Pearson
Edexcel GCSE

Mathematics A

Paper 1 (Non-Calculator)

Higher Tier

| Wednesday 5 November 2014 – Morning | Paper Reference |
| Time: 1 hour 45 minutes | **1MA0/1H** |

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. 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.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**

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.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.
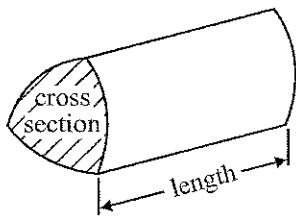
Turn over ▶

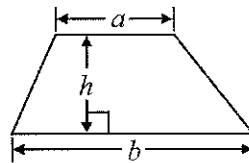**PEARSON**

GCSE Mathematics 1MA0

Formulae: Higher Tier

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

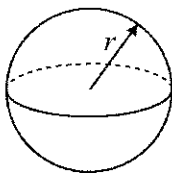**Volume of prism** = area of cross section × length

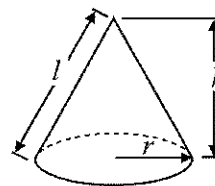**Area of trapezium** = $\frac{1}{2}(a + b)h$

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

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

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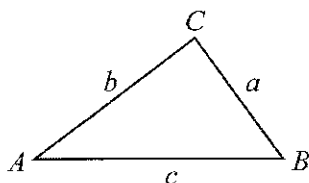
Curved surface area of cone = $\pi r l$

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 $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

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

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1   Using the information that

$$6.7 \times 52 = 348.4$$

find the value of

(i) 6.7×520

$$6.7 \times 52 \times 10 = 348.4 \times 10$$

.....**3484**.....

(ii) 67×0.52

$$6.7 \times 10 \times 52 \div 100 = 348.4 \times 10 \div 100$$

.....**34.84**.....

(iii) $3484 \div 5.2$

$$3484 \div 52 = 6.7$$
$$3484 \div 52 = 67$$
$$3484 \div 5.2 = 670$$

.....**670**.....

(Total for Question 1 is 3 marks)

*2   Karen got 32 out of 80 in a maths test.
She got 38% in an English test.

Karen wants to know if she got a higher percentage in maths or in English.

Did Karen get a higher percentage in maths or in English?

$$\text{Maths} = \frac{32}{80} = \frac{8}{20} = \frac{40}{100} = 40\%$$

$$\text{English} = 38\%$$

Higher percentage Maths

(Total for Question 2 is 2 marks)

3 Here are the heights, in cm, of 18 children.

98	90	84	102	115	91
88	91	108	110	97	93
90	89	103	95	92	106

Show this information in an ordered stem and leaf diagram.

```
 8 | 4 8 9
 9 | 0 0 1 1 2 3 5 7 8
10 | 2 3 6 8
11 | 0 5
```

Key:
$10 \mid 2 = 102$ cm

(Total for Question 3 is 3 marks)

4 Kalinda buys x packs of currant buns and y boxes of iced buns.

There are 6 currant buns in a pack of currant buns. $6 \times x$
There are 8 iced buns in a box of iced buns. $8 \times y$

Kalinda buys a total of T buns.
Write down a formula for T in terms of x and y.

$$T = 6 \times x + 8y$$

$$T = 6x + 8y$$

(Total for Question 4 is 3 marks)

5 (a) Solve the inequality $6y + 5 > 8$
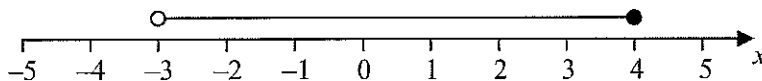
$$6y + 5 > 8$$
$$-5 \qquad -5$$
$$6y > 3$$
$$y > \tfrac{3}{6}$$

$$y > \tfrac{1}{2}$$

(2)

(b) Here is an inequality, in x, shown on a number line.

Write down the inequality.

$$-3 < x \leqslant 4$$

(2)

(Total for Question 5 is 4 marks)

P 4 4 5 8 5 A 0 5 2 8

*6 Steve wants to put a hedge along one side of his garden.

He needs to buy 27 plants for the hedge.
Each plant costs £5.54

Steve has £150 to spend on plants for the hedge.

Does Steve have enough money to buy all the plants he needs?

