the PiXL club
partners in excellence

Worked Solutions

Pre Public Examination

GCSE Mathematics (Edexcel style)

November 2016

Higher Tier

Paper 3H

Name .....

Class .....

TIME ALLOWED

1 hour 30 mins

INSTRUCTIONS TO CANDIDATES

- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- You are permitted to use a calculator in this paper.
- You may use the π button on your calculator or you may take the value of π to be 3.142.
- Do all rough work in this book.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question on the Question Paper**.**
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **80**.

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Question	Mark	out of
1		3
2		2
3		3
4		5
5		5
6		2
7		2
8		5
9		5
10		4
11		2
12		5
13		3
14		5
15		4
16		5
17		6
18		3
19		5
20		3
21		3
Total		80

Question 1

Here are the marks scored in a test by the girls in class 11C.

5 9 11 12 15 16 16 17 19 21 27

(a) Work out the interquartile range of the girls' marks.

Median = 16, Lower quartile = 11, Upper quartile = 19
interquartile range = 19 – 11 = 8

.....

(2)

The boys in class 11C did the same test.
The boys' marks had a range of 23 and an interquartile range of 10 marks.

Gail says that the girls' marks are more spread out than the boys' marks.

(b) Is Gail right?

Tick (✓) the appropriate box.

Yes	No
☐	☐ ✓

Give a reason for your answer.

The girls' range and interquartile range are smaller than the boys' and so the boys' marks are more spread out.

.....

.....

(1)

(Total 3 marks)

Question 2

A time T is measured as 35 seconds is accurate to the nearest second.

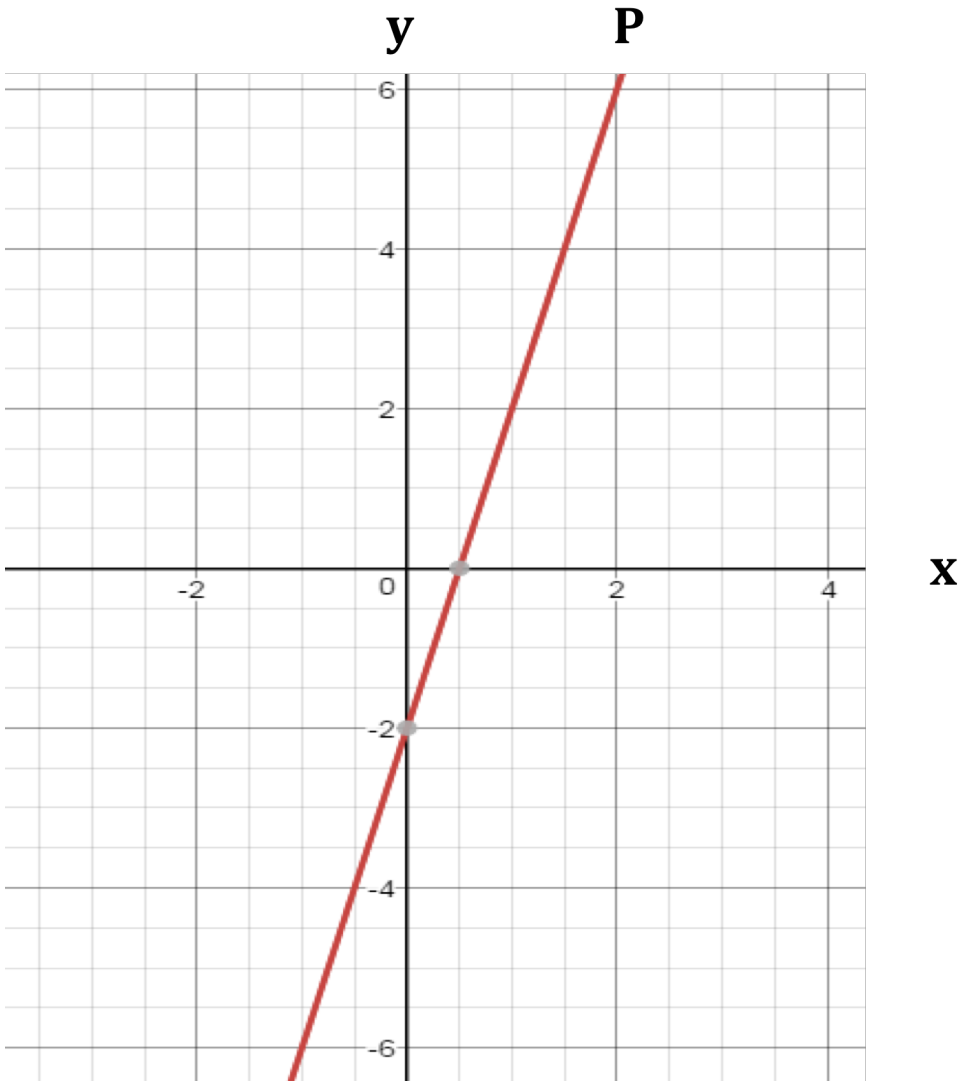
Complete the following statement to show the range of possible values of T

