Answers to the sample questions and additional information. (Core level) Includes 2016 papers

Section 1 Two dimensional shapes; quadrilaterals; angles and symmetry

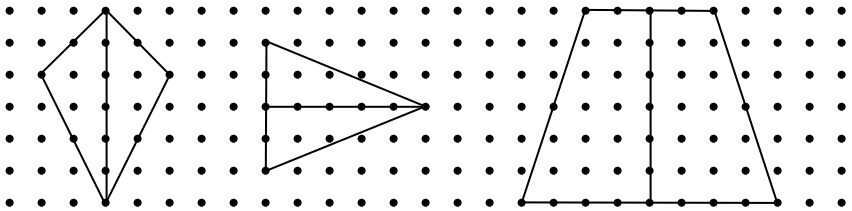
1. (a) Trapezium

(b) p = 32º $\angle CAB$ and $\angle ACD$ are alternating angles.

t = 32º +67º = 99º exterior angle of $\triangle$ABC

w = (180º – 32º) ÷ 2 = 74º $\triangle$ ACD is isosceles.

2. (a)



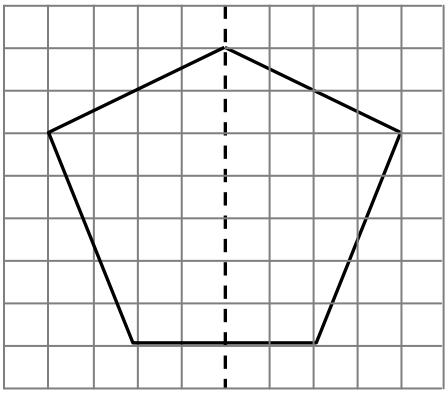
(b) → → → Kite Isosceles triangle Isosceles trapezium

3. a = 180º – 42º – 52º = 86º [Use property of opposite angles & angles in a $\triangle$add up to 180º]]

b = 180º – 86º = 94º [Two angles on a straight line add up to 180º (supplementary angles)]

c = 90º [$\angle$C and c are co- interior angles so they add up to 180º]

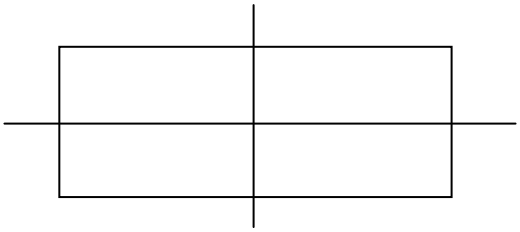
4. (a)



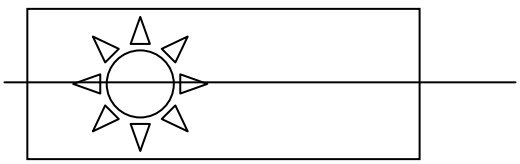
(b) Polygon is a pentagon.

5. a = 180º – 32º – 78º = 70º b = 180º – 32º = 148º c = 180º – 70º – 78º = 32º

6. (a)

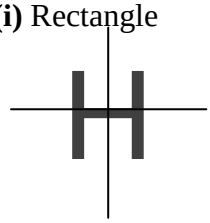


(b)



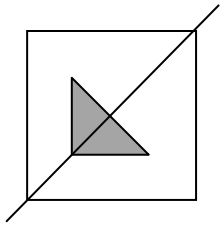
(a) (i) Rectangle **(ii)** Order of rotational symmetry of a rectangle is 2

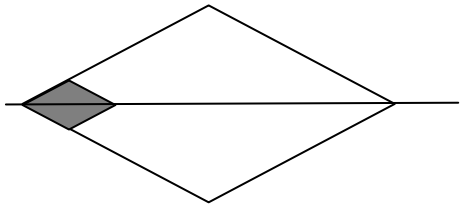
7. (a)



two lines of symmetry. **(b)** The letter S.

8.

Shape **A** 

Shape **B** 

9. angle $BAC = 180 - 50 - 50 = \underline{80°}$

Section 2 Three dimensional shapes; nets and volume and area calculations.

1. (a) Area base = $\pi r^2 = \pi \times 35^2 = \underline{3848.45\ \text{cm}^2} = \underline{3850\ \text{cm}^2}$ in 3 significant figures.
(b) Volume = area base × height = $3848 \times 44 = \underline{169\ 332\ \text{cm}^3} = \underline{169000\ \text{cm}^3}$ in 3 significant figures.
(c) $169332\ \text{cm}^3 = \underline{169\ \ell}$.

2. (a) $V = \pi r^2 h = \pi \times 2^2 \times 10 = 40\pi \approx \underline{126\ \text{cm}^3}$
(b) (i) $48 \div 4 = 12$ and $24 \div 4 = 6$ so the box can contain $12 \times 6 = \underline{72\ \text{containers}}$
(ii) $V = 10 \times 24 \times 48 = \underline{11520\ \text{cm}^3}$
(iii) $11520 - 72 \times 40\pi = \underline{2472\text{cm}^3}$
(b) TSA $= 2(48 \times 24 + 24 \times 10 + 48 \times 10) = \underline{3744\ \text{cm}^2}$

3. (a) (i) $(180^\circ - 69.4^\circ) \div 2 = \underline{55.3^\circ}$ **(ii)** $ON = \sqrt{(9^2 - 7.4^2)} = \underline{5.12\ \text{cm}}$ [or $9 \times \cos 55.3^\circ = \underline{5.12\ \text{cm}}$ as well.]
(iii) so the width of the chest is $2 \times 5.12 = \underline{10.24\text{cm.}}$
(b) (i) Area rect. $KMNP = 10.24 \times 7.4 = \underline{75.8\ \text{cm}^2}$
(ii) Area semicircle $KLM = ½ \times \pi \times 5.12^2 = \underline{41.2\ \text{cm}^2}$
(iii) Area cross section is $75.8 + 41.2 = \underline{117.0\ \text{cm}^2}$
(c) Volume is $117.0 \times 15 = \underline{1755\ \text{cm}^3}$

4. (a) Volume is $3 \times 1.5 \times 1.8 = 8.1\ \text{m}^3$
(b) (i) $9 \times 10^{-3} = 0.009$ **(ii)** $8.1 \div 0.009 = 900$ tiles.

5. (a) Trapezium **(b)** $½ \times b \times h = ½ \times 4 \times 5 = 10\ \text{m}^2$

Section 3 Accuracy; standard form and significant figures; calculator skills

1. $1600\ \text{km} = \underline{1.6 \times 10^3\ \text{km}}$

2. (a) <u>1.56097561</u> **(b)** <u>2</u>

3. $5850\ \text{m} \leq h < 5950\ \text{m}$

4. $2 \times 6 - 4 \times 2 = 12 - 8 = \underline{4}$

5. (a) <u>110 000</u> **(b)** $111488 \div 30 = \underline{3716\ \text{cars}}$ **(c)** 30 months $= 30 \div 12 = \underline{2.5\ \text{years.}}$

6. (a) $22\ 500 \leqslant \text{area} < 23\ 500$ **(b)** $4730 \div 23000 \times 100\% = \underline{20.6\%}$ **(c)** $200\ 000 = \underline{2 \times 10^5}$

7. (a) $\sqrt{81} = \underline{9}$ **(b)** $\sqrt{125} \approx \underline{11}$.

8. (a) $\underline{82} - 44 = 38$ **(b)** $13 \times \underline{5} = 65$ **(c)** $72 \div \underline{12} = 6$.

9. (a) Difference is $\underline{16}^{\circ}$C **(b)** City F is warmer.

10. 200 million = $\underline{2 \times 10^8 \text{ years}}$.

11. $\underline{30.5 \text{ km} \le d < 31.5 \text{ km}}$

12. (a) (i) 185→ $\underline{200}$ and 35→$\underline{40}$ **(ii)** $200 \div 40 = \underline{5}$ **(c)** $185 \div 35 = \underline{5.29}$

13. (a)

−2	5	−3
−1	0	1
3	−5	2

(b) $(-2) \times 5 \times (-3) = \underline{30.}$

14. (a) $17 - 9 \div 3 + 6 = 17 - 3 + 6 = 14 + 6 = \underline{20}$
(b) (i) $\underline{4\ 360}$ **(ii)** $\underline{4\ 400}$
(c) $\underline{345 \text{ km} \le d < 355 \text{ km}}$

Section 4 Algebra I: expansion; changing the subject of the formula and substitution.

1. (a) $t = 12$ substitute in $v = \frac{4t}{3}$ → $v = \frac{4 \times 12}{3} = 16$ → $\underline{v = 16}$

(b) $v = \frac{4t}{3}$ → multiply both sides by 3: $3v = 4t$ →divide both sides by 4: $t = \frac{3v}{4}$

2. When $x = -3$ and $y = 2$, find the value of
(a) $x + y = -3 + 2 = \underline{-1}$
(b) $y - x = 2 - (-3) = 2 + 3 = \underline{5}$
(c) $x^3 + 2x^2 = (-3)^3 + 2(-3)^2 = -27 + 2 \times 9 = -27 + 18 = \underline{-9}$

3. (a) $\underline{a = 2b^2}$ **(b)** $18 = 2b^2$ → divide both sides by 2: $9 = b^2$ so that $\underline{b = 3}$

4. $3a(2a - 4b) = \underline{6a^2 - 12ab}$

5. (a) $3x^2 - 6x = \underline{3x(x - 2)}$ **(b)** $3 \times 3^2 - 6 \times 3 = 27 - 18 = \underline{9}$

6. $5x(2x - 3y) = \underline{10x^2 - 15xy}$

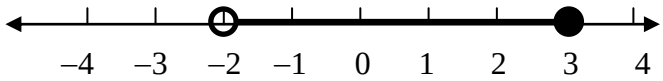
7. $2x - y = 5$ or $2x = 5 - y$ divide by 2: $\underline{x = 2.5 - 0.5y}$ or $\underline{x = 2½ - ½ y}$

Section 5 Algebra II: factorization; simplification; linear and quadratic equations and inequalities

1. (a) Factorise completely $2y + 8y^2 = \underline{2y(1 + 4y)}$
(b) Solve this equation $36 = 4(x - 3)$ → divide both sides by 4: $9 = x - 3$ → $\underline{x = 12}$
(c) Solve for x: $(x - 7)(x + 3) = 0$ → $x - 7 = 0$ so that $\underline{x = 7}$ or $x + 3 = 0$ so that $\underline{x = -3}$.
(d) Solve for y: $(2y - 6)(y + 5) = 0$ → $2y - 6 = 0$ → $2y = 6$ so that $\underline{y = 3}$ or $y + 5 = 0$ so that $\underline{y = -5}$

2. $4x^2 + 12\,xy = \underline{4x(x + 3y)}$

3. (a)



(b) (i) $m < n$ **(ii)** $m^2 > n^2$

4. (a) (i) $n + (n + 1) + (n + 2) = 36$ or $\underline{3n + 3 = 36}$

(ii) $3n + 3 = 36 \rightarrow 3n = 33$ or $n = 11$. So the numbers are $\underline{11, 12 \text{ and } 13}$.