Cost of 27 plants :

$$5.54$$
$$\times \quad 27$$
$$= 3878$$
$$ 1108$$
$$ 149.58$$

Cost = £149.58

Steve has enough money .
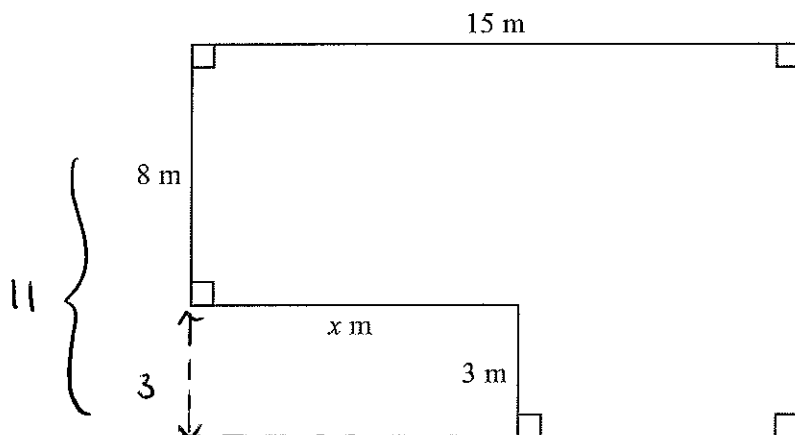
7   The diagram shows the plan of a floor.

15 m

8 m

11

3

x m

3 m

Diagram **NOT**
accurately drawn

The area of the floor is 138 m².

Work out the value of x.

Area of the floor = $(15 \times 11) - (3 \times x)$.

$(15 \times 11) - (3 \times x) = 138$

$165 - 3x = 138$

$165 - 138 = 3x$

$x = \dfrac{165 - 138}{3}$

$x = \dfrac{27}{3}$

$x = 9$

x = 9 m

(Total for Question 7 is 4 marks)

A ———————————— B ———————————→ C

65°
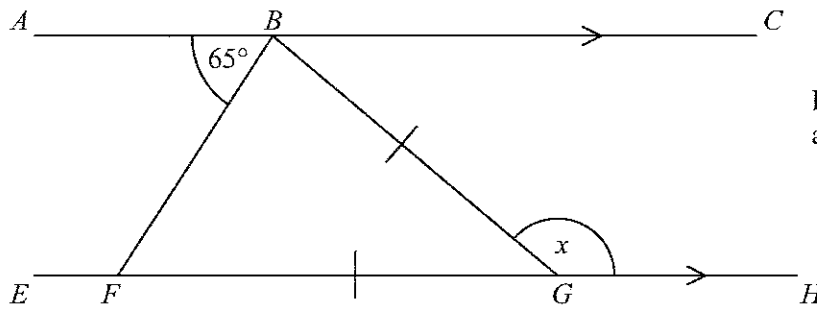
Diagram **NOT**
accurately drawn

E   F ——————————— G ——————— H

ABC is parallel to *EFGH*.

GB = GF
Angle *ABF* = 65°

Work out the size of the angle marked *x*.
Give reasons for your answer.

$\overset{\frown}{BFG} = 65°$ alternate angles in parallel lines

$\overset{\frown}{FBG} = 65°$ isocelas triangle

$\overset{\frown}{FGB} = 180 - 2 \times 65 = 50°$ angles in a
triangle + 180

$x = 180 - 50 = 130°$ angles on straight line
+ to 180°

OR $x = \overset{\frown}{FBG} + \overset{\frown}{BFG}$ (sum of opposite
interiors).

$x = 65 + 65 = 130°$

(Total for Question 8 is 4 marks)

9 Jack wants to find out how far people live from their nearest supermarket.

He uses this question on a questionnaire.

How far do you live from your nearest supermarket?

☐   ☐   ☐   ☐

0 to 2   2 to 3   3 to 4   5 to 6

(a) Write down **two** things wrong with this question.

1 *Overlapping.*

2 *Not specific   (no units of distance)*

(2)

Jack also wants to find out how often people go shopping.

(b) Write a question Jack could use on his questionnaire to find out how often people go shopping.

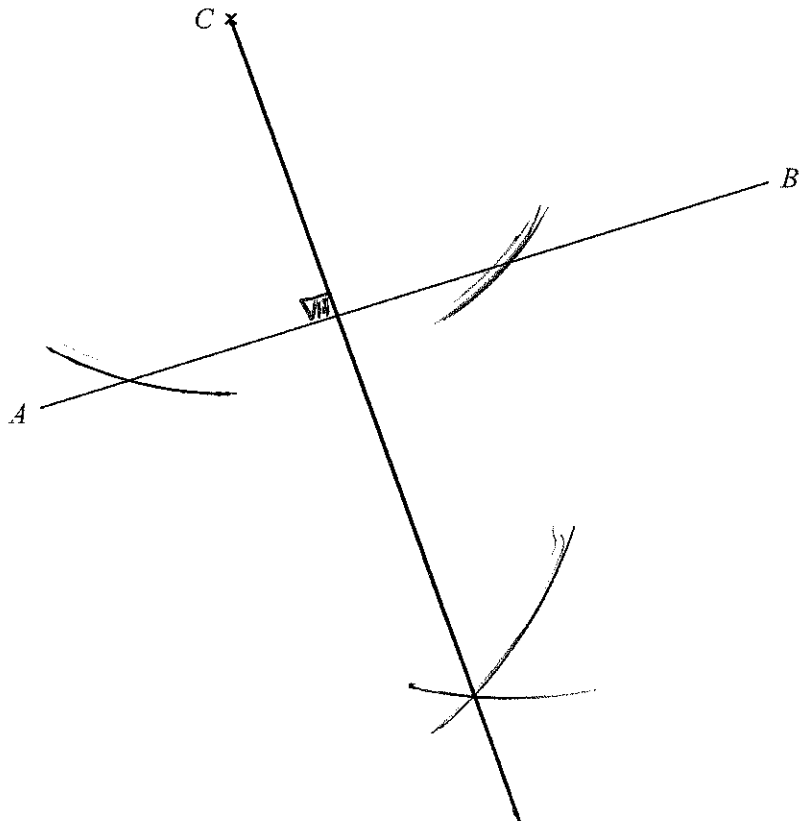*How often do you go shopping
per week ?*

