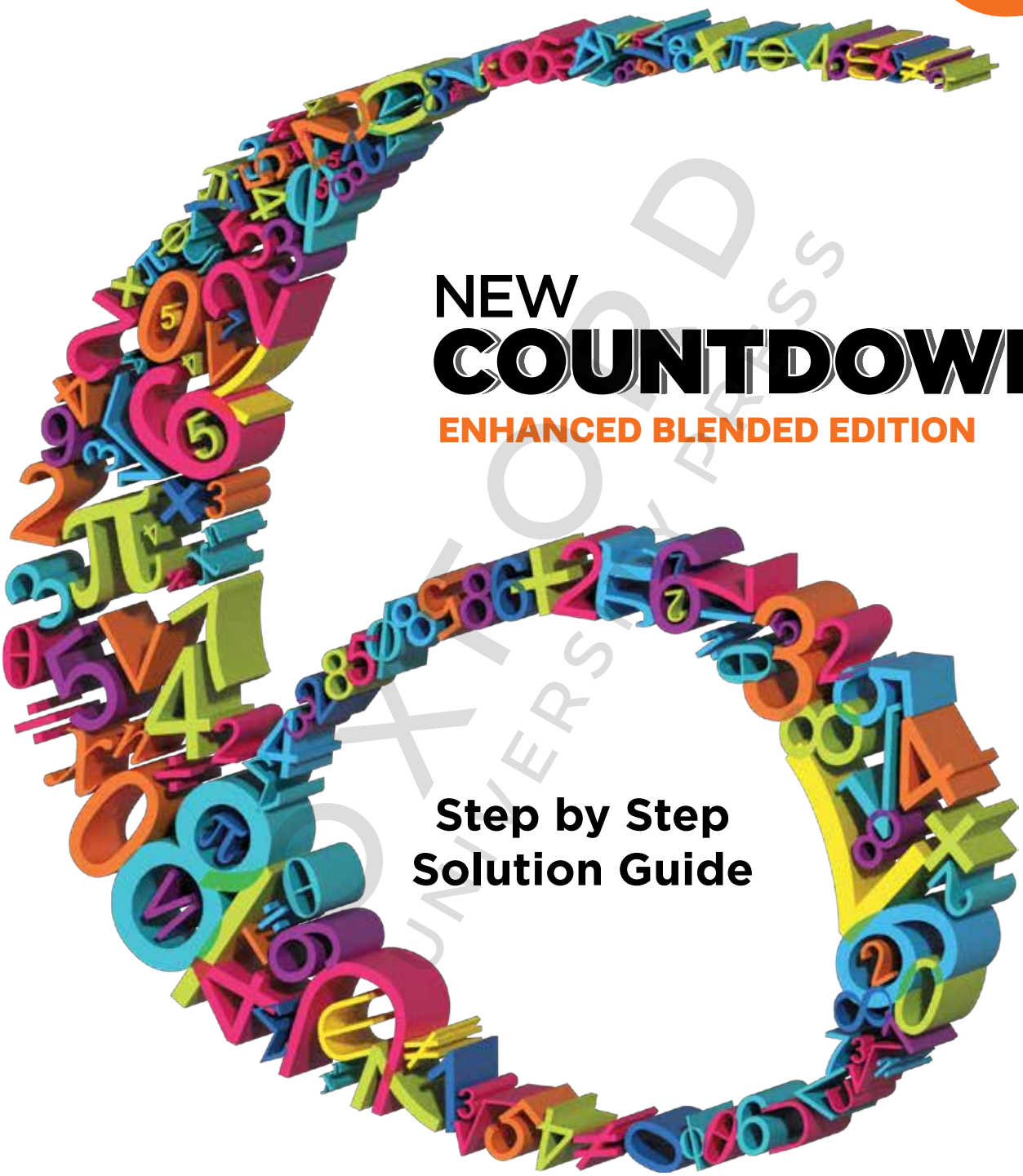
6



NEW COUNTDOWN

ENHANCED BLENDED EDITION

Step by Step Solution Guide

OXFORD UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trade mark of Oxford University Press in the UK and in certain other countries

Published in Pakistan by
Oxford University Press
No. 38, Sector 15, Korangi Industrial Area,
PO Box 8214, Karachi-74900, Pakistan

© Oxford University Press 2027

The moral rights of the author have been asserted

First Edition published in 2021
Third Edition (Enhance Blended) published in 2027

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, used for text and data mining, or used for training artificial intelligence, in any form or by any means, without the prior permission in writing of Oxford University Press, or as expressly permitted by law, by licence, or under terms agreed with the appropriate reprographics rights organisation. Enquiries concerning reproduction outside the scope of the above should be sent to the Rights Department, Oxford University Press, at the address above

You must not circulate this work in any other form
and you must impose this same condition on any acquirer

ISBN 9786275228158

OXFORD UNIVERSITY PRESS

Preface

New Countdown Third Edition (Enhanced Blended Edition) is a carefully structured and graded mathematics course, comprising eleven books for Classes Pre-Primary to Class 6. The pattern followed in the entire series ensures development in all areas of a child's growth through basic multi-focal knowledge, emphasising number skills and mathematical concepts.

The **Step by Step Solution Guide** is a comprehensive resource that complements the New Countdown series to provide a holistic framework within which students are able to understand, grasp, approach, and apply the learned mathematical concepts, and to successfully implement the objectives of the mathematics curriculum.

This guide highlights the patterns, approaches, functions, and relationships between the curriculum strands, so that the students can apply their mathematical knowledge and develop a holistic understanding of the subject that can then be translated into real-life application. The main objective of this guide is not to simply cross-reference the answers, but to guide the students through the thinking process upon approaching a mathematical problem, to reaching the correct answer. This guide, therefore, provides the extensive breakdown of not only solving the equation, but also the mental strategies, appropriate reasoning and formatting, and the ability to decipher what mathematical concepts can be applied to the particular question, in order to work towards the answer.

This in-depth breakdown of solving questions encompasses all the questions in each exercise, as well as the questions in the revision exercises. There are also helpful hints available in this guide that supplements a student's thinking process when approaching a certain problem. The helpful hints will help to avoid preemptive misconceptions that will be beneficial to students and teachers. They help guide the student towards the correct formula by effectively contextualising the mathematical concept and linking it to real-life application. The mathematical proofing, format, and reasoning is in line with the assessment expectations.

The Step by Step Guide provides thorough insight and furthers one's understanding of what is expected of a student in an examination beyond simply arriving at the right answer. This guide helps ensure that the process comes from a place of deep understanding and reasoning of mathematical concepts by guiding the students' approach and thinking process during problem solving, and therefore reaching the desired answer.

OXFORD UNIVERSITY PRESS

CONTENTS

1	Introduction to Sets	1
	Revision 1: Sets	4
2	Integers	6
3	Factors and Multiples	12
4	Factorisation: HCF and LCM	16
	Revision 2: Numbers	26
5	Ratio and Rate	29
6	Financial Arithmetic: Percentages	32
	Revision 3: Arithmetic	37
7	Introduction to Algebra	40
8	Linear Equations	48
	Revision 4: Algebra	54
9	Geometry: Lines and Angles	57
10	Practical Geometry	64
11	Triangles	68
12	Perimeter and Area	72
13	Volume and Surface Area	80
	Revision 5: Mensuration	84
14	Data Handling	90

OXFORD UNIVERSITY PRESS

1 INTRODUCTION TO SETS

Exercise 1A

1. (i), (iii), (v), (vii), and (viii) are well defined sets, because they have specific property which can easily be identified. While in (ii), (iv), and (vi) the terms tasty, naughty, and large are not well defined.

2. (i) $2 \in P$ (ii) $5 \notin P$ (iii) $a \notin P$
   (iv) $d \in Q$ (v) $g \notin Q$ (vi) $3 \notin Q$

3. (i) A = {1, 2, 3, 4, 5, 6, 7, 8, 9}
   (ii) B = {I, A, E }
   (iii) C = {M, A, N, G, O}
   (iv) D = {white, green}
   (v) E = {5, 10, 15, 20}
   (vi) F = {blue, violet, indigo, green, yellow, orange, red}
   (vii) G = {3, 6, 9, 12}

4. (ii), (iii), and (v) will form sets as they are well defined.
   In (i), (iv), and (vi) strong, famous, and honest is not well defined.

Exercise 1B

1.

Helpful Hint

In tabular notation, all the elements of the set are listed within the curly brackets and separated by commas.

   (i) M = {Iskander Mirza, Ayub Khan, Yahya Khan, Gen. Ziaul Haq, Farooq Leghari, Rafiq Tarar, Pervez Musharraf, Asif Ali Zardari, Mamnoon Hussain}
   (ii) N = {1, 2, 3, 4, 5}
   (iii) A = {3, 6, 9, …}
   (iv) B = {0, 2, 4, 6, 8}
   (v) C = {3, 6, 9, 12, 15, 18}
   (vi) D = {Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune}
   (vii) F = {Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday}
   (viii) Q = (Bhutan, Bangladesh, Belgium}, or {Bolivia, Bulgaria, Bahrain} etc.

2.

Helpful Hint

In set builder notation, the set is expressed in the form of a rule.

   (i) P = {x : x is a letter of the English alphabet}
   (ii) Q = {y : y is an even number}
   (iii) R = {x : x is an odd number less than 10}
   (iv) S = {y : y is a square number less than 30}
   (v) T = {x : x is the name of a month beginning with J}
   (vi) M = {x : x is the only even prime number}
   (vii) V = {z : z is a week day, starting with letter t}
   (viii) X = {y : y is colour in a rainbow}
   (ix) A = {x : x is multiple of 4}
   (x) C = {x : x is multiple of 3}
   (xi) E = {x : x is multiple of 7 between 20 and 50}
   (xii) N = {x : x is first 3 multiples of 6}

3.

Helpful Hint

In tabular form, all the elements of the set are listed within the curly brackets and separated by commas.

   (i) {Sunday, Monday, ..., Saturday}

OXFORD UNIVERSITY PRESS

(ii) {1, 2, 3, ..., 9}
(iii) {14, 16, 18, 20}
(iv) {11, 13, 15, 17, 19}
(v) {Mercury, Venus, Earth, Mars, Jupiter}
(vi) {10, 11, 12, ..., 99}

Exercise 1C

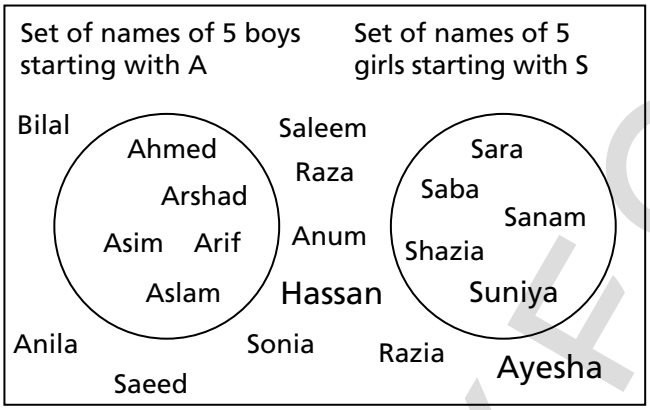
1.

Helpful Hint

A Venn diagram is a pictorial representation of a set.

(i) — (v) are open sentences, therefore, any name, any animal, any famous personality or city can be written.

(i) has been done for you.



Exercise 1D

1. (i) singleton (ii) infinite
(iii) empty (iv) cardinality
(v) {1, 2, 3, 4, 5, 6}

2. Reason
(i) False: Set P is given in tabular form.
(ii) True: By definition–limited number of students.
(iii) False: By definition – limited number of countries of the world
(iv) False '∈' denotes 'belong to'.
(v) True: 'a' is a member of the set.
(vi) False: 'c' is a member of the set.

3. (i), (ii), and (vi), are finite sets, because they have limited number of elements.
While (iii), (iv), and (v) are infinite sets, because they have unlimited number of elements.

4. (i), (ii), and (v) are empty sets because these sets do not contain any element.

5. Students can write any two examples of their choice.

6. (i) 3 does not belong to set S, as it is a number not an alphabet.
∴ S = {a, b, c, d, e}.
(ii) 6 dose not belong to set T, as it is an even number
∴ T = {3, 5, 7, 9}
(iii) 35 dose not belong to set X, as it is not a square number
∴ X = {4, 9, 25, 49}
(iv) 9 dose not belong to set Y, as it is not a prime number
∴ Y = {2, 3, 5, 7, 11, 13, 17, 19, 23}
(v) Sindh does not belong to set R, as it is a province not a city of Pakistan.
∴ R = {Karachi, Lahore, Islamabad, Quetta}
(vi) Onion does not belong to set F as it is a vegetable not a fruit.
F = {apple, orange, banana, guava, mango}

Multiple Choice Questions 1

1. Option C: P = {2, 4, 6, 8}
Reason: This Set P has all positive even integers less that 10.
Option A and B are clearly incorrect as they contain both even and odd integers.
Option D though has positive even numbers only, but includes 10 which contradicts the given statement (<10)

2. Option D: Five
Reason: Set of odd numbers between 50 and 60 = {51, 53, 55, 57, 59}

OXFORD UNIVERSITY PRESS

3. Option C: A = Ostriches who can fly

   Reason: This set will be an empty set because ostriches do not fly.

4. Option B: Set B

   Reason: There are no element in set B.

   Option A, C, and D are incorrect because they all have limited or unlimite elements.

5. Option B: Infinite

   Reason: The set of whole numbers is infinite because it contains unlimited number of elements.

   Option A and C are incorrect while Option D is a contradictory statement.

6. Option C: Set B is a set of whole numbers

   Reason: Set of whole numbers includes a zero while set B does not include a zero.

   Option A, B, and D all are true.

OXFORD UNIVERSITY PRESS

1 Revision 1: Sets

1. Write the members of the following sets.
   (i) A = Odd numbers from 7 to 17
   A = {7, 9, 11, 13, 15, 17}
   (ii) B = Months beginning with J
   B = {January, June, July}
   (iii) C = Even numbers between 20 and 30
   C = {22, 24, 26, 28}
   (iv) D = Prime numbers less than 13
   D = {2, 3, 5, 7, 11}
2. Rewrite the following using set-builder notation:
   (i) A = {4, 8, 12, 16, ...}
   A = {x : x is a multiple of 4}
   (ii) B = {2, 3, 5, 7, 11, 13, 17, ...}
   B = {x : x is a prime number}
   (iii) C = {1, 4, 9, 16, 25, 36, ...}
   C = {x : x is a perfect square and $x \in$ N}
   (iv) D = {1, 3, 5, 7, 9, 11, ...}
   D = {x : x is an odd number}
3. Which of the following sets are finite, infinite or empty.
   (i) A = {12, 14, 16, 18, 18, 20, ...} Infinite
   (ii) B = {15, 17, 19, 21} Finite
   (iii) Set of points on a line Infinite
   (iv) Set of odd numbers exactly divisible by 2 Empty
   (v) Set of even numbers that can be divided exactly by 3 Infinite
   (vi) Set of months in a year Finite
   (vii) A woman who stepped on the moon Empty
4. Fill in the blanks with $\in$ or $\notin$.
   (i) 30 $\underline{\notin}$ {1, 2, 3, 4, 5, 6}
   (ii) 19 $\underline{\in}$ {2, 3, 5, 7, 11, ...}
   (iii) {bicycle} $\underline{\notin}$ {car, aeroplane, bus, train}
   (iv) 27 $\underline{\notin}$ {1, 4, 9, 16, ...}
   (v) {parrot} $\underline{\notin}$ {cow, goat, cat, dog}
5. A = {x : x is an odd number < 10}
   B = {x : x is a prime number < 16}
   C = {x : x is a two-digit odd number less than 20}
   (i) List the elements of A, B, and C.
   A = {1, 3, 5, 7, 9}
   B = {2, 3, 5, 7, 11, 13}
   C = {11, 13, 15, 17, 19}
   (ii) List the elements common to B and C.
   {11, 13}
   (iii) Find the set which contains the elements of A and C.
   { }
6. Express the following in tabular form:
   (i) A = Set of natural numbers between 2 and 7.
   {3, 4, 5, 6}
   (ii) B = Set of odd numbers less than 10.
   B = {1, 3, 5, 7, 9}
   (iii) C = {x : x is a colour of the rainbow}.
   C = {violet, indigo, blue, green, yellow, orange, red}
7. Name each of the following sets.
   (i) A = {a, e, i, o, u}
   A = Set of vowels

OXFORD UNIVERSITY PRESS

(ii) B = {mother, father, sister, brother}

B= Set of family members

(iii) C = {1, 4, 9, 16}

C = Set of square numbers less than 25

(iv) P = {3, 5, 7, 11, 13, 17}

P = Set of prime numbers between 2 and 19

(v) D = {25}

D = Set of square of 5

8. A = Set of odd positive integers from 8 to 20

A = {9, 11, 13, 15, 17, 19}

B = Set of even numbers between 8 and 20

B = {10, 12, 14,16, 18}

C = Set of prime numbers between 8 and 20

C = {11, 13, 17, 19}

D = {x : $x \in$ positive numbers from 8 to 20, x is a multiple of 7}

D = {14}

(i) Write C and D in tabular form.

C = {11, 13, 17, 19}

D = {14}

(ii) Determine the set of elements common in A and C.

A = {9, 11,13, 15, 17, 19}

C = {11, 13, 17, 19}

Set of elements common in A and C: {11, 13, 17, 19}

(iii) Determine the elements common in A and B.

A = {9, 11, 13, 15, 17, 19}

B = {10, 12, 14,16, 18}

Set of elements common in A and B:

9. Write the missing element in each of the following sets

(i) A = {Letters of the word LAHORE}

B = {A, H, R, E, _____, _____}

B = {A, H, R, E, L, O}

(ii) A = {x : x is a month of the year beginning with A},

B = {April, August}

(iii) A = {_____},

B = {x : x is the smallest whole number}

A = {0}

(iv) A = {5, 10, 15, 20},

B = {x : x is a multiple of 5 less than 25}

OXFORD UNIVERSITY PRESS

2 INTEGERS

Exercise 2A

1. Fill in the blanks.

   (i) The smallest natural number __1__

   (ii) The smallest whole number is __0__

   (iii) 512 + 205 = __205__ + 512

   (iv) 5430 + 0 = __5430__

   (v) 54 + (36 + 40) = (54 + __36__) + 40

   (vi) __18__ + 0 = 0 + 18

   (vii) 6 × 9 = 9 × __6__

   (viii) 5 × (7 + 2) = (5 × __7__) + (__5__ × 2)

   (ix) __5__ = (3 + 4) = (__5__ × 3) + (5 × 4)

   (x) 6 × __1__ = 6

   (xi) 5 + __0__ = 5

   (xii) 12 ÷ __1__ = 12

   (xiii) __0__ ÷ 10 = 0

   (xiv) __0__ ÷ 0 = 0

2. (i) True statement, because all natural numbers are included in a set of whole numbers.

   (ii) False statement, because zero is a whole number but is not included in natural numbers.

   (iii) 8 – (4 – 2) = (8 – 4) – 2

Helpful Hint

Solve brackets first on both sides.

LHS 8 – 2 = 6

RHS 4 – 2 = 2

LHS ≠ RHS

∴ false.

(iv) 10 – (6 – 4) = (10 – 6) – 4

LHS: 10 – 2 = 8

RHS: 4 – 4 = 2

LHS ≠ RHS

∴ false.

(v) 15 – 12 = 12 + 15

LHS = 15 – 12 = 3

RHS = 12 + 15 = 27

LHS ≠ RHS

∴ false.

(vi) (16 ÷ 4) ÷ 2 = 16 ÷ (4 ÷ 2)

4 ÷ 2 = 16 ÷ 2

2 8

LHS RHS

∴ false.

(vii) 4 × (5 × 6) = (4 × 5) × 6

4 × 30 = 20 × 6

120 = 120

LHS = RHS

∴ true.

(viii) 3 × 4 + 1 = 3 × 5

12 + 1 = 15 (multiply first)

13 15

LHS RHS

∴ false.

(ix) 20 + 10 ÷ 2 = 30 ÷ 2

20 + 5 = 15 (divide first)

25 15

LHS RHS

∴ false.

OXFORD UNIVERSITY PRESS

(x) $5 \div 10 = 2$

$= \frac{1}{2}$ which is a fraction not a whole number.

$\therefore$ false.

(xi) $5 \div 5 = 1$

$1 = 1$

LHS = RHS

$\therefore$ true.

(xii) $12 \div 4 = 4 \div 12$

$\frac{12}{4} = \frac{4}{12}$

$3 \quad \frac{1}{3}$

LHS RHS

$\therefore$ false.

3. Largest 3-digit odd number = 999

Smallest 3-digit even number = 100

Difference = 999 – 100

= 899

4. (i) $542 \times 92 + 8 \times 542$

Helpful Hint

Use distributive property, therefore, take common.

$= 542 \times (92 + 8)$

$= 542 \times 100$

$= 54200$

(ii) $365 \times 99 + 365$

$= 365 \times 99 + 365 \times 1$

Helpful Hint

Use multiplicative identity.

$= 365 \times (99 + 1)$

Helpful Hint

Use distributive property, therefore, take common.

$= 365 \times 100$

$= 36500$

(iii) $6 \times 612 + 4 \times 612$

Helpful Hint

Use distributive property, therefore, take common.

$= 612 \times (6 + 4)$

$= 612 \times 10$

$= 6120$

(iv) $238 \times 55 - 45 \times 238$

Helpful Hint

Use distributive property, therefore, take common.

$= 238 \times (55 - 45)$

$= 238 \times 10$

$= 2380$

Exercise 2B

1.

Helpful Hint

All negative numbers are written on the left side of zero on the number line. Larger the negative number smaller its value.

(i) – 5, – 2, 1, 3

(ii) – 8, – 7, – 2, – 1

(iii) – 4, – 2, 0, 2

2. (i) – 9, – 6, – 3, 0, 3, 6 (Rule: Add three to each term.)

(ii) 7, 4, 1, –2, –5 –8, (Rule: Subtract three from each term)

(iii) 2, 7, 12, 17, 22, 27 (Rule: Add five to each term.)

3. (i) $-1, -2 < 0$

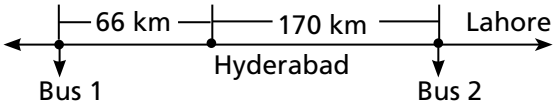
(ii) $-1, 0 > -2$

(iii) $-5, -4 < -3$

OXFORD UNIVERSITY PRESS

4. $-111 > -1111$
Reason: Larger the negative number smaller its value.

5. (i) 2, 0, –3, –5
(ii) 4, 1, –2, –5
(iii) 4, 2, –1, –2

6. 

Distance between the two buses:
66 + 170 = 236 km

Exercise 2C

1. (i) True: [LHS = RHS that is 3 = 3 (commutative law)]
(ii) True: [3 + (–5) = –2 is an integer]
(iii) False: [5 + (–5) = 0 is not a positive integer.]
(iv) True: [LHS = RHS that is –25 (commutative law)]
(v) True: [Any number multiplied by 0 is 0]
(vi) False: [Negative of (–5) is –(–5) = +5]
(vii) True: [LHS = RHS (distributive law)]
(viii) False: [LHS RHS that is 9 13
(ix) False: [Any number multiplied by zero is zero.]
(x) False: [LHS = RHS that is 27 – 27 54]

2. (i) $-6, |-5|, |8|, |-11|, |-13|$
(ii) $-27, |-7|, |-9|, |14|, |-18|$

3. (i) $|74|, |-66|, |39|, |-30|, -52$
(ii) $85, |-76|, |-18|, |-2|, -45$

4. (i) $-29 - 11 + 40 = -40 + 40 = \underline{0}$
(ii) $-231 + 51 - 20 = -180 - 20 = -200$
(iii) $-107 + 97 - 10 = -10 - 10 = -20$
(iv) $3 - 14 + 10 = -11 + 10 = -1$

5. $\square + 150 = -129$
$\square = -129 - 150$
$\square = -279$

6. $\square + (-18) = 52$
$\square - 18 = 52$
$\square = 52 + 18$
$\square = 70$

7. $\square \times 8 = -160$
$\square = -\frac{160}{8}$
$\square = -20$

8. $-5 + 28 - (-20)$
$= -5 + 28 + 20$
$= 23 + 20$
$= 43$

9. $= -23 - (-11 + (-18))$
$= -23 - (-11 - 18)$
$= -23 - (-29)$
$= -23 + 29$
$= 6$

10. $-17 \times -1 = +17$
$[-(-17) = 17]$
Yes the product is negative of – 17.

11. (i) 170 (ii) 23 000 (iii) 290 000
(iv) – 40 000

12. $\frac{-100}{\square} = -5$
[check: $\frac{-100}{20} = -5$]
$\frac{-100}{-5} = \square$
$\therefore \square = 20$

13. (i) $(-63) \div 7 = -9$
(ii) $(-56) \div (-8) = 7$
(iii) $112 \div (-7) = -16$
(iv) $(-231) \div (-11) = 21$

14. (i) – 3 (ii) 9 (iii) 2

OXFORD UNIVERSITY PRESS

15. Year of birth: 1898
Year of death: 1971
Mrs. Ahmed lived for:
1971 – 1898 = 73 years

16. Year of birth: 276 BCE
Year of death: 194 BCE
Eratosthenes lived for: 276 – 194 = 82 years

17. Temperature at noon rose: + 11°C
Temperature at midnight fell: – 5°C
Change in temperature = 11 – (– 5)
= 11 + 5
= 16°C

Exercise 2D

1. (i) $3\frac{2}{3} \times \frac{3}{11} + \left[2\frac{3}{4} \div 1\frac{1}{4} \times \left(-1\frac{2}{3}\right)\right] + \left(-\frac{1}{3}\right)$

$= \frac{\cancel{11}^{1}}{\cancel{3}_{1}} \times \frac{\cancel{3}^{1}}{\cancel{11}_{1}} + \left[\frac{11}{4} \div \frac{5}{4} \times \left(-\frac{5}{3}\right)\right] - \frac{1}{3}$

$= 1 + \left[\frac{11}{\cancel{4}_{1}} \times \frac{\cancel{4}^{1}}{\cancel{5}_{1}} \times \frac{\cancel{-5}^{1}}{3}\right] - \frac{1}{3}$

$= 1 + \left[\frac{-11}{3}\right] - \frac{1}{3}$

$= 1 - \frac{11}{3} - \frac{1}{3}$

$= \frac{3 - 11 - 1}{3}$

$= -\frac{\cancel{9}^{3}}{\cancel{3}_{1}}$

$= -3$

(ii) $\left(-\frac{1}{4} + \frac{1}{9}\right) \div \left[\left(\frac{1}{2} + \frac{1}{4}\right) \div \left(-\frac{1}{8}\right)\right]$

$= \left(\frac{-9 + 4}{36}\right) \div \left[\left(\frac{2 + 1}{4}\right) \div \left(-\frac{1}{8}\right)\right]$

$= \frac{-5}{36} \div \left[\frac{3}{\cancel{4}_{1}} \times \frac{\cancel{-8}^{2}}{1}\right]$

$= \frac{-5}{36} \div (-6)$

$= \frac{-5}{36} \times \frac{-1}{6}$

$= \frac{5}{216}$

(iii) $0.13 - \left[17 - \{0.5 + 1.2 - (40 \div 2 \times 7)\}\right]$

$= 0.13 - \left[17 - \{0.5 + 1.2 - 140\}\right]$

$= 0.13 - \left[17 + 138.3\right]$

$= 0.13 - 17 - 138.3$

$= -16.87 - 138.3$

$= -155.17$

(iv)

$\{16 \text{ of } (2.4 \div 1.2 - 0.9) - 3.25\} - (7.5 \times 10 + 4)$

$= \{16 \times 1.1 - 3.25\} - 79$

$= \{17.6 - 3.25\} - 79$

$= 14.35 - 79$

$= -64.65$

(v) $14 - \left[16 - \{17 - (18 - 6 - 3)\}\right]$

$= 14 - \left[16 - \{17 - 9\}\right]$

$= 14 - \left[16 - 8\right]$

$= 14 - 8$

$= 6$

(vi) $\{6 \times (24 \div 12 - 9) - 12\} - \{8 \times 10 + (-4)\}$

$= \{6 \times (-7) - 12\} - \{80 - 4\}$

$= \{-42 - 12\} - 76$

$= -54 - 76$

$= -130$

(vii) $(-54 - 42) \div \{9 + (-5 \times -8) \div 4 - 3\}$

$= -96 \div \{9 + 40 \div 4 - 3\}$

$= -96 \div \{9 + 10 - 3\}$

$= -96 \div \{19 - 3\}$

$= -96 \div \{16\}$

$= -6$

(viii) $10 - \left[8 - \{2 - (7 - 9 + 2 - 3)\}\right]$

$= 10 - \left[8 - \{2 - (-3)\}\right]$

$= 10 - \left[8 - \{2 + 3\}\right]$

$= 10 - \left[8 - 5\right]$

$= 10 - 3$

$= 7$

OXFORD UNIVERSITY PRESS

(ix) $-27-\left[18-\left\{16-(9-8-1)\right\}\right]$

$= -27-\left[18-\left\{16-0\right\}\right]$

$= -27-\left[18-16\right]$

$= -27-2$

$= -29$

(x) $36-\left[18-\left\{-14+(-16-4\div 2\times 5)\right\}\right]$

$= 36-\left[18-\left\{-14+(-16-2\times 5)\right\}\right]$

$= 36-\left[18-\left\{-14+(-16-10)\right\}\right]$

$= 36-\left[18-\left\{-14+(-26)\right\}\right]$

$= 36-\left[18-\left\{-14-26\right\}\right]$

$= 36-\left[18-\left\{-40\right\}\right]$

$= 36-\left[18+40\right]$

$= 36-58$

$= -22$

2. (i) $25^2 = 25 \times 25 = 625$

(ii) $19^2 = 19 \times 19 = 361$

(iii) $21^2 = 21 \times 21 = 441$

(iv) $23^2 = 23 \times 23 = 529$

(v) $32^2 = 32 \times 32 = 1024$

(vi) $35^2 = 35 \times 35 = 1225$

(vii) $42^2 = 42 \times 42 = 1764$

(viii) $51^2 = 51 \times 51 = 2601$

(ix) $48^2 = 48 \times 48 = 2304$

(x) $92^2 = 92 \times 92 = 8464$

(xi) $86^2 = 86 \times 86 = 7396$

(xii) $75^2 = 75 \times 75 = 5625$

3. Number of rows of plants = 25
Number of plants in each row
= Number of rows of plants = 25
∴ total number of plants the gardner has is $25 \times 25 = 625$

4. $\square^2 + 13^2 = 794$

$\square^2 + 169 = 794$

$\square^2 = 794^2 - 169$

$\square^2 = 625$ [$25 \times 25 = 625$]

∴ the other number is 25.

