

7. Rewrite these expressions into mathematical symbols:

- a) $A \subset B \Leftrightarrow \forall a \in A : a \in B$
- b) $A \cap B = \emptyset$
- c) $A \subseteq B \wedge B \subseteq A \Rightarrow A = B$
- d) $X \wedge \neg Y \Leftrightarrow \neg(X \vee Y)$
- e) $(3,5) \cup (4,6) \neq (1,6) \cap (3,8)$

8. Read out the following notation (Logic and Sets):

FOR INSTANCE:

- a) a is greater than or equal to zero if and only if the absolute value of a is equal to a
- b) the sign of a is equal to 1 if and only if a is greater than zero
- c) the absolute value of a is equal to 0 if and only if a is equal to 0
- d) if A is a subset of B and B is a subset of C then A is a subset of C
- e) A is a subset of B if and only if the complement of B (with respect to R) is a subset of the complement of A (with respect to R)
- f) the sign of a is equal to minus one if and only if a is less than zero
- g) u or v implies the negation of u and the negation of v
- h) the intersection of A and B equals the empty set if and only if A is a subset of the complement of B (with respect to R)
- i) A is a subset of B if and only if the union of A and B is equal to B
- j) the negation of u and v
- k) C is a subset of A and C is a subset of B if and only if C is a subset of the intersection of A and B
- l) the proposition that if x is less than y and y is less than z then x is less than z holds for all real x , y and z
- m) A is equal to B if and only if B is equal to A
- n) for every non-zero real x there exists a real $-x$ such that x plus $-x$ is equal to 0
- o) if A is equal to B and B is equal to C then A is equal to C
- p) A is a subset of the union of A and B
- q) the intersection of A and B is equal to the empty set if and only if B is a subset of the complement of A (with respect to R)
- r) x is greater than zero for all natural x
- s) A is a subset of C and B is a subset of C if and only if the union of A and B is a subset of C
- t) the absolute value of a is greater than zero if and only if a is not equal to 0
- u) a is less than 0 if and only if the absolute value of a is equal to minus a
- v) the sign of a is equal to 0 if and only if a is equal to 0
- w) the intersection of A and B is a subset of A
- x) the negation of u or the negation of v
- y) A is equal to A

9. Read the following propositions. What are their truth values?

- a) 1 (true)
 - b) 1 (true)
 - c) 1 (true)
 - d) 0 (false)
 - e) 1 (true)
- a), b), c), e) are tautologies

10. Say whether the following equivalences are true or false? Draw pictures to demonstrate the equivalences:

- a) True
b) True

⇒ FOCUS B

P. 27-30

TRIANGLES

I. A triangle

1. Complete the table with the correct name for each triangle:

Properties	Triangle
<ul style="list-style-type: none"> has one right angle can be isosceles 	right-angled
<ul style="list-style-type: none"> all three sides the same all three angles the same size 	equilateral
<ul style="list-style-type: none"> two sides equal in length angles opposite the equal sides are equal 	isosceles
<ul style="list-style-type: none"> no sides are the same no angles are equal 	scalene

2. Look and read, and fill in the missing expressions:

A straight line drawn from any **vertex** of a triangle to the mid-point of the **opposite side** is known as a **median** of a triangle. The **point** where they meet is called the **centroid**, or the **centre of gravity** of the triangle.

II. A right-angled triangle

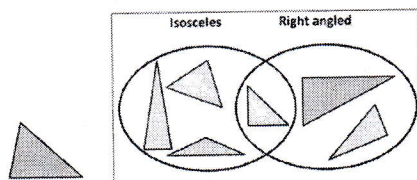
4. Complete this statement of Pythagoras's Theorem:

The square of the **longest side**, known as hypotenuse, is equal to the sum of the **squares of the lengths of the other two sides**. $a^2 + b^2 = c^2$

5. Complete the following sentences and answer the question:

This is a **right-angled triangle**. Its sides are 3 cm and 4 cm **long**. The length of the **hypotenuse** is 5 cm.
Its area is 6 cm².

6. Draw lines to join each triangle to the correct place on the Venn diagram:



7. Complete the following:

a) $\text{tangent} = \frac{\text{opposite}}{\text{adjacent}}$

- b) $\text{sine} = \frac{\text{opposite}}{\text{hypotenuse}}$
 c) $\text{cosine} = \frac{\text{adjacent}}{\text{hypotenuse}}$
 d) $\text{cotangent} = \frac{\text{adjacent}}{\text{opposite}}$

III. Congruence, similarity and symmetry

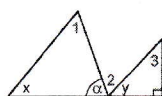
9. What type of transformation are these?

- a) rotation b) reflection c) translation

10. State whether or not each of the following triangle pairs is congruent. If so, state a reason:

The triangles are congruent; the length of one side and the angle made with the other side are the same. In addition they have a common side.

