Please check the examination details below before entering your candidate information

Candidate surname	Other names
Eng. Ahmed Sherif	

Pearson Edexcel International GCSE

Centre Number

Candidate Number

Time **2 hours**

Paper reference	**4MA1/2H**

Mathematics A
PAPER 2H
Higher Tier

+201003773995

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.
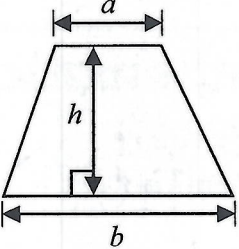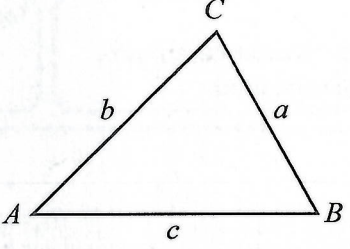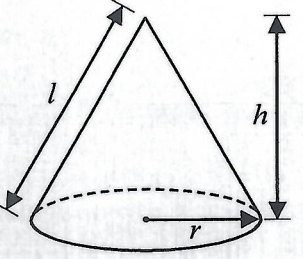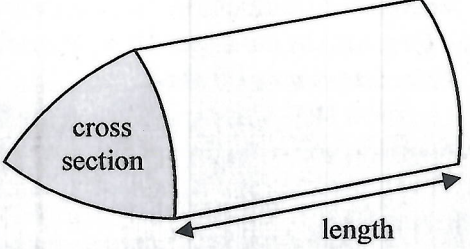- Good luck with your examination.
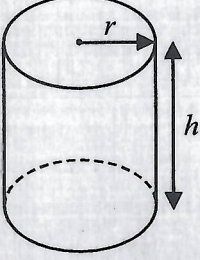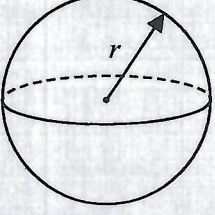
*Turn over* ▶

International GCSE Mathematics
Formulae sheet – Higher Tier

Arithmetic series

Sum to n terms, $S_n = \dfrac{n}{2}\,[2a + (n-1)d]$

The quadratic equation

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

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

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

Trigonometry

In any triangle ABC

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 $= \dfrac{1}{2}ab\sin C$

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

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

Volume of prism = area of cross section × length

Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi r h$

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

Surface area of sphere $= 4\pi r^2$
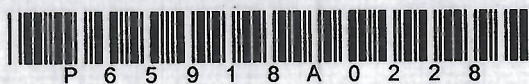
Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.
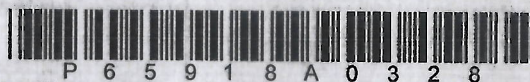
1   Write 600 as a product of powers of its prime factors.
    Show your working clearly.

$$600 = 2^3 \times 5^2 \times 3$$

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2	600
2	300
2	150
3	75
5	25
5	5
	1

....

(Total for Question 1 is 3 marks)

P65918A0328

2 Show that $2\frac{4}{7} \div 1\frac{1}{8} = 2\frac{2}{7}$

$$\frac{18}{7} \div \frac{9}{8} = \frac{\cancel{18}^{2}}{7} \times \frac{\cancel{8}}{\cancel{9}} = \frac{16}{7}$$

$$= 2\frac{2}{7}$$

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(Total for Question 2 is 3 marks)

3 The bearing of Paris from London is 149°

Work out the bearing of London from Paris.

London   149

31   Paris

360 − 31
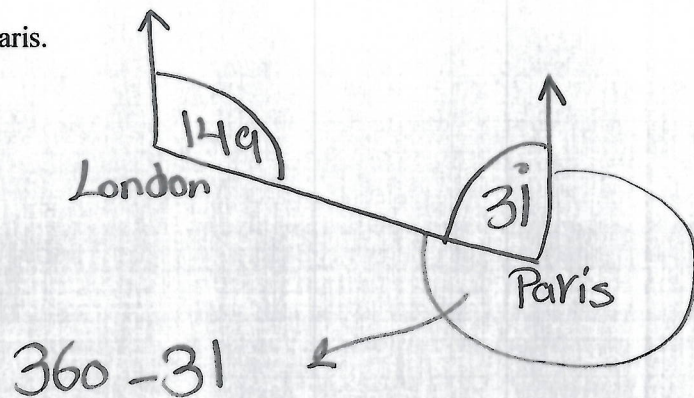
329 °

(Total for Question 3 is 2 marks)
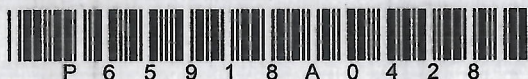
4 $\mathscr{E}$ = {letters of the alphabet}
  B = {b, r, a, z, i, l}
  I = {i, r, e, l, a, n, d}

  (a) List the members of the set

   (i) $B \cup I$

   b, r, a, z, i, L, e, n, d

   (ii) $B \cap I'$

   b, z
   (2)

  K = {k, e, n, y, a}

  Cody writes down the statement $B \cap K = \varnothing$
  Cody's statement is wrong.

