

Rates of change and standardised rates

About 50 minutes Calculator allowed 42 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/stats-rates-of-change-and-standardised-rates/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

A1 Needed today [2 marks] **A2** Last lesson [2 marks]

$x : y = 4 : 3$ and $y : z = 2 : 5$.
Find $x : z$ in its simplest form.

Answer

The chain base index numbers for the price of a litre of milk are 104 for 2021, 106 for 2022 and 108 for 2023, each compared with the year before. Work out the index number for 2023 with 2020 as the base year. Give your answer to 1 decimal place.

Answer

A3 Maths skill [2 marks] **A4** Maths skill [2 marks]

Two counters are taken at random, with replacement, from a bag of 9 red and 1 blue counters. Find the probability that both are red.

Answer

Work out $1.2^2 - 0.9 \times 0.5$.

Answer

B Examples, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A town of 48 000 people had 576 births in a year. Work out the crude birth rate and say what it means.

Hint Divide the births by the population, then multiply by 1000.

B1 A city of 75 000 people had 1350 deaths in a year. Work out the crude death rate and say what it means. [2 marks]

EXAMPLE 2

A district of 62 000 people has a crude death rate of 9.5 per 1000. How many deaths were there?

Hint 9.5 per 1000 means 9.5 deaths for every 1000 people.

EXAMPLE 3

The table shows the death rates in each age group of a town, and a standard population. Work out the standardised death rate for the town.

Age group	0–24	25–64	65 and over
Deaths per 1000	2	5	40
Standard population (%)	30	50	20

Hint Weight each rate by the standard population, not by the town's own people.

EXAMPLE 4

A town has 6400 women aged 15 to 44. There were 416 births in a year. Work out the general fertility rate.

Hint Divide the births by the number of women aged 15 to 44, then multiply by 1000.

EXAMPLE 5

Town P has a crude death rate of 15 per 1000 and town Q has 9 per 1000. Many retired people live in P. Explain why this does not show that P is a less healthy place to live.

Hint Which people are most likely to die in any year?

- B2** A town had 784 births in a year. Its crude birth rate was 11.2 per 1000. Work out the population of the town. [2 marks]

Answer

- B3** The table shows the death rates in each age group of a village, and a standard population. Work out the standardised death rate for the village, to 1 decimal place. [3 marks]

Age group	0–24	25–64	65 and over
Deaths per 1000	2	4.6	43
Standard population (%)	25	55	20

Answer

- B4** A town has 90 000 people, and 18% of them are women aged 15 to 44. There were 1134 births in a year. Work out the general fertility rate. [3 marks]

Answer

- B5** City R has many students and a crude death rate of 6 per 1000. City S has 10 per 1000. Ella says R must be the healthier city. Give a reason why she may be wrong. [2 marks]

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C Practice

- C1** City A had 2340 births and a population of 180 000. City B had 1736 births and a population of 124 000. Which city had the higher crude birth rate? Show your working. [3 marks]

Answer

- C3** An island has 7250 women aged 15 to 44, and 377 babies were born there in a year. Work out the general fertility rate. [2 marks]

Answer

- C2** A county of 46 000 people has a crude death rate of 8.5 per 1000. Work out the number of deaths in a year. [2 marks]

- C4** The table shows the death rates in each age group of a town, and a standard population. Work out the standardised death rate. [3 marks]

Age group	0–29	30–59	60 and over
Deaths per 1000	3	6	50
Standard population (%)	20	60	20

Answer

D Exam-style questions

- D1** Hillford has a crude death rate of 9.6 per 1000. Seaport, where many retired people live, has a crude death rate of 14.8 per 1000. The table shows their death rates in each age group, and a standard population.

Age group	0–44	45–74	75 and over
Hillford: deaths per 1000	1.2	8	90
Seaport: deaths per 1000	1.0	7	85
Standard population (%)	60	30	10

- (a) Work out the standardised death rate for Hillford, to 1 decimal place. [2 marks]

Answer

- (b) Work out the standardised death rate for Seaport. [2 marks]

Answer

- (c) Compare the death rates of the two towns. Explain why the crude rates and the standardised rates disagree. [2 marks]

Total for D1: 6 marks

D2

A town has 52 000 people, and 21% of them are women aged 15 to 44. There were 819 births in a year. Leo works out $\frac{819}{10\,920} \times 100 = 7.5$ and says the general fertility rate is 7.5.

[3 marks]

Explain why Leo is wrong, and work out the correct general fertility rate.

E

Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

E1

The table shows a town's death rates in each age group and a standard population. One rate, x , is missing. The town's standardised death rate is 13.4 per 1000. Find x .

[3 marks]

Age group	0–39	40–69	70 and over
Deaths per 1000	2	x	60
Standard population (%)	40	45	15

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1
- Hint 1

Write the standardised rate as a fraction with x in the top.

Hint 2

$$\frac{2 \times 40 + 45x + 60 \times 15}{100} = 13.4.$$

Hint 3

$980 + 45x = 1340$, so $45x = 360$ and $x = 8$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can work out a crude rate or a general fertility rate per 1000 and say what it means.
- I can work out a standardised rate using a standard population.
- I can explain why crude rates can mislead when two places have people of different ages.