MOCK UPCAT 9: ANSWER KEY WITH SOLUTIONS

1. **B**

$16\frac{2}{3}\%$ of N is 35

$16\frac{2}{3}\% = \frac{50}{3}\%$

$\frac{50}{3}$ x N = 35

$\frac{3}{50}\left[\frac{50}{3}\text{ x N} = 35\right]\frac{3}{50}$

$N = \frac{21}{10}$

What percent of *N* is 63?

A% x N = 63

$A\text{ x }\frac{21}{10} = 63$

$\frac{10}{21}\left[A\text{ x }\frac{21}{10} = 63\right]\frac{10}{21}$

A = 30%

2. **C**

Evaluate. Use formulas for Arithmetic Sequence.

a. n = -12 (we cannot have a negative number of terms)

b. n = 9

$a_9 = 2+(9-1)3 = 26$

$\text{Sum} = \frac{(2+26)}{2}(9) = 126$

sum = 155 ≠ 126

c. **n = 10**

$a_{10} = 2+(10-1)3 = 29$

$\text{Sum} = \frac{(2+29)}{2}(10) = 155$

Sum = 155 = 155

3. **C**

Use formulas for Geometric Sequence.

$a_4 = 24 = a_1 r^{(4-1)}$

$a_7 = 192 = a_1 r^{(7-1)}$

Since $a_1 = a_1$, then

$\frac{24}{r^3} = \frac{192}{r^6}$

$r = 2$

$a_1 = \frac{24}{2^3} = 3$

4. **D**

Use synthetic division especially when coefficients are involved.

-3	1	a	3	-9
		-3	9-3a	-36+9a
	1	-3+a	12-3a	-45+9a

$-45+9a = 0$

$a = 5$

5. **B**

Solve for remainder (Q_1+Q_2).

-3	1	a	3	-9
		-3	9-3a	-36+9a
	1	-3+a	12-3a	**-45+9a**

2	1	k	-12	6
		2	4+2k	-16+4k
	1	2+k	-8+2k	**-10+4k**

$Q_1 + Q_2 = 20$

$5k-6+4k-10 = 20$

$k = 4$

6. **C**

Solve for the discriminant.

a. $(-7)^2 - 4(1)(4) = 33$

b. $(-7)^2 - 4(1)(-4) = 65$

c. $(-1)^2 - 4(7)(4) = -111$

d. $(-1)^2 - 4(7)(-4) = 113$

7. **B**

$f(a) - f(a-1) =$

$= a^2 + 4a + 4 - \left[(a-1)^2 + 4(a-1) + 4\right]$

$= a^2 + 4a + 4 - \left[a^2 - 2a + 1 + 4a - 4 + 4\right]$

$= a^2 + 4a + 4 - a^2 - 2a - 1$

$= 2a + 3$

8. **E**

$$\frac{g(m+n)-g(m)}{n} =$$

$$= \frac{(m+n)^2 - 5(m+n) + 6 - \left[m^2 - 5m + 6\right]}{n}$$

$$= \frac{m^2 + 2mn + n^2 - 5m - 5n + 6 - m^2 + 5m - 6}{n}$$

$= 2m + n - 5$

9. **B**

Evaluate.

a. $f(x) = x^2 - 16, 0 = (x+4)(x-4)$

Zeroes are 4 and -4.

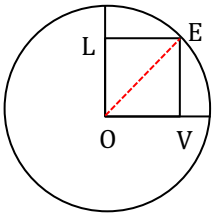
b. The x-intercepts are the value of x when y=0. Thus, x = 4 and x = -4.

10. **A**

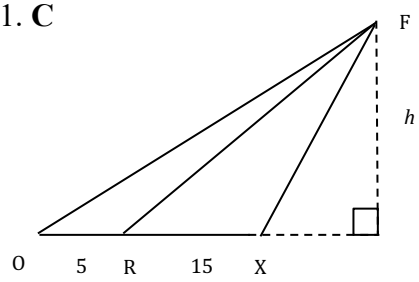
$\text{Area}_{\text{circle}} = \pi r^2 = 64\pi$

r = 8 = diagonal of square(d)

$\text{Area}_{\text{square}} = \frac{d^2}{2} = \frac{8^2}{2} = 32$



11. **C**



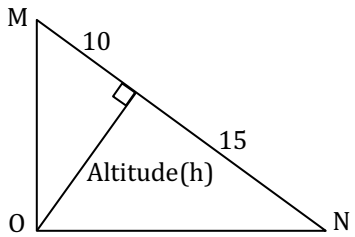
$\text{Area}_{\triangle FOX} = 160 = \frac{bh}{2}$

$160 = \frac{(20)h}{2}$

$h = 16$

$\text{Area}_{\triangle FOR} = \frac{5(16)}{2} = 40$

12. **D**



Using similar triangles.

$\frac{h}{10} = \frac{15}{h}$

$h^2 = 150$

$h = \sqrt{150}$

$h = 5\sqrt{6}$

13. **B**

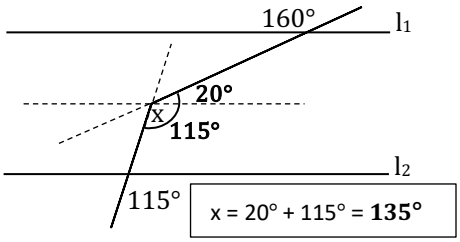
$$\lim_{x\to\infty} \frac{3x^2+1}{4x^3 - x} =$$

$$= \frac{\frac{3x^2}{x^3} + \frac{1}{x^3}}{\frac{4x^3}{x^3} - \frac{x}{x^3}} = \frac{\frac{3}{x} + \frac{1}{x^3}}{4 - \frac{1}{x^2}}$$

$$= \frac{0+0}{4-0} = 0$$

14. **E**

Use properties of transversal.



x = 20° + 115° = **135°**

15. **D**

$$\frac{x^2 - 2xy + y^2}{x^2 - y^2} =$$

$$= \frac{(x-y)(x-y)}{(x-y)(x+y)} = \frac{x-y}{x+y} = \frac{8}{4} = 2$$

16. **C**

$a_n = a_1 r^{(n-1)}$

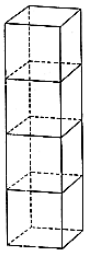
$a_9 = \sqrt{3}\left(\sqrt{2}\right)^8$

$a_9 = 16\sqrt{3}$

17. **C**

$SA = 6s^2 = 54m^2$

$s^2 = 9m^2$

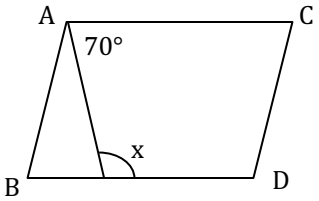


$SA_{rectangularprism} = 18 \times s^2$

$SA = 18 \times 9m^2 = 162m^2$

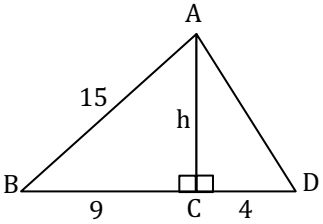
18. **D**

Given $AC \parallel BD$, then $x + 70° = 180$ (property of transversal), $x = 110°$



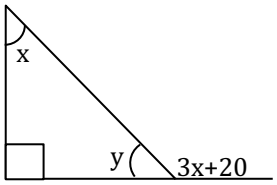
19. **B**

Use pythagorean triples.



a	b	c
3	4	5
5	12	13
7	24	25
9	**h=12**	15

20. **B**



(Sum of remote interior angles = exterior angle)

$3x + 20 = 90 + x$

$2x = 70$

$x = 35$

(Sum of interior angles of a triangle = 180)

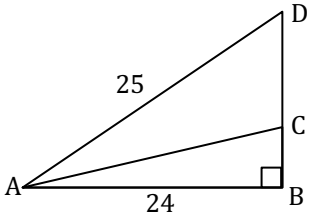
$90 + x + y = 180$

$y = 180 - 90 - 35$

$y = 55$

21. **B**

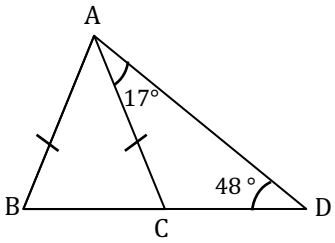
$\overline{DB} = 7$ (pythagorean triples)



