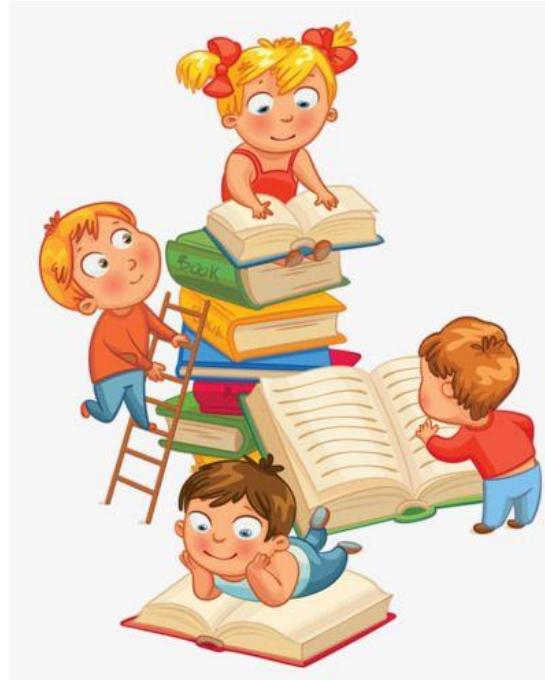


Grade 8

Mathematics

Term 1-4



Background knowledge – Rational numbers

Number systems:

Rational numbers: $\mathbb{Q} = \left\{ \frac{a}{b} \mid a, b \in \mathbb{Z}, b \neq 0 \right\}$

Remember the properties of 1: (i) $a \times 1 = a$

$$\text{(ii)} \quad \frac{a}{1} = a$$

$$\text{(iii)} \quad \frac{a}{a} = 1$$

Equivalent fractions:

E.g.1 Write two equivalent fractions for $\frac{1}{2}$:

$$\frac{1 \times 3}{2 \times 3} = \frac{3}{6} \quad \text{or} \quad \frac{1 \times 5}{2 \times 5} = \frac{5}{10} \quad [\text{These are possible answers!}]$$

Arrange rational numbers:

E.g.2 (a) Arrange the following fractions in ascending order: $\frac{1}{2}$; $\frac{3}{4}$ and $\frac{2}{3}$

$$\frac{1}{2} = \frac{6}{12} ; \quad \frac{3}{4} = \frac{9}{12} \quad \text{and} \quad \frac{2}{3} = \frac{8}{12}$$

$$\therefore \frac{1}{2} < \frac{2}{3} < \frac{3}{4}$$

(b) Write a rational number between $\frac{3}{4}$ and $\frac{1}{3}$:

$$\frac{3}{4} = \frac{9}{12} \quad \text{and} \quad \frac{1}{3} = \frac{4}{12}$$

$$\therefore \frac{1}{3} < \frac{5}{12} \text{ or } \frac{6}{12} \text{ or } \frac{7}{12} \text{ or } \frac{8}{12} < \frac{3}{4}$$

Addition and subtraction of fractions:

E.g.3 Simplify:

$$\begin{aligned}
 (a) \quad & \frac{1}{2} + \frac{4}{3} - \frac{3}{4} \\
 &= \frac{1}{2} \times \frac{6}{6} + \frac{4}{3} \times \frac{4}{4} - \frac{3}{4} \times \frac{3}{3} \\
 &= \frac{6}{12} + \frac{16}{12} - \frac{9}{12} \\
 &= \frac{6+16-9}{12} \\
 &= \frac{13}{12} \\
 &= 1\frac{1}{12}
 \end{aligned}
 \quad
 \begin{aligned}
 (b) \quad & 3x + \frac{2}{3}y - \frac{3}{5}x + 1\frac{3}{4}y \\
 &= \frac{3}{1}x - \frac{3}{5}x + \frac{2}{3}y + \frac{7}{4}y \\
 &= \frac{5}{5} \times \frac{3}{1}x - \frac{3}{5}x + \frac{4}{4} \times \frac{2}{3}y + \frac{3}{3} \times \frac{7}{4}y \\
 &= \frac{15}{5}x - \frac{3}{5}x + \frac{8}{12}y + \frac{21}{12}y \\
 &= \frac{15x-3x}{5} + \frac{8y+21y}{12} \\
 &= \frac{12x}{5} + \frac{29y}{12} \\
 &= 2\frac{2}{5}x + 2\frac{5}{12}y
 \end{aligned}$$

E.g.4 Simplify:

$$\begin{aligned}
 (a) \quad & \frac{2}{3x} + \frac{6}{x} \\
 &= \frac{2}{3x} + \frac{6}{x} \times \frac{3}{3} \\
 &= \frac{2+18}{3x} \\
 &= \frac{20}{3x}
 \end{aligned}
 \quad
 \begin{aligned}
 (b) \quad & \frac{y}{2} - \frac{y^2}{5} \\
 &= \frac{y}{2} \times \frac{5}{5} - \frac{y^2}{5} \times \frac{2}{2} \\
 &= \frac{5y}{10} - \frac{2y^2}{10} \\
 &= \frac{5y-2y^2}{10}
 \end{aligned}$$

Multiplication and division:

E.g.5 Simplify:

$$\begin{aligned}
 (a) \quad & \frac{z^1}{3} \times \frac{8}{12^6} \\
 = & \frac{1}{3} \times \frac{8^4}{6^3} \\
 = & \frac{4}{9} \\
 (b) \quad & 1\frac{1}{3} \div \frac{4}{15} \\
 = & \frac{4}{3} \times \frac{15}{4} \\
 = & \frac{4^1}{3^1} \times \frac{15^5}{4^1} \\
 = & 5
 \end{aligned}$$

E.g.6 Simplify:

$$\begin{aligned}
 (a) \quad & \frac{4b}{12a} \times \frac{24a}{8b} \\
 = & \frac{4^1 b}{12^1 a} \times \frac{24^2 a}{8^2 b} \\
 = & \frac{2}{2} = 1 \\
 (b) \quad & \frac{4y^2}{3} \div \frac{2y}{x} \\
 = & \frac{4^2 y \cdot y}{3} \times \frac{x}{2^1 y} \\
 = & \frac{2xy}{3}
 \end{aligned}$$

Powers and roots:

E.g.7 Calculate, without using a calculator: (a) $\sqrt{\frac{49}{36}}$ (b) $\left(\frac{5-1}{9}\right)^2$

$$(a) \quad \sqrt{\frac{49}{36}} = \frac{\sqrt{49}}{\sqrt{36}} = \frac{7}{6} = 1\frac{1}{6}$$

$$(b) \quad \left(\frac{5-1}{9}\right)^2 = \left(\frac{4}{9}\right)^2 = \frac{4^2}{9^2} = \frac{16}{81}$$

Combination of operations:

- Remember the order of operations: (1) Brackets
 (2) Powers and roots
 (3) Of → ×
 (4) Multiplication and division
 (5) Addition and subtraction

E.g.8 Simplify: $\frac{1}{3} + \frac{2}{3} \div \frac{1}{5} \times \left(\frac{5}{2} - \frac{3}{2}\right)$

$$= \frac{1}{3} + \frac{2}{3} \times \frac{5}{1} \times \frac{2}{2}$$

$$= \frac{1}{3} + \frac{10}{3} = \frac{11}{3} = 3\frac{2}{3}$$

Substitution:

E.g.9 If $a = \frac{1}{2}$; $b = \frac{-1}{3}$ and $c = 4$, then calculate:

$$(a) abc$$

$$= \left(\frac{1}{2}\right) \left(\frac{-1}{3}\right) (4)$$

$$= \frac{1}{2} \times \frac{-1}{3} \times \frac{4^2}{1}$$

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

$$(b) ac + b$$

$$= \left(\frac{1}{2}\right) \left(\frac{4^2}{1}\right) + \left(\frac{-1}{3}\right)$$

$$= \frac{2}{1} - \frac{1}{3}$$

$$= \frac{2}{1} \times \frac{3}{3} - \frac{1}{3}$$

$$= \frac{6}{3} - \frac{1}{3}$$

$$= \frac{5}{3}$$

$$= 1\frac{2}{3}$$

$$(c) 2(b + a) + c^2$$

$$= 2\left(\frac{-1}{3} + \frac{1}{2}\right) + (4)^2$$

$$= 2\left(\frac{-1}{3} \times \frac{2}{2} + \frac{1}{2} \times \frac{3}{3}\right) + 16$$

$$= 2\left(\frac{-2}{6} + \frac{3}{6}\right) + 16$$

$$= \frac{2}{1} \left(\frac{1}{6^3}\right) + 16$$

$$= \frac{1}{3} + 16$$

$$= 16\frac{1}{3}$$

Calculations with percentages:

- E.g. 10 (a) For a Biology test your marks were 26 out of 40. What is your percentage?
 (b) Recently your father earned R5 400 per month. He receives an increase of 12%. Calculate his increased salary per month.
 (c) Decrease 80 with 15%.

$$(a) \frac{26}{40} \times \frac{100}{1} = \frac{26}{4^2} \times \frac{10^5}{1} = \frac{26^{13}}{2^1} \times \frac{5}{1} = 13 \times 5 = 65\%$$

$$(b) \text{Increase} = \frac{5400}{1} \times \frac{12}{100} = 54 \times 12 = 648$$

$$\text{Increased salary} = \text{R}5\,400 + \text{R}648 = \text{R}6\,048$$

$$(c) 80 - 15\% \text{ of } 80 = 80 - \frac{15}{100} \times \frac{80}{1} = 80 - \frac{15^3}{10^2} \times \frac{8^4}{1} = 80 - 12 = 68$$

$$(d) \therefore \text{Compare } 75c \text{ with } 1\,500c [R15 = 1\,500c]$$

$$\therefore \frac{75}{1\,500} \times \frac{100}{1} = \frac{75}{1\,500} \times \frac{100}{1} = \frac{75}{15} = 5\%$$

Order and comparison of fractions:

Equivalent fractions:

E.g. 11 Write three equivalent fractions for each of the following rational numbers:

$$(a) 0,4$$

$$(b) -3,75$$

$$(a) 0,4 = \frac{4}{10} = \frac{2}{5} = \frac{6}{15}$$

$$(b) -3,75 = -3\frac{75}{100} = -3\frac{3}{4} = \frac{-15}{4}$$

[These are only POSSIBLE answers!]

Order of decimal fractions:

Remember: $0,71 > 0,72$; $0,5 > 0,05$; $0,9 > 0,8$ or $-0,4 > -0,5$

Rounding off of decimal fractions:

Remember: the symbol \approx means – approximately equal or more or less equal to!

Remember: To round off to the nearest tenth means the same as correct to 1 decimal place.

To round off to the nearest hundredth means the same as correct to 2 decimal places.

To round off to the nearest thousandth means the same as correct to 3 decimal places.

E.g.12 Round off the following, correct to one decimal:

(a) 3,776

(b) -18,045

(c) 5,35

The underlined digit indicates whether the previous digit stays the same or increases by 1.

(a) 3,776
 \approx 3,8

(b) -18,045
 \approx -18,0

(c) 5,35
 \approx 5,4

Operations with decimal fractions:

Addition and subtraction of fractions:

E.g.13 Calculate, without using a calculator:

(a) 0,3 + 1,4 = 1,7

(b) 5,8 - 5,3 = 0,5

E.g.14 Calculate, without using a calculator:

(a) 1,83 + 3,466

(b) 0,675 - 0,512

(c) 9 - 3,7

(a)
$$\begin{array}{r} 1,83 \\ + 3,466 \\ \hline \underline{5,296} \end{array}$$

(b)
$$\begin{array}{r} 0,675 \\ - 0,512 \\ \hline \underline{0,163} \end{array}$$

(c)
$$\begin{array}{r} 89,10 \\ - 3,7 \\ \hline \underline{5,3} \end{array}$$

Multiplication and division:

E.g.15 Calculate, without using a calculator:

(a) 38,745 × 10 = **387,45**

(b) 38,745 × 100 = **3 874,5**

(c) 38,745 × 1 000 = **38 745**

(d) 4,23 × 60 = $4,23 \times 10 \times 6$
= 42,3 × 6
= **253,8**

$$\begin{array}{r} 4^1 2^1 , 3 \\ \times \quad \quad \quad 6 \\ \hline 253,8 \end{array}$$

Start multiplication from the back ∴ with 2

E.g.16 Calculate, without using a calculator:

$$(a) 9\ 761 \div 10 = \underline{\underline{976,1}}$$

$$(b) 9\ 761 \div 100 = \underline{\underline{97,61}}$$

$$(c) 9\ 761 \div 1\ 000 = \underline{\underline{9,761}}$$

$$(d) 97,61 \div 10 = \underline{\underline{9,761}}$$

$$(e) 153,66 \div 60 = \frac{153,66}{60}$$

$$= \frac{153,66}{10 \times 6}$$

$$= \frac{15,366}{6} \quad \therefore \text{first divide by 10.}$$

$$= 2,561$$

$$\boxed{6 \overline{)1\ 5,\ ^33^3\ 6\ 6}^{2,\ 5\ 6\ 1}}$$

Start dividing from the, front \therefore with 15!

$$(f) 841,4 \div 2\ 000 = \frac{841,4}{2\ 000} = \frac{\cancel{841,4}}{\cancel{2\ 000}} = \frac{0,841^14}{2} = 0,4207$$

Powers and roots:

E.g.17 Calculate, without using a calculator:

$$(a) (0,2)^3 = 0,2 \times 0,2 \times 0,2 = 0,008 \quad (\text{Three places after the comma!})$$

$$(b) \sqrt{0,09} = \sqrt{(0,3)^2} = 0,3$$

Applications:

E.g.8 Thirty friends went to a restaurant. They decided to share the account evenly between them. If the total account was R2 173,80, calculate the amount that each one paid.

$$\text{Each one paid: } R2\ 173,80 \div 30 = \frac{2\ 173,80}{30} = \frac{217,^13^18}{3} = 72,46$$

\therefore Each one paid R72,46.

Worksheet

Simplify:

(1) $4x(2x^2 + 3x)$

(2) $m^2n^5(4m^5 - mn^3)$

(3) $(6k^3 - 3k^5)(5k^3)$

(4) $(x^7 - 5xy^4)(-2x^3y)$

(5) $2ab(2a^2b + 5a^2b^2) - 4a^2b^2(3ab + a)$

$$(6) \quad t^2(t^2 - 6t - 4) - t^3(5 + 3t)$$

$$(7) \quad 7p(2p + 2q) - 3q(7p - q)$$

$$(8) \quad 2a^3(5a^2 + 7a) + 5a^4(6a + 8)$$

$$(9) \quad (15x - 6y)4 - 2(2y + 6x)$$

$$(10) \quad (2k^6m^2 + 3k^3m^3) - 3km(6k^5m + 9km)$$

MEMO

Simplify:

$$(1) \quad 4x(2x^2 + 3x)$$

$$= \boxed{8x^3 + 12x^2}$$

$$(2) \quad m^2n^5(4m^5 - mn^3)$$

$$= \boxed{4m^7n^5 - m^3n^8}$$

$$(3) \quad (6k^3 - 3k^5)(5k^3)$$

$$= \boxed{(5k^3)(6k^3 - 3k^5)}$$

$$= \boxed{30k^6 - 15k^8}$$

$$(4) \quad (x^7 - 5xy^4)(-2x^3y)$$

$$= \boxed{(-2x^3y)(x^7 - 5xy^4)}$$

$$= \boxed{-2x^{10}y + 10x^4y^5}$$

$$(5) \quad 2ab(2a^2b + 5a^2b^2) - 4a^2b^2(3ab + a)$$

$$= \boxed{4a^3b^2 + 10a^3b^3 - 12a^3b^3 - 4a^3b^2}$$

$$= \boxed{4a^3b^2 - 4a^3b^4 + 10a^3b^3 - 12a^3b^3}$$

$$= \boxed{0a^3b^2 - 2a^3b^3}$$

$$= \boxed{-2a^3b^3}$$

$$(6) \quad t^2(t^2 - 6t - 4) - t^3(5 + 3t)$$

$$= \boxed{t^4 - 6t^3 - 4t^2 - 5t^3 - 3t^4}$$

$$= \boxed{1t^4 - 3t^4 - 6t^3 - 5t^3 - 4t^2}$$

$$= \boxed{-2t^4 - 11t^3 - 4t^2}$$

$$\begin{aligned}(7) \quad & 7p(2p + 2q) - 3q(7p - q) \\&= 14p^2 + 14pq - 21pq + 3q^2 \\&= 14p^2 + 14pq - 21pq + 3q^2 \\&= 14p^2 - 7pq + 3q^2\end{aligned}$$

$$\begin{aligned}(8) \quad & 2a^3(5a^2 + 7a) + 5a^4(6a + 8) \\&= 10a^5 + 14a^4 + 30a^5 + 40a^4 \\&= 10a^5 + 30a^5 + 14a^4 + 40a^4 \\&= 40a^5 + 54a^4\end{aligned}$$

$$\begin{aligned}(9) \quad & (15x - 6y)4 - 2(2y + 6x) \\&= 4(15x - 6y) - 2(2y + 6x) \\&= 60x - 24y - 4y - 12x \\&= 60x - 12x - 24y - 4y \\&= 48x - 28y\end{aligned}$$

$$\begin{aligned}(10) \quad & (2k^6m^2 + 3k^3m^3) - 3km(6k^5m + 9km) \\&= 2k^6m^2 + 3k^3m^3 - 18k^6m^2 - 27k^2m^2 \\&= 2k^6m^2 - 18k^6m^2 + 3k^3m^3 - 27k^2m^2 \\&= 16k^6m^2 + 3k^3m^3 - 27k^2m^2\end{aligned}$$

Worksheet

(1) (1) Simplify by using exponential laws:

(a) $k^3 \times k^{-1} \times k^0 \times k$

(b) $(2x^3y)^2$

(c) $\frac{p^2q^3}{p^4q^3}$

(d) $\sqrt{81x^8}$

(e) $m^4 \times m^2 \times n \div n^2 \div m^3 \div n^3$

(2) Find the product of 5^{12} and 25^3 .

(3) Write the following in scientific notation:

(4) Write the following as a number:

- $$(a) 7,3 \times 10^1 \quad (b) 1,0 \times 10^{10} \quad (c) 5,00002 \times 10^3$$

Memo

(1) (1) Simplify by using exponential laws:

$$(a) k^3 \times k^{-1} \times k^0 \times k^1$$

$$= \underline{k^{3-1+0+1}}$$

$$= \underline{k^3}$$

$$(b) (\overbrace{2x^3y}^1)^2$$

$$= \underline{2^2 x^6 y^2}$$

$$= \underline{4x^6 y^2}$$

$$(c) \frac{p^2 q^3}{p^4 q^3}$$

$$= \underline{p^{2-4} \times q^{3-3}}$$

$$= \underline{p^{-2} \times q^0}$$

$$= \underline{\frac{1}{p^2}}$$

$$(d) \sqrt{81x^8}$$

$$= \underline{\sqrt{81}} \times \underline{\sqrt[3]{x^8}}$$

$$= \underline{9x^{\frac{8}{2}}} = \underline{9x^4}$$

$$(e) m^4 \times m^2 \times n \div n^2 \div m^3 \div n^3$$

$$= \underline{m^4 \times m^2 \div m^3 \times n^1 \div n^2 \div n^3}$$

$$= \underline{m^{4+2-3} \times n^{1-2-3}}$$

$$= \underline{m^3 \times n^{-4}}$$

$$= \underline{\frac{m^3}{n^4}}$$

(2) Find the product of 5^{12} and 25^3 .

$$\text{Product} = 5^{12} \times 25^3$$

$$= 5^{12} \times (5^2)^3$$

$$= 5^{12} \times 5^6$$

$$= 5^{12+6}$$

$$= 5^{18}$$

(3) Write the following in scientific notation:

(a) 800

$$= 8 \times 10^2$$

(b) 17 897

$$= 1,7897 \times 10^4$$

(c) 4 million

$$= 4\,000\,000$$

$$= 4,0 \times 10^6$$

(4) Write the following as a number:

(a) $7,3 \times 10^1$

$$= 7,3 \times 10$$

(b) $1,0 \times 10^{10}$

$$= 1 \times 10^{10}$$

(c) $5,00002 \times 10^3$

$$= 5,00002 \times 1\,000$$

$$= 73$$

$$= 10\,000\,000\,000$$

$$= 5\,000,02$$

Worksheet

(1) Classify each of the following polyhedrons. Use the words in the word bank.