5. $65^2 - 45^2$

$= 4225 - 2025$

$= 2200$

Multiple Choice Questions 2

1. Option B: True
Reason: Set of whole numbers
W = {0, 1, 2, 3, ...}
Option A, C, and D are incorrect statements.

2. Option B: Not always true
Reason: If two large 3-digit numbers are added, we may have to carry forward a number
Example:

$$\begin{array}{r} \overset{1}{9}\,3\,8 \\ +\quad 7\,0\,6 \\ \hline 1\,7\,4\,4 \end{array}$$

3. Option C: –3
Reason: The numbers on LHS of 0 and closest to 0 are greater.
Option A and B are incorrect because larger the negative number, smaller its value
Option D: None of the above – contradictory statement as option C is correct.

4. Option C: + 23, + 3, 0, – 12, – 25
Reason: Positive numbers are greater than negative numbers. The above sequence is in decreasing order.
Incorrect options:
Option A: Incorrect sequence.
Option B: Numbers are in ascending order.
Option D: Incorrect sequence

OXFORD UNIVERSITY PRESS

5. Option D: 0, + 11

   Reason: Sequence is in ascending order, where + 11 is added to each term.

   Option A, B, and C are incorrect because the rule is not followed.

6. Option B: $0 > -25$

   Reason: All negative numbers are smaller than 0.

   Option A, C, and D are incorrect.

7. Option A: – 12

   Reason: $5 \times (-3) - (-3) = -15 + 3 = -12$

   Option B, C, and D are clearly incorrect.

8. Option D: Zero is a positive integer
   Reason: Zero is neither positive nor negative.
   Option A, B, and C are all true statements.

9. Option C: is always negative integer if there are odd number of negative signs

   [Example: $\underbrace{-2 \times -2 \times -2}_{\text{(Three negative signs)}} = -8$

   Option A, B, and D are incorrect.

10. Option C: True
    Option A, B, and D are incorrect.

11. Option A: True for addition and multiplication
    Option B, C, and D are incorrect.

12. Option B: 0
    Reason: $-8 - (-8) = -8 + 8 = 0$
    Option A, C, and D are incorrect.

OXFORD UNIVERSITY PRESS

3 FACTORS AND MULTIPLES

Exercise 3A

1. (i) 11, 3 (ii) 9, 12 (iii) 13, 6

2. (i) True (ii) True (iii) False
   (iv) True

3. (i)

Helpful Hint

The first multiple will always be the number itself.

First 5 multiples of 17 are:
17, 34, 51, 68, 85

(ii) First 5 multiples of 23 are:
23, 46, 69, 92, 115

(iii) First 5 multiples of 47 are:
47, 94, 141, 188, 235

4.

Helpful Hint

The word 'between' tells that the given two numbers will not be included.

Multiples of 7 between 10 and 40 are:
14, 21, 28, 35

5.

Helpful Hint

The word 'less than' tells that the multiples will not exceed 50.

Multiples of 11 less than 50 are:
11, 22, 33, 44

6.

Helpful Hint

The word 'both' tells to consider common multiples of 2 and 3, while the word 'less than' tells that these common multiples will be below 50.

Multiples of 2 and 3 less than 50 are:

6, 12, 18, 24, 30, 36, 42, 48

7. (i) 105
The digit in the unit's place is 5 which is not divisible by 2.
∴ 105 is not divisible by 2.
1 + 0 + 5 = 6
The sum of the digits of 105 is 6, which is divisible by 3.
∴ 105 is divisible by 3.
The number 105 ends with 5.
∴ 105 is divisible by 5.
Sum of the digits in the odd places:
1 + 5 = 6
Sum of the digits in the even places is 0.
Difference between the two sums:
6 – 0 = 6, which is not divisible by 11.
∴ 105 is not divisible by 11.

(ii) 997
The digit in the unit's place is not an even number.
∴ 997 is not divisible by 2.
The sum of digits is 9 + 9 + 7 = 25, which is not divisible by 3.
∴ 997 is not divisible by 3.
The number does not end with 0 or 5
∴ 997 is not divisible by 5.
Sum of the digits in odd places:
9 + 7 = 16
Sum of the digits in even places is 9.

OXFORD UNIVERSITY PRESS

Difference between the two sums:
16 – 9 = 7, which is not divisible by 11.
∴ 997 is not divisible by 11

(iii) 2091

The digit in the unit's place is 1, which is not an even number.

∴ 2091 is not divisible by 2.

2 + 0 + 9 + 1 = 12

The sum of the digits is 12, which is divisible by 3.

∴ 2091 is divisible by 3.

The number 2091 does not end with a 0 or 5.

∴ 2091 is not divisible by 5.

Sum of the digits in odd places is

2 + 9 = 11

Sum of the digits in even places is

0 + 1 =1.

Difference between the two sums:

11 – 1 = 10.

∴ 2091 is not divisible by 11

(iv). 2730

The digit in unit's place is 0.

∴ 2730 is divisible by 2.

The sum of digits is 2 + 7 + 3 + 0 = 12, which is divisible by 3.

∴ 2730 is divisible by 3.

2730 ends with 0.

∴ 2730 is divisible by 5.

Sum of digits at odd places:

2 + 3 = 5

Sum of digits at even places:

7 + 0 = 7

Difference between the two sums:

7 – 5 = 2, which is not divisible by 11.

∴ 2730 is not divisible by 11.

(v) 1331

The digit in unit's place is not an even number.

∴ 1331 is not divisible by 2.

Sum of digits: 1 + 3 + 3 + 1 = 8, which is not divisible by 3.

∴ 1331 is not divisible by 3.

1331 does not end with 0 or 5.

∴ 1331 is not divisible by 5

Sum of digits at odd places: 1 + 3 = 4

Sum of digits at even places: 3 + 1 = 4

Differences between the two sum:

4 – 4 = 0, which is divisible by 11

∴ 1331 is divisible by 11.

8. (i) 105, 126, 147, 168, and 189

(ii) 162, 189, 216, and 243

(iii) 111, 148, 185, and 222

9. (i) 1661

Sum of digits at odd places:

1 + 6 = 7

Sum of digits at even places:

6 + 1 = 7

Difference of the two sums:

7 – 7 = 0, which is divisible by 11.

∴ 1661 is divisible by 11.

(ii) 54 240

Sum of digits at odd places:

5 + 2 + 0 = 7

Sum of digits at even places:

4 + 4 = 8

Difference of the two sums:

8 – 7 = 1 which is not divisible by 11.

∴ 54 240 is not divisible by 11.

(iii) 15 315

Sum of digits at odd places:

1 + 3 + 5 = 9

Sum of digits at even places:

5 + 1 = 6

Difference of the two sums:

9 – 6 = 3 which is not divisible by 11.

∴ 15 315 is not divisible by 11.

OXFORD UNIVERSITY PRESS

(iv) 103 081

Sum of digits at odd places:

1 + 3 + 8 = 12

Sum of digits at even places:

0 + 0 + 1 = 1

Difference of the two sums:

12 – 1 = 11 which is divisible by 11.

∴ 103 081 is divisible by 11.

(v) 38 453

Sum of digits at odd places:

3 + 4 + 3 = 10

Sum of digits at even places:

8 + 5 + 13

Difference of the two sums:

13 – 10 = 3 which is not divisible by 11.

∴ 38 453 is not divisible by 11.

(vi) 769 494

Sum of digits at odd places:

7 + 9 + 9 = 25

Sum of digits at even places:

6 + 4 + 4 = 14

Difference of the two sums:

25 – 14 = 11 which is divisible by 11.

∴ 769 494 is divisible by 11.

10. (i) 21 (ii) 20 (iii) 9

These are open sentences, therefore, any number satisfying the condition is acceptable.

11.

Helpful Hint

To test whether the given numbers are divisible by 6, check if it is even and that its sum is divisible by 3.

(i) 504

The last digit is a multiple of 2.

The sum 5 + 0 + 4 = 9, is divisible by 3.

∴ 504 is divisible by 3.

504 is divisible by 2 and 3 both.

∴ 504 is divisible by 6.

(ii) 306

306 is divisible by 2 and its sum is divisible by 3.

∴ 306 is divisible by 6.

(iii) 4128

4128 is divisible by 2 and its sum is divisible by 3.

∴ 4128 is divisible by 6.

(iv) 4510

4510 is divisible by 2 but its sum is not divisible by 3.

∴ 4510 is not divisible by 6.

12. (i) 207

Sum of digits: 2 + 0 + 7 = 9

9 is divisible by 9.

∴ 9 is a divisor of 207.

(ii) 4050

Sum of digits:

4 + 0 + 5 + 0 = 9

9 is divisible by 9.

∴ 9 is a divisor of 4050.

(iii) 2727

Sum of digits: 2 + 7 + 2 + 7 = 18

18 is divisible by 9.

∴ 9 is a divisor of 2727.

(iv) 3655

Sum of digits: 3 + 6 + 5 + 5 = 19

19 is not divisible by 9

∴ 9 is not a divisor of 3655.

Exercise 3B

1. (i) False

Helpful Hint

+	E	O
E	E	O
O	O	E

(ii) True

(iii) False [2 is even and prime]

(iv) False [1 is a natural number but it is neither prime nor composite]

OXFORD UNIVERSITY PRESS

(v) False

(vi) False

(vii) False [4 is the smallest composite number]

(viii) True

2. 47, 123, and 27001 are odd numbers.

458, 2732, and 15280 are even numbers.

3.

Helpful Hint

The word 'between' tells that the two given numbers will be excluded from the list

List of prime numbers between 50 and 75 are:

53, 59, 61, 67, 71, 73

4.

Helpful Hint

Twin prime are pair of prime numbers with a difference of two.

Twin primes between 50 and 80 are: (59,61) and (71,73).

5. (i) 19 = 3 + 5 + 11

(ii) 35 = 5 + 11 + 19

(iii) 91 = 23 + 31 + 37

6.

Helpful Hint

(11, 13), (59, 61), and (71, 73) are twin primes because their difference is 2

(i) 24 = 11 + 13

(ii) 120 = 59 + 61

(iii) 144 = 71 + 73

7.

Helpful Hint

The word 'below' 30 tells that the list of consecutive numbers will not contain 30

Five consecutive composite numbers below 30 are:

24, 25, 26, 27, and 28

8.

Helpful Hint

The words 'just below' tells that the list of consecutive number will begin by counting backwards from 100.

The seven consecutive composite numbers just below 100 are:

90, 91,92, 93, 94, 95, and 96

Multiple Choice Questions 3

1. Option C : All positive factors are listed here.

Options A, B, and D are incorrect, because A contains multiples of 12, B contains even numbers, while D contains factors of 12 but 3 is missing.

2. Option A: 65

Correct answer is 65 when rule of four operations is applied.

[2 + 7 × 9 = 2 + 63 = 65]

3. Option B : True

Options A, C, D are in correct because they may or may not satisfy the test of divisibility by 11.

4. Option D: All the above

3294 is divisible by 9 and 3, because sum of digits (3 + 2+ 9 + 4) 18 is divisible by 9 and 3294 is also divisible by 27, because it is divisible by 9 and 3 both.

5. Option C: The set is infinite

Options A, B, and D are incorrect, because 1 is neither prime nor composite and 2 is the only even prime .

6. Option D: All of the numbers will be factors

Option A, B, and C are incorrect. For example if we have 500, it has two zeros at the end but it is not divisible by 8.

OXFORD UNIVERSITY PRESS

4 FACTORISATION: HCF AND LCM

Exercise 4A

1.

Helpful Hint

Always start dividing by the smallest possible prime number.

(i) 360

2	360
2	180
2	90
3	45
3	15
5	5
	1

$\therefore 360 = 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$= 2^3 \times 3^2 \times 5$

(ii) 663

3	663
13	221
17	17
	1

$\therefore 663 = 3 \times 13 \times 17$

(iii) 5184

2	5184
2	2592
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

$\therefore 5184 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$

$= 2^6 \times 3^4$

(iv) 27 830

2	27830
5	13915
11	2783
11	253
23	23
	1

$\therefore 27\,830 = 2 \times 5 \times 11 \times 11 \times 23$

$= 2 \times 5 \times 11^2 \times 23$

(v) 1875

3	1875
5	625
5	125
5	25
5	5
	1

$\therefore 1875 = 3 \times 5 \times 5 \times 5 \times 5$

$= 3 \times 5^4$

(vi) 5022

2	5022
3	2511
3	837
3	279
3	93
31	31
	1

$\therefore 5022 = 2 \times 3 \times 3 \times 3 \times 3 \times 31$

$= 2 \times 3^4 \times 31$

OXFORD UNIVERSITY PRESS

(vii) 1521

3	1521
3	507
13	169
13	13
	1

$\therefore$ 1521 = 3 × 3 × 13 × 13
= $3^2 \times 13^2$

(viii) 8575

5	8575
5	1715
7	343
7	49
7	7
	1

$\therefore$ 8575 = 5 × 5 × 7 × 7 × 7
= $5^2 \times 7^3$

2.

Helpful Hint

If the HCF of two numbers is 1, then the numbers are co-prime.

(ii) , (iv) , and (v) are co-prime, because they have only 1 as a common factor.

(i) 6 and 8 have 1 and 2 as a common factor.

(iii) 21 and 24 have 1 and 3 as a common factor.

Therefore, both pairs are not co-prime.

3.

Helpful Hint

HCF is the product of common factors with lowest power.

(i) $2^2 \times 3^3 = 2 \times 2 \times 3 \times 3 \times 3$

$2^2 \times 3^2 \times 5 = 2 \times 2 \times 3 \times 3 \times 5$

$3^2 \times 5 = 3 \times 3 \times 5$

$\therefore$ HCF = 3^2 = 9

(ii) $2 \times 3^2 \times 5 = 2 \times 3 \times 3 \times 5$

$5^2 = 5 \times 5$

$2^3 \times 3 \times 5 = 2 \times 2 \times 2 \times 3 \times 5$

$\therefore$ HCF = 5

4. (i) 36 and 84

2	36
2	18
3	9
3	3
	1

$\therefore$ Prime factors of 36 = 2 × 2 × 3 × 3
= $2^2 \times 3^2$

2	84
2	42
3	21
7	7
	1

$\therefore$ Prime factors of 84 = 2 × 2 × 3 × 7
= $2^2 \times 3 \times 7$

$\therefore$ HCF of 36 and 84 = $2^2 \times 3$ = 12

(ii) 60 and 96

2	60
2	30
3	15
5	5
	1

$\therefore$ 60 = 2 × 2 × 3 × 5 = $2^2 \times 3 \times 5$

2	96
2	48
2	24
2	12
2	6
3	3
	1

$\therefore$ 96 = 2 × 2 × 2 × 2 × 2 × 3 = $2^5 \times 3$

$\therefore$ HCF of 60 and 96 = $2^2 \times 3$ = 12

OXFORD UNIVERSITY PRESS

(iii) 36, 54 and 108

2	36
2	18
3	9
3	3
	1

$\therefore 36 = 2 \times 2 \times 3 \times 3$
$= 2^2 \times 3^2$

2	54
3	27
3	9
3	3
	1

$\therefore 54 = 2 \times 3 \times 3 \times 3$
$= 2 \times 3^3$

2	108
2	54
3	27
3	9
3	3
	1

$\therefore 108 = 2 \times 2 \times 3 \times 3 \times 3$
$= 2^2 \times 3^3$

$\therefore$ HCF of 36, 54 and 108
$= 2 \times 3^2 = 18$

(iv) 27, 36 and 45

3	27
3	9
3	3
	1

$\therefore 27 = 3 \times 3 \times 3 = 3^3$

2	36
2	18
3	9
3	3
	1

$\therefore 36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$

3	45
3	15
5	5
	1

$\therefore 45 = 3 \times 3 \times 5$
$= 3^2 \times 5$

$\therefore$ HCF of 27, 36 and 45 $= 3^2 = 9$

(v) 84, 132 and 156

2	84
2	42
3	21
7	7
	1

$\therefore 84 = 2 \times 2 \times 3 \times 7$
$= 2^2 \times 3 \times 7$

2	132
2	66
3	33
11	11
	1

$\therefore 132 = 2 \times 2 \times 3 \times 11$
$= 2^2 \times 3 \times 11$

2	156
2	78
3	39
13	13
	1

$\therefore 156 = 2 \times 2 \times 3 \times 13$
$= 2^2 \times 3 \times 13$

$\therefore$ HCF of 84, 132 and 156
$= 2^2 \times 3 = 12$

OXFORD UNIVERSITY PRESS

(vi) 125, 475 and 650

5	125
5	25
5	5
	1

$\therefore$ 125 = 5 × 5 × 5 = 5^3

5	475
5	95
19	19
	1

$\therefore$ 475 = 5 × 5 × 19

= 5^2 × 19

2	650
5	325
5	65
13	13
	1

$\therefore$ 650 = 2 × 5 × 5 × 13

= 2 × 5^2 × 13

$\therefore$ HCF of 125, 475 and 650 = 5^2 = 25

(vii) 102, 595 and 357

2	102
3	51
17	17
	1

$\therefore$ 102 = 2 × 3 × 17

5	595
7	119
17	17
	1

$\therefore$ 595 = 5 × 7 × 17

3	357
7	119
17	17
	1

$\therefore$ 357 = 3 × 7 × 17

$\therefore$ HCF of 102, 595 and 357 = 17

5.

Helpful Hint

Divide the greater number by the smaller number. Then use the remainder as the divisor and the first divisor as the dividend. Continue dividing until the remainder is 0. The last divisor is the HCF of the given numbers.

(i) 300, 3996

```
        13
300 ) 3996
    - 3900
        96 ) 300 ( 3
           - 288
             12 ) 96 ( 8
                - 96
                  0
```

$\therefore$ HCF is 12

(ii) 5445, 9317

```
          1
5445 ) 9317
     - 5445
       3872 ) 5445 ( 1
            - 3872
              1573 ) 3872 ( 2
                   - 3146
                     726 ) 1573 ( 2
                         - 1452
                           121 ) 726 ( 6
                               - 726
                                 0
```

$\therefore$ HCF is 121

(iii) 399, 665 and 1463

```
          1
399 ) 665
    - 399
      266 ) 399 ( 1
          - 266
            133 ) 266 ( 2
                - 266
                  0
```

```
          11
133 ) 1463
    - 133
      133
      133
        0
```

$\therefore$ HCF is 133

OXFORD UNIVERSITY PRESS

(iv) 427, 1159, 1281 and 3416

```
        2
427 ) 1159
      – 854
        305 )  427
             – 305
               122 )  305
                    – 244
                      61 )  122
                          – 122
                            0
```

```
      21
61 ) 1281
   – 122
      61
    – 61
      0
```

```
      65
61 ) 3416
   – 305
     366
   – 305
       61 )  61
            – 61
              0
```

∴ HCF is 61

6.

Helpful Hint

Subtract the remainders to find the original numbers.

2300 – 32 = 2268 (remainder is 32)

3500 – 56 = 3444 (remainder is 56)

Now find HCF of 2268 and 3444.

2	2268
2	1134
3	567
3	189
3	63
3	21
7	7
	1

2	3444
2	1722
3	861
7	287
41	41
	1

$2268 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 7$

$= 2^2 \times 3^4 \times 7$

$3444 = 2 \times 2 \times 3 \times 7 \times 41$

$= 2^2 \times 3 \times 7 \times 41$

$\therefore$ HCF $= 2^2 \times 3 \times 7 = 84$

7. Length of the room = 12 m 15 cm

= 1215 cm

Width of the room = 8 m 91 cm

= 891 cm

3	1215
3	405
3	135
3	45
3	15
5	5
	1

3	891
3	297
3	99
3	33
11	11
	1

$1215 = 3 \times 3 \times 3 \times 3 \times 3 \times 5$

$= 3^5 \times 5$

$891 = 3 \times 3 \times 3 \times 3 \times 11$

$= 3^4 \times 11$

$\therefore$ HCF $= 3^4 = 3 \times 3 \times 3 \times 3 = 81$

$\therefore$ length of the largest tile = 81 cm

8.

Helpful Hint

Find multiples of 24 between 100 and 150.

$24 \times 1 = 24$, $24 \times 2 = 48$

$24 \times 3 = 72$, $24 \times 4 = 96$

$24 \times 5 = 120$, $24 \times 6 = 144$

Ignore the first four as they are less than 100. So the numbers between 100 nd 150 with HCF 24 are 120 and 144.

2	120
2	60
2	30
3	15
5	5
	1

$\therefore 120 = 2 \times 2 \times 2 \times 3 \times 5$

$= 2^3 \times 3 \times 5$

OXFORD UNIVERSITY PRESS

2	144
2	72
2	36
2	18
3	9
3	3
	1

$\therefore$ 144 = 2 × 2 × 2 × 2 × 3 × 3
= $2^4 \times 3^2$

$\therefore$ HCF of 120 and 144 = $2^3 \times 3 = 24$

Exercise 4B

1. (i) Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40

Multiples of 6: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60

Multiples of 8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

Common multiple is 24

$\therefore$ LCM of 4, 6, 8 = 24

(ii) Multiples of 10: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Multiples of 15: 15, 30, 45, 60, 75, 90, 105, 120, 135, 150

Multiples of 20: 20, 40, 60, 80, 100, 120, 140, 160, 180, 200

Common multiple is 60

$\therefore$ LCM of 10, 15, 20 = 2 × 2 × 3 × 5 = 60

2. (i)

Helpful Hint

Find prime factors of each number.

3	45
3	15
5	5
	1

$\therefore$ 45 = 3 × 3 × 5
= $3^2 \times 5$

3	75
5	25
5	5
	1

$\therefore$ 75 = 3 × 5 × 5
= 3×5^2

5	125
5	25
5	5
	1

$\therefore$ 125 = 5 × 5 × 5
= 5^3

Helpful Hint

LCM is the product of all prime factors with the highest power.

$\therefore$ LCM of 45, 75, 125 = $3^2 \times 5^3$ = 9 × 125 = 1125

(ii)

5	35
7	7
	1

7	49
7	7
	1

7	91
13	13
	1

$\therefore$ 35 = 5 × 7 $\therefore$ 49 = 7 × 7 = 7^2 $\therefore$ 91 = 7 × 13

$\therefore$ LCM of 35, 49, 91 = 5 × 7^2 × 13
= 5 × 49 × 13 = 3185

(iii)

2	42
3	21
7	7
	1

$\therefore$ 42 = 2 × 3 × 7

2	48
2	24
2	12
2	6
3	3
	1

$\therefore$ 48 = 2 × 2 × 2 × 2 × 3 = $2^4 \times 3$

2	56
2	28
2	14
7	7
	1

$\therefore$ 56 = 2 × 2 × 2 × 2 ×7 = $2^3 \times 7$

$\therefore$ LCM of 42, 48, 56 = $2^4 \times 3 \times 7$
= 16 × 3 × 7 = 336

(iv)

2	28
2	14
7	7
	1

$\therefore$ 28 = 2 × 2 × 7 = $2^2 \times 7$

OXFORD UNIVERSITY PRESS

5	35
7	7
	1

$\therefore$ 35 = 5 × 7

2	56
2	28
2	14
7	7
	1

$\therefore$ 56 = 2 × 2 × 2 × 7 = 2^3 × 7

2	84
2	42
3	21
7	7
	1

$\therefore$ 84 = 2 × 2 × 3 × 7 = 2^2 × 3 × 7
$\therefore$ LCM of 28, 35, 56, 84 = 2^3 × 3 × 5 × 7
= 8 × 3 × 5 × 7 = 840

3. (i)

2	45, 50
3	45, 25
3	15, 25
5	5, 25
5	1, 5
	1, 1

$\therefore$ LCM of 45, 50 = 2 × 3 × 3 × 5 × 5 = 450

(ii)

2	14, 21, 56
2	7, 21, 28
2	7. 21, 14
3	7, 21, 7
7	7, 7, 7
	1, 1, 1

$\therefore$ LCM of 14, 21, 28 = 2 × 2 × 2 × 3 × 7 = 168

(iii)

2	16, 24, 30, 40, 48
2	8, 12, 15, 20, 24
2	4, 6, 15, 10, 12
2	2, 3, 15, 5, 6
3	1, 3, 15, 5, 3
5	1, 1, 5, 5, 1
	1, 1, 1, 1, 1

$\therefore$ LCM of 16, 24, 30, 40, 48
= 2 × 2 × 2 × 2 × 3 × 5 = 240

(iv)

2	36, 54, 72, 96, 108
2	18, 27, 36, 48, 54
2	9, 27, 18, 24, 27
2	9, 27, 9, 12, 27
2	9, 27, 9, 6, 27
3	9, 27, 9, 3, 27
3	3, 9, 3, 1, 9
3	1, 3, 1, 1, 3
	1, 1, 1, 1, 1

$\therefore$ LCM of 36, 54, 72, 96, 108
= 2 × 2 × 2 × 2 × 2 × 3 × 3 × 3 = 864

4.

Helpful Hint
To find the lowest hundred divisible by 15, 20, 25, find the LCM.

2	15, 20, 25
2	15, 10, 25
3	15, 5, 25
5	5, 5, 25
5	1, 1, 5
	1, 1, 1,

$\therefore$ The lowest number divisible by 15, 20 25
= 2 × 2 × 3 × 5 × 5 = 300

OXFORD UNIVERSITY PRESS

5.

Helpful Hint

First find the lowest number then add the remainder 3 to get the answer.

2	8, 10, 12. 30
2	4, 5, 6, 15
2	2, 5, 3, 15
3	1, 5, 3, 15
5	1, 5, 1, 5
	1, 1, 1, 1

∴ LCM of 8, 10, 12, 30,

= 2 × 2 × 2 × 3 × 5 = 120

120 is less than 200, therefore, the next multiple will be 120 × 2 = 240 which lies between 200 and 500.

Since 3 is the remainder add it to 240.

240 + 3 = 243 is the lowest number between 200 and 500 which leaves a remainder 3 in each case when divided by 8, 10, 12. 30.

6. Find the LCM of these numbers first.

2	12, 15, 18, 27
2	6, 15, 9, 27
3	3, 15, 9, 27
3	1, 5, 3, 9
3	1, 5, 1, 3
5	1, 5, 1, 1
	1, 1, 1, 1

∴ LCM of 12, 15, 18, 27 = 2 × 2 × 3 × 3 × 3 × 5
= 540

Subtract remainder in each case to find the common remainder: 12 – 8 = 4;

15 – 11 = 4;

18 – 14 = 4;

27 – 23 = 4

Since 4 is the common remainder subtract 4 from 540.

∴ 540 – 4 = 536

7. Find the LCM first.

2	40, 50, 60
2	20, 25, 30
2	10, 25, 15
3	5, 25, 15
5	5, 25, 5
5	1, 5, 1
	1, 1, 1

∴ LCM of 40, 50, 60 = 2 × 2 × 2 × 3 × 5 × 5
= 600

Since, we require a 4 digit number find the next multiple 600 × 2 = 1200.

The remainder in each case is 5, therefore, add it to 1200: 1200 + 5 = 1205.

8. Find the LCM first.

2	25, 30, 40
2	25, 15, 20
2	25, 15, 10
3	25, 15, 5
5	25, 5, 5
5	5, 1, 1
	1, 1, 1

∴ LCM of 25, 30, 40 = 2 × 2 × 2 × 3 × 5 × 5
= 600

Since the remainder in each case is 5

(25 – 5 = 20; 30 – 5 – 25; 40 – 5 = 35)

subtract 5 from 600: 600 – 5 = 595

∴ the greatest 5 digit number is: 99, 595.

9. Find the LCM first.

2	10, 12, 16, 18
2	5, 6, 8, 9
2	5, 3, 4, 9
2	5, 3, 2, 9
3	5, 3, 1, 9
3	5, 1, 1, 3
5	5, 1, 1, 1
	1, 1, 1, 1

OXFORD UNIVERSITY PRESS

∴ LCM of 10, 12, 16, 18

= 2 × 2 × 2 × 2 × 3 × 3 × 5 = 720

Now find multiples of 720

720, 1440, 2160, 2880, ….

∴ Lowest number that must be added to 2000 is 160.

2000 + 160 = 2160

10. First find the LCM.

2	8, 9, 12, 15
2	4, 9, 6, 15
2	2, 9, 3, 15
3	1, 9, 3, 15
3	1, 3, 1, 5
5	1, 1, 1, 5
	1, 1, 1, 1

∴ LCM of 8, 9, 12, 15 = 2 × 2 × 2 × 3 × 3 × 5

= 360 min

Now convert 360 minutes to hours:

360 ÷ 60 = 6 hrs

∴ The bells will toll after 6 hrs after 3 p.m. that is at 9 p.m.

11.

Helpful Hint

Product of two numbers = Product of their HCF and LCM.

3000 = 10 × LCM

∴ LCM = $\frac{3000}{10}$ = 300

12. One number × second number = HCF × LCM

160 x second number = 32 × 1760

Second number = $\frac{\overset{2}{\cancel{32}} \times 176\cancel{0}}{\underset{1}{\cancel{16}\cancel{0}}}$ = 352

13. Product of two numbers = HCF × LCM

2400 = HCF × 120

∴HCF = $\frac{\overset{20}{\cancel{240}\cancel{0}}}{\cancel{12}\cancel{0}}$ = 20

14. Product of two numbers = HCF × LCM

Product of two numbers = 20 × 300 = 600

One pair of numbers will be 20 and 300 and the second pair of numbers will be 60 and 100.

Remember: Although there are other factors of 6000, but only these two pairs will give the HCF 20 and LCM 300.

