Write your name here

Surname	Other names

Pearson Edexcel International GCSE

Centre Number	Candidate Number

Mathematics A

Paper 3HR

Higher Tier

Thursday 24 May 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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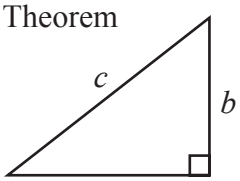
Pearson

International GCSE MATHEMATICS
FORMULAE SHEET – HIGHER TIER

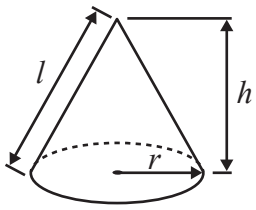
Pythagoras' Theorem



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

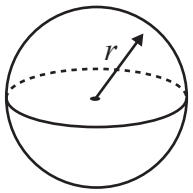
Volume of cone = $\frac{1}{3}\pi r^2 h$

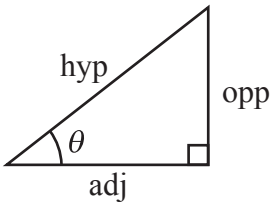
Curved surface area of cone = $\pi r l$



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

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





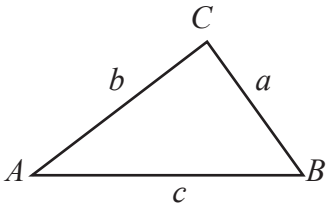
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

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

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

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

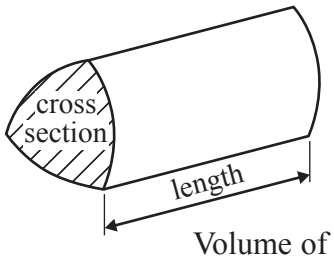
In any triangle ABC



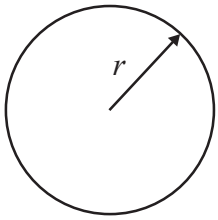
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



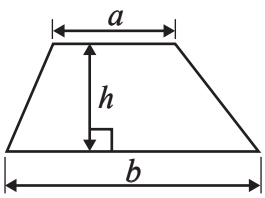
Volume of prism = area of cross section × length

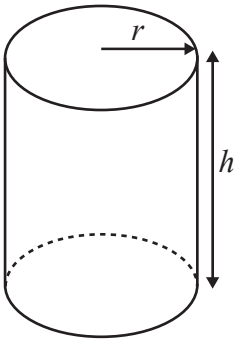


Circumference of circle = $2\pi r$

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 (a) Work out the value of $\left(\frac{125.6}{4.7}\right)^2$

Write down all the figures on your calculator display.

.....

(2)

(b) Write your answer to part (a) correct to 3 significant figures.

.....

(1)

(Total for Question 1 is 3 marks)

2 Helga has played a game many times.

She scored 9 or more in $\frac{5}{6}$ of these games.

