ExamPath

CLASS 9 MATHEMATICS · FBISE PATTERN · FULL-BOOK MOCK PAPER

Mock Exam 3: all 11 units

Total 75 marks · 3 hours Section A: **48 MCQs × 0.75 = 36** (1 hour 20 minutes) Section B: **7 × 3 = 21**

Section C: **3 × 6 = 18** (B and C: 1 hour 40 minutes)

Name: _____ Date: _____ Marks: / 75

Section A: circle one answer for each question; questions 33–48 are based on four scenarios. Sections B and C start on a new page. The answer key and model answers are on the last pages. This practice paper follows the structure of the FBISE SSC-I Mathematics model paper. It is not an official FBISE paper.

Section A · 48 MCQs (36 marks) · 1 hour 20 minutes

Part 1 · Questions 1–32

1. $\sqrt{0.09}$ = ?

(A) 0.3 (B) 0.81
(C) 0.03 (D) 0.9

2. Simplify $(x^2y^{-3})^2 \div x^3y^{-4}$.

(A) xy^2 (B) y^2/x
(C) x^7/y^{10} (D) x/y^2

3. Which fraction gives a terminating decimal?

(A) 5/6 (B) 1/3
(C) 2/7 (D) 3/8

4. The characteristic of log 0.0042 is:

(A) −3 (B) −4
(C) 3 (D) −2

5. The exponential form of $\log_2 8 = 3$ is:

(A) $2^8 = 3$ (B) $3^2 = 8$
(C) $8^3 = 2$ (D) $2^3 = 8$

6. $\log_3 54 - \log_3 2$ = ?

(A) 3 (B) 52
(C) 27 (D) $\log_3 52$

7. If U = {1, 2, 3, …, 8} and A = {2, 4, 6, 8}, then A′ is:

(A) ∅ (B) {1, 3, 5, 7}
(C) {1, 2, 3, 4} (D) {2, 4, 6, 8}

8. If $A \times B = \{(1, x), (1, y), (2, x), (2, y)\}$, then B is:

(A) $\{1, 2, x, y\}$ (B) $\{(1, x)\}$
(C) $\{1, 2\}$ (D) $\{x, y\}$

9. The domain of $R = \{(2, 5), (3, 6), (4, 7), (2, 8)\}$ is:

(A) $\{2, 3, 4, 5, 6, 7, 8\}$ (B) $\{5, 6, 7, 8\}$
(C) $\{2, 3, 4\}$ (D) $\{2, 8\}$

10. $(a + b)^2 - (a - b)^2 = ?$

(A) $2ab$ (B) $2a^2 + 2b^2$
(C) $4ab$ (D) 0

11. The area of a rectangle is $x^2 + 2x - 15$. Which pair of factors could be its length and width?

(A) $(x + 5)$ and $(x - 3)$ (B) $(x - 5)$ and $(x + 3)$
(C) $(x + 3)$ and $(x + 5)$ (D) $(x + 15)$ and $(x - 1)$

12. The HCF of $x^2 - 4$ and $x^2 + 5x + 6$ is:

(A) $x + 2$ (B) $(x + 2)(x - 2)$
(C) $x + 3$ (D) $x - 2$

13. Solve $0.4x - 1.2 = 0.8$.

(A) $x = 5$ (B) $x = -1$
(C) $x = 2$ (D) $x = 0.5$

14. The solution of $3x - 7 \geq 2$ is:

(A) $x \geq -3$ (B) $x > 3$
(C) $x \leq 3$ (D) $x \geq 3$

15. Ali is 4 years older than twice his sister's age. Their ages add up to 31. How old is his sister?

(A) 11 (B) 22
(C) 13.5 (D) 9

16. $\tan 45° + \sin 90° = ?$

(A) $\sqrt{2}$ (B) 0
(C) 2 (D) 1

17. A sector of a circle has radius 10 cm and central angle 0.6 radians. Its area is:

(A) $6\ cm^2$ (B) $30\ cm^2$
(C) $60\ cm^2$ (D) $300\ cm^2$

18. The bearing of B from A is 135°. In which direction is B from A?

(A) North-west (B) South-west
(C) South-east (D) North-east

19. The distance between (1, −1) and (4, 3) is:

(A) 7
(B) 5
(C) √7
(D) 25

20. The midpoint of (−4, −6) and (8, 2) is:

(A) (6, 4)
(B) (−6, −4)
(C) (4, −4)
(D) (2, −2)

