Pearson Edexcel
Level 1 / Level 2
GCSE (9–1)

Centre Number **1 0 6 5 8**

Candidate Number **2 4 5 0**

Mathematics
Paper 2 (Calculator)

Higher Tier

Thursday 8 June 2017 – Morning
Time: 1 hour 30 minutes

Paper Reference
1MA1/2H

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

42 41

NDU56041676

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.*
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 80.
- 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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P 4 8 1 4 8 R A 0 1 2 4

Pearson

1 The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6 [3] ✓ [3] Q01

Number on dice	1	2	3	4	5	6
Probability	0.31	0.17	0.18	0.09	0.15	0.1

Neymar rolls the biased dice 200 times.

Work out an estimate for the total number of times the dice will land on 1 (or on 3

No. 1 $= 1 - (0.17 + 0.18 + 0.09 + 0.15 + 0.1) = 0.31$

No. 3 $= 0.18 \times 200 = 36 = \dfrac{36}{200}$

No. 1 $= 0.31 \times 200 = 62$ $\dfrac{62}{200}$

$\dfrac{36}{200} + \dfrac{62}{200} = \dfrac{49}{100} = 0.49 \approx 50\% \text{ chance}$

$36 + 62 = 98$ ⟶ $49 \times 2 = 98$ $\dfrac{98}{200}$

..........98..........

(Total for Question 1 is 3 marks) [3] [3]

2 On Saturday, some adults and some children were in a theatre. *a : c*
The ratio of the number of adults to the number of children was 5 : 2

Each person had a seat in the Circle or had a seat in the Stalls.

$\frac{3}{4}$ of the children had seats in the Stalls.

117 children had seats in the Circle.

There are exactly 2600 seats in the theatre. *total*

On this Saturday, were there people on more than 60% of the seats?
You must show how you get your answer.

CHILDREN

STALLS   CIRCLE

$\frac{3}{4}$ ∴ $\frac{1}{4}$ in circle   117
                                  ↑ = $\frac{1}{4}$ of children

117 × 3 = $\frac{3}{4}$ of children = 351 in stalls

251 + 117 = 368 children in total.

Adults : children
    5   :   2   → ÷2 = 184 = 1 part
         :   368

184 × 5 = 920 adults.

Total people:
    368 + 920 = 1288

$\frac{1288}{2600}$ = 0.49.53....
          49.53... %
          ↗ ≈ 50%
    lower than 60%.

No ~~there were~~ less than 66%
seats ~~are~~ filled with people

(Total for Question 2 is 5 marks)