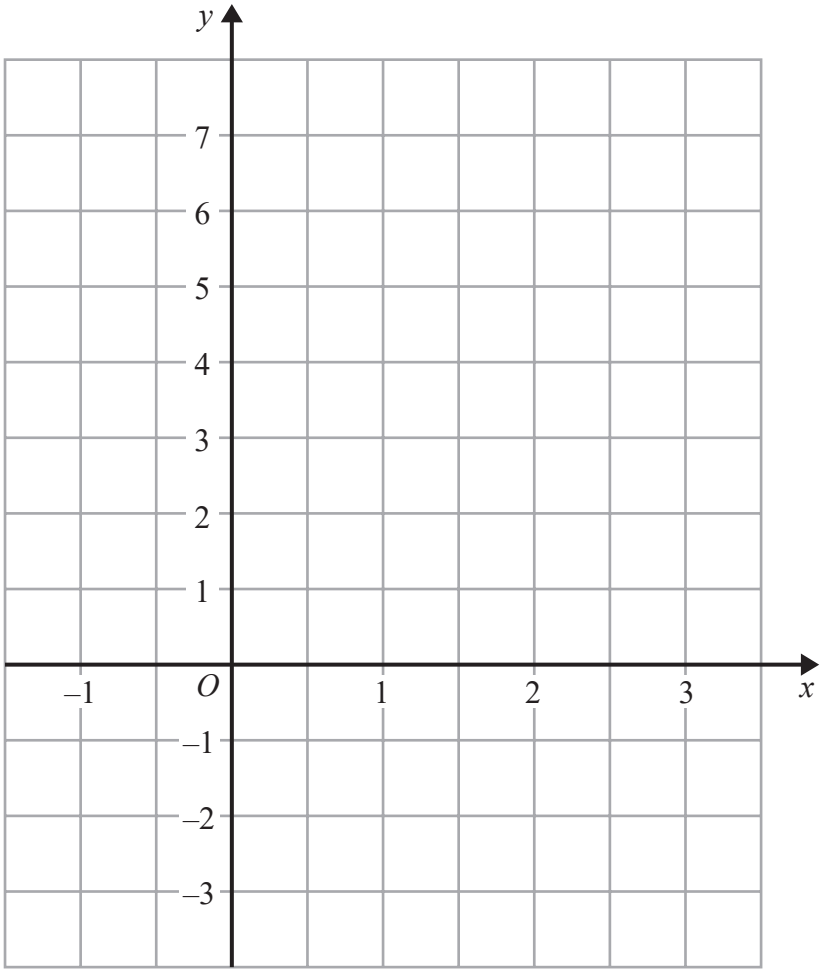
Helga is going to play the game another 60 times.

Work out an estimate for the number of times she will score 9 or more in these 60 games.

.....

(Total for Question 2 is 2 marks)

3 (a) On the grid, draw the graph of $y = 4 - 2x$ for values of x from -1 to 3



(3)

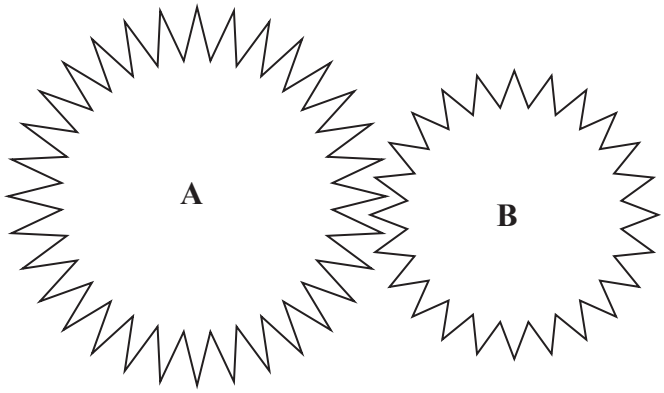
(b) Write down the coordinates of the point where the graph of $y = 4 - 2x$ crosses the line $y = 1$

(..... , ...)

(1)

(Total for Question 3 is 4 marks)

4 The diagram shows two cogs, **A** and **B**.



There are 32 teeth on cog **A**.
There are 24 teeth on cog **B**.

The two cogs both rotate.
Cog **A** completes 12 full turns while cog **B** completes 16 full turns.

Work out the number of full turns that cog **A** completes while cog **B** completes 60 full turns.

.....

(Total for Question 4 is 2 marks)

5 The size of each exterior angle of a regular polygon is 24°

(a) Work out the number of sides of the polygon.

.....

(2)

Here is a pentagon.

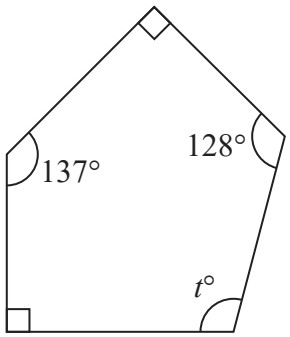


Diagram **NOT** accurately drawn

(b) Work out the value of t.

.....

(3)

(Total for Question 5 is 5 marks)

6 $\mathscr{E}$ = {fish in Jake's lake}
A = {fish of length greater than 20 cm}
B = {fish that weigh more than 1 kg}
C = {fish less than 1 year old}

A fish in Jake's lake is caught.
The fish is 2 years old, weighs 1.2 kg and is 19 cm in length.

(a) Write down the set, A or B or C, of which this fish is a member.

.....

(1)

(b) Describe in words fish that are members of the set $A \cup B$

.....

