CLOCKS & CALENDERS

DRILL 1: SOLUTIONS

Exercise 1

a. *Answer:* 17.5°

Explanation:

The time shown in the clock is 4 (h):25 (M)

Angle traced by minute hand is = $25*6^0 = 150^0$

Angle traced by hour hand is $(4* 30^0) + (25 * ½^0)$

$= 120^0 + 12.5^0 = 132.5$

Angle between the hands = $150^0 \approx 132.5^\circ$ = **17.5°**

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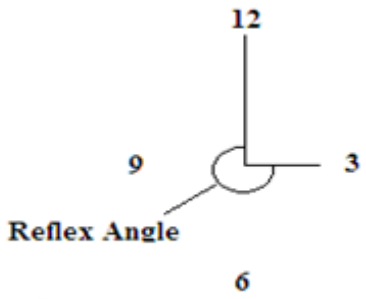
b. *Answer:* 270^0

Explanation:



Reflex angle = $360^0 - 90^0 = \mathbf{270^0}$

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c. *Answer:* 9hrs 36(12/13) mins

Explanation:

Initially the clocks will be

Original Clock **Set Clock**

5:00 am 5:00 am

[Set clock gains 5 minutes for every hour]

Original **Set**

60 Mins 65 Mins

60 : 65 (or) **12 : 13**

Given that set clock shows 10 am what should be the time at original clock?

10 am

300 * 12/13 mins: 300 mins

3600/13: 300 (or) 276 (12/13): 300

276 (12/13) mins ➔ 4 hours 36 12/13 mins will be covered by original clock while set clock covers 5 hours
I.e. after 4 hr 36 12/13 mins from 5 am will be 9:36 (12/13).

Drill 2

a. *Answer:* Cannot be determined.
Explanation:
As we cannot exactly tell the number of leap years in a decade, it is impossible to find the number of odd days.

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b. *Answer:* 1 odd day.
Explanation:
The number of odd days in 2010 is 1
Since 2010 is an ordinary year it'll have only **one odd day.**

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c. *Answer:* 24 leap years and 76 normal years.
Explanation:
3rd century is years from 201 to 300. Here, 25 years will be multiples of 4 but 300 is not a leap year.
Hence 3rd century has **24 leap years 76 normal years.**

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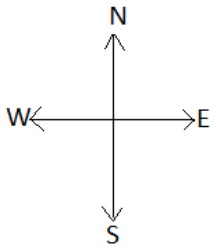
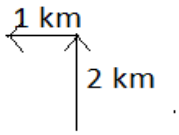
d. *Answer:* Thursday
Explanation:
1970 = 1600 + 300 + 70
Odd days for the above = 0 + 1 + 3 = 4
Number of odd days from 1'st Jan to 29th July
3 (J) + 0 (F) + 3 (M) + 2 (A) + 3 (M) + 2 (J) + 1 (Jul) = 14/7 = 0
Total odd days = 0+4 = 4
Hence, it falls on **Thursday.**

DRILL 3:

a. *1.Answer:* North West
Explanation: (For questions 1 and 2)





2. Answer: West.

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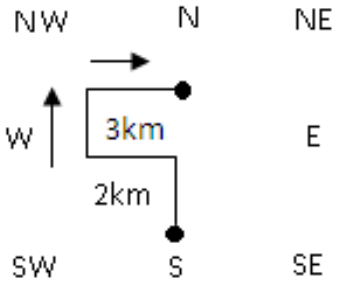
a. *3. Answer:* North.
Explanation: (For questions 3, 4 and 5)



His position with respect to his house is North.

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*4. Answer: E*ast.
Explanation:
The direction that he is facing is east.

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5. Answer: 5 kms.
Explanation:
The distance of his current position from his house is 5kms.

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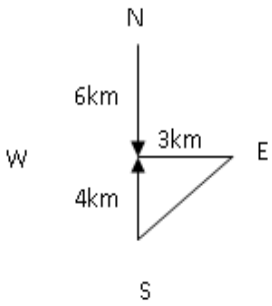
b. Answer: 5 kms North East.
Explanation:



To find the shortest path we can apply pythogaros theorem
i.e. $\sqrt{3^2 + 4^2} = \sqrt{9+6} = \sqrt{25} = 5$kms
5 kms North East.