(b) $(a – 2)(a + 5) = 0 \rightarrow a = 2$ or $a = –5$.

5. (a) N$25

(b) $25 \times 4 + 60 =$ N$160

(c) $w = 25h + t \rightarrow 25h = w – t$ so $h = (w – t) \div 25$ or $h = \frac{1}{25}w - \frac{1}{25}t$

6. $4xy + 3x = x(4y + 3)$

7. $8x + 7 = 31$ subtract 7 from both sides: $8x = 24 \rightarrow \underline{x = 3}$

8. $2a + 3b + 5a – 7b = \underline{7a – 4b}$

9. (a) $2x – 5$ **(b)** $2x – 5 = 10$ or $2x = 15$ so $x = 7½$.

10. (a) $\frac{x}{4} = 6$ multiply both sides with 4: $\underline{x = 24.}$

(b) $5(a – 4) = 3a + 14$ or $5a – 20 = 3a + 14$ so $2a = 34$ divide by 2: $\underline{a = 17}$.

Section 6 Algebra III: simultaneous equations and exponents.

1. $2x – y = 6$…..①

$3x + y = 14$….② Add ① + ②: $5x = 20 \rightarrow \underline{x = 4}$ substitute this value in ①: $8 – y = 6$ so $\underline{y = 2.}$

2. $3x^2 \times 2x^3 = 6x^5$

3. (a) $2^3 < 3^2$

(b) $2^{-3} > 3^{-2}$

(c) $2^0 = 3^0$

4.
$$\begin{array}{rl} & 7x – 3y = 13 \\ – & 4x – 3y = 7 \\ \hline & 3x \quad = 6 \end{array}$$
$\rightarrow \underline{x = 2}$ substitute this in one of the equations: $14 – 3y = 13$ so $–3y = –1 \rightarrow y = \frac{1}{3}$

5. $\frac{24x^{18}\ (\div 8)}{16x^9\ (\div 8)} = \frac{3x^{18-9}}{2} = \frac{3x^9}{2} = 1.5x^9$ [Both answers are correct]

6. $3x + y = 5$ Eliminate the y by subtracting the two equations.

$$\begin{array}{rl} – & 2x + y = 1 \\ \hline & x \quad = 4 \end{array}$$
substitute this in the first equation: $3 \times 4 + y = 5 \rightarrow \underline{y = –7}$

7. $x + y = 18 \rightarrow$ $\quad x + y = 18$

$4x + 8y = 52$ divide by 4: $\quad – \quad x + 2y = 13$

$–y = 5$ so $y = −5$ substitute in the first equation $x − 5 = 18 \rightarrow x = 23$.

Section 7 Distant time graph; average speed and duration

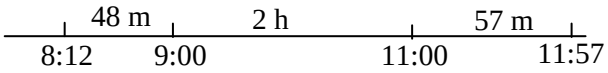
1. 15 hours and 30 minute = 15.5 h. Average speed = $\frac{\text{total covered distance}}{\text{total time used}} = \frac{1400}{15.5}$ = 90.3 km/h

2. 4hours 18 minutes = $4\frac{18}{60} = 4\frac{3}{10}$ = 4.3 h so average speed is 350 ÷ 4.3 = 81.4 km/h

3. From 9:30 to 13:05 = 3 hours and 35 minutes.

4. (i) 45 + 10 = 55 min. **(ii)** 5 km in 55 min = 5 ÷ 55 km in 1 min = (5 ÷ 55) × 60 km/h = 5.45 km/h.

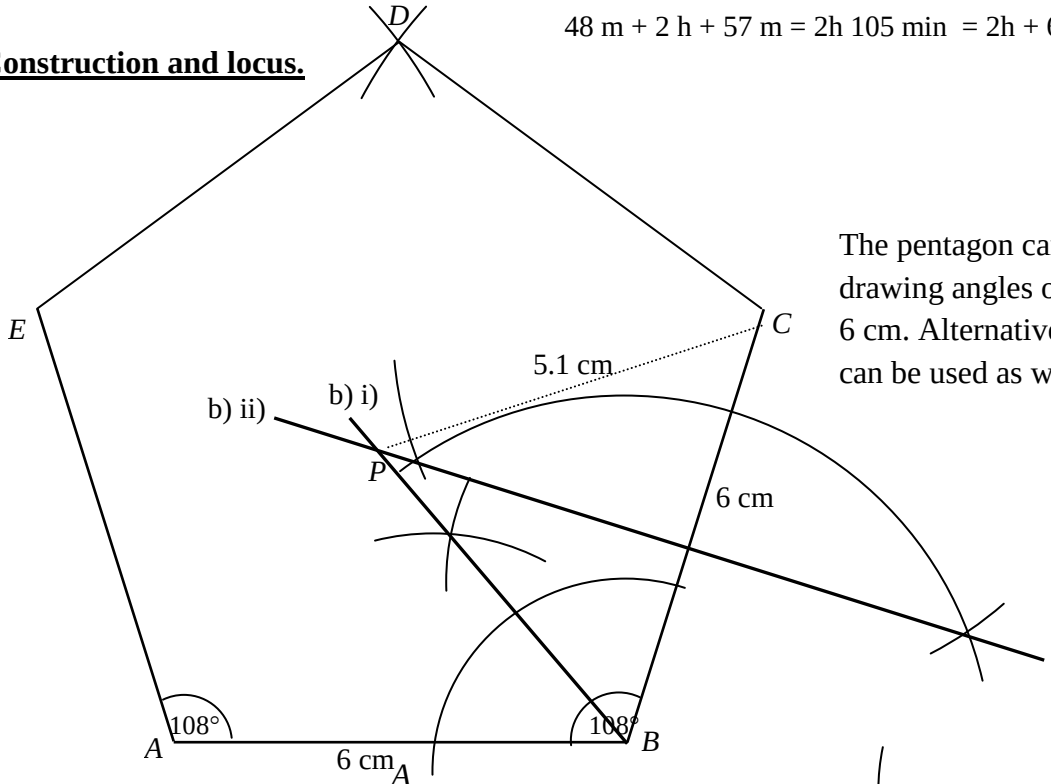
5. Subtract: 11:57 – 08:12 = 3h 45 min or make a time line:



48 m + 2 h + 57 m = 2h 105 min = 2h + 60m + 45m = 3h 45 m

Section 8 Construction and locus.

1.



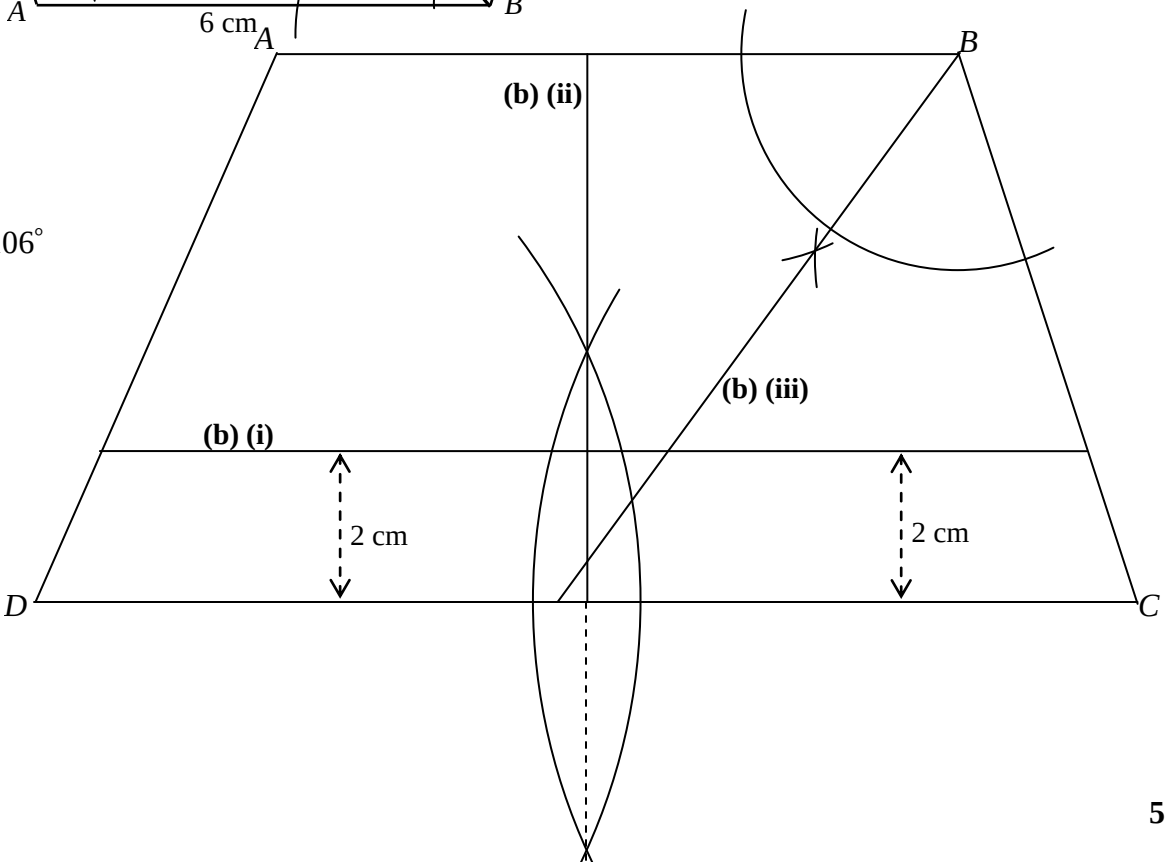
The pentagon can be completed by drawing angles of 108º and sides of 6 cm. Alternatively a pair of compasses can be used as well to find point D.

(c) *PC* = 5.1 cm.