Hexahedron

Cone

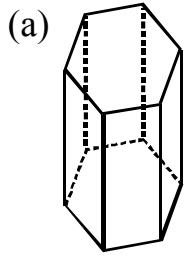
Rectangular prisms

Triangular prisms

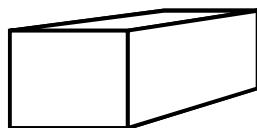
Rectangular pyramid

Octahedron

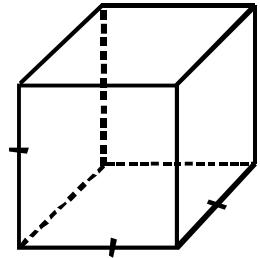
Tetrahedron



(b)



(c)



(2) Convert the following to the given units in brackets:

(a) $3\ 000 \text{ mm}^3$ (liter)

(d) $1,3 \text{ ha}$ (m^2)

(b) $0,1 \text{ cm}^2$ (mm^2)

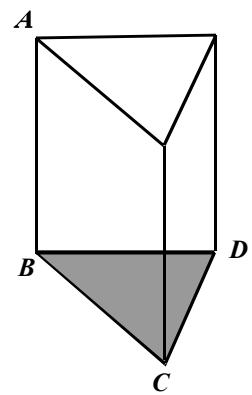
(e) 33 m^3 (cm^3)

(c) $1,345 \text{ mm}^2$ (cm^2)

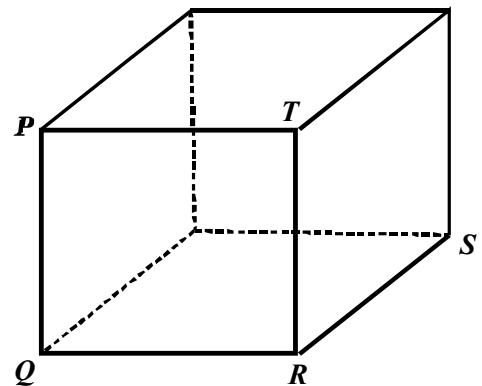
(f) 1 mm^3 (m^3)

- (3) Calculate the surface area of the following, correct to 2 dec:
Give the answer in cm².

AB = 116 cm, BC = 83 cm,
CD = 77 cm and BD = 85 cm.
Area $\Delta BCD = 1\ 763,75 \text{ cm}^2$.



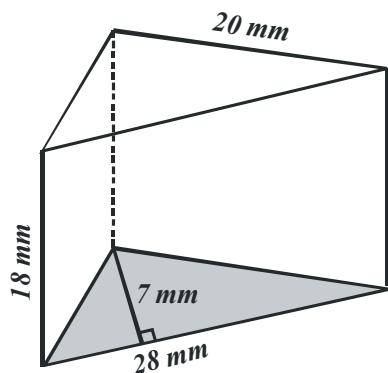
- (b) PQ = 267 mm, QR = 282 mm and RS = 31 cm.



(4) Calculate the volume, correct to 2 dec, of each of the following.

Also give the volume in cm^3 .

(a)

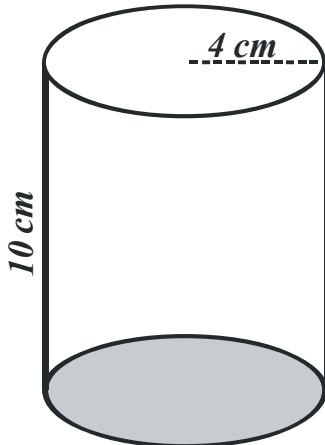


(b) $AB = 3,2 \text{ m}$ and $AD = 40 \text{ cm}$



(5) Cans with dimensions as in the sketch, are manufactured from tin. The cans are open on the upper side. Round off correct to the nearest integer.

- (a) Calculate the surface area of the can.
- (b) Calculate the volume of the can in cm^3 .
- (c) If 1 litre = 1 000 cm^3 , calculate how many ml of water is needed to fill the can.



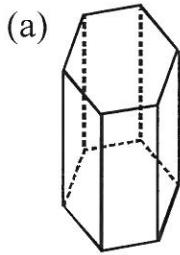
(6) Match the two columns:

	Column A		Column B
(a)	Hexahedron	M	All 8 faces are equilateral triangles
(b)	Polyhedron	N	Multiple faces
(c)	Octahedron	P	All 4 faces are equilateral triangles
(d)	Tetrahedron	Q	Cube

Memo

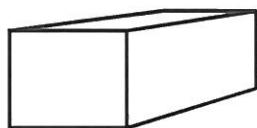
(1) Classify each of the following polyhedrons. Use the words in the word bank.

Hexahedron	Triangular prisms	Octahedron
Cone	Rectangular pyramid	Tetrahedron
Rectangular prisms		



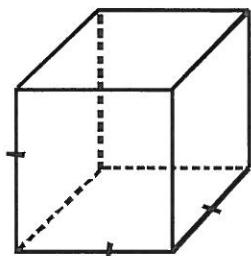
Octahedron

(b)



Rectangular
prism

(c)



Hexahedron

(2) Convert the following to the given units in brackets:

(a) $3\ 000 \text{ mm}^3$ (liter)

$$= 3\ 000 \div (10)^3 \text{ cm}^3$$

$$= 3 \text{ cm}^3$$

$$= 3 \div 1\ 000 \text{ l}$$

$$= 0,003 \text{ l}$$

(d) $1,3 \text{ ha}$ (m^2)

$$= 1,3 \times 10\ 000 \text{ m}^2$$

$$= 13\ 000 \text{ m}^2$$

(b) $0,1 \text{ cm}^2$ (mm^2)

$$= 0,1 \times 10^2 \text{ mm}^2$$

$$= 10 \text{ mm}^2$$

(e) 33 m^3 (cm^3)

$$= 33 \times (100)^3 \text{ cm}^3$$

$$= 33\ 000\ 000 \text{ cm}^3$$

(c) $1,345 \text{ mm}^2$ (cm^2)

$$= 1,345 \div 10^2 \text{ cm}^2$$

$$= 0,01345 \text{ cm}^2$$

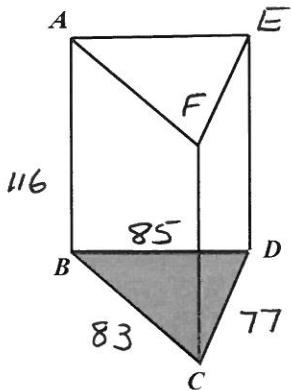
(f) 1 mm^3 (m^3)

$$= 1 \div (1\ 000)^3 \text{ m}^3$$

$$= 0,00000001 \text{ m}^3$$

- (3) Calculate the surface area of the following, correct to 2 dec:
Give the answer in cm².

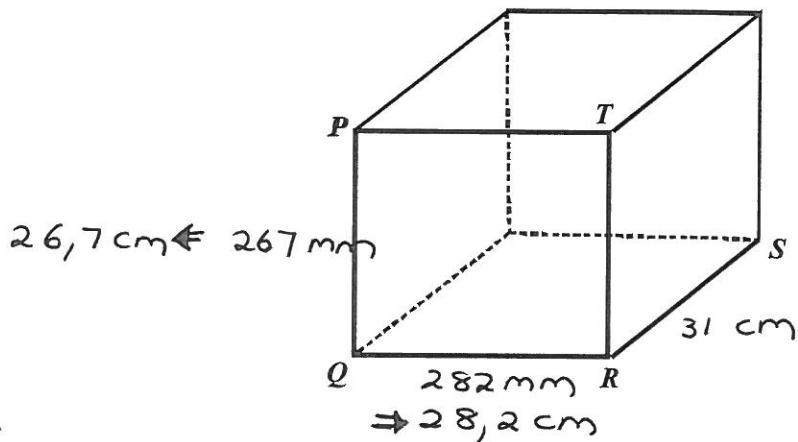
$AB = 116 \text{ cm}$, $BC = 83 \text{ cm}$,
 $CD = 77 \text{ cm}$ and $BD = 85 \text{ cm}$.
 $\text{Area } \triangle BCD = 1763,75 \text{ cm}^2$.



Surface area

$$\begin{aligned}
 &= \Delta AEF + \Delta BDC + ABCF + CDEF + ABDE \\
 &= 1763,75 + 1763,75 + L \times B + L \times B + L \times B \\
 &= 3527,5 + (116) \times (83) + (116) \times (77) + (116) \times (85) \\
 &= 3527,5 + 9628 + 8932 + 9860 \\
 &= 31947,5 \text{ cm}^2
 \end{aligned}$$

- (b) $PQ = 267 \text{ mm}$, $QR = 282 \text{ mm}$ and $RS = 31 \text{ cm}$.



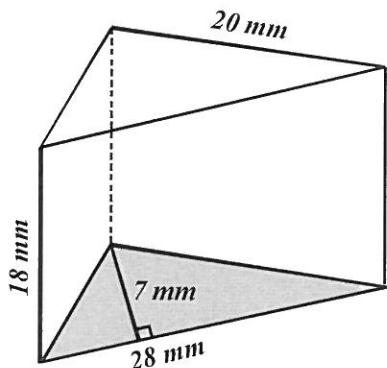
Surface area

$$\begin{aligned}
 &= 2 [L \times B + B \times H + H \times L] \\
 &= 2 [31 \text{ cm} \times 28,2 \text{ cm} + 28,2 \text{ cm} \times 26,7 \text{ cm} + 26,7 \text{ cm} \times 31 \text{ cm}] \\
 &= 2 [874,2 \text{ cm}^2 + 752,94 \text{ cm}^2 + 827,7 \text{ cm}^2] \\
 &= 2 [2454,84 \text{ cm}^2] \\
 &= 4909,68 \text{ cm}^2
 \end{aligned}$$

(4) Calculate the volume, correct to 2 dec, of each of the following.

Also give the volume in cm^3 .

(a)



Volume

$$= \text{Area of base} \times H$$

$$= [\frac{1}{2} b \times \perp h] \times H$$

$$= [\frac{1}{2} \times 28 \text{ mm} \times 7 \text{ mm}] \times 18 \text{ mm}$$

$$= 98 \text{ mm}^2 \times 18 \text{ mm}$$

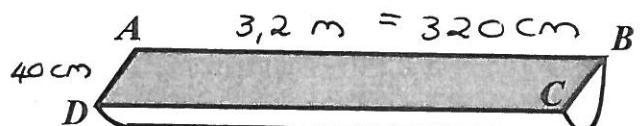
$$= 1764 \text{ mm}^3$$

$$= 1764 \div (10)^3 \text{ cm}^3$$

$$= 1,764 \text{ cm}^3$$

$$\approx 1,76 \text{ cm}^3$$

(b) $AB = 3,2 \text{ m}$ and $AD = 40 \text{ cm}$



Volume

$$\therefore d = 40 \text{ cm}$$

$$= \frac{1}{2} \text{ Cylinder}$$

$$\therefore r = 20 \text{ cm}$$

$$= \frac{1}{2} (\pi r^2 H)$$

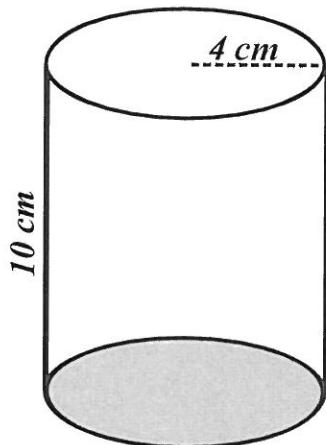
$$= \frac{1}{2} (\pi (20)^2 \times 320)$$

$$= 201\ 061,9298 \text{ cm}^3$$

$$\approx 201\ 061,93 \text{ cm}^3$$

- (5) Cans with dimensions as in the sketch, are manufactured from tin. The cans are open on the upper side. Round off correct to the nearest integer.

- Calculate the surface area of the can.
- Calculate the volume of the can in cm^3 .
- If 1 litre = 1 000 cm^3 , calculate how many ml of water is needed to fill the can.



(a) Surface area

$$\begin{aligned}
 &= 2\pi r^2 + 2\pi r H - \cancel{\pi r^2} \quad \text{Topside open} \\
 &= \cancel{1\pi r^2} + 2\pi r H \quad \therefore \text{one circle} - ! \\
 &= \pi(4\text{cm})^2 + 2\pi(4\text{cm})(10\text{cm}) \\
 &= 301,592 \dots \\
 &\approx 302 \text{ cm}^2
 \end{aligned}$$

(b) Volume = $\pi r^2 H = \pi (4\text{cm})^2 (10\text{cm})$

$$\begin{aligned}
 &= 502,654 \dots \\
 &\approx 503 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 (c) 503 \text{ cm}^3 &= \frac{503}{1000} = 0,503 \text{ l} \\
 &= 0,503 \times 1000 \text{ ml} \\
 &= 503 \text{ ml}
 \end{aligned}$$

- (6) Match the two columns:

	Column A		Column B
(a)	Hexahedron	Q	M ✓ All 8 faces are equilateral triangles
(b)	Polyhedron	N	N ✓ Multiple faces
(c)	Octahedron	M	P ✓ All 4 faces are equilateral triangles
(d)	Tetrahedron	P	Q ✓ Cube

Worksheet

(1) Choose the correct answer:

(a) $((-2^2)^3)^4 = \dots$

- A. -2^{24} B. $(-2)^9$ C. $(-2)^{24}$ D. -2^9

(b) $b^m \times 2b^n = \dots$

- A. $2b^{2mn}$ B. $2b^{mn}$ C. $2^{mn}b^{mn}$ D. $2b^{m+n}$

(c) The scientific notation for 12 003 is:

- A. $1,2003 \times 10^3$ B. $1,23 \times 10^4$ C. $1,2003 \times 10^4$ D. 12×10^3

(2) Which of the following is equal to 1?

- A. $4^0 \times 3^0 \times 2^0$ B. $4^0 + 3^0 + 2^0$ C. $4^0 - 3^0 + 2^0$ D. $4^0 \div 3^0 \div 2^0$
-
-

(3) Simplify the following by using exponential laws:

(a) $\left(\frac{a}{b}\right)^2 \times \left(\frac{b}{a}\right)^2$

(b) $\sqrt{5^{16m} 2^{2mn}}$

(c) $(-2)^3 \times (-2)^4 \times (-1)^{18}$

(d) $-k^2(2k + 3p)^0$

(4) Calculate the value of P if $3^{2010} + 3^{2011} + 3^{2012} = P \cdot 3^{2010}$

Show all steps.

(5) Which of the following have the greater value?

A. 0,002

C. $\sqrt{0,000004}$

B. $\frac{2}{10\ 000}$

D. $(0,02)^4$

MEMO

(1) Choose the correct answer:

(a) $((-2^2)^3)^4 = (-2)^{2 \times 3 \times 4} = (-2)^{24}$

A. -2^{24}

B. $(-2)^9$

C. $(-2)^{24}$

D. -2^9

(b) $b^m \times 2b^n = 2 \times b^m \times b^n = 2 \times b^{m+n} = 2b^{m+n}$

A. $2b^{2mn}$

B. $2b^{mn}$

C. $2^{mn}b^{mn}$

D. $2b^{m+n}$

(c) The scientific notation for 12 003 is:

A. $1,2003 \times 10^3$

B. $1,23 \times 10^4$

C. $1,2003 \times 10^4$

D. 12×10^3

(2) Which of the following is equal to 1?

A. $4^0 \times 3^0 \times 2^0$

B. $4^0 + 3^0 + 2^0$

C. $4^0 - 3^0 + 2^0$

D. $4^0 \div 3^0 \div 2^0$

= $1 \times 1 \times 1$

= $1 + 1 + 1$

= $1 - 1 + 1$

= $1 \div 1 \div 1$

= 1

= 3

= 1

= 1

(3) Simplify the following by using exponential laws:

(a) $\left(\frac{a}{b}\right)^2 \times \left(\frac{b}{a}\right)^2$

(b) $\sqrt{5^{16m} 2^{2mn}}$

= $\frac{a^2}{b^2} \times \frac{b^2}{a^2}$

= $\sqrt{5^{16m}} \times \sqrt{2^{2mn}}$

= $\frac{a^2}{a^2} \times \frac{b^2}{b^2}$

= $5^{16m \div 2} \times 2^{2mn \div 2}$

= 1

= $5^{8m} \times 2^{mn}$

$$(c) (-2)^3 \times (-2)^4 \times (-1)^{18} \quad (d) -k^2(2k + 3p)^0$$

$$= (-2)^{3+4} \times (1) = -k^2 \times (1)$$

$$= (-2)^7 = -k^2$$

$$= -128$$

(4) Calculate the value of P if $3^{2010} + 3^{2011} + 3^{2012} = P \cdot 3^{2010}$

Show all steps.

$$\begin{aligned}\text{LHS} &= 3^{2010} + 3^{2011} + 3^{2012} \\&= 3^{2010} + 3^1 \times 3^{2010} + 3^2 \times 3^{2010} \\&= 3^{2010}(1 + 3^1 + 3^2) \\&= 3^{2010}(1 + 3 + 9) \\&= 13 \cdot 3^{2010} = P \cdot 3^{2010} = \text{RHS}\end{aligned}$$

$$\therefore P = 13$$

(5) Which of the following have the greater value?

A. $0,002$ C. $\sqrt{0,000004}$

$$= 0,002$$

B. $\frac{2}{10\ 000}$ D. $(0,02)^4$

$$= 0,0002 = 0,0004$$

Worksheet

(1) Complete the missing expressions:

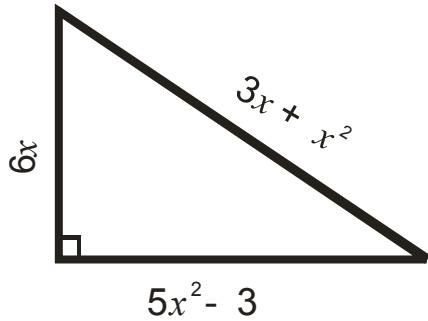
(a) $(5x - 3) + (\underline{\hspace{2cm}}) = 8x + 1$

(b) $(\underline{\hspace{2cm}}) + (-x + 2y) = 4x - 3y$

(c) $(4x - 7) - (\underline{\hspace{2cm}}) = 3x - 7$

(2) The sum of the two expressions is $4m^3 - 2n$. If the one expression is $2n^2 + 6m^2 - 1$, Determine the other expression.

(3) Determine the area of the triangle in terms of x .



(4) If $K = 3x^2 - 3x + 6$, determine $K - 12$.

(5) Which of the following statements is not true? Correct the incorrect statement(s).

(a) $mn(n - 3m) = mn^2 - 3m^2 n$

(b) $(-4a^2 b)^2 = 16a^4 b$

(c) If $x = -3$ and $y = 3$, then $-3x^2 y = 243$

Memo

(1) Complete the missing expressions:

$$(a) (\underline{5x} - \underline{3}) + (\underline{3x} + \underline{4}) = \underline{8x} + \underline{1}$$

$$\underline{5x} + \underline{3x} = \underline{8x} \quad \text{and} \quad \underline{-3} + \underline{4} = \underline{1}$$

$$(b) (\underline{5x} - \underline{5y}) + (\underline{-x} + \underline{2y}) = \underline{4x} - \underline{3y}$$

$$\underline{5x} + \underline{(-x)} = \underline{4x} \quad \text{and} \quad \underline{-5y} + \underline{2y} = \underline{-3y}$$

$$(c) (\underline{4x} - \underline{7}) - (\underline{5x} - \underline{0}) = \underline{3x} - \underline{7}$$

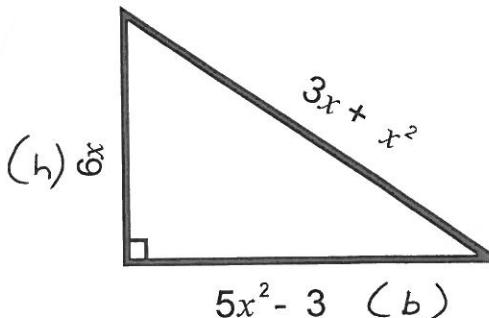
$$\underline{4x} - \underline{5x} = \underline{3x} \quad \text{and} \quad \underline{-7} + \underline{0} = \underline{-7}$$

(2) The sum of the two expressions is $4m^3 - 2n$. If the one expression is $2n^2 + 6m^2 - 1$, Determine the other expression.

$$(4m^3 - 2n) - (2n^2 + 6m^2 - 1)$$

$$= 4m^3 - 2n - 2n^2 - 6m^2 + 1$$

(3) Determine the area of the triangle in terms of x .



$$\text{Area} = \frac{1}{2} b \times h$$

$$= \frac{1}{2} (5x^2 - 3)(6x)$$

$$= \frac{1}{2} (6x)(5x^2 - 3)$$

$$= 30x(5x^2 - 3)$$

$$= 15x^3 - 9x$$

(4) If $K = 3x^2 - 3x + 6$, determine $K - 12$.

$$\begin{aligned}K - 12 \\= & \underline{(3x^2 - 3x + 6) - 12} \\= & \underline{3x^2 - 3x + 6 - 12} \\= & \underline{3x^2 - 3x - 6}\end{aligned}$$

(5) Which of the following statements is not true? Correct the incorrect statement(s).