  (b) Explain why.

   as, $B \cap K = \{a\}$
   (1)

   (Total for Question 4 is 3 marks)

P 6 5 9 1 8 A 0 5 2 8

5

E

44°

$6\chi°$

$\dfrac{180 - 44}{2}$

$= 68°$

Diagram **NOT** accurately drawn

A —— B —— C —— D

F —— G   H —— I

J

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#
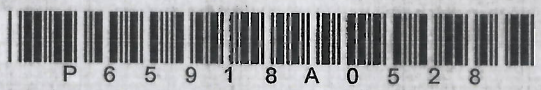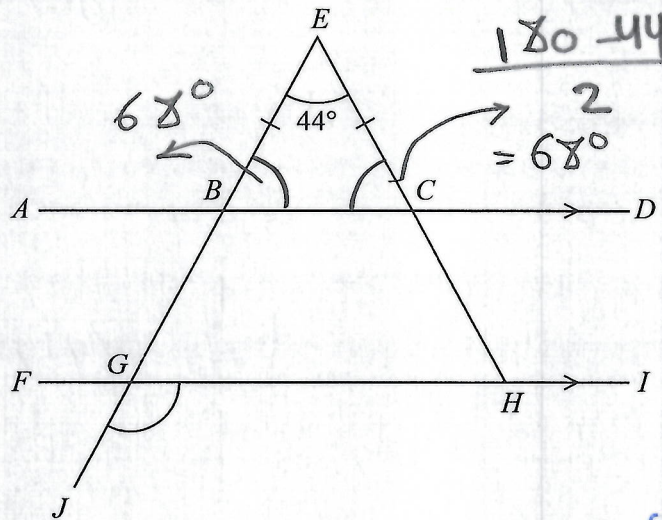
ABCD and *FGHI* are parallel straight lines.
EBGJ and *ECH* are straight lines.

BE = *CE*
Angle *BEC* = 44°

Work out the size of angle *JGH*.
Give a reason for each stage of your working.

Angle (EBC) = Angle (ECB) = $\dfrac{180 - 44}{2} = 68°$

"iscoscedes triangle"

Angle (EBC) = Angle (EGH) = $68°$

" corresPonding Angles "

Angle (jGH) = $180 - 68 = 112°$

" straight angle "

112 °

(Total for Question 5 is 5 marks)

P 6 5 9 1 8 A 0 6 2 8

6 Mariana sells bags of bird food.

The bags that Mariana sold last week each contained 12 kg of seeds.

The bags that she is going to sell next week will each contain a mixture of nuts and seeds where for each bag

$$\text{weight of nuts} : \text{weight of seeds} = 4 : 5$$

The total weight of the nuts and the seeds in each bag will be 19.35 kg

The weight of seeds in each bag that Mariana sells next week will be less than the weight of seeds in each bag that Mariana sold last week.

Work out this decrease as a percentage of the weight of seeds in each bag that Mariana sold last week.

Give your answer correct to one decimal place.

Nuts : Seeds : Total
4 : 5 : 9

next week
↑
: 19.35

$$\text{Seeds} = \frac{5 \times 19.35}{9} = 10.75 \text{ kg}$$

$$\% \text{ increase} = \left(\frac{12 - 10.75}{12}\right) \times 100 = 10.4 \% \underline{(1 \, d.P)}$$

10.4 %

(Total for Question 6 is 4 marks)

P 6 5 9 1 8 A 0 7 2 8
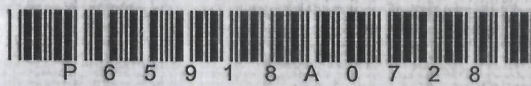
7 Here is a right-angled triangle.

Diagram NOT
accurately drawn

6.5 cm

x cm

42°
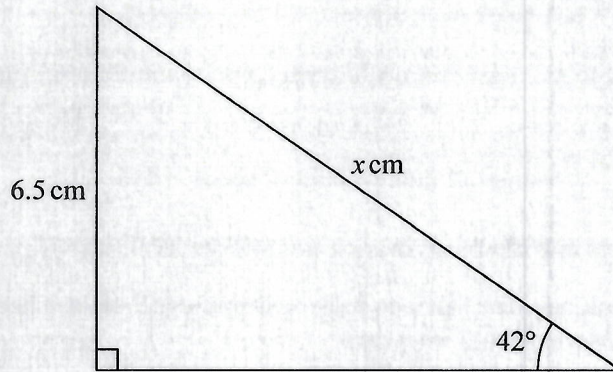
Work out the value of x.
Give your answer correct to one decimal place.

$$\sin(42°) = \frac{6.5}{X}$$

$$X = \frac{6.5}{\sin(42°)} = 9.7 \text{ cm } (1 \text{ d.P})$$

$x = $ .... 9.7 ....

