Math Practice Test 23
"More Practice" Answer Key

1. **B**

$4 - 6\left(\frac{1}{3} + \frac{2}{3}\right)^{-1}$

$= 4 - 6\,(1)^{-1}$

$= 4 - 6\,(1)$

$=-2$

2. **C**

To know what is between 1/4 and 1/6, get the midpoint.

$\frac{\frac{1}{4}+\frac{1}{6}}{2} = \frac{\frac{3}{12}+\frac{2}{12}}{2} = \frac{\frac{5}{12}}{2} = \frac{5}{24}$

3. **B**

Find the number of terms:

$a_n = a_1(n-1)\,d$

where $a_n = 104$, $a_1 = 4$, $d = 2$

Substitute the values:

104= 4 + (n-1) 2

104 = 4 + 2n - 2

104= 2n + 2

2n = 102

n=51

Find the sum:

$S = \frac{n}{2}(a_1 + a_n)$

$S = \frac{51}{2}(104 + 4) = \frac{51}{2}(108)$

S= 51 x 52 = 2754

4. **C**

Even numbers from 11 to 41:

Formula = $\frac{last\ even - first\ even}{2} + 1$

$= \frac{40-12}{2} + 1 = 15\ numbers$

Numbers divisible by 3 from 11 to 41:

$\frac{39-12}{3} + 1 =$ = 10 numbers

There are a total of 25 numbers that are even and divisible by 3. Next, we remove the overlap which are the multiples of 6 including 12, 18, 24, 30, 36.

25 – 5 = **20 numbers**

5. **C**

$S = \frac{a}{1-r}$

where a (first term)= 4, $r = \frac{1}{3}$

$S = \frac{4}{1-\frac{1}{3}} = \frac{4}{\frac{2}{3}} = 4 \times \frac{3}{2} = 6$

6. **A**

$a_n = a_1\,(n-1)\,d$

80 = 10 + (11−1)d

80 = 10 + 10d

70 = 10d

d =7

7. **C**

109 minutes is equal to 60 mins + 49 mins. After 60 mins, the time will be 12:53 pm. After adding the remaining 49 mins, the time is now 13:42 pm

8. **B**

rate= $\frac{520\ toys}{120\ mins}$

Use Ratio and Proportion (RAP)

$\frac{520\ toys}{120\ mins} = \frac{x\ toys}{12\ mins}$

x=52 toys

9. **B**

I = Prt

546 = 9000 x r x 2

546 = 18000 r

r= 0.03

r= 3%

10. **B**
Bank A uses compound interest of 15%:
A=P $(1 + r)^t$
A=1000 $(1.15)^2$ = 1000(1.3225) = 1322.5

Interest= 1322.5−1000=**322.5**

Bank B uses annual interest of 10%:
I=Prt =1000(0.10)(2)=**200**

Bank A has higher interest by 322.5-200 = **122.5**.

11. **C**
Arrange scores in increasing order:
1 2 2 2 2 3 3 4 4 4 9 9 9 9 9

Since there are 15 numbers, the position of the median is:
Position (odd)= $\frac{15+1}{2}$ = 8th position.

In the given scores, the 8th number is **4.**

12. **C**
The average of nine numbers is 6:
$\frac{total\ sum}{9}$= 6
Get the total sum: 9 x 6= 54

Solve for the number that should be added to make the average 12:
$\frac{54+x}{10}$= 12
54 + x =120
x = 66

13. **A**
To get the median, get the average of the median = $\frac{4+5}{2}$ = 4.5

If we remove the smaller numbers (1,3, or 4), the median will become higher.

If we remove 1:{3,4,5,6,7}, 5 is the median
If we remove 3 {1,4,5,6,7}, 5 is the median
If we remove 4: {1,3,5,6,7},5 is the median

Get the difference:
5-4.5= 0.5.

14. **C**
If we add 2, the set of numbers becomes:
{1, 1, 2, 2 ,2, 3,3 }
The mode is 2 while the median is also 2.

15. **A**
Probability= $\frac{no.\ of\ favorable\ outcomes}{total\ no.\ of\ possible\ outcomes}$

When two fair dice are rolled, there are 6×6=36 total possible outcomes.

There are 10 possible outcomes that show consecutive integers on the dice:

(1,2), (2,1), (2,3), (3,2), (3,4),
(4,3), (4,5), (5,4), (5,6), (6,5)

Probability= $\frac{10}{36} = \frac{5}{18}$

16. **B**
For the necklace: $_6C_4 = \frac{6!}{4!2!}$ =15
For the bracelet: $_4C_1$ = 4
For the rings: $_2C_1$=2

Multiply the number of choices for each jewellery: 15 x 4 x 2 = 120

Thus, there are 120 possible ways for Andy to wear the jewellery.