(a) $mn(n - 3m) = mn^2 - 3m^2n$

$$\begin{aligned}LHS &= mn \widehat{(n - 3m)} \\&= mn^2 - 3m^2n \\&\text{True!}\end{aligned}$$

(b) $(-4a^2b)^2 = 16a^4b$

$$\begin{aligned}LHS &= (-4a^2b)^2 \\&= (-4)^2 a^4 b^2 = 16b^4 \underline{a^2} \\&\text{False!}\end{aligned}$$

(c) As $x = -3$ en $y = 3$, dan is $-3x^2y = 243$

$$\begin{aligned}LHS &= -3x^2y \\&= -3(-3)^2(3) \\&= -3(9)(3) \\&= -81 \neq 243\end{aligned}$$

False!

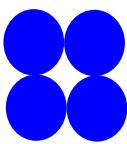
Worksheet

(1) Consider the following patterns:

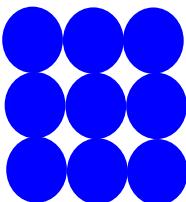
P 1



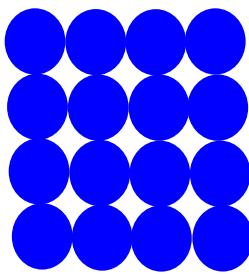
P 2



P 3



P 4



(a) Write down a sequence which represents the number of circles in each pattern.

(b) Write the sequence in (a) in words.

(c) Write a general rule for the sequence in (a).

(d) How many circles will there be in pattern 8?

(e) Which pattern will consist of 121 circles?

(2) Consider the following sequence and answer the questions: $\frac{2}{7}, \frac{5}{3}, \frac{8}{-1}, \frac{11}{-5}, \dots$

(a) Write down the 5th and 6th terms.

(b) Write an algebraic rule to describe the pattern sequence.

Hint: The numerator and denominator have different rules.

(c) Calculate the 25th term.

(d) For which term in the sequence will the numerator be equal to 89?

Memo

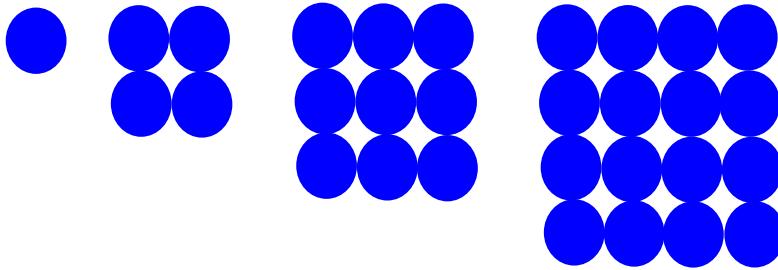
(1) Consider the following patterns:

P 1

P 2

P 3

P 4



(a) Write down a sequence which represents the number of circles in each pattern.

$$1 ; 4 ; 9 ; 16 ; \dots \dots$$

(b) Write the sequence in (a) in words.

The complete squares.

(c) Write a general rule for the sequence in (a).

$$T_n = n^2$$

(d) How many circles will there be in pattern 8?

$$T_n = n^2$$

$$T_8 = 8^2$$

$$T_8 = 64$$

∴ In pattern 8 there will be 64 circles.

(e) Which pattern will consist of 121 circles?

$$T_n = n^2$$

$$121 = n^2$$

$$\therefore \sqrt{121} = n$$

$$\therefore n = 11$$

∴ In pattern 11 there will be 121 circles.

(2) Consider the following sequence and answer the questions: $\frac{2}{7}$; $\frac{5}{3}$; $\frac{8}{-1}$; $\frac{11}{-5}$;

(a) Write down the 5th and 6th terms.

$$\dots ; \frac{14}{-9} \quad \therefore T_5 = \frac{14}{-9}$$

(b) Write an algebraic rule to describe the pattern sequence.

Hint: The numerator and denominator have different rules.

$$T_n = \frac{3n - 1}{-4n + 11}$$

(c) Calculate the 25th term.

$$T_n = \frac{3n - 1}{-4n + 11}$$

$$\therefore T_{25} = \frac{3(25) - 1}{-4(25) + 11}$$

$$\therefore T_{25} = \frac{75 - 1}{-100 + 11}$$

$$\therefore T_{25} = \frac{74}{-89}$$

(d) For which term in the sequence will the numerator be equal to 89?

$$\therefore T_n = 3n - 1 \rightarrow \text{for the numerator}$$

$$\therefore 89 = 3n - 1$$

$$\therefore 89 + 1 = 3n$$

$$\therefore 3n = 90$$

$$\therefore n = \frac{90}{3}$$

$$\therefore n = 30$$

\therefore For term 30, the numerator will be 89.

Worksheet

(1) Complete the next 5 terms in each of the following sequences:

(a) 6 ; 12 ; 18 ; 24 ; _____

(b) -1 ; -12 ; -23 ; -34 ; _____

(c) $1\frac{9}{10}$; $1\frac{7}{10}$; $1\frac{1}{2}$; $1\frac{3}{10}$; _____

(d) 240 ; 120 ; 60 ; 30 ; _____

(e) 3 ; 4 ; 6 ; 9 ; 13 ; _____

(2) The following sequence shows the Whole numbers: 12 ; 14 ; 16 ; 18 ; 20 ;

(a) Describe the pattern of the sequence in words.

(b) Which of the given numbers are complete squares?

(c) Which of the given numbers are multiples of 8?

(d) Write the next complete square that will appear in the sequence.

(e) Write the next multiple of 8 that will appear in the sequence.

Memo

(1) Complete the next 5 terms in each of the following sequences:

(a) 6 ; 12 ; 18 ; 24 ; 30 ; 36 ; 42 ; 48 ; 54 (+6)

(b) -1 ; -12 ; -23 ; -34 ; -45 ; -56 ; -67 ; -78 ; -89 (-11)

(c) $1\frac{9}{10}$; $1\frac{7}{10}$; $1\frac{1}{2}$; $1\frac{3}{10}$; $\frac{1}{10}$; $\frac{9}{10}$; $\frac{7}{10}$; $\frac{5}{10} = \frac{1}{2}$; $\frac{3}{10}$ ($-\frac{2}{10}$)

(d) 240 ; 120 ; 60 ; 30 ; $\frac{15}{2}$; $\frac{15}{4}$; $\frac{15}{8}$; $\frac{15}{16}$ ($\div 2$)

(e) $\overset{+1}{3}$; $\overset{+2}{4}$; $\overset{+3}{6}$; $\overset{+4}{9}$; $\overset{+5}{13}$; $\overset{+6}{18}$; $\overset{+7}{24}$; $\overset{+8}{31}$; $\overset{+9}{39}$; $\overset{+9}{48}$

(2) The following sequence shows the Whole numbers: 12 ; 14 ; 16 ; 18 ; 20 ;

(a) Describe the pattern of the sequence in words.

Add 2.

(b) Which of the given numbers are complete squares?

16

(c) Which of the given numbers are multiples of 8?

16

(d) Write the next complete square that will appear in the sequence.

36

(e) Write the next multiple of 8 that will appear in the sequence.

24

Mathematics Gr.8

60 minutes

50 marks

Question 1: [14]

1.1 Complete the following: (3)

- (a) Supplementary angles add up to _____
- (b) An obtuse angle lies between _____° and _____°
- (c) Vertically opposite angles _____

1.2 Study the diagram and write down the following (5)
in terms of x , y , p and/or k :

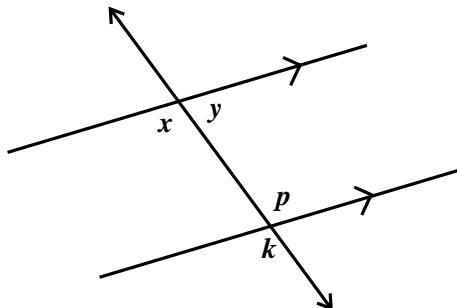
- (a) a pair of alternate angles.

- (b) a pair of corresponding angles.

- (c) a pair of co-interior angles.

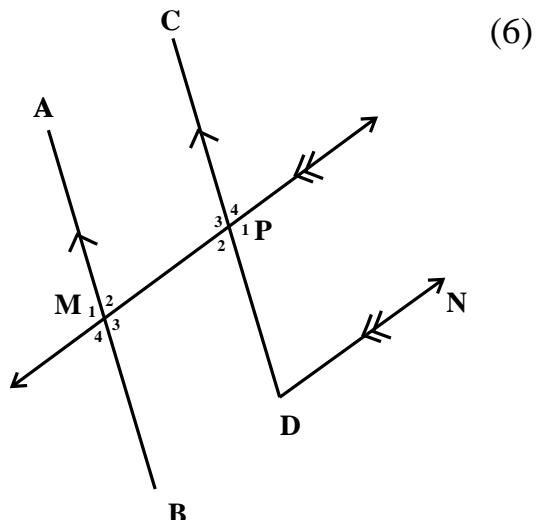
- (d) a pair of vertically opposite angles.

- (e) a pair of adjacent angles on a straight line.



1.3 AB // CD with secant MP and MP // DN with
 $\hat{M}_1 = 92^\circ$.

Calculate P \widehat{D} N. Show all calculations and give reasons.



(6)

2.1 Complete the following: (2)

(a) The sum of the interior angles of a triangle is _____

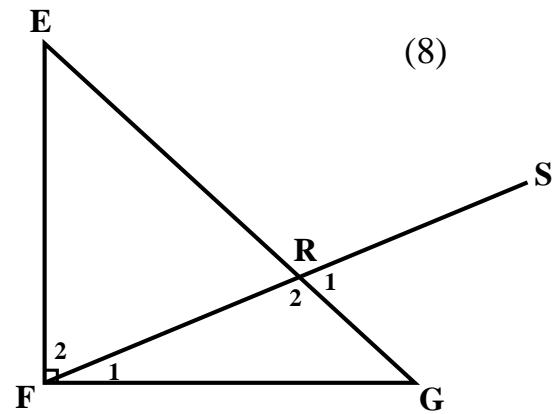
(b) The exterior angle of a triangle is equal to _____

2.2 Explain the difference between an isosceles triangle and an equilateral triangle. Give two properties of each to illustrate the difference. (4)

2.3 ΔEFG with $EF = FG$ and $EF \perp FG$ are given.

$$\hat{F}_2 = 2\hat{F}_1$$

- (a) Describe in words, what type of triangle EFG will be.
- (b) Calculate \hat{R}_1 . Show all calculations and give reasons.



Question 3: [11]

3.1 Complete:

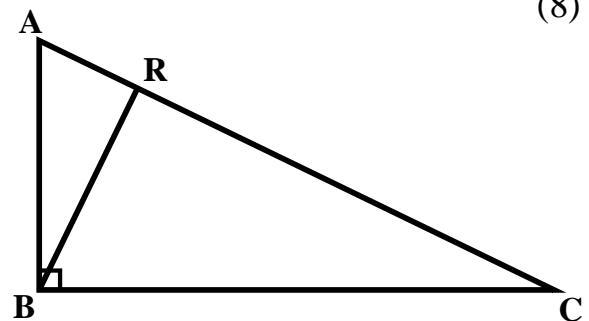
(3)

According to the theorem of Pythagoras, the square on the hypotenuse of a ...

- 3.2 In rectangular ΔABC , $AB = 10 \text{ cm}$
and $BC = 24 \text{ cm}$.
BR is drawn with $BR \perp AC$ and
 $AR = 3,85 \text{ cm}$. Calculate:

(8)

- (a) AC
 - (b) BR, correct to 2 decimals.

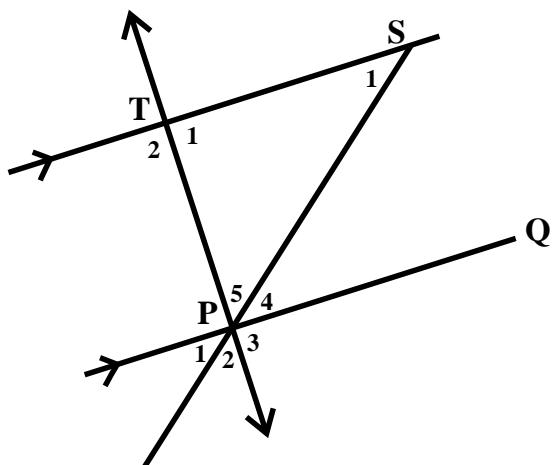


Question 4: [11]

TS // PQ with $\widehat{P}_1 = 35^\circ$ and $\widehat{P}_5 = 55^\circ$.

4.1 Calculate, with reasons:

- (a) \widehat{P}_4
 - (b) \widehat{S}_1
 - (c) \widehat{T}_1



4.2 Calculate the area of Δ TSP if

TS = 8 cm, TP = 6 cm and PS = 10 cm.

Mathematics Gr.8**60 minutes****50 marks****Question 1: [14]**

1.1 Complete the following:

(3)

- (a) Supplementary angles add up to 180° ✓
- (b) An obtuse angle lies between 90° ✓ and 180°
- (c) Vertically opposite angles even ✓

1.2 Study the diagram and write down the following
in terms of x , y , p and/or k :

(5)

- (a) a pair of alternate angles.

 x and p ✓

- (b) a pair of corresponding angles.

 x and k ✓

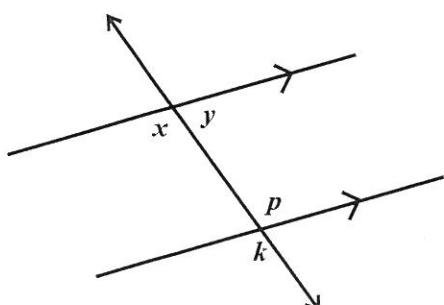
- (c) a pair of co-interior angles.

 y and p ✓

- (d) a pair of vertically opposite angles.

 p and k

- (e) a pair of adjacent angles on a straight line.

 x and y 

1.3 AB // CD with secant MP and MP // DN with

$$\hat{M}_1 = 92^\circ.$$

Calculate \widehat{PDN} . Show all calculations and give reasons.

$$\hat{M}_1 = \hat{P}_3 = 92^\circ \quad [\text{corresp. } \angle^s, AB \parallel CD]$$

$$\therefore \hat{P}_3 = \hat{P}_1 = 92^\circ \quad [\text{vert. opp. } \angle^s]$$

$$\hat{P}_1 + \widehat{PDN} = 180^\circ \quad [\text{co-int. } \angle^s, MP \parallel DN]$$

$$\therefore \widehat{PDN} = 88^\circ$$

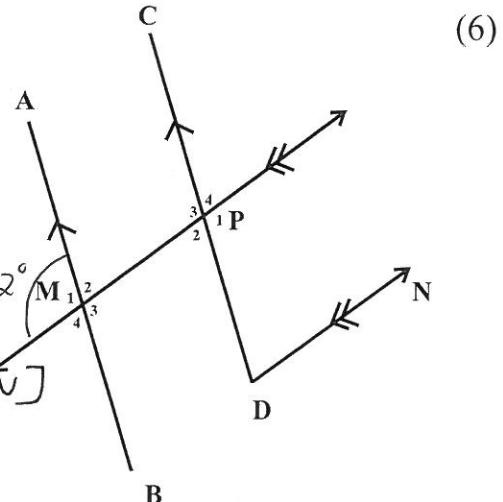
or

$$\hat{M}_1 + \hat{M}_3 = 92^\circ \quad [\text{vert. opp. } \angle^s]$$

$$\hat{M}_3 + \hat{P}_2 = 180^\circ \quad [\text{co-int. } \angle^s, AB \parallel CD]$$

$$\therefore \hat{P}_2 = 88^\circ$$

$$\therefore \hat{P}_2 = \widehat{PDN} = 88^\circ \quad [\text{alt. } \angle^s, MP \parallel DN]$$



Question 2: [14]

2.1 Complete the following:

(2)

(a) The sum of the interior angles of a triangle is suppl. or add up to 180°

(b) The exterior angle of a triangle is equal to the sum of the opposite interior angles.

2.2 Explain the difference between an isosceles triangle and an equilateral triangle. Give two properties of each to illustrate the difference.

Isosceles \triangle :

* 2 sides equal ✓

* \angle^s opp. equal
sides = ✓

Equilateral \triangle :

* all 3 sides equal ✓

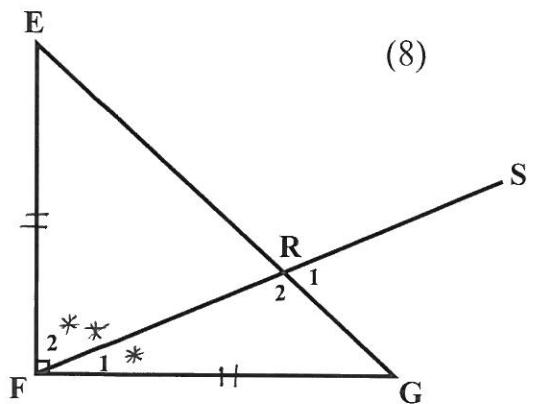
* all 3 angles equal
to 60° each.

2.3 $\triangle EFG$ with $EF = FG$ and $EF \perp FG$ are given.

$$|\hat{F}_2| = 2|\hat{F}_1|$$

- (a) Describe in words, what type of triangle EFG will be.

- (b) Calculate \hat{R}_1 . Show all calculations and give reasons.



(a) EFG is an isosceles \triangle ✓

(b) $\hat{E} = \hat{G}$ ✓ [opp. equal sides]

but $\hat{E} + \hat{G} = 90^\circ$ [int. \angle s of \triangle]

$\therefore \hat{E} = \hat{G} = 45^\circ$ ✓

$\hat{F}_1 + \hat{F}_2 = 90^\circ$ ✓ [Complementary \angle s]

$\therefore 1\hat{F}_1 + 2\hat{F}_1 = 90^\circ$

$3\hat{F}_1 = 90^\circ$ ✓

$\hat{F}_1 = \frac{90^\circ}{3} = 30^\circ$ ✓

but $\hat{R}_1 = \hat{F}_1 + \hat{G}$ ✓ [ext. \angle of \triangle]

$\therefore \hat{R}_1 = 30^\circ + 45^\circ = 75^\circ$

Question 3: [11]

3.1 Complete:

(3)

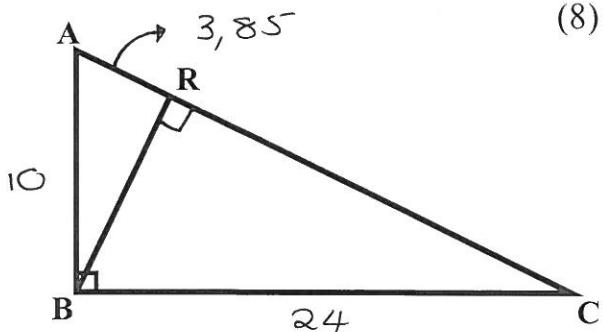
According to the theorem of Pythagoras, the square on the hypotenuse of a ...

right-angled triangle is equal to the sum of the squares on the other two sides

3.2 In rectangular ΔABC , $AB = 10 \text{ cm}$
and $BC = 24 \text{ cm}$.

BR is drawn with $BR \perp AC$ and
 $AR = 3,85 \text{ cm}$. Calculate:

- AC
- BR , correct to 2 decimals.



(a) In $\triangle ABC$:

$$AC^2 = AB^2 + BC^2 \quad [\text{Pythagoras}]$$

$$AC^2 = 10^2 + 24^2$$

$$= 100 + 576$$

$$AC^2 = 676$$

$$\therefore AC = 26 \text{ cm}$$

(b) In $\triangle ABR$:

$$AB^2 = AR^2 + BR^2 \quad [\text{Pythagoras}]$$

$$(10)^2 = (3,85)^2 + BR^2$$

$$100 = 14,8225 + BR^2$$

$$\therefore BR^2 = 100 - 14,8225$$

$$BR^2 = 85,1775$$

$$\therefore BR = 9,2291 \dots$$

$$\therefore BR \approx 9,23 \text{ cm}$$

Question 4: [11]

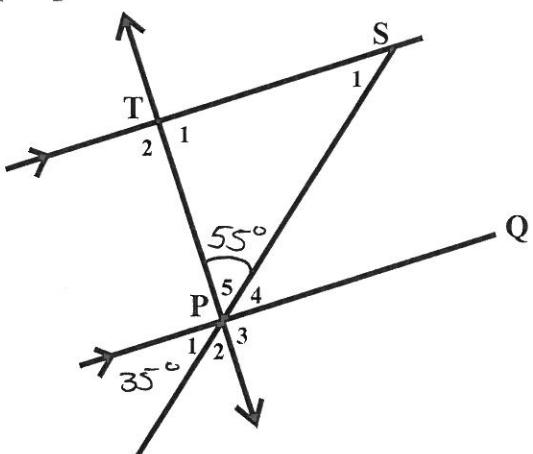
TS // PQ with $\widehat{P}_1 = 35^\circ$ and $\widehat{P}_5 = 55^\circ$.

4.1 Calculate, with reasons:

(a) \widehat{P}_4

(b) \widehat{S}_1

(c) \widehat{T}_1



4.2 Calculate the area of ΔTSP if

TS = 8 cm, TP = 6 cm and PS = 10 cm.