Multiple Choice Questions 4

1. Option D: 1000
   Reason: 1000 is the highest common factor of 2000 and 3000.
   Incorrect options:
   Option A: 250 is a factor of 2000 and 3000, but it is not the highest common factor.
   Option B: 300 is not a factor of 2000
   Option C: 400 is not a factor of 3000.

2. Option A: 48
   Reason: 48 is the lowest common multiple of 12, 24, 48.
   Incorrect options:
   Option B: 12 is not a multiple of 48
   Option C: 96, though is a multiple of all 3 numbers, but it is not the lowest common multiple.
   Option D: None of the above – contradictory statement as option A is correct.

3. Option C: 200
   Reason: 1000 + 200 = 1200 ÷ 300 = 4
   Incorrect options:
   Option A: 300 + 1000 = 13 000 is not divisible by 300
   Option B: 500 + 1000 = 1500 is divisible by 300, but it is not the smallest number
   Option D: 400 + 1000 = 1400 which is not divisible by 200

4. Option B: 105
   Reason: 30 × second number = 15 × 210

   Second number = $\frac{\overset{5}{\cancel{15}} \times 21\cancel{0}}{\cancel{3}\cancel{0}}$ = 105

OXFORD UNIVERSITY PRESS

Option A, C, and D are incorrect options because:

150 × 30 15 × 210
210 × 30 15 × 210
120 × 30 15 × 210

5. Option A: 30
   Incorrect options:
   Option B: 60 is divisible by 2, 3, and 5 but it is not the smallest number.
   Option C: 20 is divisible by 2 and 5 but not divisible by 3.
   Option D: None of the above – contradictory statement as option A is correct.

6. Option B: Only 1, 3, 5, 15, 25, 75
   Incorrect options:
   Option A and C: 75 is not a prime number so it has more than two factors.
   Option D: all the above – contradictory statement as only Option B is correct.

7. Option A: HCF < LCM
   Option B: LCM > HC and
   Option C: HCF = LCM (sometimes) are all correct options
   Incorrect option:
   Option D: Two of the above are true contradictory statement.

OXFORD UNIVERSITY PRESS

2 Revision 2: Numbers

1. Sum of two numbers:

   – 20 + ☐ = 84

   ☐ = 84 + 20

   ☐ = 104

2. Difference of two numbers:

   – 15 – ☐ = 17 [given (– 15) is the bigger number]

   – ☐ = 17 + 15

   – ☐ = 32

   ☐ = – 32

   OR

   – 15 – ☐ = 17

   – 15 – 17 = ☐

   – 32 = ☐

3.

Helpful Hint
When odd number of negative signs are multiplied, the resulting sign will also be negative.

(i) (– 13) × (–10) × (–7)

= – 910

Helpful Hint
When numbers are multiplied by zero, the result will be zero.

(ii) 8 × (–24) × 0 × (–5)

= 0

Helpful Hint
When two like signs are divided, the result is always positive.

(iii) – 650 ÷ (–5)

= 130

(iv)

Helpful Hint
When two unlike signs are divided, the result is always negative.

726 ÷ (– 6)

= – 121

4.

Helpful Hint
A number is divisible by 4, if the number formed by the last two digits is divisible by 4.

(i) 598 746
Number formed by last two digit is 46 which is not divisible by 4.
Therefore, 598 746 is not divisible by 4.

(ii) 461 706
Number formed by last two digit is 06 which is not divisible by 06.
Therefore, 461 706 is not divisible by 4.

(iii) 54 964
Number formed by last two digits is 64 which is divisible by 4.
Therefore, 54 964 is divisible by 4.

(iv) 237 978
Number formed by last two digits is 78 which is not divisible by 4.
Therefore, 237 978 is not divisible by 4.

5.

Helpful Hint
If the sum of the digits of the number is divisible by 3, then the number is divisible by 3.

(i) 859 467
Sum of digits:
8 + 5 + 9 + 4 + 6 + 7 = 39
Since, 39 is divisible by 3,
therefore, 859 467 is divisible by 3.

OXFORD UNIVERSITY PRESS

(ii) 34 576
Sum of digits: 3 + 4 + 5 + 7 + 6 = 25
Since, 25 is not divisible by 3,
therefore, 34 576 is not divisible by 3.

(iii) 837 721
Sum of digits: 8 + 3 + 7 + 7 + 2 + 1 = 28
Since, 28 is not divisible by 3,
therefore, 837 721 is not divisible by 3.

(iv) 56 149
Sum of digits: 5 + 6 + 1 + 4 + 9 = 25
Since, 25 is not divisible by 3,
therefore, 56 149 is not divisible by 3.

6.

2	12
2	6
3	3
	1

Prime factors of 12 are 2 × 2 × 3

7.

2	210
3	105
5	35
7	7
	1

Prime factors of 210 are 2 × 3 × 5 × 7

8. HCF of two numbers = 8
LCM of two numbers = 504
One of the number = 72
Product of HCF and LCM = Product of two numbers.

$$8 \times 504 = 72 \times \square$$

$$\frac{\overset{1}{\cancel{8}} \times \overset{56}{\cancel{504}}}{\cancel{72}_{\cancel{9}\,1}} = \square$$

$$56 = \square$$

∴ the second number = 56.

Check:
8 × 504 = 72 × 56
4032 = 4032
LHS = RHS

9. To find the largest 4-digit number divisible by 18, 25, and 35 find the LCM of these numbers.

2	18, 25, 35
3	9, 25, 35
3	3, 25, 35
5	1, 25, 35
5	1, 5, 7
7	1, 1, 7
	1, 1, 1

LCM of 18, 25, 35 = 2 × 3 × 3 × 5 × 5 × 7
= 3150
∴ the first 4-digit number divisible by 18, 25, 35 is 3150.
Second 4-digit number will be
3150 × 2 = 6300
Third 4-digit number will be 3150 × 3 = 9450
∴ 9450 is the largest number divisible by 18, 25, 35.

10. Find the LCM of 16, 24, 30

2	16, 24, 30
2	8, 12, 15
2	4, 6, 15
2	2, 3, 15
3	1, 3, 15
5	1, 1, 5
	1, 1, 1

LCM of 16, 24, 30 = 2 × 2 × 2 × 2 × 3 × 5
= 240
Now find multiples of 240 till you reach the required 5-digit number.
240 × 2 = 480; 240 × 3 = 760; 240 × 4 = 960;
It is time consuming to find many multiples, so use approximation to find the highest 4-digit number.
240 × 40 = 9600
240 × 41 = 9841
240 × 42 = 10 080
∴ the smallest 5-digit number divisible by 16, 24, 30 is 10 080.

OXFORD UNIVERSITY PRESS

11. (i) The smallest prime number is 97.

(ii) The largest prime factor of 105 is 7.

(iii) The largest perfect number less than 50 is 28.

Reason: A perfect number is a number whose divisors (except the number itself) add up to the number.

Divisors of 28 are: 1, 2, 4, 7, 14

(exclude 28)

Sum: 1 + 2 + 4 + 7 + 14 = 28

(iv) The pair of twin primes is 137, 139.

Reason: In other pairs 141 and 147 are not prime numbers, (141 ÷ 3 = 47 and 147 ÷ 7 = 21) because they have more than two factors.

12.

2	180, 240, 270
3	90, 120, 135
5	30, 40, 45
	6, 8, 9

∴ HCF of 180, 120, 270, = 2 × 3 × 5 = 30

13.

```
        2
400 ) 1000
      - 800
        200 ) 400
              - 400
                000
```

```
        3
200 ) 750
      - 600
        150 ) 200
              150
                50 ) 150
                     150
                     000
```

14.

5	35, 55
	7, 11

Measuring container should be of 5 litre.

15.

2	14, 35, 28, 63
2	7, 35, 14, 63
3	7, 35, 7, 63
3	7, 35, 7, 21
5	7, 35, 7, 7
7	7, 7, 7, 7
	1, 1, 1, 1

∴ LCM of 14, 35, 28, 63, is

2 × 2 × 3 × 3 × 5 × 7 =1260

16.

2	10, 15, 20
2	5, 15, 10
3	5, 15, 5
3	5, 5, 5
5	1, 1, 1

∴ least number of boxes of biscuits required is 2 × 2 × 3 × 5 = 60

OXFORD UNIVERSITY PRESS

5 RATIO AND RATE

Exercise 5

1. (i) 13 : 39
   1 : 3

   (ii) 42 : 63
   14 : 21
   2 : 3

   (iii) 48 : 64
   24 : 32
   12 : 16
   6 : 8
   3 : 4

   (iv) 6.4 : 8
   0.8 : 1
   8 : 10
   4 : 5

   (v) 36 kg : 80 kg
   18 : 40
   9 : 20

   (vi) Rs 27 : Rs 63
   9 : 21
   3 : 7

   (vii) 4 dozen : 3 dozen
   4 : 3

   (viii) 60 cm : 3 m
   60 cm : 300 cm
   10 : 50
   1 : 5

   (ix) Rs 2 : Rs 80
   1 : 40

   (x) 0.5 m : 75 cm
   10 : 15
   2 : 3

2. copper : zinc
   13.5 gm : 4.5 gm
   Or 135 : 45
   27 : 9
   3 : 1

3. Cost of 9 textbooks at Rs 12 each
   = 8 × 12 = Rs 96
   Cost of 4 story books at Rs 9 each
   = 4 × 9 = 36
   Ratio textbooks : story books
   Rs 96 : Rs 36
   8 : 3

4. Money spent on chocolates: $\frac{3}{4}$
   Money spent on chewing gum: $\frac{1}{4}$
   Ratio chocolate : chewing gum
   $\frac{3}{4} : \frac{1}{4}$
   $\frac{3}{\cancel{4}_1} \times \cancel{4}^1 : \frac{1}{\cancel{4}_1} \times \cancel{4}^1$
   3 : 1

5. Mixture = 70 litre
   Pure milk = 56 litre
   Water = 70 – 56 = 14 litre
   Ratio milk : water
   56 : 14
   8 : 2
   4 : 1

6. Income = Rs 5400
   Expenditure = Rs 4500
   Saving = Rs 5400 – Rs 4500 = Rs 900

   (i) income : expenditure
   5400 : 4500
   54 : 45
   6 : 5

   (ii) income : saving
   5400 : 900
   54 : 9
   6 : 1

   (iii) expenditure : saving
   4500 : 900
   45 : 9
   ` 5 : 1

OXFORD UNIVERSITY PRESS

7. First quantity = 28
Second quantity = ?
Ratio of quantities 2 : 7

Or $\frac{2^{\times 14}}{7_{\times 14}} = \frac{28}{\boxed{98}}$

8. Larger quantity = 84
Smaller quantity = ?
Ratio of quantities 7: 12

Or $\frac{7^{\times 7}}{12_{\times 7}} = \frac{\boxed{49}}{84}$

9. School A $\frac{275}{300}$

Or 275 : 300
55 : 60
11 : 12

School B : $\frac{120}{150}$

Or 120 : 150
12 : 15
3 : 5

School A has a better record.

10. Mixture = 9 litres

Ratio milk : water
5 : 1

Total ratio = 5 + 1 = 6

Ratio of water = $\frac{1}{\cancel{6}_2} \times \cancel{9}^3 = \frac{3}{2} = 1\frac{1}{2}$

11. Continued ratio

2	3	
	3	4
6	9	12

Simplest form 2 : 3 : 4

12. **Share** Bilal : Asif : Iqbal

4	5	
	3	2
12	15	10

Ratio of Bilal and Iqbal is 12 : 10 or 6 : 5

13. **Income** Amina : Ayesha : Sara

3	5	
	5	6
15	25	30

Ratio in simplest form is 3 : 5 : 6

14. Let the number of boys be 'x'

boys : girls
4 : 3
x : 162

$\frac{4}{x} = \frac{3}{162}$

Applying cross product rule:

$\frac{4 \times \cancel{162}^{54}}{\cancel{3}} = x$

$216 = x$

∴ there are 216 boys in the school.

girls :	total students
162 :	(162 + 216)
81 :	189
9 :	21
3 :	7

15. In 10 min Akram ran 70 m
In 1 min he ran 70 ÷ 10 = 7 m
In 12 min Sohail ran 84 km
In 1 min he ran 84 ÷ 12 = 7 m
Both ran at the same speed

Multiple Choice Questions 5

1. Option A: ice cream : milk = 2 : 1
Reason: Ratio of quantities is given in the recipe of milkshake.

Option B, C, and D are incorrect, because either ratio or the sequence of quantity is wrong.

2. Option A: 1 : 8

Option B is incorrect because the ratio is

OXFORD UNIVERSITY PRESS

reversed

Option C and D are not in the simplest form.

3. Option B: 2 : 1

Reason: lions : tigers

4 : 2

2 : 1

Option A is incorrect, because quantity of tigers is wrong.

In Option C and D ratio of tigers to lion is considered.

4. Option D: 2 : 3 : 4

Option A, B, and C are not given in simplest form.

5. Option D: Ratio 1 = Ratio 2

Reason: Ratio 1 = 3 : 5 : 8

Ratio 2 = 12 : 20 : 32

Ratio 1 is simplest form of Ratio 2,therefore, the two ratios are equivalent.

Option A, B, and C are incorrect.

6. Option C: Rs 1305

Option A, B, and D are incorrect.

OXFORD UNIVERSITY PRESS

6 FINANCIAL ARITHMETIC: PERCENTAGES

Exercise 6A

1. (i) $15\ \% = \frac{15}{100} = \frac{3}{20}$

   (ii) $27\% = \frac{27}{100}$

   (iii) $3.5\% = \frac{3.5}{100} = \frac{0.7}{20}$

   $= \frac{7}{200}$

2. (i) $\frac{1}{\cancel{5}_1} \times \cancel{100}^{20} = 20\%$

   (ii) $\frac{2}{\cancel{25}_1} \times \cancel{100}^{4} = 8\%$

   (iii) $\frac{3}{\cancel{50}_1} \times \cancel{100}^{2} = 6\%$

   (iv) $0.35 \times 100 = 35\%$

   (v) $4.2 \times 100 = 420\%$

3. (i) $\frac{\cancel{7}^1}{\cancel{28}_{\cancel{4}_1}} \times \cancel{100}^{25} = 25\%$

   (ii) $\frac{20}{\cancel{50}_1} \times \cancel{100}^{2} = 40\%$

   (iii) $\frac{\cancel{60}^2}{\cancel{150}_{\cancel{5}_1}} \times \cancel{100}^{20} = 40\%$

   (iv) $\frac{\cancel{44}^{\cancel{4}^2}}{\cancel{66}_{\cancel{6}_3}} \times 100 = \frac{200}{3} = 66\frac{2}{3}$ or 66.6%

   (v) $\frac{39.50}{1975} \times 100$

   $\frac{\cancel{3950}^{\cancel{158}^{2}}}{\cancel{1975}_{\cancel{395}_{\cancel{79}_1}}} = 2\%$

4. suppose the percentage is x

   $\therefore x\%$ of $240 = 30$

   $\frac{x}{100} \times 240 = 30$

   $\therefore x = \frac{\cancel{30}^1 \times \cancel{100}^{25}}{\cancel{240}_{\cancel{8}_2}} = \frac{25}{2} = 12\frac{1}{2} = 12.5$

   $\therefore$ 12.5% of 240 is 30.

5. **Helpful Hint**

   First find the number of minutes in a day
   1 day = 24 hrs
   = 24 × 60 (1 hr = 60 min)
   = 1440 min

   Suppose the percentage is x.

   x % of 1440 min = 18 min

   $\frac{x}{100} \times 1440 = 18$

   $x = \frac{\cancel{18}^{\cancel{9}^1} \times \cancel{100}^5}{\cancel{1440}_{\cancel{72}_{\cancel{8}_4}}} = \frac{5}{4} = 1\frac{1}{4} = 1.25\%$

   $\therefore$ 18 min of 1 day is 1.25%.

6. Adila's salary = Rs 21,000
   Adila saves per month = 16%
   Amount saves per month : 16% of salary
   16% × 2100

   $\frac{16}{\cancel{100}} \times 21\cancel{00} = 3360$

   $\therefore$ Adila saves Rs 3360 per month.

OXFORD UNIVERSITY PRESS

7. Total number of students = 1650

Percentage of boys = 70%

$\therefore$ number of boys = 70% of 1650

$= \frac{70}{100} \times 1650 = 1155$

$\therefore$ number of girls = 1650 – 1155

= 495 girls

8. Suppose the total profit made is x.

$\therefore$ 60% of x = 9000

Profit per year = Rs 9000

$\frac{60}{100} \times x = 9000$

$x = \frac{9000 \times 100}{60} = 150\,000$

$\therefore$ total profit per year = Rs 150 000.

9. Total marks = 400

Marks secured by Shahid = 338

$\therefore$ marks percentage of Shahid $= \frac{338}{400} \times 100$

= 84.5%

10.

Helpful Hint

First find the exact measurment of the line in each case, then draw the lines accordingly.

(i) 10% of 10 cm

$\frac{10}{100} \times 10 = 1$ cm

1 cm

(ii) 15% of 10 cm

$\frac{15}{100} \times 10 = \frac{3}{2} = 1.5$ cm

1.5 cm

(iii) 3% of 10 cm

$\frac{3}{100} \times 10 = 0.3$ cm

0.3 cm

(iv) 90% 0f 10 cm

$\frac{90}{100} \times 10 = 9$ cm

9 cm

(v) 5% 0f 10 cm

$\frac{5}{100} \times 10 = \frac{1}{2} = 0.5$ cm

0.5 cm

(vi) 38% of 10 cm

$\frac{38}{100} \times 10 = 3.8$ cm

3.8 cm

(vii) 100% of 10 cm

$\frac{100}{100} \times 10 = 10$ cm

10 cm

11.

Fractions	Equivalent percentages
$\frac{1}{2}$	**50%**
$\frac{3}{4}$	$\frac{3}{4} \times 100 = 75\%$
$\frac{25}{100} = \frac{1}{4}$	**25%**
$\frac{7}{10}$	$\frac{7}{10} \times 100 = 70\%$
$\frac{9}{25}$	$\frac{9}{25} \times 100 = 36\%$
$12\frac{1}{2}\% \div 100$ $= \frac{25}{2} \times \frac{1}{100}$ $= \frac{1}{8}$	$12\frac{1}{2}\%$
$33\frac{1}{2}\% \div 100$ $\frac{67}{2} \times \frac{1}{100} = \frac{67}{200}$	$33\frac{1}{2}\%$
$\frac{19}{50}$	$\frac{19}{50} \times 100 = 38\%$

OXFORD UNIVERSITY PRESS

Exercise 6B

1.

Helpful Hint

Convert bigger unit to smaller unit, when required

(i) 55 cm, 5 m

$\begin{bmatrix} 1 \text{ m} = 100 \text{ cm} \\ 5 \text{ m} = 500 \text{ cm} \end{bmatrix}$

$\frac{\cancel{55}^{11} \text{ cm}}{\cancel{500}_{\cancel{5}} \text{ cm}} \times \cancel{100}\% = 11\%$

(ii) 72 g, 1.44 kg

$\begin{bmatrix} 1 \text{ kg} = 1000\text{g} \\ 1.44 \text{ kg} = 1.44 \times 1000 \\ \quad = 1440 \text{ g} \end{bmatrix}$

$\frac{\cancel{72}^{\cancel{6}\,1} \text{ g}}{\cancel{1440}_{\cancel{12}\,\cancel{2}\,1} \text{ g}} \times \cancel{100}^{5}\% = 5\%$

(iii) 18 days, 30 days

$\frac{\cancel{18}^{6}}{\cancel{30}_{\cancel{3}\,1}} \times \cancel{100}^{10}\% = 60\%$

(iv) 36 min, 6 hrs

$\begin{bmatrix} 1 \text{ hr} = 60 \text{ min} \\ 6 \text{ hrs} = 6 \times 60 \text{ min} \\ \quad = 360 \text{ min} \end{bmatrix}$

$\frac{\cancel{36}^{1} \text{ min}}{\cancel{360}_{\cancel{10}} \text{ min}} \times \cancel{100}^{10}\% = 10\%$

(v) Rs 0.75, Rs 12.50

$\frac{\text{Rs } 0.75}{\text{Rs } 12.50}$

$\frac{\cancel{75}^{3}}{\cancel{1250}_{\cancel{50}}} \times \cancel{100}^{2}\% = 6\%$

2.

Helpful Hint

First find the total number of students in each class

Number of students in class V

$= 4 + 5 + 9 + 7 = 25$

Number of students in class VI

$= 7 + 5 + 6 + 12 = 30$

(i) Percentage of students of class V who like mathematics:

$\frac{\cancel{9}^{5}}{\cancel{25}_{1}} \times \cancel{100}^{4}\% = 36\%$

(ii) Percentage of students of class VI who like mathematics:

$\frac{\cancel{6}^{1}}{\cancel{30}_{\cancel{5}\,1}} \times \cancel{100}^{20}\% = 20\%$

(iii) Percentage of students of class V who like science:

$\frac{7}{\cancel{25}_{1}} \times \cancel{100}^{4}\% = 28\%$

(iv) Percentage of students of class VI who like science:

$\frac{\cancel{12}^{4}}{\cancel{30}_{\cancel{10}}} \times \cancel{100}^{10}\% = 40\%$

(v) Mathematics is the favourite subject among Class V students.

[9 out of 25 student like mathematics]

Science is the favourite subject among Class VI students.

[12 out of 30 student like science]

3. Mr Saleem covered 36% of 150 km.

Therefore, he covered $\frac{\cancel{36}^{18}}{\cancel{100}_{\cancel{50}}} \times \cancel{150}^{3} = 54$ km

Mr Sabir covered 30% of 200 km.

Therefore, he covered $\frac{30}{\cancel{100}_{1}} \times \cancel{200}^{2} = 60$ km

Thus, Mr Sabir covered more distance as compared to Mr Saleem.

4.

Helpful Hint

First find the total number of people who come to watch the match.

Number of men = 396

Number of women = 324

Total number of people = 396 + 324

= 720

Percentage of men = $\frac{\cancel{396}^{\cancel{33}\,11}}{\cancel{720}_{\cancel{6}\,2}} \times \cancel{100}^{5} = 55\%$

OXFORD UNIVERSITY PRESS

Percentage of women = $\frac{\cancel{324}^{9}}{\cancel{720}_{2}} \times 10\cancel{0}^{5} = 45\%$

Thus, men were more in number

[Simpler method:
If men are 55%, then women are 100 – 55% = 45%]

5.

Helpful Hint

To find the percentage increase or decrease, first find the difference. Then divide the difference by the original value.

Actual price of the book = Rs 320
Reduced price of the book = Rs 240
Decrease in price of book = Rs (320 – 240)
= Rs 80

Percentage decrease in price

$= \frac{8\cancel{0}^{1}}{3\cancel{2}\cancel{0}_{1}} \times 1\cancel{00}^{25}\%$

= 25%

6. Actual population of the town = 25000
Increased population of the town = 30000
Increase in population
= 30000 – 25000 = 5000

Percentage increase in population

$= \frac{\cancel{5000}^{1}}{\cancel{25000}_{1}} \times 1\cancel{00}^{20}\%$

= 20%

7. Actual price of the property = Rs 975500
Decreased price of the property = Rs 829175
Decrease in price of the property
= Rs (975500 – 829175)
= Rs 146325

Percentage decrease in price

Percentage increase in population $= \frac{146325}{975500} \times 1\cancel{00}\%$

= 15%

8. Height of the boy = 108 cm
Increased height = 135 cm
Increase in height = (135 – 108) cm
= 27 cm

Percentage increase in height

$= \frac{\cancel{27}^{1}}{\cancel{108}_{4}} \times 1\cancel{00}^{25}\%$

= 25%

9. Percentage in the first term examinations

$= \frac{41}{\cancel{75}_{3}} \times 1\cancel{00}^{4}$

$= \frac{164}{3} = 54.66\%$

Percentage in the second examinations

$= \frac{65}{\cancel{75}_{3}} \times 1\cancel{00}^{4}$

$= \frac{260}{3} = 86.66\%$

Percentage increase
= 86.66% – 54.66%
= 32%

Helpful Hint

Another easier method is to find the increase in marks and then divide by the total marks.

65 – 41 = 24

Percentage increase = $\frac{\cancel{24}^{3}}{\cancel{75}_{1}} \times \cancel{100}^{4} = 32\%$

10. Original rent of the house = Rs 35000
Rent after decrease = Rs 30800
Difference in rent = Rs 35000 – 30800)
= Rs 4200

Percentage decrease in rent

$= \frac{\cancel{4200}^{6}}{\cancel{35000}_{1}} \times 1\cancel{00}^{2}$

= 12%

OXFORD UNIVERSITY PRESS

Multiple Choice Questions 6

1. Option C: 70% = Rs 84

   Reason: 70% of Rs 120

   $\frac{70}{100} \times 120 = 84$

   Option A is incorrect, because 120% means higher value.

   Option B and D are also incorrect, because 20% and 30% will give less value.

2. Option A: 10

   Reason: If 75% of pupils in a class of 40 passed, then 25% of pupils failed.

   25% of 40 will be

   $\frac{25}{100} \times 40 = 10$

   Option B, C, and D are incorrect.

3. Option D: Final value is 45

   Reason: Final value = $\overset{3}{\cancel{60}} \times \frac{\overset{15}{75}}{\underset{\cancel{5}\,1}{\cancel{100}}} = 45$

   Option A, B, and C are incorrect.

OXFORD UNIVERSITY PRESS

3 Revision 3: Arithmetic

1. Time taken by car A : Time taken by car B

2 hrs 30 min	:	2 hrs 15 min
(2 × 60 + 30) min	:	(2 × 60 + 15) min
150	:	135
30	:	27
10	:	9

2. Total workers in a factory = 75

Number of women workers = 20

∴ Number of male workers = 75 – 20 = 55

Male workers	:	Female workers
55	:	20
11	:	4

3. Total number of students = 318

Number of students who got first division = 276

∴ number of students who get second division = 318 – 276 = 42.

Students with first division : Students with second division

276 : 42

138 : 21

46 : 7

4. Total number of buildings = 488

Three–storyed buildings : Four–storyed buildings

5 : 3

Total ratio = 5 + 3 = 8

∴ four–storyed building are $\frac{3}{\cancel{8}_{\cancel{2}\,1}} \times \cancel{488}^{\cancel{122}\,61}$

= 183 buildings

check: three-storyed building

$= \frac{5}{\cancel{8}} \times \cancel{488}^{61} = 305$

183 + 305 = 488

5. Monthly income of Mr Jamil = Rs 80 000

His expenses: = Rs 55 000

His savings: Rs (80 000 – 55 000) = Rs 25 000

Monthly income of Mr Sohail = Rs 75 000

His expenses: = Rs 55 000

His savings: Rs (75 000 – 55 000) = Rs 20 000

Ratio of their savings:

25 000 : 20 000

25 : 20

5 : 4

6. Ratios 3 : 5 and 5 : 8

Expressing ratios in fractions: $\frac{3}{5}$ and $\frac{5}{8}$

Comparing ratios: $\frac{3 \times 8}{5 \times 8}$ and $\frac{5 \times 5}{8 \times 5}$

(make denominators same to compare)

$= \frac{24}{40}$ and $\frac{25}{40}$

$\therefore \frac{3}{5} < \frac{5}{8}$

∴ ratio 5 : 8 is greater than 3 : 5.

Check:

$\frac{3}{5} \times \frac{5}{8}$

3 × 8 < 5 × 5

24 < 25

OXFORD UNIVERSITY PRESS

7. Ratio of dimensions of a piece of cloth is 8 : 5
Breadth of the cloth = 1.25 m

$$\frac{\text{Length}}{\text{Breadth}} = \frac{8}{5}$$

$$\frac{\text{Length}}{1.25} = \frac{8}{5}$$

$$\therefore \text{length} = \frac{8}{\cancel{5}_{1}} \times \cancel{1.25}^{0.25}$$

$$= 8 \times 0.25 = 2$$

$\therefore$ length of the cloth = 2 m

8. $a : b : c$ Given:

3 : 4 $a : b = 3 : 4$

2 : 3 $b : c = 2 : 3$

$a : c = ?$

Note that 'b' is the common ratio.
Therefore, make it equal

$a : b : c$
3 : 4
$2 \times 2 : 3 \times 2$
$a : b : c$
3 : 4
4 : 6

Now $a : c$
3 : 6
1 : 2

9. Rohail's income per month = Rs 30000
Rohail's saving per month = Rs 7000
Rohail's expenditure per month
= Rs (30000 – 7000)
= Rs 23000

(i) income : expenses
30000 : 23000
30 : 23

(ii) expenses : savings
23000 : 7000
23 : 7

(iii) saving : income
7000 : 30000
7 : 30

10. Total amount = Rs 7475
Ratio = 3 : 7 : 13
Total ratio = 3 + 7 + 13 = 23

$$\frac{3}{\cancel{23}_{1}} \times \cancel{7475}^{325} = \text{Rs } 975$$

$$\frac{7}{\cancel{23}_{1}} \times \cancel{7475}^{325} = \text{Rs } 2275$$

$$\frac{13}{\cancel{23}_{1}} \times \cancel{7475}^{325} = \text{Rs } 4225$$

Check:
Rs (975 + 2275 + 4225)
= Rs 7475

11. (i) Ratio = 2 : 5

$$\frac{\text{Smaller amount}}{\text{Larger amount}} = \frac{2}{5}$$

$$\frac{\text{Smaller amount}}{275} = \frac{2}{5}$$

$$\text{Smaller amount} = \frac{2}{\cancel{5}_{1}} \times \cancel{275}^{55}$$

$\therefore$ smaller amount = Rs 110

(ii) Total amount = Rs 275 + Rs 110
= Rs 385

12. Ratio of savings to expenditure = 2 : 5
Expenditure of the family = Rs 3500
Saving of the family = ?
Total income of the family = ?

$$\frac{\text{Saving}}{\text{Expenditure}} = \frac{2}{5}$$

$$\text{Saving} = \frac{2}{\cancel{5}_{1}} \times \cancel{3500}^{700}$$

$\therefore$ saving = Rs 1400
$\therefore$ total income = Expenditure + Savings
= Rs 3500 + Rs 1400
$\therefore$ total income = Rs 4900

OXFORD UNIVERSITY PRESS

13. **Ratio** orange juice : lemonade

3 : 4

Total ratio = 3 + 4 = 7

Total amount of drink = 2.8 litre

Amount of orange juice

$= \frac{3}{\cancel{7}} \times \overset{0.4}{\cancel{2.8}} = 1.2$ litre

Amount of lemonade

$= \frac{4}{\cancel{7}} \times \overset{0.4}{\cancel{2.8}} = 1.6$ litre

14. Story books : Science books :

2475 : 1650

x : 1650

Ratio expressed as fraction is $\frac{2475}{1650}$

Science books : Mathematics books

1650 : x

Ratio expressed as fraction is $\frac{1650}{x}$

Equating both ratios:

$$\frac{2475}{1650} = \frac{1650}{x}$$

$$x = \frac{\overset{150}{\cancel{1650}} \times \overset{330}{\cancel{1650}}}{\underset{\underset{45}{\cancel{225}}}{\cancel{2475}}}$$

$$x = \frac{\overset{50}{\cancel{150}} \times \overset{22}{\cancel{330}}}{\underset{\underset{3}{\cancel{9}}}{\cancel{45}}} = 1100$$

∴ there are 1100 mathematics books.

