Write your name here

Surname	Other names

Pearson Edexcel Certificate
Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Mathematics A

Paper 3H

Higher Tier

Monday 11 January 2016 – Morning
Time: 2 hours

Paper Reference
4MA0/3H
KMA0/3H

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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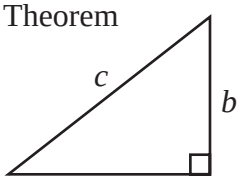
1/1/1/1/

P 4 6 9 1 0 A 0 1 2 4

PEARSON

International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER

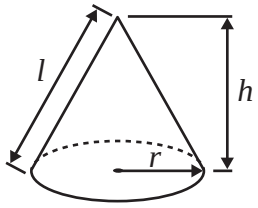
Pythagoras' Theorem



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

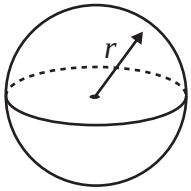
Volume of cone = $\frac{1}{3}\pi r^2 h$

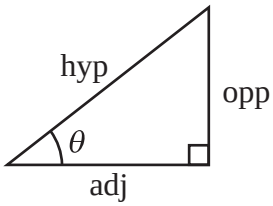
Curved surface area of cone = $\pi r l$



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

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





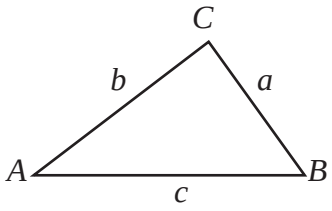
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

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

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

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

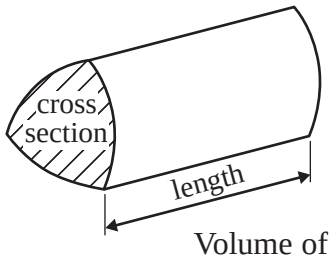
In any triangle *ABC*



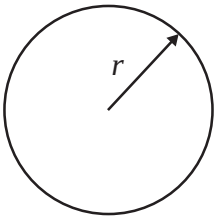
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



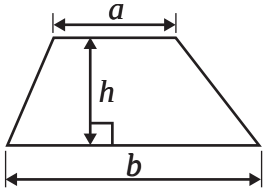
Volume of prism = area of cross section × length

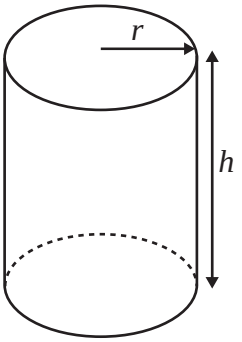


Circumference of circle = $2\pi r$

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 Here is a list of the ingredients needed to make lentil soup for 6 people.

Lentil Soup (for 6 people)
120 g lentils 300 g carrots 800 ml vegetable stock 3 onions

Jenny wants to make lentil soup for 24 people.

(a) Work out the amount of vegetable stock she needs.

..... ml

(2)

Ravi is going to make lentil soup.
He uses 450 g of carrots.

(b) How many people is Ravi making the lentil soup for?

.....

(2)

(Total for Question 1 is 4 marks)

2 Lizzy drove by car to visit her aunt.
She left home at 930 am.

Lizzy arrived at her aunt's house at 1115 am.
She drove a distance of 140 km.

Work out, in km/h, Lizzy's average speed for the journey.

..... km/h

(Total for Question 2 is 3 marks)

3 Show that $\frac{3}{8} \div \frac{7}{12} = \frac{9}{14}$

(Total for Question 3 is 2 marks)

4 (a) Factorise $15r + 10$

.....

(1)

(b) Simplify $y^7 \times y^2$

.....

(1)

(c) Expand and simplify $(x + 5)(x - 1)$

.....

(2)

(d) Simplify fully $\dfrac{36k^3m^4}{30k^5m}$

.....

(2)

(Total for Question 4 is 6 marks)

5 Kim asked 40 people how many text messages they each sent on Monday.
The table shows her results.

Number of text messages sent	Frequency
0 to 4	6
5 to 9	3
10 to 14	5
15 to 19	12
20 to 24	14

(a) Write down the modal class.

.....

(1)

(b) Calculate an estimate for the mean number of text messages sent.

.....