.....

(2)

$B \cap C = \varnothing$

(c) Explain what this statement tells us about the fish in Jake's lake.

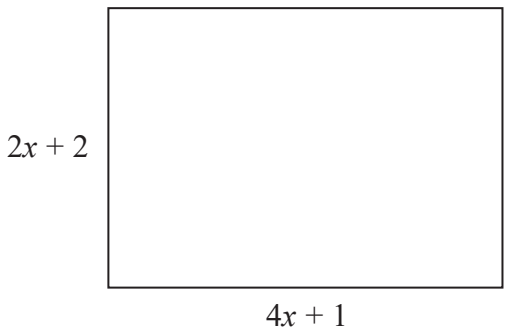
.....

.....

(1)

(Total for Question 6 is 4 marks)

7 The diagram shows a rectangle and an isosceles triangle.
All measurements are in centimetres.



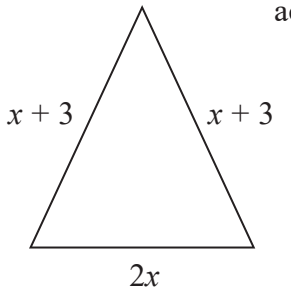


Diagram **NOT** accurately drawn

(a) Write down an expression in terms of x for

(i) the perimeter of the rectangle,

.....cm

(ii) the perimeter of the triangle.

.....cm

(2)

The perimeter of the rectangle is equal to 2 times the perimeter of the triangle.

(b) Work out the value of x.
Show clear algebraic working.

.....

(4)

(Total for Question 7 is 6 marks)

8 Marta breeds dogs.
32 dogs give birth to puppies.
The table shows information about the number of puppies born to each dog.

Number of puppies	Frequency
1 – 3	5
4 – 6	12
7 – 9	10
10 – 12	4
13 – 15	1

(a) Write down the modal class.

.....

(1)

(b) Work out an estimate for the mean number of puppies born to each dog.

.....

(4)

(Total for Question 8 is 5 marks)

9 Show that $3\frac{3}{8} \div 2\frac{1}{4} = 1\frac{1}{2}$

(Total for Question 9 is 3 marks)

10

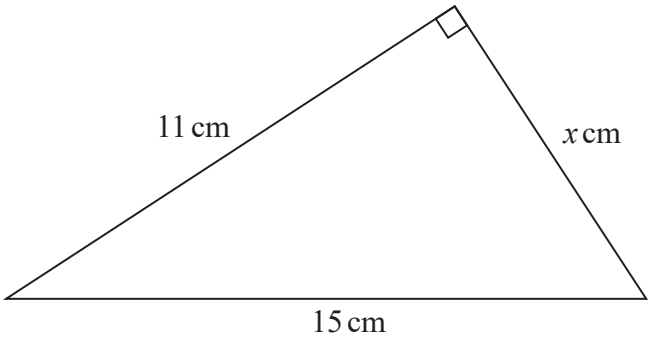


Diagram **NOT** accurately drawn

Work out the value of x.
Give your answer correct to 3 significant figures.

.....

(Total for Question 10 is 3 marks)

11 The line **L** has equation $4x + 5y = 20$

(a) Work out the gradient of **L**.

.....

(2)

The line **M** has gradient 2
L and **M** both cross the y-axis at the same point.

(b) Find an equation for **M**.

.....

(2)

(Total for Question 11 is 4 marks)

12

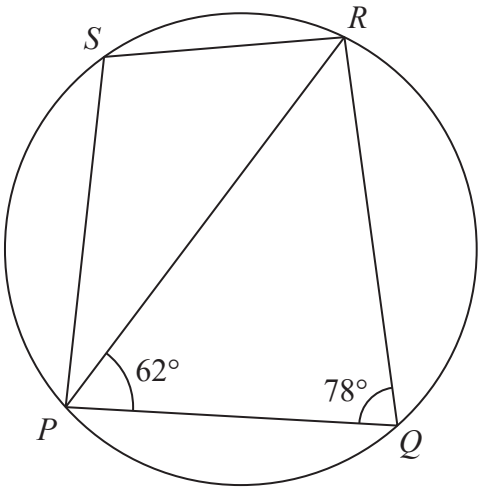


Diagram **NOT** accurately drawn

P, *Q*, *R* and *S* are points on a circle.
Angle *RPQ* = 62° and angle *PQR* = 78°

(a) (i) Find the size of angle *PSR*.