(Total for Question 7 is 3 marks)
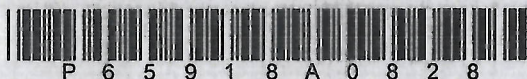
8 Solve the simultaneous equations

$$5a + 2c = 10 \quad \times 2$$
$$2a - 4c = 7$$

Show clear algebraic working.

$$+\begin{array}{r} 10a + 4c = 20 \\ 2a - 4c = 7 \\ \hline 12a = 27 \div 12 \end{array}$$

$$\boxed{a = \frac{9}{4}}$$

$$5\left(\frac{9}{4}\right) + 2c = 10$$

$$2c = \frac{-5}{4}$$

$$\boxed{c = \frac{-5}{8}}$$

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a = __9/4__

c = __-5/8__

(Total for Question 8 is 3 marks)

9 (i) Factorise $x^2 + 2x - 24$

$(x-2)($

$(x-4)(x+6)$

(2)

(ii) Hence solve $x^2 + 2x - 24 = 0$

$$x = 4, \; x = -6$$

(1)

(Total for Question 9 is 3 marks)
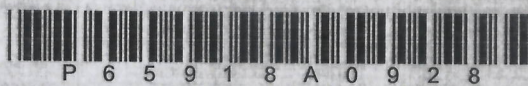
10 Here is a triangular prism.

11.2 cm

Diagram **NOT** accurately drawn

15 cm

7.4 cm
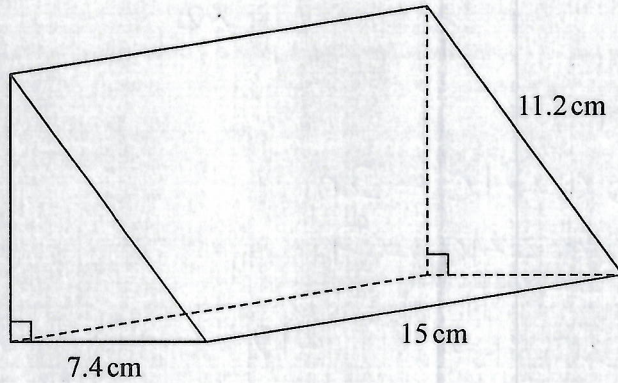
Work out the volume of the prism.
Give your answer correct to 3 significant figures.

$$h = \sqrt{(11\cdot2)^2 - (7\cdot4)^2}$$

$$h = 8.41 \text{ cm } \underline{(3 S \cdot F)}$$

(h)   11·2

7·4
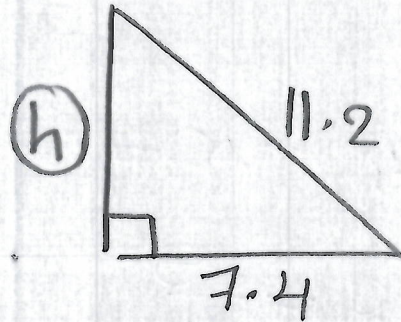
Volume = Area OF △ × length

$$= \frac{1}{2} \times 7.4 \times 8.41 \times 15$$

$$= 466.755 \text{ cm}^3$$

$$\simeq 467 \text{ cm}^3$$

.... cm³

(Total for Question 10 is 5 marks)

P 6 5 9 1 8 A 0 1 0 2 8

11 Chengbo sold a house for 180 000 yuan.

The amount for which he sold the house is 24% more than the amount he paid for the house.

(a) Work out how much Chengbo paid for the house.
   Give your answer correct to 3 significant figures.

$$124\% \longrightarrow 180000$$
$$100\% \longrightarrow \otimes$$

$$\text{Paid} = \frac{100 \times 180000}{124} = 145161.29$$

$$\simeq 145000 \text{ Yuan (3S.F)}$$

................145000........... yuan

(3)

Zhi bought a house on 1st January 2017
When she bought the house, its value was 120 000 yuan.

The value of the house increased by 1.8% per year.

(b) Work out the value of Zhi's house on 1st January 2020 → 3 Years
   Give your answer correct to 3 significant figures.

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$$120\,000\left(1 + \frac{1.8}{100}\right)^3$$

$$= 126597.34 \quad \text{Yuan}$$

$$\simeq 127000 \quad \text{Yuan}$$

................127000........... yuan

(3)

(Total for Question 11 is 6 marks)

P 6 5 9 1 8 A 0 1 1 2 8
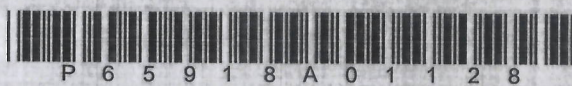
12 The cumulative frequency table gives information about the distance, in kilometres, that each of 80 workers travel from home to work at Office A.