21. A triangle has vertices A(0, 0), B(4, 0) and C(0, 3). What is its perimeter?

(A) 12
(B) 7
(C) 10
(D) 14

22. A line makes an angle of 45° with the positive x-axis. Its gradient is:

(A) √3
(B) 0
(C) 1
(D) undefined

23. The line through (1, 2) with gradient −3 is:

(A) $y = -3x + 5$
(B) $y = 3x - 1$
(C) $y = -3x - 1$
(D) $y = -3x + 2$

24. The x-intercept of the line $2x - 3y = 12$ is:

(A) −4
(B) 6
(C) 4
(D) −6

25. Each interior angle of a regular polygon is 140°. How many sides does it have?

(A) 8
(B) 10
(C) 9
(D) 7

26. A map has a scale of 1 : 50 000. What real distance does 3 cm on the map represent?

(A) 1.5 km
(B) 150 km
(C) 15 km
(D) 0.15 km

27. Which statement about the claim “All rhombuses are squares” is correct?

(A) It cannot be tested
(B) It is true only for parallelograms
(C) It is false: a rhombus with angles of 60° and 120° is a counterexample
(D) It is true

28. Where does the orthocentre of an obtuse-angled triangle lie?

(A) Inside the triangle
(B) On the longest side
(C) Outside the triangle
(D) At a vertex

29. The in-centre of a triangle is the same distance from:

(A) the three vertices
(B) the midpoints of the sides
(C) the centroid
(D) the three sides

30. You are given sides of 5 cm and 7 cm, and an angle of 30° opposite the 5 cm side. How many different triangles can be constructed?

(A) 1
(B) 2
(C) 0
(D) Infinitely many

31. The mode of 4, 7, 7, 2, 9, 4, 7, 3 is:

(A) 5.375
(B) 7
(C) 9
(D) 4

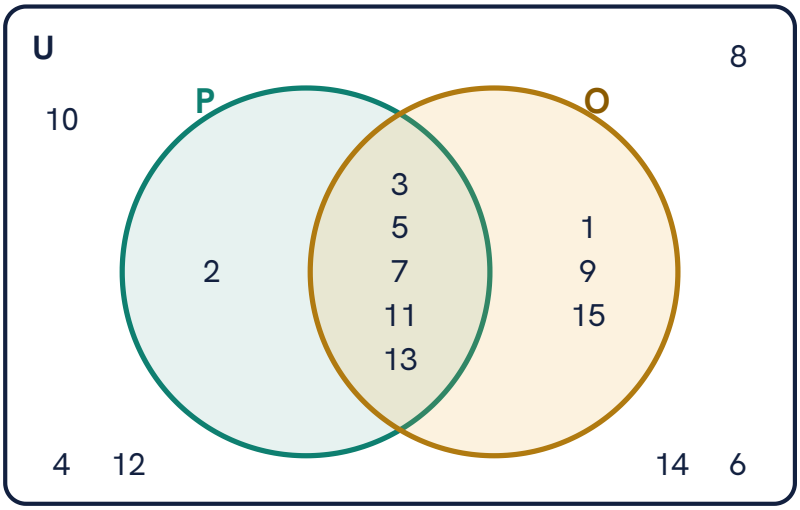
32. A test mark of 60 has weight 1 and an exam mark of 80 has weight 3. What is the weighted mean?

(A) 70
(B) 75
(C) 80
(D) 72

Part 2 · Scenario-based questions 33–48

Scenario 1: Sets (Unit 3) · Questions 33–36

U = {1, 2, 3, ..., 15}. P is the set of prime numbers in U, and O is the set of odd numbers in U. The Venn diagram shows the sets.