.....°

(ii) Give a reason for your answer.

.....

.....

(2)

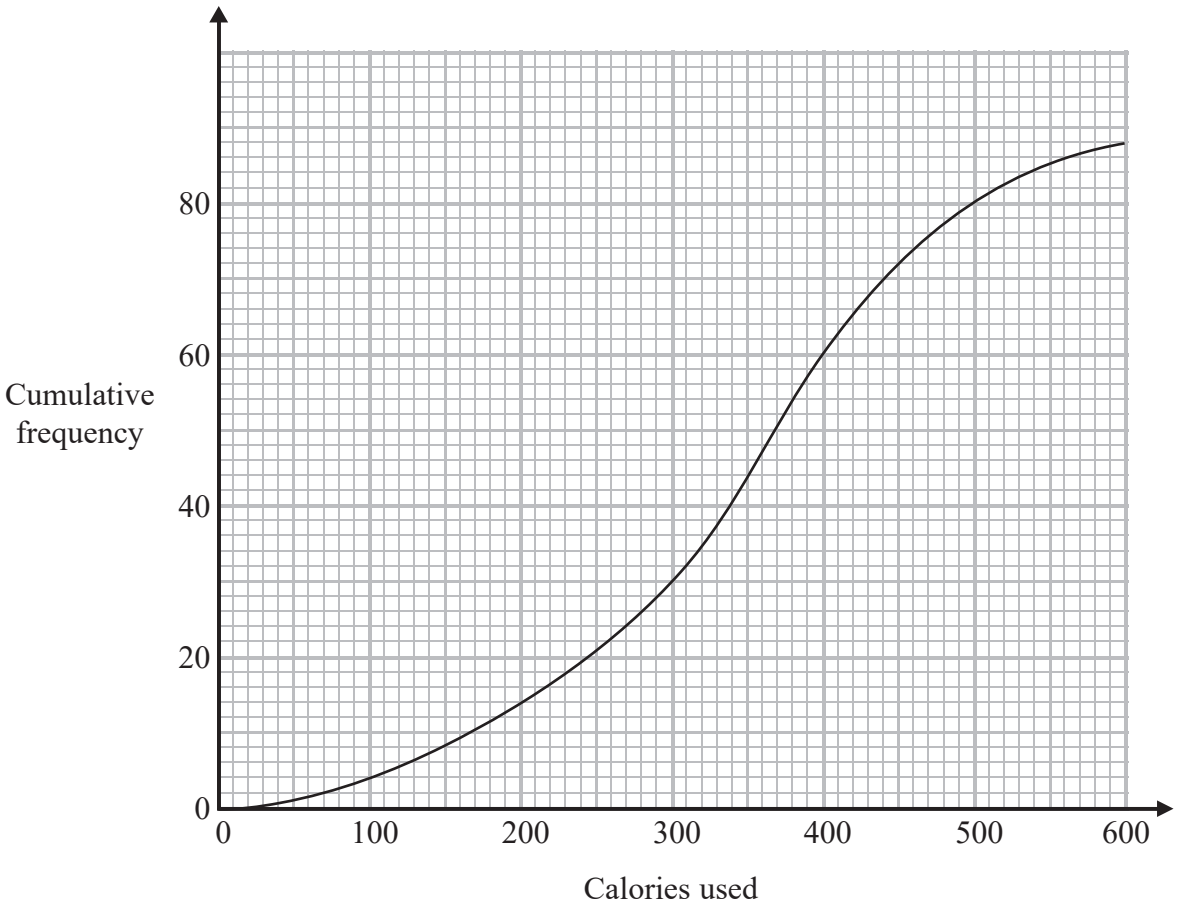
(b) Work out the size of angle *PSQ*.

.....°

(2)

(Total for Question 12 is 4 marks)

13 The cumulative frequency graph shows information about the number of calories used by 88 people during their exercise programme at a sports centre.



(a) Use the graph to find an estimate for the median number of calories used.

