MOCK UPCAT 1: ANSWER KEY WITH SOLUTIONS

1. **D**

   $0.04 = \frac{4}{100} = \frac{1}{25} = \mathbf{\frac{10}{250}}$

2. **A**

   $\frac{2a}{2b} = \frac{\cancel{2}a}{\cancel{2}b} = \boldsymbol{\frac{a}{b}}$

3. **C**

   $(2a)^2 = (2^2)(a^2) = 4a^2$

   $x^5 - x^3 = (x^3)(x^2-1)$

   $\mathbf{a^3 + a^3 = (a^3)(1+1) = 2a^3}$

   $(x+y)^2 = x^2 + 2xy + y^2$

4. **C**

   $\frac{1}{a} + \frac{1}{b} = \frac{b}{ab} + \frac{a}{ba} = \frac{b+a}{ab}$

   $\sqrt{3} - \sqrt{2} = 1.732 - 1.414 = 0.318$

   $\mathbf{(x-y)^2 = x^2 - 2xy + y^2}$

5. **B**

   $\frac{(2^{13})(3^{14})}{(27)(6^{12})} = \frac{(2^{13})(3^{14})}{(3^3)(3^{12})(2^{12})} = \frac{(2^{13})(3^{14})}{(3^{15})(2^{12})} = \frac{(2^{13})(3^{14})}{(3^{15})(2^{12})} =$

   $\frac{(2)(\cancel{2^{12}})(3^{14})}{(3^{15})(\cancel{2^{12}})} = \frac{(2)(3^{14})}{3^{15}} = \frac{(2)(\cancel{3^{14}})}{(3)(\cancel{3^{14}})} = \mathbf{\frac{2}{3}}$

6. **C**

   $s = \frac{rst + xy}{ty - r}$

   $sty - sr = rst + xy$

   $sty - xy = rst + sr$

   $(y)(st - x) = (rs)(t + 1)$

   $r = \mathbf{\frac{y(st - x)}{s(t+1)}}$

7. **B**

   $[(\sqrt[3]{x})(\sqrt[5]{x})]^{10} = [(x^{1/3})(x^{1/5})]^{10}$

   $= (x^{10/3})(x^{10/5}) = (x^{10/3})(x^2)$

   $= x^{\frac{10}{3}+2} = x^{\frac{10}{3}+\frac{6}{3}} = x^{16/3} = \boldsymbol{\sqrt[3]{x^{16}}}$

8. **C**

   $(-8a^5b^2c^3)(-2a^2b^7c)^2$

   $= (-8a^5b^2c^3)\,[(-2)^2(a^2)^2(b^7)^2(c^2)^2]$

   $= (-8a^5b^2c^3)\,(4a^4b^{14}c^2)$

   $= -32a^{5+4}b^{2+14}c^{3+2} = \mathbf{-32a^9b^{16}c^5}$

9. **C**

   $m = \frac{4t}{3t - 2h}$

   $3mt - 2hm = 4t$

   $3mt - 4t = 2hm$

   $(3m - 4)(t) = 2hm$

   $t = \boldsymbol{\frac{2hm}{3m-4}}$

10. **C**

    $32 \underbrace{\;}_{-8} 24 \underbrace{\;}_{+24} 48 \underbrace{\;}_{-8} 40 \underbrace{\;}_{+24} 64 \underbrace{\;}_{-8} 56 \underbrace{\;}_{+24} \underline{x}$

    $x = 56 + 24 = \mathbf{80}$

11. **C**

    Sum of terms in a sequence

    =(Average)(# of terms)

    Average $= \frac{\text{1st term + last term}}{2}$

    $= \frac{21 + 72}{2} = 46.5$

    Number of terms

    $= \frac{\text{last term} - \text{1st term}}{\text{common difference}} + 1$

    $= \frac{72 - 21}{3} + 1 = \frac{51}{3} + 1 = 18$

    Sum = (46.5)(18) = **837**

12. **C**

    In an arithmetic sequence, the 8th term =[1st term + (7)(common difference)] and the 15th term = [1st term + (14)(common difference)].

    Let A_1 be the 1st term

    d be the common difference

    $A_1 + 14d = 30$

    $-\ \underline{A_1 + 7d = 9}$

    $7d = 21$

    $d = 3$

    $A_1 + 14d = 30$

    $A_1 = 30 - 14d$

    $A_1 = 30 - (14)(3) = 30 - 42 = \mathbf{-12}$

13. **C**

    $\frac{3}{125} = 0.024$

    $0.028 - 0.024 = 0.004 = \frac{4}{1000} = \mathbf{\frac{1}{250}}$

14. **C**

    Let x be the price of spaghetti;

    y be the price of juice

    $x + y = 230$

    $x = y + 100$

    $y + 100 + y = 2y + 100 = 230$

    $2y = 130$

    $y = \mathbf{65}$

15. **C**

    rate: 50 envelopes/minute

    time: $\frac{number\ of\ envelopes}{rate}$

    n/50

16. **C**
Let x be the price of refrigerator
(5%)(x) = (0.05)(x) = P500.00
x = $\frac{P500}{0.05}$ = **P10 000**

17. **B**
rate: 7 tables/day
time: $\frac{number\ of\ tables}{rate}$
t/7

18. **A**
LCM (9, 21): 63
The bells will ring simultaneously 63 minutes after 12 noon or at **1:03 p.m.**

19. **B**
Let x be the mother's age;
(3x – 7) be the son's age

If x = 15, then 3x – 7 = 45 – 7 = 38
She gave birth 15 years ago and her age was then 38 – 15 = **23 years old**.

20. **D**
Let x be Trina's age;
37 - x be Trisha's age;
x - 5 be Trina's age 5 years ago;
32 - x be Trisha's age 5 years ago;

x – 5 = (2)(32 – x)
x – 5 = 64 – 2x
3x = 64 + 5 = 69
x = **23**

21. **B**
Let x be the # of tables w/ 4 chairs
20 – x be the # of tables w/ 6 chairs

(4)(x) + (6)(20 - x) = 92
4x + 120 – 6x = 92
-2x = -28
x = **14**

22. **C**
Total cost of taxed goods
=P540 + (P540) (12%)
=P540 + (P540) (0.12)
=(P540) (1.12)
=P604.80
Total cost of all goods
= taxed goods + untaxed goods
= P604.80 + P66
= **P670.80**

23. **A**
Let x be mother's age
2x be Grandmother's age
2x – 60 be Tanisha's age

x + 2x + 2x – 60 = 150;
5x – 60 = 150;
5x = 210;
x = 42;
2x – 60 = (2)(42) – 60 = 84 – 60 = **24**

24. **D**
If growth of sales of Pet Habitat this year is 20%, it's sales next year is 1.2 times as this year. So, the sales of an indicated year are 1.2 times as that of its previous year.
Ratio: 1.2 :1 = **6:5**

25. **C**
Ave. speed = $\frac{totaldistance}{totaltime} = \frac{120\cdot 2\ km}{2+3\ hrs}$
$= \frac{240\ km}{5\ hrs}$=48 km/hr = **48 kph**

26. **A**
2:25 pm = 14:25 (military time)
10:00 to 14:25 = 4 hrs and 25 mins
8:00 – 7:00 = 1 hour time difference
4 hrs. & 25 min. – 1 hr = **3 hrs. & 25 mins.**

27. **D**
Time = $\frac{distance}{speed} = \frac{5\ km}{25\ km/h}$ = 0.2 hr
(0.2 hr)$\left(\frac{60\ minutes}{hour}\right)$ = 12 mins.
He will arrive 12 minutes past 9:00 or at **9:12 a.m.**

28. **D**
At 6:15:
Train A:
(6:15 – 5:00)(10kph) = 12.5 km from station
Train B:
(6:15 – 5:30)(8kph)= 6 km from station
Distance: 12.5km – 6km = 6.5 km = $\mathbf{\frac{13}{2}}$ **km**

29. **A**
f(x) = $\frac{x+1}{x^2-1} = \frac{x+1}{(x-1)(x+1)} = \frac{1}{x-1}$, x≠ ±1
g(x) = $\frac{3x+7}{2x}$
f[g(x)] = $\frac{1}{\frac{3x+7}{2x}-1} = \frac{1}{\frac{3x+7}{2x}-\frac{2x}{2x}} = \frac{1}{\frac{3x+7-2x}{2x}}$
$= \frac{1}{\frac{x+7}{2x}} = \mathbf{\frac{2x}{x+7}}$

30. **C**
$28x - 4y - 12 = 0;$
$28x - 12 = 4y;$
$7x - 4 = y;$
$y = 7x - 4;$ (slope-intercept form)
slope = **7**

31. **C**
$x^2 - y^2 = (x + y)(x - y) = 77$
$x + y = 11$
$x - y = \frac{77}{11} = 7$

$$\begin{array}{l} x + y = 11 \\ +\underline{x - y = 7} \end{array}$$

$2x = 18; x =$ **9**

32. **B**
A midpoint of a line segment is equidistant from the 2 end points.
Distance (-14,-6) = |-14 – (-6)| = |-8| = 8
-6 + 8 = **2**

33. **C**

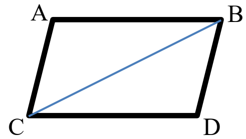
Statement	**Reason**
1. $\overline{BD} = \overline{CD}$; $\overline{AD} = \overline{BD}$	1. Definition of isosceles triangle
2. $\overline{AD} = \overline{CD}$	2. Transitive Property of Equality
3. m∠DBC = m∠DCB; m∠DAB=m∠DBA; m∠DAC=m∠DCA	3. Isosceles Triangle Theorem
4. m∠DBC + m∠DCB + 120° = 180°	4. Definition of a triangle
5. m∠DBC + m∠DCB = 60°	5. Subtraction Property of Equality
6. m∠DBC + m∠DBC = 2(m∠DBC) = 60°	6. Addition Property of Equality
7. m∠DBC = 30°	7. Division Property of Equality
8. m∠DCB = 30°	8. Transitive Property
9. m∠DAB + m∠DBA + m∠DBC + m∠DCB + m∠DCA + m∠DAC = 360°	9. Triangle Angle Sum Theorem
10. m∠DAB + m∠DAB + m∠DBC + m∠DBC + m∠DCA + m∠DCA = 2(m∠DAB+m∠DBC +m∠DAC) = 180°	10. Addition Property of Equality
11. m∠DAB+m∠DBC +m∠DAC = 90°	11. Division Property of Equality
12. m∠DAB+30° +m∠DAC = 90°	12. Substitution
13. m∠DAB+m∠DAC = 60°	13. Subtraction Property of Equality
14. m∠DAB+m∠DAC = m∠BAC = 60°	14. Angle Addition Postulate
15. ∠BAC and ∠x forms a linear pair and are supplementary	15. Definition of a Linear Pair; Linear Pair Theorem
16. m∠BAC+m∠x = 180°	16. Definition of Supplementary
17. 60° + m∠x = 180°	17. Substitution of Values
18. m∠x = **120°**	18. Subtraction Property of Equality

34. **A**
12+6 =18; height of bigger triangle
12:20::18:20 + x
$20 + x = \frac{(20)(18)}{12} = 30$
$x = 30 - 20 =$ **10**

35. **D**
The first three statements (Opposite angles are congruent, opposite sides are equal in length, and

adjacent angles are always supplementary.) are among the properties of parallelograms.

Let ABCD be a parallelogram and BC be one of its diagonals.

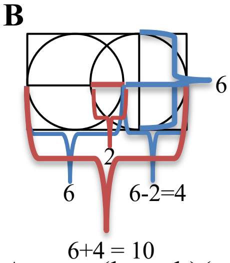


Statement	Reason
1. AB ∥ CD; AC ∥BD	Defn. of parallelogram
2. ∠ACB = ∠DBC; ∠ABC = ∠DCB	Alternate interior angles of parallel lines are congruent.
3. $\overline{BC} = \overline{BC}$	Reflexive Property
4. ΔACB ≅ΔDBC	ASA Postulate
5. ∠A = ∠D;	Corresponding parts of congruent triangles are congruent
Statement 1 proved. You can also prove that ∠B = ∠D by using the segment AD.	
6. $\overline{AB} = \overline{CD}$; $\overline{AC} = \overline{BD}$	Corresponding parts of congruent triangles are congruent
Statement 2 proved.	
7. m∠A+m∠ACB+m ∠ABC = 180	Definition of a triangle
8. m∠ABC ≡m∠DCB	Definition of congruent angles
9. m∠A+m∠ACB+m ∠DCB = 180	Addition Property of Equality
10. m∠ACB+m∠DCB = m∠C	Angle Addition Postulate
11. m∠A+m∠C = 180	Addition Property of Equality
Statement 3 proved. You can also prove that m∠B+m∠D = 180 if the diagonal used is AD.	