☐   ☐   ☐   ☐

never   once   twice   3 times or more

(2)

(Total for Question 9 is 4 marks)

P 4 4 5 8 5 A 0 9 2 8

10 Use ruler and compasses to **construct** the perpendicular from point C to the line AB.
You must show all your construction lines.

C

B

A

(Total for Question 10 is 2 marks)

11 Ria is going to buy a caravan.
The total cost of the caravan is £7000 **plus** VAT at 20%.

Ria pays a deposit of £3000
She pays the rest of the total cost in 6 equal monthly payments.

Work out the amount of each monthly payment.

$$VAT = 20\% \text{ of } 7000 = \frac{20}{100} \times 7000 = £1400$$

$$\text{Total cost} = 7000 + 1400 = £8400$$

$$\text{Less the deposit} = 8400 - 3000 = £5400$$

$$\text{Monthly payment} = 5400 \div 6$$

$$= £900$$

£ ...... 900 ......

12 (a) Factorise $3e^2 + 5e$

$$e(3e + 5)$$

$$e(3e + 5)$$
(1)

(b) Solve $7(k - 3) = 3k - 5$

$$7k - 21 = 3k - 5$$
$$7k - 3k = -5 + 21$$
$$4k = 16$$
$$k = \frac{16}{4}$$

$k = \underline{\quad 4 \quad}$
(3)

(c) Expand and simplify $(2x + 3)(x - 8)$

$$2x^2 - 16x + 3x - 24$$
$$2x^2 - 13x - 24$$

$$2x^2 - 13x - 24$$
(2)

(d) Solve $\dfrac{7 - 3f}{4} = 2$

$$7 - 3f = 4 \times 2$$
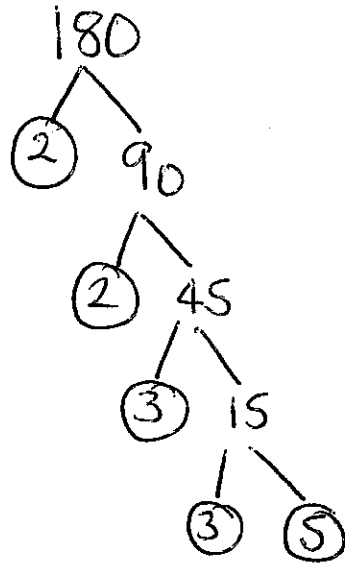$$7 - 3f = 8$$
$$7 - 8 = 3f$$
$$-1 = 3f$$

$f = \underline{\quad -\tfrac{1}{3} \quad}$
(3)

(Total for Question 12 is 9 marks)

13 (a) Express 180 as a product of its prime factors.

$$180$$
$$2 \quad 90$$
$$2 \quad 45$$
$$3 \quad 15$$
$$3 \quad 5$$

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

(3)

Martin thinks of two numbers.

He says,

"The Highest Common Factor (HCF) of my two numbers is 6
The Lowest Common Multiple (LCM) of my two numbers is a multiple of 15"

(b) Write down **two** possible numbers that Martin is thinking of.

$HCF = 6$
$LCM = $ multiple of $15 = 30, 45, 60$

2 numbers   6, 30

or   12, 30

$(6, 30)$, $(12, 30)$

(2)

(Total for Question 13 is 5 marks)

P 4 4 5 8 5 A 0 1 3 2 8

14 Suha has a full 600 m*l* bottle of wallpaper remover.
She is going to mix some of the wallpaper remover with water.

Here is the information on the label of the bottle.

Wallpaper remover
600 m*l*

Mix $\frac{1}{4}$ of the wallpaper remover
with 4500 m*l* of water

$= \frac{1}{4} \times 600 = 150 \text{ ml}$

Suha is going to use 750 m*l* of water.