4.1 (a) $\widehat{P}_4 = \widehat{P}_1 = 35^\circ \checkmark$ [Vert. opp. \angle^s]

(b) $\widehat{S}_1 = \widehat{P}_4 = 35^\circ \checkmark$ [Alt. \angle^s ; $T\bar{S} \parallel P\bar{Q}$]

(c) $\widehat{T}_1 + \widehat{S}_1 + \widehat{P}_5 = 180^\circ$ [Int. \angle^s of S]

$$\therefore \widehat{T}_1 + 35^\circ + 55^\circ = 180^\circ$$

$$\therefore \widehat{T}_1 = 180^\circ - 35^\circ - 55^\circ$$

$$\therefore \widehat{T}_1 = 90^\circ \checkmark$$

4.2. Area of $\triangle TSP = \frac{1}{2} b \times h$

$$= \frac{1}{2} (TS)(TP)$$

$$= \frac{1}{2} (8)(6)$$

$$= 24 \text{ cm}^2$$

Mathematics Gr.8

60 minutes

Total: 50

NO CALCULATOR MAY BE USED IN THIS TEST!

Question 1: [14]

- 1.1 Write the factors of 24 which are also multiples of 2. (2)

- 1.2 Write a whole number which is neither a prime number nor a composite number. (1)

- 1.3 Determine the product of first three prime numbers. (3)

- 1.4 (a) Determine the prime factors of 4 356. (2)

(b) Are the number 4 356 divisible by: [Motivate.]

2 ; 3 ; 4 ; 5 ; 6 and/or 11?

(3)

(c) Calculate: $\sqrt{4\ 356}$

(3)

Question 2: [11]

2.1 Calculate:

(a) $3^2 - 2^3$

(2)

(b) $\sqrt{-12} \times \sqrt{-3}$

(2)

(c) $\{19 - 3(7 - 5)^3\}^2$ (3)

2.2 Are the following statements true or false? (4)
If false, write the correct statement.

(a) $(3^2)^3 = 3^5$

(b) $(-1)^{11} = -1$

Question 3: [13]

3.1 Simplify by using exponential laws:
[Write your answer as a positive exponent.]

(a) $4ab(3abc^2)^{3-3}$ (1)

(b)
$$\frac{x^2y \times x^4y^3}{x^8y^2}$$
 (3)

(c) $2(3mn^{-3})^2$ (3)

3.2 Write the following in scientific notation: 23 001 (2)

3.3 Choose the correct answer(s): (4)

(a) $\sqrt[3]{9p^{27}} = \dots$

A. $3x^3$ B. $\sqrt[3]{9} p^9$ C. $\sqrt[3]{9} p^3$ D. $3x^9$

(b) $-(-2)^4 = \dots$

A. -16 B. 2^4 C. -8 D. $-((-2)^2)^2$

Question 4: [12]

4.1 Complete the next 4 terms of each of the following sequences and also describe the pattern in words:

(a) -1 009 ; -1 005 ; -1 001 ;

- (b) 1 ; 2 ; 4 ; 8 ;

4.2 Consider the sequence: 126 ; 133 ; 140 ; 147 ;

- (a) Write a rule for the pattern of the sequence in the form $T_n = \dots$ (2)

- (b) Are all the numbers in the sequence multiples of 7? (1)

- (c) Determine the 40th term. (3)

Mathematics Gr.8

Memo

60 minutes

Total: 50

NO CALCULATOR MAY BE USED IN THIS TEST!

Question 1: [14]

1.1 Write the factors of 24 which are also multiples of 2. (2)

$$F_{24} = \{1, 2, 3, 4, 6, 8, 12, 24\} \checkmark$$

$$\therefore \text{Multiples of } 2: 2, 4, 6, 8, 12, 24 \checkmark$$

1.2 Write a whole number which is neither a prime number nor a composite number. (1)

$$1 \checkmark$$

1.3 Determine the product of first three prime numbers. (3)

$$\text{First 3 prime numbers: } 2, 3, 5 \checkmark$$

$$\begin{aligned} & \therefore 2 \times 3 \times 5 \\ & = 30 \end{aligned}$$

1.4 (a) Determine the prime factors of 4 356. (2)

$$\begin{array}{c|c}
 2 & 4356 \\
 2 & 2178 \\
 3 & 1089 \\
 3 & 363 \\
 11 & 121 \\
 11 & 11 \\
 & 1
 \end{array}$$

$$\therefore 4356 = 2^2 \times 3^2 \times 11^2$$

(b) Are the number 4 356 divisible by: [Motivate.]

2 ; 3 ; 4 ; 5 ; 6 and/or 11? (3)

divisible by 2: end on even number

divisible by 3: $4+3+5+6=18$ and 18 is
divisible by 3.

divisible by 6: divisible by 2 and 3

divisible by 11: $4\overbrace{35}^{\rightarrow}6\overbrace{9-9}^{\rightarrow}=0$

(c) Calculate: $\sqrt{4356}$ (3)

$$= \sqrt{2^2 \times 3^2 \times 11^2} \checkmark$$

$$= 2 \times 3 \times 11 \checkmark$$

$$= 66 \checkmark$$

Question 2: [11]

2.1 Calculate:

(a) $3^2 - 2^3$ (2)

$$= 9 - 8$$

$$= 1 \checkmark$$

(b) $\sqrt{-12} \times \sqrt{-3}$ (2)

$$= \sqrt{-12} \sqrt{-3}$$

$$= \sqrt{36} = 6 \checkmark$$

$$(c) \quad \{19 - 3(7 - 5)^3\}^2 \quad (3)$$

$$\begin{aligned} &= \{19 - 3(2)^3\}^2 \\ &= \{19 - \cancel{3}(8)\}^2 \quad \rightarrow = \{\cancel{-5}\}^2 \\ &= \{19 - 24\}^2 \quad = 25 \quad \checkmark \end{aligned}$$

2.2 Are the following statements true or false? (4)

If false, write the correct statement.

$$(a) \quad (3^2)^3 = 3^5$$

False ✓

$$(3^2)^3 = 3^6 \quad \checkmark$$

$$(b) \quad (-1)^{11} = -1$$

True ✓✓

Question 3: [13]

3.1 Simplify by using exponential laws:

[Write your answer as a positive exponent.]

$$(a) \quad 4ab(3abc^2)^{3-3} \quad (1)$$

$$= 4ab(3abc^2)^0$$

$$= 4ab(1) = 4ab \quad \checkmark$$

$$(b) \quad \frac{x^2y^4 \times x^4y^3}{x^8y^2} \quad (3)$$

$$= \frac{x^{16} \times y^{12}}{x^8 \times y^2} \quad \checkmark$$

$$= x^{-2} \times y^2$$

$$= \frac{y^2}{x^2} \quad \checkmark$$

$$\begin{aligned}
 (c) \quad & 2(3'mn^{-3})^2 & (3) \\
 & = 2(3^2 m^2 n^{-6}) \\
 & = 2(9m^2 n^{-6}) \\
 & = 18m^2 n^{-6} \\
 & = \frac{18m^2}{n^6}
 \end{aligned}$$

3.2 Write the following in scientific notation: 23 001 (2)

$$23\ 001 = 2,300,1 \times 10^{\cancel{4}}$$

3.3 Choose the correct answer(s): (4)

(a) $\sqrt[3]{9p^{27}} = \dots$

A. $3x^3$ B. $\sqrt[3]{9} p^9$ C. $\sqrt[3]{9} p^3$ D. $3x^9$

$$\begin{aligned}
 & \sqrt[3]{9p^{27}} \\
 & = \sqrt[3]{9^1} \times \sqrt[3]{p^{27}} = \sqrt[3]{9} p^{\frac{27}{3}} = \sqrt[3]{9} p^9
 \end{aligned}$$

(b) $-(-2)^4 = \dots$

A. -16 B. 2^4 C. -8 D. $-((-2)^2)^2$

$$\begin{aligned}
 & -(-2)^4 \\
 & = - (16) = -16 \Rightarrow - (4)^2 = -16
 \end{aligned}$$

Question 4: [12]

4.1 Complete the next 4 terms of each of the following sequences and also describe the pattern in words:

(a) -1 009 ; -1 005 ; -1 001 ;

$$\begin{aligned}
 & \underline{\dots} ; \underline{-997} ; \underline{-993} ; \underline{-989} ; \underline{-985} \\
 & \text{Add } 4
 \end{aligned}$$

(b) 1 ; 2 ; 4 ; 8 ;

$$\underline{\dots; 16, \check{32}, 64, \check{128}}$$

Multiply by $\check{2}$.

4.2 Consider the sequence: 126 ; 133 ; 140 ; 147 ;

(a) Write a rule for the pattern of the sequence in the form $T_n = \dots$ (2)

$$T_n = \sqrt{n} + k$$

$$T_1 = \sqrt{1} + k = 126$$

$$k = 126 - 7 = 119$$

$$\therefore T_n = \sqrt{n} + 119 \checkmark$$

(b) Are all the numbers in the sequence multiples of 7? (1)

Yes \checkmark

(c) Determine the 40th term. (3)

$$T_n = \sqrt{n} + 119$$

$$T_{40} = \sqrt{40} + 119$$

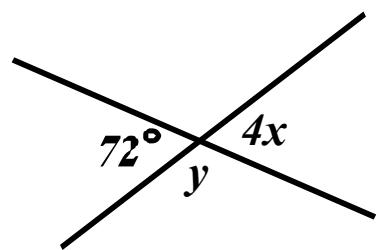
$$= \check{280} + 119$$

$$= 399 \checkmark$$

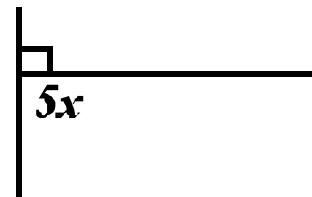
Worksheet

(1) Determine the value(s) of x and/or y in each of the following sketches. Also give complete reasons.

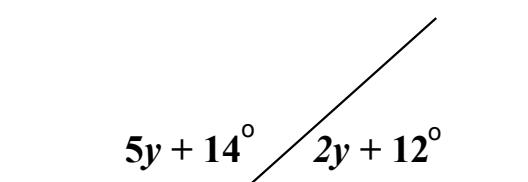
(a)



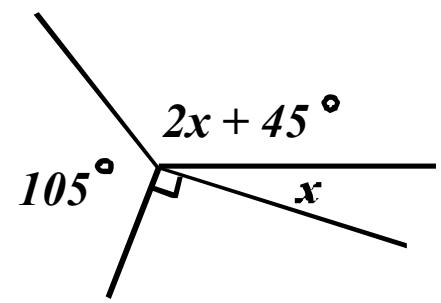
(b)



(c)

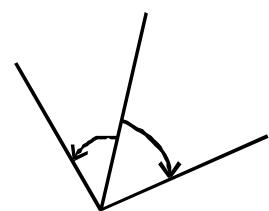


(d)

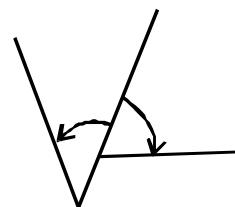


- (2) Which of the following pairs of indicated angles are adjacent? If not adjacent, motivate why not.

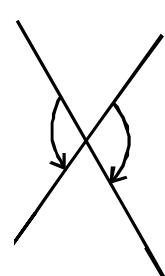
(a)



(b)

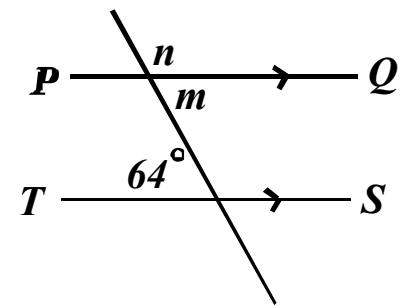


(c)

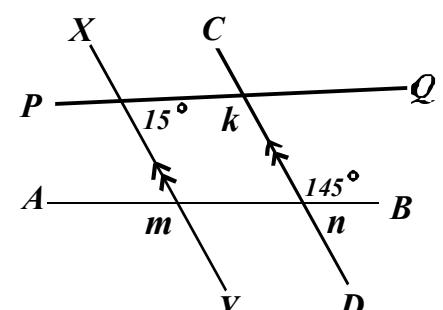


- (3) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

(a)



(b)



(4) (a) Label the following angles (according to size):

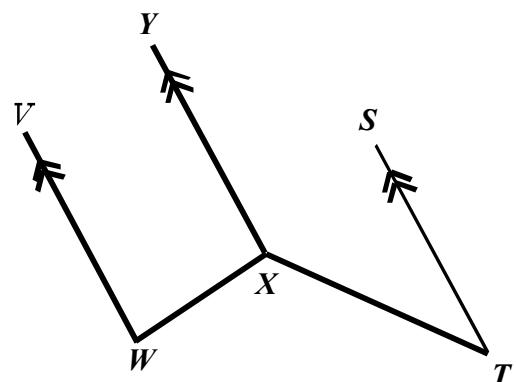
- (i) \widehat{WXT}
- (ii) \widehat{XTS}
- (iii) \widehat{TXY}

(b) Calculate the value of x if

$$\begin{aligned}\widehat{WXT} &= 154^\circ \text{ with } \widehat{TXY} = 3x + 52^\circ \\ \text{and } \widehat{WXY} &= 4x - 14^\circ\end{aligned}$$

(c) Calculate, with reasons:

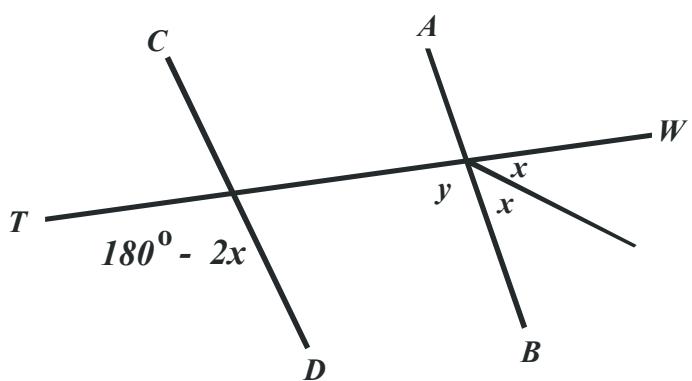
- (i) \widehat{W}
- (ii) \widehat{T}



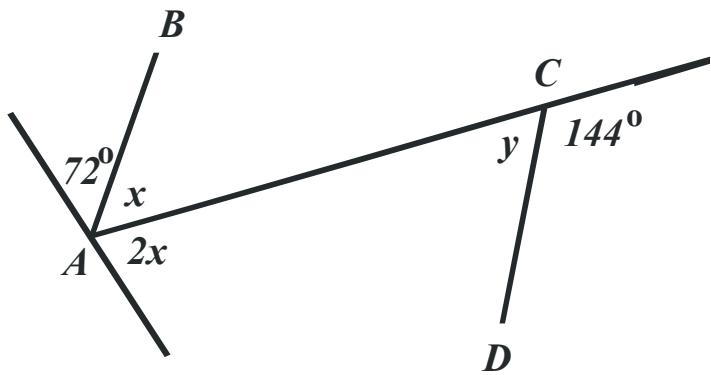
(5) Write three conditions under which two lines will be parallel to one another.

(6) Prove that $AB \parallel CD$ in each of the following sketches. Show all calculations:

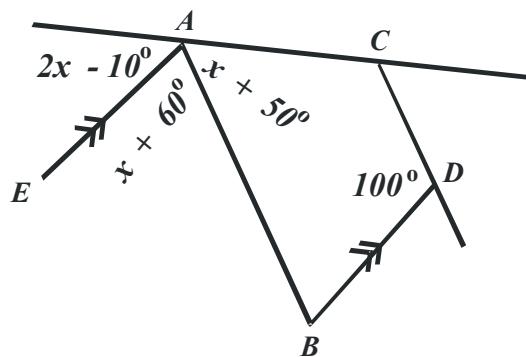
(a)



(b)



(c)



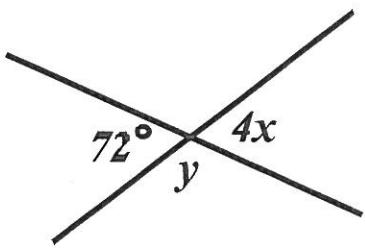
Memo

(1) Determine the value(s) of x and/or y in each of the following sketches. Also give complete reasons.

(a)

$$4x = 72^\circ \quad [\text{Vert. opp. } \angle^s]$$

$$\therefore x = \frac{72^\circ}{4} = 18^\circ$$



$$y + 72^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore y = 180^\circ - 72^\circ$$

$$\therefore y = 108^\circ$$

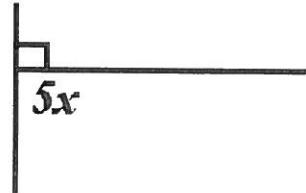
(b)

$$5x + 90^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore 5x = 180^\circ - 90^\circ$$

$$\therefore 5x = 90^\circ$$

$$\therefore x = \frac{90^\circ}{5} = 18^\circ$$



(c)

$$5y + 14^\circ + 12^\circ + 2y = 180^\circ \quad [\angle^s \text{ on str. line}]$$

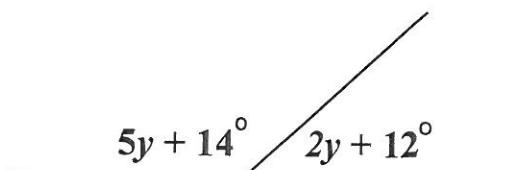
$$\therefore 7y + 26^\circ = 180^\circ$$

$$\therefore 7y = 180^\circ - 26^\circ$$

$$7y = 154^\circ$$

$$y = \frac{154^\circ}{7}$$

$$y = 22^\circ$$



(d)

$$105^\circ + 2x + 45^\circ + x + 90^\circ = 360^\circ$$

[Resolution]

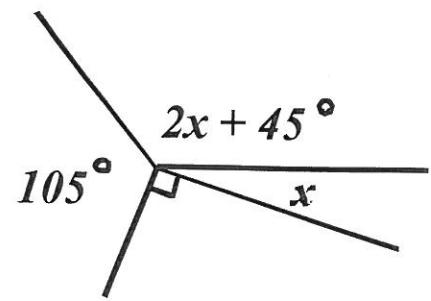
$$\therefore 3x + 240^\circ = 360^\circ$$

$$\therefore 3x = 360^\circ - 240^\circ$$

$$\therefore 3x = 120^\circ$$

$$\therefore x = \frac{120^\circ}{3}$$

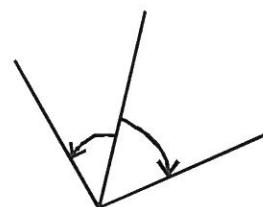
$$x = 40^\circ$$



- (2) Which of the following pairs of indicated angles are adjacent? If not adjacent, motivate why not.

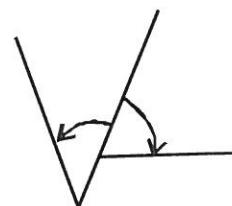
(a)

Adjacent



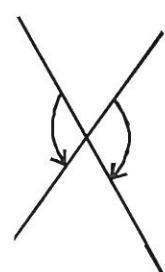
(b)

Not adjacent, because there are no common vertex



(c)

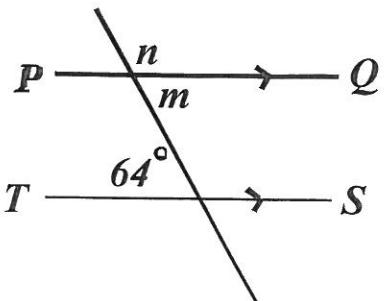
Not adjacent, because the angles do not have a common arm.



(3) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

(a)

$$m = 64^\circ \quad [\text{alt. } \angle^s; PQ \parallel TS]$$



$$n + m = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore n + 64^\circ = 180^\circ$$

$$\therefore n = 180^\circ - 64^\circ$$

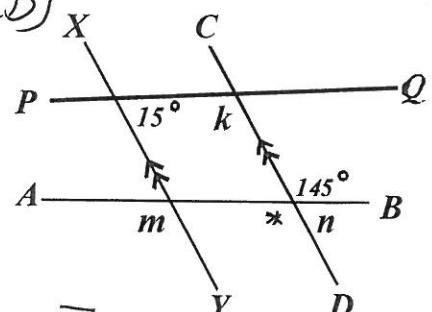
$$\therefore n = 116^\circ$$

(b)

$$k + 15^\circ = 180^\circ \quad [\text{co-int. } \angle^s; XY \parallel CD]$$

$$\therefore k = 180^\circ - 15^\circ$$

$$\therefore k = 165^\circ$$



$$n + 145^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore n = 180^\circ - 145^\circ$$

$$\therefore n = 35^\circ$$

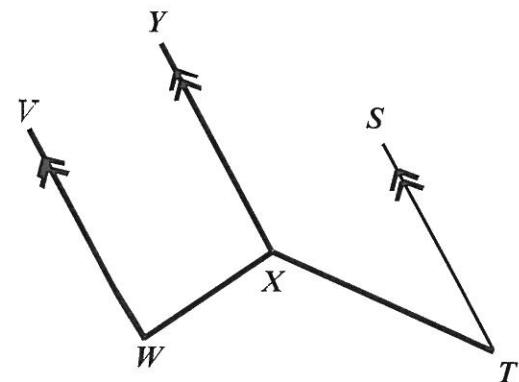
$$* = 145^\circ \quad [\text{Vert. opp. } \angle^s]$$

$$m = * = 145^\circ \quad [\text{corresp. } \angle^s; CD \parallel XY]$$

Remember: PQ not $\parallel AB$ as given!

