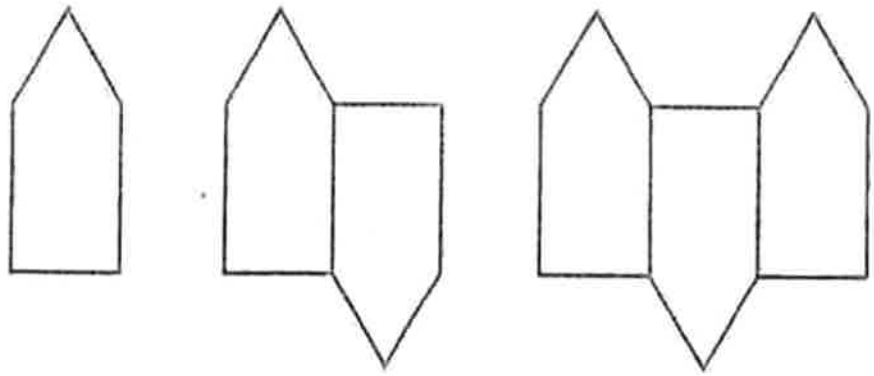
Kyle Academy Mathematics Department

National 4 - Unit 1- Expressions & formulae - Practice Test A

1.1	Applying algebraic skills to manipulating expressions and working with formulae	
1.	(a) Expand the brackets: $3(6x - 5) = 18x - 15$ (b) Expand the brackets and simplify: $4(2p + 6) + 8p = 8p + 24 + 8p = 16p + 24$ ✓	1 2
2.	Factorise $5y + 25$ $5(y + 5)$ ✓ ✓	2
3.	Simplify $7w + 6s + 2w - 2s$ $= 7w + 2w + 6s - 2s$ $= 9w + 4s$	1
4	(a) When $x = 3$ and $y = 4$, find the value of $9x - 2y$ $= (9 \times 3) - (2 \times 4)$ ✓ $= 27 - 8$ $= 19$ ✓ (b) Sandra works for a camera repair shop. Her weekly pay is calculated using the formula: $P = 4.5H + 2.5R$ where P is her pay (in pounds), H is the hours she works, and R is the number of repairs she makes. One week she works 29 hours and repairs 38 cameras. Calculate her pay for that week. $P = (4.5 \times 29) + (2.5 \times 38)$ ✓ $= 130.50 + 95$ $P = £225.50$ ✓	2 2

5. Jamie is working on a design for a bracelet.
She using matches to make each shape.



(a) Complete the table below: 2

7 jumps

Number of shapes (s)	1	2	3	4	5		12
Number of matches (m)	5	9	13	17	21		49.

+4 +(4×7)=28

2

(b) Write down a formula for calculating the number of dots (d) when you know the number of stars (s)

$m = 4s + 1$ ✓

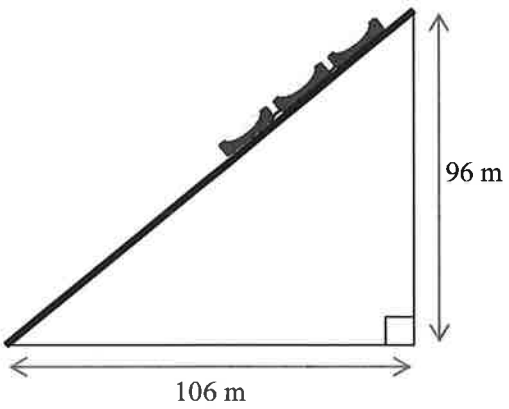
(c) One bracelet has 61 matches. How many shapes does it have? You must show your working. 1

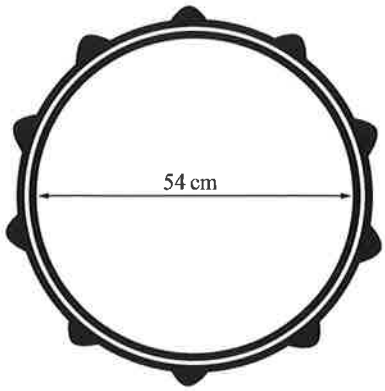
$61 = 4s + 1$
$-1 \quad -1$
$60 = 4s$
$\div 4 \quad \div 4$
$s = 15$ ✓

61 matches would make 15 shapes.