33. What is P ∩ O?

(A) {2}
(B) {3, 5, 7, 11, 13}
(C) {1, 9, 15}
(D) {2, 3, 5, 7, 11, 13}

34. What is P − O?

(A) ∅
(B) {3, 5, 7, 11, 13}
(C) {2}
(D) {1, 9, 15}

35. What is O − P?

(A) {1, 9, 15}
(B) {4, 6, 8}
(C) {2}
(D) {1, 9}

36. What is n((P ∪ O)′)?

(A) 5
(B) 9
(C) 6
(D) 7

Scenario 2: Similar figures (Unit 9) · Questions 37–40

A model car is made to a scale of 1 : 20. The model is 21 cm long, its windscreen has an area of 30 cm^2, and its boot holds 0.05 litres.

37. How long is the real car?

(A) 4.2 m
(B) 2.1 m
(C) 42 m
(D) 0.42 m

38. What is the area of the real windscreen?

(A) 0.12 m^2
(B) 1.2 m^2
(C) 12 m^2
(D) 600 cm^2

39. How much does the real boot hold?

(A) 8000 litres
(B) 400 litres
(C) 1 litre
(D) 20 litres

40. What is the ratio of the area of the model windscreen to the real windscreen?

(A) 20 : 1
(B) 1 : 400
(C) 1 : 20
(D) 1 : 8000

Scenario 3: Statistics (Unit 11) · Questions 41–44

The table shows the number of hours that 40 students spend studying each day.

Hours	0–2	2–4	4–6	6–8
Number of students (f)	5	12	15	8

41. What is the modal class?

(A) 2–4
(B) 6–8
(C) 0–2
(D) 4–6

42. Using class marks, what is the mean number of hours?

(A) 3.9
(B) 5
(C) 4.3
(D) 4

43. How many students study for less than 4 hours a day?

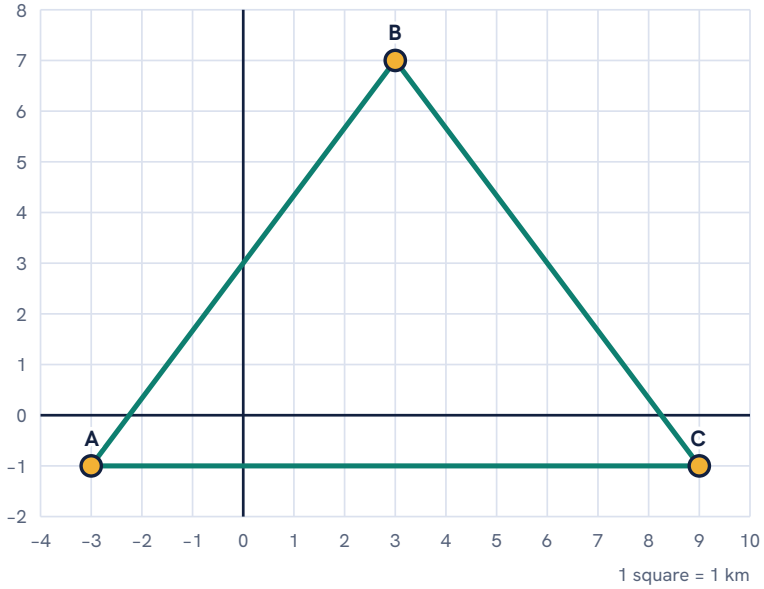
(A) 17
(B) 32
(C) 12
(D) 23

44. Using Mode = $l + (f_m - f_1) / (2f_m - f_1 - f_2) \times h$, the mode is:

(A) 4.5
(B) 4.6
(C) 4.3
(D) 5

Scenario 4: Coordinate geometry (Unit 7 and Unit 8) · Questions 45–48

Three towns A(−3, −1), B(3, 7) and C(9, −1) are joined by straight roads, as shown. Each square is 1 km.



