AJ INSTITUTE OF ENGINEERING & TECHNOLOGY

DEPT. OF TRAINING & PLACEMENT

Test - 5

Problems on Clock, Square root & Cube root

Wednesday 29th May 2024

1.An accurate clock shows 8 o'clock in the morning. Through how may degrees will the hour hand rotate when the clock shows 2 o'clock in the afternoon?

A. 144°
B. 150°
C. 168°
D. 180°

Answer: Option (D)

Explanation:

Angle traced by the hour hand in 6 hours = $\left(\frac{360}{12} \times 6\right)^{\circ}$ = 180°.

2. How many times the hands of a clock coincide in a day?

A. 24
B. 22
C. 23
D. 21

The Correct answer is (B)

Explanation:

The hands of a clock coincide only once between 11 O' clock and 1 O' clock, so in every 12 hours, the hands of a clock will coincide for 11 times.

∴ In a day or 24 hours, the hands of a clock will coincide for 22 (11+11) times.

3. An accurate clock indicates 8 O' clock in the morning. Through how many degrees the hour hand turns when the clock indicates 3 O' clock in the afternoon?

A. 210°
B. 200°

C. 190°

D. 185°

The Correct answer is (A)

Explanation:

There are 7 hours between 8 O' clock in the morning and 3 O' clock in the afternoon.

Now, angle traced by the hour hand in 12 hours = 360°

∴ Angle traced by the hour hand in 7 hours = $\frac{360}{12} * 7 = 210°$

4. What is the angle between hour hand and minute hand of a clock at 3.30?

A. 65°

B. 70°

C. 75°

D. 80°

The Correct answer is (C)

Explanation:

Angle traced by the hour hand in 12 hours = 360°

Angle traced by the hour hand in 3 hours 30 minutes = $\frac{360}{12} * 3 + \frac{30}{60}\ (\text{hours})$

$= \frac{360}{12} * \frac{21}{6} = 105°$

Angle traced by minute hand in 60 minutes = 360°

Angel traced by minute hand in 30 minutes = $= \frac{360}{60} * 30 = 180°$

∴ Required angle would be = (180 - 105)° = 75°

5. A clock is set at 4am. It loses 16 minutes in 24 hours. What will be the correct time when the clock indicates 9pm on the 4th day?

A. 8pm

B. 7pm

C. 10pm

D. 11pm

The Correct time is (C)

Explanation:

Time from 4am on a day to 9pm on the 4^{th} day = 89 hours

As per the question, 23 hrs 44 minutes of this clock = 24 hours of the correct clock as this clock loses 16 minutes in 24 hours.

23 hrs 44 minutes =: $\frac{356}{15}$ Hrs

Now, $\frac{356}{15}$ Hrs of this clock = 24 hours of correct clock

89 hours of this clock = $\frac{24*15}{356}$ * 89 = 90 hours of the correct clock, i.e. the correct clock gains one hour over the incorrect clock.

∴The correct time on the fourth day would be 10pm.

6. A clock is started at noon. By 10 minutes past 5, the hour hand has turned through:

A. 145°

B. 150°

C. 155°

D. 160°

Answer: Option Ⓒ

Explanation:

Angle traced by hour hand in 12 hrs = 360°.

Angle traced by hour hand in 5 hrs 10 min. *i.e.*, $\frac{31}{6}$ hrs = $\left(\frac{360}{12} \times \frac{31}{6}\right)^{\circ}$ = 155°.

7. The angle between the minute hand and the hour hand of a clock when the time is 4.20, is:

A. 0°

B. 10°

C. 5°

D. 20°

Answer: Option Ⓑ

Explanation:

Angle traced by hour hand in $\frac{13}{3}$ hrs = $\left(\frac{360}{12} \times \frac{13}{3}\right)^{\circ}$ = 130°.

Angle traced by min. hand in 20 min. = $\left(\frac{360}{60} \times 20\right)^{\circ}$ = 120°.

∴ Required angle = (130 - 120)° = 10°.