15. (i) $\frac{13}{\underset{1}{\cancel{20}}} \times \overset{5}{\cancel{100}}\% = 65\%$

Or $\frac{13}{\underset{1}{\cancel{20}}} \times \frac{\overset{5}{\cancel{100}}}{100} = \frac{65}{100} = 65\%$

(ii) $\frac{\overset{2}{\cancel{4}}}{\underset{\underset{5}{\cancel{10}}}{\underset{\cancel{50}}{\cancel{250}}}} \times \overset{4}{\cancel{100}}\% = \frac{8}{5} = 1.6\%$

(iii) $\frac{17}{\underset{1}{\cancel{25}}} \times \overset{4}{\cancel{100}}\% = 68\%$

16. (i) 9%

$= \frac{9}{100}$

$= 0.09$

(ii) 7.5%

$= \frac{7.5}{100}$

$= 0.075$

(iii) 6.25%

$= \frac{6.25}{100}$

$= 0.0625$

17. (i) 2.3% of 200

$\frac{2.3}{\cancel{100}} \times \cancel{200}$

$= 4.6$

(ii) 36% of Rs 2500

$\frac{36}{\cancel{100}} \times 2\cancel{500}$

= Rs 900

(iii) $8\frac{1}{3}$% of 300 kg

$= \frac{8.333}{\underset{1}{\cancel{100}}} \times \overset{3}{\cancel{300}}$

= 24.99 kg or 25 kg

(iv) $33\frac{1}{3}$% of 12 litre

$= \frac{33.333}{\underset{25}{\cancel{100}}} \times \overset{3}{\cancel{12}}$

= 4 litre

18. Price of rice per kg in 2012 = Rs 90

Price of rice per kg in 2016 = Rs 120

Increase in price = 120 – 90 = Rs 30

Percentage increase in price $= \frac{\overset{1}{\cancel{30}}}{\underset{3}{\cancel{90}}} \times 100$

$= \frac{100}{3}$

$= 3.33\%$

OXFORD UNIVERSITY PRESS

7 INTRODUCTION TO ALGEBRA

Exercise 7A

1. (i) True
   (ii) False
   (iii) True
   (iv) True
   (v) False
   (vi) False
   (vii) True
   (viii) True
   (ix) False

2. Reason

(i)	$x = 7$	$7 + 2 = 9$
(ii)	$p = 5$	$7 - 5 = 2$
(iii)	$y = 5$	$3 \times 5 = 15$
(iv)	$x = 9$	$45 \div 9 = 5$

3. (i) $p + q$
   (ii) $a - b$
   (iii) $\frac{2}{3}x + 2y$
   (iv) $m + n + mn$
   (v) $3q - 2p$
   (vi) $3a + 4b$
   (vii) $m + \frac{n}{2}$
   (viii) $\frac{a}{b} + ab$
   (ix) $\frac{x}{3}(x - y)$
   (x) $\frac{3}{4}x(5q - 2p)$

4. (i) $a, b, -2c$
   (ii) $-2xyz, -3xy, z$
   (iii) $abc, 2fgh, -af^2, -bg^2, -ch^2$

5. (i) $a - 3b + 4c$
   (ii) $-5abc - 7bcd + 3abd$
   (iii) $3u - \frac{1}{2}gt$

Exercise 7B

1. (i) $x - 5$
   (ii) $2p + q$
   (iii) $(m - n) + (2m + n)$
   $m - \cancel{n} + 2m + \cancel{n} = 3m$

2. $x = -3, y = 5, z = -2$
   Substitute values of x, y, and z in each question
   (i) $x + y - z$
   $= -3 + (5) - (-2)$
   $= -3 + 5 + 2$
   $= 2 + 2 = 4$
   (ii) $2x - 3y + z$
   $= 2(-3) - 3(5) + (-2)$
   $= -6 - 15 - 2$
   $= -21 - 2$
   $= -23$
   (iii) $\dfrac{x^2 - yz}{z^2}$
   $= \dfrac{(-3)^2 - (5)(-2)}{(-2)^2}$
   $= \dfrac{9 + 10}{4} = \dfrac{19}{4}$

OXFORD UNIVERSITY PRESS

(iv) $\dfrac{x^2 + y^2 + z^2}{xyz}$

$= \dfrac{(-3)^2 + (5)^2 + (-2)^2}{(-3)(5)(-2)}$

$= \dfrac{9 + 25 + 4}{30}$

$= \dfrac{38}{30} = \dfrac{19}{15}$

(v) $\dfrac{x+y}{z} + \dfrac{y+z}{x}$

$= \dfrac{-3 + (5)}{-2} + \dfrac{5 + (-2)}{-3}$

$= \dfrac{-3 + 5}{-2} + \dfrac{5 - 2}{-3}$

$= \dfrac{\cancel{2}^{1}}{-\cancel{2}_{1}} + \dfrac{\cancel{3}^{1}}{-\cancel{3}_{1}}$

$= -1 + (-1) = -1 - 1$

$= -2$

(vi) $\dfrac{2x + y - z}{x - 3y + z}$

$= \dfrac{2(-3) + (5) - (-2)}{-3 - 3(5) + (-2)}$

$= \dfrac{-6 + 5 + 2}{-3 - 15 - 2}$

$= \dfrac{-1 + 2}{-18 - 2}$

$= -\dfrac{1}{20}$

(vii) $\dfrac{x(2y + 3z)}{3zx}$

$= \dfrac{-3[(2)(5) + 3(-2)]}{3(-2)(-3)}$

$= \dfrac{-3(10 - 6)}{18}$

$= \dfrac{-3(4)}{18}$

$= \dfrac{-12}{18}$

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

(viii) $x^3 + 3xyz - y^3 + z^3$

$= (-3)^3 + 3(-3)(5)(-2) - (5)^3 + (-2)^3$

$= -27 + 90 - 125 - 8$

$= 63 - 125 - 8$

$= -62 - 8 = -70$

3. Given $a = 4$, $b = 9$, $c = 25$

$b^2 - 4ac$

$= (9)^2 - 4(4)(25)$

$= 81 - 400$

$= -319$

4. Given $x = 1$

$= 1 - \left[1 - \{1 - (1 - \overline{1 + x})\}\right]$

First substitute value of x.

$= 1 - \left[1 - \{1 - (1 - \overline{1 + 1})\}\right]$

Solve vinculum.

$= 1 - \left[1 - \{1 - (\cancel{1} - \cancel{1} - 1)\}\right]$

$= 1 - \left[1 - \{1 + 1\}\right]$

$= 1 - \left[1 - 2\right]$

$= 1 - \left[-1\right]$

$= 1 + 1 = 2$

5. Given $a = 7$ and $b = 6$

$= 4a^2 - 2\left[b + a(3 - a) + 3b^2\right]$

First simplify.

$= 4a^2 - 2\left[b + 3a - a^2 + 3b^2\right]$

$= 4a^2 - 2b - 6a + 2a^2 - 6b^2$

$= 4a^2 + 2a^2 - 2b - 6a - 6b^2$

$= 6a^2 - 2b - 6a - 6b^2$

Now substitute values.

$6(7)^2 - 2(6) - 6(7) - 6(6)^2$

$= 6(49) - 12 - 42 - 6(36)$

$= 294 - 12 - 42 - 216$

$= 282 - 42 - 216$

$= 240 - 216$

$= 24$

OXFORD UNIVERSITY PRESS

6. (i) $2x + (-3x) + 5x$

$= (2 - 3 + 5)\,x$

$= (-1 + 5)\,x$

$= 4x$

(ii) $3abc + 2abc - 7abc$

$= 5abc - 7abc$

$= -2abc$

(iii)
$$\begin{array}{r} 2a + 3b \\ 3a - 4b \\ \hline 5a - b \\ \hline \end{array}$$

(iv)
$$\begin{array}{r} a + b - c \\ 3a + b - 2c \\ \hline 4a + 2b - 3c \\ \hline \end{array}$$

(v)
$$\begin{array}{r} 4a - 3b + 5c \\ -5a + 4b - c \\ \hline -a + b + 4c \\ \hline \end{array}$$

(vi)
$$\begin{array}{r} m^2 + mn + n^2 \\ 2m^2 - 3mn + 4n^2 \\ -m^2 + mn - 2n^2 \\ \hline 2n^2 - mn + 3n^2 \\ \hline \end{array}$$

(vii)
$$\begin{array}{r} 3x^2 - 4x^2 + 5x + 1 \\ x^3 + 2x^2 - 3x + 4 \\ 4x^3 - 3x^2 + 4x - 5 \\ \hline 8x^3 - 5x^2 + 6x \\ \hline \end{array}$$

7. (i) $8a - 5a = 3a$

(ii) $4x - 7x = -3x$

(iii) $(x + 1) - (-2x)$

$= x + 1 + 2x$

$= 3x + 1$

(iv) $-x - (2x + 1)$

$= -x - 2x - 1$

$= -3x - 1$

(v)
$$\begin{array}{r} 7a + 8b \\ 2a + 3b \\ - \quad - \\ \hline 5a + 5b \\ \hline \end{array}$$

(vi)
$$\begin{array}{r} 4a + 2b - 3c \\ 3a - b + c \\ - \quad + \quad - \\ \hline a + 3b - 4c \\ \hline \end{array}$$

(vii)
$$\begin{array}{r} 2x + y - 3z \\ x - 2y - 3z \\ - \quad + \quad + \\ \hline x + 3y + 6z \\ \hline \end{array}$$

8. $1 - (5x^4 - 4x^3 + 3x^2 - 2x)$

$1 - 5x^4 + 4x^3 - 3x^2 + 2x$

9.

Helpful Hint
Subtract to get the term that will be added.

$$\begin{array}{r} 3a^3 - 3a^2 + 3a - 1 \\ a^3 + 3a^2 - 3a + 1 \\ - \quad - \quad + \quad - \\ \hline 2a^3 - 6a^2 + 6a - 2 \\ \hline \end{array}$$

10. $a^4 + 0 + 0 + 0 - 1$

$$\begin{array}{r} a^4 - 4a^3 + 6a^2 - 4a + 1 \\ - \quad + \quad - \quad + \quad - \\ \hline 4a^3 - 6a^2 + 4a - 2 \\ \hline \end{array}$$

$\therefore$ $a^4 - 4a^3 + 6a^2 - 4a + 1$ should be subtracted from $a^4 - 1$ to get

$a^4 - 4a^3 + 6a^2 - 4a + 1$

11.

Helpful Hint
First find the sum, then Subtract.

Add:
$$\begin{array}{r} -a^2 + 2a + 3 \\ 3a^2 - 4a + 5 \\ \hline 2a^2 - 2a + 8 \\ \hline \end{array}$$

Subtract:
$$\begin{array}{r} 2a^2 - 2a + 8 \\ a^2 - a + 1 \\ - \quad + \quad - \\ \hline a^2 - a + 7 \\ \hline \end{array}$$

12.

Helpful Hint
First find the two sums and then subtract.

OXFORD UNIVERSITY PRESS

Step 1: $l - m + 2n$

Add $3l - 2m + n$

$4l - 3m + 3n$

$4l + 5m - 6n$

$8l + 2m - 3n$

Step 2: $l + m + n$

Add $2l + 3m + 4n$

$3l + 4m + 5n$

Now subtract the two sums.

$8l + 2m - 3n$

$3l + 4m + 5n$

$- \quad - \quad -$

$5l - 2m - 8n$

13. (i) A + B + C

A: $x - y + z$

B: $2x - 3y + 4z$

$3x - 4y + 5z$ [A + B]

C: $4x - 5y - 6z$ [add C]

$7x - 9y - z$

(ii) A – B + C

Step 1: A – B

Subtract

A: $x - y + z$

B: $2x - 3y + 4z$

$- \quad + \quad -$

$-x + 2y - 3z$

C: $4x - 5y - 6z$ [add C]

$3x - 3y - 9z$

(iii) A + B – C

Step 1: A + B

A: $x - y + z$

B: $2x - 3y + 4z$

$3x - 4y + 5z$

C: $4x - 5y - 6z$ [subtract C]

$- \quad + \quad +$

$-x + y + 11z$

14. (i) $a + 2b - 3c - 4a - b + 2c$

Step 1: Collect like terms, without changing signs

$\underline{a - 4a} + \underline{2b - b} - \underline{3c + 2c}$

Step 2: Simplify terms

$-3a + b - c$

(ii) $l + m - 3n - m + 2l + 3n + 2m$

$= l + 2l + \cancel{m} - \cancel{m} + 2m - \cancel{3n} + \cancel{3n}$

$= 3l + 2m$

(iii) $(a^2 + 2a + 1) - (b^2 + 2a - 1)$

Step 1: Open brackets. Remember the sign outside the bracket is multiplied by each term within the bracket.

$a^2 + 2a + 1 - b^2 - 2a + 1$

$= a^2 + \cancel{2a} - \cancel{2a} - b^2 + 1 + 1$

$= a^2 - b^2 + 2$

Exercise 7C

Helpful Hint

Follow the order as given below in each sum.

1st Solve the vinculum: ———

2nd Solve the inner brackets: Parenthesis: ( )

3rd Solve the middle brackets. brackets : { }

4th Solve the outer most brackets: brackets [ ].

1. $5x - \{3x + (4x - 2x)\}$

$= 5x - \{3x + 2x\}$ (simplify Parenthesis first)

$= 5x - \{5x\}$ (simplify bracket)

$= 5x - 5x$

$= 0$

2.

Helpful Hint

Remember: If there is a negative sign outside the brackets, it is always better to solve in two steps, to avoid making an error.

Simplify parenthesis first.

$8a - \{4a - (3a + 5a)\}$

$= 8a - \{4a - (8a)\}$

$= 8a - \{4a - 8a\}$

$= 8a - \{-4a\}$

$= 8a + 4a$

$= 12a$

3. $a + 3b - (b - 3a) - \{a - 2b - (a + 2b)\}$

$= a + 3b - b + 3a - \{a - 2b - a - 2b\}$

$= a + 3a + 3b - b - \{-4b\}$

$= 4a + 2b + 4b$

$= 4a + 6b$

4. $3\{a - 2\,(b - \overline{a - b})\}$

$= 3\{a - 2\,(b - a + b)\}$ (simplify vinculum first)

$= 3\{a - 2\,(-a + 2b)\}$

$= 3\{a + 2a - 4b\}$

$= 3\{3a - 4b\}$

$= 9a - 12b$

5. $5a - [3b - \{4a - (5b - \overline{6a - 7b})\}]$

$= 5a - [3b - \{4a - (5b - 6a + 7b)\}]$

$= 5a - [3b - \{4a - (-6a + 12b)\}]$

$= 5a - [3b - \{4a + 6a - 12b\}]$

$= 5a - [3b - \{10a - 12b\}]$

$= 5a - [3b - 10a + 12b]$

$= 5a - [-10a + 15b]$

$= 5a + 10a - 15b$

6. $7a - 4b - [5a - 3\{b - 2(a - b)\}]$

$= 7a - 4b - [5a - 3\{b - 2a + 2b\}]$

$= 7a - 4b - [5a - 3\{-2a + 3b\}]$

$= 7a - 4b - [5a + 6a - 9b]$

$= 7a - 4b - [11a - 9b]$

$= 7a - 4b - 11a + 9b$

$= 7a - 11a - 4b + 9b$

$= -4a + 5b$

7. $a - [b - c + a - \{b - (c - a - \overline{a - b})\}]$

$= a - [b - c + a - \{b - (c - a - a + b)\}]$

$= a - [b - c + a - \{b - (c - 2a + b)\}]$

$= a - [b - c + a - \{b - c + 2a - b\}]$

$= a - [b - c + a - \{-c + 2a\}]$

$= a - [b - c + a + c - 2a]$

$= a - [-a + b]$

$= a + a - b$

$= 2a - b$

8. $10\,a - [4\{5a - 3(a - 1)\} - 3(4a - \overline{3a + 1})]$

$= 10\,a - [4\{5a - 3a + 3\} - 3(4a - 3a - 1)]$

$= 10\,a - [4\{2a + 3\} - 3(a - 1)]$

$= 10\,a - [8a + 12 - 3a + 3]$

$= 10\,a - [5a + 15]$

$= 10\,a - 5a - 15$

$= 5a - 15$ *or* $5\,(a - 3)$

9. $2(a^2 - b^2) - 3[a^2 - \{b^2 - a^2 + (a^2 - b^2 - a^2)\}]$

$= 2\,a^2 - 2b^2 - 3[a^2 - \{\cancel{b^2} - \cancel{a^2} + \cancel{a^2} - b^2 - a^2\}]$

$= 2\,a^2 - 2b^2 - 3[a^2 - (-a^2)]$

$= 2a^2 - 2b^2 - 3[a^2 + a^2]$

$= 2a^2 - 2b^2 - 3[2a^2]$

$= 2a^2 - 2b^2 - 6a^2$

$= 2a^2 - 6a^2 - 2b^2$

$= -4a^2 - 2b^2$

$= -2\,(2a^2 + b^2)$

10. $ab - [bc - \{ca + ab + (bc - \overline{ca - ab})\}]$

$= ab - [bc - \{\cancel{ca} + ab + bc - \cancel{ca} + ab\}]$

$= ab - [bc - \{2ab + bc\}]$

$= ab - [\cancel{bc} - 2ab - \cancel{bc}]$

$= ab + 2ab = 3ab$

OXFORD UNIVERSITY PRESS

11. (i) $\frac{5}{2x} + \frac{y}{2x}$

$= \frac{5+y}{2x}$ (LCM is $2x$)

(ii) $24 - 8y^2 + z^2$

$= 8(3 - y^2) + z^2$ (take 8 common)

(iii) $xy + zx + ax$

$= x(y + z + a)$ (take x common)

(iv) $x^2y + x^2y^2 + x^2y^3$

$= x^2y(1 + y + y^2)$ (take x^2y common)

12. (i) +4 +4 +4 +4 +4 +4 +4

5, 9, 13, 17, 21, 25, 20, 31,

Rule: add 4 to each term.

(ii) –4 –4 –4 –4 –4 –4 –4

40, 36, 32, 28, 24, 20, 16, 12,

Rule: subtract 4 from each term.

(iii) ×10 ×10 ×10 ×10 ×10 ×10 ×10

0.003, 0.03, 0.3, 3, 30, 300, 3000, 30000

Rule: multiply each term by 10.

13. (i) n^{th} team = $6n$

Let $n = 1$, then $6 \times 1 = 6$

Let $n = 2$, then $6 \times 2 = 12$

Let $n = 3$, then $6 \times 3 = 18$

Let $n = 4$, then $6 \times 4 = 24$

Let $n = 5$, then $6 \times 5 = 30$

∴ first five terms of the sequence are:
6, 12, 18, 24, 30.

(ii) n^{th} team = $n + 3$

Let $n = 1$, then $1 + 3 = 4$

Let $n = 2$, then $2 \times 3 = 5$

Let $n = 3$, then $3 \times 3 = 6$

Let $n = 4$, then $4 \times 3 = 7$

Let $n = 5$, then $5 \times 3 = 8$

∴ first five terms of the sequence are:
4, 5, 6, 7, 8.

(iii) n^{th} team = $2n - 1$

Let $n = 1$, then $2(1) - 1 = 1$

Let $n = 2$, then $2(2) - 1 = 3$

Let $n = 3$, then $2(3) - 1 = 5$

Let $n = 4$, then $2(4) - 1 = 7$

Let $n = 5$, then $2(5) - 1 = 9$

∴ first five terms of the sequence are:
1, 3, 5, 7, 9.

(iv) n^{th} team = $4n - 4$

Let $n = 1$, then $4(1) - 4 = 0$

Let $n = 2$, then $4(2) - 4 = 4$

Let $n = 3$, then $4(3) - 4 = 8$

Let $n = 4$, then $4(4) - 4 = 12$

Let $n = 5$, then $4(5) - 4 = 16$

∴ first five terms of the sequence are:
0, 4, 8, 12, 16.

(v) n^{th} team = $2n + 5$

Let $n = 1$, then $2(1) + 5 = 7$

Let $n = 2$, then $2(2) + 5 = 9$

Let $n = 3$, then $2(3) + 5 = 11$

Let $n = 4$, then $2(4) + 5 = 13$

Let $n = 5$, then $2(5) + 5 = 15$

∴ first five terms of the sequence are:
7, 9, 11, 13, 15.

(v) n^{th} team = $6n - 3$

Let $n = 1$, then $6(1) - 3 = 3$

Let $n = 2$, then $6(2) - 3 = 9$

Let $n = 3$, then $6(3) - 3 = 15$

Let $n = 4$, then $6(4) - 3 = 21$

Let $n = 5$, then $6(5) - 3 = 27$

∴ first five terms of the sequence are:
3, 9, 15, 21, 27.

OXFORD UNIVERSITY PRESS

14.

Helpful Hint
For the 15th term of the sequence $n = 15$

The rule of the sequence 2, 7, 12, 22, ... is $5n - 3$.

The 15th term of the sequence $5n - 3$ will be:

$= 5(15) - 3$

$= 75 - 3 = 72$

$\therefore$ the 15th term of the sequence is 72.

15. (i) The rule of the sequence 7, 9, 11, 13, 15, ... is $2n + 5$.

The 20th term of the sequence $2n + 5$ will be:

$= 2(20) + 5$

$= 40 + 5 = 45$

$\therefore$ the 20th term of the sequence is 45.

(ii) The rule of the sequence 4, 9, 14, 19, 24,... is $5n - 1$.

The 20th term of the sequence $5n - 1$ will be:

$= 5(20) - 1$

$= 100 - 1 = 99$

$\therefore$ the 20th term of the sequence is 99.

Multiple Choice Questions 7

1. Option A: $x = y = a = 2$

Reason: Calculating the value of x, y, a, and b gives us the correct answer.

Given:

$x + 3 = 5$	$3 + y = 5$
$2 + 3 = 5$	$3 + 2 = 5$
$\therefore x = 2$	$\therefore y = 2$
$a - 1 = 1$	$2 \times 2 = b$
$2 - 1 = 1$	$4 = b$
$\therefore a = 2$	

Option B, C and D are clearly incorrect

2. Option D: None of the above

Reason: When value of a is calculated it equals to 71.66, but it is not a whole number as required.

Option A, B, and C are incorrect.

3. Option A: 1

Reason: When the value of $\frac{3ab - 2ac}{3ab}$ is calculated with the given values, that is a = 1, $b = 2$ and $c = 0$

$= \frac{3(1)(2) - 2(1)(0)}{3(1)(2)}$

$= \frac{6 - 0}{6} = 1$

Options B, C, and D are clearly incorrect.

4. Option B: x

Reason: Simplification of the given expression gives x.

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

$= 2x + \cancel{y} - x - \cancel{y}$

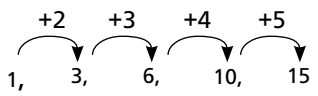
$= 2x - x$

$= x$

Option A, C, and D are clearly in correct.

5. Option D : 15

Reason: Rule of the sequence is add 2, then add 3, than add 4. Therefore, the next term will be found by adding 5 to the previous term.



Option A, B, and C are incorrect.

OXFORD UNIVERSITY PRESS

6. Option B: Square each term of the sequence 1, 2, 3, 4, 5, ...

   Option A, C, and D are incorrect as they do not follow the correct rule of the sequence.

OXFORD UNIVERSITY PRESS

8 LINEAR EQUATIONS

Exercise 8

1. In these statements each word has a specific meaning.

   (i) Increased by 5: implies more than 5.
   is 12: implies equal to 12
   Let the number be 'x'. Therefore, the equation will be:
   $x + 5 = 12$

   (ii) Twice a number: implies two times the number.
   decreased by 3: implies subtract 3 from the number
   is 15: implies equal to 15
   Let the number be 'x'. Therefore, the equation will be:
   $2x - 3 = 15$

   (iii) Four times a number: implies 4 times the number
   six less: implies subtract 6 from the number
   is 30: implies equal to 30.
   Let the number be 'x'. Therefore, the equation will be:
   $4x - 6 = 30$

   (iv) One-fifth of a number: implies the number is divided by 5
   Let the number be 'x'. Therefore, the equation will be:
   $\frac{x}{5} + 6 = 10$

   (v) Two-third of a number: implies $\frac{2}{3}$ of the number
   subtracted from 8: implies 8 is written first
   Let the number be 'x'. Therefore, the equation will be:
   $8 - \frac{2}{3}x = 4$

   (vi) Let the quotient of the number be 'x'. Therefore, the equation will be:
   $\frac{x}{3} + 4 = 7$

   (vii) Consecutive odd numbers: implies x and $(x + 2)$
   Let the number be 'x'. Therefore, the equation will be:
   $x + (x + 2) = 12$

   (viii) Here two ages are to be considered, that is present age and then the age after 12 years.

   Helpful Hint
   In such type of questions, always suppose the present age.

   Let the present age = x
   4 times the present age = $4x$
   age after 12 years = $x + 12$
   $\therefore x + 12 = 4x$

2. (i) $x + 2 = 7$
   [Remember linear equations can be solved by balancing method or by transposition of terms.]
   $x + \cancel{2} - \cancel{2} = 7 - 2$ (subtracting 2 from both sides)
   $\therefore x = 5$
   Method 2:
   $x = 7 - 2$ (by transposition)
   $\therefore x = 5$
   [Note: Teachers and students can adopt any method for finding the value of the unknown quantity.]

OXFORD UNIVERSITY PRESS

(ii) $3x - 1 = 23$

$3x = 23 + 1$ (by transposition)

$3x = 24$

$\frac{3x}{3} = \frac{24}{3}$ (dividing both sides by 3)

$\therefore x = 8$

OR

$3x - 1 + 1 = 23 + 1$ (adding 1 on both sides)

$3x = 24$

$\frac{3x}{3} = \frac{24}{3}$ (dividing both sides by 3)

$\therefore x = 8$

(iii) $5x + 7 = 2(x + 2)$

$5x + 7 = 2x + 4$ (removing brackets)

$5x - 2x = 4 - 7$ (by transposition)

$3x = -3$

$\frac{3x}{3} = \frac{-3}{3}$ (dividing both sides by 3)

$\therefore x = -1$

(iv) $5x - 1 = 44$

$5x = 44 + 1$ (by transposition)

$5x = 45$

$\frac{5x}{5} = \frac{45}{5}$ (dividing both sides by 5)

$\therefore x = 9$

(v) $13t - 14 = 3t + 16$

$13t - 3t = 16 + 14$ (by transposition)

$10t = 30$

$\frac{10t}{10} = \frac{30}{10}$ (dividing both sides by 10)

$\therefore t = 3$

(vi) $3(t-1) - 2(2t + 3) = 5(t + 3)$

$3t - 3 - 4t - 6 = 5t + 15$ (removing brackets)

$3t - 4t - 3 - 6 = 5t + 15$ (collecting like terms)

$-t - 9 = 5t + 15$

$-t - 5t = 15 + 9$ (by transpositions)

$-6t = 24$

$\frac{-6t}{-6} = \frac{24}{-6}$ (dividing both sides by – 6)

$\therefore t = -4$

(vii) $14(2t - 3) - 2(t + 2) = 10(3t - 4)$

$28t - 42 - 2t - 4 = 30t - 40$ (removing brackets

$28t - 2t - 42 - 4 = 30t - 40$ (collecting like terms)

$26t - 46 = 30t - 40$

$26t - 30t = -40 + 46$ (by transposition)

$-4t = 6$

$\frac{-4t}{-4} = \frac{6}{-4}$ (dividing both sides by –4)

$t = \frac{6}{-4}$

$\therefore t = -\frac{3}{2}$ or $-1\frac{1}{2}$

(viii) $\frac{3x}{4} - 5 = 2x$

$\frac{3x}{4} = 2x + 5$ (by transposition)

$3x = 4(2x + 5)$ (by transposition)

$3n = 8x + 20$ (remove brackets)

$3x - 8x = 20$ (by transposition)

$-5x = 20$

$\frac{-5x}{-5} = \frac{20}{-5}$ (dividing both sides by – 5)

$\therefore x = -4$

(ix) $-0.2(x - 2.5) = 52.8$

$= -02x + 0.5 = 52.8$

$= -0.2x = 52.8 - 0.5$

$= -0.2x = 52.3$

$x = \frac{52.3}{-0.2}$

$x = -26.15$

(x) $4(2.8 - x) = -3.8 - x$

$11.2 - 4x = -3.8 - x$

$-4x + x = -3.8 - 11.2$

$\cancel{-}3x = \cancel{-}15$

$x = \frac{15}{3}$

$x = 5$

OXFORD UNIVERSITY PRESS

(xi) $0.2(x + 1) - 0.3(x - 1) = 0.4(x + 5)$

$= 0.2x + 0.2 - 0.3x + 0.3 = 0.4x + 2$

$= -0.1x + 0.5 = 0.4x + 2$

$= -x - 0.4x = 2 - 0.5$

$= -0.5x = 1.5$

$x = \frac{1.5}{-0.5} = -\frac{15}{5}$

$x = -3$

(xii) $\frac{1}{3}(1 + x) = \frac{1}{2}(1 - x)$

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

$2(1 + x) = 3(1 - x)$

$2 + 2x = 3 - 3x$

$2x + 3x = 3 - 2$

$5x = 1$

$x = \frac{1}{5}$

(xiii) $\frac{3}{4}(1 + x) = \frac{1}{4}(5 + x)$

$\frac{3 + 3x}{4} = \frac{5 + x}{4}$

$3 + 3x = 5 + x$

$3x - x = 5 - 3$

$2x = 2$

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

$x = 1$

(xiv) $\frac{1}{6}(x + 5) = \frac{5}{12}(x + 9)$

$\frac{x + 5}{6} = \frac{5x + 45}{12}$

$12(x + 5) = 6(5x + 45)$

$12x + 60 = 30x + 270$

$12x - 30x = 270 - 60$

$-18x = 210$

$x = -\frac{210}{18}$

$x = -\frac{35}{3}$ or $-11\frac{2}{3}$

(xv) $\frac{7 - x}{8} = \frac{3}{4}$

$4(7 - x) = 3 \times 8$

$28 - 4x = 24$

$-4x = 24 - 28$

$-4x = -4$

$x = 1$

(xvi) $\frac{2x - 5}{7x - 3} = \frac{5}{4}$

$4(2x - 5) = 5(7x - 3)$

$8x - 20 = 35x - 15$

$8x - 35x = -15 + 20$

$-27x = 5$

$x = -\frac{5}{27}$

(xvii) $\frac{3 - x}{7} = \frac{4 - x}{5}$

$5(3 - x) = 7(4 - x)$

$15 - 5x = 28 - 7x$

$-5x + 7x = 28 - 15$

$2x = 13$

$x = \frac{13}{2}$ or $6\frac{1}{2}$

(xviii) $\frac{2x + 2}{6} = \frac{3x - 3}{30}$

$30(2x + 2) = 6(3x - 3)$

$60x + 60 = 18x - 18$

$60x - 18x = -18 - 60$

$42x = -78$

$x = \frac{-78}{42}$

$x = -\frac{13}{7}$ or $-1\frac{6}{7}$

3.

