# PERCENTAGES

## DRILL 1: SOLUTIONS

a. *Answer:* 20

*Explanation:*

25% of 80 = (1/4)*80
= **20**

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b. *Answer:* 30

*Explanation:*

15% of 200:
10% of 200 = 20 +
5% of 200 = 10
**30**

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c. *Answer:* 37.5%

*Explanation:*

We know, 1/8 = 12.5%
Therefore 3/8 = 12.5*3
= **37.5%**

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d. *Answer: 5/8*

*Explanation:*

62.5% as fraction
50% = 1/2
12.5% = 1/8
(1/2) + (1/8) **= (5/8)**

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e. *Answer:125%*

*Explanation:*

1.25 in percentage is
**1.25 * 100 = 125%.**

## Drill 2

a) *Answer:* 40%

*Explanation:*

$$[\frac{Difference}{Compared\ value}] * 100 = (\frac{7-5}{5}) * 100$$
$$= \frac{2}{5} * 100$$
$$= \mathbf{40\%}$$

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b) *Answer:* 30%

*Explanation:*

$$[\frac{Difference}{Compared\ value}] * 100 = (\frac{40-28}{40}) * 100$$
$$= \frac{12}{40} * 100$$
$$= \mathbf{30\%}$$

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c) *Answer:* 16.66%

*Explanation:*

Assume Y=100;

X=120 (Because X is 20% ↑ than Y)

$$\%\ \text{less} = \frac{\text{difference}}{\text{Compared value}} * 100$$

$$= \frac{120-100}{120} * 100$$

$$= \frac{20-100}{120} * 100$$

= 16.66%

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d) *Answer:* 11.11%

*Explanation:*

Initially rate was Rs.24 /kg

Now, the rate is Rs. 27/kg

The increase was Rs.27-Rs.24 = **Rs.3/kg.**

So there is $\frac{1}{8}[\frac{1}{n}]$ increase,

Hence the decrease should be $\frac{1}{9}[\frac{1}{n+1}]$ = 11.11%

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e) *Answer:* 50%

*Explanation:*

$$a + b + \frac{ab}{100}(\text{successive \% increase/decrease})$$

$a + b + \frac{ab}{100}$ = 25+20+(25*20)/100

= **50%**

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f) *Answer:* a) 20%, b) 2% point, c) 200

*Explanation:*

a. % increase = $\left(\frac{\text{Difference}}{\text{Compare value}}\right)$ *100

= [(12-10)/10] *100

= (2/10)*100

= **20%**

b. Percentage point = 12-10

= **2 percentage points**

c. Percentage point = 100 base point

Therefore,

2 Percentage point = **200.**

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g) *Answer:* Maximum %change was 2002 - 2003

*Explanation:*

$$\%\ \text{change} = \left(\frac{\text{Difference}}{\text{Base value}}\right) * 100$$

2002- 2003 => [(120-80)/80]*100 = (40/80)*100

= 50%

2003- 2004 => [(120-110)/120]*100 = (10/120)*100

= 8.33%

2004-2005 => [(150-110)/110] * 100 = (40/110) * 100

= 36.3%

2005–2006 => [200-150)/150]*100 = (50/150) * 100

=33.33%

**Therefore percentage change over 2002- 2003 is greatest**!!!

## Drill 3

a) *Answer:* 15,000

*Explanation:*

As we all know,

$$\textbf{S.I} = \frac{Pnr}{100}$$

Here they have told that an amount P have been lend for 3 years at 12% simple interest and the person pays back Rs.5400.

So if I equate this in the equation:

5400 = (P* 3* 12)/100

**P = 15,000**

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b) *Answer:* 4 years

*Explanation:*

In the problem they have given the amount as Rs. 450 and simple interest Rs. 81 at the rate of interest 4.5%

To find n:-

We all know,

$$\textbf{S.I} = \frac{Pnr}{100}$$

81 = (450* n *4.5)/100

N = 8100/ (450*4.5)

**N = 4years**

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c) *Answer:* 1500

*Explanation:*

From the question,

Amount = Rs.2400

N = 6 yrs,

R = 10%

As we all know,

$$A = P + I$$

2400 = P+0.6P (for 6 yrs)

[10% for 1 yr, therefore for 6 years its 60%]

2400 = 1.6 P

**P = 1500**

## Drill 4

a) *Answer: 2 years*

*Explanation:*

Principal = Rs. 30,000
R= 7%
C.I = 4347 &
A=?

$$\mathbf{A = P\,[1+\frac{r}{100}]^n}$$

$34347 = 30000\,[1+\frac{7}{100}]^N$

**N = 2 years.**

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b) *Answer: 6%*

*Explanation:*

From the problem,

P = 1200
Amount = 1348.32
N = 2 yrs

$$A = P\,[1+\frac{r}{100}]^n$$

$1348.32 = 1200\,[1+\frac{r}{100}]^2$

Simplifying this,

**R = 6%**

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c) *Answer: 11261.62*

*Explanation:*

Principal = Rs. 10,000
R = 8%,
N = 1.5 yrs
They are calculated quarterly.
N = 6.