(4)

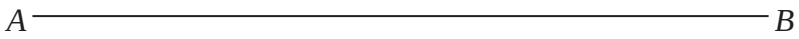
(c) What percentage of these 40 people sent 20 or more text messages?

.....%

(2)

(Total for Question 5 is 7 marks)

6 Use ruler and compasses only to construct the perpendicular bisector of line *AB*.
You must show all your construction lines.



(Total for Question 6 is 2 marks)

7 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{1, 2, 3, 4, 5, 6\}$
$B = \{\text{odd numbers}\}$

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

.....

(1)

C is a set such that $A \cap C = \{4, 5\}$
The set C has 4 members.

(b) List the members of one possible set C

.....

(2)

(Total for Question 7 is 3 marks)

8 Solve $3(2x + 5) = 4 - x$
Show clear algebraic working.

$x =$ .....

(Total for Question 8 is 3 marks)

9

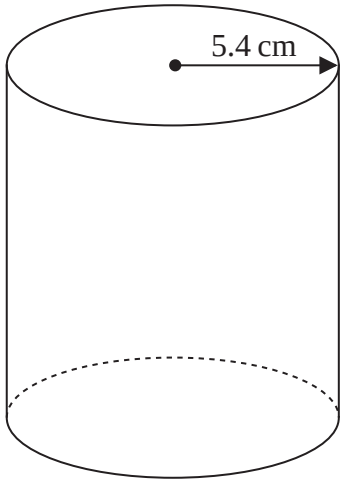


Diagram **NOT** accurately drawn

A cylinder has radius 5.4 cm and height 16 cm.

(a) Work out the volume of the cylinder.
Give your answer correct to the nearest whole number.

..... cm^3

(2)

The radius 5.4 cm is correct to 2 significant figures.

(b) (i) Write down the upper bound of the radius.

..... cm

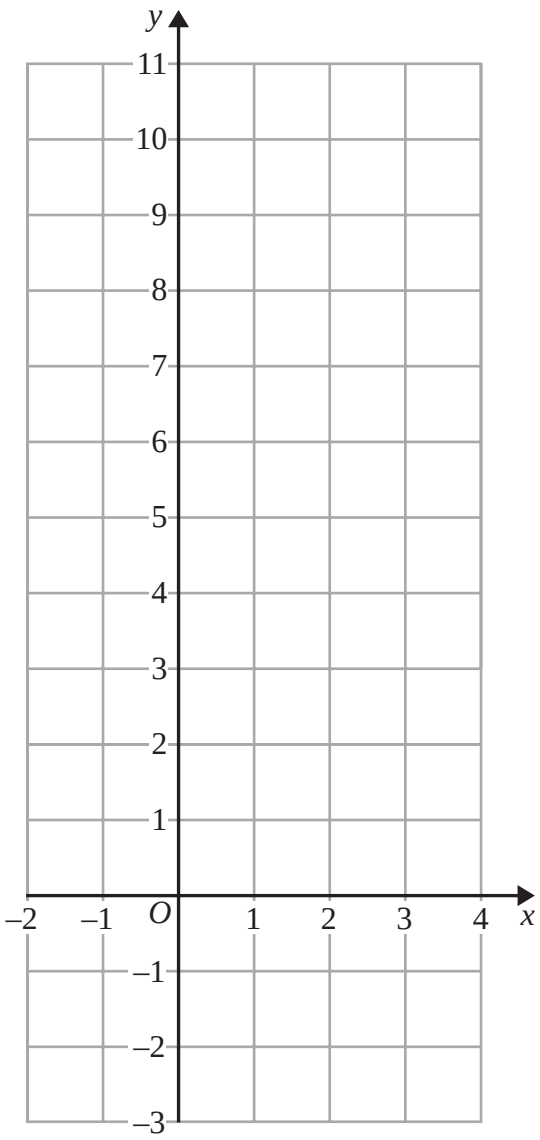
(ii) Write down the lower bound of the radius.

..... cm

(2)

(Total for Question 9 is 4 marks)

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



(3)

(b) Show, by shading on the grid, the region that satisfies **all three** of the inequalities

$$x \leqslant 3 \quad \text{and} \quad y \geqslant 2 \quad \text{and} \quad y \leqslant 2x + 3$$

Label your region **R**.

