Mathematics Companion

WORKBOOK 2

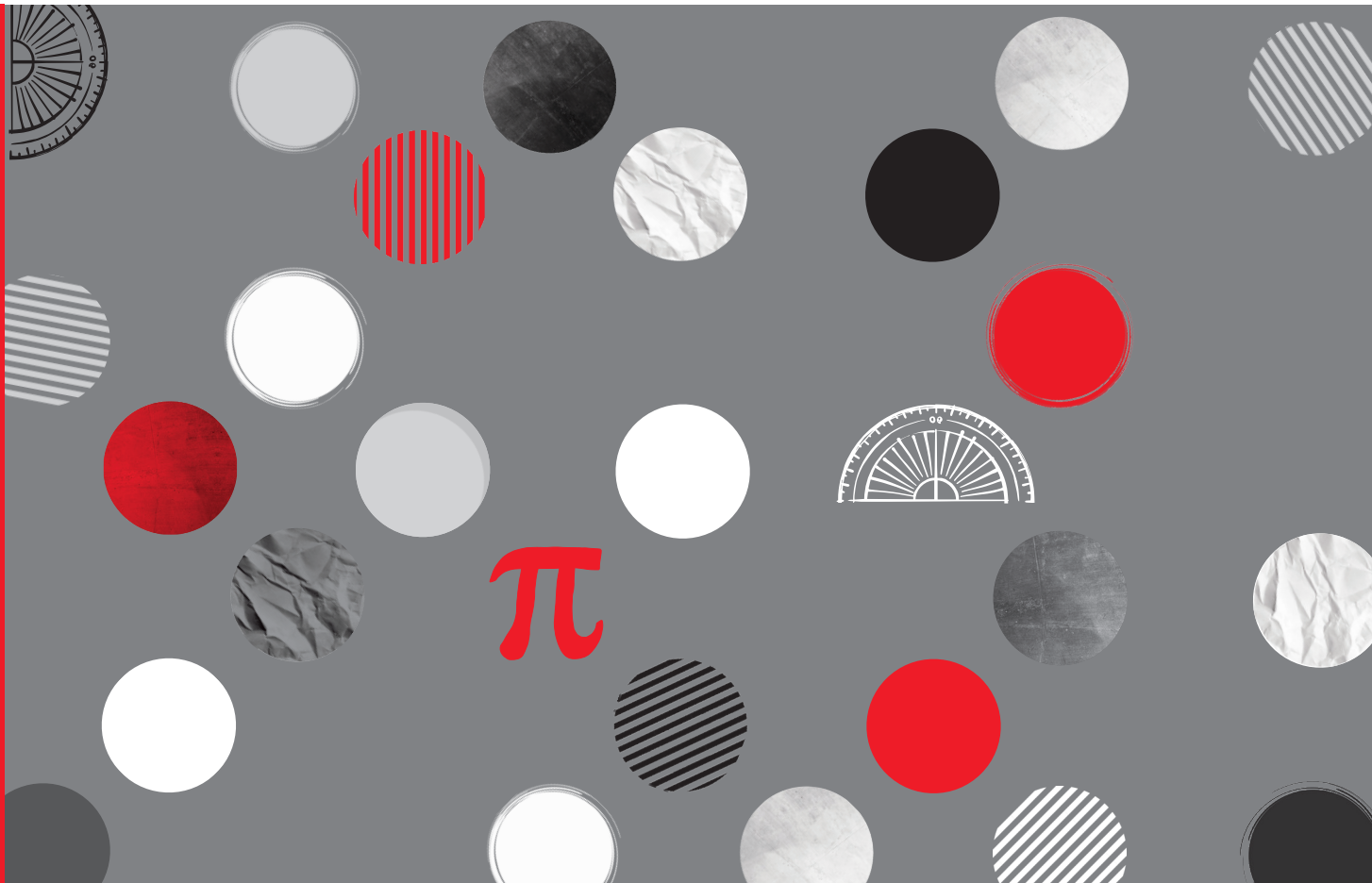
Marilyn Buchanan, Andrew Lewis, *et al.*

GRADE

8

CAPS

Terms 3 & 4



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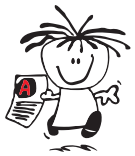

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Mathematics Companion

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1 Exercises

2 End-of-unit tests

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WORKBOOK 2

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Hire Purchase Agreement

A **hire purchase agreement** is a **contract** between a buyer and a seller, where the buyer does **not pay the full cost** of an item before taking it out of the store. Instead of paying the **full price**, the buyer pays **monthly instalments**, which may be compared to hiring the item (i.e. paying a **fee** for using it, without actually owning it).