45. How long is the road from A to B?

(A) 8 km
(B) 14 km
(C) 10 km
(D) 12 km

46. What type of triangle do the three roads form?

(A) Equilateral
(B) Scalene
(C) Right-angled
(D) Isosceles

47. What is the gradient of the road BC?

(A) 3/4
(B) −3/4
(C) 4/3
(D) −4/3

48. A new road will go straight from B to meet road AC at a right angle. How long will it be?

(A) 6 km
(B) 7 km
(C) 10 km
(D) 8 km

SECTIONS B AND C · 39 MARKS · TIME: 1 HOUR 40 MINUTES

Answer every question. In each question attempt either (i) or (ii). Show all your working.

Section B · Short questions (7 × 3 = 21 marks)

Question 1 · 3 marks · answer (i) OR (ii)

(i) Simplify $(x^{1/2}y^{-1/3})^6 \div (xy^{-1})^2$, where $x, y > 0$.

OR

(ii) Find the equation of the line through $(4, -3)$ that is perpendicular to $y = 2x + 5$. Write it in the form $ax + by + c = 0$.

Question 2 · 3 marks · answer (i) OR (ii)

(i) Solve $|2 - 5x| = 8$.

OR

(ii) Points A and B are 6 cm apart. How many points are both equidistant from A and B and exactly 4 cm from A? Explain using loci.

Question 3 · 3 marks · answer (i) OR (ii)

(i) Find the gradient of the line $3x + \sqrt{3}y = 6$ and the angle it makes with the positive x-axis.

OR

(ii) Prove that $(1 + \tan^2\theta)\cos^2\theta = 1$.

Question 4 · 3 marks · answer (i) OR (ii)

(i) The volume of a tank is $x^3 - 7x + 6$ m^3. Show that $(x - 1)$ is a factor, factorise completely, and find the dimensions and volume when $x = 6$.

OR

(ii) Solve $-7 \le 3 - 2x < 5$ and show the solution on a number line.

Question 5 · 3 marks · answer (i) OR (ii)

(i) A basketball player scored 36 out of 48 shots. (a) Find the relative frequency of scoring. (b) Estimate how many she will score in her next 60 shots.

OR

(ii) A culture starts with 500 bacteria, and the number doubles every hour, so after t hours there are 500×2^t. Use logarithms to find when there will be 64 000 bacteria.

Question 6 · 3 marks · answer (i) OR (ii)

(i) A stick 1.5 m tall casts a shadow 2 m long. At the same time, a tree casts a shadow 14 m long. Find the height of the tree.

OR

(ii) The foot of a 13 m ladder is 5 m from a wall. How high up the wall does it reach, and what angle does it make with the ground?

Question 7 · 3 marks · answer (i) OR (ii)

(i) On the set {1, 2, 3, 4, 5, 6}, the relation R is defined by x + y = 7. List R and state its domain and range.

OR

(ii) From a ship S, a lighthouse L is 8 km away on a bearing of 040°. How far north and how far east of S is L? What is the bearing of S from L?

Section C · Long questions (3 × 6 = 18 marks)

Question 8 · 6 marks · answer (i) OR (ii)

(i) U = {1, 2, ..., 10}, A = {1, 2, 3, 4, 5}, B = {4, 5, 6, 7} and C = {5, 7, 9}.
(a) Verify that A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C). (4 marks)
(b) Find (A ∪ B)′. (2 marks)

OR

(ii) A model of a statue is made to a scale of 1 : 10, in the same material as the statue.
(a) The model is 25 cm tall. How tall is the statue? (2 marks)
(b) The model has a mass of 2 kg. Find the mass of the statue. (2 marks)
(c) Painting the model needs 0.05 litres of paint. How much paint does the statue need? (2 marks)

Question 9 · 6 marks · answer (i) OR (ii)

(i) For $p = x^3 - x$ and $q = x^2 + 2x + 1$:
(a) Factorise p and q. (2 marks)
(b) Find the HCF and LCM. (2 marks)
(c) Verify that p × q = HCF × LCM. (2 marks)

OR

(ii) From the top of a lighthouse 75 m high, the angles of depression of two ships, on the same side and in line with its foot, are 45° and 30°.
(a) Find the distance of each ship from the foot. (4 marks)
(b) Find the distance between the ships. (2 marks)

Question 10 · 6 marks · answer (i) OR (ii)

(i) Construct triangle ABC with AB = 6 cm, BC = 4.5 cm and angle B = 75°. Draw its three altitudes and state where they meet.

