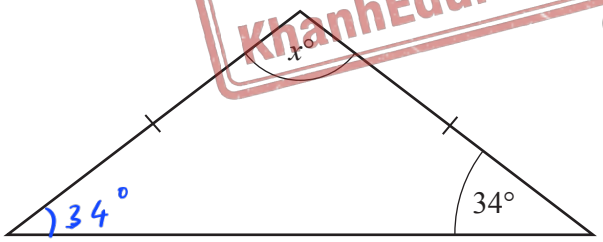
1



NOT TO SCALE

The diagram shows an isosceles triangle.

Find the value of x.

$180° - 34° \times 2$

$x =$ 112° [2]

2 Simplify.

$y \times 27 - y \times 77$

$27y - 77y$

$-50y$ [1]

3 Find the sum of 3^2 and -3^2.

$9 + -9 = 0$

0 [1]

4 Expand.

$x(3 + x^2)$

$3x + x^3$ [2]

5 Jenna buys 2.4 m of ribbon and 4.8 m of fabric.
The total cost is $33.48 .
Ribbon costs $0.85 per metre.

Find the cost of 1 m of fabric. f

$2.4 \times 0.85 + 4.8f = 33.48$

$2.04 + 4.8f = 33.48$

$4.8f = 31.44$

$f = 6.55$

$ 6.55 [3]

6 **(a)** These are the first five terms of a sequence.

27, 26, 23, 18, 11, 2, −9

(−1, −3, −5, −7, −9, −11)

Find the next two terms in the sequence.

2 , −9 [2]

(b) The table shows information about two different sequences.

	First five terms of sequence	*n*th term
Sequence A	3, 10, 17, 24, 31 (+7, +7, +7, +7)	$7n - 4$
Sequence B	2, 11, 26, 47, 74 (+9, +15, +21, +27; +6, +6, +6)	$3n^2 - 1$

Complete the table.

[4]

7 **Without using a calculator**, work out $\frac{5}{9} - \frac{1}{6}$.

You must show all your working and give your answer as a fraction in its simplest form.

$\frac{5 \times 6 - 1 \times 9}{9 \times 6}$

$= \frac{21}{54} = \frac{7}{18}$

..... $\frac{7}{18}$ ..... [2]

8 Daryl records the number of hours in a week 8 people spend exercising.

5	2	1.5	3	18	4.5	2	4

(a) Find the median.

1.5 2 2 3 4 4.5 5 18

$\frac{3+4}{2} = 3.5$

..... 3.5 ..... h [2]

(b) Explain why the mean may not be a suitable average to use.

..... Because there is one extreme value : 18 ..... [1]

10 Calculate.

(a) 2000×1.2^3

3456 [1]

(b) $2\frac{1}{8} \times \frac{6}{17}$

$\frac{17}{8} \times \frac{6}{17} = \frac{6}{8}$

$\frac{3}{4}$ [1]

(c) $\frac{4.5(\cos 30°)}{\sqrt{3}} - 2$

$\frac{4.5 \times \frac{\sqrt{3}}{2}}{\sqrt{3}} - 2 = \frac{2.25\sqrt{3}}{\sqrt{3}} - 2 = 2.25 - 2 = 0.25$

0.25 [1]

11 The graph of $y = (x-3)(x+b)(x+2)$ intersects the y-axis at -30.

$x = 0$

(a) Find the value of b.

$(0-3)(0+b)(0+2) = -30$

$-6b = -30$

$b =$ 5 [2]

(b) When $x > 0$ the graph crosses the x-axis once. $y = 0$

Write down the coordinates of this point.

$(x-3)(x+5)(x+2) = 0$

$x > 0 \Rightarrow x = 3$

(3 , 0) [1]

12 $x = 3^2 \times 5^2 \times 7 \times 199^{57}$ when written as a product of its prime factors.

Write $x \div 315$ as a product of its prime factors.