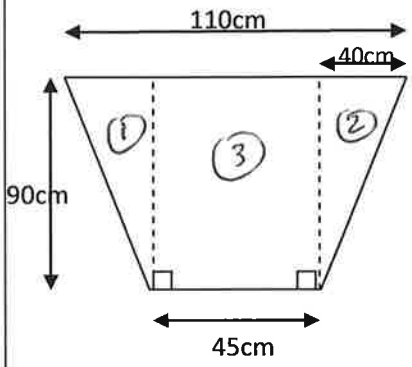
For working backwards -1 then ÷4

#2.1

6	Sheila is designing a new roller coaster ride. Regulations state that the gradient of the uphill slope at the start of the ride must be less than 0.93. Her plan of the slope is shown below.  (a) Calculate the gradient of the slope. gradient = $\frac{\text{vertical}}{\text{horizontal}} = \frac{96}{106} = 0.90566$ $= 0.91$ ✓ (b) Does this slope meet the regulations? Give a reason for your answer. Yes it does meet the regulations as the slope is 0.91 which is less than 0.93 #2.2	1
1.1	Total score /16	P/F

1.2	Applying geometric skills to circumference, area and volume.	
7	The diagram shows a drum. The front face of the drum is a circle with a diameter of 42cm, as shown below.  (a) Calculate the circumference of the sticker $C = \pi D$ $C = \pi \times 54$ ✓ $C = 169.6460$ $C = 169.65$ cm ✓ (b) Calculate the area of the sticker. $A = \pi r^2$ $\quad r = \frac{D}{2} = \frac{54}{2} = 27$cm $A = \pi \times 27^2$ ✓ $A = 2290.2210$ $A = 2290.22$ cm^2 ✓	$\frac{}{2}$ $\frac{}{2}$
8.	A window is in the shape of a trapezium.  The trapezium is made up of a rectangle and two identical right-angled	

triangles, as shown in the diagram on the next page.



Find the area of the window.

Area ① $= \frac{1}{2} b \times h$

$= \frac{1}{2} \times 40 \times 90$

$= 1800\ cm^2$

Area ② = Area ① = $1800 cm^2$

Area ③ $= l \times b$

$= 45 \times 90$

$= 4050\ cm^2$ ✓

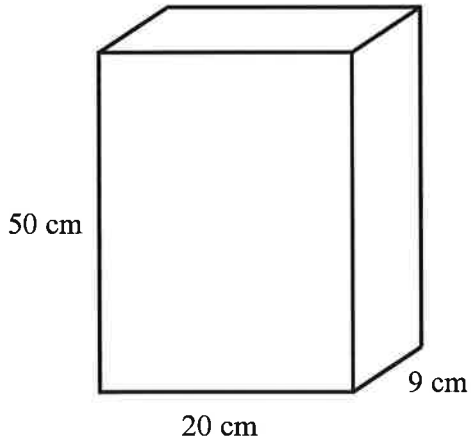
Total Area = Area ① + Area ② + Area ③

$= 1800 + 1800 + 4050$

$= 7650\ cm^2$ ✓

2

9. A cereal box is in the shape of a cuboid.
The cuboid is 20 centimetres long, 9 centimetres wide and 55 centimetres high, as shown in the diagram below.

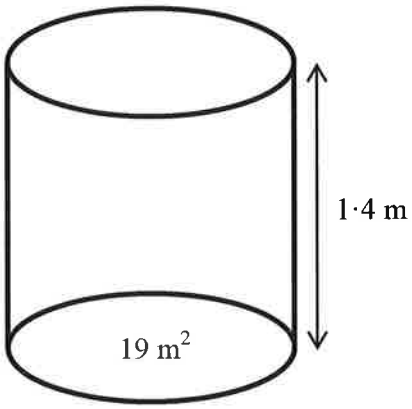
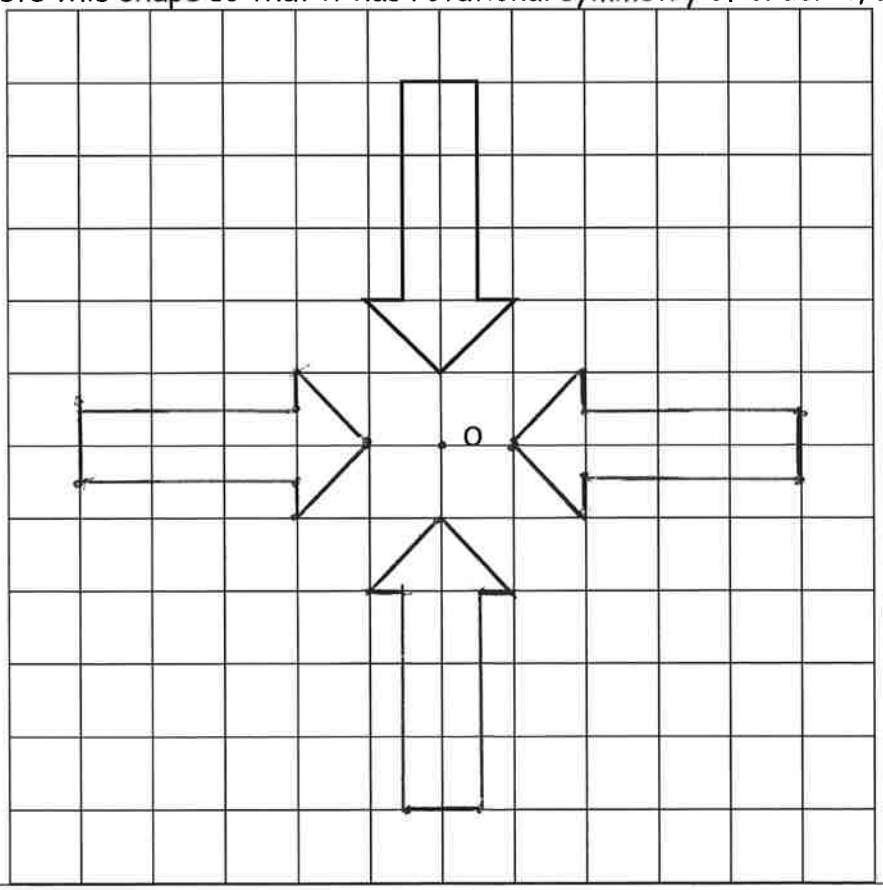


