1 The temperature at midnight is −8.5 °C.
The temperature at 11 am is −1 °C.

Work out the difference between the temperature at midnight and the temperature at 11 am.

$(-1) - (-8.5) = 7.5$

.....7.5..... °C [1]

2 The stem-and-leaf diagram shows the age, in years, of each of 15 women.

3	1	5	8	9				
4	1	1	2	3	5	6	9	
5	0	2	3	8				

Key: 3 | 1 represents 31 years

Complete these statements.

The modal age is .....41.....

The median age is .....43.....

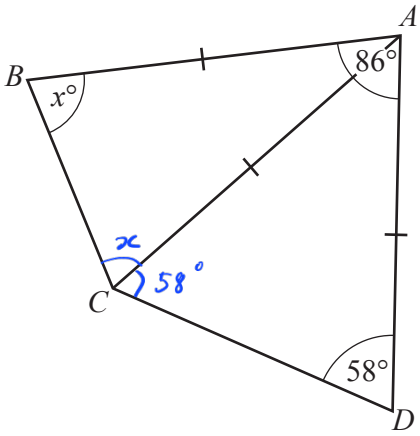
The percentage of women that are older than 51 years is .....20..... %. $\frac{3}{15} \times 100$ [3]

3 Change 2.15 hours into minutes.

$2.15 \times 60 = 129$

.....129..... min [1]

4



NOT TO SCALE

Triangle ABC and triangle ACD are isosceles.
Angle $DAB = 86°$ and angle $ADC = 58°$.

Find the value of x.

$2x + 58° + 58° + 86° = 360°$

$2x = 158°$

$x = 79°$

$x =$ 79° [3]

5 Angelique rents a room for a party.
The cost of renting the room is \$15.50 for the first hour and then \$7.25 for each additional hour.
She pays \$95.25 in total.

Work out the total number of hours she rents the room for.

The number of additional hour: $\frac{95.25 - 15.5}{7.25} = 11$

12 hours [3]

6 **Without using a calculator**, work out $\frac{1}{3} \div \frac{7}{6} + \frac{1}{5}$.

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

$\frac{1}{3} \times \frac{6}{7} + \frac{1}{5}$

$= \frac{6}{21} + \frac{1}{5}$

$= \frac{6 \times 5 + 1 \times 21}{21 \times 5}$

$= \frac{51}{105} = \frac{17}{35}$

.....$\frac{17}{35}$..... [4]

7 Katy has 5 white flowers, x red flowers and $(2x+1)$ yellow flowers.
She picks a flower at random.

The probability that it is white is $\frac{1}{12}$.

Find the probability that it is yellow.

$\frac{5}{5 + x + 2x + 1} = \frac{1}{12}$

$5 + x + 2x + 1 = 5 \times 12$

$3x = 54$

$x = 18$

$P(Y) = \frac{2x + 1}{5 + x + 2x + 1} = \frac{2 \times 18 + 1}{5 + 18 + 2 \times 18 + 1}$

.....$\frac{37}{60}$..... [4]

8 Calculate $\sqrt[4]{39\frac{1}{16}}$.

.....2.5..... [1]

9 2.1×10^{-1} $0.\dot{2}$ 22% $\sqrt{0.2}$ $\frac{24}{1000}$

0.21 0.222... 0.22 0.45... 0.024

Write these values in order of size, starting with the smallest.

$\frac{24}{1000}$ < 2.1×10^{-1} < 22% < 0.2 < $\sqrt{0.2}$ [2]

smallest

10 The interior angle of a regular polygon is 156°.

Work out the number of sides of this polygon.