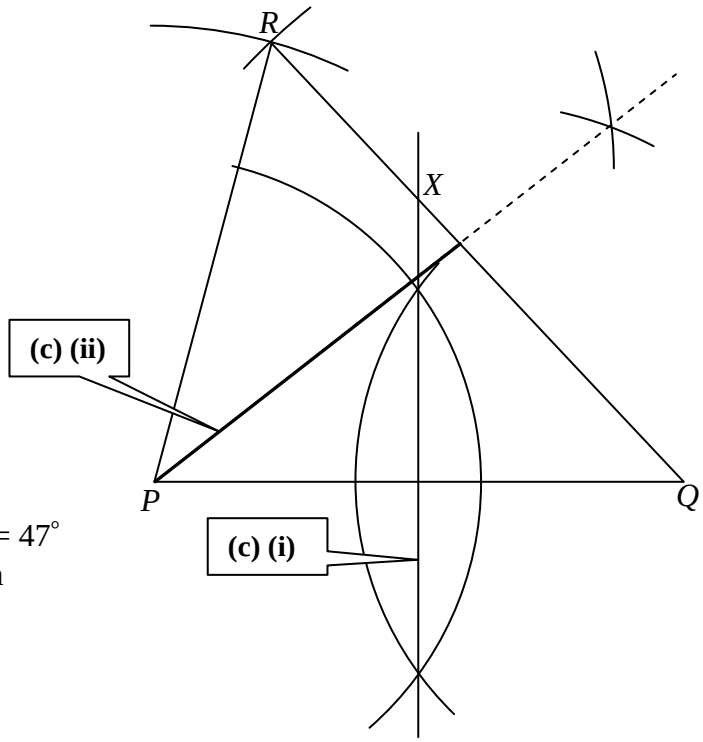
2. (a) (i) *DC* = 14.6 cm

(ii) angle *ABC* = 106°

(b)



3. (a)



(b) Angle $PQR = 47^\circ$
(d) $QX = 4.3$ cm

Section 9 Finance: Bills; profit & loss; exchange and interest.

1. $50 - (27.40 + 5.68) =$ N$16.92

2. $1500 \times 1.05 = 1575$ pula.

3. N$30 – N$6.45 = N$23.55

4. (a) $4550 \times 1.12 =$ N$5096
(b) $20000 \times 1.05 \times 1.05 =$ N$22050
(c) $0.85 \times 135000 =$ N$114750

5. (a) (i) $113 \times 3.50 =$ N$ 395.50 **(ii) (**$0.50 \div 3.00) \times 100\% = 16.7\%$ or $16\frac{2}{3}\%$
(b) $21.60 \div 3.2 =$ N$ 6.75 per kg.
(c) 3.5 kg of cookies will cost $4 \times 3.5 \times 20 =$ N$280.

6. (a) (i) Deposit is 10% of 25000= N$2500 **(ii)** $24 \times 1200 =$ N$28 800 **(iii)** 28800+2500 = N$31 300
(b) 31300 – 25000 = N$6300

7. (a) $36 \times 3.12 - 93.60 =$ N$18.72 **(b)** %profit $= \frac{profit}{cost\ price} \times 100 = \frac{18.72}{93.60} \times 100 =$ 20%

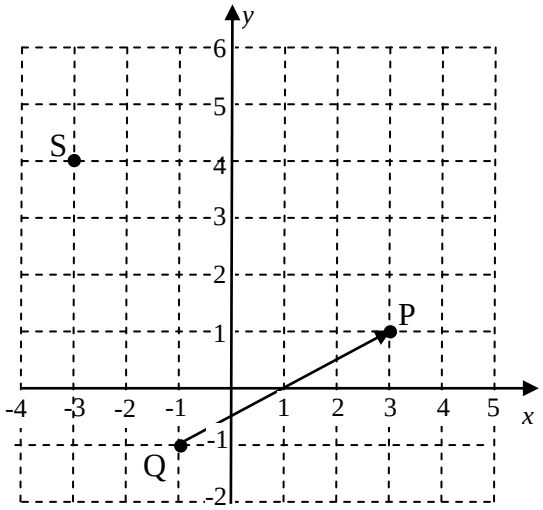
8. amount $= 3.50 + 12 \times 2.50 =$ N$33.50

9. 8% of 5200 $= 0.08 \times 5200 =$ N$416 for 3 years: $3 \times 416 =$ N$1248

10. (a) $2500 \div 5 =$ N$500 **(b)** $5 \times 21 =$ N$105 **(c)** $1.15 \times 2500 =$ N$2 875

Section 10 Vectors

1.

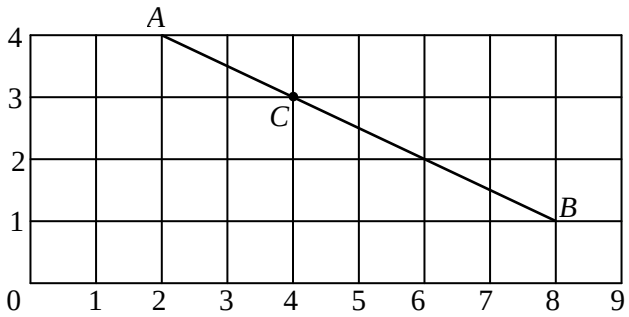


(a) $\overrightarrow{QP} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$

(b) (i) $\overrightarrow{PS} = \begin{pmatrix} -6 \\ 3 \end{pmatrix}$.

(ii) see diagram

2.



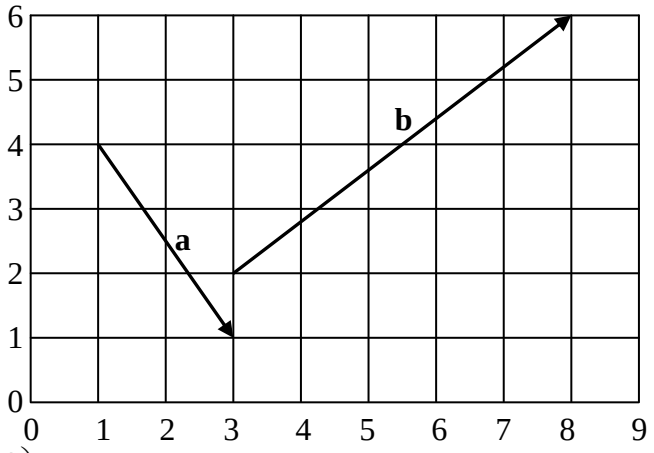
(a) $\overrightarrow{AB} = \begin{pmatrix} 6 \\ -3 \end{pmatrix}$

(b) See diagram

3. (a) a = $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

(b) See diagram→

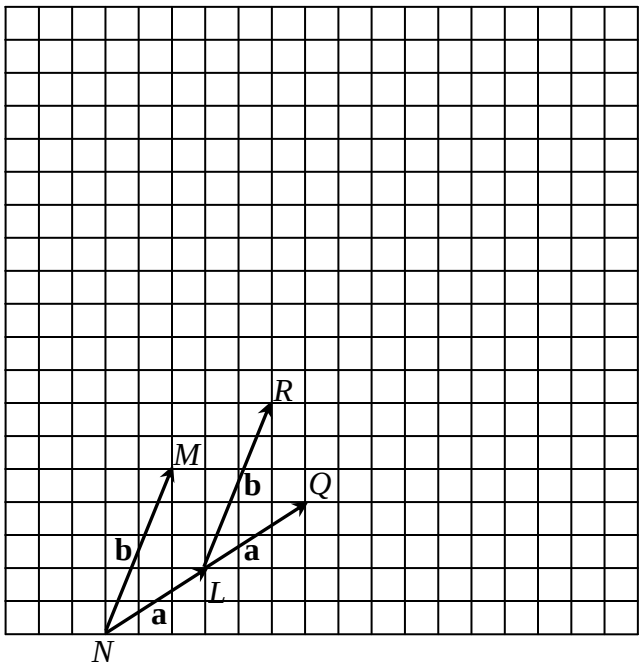
(c) 2**b** = $\begin{pmatrix} 10 \\ 8 \end{pmatrix}$



4. (a) $x + y = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$ **(b)** ½ $y = \begin{pmatrix} -2 \\ 0 \end{pmatrix}$

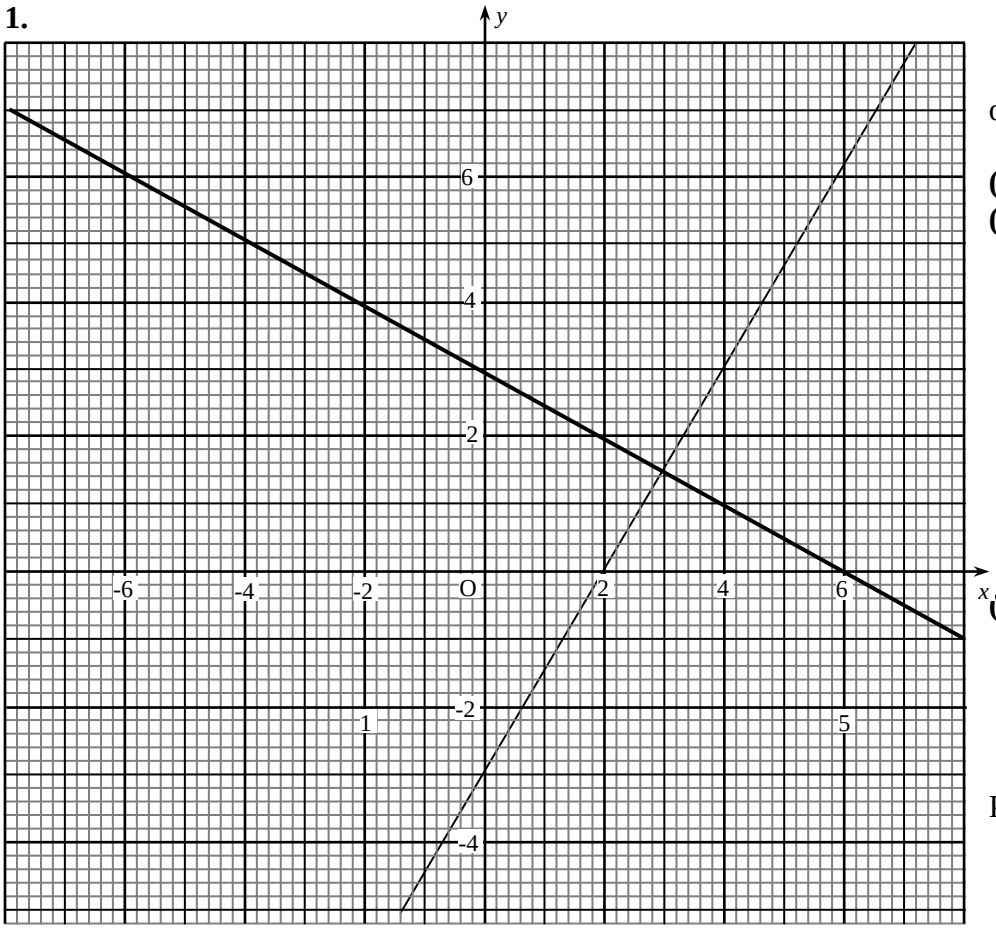
5. (a) $\overrightarrow{NL} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

(b) & (c) see diagram.