3 The diagram shows a prism with a cross section in the shape of a trapezium.

2.5 × 2 = ⑤

2.5 m

④ 2×2= 2 m

0.5 × 2 = 0.5 m ①

① 0.5 m
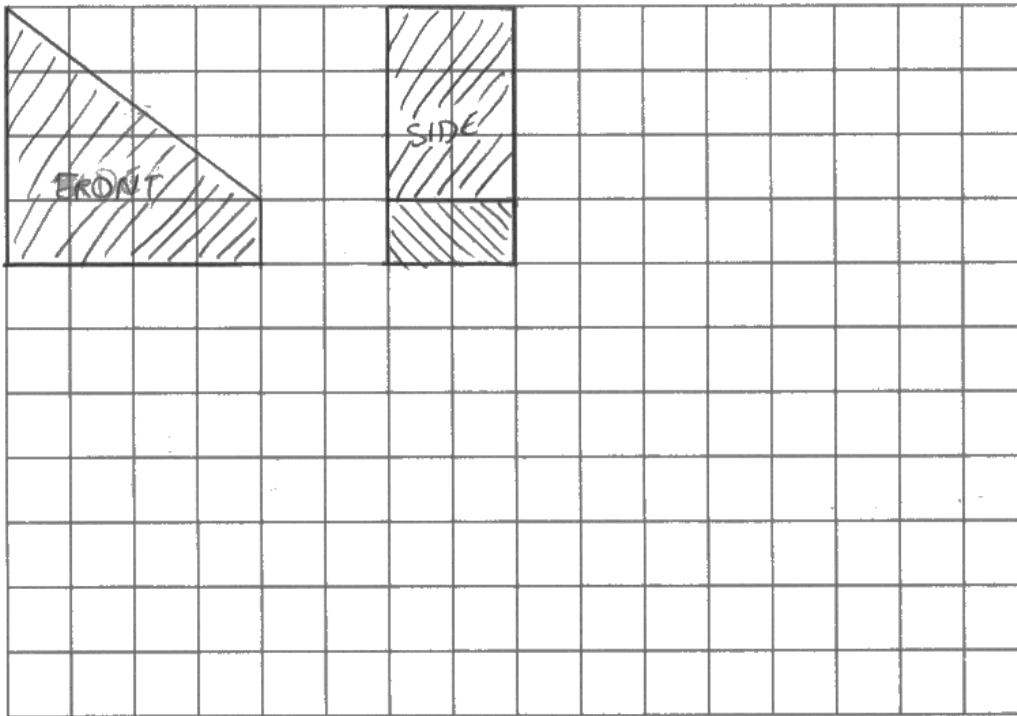
2 m   1 m

1 × 2 = ②

front   2×2 = ④   side
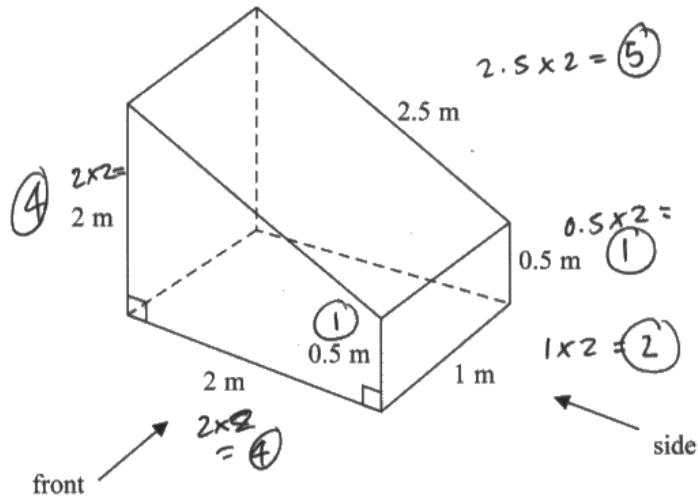
On the centimetre grid below, draw the front elevation and the side elevation of the prism. Use a scale of 2 cm to 1 m.

FRONT   SIDE

(Total for Question 3 is 4 marks) 4   4

4   Olly drove 56 km from Liverpool to Manchester.
    He then drove 61 km from Manchester to Sheffield.

    Olly's average speed from Liverpool to Manchester was 70 km/h.
    Olly took 75 minutes to drive from Manchester to Sheffield.

    (a) Work out Olly's average speed for his total drive from Liverpool to Sheffield.

$L \rightarrow M = 56 Km$ $M \rightarrow S = 61 km$ d $S = \dfrac{d}{t}$
$= 70 km/h$ $x = ? km/h$ s
$= ? min$ $= 75 min$ t

~~75×60 = 4500~~ $\dfrac{61}{75} \times 100 = 81.3$

                                              km/h

$81.3 - 70 = 11.3 \div 2 = 5.65$

$70 + 5.65 = 75.65$

                                       75.65   km/h
                                    (0   ✓   0   Q04a

Janie drove from Barnsley to York.

Janie's average speed from Barnsley to Leeds was 80 km/h.
Her average speed from Leeds to York was 60 km/h.

Janie says that the average speed from Barnsley to York can be found by working out the
mean of 80 km/h and 60 km/h.

(b) If Janie is correct, what does this tell you about the two parts of Janie's journey?
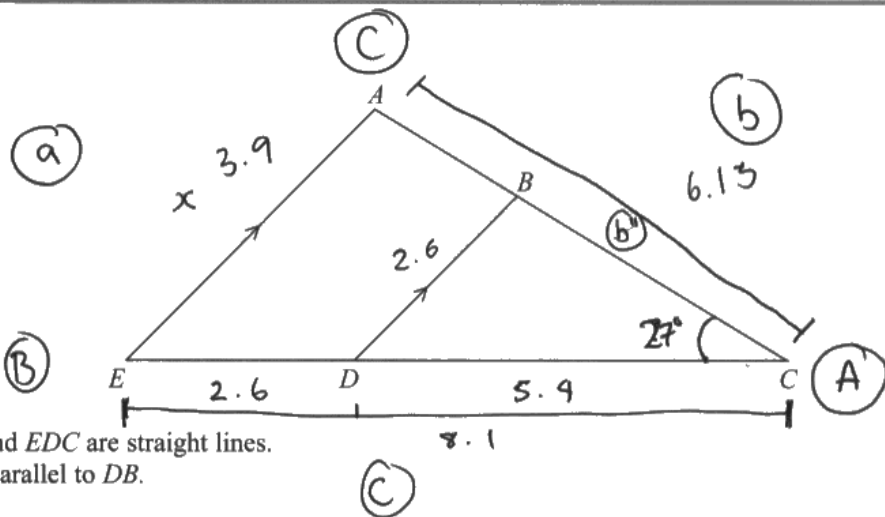
    She drove consistantly.