..... calories

(2)

(b) Use the graph to find an estimate for the number of these 88 people who used more than 500 calories.

.....

(2)

(Total for Question 13 is 4 marks)

14 (a) Solve the inequality $\frac{1}{4}p < 7$

.....

(1)

(b) Solve the inequality $16q^2 > 9$

.....

(3)

(Total for Question 14 is 4 marks)

15 Cylinder **A** has height 12 cm and diameter 8 cm.

(a) Work out the volume of cylinder **A**.
Give your answer correct to 3 significant figures.

..... cm^3
(2)

Cylinder **B** is similar to cylinder **A**.
The height of cylinder **B** is 21 cm.

(b) Work out the diameter of cylinder **B**.

..... cm
(2)

Cylinder **C** is similar to cylinder **A**.
The volume of cylinder **C** is 64 times the volume of cylinder **A**.

(c) Work out the height of cylinder **C**.

..... cm
(3)

(Total for Question 15 is 7 marks)

16 Daniel buys a new car.
In the first year, the value of the car decreases by 24% of its original value.
The value of the car at the end of the first year is \$13 300

(a) Work out the original value of the car.

\$ .....

(3)

The value of the car at the end of the first year is \$13 300
In each of the second year, the third year and the fourth year, the value of the car decreases by x% of its value at the beginning of each year.

The value of the car at the end of the fourth year is \$6500

(b) Work out the value of x.
Give your answer correct to 3 significant figures.

x = ...

(3)

(Total for Question 16 is 6 marks)

17 The curve **C** has equation $y = 2x^3 - 6x$

(a) Find $\frac{dy}{dx}$

$\frac{dy}{dx} =$ .....

(2)

(b) Work out the gradient of **C** at the point (2, 4)

.....

(1)

(c) Find the x coordinates of the points on **C** where the gradient of the curve is $7\frac{1}{2}$
Show clear algebraic working.

.....

(3)

(Total for Question 17 is 6 marks)

18 Two fair 6-sided dice are thrown.
The total is the sum of the numbers that each dice lands on.

(a) Work out the probability that the total is 4

.....

(2)

Three people each throw the two dice.

(b) Work out the probability that none of the three people get a total of 4

.....

(2)

(Total for Question 18 is 4 marks)

19 Solve the simultaneous equations

$$y = 5x^2$$

$$y - 4 = 3x$$

Show your working clearly.
Give your solutions correct to 2 decimal places.

.....

(Total for Question 19 is 4 marks)

20 Show that $\frac{\sqrt{50} - \sqrt{18}}{4}$ can be written in the form $\frac{1}{\sqrt{k}}$ where k is an integer.

Show your working clearly.

(Total for Question 20 is 3 marks)

21

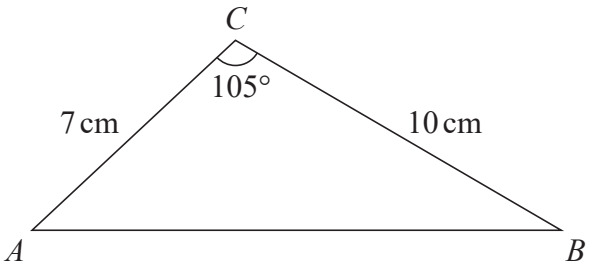


Diagram **NOT** accurately drawn

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

..... cm^2

(2)

(b) Work out the size of angle *BAC*.
Give your answer correct to 1 decimal place.

°

.....

(5)

(Total for Question 21 is 7 marks)

22 Simplify fully $\dfrac{12x^2 - 3}{6x^2 + 5x - 4}$

.....

(Total for Question 22 is 3 marks)

23 f is the function such that $f(x) = \sqrt{4 - x}$ and $f(x) \geqslant 0$

(a) State which values of x must be excluded from any domain of f

.....

(1)

The inverse function f^{-1} has domain $x \geqslant 0$

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

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

(2)

g is the function such that $g(x) = (5 - x)(x - 1)$
The composite function fg has domain $x \geqslant 3$

(c) Find $fg(x)$
Give your answer in its simplest form.

$fg(x) =$ .....

(4)

(Total for Question 23 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS