

1 (a) $\frac{3}{35} \times 100\% = 8\frac{4}{7}\%$

(b) $17\frac{1}{2} \div 100 = \frac{7}{40}$

2
$$\frac{3.93}{(7.47 + 3.02) 5.67} = 0.06607$$

$$\approx 0.066 \text{ (2 sf)}$$

3
$$3x^3 - 12xy^2 = 3x(x^2 - 4y^2)$$

$$= 3x(x^2 - (2y)^2)$$

$$= 3x(x + 2y)(x - 2y)$$

4 (a) $3^{23} \div 27 = 3^k$
 $3^{23} \div 3^3 = 3^k$
 $3^{23-3} = 3^k$
 $23 - 3 = k$
 $k = 20$

(b) $1 \div 2x^{-5} = 1 \div \frac{2}{x^5}$
 $= 1 \times \frac{x^5}{2}$
 $= \frac{x^5}{2}$

5 (a) $|t - (-3)| = |t + 3|$

(b) Mean temperature = $\frac{-3 + 5 + t}{3}$
 $= \frac{2 + t}{3}$

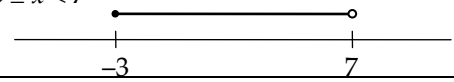
6 Let S denote the sum of money.
$$\left(\frac{1}{3} - \frac{2}{2+3+4}\right)S = \left(\frac{1}{3} - \frac{2}{9}\right)S = \frac{S}{9} = 20$$

 $S = 9 \times 20 = 180$

7 (a) $2x^2 - 5x - 3 = (2x + 1)(x - 3)$

(b) $2x^2 - 5x - 3 = 0$
 $(2x + 1)(x - 3) = 0$
 $2x + 1 = 0 \quad \text{OR} \quad x - 3 = 0$
 $2x = -1 \quad \quad \quad x = 3$
 $x = -\frac{1}{2}$

8 $-2 \leq 2x + 4 < 18$
 $-2 \leq 2x + 4 \quad \text{OR} \quad 2x + 4 < 18$
 $-2 - 4 \leq 2x \quad \quad \quad 2x < 18 - 4$
 $-6 \leq 2x \quad \quad \quad 2x < 14$
 $-3 \leq x \quad \quad \quad x < 7$
 $\therefore -3 \leq x < 7$



9 (a) $\hat{AOC} = 180^\circ - 2(28^\circ)$
 $= 124^\circ$

(b) Let D be a point along the major arc AC .
 $\hat{ADC} = 124^\circ \div 2$ (angle at the circumference)
 $= 62^\circ$
 $\hat{ABC} = 180^\circ - 62^\circ$ (cyclic quadrilateral)
 $= 118^\circ$

(c) $\hat{OAT} = 90^\circ$ (tangent to a circle)
 $\hat{CAT} = 90^\circ - 28^\circ$
 $= 62^\circ$
 $\hat{ATC} = 180^\circ - 2(62^\circ)$
 $= 56^\circ$

10 (a) $168 = 2 \times 2 \times 2 \times 3 \times 7$
 $= 2^3 \times 3 \times 7$

(b) (i) LCM of 168 and 4900
 $= 2^3 \times 3 \times 5^2 \times 7^2$
(ii) GCD of 168 and 4900
 $= 2^2 \times 7$
 $= 28$

11 (a) $P(\text{the total of the three numbers is 18})$
 $= \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$

(b) $P(\text{the three dice show the same number})$
 $= \frac{1}{216} \times 6$
 $= \frac{1}{36}$

(c) Out of the three dice, one of them should be a 5.

There are $\binom{3}{1}$ possible ways to select that die.