$\frac{(n-2)180}{n} = 156$

$180n - 360 = 156n$

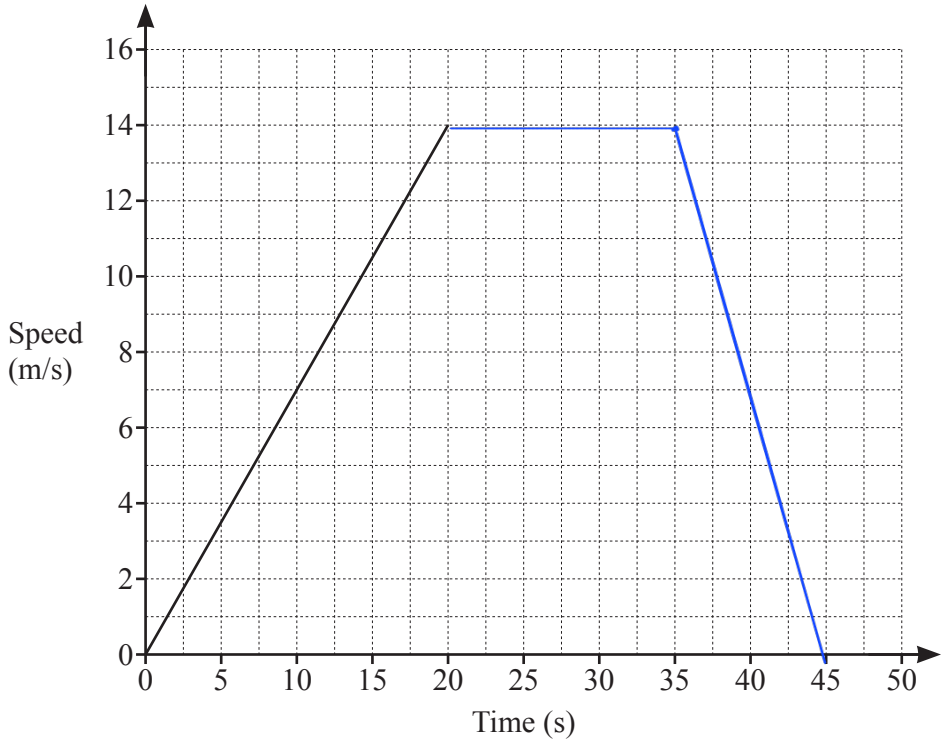
$24n = 360$

$n = 15$

15 [2]

11 A car starts its journey by accelerating from rest at a constant rate of 0.7 m/s^2 for 20 seconds, before reaching a constant speed of 14 m/s.
It then travels at 14 m/s for a distance of 210 m.
The car then decelerates at a constant rate of 1.4 m/s^2, before coming to a stop.

On the grid, complete the speed–time graph for the car's journey.



$\frac{210}{14} = 15$

$\frac{14}{1.4} = 10$

[3]

12 The table shows the first five terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	8	3	-2	-7	-12	$13-5n$
Sequence B	2	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$	$\frac{n+1}{n}$
Sequence C	$\frac{1}{2}$	1	2	4	8	2^{n-2}

Complete the table to show the nth term of each sequence.

[5]

13 **(a)** Write 243×27^{2n} as a single power of 3 in terms of n.

$3^5 \times (3^3)^{2n}$

$3^5 \times 3^{6n}$

3^{5+6n} [2]

(b) $k = 2 \times 3^2 \times p^3$, where p is a prime number greater than 3.

Write $6k^2$ as a product of prime factors in terms of p.

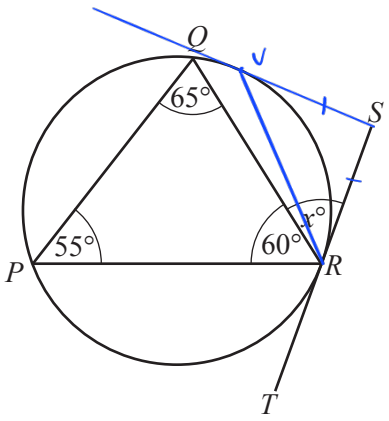
$6k^2 = 6(2 \times 3^2 \times p^3)^2$

$= 6 \times 2^2 \times 3^4 \times p^6$

$= (2 \times 2^2) \times (3 \times 3^4) \times p^6$

$2^3 \times 3^5 \times p^6$ [2]

14



NOT TO SCALE

P, *Q* and *R* are points on a circle.
ST is a tangent to the circle at *R*.

(a) Write down the value of *x*.
Give a geometrical reason for your answer.

$x =$ 55° because alternate segment theorem

[2]

(b) Another tangent from the point *S* touches the circle at *V*.

Give a geometrical reason why triangle *SVR* is isosceles.

Tangents from external point are equal in length

[1]

15 **(a)** *A* is the point (3, 16) and *B* is the point (8, 31).

Find the equation of the line that passes through *A* and *B*.
Give your answer in the form $y = mx + c$.

$m_{AB} = \frac{31-16}{8-3} = 3$

$y - 16 = 3(x - 3)$

$y - 16 = 3x - 9$

$y =$ 3x + 7 [3]

(b) The line *CD* has equation $y = 0.5x - 11$.

Find the gradient of a line that is perpendicular to the line *CD*.