Drill 4:

a. *Answer:* 5 pieces.
Explanation:
We know that for every 'n' cuts we get 'n+1' pieces.
For 4 cuts we will get 5 pieces.

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b. *Answer:* 25 pieces.
Explanation:
4 cuts along the length ➔ 5 pieces.
4 cuts along the breadth ➔ in 5 pieces, 4 cuts are made, we'll get 25 small cubes.

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c. *Answer:* 125.
Explanation:
4 cuts on [length, breadth, and height]
Along the entire three dimensions, the number of cubes will be 5*5*5= **125**

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d. *Answer:* 9
Explanation:
Number of cuts required to get 64 small cubes out of a cube
64 cubes =4*4*4 cubes
We know that for 'n' number of cuts, we'll get 'n+1' number of cubes
4*4*4 Number of cubes
3+3+3 Number of cuts
3 cuts on each. Total cuts will be **9.**

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e. *Answer:* 8
Explanation:
A cube of side 4 cm is cut into smaller cubes of side 1 cm.
We'll get totally (4*4*4) 64 small cubes.

i. Smaller cubes painted on 2 faces = 12 (n-2) =12(4-2) =**24.**
ii. Cubes painted on 3 faces are **8**(corner cubes).
iii. To make hollow cube we need to remove 0 face painted cubes i.e. $(n-2)^3 = (4-2)^3 = 2^3 =$ **8.**

Googly Questions

1. **Wrong**
The hands of the clock meet each other or 0° will be 11 times for every 12 hours
22 times for every 24 hours (1 day).

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2. **Wrong**
Today is Friday, the day after 1 year and 25 days cannot be determined. Since they have not mentioned whether the given year is a leap year or not.

3. **Wrong**
   29^{th} Feb 1896, the next 29^{th} February only comes on 1904.
   Since 1900 is not a leap year.

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4. **Wrong**
   2 cuts each along 3 dimension of a cube
   We know that for every n cuts, we'll get (n+1) pieces
   Cuts 2 2 2
   Pieces 3*3 *3 = 27 smaller cubes

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5. **Correct.**

CONCEPT REVIEW QUESTION

1. *Answer:* Option d
   Explanation:
   Given that the hands meet each other i.e. $\theta = 0^0$ duration within 5 am to 6 am
   We know that θ= 30h~11/2m for Angle measurement
   It can also be represented as θ= 11/2m ≈ 30h with 5-6 shows H=5hrs.
   0^0= 11/2m-30 (5) ➔150 = 11/2 m
   M = 300/11 or 27 (3/11) mins
   Exactly at **5 hrs 27 (3/11) mins** clocks be together.

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2. *Answer:* Option a
   Explanation:
   Generally in a clock the hour hand and the minute hand coincide for every 65 5/11 mins
   The hands of the test clock mentioned coincide for every 64 mins
   ➔ For every coincidence it'll save 1 5/11 mins
   I.e. for every 64 mins, 1 5/11 mins are saved,
   Gain per day = 1 5/11 /64 *24 * 60.
   = **360/11 mins**

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3. *Answer:* Option b
   Explanation:
   Today time is given as 5 am.
   We need to find original time while the set clock shows 5pm on the 5^{th} day
   Here they have given that the watch gains
   5 mins for every 12 hours
   10 mins for every 24 hours
   Similarly at 5^{th} day, 5 a.m it'll gain 50 mins 120 hours
   At 5^{th} day 5 a.m on set clock the original clock will show 4:10am.
   Similarly at 5 pm after 12 hours, it'll gain 5 more mins
   At 5^{th} day 5 p.m on set clock the original clock will show **4:05pm.**

4. *Answer:* Option c
   Explanation:
   The hands of the clock should be at right angle ($\theta=90^0$) between 5:30 to 6. So hour should be h=5hrs
   We know that $\theta = 11/2\ m - 30h$
   $90^0 = 11/2\ m - 30*5$
   $240 = 11/2\ m$ (or) $m=480/11$
   M=43 7/11 mins
   Between 5:30 to 6, the clock shows a right angle at **43 7/11 mins past 5**

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5. *Answer:* Option c
   Explanation:
   We need to find the angle formed at 14:40 am in a different planet
   I.e. we need to find angle difference between hour hand and min hand

Hr	Min
$18h - 360^0$	$90\ m - 360^0$
$1h - 20^0$	$1\ m - 4^0$

   Similarly
   $1\ hour\ or\ 90\ m - 20^0$
   $1m - (2/9)^0$
   Angle traced by min hand = $40 * 4 = 160^0$
   Angle traced by hour hand = $(14 * 20^\circ) + (40 * 2/9)^\circ$
   $= 280 + 8.8^\circ \approx 289^\circ$
   Angle Difference = $289^\circ \approx 160^\circ = \mathbf{129^0}$.