(2)

(Total for Question 10 is 5 marks)

11

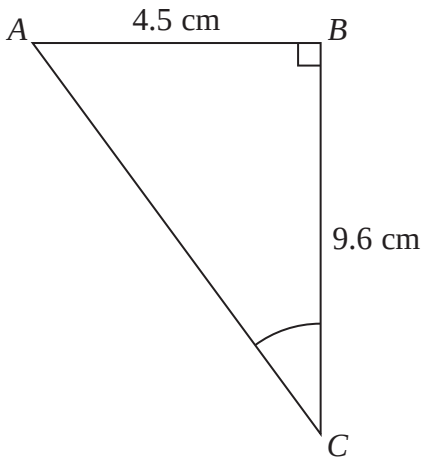


Diagram **NOT** accurately drawn

Work out the size of angle *ACB*.
Give your answer correct to 1 decimal place.

.....°

(Total for Question 11 is 3 marks)

12 Make t the subject of $5(t - g) = 2t + 7$

.....

(Total for Question 12 is 3 marks)

13 Here are the marks that James scored in eleven maths tests.

16 12 19 18 17 13 13 20 11 19 17

(a) Find the interquartile range of these marks.

.....

(3)

Sunil did the same eleven maths tests.
The median mark Sunil scored in his tests is 17
The interquartile range is 8

(b) Which one of Sunil or James has the more consistent marks?
Give a reason for your answer.

.....

.....

(1)

Sunil did four more maths tests.
His scores in these four tests were 16, 20, 18 and 10

(c) How does his new median mark for the fifteen tests compare with his median mark of 17 for the eleven tests?

Tick (✓) one box.

☐ new median is lower ☐ new median is 17 ☐ new median is higher

Explain your answer.

.....

.....

(1)

(Total for Question 13 is 5 marks)

14 Liam invests £8000 in a savings account for 4 years.
The savings account pays compound interest at a rate of

4.5 % for the first year
2.75 % for all subsequent years.

(a) Work out the value of Liam's investment at the end of 4 years.

£.....

(3)

Max invests some money in a savings bond.
The savings bond pays interest at a rate of 2% per year.

At the end of the first year, his savings bond is worth £5763

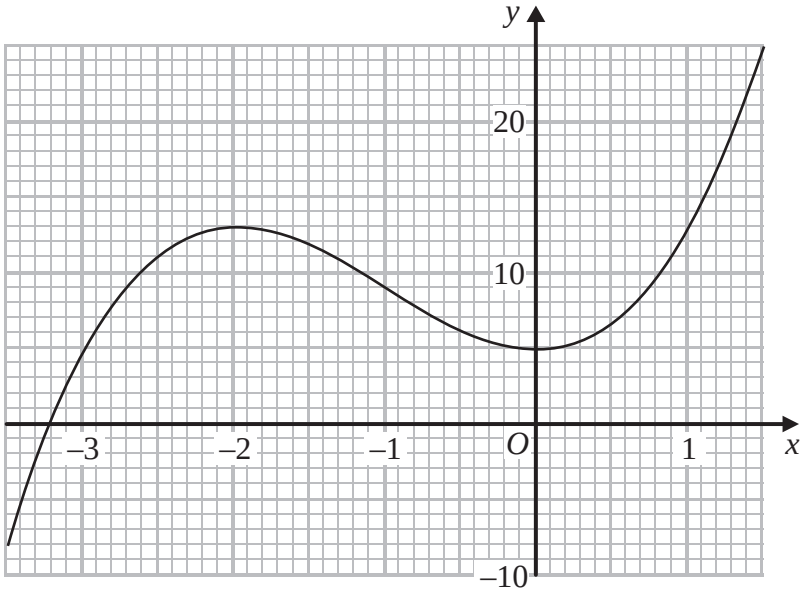
(b) How much money did Max invest in the savings bond?

£.....

(3)

(Total for Question 14 is 6 marks)

15 The diagram shows the graph of $y = f(x)$ for $-3.5 \leqslant x \leqslant 1.5$



(a) Find f(0)

.....

(1)

(b) For which values of k does the equation $f(x) = k$ have only one solution?

.....

(2)

(c) Find an estimate for the gradient of the curve at the point where $x = -2.5$

.....