Section 11 graphs: linear; quadratic and hyperbola.

1.



The graph of $x + 2y = 6$ is drawn on the grid to the left.

(a) Gradient –½

(b) (i) Complete the table below when

$y = \frac{3}{2}x - 3$

x	0	2	4
y	**–3**	**0**	**3**

(ii) See grid

(c) Use the graph to solve the simultaneous equations

$x + 2y = 6.$

$y = \frac{3}{2}x - 3$

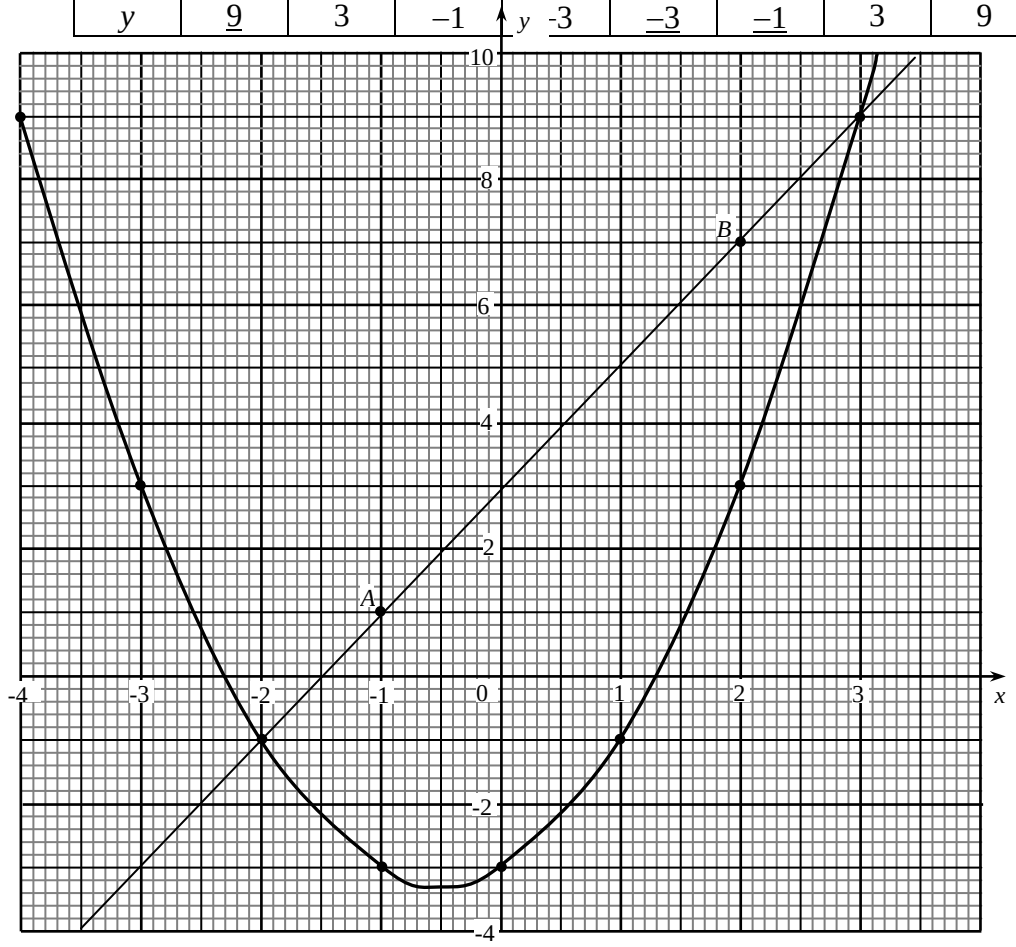
Point of intersection is: (3, 1.5)

2. (a) 50ºF
(b) 65ºC
(c) (i) 32ºF **(ii)** 213ºF

3. (a) F
(b) $y = -2$
(c) G
(d) (0, 4)
(e) 2

4. (a) **(i)** Complete the table below for the function $y = x^2 + x - 3$.

x	-4	-3	-2	-1	0	1	2	3
y	$\underline{9}$	3	-1	-3	$\underline{-3}$	$\underline{-1}$	3	9



(b) **(i)** see graph

(ii) (3, 9) and $(-2, -1)$

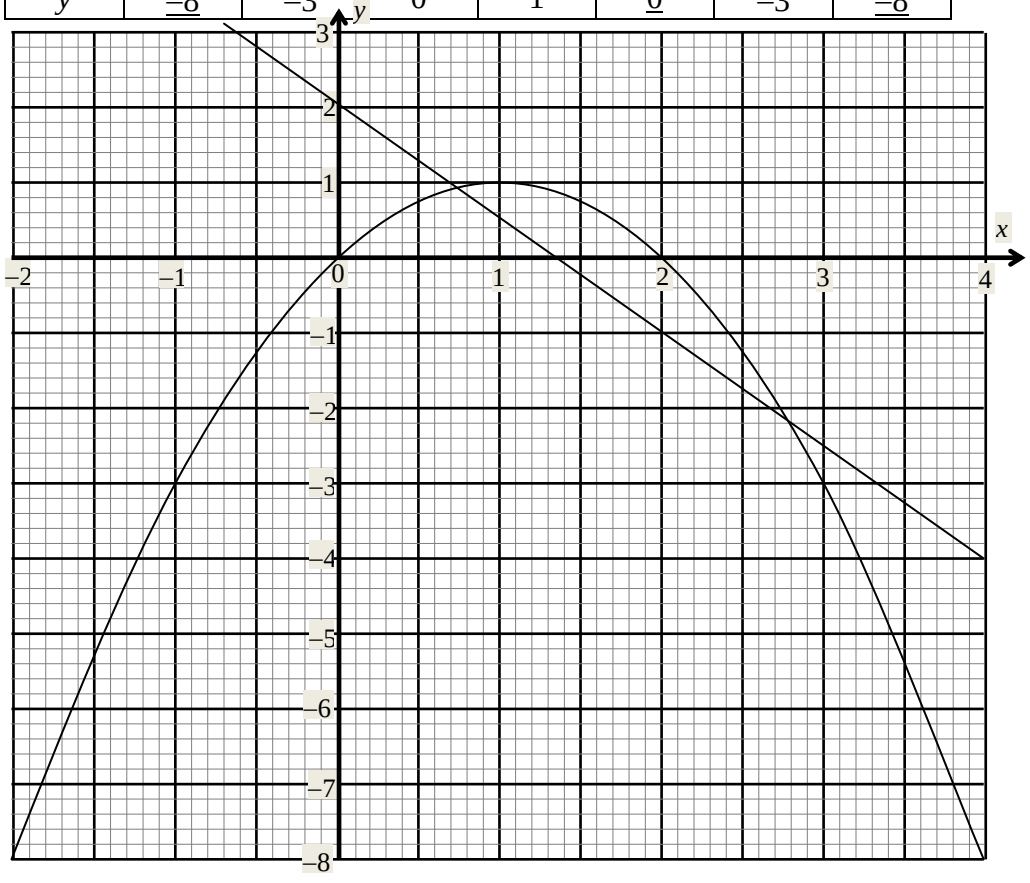
(iii) gradient is 2

As well: $\frac{9-(-1)}{3-(-2)} = \frac{10}{5} = 2$

(iv) $y = 2x + 3$

5.

x	-2	-1	0	1	2	3	4
y	$\underline{-8}$	-3	0	1	$\underline{0}$	-3	$\underline{-8}$



(b) (i)

x	0	2	4
y	2	–1	–4

(ii) see grid above

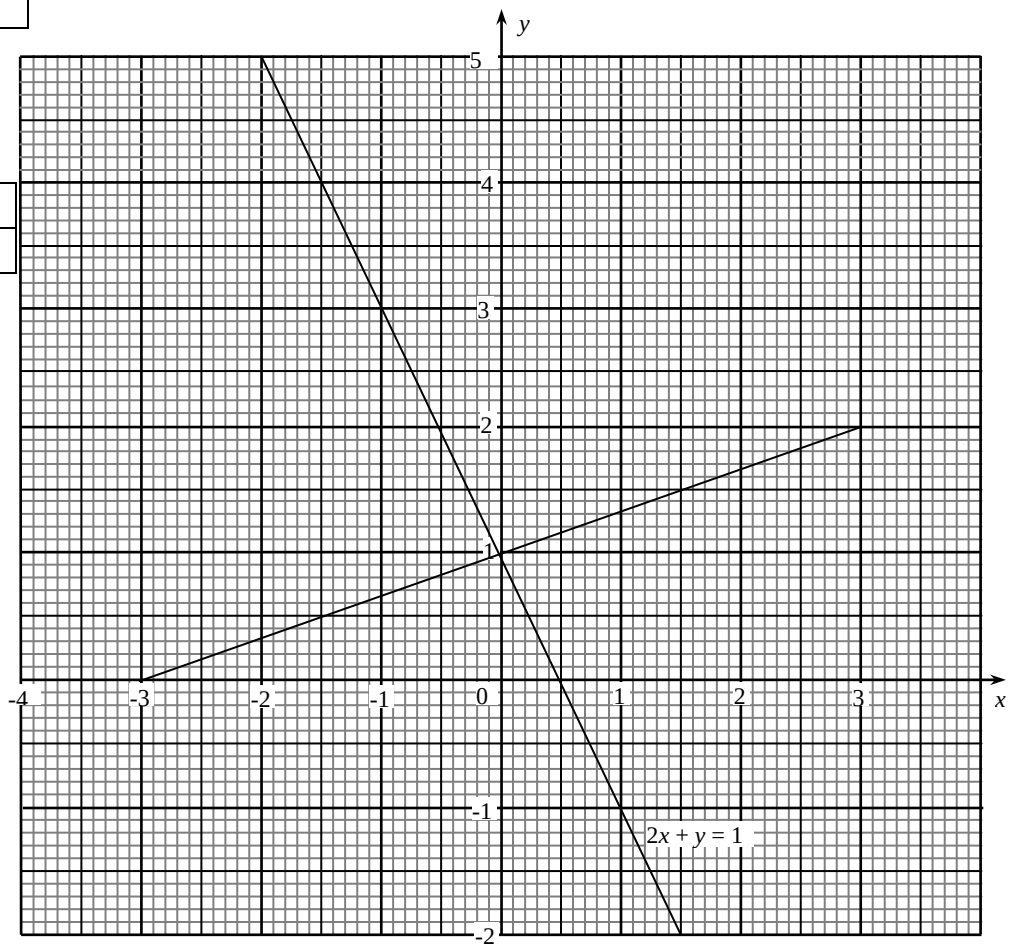
(c) $x = 2.8$ or $x = 0.75$ [or $x = 0.7$]

6. (a) $2x + y = 1 \rightarrow y = -2x + 1$ so the gradient is -2

(b)

x	−3	−2	0	2	3
y	0	0.3	1	1.7	2

(c) See diagram for the graph of $y = \frac{1}{3}x + 1$.
The two lines intersect in (0, 1) so
$2x + y = 1$
$y = \frac{1}{3}x + 1$
have solution $x = 0$ and $y = 1$.