Helpful Hint

Convert the sentences to algebraic expressions and equations.

Suppose Shirin's present age = x years

Her father's present age = $4x$ years

(4 times, her age 'x')

After 18 years Shirin's age will be: $(x + 18)$ yrs.

After 18 years her father's age will be:

OXFORD UNIVERSITY PRESS

$(4x + 18)$ years

Father Shirin

$\therefore 4x + 18 = 2(x + 18)$ (2 times Shirin's age)

$4x + 18 = 2x + 36$

$4x - 2x = 36 - 18$

$2x = 18$

$x = 9$

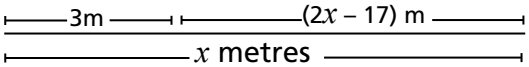
$\therefore$ Shirin's present age = 9 years

Her father's present age = $4x = 4 \times 9 = 36$ years

4. Total length of the pole = x metres

One part = 3 metres

Second part = $(2x - 17)$metres



$\therefore$ Length of the pole:

$x = 3 + (2x - 17)$

$x = 3 + 2x - 17$

$x - 2x = 3 - 17$

$\cancel{-}\, x = \cancel{-}\, 14$

$\therefore$ length of pole is 14 metres

Check:

$x = 3 + (2x - 17)$

$14 = 3 + (2 \times 14 - 17)$

$14 = 3 + (28 - 17)$

$14 = 3 + 11$

$14 = 14$

LHS = RHS

5. Let the number be 'x'

Triple the number = $3x$

Increase the result by 5: $3x + 5$

$\therefore 3x + 5 = 44$

$3x = 44 - 5$ (by transposition)

$3x = 39$

$x = 13$ (dividing both sides by 3)

$\therefore$ the number is 13

Check:

$3x + 5 = 44$

$3 \times 13 + 5 = 44$

$39 + 5 = 44$

$44 = 44$

LHS = RHS

6. Let the number be 'x'

Twice the number : $2x$

half the number : $\frac{x}{2}$

$\therefore 2x + \frac{x}{2} = 20$

$\frac{4x + x}{2} = 20$ (find LCM)

$\frac{5x}{2} = 20$ (by transposition)

$5x = 40$ (dividing both sides by 5)

$\therefore x = 8$

Check:

$2x + \frac{x}{2} = 20$

$2 \times 8 + \frac{8}{2} = 20$

$16 + 4 = 20$

$20 = 20$

LHS = RHS

7. Let the number be 'x'

Thrice the number : $3x$

Number decreased by 5 : $3x - 5$

Twice the number : $2x$

Exceeds by 1 unit : $2x + 1$

$\therefore 3x - 5 = 2x + 1$

$3x - 2x = 1 + 5$

$x = 6$

Check:

$3x - 5 = 2x + 1$

$3(6) - 5 = 2(6) + 1$

$18 - 5 = 12 + 1$

$13 = 13$

LHS = RHS

OXFORD UNIVERSITY PRESS

8. Let the first even number be 'x'
then the second even number is : $(x + 2)$
the third even number is: $(x + 2) + 2 = x + 4$
$\therefore$ Sum of three even numbers:
$x + (x + 2) + (x + 4) = 36$
$x + x + 2 + x + 4 = 36$
$x + x + x + 2 + 4 = 36$ (collecting like terms)
$3x + 6 = 36$
$3x = 36 - 6$ (by transposition)
$3x = 30$
$\frac{3x}{3} = \frac{30}{3}$ (dividing both terms by 3)
$x = 10$
Check:
$x + (x + 2) + (x + 4) = 36$
$10 + (10 + 2) + (10 + 4) = 36$
$10 + 12 + 14 = 36$
$36 = 36$
LHS = RHS

9. Suppose Mona's age is 'x' years
$\therefore$Sana's age is : $(x + 18)$ years
After 6 years Mona's age: $(x + 6)$ years
After 6 years Sana's age: $(x + 18) + 6 = x + 24$
$\therefore x + 24 = 2(x + 6)$
$x + 24 = 2x + 12$
$24 - 12 = 2x - x$
$12 = x$
$\therefore$ Mona's present age $= x = 12$ years
Sana's present age $= x + 24 = 12 + 24 = 36$
Check:
$x + 24 = 2(x + 6)$
$12 + 24 = 2(12 + 6)$
$36 = 2(18)$
$36 = 36$
LHS = RHS

10. Let the cost of the pen be Rs x.
Twice the cost of the pen is Rs $2x$
cost of book is Rs 8 more: Rs $(2x + 8)$
cost of the book + cost of the pen = Rs 50
$(2x + 8) + x = 50$
$2x + 8 + x = 50$
$3x + 8 = 50$
$3x = 50 - 8$
$3x = 42$
$x = 14$
$\therefore$ cost of the pen is Rs x = Rs 14
cost of the book is Rs $(2x + 8)$ = Rs $(2 \times 14 + 8)$
= Rs 36
Check:
$(2x + 8) + x = 50$
$2 \times 14 + 8 + 14 = 50$
$28 + 8 + 14 = 50$
$50 = 50$
LHS = RHS

11. Let the man's present age be 'x' years.
12 years ago his age was: $(x - 12)$ years
After 12 years his age will be: $x + 12)$ years
$\therefore 2(x - 12) = x + 12$
$2x - 24 = x + 12$
$2x - x = 12 + 24$
$x = 36$
$\therefore$ Man's present age $= x = 36$ years
Check:
$2(x - 12) = x + 12$
$2(36 - 12) = 36 + 12$
$2(24) = 48$
$48 = 48$
LHS = RHS

Multiple Choice Questions 8

1. Option A: 8
Reason: According to the statement:
$x - 4 = \frac{x}{2}$
$2x - 8 = x$
$2x - x = 8$
$\therefore x = 8$
Option B, C, and D are clearly incorrect.

OXFORD UNIVERSITY PRESS

2. Option C: 4
Reason: According to the statement:

$4x + 8 = 24$

$4x = 24 - 8$

$4x = 16$

$x = 4$

Option A, B, and D are clearly incorrect.

3. Option D: In linear equations, power of the variable is always 1.
Reason: By definition a linear equation has one variable.
Option A, B, and C are clearly incorrect,

4. Option D: All the above options are true
Reason: Accordingly to the statement:

$3(x - 5) = x + 5$

$3x - 15 = x + 5$

$3x - x = 5 + 15$

$2x = 20$

$\therefore x = 10$

Since Ronnie's present age is 10, therefore, option A, B, and C are all true statements.

OXFORD UNIVERSITY PRESS

4 Revision 4: Algebra

1. (i) d (ii) c (iii) a (iv) e (v) b

2. Given $x = 2$, $y = -1$, $z = 3$

(i) $2x + 3y - z$
$= 2(2) + 3(-1) - 3$
$= 4 - 3 - 3$
$= -2$

(ii) $5y^2 - x + z$
$= 5(-1)^2 - 2 + 3$
$= 5 - 2 + 3$
$= 6$

(iii) $3y^2 + 2x - 3z$
$= 3(-1)^2 + 2(2) - 3(3)$
$= 3 + 4 - 9$
$= -2$

(iv) $\frac{1}{2}x^2 - \frac{1}{3}z + y$
$= \frac{1}{2}(2)^2 - \frac{1}{3}(3) + (-1)$
$= \frac{1}{\cancel{2}} \times \overset{2}{\cancel{4}} - \frac{1}{\cancel{3}} \times \overset{1}{\cancel{3}} - 1$
$= 2 - 1 - 1$
$= 0$

(v) $\frac{1}{9}z^2 - y + x$
$= \frac{1}{9}(3)^2 - (-1) + 2$
$= \frac{1}{\cancel{9}} \times \cancel{9} + 1 + 2$
$= 1 + 1 + 2$
$= 4$

3. (ii) and (iii)

4. (i) Two (ii) Three
(iii) Two (iv) One
(v) Three (vi) Three
(vii) Two (viii) Two
(ix) One (x) One

5. (i) -2 (ii) $\frac{1}{2}a$ (iii) pqr
(iv) $-7ab^2y$ (v) $14yz$

6.
$$\begin{array}{r} a - 2b + c \\ -2a + b - 3c \\ -3a + 2b - c \\ \hline -4a + b - 3c \end{array}$$

7.
$$\begin{array}{r} a + 2b - c \\ 2a - b + 3c \\ - \quad + \quad - \\ \hline -a + 3b - 4c \end{array}$$

8.
$$\begin{array}{r} x + 2y - z \\ 2x - y + z \\ - \quad + \quad - \\ \hline -x + 3y - 2z \end{array}$$

9.
$$\begin{array}{r} 2x + y + z \\ x - y + 3z \\ - \quad + \quad - \\ \hline x + 2y - 2z \end{array}$$

10. Sum:
$$\begin{array}{r} 2a^2 - 3ab + b^2 \\ a^2 + ab + b^2 \\ \hline 3a^2 - 2ab + 2b^2 \end{array}$$

Sum:
$$\begin{array}{r} 3a^2 + 2ab - b^2 \\ 2a^2 - 3ab + 3b^2 \\ \hline 5a^2 - ab + 2b^2 \end{array}$$

$$\begin{array}{r} 5a^2 - ab + 2b^2 \\ - \quad + \quad - \\ \hline -2a^2 - ab \end{array}$$

(Subtract the 2nd sum from the 1st sum)

OXFORD UNIVERSITY PRESS

11. $\frac{x}{5} = 2$

$\therefore x = 10$

Value of $3x - 2$

$= 3(10) - 2$

$= 30 - 2$

$= 28$

12. $2x - 3 = 1$

$2x = 1 + 3$

$2x = 4$

$x = \frac{4}{2} = 2$

$3y - 1 = 5$

$3y = 5 + 1$

$3y = 6$

$y = \frac{6}{3} = 2$

$\therefore x + 2y$

$2 + 2(2) = 2 + 4 = 6$

13. $4x - 1 = 11$

$4x = 11 + 1$

$4x = 12$

$x = \frac{12}{4} = 3$

$\therefore x^2 - x + 1$

$(3)^2 - 3 + 1$

$= 9 - 3 + 1$

$= 7$

14. (i) $3x - 4 = 17$

$3x = 17 + 4$

$3x = 21$

$x = \frac{21}{3} = 7$

(ii) $\frac{x+1}{2} = 5$

$x + 1 = 10$

$x = 10 - 1$

$x = 9$

(iii) $\frac{x-5}{3} = 1$

$x - 5 = 3$

$x = 3 + 5$

$x = 8$

(iv) $\frac{4x-70}{2} = 1$

$4x - 70 = 2$

$4x = 2 + 70$

$4x = 72$

$x = \frac{72}{4}$

$\therefore x = 18$

(v) $\frac{x}{7} - 3 = 2$

$\frac{x}{7} = 2 + 3$

$\frac{x}{7} = 5$

$\therefore x = 35$

or

$\frac{x}{7} - 3 = 2$

$\frac{x-21}{7} = 2$

$x - 21 = 14$

$x = 14 + 21$

$\therefore x = 35$

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

$\frac{3x - 2x}{6} = 1$

$= \frac{x}{6} = 1$

$\therefore x = 6$

(vii) $3x - \frac{x}{2} = 5$

$\frac{6x - x}{2} = 5$

$5x = 10$

$x = \frac{10}{5}$

$\therefore x = 2$

(viii) $\frac{x}{3} + \frac{3x}{2} = 11$

$\frac{2x + 9x}{6} = 11$

$11x = 66$

$x = \frac{66}{11}$

$\therefore x = 6$

OXFORD UNIVERSITY PRESS

15.

Let Tahir's present age = T

$\therefore$ Tahir's age 3 years ago = T – 3

Let Masood's present age = M

$\therefore$ Masood's age 3 years ago = M – 3

According to statements:

Sum of Tahir and Masood's present ages : T + M = 18..... equ. (i)

$\therefore$ M = 18 – T ..... equ. (ii)

3 years ago their ages were:

T – 3 = 3(M – 3)

T – 3 = 3M – 9

T – 3M = – 9 + 3

T – 3M = – 6 ..... equ. (iii)

Substitute the value of 'M' from equ. (ii) in equ. (iii)

T – 3(18 – T) = –6

T – 54 + 3T = –6

T + 3T = –6 + 54

4T = 48

$T = \frac{48}{4} = 12$

$\therefore$ Tahir's present age = 12 years.

Substitute the value of T in equ. (i).

T + M = 18

12 + M = 18

M = 18 –12 = 6

$\therefore$ Masood's present age = 6 years

16. Let the smaller number be 'x'

$\therefore$ Larger number = $x + 5$

Sum of numbers = 19

$\therefore x + x + 5 = 19$

$2x = 19 - 5$

$2x = 14$

$x = \frac{14}{2} = 7$

$\therefore$ smaller number = 7

$\therefore$ larger number $= x + 5$

$= 7 + 5 = 12$

17. Let the first odd number be 'x'

second odd number = $x + 2$

third odd number = $(x + 2) + 2 = x + 4$

Sum of three consecutive odd numbers = 39

$\therefore x + x + 2 + x + 4 = 39$

$3x + 6 = 39$

$3x = 39 - 6$

$3x = 33$

$x = \frac{33}{3}$

$\therefore x = 11$

$\therefore$ first odd number = 11

second odd number = $x + 2 = 11 + 2 = 13$

third odd number = $x + 4 = 11 + 4 = 15$

$\therefore$ three odd consecutive odd number are 11, 13, 15

Check:

11 + 13 + 15 = 39

18. Let the larger number be 'x'

then the smaller number = $x - 4$

$\therefore$ according to the statement

$3x + 4(x - 4) = 61$

$3x + 4x - 16 = 61$

$7x = 61 + 16$

$7x = 77$

$x = \frac{77}{7} = 11$

$\therefore$ the larger number is 11

$\therefore$ the smaller number is $x - 4 = 11 - 4 = 7$

Check:

3(11) + 4(11– 4) = 61

33 + 4(7) = 61

33 + 28 = 61

LHS = RHS

OXFORD UNIVERSITY PRESS

9 GEOMETRY: LINES AND ANGLES

Exercise 9A

1. (i) collinear points (ii) unlimited
   (iii) two points (iv) one; length
   (v) two

2. (i) False (ii) True (iii) False
   (iv) True (v) False

3. (i) line AB (ii) ray AB
   (iii) ray BA (iv) line segment AB

4. (i) infinite (ii) infinite
   (iii) only one

5. Student's examples will vary. For examples, parallel lines.

6. (i) six (ii) only one (iii) four

7. $\overline{AB}$; $\overline{BC}$; $\overleftrightarrow{AD}$; $\overrightarrow{DC}$

8. (i) $\overleftrightarrow{EF}$, $\overleftrightarrow{GH}$, $\overleftrightarrow{AC}$ and $\overleftrightarrow{BD}$ (ii) $\overleftrightarrow{AB}$, $\overleftrightarrow{AD}$ and $\overleftrightarrow{AC}$

9. Seven

Exercise 9B

1. (i) acute (ii) acute
   (iii) right (iv) obtuse
   (v) straight (vi) reflex
   (vii) acute (viii) complete
   (ix) reflex (x) reflex

2. (i) four right angles
   [One right angle = 90°]
   ∴ 4 right angles
   = 90° + 90° + 90 + 90 = 360°
   (ii) $2\frac{1}{2}$ right angles = 90° + 90° + 45° = 225°
   (iii) $\frac{2}{3}$ right angles = $\frac{2}{\cancel{3}_1} \times \cancel{90}^{30}° = 60°$
   (iv) $\frac{1}{2}$ right angles = $\frac{1}{\cancel{2}_1} \times \cancel{90}^{45}° = 45°$
   (v) $1\frac{1}{2}$ right angles = $\frac{3}{\cancel{2}_1} \times \cancel{90}^{45}° = 135°$

3. (i) right angle
   (ii) straight angle
   (iii) right angle
   (iv) acute
   (v) obtuse

4. (i) 270° (ii) 240° (iii) 210°

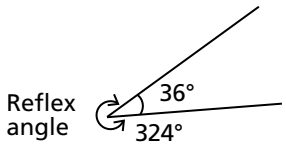
5.

Helpful Hint

First find $\frac{2}{5}$ of a right angle.

$\frac{2}{\cancel{5}_1} \times \cancel{90}^{18}° = 36°$

∴ reflex angle = 360° – 36° = 324°.



6.

Helpful Hint

Two angle are complementary if their sum equals to 90°. To find the complement of any angle subtract it from 90°.

(i) Complement of 70° is : 90° – 70° = 20°
(ii) 67° (iii) 31° (iv) 45°
(v) 90° (vi) 0° (vii) 10°
(viii) 79.5° (ix) 60° (x) 89.5°

7.

OXFORD UNIVERSITY PRESS

Helpful Hint

Two angles are supplementary if their sum equals 180°. To find supplement of any angle, subtract it from 180°.

(i) Supplement of 90° is:
180° – 90° = 90°

(ii) 100° (iii) 180° (iv) 0°

(v) 18° (vi) 95° (vii) 99.5°

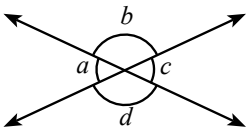
(viii) 80°

8. (i) ∠COA, ∠AOB

(ii) ∠TQP, ∠PQS; ∠PQS, ∠SQR; ∠SQR, ∠RQT; ∠RQT, ∠TQP.

(iii) ∠COA, ∠AOD; ∠AOD, ∠DOB; ∠DOB, ∠BOC; ∠BOC, ∠COA

9.



Given $a = 50°$

$\angle a + \angle b = 180°$ (supplementary angles)

$50° + \angle b = 180°$

$\angle b = 180° - 50°$

$\therefore \angle b = 130°$

Similarly, $\angle b + \angle c = 180°$ (supplementary angles)

$130° + \angle c = 180°$

$\angle c = 180° - 130°$

$\therefore \angle c = 50°$

or $\angle a = \angle c = 50°$ (vertically opposite angles)

And $\angle c + \angle d = 180°$

$50° + \angle d = 180°$ (supplementary angles)

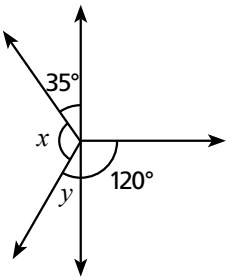
$\angle d = 180° - 50°$

$\therefore \angle d = 130°$

10.

Helpful Hint

Angles on a straight line add up to 180°



$\angle y + 90° = 120°$

$\angle y = 120° - 90°$

$\therefore \angle y = 30°$

$\angle y + \angle x + 35° = 180°$ (∠s on a st. line)

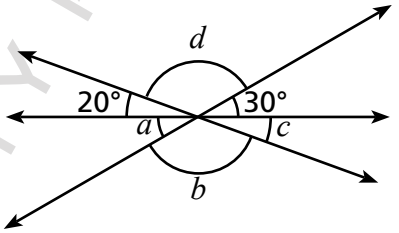
$30° + \angle x + 35° = 180°$

$\angle x + 65° = 180°$

$\angle x = 180° - 65°$

$\therefore \angle x = 115°$

11.



$\angle a = 30°$ (vertically opposite angles)

$\angle c = 20°$ (vertically opposite angles)

$\angle a + 20° + \angle d = 180°$ (∠s on a st. line)

$30° + 20° + \angle d = 180°$

$50° + \angle d = 180°$

$\angle d = 180° - 50°$

$\therefore \angle d = 130°$

$\angle b + \angle c + 30° = 180°$ (∠s on a st. line)

$\angle b + 20° + 30° = 180°$

$\angle b + 50° = 180°$

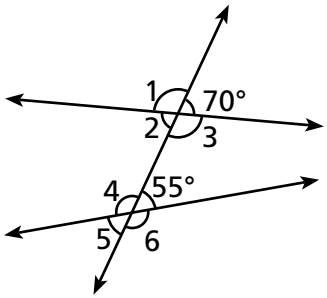
$\angle b = 180° - 50°$

$\therefore \angle b = 130°$

Hint: $\angle b$ and $\angle d$ are vertically opposite to each other, therefore, $\angle b = \angle d$. So, find either one of them and then equate.

OXFORD UNIVERSITY PRESS

12.



$70° + \angle 3 = 180°$ (supplementary angles)

$\angle 3 = 180° - 70°$

$\therefore \angle 3 = 110°$

$\angle 2 = 70°$ (vertically opposite angles)

$\angle 1 = \angle 3 = 110°$ (vertically opposite angles)

$\angle 5 = 55°$ (vertically opposite angles)

$\angle 4 + \angle 5 = 180°$ (supplementary angles)

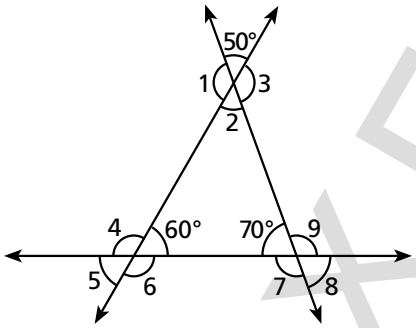
$\angle 4 + 55° = 180°$

$\angle 4 = 180° = 55°$

$\therefore \angle 4 = 125°$

$\angle 6 = \angle 4 = 125°$ (vertically opposite angles)

13.



$\angle 2 = 50°$ (vertically opposite angles)

$\angle 1 + 50° = 180°$ (supplementary angles)

$\angle 1 = 180° - 50°$

$\therefore \angle 1 = 130°$

$\angle 1 = \angle 3 = 130°$ (vertically opposite angles)

$\angle 5 = 60°$ (vertically opposite angles)

$\angle 4 + 60° = 180°$ (supplementary angles)

$\angle 4 = 180° - 60°$

$\therefore \angle 4 = 120°$

$\angle 4 = \angle 6 = 120°$ (vertically opposite angles)

$\angle 8 = 70°$ (vertically opposite angles)

$\angle 9 + 70° = 180°$

$\angle 9 = 180° - 70°$

$\therefore \angle 9 = 110°$

$\angle 7 = \angle 9 = 110°$ (vertically opposite angles)

Exercise 9C

1. Reason:

   All statements are completed by facts.

   (i) Lines that maintain a constant distance between them are Parallel.

   (ii) When a transversal intersects two parallel lines, four interior angles are formed.

   (iii) Sum of the interior angles on the same side of the transversal is equal to 180°.

   (iv) When a transversal intersects two parallel lines, the alternate angles are equal.

   (v) When a transversal intersects two parallel lines, corresponding angles are formed on same side of the transversal.

2. Reason:

   (i) False: Corresponding angles are equal to each other, therefore, they do not add up to 180°.

   (ii) True: By definition of alternate angles

   (iii) False: Transversal may or may not be perpendicular to parallel lines. Transversal can cut the parallel lines at any angle.

   (iv) False: Corresponding angles are equal, thus their same cannot be 360°.

   (v) False: When two parallel lines are cut by a transversal, the sum of interior angles is 180°, thus supplementary.

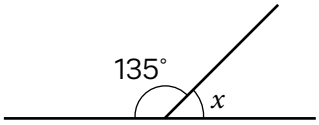
3. (i) Yes, the given lines are parallel to each other, because alternate angles are equal.

   (ii) No, the given lines an not be parallel to each other, because the corresponding angles are not equal.

OXFORD UNIVERSITY PRESS

(iii) Yes, the given lines are parallel to each other, because alternate angles are equal.

4. (i)

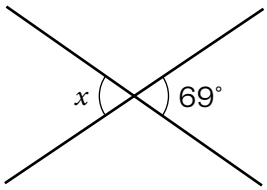


$135° + x = 180°$ (supplementary angles)

$x = 180° - 135°$

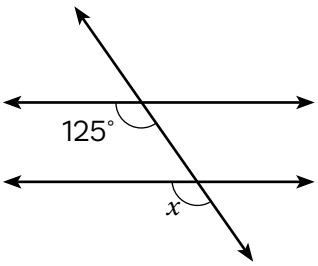
$x = 45°$

(ii)



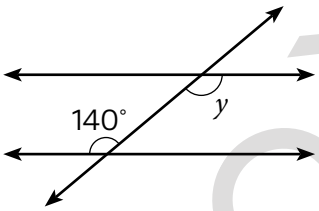
$\angle x = 69°$ (vertically opposite angles)

(iii)



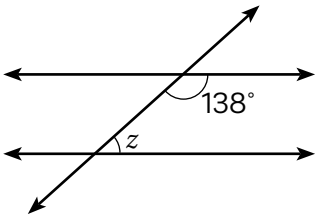
$\angle x = 125°$ (corresponding angles)

(iv)



$\angle y = 140°$' (alternate angles)

(v)

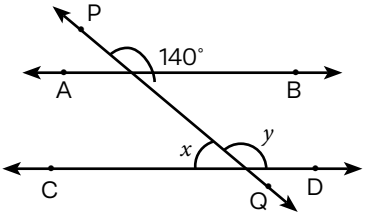


$\angle z + 138° = 180°$ (interior angles)

$\angle z = 180° - 138°$

$\angle z = 42°$

5.



Given:

$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$

$\overleftrightarrow{PQ}$ is a transversal.

$\angle y = 140°$ (corresponding angle are equal)

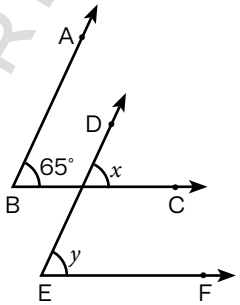
$\angle x + \angle y = 180°$ (supplementary angles add up to 180°)

$\angle x + 140° = 180°$

$\angle x = 180° - 140°$

$\angle x = 40°$

6.



$\overline{AB} \parallel \overline{ED}$

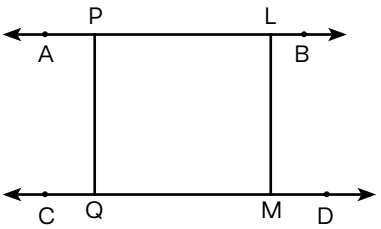
$\overline{BC} \parallel \overline{EF}$

$\angle x = 65°$ (corresponding angles)

$\angle x = \angle y$ (corresponding angles)

$\therefore \angle x = \angle y = 65°$

7.



Given:

$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$

$\overline{PQ} \perp \overleftrightarrow{AB}$

$\overline{LM} \perp \overleftrightarrow{CD}$

$\overline{PQ} = 1.4$ cm

OXFORD UNIVERSITY PRESS

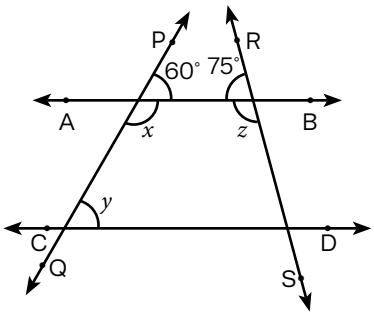
Helpful Hint:

The perpendicular distance between two parallel lines is always same.

Since, $m\,\overline{LM} = m\,\overleftrightarrow{PQ}$

Therefore, $m\,\overline{LM} = 1.4$ cm

8.



Given:

$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$

$\overleftrightarrow{PQ}$ and $\overleftrightarrow{RS}$ are two transversals.

$\angle x + 60° = 180°$ (supplementary angles)

$\angle x = 180° - 60°$

$\angle x = 120°$

$\angle x + \angle y = 180°$ (sum of interior angles)

$120° + \angle y = 180°$

$\angle y = 180° - 120°$

$\angle y = 60°$

Note: $\angle y$ can be found directly also.

$\angle y = 60°$ (corresponding angles)

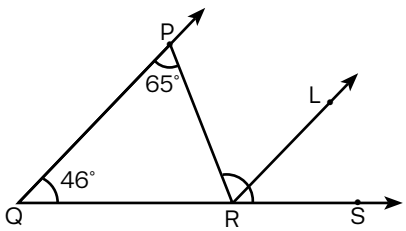
$75° + \angle z = 180°$ (supplementary angles)

$\angle z = 180° - 75°$

$\angle z = 180° - 75°$

$\therefore \angle z = 105°$.

9.