$P(\text{the total of the three numbers is 17})$
 $= \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \binom{3}{1}$
 $= \frac{1}{72}$

12 (a) $A' = \{-3, 3\}$

(b) $A \cap B = \{1, 2\}$

(c) $A \cup B = \{-2, -1, 0, 1, 2, 3\}$

- 13 (a) Since V is inversely proportional to P , $V = \frac{k}{P}$.

$$3 = \frac{k}{200}$$

$$k = 3 \times 200 = 600$$

$$\therefore V = \frac{600}{P}$$

$$\text{When } P = 150, V = \frac{600}{150} = 4.$$

- (b) When $V = 5$, $P = \frac{600}{V} = \frac{600}{5} = 120$.

14 (a) $(3 \times 10^5) \times 10^3 = 3 \times 10^8$

(b) $\frac{1 \div (3 \times 10^8)}{10^{-9}} = 3 \frac{1}{3}$

15 (a)
$$\begin{pmatrix} 7 & 2 & 3 \\ 6 & 6 & 2 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} (7)(3) + (2)(1) + (3)(0) \\ (6)(3) + (6)(1) + (2)(0) \end{pmatrix}$$

$$= \begin{pmatrix} 23 \\ 24 \end{pmatrix}$$

- (b) The matrix represents the total points awarded for the two football teams.
The total points awarded for City and United is 23 and 24 respectively.

16 (a) $\frac{3a^2}{7bc} \div \frac{9a}{14b} = \frac{3a^2}{7bc} \times \frac{14b}{9a} = \frac{2a}{3c}$

(b)
$$\frac{2x}{(2x-3)^2} - \frac{1}{2x-3} = \frac{2x}{(2x-3)^2} - \frac{2x-3}{(2x-3)^2}$$

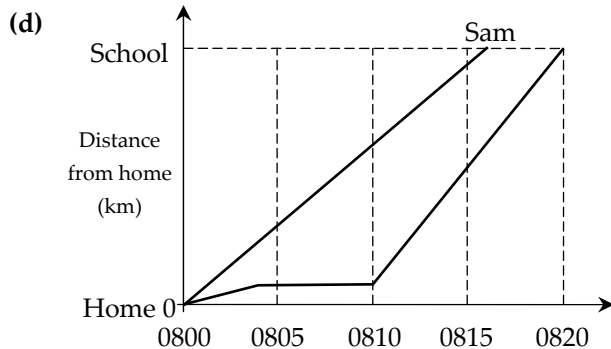
$$= \frac{2x - (2x-3)}{(2x-3)^2}$$

$$= \frac{3}{(2x-3)^2}$$

- 17 (a) Time difference between 0804 and 0810
= 6 minutes

(b) $5.4 - 2.9 = 2.5$

(c) $2.5 \div \frac{5}{60} = 30$

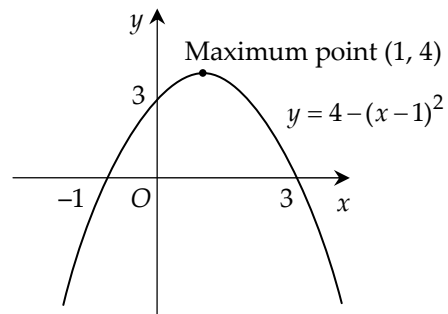


- 18 (a) 75

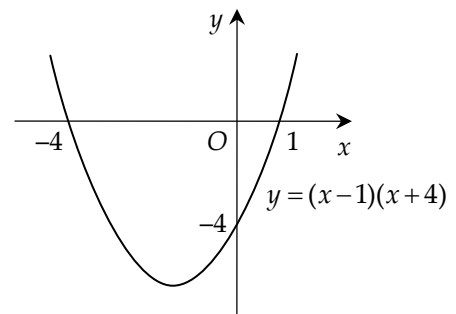
- (b) 69

- (c) The girls performed better because the mean marks of the girls are higher than that of the boys.