36. **B**

- **a. A rectangle is always a square.**
  Rectangle: a quadrilateral with opposite sides parallel and 4 right angles.
  Square: a quadrilateral with opposite sides parallel, 4 right angles and 4 equal sides.
  *Not all rectangles have 4 equal sides. However, we can say that all squares are rectangles.
- **b. A square is always a rhombus.**
  Rhombus: a quadrilateral with opposite sides parallel and 4 equal sides.
  *Since a square has parallel opposite sides and 4 equal sides, then we can say that this statement is true.
- **c. A rhombus is always a rhomboid.**
  Rhomboid: a quadrilateral with opposite sides parallel and opposite sides and angles equal.
  *The adjacent sides of rhomboids may or may not be equal.
- **d. A rhomboid is always a rectangle.**
  *Even though opposite angles of rhomboids are equal, it is possible that these angles are not 90°.

37. **B**



Area = (length)(width) = (10)(6) = **60 sq. units**

38. **A**

The Pythagorean Theorem ($a^2 + b^2 = c^2$) applies in any given right triangle. Thus, if the sides of the triangles are consecutive even integers, then we can substitute the lengths of the sides such that the resulting equation is

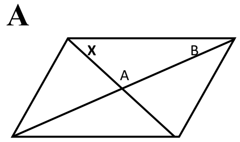
$a^2 + (a+2)^2 = (a+4)^2$
$a^2 + (a^2 + 4a + 4) = a^2 + 8a + 16$
$a^2 + a^2 + 4a + 4 = a^2 + 8a + 16$
$2a^2 + 4a + 4 = a^2 + 8a + 16$
$a^2 - 4a - 12 = 0$
$(a-6)(a+2) = 0$
$a = \mathbf{6}, -2$

Since the length of a side of a triangle cannot be negative, thus the length of the shortest side is 6.

39. **D**

Let A, B and C be the any of sides of a triangle.
A + B > C; wherein A, B and C are the lengths of the three sides of a triangle. (Note: Values for A, B and C are interchangeable.)
10+9>8;
10+8>9;
9+8>10

40. **A**



Y

Z

Statement	Reason
1. ∠A and ∠Y are vertical angles	1. Definition of Vertical Angles
2. m∠A = m∠Y = 100°	2. Vertical Angle Theorem; Given
3. m∠A + m∠B + m∠X = 180	3. Triangle Angle Sum Theorem
4. 100° + m∠B + 55° = 180°	4. Given
5. m∠B = 25°	5. Subtraction Property of Equality
6. m∠B = m∠Z	6. Alternate Interior Angle Theorem
7. m∠Z = **25**	7. Transitive Property of Equality

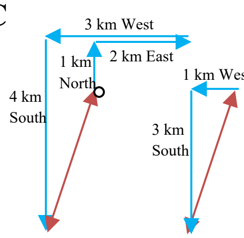
41. **C**

Width of smallest triangle: 2x;
Width of new triangle: 8x;
Height of smallest triangle: y;
Height of new triangle: 4y;
Area of smallest triangle: $\frac{(2x)(y)}{2} = xy$;
Area of new triangle: $\frac{(8x)(4y)}{2} = 16xy$;
Area is increased **16 times**

42. **B**

Area of triangle: 4cm^2;
Side of square: $\sqrt{8}$ = Radius of circle
Area of circle: $\pi r^2 = \pi(\sqrt{8})^2 = \mathbf{8\pi\ cm^2}$

43. **C**



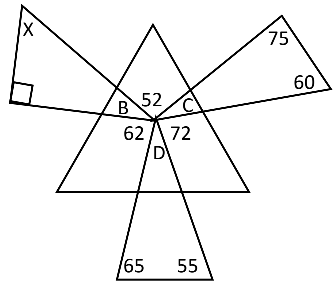
Note: ∘ origin; ↔ displacement

Displacement = $\sqrt{3^2 + 1^2} = \sqrt{9 + 1} = \sqrt{10}$

44. **C**

Volume of cylinder: $\pi r^2 h$;
Since π and height are constant, ratio of volume depends on r^2.
Ratio: $1^2{:}2^2{:}4^2 = 1{:}4{:}16$

45. **B**



Note: ☐ right angle = 90°

Statement	Reason
1. 75° + 60° + m∠C = 180°	1. Triangle Angle Sum Theorem
2. m∠C = 45°	2. Subtraction Property of Equality
3. 65° + 55° + m∠D = 180°	3. Triangle Angle Sum Theorem
4. m∠D = 60°	4. Subtraction Property of Equality
5. 52° + m∠C + 72° + m∠D + 62° + m∠B = 360°;	5. The sum of all angles that meet at a point is equal to 360°.
6. 52° + 45° + 72° + 60° + 62° + m∠B = 360°	6. Substitution of Values
7. m∠B = 69°	7. Subtraction Property of Equality
8. 90° + m∠X + m∠B = 360;	8. Triangle Angle Sum Theorem
9. 90° + m∠X + 69° = 360;	9. Substitution of Values
10. m∠X = **21°**	10. Subtraction Property of Equality