(4) (a) Label the following angles (according to size):

- (i) \hat{WXT}
- (ii) \hat{XTS}
- (iii) \hat{TXY}



(b) Calculate the value of x if

$$\hat{WXT} = 154^\circ \text{ with } \hat{TXY} = 3x + 52^\circ$$

and $\hat{WXY} = 4x - 14^\circ$

(c) Calculate, with reasons: (i) \hat{W}
(ii) \hat{T}

(a)(i) Obtuse angle

(ii) Acute angle

(iii) Obtuse angle

$$(b) \hat{WXT} + \hat{TXY} + \hat{WXY} = 360^\circ \quad [\text{Revolution}]$$

$$\therefore 154^\circ + 3x + 52^\circ + 4x - 14^\circ = 360^\circ$$

$$\therefore 7x + 192^\circ = 360^\circ$$

$$\therefore 7x = 360^\circ - 192^\circ = 168^\circ$$

$$\therefore x = \frac{168^\circ}{7} = 24^\circ$$

$$(c)(i) \hat{WXY} = 4x - 14^\circ \quad [\text{given}]$$

$$\therefore \hat{WXY} = 4(24^\circ) - 14^\circ \quad [x = 24^\circ \rightarrow \text{see (b)}]$$

$$\therefore \hat{WXY} = 82^\circ$$

$$\text{but } \hat{WXY} + \hat{W} = 180^\circ \quad [\text{co-int } \angle^s; VW \parallel XY]$$

$$\therefore 82^\circ + \hat{W} = 180^\circ$$

$$\therefore \hat{W} = 180^\circ - 82^\circ = 98^\circ$$

$$(ii) \hat{YXT} = 3x + 52^\circ \quad [\text{given}]$$

$$\therefore \hat{YXT} = 3(24^\circ) + 52^\circ \quad [x = 24^\circ \rightarrow \text{see (b)}]$$

$$\therefore \hat{YXT} = 72^\circ + 52^\circ$$

$$\therefore \hat{YXT} = 124^\circ$$

$$\text{but } \hat{YXT} + \hat{T} = 180^\circ \quad [\text{co-int } \angle^s; YX \parallel ST]$$

$$\therefore 124^\circ + \hat{T} = 180^\circ$$

$$\therefore \hat{T} = 180^\circ - 124^\circ = 56^\circ$$

(5) Write three conditions under which two lines will be parallel to one another.

Two lines will be parallel if:

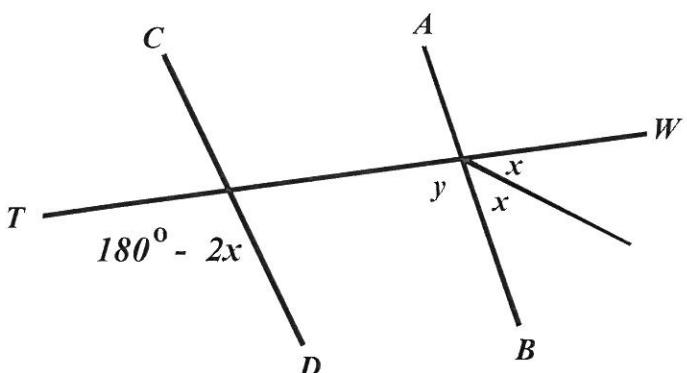
* one pair of alternate angles are equal

or * one pair of corresponding angles are equal

or * one pair of co-interior angles are supplementary.

(6) Prove that $AB \parallel CD$ in each of the following sketches. Show all calculations:

(a)



$$y + x + x = 180^\circ \quad [\text{L}^\circ \text{ on str. line J}]$$

$$\therefore y = 180^\circ - x - x$$

$$\therefore y = 180^\circ - 2x$$

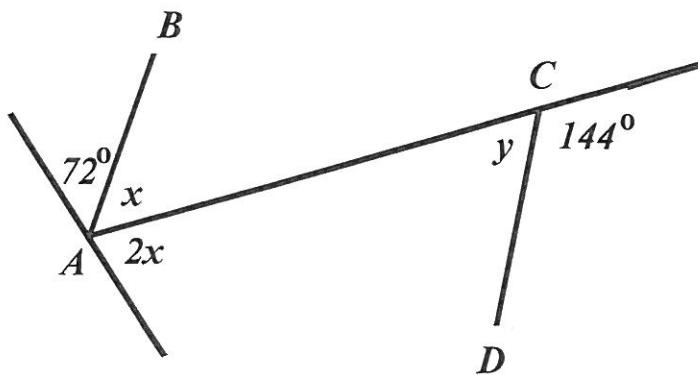
$$\text{but } \angle TSD = 180^\circ - 2x$$

$$\therefore \angle TSD = \angle SVB = 180^\circ - 2x$$

but these are corresponding angles

$$\therefore AB \parallel CD$$

(b)



$$72^\circ + x + 2x = 180^\circ \quad [\angle \text{ s on str. line}]$$

$$\therefore 72^\circ + 3x = 180^\circ$$

$$\therefore 3x = 180^\circ - 72^\circ = 108^\circ$$

$$\therefore x = \frac{108^\circ}{3} = 36^\circ$$

$$\text{but } y + 144^\circ = 180^\circ \quad [\angle \text{ s on str. line}]$$

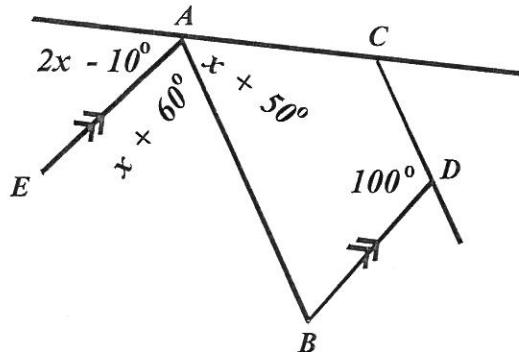
$$\therefore y = 180^\circ - 144^\circ = 36^\circ$$

$$\therefore y = x = 36^\circ$$

but these are alternate angles

$$\therefore AB \parallel CD$$

(c)



$$2x - 10^\circ + x + 60^\circ + x + 50^\circ = 180^\circ \quad [\angle \text{ s on str. line}]$$

$$\therefore 4x + 100^\circ = 180^\circ$$

$$\therefore 4x = 180^\circ - 100^\circ = 80^\circ$$

$$\therefore x = \frac{80^\circ}{4} = 20^\circ$$

$$\therefore EA^{\hat{B}} = x + 60^\circ = 20^\circ + 60^\circ = 80^\circ$$

but $\hat{B} = EA^{\hat{B}} = 80^\circ$ [alt. \angle s; $EA \parallel BD$]

$$\text{but } \hat{B} + \hat{BDC} = 80^\circ + 100^\circ = 180^\circ$$

but these are co-interior angles

$$\therefore AB \parallel CD$$

Worksheet 20

(1) Each of the following statements is incorrect. Correct the statement by writing the correct version:

(a) Corresponding angles are always equal.

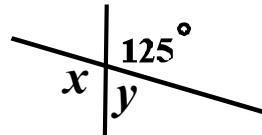
(b) A straight angle is greater than 180° .

(c) A revolution is double the size of a right angle.

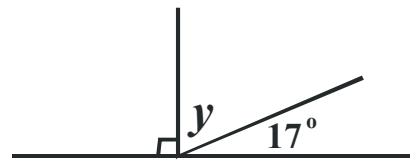
(2) Draw a sketch to describe the following: corresponding angles , alternate angles and co-interior angles.

(3) Determine the value(s) of x and/or y in each of the following sketches. Also give complete reasons.

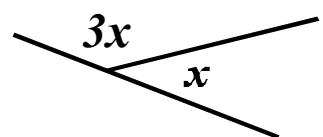
(a)



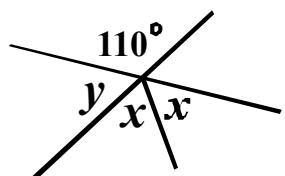
(b)



(c)

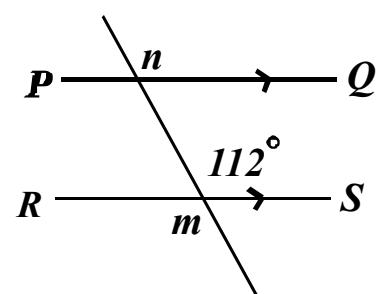


(d)

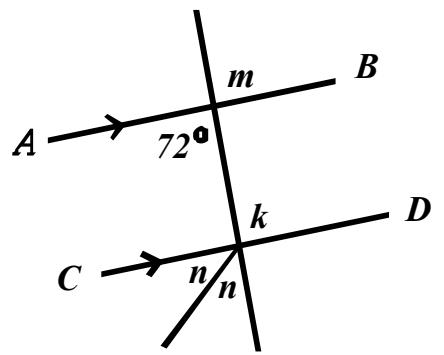
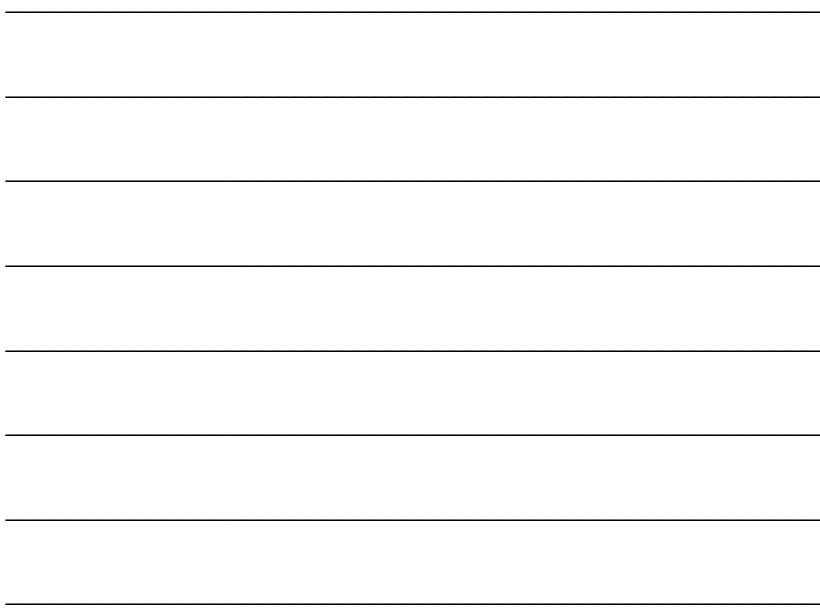


(4) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

(a)



(b)



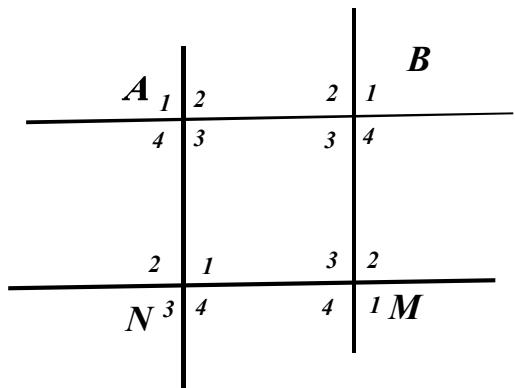
- (5) In the sketch $AB \parallel NM$ and $AN \parallel BM$.

$$B\hat{A}N = 92^\circ$$

Calculate, with reasons. Show all calculations.

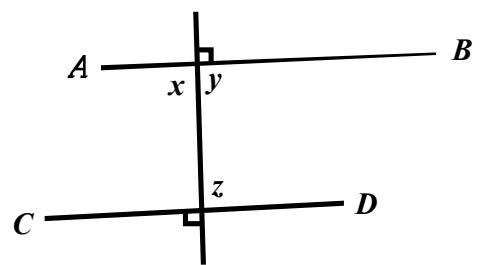
(a) \hat{B}_1

(b) \hat{M}_1

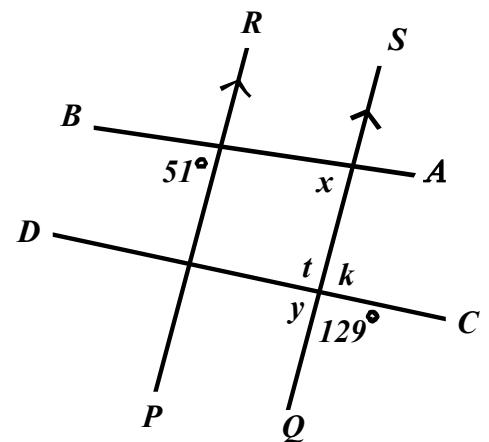


(6) Prove that $AB \parallel CD$ in each of the following sketches. Show all calculations:

(a)



(b)



Memo

- (1) Each of the following statements is incorrect. Correct the statement by writing the correct version:

- (a) Corresponding angles are always equal.

Corresponding angles are only equal if it is formed by parallel lines.

- (b) A straight angle is greater than 180° .

A straight angle is equal to 180° .

- (c) A revolution is double the size of a right angle.

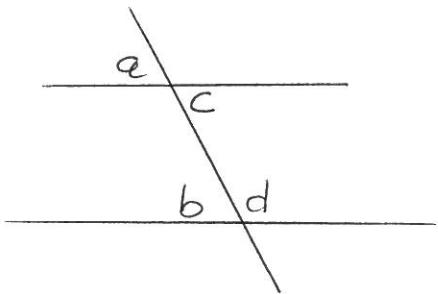
A revolution is four times the size of a right angle. $[4 \times 90^\circ = 360^\circ]$

- (2) Draw a sketch to describe the following: corresponding angles , alternate angles and co-interior angles.

* a and b are corresp. \angle 's

* b and c are alternate \angle 's

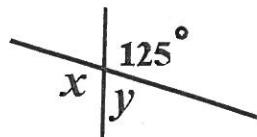
* c and d are co-int. \angle 's



- (3) Determine the value(s) of x and/or y in each of the following sketches. Also give complete reasons.

(a)

$\angle c = 125^\circ$ [vert opp. \angle 's]



$$y + 125^\circ = 180^\circ \quad [\angle's \text{ on str. line}]$$

$$\therefore y = 180^\circ - 125^\circ$$

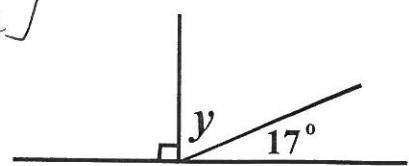
$$\therefore y = 55^\circ$$

(b)

$$90^\circ + y + 17^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore y = 180^\circ - 90^\circ - 17^\circ$$

$$y = 73^\circ$$



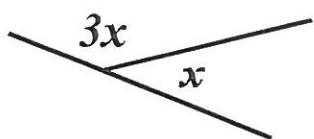
(c)

$$3x + x = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore 4x = 180^\circ$$

$$\therefore x = \frac{180^\circ}{4}$$

$$\therefore x = 45^\circ$$



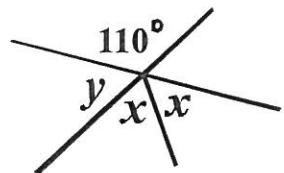
(d)

$$y + 110^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore y = 180^\circ - 110^\circ = 70^\circ$$

$$2x = 110^\circ \quad [\text{vert. opp. } \angle^s]$$

$$\therefore x = \frac{110^\circ}{2} = 55^\circ$$

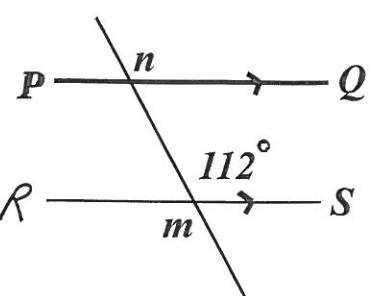


- (4) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

(a)

$$m = 112^\circ \quad [\text{Vert. opp. } \angle^s]$$

$$n = 112^\circ \quad [\text{corresp. } \angle^s; PQ \parallel RS]$$



(b)

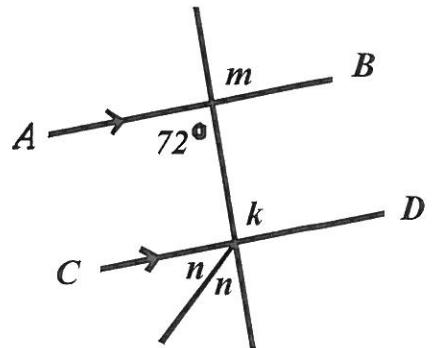
$$n+n = 72^\circ \quad [\text{corresp. } \angle^s; AB \parallel CD]$$

$$\therefore 2n = 72^\circ$$

$$n = \frac{72^\circ}{2} = 36^\circ$$

$$k = 72^\circ \quad [\text{alt. } \angle^s; AB \parallel CD]$$

$$m = 72^\circ \quad [\text{Vert. opp. } \angle^s]$$



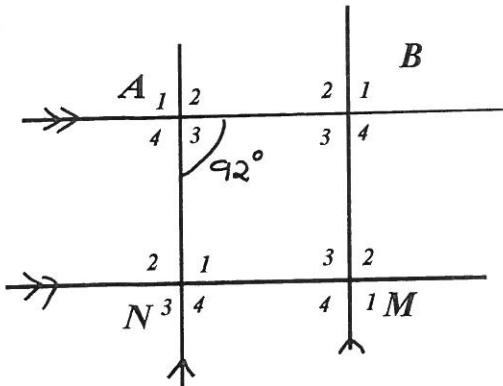
(5) In the sketch $AB \parallel NM$ and $AN \parallel BM$.

$$B\hat{A}N = 92^\circ$$

Calculate, with reasons. Show all calculations.

$$(a) \hat{B}_1$$

$$(b) \hat{M}_1$$



$$(a) \hat{A}_3 = \hat{B}_2 = 92^\circ \quad [\text{alt. } \angle^s; AN \parallel BM]$$

$$\text{but } \hat{B}_2 + \hat{B}_1 = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore 92^\circ + \hat{B}_1 = 180^\circ$$

$$\therefore \hat{B}_1 = 180^\circ - 92^\circ$$

$$\therefore \hat{B}_1 = 88^\circ$$

$$(b) \hat{N}_4 = \hat{A}_3 = 92^\circ \quad [\text{corresp. } \angle^s; AB \parallel NM]$$

$$\text{but } \hat{N}_4 = \hat{M}_1 \quad [\text{corresp. } \angle^s; AN \parallel BM]$$

$$\therefore \hat{M}_1 = 92^\circ$$

(6) Prove that $AB \parallel CD$ in each of the following sketches. Show all calculations:

(a)

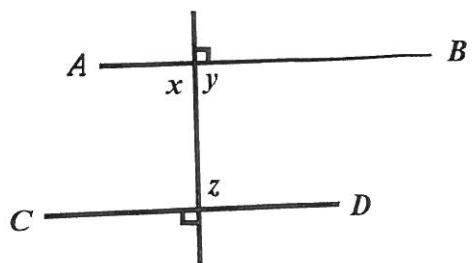
$$x = 90^\circ \quad [\text{Vert. opp. } \angle^s]$$

$$z = 90^\circ \quad [\text{Vert. opp. } \angle^s]$$

$$\therefore x = z = 90^\circ$$

but these are alt. \angle^s

$$\therefore AB \parallel CD$$



(b)

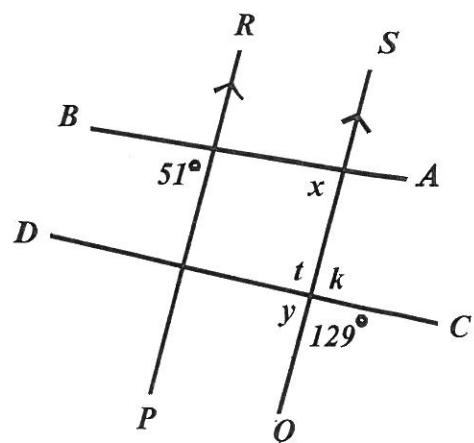
$$x = 51^\circ \quad [\text{corresp. } \angle^s, PR \parallel SQ]$$

$$t = 129^\circ \quad [\text{Vert. opp. } \angle^s]$$

$$\therefore x + t = 51^\circ + 129^\circ = 180^\circ$$

but these are co-int. \angle^s

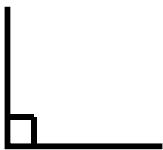
$$\therefore AB \parallel CD$$



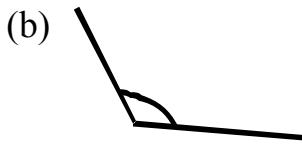
Worksheet

(1) Classify each of the following angles according to their size:

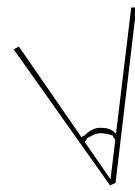
(a)



(b)

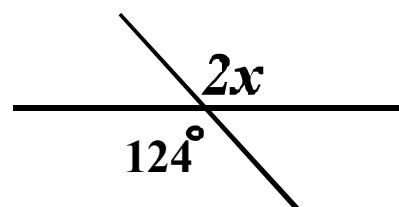


(c)

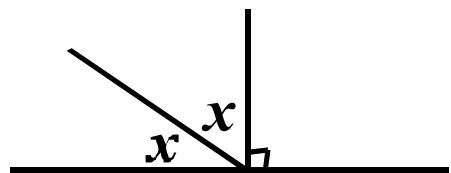


(2) Determine the value(s) of x in each of the following sketches. Also give complete reasons.