Area of Front = $20 \times 50 = 1000 cm^2$
Area of Back = $1000 cm^2$
Area of Left = $9 \times 50 = 450 cm^2$
Area of Right = $9 \times 50 = 450 cm^2$
Area of Top = $9 \times 20 = 180 cm^2$
Area of Bottom = $180 cm^2$ ✓

Find the surface area of the cuboid shown.

Total Surface Area = $1000 + 1000 + 450 + 450 + 180 + 180$

$= 3260\ cm^2$ ✓

		2
10	A farmer has a large cylindrical container for storing grain to feed his hens. The area of the base of the container is 19 square metres. The height of the container is 1.4 metres.  Calculate the volume of the container. $V = A \times h$ $V = 19 \times 1.4$ ✓ $V = 26.6\ m^3$ ✓	2
11.	V & V bikes want a new logo to go on the wheels of their bicycles. Part of the design for the logo is shown below. Complete this shape so that it has rotational symmetry of order 4, about O.  # 3 arrows need to be drawn accurately #2.1	

1.2	Total Score /10	P/F
1.3	Applying statistical skills to representing and analysing data and to probability.	

12. The number of visitors to a local library was recorded each day for two weeks.
The results are shown below.

32	66	63	45	63	63	75
50	58	64	71	57	67	79

Complete the frequency table for these results.

Score	Tally	Frequency
30-39	I	1
40-49	I	1
50-59	III	3
60-69	𝍸 I	6
70-79	III	3 ✓
✓		Total = 14

2

13 Eight people were timed running 5 kilometres.
The time, in minutes, each person took was recorded and the results are shown below.

14	17	31	29
20	26	22	15

(a) Calculate the mean time taken.

$$\text{mean} = \frac{\text{total}}{8} = \frac{174}{8} = 21.75 \text{ mins}$$ ✓ ✓

2

(b) Calculate the range.

range = highest − lowest = 29 − 14 = 15 minutes

1

Each person then followed a training programme for 6 weeks.
At the end of the training programme they were timed running 5 kilometres again.

After training:

- the mean was 17 minutes, and
- the range was 19

(c) Write two comments comparing the results before training with the results after training.

After training the average time has gone down and the difference between the fastest and the slowest runners has increased

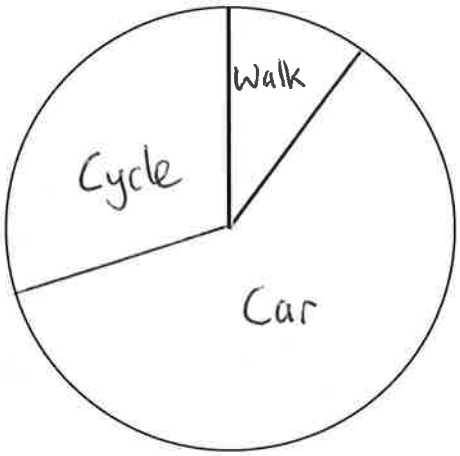
14. Ninety pupils were asked how they travelled to school.
The table below shows the results.
You have to complete the blank pie chart to show this same information.

Travel Method	No. of pupils
Cycle	24
Walk	8
Car	48

To help you complete the pie chart, fill in the blanks in the table.

Travel Method	No. of Pupils	Angle at the centre
Cycle	24	$\frac{24}{80} \times 360 = 108°$
Walk	8	$\frac{8}{80} \times 360 = 36°$
Car	48	$\frac{48}{80} \times 360 = 216°$

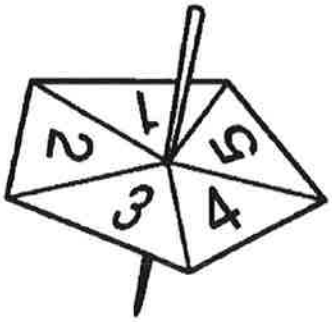
Now complete the pie chart.



Angles within 2° ✓
Labels ✓

3

15 A spinner has 5 edges as shown in the diagram.
When it is spun it comes to rest on one edge.



What is the probability that it comes to rest on a number less than 5?

$P = \frac{4}{5}$

1