How many millilitres of wallpaper remover should Suha use?
You must show your working.

$$75\cancel{0} \overline{)4\,50\cancel{0}} \quad 006$$

Wallpaper   water

$\div 6 \left(\begin{array}{cc} 150 & 4\,500 \\ 25 & 750 \end{array} \right) \div 6$

.... 25 .... m*l*

(Total for Question 14 is 4 marks)

15 The students in a class kept a record of the amount of time, in minutes, they spent doing homework last week.

The table shows information about the amount of time the girls spent doing homework last week.

	Minutes
Least amount of time	60
Range	230
Median	170
Lower quartile	100
Upper quartile	220

∴ maximum value =
60 + 230 = 290

(a) On the grid, draw a box plot for the information in the table.

Amount of time (minutes)
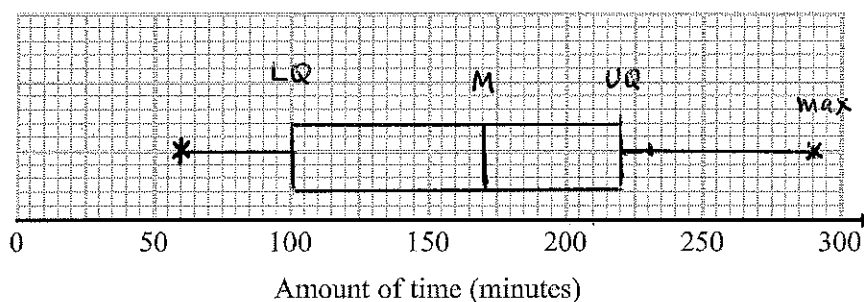
(2)

The box plot below shows information about the amount of time the boys spent doing homework last week.

Amount of time (minutes)
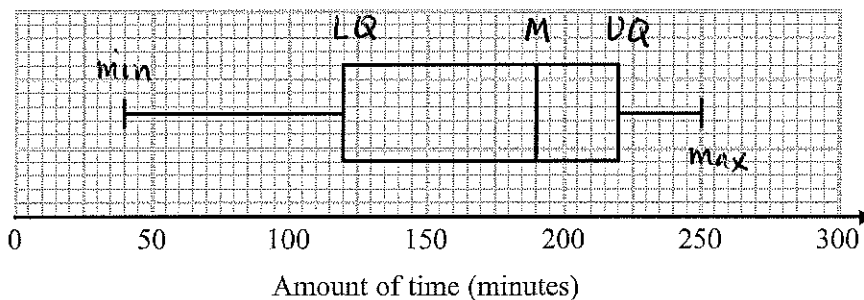
*(b) Compare the amount of time the girls spent doing homework with the amount of time the boys spent doing homework.

Median Boys higher than Median Girls

IQR Girls higher than IQR Boys -
= (120)   = (100)

(2)

(Total for Question 15 is 4 marks)

16 There are 200 workers at a factory.

The cumulative frequency table gives information about their ages.

Age (a years)	Cumulative frequency
$0 < a \leqslant 20$	25
$0 < a \leqslant 30$	70
$0 < a \leqslant 40$	138
$0 < a \leqslant 50$	175
$0 < a \leqslant 60$	186
$0 < a \leqslant 70$	194
$0 < a \leqslant 80$	200