The buyer takes the item from the store and uses it **before** it is completely paid off, so the **buyer is in debt** to the seller. The seller charges **interest**, and allows the buyer to pay for the item over an **extended period**. Ultimately the buyer pays **far more** than the **original cash price**.

So the buyer purchases the item, but is really **hiring** it until it is paid for in full. Until the buyer completes payment, the item is really **on loan from the seller**.

Stop and multiply... before you buy!

Important terminology

Simple interest …is money you earn by lending money to another person. It is a **fixed percentage** of the loan and it is converted into a **fixed amount** added to **each repayment**.

An instalment …is **one part** of your repayment. In general, a debt is divided into equal **payments** (i.e. **instalments**) to be paid back on a monthly basis.

Per annum (p.a.) …is the Latin phrase meaning **per year** or over one year.

Example 2

A furniture store allows you to buy a lounge suite, with a cash price of R7200, on credit, as part of a hire purchase agreement. The hire purchase contract requires that you pay for the lounge suite on a monthly basis, over 12 months. Calculate the total cost to you, if you are charged simple interest at 25% for the year.

Solution:

Interest: 25% of R7 200 $\quad I = \frac{25}{100} \times 7\,200$

$= 1\,800$ ...R7 200 + R1 800 = R9 000

Over the course of the year you will pay R9 000 for the lounge suite.

Example 3

A micro-lender offers an instant cash loan of R5 000 and charges interest at a rate of 20% p.a. The loan agreement requires that the debt must be paid in monthly instalments, over 12 months. Determine the value of each monthly instalment.

Solution:

Interest: $I = \frac{20}{100} \times 5\,000$

$= 1\,000$ ...R5 000 + R1 000 = R6 000

Total repayment: R6 000

Monthly instalments: $\frac{6\,000}{12} = R500$ (per month)

Example 4

A furniture store allows you to buy, on credit, a television, marked with a cash price of R4 500. The hire purchase contract requires you to pay for the TV over 24 months in equal monthly instalments. You are charged simple interest at 25% p.a. Calculate the value of each instalment.

Solution:

Interest for 1 year: $I = \frac{25}{100} \times 4\,500 = R1\,125$

Total interest: Simple I = R1 125 p.a. × 2 years = R2 250

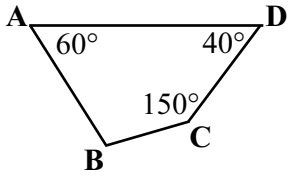
Total repayment: R4 500 + R2 250 = R6 750

Monthly instalments: $\frac{6\,750}{24} = R281{,}25$

It is worth noting that an administration fee and/or an insurance fee may be added to your monthly instalment.

Example 1:

Determine the size of $A\hat{B}C$ in ABCD.



Solution

$A\hat{B}C + 60° + 40° + 150° = 360°$ ($\angle$'s of quad. ABCD)

$\therefore A\hat{B}C + 250° = 360°$

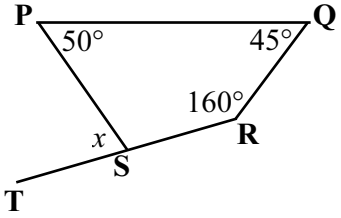
$-250° \quad -250°$

$\therefore A\hat{B}C = 110°$

If you make a statement based on a rule, mention the rule.

Example 2:

Determine the value of x.