OR

(ii) A student's final score uses weights: test 1 (20%) 60 marks, test 2 (30%) 75 marks, final exam (50%) 82 marks.
(a) Find the weighted mean score. (3 marks)
(b) What final exam mark would have given an overall score of 80? (3 marks)

Answer key

Mock Exam 3 · Section A marks = number correct × 0.75

1 A	**2** D	**3** D	**4** A	**5** D
6 A	**7** B	**8** D	**9** C	**10** C
11 A	**12** A	**13** A	**14** D	**15** D
16 C	**17** B	**18** C	**19** B	**20** D
21 A	**22** C	**23** A	**24** B	**25** C
26 A	**27** C	**28** C	**29** D	**30** B
31 B	**32** B	**33** B	**34** C	**35** A
36 C	**37** A	**38** B	**39** B	**40** B
41 D	**42** C	**43** A	**44** B	**45** C
46 D	**47** D	**48** D		

Section A explanations

1. **A. 0.3** · Unit 1

$0.3 \times 0.3 = 0.09$, so $\sqrt{0.09} = 0.3$.

2. **D. x/y^2** · Unit 1

$(x^2y^{-3})^2 = x^4y^{-6}$. Dividing by x^3y^{-4} gives $x^{4-3}y^{-6+4} = xy^{-2} = x/y^2$.

3. **D. 3/8** · Unit 1

$3/8 = 0.375$ terminates because $8 = 2^3$ has only the prime factor 2. The others give repeating decimals.

4. **A. –3** · Unit 2

$0.0042 = 4.2 \times 10^{-3}$, so the characteristic is −3 (written as 3 with a bar over it).

5. **D. $2^3 = 8$** · Unit 2

$\log_b N = p$ means $b^p = N$, so $2^3 = 8$.

6. **A. 3** · Unit 2

$\log_3 54 - \log_3 2 = \log_3 (54 \div 2) = \log_3 27 = 3$.

7. **B. {1, 3, 5, 7}** · Unit 3

A′ contains the elements of U that are not in A: {1, 3, 5, 7}.

8. **D. {x, y}** · Unit 3

B is the set of second elements: {x, y}. The first elements form A = {1, 2}.

9. **C. {2, 3, 4}** · Unit 3

The domain is the set of first elements, each written once: {2, 3, 4}.

10. **C. 4ab** · Unit 4

$(a^2 + 2ab + b^2) - (a^2 - 2ab + b^2) = 4ab$.

11. **A. (x + 5) and (x – 3)** · Unit 4

Find two numbers with product −15 and sum +2: +5 and −3. So $x^2 + 2x - 15 = (x + 5)(x - 3)$.

12. **A. x + 2** · Unit 4

$x^2 - 4 = (x - 2)(x + 2)$ and $x^2 + 5x + 6 = (x + 2)(x + 3)$. The common factor is $x + 2$.

13. **A. x = 5** · Unit 5
0.4x = 2, so x = 2 ÷ 0.4 = 5.

14. **D. x ≥ 3** · Unit 5
3x ≥ 9, so x ≥ 3. The value 3 itself is included because of the "≥" sign.

15. **D. 9** · Unit 5
Let the sister be x. Then x + (2x + 4) = 31, so 3x = 27 and x = 9. Ali is 22.

16. **C. 2** · Unit 6
tan 45° = 1 and sin 90° = 1, so the sum is 2.

17. **B. 30 cm^2** · Unit 6
A = ½$r^2\theta$ = ½ × 100 × 0.6 = 30 cm^2.

18. **C. South-east** · Unit 6
135° is between 090° (east) and 180° (south), exactly halfway, so B is south-east of A.

19. **B. 5** · Unit 7
$\sqrt{(3^2 + 4^2)} = \sqrt{25} = 5$.

20. **D. (2, −2)** · Unit 7
((−4 + 8)/2, (−6 + 2)/2) = (2, −2).

21. **A. 12** · Unit 7
AB = 4, AC = 3 and BC = $\sqrt{(4^2 + 3^2)} = 5$, so the perimeter is 12.

22. **C. 1** · Unit 8
m = tan 45° = 1.

23. **A. y = −3x + 5** · Unit 8
y − 2 = −3(x − 1), so y = −3x + 3 + 2 = −3x + 5. Check: at x = 1, y = 2.

24. **B. 6** · Unit 8
Put y = 0: 2x = 12, so x = 6. (−4 is the y-intercept.)

25. **C. 9** · Unit 9
Each exterior angle is 180° − 140° = 40°, so n = 360° ÷ 40° = 9.

26. **A. 1.5 km** · Unit 9
3 × 50 000 = 150 000 cm = 1500 m = 1.5 km.

27. **C. It is false: a rhombus with angles of 60° and 120° is a counterexample** · Unit 9
A rhombus needs four equal sides but not right angles. One rhombus without right angles disproves the claim.

28. **C. Outside the triangle** · Unit 10
Two of the altitudes must be extended beyond the triangle, so they meet outside it.

29. **D. the three sides** · Unit 10
Each angle bisector is the set of points equidistant from two sides, so the in-centre is equidistant from all three sides.

30. **B. 2** · Unit 10
The shortest distance is 7 × sin 30° = 3.5 cm. Since 3.5 < 5 < 7, the 5 cm arc cuts the other arm twice, giving two triangles.

31. **B. 7** · Unit 11
7 occurs three times, more than any other value. (5.375 is the mean.)

32. **B. 75** · Unit 11

(60 × 1 + 80 × 3) ÷ (1 + 3) = 300 ÷ 4 = 75. The simple mean 70 ignores the weights.

33. **B. {3, 5, 7, 11, 13}** · Unit 3

The odd primes up to 15: 3, 5, 7, 11, 13.

34. **C. {2}** · Unit 3

2 is the only prime that is not odd.

35. **A. {1, 9, 15}** · Unit 3

The odd numbers that are not prime: 1, 9 and 15. (1 is not a prime number.)

36. **C. 6** · Unit 3

P ∪ O has 9 elements, so its complement in U has 15 − 9 = 6 elements: 4, 6, 8, 10, 12, 14.

37. **A. 4.2 m** · Unit 9

21 × 20 = 420 cm = 4.2 m.

38. **B. 1.2 m^2** · Unit 9

Areas scale by $20^2 = 400$: 30 × 400 = 12 000 cm^2 = 1.2 m^2 (1 m^2 = 10 000 cm^2).

39. **B. 400 litres** · Unit 9

Volumes scale by $20^3 = 8000$: 0.05 × 8000 = 400 litres.

40. **B. 1 : 400** · Unit 9

Area ratio = $1^2 : 20^2 = 1 : 400$.

41. **D. 4–6** · Unit 11

The class with the highest frequency (15) is 4–6.

42. **C. 4.3** · Unit 11

Class marks are 1, 3, 5, 7. Σfx = 5 + 36 + 75 + 56 = 172, and 172 ÷ 40 = 4.3 hours.

43. **A. 17** · Unit 11

5 + 12 = 17 students are in the classes 0–2 and 2–4.

44. **B. 4.6** · Unit 11

l = 4, h = 2, f_m = 15, f_1 = 12, f_2 = 8. Mode = 4 + 3/10 × 2 = 4.6 hours.

45. **C. 10 km** · Unit 7

$\sqrt{[(3 + 3)^2 + (7 + 1)^2]} = \sqrt{(36 + 64)} = 10$ km.