Section 12 Mensuration

1. (a) Perimeter = 57.6 + 48.6 + 57.6 + 48.6 = 212.4 m
(b) 212.4 ÷ 1.8 = 118 fencing panels are needed.

2. Mass of the fish is 1.4 – 0.1 = 1.3 kg

3. (a) Cup **Y** contains more lemonade **(b)** difference is $275 - \frac{1}{4}\ell = 275 - 250 =$ 25 ml.

4. (a) Perimeter is $2(3 + 5) =$ 16 cm. **(b)** $b = \frac{1}{2}(20 - 16) =$ 2 cm

5. 3.7 kg = 3 700 grams or 3 700 g

6. Area circle = $\pi r^2 = \pi \times 5^2 = 25\pi =$ 78.5 cm^2 [25π is correct as well]

7. (a) $15 \times 15 \times 15 =$ 3375 cm^3
(b) (i) diameter = 15 cm **(ii)** 15 cm **(iii)** Volume tin = $\pi r^2 h = \pi \times 7.5^2 \times 15 =$ 2650 cm^3
(c) Space between the box and the tin has a volume of 3375 – 2650 = 725 cm^3

Section 13 Number sets; prime numbers; factors and multiples

1. 1 2 3 5 7 11 12
From the list of numbers above choose one that is
(a) A square number : 1 **(b)** The cube root of 8: 2 **(c)** Not a prime number: 12
(d) A factor of 77: 11 **(e)** A multiple of 3: 3 or 12

2. SHOW ALL WORKING

Without using a calculator, find the value of **(a)** $1\frac{1}{3} \div 2\frac{4}{5} = \frac{4}{3} \div \frac{14}{5} = \frac{4}{3} \times \frac{5}{14} = \frac{20}{42} = \frac{20 \div 2}{42 \div 2} = \frac{10}{21}$

(b) $\frac{13}{15} + \frac{3}{5} = \frac{13}{15} + \frac{3 \times 3}{5 \times 3} = \frac{13}{15} + \frac{9}{15} = \frac{22}{15} = 1\frac{7}{15}$

3. HCF of 21 and 35 is 7 [Factors of 21 are: 1; 3; 7 and 21 and the factors of 35 are 1; 5; 7 and 35]

4. (a) non-real numbers → $\sqrt{-8}$
(b) irrational numbers → π
(c) negative numbers → –3, –2½, –0.532
(d) prime numbers → 2

5. (a) (i) $8^0 = 1$ **(ii)** $\sqrt[3]{8} = 2$ **(iii)** $(2.34)^2 = 5$
(b) (i) HCF of 21 and 35 is 7. **(ii)** LCM of 9 and 15 is 45.
(c) (i) 2 and 3 **(ii)** $2007 = 3^2 \times 223$ so the factors are 3 and 223.

6. (a) 25 is a square number
(b) 23 is prime numbers. [29 as well.]

7. (a) Square numbers or perfect squares.
(b) (i) 25 or 100 **(ii)** 16 **(iii)** 49 **(iv)** 1 or 64 **(v)** 25 and 36.

8. (a) negative integer: –1 **(b)** 8 is a multiple of 4, **(c)** 9 is a factor of 225.

9. Factors of 38 are: 1, 2, 19 and 38.

10. Prime factors of 24 are: 2 and 3.

11.(a) 2 is a prime number **(b)** 21 is a multiple of 7 **(c)** 4 is a square number
(d) 15 is a factor of 75. **(e)** $x = 2$ and $y = 8$

Section 14 Order of numbers

1. (a) Two equal numbers → $\frac{5}{8}$ and 0.625
(b) The smallest number 6.2% [= 0.062]
(c) the largest number. → $\frac{19}{30}$ [= 0.633…]

2. (a) $3^0 < 3$ **(b)** $2^{-2} > -4$ **(c)** $(2^3)^2 = 64$ **(d)** $\sqrt{5} > 2.23$

3. (i) $\frac{5}{8}$ and 0.625 **(ii)** $\frac{29}{40}$ **(iii)** 6.3% **(iv)** 6.3%
[Write the numbers as they appear in the question paper!]

4. (a) Tuesday and Wednesday
(b) –8°C
(c) 11°C

5. (a) $\sqrt{0.16} = \frac{2}{5}$ **(b)** $2^3 < 3^2$ **(c)** $3\,520 < 3.4 \times 10^4$ **(d)** $5^0 < 6$

6. Largest possible number is: 9 321

7. (a) 30% **>** $\frac{1}{4}$ **(b)** $\sqrt[3]{8} = \sqrt{4}$ **(c)** $-3.2 < -2.3$

8. $2.46 < 2.5 < 2.612$

9. (i) $\frac{1}{9}$ **(ii)** 18%.

Section 15 Percentage and fractions

1. (a) $1\,830\,330 - 1\,409\,920 = 420410$

(b) percentage increase $= \frac{\text{increase}}{\text{old value}} \times 100 = \frac{420410}{1409920} \times 100 = \underline{29.8\%}$

2. (a) (i) 0.35 **(ii)** 30% **(iii)** $0.32 = \frac{32}{100} = \frac{32 \div 4}{100 \div 4} = \frac{8}{25}$

(b) (i) 51 **(ii)** 49 **(iii)** 57

(c) $-4\ ^{o}C$

(d) About 100 cm^3. [Answers between 90 cm^3 and 110 cm^3 are acceptable.]

3. (a) 2 066 400

(b) $(768557 \div 2066398) \times 100\% = 37.2\%$

(c) (i) Economical active people are: 2066398 – 374171 = 1 692 227 persons

(ii) $0.52 \times 374171 = 194\,569$ students.

(d) (i) $17 \times 80 + 3 \times 120 =$ N$1720

(ii) She worked for 4 hours so she received $4 \times 30 =$ N$120.

(e) $\frac{7}{11} \times 550 =$ N$350 and $\frac{1}{4}$ of 350 = $\underline{\text{N}\$87.50}$

4. (a) $8 \div 40 = \frac{8}{40} = \frac{1}{5} = \underline{0.2}$ **(b)** $\frac{32}{40} \times 100 = \frac{4}{5} \times 100 = \underline{80\%}$

5. (a) $\frac{1}{4} = \underline{0.25}$ **(b)** $\frac{1}{4} \rightarrow \underline{25\%}$

6. $\frac{2}{12} = \underline{\frac{1}{6}}$

7. (a) $\frac{18}{25} = \frac{18 \times 4}{25 \times 4} = \frac{72}{100} = \underline{0.72}$ **(b)** $\frac{67}{1000} \times 100 = \underline{6.7\%}$

8. (a) $\frac{2}{5} \times 80 = 2 \times 16 = \underline{32 \text{ ha.}}$ **(b)** $1 - \frac{2}{5} = \frac{5}{5} - \frac{2}{5} = \frac{3}{5}$

9. (a) $\frac{18}{72} = \frac{2}{9}$ **(b)** $72 - (9 + 18 + 24) = 72 - 51 = 21$ learners.

(c) $\frac{1}{9} \times 72 = 8$ learners. **(d)** $\frac{37.5}{100} \times 72 = 27$ boys

Section 16 Angles in a circle: [Angle in a semi circle; angle between radius and tangent.]

1. (a) Angle *TAB* =180º – 90º – 48º = 42º [Angle *ABT* is 90º since *BT* is a tangent and the angles in Δ *ABT* add up to 180º]

(b) Angle ARB = 90º [Angle in a semicircle]

2. (a) (i) Calculate the value of

(i) angle *ABC* = 90º [Angle in a semi circle]
(ii) angle *BAC* = 180º – 90º – 30º = 60º [Sum of the angles in a triangle add up to 180º]
(iii) angle *CEO* = 45º [Angle *OCE* = 90º because *ED* is a tangent]
(b) *Triangle CEO* is an isosceles right-angled triangle.

3. (i) Angle *AED* = 90° **(ii)** Angle *CDE* = 90° – 32° = 58° **(iii)** Angle *EBD* = 180° – 90° – 58° = 32°.

4. (a) (i) $\angle ABC$ =90° **(ii)** $\angle OAB$=(180 – 70) ÷ 2 = 55°. **(iii)** $\angle OCB$=180 – 90 – 55 = 35°

5. (a) Circumference = $2\pi r = 2 \times \pi \times 6 = 12\pi =$ 37.7 cm. [In three significant figures]
(b) (i) Angle *ACB* = 90° Reason: angle in a semicircle.
(ii) Angle *CBD* = 90° – 36° = 54°.
(iii) ΔOBF is an isosceles triangle [*OF* = *OB*] so angle *OBF* = (180° – 58°) ÷ 2 = 61°

6. (a) *AB* is the diameter. **(b)** *CD* is a tangent.

Section 17 Probability.

1. (a) $\frac{5}{8+5+3} = \frac{5}{16}$ **(b)** $\frac{8+3}{8+5+3} = \frac{11}{16}$ **(c)** $\frac{0}{16} = 0$

2. (a) $P = \frac{15}{35} = \frac{3}{7}$ **(b)** $P = \frac{28}{35} = \frac{4}{7}$ **(c)** $P = \frac{5}{35} = \frac{1}{7}$ **(d)** $P =$ 0

3. (a) *unlikely* **(b)** *impossible* **(c)** *certain*

4. (a) $\frac{1}{6}$ **(b)** $\frac{2}{6} = \frac{1}{3}$ **(c)** 0

Section 18 Proportion & rate

1. 15 × 70 = 1050 grams = 1.050 kg

2. (a) 500 ml = 0.5 litre

(b)

Container	Cost per litre
A	N$ 16.58
B	N$ 13.35
C	N$ 14.25

(c) Best value for money is container B

3. (a) N$40 **(b)** US$ 5.75

4. (a) 630 ÷ 70 = 9 km. **(b)** 70 ×11.56 = N$809.20
(c) 630 ÷ 6 = 105 km/h **(d)** 09:15

Section 19 Ratio

1. 1 : 50000 means 1cm on the map is 50000 cm in reality. 50000 cm = 500m = ½ km.
So the distance between Gobabis and the airfield is 10 × ½ = 5 km.