8. At 3:40, the hour hand and the minute hand of a clock form an angle of:

A. 120°

B. 125°

C. 130°

D. 135°

Answer: Option ©

Explanation:

Angle traced by hour hand in 12 hrs. = 360°.

Angle traced by it in $\frac{11}{3}$ hrs = $\left(\frac{360}{12} \times \frac{11}{3}\right)^\circ$ = 110°.

Angle traced by minute hand in 60 min. = 360°.

Angle traced by it in 40 min. = $\left(\frac{360}{60} \times 40\right)^\circ$ = 240°.

∴ Required angle (240 - 110)° = 130°.

9. How many times are the hands of a clock at right angle in a day?

A. 22

B. 24

C. 44

D. 48

Answer: Option ©

Explanation:

In 12 hours, they are at right angles 22 times.

∴ In 24 hours, they are at right angles 44 times.

10. The angle between the minute hand and the hour hand of a clock when the time is 8.30, is:

A. 80°

B. 75°

C. 60°

D. 105°

Answer: Option ®

Explanation:

Angle traced by hour hand in $\frac{17}{2}$ hrs = $\left(\frac{360}{12} \times \frac{17}{2}\right)^\circ$ = 255°.

Angle traced by min. hand in 30 min. = $\left(\frac{360}{60} \times 30\right)^\circ$ = 180°.

∴ Required angle = (255 - 180)° = 75°.

11. How many times in a day, are the hands of a clock in straight line but opposite in direction?

A. 20

B. 22

C. 24

D. 48

Answer: Option Ⓑ

Explanation:

The hands of a clock point in opposite directions (in the same straight line) 11 times in every 12 hours. (Because between 5 and 7 they point in opposite directions at 6 o'clcok only).

So, in a day, the hands point in the opposite directions 22 times.

12. How many times do the hands of a clock coincide in a day?

A. 20

B. 21

C. 22

D. 24

Answer: Option Ⓒ

Explanation:

The hands of a clock coincide 11 times in every 12 hours (Since between 11 and 1, they coincide only once, *i.e.,* at 12 o'clock).

AM

12:00
1:05
2:11
3:16
4:22
5:27
6:33
7:38
8:44
9:49
10:55

PM

12:00
1:05
2:11
3:16
4:22
5:27
6:33
7:38
8:44
9:49
10:55

The hands overlap about every 65 minutes, not every 60 minutes.

∴ The hands coincide 22 times in a day.

13. How many times in a day, the hands of a clock are straight?

A. 22

B. 24

C. 44

D. 48

Answer: Option ©

Explanation:

In 12 hours, the hands coincide or are in opposite direction 22 times.

∴ In 24 hours, the hands coincide or are in opposite direction 44 times a day.

14. A watch which gains uniformly is 2 minutes low at noon on Monday and is 4 min. 48 sec fast at 2 p.m. on the following Monday. When was it correct?

A. 2 p.m. on Tuesday

B. 2 p.m. on Wednesday

C. 3 p.m. on Thursday

D. 1 p.m. on Friday

Answer: Option ⒷⒷ

Explanation:

Time from 12 p.m. on Monday to 2 p.m. on the following Monday = 7 days 2 hours = 170 hours.

∴ The watch gains $\left(2 + 4\frac{4}{5}\right)$ min. or $\frac{34}{5}$ min. in 170 hrs.

Now, $\frac{34}{5}$ min. are gained in 170 hrs.

∴ 2 min. are gained in $\left(170 \times \frac{5}{34} \times 2\right)$ hrs = 50 hrs.

∴ Watch is correct 2 days 2 hrs. after 12 p.m. on Monday *i.e.*, it will be correct at 2 p.m. on Wednesday.

15. A clock was set right at 2 p.m. It gains 5 seconds in 3 minutes, and it indicates 8.30 a.m. the next morning, then the true time is:

A. 8.00 a.m.
B. 7.45 a.m.
C. 8.15 a.m.
D. 7.30 a.m.

Answer: Option A

Solution:

Time elapsed from 2 p.m. to 8.30 a.m. = 18 hours 30 minutes = 1110 minutes.
Now, 3 minutes and 5 seconds of the given clock is 3 minutes of the correct clock.
Therefore, 1110 minutes of this clock is (1110 * 3) / (37/12) minutes of the correct clock.
= 1080 minutes = 18 hours of the correct clock
Hence, the correct time is 8 a.m.