(a) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(b) Graham says,

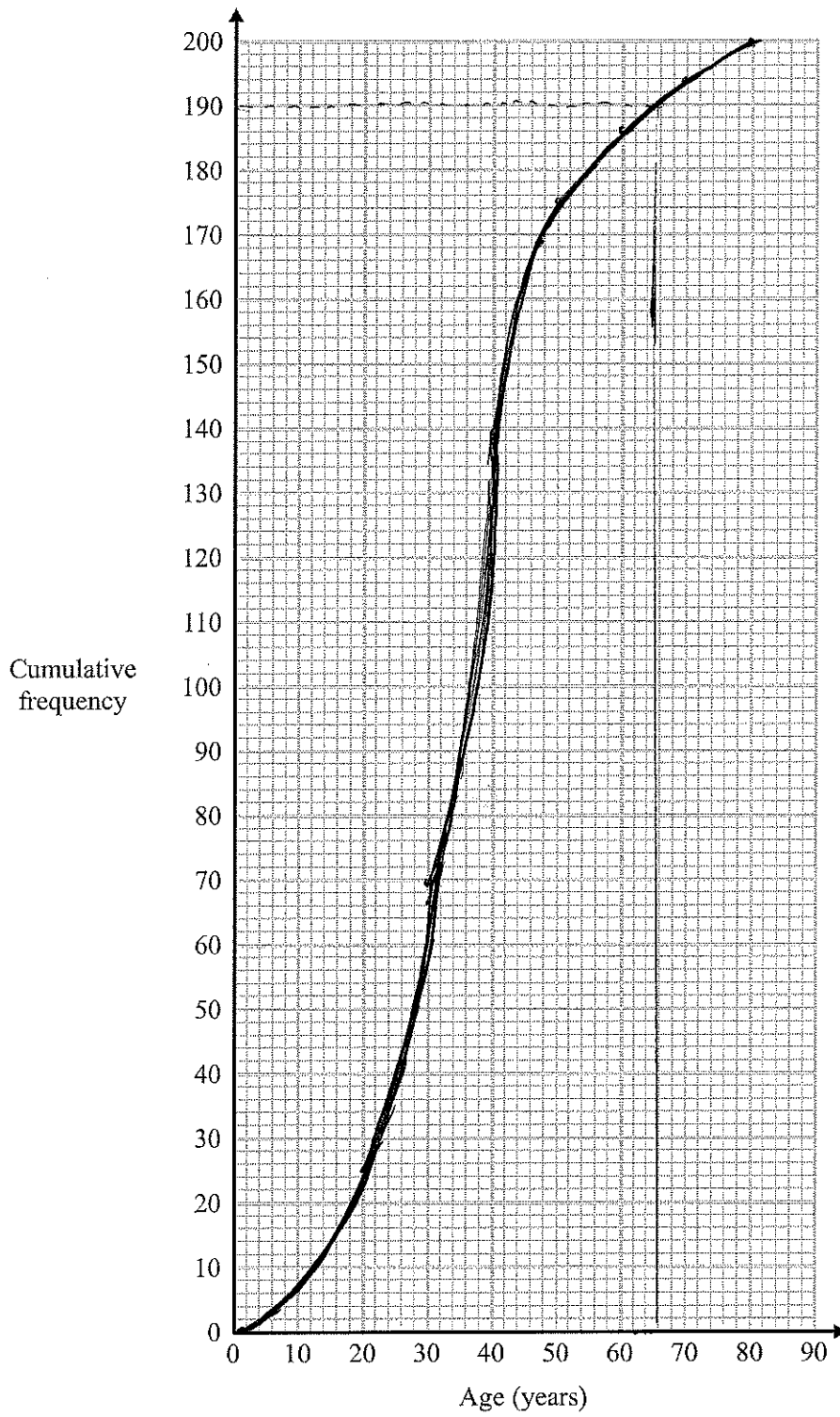"10% of workers at the factory are older than 65"

Is Graham correct?
You must show how you get your answer.

$10\% \ of \ 200 = \dfrac{10}{100} \times 200 = 20 \ workers.$

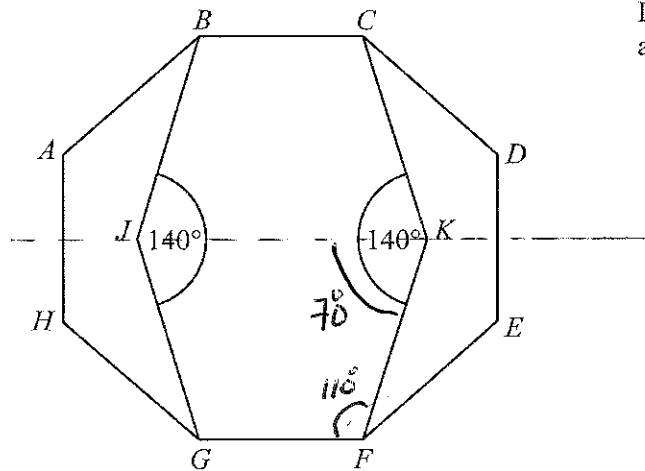From the CF curve, only about 10 workers are over 65 years old.

(2)

P 4 4 5 8 5 A 0 1 6 2 8

(Total for Question 16 is 4 marks)

Diagram **NOT** accurately drawn

ABCDEFGH is a regular octagon.
BCKFGJ is a hexagon.

JK is a line of symmetry of the hexagon.
Angle *BJG* = angle *CKF* = 140°

Work out the size of angle *KFE*.
You must show all your working.

$$K\widehat{F}E = G\widehat{F}E - G\widehat{F}K$$

• $G\widehat{F}E$ = interior angle of octagon.
Ext. = 360 ÷ 8 = 45° ∴ $G\widehat{F}E$ = 180 - 45 = 135°

$G\widehat{F}E = 135°$

• • JK line of symmetry   Trapezium JKGF isoceles
$J\widehat{K}F = G\widehat{J}K = 140 ÷ 2 = 70°$
$G\widehat{F}K = \dfrac{360 - 140}{2} = 110°$ (angles in a quadrilateral add up to 360°).