                                              (0   ✓   0   Q04b
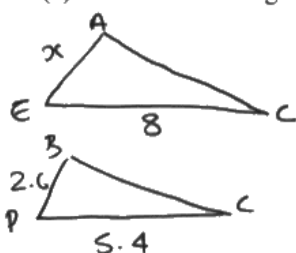   (Total for Question 4 is 5 marks)   0   0

5

(C)

(a) (b)

(B) (A)

3.9

x

2.6

6.15

b''

27°

E   2.6   D   5.9   C

8.1

(C)

ABC and EDC are straight lines.
EA is parallel to DB.

EC = 8.1 cm.
DC = 5.4 cm.
DB = 2.6 cm.

(a) Work out the length of AE.

A
x
E   8   C

B
2.6
P   5.4   C

$EC = 2.6 + 5.9 = 8$

$8 \div 5.4 = 1.48\dot{1} = sf.$

$2.6 \times 1.48\dot{1} = 3.8\dot{5}\dot{1} = AE$

3.9 (2dp) cm

(2 2 ✗ 1   Q05a

AC = 6.15 cm.

(b) Work out the length of AB.

6.13
2.6
5.4
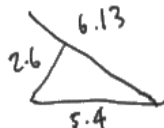
$Cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

$\dfrac{6.13^2 + 8.1^2 - 3.8\dot{5}\dot{1}^2}{2 \times 6.13 \times 8.1} = cos^{-1}(ans) = 27m$

$= 27.16747391$

$\dfrac{a}{SinA} = \dfrac{b}{SinB} = \dfrac{2.6}{Sin(ans)}$ ✗

.... cm

(2 0 ✓ 0   Q05b

(Total for Question 5 is 4 marks) 2 1

6

Please find the annotations at the end of the script.

6 Anil wants to invest £25 000 for 3 years in a bank.

Personal Bank	**Secure Bank**
Compound Interest	Compound Interest
2% for each year	4.3% for the first year 0.9% for each extra year

Which bank will give Anil the most interest at the end of 3 years?
You must show all your working.

PERSONAL

$25\,000 \times 1.02^3 = £26530.42$

more than £26527.03
∴ the personal bank will
give her most interest
after 3 years.

SECURE

$25000 \times 1.043 = £26075$
$25000 \times 1.009^2 = £25452.025$

$25000 - ans = 452.025$

$£26075 + £452.025 =$
$£26527.025$

(Total for Question 6 is 3 marks)

7 A number, n, is rounded to 2 decimal places.
The result is 4.76

Using inequalities, write down the error interval for n.

0.005

$4.76 + 0.005 = 4.765$ UB
$4.76 - 0.005 = 4.755$ LB

$4.755 \leqslant n < 4.765$

(Total for Question 7 is 2 marks)

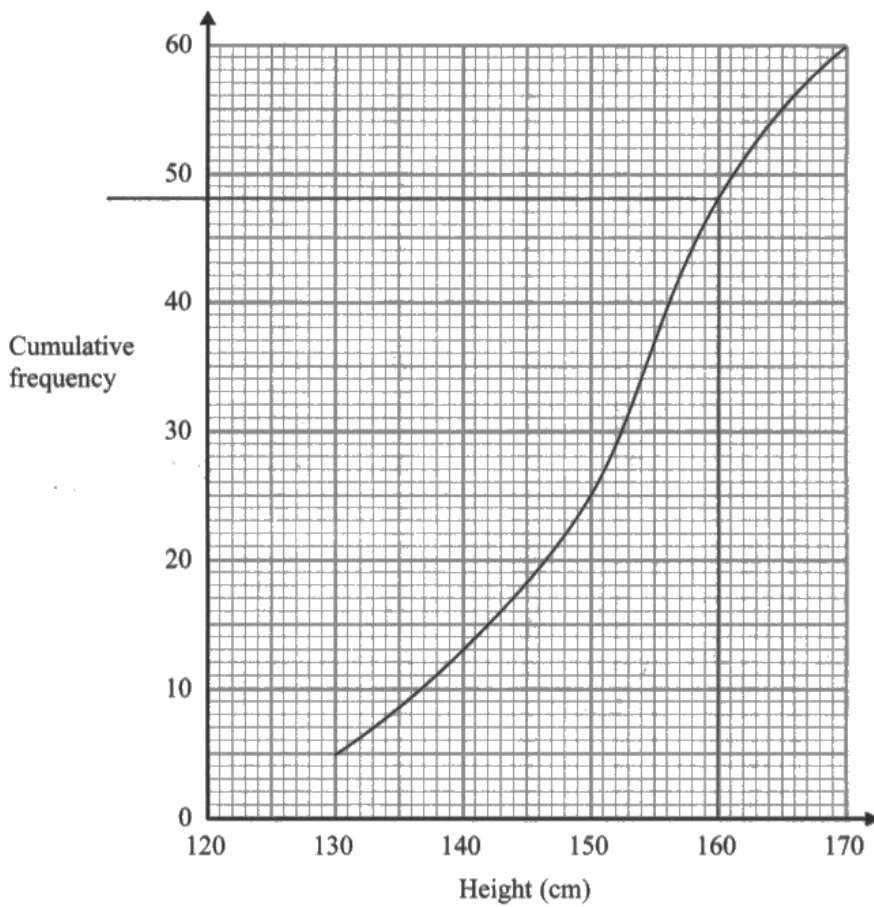**8** The cumulative frequency graph shows some information about the heights, in cm, of 60 students.