$-1 : 0.5 = -2$

−2 [1]

16 Sachin picks a number at random from the first three multiples of 3.
He then picks a number at random from the first three prime numbers.
He adds the two numbers to find a score.

(a) Complete the table.

		Multiples of 3		
		3	6	9
Prime numbers	2	5	8	11
	3	6	9	12
	5	8	11	14

[2]

(b) Given that the score is even, find the probability that one of the numbers he picks is 9.

..... $\frac{2}{5}$ ..... [2]

17 Solve.

$(5x-3)(2x+7)=0$

$5x-3=0$ or $2x+7=0$

$x=\frac{3}{5}$ or $x=-\frac{7}{2}$

$x =$ ..... $\frac{3}{5}$ ..... or $x =$ ..... $-\frac{7}{2}$ ..... [1]

18 Solve the simultaneous equations.
You must show all your working.

$$y = x^2 - 9x + 21$$
$$y = 2x - 3$$

$2x - 3 = x^2 - 9x + 21$

$x^2 - 11x + 24 = 0$

$(x - 8)(x - 3) = 0$

$x = 8$ or $x = 3$

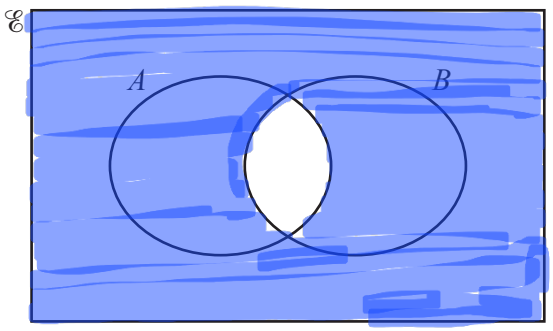
when $x = 8$, $y = 2 \times 8 - 3 = 13$

when $x = 3$, $y = 2 \times 3 - 3 = 3$

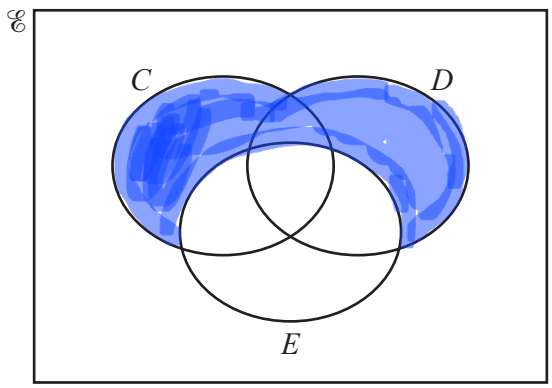
$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [5]

19 In these Venn diagrams, shade the given regions.



$A' \cup B'$



$(C \cup D) \cap E'$

[2]

20 $f(x) = 2^{x-3}$ $g(x) = 2x - 1$ $h(x) = \frac{5}{x-4}$

(a) Find ff(6).

$f(6) = 2^{6-3} = 8$

$f(8) = 2^{8-3} = 2^5 = 32$

.....32..... [2]

(b) Find $g^{-1}g(x+21)$.

$g(x+21) = 2(x+21) - 1 = 2x + 40$

$g^{-1}(x) = \frac{x+1}{2} \Rightarrow g^{-1}g(x+21) = \frac{2x+40+1}{2}$

.....x + 21..... [1]

(c) Find x when $f(x) = h(84)$.

$2^{x-3} = \frac{5}{84-4} = \frac{5}{80} = \frac{1}{16} = 2^{-4}$

$x - 3 = -4$

$x = -1$

$x =$ .....−1..... [2]

21 Expand and simplify.

$(x-3)^2(2x+5)$

$(x^2 - 6x + 9)(2x+5)$

$2x^3 - 12x^2 + 18x + 5x^2 - 30x + 45$

$2x^3 - 7x^2 - 12x + 45$ [3]

22 Solve the equation $7\sin x + 2 = 0$ for $0° \leqslant x \leqslant 360°$.

$7\sin x = -2$

$\sin x = -\frac{2}{7}$

$x = -16.6°$ or $x = 180° - (-16.6°) = 196.6°$

or $x = -16.6° + 360° = 343.4°$

196.6°, 343.4° [3]

23 Simplify.

$$\frac{3xy + 36y - 5x - 60}{2x^2 - 288}$$

$$\frac{3y(x+12) - 5(x+12)}{2(x^2-144)}$$

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

$\frac{3y-5}{2(x-12)}$ [4]