(3)

$$g(x) = \frac{1}{2 + x}$$

(d) State which value of x must be excluded from any domain of g

.....

(1)

(e) Find fg(–3)

.....

(2)

(Total for Question 15 is 9 marks)

16 Solve the inequality $5x^2 - 13 < 32$
Show clear algebraic working.

.....

(Total for Question 16 is 3 marks)

17

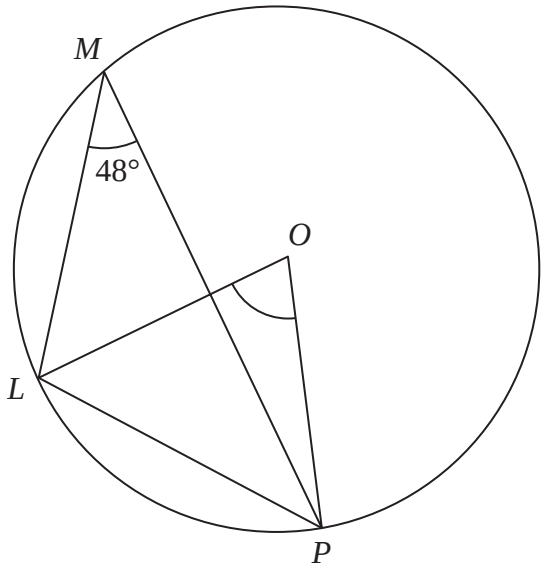


Diagram **NOT** accurately drawn

L, *M* and *P* are points on a circle, centre *O*
Angle *LMP* = 48°

(a) (i) Write down the size of angle *LOP*

.....°

(ii) Give a reason for your answer.

.....

.....

.....

(2)

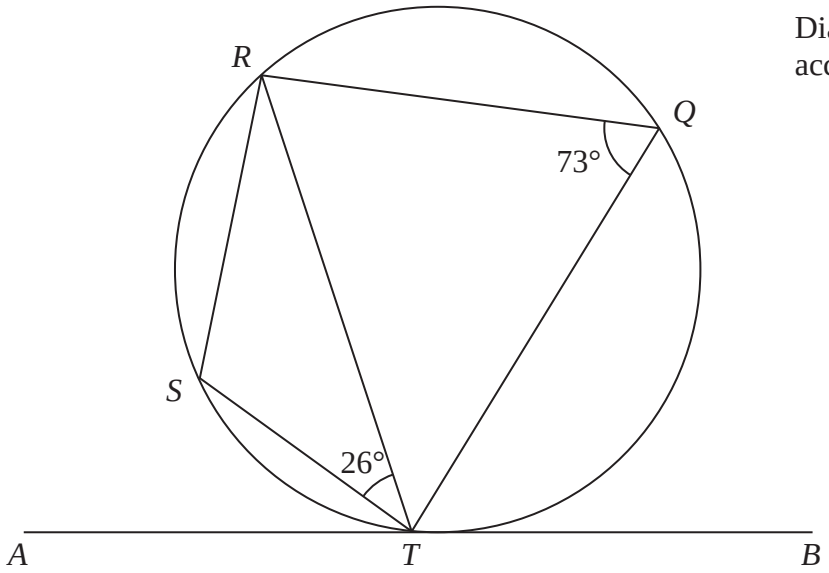


Diagram **NOT** accurately drawn

Q, *R*, *S* and *T* are points on a circle.
ATB is the tangent to the circle at *T*

Angle *STR* = 26°
Angle *RQT* = 73°

(b) Work out the size of angle *STA*
Give a reason for each stage in your working.

.....°

(3)

(Total for Question 17 is 5 marks)

18 *A* is the point with coordinates (1, 3)
B is the point with coordinates (–2, –1)

The line **L** has equation $3y = 4 - 2x$

Is line **L** parallel to *AB*?
Show your working clearly.