46. **D. Isosceles** · Unit 7

AB = 10 km, BC = 10 km and AC = 12 km. Two sides are equal, so it is isosceles. It is not right-angled because $10^2 + 10^2 \neq 12^2$.

47. **D. −4/3** · Unit 8

m = (−1 − 7)/(9 − 3) = −8/6 = −4/3.

48. **D. 8 km** · Unit 7

AC is horizontal (y = −1), so the perpendicular from B(3, 7) meets it at (3, −1). Its length is 7 − (−1) = 8 km.

Sections B and C: model answers

Both options of each question are answered. Give marks for correct working as well as the final answer. These are model answers, not an official FBISE marking scheme.

Q1 (i) · Unit 1 · Laws of indices

1. $(x^{1/2}y^{-1/3})^6 = x^3y^{-2}$
2. $(xy^{-1})^2 = x^2y^{-2}$
3. $x^3y^{-2} \div x^2y^{-2} = x^1y^0 = x$

Answer: x

Q1 (ii) · Unit 8 · Equation of a line

1. The given gradient is 2, so the perpendicular gradient is −1/2.
2. $y + 3 = -\frac{1}{2}(x - 4)$. Multiply by 2: $2y + 6 = -x + 4$.
3. $x + 2y + 2 = 0$. Check (4, −3): $4 - 6 + 2 = 0$ ✓

Answer: x + 2y + 2 = 0

Q2 (i) · Unit 5 · Absolute value equation

1. $2 - 5x = 8$ gives $-5x = 6$, so $x = -6/5$.
2. $2 - 5x = -8$ gives $-5x = -10$, so $x = 2$.

Answer: x = 2 or x = −6/5

Q2 (ii) · Unit 9 · Locus

1. Points equidistant from A and B lie on the perpendicular bisector of AB, which is 3 cm from A at its closest.
2. Points 4 cm from A lie on a circle with centre A and radius 4 cm.
3. Since 4 cm > 3 cm, the circle cuts the bisector at two points.

Answer: Two points

Q3 (i) · Unit 8 · Angle of a line

1. $\sqrt{3}y = -3x + 6$, so $y = -\sqrt{3}x + 2\sqrt{3}$. Gradient $m = -\sqrt{3}$.
2. $\tan\alpha = -\sqrt{3}$, so $\alpha = 180° - 60° = 120°$.

Answer: m = −√3; angle 120° (the acute angle with the x-axis is 60°)

Q3 (ii) · Unit 6 · Trigonometric identity

1. $1 + \tan^2\theta = \sec^2\theta$
2. LHS = $\sec^2\theta \times \cos^2\theta = (1/\cos^2\theta) \times \cos^2\theta = 1$ = RHS

Answer: LHS = 1 = RHS

Q4 (i) · Unit 4 · Factorising a cubic

1. $x = 1$ gives $1 - 7 + 6 = 0$, so $(x - 1)$ is a factor.
2. $x^3 - 7x + 6 = (x - 1)(x^2 + x - 6) = (x - 1)(x - 2)(x + 3)$
3. $x = 6$: dimensions 5, 4 and 9 m; volume 180 m^3. Check: $216 - 42 + 6 = 180$ ✓

Answer: (x − 1)(x − 2)(x + 3); 5 m, 4 m, 9 m; 180 m^3

Q4 (ii) · Unit 5 · Inequality on a number line

1. Subtract 3: $-10 \le -2x < 2$
2. Divide by −2 and reverse both signs: $5 \ge x > -1$
3. So $-1 < x \le 5$: hollow circle at −1, filled circle at 5, shaded between.

Answer: −1 < x ≤ 5

Q5 (i) · Unit 11 · Relative and expected frequency

1. (a) 36 ÷ 48 = 0.75
2. (b) 60 × 0.75 = 45

Answer: (a) 0.75 (b) about 45

Q5 (ii) · Unit 2 · Logarithms in real life

1. 500 × 2^t = 64 000, so 2^t = 128.
2. t log 2 = log 128, so t = log 128 ÷ log 2.
3. t = 2.1072 ÷ 0.3010 = 7 hours (check: 2^7 = 128).