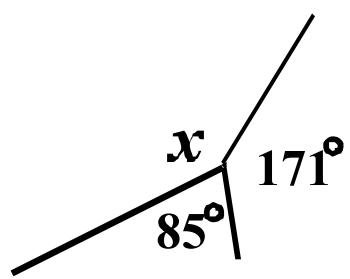
(a)



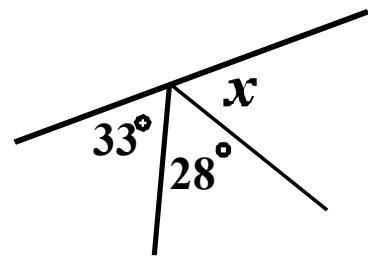
(b)



(c)

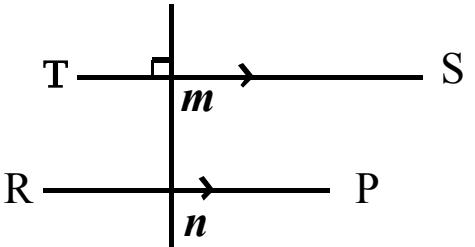


(d)

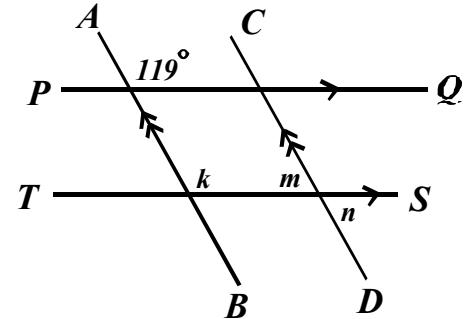


- (3) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

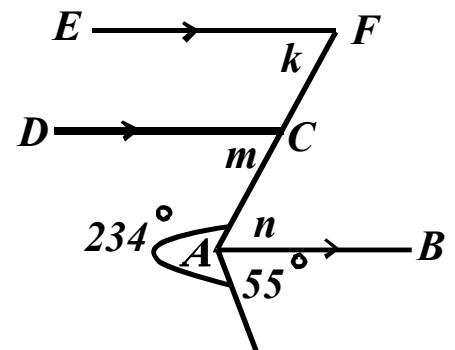
(a)



(b)

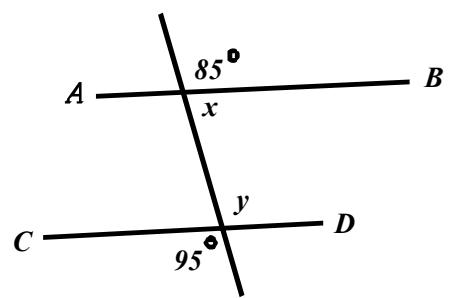


- (4) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

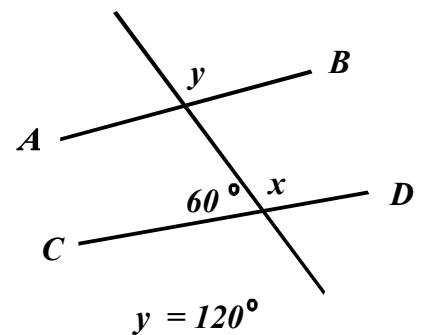


(5) Determine whether $AB // CD$ in each of the following sketches. Show all calculations:

(a)



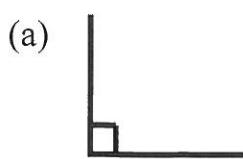
(b)



(6) Name three conditions for two angles to be adjacent.

Memo

(1) Classify each of the following angles according to their size:



Right \angle



Obtuse \angle



Acute \angle

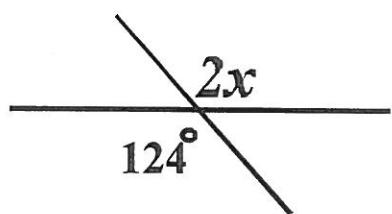
(2) Determine the value(s) of x in each of the following sketches. Also give complete reasons.

(a)

$$2x = 124^\circ \quad [\text{Vert opp. } \angle^s]$$

$$\therefore x = \frac{124}{2}$$

$$x = 62^\circ$$



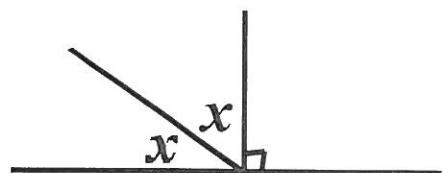
(b)

$$x + x + 90^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore 2x + 90^\circ = 180^\circ$$

$$2x = 180^\circ - 90^\circ$$

$$x = \frac{90}{2} = 45^\circ$$



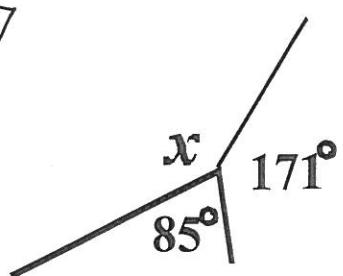
(c)

$$x + 171^\circ + 85^\circ = 360^\circ \quad [\text{Revolution}]$$

$$\therefore x + 256^\circ = 360^\circ$$

$$\therefore x = 360^\circ - 256^\circ$$

$$\therefore x = 104^\circ$$

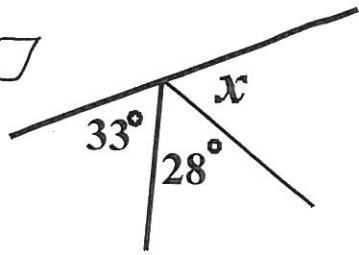


(d)

$$\alpha + 33^\circ + 28^\circ = 180^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore \alpha = 180^\circ - 33^\circ - 28^\circ$$

$$\therefore \alpha = 119^\circ$$

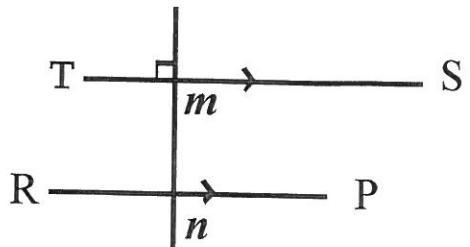


- (3) Determine the value(s) of m , n and/or k in each of the following sketches. Also give complete reasons.

(a)

$$m = 90^\circ \quad [\text{vert. opp. } \angle^s]$$

$$n = 90^\circ \quad [\text{corresp. } \angle^s; TS \parallel RP]$$



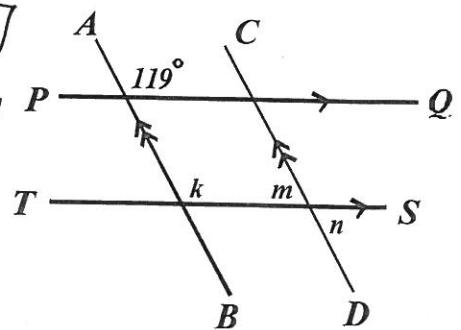
(b)

$$k = 119^\circ \quad [\text{corresp. } \angle^s; PQ \parallel TS]$$

$$k+m = 180^\circ \quad [\text{co-int. } \angle^s; AB \parallel CD]$$

$$\therefore m = 180^\circ - 119^\circ = 61^\circ$$

$$m = n = 61^\circ \quad [\text{vert. opp. } \angle^s]$$



- (4) Determine the value(s) of m , n and/or k in each of the following sketches.

Also give complete reasons.

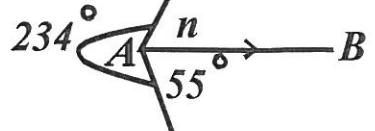
$$n + 234^\circ + 55^\circ = 360^\circ \quad [\text{Revolution}]$$

$$\therefore n = 360^\circ - 234^\circ - 55^\circ$$

$$\therefore n = 71^\circ$$

$$E \longrightarrow F \quad k$$

$$D \longrightarrow C \quad m$$



$$m = n = 71^\circ \quad [\text{alt. } \angle^s; DC \parallel AB]$$

$$m = k = 71^\circ \quad [\text{corresp. } \angle^s; EF \parallel DC]$$

(5) Determine whether $AB \parallel CD$ in each of the following sketches. Show all calculations:

(a)

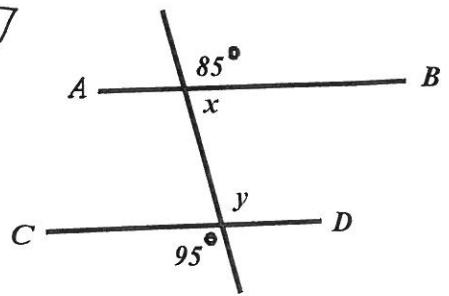
$$x = 180^\circ - 85^\circ \quad [\angle^s \text{ on str. line}]$$
$$\therefore x = 95^\circ$$

$$y = 95^\circ \quad [\text{vert. opp. } \angle^s]$$

but $95^\circ + 95^\circ \neq 180^\circ$ and

these are co-int. \angle^s

$\therefore AB \text{ not } \parallel \text{ to } CD!$



(b)

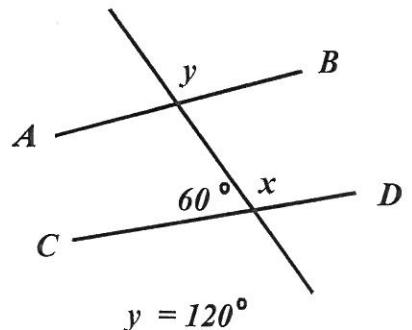
$$x = 180^\circ - 60^\circ \quad [\angle^s \text{ on str. line}]$$

$$\therefore x = 120^\circ$$

$$\therefore x = y = 120^\circ$$

but these are corresp. \angle^s

$\therefore AB \parallel CD$



(6) Name three conditions for two angles to be adjacent.

- * The angles should have a common vertex
- * The angles should have a common arm
- * The two angles should lie on either side of the common arm.

Worksheet

Calculate the following if SP → selling price and cost price → CP:

- (a) SP if the CP = R230 000 with a loss of 18%.

- (b) Loss/profit if SP = R520,56 and CP = R481,44.

- (c) CP if SP = R900 and a profit percentage of 20%.

- (d) CP if CP : SP = 2 : 3 and if the SP = R711.

(2) If the exchange rate is: pula = 0,92 : 1, calculate:

(a) how many pula are equal to 1 rand.

(b) how many rand can be exchanged for 300 pula.

(c) how many pula can be exchanged for R3 456.

(d) how many dollar can be exchanged for 6 000 pula, if $\$1 = R6,66$.

(3) Calculate the simple interest earned if:

- (a) R400 are invested for 6 years at 8% pa.

- (b) R2 569 are invested at 12,1% pa for 18 years.

- (c) R890 are invested at 0,7% pm for 20 months.

(4) Samuel decides to invest 40% of his annual bonus. His bonus for December 2008 is R12 400. If he will earn 7,4% p.a, simple interest, calculate the amount available to him (in his bonus investment) at the time that he receives his bonus in December 2010.

(5) R8 500 is invested for $3\frac{1}{2}$ years at 6% pa, simple interest. After the $3\frac{1}{2}$ years the accumulated amount will be invested for a further $2\frac{1}{2}$ years at a simple interest rate of 6,5% pa.

Calculate the accumulated amount after the six years.

(6) In March 2009 the average exchange rate was $R1 = \$0,116$ and in March 2010 the average exchange rate was $\$1 = R8,98$. For which year was the rand at its strongest opposed to the dollar?

Memo

Calculate the following if SP → selling price and cost price → CP:

- (a) SP if the CP = R230 000 with a loss of 18%.

$$\begin{aligned} \text{Loss} &= 18\% \text{ of } CP \\ &= \frac{18}{100} \times \frac{230\ 000}{1} \\ &= R41\ 400 \end{aligned}$$

$$\begin{aligned} SP &= CP - Loss = R230\ 000 - R41\ 400 \\ &= R188\ 600 \end{aligned}$$

\therefore Profit

- (b) Loss/profit if SP = R520,56 and CP = R481,44.

$$SP = CP + profit$$

$$R520,56 = R481,44 + profit$$

$$\begin{aligned} \therefore Profit &= R520,56 - R481,44 \\ &= R39,12 \end{aligned}$$

- (c) CP if SP = R900 and a profit percentage of 20%.

$$\text{Let } CP = x$$

$$\begin{aligned} \therefore Profit &= 20\% \text{ of } CP \\ &= \frac{20}{100} \times x \end{aligned}$$

$$Profit = 0,2 \times x = 0,2x$$

$$\therefore SP = CP + profit$$

$$R900 = 1x + 0,2x$$

$$900 = 1,2x$$

$$\therefore x = \frac{900}{1,2}$$

$$x = 750$$

$$\therefore CP = R750$$

- (d) CP if CP : SP = 2 : 3 and if the SP = R711.

$$\frac{CP}{SP} = \frac{2}{3}$$

$$\therefore \frac{CP}{R711} = \frac{2}{3}$$

$$\frac{CP}{R711} \times \frac{R711}{1} = \frac{2}{3} \times \frac{R711}{1}$$

$$CP = R474$$

(2) If the exchange rate is: pula = 0,92 : 1, calculate:

(a) how many pula are equal to 1 rand.

$$\begin{aligned} R : P &= 0,92 : 1 \\ \frac{R}{P} &= \frac{0,92}{1} \end{aligned}$$

$$\therefore R_1 = P_{0,92}$$

(b) how many rand can be exchanged for 300 pula.

$$P_{300} = R \frac{300}{0,92}$$

$$P_{300} = R_{326,09}$$

(c) how many pula can be exchanged for R3 456.

$$R_1 = P_{0,92}$$

$$\begin{aligned} \therefore R_{3456} &= P_{0,92} \times 3456 \\ &= P_{3179,52} \end{aligned}$$

(d) how many dollar can be exchanged for 6 000 pula, if \$1 = R6,66.

$$P_{6000} = R \frac{6000}{0,92}$$

$$P_{6000} = R_{6521,73\dots}$$

$$\text{but } \$_1 = R_{6,66}$$

$$R_{6,66} = \$,$$

$$\begin{aligned} \therefore R_{6521,73\dots} &= \$ \frac{652,73\dots}{6,66} \\ &= \$ 979,24 \end{aligned}$$

$$\therefore R_{6000} = \$ 979,24$$

(3) Calculate the simple interest earned if:

(a) R400 are invested for 6 years at 8% pa.

$$\text{Interest} = A - P = ?$$

$$A = P(1 + i \times n)$$

$$A = ?$$

$$= 400 (1 + 0,08 \times 6)$$

$$P = R400$$

$$A = R592$$

$$i = 8\% \text{ pa} = \frac{8}{100} = 0,08$$

$$\therefore \text{Interest} = R592 - R400$$

$$n = 6 \text{ years}$$

$$= R192$$

(b) R2 569 are invested at 12,1% pa for 18 years.

$$\text{Interest} = A - P = ?$$

$$A = P(1 + i \times n)$$

$$A = ?$$

$$= 2569 (1 + 0,121 \times 18)$$

$$P = R2 569$$

$$A = R8 164,28$$

$$i = 12,1\% \text{ pa} = \frac{12,1}{100} = 0,121$$

$$\therefore \text{Interest} = R8 164,28 - R2 569$$

$$n = 18 \text{ years}$$

$$= R5 595,28$$

(c) R890 are invested at 0,7% pm for 20 months.

$$\text{Interest} = A - P = ?$$

$$A = P(1 + i \times n)$$

$$A = ?$$

$$= 890 (1 + 0,007 \times 20)$$

$$P = R890$$

$$A = R1 014,60$$

$$i = 0,7\% \text{ pm} = 0,007$$

$$\therefore \text{Interest} = R1 014,60 - R890$$

$$n = 20 \text{ months}$$

$$= R124,60$$

(4) Samuel decides to invest 40% of his annual bonus. His bonus for December 2008 is R12 400. If he will earn 7,4% p.a, simple interest, calculate the amount available to him (in his bonus investment) at the time that he receives his bonus in December 2010.

$$40\% \text{ of } R12 400 = R4 960$$

$$A = ?$$

$$A = P(1 + i \times n)$$

$$P = R4 960$$

$$= 4960 (1 + 0,074 \times 2)$$

$$i = 7,4\% \text{ pa} = 0,074$$

$$A = R5 694,08$$

$$n = 2 \text{ years}$$

$$(2008 \rightarrow 2010)$$

(5) R8 500 is invested for $3\frac{1}{2}$ years at 6% pa, simple interest. After the $3\frac{1}{2}$ years the accumulated amount will be invested for a further $2\frac{1}{2}$ years at a simple interest rate of 6,5% pa.

Calculate the accumulated amount after the six years.

$$\textcircled{1} \quad A = ?$$

$$P = R8\,500$$

$$i = 6\% \text{ pa} = 0,06$$

$$n = 3\frac{1}{2} \text{ years}$$

$$A = P(1 + i \times n)$$

$$= R8\,500(1 + 0,06 \times 3\frac{1}{2})$$

$$A = R10\,285$$



$$\textcircled{2} \quad A = ?$$

$$P = R10\,285$$

$$i = 6,5\% = 0,065$$

$$n = 2\frac{1}{2} \text{ years}$$

$$A = P(1 + i \times n)$$

$$= 10\,285(1 + 0,065 \times 2\frac{1}{2})$$

$$A = R11\,956,31$$

(6) In March 2009 the average exchange rate was $R1 = \$0,116$ and in March 2010 the average exchange rate was $\$1 = R8,98$. For which year was the rand at its strongest opposed to the dollar?

$$2009: \quad R1 = \$0,116$$

$$\$0,116 = R1$$

$$\therefore \$\frac{0,116}{0,116} = R\frac{1}{0,116}$$

$$\therefore \$1 = R8,62$$

$$2010: \quad \$1 = R8,98$$

\therefore Rand was strongest in 2009

Worksheet

(1) (1) Calculate the following if SP → selling price and cost price → CP:

(a) SP if the CP = R140 with a loss of 20%.

(b) SP if the CP = R800 with a profit of 25%.

(c) Profit if SP = R3 450 and CP = R2 950.

(d) Loss percentage if CP = R400 and loss = R40.

(2) If the exchange rate is \$1 = R7,28, calculate:

(a) how many rand \$16 will be.

(b) how many rand \$3 232 will be.

(c) how many dollar R34 will be.

(d) how many dollar R1 456 will be.

(3) (a) Calculate the simple interest if R367 is invested for three years at 12% p.a.

(b) Calculate the number of years (to the nearest year) you should invest R3 000 to earn a total return of R3 600 with an interest rate of 11,2% p.a, simple interest.

- (4) The Steyn family buys a new lounge suite on hire purchase. The cost of the lounge suite is R28 000. According to the hire purchase contract, the total amount should be repaid within three years at 16% per year. Calculate the accumulated amount that the Steyn family has to repay over the three years. Calculate the monthly instalment.

- (5) A pair of shoes is reduced 25% on a sale. The original selling price of the shoes was R192. If the cost price of the shoes was R120, calculate the profit percentage on the reduced price.

(6) A student plan to tour Europe. He saved R8 000 for spending money. He decides to exchange 30% of his savings for British pounds and the remainder for euro. Calculate the amount of pounds and euro he will receive if the exchange rate is as follow:
€1 = R7,56 and £1 = R10,55

Memo

(1) (1) Calculate the following if SP → selling price and cost price → CP:

(a) SP if the CP = R140 with a loss of 20%.

$$\text{Loss} = 20\% \text{ of } R140$$

$$= \frac{20}{100} \times \frac{140}{1}$$

$$= 2 \times 14$$

$$= R28$$

$$\therefore SP = CP - \text{loss} = R140 - R28$$

$$= R112$$

(b) SP if the CP = R800 with a profit of 25%.

$$\text{Profit} = 25\% \text{ of } R800$$

$$= \frac{25}{100} \times \frac{800}{1}$$

$$= 25 \times 8$$

$$= R200$$

$$\therefore SP = CP + \text{profit} = R800 + R200$$

$$= R1000$$

(c) Profit if SP = R3 450 and CP = R2 950.

$$\text{Profit} = SP - CP$$

$$= R3450 - R2950$$

$$\therefore \text{Profit} = R500$$

(d) Loss percentage if CP = R400 and loss = R40.

$$\text{Loss \%} = \frac{\text{Loss}}{CP} \times 100$$

$$= \frac{R40}{R400} \times \frac{100}{1}$$

$$= \frac{R40}{4}$$

$$= 10\%$$

(2) If the exchange rate is \$1 = R7,28, calculate:

(a) how many rand \$16 will be.

$$\begin{aligned} \$16 &= 16 \times R7,28 \\ &= R116,48 \end{aligned}$$

(b) how many rand \$3 232 will be.

$$\begin{aligned} \$3\,232 &= 3\,232 \times R7,28 \\ &= R23\,528,96 \end{aligned}$$

(c) how many dollar R34 will be.

$$\begin{aligned} R34 &= \frac{R34}{7,28} \\ &= \$4,67 \end{aligned}$$

(d) how many dollar R1 456 will be.

$$\begin{aligned} R1\,456 &= \frac{1\,456}{7,28} \\ &= \$200 \end{aligned}$$

(3) (a) Calculate the simple interest if R367 is invested for three years at 12% p.a.