11. Solve the problem:



$$y = 180^\circ - 90^\circ - 43^\circ; \underline{y = 47^\circ}$$

$$\alpha = 180^\circ \angle y \cdot \angle 2; \alpha = 180^\circ - 47^\circ - 65^\circ; \alpha = 68^\circ$$

$$x = 180^\circ \angle 1 \angle x = 180^\circ - 53^\circ - 68^\circ; \underline{x = 59^\circ}$$

UNIT 3

FOCUS A

Exercises

1. In the text above find all the **-ing** forms and say what their grammatical meanings and positions in sentences are:

aid in graphing; use in sketching – *gerund after a preposition*;
the corresponding point on the graph – *present participle modifying a noun*;
when dealing with functions – *present participle in a separate clause*;
the following test for local maximum – *present participle modifying a noun*;

2. Put the verbs in brackets into the correct form (-ing form or infinitive):

- | | |
|--------------------------|---------------------------------|
| a) cutting; laying | f) listening; hearing |
| b) explaining | g) to learn; reading; listening |
| c) defining | h) suggesting; to emphasize |
| d) hearing; not to enter | i) to express; to mention |
| e) making; to do | j) having told / telling |

3. Put the verbs in brackets into the correct form (-ing form or infinitive):

- | | |
|---------------------------------------|--------------------|
| a) using | f) telling |
| b) persuading / to persuade; to agree | g) writing |
| c) talking; to finish | h) reading |
| d) to write | i) to inform |
| e) to find | j) solve / solving |

- 4. Rewrite these expressions into mathematical symbols:

a) $\frac{10}{20} = \frac{5}{10} = \frac{1}{2}$

b) $\frac{\frac{x}{y}}{\frac{t}{u}} = \frac{x}{y} \cdot \frac{u}{t}$

c) $(a+b) \cdot (c+d) = ac + ad + bc + bd$

d) $\frac{2}{d} \cdot \frac{d}{2} = 1$

e) $-a - (-a) = 0$

- 5. Read out the following notation (Addition, Subtraction, Multiplication, Division, Fractions). Try to read the expressions in various ways:

FOR INSTANCE:

- a plus the sum b plus c is equal to the sum of a and b plus c which is equal to the sum of a, b and c
- a plus b is equal to 0 to b plus a
- a plus 0 is equal to 0 plus a which is equal to a
- the sum of plus a and plus b is equal to plus the sum of a and b which is equal to the sum of a and b
- minus a plus minus b is equal to minus the sum of a and b
- plus a plus minus b is equal to plus the difference of a and b which is equal to minus the difference b minus a

- g) minus a plus plus b is equal to minus the difference a minus b which is equal to plus the difference b minus a
- h) plus a minus plus b is equal to plus a plus minus b which is equal to a minus b
- i) minus a minus minus b is equal to minus a plus plus b which is equal to b minus a
- j) plus a minus minus b is equal to plus a plus plus b which is equal to a plus b
- k) minus a minus plus b is equal to minus a plus minus b which is equal to minus the sum of a and b
- l) a plus open parenthesis b plus c minus d closed parenthesis is equal to a plus b plus c minus d
- m) a minus open parenthesis b plus c minus d closed parenthesis is equal to a minus b minus c plus d
- n) a times the product of b and c is equal to the product of a and b times c which is equal to the product of a , b and c
- o) a times b is equal to b times a
- p) a times 1 is equal to 1 times a which is equal to a
- q) a times 0 is equal to 0 times a which is equal to 0
- r) a times b is equal to zero if and only if a is equal to zero or b is equal to zero
- s) plus a times plus b is equal to plus the product of a and b
- t) minus a times plus b is equal to minus a times b
- u) plus a times minus b is equal to minus a times b
- v) minus a times minus b is equal to plus a times b
- w) the sum of a and b times c is equal to c times the sum of a and b which is equal to a times c plus b times c
- x) the product of the sum of a and b and the sum of c and d is equal to the sum of ac , bc , ad and bd
- y) a over b plus c over b is equal to a plus c that sum over b
- z) a over b minus c over b is equal to a minus c that difference over b
- aa) a over b times e that fraction plus c over d times e is equal to the sum of a times d and c times b over the product a times d times e
- ab) a over b that fraction times c is equal to a times c over b
- ac) c times a over b is equal to c times a that product over b
- ad) a over b that fraction divided by c is equal to the product of a over b and one over c which is equal to a over the product b times c
- ae) a divided by the fraction b over c is equal to a times the fraction c over b is equal to a times c that product over b
- af) the product of the fractions a over b and c over d is equal to a times c that product over the product of b times d
- ag) a over b that fraction divided by the fraction c over d is equal to a times d over the product b times c
- ah) open parenthesis a plus b minus c closed parenthesis divided by m is equal to a over m that fraction plus b over m that quantity minus c over m which is equal to open parenthesis a plus b minus c closed parenthesis over m
- ai) the fraction the numerator is a over b the denominator is c over d is equal to a over b that fraction divided by c over d is equal to a times d that product divided by the product of b and c

⇒ FOCUS B

P.37-39

A CIRCLE

1. Name the following:

- a) area a = a sector
- b) area b = a segment

- c) EF = a chord
- d) XF = an arc
- e) AB = a diameter
- f) OC and OD = a radius
- g) O = a centre

2. Say whether the following statements are true or false. Correct the false statements:

- a) F – a straight line
- b) T
- c) T
- d) F – 2 sides, no chord, an arc, 2 radii

4. Solve the problem:

- c) secant

5. Solve the problem:

All the options are possible.

6. A circle has a radius of 3 cm. Calculate:

- a) the diameter = $2r = 6$ cm
- b) the circumference = $2\pi r = \pi d = 6\pi = 6 \times 3.14 = 18.84$ cm

7. The circumference of a circle is approximately 15.7 cm. Calculate:

- a) the approximate radius = $\frac{\text{circumference}}{2\pi} = \frac{15.7}{2 \times 3.14} = \frac{15.7}{6.28} = 2.5$ cm
- b) the approximate diameter = $\frac{15.7}{\pi} = 5$ cm

8. Fill in the missing expressions:

- a) diameter; semi-circles
- b) inscribed; vertices
- c) sector; radii; segment; chord