2. $\frac{3}{5} \times 1040 =$ 624 girls

3. **(a)** 25 : 50 : 5 = 5 : 10 : 1
(b) 11000 × 10 = 110 000 kg = 110 tonnes.

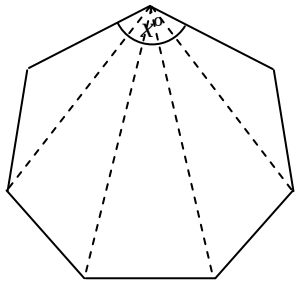
4. **(a)** Scale 1 : 2 500 000 means: 1 cm on the map is 2 500 000 cm in real and 2 500 000 cm = 25 000 m = 25 km.
So 4.5 cm is 4.5 × 25 km = 112.5 km.
(b) 1 cm → 25 km so 250 km is 10 cm.

5. **(a)** 14 : 16 : 18 = 7 : 8 : 9
(b) Paul receives $\frac{8}{7+8+9} \times 816 = \frac{8}{24} \times 816 = \frac{1}{3} \times 816 =$ N$272
(c) **(i)** $\frac{306}{816} = \frac{51}{136} = \frac{3}{8}$ [Simpler is to simplify the fraction $\frac{9}{24} = \frac{3}{8}$
(ii) $\frac{3}{10} \times 306 =$ N$91.80

6. $\frac{4}{5} \times 35 =$ 28 bars of chocolate.

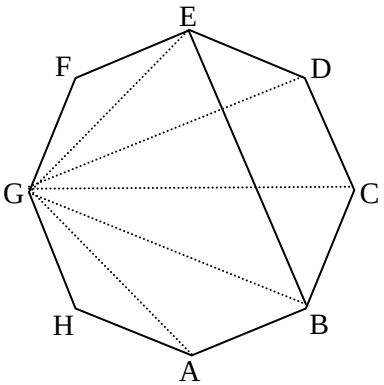
7. (a)

Section 20 Regular polygons



1. 5 triangles cover the polygon so sum of the angles is 5 × 180º = 900º
$x = \frac{900}{7} =$ 128.6º

2. 7 triangles can be drawn inside a nonagon so one angle = $\frac{7 \times 180}{9} =$ 140º



3. **(a)** 6 triangles cover the octagon so angle BCD = $\frac{6 \times 180}{8}$ = 135º
(b) Angle DEB = $\frac{360 - 2 \times 135}{2}$ = 45º
(c) Angle FEB = 135º – 45º = 90º
(d) Area of triangle BPC = ½ × BP × PC = 36.0 cm^2
(e) Area of octagon ABCDEFGH = area square PQRS – 4 × area ΔBPC =
$(12 + 8.485 + 8.485)^2 - 4 \times 36 = 695.3$ cm^2

4. (c) Exterior angle of an octagon: 360º ÷ 8 = 45º. Alternatively:180 – (8 – 2)180 ÷ 8 = 45º

5. (a) Sum of the angles is 180 × 7 – 360 = 900°
(b) 1620 = 180*n* – 360 or 162 = 18*n* – 36 divide by 6: 27 = 3*n* – 12 or 9 = *n* –4 so *n* = 13.
(c) *S* =180*n* – 360 so *S* + 360 = 180 *n* divide by 180: $n = \frac{S+360}{180}$ this maybe written as well as: $n = \frac{S}{180} + 2$
(d) 180*n* – 360 = 180(*n* – 2)

Section 21 Sequences and patterns

1. (a) 25 **(b)** 55 [table of 6 subtract 5]

2. Substitute $n = 1$, 2 then 3 and you get: 9, 15, 21

3. $T_n = 12n - 11$ [Time table of 12 subtract 11]

4. (a)

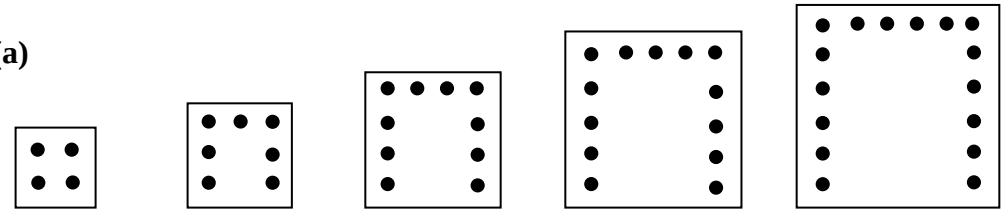


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

(b)

Diagram	1	2	3	4	5
Number of dots.	4	7	10	13	16

(d) The 12^{th} diagram has $12 \times 3 + 1 = 37$ dots.
(e) The n^{th} diagram has $3n + 1$ dots

5. (a) 17, 20 **(b)** 29 **(c)** $3n - 1$

6. (a) 27 **(b)** $6n - 3$

7. (a) 13, 16 **(b)** $T_n = 3n + 1$ **(c)** $T_{100} = 3 \times 100 + 1 = 301$ **(d)** $151 = 3n + 1$ or $3n = 150 \rightarrow n = 50$

Section 22 Statistics I: measures of central tendency→ mean; mode and median .

1. (a) Mode: 4 meals (highest frequency)
(b) Total frequency is $2 + 13 + 40 + 45 + 8 = 118$; look for $½ \times 118 = 59$; $2 + 13 + 40 = 55$'
Conclusion the median number of meals is: 4 meals
(c) $(2 \times 1 + 13 \times 2 + 40 \times 3 + 45 \times 4 + 8 \times 5) \div 118 =$ 3.1 meals

2. (a) mode is: 19 points **(b)** Put them in order: 3 7 15 19 19 so 15 is median

3. mean temperature is $(17 + 23 + 7 + 12 + 13 + 18 + 8) \div 7 = 98 \div 7 =$ 14°C

Section 23 Statistics II: frequency

1. (a) 2 books **(b)** 25 (add freq.) **(c)** $\frac{3+5}{25} = \frac{8}{25}$

2. (a) (i)

Number	1	2	3	4	5	6
Frequency	9	14	7	8	10	12

(ii) Mode is 2.
(iii) Mean is $(9 \times 1 + 14 \times 2 + 7 \times 3 + 8 \times 4 + 10 \times 5 + 12 \times 6) \div 60 =$ 3.53

(b) (i) She threw the die $6 + 10 + 5 + 7 + 16 + 6 = 50$ times.
(ii) 7 times **(iii)** The number 3 occurred the least number of times.

(c) (i) $\frac{1}{6}$ **(ii)** ½ **(iii)** $\frac{5}{6}$

3. (a) 5 people had six visit.
(b) 36 people had less than 5 visits.
(c) (i) median no of visit is 3 visits. **(ii)** modal no of visits: 4 visits.
(iii) mean = $(4 \times 0 + 7 \times 1 + 8 \times 2 + 7 \times 3 + 10 \times 4 + 6 \times 5 + 5 \times 6 + 3 \times 7) \div 50 = 165 \div 50 = 3.3$ visits.
(d) 4 cm
(e) $(5 / 50) \times 360^\circ = \underline{36^\circ.}$
(f) Less than 4 visits: they are 26 so as a %: $26/50 \times 100\ \% = \underline{52\%.}$
(g) (i) $6/50 = \underline{0.12} (= \frac{3}{25})$ **(ii)** $14/50 = \underline{0.28} (= \frac{7}{25})$ **(iii)** $\underline{0}$

4. (a) $\underline{33\ ^\circ C}$ **(b)** $\underline{\text{Moscow}}$ **(c)** biggest difference is $33 - 19 = \underline{14^\circ C.}$

5. (a) $(7 + 3 + 4 + 9 + 1 + 3 + 12 + 6 + 5 + 14 + 3 + 1 + 2) \div 14 = 70 \div 14 = \underline{5 \text{ elephants.}}$
(b) Modal no of elephants is 3
(c) Median order the no of elephants observed: 0, 1, 1, 2, 3, 3, $\underline{3, 4,}$ 5, 6, 7, 9, 12, 14 so median is $\frac{1}{2}(3+4) = \underline{3\frac{1}{2}.}$
(d)

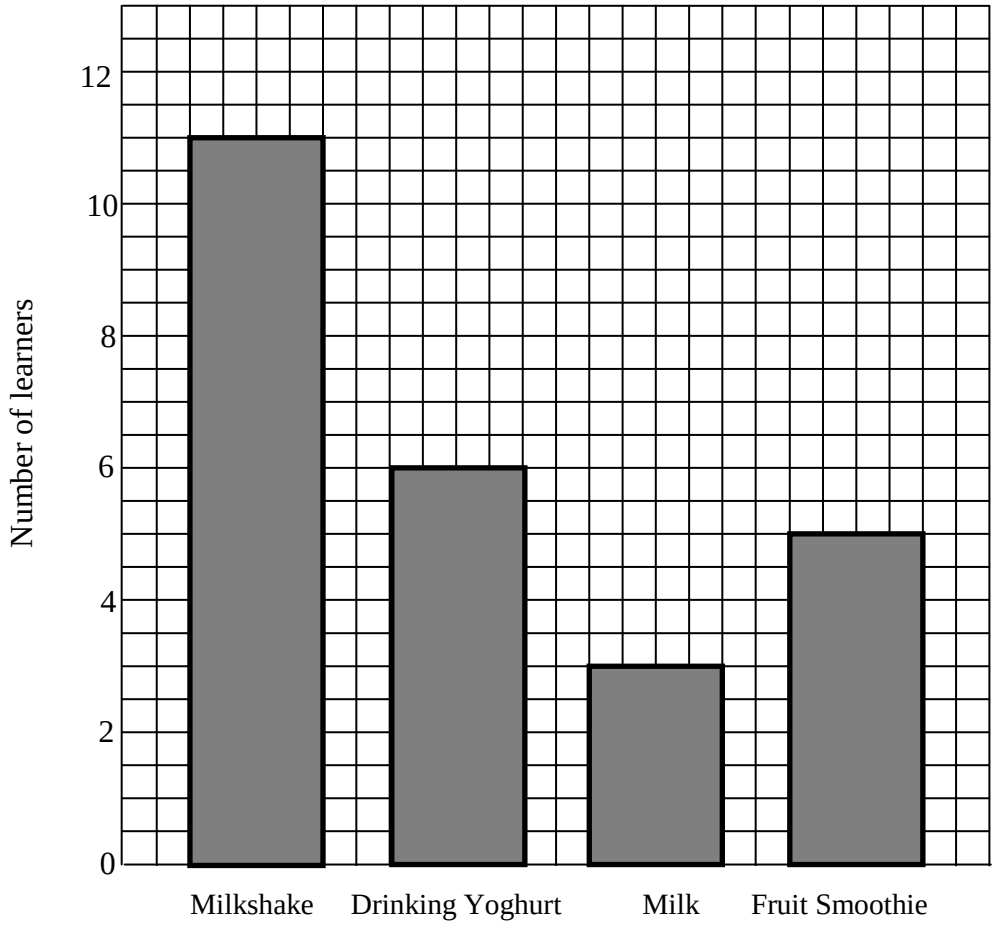
Number of elephants	0 – 3	4 – 7	8 – 11	12 – 15
frequency	7	4	1	2

(e) (i) $\frac{3}{14}$ **(ii)** $\frac{7}{14} = \frac{1}{2}$ **(iii)** 1 [This is already the case] Question is not well formulated.
(f) $4 \times 4 = 16$ days. [It happens 4 times in a fortnight so one can estimate $(8 \div 2) \times 4 = 16$ days.]