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6. *Answer:* Option b
   Explanation:
   The last day of century cannot be,
   We know that specialty of our calendar is for every 400 years, it will repeat and be the same
   First day of the calendar i.e. 01/01/0001 -Monday
   01/01/0101- Saturday [since 100y-5 odd days]
   [So last day of 100^{th} year will be Friday]
   01/01/0201 – Thursday [for 200y – 3 odd days]
   [Last day of 200^{th} year will be Wednesday]
   Similarly
   01/01/0301 – Tuesday [300y – 1 odd day]
   [Last day of 300^{th} year will be a Monday]
   01/01/0401 – Monday
   [Last day of 400^{th} year will be Sunday]
   Answer should be **Tuesday** from options

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7. *Answer:* Option c
Explanation:
Let us assume that **1/01/2007** as **Monday** [we can assume anything]
01/01/2007 Monday
01/01/2008 Tuesday
01/01/2009 Thursday
01/01/2010 Friday
01/01/2011 Saturday
01/01/2012 Sunday
01/01/2013 Tuesday
01/01/2014 Wednesday
01/01/2015 Thursday
01/01/2016 Friday
01/01/2017 Sunday
01/01/2018 Monday

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8. *Answer:* Option c
Explanation:
26^{th} Jan 1950.
Need to calculate odd days for years, months and Date
Odd days for years
1950 – Need to calculate odd days up to 1940
1949 – 1600+300+49
1600 – 0 odd days.
300 –1 odd day.
49 yrs =12 leap yrs+ 37 ordinary yrs.
= (24 odd days+ 37 odd days).
=61/7=5 odd days.
For years, odd days ➔ 1+5= 6
For months, odd days ➔ 0 [since before January there is no month]
For date, odd days ➔ 52 + 0 + 6 = 11 Odd days
I.e. 11/7 = 4 odd days
Corresponding day will be **Thursday.**

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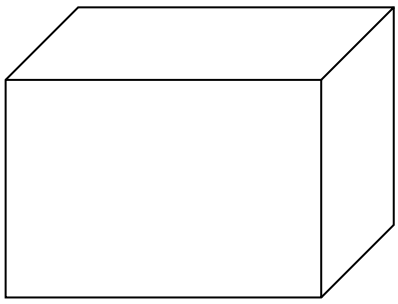
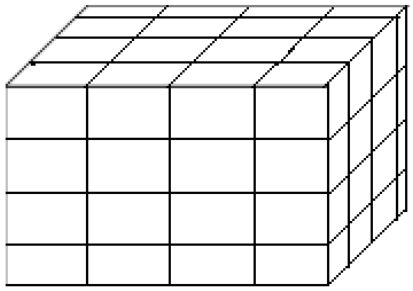
9. *Answer:* Option c
Explanation: (For Questions 9 to 13)
Initially



A solid cube of side 8 cm is cut into cubical block of 2 cm
For this we are cutting 3 cuts on one side [length], 3 cuts on another side [breadth] and 3 cuts on [height] other side



4*4*4 cube.

Cubes have no face painted= $(n-2)^3$
$= (4-2)^3$=**8.**

10. *Answer:* Option c
Explanation:
Cubes having only one face painted.
1 face painted =$6(n-2)^2$
=$6(4-2)^2$=**24.**

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11. *Answer:* Option d
Explanation:
Cubes having only two face painted.
2 face painted=12(n-2)
=12(4-2) =**24**.

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12. *Answer:* Option d
Explanation:
Cubes have 3 faces painted
Generally every cube will have only **8** corners cubes with 3 face painted

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13. *Answer:* Option c
Explanation:
Being cubes are painted with same color at opposite faces definitely the corner cubes only have 3 different color.