Solution

$P\hat{S}R + 50° + 45° + 160° = 360°$ ($\angle$'s of quad. PQRS)

$\therefore P\hat{S}R + 255° = 360°$

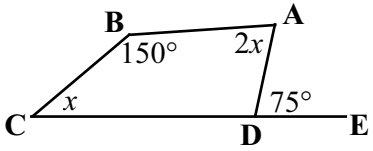
$-255° \quad -255°$

$\therefore P\hat{S}R = 105°$

$\therefore x = 75°$ (adj. $\angle$'s on str. line RST)

Example 3:

Determine the value of x.



Solution

$C\hat{D}A = 105°$ (adj. $\angle$'s on str. line CDE)

$\therefore x + 2x + 150° + 105° = 360°$ ($\angle$'s of quad. ABCD)

$\therefore 3x + 255° = 360°$

$-255° \quad -255°$

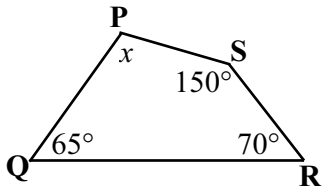
$\therefore 3x = 105°$

$\therefore x = 35°$

EXERCISE 3.4.1

1. In each of the following diagrams, determine the value of x. Give reasons for all your statements. (Note that the diagrams are not necessarily drawn to scale.)

1.1



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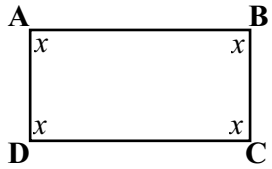
1.2



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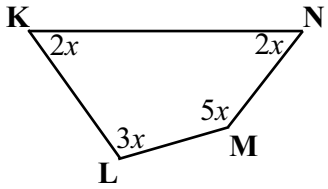
1.3



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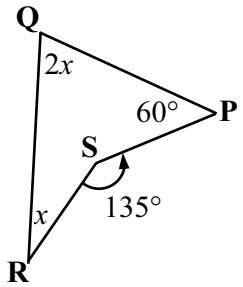
1.4



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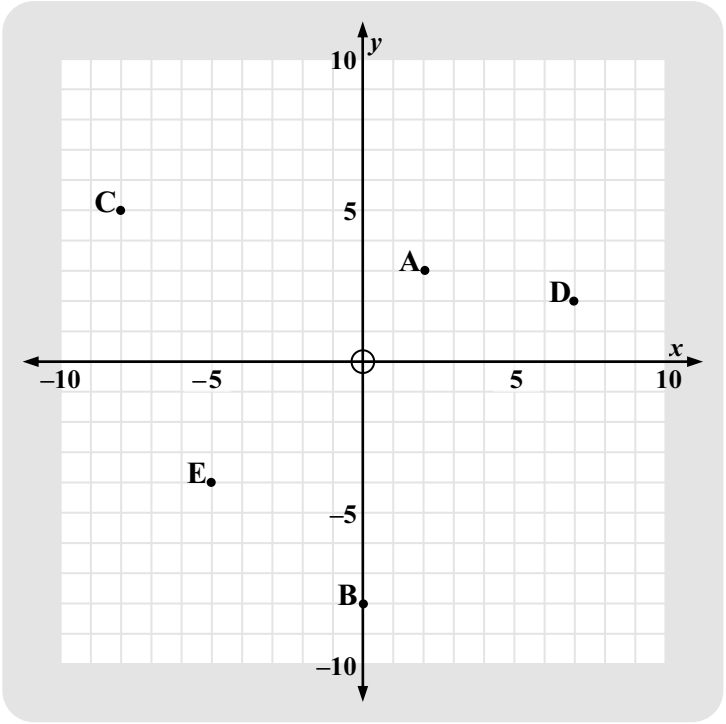
END-OF-UNIT 3.6 TEST

20 marks
20 minutes

QUESTION 1

The given diagram shows a Cartesian plane. Each block represents one square unit. Points A, B, C, D and E have been plotted in this Cartesian plane. The coordinates of A, B and C are given.

