

Firms' costs, revenue and objectives

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Last checked 1 October 2026

Read first: **Firms**

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What you need to know

This topic has five syllabus outcomes. In plain words, you should be able to:

1. **Define the costs of production:** total cost (TC), average total cost (ATC), fixed cost (FC), variable cost (VC), average fixed cost (AFC) and average variable cost (AVC). Marginal cost is **not** in the syllabus.
2. **Calculate** each of these costs, and **define, draw and interpret diagrams** that show how costs change as output changes.
3. **Define revenue:** total revenue (TR) and average revenue (AR). Marginal revenue is **not** in the syllabus.
4. **Calculate** total and average revenue, and explain how the amount a firm **sells** affects its revenue.
5. **Explain the objectives of firms:** survival, social welfare, profit maximisation and growth.

Understand it

Costs of production

A firm's **costs of production** are what it pays for the factors of production it uses: rent, wages, materials, power, interest on loans. Economists split them into two kinds.

- **Fixed costs (FC)** do **not change when output changes**, in the short run. The firm pays them even if it produces **nothing**: rent on the factory, insurance, interest on loans, the salaries of managers on fixed contracts, the cost of machines already bought. They are also called overheads or total fixed cost (TFC).
- **Variable costs (VC)** **change with output**: more output means more of them, and zero output means zero variable cost. Raw materials, fuel and power for machines, packaging, wages paid per hour or per item, and overtime pay are variable costs. They are also called total variable cost (TVC).

Total cost is the two added together:

$$TC = FC + VC$$

Each total has an **average**, the cost **per unit** of output, found by dividing by output:

$$ATC = \frac{TC}{\text{output}}, \quad AFC = \frac{FC}{\text{output}}, \quad AVC = \frac{VC}{\text{output}}, \quad ATC = AFC + AVC$$

Average total cost is often just called **average cost** or **unit cost**.

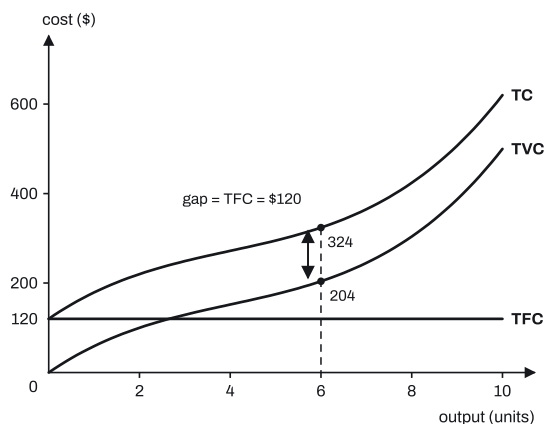
Here is a small workshop with fixed costs of \$120 a day.

Output (units)	FC (\$)	VC (\$)	TC (\$)	AFC (\$)	AVC (\$)	ATC (\$)
0	120	0	120	–	–	–
2	120	100	220	60	50	110
4	120	152	272	30	38	68
6	120	204	324	20	34	54
8	120	304	424	15	38	53
10	120	500	620	12	50	62

Read the table down each column:

- **FC stays at \$120** whatever the output, even at zero.
- **VC starts at zero** and rises as output rises.
- **TC is always \$120 more than VC**, so at zero output $TC = FC$.
- **AFC falls all the time**, because the same 120 is spread over more and more units: $120 \div 2 = 60, 120 \div 10 = \12 . It never reaches zero.
- **AVC falls at first, then rises** (lowest here, \$34, at 6 units). At first workers can specialise and machines are used more fully; later the workshop gets crowded and extra output costs more per unit.
- **ATC falls, then rises**: it is $AFC + AVC$, so it is always above AVC, and the gap between them (AFC) shrinks as output rises.

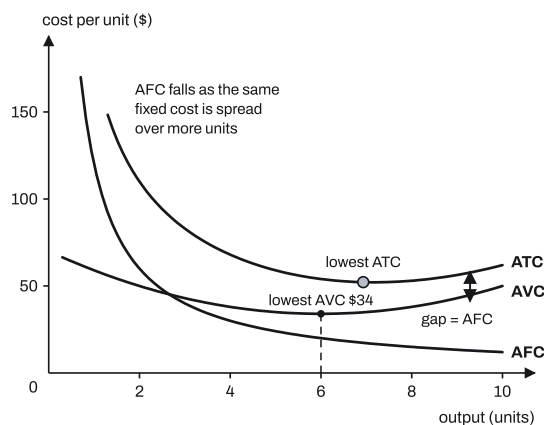
Cost diagrams



On a **total cost** diagram:

- **TFC is a horizontal line:** fixed cost is the same at every output.
- **TVC starts at the origin** (no output, no variable cost) and slopes upwards.
- **TC starts on the vertical axis at the level of fixed cost** and runs above TVC by the same vertical distance, the fixed cost, at every output.

So at any output, the **fixed cost** is the height of TFC (or the gap between TC and TVC), the **variable cost** is the height of TVC, and the **total cost** is the height of TC. If you are shown only a TC curve, the fixed cost is where it **meets the vertical axis**, and variable cost = TC – that fixed cost. A **straight TC line** means each extra unit adds the same variable cost, so AVC is **constant**.



On an **average cost** diagram:

- **AFC slopes down all the way**, getting flatter, because a fixed total is divided by a bigger and bigger output.
- **AVC and ATC are U-shaped:** they fall, reach a lowest point, then rise.
- **ATC is above AVC** by the amount of AFC. Where AFC is large (low output), the gap is wide; at high output it is narrow.
- Because $AVC = ATC - AFC$, you can compare AVC and AFC from a diagram that only shows ATC and AFC: if ATC is **less than twice** AFC, then AVC is less than AFC.

Revenue

Revenue is the money a firm **receives from selling** its output. It is not profit: costs haven't been taken off yet.

$$TR = \text{price} \times \text{quantity sold}, \quad AR = \frac{TR}{\text{quantity sold}}$$

If every unit sells at the same price, **average revenue equals the price**. A café that sells 300 coffees at 3 has $TR = 900$ and $AR = \$3$. So if you know only a firm's price and the quantity it sells, you can work out its TR and AR, but **not** its costs or profit.

How sales affect revenue. More units sold at the same price means more revenue. But a firm usually has to **lower its price to sell more**, so TR depends on how much extra it sells. With a falling price, TR often rises and then falls:

Output sold	AR (price) (\$)	TR (\$)
10	14	140
20	12	240
30	10	300

Output sold	AR (price) (\$)	TR (\$)
40	8	320
50	6	300

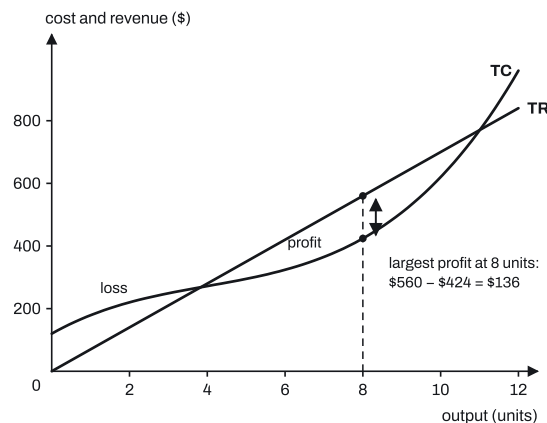
TR is highest at 40 units. Beyond that, the price cut loses more on the units already being sold than the extra units bring in. This links to price elasticity of demand: cutting the price **raises** TR when demand is **elastic** and **lowers** it when demand is **inelastic**.

Revenue rises when **demand** for the product rises (higher incomes, successful advertising, a change in tastes, a rise in the price of a substitute or a fall in the price of a complement, better quality), when the firm gains **market share or market power**, or when it gets a government **subsidy** paid per unit sold.

Profit

$$\text{profit} = \text{TR} - \text{TC} = (\text{AR} - \text{ATC}) \times \text{quantity}$$

A firm makes a **profit** when revenue is more than cost and a **loss** when cost is more than revenue. Profit rises when revenue rises by more than costs, or costs fall by more than revenue. A higher output does **not** automatically mean higher profit: you must compare what happens to revenue **and** to costs.



On this diagram, **profit is the vertical gap** between TR and TC where TR is above. The firm **maximises profit** at the output where that gap is **biggest**: here 8 units, with profit $560 - 424 = \$136$. At low outputs the fixed cost makes TC higher than TR, so the firm makes a loss.

Objectives of firms

A firm's **objective** is what it is mainly trying to achieve. The syllabus names four.

- **Profit maximisation**: making **as much profit as possible**, the biggest gap between TR and TC. It is the usual aim of private sector firms, because profit rewards the owners and shareholders and pays for investment. It does not mean "more profit than last year".
- **Survival**: staying in business. It matters most for **new firms**, small firms, and any firm in a recession or facing strong competition. To survive **in the long run** a firm must at least **cover its costs** (be profitable); it doesn't need to grow. A firm may accept a short-run loss to survive, and keep producing while it expects demand to rise or costs to fall, while it can use past profits, or while it is subsidised.
- **Growth**: getting bigger, by selling more, gaining **market share**, or merging. Growth can bring economies of scale (lower average cost), more market power, higher future profits and more security from takeover; managers may gain higher pay and status. But it can bring diseconomies of scale, and it may cost profit in the short run (lower prices or heavy advertising to win customers).
- **Social welfare**: benefiting society, not the owners, for example providing an essential service cheaply or free, keeping jobs, or reducing pollution. It is the usual aim of **state-owned enterprises** (public sector firms) and charities. A state-owned health service aims at **public satisfaction** and good health, not profit; a bank or bus company may keep **loss-making** branches or routes open so people in remote areas are still served.

Firms can have more than one objective, and objectives change: a new firm aims to survive, then to grow, then to maximise profit. Private firms may also aim at social welfare to improve their image (which can raise demand and profit later).

Key facts and formulas

This topic has no formula list in the exam. "Learn it" means you must remember it.

Formula or fact	Status
$\text{TC} = \text{FC} + \text{VC}$, so $\text{VC} = \text{TC} - \text{FC}$ and $\text{FC} = \text{TC}$ at zero output	Learn it
$\text{ATC} = \frac{\text{TC}}{\text{output}} = \text{AFC} + \text{AVC}$	Learn it
$\text{AFC} = \frac{\text{FC}}{\text{output}}, \text{AVC} = \frac{\text{VC}}{\text{output}}$	Learn it
$\text{TR} = \text{price} \times \text{quantity sold}$	Learn it

Formula or fact	Status
$AR = \frac{TR}{\text{quantity sold}} = \text{price}$	Learn it
$\text{profit} = TR - TC = (AR - ATC) \times \text{quantity}$	Learn it
Fixed costs don't change with output and are paid at zero output; variable costs change with output	Learn it
AFC falls continuously; AVC and ATC are U-shaped; TFC is horizontal; TC is TVC shifted up by FC	Learn it
Objectives: survival, social welfare, profit maximisation, growth	Learn it

How to do it

We have tagged 59 questions on this topic (2021–2025): 50 multiple choice on Paper 1 and 9 structured questions on Paper 2. One structured question has two parts about this topic, so there are 60 question parts in all. They came up this often.

Question type	Question parts
Multiple choice (concept)	26
Multiple choice (calculation)	24
Explain (4 marks)	4
Discuss (6 or 8 marks)	3
Analyse (6 marks)	2
Define (2 marks)	1

1. Multiple choice (concept) (26 question parts)

- Decide which idea is tested:** a type of cost, revenue, a cost diagram, or an objective.
- Test each option** against the definitions: fixed = paid at zero output; variable = changes with output; $TR = \text{price} \times \text{quantity}$; $\text{profit} = TR - TC$.
- Eliminate** options that mix up totals and averages, or revenue and profit.

Variations you will meet:

- Reading cost and revenue diagrams** (8 parts): on a total cost diagram TFC is the horizontal line, TVC starts at the origin and TC starts at the fixed cost; the variable cost at an output is the height of TVC (or TC minus the fixed cost). A straight TC line means constant AVC. $AVC \text{ from a TC diagram} = (TC - \text{fixed cost}) \div \text{output}$, written with the diagram's letters. With ATC and AFC drawn, AVC is the gap between them, and TFC never changes. On a TR and TC diagram, profit is greatest where TR is **furthest above** TC.
- Types of cost** (7 parts): fixed costs are **present when output is zero** (rent, insurance, interest on existing loans); variable costs change with output (raw materials, fuel, overtime pay). A fall in fuel prices lowers a delivery firm's **variable** costs. $\text{Average cost} = \text{total cost} \div \text{output}$. **AFC** is the only cost that **falls continuously** as output rises.
- Revenue** (7 parts): revenue is **money received from sales**; $TR = \text{price} \times \text{quantity sold}$, not $\text{quantity} \times \text{cost}$ or profit. From price and quantity alone you know **TR and AR**, but not cost or profit.
- Objectives** (4 parts): profit maximisation = making **as much profit as possible**; a state-owned health service aims at **public satisfaction** (social welfare); keeping loss-making branches open = **social welfare**; long-run survival needs **profitability** but not growth.

2. Multiple choice (calculation) (24 question parts)

- Write the formula** you need ($ATC = TC \div \text{output}$, $TR = P \times Q$, and so on).
- Find any missing total first:** $TC = FC + VC$; $FC = TC$ at zero output; $VC = TC - FC$.
- Work out every option** in a table question, then compare.

Variations you will meet:

- Costs from figures or a table** (12 parts): for example FC 500 and VC 1500 at 100 units gives $ATC = 2000 \div 100 = 20$ (not 15, which leaves out the fixed cost). $AFC \text{ from TC and TVC} : (TC - TVC) \div \text{output}$. With a table of TVC, add the fixed cost to each before dividing, and check whether ATC falls, rises or falls then rises. If you know the average cost, 4 units at 30 each is 120; a fifth costing 40 makes 160, so the average is $160 \div 5 = \$32$. Watch whether a column is a **total** or an **average**.
- Revenue** (8 parts): $TR = AR \times \text{quantity}$. If AR goes from 6 to 8 while sales fall from 30 to 20, TR goes from 180 to 160, a fall of 20. *With AR (price) falling in a table, multiply out every row to see whether TR rises, falls, or rises then falls, and where it is highest. Profit per unit + cost per unit = AR - ATC: goods costing 50 each sold at 20 profit each have AR 70.*
- Costs read off a diagram** (3 parts): read the fixed cost where TC starts on the vertical axis, subtract it from TC at the output asked, then divide by output if the question wants AVC. Check the axis units (for example \$000).
- Profit** (1 part): $\text{profit} = (AR - ATC) \times \text{output}$ for each row; the biggest is the answer, even if $AR - ATC$ per unit is not the biggest.

3. Explain (4 marks) (4 question parts)

Two points, each 1 mark to identify + 1 mark to explain. Keep them clearly separate.

Variations you will meet:

- **Why a firm's revenue may rise, or ways a firm can raise its profit** (2 parts): higher demand (1) because of higher incomes, advertising or better quality (1); a price change **with elasticity** (1): raising the price when demand is inelastic, or cutting it when demand is elastic, raises revenue (1); more market power (1); a subsidy (1). For profit: cut costs (1), for example cheaper materials, more capital-intensive methods, training that raises productivity, or a merger that brings economies of scale (1); or raise revenue (1) as above. Each route (lower costs, higher demand) is credited once, so make your two points different. Revenue points must be about revenue: lower costs don't count in a revenue question.
- **How a change affects a firm's profits** (1 part), such as using greener materials or new equipment: go through **costs** and **revenue**. Costs up (1) → profit down (1); better image → more demand → revenue up (1) → profit up (1); subsidies or cheaper, more secure supplies in the long run (1). Both directions earn marks if each is explained; "profits rise" with no reason earns nothing.
- **Why a loss-making firm may keep producing** (1 part): it expects the loss to be **short-term** (demand to rise or costs to fall) (1 + 1); it has **past profits** to cover the loss (1 + 1); it is **subsidised** (1 + 1); it is a **new** firm aiming to survive and grow (1 + 1); its objective is **not profit**, such as social welfare or market share (1 + 1).

4. Discuss (6 or 8 marks) (3 question parts)

The 6-mark Section A parts give up to 4 marks for each side, so write **two developed points each side**. The 8-mark parts are levels-marked: Level 3 (6–8) needs **both sides developed** and a judgement.

Plan:

1. **Define** the key term in one line (average cost, profit, growth).
2. **Why it might**: two chains that end at costs, revenue or profit.
3. **Why it might not**: two **new** points, not the first side turned round.
4. **Judgement**: what it depends on (demand, competition, how long it lasts, the firm's type).

Variations you will meet:

- **Will a firm's costs fall, or its profits rise?** (2 parts): for costs falling: training and better working conditions → higher productivity → lower average cost; more or better capital → faster output, fewer mistakes, less waste; growth → economies of scale; for profits rising: higher incomes → more demand → more revenue, costs rising less than revenue. Against: raw material prices may rise (bad harvests, a weaker currency, tariffs on imported materials); lower unemployment → harder to recruit → higher wages; training and new machines cost money at first; diseconomies of scale; new taxes; foreign competition cutting sales and prices; skilled workers leaving. Profit questions need **both** revenue and costs.
- **Should a firm have growth (or profit) as its main objective?** (1 part): for growth: bigger market share and market power, economies of scale, higher profits later, harder to take over, higher pay for managers. Against: survival matters more when demand is falling; a niche market limits growth; diseconomies of scale; pressure on workers; profit first can fund growth later; a state-owned firm aims at social welfare. Keep it about **the firm**; examiners gave little for answers about economic growth, unemployment and inflation in the whole economy.

5. Analyse (6 marks) (2 question parts)

A mark per link. Write **three developed chains** (point → how → result the question asks about). A list caps you at about 3 of 6.

Variations you will meet:

- **How something affects firms' profits**, such as advances in technology (1 part): better capital (1) → higher productivity (1) → lower average cost (1) → more profit (1); better or new products (1) → more demand and revenue (1); online selling reaches more customers abroad (1) → more revenue (1). The other way: new equipment is expensive at first (1) → lower profits in the short run (1); rivals' new products (1) → less demand for older products (1). Lower costs of production are credited only once, so vary the chains.
- **Using a diagram, the effect of output on costs**, such as AFC and TFC (1 part): up to 4 marks for the diagram: axes labelled **costs** and **output** (1), TFC a **horizontal** line (1), AFC **sloping down** (1), both curves labelled (1); then up to 2 for the analysis: TFC doesn't change with output (it is paid even at zero) (1); AFC falls because the same fixed cost is divided by more units (1). Don't draw a demand and supply or PPC diagram.

6. Define (2 marks) (1 question part)

A full, precise definition earns 2; a partial one earns 1. **Average total cost** = total cost divided by output (2); "cost per unit" alone earns 1. Learn a two-part definition for each term: fixed cost = a cost that does not change with output (1) and has to be paid even when output is zero (1); total revenue = price multiplied by the quantity sold (2).

Worked examples

Example 1

A bakery has fixed costs of 600 a week. In one week it bakes 400 cakes, with variable costs of 1000.

- (a) Calculate the total cost and the average total cost. [2]
- (b) Calculate the average fixed cost and the average variable cost. [2]
- (c) It sells all 400 cakes at \$5 each. Calculate its total revenue, average revenue and profit. [3]
- (d) The next week it bakes and sells 500 cakes. Its variable costs rise to \$1250. Calculate the new average total cost and explain why it has changed. [3]

(a) $TC = 600 + 1000 = 1600$ (1). $ATC = 1600 \div 400 = \$4$ (1).

(b) $AFC = 600 \div 400 = 1.50$ (1). $AVC = 1000 \div 400 = 2.50$ (1).

(c) $TR = 5 \times 400 = 2000$ (1). $AR = 2000 \div 400 = 5$, the price (1). Profit = $2000 - 1600 = \$400$ (1).

(d) $ATC = (600 + 1250) \div 500 = 3.70$ (1). *AVC is unchanged at 2.50 (1), but the same 600 of fixed cost is now spread over more cakes, so AFC falls from 1.50 to 1.20, and ATC falls with it (1).*

Example 2

- (a) Define fixed cost. [2]
- (b) Explain two reasons why a firm's profit may fall even though its revenue has risen. [4]
- (a) A cost that does not change when the firm's output changes (1), and which must be paid even when output is zero, such as rent (1).
- (b) Its costs may have risen by more than its revenue (1): for example, if the price of raw materials rises, variable costs rise on every unit, so the gap between TR and TC narrows (1).

It may have raised its revenue by spending heavily on advertising (1): the advertising adds to total cost, and if it costs more than the extra revenue it brings in, profit falls (1).

Example 3

Analyse how a rise in the price of raw materials may affect a firm's costs and profits. [6]

Raw materials are a variable cost (1), so their higher price raises the variable cost of every unit made, increasing AVC and ATC (1). Fixed costs such as rent don't change (1).

If the firm keeps its price the same, the gap between average revenue and average cost narrows (1), so its profit falls (1).

If it raises its price to cover the cost, revenue depends on price elasticity of demand (1): with inelastic demand sales fall only a little, so revenue rises and profit may be protected (1); with elastic demand sales fall a lot, so revenue falls and profit falls further (1). (Any 6.)

Example 4

Discuss whether or not a state-owned bus company should aim to maximise its profit. [8]

Profit maximisation means making the largest possible difference between total revenue and total cost.

Why it should. Profits could pay for new, cleaner buses and better services without using taxes, so the government could spend its tax revenue on schools or hospitals instead (developed point for).

Aiming for profit pushes managers to cut waste and keep average cost low, for example by running fewer empty buses. An efficient company provides the service at a lower cost to society, and a loss-making one is a burden on taxpayers (second developed point for).

Why it should not. A state-owned firm usually exists for social welfare. To maximise profit it would raise fares and close quiet routes, so people in rural areas and on low incomes, who depend on buses, could not get to work, school or hospital (developed point against).

Buses reduce traffic congestion and pollution, benefits that do not show up in the firm's revenue. Low fares that encourage people to leave their cars at home help society even if the company makes less profit or a loss (second developed point against).

Judgement. It depends on the routes and who uses them. On busy city routes the company can make a profit without harming anyone, but on routes that people have no alternative to, social welfare should come first, with the loss covered by a subsidy. A sensible aim is to cover costs where possible, not maximise profit. Both sides are developed and the conclusion says what the answer depends on, so this meets the Level 3 descriptor (6–8 marks).

Common mistakes

- **Mixing up totals and averages.** In a table of total variable cost, examiners saw candidates treat the column as average variable cost. Read every heading, and divide a total by output to get an average.
- **Leaving fixed cost out of ATC.** $ATC = (FC + VC) \div \text{output}$. $\$1500 \div 100$ is AVC, not ATC.
- **Thinking AVC or ATC keeps falling.** Only AFC falls continuously; AVC and ATC fall and then rise.

- **Misreading cost diagrams.** TVC starts at the origin; the fixed cost is where TC meets the vertical axis. Examiners reported diagrams with TFC rising, AFC flat, and AFC confused with AVC. TFC is **horizontal** and AFC **slopes down**.
- **Drawing the wrong diagram.** In a cost question, a demand and supply or PPC diagram earns nothing.
- **Treating revenue as profit.** Revenue is money from sales; profit is revenue minus costs. Lower costs don't raise revenue.
- **Saying more output means more profit.** Examiners saw answers that said profit rises because revenue rises, and others that said costs rise so profit falls. Compare the change in revenue **and** in costs.
- **Changing price without elasticity.** "Raise the price to raise revenue" earns nothing unless you say demand is inelastic.
- **Writing about the whole economy in a firm question.** For "should a firm aim to grow?", write about economies and diseconomies of scale, market share and other objectives, not unemployment and inflation.

How to get the marks

- **Define** (2 marks): a precise definition earns both marks. Learn exact forms: ATC is total cost **divided by output**; fixed costs **don't change with output**.
- **Explain two ...** (4 marks): identify (1) + develop (1), twice, with two **different** routes (one about costs, one about revenue, for example).
- **Analyse** (6 marks): three developed chains, each ending at the result the question names (costs, revenue, profit). With "using a diagram", the diagram can earn up to 4 marks: label both axes, draw each curve the right shape, and label every curve.
- **Discuss** (6 or 8 marks): two developed points each side, then a judgement saying **what it depends on**. Keep it about the firm in the question.
- **Calculations:** write the formula, show the working and give the units (\$, per unit).
- **Multiple choice:** 1 mark each, no penalty for guessing, so answer every one. Work out every option in a table question.

Quick check

1. Which is a fixed cost for a taxi firm?
 - **A** fuel for the taxis
 - **B** pay for drivers per trip
 - **C** the yearly insurance on the taxis
 - **D** tyres worn out by driving
2. A firm produces 50 units. Its total cost is 900 and its fixed cost is 400. What is its average variable cost?
 - **A** \$8
 - **B** \$10
 - **C** \$18
 - **D** \$500
3. A firm can sell 20 units at 9, 40 units at 7, 50 units at 5 or 60 units at 3. At which price is its total revenue highest, and what is it?
4. A café run by a charity keeps its prices low so that elderly people can afford a hot meal. Which objective is it mainly pursuing?
 - **A** growth
 - **B** profit maximisation
 - **C** social welfare
 - **D** survival
5. Explain two reasons why a new firm may aim for survival rather than profit maximisation. **[4]**

Answers

1. **C.** Insurance is paid whether the taxis carry anyone or not. Fuel, pay per trip and tyre wear all rise with the number of trips. (1)
2. **B.** $VC = 900 - 400 = 500$; $AVC = 500 \div 50 = 10$. *As* $AFC(400 \div 50)$ and C is $ATC(900 \div 50)$. (1)
3. $TR = 20 \times 9 = 180$, $40 \times 7 = 280$, $50 \times 5 = 250$, $60 \times 3 = 180$. It is highest at 7^* , *with* $TR^* = 280$.
4. **C.** It puts people's welfare ahead of profit. (1)
5. It has few customers at first (1): customers don't know it yet, so its revenue may not cover its costs and it must first make sure it can stay in business (1). It faces established rivals (1): to win customers it may charge low prices and spend on advertising, accepting little or no profit until it has built up its sales (1). (Also: it has high set-up costs to pay off; it may find it hard to borrow.)

Past questions to try

- 0455/21/M/J/21 Q5: part (d), whether a firm should have growth as its main objective.
- 0455/22/F/M/22 Q3: part (c), a diagram of AFC and TFC as output rises.
- 0455/13/M/J/25 Q15: average total cost from a table of variable costs.
- 0455/12/M/J/24 Q14: total revenue from a table of average revenue.