- 19 (a)



- (b) (i)



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

Line of symmetry is $x = -\frac{3}{2}$

20 (a) Area of triangle $ABC = \frac{1}{2} \times (6-3) \times (5-1)$
= 6

- (b) Let x represent the x -coordinate of the point D .

$$\frac{AB+DC}{2} \times \text{height} = 14$$

$$\frac{(6-3) + (9-x)}{2} \times (5-1) = 14$$

$$\frac{12-x}{2} \times 4 = 14$$

$$12-x = 7$$

$$x = 5$$

Since the y -coordinate of the point C is 5, the coordinates of the point D is $(5, 5)$.

- (c) Let h represent the height of triangle ABE .

$$\frac{1}{2} \times AB \times h = 9$$

$$\frac{1}{2} \times (6-3) \times h = 9$$

$$h = \frac{9 \times 2}{3} = 6$$

$$k = 1+6 = 7 \quad \text{OR} \quad k = 1-6 = -5$$

21 (a) $1000 \text{ m} = 1 \text{ km}$

$$\text{time taken} = \frac{\text{distance}}{\text{speed}} = \frac{1}{4} \text{ h}$$

$$= 15 \text{ minutes}$$

(b) $\text{speed} = \frac{\text{distance}}{\text{time taken}} = \frac{1.3}{5 \div 60} = 15\frac{3}{5} \text{ km/h}$

(c) $\text{average speed} = \frac{\text{total distance}}{\text{total time taken}}$

$$= \frac{1+1.3}{\frac{1}{4} + \frac{5}{60}}$$

$$= \frac{2.3}{\frac{1}{3}}$$

$$= 6.9 \text{ km/h}$$

22 (a) $(2n-1)+2 = 2n+1$

$$(2n+1)+2 = 2n+3$$

The next two odd numbers are $2n+1$ and $2n+3$.

(b) (i) $(2n-1)+(2n+1)+(2n+3)$

$$= 6n+3$$

$$= 3(2n+1)$$

(ii) Since 3 is a factor of $3(2n+1)$, the sum is a multiple of 3.

(c) $(2n-1)^2 + (2n+1)^2 + (2n+3)^2$

$$= (4n^2 - 4n + 1) + (4n^2 + 4n + 1) + (4n^2 + 12n + 9)$$

$$= 12n^2 + 12n + 11$$

23 (a) In $\Delta s ALB$ and NLD ,

$$\hat{A}LB = \hat{N}LD \text{ (vertically opposite angles)}$$

$$\hat{A}BL = \hat{N}DL \text{ (alternate angles since } AB \parallel DN)$$

$$\hat{B}AL = \hat{D}NL \text{ (angle sum)}$$

By the AAA property, $\Delta s ALB$ and NLD are similar.

(b) ΔNDA

(c) ΔADB and ΔCBD

(d) (i) Consider triangles ALB and NLD .

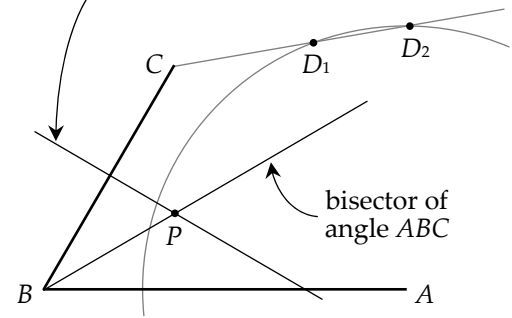
Since $\frac{AB}{ND} = \frac{1}{3}$ and $AB = CD$,

$$\frac{AB}{CN} = \frac{AB}{ND - CD} = \frac{AB}{ND - AB} = \frac{1}{3-1} = \frac{1}{2}$$

(ii) $\frac{\text{Area of } \Delta ABL}{\text{Area of } \Delta ADL} = \frac{1}{3}$

(iii) $\frac{\text{Area of } \Delta MLB}{\text{Area of } \Delta ALD} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$

24 (a) perpendicular bisector of BC



(b) See diagram

(c) The point P is equidistant from the lines AB and BC and equidistant from the points B and C .

(d) See diagram

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