A (2; 3) **B (0; –8)** **C (–8; 5)**



1.1 Write down the coordinates of point D. (..... ; .....) (2)

1.2 Write down the coordinates of point E. (..... ; .....) (2)

1.3 In each of the following questions, circle the correct answer (A, B or C).

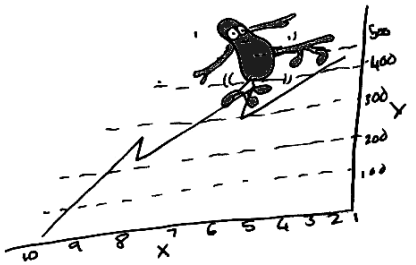
1.3.1 Which of the three points lies in quadrant 1 of the Cartesian plane? **A B C** (1)

1.3.2 Which of the three points lies in quadrant 2 of the Cartesian plane? **A B C** (1)

1.3.3 Which of the three points lies exactly eight units from the origin? **A B C** (1)

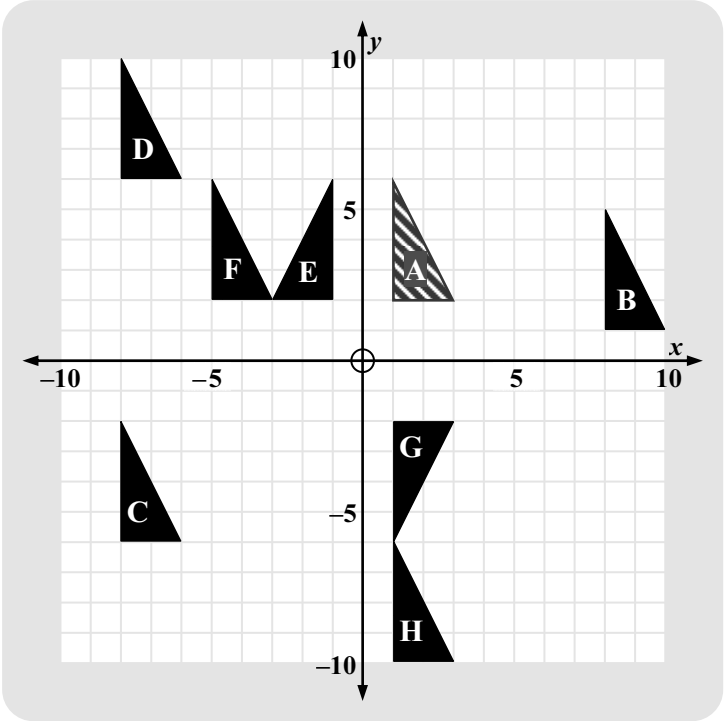
1.3.4 Which of the three points has a negative x-coordinate? **A B C** (1)

[8]



QUESTION 3

In the given diagram, each of the triangles labelled B, C, D, E, F, G and H is an image of triangle A under a particular transformation.



In each of the spaces provided below, write the letter which refers to the correct triangle. Which triangle is the image of triangle A...

3.1 under translation left 6 units? A → ..... (1)

3.2 under translation down 12 units? A → ..... (1)

3.3 under translation right 7 units and down 1 unit? A → ..... (1)

3.4 under translation left 9 units and down 8 units? A → ..... (1)

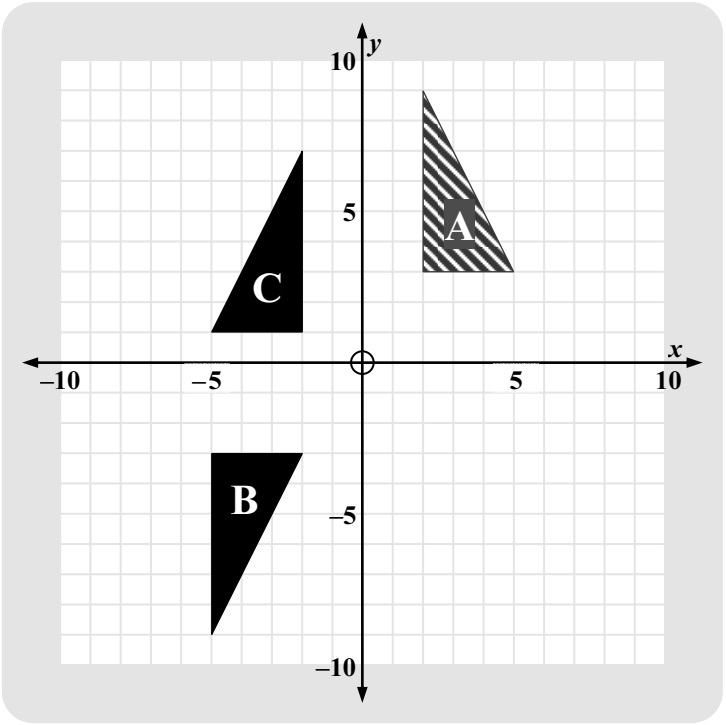
3.5 under reflection in the *y*-axis? A → ..... (1)