Distance travelled (d km)	Cumulative frequency
$0 < d \leqslant 5$	17
$0 < d \leqslant 10$	32
$0 < d \leqslant 15$	57
$0 < d \leqslant 20$	70
$0 < d \leqslant 25$	76
$0 < d \leqslant 30$	80

(a) On the grid below, draw a cumulative frequency graph for the information in the table.
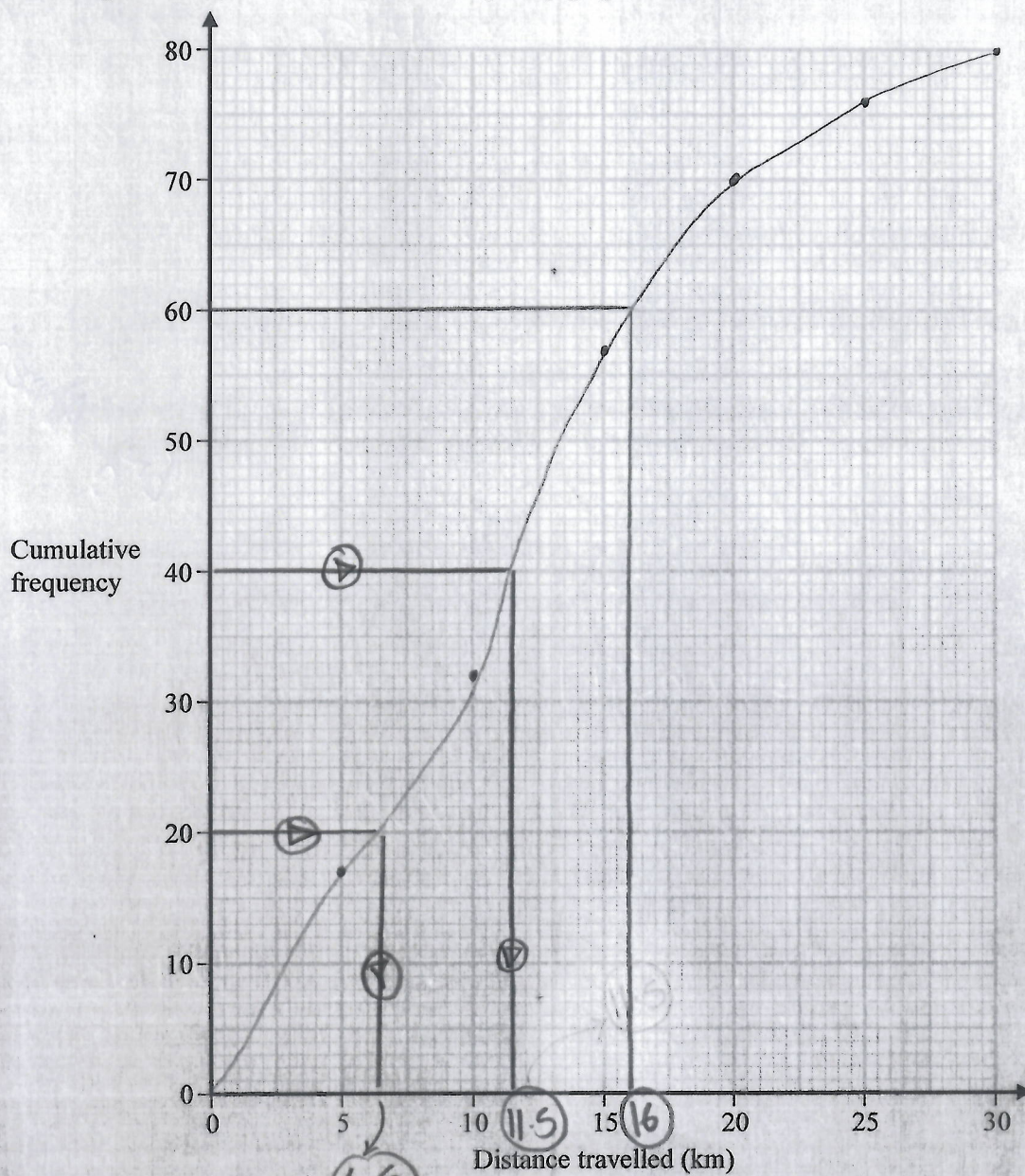
Cumulative frequency

Distance travelled (km)

(2)
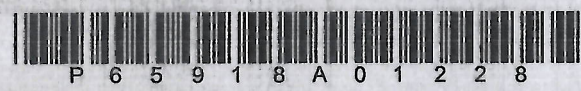
(b) Use your graph to find an estimate for the median distance travelled.