Work out an estimate for the number of these students with a height greater than 160 cm.

.... 48 ....
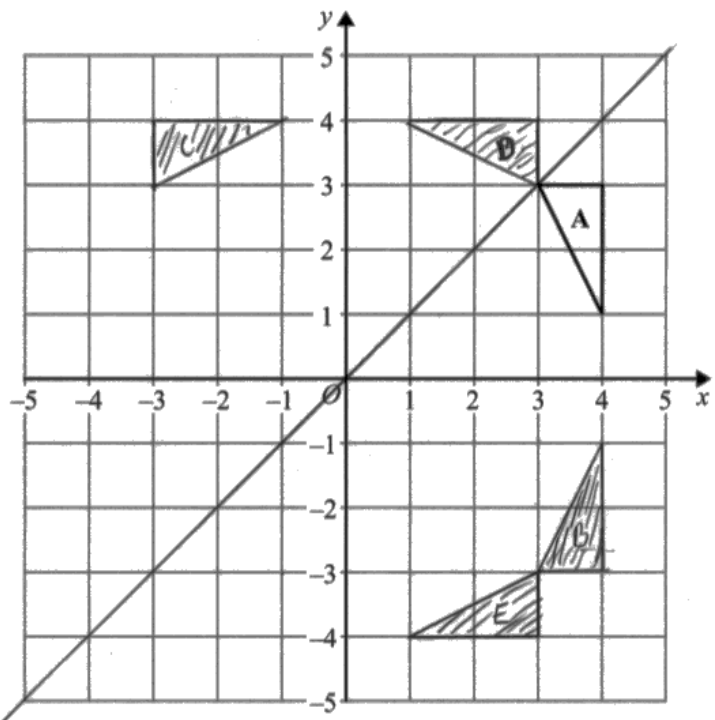
(Total for Question 8 is 2 marks) 1 1

9 The diagram shows triangle **A** drawn on a grid.

Kyle reflects triangle **A** in the *x*-axis to get triangle **B**.
He then reflects triangle **B** in the line *y* = *x* to get triangle **C**.

Amy reflects triangle **A** in the line *y* = *x* to get triangle **D**.
She is then going to reflect triangle **D** in the *x*-axis to get triangle **E**.

Amy says that triangle **E** should be in the same position as triangle **C**.

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

No   Amy is not correct.

(Total for Question 9 is 3 marks)

3   3.

10 The table shows some information about eight planets.

Planet	Distance from Earth (km)	Mass (kg)
Earth	0	5.97×10^{24}
Jupiter	6.29×10^{8}	1.898×10^{27}
Mars	7.83×10^{7}	6.42×10^{23}
Mercury	9.17×10^{7}	3.302×10^{23}
Neptune	4.35×10^{9}	1.024×10^{26}
Saturn	1.28×10^{9}	5.68×10^{26}
Uranus	2.72×10^{9}	8.683×10^{25}
Venus	4.14×10^{7}	4.869×10^{24}

(a) Write down the name of the planet with the greatest mass.

...JUPITER................

(1) ☐1 ✓ ☐1 Q10a

(b) Find the difference between the mass of Venus and the mass of Mercury.

$$4.869 \times 10^{24} - 3.302 \times 10^{23} = 4.5388 \times 10^{24}$$

......4.5388×10^{24}...... kg

(1) ☐1 ✓ ☐1 Q10b

Nishat says that Neptune is over a hundred times further away from Earth than Venus is.

(c) Is Nishat right?
You must show how you get your answer.

VESUS = 4.14×10^{7} = 41400000   ← 2 more 0s atend
NEPTUNE = 4.35×10^{9} = 4350000000   = 100x bigger.

414 is smaller than 435

∴ Nishat is right.

(2) ☐2 ✗ ☐0 Q10c

☐4 ☐2

(Total for Question 10 is 4 marks)

10

11 Solve $\dfrac{3x-2}{4} - \dfrac{2x+5}{3} = \dfrac{1-x}{6}$

$$\frac{3x-2}{4} - \frac{2x+5}{3} = \frac{1-x}{6}$$

$$\frac{3(3x-2)}{12} - \frac{4(2x+5)}{12}$$

$$\frac{9x-6}{12} - \frac{8x+20}{12}$$

$$\frac{x-26}{12} = \frac{1-x}{6}$$

$$\frac{6x-156}{72} = 1-x$$

$$6x-156 = 72-72x$$

$$78x = 228$$

$$x = 2.923076$$

$x =$ .....2.92 (2dp).....