$K\widehat{F}E = 135° - 110° = 25°$

25°

(Total for Question 17 is 4 marks)

18 cm

12 cm

5 cm

B *C* *E* *F* *A* *G* *D*
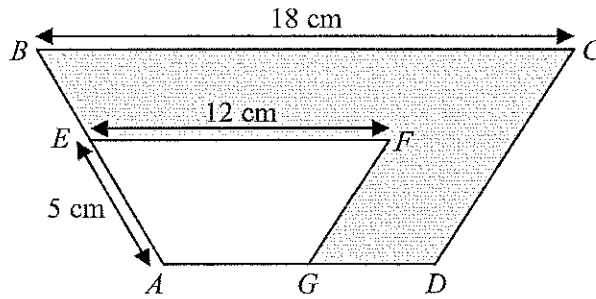
Diagram **NOT** accurately drawn

ABCD and *AEFG* are mathematically similar trapeziums.

AE = 5 cm

EF = 12 cm

BC = 18 cm

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

$12 \times sf = 18$ ∴ $SF = \frac{18}{12} = 1.5 = \frac{3}{2}$

$AE \times Sf = AB$

$5 \times 1.5 = AB$

$AB = 7.5$

............7.5............ cm

(2)

Trapezium *AEFG* has an area of 36 cm².

(b) Work out the area of the shaded region.

$\text{Area of } AEFG \times SF^2 = \text{Area } ABCD$

$\text{Area of } ABCD = 36 \times \left(\frac{3}{2}\right)^2 = 36 \times \frac{9}{4} = 81$

$\text{Area of shaded region} = 81 - 36$

$81 - 36 = 45$

............45............ cm²

(3)

(Total for Question 18 is 5 marks)

19 (a) Complete the table of values for $y = \dfrac{4}{x}$

x	0.5	1	2	4	5	8
y	$\dfrac{4}{0.5} = 8$	4	2	1	$\dfrac{4}{5} = 0.8$	$\dfrac{4}{8} = \frac{1}{2} = 0.5$

(2)

(b) On the grid, draw the graph of $y = \dfrac{4}{x}$ for $0.5 \leqslant x \leqslant 8$

(2)
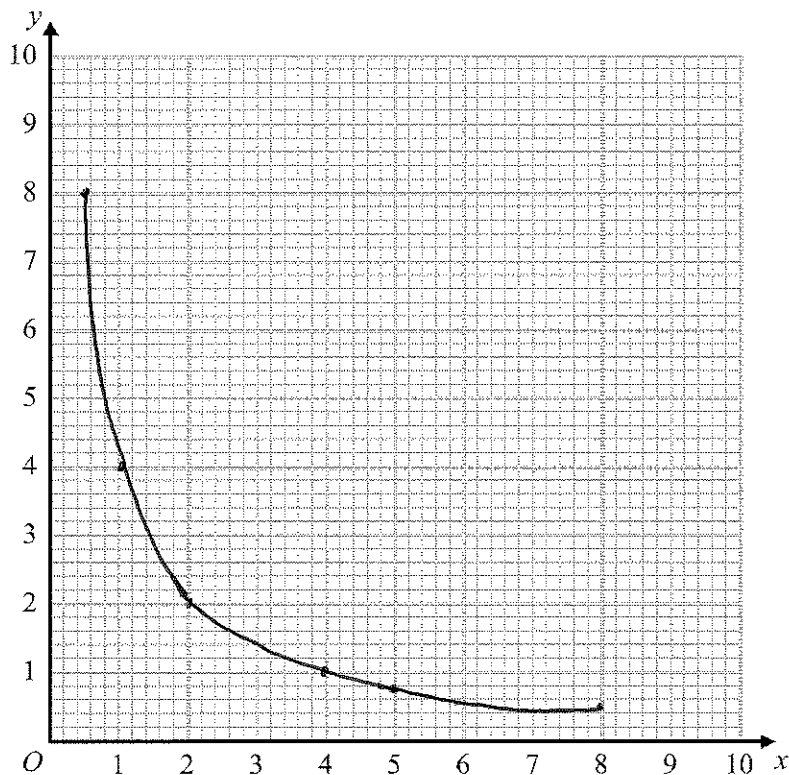
(Total for Question 19 is 4 marks)

20 The diagram shows a solid shape.

Diagram **NOT**
accurately drawn

10 cm

$2\pi r$

10 | SA cylinder

$2\pi r$
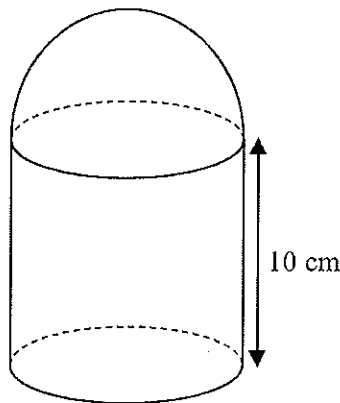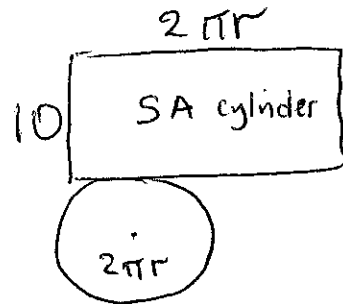
The solid shape is made from a cylinder and a hemisphere.
The radius of the cylinder is equal to the radius of the hemisphere.