$315 = 3^2 \times 5 \times 7$

$x : 315 = \frac{3^2 \times 5^2 \times 7 \times 199^{57}}{3^2 \times 5 \times 7}$

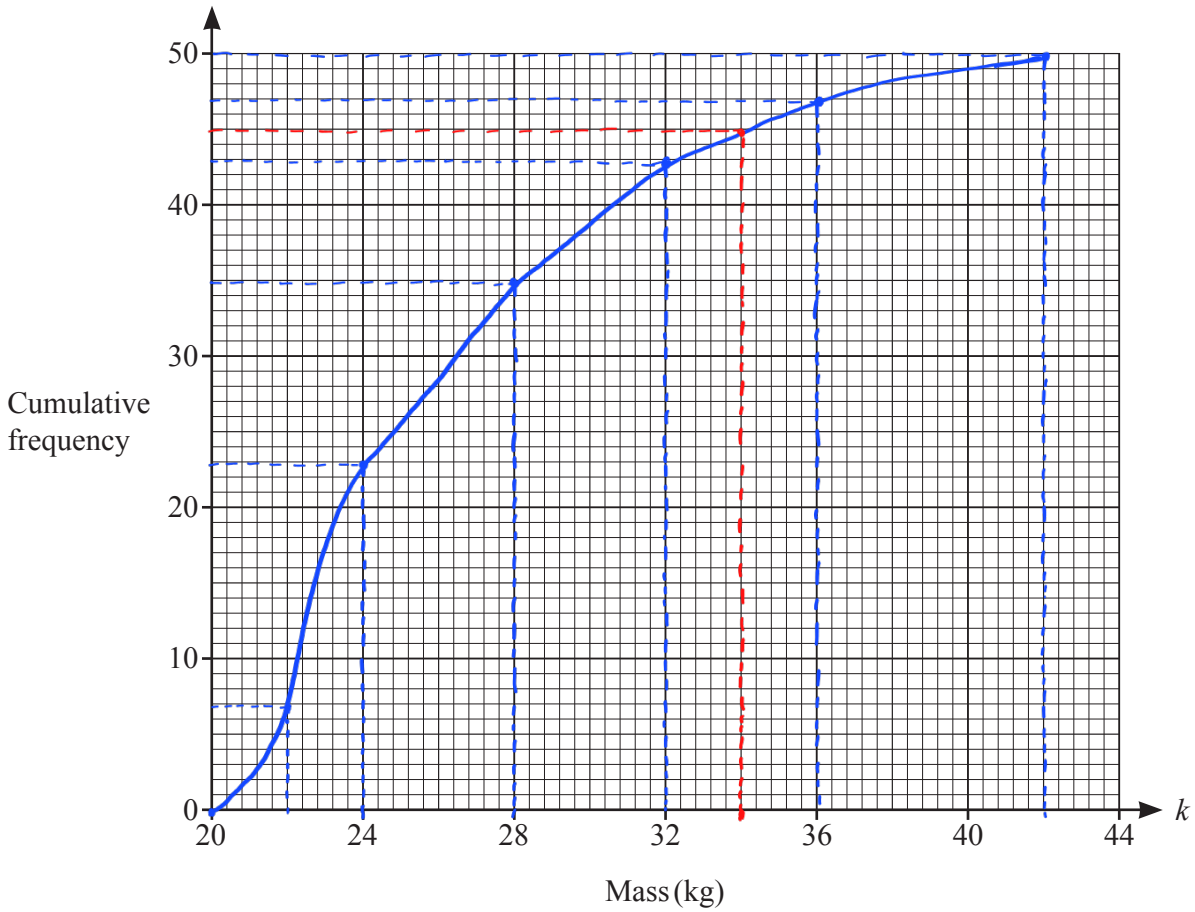
$= 5 \times 199^{57}$

5×199^{57} [2]

13 The table shows information about the mass of each of 50 children.

Mass (k kg)	Cumulative Frequency
$k \leqslant 20$	0
$k \leqslant 22$	7
$k \leqslant 24$	23
$k \leqslant 28$	35
$k \leqslant 32$	43
$k \leqslant 36$	47
$k \leqslant 42$	50

(a) Draw a cumulative frequency diagram to show this information.