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.......11·5....... km

(1)

(c) Use your graph to find an estimate for the interquartile range of the distances travelled.

$$UQ = 16$$
$$LQ = 6\cdot5$$
$$IQR = 16 - 6\cdot5 = 9\cdot5$$

.......9·5....... km

(2)

For Office B, the median distance workers travel from home to work is 15 km and the interquartile range is 5 km.

(d) Use the information above to compare the distances that workers at Office A and workers at Office B travel from home to work.
Write down **two** comparisons.

1 ....Median)$_B$ > Median)$_A$.......................................

....on Average the distance to office B were longer....

2 ....

....IQR)$_B$ < IQR)$_A$....

(2)

distance to office B
less variable then to office A

(Total for Question 12 is 7 marks)
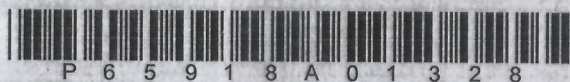
13 Emilie takes part in two races.

The probability that she wins the first race is 0.7
The probability that she wins the second race is 0.4
The outcomes of the two races are independent.

(a) Complete the probability tree diagram.

First race   Second race

```
                                                    0.4      Emilie wins
                            Emilie wins
              0.7                          0.6      Emilie does
                                                    not win

              0.3                          0.4      Emilie wins
                            Emilie does
                            not win        0.6      Emilie does
                                                    not win
```
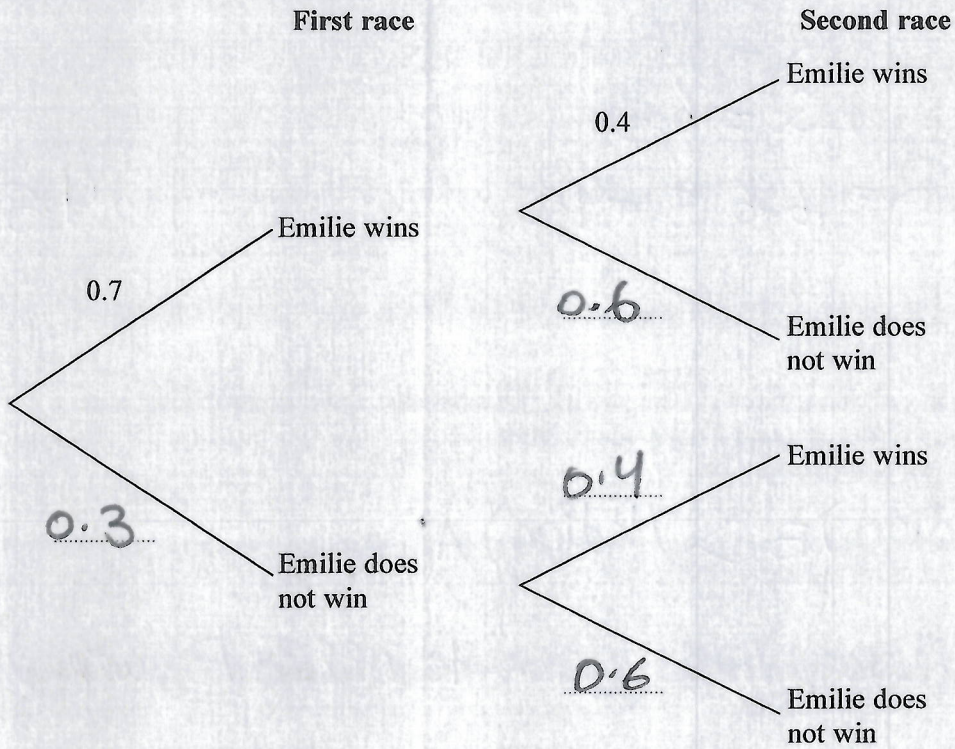
(2)

(b) Work out the probability that Emilie wins exactly one of the two races.

$$P(\text{win, not}) + P(\text{not, win})$$

$$0.7 \times 0.6 + 0.3 \times 0.4$$

$$= 0.54$$

0.54

(3)

Emilie is going to take part in a third race.

If she wins both of the first two races, the probability that she will win the third race is 0.6

If she wins exactly one of the first two races, the probability that she will win the third race is 0.3

(c) Work out the probability that Emilie will win exactly two of the three races.