The cylinder has a height of 10 cm.
The curved surface area of the hemisphere is 32π cm².

Work out the total surface area of the solid shape.
Give your answer in terms of π.

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

Surface area of hemisphere $= \dfrac{4\pi r^2}{2}$

$\dfrac{4\pi r^2}{2} = 2\pi r^2 \quad \therefore \quad 2\pi r^2 = 32\pi$

$r^2 = \dfrac{32\pi}{2\pi} = 16$

$r = 4\,cm$

Surface area of cylinder

$\pi r^2 + 2\pi r \times 10 = \pi \times 4^2 + 2\pi \times 4 \times 10$
$= 16\pi + 80\pi = 96\pi$

Total surface area $= 32\pi + 96\pi$
$= 128\pi$

........128π........ cm²

(Total for Question 20 is 5 marks)

P 4 4 5 8 5 A 0 2 1 2 8

21 Expand $(1 + \sqrt{2})(3 - \sqrt{2})$

Give your answer in the form $a + b\sqrt{2}$ where a and b are integers.

$$\left(1 + \sqrt{2}\right)\left(3 - \sqrt{2}\right)$$
$$3 - \sqrt{2} + 3\sqrt{2} - \sqrt{2}\sqrt{2}$$
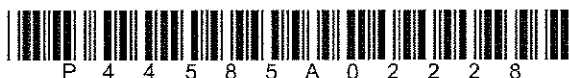$$3 + 2\sqrt{2} - \sqrt{4}$$
$$3 + 2\sqrt{2} - 2$$
$$1 + 2\sqrt{2}$$
$$a = 1 \quad b = 2$$

$\underline{1 + 2\sqrt{2}}$

(Total for Question 21 is 2 marks)

22 (a) Simplify fully $(3e)^0$

$= 3^0 e^0$

$$(1)$$

(b) Simplify fully $\left(\dfrac{64x^6}{25y^2}\right)^{-\frac{1}{2}}$

$= \dfrac{1}{\left(\dfrac{64x^6}{25y^2}\right)^{1/2}} = \dfrac{(25y^2)^{1/2}}{(64x^6)^{1/2}}$

$\dfrac{1}{}$

$= \dfrac{25^{1/2}\, y^{2\times\frac{1}{2}}}{64^{1/2}\, x^{6\times 1/2}}$

$\dfrac{5y}{8x^3}$

$$(2)$$

(c) Write $\dfrac{5}{x-3} - \dfrac{4}{x+3}$ as a single fraction in its simplest form.

$\dfrac{5(x+3) - 4(x-3)}{(x+3)(x-3)}$

$\dfrac{5x+15 - 4x+12}{(x+3)(x-3)} = \dfrac{x+27}{(x+3)(x-3)}$
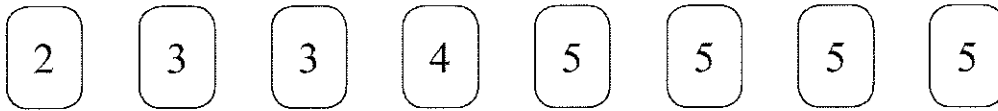
$\dfrac{x+27}{(x+3)(x-3)}$

$$(3)$$

(Total for Question 22 is 6 marks)

23 Paul has 8 cards.
There is a number on each card.

| 2 | | 3 | | 3 | | 4 | | 5 | | 5 | | 5 | | 5 |

Paul takes at random 3 of the cards.
He adds together the 3 numbers on the cards to get a total T.

Work out the probability that T is an odd number.

$$\begin{matrix} 2 \\ 3 \\ 4 \end{matrix} \quad \text{or} \quad \begin{matrix} 2 \\ 4 \\ 5 \end{matrix} \quad \text{or} \quad \begin{matrix} 3 \\ 3 \\ 5 \end{matrix} \quad \text{or} \quad \begin{matrix} 3 \\ 5 \\ 5 \end{matrix} \quad \text{or} \quad \begin{matrix} 5 \\ 5 \\ 5 \end{matrix}$$

