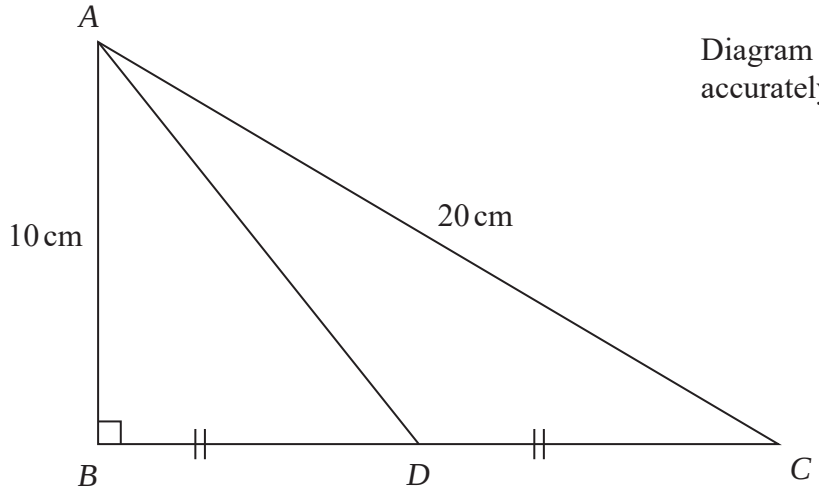


Diagram **NOT** accurately drawn

Angle *ABC* = 90°
AC = 20 cm
AB = 10 cm

D is the midpoint of *BC*.

Work out the length of *AD*.
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 11 is 4 marks)

12 Here is a triangle *ABC*.

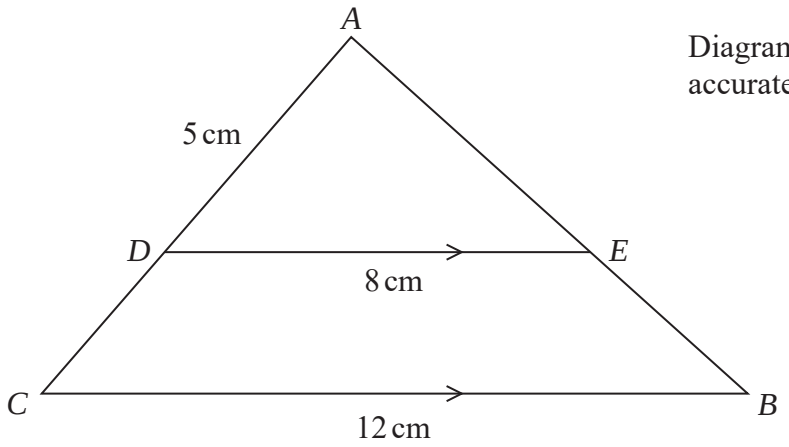


Diagram **NOT** accurately drawn

ADC and *AEB* are straight lines.
DE is parallel to *CB*.

AD = 5 cm
DE = 8 cm
CB = 12 cm

(a) Work out the length of *AC*.

.....cm

(2)

AB = 13.5 cm

(b) Work out the length of *EB*.

.....cm

(2)

(Total for Question 12 is 4 marks)

13 A train travels at a constant speed of v kilometres per hour.
The train crosses a bridge.

The length of the bridge is b metres.
The length of the train is x metres.

T seconds is the time between the instant that the front of the train moves onto the bridge and the instant that the back of the train leaves the bridge.

Find a formula for T in terms of b, x and v.
Give your answer in its simplest form.

.....

(Total for Question 13 is 3 marks)

14 Andrew invests £3000 in an account for 3 years at 2.4% compound interest per year.
At the end of the 3 years, a deduction of 40% of the **total interest** is made from the account.

Work out the amount in the account at the end of the 3 years, after the deduction has been made.

£.....