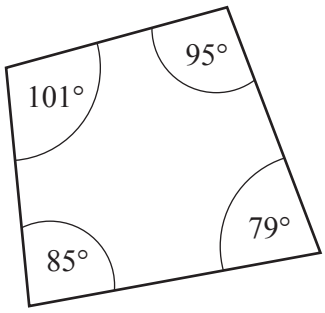


[3]

(b) Use your graph to find an estimate of the 90th percentile.

..... 34 ..... [1]

15



NOT TO SCALE

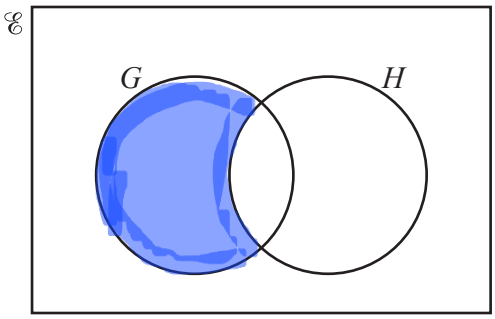
The diagram shows a quadrilateral.

Give a geometrical reason why this is a cyclic quadrilateral.

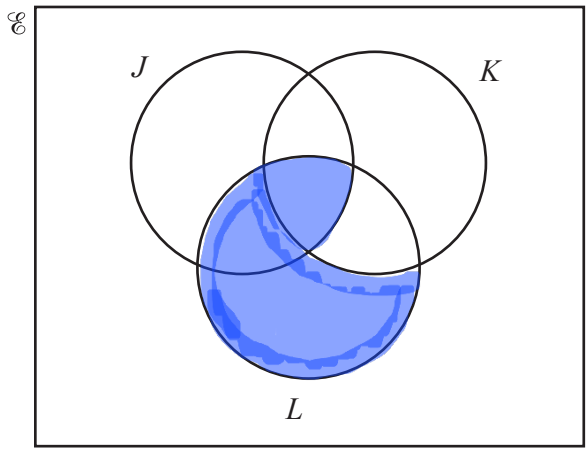
The sum of 2 opposite angles is 180° [1]

16 **(a)** Shade the region indicated in each Venn diagram.

$G \cap H'$

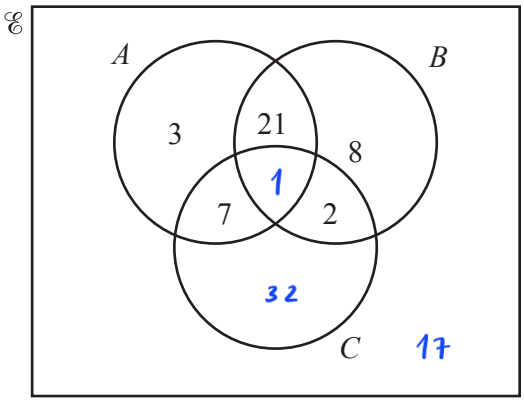


$(J \cup K') \cap L$



[2]

(b) The Venn diagram shows some information about the number of elements in sets A, B, C and $\mathscr{E}$.



Given the following information, complete the Venn diagram.

$n(A \cap B \cap C) = 1$
$n(A \cup B \cup C)' = 17$
$n(C) = 42$

42 − 1 − 2 − 7 = 32

[2]

17 $f(x) = x^2$ $g(x) = \frac{x+5}{2}$ $h(x) = 7x-3$

(a) Find $f(-3)$.

$(-3)^2 = 9$

.....9..... [1]

(b) Find $g^{-1}(x)$.

g: +5 → : 2

−5 ← ×2 : g^{-1}

$g^{-1}(x) =$ .....2x − 5..... [2]

(c) Solve $gf(x) = hh^{-1}(63)$ where $x > 0$.

