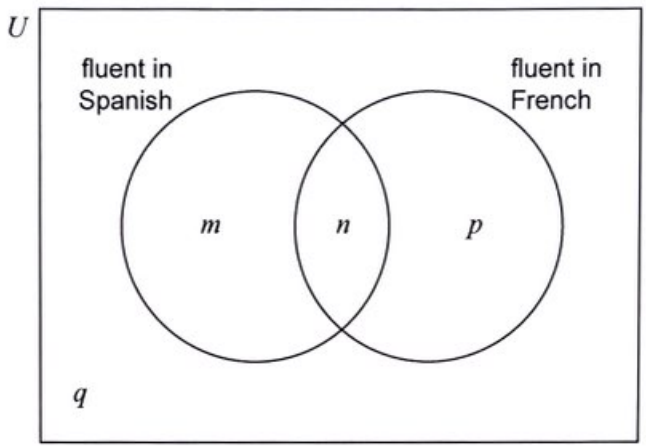
Solutions

2. [Maximum mark: 6]

In a class of 30 students, 18 are fluent in Spanish, 10 are fluent in French, and 5 are not fluent in either of these languages. The following Venn diagram shows the events "fluent in Spanish" and "fluent in French".

The values m, n, p and q represent numbers of students.



(a) Write down the value of q. [1]

(b) Find the value of n. [2]

(c) Write down the value of m and of p. [3]

(a) $q = 5$

(b) $n(U) = 30$

$m + n = 18$

$p + n = 10$

$(m + n + p) + n = 28$ $\quad m + n + p = 28 - n$

$m + n + p + q = 30$

$(28 - n) + 5 = 30$

$n = 3$

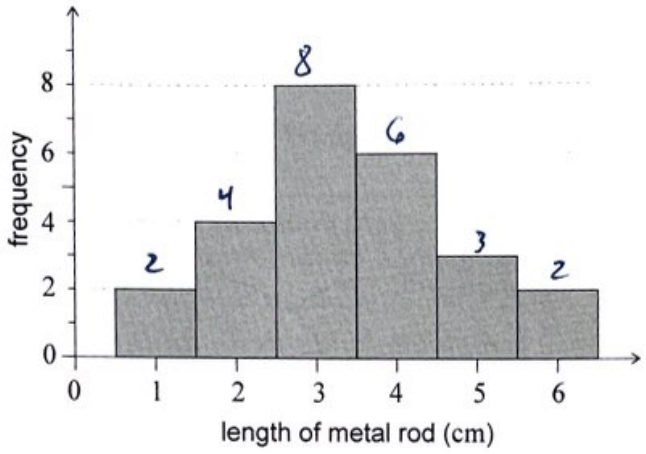
check

$18 + 10 + 5 - 3 = 30$ ✓

(c) $m = 18 - 3 = 15$

$p = 10 - 3 = 7$

2. The histogram shows the lengths of 25 metal rods, each measured correct to the nearest cm.



(a) Write down the modal length of the rods. [1]

(b) Find the median length of the rods. [3]

The upper quartile is 4 cm.

(c) Calculate

(i) the lower quartile;

(ii) the interquartile range. [2]

Working:

(a) 3

(b) $n_{median} = \frac{25+1}{2} = 13$

$2+4+8 = 14$

median = 3 cm

(c) $n_{Q_1} = \frac{1}{4} \times 6\frac{1}{2}$

i) $\frac{2+3}{2} = 2.5$

ii) $Q_3 = 4$

IQR = $4 - 2.5 = 1.5$

13
n_{median}

1, 1, 2, 2, 2, 2, 3, ... 3, 3, 4, 4, ... 4, 5, 5, 5, 6, 6

2 4 8 6

Answers:

(a) 3 cm

(b) 3 cm

(c) (i) 2.5 cm

(ii) 4 cm

5. The table shows the first five terms of three sequences: u_n, v_n and w_n.

	n				
	1	**2**	**3**	**4**	**5**
u_n	10	20	40	80	160
v_n	10	20	30	60	100
w_n	10	20	30	40	50

(a) State which sequence is

(i) arithmetic;

(ii) geometric. [2]

(b) Find the exact value of the 11th term of the geometric sequence. [2]

(c) Find the sum of the first 20 terms of the arithmetic sequence. [2]

Working:

(a) i) arithmetic w_n

ii) u_n

(b) $u_{11} = 10 \cdot 2^{(11-1)}$

$= 10,240$

(c) $S_{20} = \frac{20}{2}(2 \cdot 10 + (20-1)(10))$

$= \cancel{2010}$ 2100

Answers:

(a) (i) w_n

(ii) u_n

(b) 10,240

(c) ~~2010~~ 2100

7. Nick has \$150 000 in a trust fund. Each year he donates 8% of the money remaining in his trust fund to charity.

(a) Determine the maximum number of years Nick can donate to charity while keeping at least \$50 000 in the trust fund. [3]

Louise invests \$200 000 in a bank account that pays a nominal interest rate of 5%, **compounded quarterly**, for eight years.

(b) Calculate the value of Louise's investment at the end of this time. Give your answer correct to the nearest cent. [3]

Working:

(a) $PV = 150,000(1-0.08)^n > 50,000$

$0.92^n > \frac{1}{3}$

$n < \log_{0.92}(1/3)$

$= 13.1757...$

13 years

(b) $PV = 200,000\left(1+\frac{0.05}{4}\right)^{8.4}$

$= 297,626.10$

Answers:

(a) 13

(b) .....