.....**34.5**..... ≤ T ≤ .....**35.5**.....

(Total 2 marks)

Question 3

Line **P** is drawn on the grid below



Find an equation for the straight line **P**.

Give your answer in the form y = mx + c

gradient of 4

y intercept of -2

y = 4x – 2

(Total 3 marks)

Question 4

The table shows information about 150 stones that have been collected from a beach.

Stone size	Mass (g)	Frequency
Extra small	$20 < m \leq 40$	36
Small	$40 < m \leq 60$	20
Medium	$60 < m \leq 80$	45
Large	$80 < m \leq 100$	27
Extra large	$100 < m \leq 120$	22

(a) Calculate an estimate for the mean stone size.

(30 x 36) + (50 x 20) + (70 x 45) + (90 x 27) x (110 x 22)

= 1080 + 1000 + 3150 + 2430 + 2420

= 10080

10080 ÷ 150 = 67.2

..... **67.2**

.....g

(3)

(b) Ben thinks that about ½ of the stones are medium sized as medium is the mode. Is Ben correct?

You must give a reason for your answer.

strategy to work out ½ of 150 = 75 and compare to number of medium stones

clear comparison that medium size is not ½ and so Ben is not correct

.....

.....

(2)

(Total 5 marks)

Question 5

The diagram below shows the floor of a hexagonal shower cubicle.

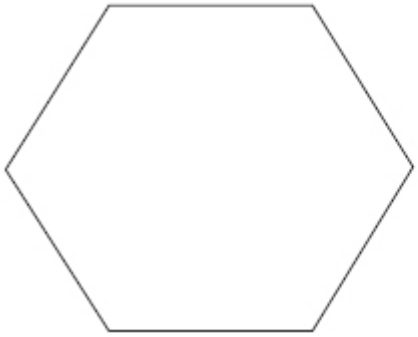


Diagram **NOT** accurately drawn

Julie is going to tile the floor. The perimeter of the floor is 4.2m

Work out the area of the floor to four significant figures.

Area of one equilateral triangle ½ x 70 x 70 x sin 60° = 35 x 60.62 = 2121.76cm^2

Area of floor = 2121.76 x 6 = 12730cm^2

----------**12730cm^2**----------

(Total 5 marks)

Question 6

Factorise x^2 - 6x – 7

(x ± 7)(x ± 1)

(x - 7)(x + 1) oe

.... **(x - 7)(x + 1)**.....

(Total 2 marks)

Question 7

Here are the equations of four straight lines.

Line K $y = 3x - 1$

Line L $4y = 2x + 2$

Line M $3x + 3y = 3$

Line N $3x - y = -9$

Line P $2y + 4x - 5 = 0$

Two of these lines are parallel.

a) Write down the two parallel lines.

K and N in any order

Line .....**K**..... and line.....**N**.....(1)

b) Write down the two perpendicular lines.

L and P in any order

Line .....**L**..... and line.....**P**.....(1)

(Total 2 marks)

Question 8

(a) A coat was priced £64 in a sale after a 20% reduction. What was the original price of the coat?

10% = £8 (64 ÷ 8) or 20% = £16,

8 x 10 = £80

(alt 64 ÷ 80 x 100 = £80)

(2)

(b) A car bought for £15 000 loses 15.5% of its value each year.
What is the value of the car after ten years?