Given:

$\overrightarrow{RL} \parallel \overrightarrow{QP}$

$\angle PQR = 46°$

$\angle QPR = 65°$

$\angle PRS = ?$

$\angle PRL = \angle QPR = 65°$ (alternate angles)

$\angle PQR = \angle LRS = 46°$

Now,

$\angle PRS = \angle PRL + \angle LRS$

$\angle PRS = 65° + 46°$

$\angle PRS = 111°$

10.

Helpful Hint:

- The order of rotation depends on number of times the shape matches the original shape in one complete rotation of 360°.
- Remember, every shape has a rotational symmetry of order 1, as it will always come back to its original position after one complete rotation of 360°.

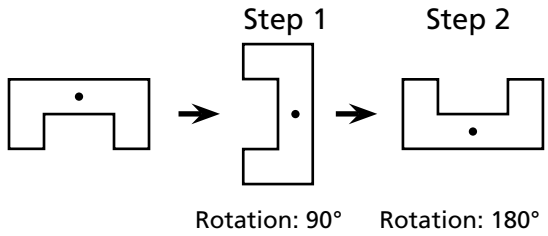
Order of rational symmetry of:

(i) letter H is two. (ii) letter N is two.

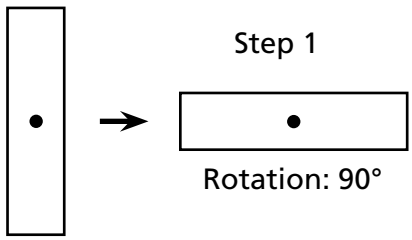
(iii) letter X is four. (iv) letter I is two.

(v) letter S is two.

11. (i)



(ii)



$\therefore$ the angle of rotation will be 90° to come to the required shape.

OXFORD UNIVERSITY PRESS

12. The given parallelogram has rotational symmetry of order 2.

Multiple Choice Questions 9

1. Option A: True
   Reason: By definition of concentric circles the statement is correct.
   Option B, C, and D are clearly incorrect.

2. Option C: Unlimited
   Reason: No matter at what degree a circle is rotated it will come back to its original shape.
   Option A, B, and D are clearly incorrect.

3. Option C: 3 dimensions
   Reason: A solid has length, breadth, and height which shows it has 3 dimensions.

4. Option D: A perpendicular can be drawn at the end point of a line segment.
   Option A, and B are incorrect because perpendicular can be drawn at any point on the line or outside the line. Therefore, it may not necessarily be a bisector.
   Option C, is incorrect, because two perpendicular lines make an angle of 90° with each other.

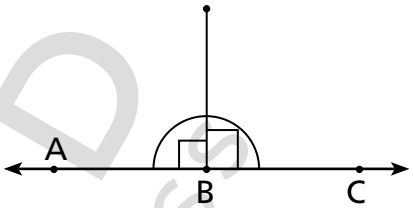
5. Option A: Line AB has a number of points, which can be counted.
   Reason: By definition a line has infinite (uncountable) number of points.
   Option B, C, and D are clearly incorrect.

6. Option C: 90°
   Reason: An acute angle is less than 90°.
   In option A, B, and D all are acute angles.

7. Option A: 130°
   Reason: An obtuse angle is more than 90°, but less than 180°.
   Option B: 240° is a reflex angle
   Option C: 198° is a reflex angle
   Option D: 180° is a straight angle

8. Option D: 180°
   Reason: By definition sum of angles of a triangle is 180°.
   Option A, B, and C are clearly incorrect.

9. Option C: True only when they are adjacent to each other
   Reason: Two adjacent right angles will make an angle of 180°
   ∠ABC = 180°



   Option A, B, and D are clearly incorrect

10. Option B: False
    Reason: An obtuse angle is less then 180°, and more than 90°. While two angles are supplementary if their sum is 180°. These two statements contradict each other.
    Option A, C, and D are clearly incorrect.

11. Option B: 90°
    Reason: Perpendicular lines make an angle of 90° to each other (⊥).
    Option A, C, and D are clearly incorrect.

12. Option D: 0°
    Reason: Two parallel lines never meet, so they do not make an angle.
    Option A, B, and C are clearly incorrect, because if an angle is formed between them, then it means that they are meeting at a point.

13. Option B: It overlaps the other line
    Option A, C, and D are clearly incorrect statements.

OXFORD UNIVERSITY PRESS

14. Option A: Vertically opposite angles.

Reason: By definition and can also be proved through an activity.

Option B is incorrect because supplementary angles are equal only when both the angles are of 90°.

Option C is incorrect because adjacent angles have common vertex and a common arm, but the angles are not necessarily equal.

Option D is incorrect because complementary angles are equal only when both the angles measure 45°.

15. Option C: Corresponding angles are equal.

Reason: By definition and can also be proved through an activity.

Option A, B, and D are clearly incorrect statement.

16. Option D: The distance between them remains the same.

Reason: The lines can only be parallel if they never meet, or do not intersect each other, and distance between them remains same.

Option A, B, and C are clearly incorrect statements

17. Option C: 96°, 94°

Reason: $96° + 94° \neq 180°$

Option A, B, and D are all correct pair of angles in each add up to 180°.

18. Option C : $\frac{5}{6}$ of 180°

Reason: $\frac{5}{\cancel{6}_1} \times \cancel{180}^{30} = 150°$ which is an obtuse angle.

Option A, B, and D all angles are acute.

19. Option B: Complementary angles

Reason: $x° + (90 - x)°$

$= x° + 90° - x°$

$= 90°$

For example if $x = 30°$, than

$(90 - x)° = 90° - 30°$

$= 60°$

$30° + 60° = 90°$

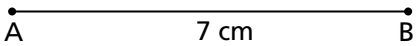
OXFORD UNIVERSITY PRESS

10 PRACTICAL GEOMETRY

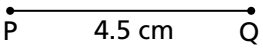
Exercise 10A

[Lines are not drawn to scale in these questions]

1. Step 1: Open the points of a pair of divider of any length of your choice.
   Step 2: Press the pointed ends on the note book.
   Step 3: Denote the two marks as A and B.
   Step 4: Join A to B.
   Step 5: Measure the length of $\overline{AB}$

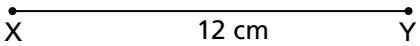


2. Step 1: Measure $\overline{AB}$.
   $\overline{AB}$ = 4.5 cm
   Step 2: Draw PQ = 4.5 cm



3. Step 1: Measure the given line segments.
   $\overline{EF}$ = 2 cm
   $\overline{CD}$ = 3.5 cm
   $\overline{GH}$ = 3.8 cm
   ∴ GH is the longest line segment

4. Steps of construction:
   Step 1: Measure $\overline{MN}$.
   $\overline{MN}$ = 6 cm
   Step 2: $\overline{XY}$ is double of $\overline{MN}$.
   ∴ $\overline{XY}$ = (6 + 6) cm = 12 cm
   Step 3: Draw $\overline{XY}$ = 12 cm



Exercise 10B

1. (i) ∠ ABC = 75°
   (ii) ∠ DEF = 90°
   (iii) ∠ XYZ = 108°
   (iv) ∠ RST = 34°

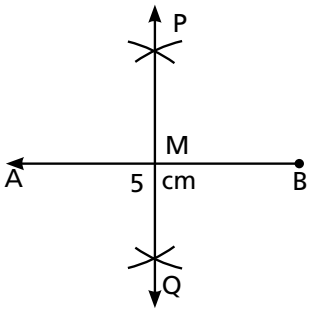
2.

Helpful Hint

Measure each pair of angles to check whether they are equal to less then or more than each other.

   (i) ∠ ABC is equal to ∠ DEF
   (ii) ∠ XYZ is greater than ∠ RST
   (iii) ∠ PQR is less than ∠ MNL

3. (i) Steps of construction:
   Step 1: Draw a line segment $\overline{AB}$ = 5 cm
   Step 2: With A as centre and a radius more than half of $\overline{AB}$, draw two arcs, one on each side of $\overline{AB}$ as shown.
   Step 3: With B as centre and with the same radius as before, draw two more arcs to cut the previous arcs at P and Q.
   Step 4: Join P to Q. Produce $\overline{PQ}$ in both directions to form $\overleftrightarrow{PQ}$.
   Step 5: Measure $\overline{AM}$ and $\overline{MB}$.
   $\overline{AM}$ = $\overline{MB}$ = 2.5 cm
   Therefore, $\overleftrightarrow{PQ}$ bisects the line segment $\overline{AB}$ at M.



Follow the same steps in (ii), (iii), (iv) and (v)

OXFORD UNIVERSITY PRESS

4. (i) Steps of construction:

Step 1: Draw $\overline{AB}$ = 4 cm. Mark a point N on it.

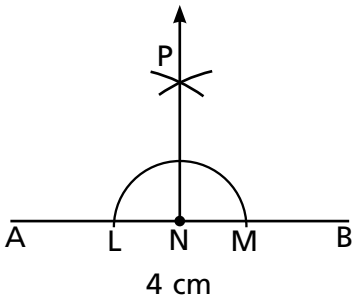
Step 2: With N as centre and with a suitable radius, draw an arc to intersect $\overline{AB}$ at L and M.

Step 3: With L as centre and a radius of more than $\overline{LM}$, draw an arc above AB.

Step 4: With M as centre and the same radius, draw another arc to intersect the previous arc at P.

Step 5: Join P and N.

$\overline{NP}$ is the required perpendicular to $\overline{AB}$



Follow the same steps of construction for:

(ii), (iii), (iv) and (v)

5. (i) Steps of construction:

Steps 1: Draw a line segment

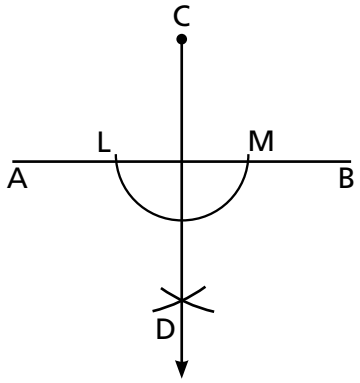
$\overline{AB}$ = 9 cm. Take a point C lying outside and above it.

Step 2: With C as centre and with a suitable radius, draw an arc to intersect $\overline{AB}$ at L and M.

Step 3: With L as centre, draw an arc with radius greater than half of $\overline{LM}$.

Step 4: With M as centre and the same radius, draw another arc to intersect the previous arc at D.

Step 5: Draw a line through C and D.

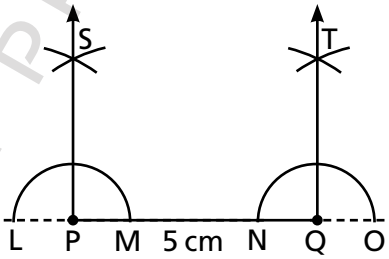


$\overline{CD}$ is the required perpendiuclar to $\overline{AB}$.

6. Steps of construction:

Step 1: Draw a line segment $\overline{PQ}$ = 5 cm.

Step 2: Follow the steps of construction of drawing a perpendicular as given in Q4 (i).



$\overline{PS}$ is a perpendicular to $\overline{PQ}$ at point P.

Simlarly, $\overline{QT}$ is a perpendicular to $\overline{PQ}$ at point Q. The distance between the two perpendiculars $\overline{PQ}$ and $\overline{QT}$ is same, that is 5 cm.

Therefore, $\overline{PQ}$ is parallel to $\overline{QT}$.

7. Follow the steps of construction on the given pages of NCD 6 textook to construct the following angles.

(i) 60° (page: 159)

(ii) 90° (page: 160)

(iii) 45° (page: 160)

(iv) 75° (page: 161)

(v) 105° (page: 162)

(vi) 120° (page: 161)

OXFORD UNIVERSITY PRESS

8. (i) Stepe ofconstruction:

Step 1: Draw an angle of 30° using a protractor by following the steps given on page 159 of NCD textbook.

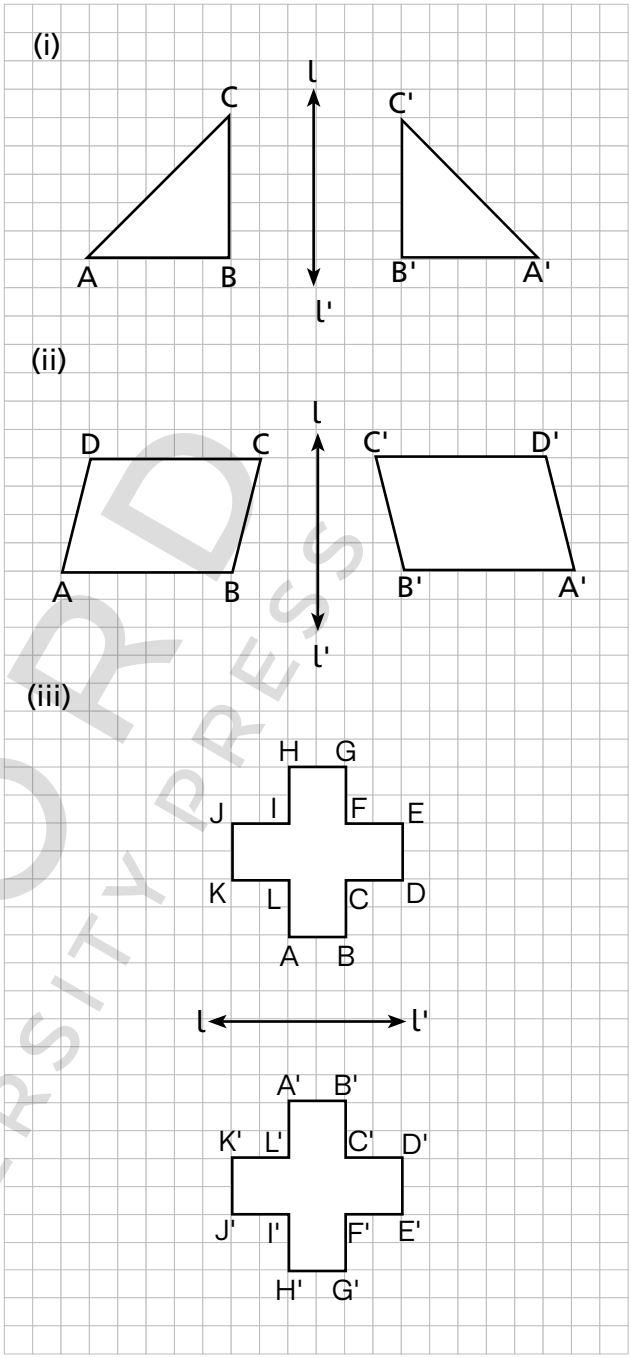
Step 2: Follow the steps of bisecting an angle given on page 159 of NCD textbook and bisect angle of 30°.

Follow the same steps of construction to draw and bisect each of the gvien angle.

(ii) 65° (iii) 130° (iv) 72° (v) 150°

9. Follow the steps given in Q8 to draw an angle bisector of 90°.

10. Draw the reflection of the shapes by counting the number of small squares between the shape and the line of reflection.



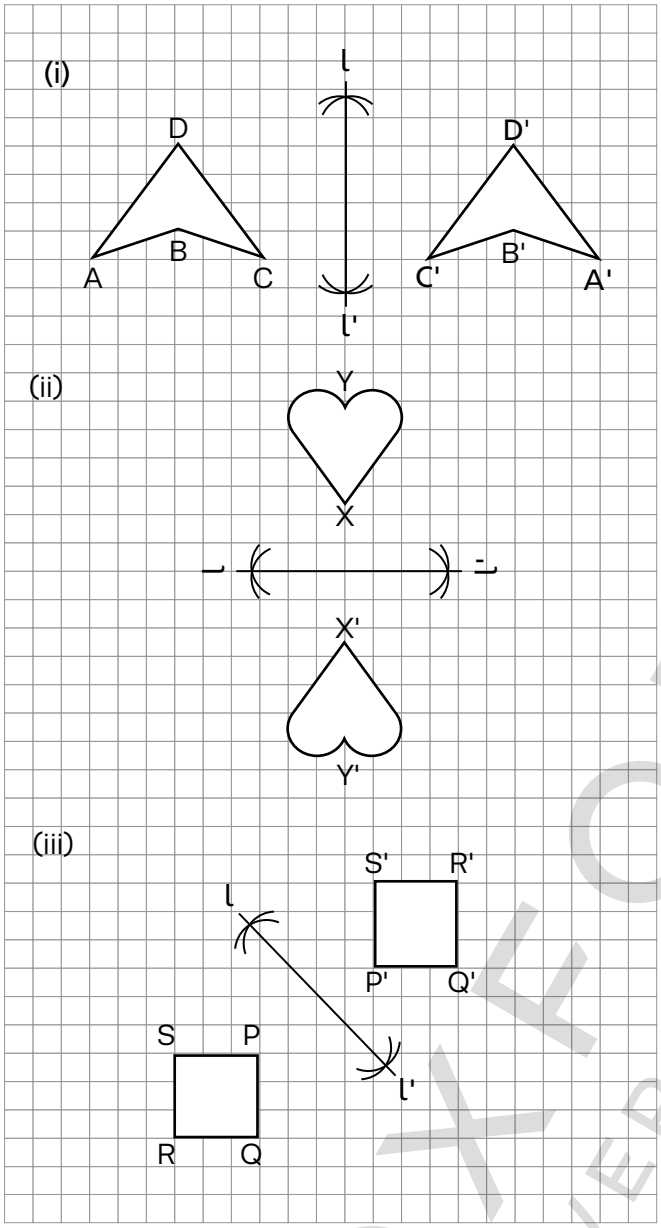
11. Follow the steps of construction to draw the line of reflection, given on page 164 of the NCD textbook.

(i) Take D and D' as centres to draw arcs.

(ii) Take X and X' as centres to draw arcs.

(iii) Take P and P' as centres to draw arcs.

OXFORD UNIVERSITY PRESS



Multiple Choice Questions 10

1. Option D: False
   Reason: By definition a line has no end points and can be extended on both sides, while a line segment has two end points.
   Option A, B, and C are clearly incorrect.

2. Option A: Never
   Reason: A line segment cannot be longer than a line as it has two end points.
   Option: B, C, and D are clearly incorrect.

3. Option B: $\overline{LM} > \overline{PQ}$
   Reason: PQ lies between L and M.
   Option A, C, and D are clearly incorrect.

4. Option C: Angles
   Reason: A protractor is used to draw and measure angles.
   Option A, B, and D are incorrect, because arcs and curved lines are drawn with a pair of compasses, while a straight line is drawn with a ruler.

5. Option D: Isosceles triangle
   Reason: In an isosceles triangle two sides are equal.
   Option A, B, and C are incorrect. Square has 4 lines of symmetry. Rectangle has 2 lines of symmetry, scalene triangle does not have a line symmetry, because all its sides are of different lengths.

6. Option C: Circle
   Reason: A circle has infinite points on the circumference.
   Option A, B, and D are incorrect.

OXFORD UNIVERSITY PRESS

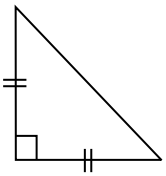
11 TRIANGLES

Exercise 11A

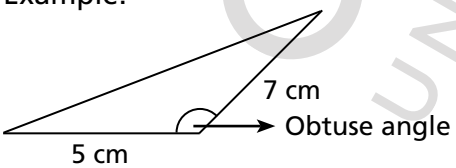
1. Four; ΔPQR, ΔPRS, ΔPQS and ΔQRS
2. (i) yes; equilateral (ii) isosceles
   (iii) obtuse-angled
3. (i) scalene (ii) isosceles
   (iii) equilateral
4. eight; ΔABC, ΔBCD, ΔCDA, ΔPAB, ΔPBC, ΔPCD, ΔPDA, ΔDAB; four
5. ΔABC, ΔADC, ΔATP, ΔCTQ, ΔCTR, ΔATS; two
6. (i) right-angled (ii) acute-angled
   (iii) right-angled (iv) obtuse-angled

Exercise 11B

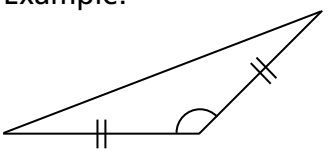
1. (i) True
   Example:



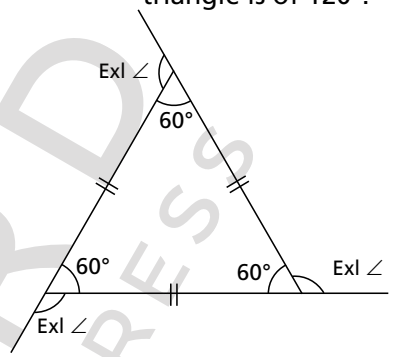
   (ii) False
   Example:



   (iii) True
   Example:



   (iv) False
   Example: Each Exl ∠ of an equilateral triangle is of 120°.



2.

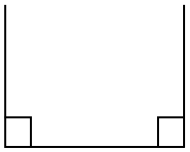
Helpful Hint

If the sum of the given angles is equal to 180°, then a triangle can be constructed.

   (i) Δ ABC can be constructed because
   $m\angle A + m\angle B + m\angle C = 180$
   $45° + 60° + 75° = 180°$

   (ii) Δ ABC cannot be constructed because
   $m\angle A + m\angle B + m\angle C \quad 180$
   $65° + 90° + 35° = 190° > 180°$

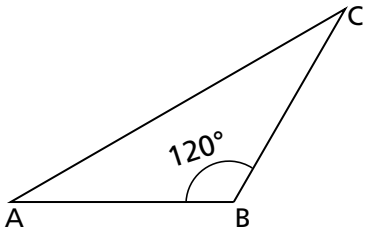
   (iii) Δ ABC cannot be constructed because
   $m\angle A = m\angle B = 90°$
   A triangle cannot be constructed with two right angles.



   (iv) Δ ABC can be constructed because one of the angle that is m∠ B = 120° and the second angle m∠ C is less than = 60°
   This implies the third angle is also acute.

OXFORD UNIVERSITY PRESS

Example:



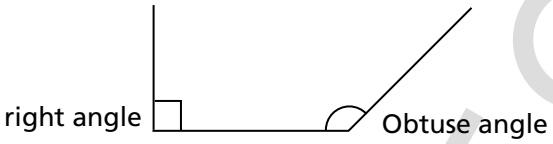
Note that a triangle can easily be constructed if one of the angle is obtuse and the remaining two are acute angles.

(v) Δ ABC can be constructed because:

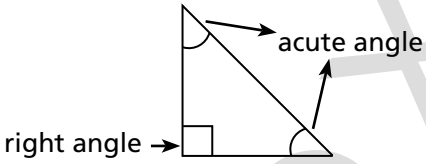
$m\angle A + m\angle B + m\angle C = 180°$

$68° + 50° + 62° = 180°$

3. No an obtuse-angled triangle can never have a right angle because the sum of the three angles of a triangle cannot be greater than 180°



4. Yes, if one of the angle of a triangle is of 90°, then the other two must be acute.



5. (i) an equilateral: 60°, 60°, 60°

(ii) an isosceles right-angle triangle: 90°, 45°, 45°

6. Ratio of angles = 2 : 3 : 5

Total ratio = 2 + 3 + 5 = 10

[sum of angles of a triangles = 180°]

First angle: $\frac{2}{10} \times 180° = 36°$

Second angle: $\frac{3}{10} \times 180° = 54°$

Third angle: $\frac{5}{10} \times 180° = 90°$

[check: 36° + 54° + 90° = 180°]

Since one of the angle is of 90°, therefore, it is a right-angled triangle.

7. Ratio of angles = 3 : 5 : 7

Total ratio = 3 + 5 + 7 = 15

[sum of angles of a triangle = 180°]

First angle: $\frac{3}{15} \times 180° = 36°$

Second angle: $\frac{5}{15} \times 180° = 60°$

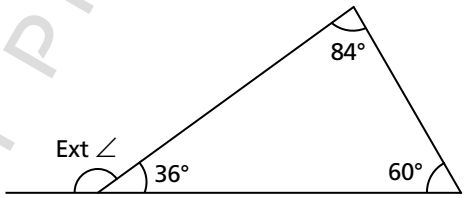
Third angle: $\frac{7}{15} \times 180° = 84°$

[check: 36° + 60° + 84° = 180°]

To find the size of the greatest exterior angle choose the smallest angle.

Exterior angle = sum of the opposite two interior angles = 60° + 84°

$\therefore$ exterior angle = 144°.



8. Let the angles of the triangle be:

$m\angle A + m\angle B + m\angle C = 180°$

[$m\angle B = m\angle C$ in an isosceles triangle]

$100° + x + x = 180°$

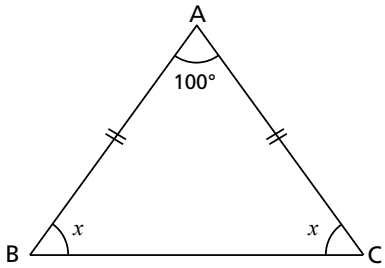
$2x = 180° - 100$

$2x = 80°$

$x = 40°$

Check: 100° + 40° + 40° = 180°

$\therefore$ each angle is of 40°.



9. Let the angles of the triangle be:

m∠ A + m∠ B + m∠ C = 180°

54° + 54° + x = 180°

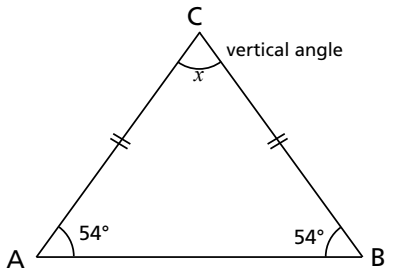
108° + x = 180°

x = 180° – 108°

x = 72°

∴ the vertical angle is 72°.

[Since it is an isosceles triangle both base angles will be same]



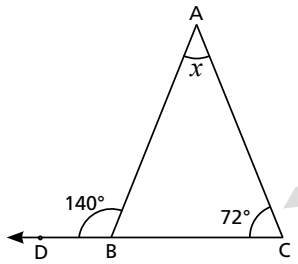
10. Ext ∠ = sum of the opposite two int ∠ s

m∠ DBA = m∠ A + m∠ C

140° = x + 72°

140° – 72° = x

∴ x = 68°.



11. In Δ ABC:

m∠ A + m∠ B + m∠ C = 180°

84° + x + x = 180°

2x + 84° = 180°

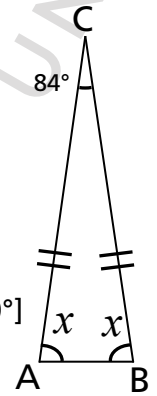
2x = 180° – 84°

2x = 96°

x = 48°

∴ each base angle is of 48°.

[Check: 84° + 48° + 48° + = 180°]



12. 115° + y = 180° (supplementary angles)

y = 180° – 115°

∴ y = 65°

Ext ∠ = sum of opposite two int ∠ s

115° = x + 64°

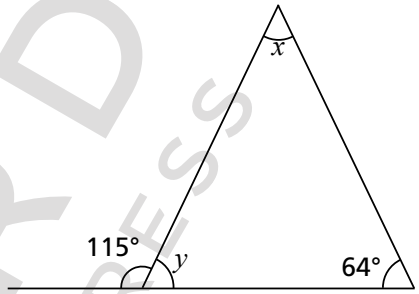
115° – 64° = x

∴ x = 51°

Check:

∠x + ∠y + 64° = 180°

51° + 65° + 64° = 180°



13.

Helpful Hint

First find ∠ B and ∠ C in Δ ABC.

In Δ ABC, m∠ A + m∠ B + m∠ C = 180°

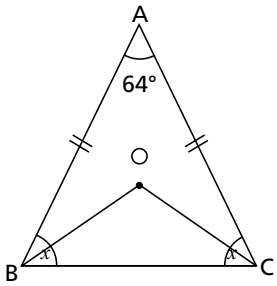
64° + x + x = 180° (base s of an iso Δ.)

64° + 2x = 180°

2x = 180° – 64°

2x = 116°

x = 58°



We know that Δ ABC

∠ ABC = ∠ ACB = x = 58°

∴ m∠ ABO = m∠ OBC = $\frac{x}{2}$

$= \frac{58°}{2} = 29°$

In Δ BCO, $\overline{BO}$ and $\overline{CO}$ are angle bisectors which meet at O.

OXFORD UNIVERSITY PRESS

$\therefore \Delta$ BOC is also an isosceles triangle where the base angles are equal.

$\therefore m\angle OBC = m\angle OCB = 29°$

In Δ OBC: $m\angle B + m\angle C + m\angle O = 180°$

$29° + 29° + \angle O = 180°$

$58° + \angle O = 180°$

$\angle O = 180° - 58°$

$\angle O = 122°$

$\therefore$ BOC = 122°

Multiple Choice Questions 11

1. Option B: False

   Reason: By definition a scalene triangle has all three sides of unequal length, while an equilateral triangle has three equal sides.

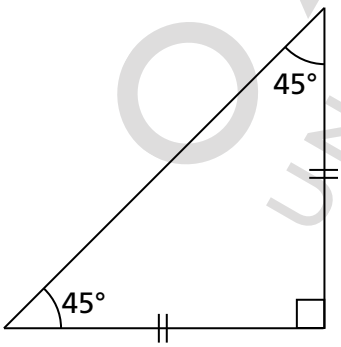
   Therefore, a scalene triangle can not be an equilateral triangle.

   Option A, C, and D are clearly incorrect.

2. Option A: True

   Reason: In a right-angled triangle if the remaining two angles are 45° each, then it is an isosceles triangle too. In other words, if two sides of a right-angled triangle are equal, then the base angles are also equal.

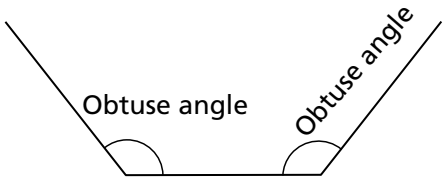
   Option B, C, and D are clearly incorrect.



3. Option C: False

   Reason: If there are two obtuse angles the figure will not be a closed figure.

   Option A, B, and D are clearly incorrect.