17. **C**
Since 2 people out of 7 must sit together, we treat those two as a single unit. Thus, in total we have 6 units. The number of ways

to arrange these 6 units in a row is 6!, which equals 720. These 2 individuals within the block can switch places with each other. Thus, we multiply by 2!. Therefore, the total number of arrangements is 720 x 2= 1440 different ways.

18.-
$\log_2 x=8$
$x=2^8$
x=256

19. **D**
The product of the two numbers is 3:
xy=3

The sum of the reciprocals of two numbers is 12:
$\frac{1}{x} + \frac{1}{y} = 12$
$\frac{x+y}{xy} = 12$
$\frac{x+y}{3} = 12$
x+y = **36**

20. **B**
Solve the system of equations below:
Eq. 1 : 2x + 3y=1 [multiply by 3]
Eq. 2 : 3x+ 2y=4 [multiply by 2]

Eq. 1: 6x + 9y = 3
Eq. 2: 6x + 4y = 8

Subtract:
(6x+9y)−(6x+4y)= 3−8
5y=−5
y=-1

Substitute y=-1 to the first equation:
2x+3(−1)=1
2x−3=1
2x = 4
x=2

21. **B**
Let x be Kevin's age
Wayne= x + 6

5 years later, the sum of their ages is 58:
Kevin's age= x + 5
Wayne's age= (x + 6) + 5

Solve for x:
(x + 5) + (x + 11) = 58
2x + 16 = 58
2x=42
x=21

Since Kevin is 6 years older than Wayne, Kevin is 27 years old.

22. **B**
Nikki's rate : $\frac{15\ boxes}{30\ mins}=\frac{2\ boxes}{hour}$

Since Megan creates 15 boxes for every 10 boxes Nikki creates, this means that Megan is 1.5 times faster than Nikki.
Megan's Rate= $\frac{2\ boxes}{hour}$ x 1.5 = $\frac{3\ boxes}{hour}$

Nikki and Megan can create 5 boxes per hour.
Time=$\frac{180\ \ boxes}{5\ boxes\ per\ hour}$= 36 hours

23. **D**
$(g \circ f)(2)=\ g(f(2))$

f(x)= 2x + 3
f(2)= 2 (2) + 3= 7

$g(x)=x^2$
$g(7)=7^2=49$

24. **-**
We need to solve the values of x.

Let us express first the equation into a single trigonometric variable, we will use the identity $sin^2 x + cos^2 x = 1$, manipulating this equation we can get $cos^2 x = 1 - sin^2 x$.

Substituting,

$$2(1 - sin^2 x) - sin\, x = 1$$
$$2 - 2sin^2 x - sin\, x = 1$$
$$1 - sin\, x - 2sin^2 x = 0$$

Let y be sin x,

$$1 - y - 2y^2 = 0$$
$$(1 - 2y)(1 + y) = 0$$
$$(1 - 2y) = 0; (1 + y) = 0$$
$$y = \frac{1}{2};\ y =- 1$$

Substituting back the value of y,

$$sin\, x = \frac{1}{2};\ sin\, x =- 1$$

Since the values of x must come from the interval $[0, 2\pi)$, we need to find all values of x that will satisfy the sin equation in this interval only. When is $sin\, x = \frac{1}{2}$, it is when $x = \frac{\pi}{6}, \frac{5\pi}{6}$. When is $sin\, x =- 1$, it is when $x = \frac{3\pi}{2}$. Based on the choices, we can say that $\frac{11\pi}{6}$ is the only one that does not satisfy the given equation.

25. **A**
2cos(x) - 1 = sec (x)
2cos(x)-1= $\frac{1}{cos(x)}$[Multiply both sides by cos(x)]
$2cos^2(x)$ - cos(X) = 1
$2cos^2(x)$ - cos(X) - 1 = 0

Let u = cos(x)
$2u^2$ - u - 1 = 0
(2u + 1) (u - 1) = 0
(2cos(x) + 1) (cos(x) - 1) = 0

Possible values for cos(x):
2cos(x) + 1)= 0
cos(x) = -½

cos(x)-1=0
cos (x)=1

Since the given interval is ($\frac{\pi}{2}$,π], it means we are looking for the second quadrant. This means that cosine is negative so we use cos(x)=-½ . The angle that has cosine of -½ is x=$\frac{2\pi}{3}$.

26. **C**

27. **B**
x + (x-15) + (x+30)= 180
3x + 15 =180
3x= 165
x=53

28. **B**
Let w= width
length=2w

Area of rectangle = Length x width
Area of rectangle= (2w) (w)= **2**w^2
Perimeter = 2 (l +w) = 2 (2w +w)= **6w**

Given: Area = Perimeter + 8

Substitute values:

$2w^2 = 6w + 8$

$2w^2 - 6w - 8 = 0$

$w^2 - 3w - 4 = 0$

$(w-4)(w+1)=0$

Since width must be positive, w=4. Since it is given that the length is twice its length, the width is 8.

29. **D**

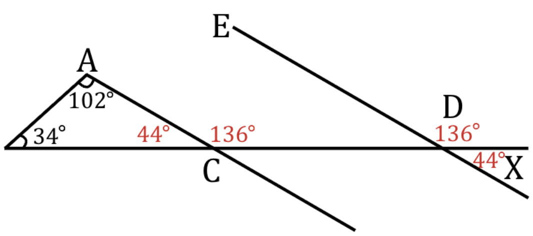
Use the Pythagorean theorem: $c^2 = a^2 + b^2$

$12^2 = 5^2 + b^2$

$b^2 = 144-25 = 119$

$b = \sqrt{119}$

30. **A**



Angle X is equal to 44°.

31. **E**

Area of the circle= $2\pi r^2$

Area of the circle= $5\pi r^2$

Area of the circle= **25**π

Area of the triangle= $\frac{1}{2}bh$

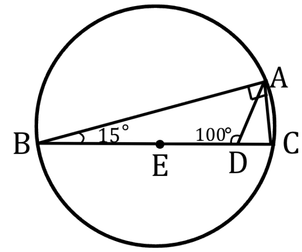
Area of the triangle= $\frac{1}{2}(5 \times 5) = \frac{25}{2}$

Area of the shaded region=

$\frac{1}{4}$ Area of the circle- Area of triangle=

$\frac{1}{4}(25\pi) - \frac{25}{2} = \frac{25\pi}{4} - \frac{25}{2} = \frac{25\pi - 50}{4}\ m^2$

32. **B**



Angle ∠DAB = 180 - (100 + 15) = 65°

Angle ∠CAB = 90°

Angle ∠CAD = 90° - 65° = **25°**

33. **A**

Coordinate Area Formula=

$\frac{1}{2}\,|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_x(y_1 - y_2)$

$P(x_1,y_1) = (0,5)$

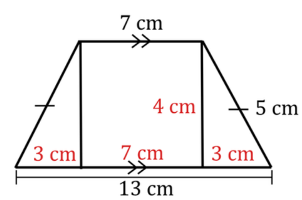
$P(x_2,y_2) = (3,0)$

$P(x_3,y_3) = (-1,-2)$

Area= $\frac{1}{2}|0(0 - (-2)) + 3((-2) - 5) + (-1)(5 - 0)|$

Area= $\frac{1}{2}\,|0-21-5| = \frac{1}{2}\,|-26| =$ **13 sq. units**

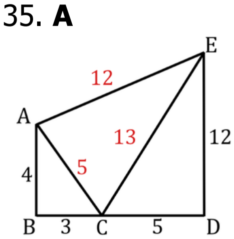
34. **B**



Use Pythagorean triple: 3-4-5

y= 4 cm

35. **A**



Use the Pythagorean triples:

3-4-5

5-12-13

36. **A**

The Thales theorem states that if "A, B, and C are distinct points on a circle where the line AC is a diameter, the angle ∠ ABC is a right angle."

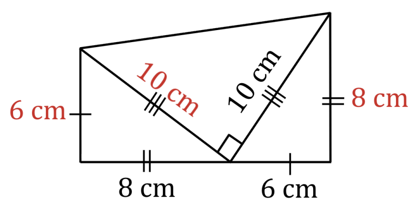
Thus, the inscribed triangle is a right triangle.

$180° = 15° + 90° + m\angle B$

$180° = 115° + m\angle b$

$m\angle b = 180° - 115° = 75°$

37. B



Area of triangle= $\frac{1}{2}$ bh

Area= $\frac{1}{2}$ (6 x 8)= 24 cm^2

Area= $\frac{1}{2}$ **(**10x10) = 50 cm^2

There are 2 triangles with an area of 24 cm^2 while the other triangle has an area of 50 cm^2. Thus, the total area is 98 cm2.

38. **D**

$\angle A = 52°$

The inscribed angle theorem states that an inscribed angle is half of the central angle that subtends the same arc. Thus, angle A is half of angle C.

½ $\angle C = 52°$

$\angle C = 104°$

39. **B**

40. **A**

41. **B**

42. **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**.

43. **C**

For an implication statement of the form *If P, then Q*, only the form *If not P, then not Q* is true. This is called the contrapositive of the statement. Implications and their contrapositives are equivalent.

44**. B**