(b) Calculate the number of years (to the nearest year) you should invest R3 000 to earn a total return of R3 600 with an interest rate of 11,2% p.a, simple interest.

$$\begin{aligned} (a) \quad I &= \frac{Crt}{100} \\ &= \frac{R367 \times 12 \times 3}{100} \\ &= R132,12 \end{aligned}$$

$$\begin{aligned} \text{or} \quad A &= P(1 + i \cdot n) \\ &= 367(1 + \frac{12}{100} \times 3) \\ &= R499,12 \end{aligned}$$

$$\begin{aligned} \therefore \text{Interest} &= A - P \\ &= R499,12 - R367 \\ &= R132,12 \end{aligned}$$

$$(b) \quad A = R3\,600$$

$$A = P(1 + i \cdot n)$$

$$P = R3\,000$$

$$3\,600 = 3\,000 (1 + 0,112 \times n)$$

$$i = 11,2\% \quad p\% = 0,112$$

$$\frac{3\,600}{3\,000} = 1 + 0,112n$$

$$n = ?$$

$$1,2 - 1 = 0,112n$$

$$0,2 = 0,112n$$

$$\therefore n = \frac{0,2}{0,112} = 1,785\dots$$

$$\therefore n \approx 2 \text{ year}$$

- (4) The Steyn family buys a new lounge suite on hire purchase. The cost of the lounge suite is R28 000. According to the hire purchase contract, the total amount should be repaid within three years at 16% per year. Calculate the accumulated amount that the Steyn family has to repay over the three years. Calculate the monthly instalment.

$$A = ?$$

$$A = P(1 + i \cdot n)$$

$$P = R28\,000$$

$$= 28\,000 (1 + 0,16 \times 3)$$

$$i = 16\% = 0,16$$

$$= 28\,000 (1,48)$$

$$n = 3$$

$$A = 41\,440$$

\therefore Monthly instalment

$$= \frac{41\,440}{36}$$

$$(3 \text{ years} \times 12 = 36 \text{ months})$$

$$= R1\,151,11$$

- (5) A pair of shoes is reduced 25% on a sale. The original selling price of the shoes was R192. If the cost price of the shoes was R120, calculate the profit percentage on the reduced price.

25% of R192

$$= \frac{25}{100} \times \frac{R192}{1}$$

$$= \frac{R192}{4}$$

$$= R48$$

$$\text{Reduced price} = R192 - R48 = R144$$

$$\therefore \text{Profit} = R144 - R120 = R24$$

$$\therefore \text{Profit \%} = \frac{24}{120} \times 100$$

$$= 20\%$$

- (6) A student plan to tour Europe. He saved R8 000 for spending money. He decides to exchange 30% of his savings for British pounds and the remainder for euro. Calculate the amount of pounds and euro he will receive if the exchange rate is as follow:
€1 = R7,56 and £1 = R10,55

$$\begin{aligned} & \underline{\text{30 \% of R8000}} \\ &= \frac{30}{100} \times 8000 \\ &= 30 \times 80 \\ &= \underline{\text{R2400}} \rightarrow \text{pound : } \underline{\text{R2400} \div \text{R10,55}} \\ & \qquad \qquad \qquad = \underline{\text{£227,49}} \end{aligned}$$

$$\begin{aligned} & \text{Euro's : } \underline{\text{R8000 - R2400}} \\ & \qquad \qquad \qquad = \underline{\text{R5600}} \end{aligned}$$

$$\begin{aligned} & \therefore \text{Euro's} = \underline{\text{R5600} \div \text{R7,56}} \\ & \qquad \qquad \qquad = \underline{\text{€740,74}} \end{aligned}$$

Worksheet

(1) Consider the following algebraic expression: $\frac{5x - 1}{8} - 7 + x^2 + 3(2x + 1)$

- (a) How many terms does the expression consist of? _____
- (b) Write down the coefficient of x^2 . _____
- (c) Write down the constant term. _____

(2) Draw a flowchart for the following algebraic expression: $5x - 3$

(3) Write the following as mathematical sentences:

- (a) The sum of x and y . _____
- (b) Double the difference between p and q . _____
- (c) The square of m , increased by two times t . _____
- (d) Ansa is k years old now. How old was Ansa 6 years ago? _____

(4) Determine the sum of the following expressions:

(a) $7x^2 - 2x + 8$
 $9x^2 + x + 11$

(b) $1 + mn - 6m^2$
 $- 3mn + 2m^2$

(5) Simplify as far as possible:

(a) $2(xy - 3x + 5y) + x(2 - y + 3xy)$

(b) $\frac{4y^3 - (-2y)(y^4)}{-2y^3}$

(c) $6mpr(3m - 3p + 2r - k)$

(d) $3x^2 + 6y - 4 + 5x + 7y + 8$

Memo

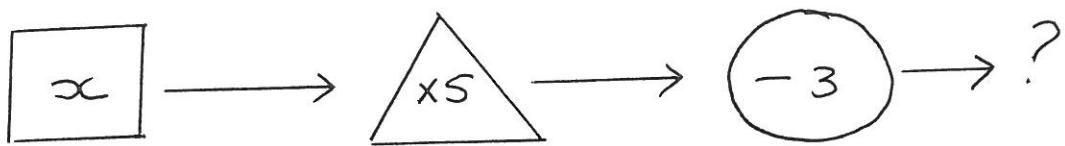
(1) Consider the following algebraic expression: $\frac{5x+1}{8} - 7 + x^2 + 3(2x+1)$

(a) How many terms does the expression consist of? 4

(b) Write down the coefficient of x^2 . +1

(c) Write down the constant term. -7

(2) Draw a flowchart for the following algebraic expression: $5x - 3$



(3) Write the following as mathematical sentences:

(a) The sum of x and y . $x+y$

(b) Double the difference between p and q . $2 \times (p-q)$ or $2 \times (q-p)$

(c) The square of m , increased by two times t . $m^2 + 2 \times t = m^2 \times 2t$

(d) Ansa is k years old now. How old was Ansa 6 years ago? $k-6$

(4) Determine the sum of the following expressions:

(a) $7x^2 - 2x + 8$
 $9x^2 + 1x + 11$
 $16x^2 - 10x + 19$

(b) $1 + 1mn - 6m^2$
 $0 - 3mn + 2m^2$
 $1 - 2mn - 4m^2$

(5) Simplify as far as possible:

$$(a) \overbrace{2(xy - 3x + 5y)} + \overbrace{x(2 - 1y + 3xy)}$$
$$= \overbrace{2xy - 6x + 10y} + \overbrace{2x - 10y + 3x^2y}$$
$$= \overbrace{10y - 4x + 10y} + \overbrace{3x^2y}$$

$$(b) \frac{4y^3 - (-2y)(y^4)}{-2y^3}$$
$$= \frac{4y^3 + 2y^5}{-2y^3} = \frac{+4y^3}{-2y^3} + \frac{2y^5}{-2y^3}$$
$$= -2 - y^2$$

$$(c) \overbrace{6mpr(3m - 3p + 2r - k)}$$
$$= \overbrace{18m^2pr - 18mp^2r + 12mpr^2 - 6kmp}$$

$$(d) \overbrace{3x^2 + 6y - 4} + \overbrace{5x + 7y + 8}$$
$$= \overbrace{3x^2 + 13y + 4} + \overbrace{5x}$$

Worksheet

Simplify:

(1) $4x(2x^2 + 3x)$

(2) $m^2n^5(4m^5 - mn^3)$

(3) $(6k^3 - 3k^5)(5k^3)$

(4) $(x^7 - 5xy^4)(-2x^3y)$

(5) $2ab(2a^2b + 5a^2b^2) - 4a^2b^2(3ab + a)$

$$(6) \quad t^2(t^2 - 6t - 4) - t^3(5 + 3t)$$

$$(7) \quad 7p(2p + 2q) - 3q(7p - q)$$

$$(8) \quad 2a^3(5a^2 + 7a) + 5a^4(6a + 8)$$

$$(9) \quad (15x - 6y)4 - 2(2y + 6x)$$

$$(10) \quad (2k^6m^2 + 3k^3m^3) - 3km(6k^5m + 9km)$$

Memo

Simplify:

$$(1) \quad 4x(2x^2 + 3x)$$

$$= \boxed{8x^3 + 12x^2}$$

$$(2) \quad m^2n^5(4m^5 - mn^3)$$

$$= \boxed{4m^7n^5 - m^3n^8}$$

$$(3) \quad (6k^3 - 3k^5)(5k^3)$$

$$= \boxed{(5k^3)(6k^3 - 3k^5)}$$

$$= \boxed{30k^6 - 15k^8}$$

$$(4) \quad (x^7 - 5xy^4)(-2x^3y)$$

$$= \boxed{(-2x^3y)(x^7 - 5xy^4)}$$

$$= \boxed{-2x^{10}y + 10x^4y^5}$$

$$(5) \quad 2ab(2a^2b + 5a^2b^2) - 4a^2b^2(3ab + a)$$

$$= \boxed{4a^3b^2 + 10a^3b^3 - 12a^3b^3 - 4a^3b^2}$$

$$= \boxed{4a^3b^2 - 4a^3b^4 + 10a^3b^3 - 12a^3b^3}$$

$$= \boxed{0a^3b^2 - 2a^3b^3}$$

$$= \boxed{-2a^3b^3}$$

$$(6) \quad t^2(t^2 - 6t - 4) - t^3(5 + 3t)$$

$$= \boxed{t^4 - 6t^3 - 4t^2 - 5t^3 - 3t^4}$$

$$= \boxed{1t^4 - 3t^4 - 6t^3 - 5t^3 - 4t^2}$$

$$= \boxed{-2t^4 - 11t^3 - 4t^2}$$

$$(7) \quad 7p(2p + 2q) - 3q(7p - q)$$

$$= 14p^2 + 14pq - 21pq + 3q^2$$

$$= 14p^2 + 14pq - 21pq + 3q^2$$

$$= 14p^2 - 7pq + 3q^2$$

$$(8) \quad 2a^3(5a^2 + 7a) + 5a^4(6a + 8)$$

$$= 10a^5 + 14a^4 + 30a^5 + 40a^4$$

$$= 10a^5 + 30a^5 + 14a^4 + 40a^4$$

$$= 40a^5 + 54a^4$$

$$(9) \quad (15x - 6y)4 - 2(2y + 6x)$$

$$= 4(15x - 6y) - 2(2y + 6x)$$

$$= 60x - 24y - 4y - 12x$$

$$= 60x - 12x - 24y - 4y$$

$$= 48x - 28y$$

$$(10) \quad (2k^6m^2 + 3k^3m^3) - 3km(6k^5m + 9km)$$

$$= 2k^6m^2 + 3k^3m^3 - 18k^6m^2 - 27k^2m^2$$

$$= 2k^6m^2 - 18k^6m^2 + 3k^3m^3 - 27k^2m^2$$

$$= 16k^6m^2 + 3k^3m^3 - 27k^2m^2$$

Worksheet

(1) Complete the following:

(a) A parallelogram is a quadrilateral with _____

(per definition)

(b) A kite is a quadrilateral with _____

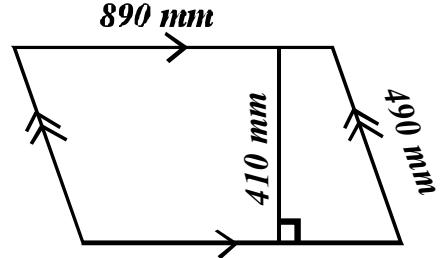
(per definition)

(c) A square is a parallelogram with _____

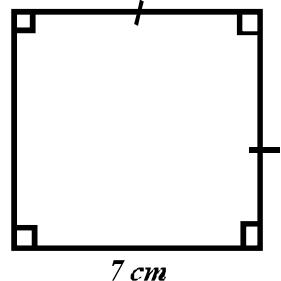
(d) A trapezium is a quadrilateral with _____

(2) Calculate the area and perimeter of the following quadrilaterals:

(a)



(b)

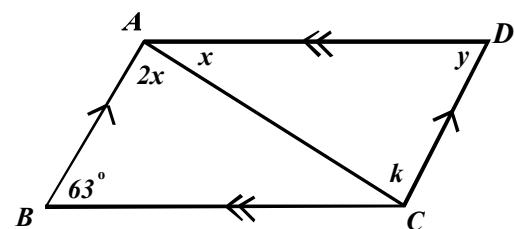


(3) Match the two columns:

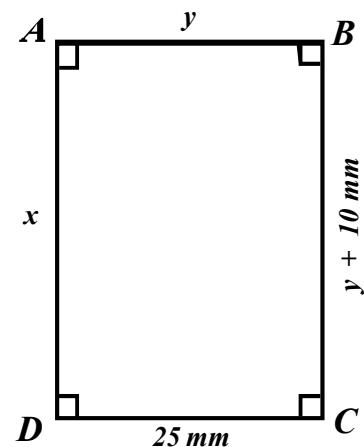
	<u>Column A:</u>		<u>Column B:</u>
(a)	All sides are equal in length.	P	Parallelogram
(b)	Opposite sides are equal in length.	Q	Rectangle
(c)	Adjacent sides are equal in length.	R	Rhombus
(d)	One pair of opposite sides is equal in length.	S	Trapezium
(e)	All angles equal to 90° .	T	Kite

(4) Determine the value(s) of x , y and k in each of the following sketches. Also give complete reasons. What type of quadrilateral will $ABCD$ be?

(a)



(b)



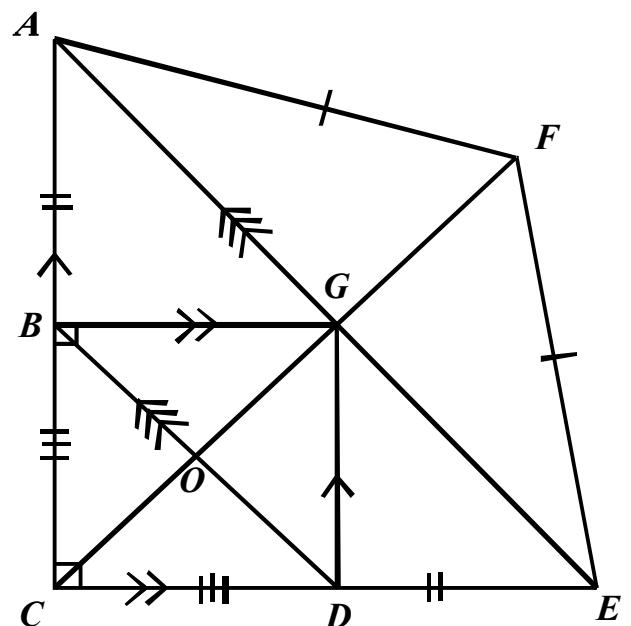
(5) Study the sketch and answer the questions:

(a) Write an example from the sketch of a:

- (i) trapezium
 - (ii) parallelogram, which will not be a rectangle
 - (iii) kite
 - (iv) square
 - (v) rectangle
 - (vi) isosceles triangle

(b) Write down ten right-angled Δ s.

(c) If $FE = 10 \text{ cm}$ and $GF = 6 \text{ cm}$, calculate the length of AE .



- (6) The sketch illustrates a regular polygon.

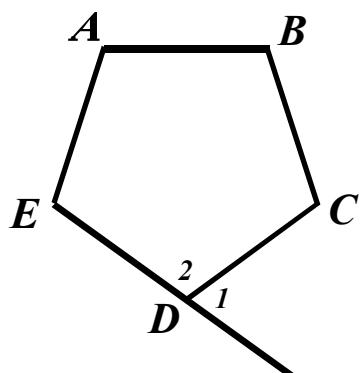
- (a) Calculate the sizes of \widehat{D}_1 and \widehat{D}_2 .

Show all calculations.

- (b) If the lengths of AB, BC, CD, DE and AE are doubled, how will that influence the sizes of \widehat{D}_1 and \widehat{D}_2 ?

- (c) Name this specific polygon.

- (d) Draw any line (only one) of symmetry in on the sketch, if it is possible.



Memo

(1) Complete the following:

(a) A parallelogram is a quadrilateral with the opposite sides parallel.

(per definition)

(b) A kite is a quadrilateral with two pair of adjacent sides equal.

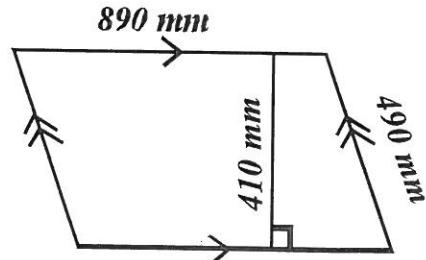
(per definition)

(c) A square is a parallelogram with all sides equal and all angles equal to 90° .

(d) A trapezium is a quadrilateral with one pair of opposite sides parallel.

(2) Calculate the area and perimeter of the following quadrilaterals:

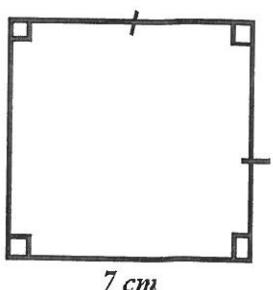
$$\begin{aligned}
 \text{(a)} \quad & \text{Perimeter} = 2(L + B) \\
 & = 2(890 \text{ mm} + 490 \text{ mm}) \\
 & = 2760 \text{ mm}
 \end{aligned}$$



$$\begin{aligned}
 \text{Area} &= L \times B = 890 \text{ mm} \times 490 \text{ mm} \\
 &= 436100 \text{ mm}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad & \text{Perimeter} = 4 \times 7 \text{ cm} \\
 & = 28 \text{ cm}
 \end{aligned}$$

$$\begin{aligned}
 \text{Area} &= L^2 \\
 &= (7 \text{ cm})^2 \\
 &= 49 \text{ cm}^2
 \end{aligned}$$



(3) Match the two columns:

	<u>Column A:</u>		<u>Column B:</u>
(a)	All sides are equal in length.	R	P ✓ Parallelogram
(b)	Opposite sides are equal in length.	P	Q ✓ Rectangle
(c)	Adjacent sides are equal in length.	T	R ✓ Rhombus
(d)	One pair of opposite sides is equal in length.	S	S ✓ Trapezium
(e)	All angles equal to 90° .	Q	T✓ Kite

(4) Determine the value(s) of x , y and k in each of the following sketches. Also give complete reasons. What type of quadrilateral will $ABCD$ be?