(Total for Question 11 is 4 marks) 1 1

12 There are 30 students in Mr Lear's class.
16 of the students are boys.

Two students from the class are chosen at random.

Mr Lear draws this probability tree diagram for this information.

	1st student		2nd student

$\frac{16}{30}$ boy

$\frac{15}{30}$ boy

$\frac{14}{30}$ girl

$\frac{14}{30}$ girl

$\frac{16}{30}$ boy

$\frac{13}{30}$ girl

(a) Write down **one** thing that is wrong with the probabilities in the probability tree diagram.

he didn't decrease the total when choosing the second student. It should be out of 29

(1) 1 ✓ 1   Q12a

Owen and Wasim play for the school football team.

The probability that Owen will score a goal in the next match is 0.4
The probability that Wasim will score a goal in the next match is 0.25

Mr Slater says,

"The probability that both boys will score a goal in the next match is 0.4 + 0.25"

(b) Is Mr Slater right?
Give a reason for your answer.

No because the events don't exclude each other. They could both score a goal so it should be 0.4 × 0.25

(1) 1 ✓ 1   Q12b

(Total for Question 12 is 2 marks) 2 2

13 The histogram shows some information about the ages of the 134 members of a sports club.
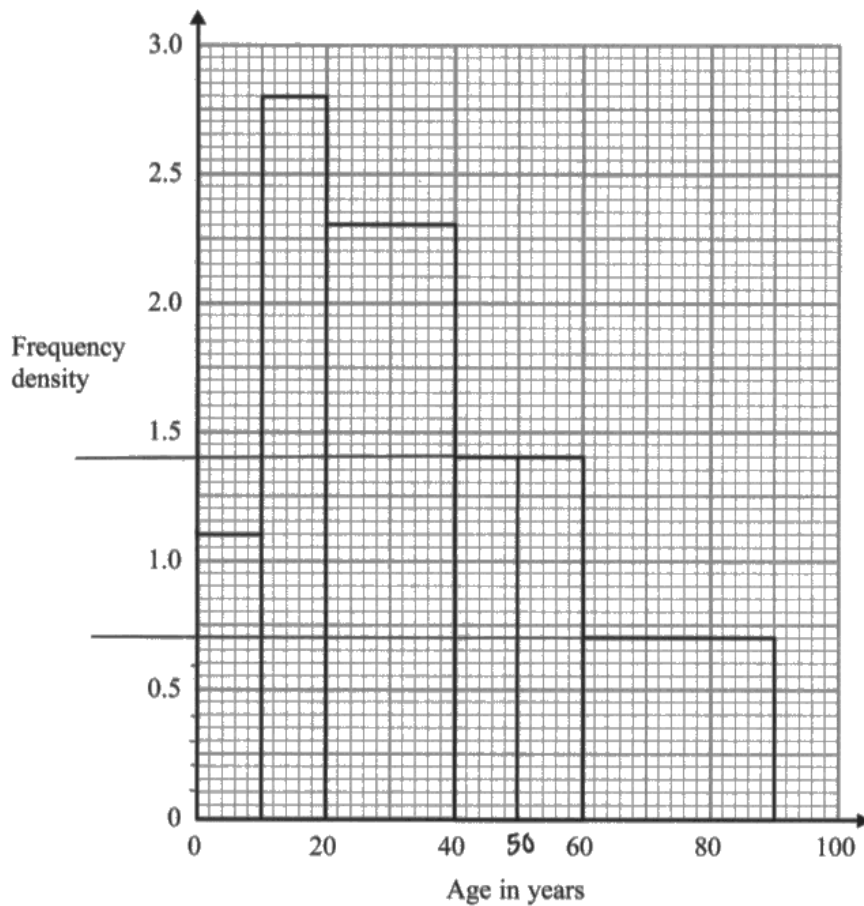
20% of the members of the sports club who are over 50 years of age are female.

Work out an estimate for the number of female members who are over 50 years of age.

50 - 60 = 10 × 1.4 = 14 members
60 - 90 = 30 × 0.7 = 21 members
                     +
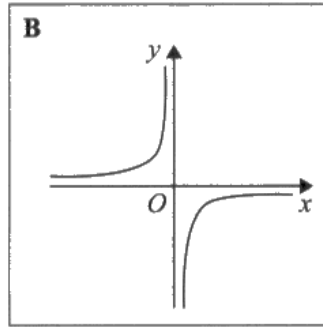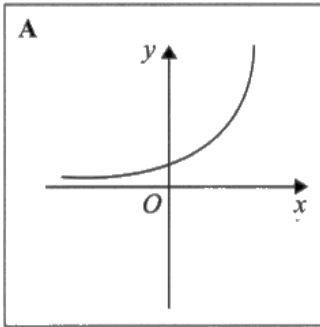   35 members m total over 50