3.6 under reflection in the *x*-axis? A → ..... (1)

[6]

QUESTION 4

In the given diagram, each of the triangles labelled B and C is an image of triangle A under a particular transformation. In the spaces provided below, describe fully a transformation which maps triangle A on to the given image in each case. Use the correct terminology (e.g. translation, reflection or glide reflection).



4.1 A → B Transformation: .....

..... (3)

4.2 A → C Transformation: .....

..... (3)

[6]

TOTAL: [40]

END–OF–UNIT 3.7 TEST

UNIT 2.5
FORMAL ALGEBRA PART 4: GRAPHS

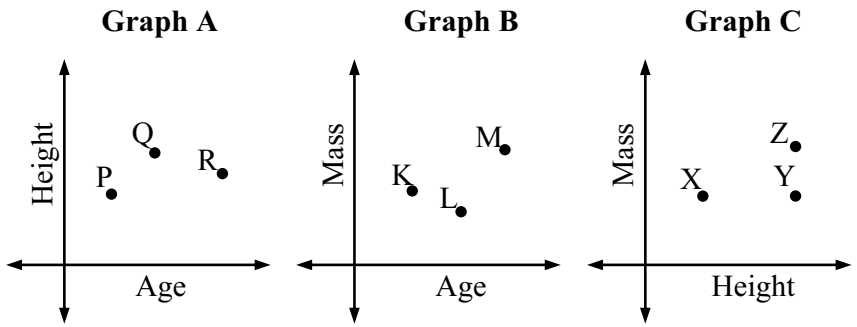
Unit 3.6 has an introduction to the Cartesian Plane, so should be done before this unit.

INTERPRETATION OF GLOBAL GRAPHS

Information is often displayed in the form of a graph, giving us a visual image. This makes it easy for us to analyse the data.

EXERCISE 2.5.1

1. Consider each of the following graphs, A B and C where two sets of data are taken for a few people.



1.1 In graph A, the heights and ages of three people, P, Q and R are represented.

1.1.1 Which person is the tallest? *Circle one.* P Q R

1.1.2 Which person is the oldest? *Circle one.* P Q R

1.2 In graph B, the masses (weights) and ages of three people, K, L and M are represented.

1.2.1 Which person is the lightest? *Circle one.* K L M

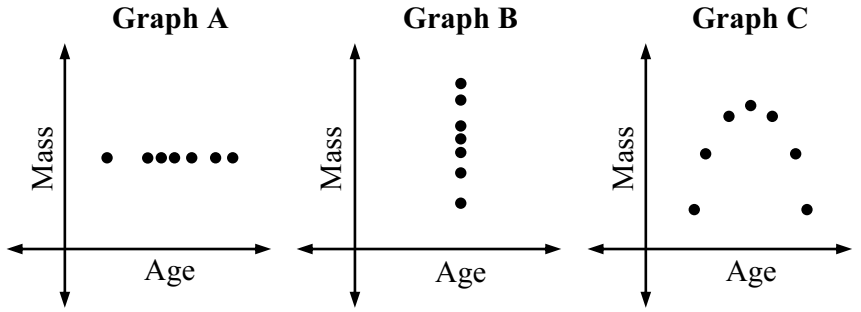
1.2.2 Which person is the youngest? *Circle one.* K L M