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$P(\text{win, win, not win}) + P(\text{win, not win, win})$

$+ P(\text{not, win, win})$

$0.7 \times 0.4 \times 0.4 + 0.7 \times 0.6 \times 0.3$
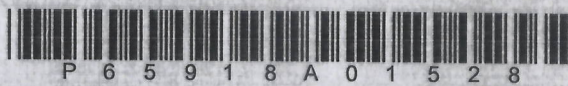
$+ 0.3 \times 0.4 \times 0.3$

$= 0.112 + 0.126 + 0.036$

$= 0.274$

(3)

(Total for Question 13 is 8 marks)

P 6 5 9 1 8 A 0 1 5 2 8

14 Simplify fully $\left(\dfrac{9x^4}{16y^{10}}\right)^{-\frac{1}{2}}$

$$\left(\frac{16y^{10}}{9x^4}\right)^{1/2} = \frac{(16)^{1/2}\; y^{10\times\frac{1}{2}}}{(9)^{1/2}\; x^{4\times\frac{1}{2}}}$$

$$= \frac{4y^5}{3x^2}$$

(Total for Question 14 is 3 marks)

15 (a) Complete the table of values for $y = \dfrac{1}{x}(x^2 + 4)$

x	0.25	0.5	1	2	4	8
y	16.25	8.5	5	4	5	8.5

(2)

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P 6 5 9 1 8 A 0 1 6 2 8

(b) On the grid, draw the graph of $y = \dfrac{1}{x}(x^2 + 4)$ for $0.25 \leqslant x \leqslant 8$

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(2)
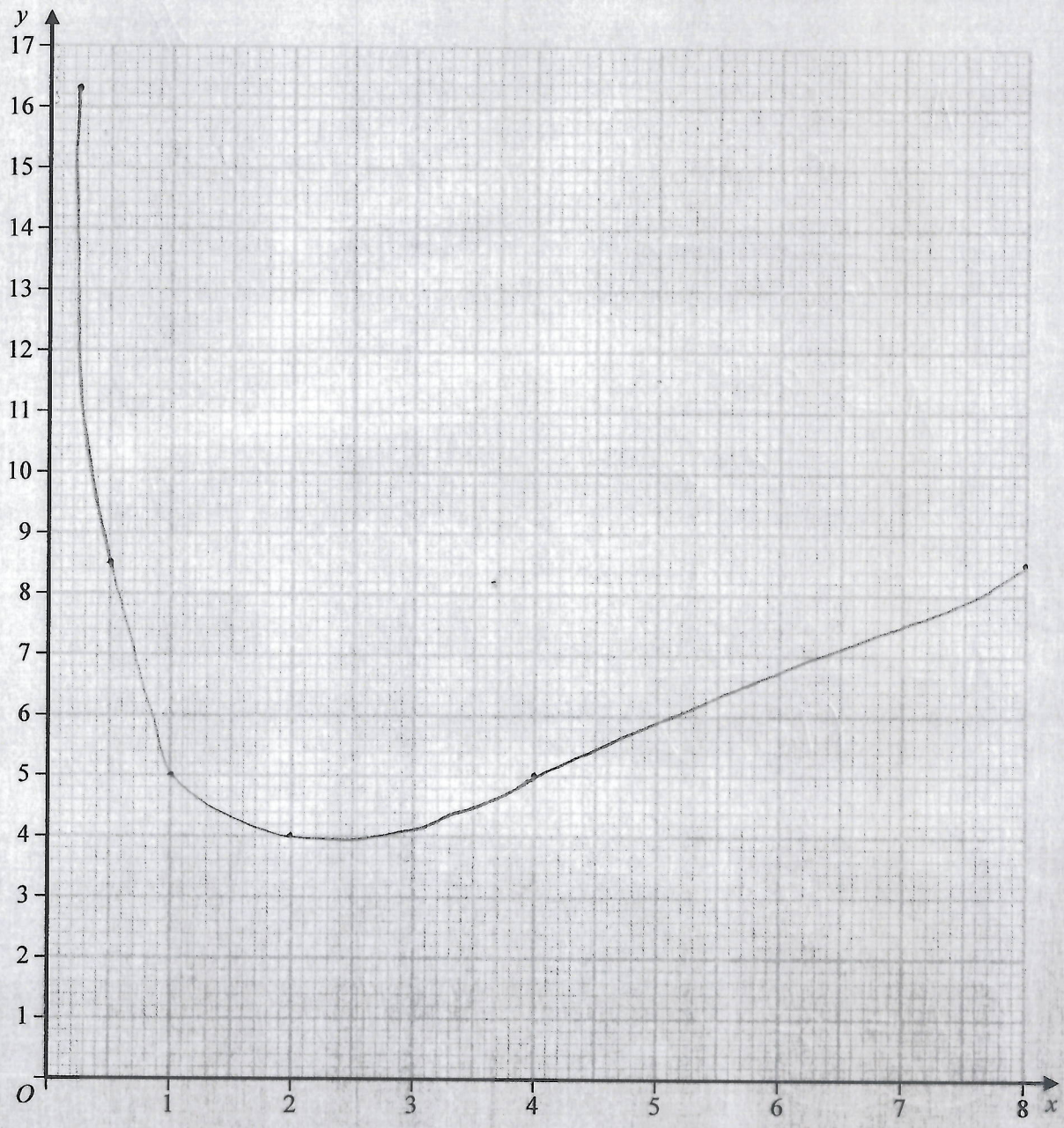
(Total for Question 15 is 4 marks)