(3)

100% – 15.5% = 84.5%

15000×0.845^{10}

£2783.93

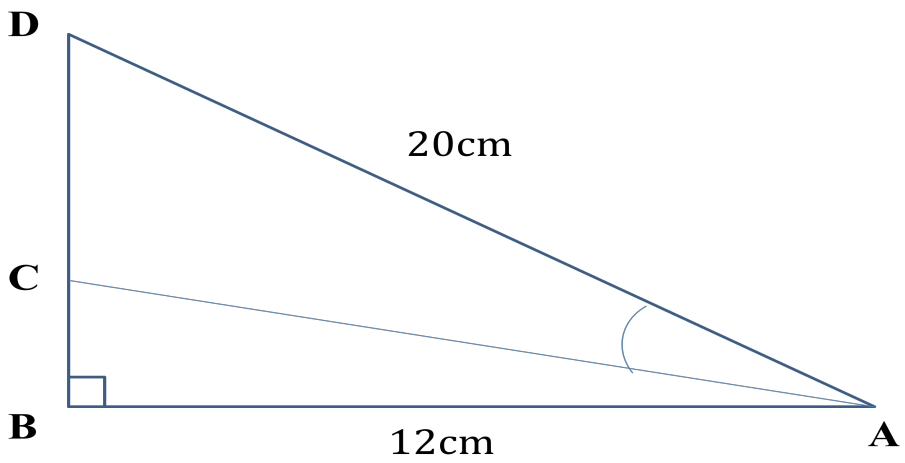
(Total 5 marks)

Question 9

The diagram below shows a sail of a toy ship with a support mast AC. Angle ABD is 90°.

Length AD is 20cm and AB is 12cm. The ratio of BC:CD is 1:3.

Calculate the angle CAD to 1 decimal place.



$\sqrt{(20^2 - 12^2)} = \sqrt{256} = 16$ (length BD)

cos BAD = 0.6 BAD = 53.1°

16 ÷ 4 = 4 so length BC = 4cm (CD = 12cm using ratio 1:3)

tan BAC = 0.33333 BAD = 18.4°

angle CAD = 53.1 – 18.4 = 34.7°

..... **34.7°**.....m

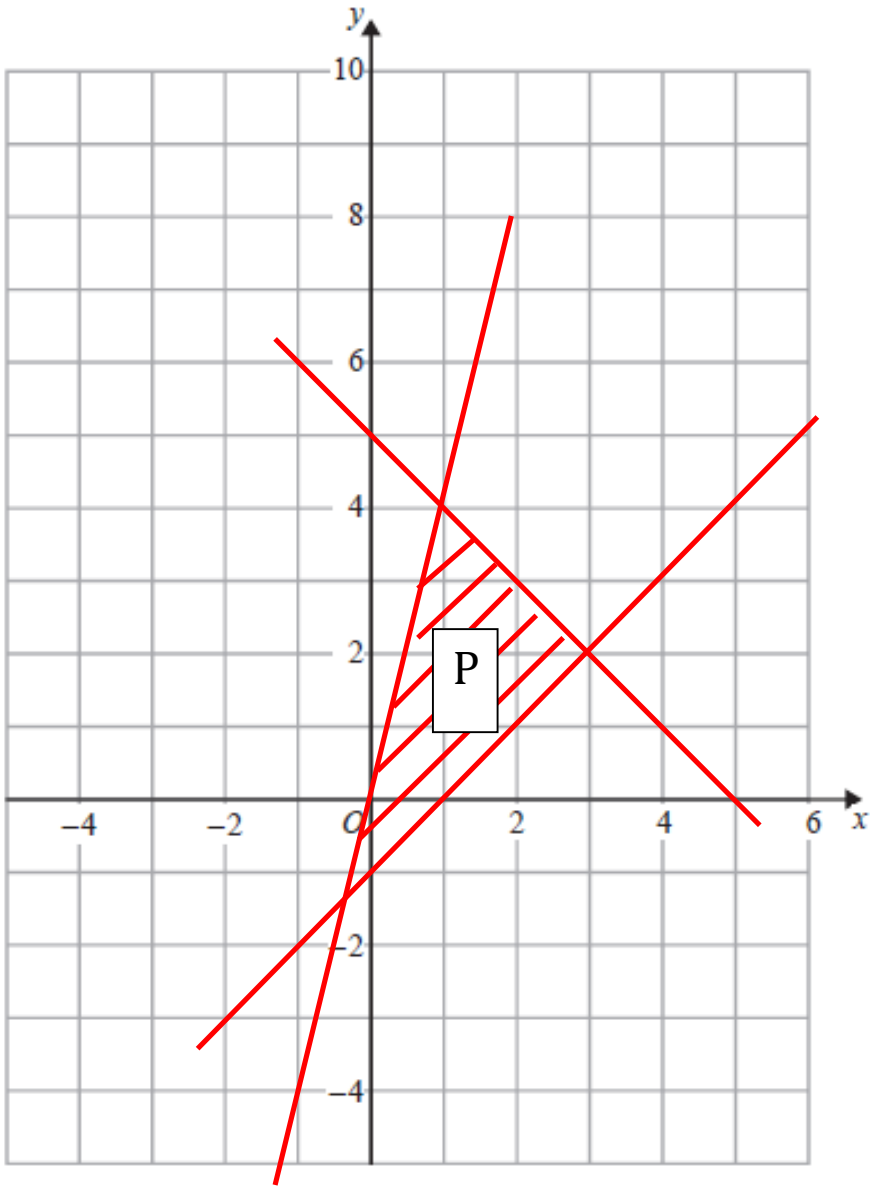
(Total 5 marks)