6
Different ways

$$P(2,3,4) = \frac{1}{8} \times \frac{2}{7} \times \frac{1}{6} = \frac{2}{336} \quad \times 6 \longrightarrow \quad \begin{matrix} 2 & 2 & 3 & 3 & 4 & 4 \\ 3 & 4 & 2 & 4 & 3 & 2 \\ 4 & 3 & 4 & 2 & 2 & 3 \end{matrix}$$

$$P(2,4,5) = \frac{1}{8} \times \frac{1}{7} \times \frac{4}{6} = \frac{4}{336} \quad \times 6 \longrightarrow \quad \begin{matrix} 2 & 2 & 4 & 4 & 5 & 5 \\ 4 & 5 & 5 & 2 & 4 & 2 \\ 5 & 4 & 2 & 5 & 2 & 4 \end{matrix}$$

$$P(3,3,5) = \frac{2}{8} \times \frac{1}{7} \times \frac{4}{6} = \frac{8}{336} \quad \times 3 \longrightarrow \quad \begin{matrix} 3 & 3 & 5 \\ 3 & 5 & 3 \\ 5 & 3 & 3 \end{matrix}$$
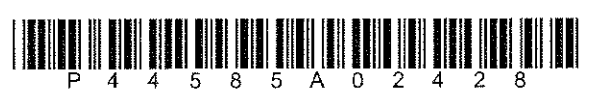
$$P(3,5,5) = \frac{2}{8} \times \frac{4}{7} \times \frac{3}{6} = \frac{24}{336} \quad \times 3 \longrightarrow \quad \begin{matrix} 3 & 5 & 5 \\ 5 & 3 & 5 \\ 5 & 5 & 3 \end{matrix}$$

$$P(5,5,5) = \frac{4}{8} \times \frac{3}{7} \times \frac{2}{6} = \frac{24}{336} \quad \times 1 \longrightarrow \quad \begin{matrix} 5 \\ 5 \\ 5 \end{matrix}$$

$$= 6 \times \frac{2}{336} + 6 \times \frac{4}{336} + 3 \times \frac{8}{336} + 3 \times \frac{24}{336} + 1 \times \frac{24}{336}$$

$$= \frac{12}{336} + \frac{24}{336} + \frac{24}{336} + \frac{72}{336} + \frac{24}{336} = \frac{12+144}{336} \quad \boxed{\frac{156}{336}}$$

(Total for Question 23 is 4 marks)

*24 A is the point with coordinates (1, 3)

B is the point with coordinates (4, –1)

The straight line L goes through both A and B.

Is the line with equation $2y = 3x - 4$ perpendicular to line L?

You must show how you got your answer.

. Gradient of line AB :

$$\frac{-1 - 3}{4 - 1} = \frac{-4}{3}$$

. Gradient of line with equation (L₁).

$$2y = 3x - 4$$

$$y = \frac{3}{2}x - \frac{4}{2}$$

$$= \frac{3}{2}x - 2 \quad . \text{ Gradient } \frac{3}{2}$$

2 lines are perpendicular if $G_L \times G_{L_1} = -1$.

$$-\frac{4}{3} \times \frac{3}{2} \overset{?}{=} -1$$
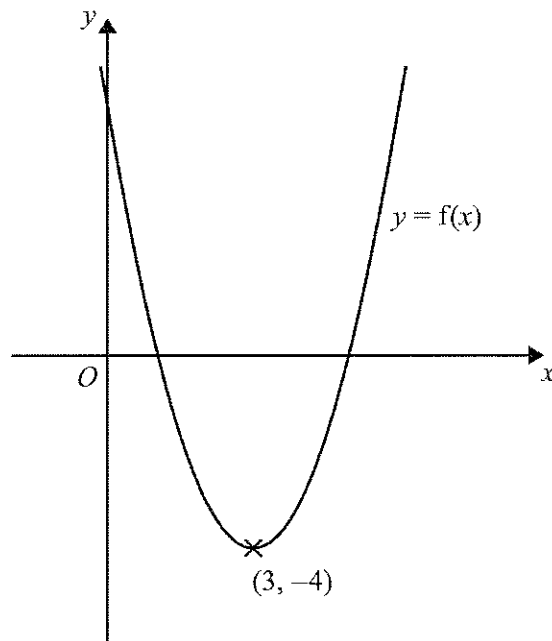
$$-\frac{4}{2} \overset{?}{=} -1$$

$$-2 \neq -1 .$$

(Total for Question 24 is 4 marks)

Lines are <u>Not</u> perpendicular.

The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the minimum point of this curve are $(3, -4)$

Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x) + 3$ $\left(3, -4\right) \longrightarrow \left(3, -4+3\right)$

(...3.... , ...-1...)

(ii) $y = f(2x)$ $\left(3, -4\right) \longrightarrow \left(3 \times \frac{1}{2}, -4\right)$

(...1·5... , ...-4...)

(iii) $y = f(-x)$ $\left(3, -4\right) \longrightarrow \left(-3, -4\right)$

(...-3... , ...-4...)

(Total for Question 25 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS

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