$\frac{x^2+5}{2} = 63$

$x^2 + 5 = 126$

$x^2 = 121$

$x = \pm 11$

Because $x > 0$ so $x = 11$

$x =$ .....11..... [3]

18 Write $0.4\dot{1}\dot{9}$ as a fraction in its simplest form.
You must show all your working.

$x = 0.4191919\ldots$

$10x = 4.1919\ldots$

$1000x = 419.1919\ldots$

$990x = 419 - 4 = 415$

$x = \frac{415}{990} = \frac{83}{198}$

..... $\frac{83}{198}$ ..... [3]

19 Katy picks a number at random from the numbers 2, 3 and 5.
She then picks a number at random from the numbers 5, 6, 7 and 9.
When she adds the two numbers the answer is even.

Find the probability that **exactly one** of the numbers picked is a 5.

$2 + 6$

$3 + 5$

$3 + 7$

$3 + 9$

$5 + 5$

$5 + 7$

$5 + 9$

..... $\frac{3}{7}$ ..... [3]

20 Simplify fully.

(a) $(81x^{16})^{\frac{3}{4}}$

$81^{\frac{3}{4}}(x^{16})^{\frac{3}{4}}$

$= \left(\sqrt[4]{81}\right)^3 x^{16\times\frac{3}{4}} = 3^3 x^{12}$

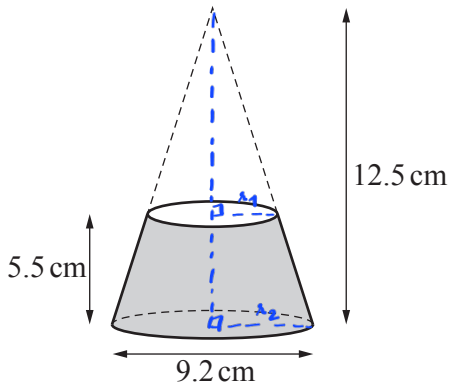
.....$27x^{12}$..... [2]

(b) $\left(\frac{1}{y^2}\right)^{-\frac{1}{2}}$

$(y^{-2})^{-\frac{1}{2}} = y^{(-2)(-\frac{1}{2})} = y^1$

.....y..... [1]

21



NOT TO SCALE

A solid is made by cutting a small cone from a larger cone, as shown in the diagram.
The height of the larger cone is 12.5 cm.
The height of the solid is 5.5 cm.
The diameter of the base of the larger cone is 9.2 cm.

Work out the volume of the solid.

$r_2 = \frac{9.2}{2} = 4.6$

The height of smaller cone $= 12.5 - 5.5 = 7$

$\frac{r_1}{r_2} = \frac{7}{12.5} \Rightarrow r_1 = \frac{7\times 4.6}{12.5} = 2.576$

$V_{solid} = V_{large\ cone} - V_{small\ cone}$

$= \frac{1}{3}\pi 4.6^2 \times 12.5 - \frac{1}{3}\pi \times 2.576^2 \times 7$

≈ 228

.....228..... cm^3 [4]

22 The volumes of two mathematically similar objects are $56\,cm^3$ and $875\,cm^3$.
The height of the smaller object is 18 cm.

Find the height of the larger object.

$$\frac{V_{small}}{V_{large}} = \left(\frac{h_{small}}{h_{large}}\right)^3 = \left(\frac{18}{h_{large}}\right)^3 = \frac{56}{875}$$

$$\Rightarrow \frac{18}{h_{large}} = \frac{2}{5} \Rightarrow h_{large} = \frac{18 \times 5}{2} = 45$$

..... 45 ..... cm [3]

23 Solve $\frac{4}{x+1} + \frac{2}{2x-5} = 3$.

You must show all your working.

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

$$8x - 20 + 2x + 2 = 3(2x^2 + 2x - 5x - 5)$$

$$10x - 18 = 3(2x^2 - 3x - 5)$$

$$10x - 18 = 6x^2 - 9x - 15$$

$$6x^2 - 19x + 3 = 0$$

$$6x^2 - x - 18x + 3 = 0$$

$$x(6x-1) - 3(6x-1) = 0$$

$$(x-3)(6x-1) = 0$$

$$x - 3 = 0 \quad \text{or} \quad 6x - 1 = 0$$

$$x = 3 \quad \text{or} \quad x = \frac{1}{6}$$

$x =$ ..... 3 ..... or $x =$ ..... $\frac{1}{6}$ ..... [7]