35 × 20% = 7 female

7

(Total for Question 13 is 3 marks)

3 3

14 Here are some graphs.
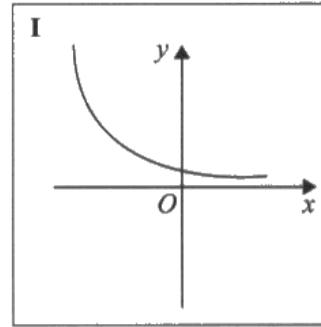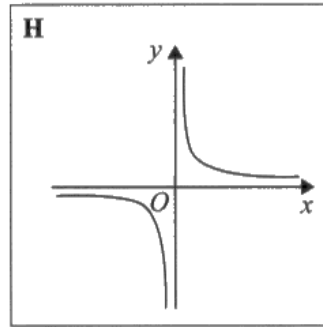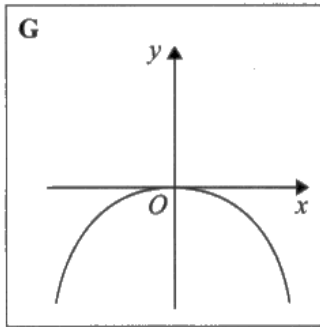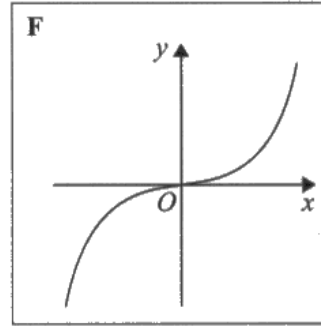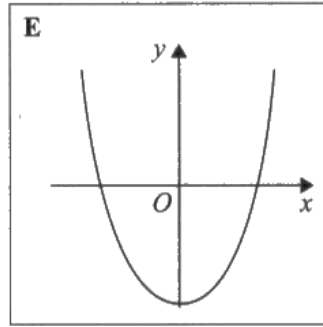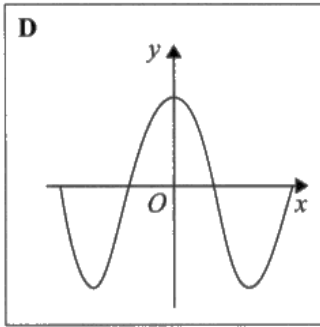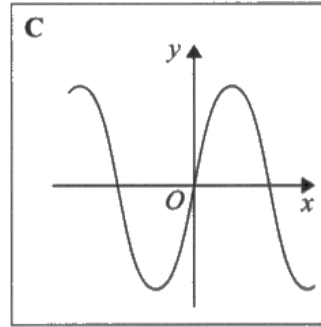
In the table below, match each equation with the letter of its graph.

Equation	Graph
$y = \sin x$	D
$y = x^3 + 4x$	E
$y = 2^x$	A
$y = \dfrac{4}{x}$	G

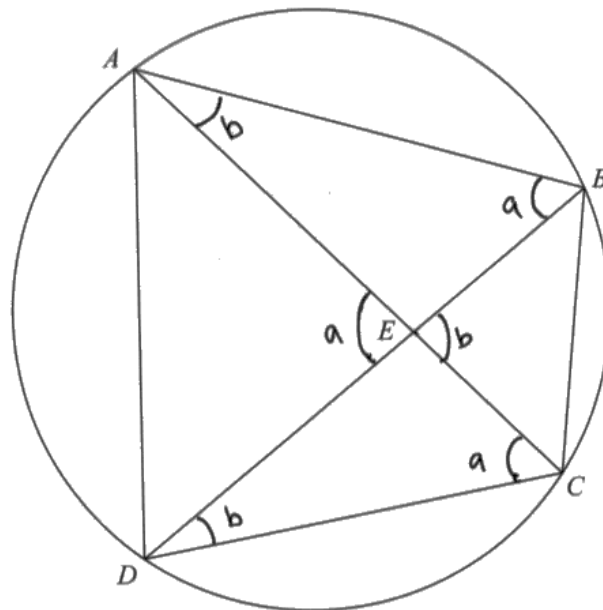(Total for Question 14 is 3 marks)

P 4 8 1 4 8 R A 0 1 4 2 4

15 *A, B, C* and *D* are four points on the circumference of a circle.

AEC and *BED* are straight lines.

Prove that triangle *ABE* and triangle *DCE* are similar.
You must give reasons for each stage of your working.

- Angles formed in the same arc are equal ∴ ABD and ACD
  are equal, and   CDB and CAB are equal   and A ED
                          and CEB

- Triangles ~~AB~~ ABE and DCE ~~are equal share two com angles~~
  have 2 angles that are equal. Angles in a triangle
  = 180° ∴ 180 - a - b = c⁴. And this 3ʳᵈ angle
  are therefore equal.

