Unit 3 · Growth and Depreciation

ANSWER KEY · FOR TEACHERS

Full marks 33

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. growth rate → **c.** the percentage of itself a population or price gains each year
2. depreciation → **a.** the fall in a thing's value as it is used and ages
3. depreciated amount → **d.** the value a thing has lost, $V_0 - V_T$
4. $P(1 + R/100)^T$ → **g.** a population after T years of growth
5. $V_0(1 - R/100)^T$ → **f.** a value after T years of depreciation
6. in-migration → **b.** people moving to a place from somewhere else

Each carries 0.5 mark. K · 3

2 Fill the diagram

1. 25,500
2. Rs 190
3. 26,010
4. Rs 180.50

Each carries 0.5 mark. U · 2

3 Multiple choice

i. **c.** 0.85 K · 1

Losing 15% keeps 85% of the value, which is multiplying by 0.85. 1.15 is growth of 15%; 0.15 gives only the part lost.

ii. **c.** 24,200 U · 1

$20000 \times 1.1^2 = 24200$. 24,000 adds 10% of 20,000 twice, forgetting that the second year's 10% is of 22,000.

iii. **c.** 4% lower U · 1

$1.2 \times 0.8 = 0.96$: 4% lower. The fall is 20% of the bigger price.

iv. **a.** the first A · 1

Each year takes 10% of what is left, and the most is left at the start.

v. **b.** $P \times 1.04 \times 1.05 \times 1.06$ A · 1

One factor for each year's rate. $P \times 1.15$ adds the rates, which leaves out growth on growth.

4 Very short answers

a. MARKING SCHEME K · 1

✓ The formula written correctly.

b. MARKING SCHEME U · 1

✓ Rs 2,120.

c. MARKING SCHEME A · 1

✓ No, Rs 32,768.

5 Short answers

a. MARKING SCHEME U · 2

✓ Each year's growth is a percentage of that year's (bigger) population.

✓ So the number added grows each year.

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b. MARKING SCHEME U · 2

- ✓ The second year's depreciation is on the value left, not the first price.
- ✓ Rs 32,000.

c. MARKING SCHEME A · 2

- ✓ The factor 1.125 (or 6.25% gives about 1.129).
- ✓ Less than 6.25%.

6 Problems

a. ANSWER A · 4

From the beginning of 2078 to the end of 2079 is 2 years at 20%: $200 \times 1.2^2 = 200 \times 1.44 =$ **288 marketers**.

MARKING SCHEME

- ✓ 1 for every 5 is 20% a year.
- ✓ From the beginning of 2078 to the end of 2079 is 2 years.
- ✓ 200×1.2^2.
- ✓ 288 marketers.

b. ANSWER A · 4

After 2 years: $375000 \times 1.02^2 = 375000 \times 1.0404 = 390150$.
Then $390150 + 1480 - 2750 = 388880$.
After the third year: $388880 \times 1.02 = 396657.6$: **about 3,96,658**.

MARKING SCHEME

- ✓ After 2 years: $375000 \times 1.02^2 = 390150$.
- ✓ $390150 + 1480 - 2750 = 388880$.
- ✓ One more year: 388880×1.02.
- ✓ About 3,96,658.

c. ANSWER A · 4

Value after 3 years: $1600000 \times 0.95^3 = 1600000 \times 0.857375 = 1371800$.
Received: $1371800 + 510000 = 1881800$. Paid 16,00,000.
A profit of Rs 2,81,800.

MARKING SCHEME

- ✓ Value after 3 years: $1600000 \times 0.95^3 = 1371800$.
- ✓ Received: $1371800 + 510000 = 1881800$.
- ✓ Compared with Rs 16,00,000 paid.
- ✓ A profit of Rs 2,81,800.

7 Think

ANSWER HA · 2

$500 \times 1.1 = 550$, then $550 \times 0.9 = 495$. **He is not right**: the price is Rs 5 (1%) lower, because this year's 10% fall is of the bigger price, Rs 550.

MARKING SCHEME

- ✓ Rs 550, then Rs 495.
- ✓ Not right: the fall is a percentage of the bigger price.

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8 Activity: What is it worth now?

(not marked)

WHAT STUDENTS SHOULD FIND

Phones and laptops usually lose value fastest, because newer models come out quickly; vehicles more slowly (Nepal's tax law counts cars and buses as losing 20% a year); furniture slowest. The rate comes from $V_T/V_0 = (1 - R/100)^T$: for example a phone bought for Rs 30,000 and worth Rs 15,000 after 2 years has $0.5 = (1 - R/100)^2$, so $1 - R/100 \approx 0.71$: about 29% a year.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	5	9	17	2	**33**

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