(a)

Parallelogram

$$y = 63^\circ \quad [\text{Opp. } \angle^s \text{ of param}]$$

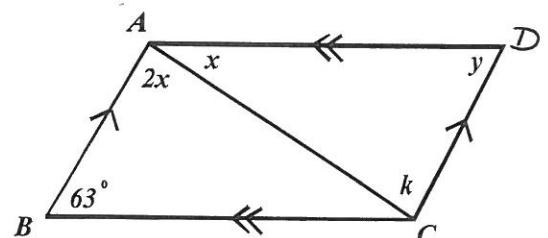
$$2x + x + 63^\circ = 180^\circ \quad [\text{co-int. } \angle^s; AD \parallel BC]$$

$$\therefore 3x = 180^\circ - 63^\circ = 117^\circ$$

$$\therefore x = \frac{117^\circ}{3} = 39^\circ$$

$$k = 180^\circ - 39^\circ - 63^\circ \quad [\text{int. } \angle^s \text{ of } \triangle]$$

$$\therefore k = 78^\circ$$



(b)

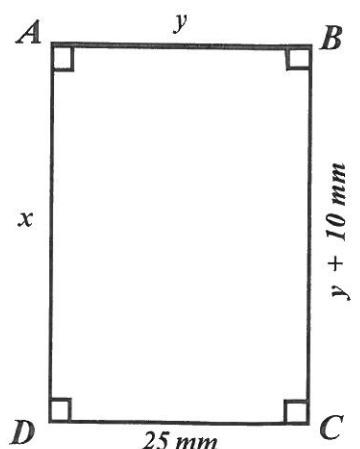
Rectangle

$$y = 25 \text{ mm} \quad [\text{Opp. sides rectangle}]$$

$$\therefore BC = y + 10$$

$$= 25 + 10 = 35 \text{ mm}$$

$$\therefore x = 35 \text{ mm} \quad [\text{Opp. sides rectangle}]$$



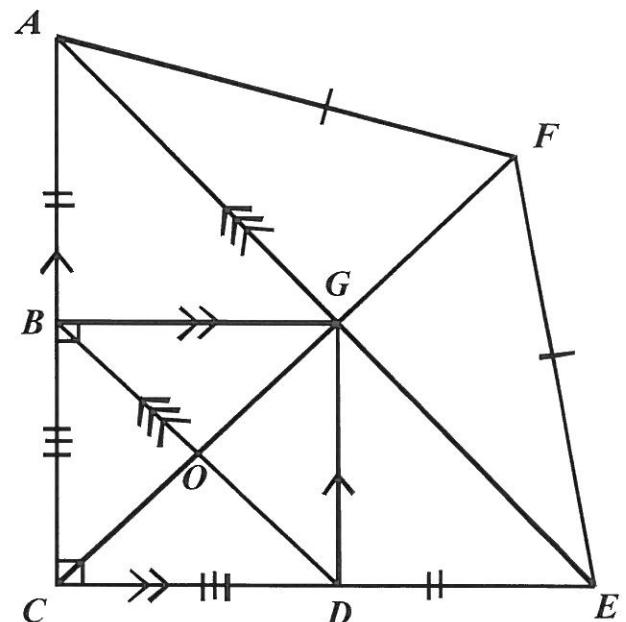
(5) Study the sketch and answer the questions:

(a) Write an example from the sketch of a:

- (i) trapezium
- (ii) parallelogram, which will not be a rectangle
- (iii) kite
- (iv) square
- (v) rectangle
- (vi) isosceles triangle

(b) Write down ten right-angled Δs.

(c) If $FE = 10 \text{ cm}$ and $GF = 6 \text{ cm}$, calculate the length of AE .



(a) (i) $\triangle ABOG$ or $\triangle OGD E$ or $\triangle ABDE$ or

$\triangle BCEG$ or $\triangle GDC A$

(ii) $\triangle AGDB$ or $\triangle BGED$

(iii) $\triangle AFEC$

(iv) $\triangle BCDG$

(v) $\triangle BCDG$

(vi) $\triangle AFE$ or $\triangle BCD$ or $\triangle BGD$ or $\triangle ACE$ or

$\triangle BCG$ or $\triangle CDG$

(b) $\triangle BGG$

$\triangle CDG$

$\triangle BDG$

$\triangle BCD$

$\triangle BCO$

$\triangle BGO$

$\triangle DOG$

$\triangle COD$

$\triangle ACE$

$\triangle ABG$

$\triangle GDE$

$\triangle EFG$ and $\triangle AGF$ (diagonals of kite \perp)

[Any 10]

(c) $EF^2 = GF^2 + GE^2$ [Pythagoras]

$$(10)^2 = (6)^2 + GE^2$$

$$\therefore GE^2 = 100 - 36 = 64$$

$$\therefore GE = \sqrt{64} = 8$$

$$\therefore AE = 16 \text{ cm} \quad [AE = 2 \times GE] \\ \rightarrow \text{Diagonals of kite}$$

(6) The sketch illustrates a regular polygon.

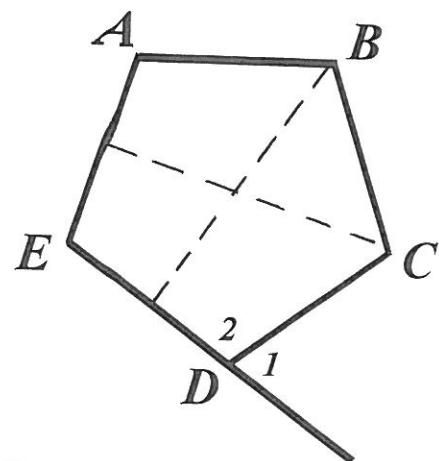
(a) Calculate the sizes of \widehat{D}_1 and \widehat{D}_2 .

Show all calculations.

(b) If the lengths of AB, BC, CD, DE and AE are doubled, how will that influence the sizes of \widehat{D}_1 and \widehat{D}_2 ?

(c) Name this specific polygon.

(d) Draw any line (only one) of symmetry in on the sketch, if it is possible.



$$\begin{aligned}\text{(a)} \quad \widehat{D}_2 &= [180^\circ \times (n-2)] \div n \\ &= [180^\circ \times (5-2)] \div 5 \\ &= 540^\circ \div 5\end{aligned}$$

$$\therefore \widehat{D}_2 = 108^\circ$$

$$\therefore \widehat{D}_1 = 180^\circ - 108^\circ \quad [\angle \text{ on str. line}]$$

$$\therefore \widehat{D}_1 = 72^\circ$$

(b) \widehat{D}_1 and \widehat{D}_2 stays the same

(c) Pentagon

(d) See 2 possible lines of symmetry on sketch.

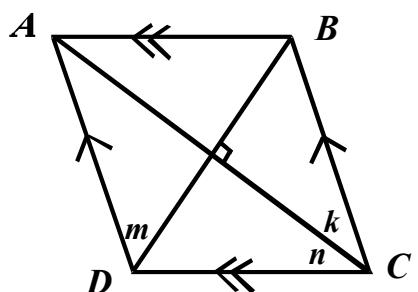
Worksheet

- (1) Make use of a table to indicate the similarities and differences between a parallelogram and a rectangle.

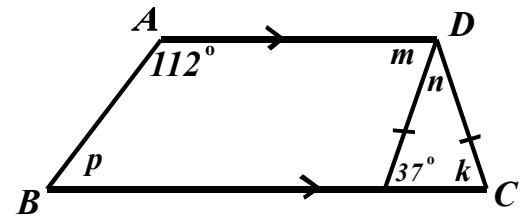
Parallelogram:	Rectangle:

- (2) Which type of quadrilateral will ABCD present? Use the properties of such a quadrilateral and calculate the values of m , n , k and/or p . Show all calculations and give reasons.
If necessary, round off to 1 decimal.

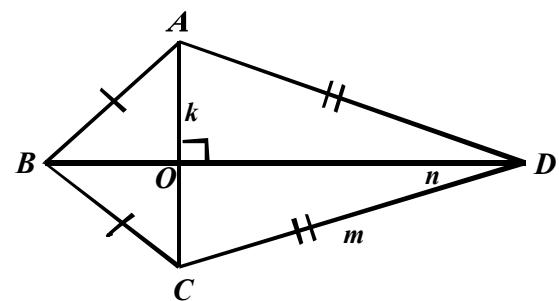
(a) $D\hat{A}B = 74^\circ$ and $AB = BC$



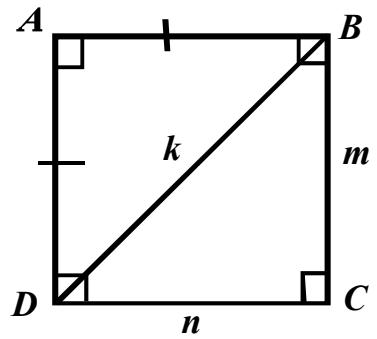
(b)



(c) $AC = 10 \text{ cm}$ and $OD = 12 \text{ cm}$
 $O\hat{A}D = 52^\circ$

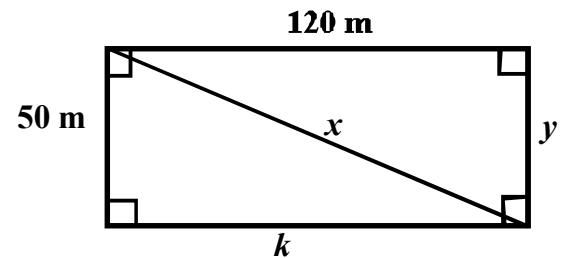


(d) $AB = DB = 6 \text{ cm}$

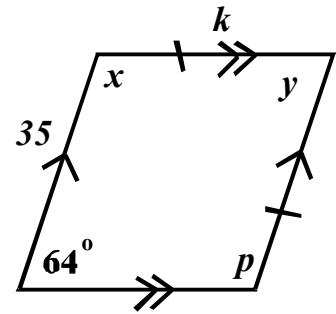


- (3) Determine the value(s) of m , p , n and/or k in each of the following sketches. Also give complete reasons. If possible, calculate the perimeter and area of the given quadrilateral.

(a)



(b)



(4) Complete the following:

(a) A rhombus is a parallelogram for which _____

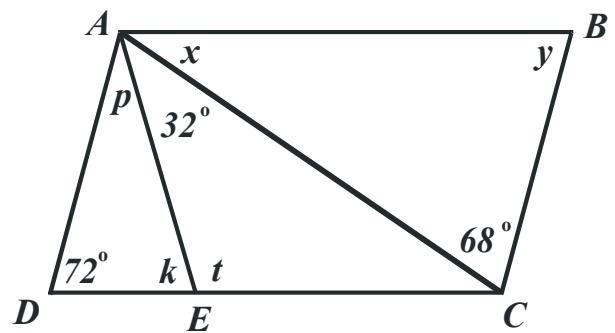
(b) A rectangle is a parallelogram for which _____

(c) A parallelogram is a quadrilateral for which _____

- (5) Construct a kite with sides 30 mm and 45 mm. The angles where the equal sides meet one another is equal to 60° and 40° respectively. Clearly show how all measurements were calculated. Give complete reasons for all your statements.

(6) In the sketch ABCD is a parallelogram.

Prove that ΔADE is an isosceles triangle.
Show all steps and give complete reasons



- (7) Explain the difference between a polygon and a regular polygon. Give two typical properties of a regular polygon to indicate the difference.

Memo

- (1) Make use of a table to indicate the similarities and differences between a parallelogram and a rectangle.

Parallelogram:	Rectangle:
<u>Similarities:</u> <ul style="list-style-type: none"> Opposite sides are // and equal. Diagonals bisect one another. 	
<u>Differences:</u> <ul style="list-style-type: none"> Opp. ∠'s equal Diagonals not equal. 	<ul style="list-style-type: none"> All ∠'s equal to 90° Diagonals equal!

- (2) Which type of quadrilateral will ABCD present? Use the properties of such a quadrilateral and calculate the values of m , n , k and/or p . Show all calculations and give reasons. If necessary, round off to 1 decimal.

(a) $D\hat{A}B = 74^\circ$ and $AB = BC$

Rhombus

$D\hat{C}B = D\hat{A}B$ [opp. ∠'s of rhombus]

but $n = k$ [diag. of rhombus bisect ∠'s]

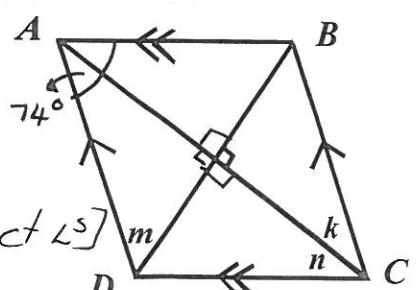
$\therefore n = k = \frac{74^\circ}{2} = 37^\circ$

Likewise $D\hat{A}C = C\hat{A}B = 37^\circ$

but $D\hat{A}C + 90^\circ + m = 180^\circ$ [int ∠'s of △]

$\therefore m = 180^\circ - 90^\circ - 37^\circ$

$m = 53^\circ$



(b)

Trapezium

$$k = 37^\circ \quad [\text{opp equal sides}]$$

$$p + 112^\circ = 180^\circ \quad [\text{co-int. } \angle \text{s}; AD \parallel BC]$$

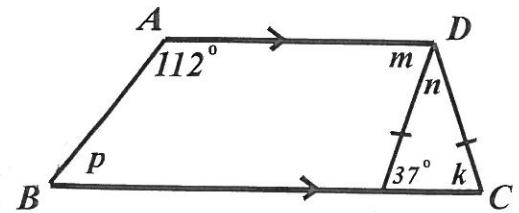
$$\therefore p = 180^\circ - 112^\circ = 68^\circ$$

$$n + 37^\circ + 37^\circ = 180^\circ \quad [\text{int. } \angle \text{s of } \triangle]$$

$$\therefore n = 180^\circ - 37^\circ - 37^\circ$$

$$\therefore n = 106^\circ$$

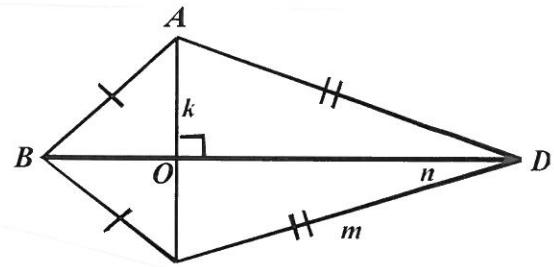
$$m = 37^\circ \quad [\text{alt. } \angle \text{s}; AD \parallel BC]$$



(c) $AC = 10 \text{ cm}$ and $OD = 12 \text{ cm}$

$$\hat{O}AD = 52^\circ$$

Kite



$$k = \frac{1}{2} AC = 5 \text{ cm} \quad [\text{diag. of kite}]$$

$$\hat{O}CD = \hat{O}AD = 52^\circ \quad [\text{opp. equal sides}]$$

$$\text{but } \hat{O}CD + 90^\circ + n = 180^\circ \quad [\text{int. } \angle \text{s of } \triangle]$$

$$\therefore n = 180^\circ - 90^\circ - 52^\circ$$

$$\therefore n = 38^\circ$$

In $\triangle ODC$:

$$DC^2 = OC^2 + OD^2 \quad [\text{Pythagoras}]$$

$$m^2 = (5)^2 + (12)^2$$

$$m^2 = 25 + 144 = 169$$

$$\therefore m = 13 \text{ cm}$$

$$(d) AB = DB = 6 \text{ cm}$$

Square

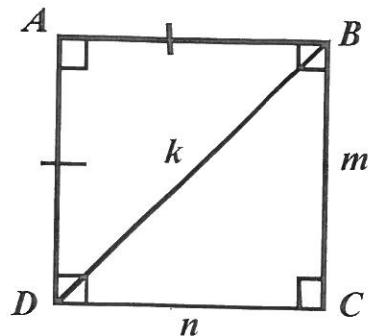
$$m = n = 6 \text{ cm} \quad [\text{opp. sides square}]$$

$$\begin{aligned} k^2 &= n^2 + m^2 \quad [\text{Pythagoras}] \\ &= (6)^2 + (6)^2 \end{aligned}$$

$$= 36 + 36$$

$$k^2 = 72$$

$$\therefore k = \sqrt{72} = 8,48\dots \approx 8,5 \text{ cm}$$

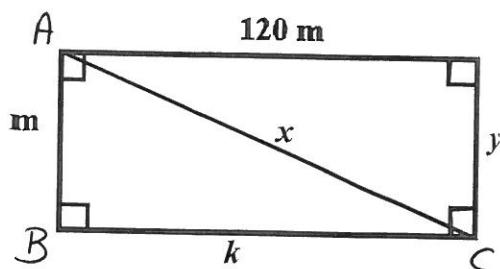


- (3) Determine the value(s) of m , p , n and/or k in each of the following sketches. Also give complete reasons. If possible, calculate the perimeter and area of the given quadrilateral.

(a)

$$k = 120 \text{ m} \quad [\text{opp. sides rectangle}]$$

$$y = 50 \text{ m} \quad ["]$$



In $\triangle ABC$:

$$AC^2 = AB^2 + BC^2 \quad [\text{Pythagoras}]$$

$$x^2 = (50)^2 + (120)^2$$

$$= 2500 + 14400$$

$$\therefore x^2 = 16900$$

$$\therefore x = \sqrt{16900}$$

$$\therefore x = 130 \text{ m}$$

$$\therefore \text{Perimeter} \quad \text{Area} = L \times B$$

$$= 50 \times 2 + 2 \times 120$$

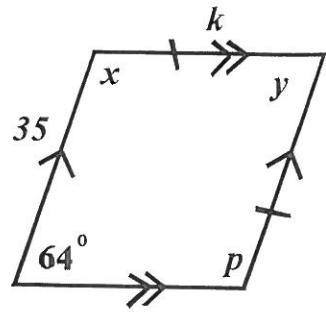
$$= 50 \times 120$$

$$= 340 \text{ m}$$

$$= 6000 \text{ m}^2$$

(b)

$$y = 64^\circ \quad [\text{Opp. } \angle^{\circ} \text{ of rhombus}]$$
$$\alpha + 64^\circ = 180^\circ \quad [\text{co-int } \angle^{\circ}; //]$$
$$\therefore \alpha = 180^\circ - 64^\circ = 116^\circ$$



$$\therefore p = \alpha = 116^\circ \quad [\text{Opp. } \angle^{\circ} \text{ of rhombus}]$$
$$k = 35 \quad [\text{sides of rhombus =}]$$

$$\text{perimeter} = 35 \times 4$$
$$= 140$$

Information not enough to determine the area.

(4) Complete the following:

(a) A rhombus is a parallelogram for which all four sides are equal in length

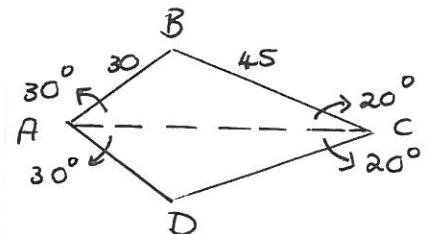
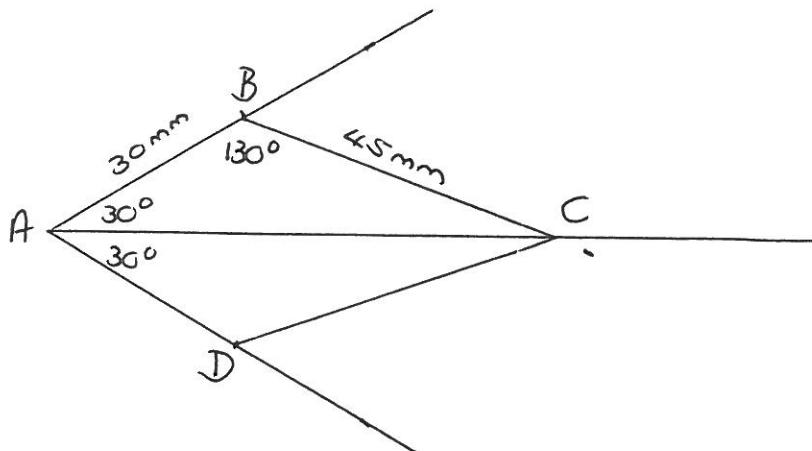
(b) A rectangle is a parallelogram for which all angles are equal to 90°

(c) A parallelogram is a quadrilateral for which _____

- * the opposite sides are equal or
- * the opposite sides are parallel or
- * the opposite \angle° are equal or
- * the diagonals bisect one another

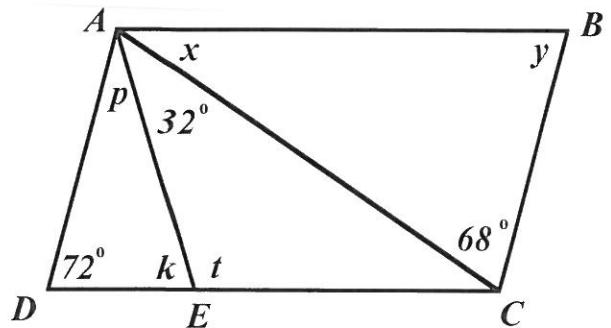
- (5) Construct a kite with sides 30 mm and 45 mm. The angles where the equal sides meet one another is equal to 60° and 40° respectively. Clearly show how all measurements were calculated. Give complete reasons for all your statements.

$$\hat{B} = \hat{D} = 180^\circ - 30^\circ - 20^\circ = 130^\circ \quad [\text{int } \angle \text{s of } \triangle]$$



- (6) In the sketch ABCD is a parallelogram.

Prove that $\triangle ADE$ is an isosceles triangle.
Show all steps and give complete reasons



$$y = 72^\circ \quad [\text{opp. } \angle \text{s of para}]$$

$$\text{but } x + y + 68^\circ = 180^\circ \quad [\text{int. } \angle \text{s of } \triangle]$$

$$\therefore x = 180^\circ - 72^\circ - 68^\circ$$

$$\therefore x = 40^\circ$$

$$k = 32^\circ + x \quad [\text{alt } \angle \text{s; } AB \parallel CD]$$

$$\therefore k = 32^\circ + 40^\circ = 72^\circ$$

$$\therefore \hat{D} = \hat{k} = 72^\circ$$

$$\therefore AD = AE \quad [\text{sides opp. equal } \angle \text{s}]$$

$$\therefore \triangle ADE \text{ is an isosceles } \triangle$$

- (7) Explain the difference between a polygon and a regular polygon. Give two typical properties of a regular polygon to indicate the difference.

A polygon is any quadrilateral, while a regular polygon has all angles equal and all sides are of equal length.