6. (a)

Types of drink	milkshake	Drinking yoghurt	milk	Fruit smoothie
Number of learners	11	6	3	$\underline{5}$

(b)



Section 24 Statistics III: pie charts

1. 108 students are represented by 360º or 108 ÷ 2 = 54 st. by 360 ÷ 2 = 180º simplify further:
54 ÷ 9 = 6 students by 180 ÷ 9 = 20º. So every 3 students are represented by an angle of 10º.
This means 42 students by 7 × 20º = <u>140º</u> (Sandwiches) 27 students by <u>90º</u> (No lunch)

2. (a) Belgian **(b) (i)** $\frac{60}{360} = \frac{1}{6}$ **(ii)** $\frac{1}{6} \times 100 = 16\frac{2}{3}\%$ or 16.7%.

3. (a) 360 = x + 130 + 90 + 20 so x = 360 – 240 = <u>120°</u> **(b)** $\frac{90}{360} \times 24 = \frac{1}{4} \times 24 =$ <u>6 hours.</u>

4. (a)

Number	4	5	6	7	8	9
Frequency	<u>2</u>	9	<u>10</u>	11	<u>2</u>	<u>2</u>

(b) (i) mode is <u>shoe size 7</u> **(ii)** <u>shoe size 6</u> [2 + 9 + 10 = 21 so the 18th learner must have shoe size 6.]
(iii) (4 × 2 + 5 × 9 + 6 × 10 + 7 × 11 + 8 × 2 + 9 × 2) ÷ 36 = <u>6.2</u>

(c) (i)

shoe size	number of boys	angle on a pie chart
6	2	36°
7	9	<u>162°</u>
8	5	90°
9	3	<u>54°</u>
10	1	18°
Total	**20**	**360°**

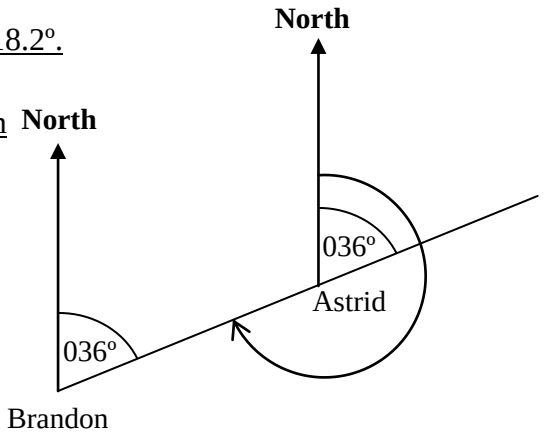
(ii) $\frac{2}{20} = \frac{1}{10}$
(iii) $\frac{17}{20}$
(iv) $\frac{1}{20} \times 100 =$ <u>5%</u>

Section 25 Trigonometry; Pythagoras; angles and bearings

1. (a) Tan $\angle B = \frac{AC}{BC} = \frac{50}{152} = 0.3289$. Angle of elevation is: $\tan^{-1}$ 0.3289 <u>= 18.2º.</u>

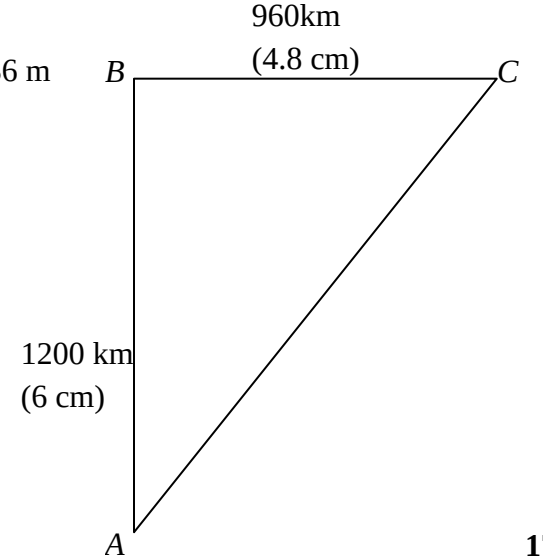
(b) $AB^2 = BC^2 + AC^2 \rightarrow AB^2 = 152^2 + 50^2$ or $AB = \sqrt{152^2 + 50^2}$ = <u>160 m</u>

2. Extend the line Brandon-Astrid:
Another angle of 36º appears.
The bearing of Brandon from Astrid is now 36 + 180 = <u>216º</u>



3. Apply Pythagoras: $25^2 = 20^2 + (\text{dist})^2$ so the distance = $\sqrt{[25^2 - 20^2]} = \sqrt{[\ 625 - 400]} = \sqrt{225} =$ <u>15 km.</u>

4. tan (angle TRS) = $\frac{TS}{SR}$ or tan 50º = $\frac{TS}{4.5}$ so TS = 4.5 × tan 50º = 5.36 m



5. (a) Scale drawing →
(b) (i) 7.7 cm
(ii) 1540 km
(b) Angle BAC = 39º bearing is 039º.

6. (a) Angle BAC = 180 – 125 = 55° so the requested bearing is
(using alternating angles) 360° – 55° = 305°
(b) $BC = \sqrt{(630^2 - 325^2)}$ = 540 m

7. (a) x → acute angle z → reflex angle. **(b)** x = 32°

8. (a) $AC = \sqrt{(6^2 + 8^2)} = \sqrt{(36 + 64)} = \sqrt{100} = \underline{10 \text{ m.}}$

(b) Tan $\measuredangle ACB = {}^{6}/_{8} = 0.75$ so $\tan^{-1}0.75 = \underline{36.9^{\circ}}$

9. Co-interior angles add up to 180° this means the angle at B is 50°, so the bearing is $360 - 50 = \underline{310°}$

10. (a) $a = 360 - 130 - 50 - 70 = \underline{110°}$

(b) Angles in a quadrilateral add up to 180° so $2a + b + 130 + 110 = 360$ or $2a + b = 120$.

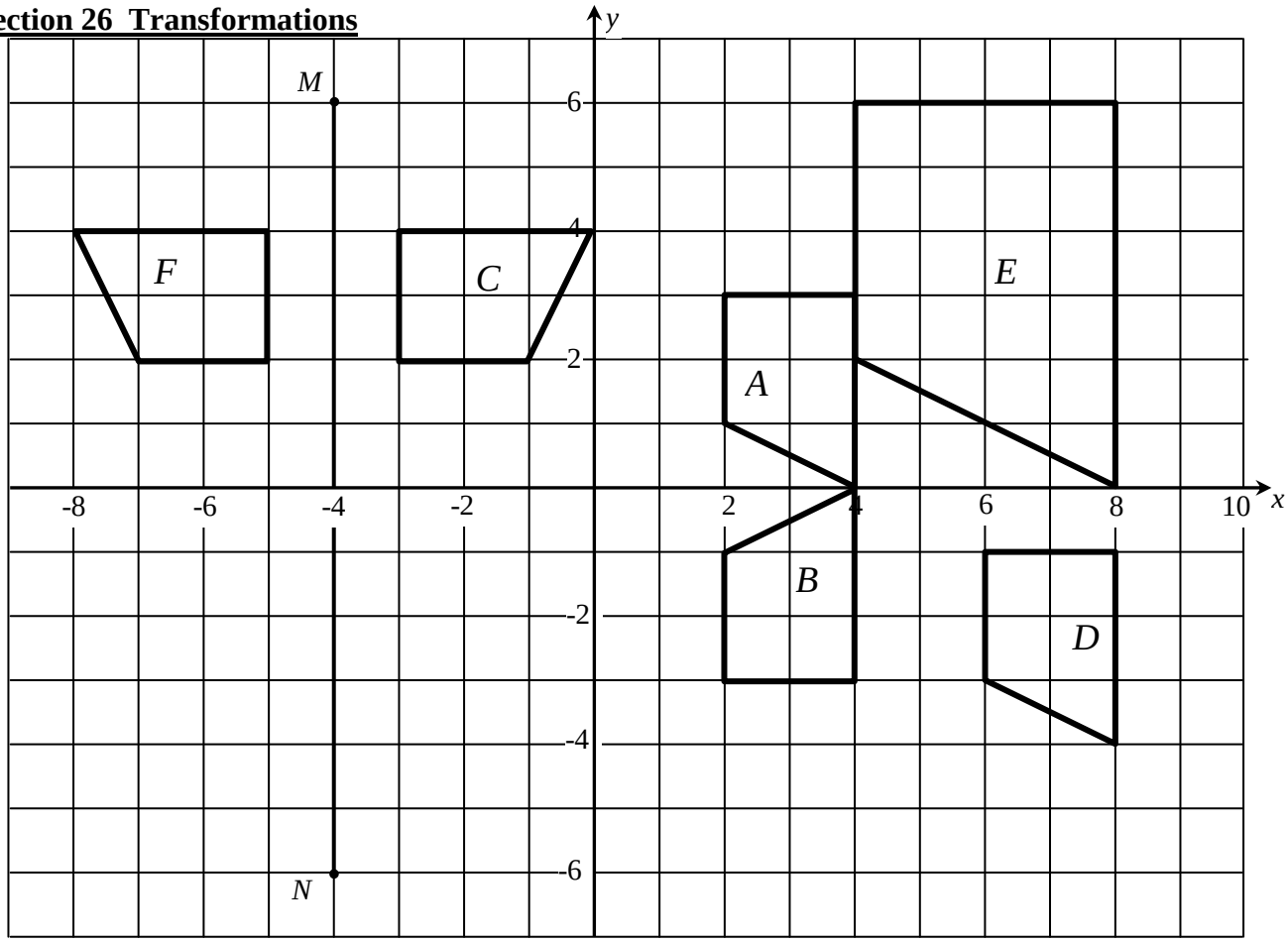
(c) Angles in a triangle add up to 180°.