Question 10

On the grid, shade the region that satisfies all these inequalities.

$x + y < 5$ $\quad y > x - 1$ $\quad y < 4x$

Label the region **P**.



(Total 4 marks)

Question 11

Write $x^2 + 4x - 7$ in the form $(x + m)^2 + n$

where m and n are integers.

$(x + 2)^2 - 4 - 7 = (x + 2)^2 - 11$

..... **$(x + 2)^2 - 11$**.....

(Total 2 marks)

Question 12

Here is part of a wall.

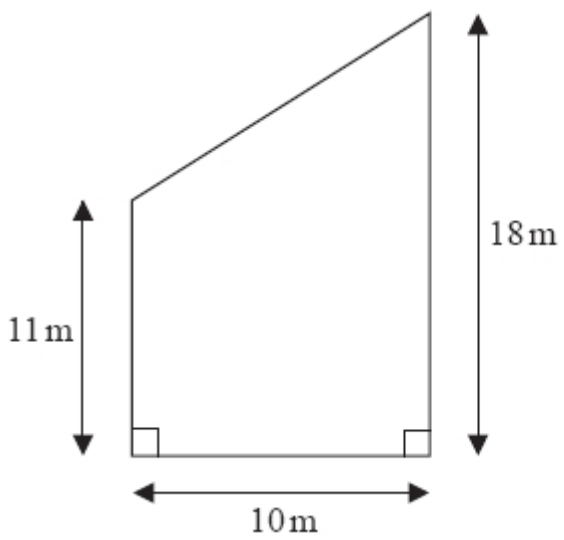


Diagram **NOT** accurately drawn

This part of the wall is in the shape of a trapezium.
An artist wants to put a frame all the way around the edge of this part of the wall.

The artist has 50m of the frame material .

Does he have enough frame material?
You must show all your working.

Missing side

$18 - 11 = 7$m **$\sqrt{(7^2 + 10^2)} = 12.20655562$**

Perimeter of trapezium = 11 + 10 + 18 + 12.20655562 = 51.20655...m

So the artist does not have enough of the frame material

.....

(Total 5 marks)

Question 13

The mean of four numbers is 3.3
One of the four numbers is 6

Find the mean of the other three numbers.

4 x 3.3 = 13.2

13.2 – 6 = 7.2

7.2 ÷ 3 = 2.4

..... **2.4**.....

(Total 3 marks)

Question 14

Solve

$$\frac{3}{(x+1)} + \frac{2}{(2x-3)} = 1$$

Show clear algebraic working.

3(2x – 3) + 2(x + 1) = (x + 1)(2x – 3)

6x – 9 + 2x + 2 = $2x^2$ – 3x + 2x – 3

8x – 7 = $2x^2$ – x – 3

$2x^2$ – 9x + 4 = 0

(2x -1)(x - 4) = 0

x= ½ x = 4

x= ½ x = 4

.....

(Total 5 marks)

Question 15

$M = kT^4$

$k = 8.62 \times 10^{-6}$

$T = 6700$

(a) Work out the value of M.
Give your answer in standard form correct to 3 significant figures.

$8.62 \times 10^{-6} \times 6700^4 = 1.74 \times 10^{10}$

$M =$ ..... **1.74×10^{10}** .....