46. **C**

Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(21 - 5)^2 + (\text{-}9 - 3)^2}$

$= \sqrt{(16)^2 + (\text{-}12)^2}$

$= \sqrt{256 + 144}$

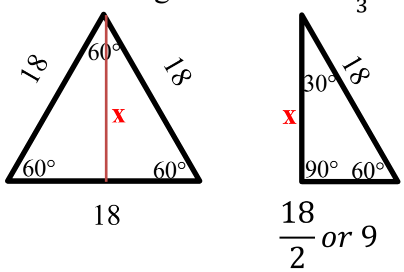
$= \sqrt{400}$

$= \mathbf{20}$

47. **B**

Since the triangle is equilateral, we can also say that the triangle is equiangular, with each angle = 60°.

If the perimeter of an equilateral triangle is 54, then the length of a side is $\frac{54}{3}$ or 18.



Pythagorean Theorem: $a^2 + b^2 = c^2$

$x^2 + 9^2 = 18^2$

$x^2 + 81 = 324$

$x^2 = 324 - 81 = 243$

$x = \sqrt{243} = \sqrt{3^5} = \mathbf{9\sqrt{3}}$

48. **B**

15:20::6:x

$x = \frac{(20)(6)}{15} = \frac{120}{15} = \mathbf{8}$

49. **C**

A∩B = X

(A∩B)∩X = X∩X = **X**

50. **C**

(A∪B) = set of all numbers which are contained in either A or B = $\left\{\frac{1}{2}, \frac{1}{4}, \frac{3}{2}, \frac{3}{4}\right\}$

(A∪B)∪C = set of all numbers which are contained in either the union of A or B $\left(\left\{\frac{1}{2}, \frac{1}{4}, \frac{3}{2}, \frac{3}{4}\right\}\right)$ or in C $\left(\left\{\frac{1}{6}, \frac{1}{3}, \frac{1}{2}\right\}\right) = \left\{\mathbf{\frac{1}{2}, \frac{1}{4}, \frac{3}{2}, \frac{3}{4}, \frac{1}{6}, \frac{1}{3}}\right\}$

X = A∩B = set of all numbers which are contained in both A and B = $\left\{\mathbf{\frac{1}{2}, \frac{1}{4}}\right\}$

51. **B**
52. **A**
53. **B**
54. **D**

Probability = $\frac{number of desired outcomes}{total number of outcomes}$

$= \frac{5\ green marbles}{5\ green marbles + 2\ blue marbles + 3\ red marbles} = \frac{5}{10} = \frac{1}{2} = 50\%$

55. **B**

If three pairs of pants could be partnered to five shirts, then the number of shirt-pants combinations from those are (3)(5) or 15 combinations.

If two pairs of pants could be partnered to four shirts, then the number of shirt-pants combinations from those are (2)(4) or 8 combinations.

Since all the shirt-pants combinations can be paired with any of the two blazers, then the number of possible 3-piece attires is (15+8)(2) = (23)(2) = **46**.

56. **A**

Sum = (Average)(Number of terms);

Since arithmetic mean is synonymous to average, we can change the equation above to

Sum = (Arithmetic Mean)(Number of terms)

= (12)(10)

=120

After one of the ten numbers is removed, the average of the remaining numbers goes up to 13. Thus the sum of the remaining 9 numbers is

Sum = (13)(9)

= 117

Thus, the number the difference between the sum of the ten numbers and the sum of the nine numbers is 120 – 117 = **3**.

57. **B**

Let A be the set of players in the 1st game

B be the set of players in the 2nd game

Assuming that all the players will play at least one game, then A∪B = 12.

A+B - A∪B = A∩B

8 + 7 – 12 = A∩B = **3**

58. **C**

Let A be the set of students playing basketball

B be the set of students playing badminton

Assuming that the whole class plays either basketball or badminton or both, then A∪B is the set of all students = 30.

A+B - A∪B = A∩B

20 + 23 – 30 = A∩B = **13**

59. **D**

If there are 98 seniors and 48 of these are girls, then there are 98 – 48 or 50 boys. Consequently, the ratio of girls to boys among seniors is **48:50**.

60. **B**

If 90% of 50 students scored 70 or higher, then 100% - 90% or 10% did not reach the score of 70. 10% of 50 students is equivalent to **5 students**.