(d) $\cos 32° = 10/AC$ or $\frac{\cos 32}{1} = \frac{10}{AC}$ use cross multiplication: $AC \times \cos 32 = 10$

so $AC = 10 \div \cos 32° = \underline{11.8 \text{ m}}$

Section 26 Transformations

1.

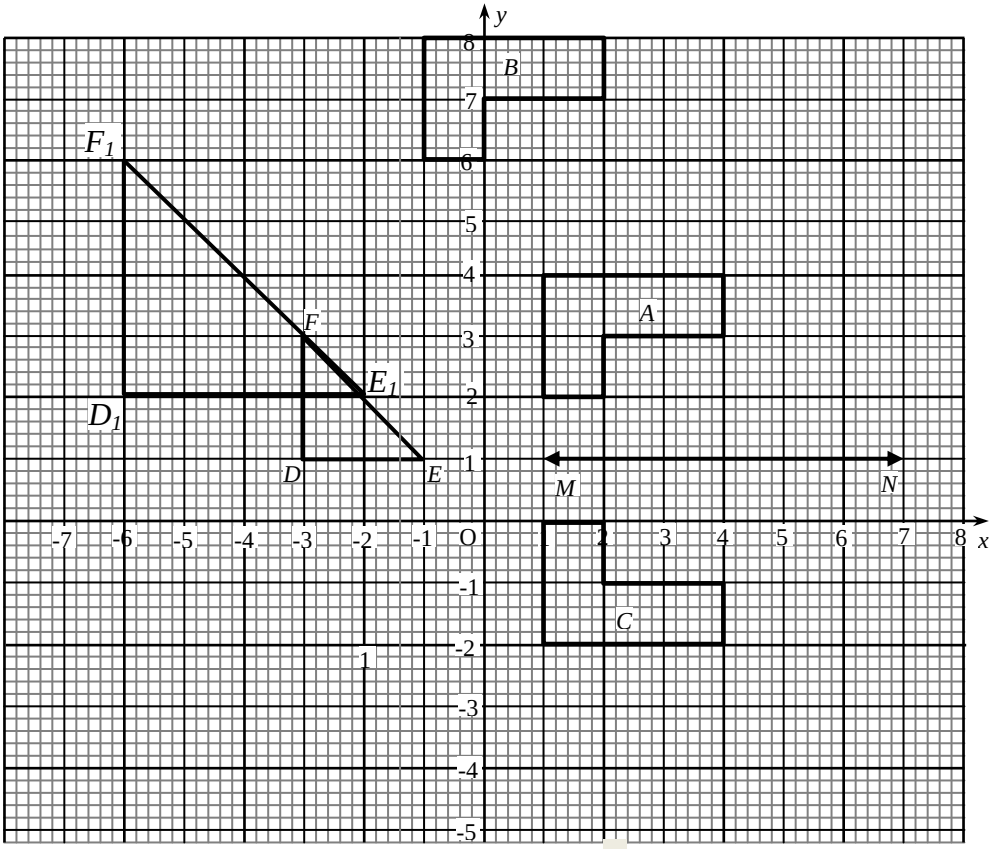


(c) (i) Scale factor 2 **(ii)** (0, 0) [Origin]

(e) Rotation of 90º about (0, 0) anticlockwise.

2. (a) Translation $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$

(b) & (c) see diagram

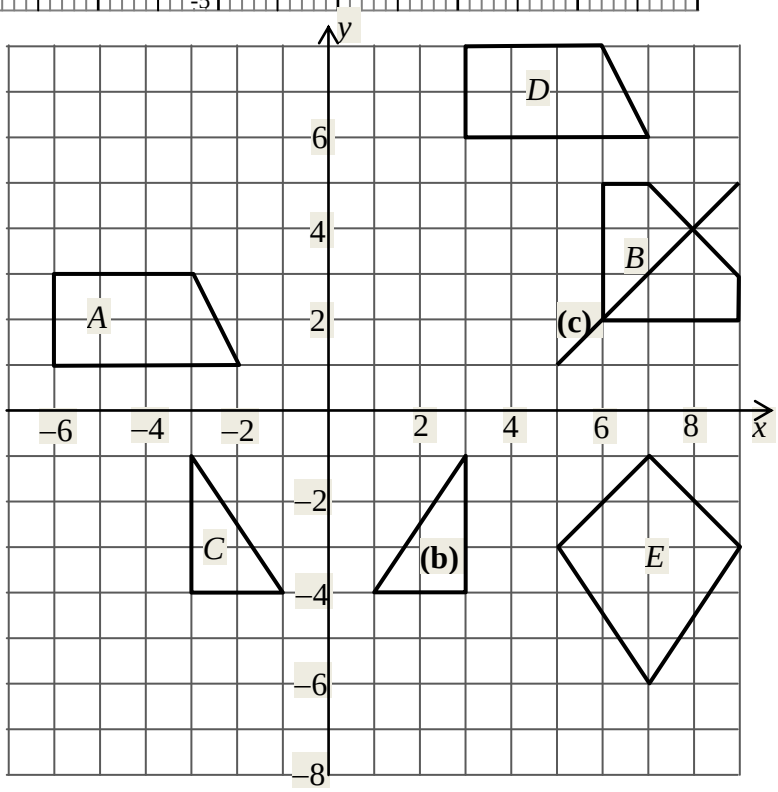


3. (a) Translation $\begin{pmatrix} 9 \\ 5 \end{pmatrix}$

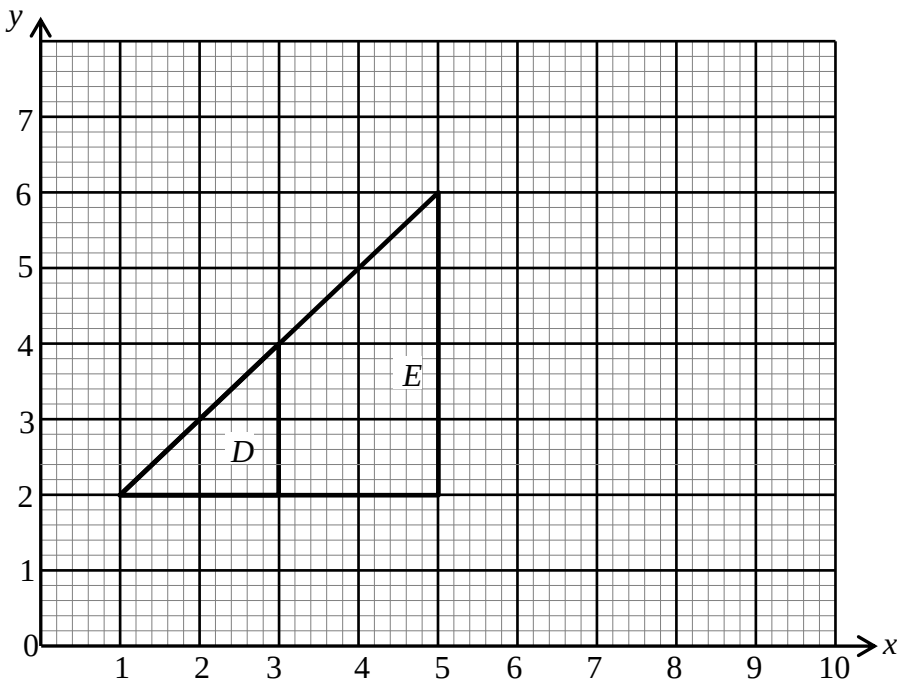
(b) see diagram on the right.

(c) see diagram on the right.

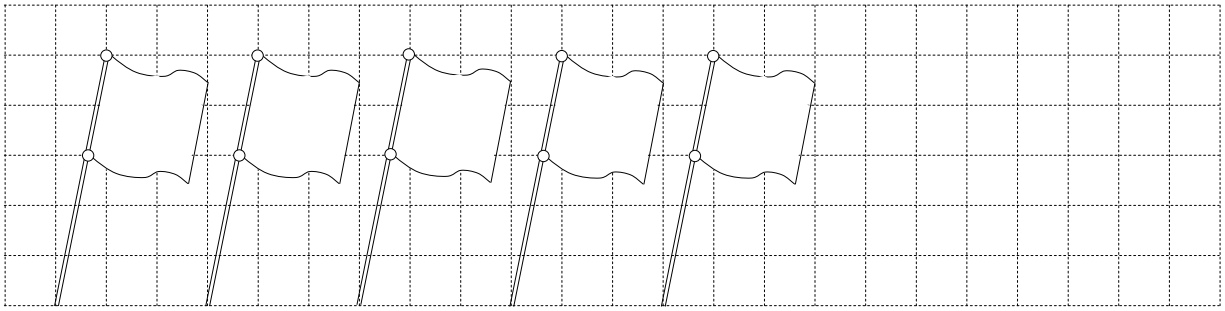
(d) Kite.



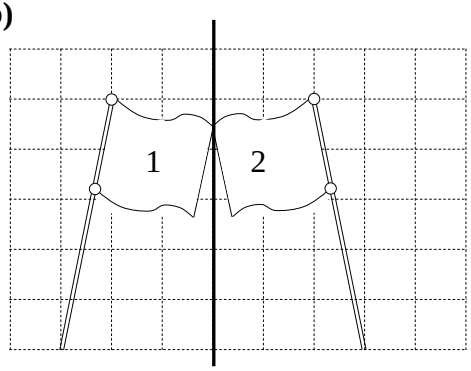
4.



5. (a)

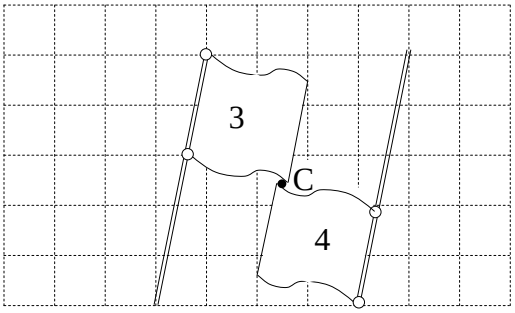


(b)



Describe fully the single transformation which maps 1 onto 2. Draw on the diagram any other information which can help you describe this transformation.

Answer: Reflection in the line drawn.



Describe fully the single transformation which maps 3 onto 4. Draw on the diagram any other information which can help you describe this transformation.

Answer: Rotation of 180° about C