4. Option A: Greater than the length of the third side

   Reason: The sum of two sides will always be greater

   Example: In Δ ABC,

   $m\overline{AB} + m\overline{AC} > mBC$

   7 cm + 8 cm > 5 cm

   15 cm > 5 m

   Similarly: $m\overline{AB} + m\overline{BC} > m\overline{AC}$

   7 cm + 5 cm > 8 cm

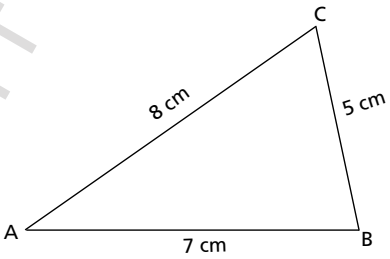
   12 cm > 8 cm

   Also: $m\overline{BC} + m\overline{AC} > m\overline{AB}$

   5 cm + 8 cm > 7 cm

   13 cm > 7 cm

   Option B, C, and D contradict the true statement.



5. Option D: 180°

   Reason: Verified through activity on page 172 of NCD textbook.

   Option A, B, and C are incorrect.

6. Option D: False

   Reason: The given statement is false because by definition the exterior angle is equal to the sum of the two opposite interior angles.

   Option A, B, and C are clearly in correct.

OXFORD UNIVERSITY PRESS

12 PERIMETER AND AREA

Exercise 12A

1. (i) Perimeter
   (ii) 16 square centimetre
   (iii) P = 2 (l + b) where 'l' is length and 'b' is breadth of the rectangle.
   (iv) A = $l \times b$
   (v) 9 cm
2. (i) True
   Area = $l \times b$ = (15 × 50)m = 750 m^2
   (ii) False
   The three sides of the triangle sum up to 15 m.
   (iii) True
   Perimeter of a square = 4 l where 'l' is the length of one side of the square.
   (iv) False
   Area of a triangle = $\frac{\text{base} \times \text{height}}{2}$
   (v) False
   Area of square = l^2
   = 1 cm × 1 cm
   = 1 cm^2
3. (i) Perimeter of a square = 4 l where 'l' is the side of the square.
   P = 4 × 8 cm = 32 cm
   (ii) Perimeter of a rectangle = 2(l + b) when l = length and b = breadth
   P = 2(6 + 4) cm
   = 20 cm
   (iii) Perimeter of a triangle = sum of length of all the 3 sides.
   P = (3 + 4 + 5) cm
   = 12 cm
   (iv) Length of rectangle = 8 cm
   Breadth of rectangle = 8 ÷ 2 = 4 cm
   Perimeter of rectangle = 2(l + b)
   = 2(8 + 4) cm
   = 24 cm
   (v) Perimeter of a triangle = Sum of length of all 3 sides
   = (5.5 + 5.5 + 5.5) cm
   = 16.5 cm

Helpful Hint:
All three sides of an equalitarian triangle are equal.

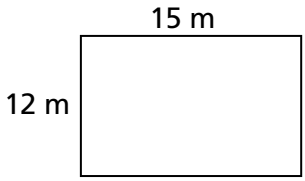
4. (i) P = m$\overline{AB}$ + m$\overline{BC}$ + m$\overline{CD}$ + m$\overline{DA}$
   = (3 + 5.2 + 4 + 3) cm
   = 15.2 cm
   (ii) P = (6 + 7 + 10 + 5 + 12 + 20 + 10) m
   = 70 metres.
5. Perimeter of rectangular land = 2(l + b)
   = 2(8 + 5)
   = 26 m
   The length of wire needed to fence the field once = 26 m
   The length of wire for fencing 4 lines
   = 26 × 4
   = 104 m
6. The perimeter of rectangular garden
   = 2(l + b)
   = 2(105 + 75)
   = 2(180)
   = 360 m
   360 m will cover 1 round
   3600 m will cover 3600 ÷ 360 =10 rounds.

OXFORD UNIVERSITY PRESS

7. Data:
Length = 15 m
Breadth = 12 m
Perimeter = ?
cost of 1 m = Rs 25

Helpful Hint

It is always easier to draw a figure for better understanding.



Perimeter of a rectangle = $l + b + l + b$
or $2l + 2b$
or $2(l + b)$

∴ perimeter of the rectangular field.
$= 2(l + b)$
$= 2(15 + 12)$
$= 2(27)$
$= 54$ m

Cost of fencing 1 metre = Rs 25
∴ cost of fencing 54 metres = 25 × 54
= Rs 1350

8. (i) Area of a rectangle = Length × Breadth
= (15 × 9) m
= 135 m^2

(ii) Area of a rectangle = L × B
= (32 × 24) m
= 768 m^2

(iii) Area of a rectangle = L × B
= (5 × 3.5) m
= 17.5 m^2

(iv) Area of a rectangle = L × B
(converting 2 m 25 cm into m:
2 m + 0.25 m = 2.25 m)
= 4.5 × 2.25
= 10.125 m^2

9. (i) Area of square = $l \times l$
= 21 × 21 (l = 21 cm)
= 441 cm^2

(ii) Area of square = $l \times l$
= 4.5 × 4.5 (l = 4.5 m)
= 20.25 m^2

(iii) Area of square = $l \times l$
= 1.2 × 1.2 (l = 1.2 m)
= 1.44 m^2

(iv) Area of square = $l \times l$
(converting 2 m 50 cm into m
2 m + 0.50 m = 2.5 m) = (2.5 × 2.5) m
= 6.25 m^2
(l = 2 m 50 cm)

10. Data:
Area = 216 m^2
Length = 18 m
breadth = ?
Area of rectangle = $l \times b$

∴ breadth of rectangle = $\frac{\text{Area}}{\text{Length}}$

$= \frac{\cancel{216}^{\cancel{36}\,12}}{\cancel{18}_{\cancel{3}}}$

∴ breadth of rectangle = 12 m

11. Data:
Area = 336 m^2
Breadth = 16 m
Length = ?
Area of rectangle = $l \times b$

∴ breadth of rectangle = $\frac{\text{Area}}{\text{Breadth}}$

$= \frac{\cancel{336}^{\cancel{86}\,21}}{\cancel{16}_{\cancel{4}}}$

∴ breadth of rectangle = 21 m

12. Data:
Length = 36 m
Breadth = 25 m

OXFORD UNIVERSITY PRESS

Area = ?
cost of 1 m^2 = Rs 3

Helpful Hint

Levelling the ground means area of the playground is to be found.

Area of a rectangle = $l \times b$
∴ area of the playground = (36 × 25) m
= 900 m^2
Cost of levelling 1 m^2 = Rs 3
∴ cost of levelling 900 m^2 = 3 × 900
= Rs 2700

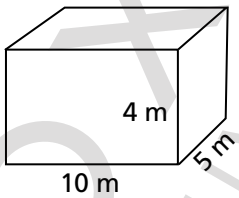
13. Data:
Length = 6 m
Area = ?
Cost of 1 m^2 = Rs 200

Helpful Hint

Flooring a square room means area of the room is to be found.

Area of a square = $l \times l$
∴ Area of a square room = (6 × 6) m
= 36 m^2
Cost of flooring 1 m^2 = Rs 200
∴ cost of flooring 36 m^2 = 36 × 200 = Rs 7200

14. Data:
Length = 10 m
Breadth = 5 m
Height = 4 m
Area of each wall = ?



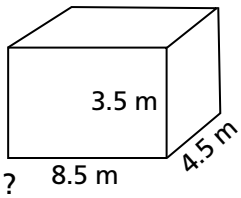
Helpful Hint

Draw a figure of a room, which looks like a cuboid.

Remember:
- The opposite two walls will have same dimensions.
- The roof and floor dimensions are to be ignored.
- Height remains the same, while the length and breadth change.

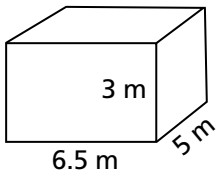
(i) Area of two opposite walls
= 2(length × height)
= 2(10 × 4) m
= 80 m^2
Area of the other two opposite walls
= 2(breadth × height)
= 2(5 × 4) m
= 40 m^2
∴ area of all four walls
= 80 m^2 + 40 m^2
= 120 m^2

(ii) Data:
Length = 8.5 m
Breadth = 4.5 m
Height = 3.5 m
Area of each wall = ?



Area of two opposite walls
= 2(length × height)
= 2(8.5 × 3.5) m
= 2(29.75) m^2
= 59.5 m^2
Area of the other two opposite walls
= 2(breadth × length)
= 2(4.5 × 3.5) m
= 2(15.75) m^2
= 31.5 m^2
∴ area of all four walls
= 59.5 m^2 + 31.5 m^2
= 91 m^2

(iii) Data:
Length = 6.50 m
= 6.50 m
Breadth = 5 m
Height = 3 m



Area of two opposite walls
= 2(length × height)
= 2(6.50 × 3) m
= 2(19.50) m^2
= 39 m^2
Area of the other two opposite walls
= 2(breadth × height)

OXFORD UNIVERSITY PRESS

$= 2(5 \times 3)$ m

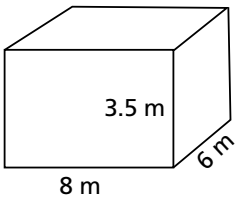
$= 30$ m^2

$\therefore$ Area of all four walls

$= 39$ m$^2 + 30$ m^2

$= 69$ m^2

15. Data:



Length = 8 m

Breadth = 6 m

Height = 3.5 m

Area of walls = ?

cost of white-washing 1 m^2 = Rs 50

Area of two opposite walls

$= 2(\text{length} \times \text{height})$

$= 2(8 \times 3.5)$ m

$= 56$ m^2

Area of the other two opposite walls

$= 2(\text{breadth} \times \text{height})$

$= 2(6 \times 3.5)$ m

$= 42$ m^2

$\therefore$ Area of all four walls

$= 56$ m$^2 + 42$ m^2

$= 98$ m^2

Cost of white-washing 1 m^2 = Rs 50

$\therefore$ Cost of white-washing 98 m^2 = 50×98

$= 4900$

16. Area of the floor = length $\times$ breadth

$= (12 \times 9)$ m

$= 108$ m^2

Cost of tiling 1 m^2 of the floor = Rs 50

Cost of tiling 108 m^2 of the floor

$= 108 \times 50$

= Rs 5400

Exercise 12B

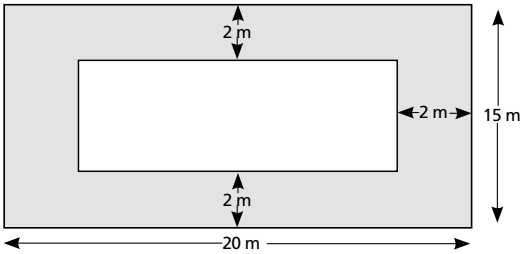
1. (i) Data:

Length of larger rectangle = 20 m

Breadth of larger rectangle = 15 m

Width of shaded region = 2 m

Area of the shaded portion = ?



Helpful Hint

To find the length and breadth of the smaller rectangle subtract the width of the shaded region from both the length and the breadth.

$\therefore$ Length of the smaller rectangle

$= 20$ m $- (2 + 2)$ m

$= 16$ m

and the length of the smaller rectangle

$= 15$ m $- (2 + 2)$ m

$= 11$ m

Area of the larger rectangle

$= (20 \times 15)$ m $= 300$ m^2

Area of the smaller rectangle

$= (16 \times 11)$ m

$= 176$ m^2

Area of the shaded region

= Area of the larger rectangle – Area of the smaller rectangle

$= (300 - 176)$ m^2

$= 124$ m^2

(ii) Area of the larger square = l^2

$= (15 \times 15)$ m

$= 225$ m^2

Area of the smaller square = l^2

$= (9 \times 9)$ m

$= 81$ m^2

Area of the shaded region = Area of larger square – Area of smaller square

$= (225 - 81)$ m^2

$= 144$ m^2

2. Data:

Length = 50 m

Breadth = 30 m

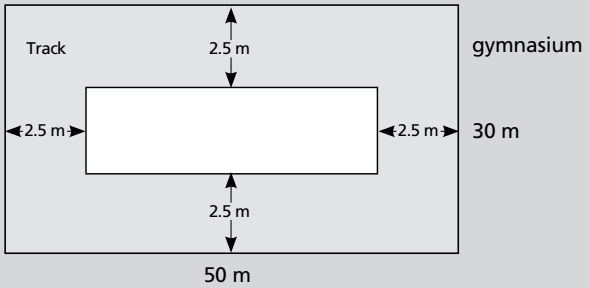
OXFORD UNIVERSITY PRESS

Width of track = 2.5 m

Area of track = ?

Helpful Hint

Draw a figure first.



Helpful Hint

Since the track is inside and all around the gymnasium the width of track will be subtracted from the length and breadth from all four sides.

∴ the inner length = 50 m – (2.5 + 2.5) m = 45 m

and the inner breadth = 30 – (2.5 + 2.5) m

= 25 m

Area of the larger rectangle

= length × breadth

= (50 × 30) m

= 1500 m^2

Area of the smaller rectangle

= length × breadth

= (45 × 250) m

= 1125 m^2

∴ area of the track = Area of the larger rectangle – Area of the smaller rectangle

= (1500 – 1125) m^2

= 375 m^2

3. Data:

Length = 150 m

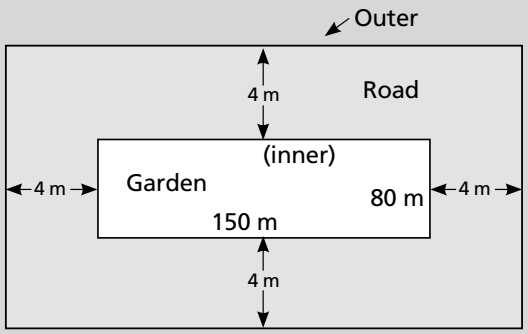
Breadth = 80 m

Width of road = 4 m

Cost of paving 1 m^2 = Rs 120

Helpful Hint

Draw a figure first.



Helpful Hint

Since the road is outside and all around the garden, the width of the road will be added to the length and the breadth of the garden.

∴ the outer length = 150 m + (4 + 4) m

= 158 m

and the outer breadth = 80 m + (4 + 4) m

= 88 m

Area of the larger rectangle

= length × breadth

= (158 × 88) m

= 13 904 m^2

Area of the smaller rectangle

= length × breadth

= (150 × 80) m

= 12 000 m^2

∴ Area of the road = Area of the larger rectangle – Area of the smaller rectangle

= (13 904 – 12 000) m^2

= 1904 m^2

Cost of paving 1 m^2 = Rs 120

Cost of paving 1904 m^2 = 120 × 1904

= Rs 228 480

4. Data:

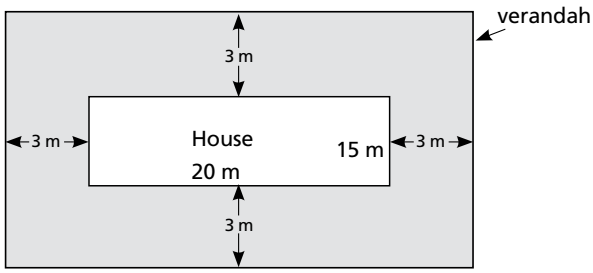
Length = 20 m

Width = 15 m

Width of verandah = 3 m

Cost of flooring 1 m^2 = Rs 200

OXFORD UNIVERSITY PRESS



Helpful Hint

Since the verandah is outside and all around the house, the width of the verandah will be added to the length and the breadth of the house.

∴ the outer length = 20 m + (3 + 3) m
= 26 m

and the outer breadth = 15 m + (3 + 3) m
= 21 m

∴ the area of the outer rectangle
= (26 × 21) m = 546 m²

and the area of the inner rectangle
= (20 × 15) = 300 m²

Area of the verandah =

Area of the larger rectangle – Area of the smaller rectangle = (546 – 300) m² = 246 m²

Cost of flooring 1 m² = Rs 200

∴ cost of flooring 246 m² = 200 × 246
= Rs 49200

5. (i) Area of a parallelogram = $b \times h$
= (25 × 10) cm = 250 cm²

(ii) Area of a parallelogram = $b \times h$
= (16 × 9) cm = 144 cm²

(iii) Area of a triangle = $\frac{1}{2} \times b \times h$
$= \frac{1}{2} \times \cancel{12}^{6} \times 5$
= 30 cm²

(iv) Area of a triangle = $\frac{1}{2} \times b \times h$
$= \frac{1}{\cancel{2}_{1}} \times \cancel{18}^{9} \times 18$
= 162 cm²

(v) Area of a triangle = $\frac{1}{2} \times b \times h$
$= \frac{1}{\cancel{2}} \times \cancel{6}^{1} \times 15$
= 45 cm²

(vi) Area of a trapezium = $\frac{1}{2}$ × (Sum of parallel sides) × height
$= \frac{1}{2} \times (20 + 35) \times 14$
$= \frac{1}{\cancel{2}_{1}} \times 55 \times \cancel{14}^{7}$
= 385 cm²

(vii) Area of a trapezium = $\frac{1}{2}$ × (Sum of parallel sides) × height
$= \frac{1}{2} \times (21 + 17) \times 15$
$= \frac{1}{\cancel{2}_{1}} \times \cancel{38}^{19} \times 15$
= 285 cm²

(viii) Area of a parallelogram = $b \times h$
= (7.5 × 5.5) cm
= 41.25 cm²

6. Area of parallelogram = base × hight
645 cm² = b × 15 cm
$\frac{645 \text{ cm}^2}{15 \text{ cm}} = b$
43 cm = b
∴ length of its sides is 43 cm.

7.

Helpful Hint

Draw a figure and then solve. Hence height of the flag is unknown

Area of a triangle = $\frac{1}{2} \times b \times h$
196 cm² = $\frac{1}{\cancel{2}_{1}} \times \cancel{14}^{7}$ cm × h
196 cm² = 7 cm × h
$\frac{196 \text{ cm}^2}{7 \text{ cm}} = h$
28 cm = h
∴ the perpendicular distance from the tip of the flag to the third side is 28 cm.

Multiple Choice Questions 12

1. Option A: Area = Length × Breadth

OXFORD UNIVERSITY PRESS

Reason : Correct formula for finding the area of a square or rectangle.

Option B, C, and D are clearly incorrect.

2. Option D: Length = 13 cm, Width = 7 cm

Incorrect Options:

Option A: L = 23, B = 17 cm

[Hint: Long multiplication is not required. Approximation and logic will give the right answer.]

Here 23 rounded down and 17 rounded up are approximately equal to 20. Therefore, 20 × 20 = 400 which is far beyond the given area 91 cm^2.

Option B and C will give a decimal answer.

3. Option A: 1 km

Reason: Since one side of the square is 1 km, therefore, its perimeter will be 4 km. The horse runs twice the square garden, therefore, the covered length is 8 km.

Incorrect Options:

Option B: 1.5 km means perimeter will be 6 km and its twice will be 12 km.

Option C: 4 km means perimeter will be 16 km which exceeds the correct answer.

Option D: 2 km means perimeter will be 8 km which seems to be correct but don't forget that the horse runs twice, that is 16 km, which exceeds the correct answer.

4. Option D: Total edge around the pool = 2(16 + 8) = 48 m

Reason: The edge ground the pool will be its perimeter: P = 2(l + b). + b). Hence width is 8 cm and length is twice the width, that is 16 m.

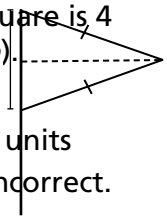
Incorrect Options:

Option A and B are clearly incorrect as to find the perimeter we do not multiply the length with breadth.

Option C seems to be correct but remember there are two lengths and breadths, therefore, the sum should be multiplied by 2.

5. Option B: True if each side of the square is 4 units.

Reason: If each side of the square is 4 units then, P = 2(l + b).



= 2(4 + 4) = 16 units

A = l × b = 4 × 4 = 16 units

Option A, C, and D are clearly incorrect.

6. Option B: True

Reason: Let us suppose length of a rectangle is 5 cm and breadth is 3 cm.

Area of rectangle = l × b

= (5 × 3) cm

= 15 cm^2

Now, double the sides, then length of the new rectangle will be 10 cm and breadth will be 6 cm.

Area of the new rectangle

= (10 × 6) cm = 60 cm^2

This proves that if the length and breadth of a rectangle is doubled then the area of the new rectangle becomes 4 times as large (15 × 4 = 60).

Helpful Hint

Use different values of length and breadth to justify the answer.

Option A, C, and D are clearly incorrect.

7. Option A: 17.5 cm^2

Reason: Value of area found by using the formula A = $\frac{1}{2}$ × b × h

Option B, C, and D are clearly incorrect.

8. Option B: 600 cm^2

Reason: Length of rectangle = 30 cm

Breadth of rectangle = half of

OXFORD UNIVERSITY PRESS

length + 5

= (30 cm ÷ 2) + 5 cm

= (15 + 5) cm

= 20 cm

∴area of rectangle = $l \times b$

= 30 cm × 20 cm

= 600 cm^2

Option A, C, and D are incorrect.

9. Option C: 10.5 cm

Reason: Since it is an equilateral triangle, all sides will be 3.5 cm

Therefore, P = (3.5 + 3.5 + 3.5) cm

P = 10.5 cm

In Option B value is correct, but the given unit of area makes it incorrect.

Option A and D are clearly in correct.

10. Option D: By dividing it into two triangles and adding their areas

Reason: Area of a trapezium can be found by using the formula: $\frac{1}{2}$ (sum of parallel sides) × height or as given.

Option A, B, and C are clearly incorrect statement in option D.

Helpful Hint

Find area the trapezium given in Q5(vi) by dividing it into two triangles. Do you get the same result?

OXFORD UNIVERSITY PRESS

13 VOLUME AND SURFACE AREA

Exercise 13

1. (i) Data:
Length = 12 cm
Breadth = 10 cm
Height = 8 cm
Volume = ?
Volume of a cuboid
= length × breadth × height
= (12 × 10 × 8) cm
= 960 cm^3

(ii) Data:
Length = 4 m
Breadth = 2.5 m
Height = 1.5 m
Volume = ?
Volume of a cuboid
= $l \times b \times h$
= (4 × 2.5 × 1.5) m
= 15 m^3

(iii) Data:
Length = 2 m 50 cm = 2.50 m
Breadth = 1 m
Height = 75 cm = 0.75 m
Volume = ?
Volume of a cuboid
= $l \times b \times h$
= (2.50 × 1 × 0.75) m
= 1.875 m^3

2. Data:
Length = 2 m
Breadth = 1.5 m
Height = 1 m
Volume = ?
Volume of the tin can = $l \times b \times h$
= (2 × 1.5 × 1) m
= 3 m^3
Now convert units:
1 m = 100 cm
∴ 1 m^3 = (100 × 100 × 100) cm^3
∴ 3 m^3 = 3 × 1 000 000 = 3 000 000 cm^3
1000 cm^3 = 1 litre
∴ the amount of kerosene oil that the tin can hold:
$\frac{3000000}{1000}$ litre
= 3000 litre

3. Data:
Length = 5 m
Breadth = 3 m
Height = 1.5 m
Volume = ?
Volume of the tank = $l \times b \times h$
= (5 × 3 × 1.5) m
= 22.5 m^3

4. Data:
Length = 75 cm
Breadth = 50 cm
Height = 40 cm
1 side of the small cube = 0.1 m
= 0.1 m × 100 = 10 cm
Number of cubes that can be carved = ?

OXFORD UNIVERSITY PRESS

Helpful Hint

Convert units first. All units should be either in cm or m.

Volume of the block of wood

$= l \times b \times h$

$= (75 \times 50 \times 40)$ cm

$= 150\ 000$ cm^3

Volume of the small block

$= (10 \times 10 \times 10)$ cm

$= 1000$ cm^3

Number of cubes that can be carved

$= \frac{150\cancel{000}}{1\cancel{000}}$

$= 150$ cubes

5. (i) Data:

Length of each side = 1.5 m

Volume = ?

Volume of cube $= l \times b \times h$

$= (1.5 \times 1.5 \times 1.5)$ m

$= 3.375$ m^3

(ii) Data:

Length of each side = 60 cm

Volume = ?

Volume of cube $= l \times b \times h$

$= (60 \times 60 \times 60)$ cm

$= 216\ 000$ cm^3

(iii) Data:

Length of each side

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

$= \frac{8}{3}$ m

Volume of cube $= l \times b \times h$

$= \left(\frac{8}{3} \times \frac{8}{3} \times \frac{8}{3}\right)$ m

$= \frac{512}{27}$ m^3

$= 18\frac{26}{27}$ m^3

6. Data:

Length of each side of bigger cube

2.1 m × 100 = 210 cm

Length of each side of smaller cube = 35 cm.
Number of cubes that can be obtained = ?

Helpful Hint

Make the units same.

Volume of the bigger wooden block

$= l \times b \times h = (210 \times 210 \times 210)$ cm

$= 9\ 261\ 000$ cm^3

Volume of the small cube

$= l \times b \times h = (35 \times 35 \times 35)$ cm

$= 42\ 875$ cm^3

Number of small cubes that can be obtained:

$= \frac{9261000}{42875}$

$= 216$ cubes

7. Data:

Length = 6 m

Breadth = 5 m

Height = 3.5 m

Capacity of smaller tank = 120 litre.
Number of smaller tanks that the storage room can hold?

Volume of the storage room

$= l \times b \times h$

$= (6 \times 5 \times 3.5)$ cm

$= 105$ m^3

Convert m^3 into cm^3:

1 m = 100 cm

1 m^3 = $(100 \times 100 \times 100)$ cm^3

= 1 000 000 cm^3

∴ 105 m^3 = 105 000 000 cm^3

1 litre = 1000 cm^3

∴ 120 litre = 120 000 cm^3

Number of smaller tanks that storage room can hold:

$= \frac{105000000}{120000}$

= 875 tanks

OXFORD UNIVERSITY PRESS

8. Volume of the cube with edge 3 cm
$= (3 \times 3 \times 3)$ cm
$= 27$ cm^3

Now, 27 cm^3 makes 1 cube

$\therefore$ 135 cm^3 will make $135 \div 27$ cubes

$= 5$ cubes

9. We have to find the area of 4 walls and ceiling. Opposite walls have equal area.

The area of 2 opposite walls

$2(9 \times 4)$ m $= 2 \times 36 = 72$ m^2

The area of other 2 opposite walls
$2(6 \times 4) = 2 \times 24 = 48$ m^2

The area of the ceiling $= (6 \times 9)$ m $= 54$ m^2

Total area to be plastered

$= (72 + 48 + 54)$ m^2

$= 174$ m^2

Cost of plastering 1 m^2 = Rs 100

Cost of plastering 174 m^2 = 100×174
= Rs 17 400

10. $l = 2$ m, b = 80 cm, and $h = 60$ cm

Volume of a cuboid $= l \times b \times h$
$= 200 \times 80 \times 60$

Helpful Hint:
2 m = 200 cm

$= 960\ 000$ cm^3
$= 960\ 000 \div 1\ 000\ 000$
$= 0.96$ m^3

Surface Area of a cuboid
$= 2(lb + bh + hl)$
$= 2[(200 \times 80) + (80 \times 60) + (60 \times 200)]$
$= 2[(16\ 000 + 4800 + 12\ 000)]$
$= 2 \times 32\ 800$
$= 65\ 600$ cm^2
$= 65\ 600 \div 10\ 000$
$= 6.56$ m^2

11. Volume of a cube $= l^3$

Total surface Area of a cube $= 6l^2$

One side of the cube = 1.5 m

Volume $= 1.5 \times 1.5 \times 1.5$
$= 3.375$ m^3

Surface area $= 6 \times 1.5 \times 1.5$
$= 13.5$ m^2

12. The volume of cube 1 $= 3 \times 3 \times 3 = 27$ m^3

The volume of cube 2 $= 4 \times 4 \times 4 = 64$ m^3

The volume of cube 3 $= 5 \times 5 \times 5 = 125$ m^3

Total volume of melted metal
$= 27 + 64 + 125 = 216$ cm^3

Hence, the volume of new cube = 216 cm^3

Helpful Hint:
Find a number which is multiplied three times to give an answer 216.
$6 \times 6 \times 6 = 216$

One edge of the new cube = 6 cm

Surface area of new cube $= 6l^2$
$= 6 \times 6 \times 6$
$= 216$ cm^2

$\therefore$ (i) Volume of the new cube = 216 cm^3

(ii) Surface area of the new cube = 216 cm^2

Multiple Choice Questions 15

1. Option A: True
Reason: by definition
Option B, C, and D are clearly incorrect

2. Option D: All the above
Reason:
Option A: $V = l \times b \times h$
$40 = 10 \times 2 \times 2$
$40 = 40$
Option B: $v = l \times b \times h$
$40 = 4 \times 10 \times 1$
$40 = 40$
Option C: $V = l \times b \times h$
$40 = 5 \times 2 \times 4$
$40 = 40$

OXFORD UNIVERSITY PRESS

3. Option B: 6 cm

Reason: Since it is a cube, all three sides will have the same length.

$\therefore$ $(6 \times 6 \times 6)$ cm = 216 cm^3

Option A, C, and D do not give the correct volume.

4. Option C: 27 times the original

Reason: Volume of original cube

= $(1 \times 2 \times 3)$ cm = 6 cm^3

Volume of the cube whose sides have been increased 3 times

= $(1 \times 3) \times (2 \times 3), (3 \times 3)$ cm

= $(3 \times 6 \times 9)$ cm = 162 cm^3

Increase in volume = $\frac{162}{6}$

= 27 times the original

5. Option B: 8, 27, 64, 125, 216, 343, 512, 729 cubic metres

Reason: The sentence, 'between the first and the last' means the volumes will be from the second to the ninth value. That is 2^3, 3^3, 4^3, 5^3, 6^3, 7^3, 8^3, 9^3

Option A and D contradict the given statement.

In Option C volume of the first and the last is included, which also contradicts the given statement.

OXFORD UNIVERSITY PRESS

5 Revision 5: Mensuration

1. (i) $P = 2(L + B)$
$= (18 + 12)$ m
$= 2(30)$ m
$\therefore P = 60$ m

Data:
L = 18 m
B = 12 m
P = ?

(ii) $P = 2(L + B)$
$= 2(12 + 9)$ m
$= 2(21)$ m
$\therefore P = 42$ m

Data:
L = 12 m
B = 9 m
P = ?

(iii) $P = 2(L + B)$
$= 2(70 + 50)$ m
$= 2(120)$ m
$\therefore P = 240$ cm

Data:
L = 70 cm
B = 50 cm
P = ?