› If triangles have all the same angles, they are mathematically
  similar.

0 2

(Total for Question 15 is 3 marks)

Please find the annotations at the end of the script.

16 Using algebra, prove that $0.1\dot{3}\dot{6} \times 0.\dot{2}$ is equal in value to $\dfrac{1}{33}$

$$x = 0.1\dot{3}\dot{6}$$
$$1000x = 136.36\ldots$$
$$10x = 1.36\ldots$$
$$\overline{\quad\quad\quad\quad\quad\quad}$$
$$990x = 135$$
$$x = \frac{135}{990}$$

$$y = 0.\dot{2}$$
$$10y = 2.\dot{2}\ldots$$
$$9y = 2$$
$$y = \frac{2}{9}$$

$$x \times y = \frac{1}{33}$$

$$\frac{135}{990} \times \frac{2}{9} = \frac{1}{33}$$

(Total for Question 16 is 3 marks)

N

4 cm

A

7

7

24.5

60°

Q 4 cm *B* 11 7 *O*
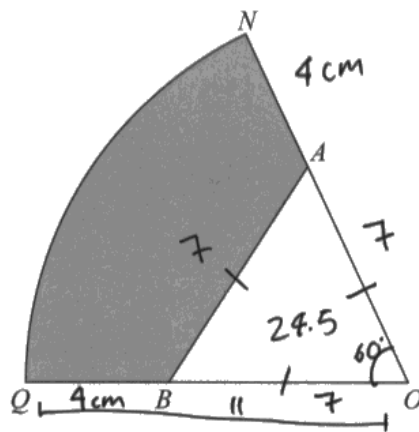
ONQ is a sector of a circle with centre *O* and radius 11 cm.

A is the point on *ON* and *B* is the point on *OQ* such that *AOB* is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector *ONQ*. Give your answer correct to 1 decimal place.

OB = 11 - 7 = 4 cm

TRIANGLE AREA =

$\frac{1}{2}$ ab

$\frac{1}{2} \times 7 \times 7 = $ (24.5 cm^2)

angles in equilateral trig. = 60° ∴ QOA = 60°

$\frac{60}{360} \times \pi \times 11^2 = 63.35545185$ cm^2 = AREA SECTOR.

ans - 24.5 = 38.85545185 cm^2 = AREA SHADED REGION

$\frac{38.85545185}{63.35545185} \times 100 = 61.329...\%$

≈ 61.3 %

61.3 %

2 2

(Total for Question 17 is 5 marks)

P 4 8 1 4 8 R A 0 1 7 2 4

18 $16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$

Work out the exact value of x.

$$16^{\frac{1}{5}} \times 2^x = 8^{\frac{3}{4}}$$

$-16^{\frac{1}{5}}$

$$2^x = 3.015727333$$

$$x = 1.50786367. \div 2$$

$$\approx 1.51 \, (2d_p)$$

1.50786367

(Total for Question 18 is 3 marks)

19 $2 - \dfrac{x+2}{x-3} - \dfrac{x-6}{x+3}$ can be written as a single fraction in the form $\dfrac{ax+b}{x^2-9}$

where a and b are integers.

Work out the value of a and the value of b.

$$2 - \frac{x+2}{x-3} - \frac{x-6}{x+3}$$

$$2 - \frac{x+2\,(x+3)}{(x-3)(x+3)} - \frac{x-6(x-3)}{(x-3)(x+3)}$$

$$2 - \frac{x^2+3x+2x+6}{x^2-9} - \frac{x^2-3x-6x+18}{x^2-9}$$

$$2 - \frac{5x+6}{x^2-9} - \frac{-9x+18}{x^2+9}$$
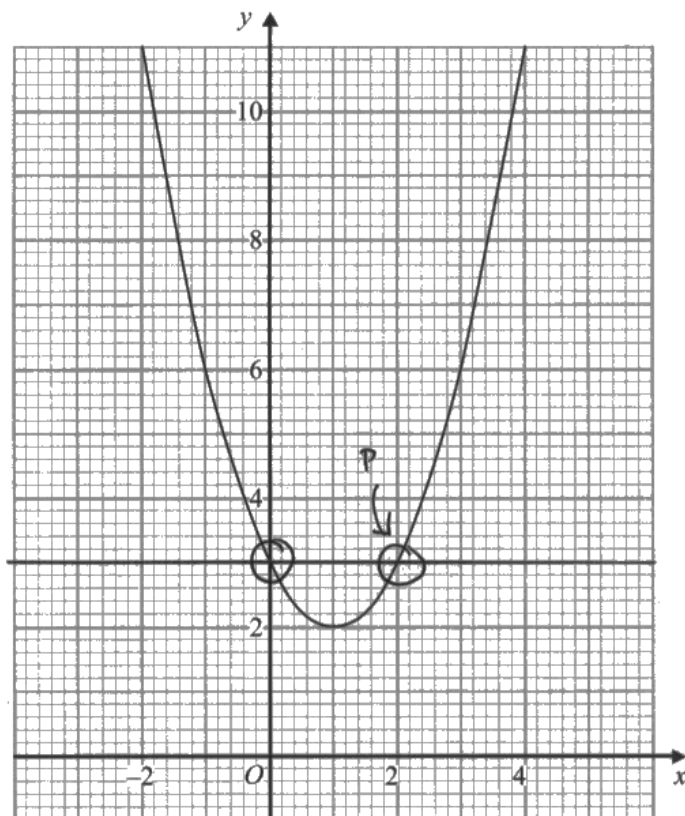
$$2 - \frac{-4x+24}{x^2-9}$$