Answer: 7 hours

Q6 (i) · Unit 9 · Similar triangles

1. The sun's rays make similar triangles, so height/shadow is the same for both.
2. h/14 = 1.5/2, so h = 14 × 0.75 = 10.5 m.

Answer: 10.5 m

Q6 (ii) · Unit 6 · Trigonometry in real life

1. Height = $\sqrt{(13^2 - 5^2)} = \sqrt{144}$ = 12 m
2. cos θ = 5/13, so θ ≈ 67.38°.

Answer: 12 m; about 67.38°

Q7 (i) · Unit 3 · Relations

1. R = {(1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)}
2. Domain = {1, 2, 3, 4, 5, 6}; range = {1, 2, 3, 4, 5, 6}.

Answer: Six pairs; domain and range are both {1, 2, 3, 4, 5, 6}

Q7 (ii) · Unit 6 · Bearings

1. North: 8 cos 40° ≈ 6.13 km. East: 8 sin 40° ≈ 5.14 km.
2. Bearing of S from L = 040° + 180° = 220°.

Answer: About 6.13 km north and 5.14 km east; 220°

Q8 (i) · Unit 3 · Laws of sets

1. (a) B ∪ C = {4, 5, 6, 7, 9}, so A ∩ (B ∪ C) = {4, 5}.
2. A ∩ B = {4, 5} and A ∩ C = {5}; their union is {4, 5}. Both sides are equal.
3. (b) A ∪ B = {1, 2, 3, 4, 5, 6, 7}, so (A ∪ B)′ = {8, 9, 10}.

Answer: (a) both sides = {4, 5} (b) {8, 9, 10}

Q8 (ii) · Unit 9 · Similar solids

1. (a) 25 × 10 = 250 cm = 2.5 m
2. (b) Mass depends on volume, which scales by 10^3: 2 × 1000 = 2000 kg.
3. (c) Paint depends on surface area, which scales by 10^2: 0.05 × 100 = 5 litres.

Answer: (a) 2.5 m (b) 2000 kg (c) 5 litres

Q9 (i) · Unit 4 · HCF and LCM

1. (a) p = x(x − 1)(x + 1); q = $(x + 1)^2$.
2. (b) HCF = x + 1; LCM = x(x − 1)$(x + 1)^2$.
3. (c) p × q = x(x − 1)$(x + 1)^3$ and HCF × LCM = (x + 1) × x(x − 1)$(x + 1)^2$ = x(x − 1)$(x + 1)^3$. Verified.

Answer: HCF = x + 1; LCM = x(x − 1)$(x + 1)^2$

Q9 (ii) · Unit 6 · Angles of depression

1. (a) Nearer ship: d = 75/tan 45° = 75 m.
2. Farther ship: d = 75/tan 30° = 75√3 ≈ 129.9 m.
3. (b) 75√3 − 75 = 75(√3 − 1) ≈ 54.9 m.

Answer: (a) 75 m and about 129.9 m (b) about 54.9 m

Q10 (i) · Unit 10 · Construction: altitudes

1. Draw AB = 6 cm. At B construct an angle of 75° and mark BC = 4.5 cm on its arm. Join AC.
2. From each vertex, construct the perpendicular to the opposite side (extended if needed). These are the altitudes.
3. The three altitudes meet at one point H, the orthocentre.
4. All the angles of this triangle are acute, so H lies inside the triangle.

Answer: The altitudes are concurrent at the orthocentre, which lies inside the triangle

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Q10 (ii) · Unit 11 · Weighted mean

1. (a) 0.2 × 60 + 0.3 × 75 + 0.5 × 82 = 12 + 22.5 + 41 = 75.5
2. (b) 12 + 22.5 + 0.5f = 80, so 0.5f = 45.5 and f = 91.

Answer: (a) 75.5 (b) 91

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