P 6 5 9 1 8 A 0 1 7 2 8
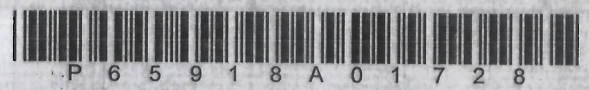
16 A is inversely proportional to the square of r

$A = 5$ when $r = 0.3$

(a) Find a formula for A in terms of r

$$A = \frac{k}{r^2}$$

$$5 = \frac{k}{(0.3)^2} \longrightarrow k = 0.45$$

$$A = \frac{0.45}{r^2}$$

(3)

(b) Find the value of A when $r = 7.5A$

$$A = \frac{0.45}{(7.5)^2 A^2}$$

$$A^3 = \frac{1}{125}$$

$$A = \frac{1}{5}$$

$A = $ ....

(3)

(Total for Question 16 is 6 marks)

P 6 5 9 1 8 A 0 1 8 2 8

17 The straight line L passes through the points (4, −1) and (6, 4)

The straight line M is perpendicular to L and intersects the y-axis at the point (0, 8)

Find the coordinates of the point where M intersects the x-axis.

$$m_L = \frac{4-(-1)}{6-4} = \frac{5}{2}$$

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$$m_M \downarrow$$

Perpendicular

$$= \frac{-2}{5}$$

use Point (0, 8)

$$y = \frac{-2}{5}x + c \longrightarrow$$

$$y = \frac{-2}{5}x + 8 \longrightarrow$$

intersects x-axis

$$\boxed{y = 0}$$

$$0 = \frac{-2}{5}x + 8$$

$$\frac{-2}{5}x = -8 \longrightarrow \boxed{x = -20}$$

(−20 , 0)

(Total for Question 17 is 4 marks)

P 6 5 9 1 8 A 0 1 9 2 8

8 cm

B

Diagram **NOT**
accurately drawn

A

98°

63°

7.5 cm

35° *C*

82°

D
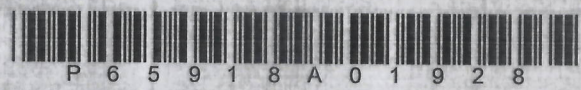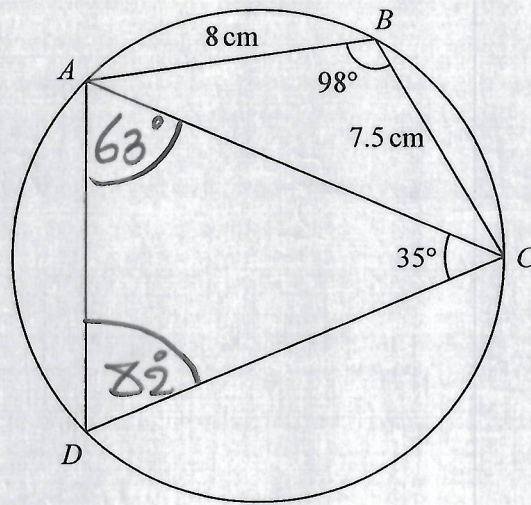
ABCD is a quadrilateral where *A*, *B*, *C* and *D* are points on a circle.

AB = 8 cm
BC = 7.5 cm
Angle *ABC* = 98°
Angle *ACD* = 35°

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Work out the perimeter of quadrilateral *ABCD*.
Give your answer correct to one decimal place.

Angle $(ADC) = 180 - 98 = 82°$

Angle $(DAC) = 180 - (82+35) = 63°$

$$AC = \sqrt{(8)^2 + (7.5)^2 - 2 \times 8 \times 7.5 \times \cos(98)} = \underline{11.7} \text{ cm}$$

$$\frac{DC}{\sin(63)} = \frac{11.7}{\sin 82} = \frac{AD}{\sin 35}$$

$$DC = \frac{11.7 \times \sin(63)}{\sin(82)} = 10.527 \text{ cm}$$

$$AD = \frac{11.7 \times \sin(35)}{\sin(82)} = 6.78 \text{ cm}$$

P 6 5 9 1 8 A 0 2 0 2 8

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$$Perimeter = AB + BC + CD + AD$$

$$= 8 + 7.5 + 10.527 + 6.78$$

$$= 32.807$$

$$\simeq \underline{\underline{32.8cm}}$$

.... cm

(Total for Question 18 is 6 marks)
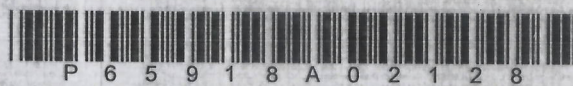
P 6 5 9 1 8 A 0 2 1 2 8

19 Solve the simultaneous equations

$$y = 3 - 2x$$
$$x^2 + y^2 = 18$$

Show clear algebraic working.