(Total for Question 18 is 3 marks)

19 The diagram shows a sphere and a cone.

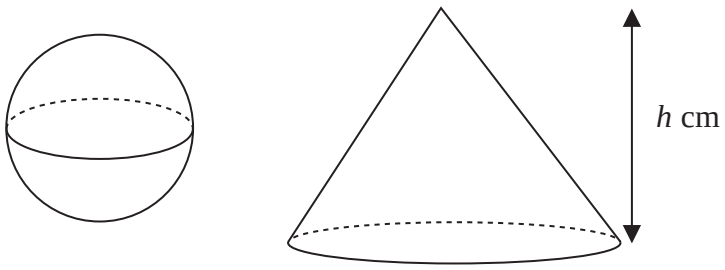


Diagram **NOT** accurately drawn

The cone has height h cm.
The radius of the base of the cone is 3 times the radius of the sphere.

Given that the volume of the sphere is equal to the volume of the cone, find an expression for the radius of the sphere in terms of h.
Give your expression in its simplest form.

.....

(Total for Question 19 is 3 marks)

20

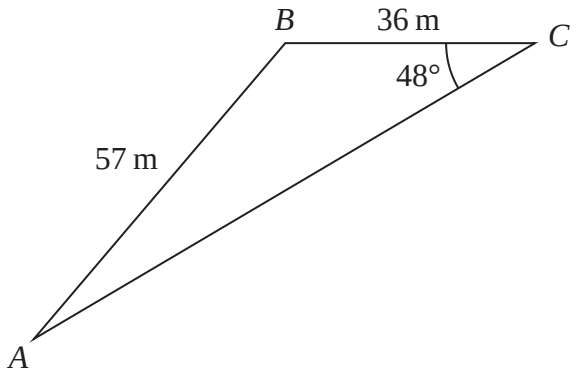


Diagram **NOT** accurately drawn

Work out the area of triangle *ABC*.
Give your answer correct to 3 significant figures.

..... m^2

(Total for Question 20 is 4 marks)

21 Peter travels to work either by bus or by bike.

The probability that Peter will travel to work by bus on any one day is 0.7

Whenever Peter travels to work by bus, the probability that he will be late is 0.1
Whenever Peter travels to work by bike, the probability that he will be late is 0.05

Peter is going to go to work on Monday and on Tuesday.

Work out the probability that he will be late for work on at least one of these days.

.....

(Total for Question 21 is 5 marks)

22 The diagram shows a rectangle.

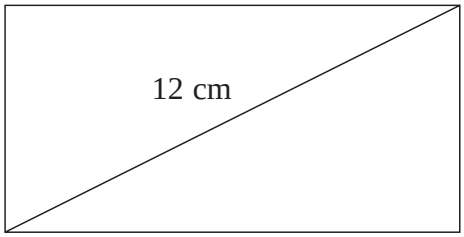


Diagram **NOT** accurately drawn

The width of the rectangle is x cm.
The length of a diagonal of the rectangle is 12 cm.

The perimeter of the rectangle is 28 cm.

Find the possible values of x.
Give your values correct to 3 significant figures.
Show your working clearly.

.....

(Total for Question 22 is 7 marks)

23

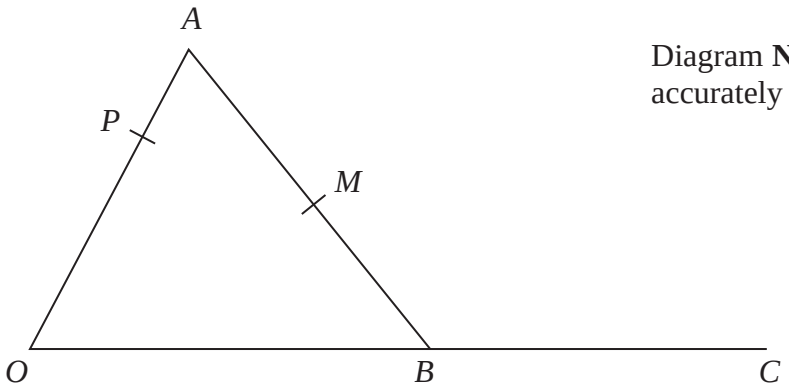


Diagram **NOT** accurately drawn

OAB is a triangle.
P is the point on *OA* such that $OP : PA = 2 : 1$

C is the point such that *B* is the midpoint of *OC*.
M is the midpoint of *AB*.

$\overrightarrow{OA} = 6\mathbf{a}$ $\overrightarrow{OB} = 4\mathbf{b}$

Show that *PMC* is a straight line.

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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