(Total for Question 14 is 4 marks)

15 Solve

$$3x - 4y = 8$$
$$5x - 2y = 11$$

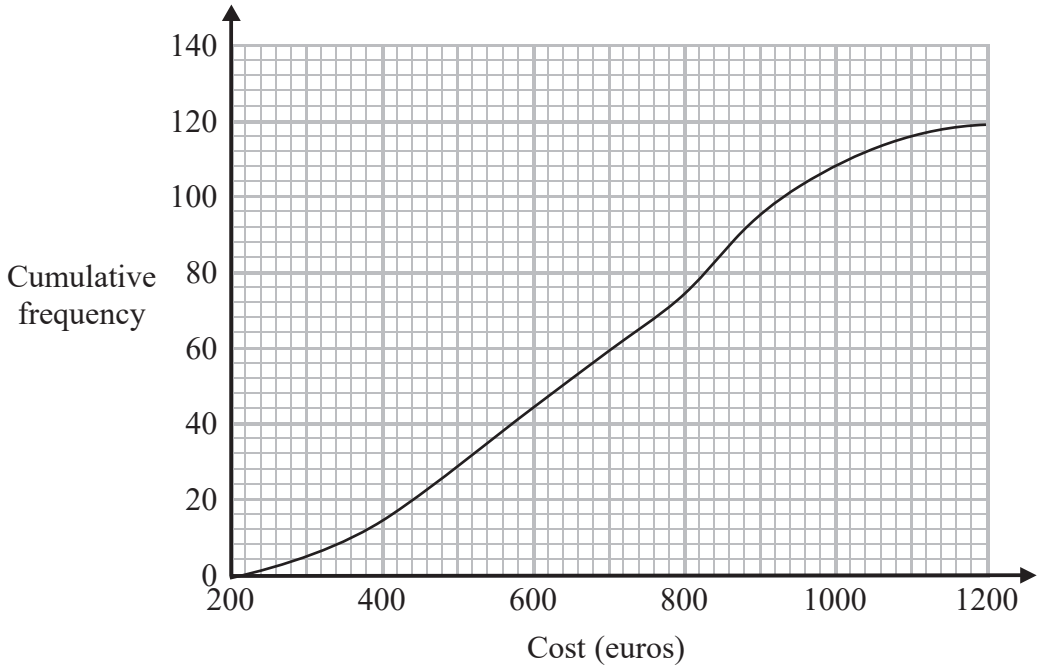
Show clear algebraic working.

$x =$ .....

$y =$ .....

(Total for Question 15 is 3 marks)

16 The cumulative frequency graph gives information about the costs, in euros, of 120 holidays in Cyprus.



(a) Find an estimate for the median cost.

.....euros

(1)

(b) Find an estimate for the interquartile range of the costs.

.....euros

(2)

15% of these holidays had a cost greater than N euros.

(c) Use the graph to find an estimate for the value of N.

.....

(3)

(Total for Question 16 is 6 marks)

17 (a) Show that $\dfrac{x+1}{2x+1} - \dfrac{1}{(2x+1)(x+1)} = \dfrac{x^2+2x}{(2x+1)(x+1)}$

(2)

(b) Hence, solve $\dfrac{x+1}{2x+1} - \dfrac{1}{(2x+1)(x+1)} = \dfrac{1}{(2x+1)(x+1)}$

Give your solutions correct to 3 significant figures.
Show your working clearly.

.....

(4)

(Total for Question 17 is 6 marks)

18 There are four white tiles and three grey tiles in a bag.
Each tile has a number on one side.

There are no other tiles in the bag.

Flora takes at random a tile from the bag.
She keeps the tile.

Esther then takes at random a tile from the bag.

(a) Work out the probability that Flora takes a white tile and Esther takes a grey tile.

.....

(2)

The numbers on the tiles taken from the bag are added together to get a total T.

(b) Work out the probability that T is 4

.....

(4)

(Total for Question 18 is 6 marks)

19

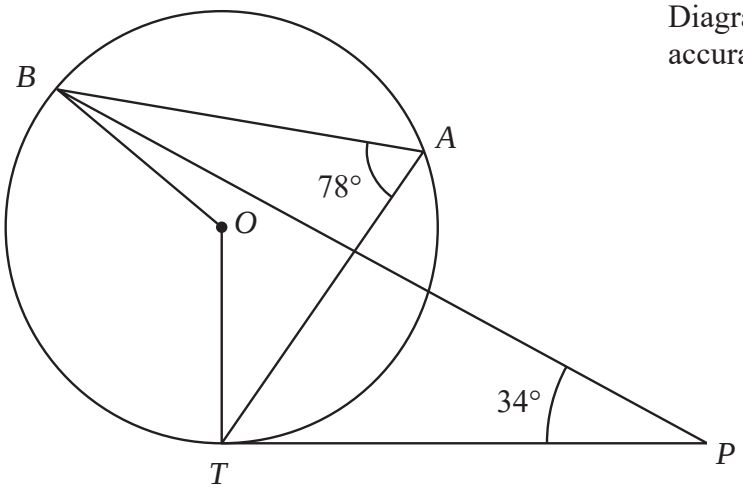


Diagram **NOT** accurately drawn

A, *B* and *T* are points on a circle, centre *O*.