16. $\frac{1120}{\sqrt{?}} = 80$

A. 3.74

B. 149.67

C. 196

D. 225

Answer: C

Explanation:

$\frac{1120}{\sqrt{?}} = 80$

$\frac{1120}{80} = \sqrt{?}$

$\sqrt{?} = 14$

$\therefore ?=14^2= 14 \times 14 = 196$

17. Value of $(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$ is

A. 5

B. 2

C. 3

D. $\sqrt{2}$

Answer: B

Explanation:

$(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$

As we know, (a+b) (a-b) = a^2 ?b^2

By using above formula:

$=(\sqrt{5} + \sqrt{3})(\sqrt{5} - \sqrt{3})$

$= \sqrt{5}^2 - \sqrt{3}^2$

= 5-3=2

18. $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}=?$

A. $2\sqrt{6}$

B. 2

C. $6\sqrt{2}$

D. $\frac{2}{\sqrt{6}}$

Answer: B

Explanation:

$$\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}=?$$

$$\frac{\sqrt{6\times4}+\sqrt{6\times6\times6}}{\sqrt{16\times6}}=?$$

$$\frac{2\sqrt{6}+6\sqrt{6}}{4\sqrt{6}}=\frac{8\sqrt{6}}{4\sqrt{6}}=2$$

19. $\sqrt{2+\sqrt{2+\sqrt{2+\cdots\ldots}}}$ is equal to

A. 1

B. 2

C. $2+\sqrt{2}$

D. $2\sqrt{2}$

Answer: B

Explanation:

Let $x=\sqrt{2+\sqrt{2+\sqrt{2+\cdots\ldots}}}$

$x=\sqrt{2+x}$

$=x^2=2+x$

$=x^2-2-x=0$

$=x^2-(2-1)x-2=0$

$=x^2-2x+x-2=0$

$=x(x-2)+1(x-2)=0$

$=(x-2)(x+1)=0$

$=x=2, x=-1$

Solution 2:

$$\sqrt{2+\sqrt{2+\sqrt{2+\cdots}}}$$

In case of same type root values addition break the given number in consecutive order, **the largest number will be the answer** i.e., the number is 2, and the consecutive order of two: 1*2 Hence, the **answer is 2**

20. The value of $\sqrt{900} + \sqrt{0.09} - \sqrt{0.000009}$ is

A. 30.297
B. 30.197
C. 30.097
D. 30.397

Answer: A

Explanation:

$$\sqrt{900} + \sqrt{0.09} - \sqrt{0.000009}$$

$$= \sqrt{900} + \sqrt{0.09} = \sqrt{0.000009}$$

$$= \sqrt{9 \times 100} + \sqrt{\frac{9}{100}} - \sqrt{\frac{9}{1000000}}$$

$$= 3 \times 10 + \frac{3}{10} - \frac{3}{1000}$$

$$=30 + 0.3 - 0.003 = 30.297$$

21. The number which is not expressible as the square of any natural number is

A. 1369
B. 5041
C. 7056
D. 9852

Answer: D

Explanation:

We have

$1369 = 37^2$,

$5041 = 71^2$,

$7056 = 84^2$,

$9852 = (99.2)^2$

All of the numbers are perfect square except the option D.

22. What is the smallest number to be subtracted from 549162 in order to make it a perfect square?

A. 28
B. 36
C. 62
D. 81

Answer: D

Explanation:

```
  7|549162 (741
   |49
   |-------
144| 591 (here 7*2 = 14, and 4 is an annexing digit. That means
         144 is a new divisor)
   | 576 (here 144*4 =576 (new divisor * annexing digit))
   |-------
1481| 1562 (similarly, 1481 is new divisor where 1 is an
           annexing digit)
   | 1481
   |-------
   |    81
```

Hence the smallest number to be subtracted is 81 to make the number a perfect square.

23. The smallest number which when multiplied to 3600 yields perfect cube is

A. 50
B. 60
C. 40
D. 100

Answer: B

Explanation:

```
    2 | 3600
----|----------
    2 | 1800
----|----------
    2 | 900
----|----------
    2 | 450
----|----------
    5 | 225
----|----------
    5 | 45
----|----------
    3 |  9
----|----------
      | 3
```

$\therefore 3600 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 3 \times 3$

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

$= \frac{2^3 \times 2^3 \times 5^3 \times 3^3}{2^2 \times 5 \times 3}$

$= \frac{(60)^3}{60}$

$\therefore$ 3600 must be multiplied by 60 to make it perfect cube.

24. If $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a + b\sqrt{3}$,what are a and b?

A. a = 11, b = -6

B. a = -6, b = 11

C. a = -11, b = 6

D. a =-11, b = -6

Answer: A

Explanation:

$\frac{5+2\sqrt{3}}{7+4\sqrt{3}}$

Multiplying the number by its conjugate:

$= \frac{5+2\sqrt{3}}{7+4\sqrt{3}} + \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$

$= \frac{35-20\sqrt{3}+14\sqrt{3}-24}{(7)^2-(4\sqrt{3})^2}$

$= \frac{11-6\sqrt{3}}{49-48} = 11-6\sqrt{3}$

Accoding to the question:

$11 - 6\sqrt{3} = a + b\sqrt{3}$

a = 11, b = -6

25. The cube root of .000216 is:

A. 0.6

B. 0.06

B. 77

D. 87

Answer: Option (B)

Explanation:

$$(.000216)^{1/3} = \left(\frac{216}{10^6}\right)^{1/3}$$

$$= \left(\frac{6 \times 6 \times 6}{10^2 \times 10^2 \times 10^2}\right)^{1/3}$$

$$= \frac{6}{10^2}$$

$$= \frac{6}{100}$$

$$= 0.06$$

26. The least perfect square, which is divisible by each of 21, 36 and 66 is:

A. 213444

B. 214344

C. 214434

D. 231444

Answer: Option (A)

Explanation:

L.C.M. of 21, 36, 66 = 2772.

Now, $2772 = 2 \times 2 \times 3 \times 3 \times 7 \times 11$

To make it a perfect square, it must be multiplied by 7×11.

So, required number = $2^2 \times 3^2 \times 7^2 \times 11^2 = 213444$

27. If $a = 0.1039$, then the value of $\sqrt{(4a^2 - 4a + 1)} + 3a$ is:

A. 0.1039

B. 0.2078

C. 1.1039

D. 2.1039

Answer: Option ©

Explanation:

$$\sqrt{4a^2 - 4a + 1} + 3a = \sqrt{(1)^2 + (2a)^2 - 2 \times 1 \times 2a} + 3a$$

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

$$= (1 - 2a) + 3a$$

$$= (1 + a)$$

$$= (1 + 0.1039)$$

$$= 1.1039$$

28. A group of students decided to collect as many paise from each member of group as is the number of members. If the total collection amounts to Rs. 59.29, the number of the member is the group is:

A. 57

B. 67

C. 77

D. 87

Answer: Option ©

Explanation:

Money collected = (59.29 × 100) paise = 5929 paise.

∴ Number of members = $\sqrt{5929}$ = 77.

29. √(0.0169 x ?) = 1.3

A. 10

B. 100

C. 1000

D. None of these

Answer: Option Ⓑ

Explanation:

Let $\sqrt{0.0169 \text{ x } x}$ = 1.3.

Then, $0.0169x = (1.3)^2 = 1.69$

$$\Rightarrow x = \frac{1.69}{0.0169} = 100$$

30. How many two-digit numbers satisfy this property.: The last digit (unit's digit) of the square of the two-digit number is 8 ?

A. 1

B. 2

C. 3

D. None of these

Answer: Option (D)

Explanation:

A number ending in 8 can never be a perfect square.