(2)

(b) Rearrange the formula $M = kT^4$ to make T the subject.

$T = \sqrt[4]{(M/k)}$

$T = \sqrt[4]{(M/k)}$

.....

(2)

(Total 4 marks)

Question 16

The function f is defined as

$$f(x) = \frac{x - 6}{2}$$

(a) Find f (8)

(8 – 6)/2 = 1

..... **1**.....
(1)

(b) Express the inverse function f^{-1} in the form $f^{-1}(x) = ...$

y = (x - 6)/2
2y = x - 6
2y + 6 = x

$f^{-1}(x)$ =.....**2x + 6** .....
(2)

The function g is defined as

$$g(x) = 4x - 8$$

(c) Express the function gf in the form $fg(x) = ...$
Give your answer as simply as possible.

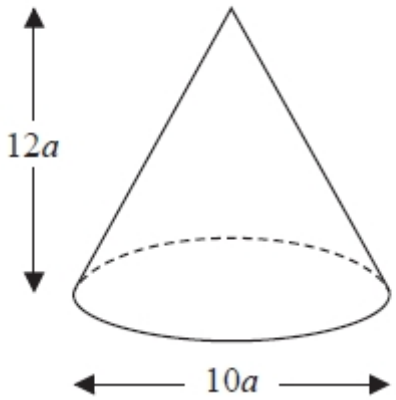
$\frac{(4x-8)-6}{2}$ **= 2x -7**

$fg(x)$ =.....**2x - 7**.....

(Total 5 marks)

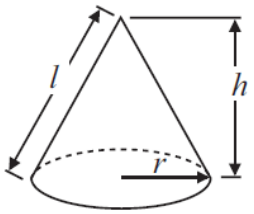
Question 17

The diagram shows a solid cone.



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

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



The diameter of the base of the cone is $10a$ cm.
The height of the cone is $12a$ cm.

The total surface area of the cone is 810π cm^2
The volume of the cone is $V\pi$ cm^3, where V is an integer.

Find the value of V.

Slanted height $= \sqrt{((12a)^2 + (5a)^2)} = 13a$

$810\pi = \pi\,(5a)^2 + \pi(5a)(13a) = 25\pi a^2 + 65\pi a^2 = 90\pi a^2$

$810\pi = 90\pi a^2 \quad a^2 = 9 \quad a = 3$

Volume $= 1/3 \times \pi \times 15^2 \times 12(3) = 2700\pi$ cm^3

(Total 6 marks)

Question 18

Thelma spins a biased coin twice.

The probability that it will come down tails both times is 0.16

Calculate the probability that it will come down heads both times.

$\sqrt{0.16} = 0.4$

$1 - 0.4 = 0.6$

$0.6 \times 0.6 = 0.36$

(Total 3 marks)

Question 19

(a) Simplify $(27x^3)^{-\frac{2}{3}}$

$3x^{-2} = \frac{1}{(3x)^2} = \frac{1}{9x^2}$

..... $\frac{1}{9x^2}$ .....

(3)

(b) Given that $2^p \times 8^q = 2^r$
express r in terms of p and q.

$2^p \times 2^{3q} = 2^r$
$p + 3q = r$

r = ... p + 3q .....

(2)

(Total 5 marks)

Question 20

Here are the first 5 terms of a quadratic sequence.

1 4 11 22 37

Find an expression, in terms of *n*, for the *n*th term of this quadratic sequence in the form $ax^2 + bx + c$.

1 4 11 22 27

3 7 11 15

4 4 4

$2x^2$ 2 8 18 32 50

1 4 11 22 27

Linear sequence -(3x -2)

Quadratic sequence $2x^2 - 3x + 2$

..... **$2x^2 - 3x + 2$** .....

(Total 3 marks)

Question 21

Two similar solids have volumes of $30m^3$ and$1920m^3$

Ravi says the area of the base of the larger solid is 16 times the smaller solid.

Jo says the area of the base of the larger solid is 4 times the smaller solid.

Show clearly why Ravi is correct.

1920 ÷ 30 = 64

Cube root of 64 = 4 (scale factor)

$4^2 = 16$ ratios of areas are 1 : 16 so Ravi is correct

(Total 3 marks)

TOTAL FOR PAPER IS 80 MARKS