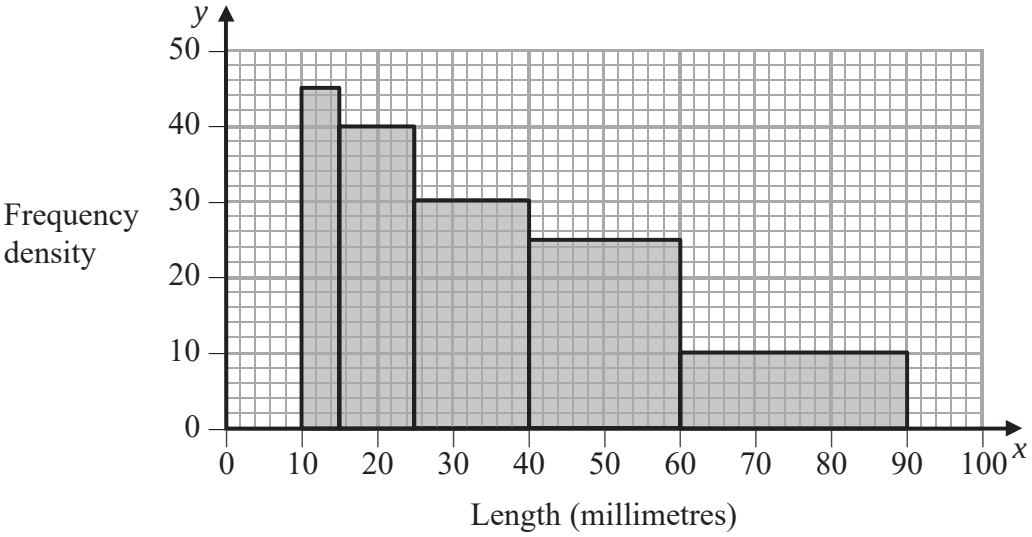
PT is the tangent at *T* to the circle.
Angle *TPB* = 34°
Angle *TAB* = 78°

Work out the size of angle *OBP*.

.....°

(Total for Question 19 is 4 marks)

20 The histogram gives information about the lengths, in millimetres, of 1875 snails.



Calculate an estimate for the proportion of the snails more than 55 millimetres in length.

.....

(Total for Question 20 is 3 marks)

21 $y = 4ax^2$

$z = a^2x^3$

Given that $y = 4a^kz^w$ find

(a) (i) the value of w,

$w =$ .....

(2)

(ii) the value of k.

$k =$ .....

(2)

$m = 10^3$

$N = m \times m^m$

(b) Write N in the form 10^n where n is an integer.

.....

(3)

(Total for Question 21 is 7 marks)

22 Here is a solid shape made from a cone and a hemisphere.

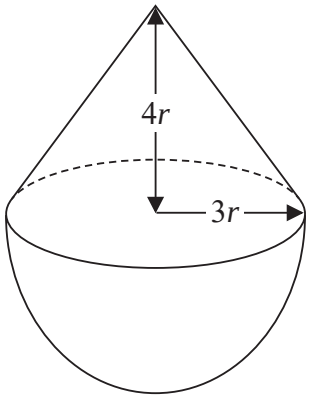


Diagram **NOT** accurately drawn

The radius of the hemisphere is $3r$ cm.

The radius of the base of the cone is $3r$ cm.
The height of the cone is $4r$ cm.

The volume of the solid shape is 330π cm^3

Find the value of r in the form $\sqrt[3]{n}$ where n is an integer.

.....

(Total for Question 22 is 5 marks)

23 f is the function such that $f(x) = (x + 1)^2$ for $x > 0$

(a) Find the value of a for which $f(a) = \frac{25}{9}$

Show clear algebraic working.

$a =$ .....

(3)

g is the function such that $g(x) = \frac{1}{x}$ for $x > 0$

(b) Show that $x^2fg(x) = f(x)$ for all $x > 0$

(2)

h is the function such that $hf(x) = x$ for all $x > 1$

(c) Find the function h in the form $h(x) = \ldots$

$h(x) =$ .....

(2)

(Total for Question 23 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS