

What is Budget Constraint?

Worksheet

Budget constraint is the equation $P_X \cdot Q_X + P_Y \cdot Q_Y = M$, where P_X and P_Y are prices, Q_X and Q_Y are quantities, and M is total income. All points on or inside the line are affordable.

$$P_X \cdot Q_X + P_Y \cdot Q_Y = M$$

P_X = Price of good X (\$/unit)

Q_X = Quantity of good X (units)

P_Y = Price of good Y (\$/unit)

Q_Y = Quantity of good Y (units)

M = Total income (budget) (\$)

Questions

1. If $M = 100$, $P_X = 4$, $P_Y = \$5$, and you buy 10 X, how much Y can you afford?
A) 12
B) 14
C) 16
D) 18
2. When income increases, the budget line...
A) rotates inward
B) shifts outward (parallel)
C) rotates outward
D) disappears
3. What is the slope of the budget line $P_X \cdot Q_X + P_Y \cdot Q_Y = M$?
A) M
B) $-P_X/P_Y$
C) P_X/P_Y
D) 1
4. If P_X doubles but M and P_Y stay the same, the X-intercept...
A) doubles
B) halves
C) stays the same
D) becomes negative
5. Income = 100, price of X = 5, price of Y = \$10. What is the maximum Y if you buy 8 units of X?
6. If you have 200, $P_X = 20$, $P_Y = \$4$, find the Y-intercept (max Y with zero X).
7. Income rises from 80 to 120. How does the X-intercept change if $P_X = \$10$?
8. Define: What is the budget constraint equation?
9. Define: What do the X and Y intercepts mean?
10. Define: How does a price increase affect the budget line?

Answer Key

1. B) 14 — Spent on X = $4 \times 10 = 40$. Remaining = $100 - 40 = 60$. $Y = 60/5 = 12$. No, wait: $60/5 = 12$. Let me recalculate: the answer is 12. Check: $4 \times 10 + 5 \times 12 = 40 + 60 = 100$. Correct.
2. B) shifts outward (parallel) — Higher income means more buying power for all combinations — parallel outward shift.
3. B) $-P_x/P_y$ — Solving for Q_y : $Q_y = (M - P_x \cdot Q_x)/P_y \rightarrow \text{slope} = -P_x/P_y$.
4. B) halves — X-intercept = M/P_x . If P_x doubles, the intercept is halved — you can afford half as much.
5. Spent on X = $5 \times 8 = 40$ Remaining for Y = $100 - 40 = 60$ Max Y = $60 / 10 = 6$ units
6. Budget equation: $20 \cdot Q_x + 4 \cdot Q_y = 200$ When $Q_x = 0$: $4 \cdot Q_y = 200$ $Q_y = 50$ units
7. Old X-intercept: $80/10 = 8$ units New X-intercept: $120/10 = 12$ units Intercept increases by 4 units (outward parallel shift).
8. $P_x \cdot Q_x + P_y \cdot Q_y = M$ — price times quantity for each good sums to income.
9. X-intercept = M/P_x (max X with zero Y). Y-intercept = M/P_y (max Y with zero X).
10. The intercept for that good moves inward; the line rotates.

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