$$x^2 + (3 - 2x)^2 = 18$$

$$x^2 + 9 - 12x + 4x^2 - 18 = 0$$

$$5x^2 - 12x - 9 = 0$$

$$(5x + 3)(x - 3) = 0$$

$$x = \frac{-3}{5}, \quad x = 3$$

$$y = 3 - 2\left(\frac{-3}{5}\right) = \frac{21}{5}$$

$$y = 3 - 2(3) = -3$$

$$\left(\frac{-3}{5}, \frac{21}{5}\right), \quad (3, -3)$$

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(Total for Question 19 is 5 marks)

P 6 5 9 1 8 A 0 2 2 2 8

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20 Mathematically similar wooden blocks are made in a workshop.

There are small blocks and there are large blocks.

The volume of each small block is 300 cm^3

Given that

the surface area of each small block : the surface area of each large block $= 25 : 36$

work out the volume of each large block.

$$\frac{A_{small}}{A_{large}} = \frac{25}{36}$$

$$\text{Scale Factor}\big)_{sides} = \sqrt{\frac{25}{36}} = \frac{5}{6}$$

$$\frac{V_{small}}{V_{large}} = \frac{300}{V_{large}} = \frac{5}{6}$$

$$V_{large} = \frac{300 \times 6}{5} = 360 \text{ cm}^3$$

360 _____ cm³

(Total for Question 20 is 3 marks)

P 6 5 9 1 8 A 0 2 3 2 8
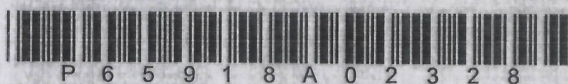
21 The point A is the only stationary point on the curve with equation $y = kx^2 + \dfrac{16}{x}$
where k is a constant.

Given that the coordinates of A are $\left(\dfrac{2}{3}, a\right)$

find the value of a.
Show your working clearly.

$$y = kx^2 + 16x^{-1}$$

$$\frac{dy}{dx} = 2kx - 16x^{-2}$$

$$2k\left(\frac{2}{3}\right) - 16\left(\frac{2}{3}\right)^{-2} = 0$$

$$\frac{4}{3}k - 36 = 0$$

$$\boxed{k = 27}$$

$$y = 27x^2 + \frac{16}{x}$$

$$a = 27\left(\frac{2}{3}\right) + \frac{16}{\frac{2}{3}}$$

$$\boxed{a = 42}$$

$a =$ 42

(Total for Question 21 is 5 marks)

22 The curve **S** has equation $y = f(x)$ where $f(x) = x^2$
The curve **T** has equation $y = g(x)$ where $g(x) = 2x^2 - 12x + 13$

By writing g(x) in the form $a(x - b)^2 - c$, where a, b and c are constants,
describe fully a series of transformations that map the curve **S** onto the curve **T**.

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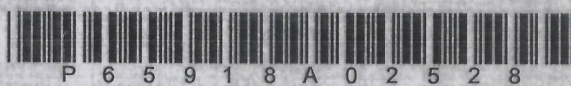#

$$g(x) = 2\left(x^2 - 6x + \frac{13}{2}\right)$$

$$2\left[(x^2 - 6x + 9) + \frac{13}{2} - 9\right]$$

$$2\left[(x - 3)^2 - \frac{5}{2}\right]$$

$$g(x) = 2(x - 3)^2 - 5$$

Horizontal (Right)

① translate x-coord. by **3** units

② Stretching vertical by **2** units

③ translate vertical "downward"
by **5** units

(Total for Question 22 is 4 marks)

P 6 5 9 1 8 A 0 2 5 2 8

23 Pippa has a box containing N pens.

There are only black pens and red pens in the box.
The number of black pens in the box is 3 more than the number of red pens.

Pippa is going to take at random 2 pens from the box.

The probability that she will take a black pen **followed** by a red pen is $\dfrac{9}{35}$

Find the possible values of N.
Show clear algebraic working.

$$\text{Black} = 3 + X$$
$$\text{Red} = X$$

$$N = 2X + 3$$

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$$P(\text{Black}, \text{Red}) = \frac{9}{35}$$

$$\frac{X+3}{2X+3} \times \frac{X}{2X+2} = \frac{9}{35}$$

$$\frac{X^2 + 3X}{4X^2 + 4X + 6X + 6} = \frac{X^2 + 3X}{4X^2 + 10X + 6} = \frac{9}{35}$$

$$36X^2 + 90X + 54 = 35X^2 + 105X$$

$$X^2 - 15X + 54 = 0$$

$$(X - 9)(X - 6) = 0$$

$$X = 9 \qquad X = 6$$

$$N = 2(9) + 3 = 21$$

$$N = 2(6) + 3 = 15$$

P 6 5 9 1 8 A 0 2 6 2 8