1.3 In graph C, the masses (weights) and heights of three people, X, Y and Z are represented.

1.3.1 Which two people are equal in height? ..... and .....

1.3.2 Which two people have equal masses? ..... and .....

2. Consider the following graphs, each of which shows the ages and masses of 3 groups of seven different people.



2.1 Which graph (A, B or C) suggests that the age of every person in the particular group was the same?

Circle one. A B C

2.2 Which graph (A, B or C) suggests that every person in the particular group was equal in mass?

Circle one. A B C

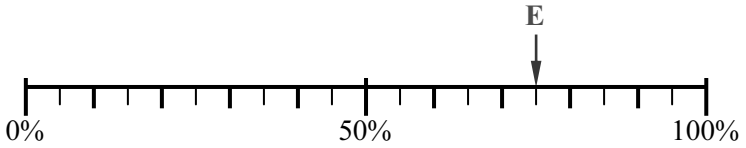
END-OF-UNIT 5.2 TEST

40 marks
40 minutes

QUESTION 1

Place each of the following events on the probability scale below. You need only write the letter of the event in the correct position on the scale.

	Example	1.1	1.2	1.3	1.4
Probability	75%	40%	0,05	0,5	$\frac{40}{200}$
Position	**E**	**A**	**B**	**C**	**D**



[4]

QUESTION 2

Complete the following table by choosing the description which BEST matches the probability value from the list of options on the right.

	Probability	Description		Description options
2.1	1			*No chance*
2.2	0			*Unlikely*
2.3	0,64			*Definite*
2.4	$\frac{3}{20}$			*Equally likely as not*
2.5	50%			*More likely than not*

[5]

QUESTION 3

Arrange the following probability values in order, from least likely to most likely.

$$33{,}3\% \ ; \ \frac{3}{8} \ ; \ 0{,}24 \ ; \ \frac{3}{4} \ ; \ 62{,}5\% \ ; \ \frac{24}{50}$$

Space for working: .....

.....

.....

Answer: ..... **[4]**

QUESTION 4

Complete the following table for an experiment where a single, fair, six-sided dice was rolled 40 times.

Outcome	*1*	*2*	*3*	*4*	*5*	*6*	Sum
Theoretical probability	.....	.....	.....	.....	.....	.....	100%
Tally	𝍸 ||	𝍸 |||	𝍸	𝍸 |||	𝍸 |	𝍸 |	
Frequency	.....	.....	.....	.....	.....	.....	**40**
Relative frequency	.....	.....	.....	.....	.....	.....	*Common fraction*
	.....	.....	.....	.....	.....	.....	*Decimal fraction*
	.....	.....	.....	.....	.....	.....	*Percentage*

[13]

A reminder...

When you divide a divisor into two or more UNLIKE terms in a bracket, the divisor must be divided into each term.

Example 1

$(6n^3 + 9n^2 - 3n) \div 3n$

$= 2n^2 + 3n - 1$

Example 2

$$\frac{9n^9 - 6n^6}{-3n^3}$$

$= -3n^6 + 2n^3$

5. Simplify each of the following expressions as far as possible. If a particular expression cannot be simplified, write ***cannot be simplified***. In each case assume that every variable is nonzero.

5.1 $\dfrac{2ab + a}{a}$

= .....

= .....

5.2 $\dfrac{x^2y + xy^2}{xy}$

= .....

= .....

5.3 $\dfrac{x^7 + x^3}{x^3}$

= .....

= .....

5.4 $\dfrac{y^3 + y^2 + y}{y}$

= .....

= .....

5.5 $\dfrac{2m^6 - m^5 + 2m^6 - 3m^5}{m^3 + m^3}$

= .....

= .....

5.6 $\dfrac{m^6 + m^6}{m^3 \times m^3}$

= .....

= .....

5.7 $\dfrac{7n^6 - n^6 + 8n^6 - 2n^6}{2n^3.3n^2}$

= .....

= .....

5.8 $\dfrac{2n^6 + 2n^6}{-2n^3 \times 2n^3}$

= .....

= .....

5.9 $\dfrac{12p^6 + 12p^8}{2p^3 \times 2p^3}$

= .....

= .....

5.10 $\dfrac{12p^6 + 12p^8}{2p^3 + 2p^3}$

= .....

= .....

QUESTION 2

Consider a hamster wheel, with a radius of 113 mm.