(iv) $P = 2(L + B)$
$= 2(15 + 8)$ m
$= 2(23)$ m
$\therefore P = 46$ mm

Data:
L = 15 mm
B = 8 mm
P = ?

(v) $P = 2(7.5 + 4.2)$ m
$= 2(11.7)$ m
$\therefore P = 23.4$ m

Data:
L = 7.5 m
B = 4.2 m
P = ?

(vi) $P = 2L + 2B$
$200 = 2(60) + 2B$
$200 = 120 + 2B$
$200 - 120 = 2B$
$80 = 2B$
$\frac{80}{2} = B$
$\therefore$ breadth = 40 cm

Data:
L = 60 cm
P = 200 cm
B = ?

(vii) $P = 2L + 2B$
$28 = 2L + 2(5)$
$28 = 2L + 10$
$28 - 10 = 2L$
$18 = 2L$
$\frac{18}{2} = L$
$\therefore$ length = 9 m

Data:
L = ?
B = 5 m
P = 28 m

2. $P = 2L + 2B$
$P = 2(8.5) + 2(6)$
$P = 17 + 12$
$P = 29$ cm
Area = L × B
$= 8.5 \times 6$
$\therefore$ area = 51 cm^2

Data:
L = 8.5 m
B = 6 m
P = ?
Area = ?

3. (i) $P = 2L + 2B$
$= 2(12) + 2(9)$
$= 24 + 18$
$P = 42$ m
Area = L × B
$= 12 \times 9$
$\therefore$ area = 108 m^2

Data:
L = 12 m
P = ?
B = 9 m
Area = ?

(ii) Data:
Perimeter = ?
Base = 8 m
Height = 6 m
Area = ?
Perimeter of triangle
$= (6 + 8 + 10)$ m
$= 24$ m

OXFORD UNIVERSITY PRESS

Area of triangle = $\frac{1}{2}$ × base × height

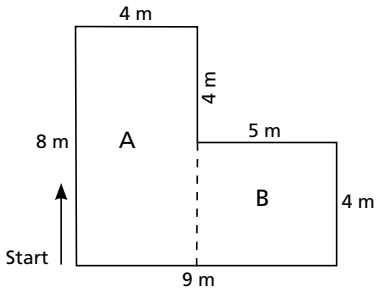
$= \frac{1}{\cancel{2}} \times \overset{4}{\cancel{8}} \times 6$

∴ area = 24 m².

(iii)

Helpful Hint

First find the missing sides, then add all sides to find perimeter.



Perimeter of shape:

= (8 + 4 + 4 + 5 + 4 + 9) m

= 34 m

To find the area of the shape divide it into two rectangles A and B.

Area of rectangle A = 4 × 8

= 32 m²

Area of rectangle B = 4 × 5

= 20 m²

Total area = area of rectangle A + area of rectangle B

= (32 + 20) m² = 52 m²

4.

Helpful Hint

To find the framing required find the perimeter.

P = 2L + 2B — Data:

= 2(40) + 2(25) — L = 40 m

= 80 + 50 — B = 25 m

= 130 cm — P = ?

∴ framing required to make a picture = 130 cm.

5. P = 2(L + B) — Data:

= 2(20 + 12) m — L = 20 m

= 2(32) m — B = 12 m

= 64 m — P = ?

Wire required for 1 row = 64 m

Wire required for 2 rows = 64 × 2

= 128 m

6. P = 2(L + B) — Data:

= 2(1.75 + 1.25) m — L = 1.75 m

= 2(3) m — B = 1.25 m

= 6 m — Cost per m = Rs 4.50

Cost of 1 m = Rs 4.50

Cost of 6 m = 4.50 × 6

= Rs 27

7. P = 2(L + B) — Data:

= 2(15 + 8) m — L = 15 m

= 2(23) m — B = 8 m

= 46 m

One round of the lawn = 46 m

∴ in five rounds Naila will cover = 46 × 5

= 230 m

8. P = 2L + 2B — Data:

72 = 2(25) + 2B — L = 25 m

72 = 50 + 2B — B = 72 m

72 – 50 = 2B — Width = ?

22 = 2 B

$\frac{22}{2}$ = B

∴ breadth of the rectangle = 11 m.

9. Data:

Length = 150 m

Breadth = 80 m

Area = ?

Area of one flower bed = L × B

= (150 × 80) m

= 12 000 m²

Area of eight flower beds = 12 000 × 8

= 96 000 m²

OXFORD UNIVERSITY PRESS

10. Data:

Length = 9 m

Breadth = 6 m

Area = ?

Cost of 1 m^2 = Rs 150

Area of room = L × B

= (9 × 6) m

= 54 m^2

Cost of carpeting 1 m^2 = Rs 150

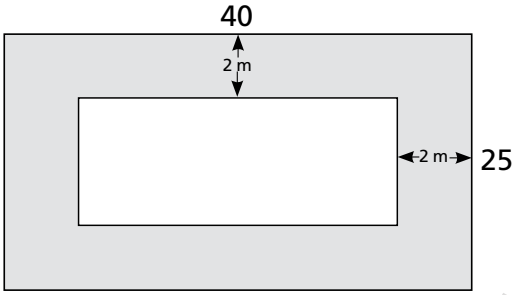
Cost of carpeting 54 m^2 = Rs 150 × 54

= Rs 8100

11.

Helpful Hint

Draw the picture first.



Data:

Length = 40 m

Breadth = 25 m

Width of the path = 2 m

Area of the path = ?

Helpful Hint

Find the dimensions of the inner rectangle.

Length of the inner rectangle = 40 – 4 = 36 m

Breadth of the inner rectangle = 25 – 4 = 21 m

Area of the outer rectangles

field = L × B

= (40 × 25) m

= 100 m^2

Area of inner rectangle = (36 × 21) m

= 756 m^2

Area of the path = Area of outer rectangle – Area of inner rectangle

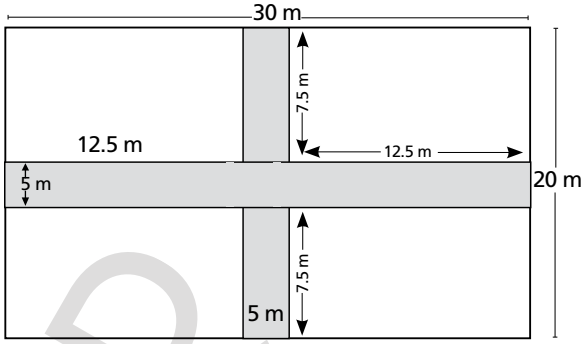
= (1000 – 756) m^2

= 244 m^2

12.

Helpful Hint

Draw the figure and find the dimensions.



Data:

Length = 30 m

Breadth = 20 m

Cost of constructing 1 m^2 = Rs 15

Length = 30 – 5 = $\frac{25}{2}$ = 12.5 m

Breadth = 20 – 5 = $\frac{15}{2}$ = 7.5 m

Area of the horizontal road

= 30 × 5 = 150 m^2

Area of two vertical roads

= 7.5 × 5 × 2 = 75 m^2

Total area of the roads = (150 + 75) m^2

= 225 m^2

Cost of constructing 1 m^2 road = Rs 15

Cost of constructing 225 m^2 road = 225 × 15

= Rs 3375

13. (i) False: because 1 l = 0.001 m^3

(ii) True: because area of floor and roof is ignored.

(iii) False: because volume of cuboid = 12 × 4 × 3 = 144 cm^3 and volume of cube = 12 × 12 × 12 = 1728 cm^3

(iv) False: Let us suppose each side of the cube = x cm

Then volume of the cube

= $x \times x \times x = x^3$ cm

When the side of cube is tripled = $3x$

OXFORD UNIVERSITY PRESS

Then volume of the new cube

$= 3x \times 3x \times 3x$

$= 27x^3$ cm^3

For example, let $x = 2$ cm

When the side is tripled = 3 × 2 = 6 cm

Then volume = 6 × 6 × 6 = 216 cm^3

Now the volume has increased 27 times.

That is 27 × 8 = 216

(v) False: because a cuboid has only 6 faces not 8.

14. Area of rectangular sheet = $l \times b$

$= 29.5 \times 20$

$= 590$ cm^2

15.

Helpful Hint

To find the cost of watering the lawn find the covered area of the lawn first

Covered area of the lawn = $l \times b$

$= (16 \times 15)$ m

$= 240$ m^2

Cost of watering the lawn = area × cost per square metre

$= 240 \times 2.50$

= Rs 600

16. Volume of the tank = $l \times b \times h$

$= 35 \times 11 \times 10$

$= 3850$ cm^3

Helpful Hint

1 litre = 1000 cm^3

Litre of petrol the tank car hold

$= \frac{3850}{1000}$

= 3.350 litres

17.

Helpful Hint

To find the cost of pointing a wooden block, calculate the surface area of the block fist and then the cost of painting.

Data

$l = 3$ cm

$b = 1.5$ cm

$h = 8$ cm

cost of painting = Rs 40/m^2

Total surface area of the block:

$= 2(l \times b) + 2(b \times h) + 2(l \times h)$

$= 2(3 \times 1.5) + 2(1.5 \times 8) + 2(3 \times 8)$

$= 2(4.5) + 2(12) + 2(24)$

$= 9 + 24 + 48$

$= 81$ cm^2

Cost of panting the block = Rs 40 per m^2

∴ cost of painting the block = 81 × 40

= Rs 3240

18. Volume of tank = $l \times b \times h$

$= 7.5 \times 3.2 \times 22$

$= 528$ m^3

Litres of water required to fill the tank:

$\frac{528 \text{ m}^3}{0.001 \text{ m}^3}$ [1 litre = 0.001 m^3]

or $\frac{528 \times 1000}{0.001 \times 1000}$

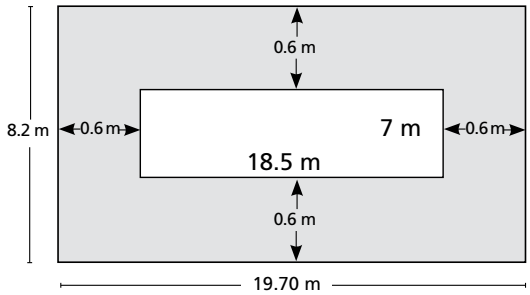
∴ litres required to fill the tank = 528 000. l

19.

Helpful Hint

- Draw a figure of the garden along with a path all around it .
- Convert 60 cm to metre making all units same as the cost given is per square metre.
- Find the measurements of bigger rectangle by adding as the path is all around it.

OXFORD UNIVERSITY PRESS



100 cm = 1 m

60 cm = 0.60 m

∴ length of the larger rectangle is

(18.5 + 0.60 + 0.60) m = 19.7 m

breadth of the larger rectangle is

(7 + 0.6 + 0.6) m = 8.2 m

∴ area of larger rectangle = 19.7 × 8.2

= 161.54 m^2

Aea of smaller rectangle

= (18.5 × 7) m

= 129.5 m^2

Area of path = Area of larger rectangle – Area of smaller rectangle

= (161.54 – 129.5)m^2

= 32.04 m^2

Cost of paving 1 m^2 = Rs 60

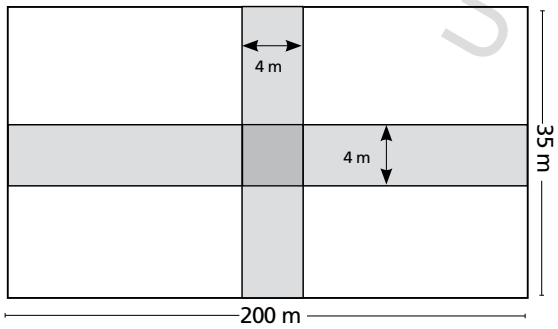
Cost of paving 15.66 m^2 = 32.04 × 60

= Rs 1922.40

20.

Helpful Hint

- Draw a figure to make the problem clear.
- The dark shaded area overlaps so consider it once only.



Area of horizontal road

= (200 × 4) m = 800 m^2

Area of vertical road = 35 × 4 = 140 m^2

Area of overlapping region

= (4 × 4) m = 16 m^2

∴ total area of the road = (800 + 140 – 16) m^2

= 924 m^2

Cost of dismantling 1 m^2 = Rs 3.75

Cost of dismantling 924 m^2

= Rs 3.75 × 924 m^2 = Rs 3465

21. Width of the corridor = 1.2 m

Length of the corridor = 4.5 × 1.2 = 5.4 m

Area of the corridor = $w \times l$

Area of the corridor = (1.2 × 5.4) m

= 6.48 m^2

Cost of carpeting 1 m^2 = Rs 125

Cost of carpeting 6.48 m^2 = Rs 125 × 6.48 m^2

= Rs 810

22. (i) Area of the terrace = $l \times b$

= (10.5 x 2.8)

= 29.4 m^2

Area of the smaller tile = $l \times b$

= (0.14 × 0.14) m [14 cm = 0.14 m]

= 0.0196 m^2

Number of tiles required $= \frac{29.4}{0.0196}$

= 1500 tiles

Cost of 1 tile = Rs 8.50

Cost of 1500 tiles = Rs 8.50 × 1500

= Rs 12750

(ii) Area of the bigger tile = $l \times b$

= (0.175 × 0.175) m [17.5 cm = 0.175 m]

= 0.030625 m^2

Number of tiles required $= \frac{29.4}{0.030625}$

= 960 tiles

Cost of 1 tile = Rs 8.50

OXFORD UNIVERSITY PRESS

Cost of 960 tiles = Rs 8.50 × 960

= Rs 8160

Money saved = Rs (12750 – Rs 8160)

= Rs 4590

23. Area of the courtyard = $l \times b$

= (10.5 × 1.89) m

= 19.845 m^2

Helpful Hint

Convert 21 cm to metre

21 cm ÷ 100 = 0.21 m

Area of tile = (0.21 × 0.21) m

= 0.0441 m^2

Number of tiles required = $\frac{19.845}{0.0441}$

= 450 tiles

24. Volume of the box = $l \times b \times h$

= (18 × 9 × 1.98) cm

= 320.76 cm^3

Volume of the dice = (1.8 × 1.8 × 1.8) cm

= 5.832 cm^3

Number of dice that can fit in the box

= $\frac{320.76}{5.832}$

= 55 dice

25. Amount of soil removed = $l \times b \times h$

= (16 × 5 × 0.75) m

Volume of soil removed = 60 m^3

To find the length of the soil layer:

Volume = $l \times b \times h$

60 = $l \times 4 \times 0.125$

$l = \frac{v}{b \times h}$

$l = \frac{60}{4 \times 0.125}$

l = 120 m

OXFORD UNIVERSITY PRESS

14 DATA HANDLING

Exercise 14A

1.

Helpful Hint

- Mean of set of data = $\frac{\text{Sum of values}}{\text{Number of quantities}}$
- Median is the middle value when data is arranged in ascending or descending order.
- Mode is the most occurring value in the data

(i) Mean height of the plants is 121

(ii) Mode of the ages of 5 students is 9

(iii) Mean of the data is 6

(iv) Arrange the data in ascending order:
10, 13, 14, 15, 17

Median of the data is 14.
It is the middle value.

(v) Mode of data is 2.
It occurs the most.

2. (i) False: because mean is the sum of the values divide by the number of quantities.

(ii) False: because, median is the middle value when data is arranged in ascending or descending order.

(iii) False: because, median of the value of a set of data which is even can be found by finding the average of the two middle values.

(iv) False: because, mode of a set of data can be none, one or more.

(v) False: because there is no value which occurs frequently.

3. (i) Mean $= \frac{135 + 270 + 186 + 309 + 320}{5}$

$= \frac{1220}{5} = 244$

(ii) Mean $= \frac{7.36 + 9.12 + 6.01 + 0.99 + 8.31}{5}$

$= \frac{31.79}{5} = 6.358$ or 6.36

(iii)

Helpful Hint

Convert all values to the same unit

Mean $= \frac{18.250\text{ g} + 6000\text{ g} + 80\text{ g} + 1.550\text{ g} + 45\text{ g}}{5}$

$= \frac{6144.8\text{ g}}{5} = 1228.96\text{ g}$

(iv) Mean first 7 negative numbers

$= \frac{(-1) + (-2) + (-3) + (-4) + (-5) + (-6) + (-7)}{7}$

$= \frac{-28}{7} = -4$

(v) Mean of prime numbers between 10 and 25

$= \frac{11 + 13 + 17 + 19 + 22}{5}$

$= \frac{83}{5} = 16.6$

(vi) Mean of first 7 perfect squares

$= \frac{1 + 4 + 9 + 16 + 25 + 36 + 49}{7}$

$= \frac{140}{7} = 20$

OXFORD UNIVERSITY PRESS

4.

Helpful Hint

- Find average of each term/exam.
- Find arrange of each subject.

Subject	1st Term	Mid-year	2nd Term	Final	Subject average
English	35	38	27	40	35
Urdu	28	32	25	35	30
G. Science	40	37	40	43	40
Maths	48	42	45	49	46
Average of each term/ exam.	37.75	37.25	34.25	41.75	

(i) Ahmed's average marks in English = 35

∴ Ahmed's highest average marks in languages were in English.

(ii) Ahmed's highest average score was in final exams, that is 41.75.

(iii) Ahmed's average in mathematics during the year was 46.

(iv) Difference in Ahmed's average score of final exams and mid-year:

41.75 – 37.25 = 4.5.

5. Guess of the 1st child = 1 kg 300 g or 1300 g

Guess of the 2nd child = 1 kg 250 g or 1250 g

Guess of the 3rd child = 1 kg 500 g or 1500 g

Average weight of the book

$= \frac{1300\text{ g} + 1250\text{ g} + 1500\text{ g}}{3}$

$= \frac{4050\text{ g}}{3}$

= 1350 g or 1 kg 350 g

6. (i) Mean of daily wages of 7 workers

$= \frac{\text{Rs }(125 + 110 + 140 + 150 + 135 + 120 + 130)}{7}$

$= \text{Rs } \frac{910}{7}$ = Rs 130.

(ii) Arranging the data in ascending order:

110, 120, 125, <u>130</u>, 135, 140, 150

∴ the median is Rs 130.
(130 is the middle value of the data)

(iii) No value occurs frequently, therefore, mode is none.

7. (i) Mean of marks obtained in a mathematics test by 15 students.

21 + 27 + 19 + 30 + 25 + 25 + 28 + 26 + 25 + 28 + 22 + 19 + 33 + 7 + 10 /15

$= \frac{345}{15}$

= 23 marks

(ii) Arranging the data in ascending order:

7, 10, 19, 19, 21, 22, 25, <u>25</u>, 25, 26, 27, 28, 28, 30, 33

Since, 25 is the middle value, therefore, the median is 25.

(iii) Since, 25 is the most occurring value, the mode is 25.

Exercise 14B

1. (i) All bars in a multiple bar graph must be of the same <u>width</u>.

(ii) In a pie chart data items are represented in a <u>circle</u>.

(iii) In a pie chart, number of data items equals to the number of <u>sectors</u>.

(iv) The letters of the word 'PAKISTAN' are placed in a bag. The probability of a vowel being taken out is <u>3/8</u>.

(v) The probability that the sum of two even numbers is even is <u>100%</u>.

2. (i) False: discrete data can be counted.

(ii) True: by definition.

(iii) True: in general the bars are always of the same width in a bar/multiple bar graph.

(iv) False: sum does not rise from the west.

(v) True: in a hexagonal spinner numbered 1, 2, 3, 4, 5, and 6 there are 3 even (2, 4, 6) and 3 odd (1, 3, 5) numbers. Therefore, the probability of occurrence even and odd numbers is 50% each.

OXFORD UNIVERSITY PRESS

3.

Helpful Hint

In each of the following questions, first read the graph carefully and find value of each item.

(i) Tickets sold for charity show by agents of different cities.

(ii) Tickets sold by agents:

Bahwalpur	:	100
Quetta	:	30
Rawalpindi	:	90
Multan	:	50
Kasur	:	80
Total tickets sold	:	350

(iii) Maximum number of tickets were sold in Bahwalpur.

(iv) Minimum number of tickets were sold in Quetta.

(v) The statement is true, because tickets sold in Bahwalpur were 100 and that in Multan were 50.

4. (i) Monthly expenses of two families on different items.

(ii) Family 1:

Food, because the amount spent on food is Rs 30000.

Family 2:

Education, because the amount spent on education is Rs 30000.

(iii) For both families the least expenditure is on miscellaneous items. That is family 1 spends Rs 10000 and family 2 spends Rs 5000 only.

(iv) Both families spent the same amount on rent, that is Rs 20000.

(v) Total monthly expenditure of each family:

	Family 1	Family 2
Food:	Rs 30 000	Rs 25 000
Education:	Rs 25 000	Rs 30 000
Rent:	Rs 20 000	Rs 20 000
Telephone:	Rs 15 000	Rs 10 000
Electricity:	Rs 15 000	Rs 20 000
Miscellaneous:	Rs 10 000	Rs 5000
Total	Rs 115 000	Rs 110 000

Savings of family 1= Rs 25 000

Savings of family 2 = Rs 20 000

Monthly income of family 1 = Expenditure + Savings = Rs 115 000 + Rs 25 000

= Rs 140 000

Monthly income of family 2 = Expenditure + Savings = Rs 110 000 + Rs 20 000

= Rs130 000

5. (i) Number of boys and girls playing different games.

(ii) Maximum number of boys play hockey

(iii) Maximum number of girls play badminton.

(iv) Badminton is equally played by boys and girls.

(v) Boys play football four times as compared to girls.

(vi) Number of boys who play hockey = 90

Number of girls who play hockey = 50

Total number of boys and girls who play hockey = 140

6.

	Week 1	Week 2	Week 3	Week 4	Week 5
Farm 1	200 kg	300 kg	400 kg	150 kg	350 kg
Farm 2	400 kg	300 kg	300 kg	400 kg	100 kg
Total	600 kg	600 kg	700 kg	550 kg	450 kg

(i) Tomatoes picked by both farms in five weeks:

(600 + 600 + 700 + 550 + 450) kg

= 2900 kg

(ii) In week 3, Farm 1 picked 400 kg of tomatoes.

(iii) Tomatoes picked by Farm 2 in week 4

= 400 kg

Total quantity of tomatoes picked in week 4 = 550 kg

∴ percentage of tomatoes picked

picked by Farm 2 $= \frac{400}{550} \times 100\%$

$= 72.7\%$

OXFORD UNIVERSITY PRESS

(iv) Quantity of tomatoes picked by Farm 1
= 1400 kg

Total quantity of tomatoes picked
= 2900 kg

Percentage of total quantity of tomatoes by Farm 1 $= \frac{1400}{2900} \times 100\%$
= 48%

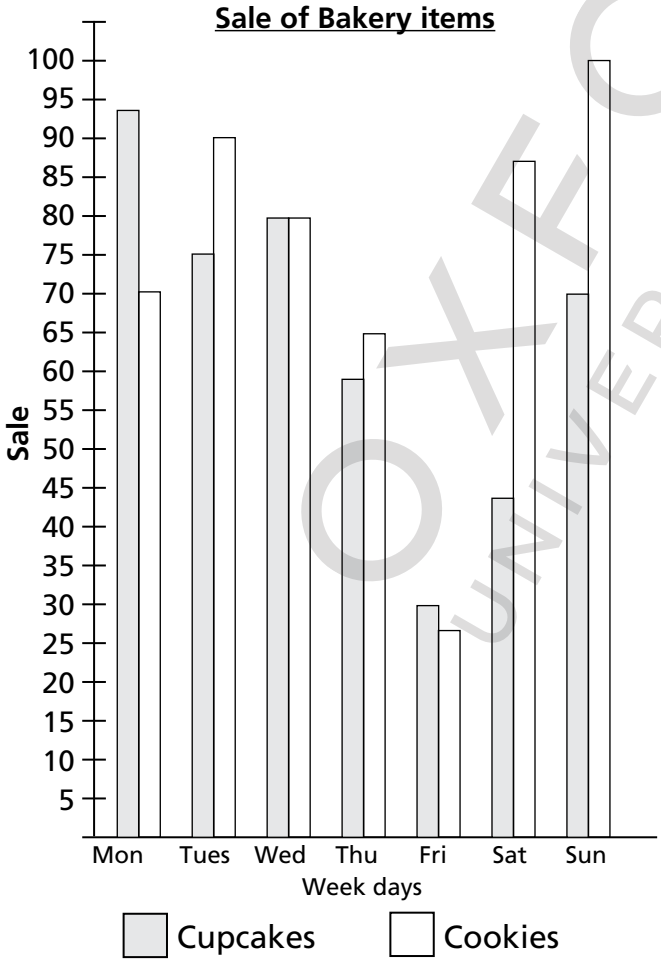
(v) Ratio of tomatoes picked in week 3 to week 4.

Week 3	:	**Week 4**
700	:	550
70	:	55
14	:	11

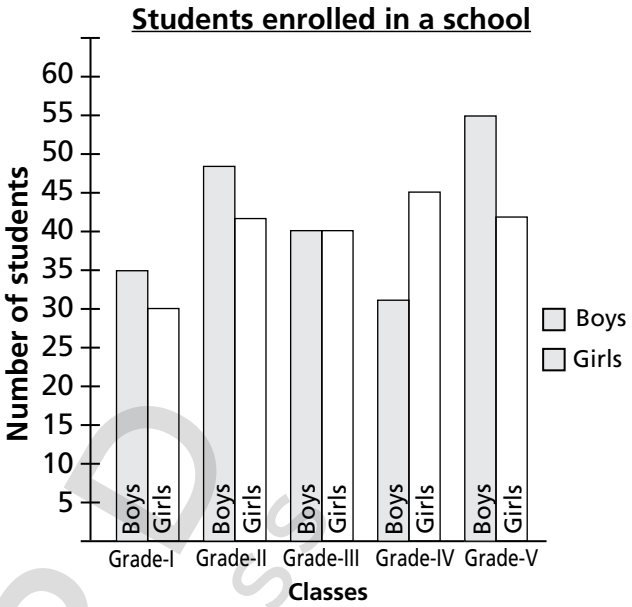
7.

Helpful Hint

- Chose the scale of the smallest and the largest value along the vertical axis.
- Draw the bars of same width leaving same distance between them.



8.



9. (i) Total number of cars parked on Monday.
11 + 9 + 28 + 30 + 12 + = 90

(ii) Red cars are least in number.

(iii) One-third of the total number of cars
$\frac{1}{\cancel{3}} \times \overset{30}{\cancel{90}} = 30$
∴ white cars are one-third of the total.

(iv) Percentage of red cars: $\frac{\overset{1}{\cancel{9}}}{\underset{1}{\cancel{90}}} \times \overset{10}{\cancel{100}} = 10\%$

10. (i) Number of employees who took part in the survey:
2 + 5 + 13 + 8 + 12 = 40

(ii) Majority of employees travel by bus, that is 13.

(iii)

Bicycles	:	Cars
8		2
4	:	1

Bicycle are four times the number of cars.

(iv) Cars are least in number.

11. (i) More people bought crystal vases, that is 23 less people bought picture frame, that 18.

(ii) Number of toys sold = 4
Number of paintings sold = 8
Difference = 8 – 4 = 4
∴ four less toys were sold as compared to paintings.

OXFORD UNIVERSITY PRESS

(iii) Total sale = 18 + 23 + 8 + 4 + 7 = 60

Flowers sold = 8

Paintings sold = 7

Total sale = 15

$$25\% \text{ of sale} = \frac{\cancel{25}^{1}}{\cancel{100}_{\cancel{4}\,1}} \times \cancel{60}^{15} = 15$$

∴ sale of paintings and flowers together make up 25% sales.

(iv) Use a protractor to measure the angle. Sector angle of flowers is 42°.

12. (i) Most popular drink is coffee (49).

(ii) Fresh juice and milkshake are equally liked, that is 25 each.

(iii) Least popular drink is tea (8).

(iv) Number of customers who participated in the survey:
13 + 25 + 49 + 8 + 25 = 120

13. (i) Probability that the selected student has blood group AB is 7/35.

(ii) Probability that the selected student does not have blood group AB = 28/35.

14. (i) Even numbers from 1 to 50 are 25.
∴ the probability that the counter has an even number = 25/50.

(ii) 2-digit numbers from 1 to 50 are 41.
∴ the probability that the counter has a 2-digit number is 41/50.

(iii) There are 10 multiples of 5 from 1 to 50.
∴ the probability that the counter has a multiple of 5 = 10/50 or 1/5.

(iv) There are 7 perfect squares from 1 to 50.
∴ the probability the counter has a perfect square is = 7/50.

Multiple Choice Questions 16

1. Option D: Sector
Reason: Sector is a part of circle, while on a bar graph data is represented as a bar.
Option A, B, and C are part of a bar graph.

2. Option A: Speed of a vehicle on different days.
Reason: Speed will continuously vary, thus value will change. Therefore, cannot be represented on a bar graph.
Option B, C, and D can be represented on a bar graph.

3. Option D: 360°
Reason: A pie chart is a circle and there are 360° in one complete rotation.
Option A, B, and C are all clearly incorrect statements.

4. Option B: The data is grouped.
Reason: The data is neither organised in ascending or descending order nor grouped.
Option A, C, and D are all correct statements.

5. Option C: In year 2013 and year 2015 same number of toys were manufactured.
Reason: In 2013 three thousands toys were manufactured, while in 2015 four thousand toys were manufactured.
Option A, B, and D are all correct statements.

6. Option C: True
Reason: By definition, graphs give instant visual information about changes that take place in a particular situation.
Option A, B, and D are clearly in correct statements.

OXFORD UNIVERSITY PRESS

7. Option D: True

Reason: Multiple bar graph shows relations between different values of data.

Option A, B, and C are incorrect statements.

8. Option C: 1/4

Reason: $\frac{\text{Number of red balls}}{\text{Total number of outcome}}$

$$\frac{12}{12 + 20 + 16} = \frac{12}{48} = \frac{1}{4}$$

Option A, B, and D are clearly incorrect.

9. Option D: 1/4

Reason: When two coins are tossed together the four possible out comes are HH, TT, HT, TH.

Therefore, the probability that both will show head is 1/4

Option A, B,and C are incorrect statement.

OXFORD UNIVERSITY PRESS