$a = $ ....

$b = $ ....

(Total for Question 19 is 4 marks)

20 The diagram shows part of the graph of $y = x^2 - 2x + 3$

(a) By drawing a suitable straight line, use your graph to find estimates for the solutions of $x^2 - 3x - 1 = 0$

$$x = 0 \quad \text{or} \quad x = 2$$

(2) | 0 | ✓ | | 0 | Q20a

P is the point on the graph of $y = x^2 - 2x + 3$ where $x = 2$

(b) Calculate an estimate for the gradient of the graph at the point P.

$y = mx + c$

$y = m \times 2 + 3$

$-3 = 2m$

$\dfrac{-3}{2} = m$

$$-\dfrac{3}{2}$$

(3) | 0 | ✓ | | 0 | Q20b
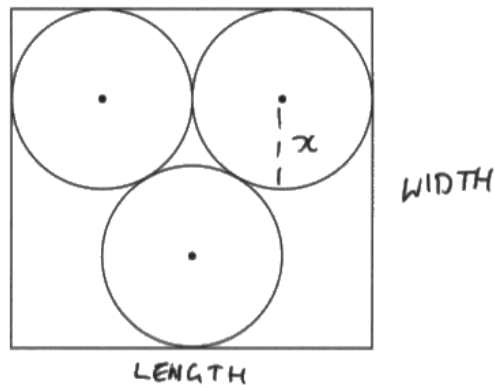
| 0 | | 0 |

(Total for Question 20 is 5 marks)

21 The diagram shows 3 identical circles inside a rectangle.
   Each circle touches the other two circles and the sides of the rectangle, as shown in the diagram.

WIDTH

x

LENGTH

The radius of each circle is 24 mm.

Work out the area of the rectangle.
Give your answer correct to 3 significant figures.

LENGTH
$(2 \times 24) \times 2 = \underline{96\,mm}$

WIDTH
$24 + 24 = 48\,mm$
$+ \text{overlap} (x)$

.... mm²

(Total for Question 21 is 4 marks)

22 Here are the first five terms of a sequence.

$$4 \qquad 11 \qquad 22 \qquad 37 \qquad 56$$

Find an expression, in terms of n, for the nth term of this sequence.

$a + b + c$

$3a + b$

$2a$

$an^2 + bn + c$

$4, 11, 22, 37, 56$

$7 \quad 11 \quad 15 \quad 19$

$4 \quad 4 \quad 4$

$2a = 4$	$3 \times 2 + b = 7$	$2 + 1 + c = 4$
$\underline{\underline{a = 2}}$	$6 + b = 7$	$3 + c = 4$
	$\underline{\underline{b = 1}}$	$\underline{\underline{c = 1}}$

$2.$

.... $2n^2 + n + 1$ ....

(Total for Question 22 is 3 marks)

3   3

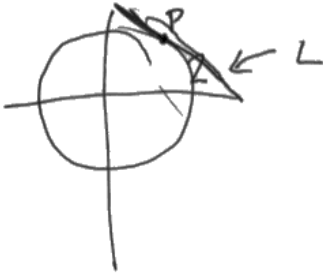**23** **L** is the circle with equation $x^2 + y^2 = 4$

$P\left(\dfrac{3}{2}, \dfrac{\sqrt{7}}{2}\right)$ is a point on **L**.

Find an equation of the tangent to **L** at the point P.

RADIUS $= \sqrt{4} = 2$

0 0

TOTAL FOR PAPER IS 80 MARKS

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

BLANK PAGE

Q05a

M1 correct method for AE
A0 misread of 8.1 for 8 so inaccurate answer.

Q10c

M0 N0 evidence of multiply by 100 or Neptune being divided by Venus.
A0 as no comparable values found to enable a conclusion to be made.

Q15

C2 2 pairs of angles identified as being equal. Thus deduced that all 3 angles are the same so that triangles are similar. We can isw the two other angles AED and CEB.
C0 as no valid reasons given.