2.1 Determine the length of the diameter and the circumference of this wheel.

.....

..... (3)

2.2 Determine the distance "covered" by the hamster if the wheel completes 50 rotations.

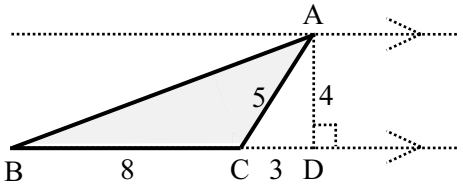
.....

..... (1)
[4]

QUESTION 3

Calculate the shaded area for each of the following figures:

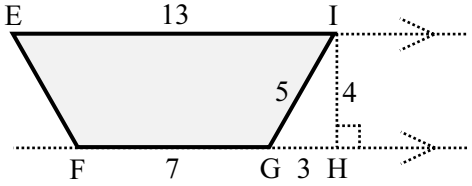
3.1



Area ΔABC = ...

= ..... (2)

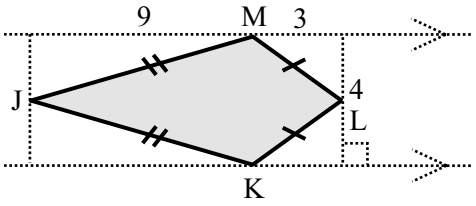
3.2



Area EFGI = ...

= ..... (3)

3.3



Area JKLM = ...

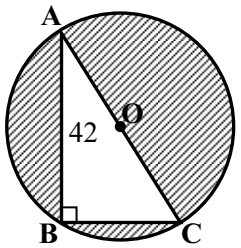
= ..... (3)
[8]

QUESTION 4

In the diagram shown alongside, O is the centre of the circle.

Points A, B and C lie on the circumference of the circle.

Δ ABC is a right-angled triangle, with $\hat{B} = 90°$, AB = 42 units and area 840 units^2.



Calculate:

4.1 The length of BC.

.....

.....

..... (3)

4.2 The length of AC.

.....

.....

.....

..... (3)

Sample Size

The total number of values in a set of data is referred to as the ***sample size***. Often, when data is collected, it is impossible to collect the data for the entire ***population of interest***, so data collectors select a ***representative sample*** of the population.

We generally use the letter ***n*** to represent ***sample size***.

Example 1

Consider the following set of data. The values have been ranked.

16 25 36 49 64 81 100

This data set consists of seven values, so for this set of data, $n = 7$.
For this set of data, the range is calculated as follows.

$$\begin{aligned} \text{Range} &= x_{max} - x_{min} \\ &= x_7 - x_1 \\ &= 100 - 16 \\ &= 84 \end{aligned}$$

Measures of Central Tendency

The measures of central tendency are three "averages", which provide us with a value that is, in some way, "typical" of the set of data.

Three averages: mean median mode

In conversation, when a person speaks of the ***average***, they are generally referring to the ***mean*** of a set of data. From now on, you need to be specific when you refer to the ***average*** for a set of data. In other words, rather than speaking of the ***average***, you must choose the word ***mean*** or ***median*** or ***mode*** (whichever is correct).

Mean (symbol: $\bar{x}$)
This is the sum of all the values divided by the number of values.

Median
If the sample size is odd (n is odd), it is the middle value in the ranked data.
If the sample size is even (n is even), it is half the sum of the two middle values.

Mode
This is the value appearing most frequently in the set of data (i.e. the most common value in the data set). There may be more than one mode for a set of data. A set of data with two modes is described as "bimodal".

The Three Averages

Mean	Median	Mode
$\bar{x} = \dfrac{\text{sum of values}}{\text{number of values}}$	*middle value*	*Most common value*

Example 1

Consider the following set of data. The values have been arranged in ascending order.

11 12 13 14 15 15 18

For this set of data, the mean, median and mode are as follows.

Mean: $\bar{x} = \dfrac{11+12+13+14+15+15+18}{7} = \dfrac{98}{7} = 14$

Median: 14 Given that $n = 7$, x_4 is the middle value.

Mode: 15 There is a single mode, which occurs twice.