$$A = P\,[1+\frac{r}{100}]^n$$

$= 10,000\,[1+\frac{2}{100}]^6$
$= 10,000[1+ 0.02]^6$
$= 10,000 * (1.02)^6$
Amount = **11261.62**

## Drill 5

*a) Answer:*

*Explanation:*

Sum of money doubles itself in 5 years
i.e, 5 years = Amount = 2P ( P+I)
We need to find 8 times of sum in both SI & CI.

i) SI

5 years = 2P(P+I)
` 10 years = 3P(P+2I)
.
.
.
35 years = 8P(P+7I)

The amount become 8 times in **35 years.**

ii) CI

5 years = 2P (P+I) where I=P
10 years = 4P (P+3I)
15 years = 8P (P+7I)

**The Amount become 8 times of the sum in 15 years [compound interest]**

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*b) Answer: 51.25*

*Explanation:*

Given that, r = 5%,
total interest = Rs. 50 as simple interest
n = 2 years.

We know that in simple interest rate of interest always be same.
i.e. 2 years interest = Rs. 50
1 year it should be Rs.25
So 5% of P = Rs.25
100% of P (or) P = Rs. 500

Compound interest for 2 years is,

$$C.I = P\left[1+\frac{r}{100}\right]^n - P$$

$$= 500\left[1+\frac{5}{100}\right]^2 - 500$$

$$= 500 * \frac{105}{100} * \frac{105}{100} - (500)$$

$$= 551.25 - 500$$

C.I = Rs. 51.25

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c) *Answer: 5%*

*Explanation:*

| Years | SI | CI |
|---|---|---|
| 1 | Pr | Pr |
| 2 | Pr | $Pr+Pr^2$ |
| 3 | Pr | $Pr+Pr^2+Pr^2+Pr^3$ |

The difference between SI & CI for 2 years = Rs.120

$(Pr+Pr^2) - Pr$ = Rs.120

$Pr^2$ = Rs.120 ------- (1)

The difference between SI & CI for 3 years = Rs.366

$3Pr^2+Pr^3$ = Rs.366 ------- (2)

Sub (1) in (2)

$3(120) + Pr^3$ = 366 ---------- (2)

$Pr^3$ = 6

We know that $Pr^2$ =120

$Pr^3$ = 6

$Pr^2*r$ = 6

120*r = 6

$r = \frac{6}{120}*100$

$= \frac{1}{20}*100$

**r = 5%**



## GOOGLY QUESTIONS

1. *Answer:* **Wrong**

*Explanation:*

A number increased by 20% and then decreased by 10%.

When a value is successively increased and decreased it is given as

$$A-B-\frac{AB}{100}$$

[Where A, B are percentage changes]

= 20-10- [(20*10)/100]

**= 8%**

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2. *Answer:* **Wrong**

*Explanation:*

Given that 98% water and weighs 2.5kg, we can define it as

2% of 2.5kg = 0.05

Initially given that 99% water, whether water content increases or decreases the solid content will be same.

So, 1% of 2.5kg = 0.05kg

100% of solid content = 0.05*100 =5kg

3. *Answer:* **Correct**

4. *Answer:* **Correct**

5. *Answer:* **Correct**.

## Concept Review Question

1. *Answer: 30*

*Explanation:*

120% of X = 45

X = $\frac{45}{120}$ * 100

X = 225/6

X = 37.5

80% of 37.5 = $\frac{12}{100}$ *37.5

**= 30.**

2. *Answer: 6400*

*Explanation:*

Population 3 years back = 3600

Population at present = 4800

Population after 3 years =?

Increase from 3600 to 4800 = 1200

There is a (1/3) increase

So there should be same increase after 3 years

(1/3) of 4800 = 1600

3 years later = 4800+1600

= **6400**

3. *Answer: 42:33*

*Explanation:*

x+9 = 56% of [(x+9)+x]

We can find x from this

**x+9 = 42**

**x = 33**

4. *Answer: 85*

*Explanation:*

30% of marks failed by 10 marks
40% of marks got 15 marks extra
So 10% of marks = 10+15
=25
100% of marks = 250
To pass the person has to get 30% + 10 marks
30% of mark = 25* 3
= 75
To pass Peter should get = 75+10
**= 85**

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5. *Answer: x>y*

*Explanation:*

| ***Increases by x%*** | ***Decreases by y%*** |
|---|---|
| *increase by* $\frac{1}{n}$ | *Decrease by* $\frac{1}{n+1}$ |
| *Eg:* $\frac{1}{4}$ *= 25%* | *Eg:* $\frac{1}{5}$ = 20% |
| Only small work done on denominator. | more work done on denominator. |

Let us assume an example to understand this question.
**In x only 25% increased whereas y is decreased by 20%.**
So**, x>y**

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6. *Answer: 8%*

*Explanation:*

In the beginning,
Petrol price = 100%
Expenditure = 100%
Now petrol price = 125%
Kevin intends to spend 15% extra = 100+15
= 115%
So the petrol purchased should be reduced by
= 125-115
= 10
= $\frac{10}{125}$ * 100
100% = 125

10% = 12.5
1% = 1.25
1.25*8 = 10.0
Therefore 8% of 125 = 10
$\Rightarrow$ **the person has to reduce the purchase by 8%.**

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7. *Answer: 23 apples*

*Explanation:*

Let us assume there were 100 apples
60% of them are sold
Remaining apples will be 40%
15% of remaining apple $= \frac{15}{100} * 40$
= 6 apples.
So he throws 6 apples in first day.
The number of apples with him on the next day = (40-6)
= 34
He sold 50% of 34 = 17 apples
He throws away remaining apples
Apples second day =17 apples
In total he throws = 6+17
= **23 apples**.