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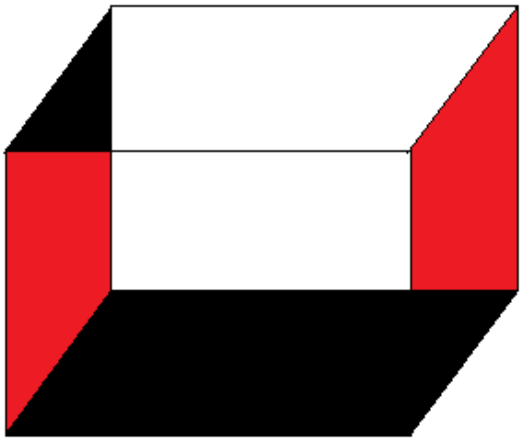
14. *Answer:* Option b
Explanation: (For questions 14&15)



4*4*4 cube

Cubes having 2 faces painted red and black remaining faces unpainted.
Edges connecting cubes with Red and Black will only have 2 face painted with red and black remaining are unpainted.

For 1 edge= (n-2)

For 4 edges (only with red &black) =4(n-2)

=4(4-2) =**8.**

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15. *Answer:* Option b
Explanation:
Cubes have one face painted red and all other faces unpainted
Red in one face= $(n-2)^2$
2 faces painted red, So $2(n-2)^2 = 2(4) =$**8 cubes.**

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16. *Answer:* Option d
Explanation:

Since colours are painted at opposite faces, none of the cubes will have the same colour on adjacent faces.

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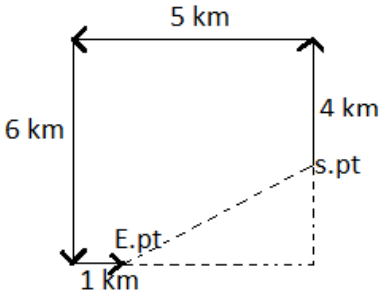
17. *Answer:* Option b
Explanation:



Shortest Distance = $\sqrt{2^2+4^2}$ = √16+4 = √20 = √4*5 or **2√5.**

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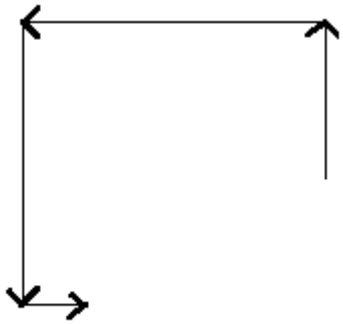
18. *Answer:* Option a
Explanation:



The person will be facing **East** direction at the end.

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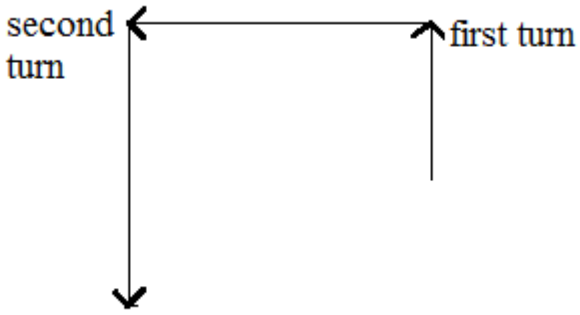
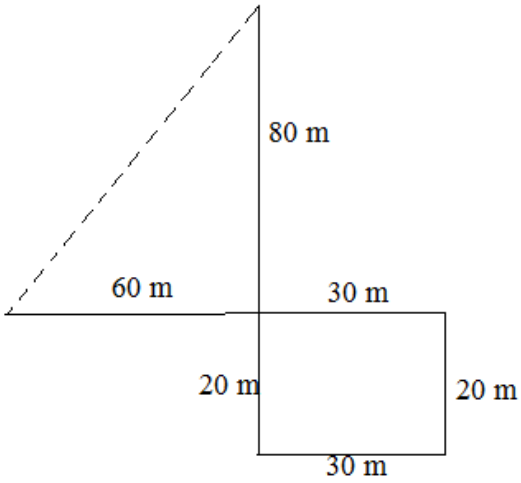
19. *Answer:* Option d
Explanation:



After taking the second turn the person will be running towards South.

20. *Answer:* Option b
Explanation:



$\sqrt{60^2 + 80^2} = \sqrt{3600+6400} = \sqrt{10000} =$ **100m.**