$Area_{ACD} = Area_{ABD} - Area_{ABC}$

$Area_{ACD} = \frac{24(7)}{2} - 25 = 59$

22. **A**



$m\angle ACB = m\angle CAD + m\angle ADC$

$m\angle ACB = 17° + 48° = 65°$

$m\angle ACB \cong m\angle ABC$

$m\angle BAC = 180° - (m\angle ACB + m\angle ABC)$

$m\angle BAC = 180° - 130° = 50°$

23. **B**

$$\frac{1\text{job}}{6\text{days}}+\frac{1\text{job}}{4\text{days}}=\frac{x}{2\text{days}}$$

$$\frac{10}{24}=\frac{x}{2}$$
$$x=\frac{5}{6}$$

24. **D**

(in getting the first digit, we can choose from 3,4, or 5 to have a digit greater than 300)

Repeating: $\underline{3}\times\underline{5}\times\underline{5}=75$

Order is important: 75

25. **C**

Ratio = Filipino:Foreigners

3:2 = **6**:4

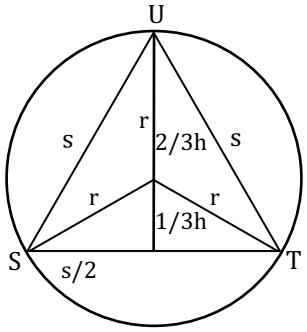
$$6=\frac{1}{4}\text{class}$$

$$\text{class}=24$$

$$\text{Boys}=\text{Class}-\text{Filipino}-\text{Foreigners}$$

Boys = 24 – 6 – 4 = **14**

26. **C**



Since *triangle UST* is equilateral, then

$s=2$

$h=6\sqrt{3}$ (using special right triangle)

radius = (r) = $\frac{2}{3}$h (using median and perpendicular bisector)

$r=\left(\frac{2}{3}\right)\left(6\sqrt{3}\right)=4\sqrt{3}$

$\text{Area}_{\text{shaded}}=\text{Area}_{\text{circle}}-\text{Area}_{\text{triangle}}$

$\text{Area}_{\text{shaded}}=\pi\left(4\sqrt{3}\right)^2-\frac{12\left(6\sqrt{3}\right)}{2}$

$\text{Area}_{\text{shaded}}=48\pi-36\sqrt{3}$

27. **C**

(*Using Midpoint Theorem*)

$\overline{AK}=\overline{AT}=\overline{TK}=\frac{24}{3}=8$

$\overline{AK}\parallel\overline{ED}$ and $\overline{ED}=\frac{1}{2}\overline{AK}$ then $\overline{ED}=4$

$\overline{AT}\parallel\overline{FD}$ and $\overline{FD}=\frac{1}{2}\overline{AT}$ then $\overline{FD}=4$

$\overline{TK}\parallel\overline{EF}$ and $\overline{EF}=\frac{1}{2}\overline{TK}$ then $\overline{EF}=4$

Perimeter$_{\textit{triangle DEF}}$ = 4 + 4 + 4 = **12**

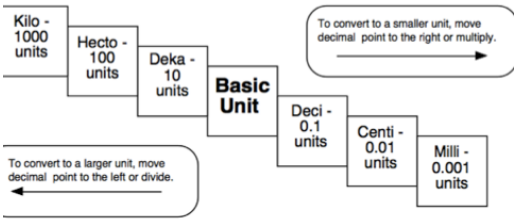
28. **A**

Using corresponding sides of similar triangles are proportional then,

$$\frac{x+2}{6}=\frac{2}{3}$$
$$3x+6=12$$
$$x=2$$

29. **A**

Using Metric Conversion Ladder Method



https://msgeshkesciencehub.wordpress.com/tag/metric-system/

Using elimination of choices, D and E cannot be both correct since they have same unit, then $5\text{km}\neq 500\text{m}$.

30. **C**

Standard form for:

i. *Ellipse:* $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ **or** $\frac{y^2}{a^2}+\frac{x^2}{b^2}=1$

ii. *Hyperbola:* $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ **or** $\frac{y^2}{a^2}-\frac{x^2}{b^2}=1$

iii. *Parabola:* $y=ax^2+bx+c$

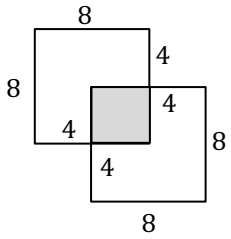
iv. *Circle:* $x^2 + y^2 = r^2$

Thus, $x^2 - 4y^2 = 4$

$$\frac{x^2 - 4y^2 = 4}{4}$$

$\frac{x^2}{4} - \frac{y^2}{1} = 1$ is a **hyperbola.**

31. **C**



Area *square* $= s^2 = 16\ m^2$
$s = 4$ m
Perimeter *whole figure* $= 8(4) + 4(4) =$ **48 m**

32. **B**

3 *vacant* : 2 *occupied* = 5 seats
36 *vacant* : **24 *occupied*** = 60 seats

33. **C**

simple interest: I = Prt

1st year: $I_1 = 1000\left(\frac{10}{100}\right)(1) = 100$

2nd year: $I_2 = 2000\left(\frac{10}{100}\right)(1) = 200$

After 2 years: Total money = $P + I_1 + I_2$
Total money = 2000 + 100 + 200 = **2300**

34. **B**

Ratio and Proportion

$$\frac{x}{8} = \frac{6}{9}$$

$$x = \frac{48}{9}$$

$x = 5\frac{1}{3}$ or **5'4"**

35. **B**

Distance(D) = Speed(s) x Time(t)
D *Train A* = (30kph)(t)= 30t
D *Train B* = (40kph)(t-2) = 40t - 80

NOTE: time for Train B is less two hours since it will leave 2 hours earlier than Train A

Distance *Train A* +Distance *Train B* = 200 km
30t + 40t - 80 = 200
70t - 80 = 200
t = 4
Train A : 8A.M. + 4h = **12P.M.**

36. **C**

$\log_2 x + \log_2(x-2) = 3$
$\log_2 x(x-2) = 3$
$\log_2(x^2 - 2x) = 3$
$x^2 - 2x = 2^3$
$x^2 - 2x - 8 = 0$
$(x-4)(x+2) = 0$
$x = 4$

Note: When x = 2, the value is UNDEFINED

37. **D**

Use synthetic division.

2	p	-1/2p	-7/2p	2
		2p	3p	-p
	p	3/2p	-1/2p	2-p

↓ remainder

To make the x-2 a factor, the reminder should be zero.

$2 - p = 0$
$p = 2$

38. **A**

Evaluate choices.

a. $y = \text{UNDEFINED}$, thus discontinuous at $x = 0$
b. $y = 0$
c. $y = 0$

d. $y = 2$

39. **C**

(Rewrite the indeterminate form by factoring both the numerator and denominator.)

$$\lim_{x\to -3}\frac{x+3}{x^2-9}=\frac{0}{0}$$

$$=\lim_{x\to -3}\frac{x+3}{(x+3)(x-3)}$$

(Divide out the factors *x - 3* , the factors which are causing the indeterminate form. The limit can now be computed.)

$$=\lim_{x\to -3}\frac{1}{(x-3)}$$

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

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

40. **B**

Power of C!

$$\frac{2}{3}\bullet\frac{3}{4}\bullet\frac{4}{5}\bullet\frac{5}{6}=\frac{2}{6}\text{or}\frac{1}{3}$$

41. **E**

Evaluate choices.

a. $|7|=7$

b. $|-7|=7$

c. $1-|7|=1-7=-6$

d. $|7-1|=6$

e. $|-7|+1=7+1=8$

42. **C**

Use partitive proportion.

Let x be the original piece

$3:4:5=12$

$\_:\_:\underline{2.5\text{m}}=x$

$$\frac{2.5}{5}:\frac{x}{12}$$

$x=6$

43. **E**

Let P = original price = 100%

(80%) P = 600

P = 750

44. **D**

Use " $\frac{\text{is}}{\text{of}}$ *" technique.*

$$\frac{\text{vinegar}}{\text{mixture}}=\frac{2}{2+3}=\frac{2}{5}$$

45. **C**

Ratio and Proportion

$$\frac{\text{xfile}}{1\text{min}}=\frac{1\text{file}}{1\frac{3}{4}}$$

$$x=\frac{1}{\frac{7}{4}}$$

$$x=\frac{4}{7}$$

46. **C**

Evaluate

$$\frac{2^{-2}-2^{-3}}{2^{-2}}=$$

$$=\frac{\frac{1}{4}-\frac{1}{8}}{\frac{1}{4}}$$

$$=\frac{4}{8}\text{or}\frac{1}{2}$$

47. **A**

Use special products

$$\frac{x^2-1}{x+1}=$$

$$=\frac{(x+1)(x-1)}{(x+1)}$$

$$=x-1$$

48. **C**

$$\frac{1\text{job}}{2\text{days}}+\frac{1\text{job}}{3\text{days}}=\frac{1\text{job}}{x\text{days}}$$

$$\frac{3+2}{6}=\frac{1}{x}$$

$$x = \frac{6}{5}\text{days}$$

49. **D**

Evaluate

$$\frac{a \bullet a \bullet a}{a + a + a} =$$
$$= \frac{a \bullet a \bullet a}{3a}$$
$$= \frac{a^2}{3}$$

50. **B**

Evaluate

$$\log_b(x + y) = z$$
$$b^z = x + y$$

51. **C**

Change to exponential form.

$\log_6(4x - 4) = 2$

$6^2 = 4x - 4$

$36 = 4x - 4$

$40 = 4x$

$10 = x$

52. **D**

Evaluate

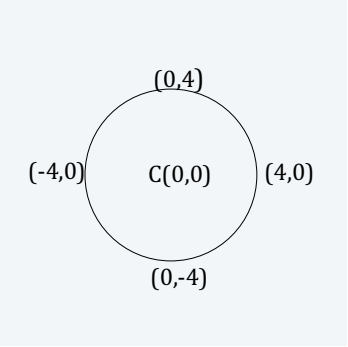
$$f(x) = y = \frac{7x - 5}{4}$$

To solve for the inverse function, interchange x and y then solve for y.

$$x = \frac{7y - 5}{4}$$
$$4x + 5 = 7y$$
$$y = \frac{4x + 5}{7}$$

53. **A**

$$\text{Area}_{\text{circle}} = \pi r^2 = 16\pi$$
$$r = 4$$



54. **B**

$$\text{Indigo} + \text{Aqua} = 8\text{blue} + 2\text{violet} + 2\text{green}$$
$$\text{Indigo} + \text{Aqua} = 12\text{parts}$$
$$\text{Blue} = \frac{8}{12} \text{or} \frac{2}{3}$$

55. **D**

	Number	Amount(pesos)
25 centavos	x	.25x
one peso	2x	2x
five peso	2x-9	10x - 45
	TOTAL	12.5x - 45

$12.5x - 45 = 28.5$

$12.5x = 73.5$

$x = 6$

Number of five-peso $= 2(6) - 9 = 3$

56. **E**

Solve for the value of a:

$a - 3 = 5$

$a = 5 + 3$

$a = 8$

Substitute the value of a:

$2a - 3$

$2(8) - 3 = 16 - 3 = 13$

57. **E**

Solve for the value of x - y

$x = y - 5$

$x - y = -5$

Substitute the value of x - y

$(x - y)^3$

$(-5)^3 = -125$

58. **B**
Apply Power of C
$\frac{9a^4 - 3a^3 + 6a}{3a}$
$= 3a^3 - a^2 + 2$

59. **B**
$2(x^{12} - 16)$
$2(x + 4)(x - 4)$

60. **E**
Substitution
a) If we substitute 0 as value of t,
$1 - t = \frac{t-1}{t}$ will be undefined.
b) $1 - t = \frac{t-1}{t}$
$1 - 1 = \frac{1-1}{1} = 0$
c) $1 - (-1) = \frac{(-1)-1}{-1} = 2$

-1 and 1 are values of *t*.