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8. *Answer: 8 years*

*Explanation:*

Sum should double with 12.5% interest per annum.
Let,
P = 100
2P = 200
So P has to become 2P with 12.5% interest
1 year =12.5
Then for 8 year,
12.5*8 =100
**So it takes 8 years for the sum to double itself**

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9. *Answer: 1080, 1920*

*Explanation:*

If the interest is calculated for more number of years then the amount should be low.
In part 1 it is 8% for 4 years so the amount should be less than second part.
In 2nd part the amount should be higher because the years are less.
8% for 4 years is similar to 32% for 1 year.
And, 9% for 2 years is similar to 18% for 1 year.
They are in the ratio,
32 : 18
16 : 9

So the amount should be divided in reverse ratio because the interest is high the amount should be low

9 : 16

Therefore 3000/25 = 120

1 part = 120

So the amount is divided as

9 * 120 : 16 * 120 = **1080, 1920**

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10. *Answer: 9%*

*Explanation:*

First year she has deposited Rs.8000.

End of 1st year she withdraws Rs.2000

Therefore for next two years she deposits

= 6000+6000

= 12000

Totally she deposits = 8000+12000

= 20,000/-

The amount with her = Rs 2000+7800

= 9800

She has deposited Rs 8000 and she gets Rs 9800

Therefore 1800 is the interest.

So in 1 year if she deposits 20000, she gets an interest of 1800.

A = 20000

I = 1800

% of interest =?

100% = 20000

1 % = 200

Therefore ----- % = 1800

9 % = 200*9

= 1800

**Therefore the rate of interest is 9 %.**

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11. *Answer: 6272*

*Explanation:*

At the end of 1st year the person gets Rs.5600

The man invested Rs 5000

Therefore the interest amount = 5600 – 5000

= 600

Therefore the man gets Rs 600 for 1 year

% of interest =?

100 % = 5000
1 % = 50
-----% = 600
12% = 50*12
= 600

Therefore the rate of interest is 12%

This is compound interest so interest is calculated on the interest amount for the second year

% 12 of 600 = 72
At the second year = 600+600+72
Interest = 1272
Amount = 5000+1272
= 6272

So, the amount due at the end of the second year is **Rs 6272.**

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12. *Answer: 9856*

*Explanation:*

P = Rs 8000
10 % is interest = 800 (first year)
12 % on Rs 8800 (second year)
1 % = 88
12 % = 88 * 12
= 1056
Therefore the amount = 8000+800+1056
**= 9856**

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13. *Answer: 6.08*

*Explanation:*

Principal = Rs. 2500

| **Simple interest** | **Compound Interest** |
|---|---|
| Rate = 4% per annum | Rate = 2%[Compounded semi annually(half year)] |
| Interest = 4% on 2500=100<br>SI for 2 years =**Rs. 200** | 4 half year in 2 years.∴<br>1st half year interest = 2% on 2500 = 50<br>2nd half year interest=50+2% on 50 =51<br>3rd half year interest = 51+2% on 51=52.02<br>4th half year interest=52.02 + 2% on 52.02 =53.06<br>CI for 2 years = **206.08** |

Difference between CI & SI = 206.08 – 200 = **Rs.6.08**

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14. *Answer: 3797.80*

*Explanation:*

Each year 4.5% increases and 20% decreases,
Hence,

For 1st year = 6500*1.045*0.8
= 5434
For 2nd year = 5434*1.045*0.8
= 4542.824
For 3rd year = 4542.824*1.045*0.8
= **3797.80**

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15. *Answer: 360*

*Explanation:*

A sum of Rs.550 was taken as a loan.
Paid in two equal instalment
Rate of interest is 20% p.a.

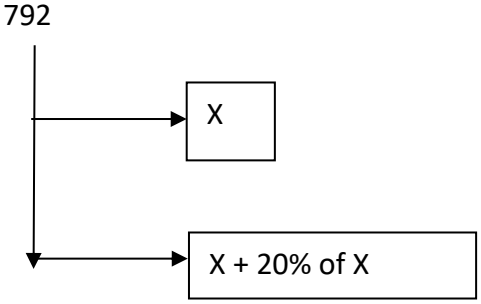
20% of 550 =?
10% = 55
20% = 110 (first year)

Second year,

20% of 550 = 110
20% of 110 = 22 [∴ compound interest]
= 132

In total he has to pay = 550 + 110 + 132
= 792

This 792 has to be paid in equal instalments.
1st instalments be x.
Then 2nd instalment 20% of x



1.2X + X = 792

2.2X = 792

**X = 360**